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# DRAFT
# FEASIBILITY STUDY REPORT

## BLACKWELL LANDFILL NPL SITE
## DU PAGE COUNTY, ILLINOIS

JUNE 1995

*PREPARED FOR:*
FOREST PRESERVE DISTRICT
*DU PAGE COUNTY, ILLINOIS*

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*PREPARED BY:*
MONTGOMERY WATSON AMERICAS, INC.
*ADDISON, ILLINOIS*

MONTGOMERY WATSON

PROJECT
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# DRAFT FEASIBILITY STUDY

## BLACKWELL LANDFILL
DU PAGE COUNTY, ILLINOIS

JUNE 1995


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# EXECUTIVE SUMMARY

This document is the Feasibility Study for the Blackwell Landfill NPL Site (site) located in DuPage County, Illinois. The Remedial Investigation (RI) performed at the site (Warzyn, 1992) demonstrated that sufficient data was generated to develop an assessment of the risks posed to health and the environment in the vicinity of the site.

The site is located in Section 26, Township 39 North, Range 9 East, DuPage County, Illinois. The site is part of the Roy C. Blackwell Forest Preserve and is owned by the Forest Preserve District of DuPage County (FPD). The landfill occupies approximately 40 acres within a forest preserve of more than 1,200 acres.

The maximum elevation of the site is formed by the landfill itself (approximate elevation 840 ft, MSL). The landfill slopes steeply to the south toward Sand Pond (elevation 690 ft, MSL). The landfill slopes more gently to the northeast toward Silver Lake, which has an approximate elevation of 708 ft, MSL.

The site is bounded by Silver Lake on the east, Spring Brook on the west, and the West Branch of the DuPage River on the southwest. Sand Pond and Pine Lake are located within the site boundaries. The landfill is located within the Spring Brook watershed of the West Branch of the DuPage River drainage basin. From Spring Brook, surface water drains to the West Branch of the DuPage River and, ultimately, to the Des Plaines River.

**Geologic Setting**

The geology of DuPage County consists of recent alluvial and Pleistocene glacial deposits overlying Silurian dolomite bedrock. The surficial deposits are predominantly the result of Wisconsin-age glaciation, with minor modifications by recent alluvial processes. Till Members of the Wedron Formation, and sand and gravels of the Henry Formation, are present in the site area. The following unconsolidated stratigraphic units have been identified at the site in ascending order: The Tiskilwa Till Member, the Malden Till Member, the Yorkville Till Member, and the Batavia Member of the Henry Formation.

The unconsolidated stratigraphic sequence is variable across the site in an east to west direction. This is due to the site's location on the western edge of the West Chicago Moraine. The uppermost till unit present at the site, the Yorkville Till Member, forms this moraine. Meltwater from the glacier that deposited the till appears to have formed a river which flowed north to south along the front of the moraine. Previously deposited

glacial sediments were subsequently eroded and re-deposited as the Batavia Member outwash sands and gravels.

**Hydrogeologic Setting**

Two aquifers are present at the site: the outwash aquifer, that has its eastern-most limit beneath the landfill, and the dolomite bedrock aquifer, which is present beneath the entire site. These two aquifers are hydraulically connected downgradient of the landfill via the Malden/Tiskilwa Till aquitard.

Horizontal gradients within the bedrock aquifer are consistently in a southwesterly direction, toward the West Branch of the DuPage River. Three horizontal flow paths were identified within the outwash aquifer: flow in an easterly direction from Spring Brook toward the landfill, flow in a southerly direction along the western side of the landfill, and flow in a southwesterly direction from the landfill toward the River in the vicinity of Sand Pond and Pine Lake.

The surface water bodies present downgradient of the landfill exert considerable control on the groundwater flow system within the outwash aquifer. The West Branch of the DuPage River exhibits a generally consistent surface water elevation. Sand Pond and Pine Lake are hydraulically connected to the River via the outwash aquifer. The net effect of this hydraulic connection is a flattening of the horizontal gradient in the vicinity of the lakes, as the river's influence is propagated eastward. Spring Brook, located downgradient of the landfill, consistently loses water to the aquifer. This causes development of a zone of stagnant groundwater between the brook and Sand Pond. The flattening of the horizontal gradient within the outwash aquifer downgradient of the landfill serves to strengthen the vertical gradient between the outwash aquifer and the bedrock aquifer.

**Nature and Extent of Contamination**

The Remedial Investigation (RI) included sampling of landfill leachate, landfill gas, groundwater, private wells, surface water, sediment, and surface soils. Occurrences of chemicals detected in site sources (leachate and landfill gas) and environmental media were documented.

No pesticides or PCBs were detected in the leachate samples. Metals detected in the leachate samples did not exceed RCRA Toxicity Characteristic levels. Maximum concentrations of individual organics detected in the leachate samples were generally low, with the exception of acetone (10,000 ug/L), 2-butanone (17,000 ug/L), 4-methyl-2-pentanone (1,100 ug/L), 2-methylphenol (17,000 ug/l), toluene (3,200 ug/L), 1,4-dichlorobenzene (940 ug/L), naphthalene (960 ug/L), and trichloroethene (720 ug/L). Other organics detected in the leachate samples occurred at maximum concentrations less than 500 ug/L.

TCE RCRA Toxicity Characteristic 500 mg/l

Organic compound groups detected in the landfill gas samples included chlorinated alkanes, chlorinated alkenes, aromatics, chlorinated aromatics, ketones, and chlorofluorocarbons. Concentrations were quite variable for any given compound among the individual groups. Aromatic compounds were found at the highest concentrations of the compound grouping detected in the landfill gas samples. Toluene was detected at the highest maximum concentration (92,000 parts per billion, volume (ppbv)).

Of the 32 organic compounds detected in leachate at the site, only 11 were detected in the groundwater. No pesticides or polychlorinated biphenyls (PCBs) were detected in the site monitoring well samples. In comparison to historical sampling data, VOC concentrations in site monitoring well samples have remained low and essentially unchanging between 1983 and the present. VOCs are apparently rapidly attenuated and diluted in the outwash aquifer, as evidenced by the lack of detection of VOCs in samples from wells G-123, G-122, and G-121, located between 300 and 600 feet downgradient of the landfill.

The highest concentrations of volatile VOCs were detected in samples from monitoring wells screened immediately downgradient of the landfill in the outwash aquifer. The maximum total VOC concentration (162 ug/L) was detected in well G-127, located approximately 100 feet downgradient of the landfill. The predominant VOCs detected were degradation products of the chlorinated alkanes and chlorinated alkenes.

Concentrations of total VOCs detected in the bedrock aquifer were very low (10 ug/L or less). VOCs were detected in samples from only three of the bedrock wells samples: G-138, G-140D, and G-141D. Detected concentrations were below the Contract Required Quantitation Limit (CRQL).

Semi-volatile organic compounds (SVOCs) were detected at very low concentrations (generally less than 5 ug/L) in seven monitoring well samples. SVOCs detected in the monitoring well samples included phenol, pyrene, and phthalates.

The SMCL for manganese was exceeded in samples from eight of the 15 monitoring wells screened in the outwash aquifer. The SMCL for iron was exceeded in samples from five outwash wells. However, with the exception of G122 and G129, these wells are located within 300 ft of the downgradient edge of the landfill. Well G129 is located approximately 350 ft downgradient of the landfill, and well G122 is located approximately 650 ft downgradient of the landfill.

Arsenic, zinc, and cyanide were detected in a few of the downgradient bedrock well samples; however, no Maximum Concentration Limits (MCLs) or SMCLs were exceeded for these metals. Manganese was detected in several of the downgradient bedrock monitoring well samples; the SMCL for manganese was exceeded in G-128D,

G-133D, and G-138. Iron was detected in three bedrock monitoring well samples; the SMCL for iron was exceeded in G-128D and G-139.

No SVOCs or PCBs were detected in any of the private well samples. 1,1-dichloroethane and cis-1,2-dichloroethene were the only VOCs detected in downgradient private well samples. These compounds were present at 2 ug/L or less in several private wells west of the landfill. MCLs were not exceeded for these compounds, and the risk assessment indicated that these detections do not result in unacceptable risks..

Although pesticides were detected below the CRQL in samples from three private wells, no pesticides were detected in any of the leachate, landfill gas, or groundwater samples obtained on-site. These detections are attributed to laboratory glassware contamination.

No organic compounds were detected in the surface water samples. Silver Lake surface water samples contained aluminum, mercury, copper, and lead at greater concentrations than those detected in the background samples. Other metals concentrations detected in Silver Lake samples were similar to background concentrations. In general, the highest concentrations of inorganic constituents detected in surface water samples were found in samples from Spring Brook. These concentrations are not believed to be related to the landfill, because Spring Brook receives wastewater effluent and consistently loses water to the groundwater system.

No pesticides or PCBs were detected in sediment samples. VOCs were detected in sediment samples from Sand Pond only. Vinyl chloride (5 ug/kg), 1,1-dichloroethane (3 ug/kg), and carbon disulfide (5 ug/kg), were detected in these samples. SVOCs were detected in both background sediment samples and samples potentially impacted by site run-off. Site samples generally contained higher concentrations of SVOCs than were found in background samples.

No pesticides were detected in the surface soil samples obtained at the site. PCBs were detected in one soil sample, SS01, at 56 micrograms/kilogram (ug/kg). SS01 is located in a run-off area from the parking lot north of Sand Pond. VOCs were detected in two background soil samples. No VOCs were detected in any soil samples potentially affected by landfill run-off. SVOCs were detected in a previous leachate seep area; sample location SS03, but also at both background sampling locations. Therefore, the source(s) of detections at SS03 may not be the landfill.

**Contaminant Fate and Transport**

In general, the highest concentrations of metals in soil samples occurred in site sample SS01. The concentrations detected in SS01 may result from the fact that this sampling location receives drainage from the western parking lot.

# TABLE OF CONTENTS

## Draft Feasibility Study

### Blackwell Landfill NPL Site

# 1


INTRODUCTION ..... 1-1
1.1 Report Organization ..... 1-1


# 2


BACKGROUND ..... 2-1
2.1 Site Location ..... 2-1
2.2 Physical Setting ..... 2-1
2.2.1 Site Setting and Land Use ..... 2-1
2.2.2 Topography and Site Drainage ..... 2-1
2.2.3 Water Supply Wells in Site Area ..... 2-2
2.2.4 Wetlands ..... 2-2
2.3 Site History ..... 2-2
2.3.1 History Prior to Landfill Construction ..... 2-2
2.3.2 Landfill Design and Construction ..... 2-3
2.3.3 Landfill Characteristics ..... 2-5
2.3.4 Post-Construction History ..... 2-5
2.4 Geologic Setting ..... 2-6
2.5 Hydrogeologic Setting ..... 2-6


# 3


NATURE AND EXTENT OF THE PROBLEM ..... 3-1
3.1 RI Summary ..... 3-1
3.1.1 Landfill Leachate ..... 3-1
3.1.2 Landfill Gas ..... 3-2
3.1.3 Groundwater Samples from Site Monitoring Wells ..... 3-2
3.1.4 Private Wells ..... 3-4
3.1.5 Surface Water ..... 3-5
3.1.6 Sediment ..... 3-6
3.1.7 Surface Soils ..... 3-6
3.2 Contaminant Fate and Transport ..... 3-7
3.3 Baseline Risk Assessment Summary ..... 3-7
3.4 Ecological Assessment Summary ..... 3-8

# 4

IDENTIFICATION AND SCREENING OF TECHNOLOGIES ..... 4-1
4.1 Identification of Media of Concern ..... 4-1
4.1.1 Groundwater ..... 4-2
4.1.2 Leachate ..... 4-3
4.2 Development of Remedial Action Objectives ..... 4-3
4.2.1 Groundwater ..... 4-3
4.2.2 Leachate ..... 4-4
4.3 Development of General Response Actions ..... 4-4
4.3.1 Groundwater ..... 4-4
4.3.2 Leachate ..... 4-4
4.4 Identification of Volumes or Area of Media ..... 4-5
4.4.1 Groundwater ..... 4-5
4.4.2 Leachate ..... 4-6
4.5 Identification and Screening of Remedial Technologies ..... 4-6
4.5.1 Groundwater ..... 4-7
4.5.2 Leachate ..... 4-8
4.6 Evaluation and Selection of Technology Process Options ..... 4-9
4.6.1 Groundwater ..... 4-10
4.6.2 Leachate ..... 4-11

# 5

DEVELOPMENT AND SCREENING OF
REMEDIAL ACTION ALTERNATIVES ..... 5-1
5.1 Development of Remedial Action Alternatives ..... 5-1
5.1.1 Groundwater ..... 5-1
5.1.2 Leachate ..... 5-2
5.2 Description of Remedial Action Alternative Components ..... 5-3
5.2.1 Leachate Extraction and Off-Site Disposal ..... 5-4
5.2.2 Groundwater Extraction and Treatment ..... 5-4
5.2.3 Landfill Cap Repair ..... 5-4
5.2.4 35 IAC 811 Cap ..... 5-5
5.2.5 Monitoring ..... 5-5
5.3 Summary of Developed Remedial Action Alternatives ..... 5-6

# 6

DETAILED ANALYSIS OF ALTERNATIVES ..... 6-1
6.1 Analysis Criteria ..... 6-1
6.1.1 Overall Protection of Human Health and the Environment ..... 6-3
6.1.2 Compliance with ARARs ..... 6-3
6.1.3 Long-Term Effectiveness and Permanence ..... 6-5
6.1.4 Reduction of Toxicity, Mobility, or Volume through Treatment ..... 6-5
6.1.5 Short-Term Effectiveness ..... 6-6
6.1.6 Implementability ..... 6-6
6.1.7 Cost ..... 6-6
6.1.8 State Acceptance ..... 6-7
6.1.9 Community Acceptance ..... 6-7

6.2 Remedial Action Alternative 1 ..... 6-9
6.2.1 Overall Protection of Human Health and Environment ..... 6-9
6.2.2 Compliance with ARARs ..... 6-10
6.2.3 Long-Term Effectiveness and Permanence ..... 6-10
6.2.4 Reduction of Toxicity, Mobility, and Volume Through Treatment ..... 6-11
6.2.5 Short-Term Effectiveness ..... 6-12
6.2.6 Implementability ..... 6-12
6.2.7 Cost ..... 6-12
6.2.8 State Acceptance ..... 6-12
6.2.9 Community Acceptance ..... 6-12

6.3 Remedial Action Alternative 2 ..... 6-13
6.3.1 Overall Protection of Human Health and Environment ..... 6-14
6.3.2 Compliance with ARARs ..... 6-15
6.3.3 Long-Term Effectiveness and Permanence ..... 6-17
6.3.4 Reduction of Toxicity, Mobility, and Volume Through Treatment ..... 6-19
6.3.5 Short-Term Effectiveness ..... 6-20
6.3.6 Implementability ..... 6-21
6.3.7 Cost ..... 6-22
6.3.8 State Acceptance ..... 6-22
6.3.9 Community Acceptance ..... 6-22

6.4 Remedial Action Alternative 3 ..... 6-23
6.4.1 Overall Protection of Human Health and Environment ..... 6-25
6.4.2 Compliance with ARARs ..... 6-26
6.4.3 Long-Term Effectiveness and Permanence ..... 6-29
6.4.4 Reduction of Toxicity, Mobility, and Volume Through Treatment ..... 6-30
6.4.5 Short-Term Effectiveness ..... 6-32
6.4.6 Implementability ..... 6-33
6.4.7 Cost ..... 6-34
6.4.8 State Acceptance ..... 6-34
6.4.9 Community Acceptance ..... 6-34

6.5 Remedial Action Alternative 4 ..... 6-35
6.5.1 Overall Protection of Human Health and Environment ..... 6-37
6.5.2 Compliance with ARARs ..... 6-38
6.5.3 Long-Term Effectiveness and Permanence ..... 6-41
6.5.4 Reduction of Toxicity, Mobility, and Volume Through Treatment ..... 6-43
6.5.5 Short-Term Effectiveness ..... 6-45
6.5.6 Implementability ..... 6-46
6.5.7 Cost ..... 6-48
6.5.8 State Acceptance ..... 6-48
6.5.9 Community Acceptance ..... 6-48

6.6 Remedial Action Alternative 5 ..... 6-49
6.6.1 Overall Protection of Human Health and Environment ..... 6-50
6.6.2 Compliance with ARARs ..... 6-52
6.6.3 Long-Term Effectiveness and Permanence ..... 6-54
6.6.4 Reduction of Toxicity, Mobility, and Volume Through Treatment ..... 6-55
6.6.5 Short-Term Effectiveness ..... 6-57
6.6.6 Implementability ..... 6-58
6.6.7 Cost ..... 6-59
6.6.8 State Acceptance ..... 6-60
6.6.9 Community Acceptance ..... 6-60

6.7 Remedial Action Alternative 6 ..... 6-61
6.7.1 Overall Protection of Human Health and Environment ..... 6-63
6.7.2 Compliance with ARARs ..... 6-64
6.7.3 Long-Term Effectiveness and Permanence ..... 6-67
6.7.4 Reduction of Toxicity, Mobility, and Volume Through Treatment ..... 6-69
6.7.5 Short-Term Effectiveness ..... 6-71
6.7.6 Implementability ..... 6-72
6.7.7 Cost ..... 6-74
6.7.8 State Acceptance ..... 6-74
6.7.9 Community Acceptance ..... 6-74

# 7

COMPARISON OF ALTERNATIVES ..... 7-1
7.1 Overall Protection of Human Health and the Environment ..... 7-1
7.2 Compliance with ARARs ..... 7-3
7.2.1 Compliance with Chemical-Specific ARARs ..... 7-4
7.2.2 Compliance with Location-Specific ARARs ..... 7-5
7.2.3 Compliance with Action-Specific ARARs ..... 7-5
7.3 Long-Term Effectiveness and Permanence ..... 7-7
7.3.1 Magnitude of Residual Risk ..... 7-7
7.3.2 Adequacy and Reliability of Controls ..... 7-8
7.4 Reduction of Toxicity, Mobility, and Volume Through Treatment ..... 7-9
7.4.1 Treatment Process Used and Materials Treated ..... 7-9
7.4.2 Amount of Hazardous Materials Destroyed or Treated ..... 7-9
7.4.3 Degree of Expected Reductions in Toxicity, Mobility, or Volume ..... 7-10
7.4.4 Degree to which Treatment is Irreversible ..... 7-11

7.4.5 Type and Quantity of Residuals Remaining After Treatment ..... 7-11
7.4.6 Reduction of Inherent Hazards ..... 7-11
7.5 Short Term Effectiveness ..... 7-11
7.5.1 Risks to Community During Remedial Action ..... 7-12
7.5.2 Risk to Workers During Remedial Action ..... 7-12
7.5.3 Environmental Impacts ..... 7-12
7.5.4 Time Until Remedial Action Objectives are Achieved ..... 7-12
7.6 Implementability ..... 7-13
7.6.1 Technical Feasibility ..... 7-13
7.6.2 Administrative Feasibility ..... 7-14
7.6.3 Availability of Materials and Services ..... 7-14
7.7 Cost ..... 7-15
7.8 State Acceptance ..... 7-16
7.9 Community Acceptance ..... 7-16

# 8

REFERENCES ..... 8-1

## LIST OF TABLES

Table 1 Identification and Screening of Remedial Technologies and Process Options
Table 2 Evaluation and Selection of Process Options
Table 3 Summary of Remedial Technologies Retained for Groundwater
Table 4 Summary of Remedial Technologies Retained for Leachate
Table 5 Summary of Process Options Retained for Groundwater
Table 6 Summary of Process Options Retained for Leachate
Table 7 List of Retained Technologies and Process Options
Table 8 Summary of Potential ARARs
Table 9 Summary of Cost Estimates

## LIST OF FIGURES

Figure 2-1 Site Location Map
Figure 2-2 Site Topographic Map
Figure 2-3 Locations of Water Supply Wells in Site Vicinity
Figure 2-4 Original Cell Configuration
Figure 2-5 Cross Section Location Map
Figure 2-6 Cross Section A-A'

Figure 3-1 Leachate Level Map (January 2, 1992)
Figure 3-2 Approximate Area of Groundwater Exceeding Maximum Concentration Levels (MCLs)

Figure 4-1 Estimated Area of Outwash Aquifer Where 1,2-DCE Concentration Potentially Exceeds MCL.
Figure 4-2 Estimated Area of Outwash Aquifer Where Vinyl Chloride Concentration Potentially Exceeds MCL.
Figure 4-3 Estimated Area of Outwash Aquifer Where TCE Concentration Potentially Exceeds MCL.

Figure 5-1 Potential Cap Repair Areas

## LIST OF APPENDICES

Appendix A Forest Preserve District Legal Opinion, Blackwell Preserve
Appendix B Groundwater Sampling Results, June 1995
Appendix C Remedial Alternative Cost Calculations

The source of chemicals of potential environmental concern at the Blackwell site is the buried waste. If gas or leachate moves into the environment surrounding the landfill, the potential exists that chemicals of concern may move along migration pathways to potential receptors. The transport of chemicals of potential concern is limited by the landfill cap and liner, and the clay cells in which waste was disposed. Further migration may be limited by dilution, adsorption, biodegradation, oxidation/reduction reactions, precipitation, and volatilization.

In general, natural attenuation and dilution appear to be limiting the migration of potential contaminants from the landfill. This limited migration is demonstrated by the following:

- While VOCs are present in the landfill gas, no VOCs were detected in ambient air samples on, or downwind of, the landfill.

- Many of the organic constituents detected in the leachate and landfill gas, such as toluene, 2-butanone, acetone, and 4-methylphenol, were not detected in the groundwater.

- While low levels of VOCs were detected in the groundwater in the outwash aquifer immediately downgradient of the landfill, the zone of impacted groundwater appears to be limited to an area a few hundred feet downgradient of the fill.

- VOC concentrations in the bedrock aquifer are very low (10 ug/L or less), even where the till aquitard between aquifers is thin and silty.

**Baseline Risk Assessment**

The baseline risk assessment was conducted to determine whether the levels of contamination detected in media at the site may pose a risk to public health. Health risks were estimated based on current land use of the site (forest preserve) and the area surrounding the site (residential development). It was determined that land use of the site and the surrounding area would not change for the future use scenario. Therefore, health risks based on current land use conditions were also considered to be applicable for future land use conditions.

The baseline risk assessment performed for the Blackwell site indicated that risks to human health are not likely to occur under either current or future land use scenarios. Health risks are not expected to occur to people working and recreating at the site, based on the level of chemical exposure, and the toxicity of the chemicals of potential concern. For this reason, under current and likely future land use conditions, recreating or working at the Blackwell Forest Preserve, or living near the Preserve does not pose a public health concern.

The Ecological Assessment identified chemicals of potential ecological concern, ecological systems, and members of those systems that are potentially exposed. The Ecological Assessment then assessed the risk for adverse ecological effects to those populations from the chemicals of potential ecological concern. Both qualitative and quantitative methods were used to assess ecological risks.

Results of the ecological assessment indicate that there is little risk to ecological populations and communities at the site from organic chemicals since pesticides were not detected in environmental media, VOCs were detected only at very low concentrations, SVOCs, where present, are not landfill-related, and SVOCs and PCBs, where present in the terrestrial environment, occur at concentrations below which adverse ecological effects are associated.

Metals of potential ecological concern in site surface soils appeared to be present in concentrations lower than those sufficient to affect small terrestrial mammal populations. Exposure of aquatic species in Silver Lake and Sand Pond to metals of potential ecological concern does not appear to pose an environmental hazard.

On the basis of current and future land use scenarios in the Baseline Risk Assessment and the Ecological Assessment, it can be concluded that there are currently no unacceptable risks to human health or the environment from the Blackwell Landfill NPL Site. However, the leachate contained within the landfill could represent a potential future risk if leakage were to increase. Therefore, groundwater and leachate were identified as the media of concern for this Feasibility Study.

**Remedial Action Objectives**

Remedial Action Objectives for groundwater include preventing the off-site migration of contaminants above MCLs, and preventing the off-site migration of groundwater containing concentrations of contaminants that represent an unacceptable human health or environmental risk. The Remedial Action Objectives for leachate include reducing the volume of leachate that has the potential to contaminate ground-water and limiting the generation of new leachate that would have the potential to contaminate groundwater.

The first step in the Feasibility Study is to identify and screen a broad range of remedial technologies and process options and then screen them on the basis of their technical implementability. Remedial technologies and process options which are applicable to the conditions at the Blackwell Site are carried forward for further evaluation. Those not applicable are eliminated from further consideration.

The next step is to evaluate and select the process options that will represent each technology type by selecting a limited number of promising process options for consideration in assembling remedial action alternatives. Process options were evaluated according to their effectiveness, implementability, and relative cost.

**Remedial Action Components**

A list of applicable and potentially effective remedial action components was developed. From these, the following five primary remedial action alternative components were developed as potentially appropriate to mitigate concerns regarding groundwater and leachate.

Leachate Extraction and Off-Site Disposal

Eight leachate extraction wells would be installed within the landfill at locations corresponding to elevated leachate head levels and high landfill gas flow. The wells would be constructed to screen the saturated leachate thickness in the landfill and zones of landfill gas accumulation in order to extract leachate and vent landfill gas from the same wells. Submersible pumps would be placed in the wells to pump leachate on a continual basis (as available) from the extraction wells. The sustainable flow rate of leachate in the extraction wells would be measured and recorded periodically to develop estimates of leachate extractability. Extracted leachate would be conveyed through underground piping to a central collection tank located in the northwest portion of the landfill site. Leachate in the central collection tank would be periodically pumped as necessary into a tanker truck and transported to the Wheaton Sanitary District POTW for treatment under an existing pretreatment permit.

Groundwater Extraction and Treatment

Twenty extraction wells would be installed in the outwash downgradient of the landfill to capture contaminants which have the potential to migrate off site. Because of the high permeability of the outwash deposits, the wells would have to be pumped at a total flow rate of approximately 250-500 gpm in order to achieve hydraulic control and effective capture in the outwash around the base of the landfill. The extracted groundwater would be conveyed through underground piping to the treatment system. The extracted groundwater would be treated by air stripping and discharged into Sand Pond located on FPD property. A pre-design investigation may be necessary to develop cost-effective groundwater extraction configuration.

Landfill Cap Repair (35 IAC 807 Cap)

The landfill cap would be repaired in designated areas of the landfill that either: 1) have a low permeability layer thickness less than two feet; or 2) are located in areas where perched surface water infiltration seeps from the sideslopes of the landfill. The repaired cap would extend to the edge of the landfill and would be sloped where necessary to promote surface water drainage off the landfill. This would complete a low permeability cap with a minimum thickness of 2 feet in accordance with the requirements of 35 IAC 807, the regulation under which the landfill was closed.

The steps in cap repair would include stripping and stockpiling the topsoil, excavating existing cover soil (including any layer of sand which may have been acting as a conduit for infiltrated surface water to migrate as a layer of perched water above the landfill), placing and compacting the clay material in the excavated areas, covering the clay with a

protective layer of soil, spreading topsoil over the disturbed areas, and revegetating the affected areas. It is expected that clay would be purchased from a suitable borrow site and transported to the landfill for cap construction.

Buildup of landfill gas below the repaired cap would be prevented by utilizing the twenty-five existing landfill vents and the eight new leachate extraction wells to passively vent landfill gas to the atmosphere. The aboveground portion of the existing landfill vents disrupted by the cap repair activities would be replaced during construction.

35 Illinois Administrative Code 811 Cap

The existing landfill cap would be removed and replaced with a 40 acre clay cap constructed according to 35 IAC 811 specifications. Existing topsoil and cover at the landfill would be excavated and stockpiled at the site for later use. Steeply sloping portions of the landfill would be regraded and re-contoured to reduce the steep grades and lessen the potential for cap erosion. Any additional clay would be purchased from a suitable borrow site and transported to the landfill for placement and compaction of a low permeable clay layer. The compacted clay layer would be placed a minimum of three feet thick over the site in accordance with 35 IAC 811. Stockpiled soil capable of supporting vegetative growth would be replaced over the clay cap at a minimum thickness of three feet and graded and seeded to revegetate the landfill cover.

Buildup of landfill gas below the repaired cap would be prevented by utilizing the twenty-five existing landfill vents and the eight new leachate extraction wells to passively vent landfill gas to the atmosphere. The aboveground portions of the existing landfill vents would be replaced during new cap construction activities.

Monitoring

Various media and systems installed at the Blackwell Landfill site would be monitored on a regular basis. The following monitoring activities are proposed. Information concerning the frequency of monitoring and the chemical analyses are reasonable for the site conditions. They were detailed to provide the basis for estimating costs.

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Results of the RI groundwater sampling programs show that groundwater contamination ~~is stabilized~~ and limited to the FPD property. Groundwater would be monitored semiannually at fifteen well locations to provide continued documentation that the contamination is stabilized. These well locations would consist of wells screened in the outwash and in the bedrock aquifer downgradient of the landfill. The outwash monitoring network would consist of nine wells, including, G-107S, G-113, G-115S, G-118S, G-117, G-123, G-128S, G-129 and G-140S, The bedrock well network would include six wells consisting of G-107D, G-115D, G-118D, G-128D, G-140D and G-141D. Six well nests consisting of two wells (one well screened in the outwash and one well screened in the bedrock aquifer) would be included in the monitoring well network at the site. All groundwater samples would be analyzed for VOCs and indicator

parameters (Cl, TDS, pH, and temperature). Groundwater elevations in the site wells would also be recorded.

Leachate levels would be monitored semiannually to document changes in head elevations. A composite leachate sample would be collected from the total system collection on an semiannual basis to characterize the on-going quality of leachate for disposal purposes.

The cap would be visually inspected semiannually by FPD personnel to verify the integrity and performance of the cap. The 40 acre cap would be maintained on a regular basis by FPD personnel.

**Remedial Action Alternatives**

Six Remedial Action Alternatives (alternatives) were developed from the remedial components. These six alternatives were retained and carried forward to the detailed analysis phase.

| | |
|---|---|
| Alternative 1 - | No action |
| Alternative 2 - | Leachate Extraction and Off-Site Disposal and Monitoring |
| Alternative 3 - | Leachate Extraction and Off-Site Disposal, Cap Repair and Monitoring |
| Alternative 4 - | Leachate Extraction and Off-Site Disposal, Groundwater Extraction and Treatment, Cap Repair and Monitoring |
| Alternative 5 - | Leachate Extraction and Off-Site Disposal, 35 IAC 811 Cap, and Monitoring |
| Alternative 6 - | Leachate Extraction and Off-Site Disposal, Groundwater Extraction and Treatment, 35 IAC 811 Cap, and Monitoring |

The six alternatives were detailed and analyzed based on nine evaluation criteria to address CERCLA requirements. The nine evaluation criteria also address additional technical and policy considerations that have proven important for selection of remedial alternatives. These evaluation criteria serve as the basis for conducting the detailed analysis during the FS and for subsequently selecting the appropriate remedial action.

The nine evaluation criteria are:

1. Overall protection of human health and the environment.
2. Compliance with ARARs.
3. Long-term effectiveness and permanence.
4. Reduction of toxicity, mobility, or volume through treatment.
5. Short-term effectiveness.
6. Implementability.
7. Cost.
8. State acceptance.
9. Community acceptance.

All six alternatives underwent a detailed evaluation and comparative analysis to evaluate the relative performance of each alternative in relation to each of the nine criteria. The purpose of the comparative analysis is to identify the advantages and disadvantages of each alternative relative to one another. The U.S. EPA and IEPA will identify the relative strengths of each alternative, combine them with risk management decisions and develop a rational for selecting a preferred alternative and provide a transition between the RI/FS and the ROD.

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# Section 1

MONTGOMERY WATSON

# 1

# INTRODUCTION

This Feasibility Study (FS) has been prepared on behalf of the Forest Preserve District (FPD) of DuPage County for the Blackwell Landfill site located in DuPage County, Illinois. The FPD entered into an Administrative Order by Consent (AOC) Agreement, on September 25, 1989, with the United States Environmental Protection Agency (U.S. EPA), to conduct a Remedial Investigation/Feasibility Study (RI/FS) at the site. The RI/FS is being conducted pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), with the requirements of the National Oil and Hazardous Substances Contingency Plan (NCP) and in accordance with guidance from the U.S. EPA.

The final RI Report was submitted to the U.S. EPA on December 1, 1994 and approved by U.S. EPA in a letter dated December 27, 1994.

This FS presents the process to evaluate a comprehensive list of general response actions to identify the best approach currently available to meet the remedial action objectives for the Blackwell Forest Preserve Landfill. Through the screening process, general response actions which are comprised of remedial technology subsets and further broken down into process options, were assembled into six remedial action alternatives for the site. The range of alternatives was limited to viable options that would mitigate site specific risks to human health and the environment, as identified in the Baseline Risk Assessment.

## 1.1 REPORT ORGANIZATION

This FS has been prepared in accordance with the U.S. EPA, 1988, *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Interim Final.* Based on the format presented in the above document, this FS has been organized in the following manner:

- Section 1 presents an introduction to the FS, and presents the document's organizational structure.

- Section 2 summarizes the site information developed in the RI, including location, history, and physical setting.

- Section 3 discusses the nature and extent of contaminants identified at the site including a summary of the results of the Baseline Risk Assessment.

- Section 4 begins the FS element of the CERCLA process. The remedial action objectives are stated, and the subsequent general response actions with associated remedial technologies and process options are introduced. The remedial technologies and process options are then evaluated, screened, and selected for the development of alternatives in Section 5.

- Section 5 presents the development of alternatives by assembling the limited number of viable process options identified through the screening process.

- Section 6 provides a detailed analysis of the six remedial action alternatives, addressing each of the nine criteria set forth in the NCP. The nine criteria include: overall protection of human health and the environment; compliance with ARARs; long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short term effectiveness; implementability; cost; state acceptance; and community acceptance.

- Section 7 provides the comparative analysis of the six alternatives.

- Section 8 lists cited and other relevant references.

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# Section 2

MONTGOMERY WATSON

# 2

# BACKGROUND

## 2.1 SITE LOCATION

The Blackwell Landfill NPL site (site) is located in Section 26, Township 39 North, Range 9 East, DuPage County, Illinois. The site is part of the Roy C. Blackwell Forest Preserve and is owned by the Forest Preserve District of DuPage County (FPD). The landfill occupies approximately 40 acres within a forest preserve of more than 1200 acres. The location of the site is illustrated in Figure 2-1.

## 2.2 PHYSICAL SETTING

### 2.2.1 Site Setting and Land Use

The Blackwell Forest Preserve encompasses approximately 1200 acres of woodlands, grasslands, wetlands, and lakes. The forest preserve is managed by the Forest Preserve District of DuPage County and used by the public for a variety of recreational uses, including hiking, boating, horseback riding, and fishing.

The landfill covers approximately 40 acres within the central part of the Preserve. The boundaries which define the extent of the Blackwell Landfill NPL site are as follows. On the north and east, the boundary of the site extends through the center of Silver Lake from Spring Brook on the north to Butterfield Road on the south. The southern boundary extends along Butterfield Road to the intersection of Butterfield Road and the West Branch of the DuPage River, and then north to the intersection of the West Branch of the DuPage River and Spring Brook. The western boundary of the site is formed by Spring Brook.

### 2.2.2 Topography and Site Drainage

The Blackwell Landfill is located in northeastern Illinois on the western edge of the Wheaton Morainal Country in the Great Lakes Section of the Central Lowlands Province. The topography of this area is generally due to the repeated glaciations of the Pleistocene epoch, and does not reflect the buried bedrock topography. In DuPage County, the surface topography generally slopes from the northwest to the southeast across the county. Total relief in the county is approximately 245 ft. The most prominent natural surface features in the county are the glacial end moraines which parallel the Lake Michigan shoreline. Other

glacially-derived geomorphic features in the county include outwash plains, kames, eskers, and filled lake basins.

The maximum elevation of the Blackwell Landfill NPL site is formed by the landfill itself (approximate elevation 840 ft, MSL). The landfill slopes steeply to the south toward Sand Pond (elevation 690 ft, MSL). The landfill slopes more gently to the northeast toward Silver Lake, which has an approximate elevation of 708 ft, MSL. Figure 2-2 is a topographic map of the site.

Streams in DuPage County flow mainly from north to south between the morainal ridges. Surface water drainage is routed mainly to the East and West Branches of the DuPage River in the central portion of the County. Drainage on the eastern portion of the County is to the Des Plaines River; drainage in the western portion is to the Fox River.

The landfill is located within the Spring Brook watershed of the West Branch of the DuPage River drainage basin. From Spring Brook, surface water drains to the West Branch of the DuPage River and, ultimately, to the Des Plaines River.

### 2.2.3 Water Supply Wells in the Site Area

During the preparation of the planning documents, water supply well logs were identified from the Illinois State Water Survey in Urbana, Illinois. Water supply wells closest to the landfill in all directions are illustrated in Figure 2-3. The screened formation identified on the majority of the water supply well logs by the drilling firms was "limestone." This "limestone" is believed to be Silurian dolomite, which is located approximately 30 to 100 feet below the ground surface.

### 2.2.4 Wetlands

Limited areas of wetlands are found on and adjacent to the Blackwell Landfill NPL Site. Other wet areas on site are open water habitats, including Silver and Pine Lakes, Sand Pond and a portion of Spring Brook. Since the lakes are man-made and Spring Brook is channelized, these waters have few wetland zones associated with them. The unnamed pond at the southern end of the site has a wetland border.

## 2.3 SITE HISTORY

### 2.3.1 History Prior to Landfill Construction

The 40-acre tract which was developed into the Blackwell Landfill was purchased by the FPD in 1960. Over the following five-year period, approximately 1,100 additional acres were acquired by the FPD. The property was purchased with the intent of developing the site as a forest preserve for recreational purposes, after construction of the landfill.

Originally, the FPD intended to use an abandoned gravel pit at the site for solid waste disposal. In 1963, gravel excavation was resumed, and continued until July of 1969.

During the course of the gravel mining, the lakes at the site were enlarged and deepened. The mined materials were sold to fund the lake construction, recreational projects, and flood control projects.

The intent was to construct a landfill that would limit the effects of waste disposal on the surrounding area, create a hill within the preserve which could be used for recreational purposes, and provide an economical means of constructing the lakes at the Preserve. Therefore the concept of landfilling in the gravel pit was abandoned. Excavation of the lakes would provide clay materials which could be used in construction of an environmentally secure landfill.

Concern regarding the suitability of the site for landfilling was expressed by several parties, including the Illinois State Geological Survey, the Illinois Sanitary Water Board, and Northeastern Illinois Planning Commission (NIPC) personnel. These concerns centered on the site's geologic and hydrogeologic characteristics, including its position on the edge of the Warrenville cone of depression, extensive sand and gravel deposits in the area, and potential hydraulic connection between the recreational lakes and the buried refuse. In response to ISGS suggestions that careful engineering procedures would be necessary to develop a secure landfill at the site, the County Board of Commissioners approved development of an engineering plan for the project.

### 2.3.2 Landfill Design and Construction

Preliminary design specifications for the Blackwell Landfill were developed by William Rose and Associates (Rose) for DuPage County and submitted in October, 1966. Rose recommended that the landfill cover a 35-acre area, that a three-to-one clay to refuse ratio be employed, and that the fill area be constructed as a honeycomb of one-acre cells. Each cell would have a 1.5-ft thick clay base and a perimeter clay berm eight to nine ft in height. Each cell would be filled with two three-ft lifts of refuse, separated by six inches of clay. Each cell would be covered by 1.5 ft of clay, which would form the base of the overlying cell. The cells were to be offset to maximize stability in the landfill design. The cover design specified a final 12-ft layer of compacted clay, covered by soil and vegetation.

Construction of the landfill was performed as a joint effort between the DuPage County Public Works Department (PWD) and the FPD. Under the agreement between the agencies, the PWD was to build the landfill, under supervision by the FPD. The following construction specifications were included in the contract drawn up between the two agencies:

- Berm Height--four ft per lift
- Berm Width--11 to 12 ft at top
- Refuse Height--three ft per lift

- Minimum Daily Cover--six inches of clay or mixture of clay and gravel

- Floor Construction--two ft of blue clay minimum, dove-tailed into existing blue clay

- Temporary Cap--one to two ft of sand, gravel, clay, or mixture

- Refuse Compaction--obtained by maximum use of site tractor crossing deposited refuse

Construction of the landfill commenced in 1965. By 1967, the shape of the hill and general cell layout had been determined. The original landfill cell configuration consisted of eight cells, and is illustrated in Figure 2-4. Cell 9, also shown on the figure, was not part of the original planned design.

The original layout of the landfill was generally followed. Daily records were not kept to detail how the construction proceeded. However, in general it was the procedure to develop cells several acres in size by building side berms, and then fill the cells with refuse and daily cover. At the completion of each cell, the clay cover was installed and side berms were constructed for the next lift of refuse. The clay covers served as the liners for the overlying cells, as the landfill construction proceeded upward.

The final load of refuse was accepted at the Blackwell Landfill in October, 1973, and was buried just below an 800 ft, Mean Sea Level (MSL) elevation in the Cell 4 area. Final contouring and landscaping continued until July, 1975. Forty to sixty ft of clay ~~were~~ was added to form the final hilltop at 839 ft, MSL, approximately 150 ft above the surrounding natural topography. The landfill was covered to final grades with two to fifteen ft of predominantly clay cover. Some areas of cover are underlain by layers of varying sand, gravel and clay composition. A final layer of a minimum of four to six inches of clayey topsoil was installed and vegetated.

The landfill contains approximately 1.5 million cy of refuse, classified as general household refuse and light industrial waste, and an equal volume of natural fill. Specific wastes known to have been disposed of at the Blackwell Landfill include:

- Eight thousand tons of dry sludge from the Metropolitan Sanitary District of Greater Chicago

- Daily trash from Owens-Illinois of St. Charles, Illinois glass manufacturing facility

- Plant trash from Kroehler Manufacturing of Naperville, Illinois

- Burnt tree cuttings and grass clippings

The landfill covers approximately 40 acres. The addition of several cells around the eight original cells increased the planned 35 acre landfill area to the existing 40 acres. These exterior cells were used for disposing of construction debris and tree trunks and branches and may not have been constructed with clay liners.

### 2.3.3 Landfill Characteristics

In general, the Blackwell Landfill was constructed as a series of clay-lined cells. A final cover was placed on the landfill, and the cover has been vegetated and maintained. The maximum elevation of the landfill is approximately 839 ft MSL. This elevation is approximately 150 ft above the surrounding natural topography.

Measurements of gas flow at the landfill vents indicated a range in flow volume from a low of "no flow" conditions to a high of 15 $ft^3$/min. The measurements of flow at the vents indicate that gas is migrating from the landfill through paths of least resistance. These paths are the installed landfill vents.

An estimate of landfill refuse volume was developed during the RI, based on refuse thickness recorded in landfill vent boring logs. The refuse volume calculated, including interstratified daily cover, was 1.9 million cy. This estimate is comparable with previously published estimates of two to three million cy.

Leachate volume was estimated at 53 to 74 million gallons (refuse porosity 25 to 35 percent), based on leachate levels measured in the landfill vents. Little fluctuation was noted in leachate elevations measured at the vents. Estimates of leachate leakage from the landfill were developed using both the U.S. EPA HELP Model and a leachate-level-change method. Leakage was estimated at 3.5 million gallons per year by the HELP Model. Leakage was estimated at 5.2 million gallons per year by the leachate-level-change method. The difference in estimated leakage volumes may be due to the fact that the leachate -level-change method evaluated potential leakage over a five-week period, while the HELP model evaluated potential leakage over a 20-year period.

### 2.3.4 Post-Construction History

In March, 1986, the site was evaluated by the U.S. EPA using the Hazard Ranking System (HRS). A composite score of 35.57 was assigned, with the following scores assigned to each potential route: Surface Water, 0.0; Air, 0.0; Groundwater, 61.54. The site was proposed for inclusion on the National Priorities List (NPL) in the Federal Register, Volume 53, Number 122, dated June 24, 1988.

On September 25, 1989, a consent order was signed between the Forest Preserve District of DuPage County and the U.S. EPA. The Blackwell Landfill received final listing on the NPL in the Federal Register, Volume 55, Number 35, dated February 21, 1990.

## 2.4 GEOLOGIC SETTING

The geology of DuPage County consists of recent alluvial and Pleistocene glacial deposits overlying Silurian dolomite bedrock. The surficial deposits are predominantly the result of Wisconsin-age glaciation, with minor modifications by Recent alluvial processes. Till Members of the Wedron Formation, and sand and gravels of the Henry Formation, are present in the site area. The following unconsolidated stratigraphic units have been identified at the site in ascending order: The Tiskilwa Till Member, the Malden Till Member, the Yorkville Till Member, and the Batavia Member of the Henry Formation.

The unconsolidated stratigraphic sequence is variable across the site in an east to west direction. This is due to the site's location on the western edge of the West Chicago Moraine. The uppermost till unit present at the site, the Yorkville Till Member, forms this moraine. Meltwater from the glacier that deposited the till appears to have formed a river which flowed north to south along the front of the moraine. Previously deposited glacial sediments were subsequently eroded and re-deposited as the Batavia Member outwash sands and gravels.

## 2.5 HYDROGEOLOGIC SETTING

Investigations performed at the Blackwell Landfill prior to the RI indicated that an area might exist immediately southwest of the landfill where no till confining units were present, i.e., the sand and gravel outwash might be in direct contact with the dolomite aquifer. Since historical groundwater monitoring data demonstrated that leachate components were present in the sand and gravel in this area, investigation activities were completed to identify the location and extent of the area where silt or clay might not be present between the outwash and the bedrock.

Of the six soil borings performed in the area of concern, sand and gravel were found to be in direct contact with the bedrock only in SB04 (Figures 2-5 and 2-6). Clay and silt were found above bedrock in the other borings performed for the RI. Therefore, the area identified in which sand and gravel may be in direct contact with the bedrock is limited by G140D on the west, SB05 on the east, SB01 on the north, and SB03 on the south.

The hydrostratigraphic setting at the site varies in an upgradient to downgradient (east to west) direction. Upgradient of the landfill, the following hydrostratigraphic units are present, in ascending order: the bedrock aquifer, the Malden/Tiskilwa Till aquitard, and the Yorkville Till aquitard. Downgradient of the landfill, the following units are found, in ascending order: the bedrock aquifer, the Malden/Tiskilwa Till aquitard, and the outwash aquifer. The landfill lies across the contact between the outwash aquifer and the Yorkville Till aquitard. Therefore, the outwash aquifer is not present upgradient of the landfill.

Two aquifers are present at the site: the outwash aquifer, that has its eastern-most limit beneath the landfill, and the dolomite bedrock aquifer, which is present beneath the entire site. These two aquifers are hydraulically connected downgradient of the landfill via the Malden/Tiskilwa Till aquitard.

The glacial outwash aquifer is a valley train deposit, consisting of coarse-grained sand and gravel, deposited by meltwater along the front of the West Chicago Moraine. In boring logs prepared for the site, the aquifer is described as a brown to gray, fine to coarse sand, gravelly sand, or sand with gravel. The range of hydraulic conductivity values determined during the RI for this aquifer was $1.4 \times 10^{-2}$ cm/sec to $6.4 \times 10^{-2}$ cm/sec.

Characteristics of the dolomite aquifer were observed in rock cores obtained during the RI. The dolomite was light brown to light gray in color, hard, containing some vuggy porosity. Fracture orientations noted in the cores were predominantly horizontal. Hydraulic conductivity values determined for the dolomite aquifer during the RI ranged from $7.1 \times 10^{-6}$ cm/sec to $3.0 \times 10^{-2}$ cm/sec.

Horizontal gradients within the bedrock aquifer are consistently in a southwesterly direction, toward the West Branch of the DuPage River. Three horizontal flow paths were identified within the outwash aquifer: flow in an easterly direction from Spring Brook toward the landfill, flow in a southerly direction along the western side of the landfill, and flow in a southwesterly direction from the landfill toward the River in the vicinity of Sand Pond and Pine Lake.

The surface water bodies present downgradient of the landfill exert considerable control on the groundwater flow system within the outwash aquifer. The West Branch of the DuPage River exhibits a generally consistent surface water elevation. Sand Pond and Pine Lake are hydraulically connected to the River via the outwash aquifer. The net effect of this hydraulic connection is a flattening of the horizontal gradient in the vicinity of the lakes, as the river's influence is propagated eastward. Spring Brook, located downgradient of the landfill, consistently loses water to the aquifer. This causes development of a zone of stagnant groundwater between the brook and Sand Pond. The flattening of the horizontal gradient within the outwash aquifer downgradient of the landfill serves to strengthen the vertical gradient between the outwash aquifer and the bedrock aquifer.

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# Section 3

# 3

# NATURE AND EXTENT OF THE PROBLEM

This section summarizes information from the RI regarding contaminant fate and transport, and the Baseline Risk Assessment. The subsection which summarizes the information in the RI discusses, among other issues, the nature and concentrations of contaminants in the various media sampled.

## 3.1 RI SUMMARY

This section presents a brief overview of the nature and extent of potential contaminants in the site media which were sampled and evaluated during the RI. Included are: a description of potential sources of impact to the environment by landfill gas, leachate, landfill surface soil, and landfill waste, and a description of potentially affected media: groundwater, surface water, sediment, and air.

During the RI, samples were obtained and analyzed from the potential sources at the site (landfill leachate and gas) and from the potential migration pathways (groundwater, surface water, surface soils and sediment). Additionally, off-site private water supply wells were sampled to assess potential impacts from site-related contaminants. The following subsections summarize occurrences of chemicals detected in the sources and the various media sampled.

### 3.1.1 Landfill Leachate

Chemical constituents detected in the leachate samples are summarized below:

- Of the organic chemical groupings present in the leachate samples, ketones were detected at the highest concentrations, e.g., 2-butanone, 17,000 micrograms/liter (ug/L). Ketones were detected only in the leachate and landfill gas samples from the site; no ketones were detected in the other media sampled during the RI.

- In general, the maximum concentrations of individual organics detected in the leachate samples were generally low, with the exception of acetone (10,000 ug/L), 2-butanone (17,000 ug/L), 4-methyl-2-pentanone (1,100 ug/L), 2-methylphenol (17,000 ug/L), toluene (3,200 ug/L), 1,4-dichlorobenzene (940 ug/L), naphthalene (960 ug/L), and trichloroethene (720 ug/L). All other organics detected in the leachate samples occurred at maximum concentrations less than 500 ug/L.

- No pesticides or PCBs were detected in the leachate samples.

- RCRA Toxicity Characteristic levels were not exceeded for metals detected in the leachate samples. The RCRA Toxicity Characteristic Level was exceeded for TCE in the sample from vent SV9.

### 3.1.2 Landfill Gas

VOC occurrences in the landfill gas samples are summarized as follows:

- Organic compound groups detected in the landfill gas samples included chlorinated alkanes, chlorinated alkenes, aromatics, chlorinated aromatics, ketones, and chlorofluorocarbons. Concentrations were quite variable for any given compound among the individual samples.

- Aromatic compounds were found at the highest concentrations of any compound grouping in the landfill gas samples. Toluene, detected at a maximum concentration of 92,000 parts per billion, volume (ppbv), was detected at the highest concentrations.

- Of the organic compounds detected in site media, eight were detected only in the landfill gas samples. Detection of these compounds only in the landfill gas indicates that migration to the surrounding media, via landfill gas, is not occurring.

### 3.1.3 Groundwater Samples From Site Monitoring Wells

Organic constituents detected in the site monitoring well samples are summarized below:

- Of the 32 organic compounds detected in leachate at the site during the RI, only 11 were detected in the groundwater.

- No pesticides or PCBs were detected in the site monitoring well samples.

- 2-butanone, acetone, 4-methylphenol, and toluene, detected at concentrations exceeding 1 milligram/Liter (mg/L) in the leachate samples were not detected in the groundwater samples.

- In comparison to historical sampling data, VOC concentrations in site monitoring well samples have remained very low and essentially unchanging from 1983 to the present.

- VOCs were detected in samples from 19 of the 23 downgradient monitoring wells sampled. The predominant VOCs detected were degradation products of the chlorinated alkanes and chlorinated alkenes.

- The highest concentrations of VOCs were detected in samples from monitoring wells screened immediately downgradient of the landfill in the outwash aquifer. The maximum total VOC concentration (162 ug/L) was detected in well G127, located approximately 100 feet downgradient of the landfill.

- VOCs are apparently rapidly attenuated and diluted in the outwash aquifer, as evidenced by the lack of detection of VOCs in samples from wells G121, G122, and G123, located within 650 feet of the landfill.

- Concentrations of total VOCs detected in the bedrock aquifer were very low (10 ug/L or less). VOCs were detected in samples from only three of the bedrock wells sampled: G138, G140D, and G141D. Detected concentrations were below the Contract Required Quantitation Limit (CRQL).

- SVOCs were detected at very low concentrations (generally less than 5 ug/L) in seven monitoring well samples. SVOCs detected in the monitoring well samples included phenol, pyrene, and phthalates.

- The phthalates detected in samples from G121, G134, G128D and G139, and G141D are probably due to laboratory contamination, since phthalates were the only organic compounds detected in these samples.

- MCLs were exceeded for organic constituents in samples from the following wells: G118S (vinyl chloride, 1,2-dichloroethene, trichloroethene); G127 (vinyl chloride, 1,2-dichloroethene, trichloroethene); G128S (1,2-dichloropropane); G129 (vinyl chloride); G130 (trichloroethene); G138 (benzene); G139 (bis(2-ethylhexyl) phthalate); and G140D (benzene).

Inorganic constituents detected in monitoring well samples from the outwash aquifer are summarized as follows:

- No MCLs or SMCLs were exceeded for arsenic, cobalt, mercury, nickel, zinc, or cyanide in samples from the outwash aquifer.

- The SMCL for manganese was exceeded in samples from eight of the 15 monitoring wells screened in the outwash aquifer. The SMCL for iron was exceeded in samples from five outwash wells. However, with the exception of G122 and G129, these wells are located within 300 ft of the downgradient edge of the landfill. Well G129 is located approximately 350 ft downgradient of the landfill, and well G122 is located approximately 650 ft downgradient of the landfill.

- High concentrations of inorganic constituents detected in samples from well G133S are attributed to this well's proximity to Spring Brook.

Inorganic constituents detected in monitoring well samples from the bedrock aquifer are summarized below:

- Aluminum, antimony, beryllium, cadmium, chromium, copper, selenium, silver, thallium, vanadium, cobalt, mercury, and nickel were not detected in samples from the downgradient monitoring wells.

- Arsenic, zinc, and cyanide were detected in a few of the downgradient bedrock well samples; however, no MCLs or SMCLs were exceeded for any of these metals.

- Manganese was detected in five of the downgradient bedrock monitoring well samples at concentrations exceeding the background comparison criteria. The SMCL for manganese was exceeded in G128D, G133D, and G138.

- Iron was detected in only three bedrock monitoring well samples. In each case, the detected concentration exceeded the background comparison criterion. The SMCL for iron was exceeded in G128D and G139.

### 3.1.4 Private Wells

Organic constituent characteristics of the private well samples are summarized below:

- No SVOCs or PCBs were detected in any of the private well samples.

- The only VOCs detected in downgradient private well samples were 1,1-dichloroethane and cis-1,2-dichloroethene. These compounds were present at trace levels of 2 ug/L or less in several private wells west of the landfill. No MCLs were exceeded for these compounds. Benzene was detected in one duplicate sample only, at a concentration of 1 ug/L.

- While pesticides were detected below the CRQL in samples from three private wells, these detections are attributed to laboratory glassware contamination. No pesticides were detected in any of the leachate, landfill gas, or groundwater samples obtained on-site.

Occurrences of inorganic constituents in the private well samples are summarized as follows:

- Arsenic was detected in 14 of the 51 downgradient private well samples. However, none of these detections exceeded the MCL, and downgradient arsenic concentrations did not fail the statistical comparison with upgradient concentrations.

- Lead was detected in samples from two downgradient private wells, but was not detected in samples from the site monitoring wells. These lead occurrences are attributed to the water distribution systems in the individual homes.

- Zinc was detected in the majority of the private well samples, but was not detected in samples from the site monitoring wells. The zinc in the private well samples is attributed to the water distribution systems in the homes.

- Manganese was detected in samples from 24 of the 51 downgradient private wells and in samples from the five upgradient wells used for statistical comparisons. The SMCL for manganese was exceeded in samples from eight downgradient private wells.

- Iron concentrations in samples from 44 of the 51 downgradient private wells and all five upgradient wells exceeded the SMCL for iron.

- While sodium detected in downgradient private well samples failed the statistical comparison, sodium concentrations are not believed to be landfill related. Sodium concentrations in the downgradient private well samples were commonly higher than concentrations observed in on-site monitoring wells. Spring Brook and private septic fields are believed to be possible sources of the elevated sodium in the private well samples.

The detection of toluene at 0.7 ug/L or less in one upgradient on-site drinking water well is attributed to the solvent glue used to weld PVC water distribution lines.

### 3.1.5 Surface Water

The chemical characteristics of surface water samples obtained at the site are summarized below:

- No organic compounds were detected in any of the surface water samples.

- Surface water samples from Silver Lake contained concentrations of arsenic, mercury, copper, calcium, magnesium, potassium, and sodium less than two times the concentration detected in background sample SW01. Aluminum, lead, and manganese were detected in investigative samples collected from Silver Lake, but not in the background sample. Barium and iron were detected at concentrations greater than two times the background concentration.

- Of the metals detected in samples from Pine Lake, only manganese was present at concentrations greater than background (manganese was not detected in sample SW01). Of metals detected in samples collected from Sand Pond, barium, manganese, calcium, iron, magnesium, and sodium were present at concentrations greater than two times the background concentration present in sample SW01.

- In general, the highest concentrations of inorganic constituents detected in surface water samples were found in samples from Spring Brook. These concentrations are not believed to be related to the landfill, since Spring Brook receives wastewater effluent upstream from the landfill and consistently loses water to the groundwater system downgradient of the landfill.

### 3.1.6 Sediment

Chemical characteristics of sediment samples collected at the site are summarized below:

- No pesticides or PCBs were detected in any of the sediment samples.

- The only VOCs detected in sediment samples were detected in samples from Sand Pond. Vinyl chloride (5 ug/kg), 1,1-dichloroethane (3 ug/kg), and carbon disulfide (5 ug/kg), were detected in these samples.

- SVOCs were detected in both background sediment samples and samples potentially impacted by site run-off. Site samples generally contained higher concentrations of SVOCs than were found in background samples.

- Sediment samples from the site lakes generally contained metals at concentrations less than two times those detected in background sample SD01. While metals were detected in the downstream sample from Spring Brook at greater than two times the concentrations detected in the upstream sample, these elevated concentrations are not attributed to the landfill. Spring Brook discharges to the water table downgradient of the landfill, and receives wastewater effluent upstream of the landfill.

### 3.1.7 Surface Soils

Chemical characteristics of the surface soil samples collected at the site are summarized below:

- No pesticides were detected in the surface soil samples obtained at the site.

- PCBs were detected in one soil sample, SS01, located in a run-off area from the parking lot north of Sand Pond.

- VOCs were detected in two background soil samples. No VOCs were detected in any soil samples potentially affected by landfill run-off.

- SVOCs were detected at background sampling location SS05 and in possible historical leachate seep area sample location SS03. Therefore, the concentrations detected at SS03 may not be a result of landfill impacts.

- In general, the highest concentrations of metals in soil samples occurred in site sample SS01. The concentrations detected in SS01 may result from the fact that this sampling location receives drainage from the western parking lot.

- Of the metals detected in the investigative samples, only silver failed the statistical comparison with background.

## 3.2 CONTAMINANT FATE AND TRANSPORT

The source of chemicals of potential environmental concern at the Blackwell site is the buried waste. If gas or leachate move into the environment surrounding the landfill, the potential exists that chemicals of concern may move along migration pathways to potential receptors. The transport of chemicals of potential concern is limited by the landfill cap and liner, and the clay cells in which waste was disposed. Further migration may be limited by dilution, adsorption/desorption, biodegradation, oxidation/reduction reactions, precipitation, and volatilization of contaminants.

In general, natural attenuation and dilution appear to be limiting the migration of potential contaminants from the landfill. This limited migration is demonstrated by the following:

- While VOCs are present in the landfill gas, no VOCs were detected in ambient air samples on, or downwind of, the landfill.

- Many of the organic constituents detected in the leachate and landfill gas, such as toluene, 2-butanone, acetone, and 4-methylphenol, were not detected in the groundwater.

- While low levels of VOCs were detected in the groundwater in the outwash aquifer immediately downgradient of the landfill, the zone of impacted groundwater appears to be limited to an area a few hundred feet downgradient of the fill.

- VOC concentrations in the bedrock aquifer are very low (10 ug/L or less), even where the till aquitard between aquifers is thin and silty.

## 3.3 BASELINE RISK ASSESSMENT SUMMARY

NEEDS REVISION

The baseline risk assessment performed for the Blackwell site indicated that risks to human health are not likely to occur under either current or future land use scenarios.

The baseline risk assessment was conducted to determine whether the levels of contamination detected in media at the site may pose a risk to public health. Health risks were estimated based on current land use of the site (forest preserve) and the area

surrounding the site (residential development). It was determined that land use of the site and the surrounding area would not change for the future use scenario. Therefore, health risks based on current land use conditions were also considered to be applicable for future land use conditions.

The first step in the risk assessment process was to determine which chemicals were of potential concern to human health. To determine this, a comparison of the concentration of chemicals detected in media (e.g., sediment) in areas potentially impacted by the landfill was made to concentrations of chemicals in the same media collected in areas not impacted by the landfill (i.e., background). This comparison was made to determine in which media chemical concentrations were elevated above background. The chemicals detected above background concentrations were considered to be chemicals of potential concern. Health risks were calculated for each chemical of potential concern. Based on this analysis, it was determined that there were some chemicals of potential concern in sediment and surface water samples collected from Silver Lake and Sand Pond and in soil samples collected on the landfill. There were also chemicals of potential concern in air (based on modeling of landfill gas emissions), and in private well samples. While no tissue samples were analyzed from fish in the site lakes, it was conservatively assumed that fish may contain certain chemicals of concern detected in Silver Lake sediment samples.

The second step was to determine pathways of exposure, based on current land use conditions and the characteristics of contamination at the site. Activity assessments were conducted of Blackwell Forest Preserve recreational users, and employees. The surveys were performed to determine how frequently, and for what duration each of these populations were likely to be exposed to chemicals of potential concern in sediment, surface water, soil, ambient air, and fish. In addition, demographic information was collected on residents living near the landfill. Information on the duration of time residents normally live at a residence was determined from national statistics compiled by the U.S. EPA. Residents living near the landfill, in the downgradient direction of groundwater flow, were considered to be exposed to chemicals of potential concern in air, and private well water. Based on the activity assessments and national statistics, and the concentration of chemicals of potential concern in media, estimates of chemical exposure were calculated for each population.

Health risks are not expected to occur to people working and recreating at the site, based on the level of chemical exposure, and the toxicity of the chemicals of potential concern. For this reason, under current and likely future land use conditions, recreating or working at the Blackwell Forest Preserve, or living near the Preserve does not pose a public health concern.

## 3.4 ECOLOGICAL ASSESSMENT SUMMARY

The Ecological Assessment identified chemicals of potential ecological concern, ecological systems, and members of those systems that are potentially exposed. The Ecological Assessment then assessed the risk for adverse ecological effects to those populations from

the chemicals of potential ecological concern. Both qualitative and quantitative methods were used to assess ecological risks.

Results of the ecological assessment indicate that there is little risk to ecological populations and communities at the site from organic chemicals, based on the following:

- Pesticides were not detected in environmental media.
- VOCs were detected only at very low concentrations
- SVOCs, where present, are not landfill-related
- SVOCs and PCBs, where present in the terrestrial environment, occur at concentrations below which adverse ecological effects are associated

Metals of potential ecological concern in site surface soils appeared to be present in concentrations lower than those sufficient to affect small terrestrial mammal populations. Exposure of aquatic species in Silver Lake and Sand Pond to metals of potential ecological concern does not appear to pose an environmental hazard.

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# Section 4

# 4

# IDENTIFICATION AND SCREENING OF TECHNOLOGIES

The objective of the identification and screening of technologies process is to identify a manageable number of applicable remedial technologies which can then be assembled into remedial action alternatives (see Section 5). For the Blackwell Landfill site, this process consists of the following tasks:

- Identification of media of concern
- Development of Remedial Action Objectives
- Development of general response actions
- Identification of volumes or areas of media
- Identification and screening of remedial technologies
- Evaluation and selection of technology process options

The following subsections provide a discussion of each of these tasks.

## 4.1 IDENTIFICATION OF MEDIA OF CONCERN

The Baseline Risk Assessment and Ecological Assessment (summarized in Sections 3.3 and 3.4, respectively) evaluated potential risks to human health and the environment from potential exposure to contaminants present at the site. The evaluation considered land use conditions as they currently exist at the site. Potential future land use conditions, such as residential and commercial development, are not applicable for this site since the landfill is located in the Blackwell Forest Preserve. The Forest Preserve of DuPage County lacks the authority to sell any portion of the Blackwell Forest Preserve to a private party (Letter dated June 12, 1992 from R. Mork to R. Utt, Appendix A). Therefore, the risk assessment considered risks to be the same for both current and future land use scenarios.

The Baseline Risk Assessment and Ecological Assessment concluded that the media present at the Blackwell Landfill site do not pose an unacceptable risk at the site. However, the leachate contained within the landfill could represent a potential risk if leakage were to increase in the future. Therefore, the following two media are being addressed in this FS:

- Groundwater
- Leachate

Landfill gas is not considered a media of concern at the landfill. The Baseline Risk Assessment noted that unacceptable health risks are not incurred by recreational users, on-site workers, and off-site residents as a result of exposure to small concentrations of VOCs through this pathway. Non-cancer risk estimates and cancer risk estimates for the three subpopulations evaluated were below levels of concern (i.e., HI<1 and $Cr<1x10^{-6}$). However, gas management would be a necessary component of a low permeability cap. Therefore, gas management will be discussed in the context of cap repair and cap construction in later sections of the FS.

### 4.1.1 Groundwater

Groundwater is a media of concern to be addressed because VOCs exist in the groundwater immediately downgradient of the landfill at concentrations that exceed MCLs. VOCs identified in the groundwater at concentrations at or above MCLs include vinyl chloride (31 ug/L), 1,2-dichloroethene (120 ug/L), 1,2-dichloropropane (5 ug/L), trichloroethene (18 ug/L), and tetrachloroethene (12 ug/L).

Two rounds of samples were collected from each monitoring well. MCLs were met or exceeded during one sampling event at two wells that are located near the downgradient Forest Preserve District Property line.

- Benzene was detected at the MCL of 5 ug/L in the sample from monitoring well G138 during the first sampling round on September 19, 1991. Benzene was not detected in the sample from G-138 during the second round of sampling. Neither benzene nor any other organic contaminant was detected in the second round sample collected from G138 on January 29, 1992.

- bis(2-ethylhexyl)phthalate was detected at a concentration of 29 ug/L in the sample collected from monitoring well G139 on September 19, 1991. This was significantly above the MCL of 3 ug/L Neither bis(2-ethylhexyl)phthalate nor any other organic contaminant was detected in the second round sample collected from G139 on January 29, 1992.

To resolve the ambiguity of these sampling results, the monitoring wells were sampled again in June 1995. The results of the resampling suggest that the detections in the September 1991 samples were anomalous. Benzene was not detected again in monitoring well G138. Bis(2-ethylhexyl)phthalate and dimethylphthalate were detected at a concentration of 2 ug/L and 1 ug/L respectively in the samples from G138 and G139. However, bis(2-ethylhexyl)phthalate was also detected the method blank, indicating that the phthalates were due laboratory contamination.

***Note regarding June 1995 Sampling:***
*During the first two weeks in June 1995, samples were collected from the same 24 monitoring wells sampled for two rounds in 1991 and 1992 during the Remedial Investigation. A sample from each well was analyzed by First*

*Environmental Laboratories in Naperville, using SW-846 methods. Because of the sensitive nature of monitoring wells G138 and G139, duplicate samples were also collected from these wells (and G128S) and sent to a CLP laboratory for analysis. These CLP results were subjected to standard data validation procedures. (The laboratory data sheets for samples sent to both laboratories are included in Appendix B.)*

Validated Data Not Available for this Draft

*It is important to note that although the Contract Required Quantitation Level (CRQL) ranges from 10 to 25 on the CLP laboratory data sheets, the lab is required to report any compound above their instrument detection limits. In general, the instrument detection limits are 1 ug/L for water with these concentrations of organic compounds. The detections below the CRQL would be reported with a "J" qualifier, indicating an estimated value.*

*Therefore, SW-846 and CLP sampling results are consistent, in showing no detections at or above MCLs.*

In summary, significant VOC and SVOC groundwater concentrations are limited to areas within approximately 200 feet downgradient of the landfill. Groundwater contaminants are apparently rapidly attenuated and diluted in the outwash aquifer within 650 feet downgradient of the landfill. Modeling results are consistent with the conclusion that VOC and SVOC concentrations have stabilized in a small area within the Forest Preserve property. No drinking water wells exist in this area of concern.

### 4.1.2 Leachate

Leachate will be addressed as a media of concern. Leachate measurements taken in landfill vents indicate leachate levels may be as high as 70 feet above the base of the landfill. If these levels represent saturated thickness, there could be as much as 70 million gallons of leachate present in the landfill. The leachate levels present in the landfill may represent a significant pressure head which may contribute to landfill leakage through the landfill base into the upper aquifer.

## 4.2 DEVELOPMENT OF REMEDIAL ACTION OBJECTIVES

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Remedial Action Objectives are media-specific goals for protecting human health and the environment. Several specific Remedial Action Objectives were developed to achieve the long-term goals of protecting human health and the environment, preventing or minimizing exposure to contaminants, and complying with ARARs. Remedial Action Objectives for the two medias of concern (groundwater and leachate) are as follows.

### 4.2.1 Groundwater

For on-site groundwater, the Remedial Action Objectives include the following:

- Prevent the off-site migration of contaminants above MCLs

- Prevent the off-site migration of groundwater containing concentrations of contaminants that represent an unacceptable human health or environmental risk.

### 4.2.2 Leachate

The Remedial Action Objectives for leachate include the following:

- Reduce the volume of leachate that has the potential to contaminate groundwater.

- Limit the generation of new leachate that would have the potential to contaminate groundwater.

## 4.3 DEVELOPMENT OF GENERAL RESPONSE ACTIONS

General response actions describe broad types of action which could be conducted to satisfy the Remedial Action Objectives. Potential general response actions are gathered from U.S. EPA guidance documents, literature review and experience at other sites. The general response actions for groundwater and leachate are discussed below.

### 4.3.1 Groundwater

The following general response actions address groundwater contamination at the landfill:

- No action
- Monitoring
- Groundwater use restrictions
- Gradient controls
- Treatment on-site
- In-Situ treatment
- Discharge

### 4.3.2 Leachate

The following general response actions address the leachate contained in the landfill fill material:

- No action
- Monitoring
- Leachate reduction
- Treatment on-site
- Leachate use restrictions
- In-Situ treatment

- Treatment off-site
- Discharge

## 4.4 IDENTIFICATION OF VOLUMES OR AREAS OF MEDIA

The purpose of this task is to make an initial assessment of the volume or area of each of the media of concern to which general response actions might be applied.

### 4.4.1 Groundwater

Section 4 of the RI Report indicates that the outwash aquifer is absent upgradient (north and east) of the landfill, and begins under the landfill itself. The outwash aquifer extends to the limit of the site downgradient of the landfill (south and west), and is separated from the bedrock aquifer by the Malden/Tiskilwa Till aquitard. The Malden/Tiskilwa Till aquitard may be absent in a small area downgradient of the landfill. This is shown on Figures 2-5 and 2-6.

MCLs were exceeded for several VOCs in samples from one or more monitoring wells screened in the outwash aquifer. VOCs for which MCLs were exceeded include vinyl chloride, 1,2-dichloroethene (1,2-DCE), 1,2-dichloropropane, trichloroethene (TCE), and tetrachloroethene (PCE).

The area of the outwash aquifer where MCLs for any of the above listed chemicals of potential concern are exceeded is presented on Figures 4-1. This figure shows that the area where MCLs are potentially exceeded is limited to a few hundred feet downgradient of the landfill and does not extend off site.

MCLs were not exceeded in samples collected from the bedrock wells. Although benzene was detected in two bedrock wells (G-140D and G-138) at the MCL value of 5 ug/L, during the first sampling round, this compound was not detected in these wells during the second round of sampling. Because of the anomaly presented by these results, the wells were resampled in June 1995. Benzene was not detected in either of these wells in the samples collected in June 1995. Therefore, the detection of benzene appears to be a laboratory or sample handling anomaly, unrelated to the groundwater quality at the site.

The MCL for bis(2-ethylhexyl)phthalate was exceeded in samples from monitoring wells G-127 and G-139 during one round only. These detections also appear to be anomalies and unrelated to the groundwater quality at the site (see section 4.1.1) since they were not detected in samples collected from these wells.

Secondary MCLs were exceeded for iron and manganese in samples from several of the outwash aquifer and bedrock aquifer monitoring wells. These exceedances are not considered critical, since secondary MCLs are not health-based criteria. In any case, the

MCL for iron was exceeded in both upgradient and downgradient private wells, indicating the condition is not landfill related.

### 4.4.2 Leachate

The volume of leachate within the landfill is estimated to be approximately 70 million gallons (Warzyn, 1994). This value was calculated by subtracting the elevation of the base of the refuse across the site from the average leachate elevation in the landfill vents. The calculation assumes the leachate levels represent saturated thickness and a 25 percent porosity. The estimate of leachate volume is conservative since it is based on the assumptions of a 25 percent porosity and total saturation of the refuse. It does not account for the possibility that porosity of the refuse may be lower because of compaction, nor does it account for the possibility that the measured leachate levels may represent perched conditions, or condensated liquid collected in the gas vent/leachate well.

Individual organic compounds detected in the leachate samples include acetone (10,000 ug/L), 2-butanone (17,000 ug/L), 4-methyl-2-pentanone (1,100 ug/L), 2-methylphenol (17,000 ug/L), toluene (3,200 ug/L), 1,4-dichlorobenzene (940 ug/L), naphthalene (960 ug/L), and trichloroethene (720 ug/L). All other organic compounds detected in the leachate samples occurred at maximum concentrations less than 500 ug/L. No pesticides or PCBs were detected in the leachate samples. RCRA Toxicity Characteristic levels were not exceeded for metals detected in the leachate samples. but were for TCE.

## 4.5 IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES

The purpose of this task is to identify and screen a broad range of remedial technologies and process options. Remedial technologies are general categories of technologies whereas process options are specific technologies or processes within each technology type. The remedial technologies and process options are screened at this point based on their technical implementability. Remedial technologies and process options which are applicable are carried forward for further evaluation. Those not applicable are eliminated from further consideration.

The evaluation process discussed above is shown schematically on Table 1. This table provides a brief description of each process option for each general response action (listed on page 4-4) and includes the reason for retaining or eliminating individual process options. A more detailed explanation of the remedial technologies under consideration for addressing groundwater and leachate has been included in Tables 3 and 4, respectively. These tables offer the reader a concise listing of the general response the various remedial technologies considered to achieve a response action, an explanation of the technology, and an explanation of why a remedial technology or a corresponding process option was either retained or eliminated from consideration.

### 4.5.1 Groundwater

Page 1 of Table 1 schematically demonstrates the identification and screening process for general response actions for groundwater. Table 3 presents the general response actions and associated remedial technologies for groundwater and provides a summary of the rationale for retaining or eliminating the remedial technologies from further consideration.

Remedial technologies for groundwater eliminated from consideration based on technical impracticability include the following:

- Groundwater Use Restrictions - Groundwater use restrictions consisting of deed restrictions, well closure and zoning restrictions are not applicable. Deed and zoning restrictions are unnecessary due to the location of the site in the Blackwell Forest Preserve. The Forest Preserve District lacks the power to sell any portion of the Blackwell Forest Preserve to a private party (Letter dated June 12, 1992 from R. Mork to R.Utt). No drinking water wells are present in the area of groundwater contamination.

- Vertical Barriers - Vertical barriers consisting of slurry walls, grout curtains, sheet piles, vibrating beam walls and soil dams are not applicable because the groundwater flow through the outwash is too great. Contamination is remaining generally stationary at the site, further making physical barriers to flow unnecessary.

- Horizontal Barriers - Horizontal barriers consisting of grout injection through closely spaced drill holes are not applicable because the groundwater flow through the outwash is too great. Contamination is remaining stationary at the site, further making physical barriers to flow unnecessary.

- Thermal Destruction - Incineration and wet air oxidation consists of treating groundwater in a thermal treatment unit at elevated temperatures. These technologies are generally not applicable to the treatment of low contaminant concentrations in a primarily aqueous liquid.

- Treatment Off-site - Groundwater transport to a POTW for treatment is not applicable because a trunk line to a local POTW does not exist in the area. It would not be cost effective to truck the large volume of groundwater from the site to an off-site treatment facility.

The remedial technologies identified and retained for detailed evaluation in this Feasibility Study include:

- No action
- Monitoring
- Extraction and/or recharge

- Biological Treatment
- Chemical Treatment
- Physical Treatment
- In-situ treatment
- Discharge

### 4.5.2 Leachate

Table 1 schematically demonstrates the identification and screening process for leachate. Table 4 presents the general response actions and associated remedial technologies for leachate and provides a summary of the rationale for retaining or eliminating the remedial technologies from further consideration.

Remedial technologies for leachate eliminated from consideration based on their technical impracticability include the following:

- Vertical Barriers - Vertical barriers consisting of slurry walls, grout curtains, sheet piles, and vibrating beam walls are not applicable because the leachate is not migrating beyond the filled areas.

- Horizontal Barriers - Horizontal barriers are not applicable because a landfill liner and cap are already present at the site.

- Groundwater Diversion - Groundwater diversion consisting of trenches or drains used to divert groundwater around the landfill is not applicable because the outwash aquifer forms beneath the landfill and groundwater flow is naturally directed around the landfill.

- Thermal Destruction - Incineration and wet air oxidation consists of treating leachate in a thermal treatment unit at elevated temperatures. These technologies are generally not applicable to the treatment of a primarily aqueous liquid.

- Leachate Use Restrictions - Leachate use restrictions consisting of deed restrictions, well closure, and zoning restrictions are not applicable. Deed and zoning restrictions are unnecessary due to the location of the site in the Blackwell Forest Preserve. The Forest Preserve District lacks the power to sell any portion of the Blackwell Forest Preserve to a private party (Letter dated June 12, 1992 from R. Mork to R. Utt). No drinking water wells are located within the landfill area.

The remedial technologies identified and retained for detailed evaluation in this Feasibility Study include:

- No action
- Monitoring

- Horizontal Barriers
- Extraction
- Capping
- Surface Stabilization
- Biological treatment
- Chemical treatment
- Physical treatment
- In-situ biological treatment
- In-situ chemical treatment
- Treatment off-site
- Discharge

## 4.6 EVALUATION AND SELECTION OF TECHNOLOGY PROCESS OPTIONS

The last task prior to assembling the alternatives is to evaluate and select the process options that will represent each technology type. The purpose of this task is to select a limited number of promising process options for consideration in assembling remedial action alternatives. Process options are evaluated considering:

1) Effectiveness
2) Implementability
3) Relative cost criteria

Effectiveness is the primary criterion used to screen process options at this point in the process. Effectiveness is evaluated considering potential end results; for example, the ability of the technology to meet the remedial action objective and the ability of the technology to adequately accommodate the relevant waste type and quantities.

Implementability is evaluated considering the technical and administrative feasibility of applying the technology. Technical implementability considers a range of factors relevant to obtaining, installing, and using a particular technology. Some remedial technologies are proven and readily available, while others are in the research and development stages. Insufficiently developed technologies are generally screened out. Site conditions must be compatible with the feasible range of a given technology's capabilities, considering for example, depth to bedrock, depth to groundwater, space requirements, ability of technology to treat identified contaminants, etc. Administrative implementability considers a range of factors relevant to the testing, review, approval, and/or permitting of a particular technology.

Cost is evaluated relative to capital, and operation and maintenance costs. Cost plays a limited role in the screening of process options at this stage. However, remedial technologies that are very expensive but also equally or only marginally more effective than much lower cost technologies are screened out.

The process options evaluated according to their effectiveness, implementability, and relative cost is documented on Table 2. Table 2 includes the evaluation of each process option retained from Table 1 for the above three criteria. Tables 5 and 6 provide a listing of general response actions and corresponding remedial technologies still under consideration for groundwater and leachate, respectively. Process options that represent each remedial technology are also presented, along with a detailed description as to whether they were retained or eliminated from further consideration during the evaluation of technology process options phase of this project.

### 4.6.1 Groundwater

Table 2 schematically demonstrate the logic used to evaluate the various leachate process options. Table 5 presents the general response actions, remedial technologies and process options retained from the screening process, explains the effectiveness, implementability and cost considerations for each process option and identifies the process options that are retained for consideration when assembling alternatives.

Remedial technologies and process options for groundwater which were evaluated and not carried forward consist of the following:

- Biological Treatment - Biological treatment, consisting of aerobic or anaerobic microbial degradation of organics in groundwater, was not carried forward due to limited effectiveness for removal of low concentrations of VOCs.

- Chemical Treatment - Chemical treatment consisting of precipitation, oxidation, photolysis, or reduction, was not carried forward due to limited effectiveness for removal of low concentrations of VOCs.

- Steam Stripping - Steam stripping is an effective and implementable method of removing VOCs present in the groundwater but would not be cost effective versus an air stripping system.

- Carbon Adsorption - Carbon adsorption would not be effective for removal of organic and inorganic contaminants from groundwater due to the high flow rate of groundwater requiring treatment.

- Reverse Osmosis - Reverse osmosis would not be effective for removal of contaminants due to the high flow rate of groundwater requiring treatment.

- Ion Exchange - Ion exchange would not be effective for removal of VOCs.

- Spray Evaporation - Spray evaporation would only be effective during non-winter months. It would not be effective during December through February, when ambient temperatures are likely to remain below freezing.

- Bioreclamation - The effectiveness of bioreclamation would be uncertain at the site. A pilot study would be required to determine if this process option would effectively treat groundwater.

- Permeable Treatment Beds - The effectiveness of permeable treatment beds to remove groundwater contaminants would be uncertain at the site. A pilot study would be required to determine if this process option would effectively treat groundwater.

- Chemical Reaction - The effectiveness of chemical reaction to remove groundwater contaminants would be uncertain at the site. A pilot study would be required to determine if this process option would effectively treat groundwater.

The process options evaluated and retained for development and evaluation in this Feasibility Study include:

- No Action
- Monitoring
- Extraction wells
- Air Stripping
- Surface water discharge

**4.6.2 Leachate**

Table 2 schematically demonstrate the logic used to evaluate the various leachate process options. Table 6 presents the general response actions, remedial technologies and process options. It explains the effectiveness, implementability and cost considerations for each process option, and identifies the process options that are retained and will be considered when assembling alternatives.

The effectiveness and implementability of remedial technologies and process options for leachate depend on several uncertainties regarding leachate volume and extraction rate. These include:

- uncertainties regarding the total existing leachate volume and the generation or infiltration rate,

- uncertainties of the actual pumping rate that can be maintained in the leachate extraction wells,

- uncertainties regarding the origin of the leachate (fossil vs. infiltration)

Conservative assumptions were intentionally used in developing an estimate of the volume and generation rate of leachate. This was done so that any errors in calculation would be on

the side of over-estimating total leachate volume. Therefore, it is likely that the actual volume of extractable leachate will be considerably lower than the calculated amount. Remedial technologies or process options which base their effectiveness or implementability on assumptions of large and sustainable leachate yields or volumes, without the results of an extended operation of the system to identify these factors, would not be cost effective to implement at this time.

Based on the effectiveness, implementability and cost effectiveness of the alternatives and their ability to address unknown leachate volumes and extraction rates at the landfill, the following remedial technologies and process options for leachate were evaluated and not carried forward:

- Grout Injection - Grout injection involves drilling to the base of the landfill and then injecting grout into the base to inhibit leachate leakage through the landfill base to groundwater. This process is difficult to implement since the exact location of the leakage must be identified and the grout must fully permeate the area to be effective. Also, the effectiveness of grout injection is limited because a clay liner already exists under most of the landfill in which elevated leachate levels are observed.

- Pavement Cap - Use of a permanent cap such as concrete or asphalt would not be effective due to differential settlement of refuse, frost action which would tend to crack and heave the cover material. A pavement cap would be difficult to implement over 40 acres and steep landfill slopes. Moreover, capping the former landfill with concrete or asphalt would prevent the site from being used for its current recreational purposes.

- Cap: RCRA Subtitle C, (hazardous waste landfill-type cap) - Although installation of a RCRA Subtitle C cap over the existing cap could reduce landfill infiltration, the existing clay cap or installation of an IAC 811 cap can provide the same function more cost effectively. Implementability may be questionable because of steep side slopes.

- Cap: RCRA Subtitle D, (solid waste cap) - Although installation of a RCRA Subtitle D cap over the existing cap could reduce landfill infiltration, the existing clay cap or installation of an IAC 811 cap can provide the same function more cost effectively. Implementability may be questionable because of steep side slopes.

- Biological Treatment - The effectiveness of biological treatment of leachate would be uncertain because of the unknown volume and sustainable leachate extraction rate at the landfill. Biological treatment would be costly to implement if leachate flow rate is low.

- Chemical Treatment - Precipitation is effective for removal of inorganic compounds but does not address the other contaminants present. This treatment option can be combined with other treatment technologies for improved effectiveness. Chemical treatment would be costly to implement if leachate flow rate is low.

- Chemical Treatment - Oxidation and photolysis are implementable, but would not be effective because these options require low turbidity, color, and dissolved inorganic constituents to effectively destroy organic constituents. The leachate does not possess these characteristics. Reduction is effective for destruction of chlorinated organics but does not address the other contaminants present.

- Air Stripping - Air stripping is not effective for the removal of inorganic compounds and some VOCs in the leachate.

- Steam Stripping - Steam stripping is an effective and implementable method of removing VOCs present in the leachate but would not be cost effective versus an air stripping system.

- Carbon Adsorption - Carbon adsorption would effectively remove organic and inorganic contaminants from leachate and can be readily implemented. However, the option would require significant pretreatment and would not be as cost effective as other viable process options.

- Reverse Osmosis - Significant pretreatment would be required prior to use of a RO system to avoid fouling of the reject side of the membrane. Inorganic contamination would be significantly removed by the pretreatment system, minimizing the need for a following RO system. Organic contamination would not be effectively removed because organic constituents present in the leachate are predominantly those with molecular weights below 200, which can pass through a RO filter.

- Ion Exchange - Ion exchange would not effectively remove contaminants from the leachate. Significant pretreatment would be required for use of this technology for the removal of heavy metals and some organic contamination. The resulting pretreatment system would be effective for removing heavy metals, minimizing the need for a following ion exchange system.

- Spray Evaporation - Spray evaporation would not be readily implementable. It is unlikely that such a system could be permitted by the regulatory authority, VOCs from the leachate would be emitted into the atmosphere.

- Bioreclamation - In-situ bioreclamation would have uncertain effectiveness for the removal/digestion of organic contaminants present in the leachate. Implementability of the technology would also be difficult due to the need for good interaction between the bacteria, nutrients and the organic contaminants. Further, the technology would not meet the remedial action objective of reducing the generation or volume of leachate present in the landfill.

- Physical/Chemical Treatment - In-situ chemical degradation/precipitation of organic contaminants would have uncertain effectiveness. Implementability of the technology would also be difficult due to the need for good interaction between injected chemicals and the organic contaminants. Further, the technology would not meet the Remedial Action Objective of reducing the level/volume of leachate present in the landfill.

- Discharge to POTW via sewer line - Direct discharge to a POTW via a sewer main has been eliminated because implementation would not cost effective in comparison to other viable alternatives. No sewer main exists in the area, and the POTW is located up slope from the landfill.

- Surface Water - Surface water discharge would be effective for discharging treated leachate. This process option would require permit coordination and would not be readily implementable at the site without leachate pretreatment. On-site pretreatment would be costly to implement if leachate flow rate is low. This treatment option may be considered in the future if leachate volume and extraction rates are higher than expected.

- Deep Well Injection - Deep well injection is an effective method for the discharge of treated leachate but is difficult to implement. Permitting of deep well injection systems is difficult, due to potential adverse effects to the aquifer in which the waste stream is discharged.

- Infiltration Basin - Infiltration basins are an effective and implementable method for discharge of treated leachate. However, surface discharge points are available that preclude the need for construction of such a system.

The process options evaluated and retained for leachate include:

- No action
- Monitoring
- Extraction Wells
- Cap Repair
- IAC 811 Cap
- Grading
- Vegetation
- Trucking to POTW

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# Section 5

MONTGOMERY WATSON

# 5

# DEVELOPMENT AND SCREENING OF REMEDIAL ACTION ALTERNATIVES

The objective of developing alternatives is to assemble the remedial technologies which remain after initial screening into remedial action alternatives that protect human health and the environment and encompass a range of potentially appropriate remedial options. The objective of subsequent alternative screening is to narrow the list of potential alternatives developed to those that will be evaluated in the detailed analysis section. This subsequent screening aids in streamlining the FS process while retaining the most promising alternatives for more detailed consideration.

Process options carried through the technology screening in Section 4 have been considered when assembling remedial alternatives for the Blackwell Landfill site. Each alternative is potentially viable in addressing the identified site concerns. The no action alternative, required by the NCP, is included to provide an assessment of the consequences of taking no remedial response actions.

Table 7 provides a listing of technologies and process options which were retained from the screening of technologies presented in Section 4 (no-action option not included).

## 5.1 DEVELOPMENT OF REMEDIAL ACTION ALTERNATIVES

For the Blackwell Landfill site, the two media of concern are groundwater and leachate. Although landfill gas is not a media of concern, it is being produced at the site. If a remedy is selected that reduces the permeability of the cap, there is the potential that gas pressures could build up beneath the cap, and result in fracturing the cap and increasing permeability. Therefore, alternatives that include measures to repair or reconstruct the landfill cap will need to contain a gas management component. The rationale used to combine process options for groundwater and leachate into remedial action alternatives is presented below.

### 5.1.1 Groundwater

Groundwater contamination at the site is limited to a small area west and southwest of the landfill. Contaminants of primary concern include six VOCs and one SVOC detected at concentrations at or above MCLs (see Section 3.1.3). Data collected during the Remedial Investigation indicated that the majority of contaminant concentrations are detected in wells located in the outwash aquifer within approximately 100 feet downgradient of the landfill. Detectable concentrations of VOCs and SVOCs were not identified in outwash wells G123, G122, and G121, located 300 to 600 feet downgradient of the landfill. The absence of

VOCs and SVOCs in these wells is attributed to natural attenuation and dilution in the outwash aquifer. The region of contaminated groundwater is at steady state and is not moving further downgradient with time.

The Remedial Action Objectives for groundwater include preventing off-site migration of contaminants above MCLs and preventing off-site migration of groundwater containing concentrations of contaminants that represent an unacceptable human health or environmental risk (see Section 4.2.1). These objectives can be achieved by implementing monitoring or gradient control measures at the landfill as general response actions. Groundwater monitoring does not require inclusion of other process options to be implemented at the site. Extraction wells, air stripping and surface water discharge were identified as specific process options for implementing the gradient control response action at the landfill. No other remedial technologies or process options were retained in Section 4 for consideration in this Feasibility Study.

### 5.1.2 Leachate

The volume of leachate present in the landfill may be as much as 70 million gallons (Warzyn, 1995, p. 4-5) and the rate of leachate generated may be as high as 9,500 gallons per day (Warzyn, 1995, p. 4-11). Analytical results from leachate sampling programs indicate the presence of a variety of inorganic constituents, VOCs and SVOCs above MCLs in the leachate. Leachate is believed to be the primary source of contaminants in the groundwater aquifers.

The Remedial Action Objectives for leachate are to reduce the volume present in the landfill, and to limit the potential for future generation of leachate that has the potential to contaminate groundwater. Because the volume and sustainable yield of leachate may be much lower than estimated due to the landfill's construction, remedial alternatives developed for evaluation in this Feasibility Study must be able to reduce leachate volume at the site independent of the sustainable leachate extraction rate. Those general response actions based on assumptions that leachate levels measured in existing landfill vents represent recoverable saturated thickness at the site were not retained in Section 4 for evaluation in the FS. Response actions assembled in this section will meet the Remedial Action Objective for leachate without relying on upper-bound estimates of leachate volume to be technically and economically feasible.

Cap repair, new cap construction, surface stabilization, extraction wells, off-site treatment and disposal, and monitoring were retained in Section 4 as potential remedial technologies to achieve the Remedial Action Objective for leachate. Specific process options considered for reducing leachate volume in the landfill included cap repair; construction of a 35 IAC 811 cap, grading and vegetation of the cap for stabilization, leachate extraction, and off-site trucking.

Uncertainties regarding leachate volume and extraction rate would be addressed by implementation of the leachate extraction and off-site disposal alternative at the landfill.

Volume and infiltration rate uncertainties and uncertainties regarding pumping rates would be addressed through assessing leachate elevation response to long-term pumping of extraction wells. Leachate origin uncertainties would be addressed through the collection and analysis of leachate to identify the presence or absence of parameters characteristic of fossil leachate. If leachate recovery from extraction wells is sustainable, and significant long-term well yields are predicted, other process options may be considered in post implementation review.

## 5.2 DESCRIPTION OF REMEDIAL ACTION ALTERNATIVE COMPONENTS

The Process Options listed in the right hand column of Table 7 have been compiled into six Remedial Action Alternative Components. These components have been prepared in lieu of the Remedial Action Alternatives required under CERCLA. These individual components will be assembled into the Remedial Action Alternatives presented in Section 5.3 and will be analyzed in the detailed analysis of alternatives section (Chapter 6) of the Feasibility Study. The following is a list of the five components that will be considered and the individual process option(s) on which they are based:

1. Monitoring
   Process options include:
   - monitoring of groundwater
   - monitoring of leachate

2. Leachate Extraction with Off-Site Disposal
   Process options include:
   - extraction wells
   - trucking to POTW

3. Groundwater Extraction and Treatment
   Process options include:
   - extraction wells
   - air stripping
   - surface water discharge

4. Landfill Cap Repair (35 IAC 807)
   Process options include:
   - clay cap repair
   - grading
   - vegetation

5. 35 IAC 811 Cap
   Process options include:
   - clay cap construction
   - grading
   - vegetation

The following is a summary of the five Remedial Action Alternative Components under consideration:

### 5.2.1 Leachate Extraction and Off-Site Disposal

Eight leachate extraction wells would be installed within the landfill at locations corresponding to elevated leachate head levels and high leachate gas flow. The wells would be constructed to screen the saturated leachate thickness in the landfill and zones of landfill gas accumulation in order to extract leachate and vent landfill gas from the same wells. Submersible pumps would be placed in the wells to pump leachate on a continual basis (as available) from the extraction wells. The sustainable flow rate of leachate in the extraction wells would be measured and recorded periodically to develop estimates of leachate extractability. Extracted leachate would be conveyed through underground piping to a central collection tank located in the northwest portion of the landfill site. Leachate in the central collection tank would be periodically pumped as necessary into a tanker truck and transported to the Wheaton Sanitary District POTW for treatment under an existing pretreatment permit.

### 5.2.2 Groundwater Extraction and Treatment

Twenty extraction wells would be installed in the outwash downgradient of the landfill to capture contaminants which have the potential to migrate off site. Because of the high permeability of the outwash deposits, the wells would have to be pumped at a total flow rate of approximately 250-500 gpm in order to achieve hydraulic control and effective capture in the outwash around the base of the landfill. The extracted groundwater would be conveyed through underground piping to the treatment system. The extracted groundwater would be treated by air stripping and discharged into Sand Pond located on FPD property. A pre-design investigation may be necessary to develop the cost-effective groundwater extraction configuration.

### 5.2.3 Landfill Cap Repair

The landfill cap would be repaired in designated areas of the landfill that either: 1) have a low permeability layer thickness less than two feet; or 2) are located in areas where perched surface water infiltration seeps from the sideslopes of the landfill. The repaired cap would extend to the edge of the landfill and would be sloped where necessary to promote surface water drainage off the landfill. This would complete a low permeability cap with a minimum thickness of 2 feet in accordance with the requirements of 35 IAC 807, the regulation under which the landfill was closed.

The steps in cap repair would include stripping and stockpiling the topsoil, excavating existing cover soil (including any layer of sand which may have been acting as a conduit for infiltrated surface water to migrate as a layer of perched water above the landfill), placing and compacting the clay material in the excavated areas, covering the clay with a protective layer of soil, spreading topsoil over the disturbed areas, and revegetating the affected areas. It is expected that clay would be purchased from a suitable borrow site and transported to the landfill for cap construction.

Buildup of landfill gas below the repaired cap would be prevented by utilizing the twenty-five existing landfill vents and the eight new leachate extraction wells to passively vent landfill gas to the atmosphere. The aboveground portion of the existing landfill vents disrupted by the cap repair activities would be replaced during construction.

For purposes of cost estimating, it is estimated that cap repair activities would encompass 25% of the landfill area (approximately 10 acres). A pre-design investigation (RD/RA) would be conducted to establish the location and size of the areas of the site requiring cap repair. At a minimum, two areas of the landfill identified during the RI as having clay cap thicknesses less than two feet will be addressed during the cap repair. These areas are located in the northwest and southeast corners of the landfill (Figure 5-1). The area of the landfill exhibiting lateral seepage from the slope of the landfill is also shown on Figure 5-1.

### 5.2.4 35 IAC 811 Cap

The existing landfill cap would be removed and replaced with a 40 acre clay cap constructed according to 35 IAC 811 specifications. Existing topsoil and cover at the landfill would be excavated and stockpiled at the site for later use. Steeply sloping portions of the landfill would be regraded and re-contoured to reduce the steep grades and lessen the potential for cap erosion. Any additional clay would be purchased from a suitable borrow site and transported to the landfill for placement and compaction of a low permeable clay layer. The compacted clay layer would be placed a minimum of three feet thick over the site in accordance with 35 IAC 811. Stockpiled soil capable of supporting vegetative growth would be replaced over the clay cap at a minimum thickness of three feet and graded and seeded to revegetate the landfill cover.

Buildup of landfill gas below the repaired cap would be prevented by utilizing the twenty-five existing landfill vents and the eight new leachate extraction wells to passively vent landfill gas to the atmosphere. The aboveground portions of the existing landfill vents would be replaced during new cap construction activities.

### 5.2.5 Monitoring

Various media and systems installed at the Blackwell Landfill site would be monitored on a regular basis. The following monitoring activities are proposed. Information concerning the frequency of monitoring and the chemical analyses are reasonable for the site conditions. They were detailed to provide the basis for estimating costs.

**Groundwater** - Results of the RI groundwater sampling programs show that groundwater contamination is stabilized and limited to the FPD property. Groundwater would be monitored semiannually at fifteen well locations to provide continued documentation that the contamination is stabilized. These well locations would consist of wells screened in the outwash and in the bedrock aquifer downgradient of the landfill. The outwash monitoring network would consist of nine wells, including, G-107S, G-113, G-115S, G-118S, G-117, G-123, G-128S, G-129 and G-140S, The bedrock well network would include six wells consisting of G-107D, G-115D, G-118D, G-128D, G-140D and G-141D. Six well nests

consisting of two wells (one well screened in the outwash and one well screened in the bedrock aquifer) would be included in the monitoring well network at the site. All groundwater samples would be analyzed for VOCs and indicator parameters (Cl, TDS, pH, and temperature). Groundwater elevations in the site wells would also be recorded.

**Leachate** - Leachate levels would be monitored semiannually to document changes in head elevations. A composite leachate sample would be collected from the total system collection on an semiannual basis to characterize the on-going quality of leachate for disposal purposes.

The cap would be visually inspected semiannually by FPD personnel to verify the integrity and performance of the cap. The 40 acre cap would be maintained on a regular basis by FPD personnel.

The results of the monitoring program would be periodically reviewed and, if appropriate, modifications to the monitoring program would be recommended.

## 5.3 SUMMARY OF DEVELOPED REMEDIAL ACTION ALTERNATIVES

Six Remedial Action Alternatives (alternatives) are developed in this section from the components presented in Section 5.2. These six alternatives will be retained and carried forward to the detailed analysis phase. As shown in the Table below, the alternatives are increasingly conservative in nature to provide a range of site remedies for consideration. Alternatives 2 through 6 introduce a variety of increasingly costly modifications to the landfill intended to address the Remedial Action Objectives for the site. A matrix of the various remedial action components combined to form the Remedial Action Alternatives is presented below.

| | REMEDIAL ALTERNATIVES | | | | | |
|---|---|---|---|---|---|---|
| **Remedial Action Components** | **1** | **2** | **3** | **4** | **5** | **6** |
| Monitoring | | x | x | x | x | x |
| Leachate Extraction and Off-Site Disposal | | x | x | x | x | x |
| Groundwater Extraction and Treatment | | | | x | | x |
| Existing Cap Repair (35 IAC 807) | | | x | x | | |
| 35 IAC 811 Cap | | | | | x | x |

The following is a listing of the six alternatives developed and retained for detailed analysis (including the no action alternative).

| | |
|---|---|
| Alternative 1 - | No action |
| Alternative 2 - | Leachate Extraction and Off-Site Disposal and Monitoring |
| Alternative 3 - | Leachate Extraction and Off-Site Disposal, Cap Repair and Monitoring |
| Alternative 4 - | Leachate Extraction and Off-Site Disposal, Groundwater Extraction and Treatment, Cap Repair and Monitoring |
| Alternative 5 - | Leachate Extraction and Off-Site Disposal, 35 IAC 811 Cap and Monitoring |
| Alternative 6 - | Leachate Extraction and Off-Site Disposal, Groundwater Extraction and Treatment, 35 IAC 811 Cap and Monitoring |

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# Section 6

MONTGOMERY WATSON

# 6

# DETAILED ANALYSIS OF ALTERNATIVES

Final alternatives for detailed analysis were compiled in Section 5 from the process options which were retained through the screening of technologies in Section 4. This section presents site specific descriptions and detailed analyses of the remedial action alternatives which were retained during the preliminary screening process.

The detailed analysis of alternatives presents information necessary for regulatory agencies to select a site remedy. During the detailed analysis, each alternative is assessed against nine evaluation criteria. This approach, outlined in Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (U.S. EPA, 1988a), is designed to provide sufficient information to adequately compare the alternatives, select an appropriate remedy, and demonstrate compliance with the statutory requirements, which will be included in the Record of Decision (ROD).

To aid in this analysis, certain assumptions were made for each alternative regarding system design. These assumptions are presented in the description of each alternative prior to analysis of the alternative. These assumptions are not intended to comprise a conceptual or preliminary design.

## 6.1 ANALYSIS CRITERIA

The specific CERCLA requirements that must be addressed in the FS report for each remedial action are that each action should:

- Be protective of human health and the environment
- Be compliant with Applicable or Relevant and Appropriate Requirements (ARARs) or provide grounds for invoking an ARAR waiver
- Be cost-effective
- Use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable

- Satisfy the preference for treatment that reduces toxicity, mobility, or volume as a principal element (or provide an explanation for use in the ROD as to why it does not)

In addition, CERCLA places an emphasis on evaluating long-term effectiveness and related considerations for each of the alternative remedial actions. These statutory considerations include:

- The long-term uncertainties associated with land disposal
- The goals, objectives, and requirements of the Solid Waste Disposal Act (RCRA)
- The persistence, toxicity, and mobility of hazardous substances and their constituents, and their propensity to bioaccumulate
- Short-term and long-term potential for adverse health effects from human exposure
- Long-term maintenance costs
- The potential for future remedial action costs if the alternative remedial action in question were to fail
- The potential threat to human health and the environment associated with excavation, transportation, redisposal, or containment

Nine evaluation criteria have been developed to address the CERCLA requirements and considerations listed above and additional technical and policy considerations that have proven to be important for selection of remedial alternatives. These evaluation criteria serve as the basis for conducting the detailed analysis during the FS and for subsequently selecting an appropriate remedial action. The nine evaluation criteria are:

1. Overall protection of human health and the environment
2. Compliance with ARARs
3. Long-term effectiveness and permanence
4. Reduction of toxicity, mobility, or volume through treatment
5. Short-term effectiveness
6. Implementability
7. Cost
8. State acceptance
9. Community acceptance

### 6.1.1 Overall Protection of Human Health and the Environment

This evaluation criterion assesses whether an alternative provides adequate protection of human health and the environment from the short-term and long-term risks posed by hazardous substances, pollutants, or contaminants present at the site. This protection can be accomplished by eliminating, reducing, or controlling exposures to contaminants to levels established during the development of remedial action objectives. Overall protection of human health and the environment draws on the assessments of other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

### 6.1.2 Compliance With ARARs

This evaluation criterion assesses whether an alternative can comply with Federal and State ARARs. An alternative that does not comply with an ARAR may provide grounds for invoking a waiver as described in the NCP under paragraph 40 CFR 300.430(f)(1)(ii)(C). ARARs are discussed in terms of chemical-specific, location-specific, and action-specific ARARs.

Chemical-specific ARARs are numerical standards that establish the acceptable amount or concentration of a chemical that may be found in, or discharged to the environment. Chemical-specific ARARs may be derived from several standards including Resource Conservation and Recovery Act (RCRA) Maximum Concentration Limits (MCLs) in groundwater, Safe Drinking Water Act (SDWA) MCLs, and Water Quality Criteria.

Location-specific ARARs are restrictions placed on the concentration of hazardous substances or the conduct of activities solely because they are in specific locations such as floodplains, wetlands, historic places, sensitive ecosystems or habitats. Location-specific ARARs may be derived from several standards including RCRA Location Requirements, National Historic Preservation Act of 1966 (NHPA), Endangered Species Act, Wilderness Act, Fish and Wildlife Coordination Act, Wild and Scenic Rivers Act, Coastal Zone Management Act, and Clean Water Act.

Action-specific ARARs are technology-based or activity-based requirements or limitations on actions taken with respect to hazardous wastes. These requirements are triggered by the particular remedial activities that are selected to accomplish a remedy.

The following definitions of "applicable" and "relevant and appropriate" are presented for the readers information:

> Applicable requirements means those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site.

"Applicability" implies that the remedial action or the circumstances at the site satisfy all of the jurisdictional prerequisites of a requirement.

If a requirement is not applicable, one must consider whether it is both relevant and appropriate.

> Relevant and appropriate requirements means those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. However, in some circumstances, a requirement may be relevant, but not appropriate for the site-specific situation.

The determination that a requirement is relevant and appropriate is a two-step process: (1) determination if a requirement is relevant and (2) determination if a requirement is appropriate. In some cases, a requirement may be relevant, but not appropriate, given site-specific circumstances. Such a requirement would not be an ARAR for the site.

In determining whether a requirement is relevant and appropriate, a comparison is made to the pertinence of several factors such as:

- The purpose of the requirement and the purpose of the CERCLA action
- The medium regulated or affected by the requirement and the medium contaminated or affected at the CERCLA site
- The substances regulated by the requirement and the substances found at the CERCLA site
- The actions or activities regulated by the requirement and the remedial action contemplated at the CERCLA site
- Any variances, waivers, or exemptions of the requirement and their availability for the circumstances at the CERCLA site
- The type of location regulated and the type of place affected by the release or CERCLA action
- The type and size of structure or facility regulated and the type and size of structure or facility affected by the release or contemplated by the CERCLA action

- Any consideration of use or potential use of affected resources in the requirement and the use or potential use of the affected resource at the CERCLA site

The pertinence of each of the factors depends, in part, on whether a requirement addresses a chemical, location or action.

In addition to applicable or relevant and appropriate requirements, the lead and support agencies may, as appropriate, identify other advisories, criteria, or guidance to be considered for a particular release. The "to be considered" (TBC) category consists of advisories, criteria, or guidance that were developed by the U.S. EPA, other federal agencies, or states that may be useful in developing CERCLA remedies.

Table 8 summarizes potential federal and state ARARs for this site and are based on ARARs presented in the RI and were approved by the agencies for the alternatives presented in this report. The ARARs listed in Table 8 are based on the list of remedial alternatives for the site and on the ARARs tentatively identified by IEPA for this site.

### 6.1.3 Long-Term Effectiveness and Permanence

This evaluation criterion assesses the long-term effectiveness and permanence an alternative affords, along with the degree of certainty that the alternative will prove successful. Factors that are considered, as appropriate, include:

- Magnitude of residual risk remaining from untreated waste, or treatment residuals remaining at the conclusion of the remedial activities. The characteristics of the residuals should be considered to the degree that they remain hazardous, taking into account their volume, toxicity, mobility, and propensity to bioaccumulate.

- Adequacy and reliability of controls, such as containment systems and institutional controls, that are necessary to manage treatment residuals and untreated waste. This factor addresses in particular the uncertainties associated with land disposal for providing long-term protection from residuals, an assessment of the potential need to replace technical components of the alternative, and the potential exposure pathways and risks posed should the remedial action need replacement.

### 6.1.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

This evaluation criterion assesses the degree to which an alternative employs recycling or treatment that reduces toxicity, mobility, or volume, including how treatment is used to address the principal threats posed by the site. Factors that are considered, as appropriate, include:

- Treatment or recycling processes the alternative employs and the materials that are treated

- Amount of hazardous substances, pollutants, or contaminants that will be destroyed, treated, or recycled

- Degree of expected reduction in toxicity, mobility, or volume of the waste due to treatment or recycling, and the specification of which reduction(s) are occurring

- Degree to which the treatment is irreversible

- Type and quantity of residuals that will remain following treatment, considering the persistence, toxicity, mobility, and propensity to bioaccumulate of such hazardous substances and their constituents

- Degree to which treatment reduces the inherent hazards posed by the principal threats at the site

### 6.1.5 Short-Term Effectiveness

This evaluation criterion assesses the short-term impacts of alternatives including:

- Short-term risks that might be posed to the community during implementation of an alternative

- Potential impacts on workers during remedial action, and the effectiveness and reliability of protective measures

- Potential environmental impacts of the remedial action, and the effectiveness and reliability of mitigative measures during implementation

- Time until remedial action objectives are achieved

### 6.1.6 Implementability

This evaluation criterion assesses the ease or difficulty of implementing the alternative by considering the following types of factors, as appropriate:

- Technical feasibility, including technical difficulties and unknowns associated with the construction and operation of a technology, the reliability of the technology, ease of undertaking additional remedial actions, and the ability to monitor the effectiveness of the remedy

- Administrative feasibility, including activities needed to coordinate with other offices and agencies, and the ability and time required to obtain any necessary approvals and permits from other agencies (for off-site actions)

- Availability of services and materials necessary for implementing the alternative, including the availability of adequate off-site treatment, storage capacity, and disposal capacity and services; the availability of necessary equipment and specialists, and provisions to provide any necessary additional resources; and availability of prospective technologies

### 6.1.7 Cost

This evaluation criterion assesses various types of costs, including:

- Capital costs
- Annual operation and maintenance (O & M) costs
- Present Net Worth (PNW) of capital and O & M costs

Cost figures obtained from readily available sources (e.g., Means Site Work Cost Data and local suppliers) are used to estimate costs for each of the alternatives for comparison purposes. These cost estimates provide relative costs among the alternatives, using consistent assumptions and estimating methods, and should not be considered the actual cost of designing and implementing a remedial action. According to Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (U.S. EPA, 1988a), cost estimates provided in the FS are expected to provide a level of accuracy of +50 to -30 percent. A more detailed cost estimate will be prepared during the Remedial Design phase.

Capital costs presented in this report include allowances for administration (5%), engineering (20%), and contingency (20%). The 5 year review cost is included in the 5% administration costs. Operation and maintenance (O&M) costs include a contingency of 15%. The present net worth (PNW) is based on a 30 year project duration, and it assumes a 3% discount rate.

A cost summary of the alternatives described in this report is presented in Table 9. The estimated capital costs, O&M costs, and PNW costs are itemized in a series of tables included in Appendix C.

### 6.1.8 State Acceptance

This evaluation criterion assesses the technical and administrative preferences and concerns that the State of Illinois may have about each alternative. This criterion has not been addressed in this report, but will be addressed in the Proposed Plan and ROD after agency review of the FS Report.

### 6.1.9 Community Acceptance

This criterion will incorporate public comments which have been provided to Federal and State agencies during the Remedial Investigation/Feasibility Study process. The analysis

will address those alternatives which the community formally supports, about which they have reservations, or which they oppose. Community input regarding the Feasibility Study will be solicited during the public comment period, during which time the Feasibility Study report will be available for public review. A responsiveness summary will be prepared to address comments received during the public comment period. The public comments and responsiveness summary will be made a part of the Record of Decision. Therefore, community acceptance issues are not included in this document.

The following subsections present the analysis of each of the nine alternatives developed in Section 5, assessed against the nine criteria.

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## 6.2 ALTERNATIVE 1

### NO ACTION

Alternative 1 is the no action alternative. This is the baseline condition assuming that no remedial measures would be implemented at the site. Existing conditions at the landfill site include passive landfill gas vents to relieve the buildup of landfill gas within the landfill interior and land use restrictions on the property. The Blackwell Landfill Site is owned by the Forest Preserve District of DuPage County (FPD) which lacks the authority to sell land to a private party. This will prevent future land use changes and development of the site.

**6.2.1 Overall Protection of Human Health and the Environment**

This criterion addresses the adequacy with which Alternative 1 can provide protection of human health and the environment by controlling exposures to contaminants.

This alternative provides sufficient protection of human health and the environment under current and future land use. The Baseline Risk Assessment indicated that unacceptable risks to human health are not likely to occur under current or future land use conditions. The current levels of risk presented in the Baseline Risk Assessment would not be changed by the no action alternative, except through dilution and natural attenuation mechanisms which are occurring at the site and relief of landfill gas by the existing passive venting system. The Ecological Assessment completed for the site indicated that unacceptable risks to ecological communities at or near the site are not likely to occur. These risk factors would remain the same for the no action alternative.

Remedial Action Objectives are media-specific goals for protecting human health and the environment. Remedial Action Objectives were developed to address the presence of site contaminants and to protect human health and the environment by preventing or minimizing exposure to contaminants present in groundwater, leachate and landfill gas. Remedial Action Objectives are listed and explained in Section 4.2. The following text discusses how Alternative 1 would address the Remedial Action Objectives.

Under this alternative, no active treatment would be performed to reduce the remaining potential risk associated with affected media. Rather, natural degradation and dilution processes would continue to reduce the concentration of chemicals over time. As the concentration of chemicals decreases over time, the level of residual risk would decrease proportionally. A discussion of the alternative's overall protection on a media-specific basis is presented separately below.

**Groundwater** - Affected groundwater does not pose an unacceptable risk under the current and future land use conditions (see Section 3.3). The location of the landfill in the Blackwell Forest Preserve prevents the area of the aquifer within the FPD property from being developed for drinking water purposes. Since the FPD cannot sell land to a private party, installation of wells and on-site residential or commercial development would not

occur. Previous groundwater sampling and analysis programs demonstrated that natural dilution and attenuation characteristics of the soil have effectively stabilized the area of groundwater containing concentrations of contaminants above MCLs.

This alternative does not provide a means of documenting prevention of off-site migration of contaminants. If the character of groundwater unknowingly changed at the site in such a way that could effect contaminant migration, off-site migration of groundwater contaminants representing an unacceptable human health or environmental risk may occur.

**Leachate** - Alternative 1 does not address the Remedial Action Objectives for leachate, to reduce the volume and to limit generation of leachate that has the potential to contaminate groundwater.

### 6.2.2 Compliance with ARARs

This criterion describes factors such as chemical-specific, location-specific, and action-specific ARARs. Potential ARARs are summarized in Table 8. County, State and Federal ARARs, whichever is more stringent, will apply. The ARARs identified in Table 81 are discussed below.

**Compliance with Chemical-Specific ARARs** - There are no chemical-specific ARARs for this alternative.

**Compliance with Location-Specific ARARs** - There are no location-specific ARARs for this alternative.

**Compliance with Action-Specific ARARs** - There are no action-specific ARARs for this alternative.

### 6.2.3 Long-Term Effectiveness and Permanence

This criterion describes factors such as residual risks remaining following implementation of the remedy and the adequacy and reliability of controls. This latter factor considers the long-term management of treatment residuals, long-term reliability of engineering and institutional controls, and the potential need for replacement of the alternative. These factors are discussed below.

**Magnitude of Residual Risk** - Residual risks left by a no action alternative are essentially the same as those calculated in the Baseline Risk Assessment, because no remedial actions would be taken. Because the Risk Assessment has indicated that unacceptable health risks will not occur as result of exposures to landfill contaminants in present and future risk scenarios, there will not be an unacceptable residual risk. Also, unacceptable risk to ecological receptors (i.e., terrestrial and aquatic species) are not expected since the Ecological Assessment indicated no unacceptable risks to ecological communities are present at the site.

Groundwater contaminant concentrations would not be addressed by this alternative. Groundwater contamination is currently contained within 200 to 300 ft of the landfill, within the Forest Preserve property. The conditions which created the present limited groundwater contamination (elevated leachate levels) are at steady state and the area of groundwater containing chemical constituents above MCLs downgradient of the landfill has stabilized. Should steady state conditions of groundwater unknowingly change at the site in such a way that effects contaminant migration, off-site migration of groundwater contaminants representing an unacceptable human health or environmental risk could occur.

The volume of leachate in the landfill would not be addressed by this alternative. Leachate levels in the landfill would remain unaffected (if fossil leachate) or potentially rise (if infiltration through the existing cap occurs) if no action is taken. Any rise in leachate head may result in increased landfill leakage through the landfill base into the upper aquifer.

A five year review of the landfill would not be conducted under this baseline alternative.

**Adequacy and Reliability of Controls** - FPD ownership and maintenance of the property would be an adequate and reliable control for the site. The potential for residential or commercial development is eliminated by FPD ownership since the FPD lacks the authority to sell any portion of the Blackwell Forest Preserve to a private party.

Passive landfill gas venting would be adequate and reliable for limiting buildup of gas beneath the existing cap. The Baseline Risk Assessment and the Ecological Assessment conclude that potential exposure to landfill gas does not pose an unacceptable risk.

Since this alternative represents a baseline no action scenario and no engineering controls or treatment activities are implemented under this alternative, there would be no long-term management, monitoring, and operations and maintenance issues or treatment residuals to be managed.

### 6.2.4 Reduction in Toxicity, Mobility, or Volume Through Treatment

This criterion considers factors such as: the treatment process used and the material treated; the amount of hazardous material destroyed or treated; the reduction in toxicity, mobility, or volume through treatment; the irreversibility of the treatment; the type and quantity of treatment residuals; and the reduction of inherent hazards. These factors are considered where appropriate.

No treatment process is proposed under the no action alternative. Therefore, no reductions in toxicity, mobility, or volume of contaminants would occur under this alternative other than those due to natural processes, such as dilution and attenuation. Landfill gas would continue to be vented from the landfill interior through the existing 25 existing landfill vents. The volume of this gas venting could be expected to decrease as the landfill wastes stabilize.

### 6.2.5 Short-Term Effectiveness

This criterion addresses additional risks which may be posed to the community, workers and the environment during implementation of the remedy. In addition, the time required to achieve Remedial Action Objectives is addressed.

**Risks to Community During Remedial Actions** - As indicated by the Baseline Risk Assessment, continuance of existing land use patterns at the site would not pose any additional risk to the community.

**Risks to Workers During Remedial Actions** - No remedial actions would occur with the no action alternative so there would be no risk to workers.

**Environmental Impacts** - The present potential ecological risks, described in the Baseline Risk Assessment and Ecological Assessment, summarized in Section 3.3, would remain. Since there would be no remedial actions, there would be no environmental impacts from such activities.

**Time Until Remedial Action Objectives are Achieved** - Groundwater Remedial Action Objectives are currently being met. Off-site migration of groundwater contaminants is not occurring at the site.

The Remedial Action Objective for leachate of reducing the volume of leachate which could have the potential to release to groundwater is not addressed by this alternative.

### 6.2.6 Implementability

This criterion considers factors, where appropriate, such as technical feasibility, administrative feasibility, and availability of materials and services. Since the no action alternative does not involve construction or operation of facilities or installation of technological features, implementability factors do not apply. Since no facilities would be installed or constructed as part of this alternative, implementation of Alternative 1 would not be expected to hinder implementation of future remedial actions, if they become required or appropriate.

### 6.2.7 Cost

This criterion considers factors such as capital costs, annual operation and maintenance (O&M) costs, and present net worth costs. There are no costs associated with the no action alternative.

### 6.2.8 State Acceptance

This criterion will be addressed in the Proposed Plan and ROD after agency review of the FS report.

### 6.2.9 Community Acceptance

This criterion will be addressed in the Responsiveness Summary (a summary of written and oral comments on the FS report) following public comment on the Proposed Plan.

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## 6.3 ALTERNATIVE 2

### LEACHATE EXTRACTION AND OFF-SITE DISPOSAL AND MONITORING

The objective of Alternative 2 is to reduce the leachate volume and monitor groundwater leachate at the Blackwell landfill site. The major elements of this alternative include:

- Leachate Extraction System with Off-Site Disposal
- Monitoring

**Leachate Extraction with Off-Site Disposal**
Eight leachate extraction wells would be installed within the landfill at locations corresponding to elevated leachate head levels and high leachate gas flow. The wells would be constructed to screen the saturated leachate thickness in the landfill and zones of landfill gas accumulation in order to extract leachate and vent landfill gas from the same wells. Submersible pumps would be placed in the wells to pump leachate on a continual basis (as available) from the extraction wells. The sustainable flow rate of leachate in the extraction wells would be measured and recorded periodically to develop estimates of leachate extractability. Extracted leachate would be conveyed through underground piping to a central collection tank located in the northwest portion of the landfill site. Leachate in the central collection tank would be periodically pumped as necessary into a tanker truck and transported to the Wheaton Sanitary District POTW for treatment under an existing pretreatment permit.

**Monitoring**
Under Alternative 2, monitoring would be conducted of the various media and systems installed at the Blackwell Landfill site. The following locations, frequencies and analytical parameters are reasonable for site conditions and have been included for cost estimating purposes.

**Groundwater** - Results of the RI groundwater sampling programs show that groundwater contamination is stabilized and limited to the FPD property. Groundwater would be monitored semiannually at fifteen well locations to provide continued documentation that the contamination is stabilized. These well locations would consist of nine wells screened in the outwash and in the bedrock aquifer downgradient of the landfill. The outwash monitoring network would consist of G-107S, G-113, G-115S, G-118S, G-117, G-123, G-128S, G-129 and G-140S, The bedrock well network would include G-107D, G-115D, G-118D, G-128D, G-140D and G-141D. At six locations, there are nested wells consisting of one well screened in the outwash and another well screened in the bedrock zone. All groundwater samples would be analyzed for VOCs and indicator parameters (Cl, TDS, pH, and temperature). Groundwater elevations in the site wells would also be recorded.

**Leachate** - Leachate levels would be monitored semiannually in existing leachate wells DV-2, DV-3, DV-7 and DV-8 and in any new leachate wells potentially installed as part of the remediation to document changes in head elevations at the site. A composite leachate sample would be collected from the total system collection on an annual basis to characterize the on-going quality of leachate for disposal purposes.

The cap would be visually inspected semiannually by FPD personnel to verify the integrity of the cap. The 40 acre cap would be maintained on a regular basis by FPD personnel.

The results of the monitoring program would be periodically reviewed and, if appropriate, modifications to the monitoring program would be recommended.

### 6.3.1 Overall Protection of Human Health and the Environment

This criterion addresses the adequacy with which the alternative can provide protection of human health and the environment by controlling exposures to contaminants.

Alternative 2 provides sufficient protection of human health and the environment under current and future land use scenarios. The Baseline Risk Assessment indicated that unacceptable risks to human health are not likely to occur under either current or future land use conditions. The Ecological Assessment completed for the site indicated that unacceptable risks do not occur to ecological communities at or near the site. The current levels of risk calculated in the Baseline Risk Assessment would be reduced by Alternative 2 by removal and off-site disposal of leachate in the landfill that could potentially migrate to groundwater.

Remedial Action Objectives are media-specific goals for protecting human health and the environment. Remedial Action Objectives were developed to address the presence of site contaminants and to further protect human health and the environment by preventing or minimizing exposure to contaminants present in groundwater, leachate and landfill gas. Remedial Action Objectives are listed and explained in Section 4.2. The following text discusses how Alternative 2 would address the Remedial Action Objectives on a media-specific basis.

**Groundwater** - Affected groundwater does not pose an unacceptable risk under the current land use conditions, as explained in Section 3.3. Currently, persons are not exposed to groundwater affected by the site, and in future scenarios, persons would not be exposed to affected groundwater. The location of the landfill in the Blackwell Forest Preserve prevents the area of the aquifer within the FPD property from being developed for drinking water purposes. Since the FPD cannot sell land to a private party, on-site residential development and installation of wells would not occur. Previous groundwater sampling and analysis programs demonstrate that natural dilution and attenuation characteristics of the soil have effectively stabilized the area of groundwater containing concentrations of contaminants above MCLs. Long-term monitoring with a five-year review would document that contaminated groundwater is not leaving the site.

Groundwater monitoring of outwash and bedrock wells downgradient of the landfill is included in Alternative 2. Groundwater monitoring would provide a measure of the rate at which groundwater contamination is being attenuated and degraded over time. It would also be effective in indicating changes in the extent and character of affected groundwater and would provide early warning, if necessary, of groundwater changes.

Therefore, Alternative 2 addresses the Remedial Action Objectives for groundwater, consisting of: preventing off-site migration of contaminants above MCLs; and preventing off-site migration of groundwater containing concentrations of contaminants that represent an unacceptable human health or environmental risk (see Section 4.2.1).

**Leachate** - Alternative 2 would meet the Remedial Action Objective for leachate to reduce the volume of leachate in the landfill that has the potential to contaminate groundwater. Eight new leachate extraction wells would be installed in the landfill and pumped on a continual basis (as leachate is available) in order to reduce the leachate head at the landfill base. Lowering the leachate head and volume in the landfill would reduce the potential for migration of leachate to groundwater.

Alternative 2 would not meet the Remedial Action Objective for leachate to limit future generation of leachate that has the potential to contaminate groundwater. This alternative would rely on the existing cap to limit future generation of leachate at the site. Because portions of the existing cap have a low permeability layer thickness of less than 2 feet and perched surface water infiltration is observed to seep from the slopes of the landfill, there is evidence to suggest that the existing cap is not providing adequate protection against infiltration into the landfill and future leachate generation.

Excessive landfill gas build-up could result in fracturing of the cap and increasing permeability through the cap. Alternative 2 would limit future leachate generation by including passive vents on the new leachate extraction wells and utilizing the existing passive landfill gas venting system to reduce build-up of gas in the landfill.

Monitoring of leachate head levels would provide information on leachate reduction and sustainable leachate extraction rates at the landfill. Groundwater monitoring in outwash and bedrock wells downgradient of the landfill may provide documentation of change in migration of leachate contaminants to groundwater at the site.

### 6.3.2 Compliance with ARARs

This criterion considers factors such as compliance with chemical-specific, location-specific, and action-specific ARARs. Potential ARARs for Alternative 2 are summarized in Table 8. County, State or Federal ARARs, whichever is more stringent, will apply. The ARARs listed in Table 8 are discussed below.

**Compliance with Chemical-Specific ARARs**

Potential chemical-specific ARARs relate to air emissions and groundwater quality.

**Air Emissions** - Air emissions from the passive landfill gas vents would be discharged to the atmosphere in accordance with the requirements of 35 IAC 218. The chemical specific air requirements for the expected emissions from this alternative are contained in Section 218.301, which limit emissions of photochemically reactive organic material (e.g., VOCs) to less than 8 lbs/hr. If VOC emissions exceed 8 lbs/hr, controls may be required to reduce emissions by 85 percent. Allowable VOC emissions, however, are typically determined on a case-by-case basis by the IEPA. The landfill gas sampling and analysis program conducted during the RI showed that VOC emissions are well below 8 lbs/hr. Therefore, the requirements of 35 IAC 218 could be met.

**Groundwater Quality** - Class I potable resource groundwater standards listed in 35 IAC 620.410 apply to groundwater located ten feet or more below the ground surface in the outwash and dolomite (bedrock) aquifers at the Blackwell site. Vinyl chloride, 1,2-dichloroethene, 1,2-dichloroethene, trichloroethene, benzene, and tetrachloroethene have equaled or exceeded the Class I potable resource groundwater standards in one or more site wells.

Compliance with the standards of 35 IAC 620.410 could be achieved under Alternative 2. The extraction of leachate would reduce the leachate head at the base of the landfill and further serve to reduce the source of contaminants to the aquifer. The reduction of contaminant loading, in combination with natural attenuation and dilution, should allow the standards to be achieved.

Until compliance with the standards of 35 IAC 620.410 is achieved, groundwater underlying the Blackwell site would be managed as a groundwater management zone in accordance with 35 IAC 620.250. The groundwater management zone would be established upon concurrence by IEPA following written confirmation of the corrective action undertaken at the site. The groundwater management zone designation would expire when corrective action is completed at the site and applicable standards are met (35 IAC 620.410). A review of the adequacy of the corrective action at the site must be completed and submitted to IEPA no less often than 5 years.

U.S. EPA MCLs designated in 40 CFR 141 are not ARARs because impacted groundwater would not be used for a public drinking water supply.

Based on the discussion above, Alternative 2 would comply with the chemical-specific ARARs.

**Compliance with Location-Specific ARARs**

Potential location-specific ARARs relate to floodplains, wetlands, and open waters. Construction of leachate wells and underground piping for Alternative 2 would occur within the interior of the landfill and not disturb floodplains, wetlands, and open water environments located in the Blackwell landfill area.

Alternative 2 would comply with the location-specific ARARs.

**Compliance with Action-Specific ARARs**
Potential action-specific ARARs relate to safety standards, air emissions, and water quality.

**Safety Standards** - Construction of the leachate extraction system would be in accordance with the general industry safety standards in accordance with 29 CFR 1910 and 29 CFR 1926. Threshold limit values would be monitored in the breathing zone during construction of the leachate extraction system and monitoring activities.

**Air Emissions** - Air emissions from the passive landfill gas venting system would meet the relevant permitting requirements of 35 IAC 201. IEPA does not have a formally promulgated air toxics program, consequently, there are no state air toxics ARARs for the Blackwell site. Moreover, there are no federal requirements under the Clean Air Act that are ARARs at this site for the following reasons:

- The Clean Air Act Amendments of 1990 listed 189 air toxics that must be regulated. Toluene, trichloroethene, vinyl chloride, methylene chloride, tetrachloroethene, and xylene are on the list. Under the new Clean Air Act, U.S. EPA plans to list the sources emitting any of these 189 chemicals and, over the next eight years, promulgate emission standards for these sources. Site remediation is listed as a source category, however, U.S. EPA has not yet promulgated maximum achievable control technology (MACT) for this or any other source category. Consequently, the Clean Air Act is not an ARAR for this site.

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**Leachate Disposal** - Extracted leachate would be transported to the Wheaton Sanitary District POTW and treated under an existing pretreatment permit.

Alternative 2 would comply with the action-specific ARARs.

Based on the discussion above, this alternative would comply with the chemical-, location-, and action-specific ARARs.

### 6.3.3 Long-Term Effectiveness and Permanence
This criterion describes factors such as residual risks remaining following implementation of the remedy, and the adequacy and reliability of controls. This latter factor considers the long-term management of treatment residuals, long-term reliability of engineering and institutional controls, and the potential need for replacement of the alternative.

**Magnitude of Residual Risk** - Residual risks left by Alternative 2 would be reduced even lower than those calculated in the Baseline Risk Assessment and Ecological Assessment. The Baseline Risk Assessment indicated that no unacceptable health risks would occur from exposures to landfill contaminants in present and future risk scenarios. The Ecological Assessment indicated that no unacceptable risks are expected to ecological communities,

there would not be an unacceptable risk to ecological receptors (i.e., terrestrial and aquatic species).

Groundwater contaminant concentrations will continue to decrease by natural attenuation/dilution processes and also because contaminant loading will be decreased as leachate volume and pressure head are reduced by the leachate collection system.

The leachate extraction system would reduce the potential risks associated with high leachate volume and levels in proportion to the resultant decrease in leachate volume, level and chemical constituent concentrations. The magnitude of these reductions will be dependent on the recoverability of the leachate from the landfill interior.

The existing passive landfill gas venting system would continue to relieve buildup of gas within the landfill. The volume of gas would decrease as the refuse in the landfill stabilizes, reducing the risk associated with fracturing of the existing cap and generation of future leachate.

The entire remedy would be subject to a five-year review. Leachate extraction system review would consist of evaluating the effectiveness of leachate extraction to lower the leachate heads in new and existing leachate wells and reduce the volume of leachate contained in the landfill. Groundwater monitoring data would document whether leachate extraction results in a corresponding decrease in groundwater contaminant concentrations. The accumulated database from groundwater monitoring would be evaluated to assess the on-going groundwater quality downgradient of the landfill.

**Adequacy and Reliability of Controls** - FPD ownership of the property is an adequate and reliable control for the site. The landfill is maintained by FPD personnel. The possibility of residential or commercial development is eliminated by FPD ownership, since the FPD lacks the authority to sell any portion of the Blackwell Forest Preserve to a private party.

Leachate extraction and treatment is a well developed remedial technology. The volume and sustainable yield of leachate at the landfill would be identified through extended pumping of the landfill extraction wells. The FPD would manage the system, and would utilize local contractors, suppliers and FPD personnel for system monitoring, operation and maintenance. The Wheaton Sanitary District POTW would be utilized to treat the collected leachate under an existing pretreatment permit. It is not anticipated that major elements of the system would require replacement. Submersible pumps placed in the leachate wells may require periodic maintenance to ensure adequate performance.

Passive landfill gas venting exists at the site and has proven to be an adequate and reliable means to limit landfill gas build-up and problems associated with landfill gas accumulation. The venting system is mechanically simple to operate and maintain.

### 6.3.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

This criterion considers factors such as: the treatment process used and the material treated; the amount of hazardous material destroyed or treated; the reduction in toxicity, mobility, or volume through treatment; the irreversibility of the treatment; the type and quantity of treatment residuals; and the reduction of inherent hazards. These factors are considered where appropriate and are discussed below.

**Treatment Process Used and Materials Treated** - This alternative includes extraction and collection of leachate at the landfill followed by treatment of the extracted leachate to remove inorganics and destroy organics. Treatment of the extracted leachate would be off-site at the Wheaton Sanitary District POTW.

**Amount of Contaminated Materials Destroyed or Treated** - The volume of leachate in the landfill may be as high as 53 million gallons and as much as 9,500 gallons per day of leachate may be generated by infiltrating precipitation. Although there are a number of uncertainties associated with these conservative estimates, the leachate extraction program will reduce the volume of leachate contaminants at the site. Depending on the accuracy of the volume estimates and sustainable yield of leachate, some portion or a majority of this material may be collected at the site ~~at~~ and treated at the POTW.

**Degree of Expected Reductions in Toxicity, Mobility, or Volume** - Extraction, collection and treatment of fossil leachate from the landfill would result in reduction of leachate toxicity.

Removal of leachate from the landfill would decrease the mobility of the landfill leachate by reducing the hydraulic head potentially present at the landfill base. Use of submersible pumps in the leachate extraction wells would provide hydraulic control of leachate migration and mobilize leachate contaminants towards the collection wells. However, the construction of new leachate extraction wells could allow vertical migration of leachate to the base of the landfill by providing a conduit across low permeability cover layers designed into the landfill. This could mobilize leachate currently residing at upper landfill positions into closer proximity of the outwash aquifer, thereby increasing leachate mobility.

Increased mobility could also occur through conveyance of leachate to the central collection tank through underground piping. Increased mobility could also result from pumping the leachate into tanker trucks and transporting the leachate to the off-site POTW. Precautions against spills and releases would be instituted to minimize such occurrences.

The volume of leachate present in the landfill would be reduced by extraction, provided the extraction system could produce an effluent flow rate greater than the rate of infiltration through the landfill cap.

The actual effect of a leachate extraction system on the reduction of toxicity, mobility, and volume would be determined by measuring sustainable leachate yields during pumping and monitoring leachate heads in the landfill to develop reliable estimates of leachate volume.

**Degree to Which Treatment is Irreversible** - Leachate extraction and off-site disposal and treatment would irreversibly reduce the volume of leachate and concentration of chemical constituents in leachate present in the landfill. The concentrations would be reduced by removal of more concentrated fossil leachate that accumulated in the landfill during construction and operation of the landfill. Leachate generated by recent infiltration of rain water could have a lower contaminant concentration, thereby reducing the overall toxicity of the leachate.

Contaminants present in the extracted leachate would be irreversibly destroyed by off-site treatment at the Wheaton Sanitary District POTW.

**Type and Quantity of Residuals Remaining After Treatment** - Any residuals associated with leachate treatment at the Wheaton Sanitary District POTW would be mixed with residual associated with routine operation of the treatment plant and disposed according to the POTW permitting requirements.

**Reduction of Inherent Hazards** - Alternative 2 would reduce inherent hazards posed by high leachate volumes and heads in the landfill by leachate extraction and treatment.

### 6.3.5 Short-Term Effectiveness

This criterion considers factors such as additional risks which may be posed to the community, workers, and the environment during implementation of the remedy. In addition, the time required to achieve remedial action objectives is addressed. These factors are discussed below.

**Risks to Community During Remedial Actions** - Implementation of Alternative 2 may pose minor risks to the community during construction of the leachate extraction system. Increased truck traffic and operation of heavy equipment during construction activities could result in increased risk of injury to the public traveling in the vicinity of the site. Dust control technologies would be used to minimize the migration of fugitive emissions from the site to nearby residents.

**Risks to Workers During Remedial Actions** - If waste materials are disturbed during leachate extraction and collection system installation, remediation workers may be exposed to chemicals through direct contact with subsurface soils, leachate and wastes, or inhalation exposure to dust and landfill gas. These exposures could be minimized by use of dust control measures and personal protective equipment. Besides risks from contaminants, workers would incur risks associated with performing construction activities due to operation of heavy equipment.

Workers performing sampling activities as part of implementing monitoring would incur potential risk through exposure to chemicals in the groundwater, leachate and landfill gas. This risk would be minimized through the use of safety procedures and personal protective equipment.

**Environmental Impacts** - Implementation of this alternative is not anticipated to pose additional risk to the environment. Soil erosion and sediment control technologies would be employed to protect surface waters during construction operations. Once the construction is completed, disturbed areas would be vegetated to protect against soil erosion and sedimentation.

**Time Until Remedial Action Objectives are Achieved** - Groundwater Remedial Action Objectives are currently being met.

The time needed to achieve the Remedial Action Objective to reduce leachate volume would be dependent on the actual volume present in the landfill and the sustainable yield of leachate recovery.

The Remedial Action Objective to limit future generation of leachate at the landfill would not be addressed by this alternative.

### 6.3.6 Implementability

This criterion considers factors, where appropriate, such as technical feasibility, administrative feasibility, and availability of materials and services. These factors are discussed below.

**Technical Feasibility** - Leachate extraction technology is well developed and an extraction system is technically constructable. The degree of success of such a recovery system at this site is uncertain because of the uncertainty regarding the total volume of leachate and the availability of that leachate for extraction. The feasibility of recovering significant portions of leachate from this site would be evaluated through the continued operation of the extraction system. Installation of underground piping and construction of a central collection tank would utilize standard equipment and procedures and be technically feasible to implement at the site.

Technologies for conducting monitoring of groundwater and leachate are readily implementable, are well developed, and have proven reliability.

The passive landfill gas venting system is in place and functioning. Implementing additional venting through new leachate extraction wells would be technically feasible.

**Administrative Feasibility** - It may be necessary to obtain conventional construction permits, land disturbance permits, grading permits, wetland permits, etc., for construction of leachate extraction and treatment systems.

The existing pretreatment permit with the Wheaton Sanitary District POTW may need to be maintained for on going off-site disposal of leachate.

An air discharge permit may be required for on-site discharge of landfill gas to the atmosphere.

**Availability of Services and Materials** - Materials, services, and equipment required to implement this alternative are readily available. Construction of the leachate extraction and treatment systems would, for the most part, utilize common construction materials, but also require some specialized equipment. This equipment is readily available from vendors and experienced constructors/installers are available in the area to install this equipment.

### 6.3.7 Cost

This criterion considers factors such as capital costs, annual O&M costs, and present net worth costs. Costs applicable to this alternative are presented below.

**Capital Costs** - The estimated capital cost for constructing leachate extraction and treatment systems is $488,000. Passive landfill gas venting is currently in place and functioning.

**Operation and Maintenance** - Operation and maintenance costs would be those incurred from operating the leachate recovery system, including power, mechanical systems upkeep and periodic replacement (e.g., lubrication, repair, etc.), heating, and preheating (if appropriate). Operation and maintenance costs would also be incurred for groundwater quality monitoring, leachate head monitoring and characterization.

The annual O&M cost for Alternative 2 is estimated to be $108,000. After the on-site leachate extraction and treatment system is operating, and annual O&M costs are estimated at $689,000 for each year thereafter. It is assumed that the leachate extraction system would be operated for 5 years at 30 gpm and for 25 years at 8 gpm, and other O&M costs would be incurred for 30 years.

**Present Net Worth Cost** - The 30-year present net worth (3 percent discount rate) associated with the above estimated costs is $2,605,000.

The costs for Alternative 2 are summarized in Table 9. Estimated costs are itemized in Appendix C (Tables C-2a through C-2c).

### 6.3.8 State Acceptance

This criterion will be addressed in the Proposed Plan and ROD after agency review of the FS report.

### 6.3.9 Community Acceptance

This criterion will be addressed in the Responsiveness Summary (a summary of written and oral comments on the FS report) following public comment on the Proposed Plan.

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## 6.4 ALTERNATIVE 3

### LEACHATE EXTRACTION AND OFF-SITE DISPOSAL, CAP REPAIR, AND MONITORING

The objective of Alternative 3 is to reduce leachate generation and volume and monitor groundwater and leachate at the Blackwell landfill site. The major elements of this alternative include:

- Leachate Extraction System and Off-Site Disposal
- Cap Repair
- Monitoring

**Leachate Extraction with Off-Site Disposal**
Eight leachate extraction wells would be installed within the landfill at locations corresponding to elevated leachate head levels and high leachate gas flow. The wells would be constructed to screen the saturated leachate thickness in the landfill and zones of landfill gas accumulation in order to extract leachate and vent landfill gas from the same wells. Submersible pumps would be placed in the wells to pump leachate on a continual basis (as available) from the extraction wells. The sustainable flow rate of leachate in the extraction wells would be measured and recorded periodically to develop estimates of leachate extractability. Extracted leachate would be conveyed through underground piping to a central collection tank located in the northwest portion of the landfill site. Leachate in the central collection tank would be periodically pumped as necessary into a tanker truck and transported to the Wheaton Sanitary District POTW for treatment under an existing pretreatment permit.

**Landfill Cap Repair**
The landfill cap would be repaired in designated areas of the landfill that either: 1) have a low permeability layer thickness less than two feet; or 2) are located in areas where perched surface water infiltration seeps from the sideslopes of the landfill. The repaired cap would extend to the edge of the landfill and would be sloped where necessary to promote surface water drainage off the landfill. This would complete a low permeability cap with a minimum thickness of 2 feet in accordance with the requirements of 35 IAC 807, the regulation under which the landfill was closed.

The steps in cap repair would include stripping and stockpiling the topsoil, excavating existing cover soil (including any layer of sand which may have been acting as a conduit for infiltrated surface water to migrate as a layer of perched water above the landfill), placing and compacting the clay material in the excavated areas, covering the clay with a protective layer of soil, spreading topsoil over the disturbed areas, and revegetating the affected areas.

It is expected that clay would be purchased from a suitable borrow site and transported to the landfill for cap construction.

Buildup of landfill gas below the repaired cap would be prevented by utilizing the twenty-five existing landfill vents and the eight new leachate extraction wells to passively vent landfill gas to the atmosphere. The aboveground portion of the existing landfill vents disrupted by the cap repair activities would be replaced during construction.

For purposes of cost estimating, it is estimated that cap repair activities would encompass 25% of the landfill area (approximately 10 acres). A pre-design investigation (RD/RA) would be conducted to establish the location and size of the areas of the site requiring cap repair. At a minimum, two areas of the landfill identified during the RI as having clay cap thicknesses less than two feet will be addressed during the cap repair. These areas are located in the northwest and southeast corners of the landfill (Figure 5-1). The area of the landfill exhibiting lateral seepage from the slope of the landfill is also shown on Figure 5-1.

**Monitoring**

Under Alternative 3, monitoring would be conducted of the various media and systems installed at the Blackwell Landfill site. The following locations, frequencies and analytical parameters are reasonable for site conditions and have been included for cost estimating purposes.

**Groundwater** - Results of the RI groundwater sampling programs show that groundwater contamination is stabilized and limited to the FPD property. Groundwater would be monitored semiannually at fifteen well locations to provide continued documentation that the contamination is stabilized. These well locations would consist of nine wells screened in the outwash and in the bedrock aquifer downgradient of the landfill. The outwash monitoring network would consist of G-107S, G-113, G-115S, G-118S, G-117, G-123, G-128S, G-129 and G-140S, The bedrock well network would include G-107D, G-115D, G-118D, G-128D, G-140D and G-141D. At six locations, there are nested wells consisting of one well screened in the outwash and another well screened in the bedrock zone. All groundwater samples would be analyzed for VOCs and indicator parameters (Cl, TDS, pH, and temperature). Groundwater elevations in the site wells would also be recorded.

**Leachate** - Leachate levels would be monitored semiannually in existing leachate wells DV-2, DV-3, DV-7 and DV-8 and in any new leachate wells potentially installed as part of the remediation to document changes in head elevations at the site. A composite leachate sample would be collected from the total system collection on an annual basis to characterize the on-going quality of leachate for disposal purposes.

The cap would be visually inspected semiannually by FPD personnel to verify the integrity of the cap. The 40 acre cap would be maintained on a regular basis by FPD personnel.

The results of the monitoring program would be periodically reviewed and, if appropriate, modifications to the monitoring program would be recommended.

### 6.4.1 Overall Protection of Human Health and the Environment

This criterion addresses the adequacy with which the alternative can provide protection of human health and the environment by controlling exposures to contaminants.

Alternative 3 provides sufficient protection of human health and the environment under current and future land use scenarios. The Baseline Risk Assessment indicated that unacceptable risks to human health are not likely to occur under either current or future land use conditions. The Ecological Assessment completed for the site indicated that unacceptable risks do not occur to ecological communities at or near the site. The current levels of risk calculated in the Baseline Risk Assessment would be reduced by Alternative 3 by removal and off-site disposal of leachate in the landfill that could potentially migrate to groundwater.

Remedial Action Objectives are media-specific goals for protecting human health and the environment. Remedial Action Objectives were developed to address the presence of site contaminants and to further protect human health and the environment by preventing or minimizing exposure to contaminants present in groundwater, leachate and landfill gas. Remedial Action Objectives are listed and explained in Section 4.2. The following text discusses how Alternative 3 would address the Remedial Action Objectives on a media-specific basis.

**Groundwater** - Affected groundwater does not pose an unacceptable risk under the current land use conditions, as explained in Section 3.3. Currently, persons are not exposed to groundwater affected by the site, and in future scenarios, persons would not be exposed to affected groundwater. The location of the landfill in the Blackwell Forest Preserve prevents the area of the aquifer within the FPD property from being developed for drinking water purposes. Since the FPD cannot sell land to a private party, on-site residential development and installation of wells would not occur. Previous groundwater sampling and analysis programs demonstrate that natural dilution and attenuation characteristics of the soil have effectively stabilized the area of groundwater containing concentrations of contaminants above MCLs. Long-term monitoring with a five-year review would document that contaminated groundwater is not leaving the site.

Groundwater monitoring of outwash and bedrock wells downgradient of the landfill is included in Alternative 3. Groundwater monitoring would provide a measure of the rate at which groundwater contamination is being attenuated and degraded over time. It would also be effective in indicating changes in the extent and character of affected groundwater and would provide early warning, if necessary, of groundwater changes.

Alternative 3 addresses the Remedial Action Objectives for groundwater by preventing off-site migration of contaminants above MCLs; and preventing off-site migration of

groundwater containing concentrations of contaminants that represent an unacceptable human health or environmental risk (see Section 4.2.1).

**Leachate** - Alternative 3 would meet the Remedial Action Objective for leachate to reduce the volume of leachate in the landfill that has the potential to contaminate groundwater. Eight new leachate extraction wells would be installed in the landfill and pumped on a continual basis (as leachate is available) in order to reduce the leachate head at the landfill base. Lowering the leachate head and volume in the landfill would reduce the potential for migration of leachate to groundwater.

Alternative 3 would also meet the Remedial Action Objective for leachate to limit future generation of leachate that has the potential to contaminate groundwater. This alternative would repair the existing cap in areas of the landfill that exhibit a low permeability layer less than 2 feet and in areas where perched surface water infiltration seeps from the landfill slopes. Repairing the cap in this manner will reduce the potential for future groundwater contamination by migrating leachate.

Excessive landfill gas build-up could result in fracturing of the cap and increasing permeability through the cap. Alternative 3 would further limit future leachate generation by including passive vents on the new leachate extraction wells and utilizing the existing passive landfill gas venting system to reduce build-up of gas in the landfill.

Monitoring of leachate head levels would provide information on leachate reduction and sustainable leachate extraction rates at the landfill. Groundwater monitoring in outwash and bedrock wells downgradient of the landfill may provide documentation of changes in migration of leachate contaminants to groundwater at the site.

### 6.4.2 Compliance with ARARs

This criterion considers factors such as compliance with chemical-specific, location-specific, and action-specific ARARs. Potential ARARs for Alternative 3 are summarized in Table 8. County, State or Federal ARARs, whichever is more stringent, will apply. The ARARs listed in Table 8 are discussed below.

**Compliance with Chemical-Specific ARARs**

Potential chemical-specific ARARs relate to air emissions and groundwater quality.

**Air Emissions** - Air emissions from the passive landfill gas vents would be discharged to the atmosphere in accordance with the requirements of 35 IAC 218. The chemical specific air requirements for the expected emissions from this alternative are contained in Section 218.301, which limit emissions of photochemically reactive organic material (e.g., VOCs) to less than 8 lbs/hr. If VOC emissions exceed 8 lbs/hr, controls may be required to reduce emissions by 85 percent. Allowable VOC emissions, however, are typically determined on a case-by-case basis by the IEPA. The landfill gas sampling and analysis program conducted

during the RI showed that VOC emissions are well below 8 lbs/hr. Therefore, the requirements of 35 IAC 218 could be met.

**Groundwater Quality** - Class I potable resource groundwater standards listed in 35 IAC 620.410 apply to groundwater located ten feet or more below the ground surface in the outwash and dolomite (bedrock) aquifers at the Blackwell site. Vinyl chloride, 1,2-dichloroethene, 1,2-dichloroethene, trichloroethene, benzene, and tetrachloroethene have equaled or exceeded the Class I potable resource groundwater standards in one or more on-site monitoring wells.

Compliance with the standards of 35 IAC 620.410 could be achieved under Alternative 3. The extraction of leachate would reduce the leachate head at the base of the landfill and further serve to reduce the source of contaminants to the aquifer. The reduction of contaminant loading, in combination with natural attenuation and dilution, should allow the standards to be achieved.

Until compliance with the standards of 35 IAC 620.410 is achieved, groundwater underlying the Blackwell site would be managed as a groundwater management zone in accordance with 35 IAC 620.250. The groundwater management zone would be established upon concurrence by IEPA following written confirmation of the corrective action undertaken at the site. The groundwater management zone designation would expire when corrective action is completed at the site and applicable standards are met (35 IAC 620.410). A review of the adequacy of the corrective action at the site must be completed and submitted to IEPA no less often than 5 years.

U.S. EPA MCLs designated in 40 CFR 141 are not ARARs because impacted groundwater would not be used for a public drinking water supply.

Based on the discussion above, Alternative 3 would comply with the chemical-specific ARARs.

**Compliance with Location-Specific ARARs**

Potential location-specific ARARs relate to floodplains, wetlands, and open waters. Construction of leachate wells and underground piping for Alternative 3 would occur within the interior of the landfill and not disturb floodplains, wetlands, and open water environments located in the Blackwell landfill area.

The regulatory requirements of Section 404 of the Clean Water Act (40 CFR 6) and the U.S. ACOE regulations pertaining to waters of the United States would not be ARARs since these regulated locations would not be disturbed during construction activities associated with cap repair. Floodplain protection requirements of 40 CFR 6 and the Illinois Floodplains Construction permits are not ARARs because the landfill is not located in a floodplain area.

Alternative 3 would comply with the location-specific ARARs.

**Compliance with Action-Specific ARARs**
Potential action-specific ARARs relate to safety standards, air emissions, and water quality.

**Safety Standards** - Construction of the leachate extraction system would be in accordance with the general industry safety standards in accordance with 29 CFR 1910 and 29 CFR 1926. Threshold limit values would be monitored in the breathing zone during construction of the leachate extraction system and monitoring activities.

**Air Emissions** - Air emissions from the passive landfill gas venting system would meet the relevant permitting requirements of 35 IAC 201. IEPA does not have a formally promulgated air toxics program, consequently, there are no state air toxics ARARs for the Blackwell site. Moreover, there are no federal requirements under the Clean Air Act that are ARARs at this site for the following reasons:

- The Clean Air Act Amendments of 1990 listed 189 air toxics that must be regulated. Toluene, trichloroethene, vinyl chloride, methylene chloride, tetrachloroethene, and xylene are on the list. Under the new Clean Air Act, U.S. EPA plans to list the sources emitting any of these 189 chemicals and, over the next eight years, promulgate emission standards for these sources. Site remediation is listed as a source category, however, U.S. EPA has not yet promulgated maximum achievable control technology (MACT) for this or any other source category. Consequently, the Clean Air Act is not an ARAR for this site.

**Leachate Disposal** - Extracted leachate would be transported to the Wheaton Sanitary District POTW and treated under an existing pretreatment permit.

**Landfill Cap Repair**- The Blackwell Landfill was classified as closed in 1973 and did not operate under 35 IAC Part 811. This site is not considered a new landfill facility or disposal unit as defined in 35 IAC 810.103, and the requirements of 35 IAC 814 may be relevant and appropriate. Part 814 defines the conditions for existing solid waste units whereby provisions of Part 811 may apply. Sections 814.105(a) and 814.302(a)(3) suggest that the final cover requirements of 35 IAC 807 and not 35 IAC 811.314 may be relevant and appropriate at this site. Consequently, solid waste landfill regulations potentially relevant and appropriate to this site include 35 IAC Parts 807 and 814. Section 807.305(c) requires the final cover to consist of not less than 2 feet of suitable material. Closure performance standards must be accomplished according to the approved closure plan in a manner that minimizes the need for further maintenance and manages any further release to the groundwater, surface water, or to the atmosphere to protect human health and the environment.

Alternative 3 would comply with or exceed all of the action-specific ARARs because this alternative would exceed the requirements of 35 IAC 807.305(c).

Alternative 3 would comply with the action-specific ARARs.

Based on the discussion above, this alternative would comply with the chemical-, location-, and specific ARARs.

### 6.4.3 Long-Term Effectiveness and Permanence

This criterion describes factors such as residual risks remaining following implementation of the remedy, and the adequacy and reliability of controls. This latter factor considers the long-term management of treatment residuals, long-term reliability of engineering and institutional controls, and the potential need for replacement of the alternative.

**Magnitude of Residual Risk** - Residual risks left by Alternative 3 would be reduced even lower than those calculated in the Baseline Risk Assessment and Ecological Assessment. The Baseline Risk Assessment indicated that no unacceptable health risks would occur from exposures to landfill contaminants in present and future risk scenarios. The Ecological Assessment indicated that no unacceptable risks are expected to ecological communities, and that there would not be an unacceptable risk to ecological receptors (i.e., terrestrial and aquatic species).

Groundwater contaminant concentrations will continue to decrease by natural attenuation/dilution processes and also because contaminant loading will be decreased as leachate volume and pressure head are reduced by the leachate collection system.

The leachate extraction system would reduce the potential risks associated with high leachate volume and levels in proportion to the resultant decrease in leachate volume, level and chemical constituent concentrations. The magnitude of these reductions will be dependent on the recoverability of the leachate from the landfill interior.

The existing passive landfill gas venting system would continue to relieve buildup of gas within the landfill. The volume of gas would decrease as the refuse in the landfill stabilizes, reducing the risk associated with fracturing of the existing cap and generation of future leachate.

The entire remedy would be subject to a five-year review. Leachate extraction system review would consist of evaluating the effectiveness of leachate extraction to lower the leachate heads in new and existing leachate wells and reduce the volume of leachate contained in the landfill. Groundwater monitoring data would document whether leachate extraction results in a corresponding decrease in groundwater contaminant concentrations. The accumulated database from groundwater monitoring would be evaluated to assess the on-going groundwater quality downgradient of the landfill.

**Adequacy and Reliability of Controls** - FPD ownership of the property is an adequate and reliable control for the site. The landfill is maintained by FPD personnel. The possibility of residential or commercial development is eliminated by FPD ownership, since the FPD lacks the authority to sell any portion of the Blackwell Forest Preserve to a private party.

Leachate extraction and treatment is a well developed remedial technology. The volume and sustainable yield of leachate at the landfill would be identified through extended pumping of the landfill extraction wells. The FPD would manage the system, and would utilize local contractors, suppliers and FPD personnel for system monitoring, operation and maintenance. The Wheaton Sanitary District POTW would be utilized to treat the collected leachate under an existing pretreatment permit. It is not anticipated that major elements of the system would require replacement. Submersible pumps placed in the leachate wells may require periodic maintenance to ensure adequate performance.

Repair of the landfill cap would be an adequate and reliable control for promoting drainage to reduce infiltration and minimize leachate generation.

Passive landfill gas venting exists at the site and has proven to be an adequate and reliable means to limit landfill gas build-up and problems associated with landfill gas accumulation. The venting system is mechanically simple to operate and maintain.

### 6.4.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

This criterion considers factors such as: the treatment process used and the material treated; the amount of hazardous material destroyed or treated; the reduction in toxicity, mobility, or volume through treatment; the irreversibility of the treatment; the type and quantity of treatment residuals; and the reduction of inherent hazards. These factors are considered where appropriate and are discussed below.

**Treatment Process Used and Materials Treated** - This alternative includes extraction and collection of leachate at the landfill followed by treatment of the extracted leachate to remove inorganics and destroy organics. Treatment of the extracted leachate would be off-site at the Wheaton Sanitary District POTW.

**Amount of Contaminated Materials Destroyed or Treated** - The volume of leachate in the landfill may be as high as 53 million gallons and as much as 9,500 gallons per day of leachate may be generated by infiltrating precipitation. Although there are a number of uncertainties associated with these conservative estimates, the leachate extraction program will reduce the volume of leachate contaminants at the site. Depending on the accuracy of the volume estimates and sustainable yield of leachate, some portion or a majority of this material may be collected at the site at treated at the POTW.

**Degree of Expected Reductions in Toxicity, Mobility, or Volume** - Extraction, collection and treatment of fossil leachate from the landfill would result in overall reduction

of leachate toxicity. Recently generated leachate would have less residence time in contact with the landfill refuse and would be potentially less toxic than fossil leachate. Cap repair would also aid in reducing leachate toxicity by limiting infiltration and reducing generation of future leachate.

Removal of leachate from the landfill would decrease the mobility of the landfill leachate by reducing the hydraulic head potentially present at the landfill base. Use of submersible pumps in the leachate extraction wells would provide hydraulic control of leachate migration and mobilize leachate contaminants towards the collection wells. However, the construction of new leachate extraction wells could allow vertical migration of leachate to the base of the landfill by providing a conduit across low permeability cover layers designed into the landfill. This could mobilize leachate currently residing at upper landfill positions into closer proximity of the outwash aquifer, thereby increasing leachate mobility.

Increased mobility could also occur through conveyance of leachate to the central collection tank through underground piping. Increased mobility could also result from pumping the leachate into tanker trucks and transporting the leachate to the off-site POTW. Precautions against spills and releases would be instituted to minimize such occurrences.

The volume of leachate present in the landfill would be reduced by extraction, provided the extraction system could produce an effluent flow rate greater than the rate of infiltration through the landfill cap. Cap repair would serve to reduce volume of leachate present in the landfill by reducing infiltration and limiting generation of future leachate at the site.

The actual effect of a leachate extraction system on the reduction of toxicity, mobility, and volume would be determined by measuring sustainable leachate yields during pumping and monitoring leachate heads in the landfill to develop reliable estimates of leachate volume.

**Degree to Which Treatment is Irreversible** - Leachate extraction and off-site disposal and treatment would irreversibly reduce the volume of leachate and concentration of chemical constituents in leachate present in the landfill. The concentrations would be reduced by removal of more concentrated fossil leachate that accumulated in the landfill during construction and operation of the landfill. Leachate generated by recent infiltration of rain water could have a lower contaminant concentration, thereby reducing the overall toxicity of the leachate.

Contaminants present in the extracted leachate would be irreversibly destroyed by off-site treatment at the Wheaton Sanitary District POTW.

**Type and Quantity of Residuals Remaining After Treatment** - Any residuals associated with leachate treatment at the Wheaton Sanitary District POTW would be mixed with residual associated with routine operation of the treatment plant and disposed according to the POTW permitting requirements.

**Reduction of Inherent Hazards** - Alternative 3 would reduce inherent hazards posed by high leachate volumes and heads in the landfill by leachate extraction and treatment.

### 6.4.5 Short-Term Effectiveness

This criterion considers factors such as additional risks which may be posed to the community, workers, and the environment during implementation of the remedy. In addition, the time required to achieve remedial action objectives is addressed. These factors are discussed below.

**Risks to Community During Remedial Actions** - Implementation of Alternative 3 may pose minor risks to the community during construction of the leachate extraction system. Increased truck traffic and operation of heavy equipment during construction activities could result in increased risk of injury to the public traveling in the vicinity of the site. Dust control technologies would be used to minimize the migration of fugitive emissions from the site to nearby residents.

**Risks to Workers During Remedial Actions** - If waste materials are disturbed during cap repair and leachate extraction system installation, remediation workers may be exposed to chemicals through direct contact with subsurface soils, leachate and wastes, or inhalation exposure to dust and landfill gas. These exposures could be minimized by use of dust control measures and personal protective equipment. Besides risks from contaminants, workers would incur risks associated with performing construction activities due to operation of heavy equipment.

Workers performing sampling activities as part of implementing monitoring would incur potential risk through exposure to chemicals in the groundwater, leachate and landfill gas. This risk would be minimized through the use of safety procedures and personal protective equipment.

**Environmental Impacts** - Implementation of this alternative is not anticipated to pose additional risk to the environment. Soil erosion and sediment control technologies would be employed to protect surface waters during construction operations associated with cap repair and installation of the leachate extraction system. Once the construction is completed, disturbed areas would be vegetated to protect against soil erosion and sedimentation.

**Time Until Remedial Action Objectives are Achieved** - Groundwater Remedial Action Objectives are currently being met.

The time needed to achieve the Remedial Action Objective for leachate aimed at reducing leachate volume at the site would be dependent on the actual volume present in the landfill and the sustainable yield of leachate recovery.

The Remedial Action Objective for leachate to limit future generation of leachate at the landfill would be met almost immediately after completion of cap repair activities. Completion of repair activities would be in approximately 6 months. Resulting decreases in leachate elevation would be observed over a period of several years following cap repair completion.

### 6.4.6 Implementability

This criterion considers factors, where appropriate, such as technical feasibility, administrative feasibility, and availability of materials and services. These factors are discussed below.

**Technical Feasibility** - Leachate extraction technology is well developed and an extraction system is technically constructable. The degree of success of such a recovery system at this site is uncertain because of the uncertainty regarding the total volume of leachate and the availability of that leachate for extraction. The feasibility of recovering significant portions of leachate from this site would be evaluated through the continued operation of the extraction system. Installation of underground piping and construction of a central collection tank would utilize standard equipment and procedures and be technically feasible to implement at the site.

The technical feasibility of repairing the existing cap would be partially dependent on a pre-design investigation to identify the areas of the cap which require repair. Once identified, construction techniques for landfill capping are well developed and utilization of good earthwork technique and materials could bring these portions of the landfill up to regulatory requirements.

Technologies for conducting monitoring of groundwater and leachate are readily implementable, are well developed, and have proven reliability.

The passive landfill gas venting system is in place and functioning. Implementing additional venting through new leachate extraction wells would be technically feasible.

**Administrative Feasibility** - It may be necessary to obtain conventional construction permits, land disturbance permits, grading permits, wetland permits, etc., for construction of leachate extraction and treatment systems.

The existing pretreatment permit with the Wheaton Sanitary District POTW may need to be maintained for on going off-site disposal of leachate.

An air discharge permit may be required for on-site discharge of landfill gas to the atmosphere.

**Availability of Services and Materials** - Materials, services, and equipment required to implement this alternative are readily available. Construction of the leachate extraction and

treatment systems would, for the most part, utilize common construction materials, but also require some specialized equipment. This equipment is readily available from vendors and experienced constructors/installers are available in the area to install this equipment.

Repair of the cap would involve using common construction materials and employing experienced contractors presently working in the area. For the cost estimate, it was assumed that appropriate materials to repair the cap could be obtained from a borrow source within 10 miles of the site.

### 6.4.7 Cost

This criterion considers factors such as capital costs, annual O&M costs, and present net worth costs. Costs applicable to this alternative are presented below.

**Capital Costs** - The estimated capital cost for constructing leachate extraction and treatment systems and repair of the landfill cap is $1,417,000. Passive landfill gas venting is currently in place and functioning.

**Operation and Maintenance** - Operation and maintenance costs would be those incurred from operating the leachate recovery system, including power, mechanical systems upkeep and periodic replacement (e.g., lubrication, repair, etc.), heating, and preheating (if appropriate). Operation and maintenance costs would also be incurred for groundwater quality monitoring, leachate head monitoring and characterization.

The annual O&M cost for Alternative 3 is estimated to be $118,000.

**Present Net Worth Cost** - The 30-year present net worth (3 percent discount rate) associated with the above estimated costs is $3,730,000.

The costs for Alternative 3 are summarized in Table 9. Estimated costs are itemized in Appendix C (Tables C-3a through C-3c).

### 6.4.8 State Acceptance

This criterion will be addressed in the Proposed Plan and ROD after agency review of the FS report.

### 6.4.9 Community Acceptance

This criterion will be addressed in the Responsiveness Summary (a summary of written and oral comments on the FS report) following public comment on the Proposed Plan.

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# 6.5 ALTERNATIVE 4

## LEACHATE EXTRACTION AND OFF-SITE DISPOSAL, GROUNDWATER EXTRACTION AND TREATMENT, CAP REPAIR, AND MONITORING

The objective of Alternative 4 is to reduce leachate generation and volume and monitor groundwater and leachate at the Blackwell landfill site. The major elements of this alternative include:

- Leachate Extraction System and Off-Site Disposal
- Groundwater Extraction and Treatment
- Cap Repair
- Monitoring

**Leachate Extraction with Off-Site Disposal**
Eight leachate extraction wells would be installed within the landfill at locations corresponding to elevated leachate head levels and high leachate gas flow. The wells would be constructed to screen the saturated leachate thickness in the landfill and zones of landfill gas accumulation in order to extract leachate and vent landfill gas from the same wells. Submersible pumps would be placed in the wells to pump leachate on a continual basis (as available) from the extraction wells. The sustainable flow rate of leachate in the extraction wells would be measured and recorded periodically to develop estimates of leachate extractability. Extracted leachate would be conveyed through underground piping to a central collection tank located in the northwest portion of the landfill site. Leachate in the central collection tank would be periodically pumped as necessary into a tanker truck and transported to the Wheaton Sanitary District POTW for treatment under an existing pretreatment permit.

**Groundwater Extraction and Treatment**
Twenty extraction wells would be installed in the outwash downgradient of the landfill to capture contaminants which have the potential to migrate off site. Because of the high permeability of the outwash deposits, the wells would have to be pumped at a total flow rate of approximately 250-500 gpm in order to achieve hydraulic control and effective capture in the outwash around the base of the landfill. The extracted groundwater would be conveyed through underground piping to the treatment system. The extracted groundwater would be treated by air stripping and discharged into Sand Pond located on FPD property. A pre-design investigation may be necessary to develop the cost-effective groundwater extraction configuration.

**Landfill Cap Repair**
The landfill cap would be repaired in designated areas of the landfill that either: 1) have a low permeability layer thickness less than two feet; or 2) are located in areas where perched

surface water infiltration seeps from the sideslopes of the landfill. The repaired cap would extend to the edge of the landfill and would be sloped where necessary to promote surface water drainage off the landfill. This would complete a low permeability cap with a minimum thickness of 2 feet in accordance with the requirements of 35 IAC 807, the regulation under which the landfill was closed.

The steps in cap repair would include stripping and stockpiling the topsoil, excavating existing cover soil (including any layer of sand which may have been acting as a conduit for infiltrated surface water to migrate as a layer of perched water above the landfill), placing and compacting the clay material in the excavated areas, covering the clay with a protective layer of soil, spreading topsoil over the disturbed areas, and revegetating the affected areas. It is expected that clay would be purchased from a suitable borrow site and transported to the landfill for cap construction.

Buildup of landfill gas below the repaired cap would be prevented by utilizing the twenty-five existing landfill vents and the eight new leachate extraction wells to passively vent landfill gas to the atmosphere. The aboveground portion of the existing landfill vents disrupted by the cap repair activities would be replaced during construction.

For purposes of cost estimating, it is estimated that cap repair activities would encompass 25% of the landfill area (approximately 10 acres). A pre-design investigation (RD/RA) would be conducted to establish the location and size of the areas of the site requiring cap repair. At a minimum, two areas of the landfill identified during the RI as having clay cap thicknesses less than two feet will be addressed during the cap repair. These areas are located in the northwest and southeast corners of the landfill (Figure 5-1). The area of the landfill exhibiting lateral seepage from the slope of the landfill is also shown on Figure 5-1.

**Monitoring**

Under Alternative 4, monitoring would be conducted of the various media and systems installed at the Blackwell Landfill site. The following locations, frequencies and analytical parameters are reasonable for site conditions and have been included for cost estimating purposes.

**Groundwater** - Results of the RI groundwater sampling programs show that groundwater contamination is stabilized and limited to the FPD property. Groundwater would be monitored semiannually at fifteen well locations to provide continued documentation that the contamination is stabilized. These well locations would consist of nine wells screened in the outwash and in the bedrock aquifer downgradient of the landfill. The outwash monitoring network would consist of G-107S, G-113, G-115S, G-118S, G-117, G-123, G-128S, G-129 and G-140S, The bedrock well network would include G-107D, G-115D, G-118D, G-128D, G-140D and G-141D. At six locations, there are nested wells consisting of one well screened in the outwash and another well screened in the bedrock zone. All groundwater samples would be analyzed for VOCs and indicator parameters (Cl, TDS, pH, and temperature). Groundwater elevations in the site wells would also be recorded.

**Leachate** - Leachate levels would be monitored semiannually in existing leachate wells DV02, DV03, DV07 and DV08 and in any new leachate wells potentially installed as part of the remediation to document changes in head elevations at the site. A composite leachate sample would be collected from the total system collection on an annual basis to characterize the on-going quality of leachate for disposal purposes.

The cap would be visually inspected semiannually by FPD personnel to verify the integrity of the cap. The 40 acre cap would be maintained on a regular basis by FPD personnel.

The results of the monitoring program would be periodically reviewed and, if appropriate, modifications to the monitoring program would be recommended.

### 6.5.1 Overall Protection of Human Health and the Environment

This criterion addresses the adequacy with which the alternative can provide protection of human health and the environment by controlling exposures to contaminants.

Alternative 4 provides sufficient protection of human health and the environment under current and future land use scenarios. The Baseline Risk Assessment indicated that unacceptable risks to human health are not likely to occur under either current or future land use conditions. The Ecological Assessment completed for the site indicated that unacceptable risks do not occur to ecological communities at or near the site. The current levels of risk presented in the Baseline Risk Assessment would be reduced by Alternative 4 by removal and off-site disposal of leachate in the landfill that could potentially migrate to groundwater.

Remedial Action Objectives are media-specific goals for protecting human health and the environment. Remedial Action Objectives were developed to address the presence of site contaminants and to further protect human health and the environment by preventing or minimizing exposure to contaminants present in groundwater, leachate and landfill gas. Remedial Action Objectives are listed and explained in Section 4.2. The following text discusses how Alternative 4 would address the Remedial Action Objectives on a media-specific basis.

**Groundwater** - Affected groundwater does not pose an unacceptable risk under the current land use conditions, as explained in Section 3.3. Currently, persons are not exposed to groundwater affected by the site, and in future scenarios, persons would not be exposed to affected groundwater. The location of the landfill in the Blackwell Forest Preserve prevents the area of the aquifer within the FPD property from being developed for drinking water purposes. Since the FPD cannot sell land to a private party, on-site residential development and installation of wells would not occur.

Previous groundwater sampling and analysis programs demonstrate that natural dilution and attenuation characteristics of the soil have effectively stabilized the area of groundwater containing concentrations of contaminants above MCLs. Groundwater extraction and treatment would hydraulically control and capture contaminated groundwater around the

base of the landfill to ensure that unanticipated off-site migration of contaminants did not occur at the site. Long-term monitoring with a five-year review would document that contaminated groundwater is not leaving the site.

Groundwater monitoring of outwash and bedrock wells downgradient of the landfill is included in Alternative 4. Groundwater monitoring would provide a measure of the rate at which groundwater contamination is being extracted over time. It would also be effective in indicating changes in the extent and character of affected groundwater and would provide early warning, if necessary, of changes in groundwater quality.

Alternative 4 addresses the Remedial Action Objectives for groundwater by preventing off-site migration of contaminants above MCLs; and preventing off-site migration of groundwater containing concentrations of contaminants that represent an unacceptable human health or environmental risk (see Section 4.2.1).

**Leachate** - Alternative 4 would meet the Remedial Action Objective for leachate to reduce the volume of leachate in the landfill that has the potential to contaminate groundwater. Eight new leachate extraction wells would be installed in the landfill and pumped on a continual basis (as leachate is available) in order to reduce the leachate head at the landfill base. Lowering the leachate head and volume in the landfill would reduce the potential for migration of leachate to groundwater.

Alternative 4 would also meet the Remedial Action Objective for leachate to limit future generation of leachate that has the potential to contaminate groundwater. This alternative would repair the existing cap in areas of the landfill that exhibit a low permeability layer less than 2 feet and in areas where perched surface water infiltration seeps from the landfill slopes. Repairing the cap in this manner will reduce the potential for future groundwater contamination by migrating leachate.

Excessive landfill gas build-up could result in fracturing of the cap and increasing permeability through the cap. Alternative 4 would further limit future leachate generation by including passive vents on the new leachate extraction wells and utilizing the existing passive landfill gas venting system to reduce build-up of gas in the landfill.

Monitoring of leachate head levels would provide information on leachate reduction and sustainable leachate extraction rates at the landfill. Groundwater monitoring in outwash and bedrock wells downgradient of the landfill may provide documentation of changes in migration of leachate contaminants to groundwater at the site.

### 6.5.2 Compliance with ARARs

This criterion considers factors such as compliance with chemical-specific, location-specific, and action-specific ARARs. Potential ARARs for Alternative 4 are summarized in Table 8. County, State or Federal ARARs, whichever is more stringent, will apply. The ARARs listed in Table 8 are discussed below.

**Compliance with Chemical-Specific ARARs**
Potential chemical-specific ARARs relate to air emissions and groundwater quality.

**Air Emissions** - Air emissions from the passive landfill gas vents would be discharged to the atmosphere in accordance with the requirements of 35 IAC 218. The chemical specific air requirements for the expected emissions from this alternative are contained in Section 218.301, which limit emissions of photochemically reactive organic material (e.g., VOCs) to less than 8 lbs/hr. If VOC emissions exceed 8 lbs/hr, controls may be required to reduce emissions by 85 percent. Allowable VOC emissions, however, are typically determined on a case-by-case basis by the IEPA. The landfill gas sampling and analysis program conducted during the RI showed that VOC emissions are well below 8 lbs/hr. Therefore, the requirements of 35 IAC 218 could be met.

**Groundwater Quality** - Class I potable resource groundwater standards listed in 35 IAC 620.410 apply to groundwater located ten feet or more below the ground surface in the outwash and dolomite (bedrock) aquifers at the Blackwell site. Vinyl chloride, 1,2-dichloroethene, 1,2-dichloroethene, trichloroethene, benzene, and tetrachloroethene have equaled or exceeded the Class I potable resource groundwater standards in one or more on-site monitoring wells.

Compliance with the standards of 35 IAC 620.410 could be achieved under Alternative 4. Groundwater extraction and treatment would remove contaminants from groundwater during pumping associated with hydraulic control and capture. The extraction of leachate would also reduce the source of contaminants to the aquifer by lowering leachate head at the base of the landfill.

Until compliance with the standards of 35 IAC 620.410 is achieved, groundwater underlying the Blackwell site would be managed as a groundwater management zone in accordance with 35 IAC 620.250. The groundwater management zone would be established at the site following approval by IEPA of the proposed corrective action to be implemented at the site. The groundwater management zone designation would expire when corrective action is completed at the site and applicable standards are met (35 IAC 620.410). A review of the adequacy of the corrective action at the site would be completed and submitted to IEPA no less often than 5 years.

U.S. EPA MCLs designated in 40 CFR 141 are not ARARs because impacted groundwater would not be used for a public drinking water supply.

Based on the discussion above, Alternative 4 may comply with the chemical-specific ARARs.

**Compliance with Location-Specific ARARs**
Potential location-specific ARARs relate to floodplains, wetlands, and open waters. Cap repair and construction of leachate wells and underground piping for Alternative 4 would

occur within the interior of the landfill and would not disturb floodplains, wetlands, and open water environments located in the Blackwell landfill area.

Construction of the extraction wells, conveyance piping and treatment building at the base of the landfill and at Sand Pond are potentially subject to the regulatory requirements of Section 404 of the Clean Water Act (40 CFR 6) and the Illinois Floodplains Construction permits statutes. Construction activities associated with the groundwater extraction and treatment system would have to address the applicable portions of these regulations.

Alternative 4 would comply with the location-specific ARARs.

**Compliance with Action-Specific ARARs**
Potential action-specific ARARs relate to safety standards, air emissions, and water quality.

**Safety Standards** - Construction of the leachate and groundwater extraction systems and cap repair would be in accordance with the general industry safety standards in accordance with 29 CFR 1910 and 29 CFR 1926. Threshold limit values would be monitored in the breathing zone during construction of the leachate extraction system and monitoring activities.

**Air Emissions** - Air emissions from the passive landfill gas venting system would meet the relevant permitting requirements of 35 IAC 201. IEPA does not have a formally promulgated air toxics program, consequently, there are no state air toxics ARARs for the Blackwell site. Moreover, there are no federal requirements under the Clean Air Act that are ARARs at this site for the following reasons:

- The Clean Air Act Amendments of 1990 listed 189 air toxics that must be regulated. Toluene, trichloroethene, vinyl chloride, methylene chloride, tetrachloroethene, and xylene are on the list. Under the new Clean Air Act, U.S. EPA plans to list the sources emitting any of these 189 chemicals and, over the next eight years, promulgate emission standards for these sources. Site remediation is listed as a source category, however, U.S. EPA has not yet promulgated maximum achievable control technology (MACT) for this or any other source category. Consequently, the Clean Air Act is not an ARAR for this site.

**Leachate Disposal** - Extracted leachate would be transported to the Wheaton Sanitary District POTW and treated under an existing pretreatment permit.

**Groundwater Discharge-** ARARs for discharge of treated groundwater to a surface water (Sand Pond) are provided by the National Pollution Discharge Elimination System Permit Regulations (40 CFR 122 and 125), the Water Quality Effluent Limitations section of the Clean Water Act (40 CFR 131), and 35 IAC, Parts 304 and 309. Sampling and analysis associated with discharge to a surface water body are found in 40 CFR 136 and would be considered a potential ARAR.

**Landfill Cap Repair**- The Blackwell Landfill was classified as closed in 1973 and did not operate under 35 IAC Part 811. This site is not considered a new landfill facility or disposal unit as defined in 35 IAC 810.103, and the requirements of 35 IAC 814 may be relevant and appropriate. Part 814 defines the conditions for existing solid waste units whereby provisions of Part 811 may apply. Sections 814.105(a) and 814.302(a)(3) suggest that the final cover requirements of 35 IAC 807 and not 35 IAC 811.314 may be relevant and appropriate at this site. Consequently, solid waste landfill regulations potentially relevant and appropriate to this site include 35 IAC Parts 807 and 814. Section 807.305(c) requires the final cover to consist of not less than 2 feet of suitable material. Closure performance standards must be accomplished according to the approved closure plan in a manner that minimizes the need for further maintenance and manages any further release to the groundwater, surface water, or to the atmosphere to protect human health and the environment.

Alternative 4 would comply with or exceed all of the action-specific ARARs because this alternative would exceed the requirements of 35 IAC 807.305(c).

Alternative 4 would comply with the action-specific ARARs.

Based on the discussion above, this alternative could comply with the chemical-, location-, and specific ARARs.

### 6.5.3 Long-Term Effectiveness and Permanence

This criterion describes factors such as residual risks remaining following implementation of the remedy, and the adequacy and reliability of controls. This latter factor considers the long-term management of treatment residuals, long-term reliability of engineering and institutional controls, and the potential need for replacement of the alternative.

**Magnitude of Residual Risk** - The Baseline Risk Assessment indicated that no unacceptable health risks would occur from exposures to landfill contaminants in present and future risk scenarios. The Ecological Assessment indicated that no unacceptable risks are expected to ecological communities and that there would not be an unacceptable risk to ecological receptors (i.e., terrestrial and aquatic species).

Groundwater contaminant concentrations would be reduced during groundwater extraction and treatment. Since most of the groundwater contaminants already exist at the site at low concentrations (less than 30 ug/L), it is likely that only minimal reduction of these contaminants levels would occur during large scale pumping associated with groundwater extraction. Further decrease in concentrations of contaminants in groundwater will also occur by natural attenuation/dilution processes and also because contaminant loading will be decreased as leachate volume and pressure head are reduced by the leachate collection system.

The leachate extraction system would reduce the potential risks associated with high leachate volume and levels in proportion to the resultant decrease in leachate volume, level and chemical constituent concentrations. The magnitude of these reductions will be dependent on the recoverability of the leachate from the landfill interior.

The leachate extraction system would reduce the potential risks associated with high leachate volume and levels in proportion to the resultant decrease in leachate volume, level and chemical constituent concentrations. The magnitude of these reductions will be dependent on the recoverability of the leachate from the landfill interior.

The existing passive landfill gas venting system would continue to relieve buildup of gas within the landfill. The volume of gas would decrease as the refuse in the landfill stabilizes, reducing the risk associated with fracturing of the existing cap and generation of future leachate.

The entire remedy would be subject to a five-year review. Leachate extraction system review would consist of evaluating the effectiveness of leachate extraction to lower the leachate heads in new and existing leachate wells and to reduce the volume of leachate contained in the landfill. A review of the groundwater extraction and treatment system would evaluate the effectiveness of the groundwater extraction system to control hydraulic gradients and capture groundwater contaminants. Groundwater monitoring data would be evaluated to identify if groundwater extraction results in a corresponding decrease in groundwater contaminant concentrations. The accumulated database from groundwater monitoring would be evaluated to assess the on-going groundwater quality downgradient of the landfill.

**Adequacy and Reliability of Controls** - FPD ownership of the property is an adequate and reliable control for the site. The landfill is maintained by FPD personnel. The possibility of residential or commercial development is eliminated by FPD ownership, since the FPD lacks the authority to sell any portion of the Blackwell Forest Preserve to a private party.

Leachate extraction and treatment is a well developed remedial technology. The volume and sustainable yield of leachate at the landfill would be identified through extended pumping of the landfill extraction wells. The FPD would manage the system, and would utilize local contractors, suppliers and FPD personnel for system monitoring, operation and maintenance. The Wheaton Sanitary District POTW would be utilized to treat the collected leachate under an existing pretreatment permit. It is not anticipated that major elements of the system would require replacement. Submersible pumps placed in the leachate wells may require periodic maintenance to ensure adequate performance.

Groundwater extraction and treatment is a well developed and widely utilized remedial technology. Because of the number of wells and the high pumping rate required to achieve hydraulic control in the permeable outwash deposits at the site, long term management and maintenance of the system would be required to ensure system performance. Submersible

pumps placed in the extraction wells would require periodic maintenance to ensure adequate performance. The extraction wells may also need to be redeveloped on a regular basis to maintain system flow rates. Elevated iron and manganese concentrations in the groundwater and bacteria may precipitate scale in the wells and require attention. The air stripping packing media will also need ongoing maintenance to prevent fouling. A pre-design study may be conducted to determine if pretreatment of the groundwater is necessary at the site.

Repair of the landfill cap would be an adequate and reliable control for promoting drainage to reduce infiltration and minimize leachate generation.

Passive landfill gas venting exists at the site and has proven to be an adequate and reliable means to limit landfill gas build-up and problems associated with landfill gas accumulation. The venting system is mechanically simple to operate and maintain.

### 6.5.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

This criterion considers factors such as: the treatment process used and the material treated; the amount of hazardous material destroyed or treated; the reduction in toxicity, mobility, or volume through treatment; the irreversibility of the treatment; the type and quantity of treatment residuals; and the reduction of inherent hazards. These factors are considered where appropriate and are discussed below.

**Treatment Process Used and Materials Treated** - This alternative includes extraction and collection of leachate at the landfill followed by treatment of the extracted leachate to remove inorganics and destroy organics. Treatment of the extracted leachate would be off-site at the Wheaton Sanitary District POTW.

Extracted groundwater would be treated by air stripping followed by discharge to Sand Pond located on FPD property. Volatile organic contaminants would be removed from the groundwater and discharged to the atmosphere. The SVOC compound identified in groundwater at the site would not be treated by this alternative.

**Amount of Contaminated Materials Destroyed or Treated** - The volume of leachate in the landfill may be as high as 70 million gallons and as much as 9,500 gallons per day of leachate may be generated by infiltrating precipitation. Although there are a number of uncertainties associated with these conservative estimates, the leachate extraction program will reduce the volume of leachate contaminants at the site. Depending on the accuracy of the volume estimates and sustainable yield of leachate, some portion or a majority of this material may be collected at the site ~~at~~ and treated at the POTW.

Because of the high permeability of the outwash deposits, the pumping rate from twenty wells would have to be approximately 250 to 500 gpm in order to achieve hydraulic control and effectively capture groundwater in the outwash at the base of the landfill. Although the system flow rate would be high, the amount of contaminants treated by air stripping would not be significant due to the low contaminant influent concentrations (generally less than 30

ug/L). Based on an influent flow rate of 500 gpm (0.72 MGD) and an average concentration of VOCs of 30 ug/L, approximately 0.2 lbs/day of volatile contaminants could be treated and removed from groundwater with this alternative.

**Degree of Expected Reductions in Toxicity, Mobility, or Volume** - Extraction, collection and treatment of fossil leachate from the landfill would result in overall reduction of leachate toxicity. Recently generated leachate would have less residence time in contact with the landfill refuse and would be potentially less toxic than fossil leachate. Cap repair would also aid in reducing leachate toxicity by limiting infiltration and reducing generation of future leachate.

Removal of leachate from the landfill would decrease the mobility of the landfill leachate by reducing the hydraulic head potentially present at the landfill base. Use of submersible pumps in the leachate extraction wells would provide hydraulic control of leachate migration and mobilize leachate contaminants towards the collection wells. However, the construction of new leachate extraction wells could allow vertical migration of leachate to the base of the landfill by providing a conduit across low permeability cover layers designed into the landfill. This could mobilize leachate currently residing at upper landfill positions into closer proximity of the outwash aquifer, thereby increasing leachate mobility.

Increased mobility could also occur through conveyance of leachate to the central collection tank through underground piping. Increased mobility could also result from pumping the leachate into tanker trucks and transporting the leachate to the off-site POTW. Precautions against spills and releases would be instituted to minimize such occurrences.

The volume of leachate present in the landfill would be reduced by extraction, provided the extraction system could produce an effluent flow rate greater than the rate of infiltration through the landfill cap. Cap repair would serve to reduce volume of leachate present in the landfill by reducing infiltration and limiting generation of future leachate at the site.

The actual effect of a leachate extraction system on the reduction of toxicity, mobility, and volume would be determined by measuring sustainable leachate yields during pumping and monitoring leachate heads in the landfill to develop reliable estimates of leachate volume.

Groundwater extraction would create a hydraulic barrier around the base of the landfill to reduce contaminant mobility in groundwater. However, the results of the RI groundwater sampling programs show that groundwater contamination is stabilized and limited to areas within 100 feet downgradient of the landfill. Groundwater contaminants are apparently rapidly attenuated and diluted in the outwash aquifer within 200 to 300 feet downgradient of the landfill. Active groundwater extraction would serve to build on and enhance the reduction of contaminant mobility already occurring naturally at the site.

The volume of contaminants in groundwater would be reduced by extraction. Air stripping would remove volatile contaminants from the water and discharge them to the atmosphere.

Cap repair would serve to reduce volume of leachate present in the landfill by reducing infiltration of precipitation, thereby limiting generation of future leachate at the site.

**Degree to Which Treatment is Irreversible** - Leachate extraction and off-site disposal and treatment would irreversibly reduce the volume of leachate and concentration of chemical constituents in leachate present in the landfill. The concentrations would be reduced by removal of more concentrated fossil leachate that accumulated in the landfill during construction and operation of the landfill. Leachate generated by recent infiltration of rain water could have a lower contaminant concentration, thereby reducing the overall toxicity of the leachate.

Contaminants present in the extracted leachate would be irreversibly destroyed by off-site treatment at the Wheaton Sanitary District POTW.

Groundwater extraction and treatment would irreversibly reduce the volume of contaminants present in groundwater at the site. Volatile organic contaminants would be irreversibly removed from groundwater by air stripping and discharged to the atmosphere. In the atmosphere, the VOCs would likely be destroyed by natural photodecomposition processes. One SVOC identified in groundwater would not be removed during the extraction and treatment process.

**Type and Quantity of Residuals Remaining After Treatment** - Any residuals associated with leachate treatment at the Wheaton Sanitary District POTW would be mixed with residual associated with routine operation of the treatment plant and disposed according to the POTW permitting requirements.

Residuals remaining in groundwater after extraction and treatment would be discharged into Sand Pond and re-enter the groundwater system. Concentrations of chemicals in discharged treated groundwater would be required to meet permit discharge limits.

**Reduction of Inherent Hazards** - Alternative 4 may reduce potential hazards posed by high leachate volumes and heads in the landfill by leachate extraction and treatment.

### 6.5.5 Short-Term Effectiveness

This criterion considers factors such as additional risks which may be posed to the community, workers, and the environment during implementation of the remedy. In addition, the time required to achieve remedial action objectives is addressed. These factors are discussed below.

**Risks to Community During Remedial Actions** - Implementation of Alternative 4 may pose minor risks to the community during construction of the leachate and groundwater extraction systems. Increased truck traffic and operation of heavy equipment during construction activities could result to increased risk of injury to the public traveling in the vicinity of the site. Dust control technologies would be used to minimize the migration of fugitive emissions from the site to nearby residents.

**Risks to Workers During Remedial Actions** - If waste materials are disturbed during cap repair and leachate extraction system installation, remediation workers may be exposed to chemicals through direct contact with subsurface soils, leachate and wastes, or inhalation exposure to dust and landfill gas. These exposures could be minimized by use of personal protective equipment and dust control measures. Construction associated with groundwater extraction and treatment would not disturb landfill materials. Workers would also incur risks associated with performing construction activities due to operation of heavy equipment.

Workers performing sampling activities as part of implementing monitoring would incur potential risk through exposure to chemicals in the groundwater, leachate and landfill gas. This risk would be minimized through the use of safety procedures and personal protective equipment.

**Environmental Impacts** - Implementation of this alternative is not anticipated to pose additional risk to the environment. Soil erosion and sediment control technologies would be employed to protect surface waters during construction operations associated with this alternative. Once the construction is completed, disturbed areas would be vegetated to protect against soil erosion and sedimentation.

**Time Until Remedial Action Objectives are Achieved** - Groundwater Remedial Action Objectives are currently being met at the landfill with existing conditions. Implementation of a groundwater extraction and treatment system would serve to provide added assurance that unanticipated migration of contaminants would not occur from the landfill.

The time needed to achieve the Remedial Action Objective for leachate aimed at reducing leachate volume at the site would be dependent on the actual volume present in the landfill and the sustainable yield of leachate recovery.

The Remedial Action Objective for leachate to limit future generation of leachate at the landfill would be met almost immediately after completion of cap repair activities. Completion of repair activities would be in approximately 6 months. Resulting decreases in leachate elevation would be observed over a period of several years following cap repair completion.

### 6.5.6 Implementability

This criterion considers factors, where appropriate, such as technical feasibility, administrative feasibility, and availability of materials and services. These factors are discussed below.

**Technical Feasibility** - Leachate extraction technology is well developed and an extraction system is technically constructable. The degree of success of such a recovery system at this site is uncertain because of the uncertainty regarding the total volume of leachate and the availability of that leachate for extraction. The feasibility of recovering significant portions

of leachate from this site would be evaluated through the continued operation of the extraction system. Installation of underground piping and construction of a central collection tank would utilize standard equipment and procedures and be technically feasible to implement at the site.

Groundwater extraction and treatment would be technically feasible to implement at the site. The wells and conveyance piping could be constructed using standard equipment and procedures. The air stripping treatment system would have to be sized accordingly to accommodate high flow rates (250 to 500 gpm). The potential for chemical precipitation or fouling to occur in the wells and air stripping packing media would have to be evaluated. Redevelopment of the wells may be required on a regular basis to prevent diminished capacity. Pretreatment of the influent water may be necessary if water quality parameters are not amenable to air stripping.

The technical feasibility of repairing the existing cap would be partially dependent on a pre-design investigation to identify the areas of the cap which require repair. Once identified, construction techniques for landfill capping are well developed and utilization of good earthwork technique and materials could bring these portions of the landfill up to regulatory requirements.

Technologies for conducting monitoring of groundwater and leachate are readily implementable, are well developed, and have proven reliability.

**Administrative Feasibility** - It may be necessary to obtain conventional construction permits, land disturbance permits, grading permits, wetland permits, etc., for construction of leachate extraction and groundwater extraction and treatment systems.

The existing pretreatment permit with the Wheaton Sanitary District POTW may need to be maintained for on going off-site disposal of leachate.

Discharge permits would be required to discharge treated groundwater to Sand Pond.

An air discharge permit may be required for on-site discharge of landfill gas to the atmosphere.

**Availability of Services and Materials** - Materials, services, and equipment required to implement this alternative are readily available. Construction of the leachate extraction and groundwater extraction and treatment systems would, for the most part, utilize common construction materials, but also require some specialized equipment. This equipment is readily available from vendors and experienced constructors/installers are available in the area to install this equipment.

Repair of the cap would involve using common construction materials and employing experienced contractors presently working in the area. For the cost estimate, it was

assumed that appropriate materials to repair the cap could be obtained from a borrow source within 10 miles of the site.

### 6.5.7 Cost

This criterion considers factors such as capital costs, annual O&M costs, and present net worth costs. Costs applicable to this alternative are presented below.

**Capital Costs** - The estimated capital cost for constructing Alternative 4 is $2,144,000 Passive landfill gas venting is currently in place and functioning.

**Operation and Maintenance** - Operation and maintenance costs would be those incurred from operating the leachate recovery system and groundwater extraction and treatment system, including power, mechanical systems upkeep and periodic replacement (e.g., lubrication, repair, etc.), heating, and preheating (if appropriate). Operation and maintenance costs would also be incurred for groundwater quality monitoring, leachate head monitoring and characterization.

The annual O&M cost for Alternative 4 is estimated to be $201,000.

**Present Net Worth Cost** - The 30-year present net worth (3 percent discount rate) associated with the above estimated costs is $5,953,000.

The costs for Alternative 4 are summarized in Table 9. Estimated costs are itemized in Appendix C (Tables C-4a through C-4c).

### 6.5.8 State Acceptance

This criterion will be addressed in the Proposed Plan and ROD after agency review of the FS report.

### 6.5.9 Community Acceptance

This criterion will be addressed in the Responsiveness Summary (a summary of written and oral comments on the FS report) following public comment on the Proposed Plan.

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## 6.6 ALTERNATIVE 5

### LEACHATE EXTRACTION AND OFF-SITE DISPOSAL, 35 IAC 811 CAP AND MONITORING

The objective of Alternative 5 is to reduce leachate generation and volume and monitor groundwater and leachate at the Blackwell landfill site. The major elements of this alternative include:

- Leachate Extraction System and Off-Site Disposal
- 35 IAC 811 Cap
- Monitoring

**Leachate Extraction with Off-Site Disposal**

Eight leachate extraction wells would be installed within the landfill at locations corresponding to elevated leachate head levels and high leachate gas flow. The wells would be constructed to screen the saturated leachate thickness in the landfill and zones of landfill gas accumulation in order to extract leachate and vent landfill gas from the same wells. Submersible pumps would be placed in the wells to pump leachate on a continual basis (as available) from the extraction wells. The sustainable flow rate of leachate in the extraction wells would be measured and recorded periodically to develop estimates of leachate extractability. Extracted leachate would be conveyed through underground piping to a central collection tank located in the northwest portion of the landfill site. Leachate in the central collection tank would be periodically pumped as necessary into a tanker truck and transported to the Wheaton Sanitary District POTW for treatment under an existing pretreatment permit.

**IAC 811 Cap**

The existing landfill cap would be removed and replaced with a 40 acre clay cap constructed according to 35 IAC 811 specifications. Existing topsoil and cover at the landfill would be excavated and stockpiled at the site for later use. Steeply sloping portions of the landfill would be regraded and re-contoured to reduce the steep grades and lessen the potential for cap erosion. Any additional clay would be purchased from a suitable borrow site and transported to the landfill for placement and compaction of a low permeable clay layer. The compacted clay layer would be placed a minimum of three feet thick over the site in accordance with 35 IAC 811. Stockpiled soil capable of supporting vegetative growth would be replaced over the clay cap at a minimum thickness of three feet and graded and seeded to revegetate the landfill cover.

Buildup of landfill gas below the repaired cap would be prevented by utilizing the twenty-five existing landfill vents and the eight new leachate extraction wells to passively vent landfill gas to the atmosphere. The aboveground portions of the existing landfill vents would be replaced during new cap construction activities.

**Monitoring**
Under Alternative 5, monitoring would be conducted of the various media and systems installed at the Blackwell Landfill site. The following locations, frequencies and analytical parameters are reasonable for site conditions and have been included for cost estimating purposes.

**Groundwater** - Results of the RI groundwater sampling programs show that groundwater contamination is stabilized and limited to the FPD property. Groundwater would be monitored semiannually at fifteen well locations to provide continued documentation that the contamination is stabilized. These well locations would consist of nine wells screened in the outwash and in the bedrock aquifer downgradient of the landfill. The outwash monitoring network would consist of G-107S, G-113, G-115S, G-118S, G-117, G-123, G-128S, G-129 and G-140S, The bedrock well network would include G-107D, G-115D, G-118D, G-128D, G-140D and G-141D. At six locations, there are nested wells consisting of one well screened in the outwash and another well screened in the bedrock zone. All groundwater samples would be analyzed for VOCs and indicator parameters (Cl, TDS, pH, and temperature). Groundwater elevations in the site wells would also be recorded.

**Leachate** - Leachate levels would be monitored semiannually in existing leachate wells DV02, DV03, DV07 and DV08 and in any new leachate wells potentially installed as part of the remediation to document changes in head elevations at the site. A composite leachate sample would be collected from the total system collection on an annual basis to characterize the on-going quality of leachate for disposal purposes.

The cap would be visually inspected semiannually by FPD personnel to verify the integrity of the cap. The 40 acre cap would be maintained on a regular basis by FPD personnel.

The results of the monitoring program would be periodically reviewed and, if appropriate, modifications to the monitoring program would be recommended.

### 6.6.1 Overall Protection of Human Health and the Environment
This criterion addresses the adequacy with which the alternative can provide protection of human health and the environment by controlling exposures to contaminants.

Alternative 5 provides sufficient protection of human health and the environment under current and future land use scenarios. The Baseline Risk Assessment indicated that unacceptable risks to human health are not likely to occur under either current or future land use conditions. The Ecological Assessment completed for the site indicated that unacceptable risks do not occur to ecological communities at or near the site. The current levels of risk calculated in the Baseline Risk Assessment would be reduced by Alternative 5 by removal and off-site disposal of leachate in the landfill that could potentially migrate to groundwater.

Remedial Action Objectives are media-specific goals for protecting human health and the environment. Remedial Action Objectives were developed to address the presence of site contaminants and to further protect human health and the environment by preventing or minimizing exposure to contaminants present in groundwater, leachate and landfill gas. Remedial Action Objectives are listed and explained in Section 4.2. The following text discusses how Alternative 5 would address the Remedial Action Objectives on a media-specific basis.

**Groundwater** - Affected groundwater does not pose an unacceptable risk under the current land use conditions, as explained in Section 3.3. Currently, persons are not exposed to groundwater affected by the site, and in future scenarios, persons would not be exposed to affected groundwater. The location of the landfill in the Blackwell Forest Preserve prevents the area of the aquifer within the FPD property from being developed for drinking water purposes. Since the FPD cannot sell land to a private party, on-site residential development and installation of wells would not occur. Previous groundwater sampling and analysis programs demonstrate that natural dilution and attenuation characteristics of the soil have effectively stabilized the area of groundwater containing concentrations of contaminants above MCLs. Long-term monitoring with a five-year review would document that contaminated groundwater is not leaving the site.

Groundwater monitoring of outwash and bedrock wells downgradient of the landfill is included in Alternative 5. Groundwater monitoring would provide a measure of the rate at which groundwater contamination is being attenuated and degraded over time. It would also be effective in indicating changes in the extent and character of affected groundwater and would provide early warning, if necessary, of groundwater changes.

Alternative 5 addresses the Remedial Action Objectives for groundwater by preventing off-site migration of contaminants above MCLs; and preventing off-site migration of groundwater containing concentrations of contaminants that represent an unacceptable human health or environmental risk (see Section 4.2.1).

**Leachate** - Alternative 5 would meet the Remedial Action Objective for leachate to reduce the volume of leachate in the landfill that has the potential to contaminate groundwater. Eight new leachate extraction wells would be installed in the landfill and pumped on a continual basis (as leachate is available) in order to reduce the leachate head at the landfill base. Lowering the leachate head and volume in the landfill would reduce the potential for migration of leachate to groundwater.

Alternative 5 would also meet the Remedial Action Objective for leachate to limit future generation of leachate that has the potential to contaminate groundwater. This alternative would replace the existing cap with a 40 acre clay cap constructed according to 35 IAC 811 specifications. Replacing the cap in this manner will reduce the potential for future leachate generation which would reduce potential for groundwater contamination by migrating leachate. Stripping the existing topsoil and cover of the landfill may allow infiltration to occur during cap construction and generate additional leachate in the landfill.

Excessive landfill gas build-up could result in fracturing of the cap and increasing permeability through the cap. Alternative 5 would further limit future leachate generation by including passive vents on the new leachate extraction wells and utilizing the existing passive landfill gas venting system to reduce build-up of gas in the landfill.

Monitoring of leachate head levels would provide information on leachate reduction and sustainable leachate extraction rates at the landfill. Groundwater monitoring in outwash and bedrock wells downgradient of the landfill may provide documentation of changes in migration of leachate contaminants to groundwater at the site.

### 6.6.2 Compliance with ARARs

This criterion considers factors such as compliance with chemical-specific, location-specific, and action-specific ARARs. Potential ARARs for Alternative 5 are summarized in Table 8. County, State or Federal ARARs, whichever is more stringent, will apply. The ARARs listed in Table 8 are discussed below.

**Compliance with Chemical-Specific ARARs**

Potential chemical-specific ARARs relate to air emissions and groundwater quality.

**Air Emissions** - Air emissions from the passive landfill gas vents would be discharged to the atmosphere in accordance with the requirements of 35 IAC 218. The chemical specific air requirements for the expected emissions from this alternative are contained in Section 218.301, which limit emissions of photochemically reactive organic material (e.g., VOCs) to less than 8 lbs/hr. If VOC emissions exceed 8 lbs/hr, controls may be required to reduce emissions by 85 percent. Allowable VOC emissions, however, are typically determined on a case-by-case basis by the IEPA. The landfill gas sampling and analysis program conducted during the RI showed that VOC emissions are well below 8 lbs/hr. Therefore, the requirements of 35 IAC 218 could be met.

**Groundwater Quality** - Class I potable resource groundwater standards listed in 35 IAC 620.410 apply to groundwater located ten feet or more below the ground surface in the outwash and dolomite (bedrock) aquifers at the Blackwell site. Vinyl chloride, 1,2-dichloroethene, 1,2-dichloroethene, trichloroethene, benzene, and tetrachloroethene have equaled or exceeded the Class I potable resource groundwater standards in one or more on-site monitoring wells.

Compliance with the standards of 35 IAC 620.410 could be achieved under Alternative 5. The extraction of leachate would reduce the leachate head at the base of the landfill and further serve to reduce the source of contaminants to the aquifer. The reduction of contaminant loading, in combination with natural attenuation and dilution, should allow the standards to be achieved.

Until compliance with the standards of 35 IAC 620.410 is achieved, groundwater underlying the Blackwell site would be managed as a groundwater management zone in

accordance with 35 IAC 620.250. The groundwater management zone would be established upon concurrence by IEPA following written confirmation of the corrective action undertaken at the site. The groundwater management zone designation would expire when corrective action is completed at the site and applicable standards are met (35 IAC 620.410). A review of the adequacy of the corrective action at the site must be completed and submitted to IEPA no less often than 5 years.

U.S. EPA MCLs designated in 40 CFR 141 are not ARARs because impacted groundwater would not be used for a public drinking water supply.

Based on the discussion above, Alternative 5 would comply with the chemical-specific ARARs.

**Compliance with Location-Specific ARARs**
Potential location-specific ARARs relate to floodplains, wetlands, and open waters. Construction of leachate wells and underground piping for Alternative 5 would occur within the interior of the landfill and not disturb floodplains, wetlands, and open water environments located in the Blackwell landfill area.

The regulatory requirements of Section 404 of the Clean Water Act (40 CFR 6) and the U.S. ACOE regulations pertaining to waters of the United States would not be ARARs since these regulated locations would not be disturbed during construction activities associated with construction of a 35 IAC 811 cap. Floodplain protection requirements of 40 CFR 6 and the Illinois Floodplains Construction permits are not ARARs because the landfill is not located in a floodplain area.

Alternative 5 would comply with the location-specific ARARs.

**Compliance with Action-Specific ARARs**
Potential action-specific ARARs relate to safety standards, air emissions, and water quality.

**Safety Standards** - Construction of the leachate extraction system and 35 IAC 811 cap would be in accordance with the general industry safety standards in accordance with 29 CFR 1910 and 29 CFR 1926. Threshold limit values would be monitored in the breathing zone during construction of the leachate extraction system and cap and monitoring activities.

**Air Emissions** - Air emissions from the passive landfill gas venting system would meet the relevant permitting requirements of 35 IAC 201. IEPA does not have a formally promulgated air toxics program, consequently, there are no state air toxics ARARs for the Blackwell site. Moreover, there are no federal requirements under the Clean Air Act that are ARARs at this site for the following reason:

- The Clean Air Act Amendments of 1990 listed 189 air toxics that must be regulated. Toluene, trichloroethene, vinyl chloride, methylene chloride,

tetrachloroethene, and xylene are on the list. Under the new Clean Air Act, U.S. EPA plans to list the sources emitting any of these 189 chemicals and, over the next eight years, promulgate emission standards for these sources. Site remediation is listed as a source category, however, U.S. EPA has not yet promulgated maximum achievable control technology (MACT) for this or any other source category. Consequently, the Clean Air Act is not an ARAR for this site.

**Leachate Disposal** - Extracted leachate would be transported to the Wheaton Sanitary District POTW and treated under an existing pretreatment permit.

**35 IAC 811 Cap** - The existing landfill cap would be removed and replaced with a 40 acre clay cap constructed according to 35 IAC 811 specifications. Closure performance standards would be accomplished according to an approved closure plan in a manner that minimizes the need for further maintenance and manages any further release to the groundwater, surface water, or to the atmosphere to protect human health and the environment.

Alternative 5 would comply with the action-specific ARARs.

Based on the discussion above, this alternative would comply with the chemical-, location-, and specific ARARs.

### 6.6.3 Long-Term Effectiveness and Permanence

This criterion describes factors such as residual risks remaining following implementation of the remedy, and the adequacy and reliability of controls. This latter factor considers the long-term management of treatment residuals, long-term reliability of engineering and institutional controls, and the potential need for replacement of the alternative.

**Magnitude of Residual Risk** - Residual risks left by Alternative 5 would be reduced even lower than those calculated in the Baseline Risk Assessment and Ecological Assessment. The Baseline Risk Assessment indicated that no unacceptable health risks would occur from exposures to landfill contaminants in present and future risk scenarios. The Ecological Assessment indicated that no unacceptable risks are expected to ecological communities and that there would not be an unacceptable risk to ecological receptors (i.e., terrestrial and aquatic species).

Groundwater contaminant concentrations will continue to decrease by natural attenuation/dilution processes and also because contaminant loading will be decreased as leachate volume and pressure head are reduced by the leachate collection system and new cap construction.

The leachate extraction system would reduce the potential risks associated with high leachate volume and levels in proportion to the resultant decrease in leachate volume, level

and chemical constituent concentrations. The magnitude of these reductions will be dependent on the recoverability of the leachate from the landfill interior.

The existing passive landfill gas venting system would continue to relieve buildup of gas within the landfill. The volume of gas would decrease as the refuse in the landfill stabilizes, reducing the risk associated with fracturing of the existing cap and generation of future leachate.

The entire remedy would be subject to a five-year review. Leachate extraction system review would consist of evaluating the effectiveness of leachate extraction to lower the leachate heads in new and existing leachate wells and reduce the volume of leachate contained in the landfill. Groundwater monitoring data would document whether leachate extraction results in a corresponding decrease in groundwater contaminant concentrations. The accumulated database from groundwater monitoring would be evaluated to assess the on-going groundwater quality downgradient of the landfill.

**Adequacy and Reliability of Controls** - FPD ownership of the property is an adequate and reliable control for the site. The landfill is maintained by FPD personnel. The possibility of residential or commercial development is eliminated by FPD ownership, since the FPD lacks the authority to sell any portion of the Blackwell Forest Preserve to a private party.

Leachate extraction and treatment is a well developed remedial technology. The volume and sustainable yield of leachate at the landfill would be identified through extended pumping of the landfill extraction wells. The FPD would manage the system, and would utilize local contractors, suppliers and FPD personnel for system monitoring, operation and maintenance. The Wheaton Sanitary District POTW would be utilized to treat the collected leachate under an existing pretreatment permit. It is not anticipated that major elements of the system would require replacement. Submersible pumps placed in the leachate wells would require periodic maintenance to ensure adequate performance.

Construction of a new landfill cap would be an adequate and reliable control for promoting drainage to reduce infiltration and minimize leachate generation.

Passive landfill gas venting exists at the site and has proven to be an adequate and reliable means to limit landfill gas build-up and problems associated with landfill gas accumulation. The venting system is mechanically simple to operate and maintain.

### 6.6.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

This criterion considers factors such as: the treatment process used and the material treated; the amount of hazardous material destroyed or treated; the reduction in toxicity, mobility, or volume through treatment; the irreversibility of the treatment; the type and quantity of treatment residuals; and the reduction of inherent hazards. These factors are considered where appropriate and are discussed below.

**Treatment Process Used and Materials Treated** - This alternative includes extraction and collection of leachate at the landfill followed by treatment of the extracted leachate to remove inorganics and destroy organics. Treatment of the extracted leachate would be off-site at the Wheaton Sanitary District POTW.

**Amount of Contaminated Materials Destroyed or Treated** - The volume of leachate in the landfill may be as high as 70 million gallons and as much as 9,500 gallons per day of leachate may be generated by infiltrating precipitation. Although there are a number of uncertainties associated with these conservative estimates, the leachate extraction program will reduce the volume of leachate contaminants at the site. Depending on the accuracy of the volume estimates and sustainable yield of leachate, some portion or a majority of this material may be collected at the site and treated at the POTW.

**Degree of Expected Reductions in Toxicity, Mobility, or Volume** - Extraction, collection and treatment of fossil leachate from the landfill would result in overall reduction of leachate toxicity. Recently generated leachate would have less residence time in contact with the landfill refuse and would be potentially less toxic than fossil leachate. Cap repair would also aid in reducing leachate toxicity by limiting infiltration and reducing generation of future leachate.

Removal of leachate from the landfill would decrease the mobility of the landfill leachate by reducing the hydraulic head potentially present at the landfill base. Use of submersible pumps in the leachate extraction wells would provide hydraulic control of leachate migration and mobilize leachate contaminants towards the collection wells. However, the construction of new leachate extraction wells could allow vertical migration of leachate to the base of the landfill by providing a conduit across low permeability cover layers designed into the landfill. This could mobilize leachate currently residing at upper landfill positions into closer proximity of the outwash aquifer, thereby increasing leachate mobility.

Increased mobility could also occur through conveyance of leachate to the central collection tank through underground piping. Increased mobility could also result from pumping the leachate into tanker trucks and transporting the leachate to the off-site POTW. Precautions against spills and releases would be instituted to minimize such occurrences.

The volume of leachate present in the landfill would be reduced by extraction, provided the extraction system could produce an effluent flow rate greater than the rate of infiltration through the landfill cap. Construction of a 35 IAC 811 cap would reduce volume of leachate present in the landfill by reducing infiltration and limiting generation of future leachate at the site.

The actual effect of a leachate extraction system on the reduction of toxicity, mobility, and volume would be determined by measuring sustainable leachate yields during pumping and monitoring leachate heads in the landfill to develop reliable estimates of leachate volume.

**Degree to Which Treatment is Irreversible** - Leachate extraction and off-site dispc and treatment would irreversibly reduce the volume of leachate and concentration chemical constituents in leachate present in the landfill. The concentrations would reduced by removal of more concentrated fossil leachate that accumulated in the land during construction and operation of the landfill. Leachate generated by recent infiltrati of rain water could have a lower contaminant concentration, thereby reducing the over toxicity of the leachate.

Contaminants present in the extracted leachate would be irreversibly destroyed by off-si treatment at the Wheaton Sanitary District POTW.

**Type and Quantity of Residuals Remaining After Treatment** - Any residuals associate with leachate treatment at the Wheaton Sanitary District POTW would be mixed witl residual associated with routine operation of the treatment plant and disposed according tc the POTW permitting requirements.

**Reduction of Inherent Hazards** - Alternative 5 would reduce inherent hazards posed by high leachate volumes and heads in the landfill by leachate extraction and treatment.

**6.6.5 Short-Term Effectiveness**

This criterion considers factors such as additional risks which may be posed to the community, workers, and the environment during implementation of the remedy. In addition, the time required to achieve remedial action objectives is addressed. These factors are discussed below.

**Risks to Community During Remedial Actions** - Implementation of Alternative 5 may pose risks to the community during construction of the leachate extraction system and the 35 IAC 811 cap. Increased truck traffic and operation of heavy equipment during construction activities could result in increased risk of injury to the public traveling in the vicinity of the site. Dust control technologies would be used to minimize the migration of fugitive emissions from the site to nearby residents.

**Risks to Workers During Remedial Actions** - If waste materials are disturbed during cap construction and leachate extraction system installation, remediation workers may be exposed to chemicals through direct contact with subsurface soils, leachate and wastes, or inhalation exposure to dust and landfill gas. These exposures could be minimized by use of dust control measures and personal protective equipment. Besides risks from contaminants, workers would incur risks associated with performing construction activities due to operation of heavy equipment.

Workers performing sampling activities as part of implementing monitoring would incur potential risk through exposure to chemicals in the groundwater, leachate and landfill gas. This risk would be minimized through the use of safety procedures and personal protective equipment.

**Environmental Impacts** - Implementation of this alternative is not anticipated to pose additional risk to the environment. Soil erosion and sediment control technologies would be employed to protect surface waters during construction operations associated with the 35 IAC 811 cap and installation of the leachate extraction system. Once the construction is completed, disturbed areas would be vegetated to protect against soil erosion and sedimentation.

**Time Until Remedial Action Objectives are Achieved** - Groundwater Remedial Action Objectives are currently being met.

The Remedial Action Objective for leachate to limit future generation of leachate at the landfill would be met almost immediately after completion of cap construction activities. Construction of the new cap would be completed in approximately one year. During cap construction, portions of the exposed landfill may be subject to increased infiltration of water and generation of new leachate. Decreases in leachate elevation would be observed over a period of several years following cap construction and leachate extraction.

The time needed to achieve the Remedial Action Objective for leachate aimed at reducing leachate volume at the site would be dependent on the actual volume present in the landfill and the sustainable yield of leachate recovery.

### 6.6.6 Implementability

This criterion considers factors, where appropriate, such as technical feasibility, administrative feasibility, and availability of materials and services. These factors are discussed below.

**Technical Feasibility** - Leachate extraction technology is well developed and an extraction system is technically constructable. The degree of success of such a recovery system at this site is uncertain because of the uncertainty regarding the total volume of leachate and the availability of that leachate for extraction. The feasibility of recovering significant portions of leachate from this site would be evaluated through the continued operation of the extraction system. Installation of underground piping and construction of a central collection tank would utilize standard equipment and procedures and be technically feasible to implement at the site.

Constructing a cap according to 35 IAC 811 specifications would be technically feasible. Construction techniques for landfill capping are well developed and utilization of good earthwork technique and materials would lessen any potential difficulty associated with construction.

Technologies for conducting monitoring of groundwater and leachate are readily implementable, are well developed, and have proven reliability.

The passive landfill gas venting system is in place and functioning. Implementing additional venting through new leachate extraction wells would be technically feasible.

**Administrative Feasibility** - It may be necessary to obtain conventional construction permits, land disturbance permits, grading permits, wetland permits, etc., for construction of the leachate extraction system and 35 IAC 811 cap.

The existing pretreatment permit with the Wheaton Sanitary District POTW may need to be maintained for on going off-site disposal of leachate.

An air discharge permit may be required for on-site discharge of landfill gas to the atmosphere.

**Availability of Services and Materials** - Materials, services, and equipment required to implement this alternative are readily available. Construction of the leachate extraction and treatment systems would, for the most part, utilize common construction materials, but also require some specialized equipment. This equipment is readily available from vendors and experienced constructors/installers are available in the area to install this equipment.

Construction of the 35 IAC 811 cap would involve using common construction materials and employing experienced contractors presently working in the area. For the cost estimate, it was assumed that appropriate materials to repair the cap could be obtained from a borrow source within 10 miles of the site.

### 6.6.7 Cost

This criterion considers factors such as capital costs, annual O&M costs, and present net worth costs. Costs applicable to this alternative are presented below.

**Capital Costs** - The estimated capital cost for constructing the leachate extraction system and the new landfill cap according to 35 IAC 811 specifications is $6,953,000. Passive landfill gas venting is currently in place and functioning.

**Operation and Maintenance** - Operation and maintenance costs would be those incurred from operating the leachate recovery system, including power, mechanical systems upkeep and periodic replacement (e.g., lubrication, repair, etc.), heating, and preheating (if appropriate). Operation and maintenance costs would also be incurred for groundwater quality monitoring, leachate head monitoring and characterization.

The annual O&M cost for Alternative 5 is estimated to be $125,000.

**Present Net Worth Cost** - The 30-year present net worth (3 percent discount rate) associated with the above estimated costs is $9,403,000.

The costs for Alternative are summarized in Table 9. Estimated costs are itemized in Appendix C (Tables C-5a through C-5c).

### 6.6.8 State Acceptance

This criterion will be addressed in the Proposed Plan and ROD after agency review of the FS report.

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### 6.6.9 Community Acceptance

This criterion will be addressed in the Responsiveness Summary (a summary of written and oral comments on the FS report) following public comment on the Proposed Plan.

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# 6.7 ALTERNATIVE 6

## LEACHATE EXTRACTION AND OFF-SITE DISPOSAL, GROUNDWATER EXTRACTION AND TREATMENT, 35 IAC 811 CAP, AND MONITORING

The objective of Alternative 6 is to reduce leachate generation and volume, extract and treat groundwater and monitor groundwater and leachate at the Blackwell landfill site. The major elements of this alternative include:

- Leachate Extraction System and Off-Site Disposal
- Groundwater Extraction and Treatment
- 35 IAC 811 Cap
- Monitoring

**Leachate Extraction with Off-Site Disposal**
Eight leachate extraction wells would be installed within the landfill at locations corresponding to elevated leachate head levels and high leachate gas flow. The wells would be constructed to screen the saturated leachate thickness in the landfill and zones of landfill gas accumulation in order to extract leachate and vent landfill gas from the same wells. Submersible pumps would be placed in the wells to pump leachate on a continual basis (as available) from the extraction wells. The sustainable flow rate of leachate in the extraction wells would be measured and recorded periodically to develop estimates of leachate extractability. Extracted leachate would be conveyed through underground piping to a central collection tank located in the northwest portion of the landfill site. Leachate in the central collection tank would be periodically pumped as necessary into a tanker truck and transported to the Wheaton Sanitary District POTW for treatment under an existing pretreatment permit.

**Groundwater Extraction and Treatment**
Twenty extraction wells would be installed in the outwash downgradient of the landfill to capture contaminants which have the potential to migrate off site. Because of the high permeability of the outwash deposits, the wells would have to be pumped at a total flow rate of approximately 250-500 gpm in order to achieve hydraulic control and effective capture in the outwash around the base of the landfill. The extracted groundwater would be conveyed through underground piping to the treatment system. The extracted groundwater would be treated by air stripping and discharged into Sand Pond located on FPD property. A pre-design investigation may be necessary to develop the cost-effective groundwater extraction configuration.

**IAC 811 Cap**

The existing landfill cap would be removed and replaced with a 40 acre clay cap constructed according to 35 IAC 811 specifications. Existing topsoil and cover at the landfill would be excavated and stockpiled at the site for later use. Steeply sloping portions of the landfill would be regraded and re-contoured to reduce the steep grades and lessen the potential for cap erosion. Any additional clay would be purchased from a suitable borrow site and transported to the landfill for placement and compaction of a low permeable clay layer. The compacted clay layer would be placed a minimum of three feet thick over the site in accordance with 35 IAC 811. Stockpiled soil capable of supporting vegetative growth would be replaced over the clay cap at a minimum thickness of three feet and graded and seeded to revegetate the landfill cover.

Buildup of landfill gas below the repaired cap would be prevented by utilizing the twenty-five existing landfill vents and the eight new leachate extraction wells to passively vent landfill gas to the atmosphere. The aboveground portions of the existing landfill vents would be replaced during new cap construction activities.

**Monitoring**

Under Alternative 6, monitoring would be conducted of the various media and systems installed at the Blackwell Landfill site. The following locations, frequencies and analytical parameters are reasonable for site conditions and have been included for cost estimating purposes.

**Groundwater** - Results of the RI groundwater sampling programs show that groundwater contamination is stabilized and limited to the FPD property. Groundwater would be monitored semiannually at fifteen well locations to provide continued documentation that the contamination is stabilized. These well locations would consist of nine wells screened in the outwash and in the bedrock aquifer downgradient of the landfill. The outwash monitoring network would consist of G-107S, G-113, G-115S, G-118S, G-117, G-123, G-128S, G-129 and G-140S, The bedrock well network would include G-107D, G-115D, G-118D, G-128D, G-140D and G-141D. At six locations, there are nested wells consisting of one well screened in the outwash and another well screened in the bedrock zone. All groundwater samples would be analyzed for VOCs and indicator parameters (Cl, TDS, pH, and temperature). Groundwater elevations in the site wells would also be recorded.

**Leachate** - Leachate levels would be monitored semiannually in existing leachate wells DV02, DV03, DV07 and DV08 and in any new leachate wells potentially installed as part of the remediation to document changes in head elevations at the site. A composite leachate sample would be collected from the total system collection on an annual basis to characterize the on-going quality of leachate for disposal purposes.

The cap would be visually inspected semiannually by FPD personnel to verify the integrity of the cap. The 40 acre cap would be maintained on a regular basis by FPD personnel.

The results of the monitoring program would be periodically reviewed and, if appropriate, modifications to the monitoring program would be recommended.

### 6.7.1 Overall Protection of Human Health and the Environment

This criterion addresses the adequacy with which the alternative can provide protection of human health and the environment by controlling exposures to contaminants.

Alternative 6 provides sufficient protection of human health and the environment under current and future land use scenarios. The Baseline Risk Assessment indicated that unacceptable risks to human health are not likely to occur under either current or future land use conditions. The Ecological Assessment completed for the site indicated that unacceptable risks do not occur to ecological communities at or near the site. The current levels of risk calculated in the Baseline Risk Assessment would be reduced by Alternative 6 by removal and off-site disposal of leachate in the landfill that could potentially migrate to groundwater.

Remedial Action Objectives are media-specific goals for protecting human health and the environment. Remedial Action Objectives were developed to address the presence of site contaminants and to further protect human health and the environment by preventing or minimizing exposure to contaminants present in groundwater, leachate and landfill gas. Remedial Action Objectives are listed and explained in Section 4.2. The following text discusses how Alternative 6 would address the Remedial Action Objectives on a media-specific basis.

**Groundwater** - Affected groundwater does not pose an unacceptable risk under the current land use conditions, as explained in Section 3.3. Currently, persons are not exposed to groundwater affected by the site, and in future scenarios, persons would not be exposed to affected groundwater. The location of the landfill in the Blackwell Forest Preserve prevents the area of the aquifer within the FPD property from being developed for drinking water purposes. Since the FPD cannot sell land to a private party, on-site residential development and installation of wells would not occur. Previous groundwater sampling and analysis programs demonstrate that natural dilution and attenuation characteristics of the soil have effectively stabilized the area of groundwater containing concentrations of contaminants above MCLs. Long-term monitoring with a five-year review would document that contaminated groundwater is not leaving the site.

Previous groundwater sampling and analysis programs demonstrate that natural dilution and attenuation characteristics of the soil have effectively stabilized the area of groundwater containing concentrations of contaminants above MCLs. Groundwater extraction and treatment would hydraulically control and capture contaminated groundwater around the base of the landfill to ensure that unanticipated off-site migration of contaminants did not occur at the site. Long-term monitoring with a five-year review would document that contaminated groundwater is not leaving the site.

Groundwater monitoring of outwash and bedrock wells downgradient of the landfill is included in Alternative 6. Groundwater monitoring would provide a measure of the rate at which groundwater contamination is being attenuated and degraded over time. It would also be effective in indicating changes in the extent and character of affected groundwater and would provide early warning, if necessary, of groundwater changes.

Alternative 6 addresses the Remedial Action Objectives for groundwater by preventing off-site migration of contaminants above MCLs; and preventing off-site migration of groundwater containing concentrations of contaminants that represent an unacceptable human health or environmental risk (see Section 4.2.1).

**Leachate** - Alternative 6 would meet the Remedial Action Objective for leachate to reduce the volume of leachate in the landfill that has the potential to contaminate groundwater. Eight new leachate extraction wells would be installed in the landfill and pumped on a continual basis (as leachate is available) in order to reduce the leachate head at the landfill base. Lowering the leachate head and volume in the landfill would reduce the potential for migration of leachate to groundwater.

Alternative 6 would also meet the Remedial Action Objective for leachate to limit future generation of leachate that has the potential to contaminate groundwater. This alternative would replace the existing cap with a 40 acre clay cap constructed according to 35 IAC 811 specifications. Replacing the cap in this manner will reduce the potential for future leachate generation which would reduce potential for groundwater contamination by migrating leachate. Stripping the existing topsoil and cover of the landfill may allow infiltration to occur during cap construction and generate additional leachate in the landfill.

Excessive landfill gas build-up could result in fracturing of the cap and increasing permeability through the cap. Alternative 6 would further limit future leachate generation by including passive vents on the new leachate extraction wells and utilizing the existing passive landfill gas venting system to reduce build-up of gas in the landfill.

Monitoring of leachate head levels would provide information on leachate reduction and sustainable leachate extraction rates at the landfill. Groundwater monitoring in outwash and bedrock wells downgradient of the landfill may provide documentation of changes in migration of leachate contaminants to groundwater at the site.

### 6.7.2 Compliance with ARARs

This criterion considers factors such as compliance with chemical-specific, location-specific, and action-specific ARARs. Potential ARARs for Alternative 6 are summarized in Table 8. County, State or Federal ARARs, whichever is more stringent, will apply. The ARARs listed in Table 8 are discussed below.

#### Compliance with Chemical-Specific ARARs

Potential chemical-specific ARARs relate to air emissions and groundwater quality.

**Air Emissions** - Air emissions from the passive landfill gas vents would be discharged to the atmosphere in accordance with the requirements of 35 IAC 218. The chemical specific air requirements for the expected emissions from this alternative are contained in Section 218.301, which limit emissions of photochemically reactive organic material (e.g., VOCs) to less than 8 lbs/hr. If VOC emissions exceed 8 lbs/hr, controls may be required to reduce emissions by 85 percent. Allowable VOC emissions, however, are typically determined on a case-by-case basis by the IEPA. The landfill gas sampling and analysis program conducted during the RI showed that VOC emissions are well below 8 lbs/hr. Therefore, the requirements of 35 IAC 218 could be met.

**Groundwater Quality** - Class I potable resource groundwater standards listed in 35 IAC 620.410 apply to groundwater located ten feet or more below the ground surface in the outwash and dolomite (bedrock) aquifers at the Blackwell site. Vinyl chloride, 1,2-dichloroethene, 1,2-dichloroethene, trichloroethene, benzene, and tetrachloroethene have equaled or exceeded the Class I potable resource groundwater standards in one or more on-site monitoring wells.

Compliance with the standards of 35 IAC 620.410 could be achieved under Alternative 6. Groundwater extraction and treatment would remove contaminants from groundwater during pumping associated with hydraulic control and capture. The extraction of leachate would also reduce the source of contaminants to the aquifer by lowering leachate head at the base of the landfill.

Until compliance with the standards of 35 IAC 620.410 is achieved, groundwater underlying the Blackwell site would be managed as a groundwater management zone in accordance with 35 IAC 620.250. The groundwater management zone would be established upon concurrence by IEPA following written confirmation of the corrective action undertaken at the site. The groundwater management zone designation would expire when corrective action is completed at the site and applicable standards are met (35 IAC 620.410). A review of the adequacy of the corrective action at the site must be completed and submitted to IEPA no less often than 5 years.

U.S. EPA MCLs designated in 40 CFR 141 are not ARARs because impacted groundwater would not be used for a public drinking water supply.

Based on the discussion above, Alternative 6 would comply with the chemical-specific ARARs.

**Compliance with Location-Specific ARARs**

Potential location-specific ARARs relate to floodplains, wetlands, and open waters. Construction of the 35 IAC 811 cap and leachate wells and underground piping for Alternative 6 would occur within the interior of the landfill and would not disturb floodplains, wetlands, and open water environments located in the Blackwell landfill area.

Construction of the extraction wells, conveyance piping and treatment building at the base of the landfill and at Sand Pond are potentially subject to the regulatory requirements of Section 404 of the Clean Water Act (40 CFR 6) and the Illinois Floodplains Construction permits statutes. Construction activities associated with the groundwater extraction and treatment system would have to address the applicable portions of these regulations.

Alternative 6 would comply with the location-specific ARARs.

**Compliance with Action-Specific ARARs**
Potential action-specific ARARs relate to safety standards, air emissions, and water quality.

**Safety Standards** - Construction of the leachate and groundwater extraction systems and the 35 IAC 811 cap would be in accordance with the general industry safety standards in accordance with 29 CFR 1910 and 29 CFR 1926. Threshold limit values would be monitored in the breathing zone during construction of the leachate extraction system and monitoring activities.

**Air Emissions** - Air emissions from the passive landfill gas venting system would meet the relevant permitting requirements of 35 IAC 201. IEPA does not have a formally promulgated air toxics program, consequently, there are no state air toxics ARARs for the Blackwell site. Moreover, there are no federal requirements under the Clean Air Act that are ARARs at this site for the following reason:

- The Clean Air Act Amendments of 1990 listed 189 air toxics that must be regulated. Toluene, trichloroethene, vinyl chloride, methylene chloride, tetrachloroethene, and xylene are on the list. Under the new Clean Air Act, U.S. EPA plans to list the sources emitting any of these 189 chemicals and, over the next eight years, promulgate emission standards for these sources. Site remediation is listed as a source category, however, U.S. EPA has not yet promulgated maximum achievable control technology (MACT) for this or any other source category. Consequently, the Clean Air Act is not an ARAR for this site.

**Leachate Disposal** - Extracted leachate would be transported to the Wheaton Sanitary District POTW and treated under an existing pretreatment permit.

Groundwater Discharge- ARARs for discharge of treated groundwater to a surface water (Sand Pond) are provided by the National Pollution Discharge Elimination System Permit Regulations (40 CFR 122 and 125), the Water Quality Effluent Limitations section of the Clean Water Act (40 CFR 131), and 35 IAC, Parts 304 and 309. Sampling and analysis associated with discharge to a surface water body are found in 40 CFR 136 and would be considered a potential ARAR.

**35 IAC 811 Cap-** The existing landfill cap would be removed and replaced with a 40 acre clay cap constructed according to 35 IAC 811 specifications. Closure performance standards would be accomplished according to an approved closure plan in a manner that minimizes the need for further maintenance and manages any further release to the groundwater, surface water, or to the atmosphere to protect human health and the environment.

Alternative 6 would comply with the action-specific ARARs.

Based on the discussion above, this alternative would comply with the chemical-, location-, and specific ARARs.

### 6.7.3 Long-Term Effectiveness and Permanence

This criterion describes factors such as residual risks remaining following implementation of the remedy, and the adequacy and reliability of controls. This latter factor considers the long-term management of treatment residuals, long-term reliability of engineering and institutional controls, and the potential need for replacement of the alternative.

**Magnitude of Residual Risk** - Residual risks left by Alternative 6 would be reduced even lower than those calculated in the Baseline Risk Assessment and Ecological Assessment. The Baseline Risk Assessment indicated that no unacceptable health risks would occur from exposures to landfill contaminants in present and future risk scenarios. The Ecological Assessment indicated that no unacceptable risks are expected to ecological communities and that there would not be an unacceptable risk to ecological receptors (i.e., terrestrial and aquatic species).

Groundwater contaminant concentrations would be reduced during groundwater extraction and treatment. Since most of the groundwater contaminants already exist at the site at low concentrations (less than 30 ug/L), it is likely that only minimal reduction of these contaminants levels would occur during large scale pumping associated with groundwater extraction. Further decrease in concentrations of contaminants in groundwater will also occur by natural attenuation/dilution processes and also because contaminant loading will be decreased as leachate volume and pressure head are reduced by the leachate collection system and new cap construction.

The leachate extraction system would reduce the potential risks associated with high leachate volume and levels in proportion to the resultant decrease in leachate volume, level and chemical constituent concentrations. The magnitude of these reductions will be dependent on the recoverability of the leachate from the landfill interior.

The existing passive landfill gas venting system would continue to relieve buildup of gas within the landfill. The volume of gas would decrease as the refuse in the landfill stabilizes, reducing the risk associated with fracturing of the existing cap and generation of future leachate.

The entire remedy would be subject to a five-year review. Leachate extraction system review would consist of evaluating the effectiveness of leachate extraction to lower the leachate heads in new and existing leachate wells and reduce the volume of leachate contained in the landfill. A review of the groundwater extraction and treatment system would evaluate the effectiveness of the groundwater extraction system to control hydraulic gradients and capture groundwater contaminants. Groundwater monitoring data would be evaluated to identify if groundwater extraction results in a corresponding decrease in groundwater contaminant concentrations. The accumulated database from groundwater monitoring would be evaluated to assess the on-going groundwater quality downgradient of the landfill.

**Adequacy and Reliability of Controls** - FPD ownership of the property is an adequate and reliable control for the site. The landfill is maintained by FPD personnel. The possibility of residential or commercial development is eliminated by FPD ownership, since the FPD lacks the authority to sell any portion of the Blackwell Forest Preserve to a private party.

Leachate extraction and treatment is a well developed remedial technology. The volume and sustainable yield of leachate at the landfill would be identified through extended pumping of the landfill extraction wells. The FPD would manage the system, and would utilize local contractors, suppliers and FPD personnel for system monitoring, operation and maintenance. The Wheaton Sanitary District POTW would be utilized to treat the collected leachate under an existing pretreatment permit. It is not anticipated that major elements of the system would require replacement. Submersible pumps placed in the leachate wells would require periodic maintenance to ensure adequate performance.

Groundwater extraction and treatment is a well developed and widely utilized remedial technology. Because of the number of wells and the high pumping rate required to achieve hydraulic control in the permeable outwash deposits at the site, long term management and maintenance of the system would be required to ensure system performance. Submersible pumps placed in the extraction wells would require periodic maintenance to ensure adequate performance. The extraction wells may also need to be redeveloped on a regular basis to maintain system flow rates. Elevated iron and manganese concentrations in the groundwater and bacteria may precipitate scale in the wells and require attention. The air stripping packing media will also need ongoing maintenance to prevent fouling. A pre-design study may be conducted to determine if pretreatment of the groundwater is necessary at the site.

Construction of a new landfill cap would be an adequate and reliable control for promoting drainage to reduce infiltration and minimize leachate generation.

Passive landfill gas venting exists at the site and has proven to be an adequate and reliable means to limit landfill gas build-up and problems associated with landfill gas accumulation. The venting system is mechanically simple to operate and maintain.

### 6.7.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

This criterion considers factors such as: the treatment process used and the material treated; the amount of hazardous material destroyed or treated; the reduction in toxicity, mobility, or volume through treatment; the irreversibility of the treatment; the type and quantity of treatment residuals; and the reduction of inherent hazards. These factors are considered where appropriate and are discussed below.

**Treatment Process Used and Materials Treated** - This alternative includes extraction and collection of leachate at the landfill followed by treatment of the extracted leachate to remove inorganics and destroy organics. Treatment of the extracted leachate would be off-site at the Wheaton Sanitary District POTW.

Extracted groundwater would be treated by air stripping followed by discharge to Sand Pond located on FPD property. Volatile organic contaminants would be removed from the groundwater and discharged to the atmosphere.

**Amount of Contaminated Materials Destroyed or Treated** - The volume of leachate in the landfill may be as high as 70 million gallons and as much as 9,500 gallons per day of leachate may be generated by infiltrating precipitation. Although there are a number of uncertainties associated with these conservative estimates, the leachate extraction program will reduce the volume of leachate contaminants at the site. Depending on the accuracy of the volume estimates and sustainable yield of leachate, some portion or a majority of this material may be collected at the site and treated at the POTW.

Because of the high permeability of the outwash deposits, the pumping rate from twenty wells would have to be approximately 250 to 500 gpm in order to achieve hydraulic control and effectively capture groundwater in the outwash at the base of the landfill. Although the system flow rate would be high, the amount of contaminants treated by air stripping would not be significant due to the low contaminant influent concentrations (generally less than 30 ug/L). Based on an influent flow rate of 500 gpm (0.72 MGD) and an average concentration of VOCs of 30 ug/L, approximately 0.2 lbs/day of volatile contaminants could be treated and removed from groundwater with this alternative.

**Degree of Expected Reductions in Toxicity, Mobility, or Volume** - Extraction, collection and treatment of fossil leachate from the landfill would result in overall reduction of leachate toxicity. Recently generated leachate would have less residence time in contact with the landfill refuse and would be potentially less toxic than fossil leachate. Cap repair would also aid in reducing leachate toxicity by limiting infiltration and reducing generation of future leachate.

Removal of leachate from the landfill would decrease the mobility of the landfill leachate by reducing the hydraulic head potentially present at the landfill base. Use of submersible pumps in the leachate extraction wells would provide hydraulic control of leachate migration and mobilize leachate contaminants towards the collection wells. However, the construction of new leachate extraction wells could allow vertical migration of leachate to the base of the landfill by providing a conduit across low permeability cover layers designed into the landfill. This could mobilize leachate currently residing at upper landfill positions into closer proximity of the outwash aquifer, thereby increasing leachate mobility.

Increased mobility could also occur through conveyance of leachate to the central collection tank through underground piping. Increased mobility could also result from pumping the leachate into tanker trucks and transporting the leachate to the off-site POTW. Precautions against spills and releases would be instituted to minimize such occurrences.

The volume of leachate present in the landfill would be reduced by extraction, provided the extraction system could produce an effluent flow rate greater than the rate of infiltration through the landfill cap. Construction of a 35 IAC 811 cap would reduce volume of leachate present in the landfill by reducing infiltration and limiting generation of future leachate at the site.

The actual effect of a leachate extraction system on the reduction of toxicity, mobility, and volume would be determined by measuring sustainable leachate yields during pumping and monitoring leachate heads in the landfill to develop reliable estimates of leachate volume.

Groundwater extraction would create a hydraulic barrier around the base of the landfill to reduce contaminant mobility in groundwater. However, the results of the RI groundwater sampling programs show that groundwater contamination is stabilized and limited to areas within 100 feet downgradient of the landfill. Groundwater contaminants are apparently rapidly attenuated and diluted in the outwash aquifer within 200 to 300 feet downgradient of the landfill. Active groundwater extraction would serve to build on and enhance the reduction of contaminant mobility already occurring naturally at the site.

The volume of contaminants in groundwater would be reduced by extraction. Air stripping would remove volatile contaminants from the water and discharge them to the atmosphere.

Construction of a 35 IAC 811 cap would serve to reduce volume of leachate present in the landfill by reducing infiltration of precipitation, thereby limiting generation of future leachate at the site.

**Degree to Which Treatment is Irreversible** - Leachate extraction and off-site disposal and treatment would irreversibly reduce the volume of leachate and concentration of chemical constituents in leachate present in the landfill. The concentrations would be reduced by removal of more concentrated fossil leachate that accumulated in the landfill during construction and operation of the landfill. Leachate generated by recent infiltration

of rain water could have a lower contaminant concentration, thereby reducing the overall toxicity of the leachate.

Contaminants present in the extracted leachate would be irreversibly destroyed by off-site treatment at the Wheaton Sanitary District POTW.

Groundwater extraction and treatment would irreversibly reduce the volume of contaminants present in groundwater at the site. Volatile organic contaminants would be irreversibly removed from groundwater by air stripping and discharged to the atmosphere. In the atmosphere, the VOCs would likely be destroyed by natural photodecomposition processes. One SVOC identified in groundwater would not be removed during the extraction and treatment process.

Type and Quantity of Residuals Remaining After Treatment - Any residuals associated with leachate treatment at the Wheaton Sanitary District POTW would be mixed with residual associated with routine operation of the treatment plant and disposed according to the POTW permitting requirements.

Residuals remaining in groundwater after extraction and treatment would be discharged into Sand Pond and re-enter the groundwater system. Concentrations of chemicals in discharged treated groundwater would be required to meet permit discharge limits.

**Reduction of Inherent Hazards** - Alternative 6 would reduce inherent hazards posed by high leachate volumes and heads in the landfill by leachate extraction and treatment.

### 6.7.5 Short-Term Effectiveness

This criterion considers factors such as additional risks which may be posed to the community, workers, and the environment during implementation of the remedy. In addition, the time required to achieve remedial action objectives is addressed. These factors are discussed below.

**Risks to Community During Remedial Actions** - Implementation of Alternative 6 may pose risks to the community during construction of the leachate and groundwater extraction system and the 35 IAC 811 cap. Increased truck traffic and operation of heavy equipment during construction activities could result in increased risk of injury to the public traveling in the vicinity of the site. Dust control technologies would be used to minimize the migration of fugitive emissions from the site to nearby residents.

**Risks to Workers During Remedial Actions** - If waste materials are disturbed during cap construction and leachate extraction system installation, remediation workers may be exposed to chemicals through direct contact with subsurface soils, leachate and wastes, or inhalation exposure to dust and landfill gas. These exposures could be minimized by use of dust control measures and personal protective equipment. Construction associated with groundwater extraction and treatment would not disturb landfill materials. Besides risks

from contaminants, workers would incur risks associated with performing construction activities due to operation of heavy equipment.

Workers performing sampling activities as part of implementing monitoring would incur potential risk through exposure to chemicals in the groundwater, leachate and landfill gas. This risk would be minimized through the use of safety procedures and personal protective equipment.

**Environmental Impacts** - Implementation of this alternative is not anticipated to pose additional risk to the environment. Soil erosion and sediment control technologies would be employed to protect surface waters during construction operations associated with the 35 IAC 811 cap and installation of the leachate and groundwater extraction systems. Once the construction is completed, disturbed areas would be vegetated to protect against soil erosion and sedimentation.

**Time Until Remedial Action Objectives are Achieved** - Groundwater Remedial Action Objectives are currently being met. Implementation of a groundwater extraction and treatment system would serve to provide added assurance that unanticipated migration of contaminants would not occur from the landfill.

The Remedial Action Objective for leachate to limit future generation of leachate at the landfill would be met almost immediately after completion of cap construction activities. Construction of the new cap would be completed in approximately one year. During cap construction, portions of the exposed landfill may be subject to increased infiltration of water and generation of new leachate. Decreases in leachate elevation would be observed over a period of several years following cap construction and leachate extraction.

The time needed to achieve the Remedial Action Objective for leachate aimed at reducing leachate volume at the site would be dependent on the actual volume present in the landfill and the sustainable yield of leachate recovery.

### 6.7.6 Implementability

This criterion considers factors, where appropriate, such as technical feasibility, administrative feasibility, and availability of materials and services. These factors are discussed below.

**Technical Feasibility** - Leachate extraction technology is well developed and an extraction system is technically constructable. The degree of success of such a recovery system at this site is uncertain because of the uncertainty regarding the total volume of leachate and the availability of that leachate for extraction. The feasibility of recovering significant portions of leachate from this site would be evaluated through the continued operation of the extraction system. Installation of underground piping and construction of a central collection tank would utilize standard equipment and procedures and be technically feasible to implement at the site.

Groundwater extraction and treatment would be technically feasible to implement at the site. The wells and conveyance piping could be constructed using standard equipment and procedures. The air stripping treatment system would have to be sized accordingly to accommodate high flow rates (250 to 500 gpm). The potential for chemical precipitation or fouling to occur in the wells and air stripping packing media would have to be evaluated. Redevelopment of the wells may be required on a regular basis to prevent diminished capacity. Pretreatment of the influent water may be necessary if water quality parameters are not amenable to air stripping.

Constructing a cap according to 35 IAC 811 specifications would be technically feasible. Construction techniques for landfill capping are well developed and utilization of good earthwork technique and materials would lessen any potential difficulty associated with construction.

Technologies for conducting monitoring of groundwater and leachate are readily implementable, are well developed, and have proven reliability.

The passive landfill gas venting system is in place and functioning. Implementing additional venting through new leachate extraction wells would be technically feasible.

**Administrative Feasibility** - It may be necessary to obtain conventional construction permits, land disturbance permits, grading permits, wetland permits, etc., for construction of the leachate extraction system and 35 IAC 811 cap.

The existing pretreatment permit with the Wheaton Sanitary District POTW may need to be maintained for on going off-site disposal of leachate.

Discharge permits would be required to discharge treated groundwater to Sand Pond.

An air discharge permit may be required for on-site discharge of landfill gas to the atmosphere.

**Availability of Services and Materials** - Materials, services, and equipment required to implement this alternative are readily available. Construction of the leachate and groundwater extraction and treatment systems would, for the most part, utilize common construction materials, but also require some specialized equipment. This equipment is readily available from vendors and experienced constructors/installers are available in the area to install this equipment.

Construction of the 35 IAC 811 cap would involve using common construction materials and employing experienced contractors presently working in the area. For the cost estimate, it was assumed that appropriate materials to repair the cap could be obtained from a borrow source within 10 miles of the site.

### 6.7.7 Cost

This criterion considers factors such as capital costs, annual O&M costs, and present net worth costs. Costs applicable to this alternative are presented below.

**Capital Costs** - The estimated capital cost for constructing the leachate extraction system, groundwater extraction and treatment system and the new landfill cap according to 35 IAC 811 specifications is $7,680,000. Passive landfill gas venting is currently in place and functioning.

**Operation and Maintenance** - Operation and maintenance costs would be those incurred from operating the leachate and groundwater extraction systems, including power, mechanical systems upkeep and periodic replacement (e.g., lubrication, repair, etc.), heating, and preheating (if appropriate). Operation and maintenance costs would also be incurred for the groundwater treatment system and groundwater quality monitoring, leachate head monitoring and characterization.

The annual O&M cost for Alternative 6 is estimated to be $208,000.

**Present Net Worth Cost** - The 30-year present net worth (3 percent discount rate) associated with the above estimated costs is $11,626,000.

The costs for Alternative 6 are summarized in Table 9. Estimated costs are itemized in Appendix C (Tables C-6a through C-6c).

### 6.7.8 State Acceptance

This criterion will be addressed in the Proposed Plan and ROD after agency review of the FS report.

### 6.7.9 Community Acceptance

This criterion will be addressed in the Responsiveness Summary (a summary of written and oral comments on the FS report) following public comment on the Proposed Plan.

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# Section 7

MONTGOMERY WATSON

# 7

# COMPARISON OF ALTERNATIVES

In Section 6, six alternatives were individually assessed against the nine evaluation criteria. In this section, a comparative analysis is conducted to evaluate the relative performance of each alternative in relation to each of the nine criteria. The purpose of this comparative analysis is to identify the advantages and disadvantages of the alternatives relative to each other, so the relative strengths, (to be evaluated by the U.S. EPA) can be identified. These strengths, combined with risk management decisions made by the Agencies, will serve as the rationale for selecting a preferred alternative and provide a transition between the RI/FS and the ROD.

## 7.1 OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Criterion 1 addresses the adequacy with which the alternative can provide protection of human health and the environment by controlling exposures to contaminants.

The Baseline Risk and Ecological Assessments indicated that no unacceptable risks to human health and the environment occur under current or future land use conditions. Existing contaminant levels in Groundwater does not pose a health concern since the groundwater containing contaminants of concern at concentrations above MCLs is limited to a small area immediately downgradient of the landfill. Migration of groundwater with these concentrations is contained on site and has stabilized due to natural attenuation and dilution processes. This area of affected groundwater is located on FPD property, which prevents residential or commercial development, since the FPD lacks the authority to sell land to a private party. Leachate does not pose a health concern or threat to the environment, because it is covered by soil and contained within the landfill which was constructed with low permeability materials. It does, however, pose an inherant threat as a continuing source of groundwater contamination.

Remedial Action Objectives are media-specific goals for protecting human health and the environment. Remedial Action Objectives were developed to address the presence of site contaminants and to further protect human health and the environment by preventing or minimizing exposure to contaminants present in groundwater and leachate. Remedial Action Objectives are listed and explained in Section 4.2. The Risk Assessment indicated that based on existing groundwater contaminant levels, unacceptable risks are not present and will not occur from the contaminants of concern in the site media. However, meeting the developed Remedial Action Objectives would contribute to the long-term goals of protecting human health and the environment. The alternatives were evaluated individually in Section 6 for their ability to meet these

objectives. The following text discusses how the alternatives would address the Remedial Action Objectives on a media-specific basis.

**Groundwater** - Remedial Action Objectives for groundwater are currently being met. Affected groundwater does not pose an unacceptable risk under current land use conditions. Currently, persons are not exposed to unacceptable risks via groundwater affected by the site, and conditions are not likely to change in the future. The location of the landfill in the Blackwell Forest Preserve prevents the area of the aquifer within the FPD property from being developed for drinking water purposes. Since the FPD cannot sell the land to a private party, there will be no on-site commercial or residential development or well installation. Furthermore, previous groundwater sampling and analysis programs demonstrate that natural dilution and attenuation characteristics of the soil and aquifer have effectively stabilized the area of groundwater containing concentrations of contaminants above MCLs.

Alternatives 2 through 6 include groundwater monitoring of outwash and bedrock wells downgradient of the landfill which would provide a measure of the rate at which groundwater contamination is being attenuated and degraded over time. It would also be effective in indicating changes in the extent and character of affected groundwater and would provide early warning, if necessary, of groundwater changes. Therefore, all of these alternatives address the Remedial Action Objectives for groundwater by documenting that off-site migration of contaminants above MCLs is not occurring at the site; and that off-site migration of groundwater containing concentrations of contaminants that represent an unacceptable human health or environmental risk is prevented.

Alternative 1 does not provide monitoring of site groundwater to document that the conditions are not changing over time. Therefore, Alternatives 2 through 6 would be more protective of human health and the environment than Alternative 1, because monitoring would provide an early warning of any change in groundwater and leachate conditions. In the event of change in monitoring results, the implications would be evaluated and additional protective measures could be taken, if necessary.

Alternatives 4 and 6 are more protective of human health and the environment than Alternatives 2, 3, and 5, since these alternatives include groundwater extraction and treatment to hydraulically control and capture contaminated groundwater around the base of the landfill to ensure that unanticipated off-site migration of contaminants did not occur at the site. Therefore, since Alternatives 2 through 6 address the Remedial Action Objectives for groundwater, implementation of groundwater extraction and treatment associated with Alternatives 4 and 6 would exceed the Remedial Action Objectives established for this media.

**Leachate** - Alternative 1 does not meet the Remedial Action Objectives established for leachate to: 1) reduce the volume of leachate in the landfill that has the potential to contaminate groundwater and 2) limit future generation of leachate that has the potential to contaminate groundwater. Alternatives 2 through 6 utilize leachate extraction and

treatment to reduce leachate head at the base of the landfill. By lowering the leachate head and volume in the landfill, these five alternatives would reduce the potential for migration of leachate to groundwater and would meet Remedial Action Objective 1.

Alternatives 3 and 4 include landfill cap repair whereas Alternatives 5 and 6 include construction of a new 35 IAC 811 cap as a portion of their alternatives. Repairing or replacing the cap at the landfill will limit the potential for future leachate generation that has the potential to contaminate groundwater and would meet Remedial Action Objective 2. Alternatives 1 and 2 do not include these landfill cap components and would not meet the second Remedial Action Objective for leachate. Therefore, Alternatives 3 through 6 are more protective of human health and the environment than Alternatives 1 and 2.

Alternatives 2 through 6 include passive landfill vents on the new leachate extraction system in addition to the existing passive landfill gas venting system utilized by Alternative 1 to reduce buildup of gas in the landfill. Because excessive landfill gas build-up could result in fracturing of the cap and increasing permeability through the cap, additional venting capabilities afforded by Alternatives 2 through 6 are more protective of human health and the environment than Alternatives 1.

Monitoring of leachate head levels is included in Alternatives 2 through 6 to provide information on leachate reduction and sustainable leachate extraction rates at the landfill. In addition, groundwater monitoring in outwash and bedrock wells downgradient of the landfill is also included in these alternatives to provide documentation of changes in migration of leachate contaminants to groundwater at the site. Alternative 1 does not include leachate or groundwater monitoring activities to document changing conditions at the site.

**Summary** - Based on Remedial Action Objectives established for groundwater and leachate at the Blackwell landfill site, Alternatives 3 through 6 meet these objectives and are therefore, equally protective of human health and the environment. Alternative 1 does not meet the Remedial Action Objectives established for both media, whereas Alternative 2 does not meet the Remedial Action Objective to limit leachate generation at the site. Although Remedial Action Objectives for groundwater are currently being met by all of the alternatives, Alternative 1 does not provide monitoring of site groundwater to document that the conditions are not changing over time and is therefore less protective of human health and the environment than Alternatives 2 through 6.

## 7.2 COMPLIANCE WITH ARARs

Criterion 2 considers factors such as compliance with chemical-specific, location-specific and action-specific ARARs. Possible ARARs for alternatives are summarized in Table 8 and compared below.

### 7.2.1 Compliance with Chemical-Specific ARARs

Chemical-specific ARARs address air emission standards and groundwater quality. Since Alternative 1 includes no action, no chemical-specific ARARs were identified. Therefore, Alternative 1 is not addressed in the following discussions.

**Air Emissions** - Air emissions from the existing passive landfill venting systems and from passive vents installed on the leachate extraction wells would meet the requirements of 35 IAC 218. The passive system, included as part of Alternatives 2 through 6, discharges landfill gas directly to the environment. The chemical-specific air requirements for the expected emissions from these alternatives are contained in Section 218.301, which limit emissions of photochemically reactive organic material (e.g., VOCs) to less than 8 lbs/hr. If VOC emissions exceed 8 lbs/hr, controls may be required to reduce emissions by 85 percent. Because the landfill gas sampling and analysis program conducted during the RI showed that VOC emissions were well below 8 pounds per hour for the existing passive venting system, the requirements of 35 IAC 218 could be met by the passive venting system included as part of Alternatives 2 through 6.

**Groundwater Quality** - Class I potable resource groundwater quality standards listed in 35 IAC 620.410 apply to groundwater located ten feet or more below the ground surface in the outwash and dolomite (bedrock) aquifers at the Blackwell site. Vinyl chloride, 1,2-dichloroethene, 1,2-dichloropropane, trichloroethene, benzene, and tetrachloroethene have equaled or exceeded the Class I potable resource groundwater standards in one or more site wells.

Compliance with the Class I potable resource groundwater standards could be achieved by Alternatives 2 through 6. The extraction of leachate, included with each of the alternatives, would reduce the leachate head at the base of the landfill and further serve to reduce the source of contaminants to the aquifer. Alternatives 3 and 4 include cap repair and Alternatives 5 and 6 add construction of a 35 IAC 811 cap. Alternatives 3 through 6 will reduce infiltration and the generation of leachate within the landfill. Over time, this reduction of leachate should result in reduced loading of leachate constituents on the aquifer downgradient of the landfill. The reduction of contaminant loading, in combination with natural attenuation and dilution, should allow the standards to be achieved over time.

Alternatives 4 and 6 add groundwater extraction and treatment to remove contaminants from groundwater during pumping associated with hydraulic control and capture. It is possible that compliance with Class I potable resource groundwater standards could be achieved more quickly with Alternatives 4 and 6, although studies on aquifer remediation have indicated that many existing groundwater extraction systems fail to achieve target clean-up levels. This scenario is quite possible at the Blackwell site, where the high permeability of the outwash aquifer would minimize the area of influence of a recovery well and, consequently, reduce the ability of a recovery system to remove groundwater contaminants. Therefore, the groundwater quality standards of 35 IAC 620.410 may not

be any more achievable even with groundwater extraction system than with solely a leachate collection system.

For Alternatives 2 through 6, until compliance with the standards of 35 IAC 620.410 is achieved, groundwater underlying the Blackwell site would be managed as a groundwater management zone in accordance with 35 IAC 620.250. The groundwater management zone would be established following approval by IEPA of the proposed corrective action to be implemented at the site. The groundwater management zone designation would expire when corrective action is completed at the site and applicable standards are met (35 IAC 620.410). A review of the adequacy of the corrective action at the site would be completed and submitted to IEPA no less often than 5 years.

U.S. EPA MCLs designated in 40 CFR 141 are not ARARs because impacted groundwater would not be used for a public drinking water supply.

### 7.2.2 Compliance with Location-Specific ARARs

Alternatives 2 through 6 could comply with the location-specific ARARs. No location-specific ARARs were identified for Alternative 1.

Potential location-specific ARARs relate to floodplains, wetlands and open waters. The regulatory requirements of Section 404 of the Clean Water Act (40 CFR 6) and the U.S. ACOE regulations pertaining to open waters (33 CFR Parts 320 through 330) and floodplain protection requirements of 40 CFR 6 and the Illinois Floodplains Construction Permits--Revised Statutes are potential ARARs for Alternatives 4 and 6. These alternatives involve construction of groundwater extraction wells, conveyance piping and a treatment building at the base of the landfill and at Sand Pond. Floodplains, wetlands and open waters may be disturbed during construction of a groundwater extraction and treatment system at the site (proposed in Alternatives 4 and 6).

Construction of leachate wells and underground piping for Alternatives 2 through 6 and cap repair and cap construction associated with Alternatives 3 and 4, and 5 and 6, respectively, would occur within the interior of the landfill and not disturb floodplains, wetlands, and open water environments located in the Blackwell landfill area.

### 7.2.3 Compliance with Action-Specific ARARs

Potential action-specific ARARs relate to safety standards, air emissions, water quality and landfill cap requirements.

**Safety Standards** - Construction activities, included in Alternatives 2 through 6, would be in accordance with the general industry standards found in 29 CFR 1910 and 29 CFR 1926. Threshold limit values would be monitored in the breathing zone during construction and monitoring activities (Alternatives 2 through 6) at the landfill.

**Air Emissions** - Air emissions from the passive landfill gas venting system (Alternatives 1 through 6) would meet the relevant permitting requirements of 35 IAC 201. IEPA does not have a formally promulgated air toxics program for the State of Illinois. Consequently, there are no state air toxics ARARs at this site. Moreover, there are no federal requirements under the Clean Air Act that are ARARs at this site for the following:

- The Clean Air Act Amendments of 1990 listed 189 air toxics that must be regulated, including toluene, trichloroethene, vinyl chloride, methylene chloride, tetrachloroethene and xylene. Under the new Clean Air Act, U.S. EPA plans to list the sources emitting any of these 189 chemicals and, over the next eight years, promulgate emission standards for these sources. Site remediation is listed as a source category, however, U.S. EPA has not yet promulgated maximum achievable control technology (MACT) for this or any other source category. Consequently, the Clean Air Act is not an ARAR at this site.

**Leachate Disposal** - Extracted leachate associated with Alternatives 2 through 6 would be transported to the Wheaton Sanitary District POTW and treated under an existing pretreatment permit.

**Groundwater Discharge** - Alternatives 4 and 6 include groundwater extraction, treatment and surface water disposal. ARARs for discharge of treated groundwater to surface water (Sand Pond) are provided by the National Pollution Discharge Elimination System Permit Regulations (40 CFR 122 and 125), the Water Quality Effluent Limitations section of the Clean Water Act (40 CFR 131), and 35 IAC, Parts 304 and 309. Sampling and analysis associated with discharge to a surface water body are found in 40 CFR 136 and would be considered a potential ARAR.

**Landfill Cap** - Alternatives 3 and 4 involve repair of the existing landfill cap in compliance with 35 IAC 807 since the Blackwell Landfill was classified as closed in 1973 and did not operate under 35 IAC 811. This site is not considered a new landfill facility or disposal unit as defined in 35 IAC 810.103, and the requirements of 35 IAC 814 may be relevant and appropriate. Part 814 defines the conditions for existing solid waste units whereby provisions of Part 811 may apply. Sections 814.105(a) and 814.302(a)(3) suggest that the final cover requirements of 35 IAC 807 and not 35 IAC 811.314 may be relevant and appropriate at this site. Consequently, solid waste landfill regulations potentially relevant and appropriate to Alternatives 3 and 4 include 35 IAC Parts 807 and 814.

Alternatives 5 and 6 involve replacement of the existing landfill cap with a new cap which would be constructed according to 35 IAC 811 specifications.

Closure performance standards for Alternatives 3, 4, 5, and 6 must be accomplished according to the approved closure plan in a manner that minimizes the need for further

maintenance and manages any further release to the groundwater, surface water, or to the atmosphere to protect human health and the environment.

In summary, no ARARs were identified for Alternative 1. Alternatives 2 through 6 would comply with the chemical-, location-, and action-specific ARARs.

## 7.3 LONG-TERM EFFECTIVENESS AND PERMANENCE

Criterion 3 describes factors such as residual risk remaining after implementation of the remedy and the adequacy and reliability of controls. This latter factor considers the long-term management of treated residuals, long-term reliability of engineering and institutional controls, and the potential need for replacement of the alternative.

### 7.3.1 Magnitude of Residual Risk

The Baseline Risk and Ecological Assessments indicated no unacceptable health risks or ecological risks would occur from exposures to landfill contaminants in present and future risk scenarios. However, residual risk could be reduced even lower in Alternatives 2 through 6 than those calculated in the Baseline Risk and Ecological Assessments.

Needs revision see earlier notes

Alternatives 4 and 5 include groundwater extraction and treatment to reduce groundwater contaminant concentrations. However, since most of the groundwater contaminants that exist at the site are already at low concentrations (less than 30 ug/L), it is likely that only minimal reduction of these contaminants levels would occur during large scale pumping associated with groundwater extraction. For Alternatives 2 through 6, decrease in concentrations of contaminants in groundwater will occur by natural attenuation/dilution processes and also because contaminant loading will be decreased as leachate volume and pressure head are reduced by the leachate collection system. Alternatives 3 and 4 add cap repair and Alternatives 5 and 6 add construction of a 35 IAC 811 cap to further reduce contaminant loading associated with generation of future leachate within the landfill.

The leachate extraction system included in Alternatives 2 through 6 would reduce the potential risks associated with high leachate volume and levels in proportion to the resultant decrease in leachate volume, level and chemical constituent concentrations. The magnitude of these reductions will be dependent on the recoverability of the leachate from the landfill interior.

Alternatives 1 through 6 include the existing passive landfill gas venting system to continue to relieve buildup of gas within the landfill. Alternatives 2 through 6 include passive vents on the leachate extraction wells. The volume of gas within the landfill would decrease as the refuse in the landfill stabilizes, reducing the risk associated with fracturing of the existing cap and generation of future leachate.

For Alternatives 2 through 6, the entire remedy would be subject to a five-year review. Leachate extraction system review would consist of evaluating the effectiveness of leachate extraction to lower the leachate heads in new and existing leachate wells and reduce the volume of leachate contained in the landfill. A review of the groundwater extraction and treatment system associated with Alternatives 4 and 6 would further evaluate the effectiveness of the groundwater extraction system to control hydraulic gradients and capture groundwater contaminants. Groundwater monitoring data would be evaluated in Alternatives 4 and 6 to identify if groundwater extraction results in a corresponding decrease in groundwater contaminant concentrations. Groundwater monitoring data would be evaluated in Alternatives 2, 3 and 5 to document whether leachate extraction results in a corresponding decrease in groundwater contaminant concentrations.

The accumulated database from groundwater monitoring would be evaluated to assess the on-going groundwater quality downgradient of the landfill. The groundwater monitoring program would address the Remedial Action Objectives that off-site migration of contaminants above MCLs is not occurring at the site; and that off-site migration of groundwater containing concentrations of contaminants that represent an unacceptable human health or environmental risk is prevented

### 7.3.2 Adequacy and Reliability of Controls

FPD ownership of the property is an adequate and reliable control for the site. The landfill is maintained by FPD personnel. The possibility of development is eliminated by FPD ownership since the FPD lacks the authority to sell any portion of the Blackwell Forest Preserve to a private party. In addition, the FPD has developed a long-term plan for the site which makes it clear that there will be no residential or commercial development of the site.

The technologies included in the remedial alternatives are well developed. The remedial action components would meet the required process efficiencies and performance specifications. The efficiency and performance of the leachate extraction system, included in Alternatives 2 through 6, would be identified through extended pumping of the landfill extraction wells. The FPD would manage the system, and would utilize local contractors, suppliers and FPD personnel for system monitoring, operation and maintenance. The Wheaton Sanitary District POTW would be utilized to treat the collected leachate under an existing pretreatment permit. It is not anticipated that major elements of the system would require replacement. Submersible pumps placed in the leachate wells would require periodic maintenance to ensure adequate performance.

Alternatives 4 and 6 add groundwater extraction and treatment which is a well developed and widely utilized remedial technology. Because of the number of wells and the high pumping rate required to achieve hydraulic control in the permeable outwash deposits at the site, long term management and maintenance of the system would be required to ensure system performance. Submersible pumps placed in the extraction wells would require periodic maintenance to ensure adequate performance. The extraction wells would also

need to be redeveloped on a regular basis to maintain system flow rates. Elevated iron and manganese concentrations in the groundwater and bacteria may precipitate scale in the wells and require attention. The air stripping packing media will also need ongoing maintenance to prevent fouling. A pre-design study may be conducted to determine if pretreatment of the groundwater is necessary at the site.

Cap repair (Alternatives 3 and 4) and construction of a new landfill cap (Alternatives 5 and 6) would be an adequate and reliable control for promoting drainage to reduce infiltration and minimize leachate generation.

Passive landfill gas venting exists at the site and has proven to be an adequate and reliable means to limit landfill gas build-up and problems associated with landfill gas accumulation. The venting system is mechanically simple to operate and maintain.

## 7.4 REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT

Criterion 4 considers factors such as the treatment process used and the material treated; the amount of hazardous material destroyed or treated; the reduction of toxicity, mobility, or volume; the irreversibility of the treatment; the type and quantity of the treatment residuals; and the reduction of inherent hazards. These factors are considered where appropriate. Alternative 1 does not utilize treatment, and therefore would not result in reduction in toxicity, mobility, or volume attributable to treatment.

### 7.4.1 Treatment Processes Used and Materials Treated

Alternatives 2 through 6 would utilize leachate extraction and off-site disposal. Treatment of the extracted leachate would be off-site at the Wheaton Sanitary District POTW to remove inorganics and destroy organics.

Alternatives 4 and 6 extract groundwater which would be treated by air stripping and discharged to Sand Pond located on FPD property. Volatile organic contaminants would be removed from the groundwater and discharged to the atmosphere. The SVOC compound identified in groundwater at the site would not be treated by this alternative.

Treatment process ranking would be higher for Alternatives 4 and 6 than for Alternatives 1, 2, 3, and 5 because Alternatives 4 and 6 include treatment of groundwater and leachate. Treatment process ranking for Alternatives 4 and 6 would be equal.

### 7.4.2 Amount of Hazardous Material Destroyed or Treated

The volume of leachate in the landfill may be as high as 70 million gallons and as much as 9,500 gallons per day of leachate may be generated by infiltrating precipitation. Although there are a number of uncertainties associated with these conservative estimates, the leachate extraction program included in Alternatives 2 through 6 will reduce the volume of

leachate contaminants at the site. Depending on the accuracy of the volume estimates and sustainable yield of leachate, some portion or a majority of this material may be collected at the site and treated at the POTW.

Because of the high permeability of the outwash deposits, the pumping rate from twenty wells would have to be approximately 250 to 500 gpm in order to achieve hydraulic control and effectively capture groundwater in the outwash at the base of the landfill. Although the system flow rate would be high, the amount of contaminants treated by air stripping would not be significant due to the low contaminant influent concentrations (generally less than 30 ug/L). Based on an influent flow rate of 500 gpm (0.72 MGD) and an average concentration of VOCs of 30 ug/L, approximately 0.2 lbs/day of volatile contaminants would be treated and removed from groundwater with Alternatives 4 and 6.

Alternative 1 does not include a treatment process. Therefore, hazardous materials are not treated or destroyed by treatment processes in this alternative.

### 7.4.3 Degree of Expected Reductions in Toxicity, Mobility, or Volume

Removal of leachate under Alternatives 2 through 6 would result in similar reductions of toxicity, mobility, and volume of leachate because the five alternatives include the same extraction and off-site disposal components. Alternative 1 would not result in any reduction in toxicity, mobility, and volume of leachate at the site.

Reduction of the volume of leachate present in the landfill would be greater for alternatives involving cap improvements to limit future leachate generation. Alternatives 3 and 4 add cap repair to leachate extraction and Alternatives 5 and 6 add construction of a 35 IAC 811 cap in order to reduce infiltration and limit generation of future leachate at the site. During construction of Alternatives 5 and 6 (35 IAC 811 cap) portions of the landfill may be exposed to a greater degree than during cap repair and may be subject to increased infiltration of water and generation of new leachate.

Alternatives 4 and 6 would reduce the toxicity, mobility and volume of groundwater contaminants at the site with groundwater extraction, whereas Alternatives 1, 2, 3, and 5 would rely on natural processes for these purposes. Groundwater extraction would create a hydraulic barrier around the base of the landfill to reduce contaminant mobility in groundwater. The results of the RI groundwater sampling programs showed that the area of elevated groundwater contamination is stabilized and limited to within 100 feet downgradient of the landfill. Alternatives 1, 2, 3, and 5 incorporate natural attenuation and dilution processes occurring within the outwash aquifer for reducing groundwater contaminant mobility. All of the alternatives include groundwater monitoring to document potential changes in groundwater conditions. Alternatives 4 and 6 provide greater reduction in groundwater contaminant mobility because these alternatives use groundwater extraction to build on and enhance the reduction of contaminant mobility already occurring naturally at the site.

The volume of contaminants in groundwater would be reduced by Alternatives 4 and 6 through extraction. Air stripping would remove volatile contaminants from the water and discharge them to the atmosphere.

### 7.4.4 Degree to which Treatment is Irreversible

Alternatives 2 through 6 would irreversibly reduce leachate levels and volumes since extracted leachate would be similarly extracted and treated off-site by each of the five alternatives. The concentrations would be reduced by removal of more concentrated fossil leachate that accumulated in the landfill during construction and operation of the landfill. Leachate generated by recent infiltration of rain water could have a lower contaminant concentration, thereby reducing the overall toxicity of the leachate. Contaminants present in the extracted leachate would be irreversibly destroyed by off-site treatment at the Wheaton Sanitary District POTW.

Groundwater extraction and treatment, included in Alternatives 4 and 6, would irreversibly reduce the volume of contaminants present in groundwater at the site. Volatile organic contaminants would be irreversibly removed from groundwater by air stripping and discharged to the atmosphere. In the atmosphere, the VOCs would likely be destroyed by natural photodecomposition processes.

### 7.4.5 Type and Quantity of Residuals Remaining After Treatment

Alternatives 1, 2, 3, and 5 do not include on-site treatment processes. Therefore, no treatment process residuals would be produced or remain on-site after treatment in those alternatives. Any residuals associated with leachate treatment at the Wheaton Sanitary District POTW would be mixed with residual associated with routine operation of the treatment plant and disposed according to the POTW permitting requirements.

Residuals remaining after treatment of groundwater in Alternatives 4 and 6 would be discharged into Sand Pond and re-enter the groundwater system. Concentrations of chemicals in discharged treated groundwater would be required to meet permit discharge limits.

### 7.4.6 Reduction of Inherent Hazards

Alternatives 1 would not reduce inherent hazards through treatment, because no treatment processes would be utilized in this alternative. Alternatives 2 through 6 would reduce inherent hazards posed by high leachate volumes and heads in the landfill by leachate extraction and treatment.

## 7.5 SHORT TERM EFFECTIVENESS

Criterion 5 considers factors, where appropriate, such as the technical feasibility, administrative feasibility, and availability of materials and services.

### 7.5.1 Risks to Community During Remedial Action

In general, alternatives possessing the fewest construction activities represent the lowest risk to the community during remedial action. Therefore, Alternative 1, the no action alternative, presents the least risk followed by Alternative 2, which includes leachate extraction and off-site disposal. Alternatives 3 through 6 involve increased truck traffic and operation of heavy equipment from cap repair and construction activities and would result in increased risk of injury and death to the public traveling in the vicinity of the site during construction. Alternatives 2 through 6 also involve disturbing the landfill through trenching for leachate conveyance piping and/or cap repair or construction. This work would add the risk of fugitive emissions from the site to nearby residents. Dust control technologies would be used to minimize the migration of fugitive emissions from the site to nearby residents.

### 7.5.2 Risks to Workers During Remedial Actions

Alternative 1 would involve no risk to workers because there would be no remedial action. Alternatives 2 through 6 would include remedial construction actions where workers would incur risks of injury and death routinely encountered while performing construction activities due to increased truck traffic and operation of heavy equipment. These construction activities would be performed in compliance with federal codes regarding health and safety. Alternatives 2 through 6 would also expose workers performing monitoring activities to chemicals in the groundwater and leachate. This risk would be minimized though the use of safety procedures and personal protective equipment.

Alternatives in which waste materials may be disturbed (Alternatives 2 through 6) would potentially expose workers to contaminants through direct contact with leachate and waste, or inhalation of dust or landfill gas. These exposures would be minimized by use of dust control measures and personal protective equipment.

### 7.5.3 Environmental Impacts

Environmental impacts could result from construction and monitoring activities. Alternative 1 would not impact the environment, because no activities would be performed. Alternatives 2 through 6, which involve construction within the landfill, would utilize soil erosion and sediment control technologies to protect surface waters during construction operations. Once construction was completed, disturbed areas would be vegetated to protect against soil erosion and sedimentation.

### 7.5.4 Time Until Remedial Action Objectives are Achieved

Groundwater Remedial Action Objectives are currently being met with existing conditions. Implementation of a groundwater extraction and treatment system (Alternatives 4 and 6) would serve to provide added assurance that unanticipated migration of contaminants would not occur from the landfill.

The Remedial Action Objective for leachate to limit future generation of leachate at the landfill would be met almost immediately after completion of cap repair (Alternatives 3 and

4) and cap construction activities (Alternatives 5 and 6). Completion of cap repair activities would be approximately 6 months, whereas construction of the 35 IAC 811 cap would be completed in approximately one year. During cap construction (Alternatives 5 and 6), portions of the exposed landfill may be subject to increased infiltration of water and generation of new leachate. Decreases in leachate elevation would be observed over a period of several years following cap construction and leachate extraction.

The time needed for Alternatives 2 through 6 to achieve the Remedial Action Objective for leachate aimed at reducing leachate volume at the site would be dependent on the actual volume present in the landfill and the sustainable yield of leachate recovery.

## 7.6 IMPLEMENTABILITY

Criterion 6 considers factors such as technical feasibility, administrative feasibility, and availability of materials and services.

### 7.6.1 Technical Feasibility

Technical feasibility relates to how the remedial action can be implemented with regard to routine and readily implemented technologies. The technologies may include both legal and engineering aspects.

Alternative 1 has no technical implementability considerations and would be the easiest to implement because no remedial activities would be involved.

Alternatives 2 through 6 are technically implementable. Technologies for the variety of remedial action components are well developed, relatively practical to implement, and reliable.

Leachate extraction technology for Alternatives 2 through 6 is well developed and an extraction system is technically constructable. The degree of success of such a recovery system at this site is uncertain because of the uncertainty regarding the total volume of leachate and the availability of that leachate for extraction. The feasibility of recovering significant portions of leachate from this site would be evaluated through the continued operation of the extraction system. Installation of underground piping and construction of a central collection tank would utilize standard equipment and procedures and be technically feasible to implement at the site.

Groundwater extraction and treatment, included in Alternatives 4 and 6, would be technically feasible to implement at the site. The wells and conveyance piping could be constructed using standard equipment and procedures. The air stripping treatment system would have to be sized accordingly to accommodate high flow rates (250 to 500 gpm). The potential for chemical precipitation or fouling to occur in the wells and air stripping packing media would have to be evaluated. Redevelopment of the wells may be required on a

regular basis to prevent diminished capacity. Pretreatment of the influent water may be necessary if water quality parameters are not amenable to air stripping.

Constructing a cap according to 35 IAC 811 specifications (Alternatives 5 and 6) would involve a greater level of effort than repairing the existing cap (Alternatives 3 and 4) and would therefore be more technically difficult to implement. Removing and replacing the entire 40-acre clay cap at the landfill would be less technically feasible than repairing approximately 10 acres of the existing cap. A pre-design investigation would be required to identify the areas of the cap which require repair. Construction techniques for both landfill capping alternatives (Alternatives 3 through 6) are well developed and utilization of good earthwork technique and materials would lessen any potential difficulty associated with construction.

Technologies for conducting monitoring of groundwater and leachate are readily implementable, are well developed, and have proven reliability.

The passive landfill gas venting system is in place and functioning. Implementing additional venting through new leachate extraction wells would be technically feasible.

### 7.6.2 Administrative Implementability

Administrative feasibility is a function of the number and types of covenants and permit requirements associated with the remediation. Alternative 1 has no administrative feasibility considerations, because no remedial actions would be involved.

Alternative 2 would be next easiest to implement. The existing pretreatment permit with the Wheaton Sanitary District POTW would need to be maintained for ongoing off-site disposal of leachate.

Alternatives 3 through 6 would require that conventional construction permits, land disturbance permits, grading permits, wetland permits, etc., for construction of the leachate extraction system, cap repair or 35 IAC 811 cap.

Adding groundwater extraction and treatment to Alternatives 4 and 6 would add a layer of administrative effort to obtain discharge permits associated with discharge of treated groundwater to Sand Pond.

An air discharge permit may be required for on-site discharge of landfill gas to the atmosphere.

### 7.6.3 Availability of Materials and Services

Alternative 1, the no-action alternative, would be the easiest to implement from a material and service availability aspect, because no materials or services would be required.

With the exception of Alternative 1, the no-action alternative, all alternatives would require monitoring services (sampling, analysis, and reporting) which are readily available from a number of competitive, experienced vendors. Therefore, the monitoring services requirement would be equivalent among Alternatives 2 through 6.

Materials, services, and equipment required to implement Alternatives 2 through 6 are readily available. The primary materials which would have the greatest effect on availability would be materials for cap repair or construction. It is assumed that materials needed to repair the cap can be obtained from a borrow source within 10 miles of the site. Construction of the leachate and groundwater extraction and treatment systems would, for the most part, utilize common construction materials, but also require some specialized equipment. This equipment is readily available, and experienced constructors/installers are available in the area to install this equipment. A number of competitive vendors supply the equipment and typically provide startup and training services for their equipment.

Cap repair (Alternatives 3 and 4) and construction of the 35 IAC 811 cap (Alternatives 5 and 6) would involve using common construction materials and employing experienced contractors presently working in the area.

## 7.7 COST

Criterion 7 considers factors such as capital costs, annual operation and maintenance costs, and present net worth costs.

Cost estimating was performed for Alternatives 2 through 6 for capital, operation and maintenance and net present worth costs. These costs are summarized in Table 9. For purposes of comparison, net present worth costs use an assumed life of 30 years and a 3 percent discount rate. A comparison of costs from lowest to highest follows.

Alternative 2 has the lowest capital cost and operation and maintenance cost, estimated to be $488,000 and $108,000 per year, respectively. The 30 year net present worth cost for Alternative 2 is estimated to be $2,605,000.

Capital Costs for Alternative 3 are estimated to be $1,417,000 for construction of the leachate extraction system and cap repair. Annual operation and maintenance costs for this system, off-site disposal of leachate and monitoring are estimated at $118,000. The 30 year present worth cost for Alternative 3 is estimated to be $3,730,000.

Capital costs for Alternative 4 are estimated to be $2,144,000 for construction of the leachate extraction system, groundwater extraction and treatment system and cap repair. Annual operation and maintenance costs associated with leachate extraction system, groundwater extraction and treatment system, cap repair and monitoring are estimated to be $201,000. The 30 year net present worth cost of Alternative 4 is estimated to be $5,953,000.

Capital costs for Alternative 5 are estimated to be $6,953,000 for construction of the leachate extraction system and cap of a 35 IAC 811 cap. Annual operation and maintenance costs are estimated to be $125,000 for off-site disposal of leachate, cap maintenance and monitoring of groundwater and leachate. The 30 year net present worth cost of Alternative 5 is estimated to be $9,403,000.

Capital costs for Alternative 6 are estimated to be $7,680,000 for construction of the leachate extraction system, groundwater extraction and treatment system, and new cap constructed to 35 IAC 811 specifications. Annual operation and maintenance costs are estimated to be $208,000 for off-site disposal of leachate, operation of the groundwater extraction and treatment system, cap maintenance and monitoring of groundwater and leachate. The 30 year net present worth cost of Alternative 6 is estimated to be $11,626,000.

## 7.8 STATE ACCEPTANCE

Criterion 8 will be addressed in the Proposed Plan and the ROD after agency review of the Feasibility Study report.

## 7.9 COMMUNITY ACCEPTANCE

Criterion 9 will be addressed in the Responsiveness Summary following public comment on the Proposed Plan.

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# Section 8

# 8

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# Tables

**TABLE 1**

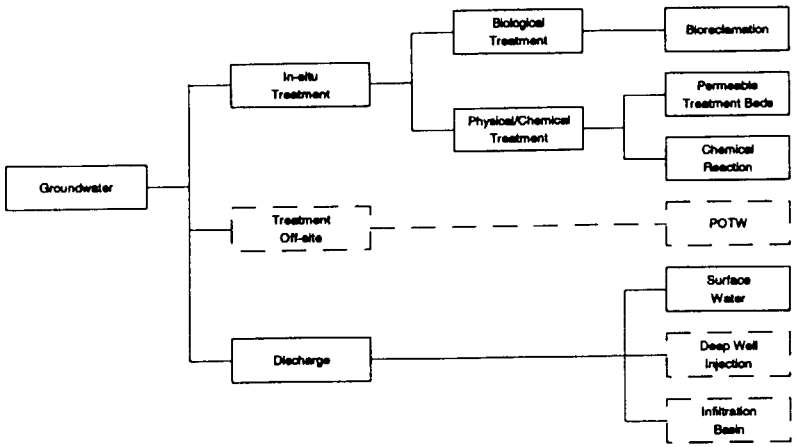
**Identification and Screening of Remedial Technologies and Process Options**
**Blackwell Landfill NPL Site**
**Feasibility Study**
**DuPage County, Illinois**

| Media | General Response Action | Remedial Technology | Process Option | Description | Applicability |
|---|---|---|---|---|---|
| Groundwater | No Action | | None | No action. | NCP requires no action to be carried through to detailed analysis of alternatives. |
| | Groundwater Use Restrictions | | Deed Restrictions | All deeds for property within potentially contaminated areas would include restrictions on property use. | Forest preserve. Deed restrictions not necessary. |
| | | | Well Closure | Closure of drinking water wells and replacement as necessary within the affected area of influence. | Wells not currently present. |
| | | | Zoning Restrictions | Zoning restrictions would be established by local agencies for the groundwater pathway. | Forest preserve. Zoning restrictions not necessary. |
| | Monitoring | | Monitoring | Long-term monitoring of site conditions and contaminant levels. | Currently in place. |
| | Gradient Controls | Vertical Barriers | Slurry Wall | Trench is excavated while filled with a bentonite water slurry. Trench is backfilled with a soil-bentonite or cement-bentonite mix. | Groundwater isolation not applicable. Flow is too great. |
| | | | Grout Curtain | Pressure injection of grout in a regular overlapping pattern of drilled holes. | Groundwater isolation not applicable. Flow is too great. |
| | | | Sheet Piles | Driven steel sheet piling. | Groundwater isolation not applicable. Flow is too great. |
| | | | Vibrating Beam Wall | Vibratory force used to advance steel beam into ground and injection of relatively thin wall of cement or bentonite as beam is withdrawn. | Groundwater isolation not applicable. Flow is too great. |
| | | | Soil Dam | In-situ placement of low permeability soil fill to cut off groundwater flow. | Groundwater isolation not applicable. Flow is too great. |
| | | Horizontal Barriers | Grout Injection | Pressure injection of grout through closely spaced drilled holes. | Groundwater isolation not applicable. Flow is too great. |
| | | Extraction and/or Recharge | Trenches | Trenches used to intercept migration of contaminated groundwater to receptors. | Groundwater interception is not applicable. Flow is too great. |
| | | | Drains | System of perforated pipe laid in trenches and backfilled with permeable media to intercept and collect contaminated groundwater. | Groundwater interception is not applicable. Flow is too great. |
| | | | Extraction Wells | Wells installed to intercept contaminated groundwater and prevent migration to receptors. | Potentially applicable. |
| | | | Injection Wells | Wells installed to inject uncontaminated water and limit contaminant migration. | Groundwater isolation not applicable. Flow is too great. |

LEGEND
Not Carried Forward

**TABLE 1**

**Identification and Screening of Remedial Technologies and Process Options**
**Blackwell Landfill NPL Site**
**Feasibility Study**
**DuPage County, Illinois**




| Media | General Response Action | Remedial Technology | Process Option | Description | Applicability |
|---|---|---|---|---|---|
| Groundwater | In-situ Treatment | Biological Treatment | Bioreclamation | System of injection and extraction wells used to inject aerated water possibly seeded with bacteria and/or nutrients to biodegrade contaminants. | Potentially applicable. |
| | | Physical/Chemical Treatment | Permeable Treatment Beds | Trenches downgradient of site backfilled with activated carbon, lime, or ion exchange resins to remove contaminants as groundwater passes through. | Potentially applicable. |
| | | | Chemical Reaction | System of injection wells used to inject oxidizers such as ozone, permanganate, or hydrogen peroxide for degradation of organics. | Potentially applicable. |
| | Treatment Off-site | | POTW | Transport groundwater to POTW for treatment. | POTW trunk line not available. |
| | Discharge | | Surface Water | Discharge treated groundwater to local surface water. | Potentially applicable. |
| | | | Deep Well Injection | Discharge groundwater to an on-site/off-site regulated deep well injection system. | Not generally accepted by regulatory authorities. |
| | | | Infiltration Basin | Discharge allowed to infiltrate into soil through a basin. | Groundwater isolation not applicable. Flow is too great. |

LEGEND

Not Carried Forward

**TABLE 1**

**Identification and Screening of Remedial Technologies and Process Options**
**Blackwell Landfill NPL Site**
**Feasibility Study**
**DuPage County, Illinois**

| Media | General Response Action | Remedial Technology | Process Option | Description | Applicability |
|---|---|---|---|---|---|
| Leachate | No Action | No Action | None | No action. | NCP requires no action to be carried through to detailed analysis of alternatives. |
| | Monitoring | Monitoring | Monitoring | Long-term monitoring of site conditions and contamination levels. | Potentially viable. |
| | Leachate Reduction | Vertical Barriers | Slurry Wall | Trench is excavated while filled with a bentonite water slurry. Trench is backfilled with a soil-bentonite or cement-bentonite mix. | Minimal horizontal movement of leachate. |
| | | | Grout Curtain | Pressure injection of grout in a regular overlapping pattern of drilled holes. | Minimal horizontal movement of leachate. |
| | | | Sheet Piles | Driven steel sheet piling. | Minimal horizontal movement of leachate. |
| | | | Vibrating Beam Wall | Vibratory force used to advance steel beam into ground and injection of relatively thin wall of cement or bentonite as beam is withdrawn. | Minimal horizontal movement of leachate. |
| | | Horizontal Barriers | Grout Injection | Pressure injection of grout through closely spaced drilled holes. | Potentially viable. |
| | | Groundwater Diversion | Trenches | Trenches used to divert groundwater around the landfill. | Aquifer originates beneath the landfill. |
| | | | Drains | System of perforated pipe laid in trenches and backfilled with permeable media to divert groundwater around the landfill. | Aquifer originates beneath the landfill. |
| | | Extraction | Extraction Wells | Wells installed to intercept contaminated leachate and prevent migration to groundwater. | Potentially viable. |
| | | Cap | Pavement | Application of a layer of asphalt or asphaltic concrete. | Potentially viable. |
| | | | Clay Cap Repair (35 IAC 807) | Fill depressions with compacted clay. | Potentially viable. |
| | | | 35 IAC 811 Cap | Compacted clay covered with a synthetic membrane followed by a layer of topsoil to provide erosion and moisture control. | Potentially viable. |
| | | | RCRA Subtitle C Cap | Compacted clay covered with a synthetic membrane followed by a drainage/filter layer and topsoil to provide erosion and moisture control. | Potentially viable. |
| | | Surface Stabilization | Grading | Mechanically reshape site grades to manage surface water. | Potentially viable. |
| | | | Vegetation | Establish vegetative cover to stabilize surface soils. | Potentially viable. |

LEGEND
Not carried forward

**TABLE 1**

**Identification and Screening of Remedial Technologies and Process Options**
**Blackwell Landfill NPL Site**
**Feasibility Study**
**DuPage County, Illinois**

| Media | General Response Action | Remedial Technology | Process Option | Description | Applicability |
|---|---|---|---|---|---|
| Leachate | Direct Treatment Onsite | Biological Treatment | Aerobic | Use microorganisms in an aerobic environment to degrade organics. | Potentially viable. |
| | | | Anaerobic | Use microorganisms in an anaerobic environment to degrade organics. | Potentially viable. |
| | | Chemical Treatment | Precipitation | Alteration of chemical equilibrium to reduce solubility of the inorganic chemical constituents. | Potentially viable. |
| | | | Oxidation | Chemical oxidation of leachate contaminants using an oxidizing agent such as peroxide hypochlorite, chlorine gas, or ozone. | Potentially viable. |
| | | | Photolysis | Photodegradation of contaminants using UV radiation or addition of polar solvents. | Potentially viable. |
| | | | Reduction | Reduction of chlorinated organics and hexavalent chromium. | Potentially viable for removal of organic contaminants. |
| | | Physical Treatment | Air Stripping | Contacting of large volumes of air with water in a packed column or through diffused aeration to promote transfer of VOCs to air. | Potentially viable for removal of volatile organic contaminants. |
| | | | Steam Stripping | Similar to air stripping except steam is pumped into stripping column to add heat in the volatilization of VOCs from liquid to air. | Potentially viable for removal of volatile organic contaminants. |
| | | | Carbon Adsorption | Passage of contaminated water over columns of activated carbon where contaminants adsorb onto the carbon surface. | Potentially viable for removal of organic contaminants. |
| | | | Reverse Osmosis | Use of high pressure to force clean water through a membrane leaving contaminants behind. | Potentially viable for the removal of metals. |
| | | | Ion Exchange | Contaminated water is passed through a bed of resin material where exchange of ions occurs between the bed and the water. | Potentially viable for the removal of metals. |
| | | | Spray Evaporation | Contaminated water sprayed into the air where volatile compounds are transferred from the water. Large collection ponds receive spray water. | Potentially viable for organic contaminants. |
| | | Thermal Destruction | Incineration | Thermal destruction of organic contaminants. | Not applicable due to high aqueous content of leachate.. |
| | | | Wet Air Oxidation | Oxidation of organic contaminants at elevated temperatures and pressures. | Not applicable due to high aqueous content of leachate.. |

LEGEND

Not carried forward

**TABLE 1**

**Identification and Screening of Remedial Technologies and Process Options**
**Blackwell Landfill NPL Site**
**Feasibility Study**
**DuPage County, Illinois**

| Media | General Response Action | Remedial Technology | Process Option | Description | Applicability |
|---|---|---|---|---|---|
| Leachate | Leachate Use Restrictions | Leachate Use Restrictions | Deed Restrictions | All deeds for property within landfill area would include restrictions on use of property. | Forest preserve. Deed restrictions not necessary. |
| | | Leachate Use Restrictions | Well Closure | Closure of drinking water wells and replacement as necessary within the affected area of influence. | Wells not currently present. |
| | | Leachate Use Restrictions | Zoning Restrictions | Zoning restrictions would be established by local agencies for use of the leachate. | Forest preserve. Zoning restrictions not necessary. |
| | In-Situ Treatment | Biological Treatment | Bioreclamation | System of injection and extraction wells used to inject aerated water possibly seeded with bacteria and/or nutrients to biodegrade contaminants. | Potentially viable. |
| | | Chemical Treatment | Chemical Reaction | System of injection wells used to inject oxidizers such as ozone, permanganate, or hydrogen peroxide for degradation of organics. | Potentially viable. |
| | Treatment Offsite | Treatment Offsite | Sewer Main to POTW | Discharge leachate to sewer main and convey to POTW for treatment. | Potentially viable. |
| | | | Trucking to POTW | Transport of leachate to POTW for treatment. | Potentially viable. |
| | Discharge | Discharge | Surface Water | Discharge of treated leachate to local surface water. | Potentially viable. |
| | | | Deep Well Injection | Discharge leachate to an onsite/offsite regulated deep well injection system. | Potentially viable. |
| | | | Infiltration Basin | Discharge of treated leachate allowed to infiltrate into soil through a basin. | Potentially viable. |

LEGEND

Not carried forward

**TABLE 2**

**Evaluation and Selection of Process Options (1)**
***Blackwell Landfill* NPL Site**
**Feasibility Study**
**DuPage County, Illinois**

| Media | General Response Action | Remedial Technology | Process Option | Effectiveness | Implementability | Cost |
|---|---|---|---|---|---|---|
| Groundwater | No Action | | None | Does not achieve remedial action objectives. | Not acceptable. | None. |
| | Monitoring | | Monitoring | Effective for documenting groundwater quality and collection system effectiveness. | Currently in place. | Low capital, Low O&M. |
| | Gradient Controls | Extraction and/or Recharge | Extraction Wells | Effective for the collection of contaminated groundwater and gradient control. | Readily implementable. | High capital, High O&M. |

LEGEND

Not carried forward

Notes:

1 Cost plays a limited role in the screening of process options at this stage. However, remedial technologies that are very expensive but are equally or marginally more effective than lower cost technologies are not carried forward.

2 Process options were not carried forward for the reasons listed below.
- (a) Not carried forward due to effectiveness limitations.
- (b) Not carried forward due to implementability limitations.
- (c) Not carried forward due to cost limitations.

**TABLE 2**

**Evaluation and Selection of Process Options (1)**
**Blackwell Landfill NPL Site**
**Feasibility Study**
**DuPage County, Illinois**

| Media | General Response Action | Remedial Technology | Process Option | Effectiveness | Implementability | Cost |
|---|---|---|---|---|---|---|
| Groundwater | Direct Treatment On-site | Biological Treatment | Aerobic (a) | Not effective for the removal of low level VOCs. | Readily implementable. | Moderate capital, Moderate O&M. |
| | | | Anaerobic (a) | Not effective for the removal of low level VOCs. | Readily implementable. | Moderate capital, Moderate O&M. |
| | | Chemical Treatment | Precipitation (a) | Not effective for the removal of low level VOCs. | Readily implementable. | Moderate capital, Moderate O&M. |
| | | | Oxidation (a) | Not effective for the removal of low level VOCs. | Readily implementable. | Moderate capital, Moderate O&M. |
| | | | Photolysis (a) | Not effective for the removal of low level VOCs. | Readily implementable. | Moderate capital, Moderate O&M. |
| | | | Reduction (a) | Not effective for the removal of low level VOCs. | Readily implementable. | Moderate capital, Moderate O&M. |
| | | Physical Treatment | Air Stripping | Effective for the removal of low level VOCs. | Readily implementable. | Moderate capital, Moderate O&M. |
| | | | Steam Stripping (c) | Effective for the removal of low level VOCs. | Readily implementable. | Moderate capital, High O&M. |
| | | | Carbon Adsorption (a) | Not effective due to high flow rate of groundwater requiring treatment. | Readily implementable. | Moderate capital, High O&M. |
| | | | Reverse Osmosis (a) | Not effective due to high flow rate of groundwater requiring treatment. | Readily implementable. | High capital, Moderate O&M. |
| | | | Ion Exchange (a) | Not effective for the removal of VOCs. | Readily implementable. | Moderate capital, High O&M. |
| | | | Spray Evaporation (a) | Not effective for year round treatment. | Readily implementable. | Moderate capital, Moderate O&M. |

LEGEND

Not carried forward

Notes:

1 Cost plays a limited role in the screening of process options at this stage. However, remedial technologies that are very expensive but are equally or marginally more effective than lower cost technologies are not carried forward.

2 Process options were not carried forward for the reasons listed below.
- (a) Not carried forward due to effectiveness limitations.
- (b) Not carried forward due to implementability limitations.
- (c) Not carried forward due to cost limitations.

**TABLE 2**

**Evaluation and Selection of Process Options (1)**
**Blackwell Landfill NPL Site**
**Feasibility Study**
***DuPage County, Illinois***

| Media | General Response Action | Remedial Technology | Process Option | Effectiveness | Implementability | Cost |
|---|---|---|---|---|---|---|
| Groundwater | In-situ Treatment | Biological Treatment | Bioreclamation (a) | Uncertain effectiveness. Pilot study would be required to determine effectiveness. | Readily implementable. | Moderate capital, Moderate O&M. |
| | | Physical/Chemical Treatment | Permeable Treatment Beds (a) | Uncertain effectiveness. Pilot study would be required to determine effectiveness. | Readily implementable. | High capital, Moderate O&M. |
| | | | Chemical Reaction (a) | Uncertain effectiveness. Pilot study would be required to determine effectiveness. | Readily implementable. | High capital, Moderate O&M. |
| | Discharge | | Surface Water | Effective for the discharge of treated groundwater. | Readily implementable. | Moderate capital, Moderate O&M. |

LEGEND

Not carried forward

Notes:

1 Cost plays a limited role in the screening of process options at this stage. However, remedial technologies that are very expensive but are equally or marginally more effective than lower cost technologies are not carried forward.

2 Process options were not carried forward for the reasons listed below.
- (a) Not carried forward due to effectiveness limitations.
- (b) Not carried forward due to implementability limitations.
- (c) Not carried forward due to cost limitations.

**TABLE 2**

**Evaluation and Selection of Process Options (1)**
**Blackwell Landfill NPL Site**
**Feasibility Study**
**DuPage County, Illinois**

| Media | General Response Action | Remedial Technology | Process Option | Effectiveness | Implementability | Cost |
|---|---|---|---|---|---|---|
| Leachate | No Action | No Action | None | Does not meet remedial action objectives. | Readily implementable. | Low capital, Low O&M. |
| | Monitoring | Monitoring | Monitoring | Effective for documenting leachate levels and contaminant concentrations. | Readily implementable. | None. |
| | Leachate Reduction | Horizontal Barriers | Grout Injection (b) | Effective means of controlling leachate infiltration to groundwater. | Difficult to implement. Requires accurate placement of grout. | High capital, Low O&M. |
| | | Extraction | Extraction Wells | Effective means of controlling leachate infiltration to groundwater. | Readily implementable. | Moderate capital, Moderate O&M. |
| | | Cap | Pavement (b,c) | Effective for reducing infiltration. | Difficult to implement over 40 acres and steep slopes. | Moderate capital, Low O&M. |
| | | | Clay Cap Repair (35 IAC 807) | Effective for reducing infiltration. | Readily implementable. May require imported clay. | Low capital, Low O&M. |
| | | | 35 IAC 811 Cap | Effective for promoting runoff and minimizing infiltration. | Readily implementable. Will require imported clay. | Moderate capital, Low O&M. |
| | | | RCRA Subtitle C Cap (c) | Effective for promoting runoff and minimizing infiltration. | Readily implementable. Will require imported clay. | High capital, Low O&M. |
| | | Surface Stabilization | Grading | Effective for minimizing infiltration. | Readily implementable. May require imported soils. | Low Capital, Low O&M. |
| | | | Vegetation | Effective for minimizing infiltration. | Readily implementable. May require imported soils. | Low Capital, Low O&M. |

LEGEND

Not carried forward

Notes:

1. Cost plays a limited role in the screening of process options at this stage. However, remedial technologies that are very expensive but are equally or only marginally more effective than much lower cost technologies are not carried forward.
2. Process options were not carried forward for the reasons listed below.

(a) Not carried forward due to effectiveness limitations.
(b) Not carried forward due to implementability limitations.
(c) Not carried forward due to cost limitations.

**TABLE 2**

**Evaluation and Selection of Process Options (1)**
**Blackwell Landfill NPL Site**
**Feasibility Study**
**DuPage County, Illinois**

| Media | General Response Action | Remedial Technology | Process Option | Effectiveness | Implementability | Cost |
|---|---|---|---|---|---|---|
| Leachate | Direct Treatment Onsite | Biological Treatment | Aerobic (a,c) | Effective for the removal of organics from leachate. Requires high sustainable leachate yields to be cost effective. | Readily implementable. | Moderate capital, Moderate O&M. |
| | | | Anaerobic (a,c) | Effective for the removal of organics from leachate. Requires high sustainable leachate yields to be cost effective. | Readily implementable. | Moderate capital, Moderate O&M. |
| | | Chemical Treatment | Precipitation (a,c) | Effective for the removal of organics from leachate. Requires high sustainable leachate yields to be cost effective. | Readily implementable. | High capital, Moderate O&M. |
| | | | Oxidation (a) | Not effective for the removal of organics from leachate. Requires low turbidity, color and dissolved inorganics. | Readily implementable. | High capital, Moderate O&M. |
| | | | Photolysis (a) | Not effective for the removal of organics from leachate. Requires low turbidity, color and dissolved inorganics. | Readily implementable. | High capital, Moderate O&M. |
| | | | Reduction (a) | Effective only for the reduction of chlorinated organics and hexavalent chromium. | Readily implementable. | High capital, Moderate O&M. |
| | | Physical Treatment | Air Stripping (a) | Not effective since SVOCs would have to be removed and SVOC removal technology typically removes VOCs. | Readily implementable. | High capital, Low O&M. |
| | | | Steam Stripping (a) | Not effective since SVOCs would have to be removed and SVOC removal technology typically removes VOCs. | Readily implementable. | High capital, Moderate O&M. |
| | | | Carbon Adsorption (c) | Effective for the removal of organics from leachate. | Readily implementable. | High capital, High O&M. |
| | | | Reverse Osmosis (a) | Not effective for the removal of metals from leachate due to high suspended solids. | Readily implementable. | High capital, Low O&M. |
| | | | Ion Exchange (a) | Not effective for the removal of metals from leachate due to high suspended solids. | Readily implementable. | High capital, High O&M. |
| | | | Spray Evaporation (a,b) | Not effective since SVOCs would have to be removed first and SVOC removal technology typically removes VOCs. Not effective for year round operations. | Not readily implementable due to permit constraints. | High capital, Low O&M. |

LEGEND

Not carried forward

Notes:

1. Cost plays a limited role in the screening of process options at this stage. However, remedial technologies that are very expensive but are equally or only marginally more effective than much lower cost technologies are not carried forward.
2. Process options were not carried forward for the reasons listed below.

(a) Not carried forward due to effectiveness limitations.
(b) Not carried forward due to implementability limitations.
(c) Not carried forward due to cost limitations.

**TABLE 2**

**Evaluation and Selection of Process Options (1)**
**Blackwell Landfill NPL Site**
**Feasibility Study**
**DuPage County, Illinois**

| Media | General Response Action | Remedial Technology | Process Option | Effectiveness | Implementability | Cost |
|---|---|---|---|---|---|---|
| Leachate | In-Situ Treatment | Biological Treatment | Bioreclamation (a,b) | Uncertain effectiveness. Requires simultaneous contact of bacteria, nutrients and organic contaminants. | Difficult to implement. Requires accurate placement of injection wells, bacteria and nutrients. | High capital, Moderate O&M. |
| | | Chemical Treatment | Chemical Reaction (a,b) | Uncertain effectiveness for organic contaminant removal. | Difficult to implement. Requires accurate placement of injection wells. | High capital, Low O&M. |
| | Treatment Offsite | Treatment Offsite | Sewer Main to POTW (b) | Effective for the removal of contaminants from leachate if flow rate is low. | Implementation difficult. Long pumping distance to POTW and no existing sewer main. | High capital, Moderate O&M. |
| | | | Trucking | Effective for removing leachate from site if flow rate is low. | Readily implementable. | Low capital, High O&M. |
| | Discharge | Discharge | Surface Water (b) | Effective means of discharging treated leachate. | Cannot be implemented without pretreatment. | Moderate capital, Low O&M. |
| | | | Deep Well Injection (b) | Effective means of discharging leachate. | Difficult to implement due to permitting considerations. May require pretreatment. | High capital, Moderate O&M. |
| | | | Infiltration Basin (c) | Effective means of discharging leachate. | Readily implementable. Requires permit and pretreatment. | High capital, Moderate O&M. |

LEGEND

Not carried forward

Notes:

1. Cost plays a limited role in the screening of process options at this stage. However, remedial technologies that are very expensive but are equally or only marginally more effective than much lower cost technologies are not carried forward.
2. Process options were not carried forward for the reasons listed below.

(a) Not carried forward due to effectiveness limitations.
(b) Not carried forward due to implementability limitations.
(c) Not carried forward due to cost limitations.

**TABLE 3**

**Summary of Remedial Technologies Retained for Groundwater**
**Blackwell Landfill NPL Site - Feasibility Study**
**DuPage County, Illinois**

| General Response Action | Remedial Technology | Action | Comments |
|---|---|---|---|
| No Action | No Action | Retained | Required by NCP. |
| Monitoring | Monitoring | Retained | Monitoring of the groundwater is a method to document groundwater quality and treatment system effectiveness. |
| Use Restrictions | Use Restrictions | Eliminated | The landfill is located in the Blackwell Forest Preserve. The Forest Preserve District lacks the power to sell land to a private party. |
| Gradient Controls | Vertical Barriers | Eliminated | Groundwater contamination is remaining generally stationary, making physical barriers to groundwater flow unnecessary. |
| | Horizontal Barriers | Eliminated | Pressure injection of grout is not applicable because groundwater contamination is relatively diffuse and low in concentration. |
| | Extraction and/or Recharge | Retained | Extraction may be applicable for removal of contaminated groundwater. Diversion of upgradient groundwater and/or collection of downgradient groundwater through trenches or drains are not applicable due to high natural permeability of outwash aquifer ($10^{-2}$ cm/sec). Injection would not be applicable for control of contaminant migration since the groundwater contamination appears generally stationary. |
| Treatment On Site | Thermal Destruction | Eliminated | Incineration and wet air oxidation are not applicable for the destruction of organic contaminants in groundwater due to the low contaminant concentration. |
| In-Situ Treatment | Biological Treatment | Retained | Biological treatment of the groundwater using bioreclamation is potentially applicable. |
| | Physical/Chemical Treatment | Retained | Chemical injection of oxidizers for degradation of organic contaminants is potentially viable. Permeable treatment beds placed in trenches located downgradient of the landfill are not applicable since groundwater contaminants are generally stationary. |

**TABLE 3 (continued)**
**Summary of Remedial Technologies Retained for Groundwater**
**Blackwell Landfill NPL Site - Feasibility Study**
**DuPage County, Illinois**

| General Response Action | Remedial Technology | Action | Comments |
|---|---|---|---|
| Treatment On Site | Biological Treatment | Retained | Aerobic and anaerobic degradation of organic contaminants are potentially applicable for the treatment of groundwater. |
| | Chemical Treatment | Retained | Precipitation is potentially applicable as a pretreatment process. Oxidation and photolysis are potentially applicable treatment alternatives. Reduction of chlorinated organics is also potentially applicable. |
| | Physical Treatment | Retained | Air stripping, stream stripping, and spray evaporation are applicable for the removal of VOCs from the groundwater. Carbon adsorption is applicable for the removal of the VOCs and SVOCs in the groundwater. Reverse osmosis and ion exchange are generally not applicable for the removal of the organic constituents present in the groundwater. |
| Treatment Off Site | POTW | Eliminated | Treatment or discharge of extracted groundwater at a local POTW is not applicable because a trunk line to a local POTW is not available in the area. |
| Discharge | Discharge | Retained | Discharge of treated groundwater to surface water, an infiltration basin or through deep well injection system is potentially applicable. Each of these methods would require permitting. |

FS-TBL-1.DOC/KES/PJV

**TABLE 4**
**Summary of Remedial Technologies Retained for Leachate**
**Blackwell Landfill NPL Site - Feasibility Study**
**DuPage County, Illinois**

| General Response Action | Remedial Technology | Action | Comments |
|---|---|---|---|
| No Action | No Action | Retained | Required by NCP. |
| Monitoring | Monitoring | Retained | Monitoring of the leachate is a method to document leachate quality and treatment system effectiveness. |
| Leachate Reduction | Vertical Barriers | Eliminated | Leachate is not migrating beyond the filled areas making barriers unnecessary. |
| | Horizontal Barriers | Retained | Pressure injection of grout potentially applicable for controlling leachate migration to groundwater. |
| | Groundwater Diversion | Eliminated | Groundwater diversion is not applicable since the outwash aquifer is not present upgradient of the landfill and groundwater naturally flows around the landfill. |
| | Extraction | Retained | Extraction of leachate from the landfill is a potentially viable remedial alternative. |
| | Capping | Retained | Capping of the landfill is a potentially viable method of reducing infiltration thereby reducing leachate generation. |
| | Surface Stabilization | Retained | Surface stabilization is a potentially viable method for promoting runoff from the landfill. |
| Direct Treatment On Site | Biological Treatment | Retained | Aerobic and anaerobic digestion is potentially viable. |
| | Chemical Treatment | Retained | Chemical treatment is potentially viable for the treatment of inorganic and organic contaminants identified in the leachate. |
| | Physical Treatment | Retained | Physical treatment is potentially viable for the removal of inorganics and organics from leachate. |
| | Thermal Destruction | Eliminated | Thermal destruction is not generally viable for the treatment of a primarily aqueous liquid. |

**TABLE 4 (CONTINUED)**
**Summary of Remedial Technologies Retained for Leachate**
**Blackwell Landfill NPL Site - Feasibility Study**
**DuPage County, Illinois**

| General Response Action | Remedial Technology | Action | Comments |
|---|---|---|---|
| Leachate Use Restrictions | Leachate Use Restrictions | Eliminated | The landfill is located in the Blackwell Forest Preserve. The Forest Preserve District lacks the power to sell the land to a private party. |
| In-Situ Treatment | Biological Treatment | Retained | Biological treatment of the leachate through bioreclamation is potentially viable. |
| | Chemical Treatment | Retained | Chemical injection of oxidizers for degradation or organic contaminants is potentially viable. |
| Treatment Off Site | Treatment Off Site | Retained | Treatment of extracted leachate at a local POTW or off-site treatment/disposal firm is potentially viable. |
| Discharge | Discharge | Retained | Discharge of treated leachate to surface water or an infiltration system is potentially viable. Each of these methods would require permitting. |

FS-TBL-2.DOC/KES/PJV

**TABLE 5**
**Summary of Process Options Retained for Groundwater**
**Blackwell Landfill NPL Site - Feasibility Study**
**DuPage County, Illinois**

| General Response Action | Remedial Technology | Process Options | Action | Comments |
|---|---|---|---|---|
| No Action | No Action | No Action | Retained | Required by NCP. |
| Monitoring | Monitoring | Monitoring | Retained | Long-term groundwater monitoring is an effective, easily implemented method of indicating whether off-site effects are likely to occur. |
| Gradient Controls | Extraction and/or Recharge | Extraction Wells | Retained | Effective for collection of contaminated groundwater and gradient control. Readily implementable. |
| Treatment On Site | Biological Treatment | Aerobic Digestion | Eliminated | Limited effectiveness for removal of low concentrations of VOCs. Readily implementable. |
| | | Anaerobic Digestion | Eliminated | Limited effectiveness for removal of low concentrations of VOCs. Readily implementable. |
| | Chemical Treatment | Precipitation | Eliminated | Limited effectiveness for removal of low concentrations of VOCs. Readily implementable. |
| | | Oxidation | Eliminated | Limited effectiveness for removal of low concentrations of VOCs. Readily implementable. |
| | | Photolysis | Eliminated | Limited effectiveness for removal of low concentrations of VOCs. Readily implementable. |
| | | Reduction | Eliminated | Limited effectiveness for removal of low concentrations of VOCs. Readily implementable. |
| | Physical Treatment | Air Stripping | Retained | Effective for removal of VOCs from groundwater. Readily implementable. |

**TABLE 5 (CONTINUED)**
**Summary of Process Options Retained for Groundwater**
**Blackwell Landfill NPL Site - Feasibility Study**
**DuPage County, Illinois**

| General Response Action | Remedial Technology | Process Options | Action | Comments |
|---|---|---|---|---|
| Treatment On Site (Continued) | Physical Treatment (Continued) | Stream Stripping | Eliminated | Stream stripping is an effective and implementable method of removing VOCs in groundwater but is not as cost effective as air stripping |
| | | Carbon Adsorption | Eliminated | Not effective for contaminant removal due to high flow rate of groundwater requiring treatment. |
| | | Reverse Osmosis | Eliminated | Not effective for contaminant removal due to high flow rate of groundwater requiring treatment. |
| | | Ion Exchange | Eliminated | Ion exchange is not effective for removal of VOCs. |
| | | Spray Evaporation | Eliminated | Not effective for contaminant removal during year around operation of the treatment system. |
| In-Situ Treatment | Biological Treatment | Bioreclamation | Eliminated | The effectiveness would be uncertain at the site. A pilot study would be required to determine if groundwater can be treated effectively. |
| | Physical/Chemical Treatment | Permeable Treatment Beds | Eliminated | The effectiveness would be uncertain at the site. A pilot study would be required to determine if groundwater can be treated effectively. |
| | | Chemical Reaction | Eliminated | The effectiveness would be uncertain at the site. A pilot study would be required to determine if groundwater can be treated effectively. |
| Discharge | | Surface Water | Retained | Surface water is an effective means of discharging treated groundwater. Readily implementable. |

**TABLE 6**
**Summary of Process Options Retained for Leachate**
**Blackwell Landfill NPL Site - Feasibility Study**
**DuPage County, Illinois**

| General Response Action | Remedial Technology | Process Options | Action | Comments |
|---|---|---|---|---|
| No Action | No Action | No Action | Retained | Required by NCP. |
| Monitoring | Monitoring | Monitoring | Retained | Effective means of documenting leachate levels and contaminant concentrations. Readily implementable. |
| Leachate Reduction | Horizontal Barriers | Grout Injection | Eliminated | Potentially effective means of controlling leachate infiltration to groundwater. Difficult to implement since successful use of this technology requires accurate placement of grout in landfill base material of elevated permeability to be effective. |
| | Extraction | Extraction Wells | Retained | Effective means of reducing the volume of leachate. Readily implementable. |
| | Capping | Pavement | Eliminated | Effective means for reducing infiltration. Difficult to implement over 40 acres and steep landfill slopes. May not be acceptable to regulatory agencies. |
| | | Cap Repair 35 IAC 807 Cap | Retained | Effective means of reducing infiltration. Readily implementable. May require the use of imported clay. |
| | | 35 IAC 811 Cap | Retained | Additional layer of clay would effectively reduce infiltration. Cap regraded to promote surface runoff. Readily implementable. May require the use of imported clay. |
| | | Hazardous Waste Type Cap (RCRA Subtitle C) | Eliminated | Not effective beyond what would be achieved through cap repair or IAC 811 cap. Readily implementable. Would require the use of imported clay. FML would not be stable on landfill slope. |

**TABLE 6 (CONTINUED)**
**Summary of Process Options Retained for Leachate**
**Blackwell Landfill NPL Site - Feasibility Study**
**DuPage County, Illinois**

| General Response Action | Remedial Technology | Process Options | Action | Comments |
|---|---|---|---|---|
| Leachate Reduction (Continued) | Capping (Continued) | Grading | Retained | Effective means of reducing ponding and infiltration into the landfill. Readily implementable. |
| | | Vegetation | Retained | Effective means of minimizing infiltration and reducing erosion. Readily implementable. |
| Treatment On Site | Biological Treatment | Aerobic Digestion | Eliminated | Effective for the removal of organic constituents from leachate. Readily implementable. Requires high sustainable leachate yields to be cost effective. Extended pilot test needed to determine sustainable yields. |
| | | Anaerobic Digestion | Eliminated | Effective for the removal of organic constituents from leachate. Readily implementable. Requires high sustainable leachate yields to be cost effective. Extended pilot test needed to determine sustainable yields. |
| | Chemical Treatment | Precipitation | Eliminated | Effective means of removing inorganic constituents and pretreating leachate. Readily implementable. Requires high sustainable leachate yields to be cost effective. Extended pilot test needed to determine sustainable yields. |
| | | Oxidation | Eliminated | Not generally effective for the treatment of leachate since technology is most effective with low turbidity, color and dissolved inorganics. Readily implementable. |
| | | Photolysis | Eliminated | Not generally effective for the treatment of leachate since technology is most effective with low turbidity, color and dissolved inorganics. Readily implementable. |

**TABLE 6 (CONTINUED)**
**Summary of Process Options Retained for Leachate**
**Blackwell Landfill NPL Site - Feasibility Study**
**DuPage County, Illinois**

| General Response Action | Remedial Technology | Process Options | Action | Comments |
|---|---|---|---|---|
| Treatment On Site (Continued) | Chemical Treatment (Continued) | Reduction | Eliminated | Treatment effectiveness limited to reduction of hexavalent chromium and chlorinated organics. Readily implementable. |
| | | Air Stripping | Eliminated | Not effective for the removal of some volatile organic constituents present in leachate. Readily implementable. |
| | | Stream Stripping | Eliminated | Effective for the removal of VOCs from leachate. However, air stripping can perform the same basic function at a lower cost. Readily implementable. |
| | | Carbon Adsorption | Eliminated | Not effective for the removal of some volatile organic constituents present in leachate. Readily implementable. |
| | | Reverse Osmosis | Eliminated | Not effective for the removal of contaminants from leachate due to pretreatment requirements. Organic contaminants present will pass through membrane due to generally low molecular weights (<200 lb/lb mole). Readily implementable. |
| | | Ion Exchange | Eliminated | Not effective for the removal of contaminants from leachate due to pretreatment requirements. Readily implementable. |
| | | Spray Evaporation | Eliminated | Not effective for removing volatile organic contaminants from leachate on year around operation. Not implementable. Regulatory agencies prefer point sources with emissions controls for treatment of liquid waste streams. |
| In-Situ Treatment | Biological Treatment | Bioreclamation | Eliminated | Uncertain effectiveness. Difficult to implement. Option requires good contact between bacteria, nutrients and contaminants. Option does not meet remedial action objective of reducing leachate level/volume. |

**TABLE 6 (CONTINUED)**
**Summary of Process Options Retained for Leachate**
**Blackwell Landfill NPL Site - Feasibility Study**
**DuPage County, Illinois**

| General Response Action | Remedial Technology | Process Options | Action | Comments |
|---|---|---|---|---|
| In-Situ Treatment (Continued) | Physical/Chemical Treatment | Chemical Reaction | Eliminated | Uncertain effectiveness. Difficult to implement. Option requires good contact between injected chemicals and contaminants. Option does not meet remedial action objective reducing leachate level/volume. |
| Treatment Off Site | Treatment Off Site | Sewer Main to POTW | Eliminated | Effective for the removal of contamination. Implementation difficult due to long pumping distance. No existing sewer main in area and POTW located upgradient of the landfill. |
| | | Trucking to POTW | Retained | Effective and implementable for the removal of leachate from the landfill if reduced flow rate is obtained from extraction wells. |
| Discharge | Discharge | Surface Water | Eliminated | Effective for discharging treatment leachate stream. Would not be implementable without leachate pretreatment. Requires NPDES permit. |
| | | Deep Well Injection | Eliminated | Effective means of discharging treated leachate. Difficult to implement due to permitting consideration. Cost prohibitive compared to surface water discharge. |
| | | Infiltration Basin | Eliminated | Effective means of discharging treated leachate. Readily implementable. Capital costs with respect to surface water make infiltration basin cost prohibitive. |

**TABLE 7**

**List of Retained Technologies and Process Options**
**Blackwell Landfill NPL Site - Feasibility Study**
**DuPage County, Illinois**

| Media of Concern | General Response Action | Remedial Technology | Process Option |
|---|---|---|---|
| Groundwater | Monitoring | Monitoring | Monitoring |
| | Gradient Controls | Extraction and/or Recharge | Extraction Wells |
| | Treatment On Site | Physical Treatment | Air Stripping |
| | Discharge | Discharge | Surface Water |
| Leachate | Monitoring | Monitoring | Monitoring |
| | Leachate Reduction | Extraction | Extraction Wells |
| | | Cap | Cap Repair (35 IAC 807) |
| | | | 35 IAC 811 Cap |
| | | Surface Stabilization | Grading |
| | | | Vegetation |
| | Treatment Off Site | Treatment Off Site | Trucking to POTW |

# TABLE 8
## Summary of Potential ARARs
## Blackwell Landfill NPL Site Feasibility Study
## DuPage County, Illinois

| ARARs | Purpose | Requirement/Applicability | Alternatives 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|---|
| **CHEMICAL SPECIFIC** | | | | | | | | |
| **Federal** | | | | | | | | |
| 1. Safe Drinking Water Act of 1974 (SDWA) - Maximum Contaminant Levels (40 CFR 141.11 - 141.16), Maximum Contaminent Level Goals (40 CFR 141.50 - 141.51), and Secondary Maximum Containment Levels (40 cfr 143.3) | National Primary Drinking Water Standards | Enforceable numerical standards for public water supplies. Site groundwater is not and will not be used for drinking water purpose | | X | X | X | X | X |
| **State** | | | | | | | | |
| 1. Illinois Emision Standards and Limitations for Stationary Sources - Illinois Administrative Code (IAC) Title 35: Environmental Protection; Subtitle B: Air Pollution; Chapter 1: Pollution Control Board; Subchapter C: Emissions Standards and Limitations for Stationary Sources; Part 215 - Organic Material Emission Standards and Limitations | Organic Material Air Emisions | Establishes limitations for air emissions of organic material from stationary sources in other than Chicago and Metro East area counties. Per Section 215.100. 35 IAC 215 does not apply for stationary sources located in DuPage County. Standards and limitations for DuPage County are set forth in 35 IAC 218. | | | | | | |
| 2. Illinois Emission Standards and Limitations for Stationary Sources - IAC Title 35 - Environmental Protection: Subtitle B: Air Pollution; Chapter 1: Pollution Control Board; Subchapter C: Emissions Standards and Limitations for Stationary Sources; Part 218 - Organic Material Emission Standards and Limitations for the Chicago Area | Organic Material Air Emissions | Establishes limitations for air emissions of organic material from stationary sources in Chicago area counties of Cook, DuPage, Kane, Lake, McHenry, and Will counties. May be applicable to air discharge from leachate treatment system and landfill gas systems at the site. | | X | X | X | X | X |

# TABLE 8

## Summary of Potential ARARs
## Blackwell Landfill NPL Site Feasibility Study
## DuPage County, Illinois

| ARARs | Purpose | Requirement/Applicability | Alternatives 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|---|
| State (Cont'd) | | | | | | | | |
| 3. Illinois Water Pollution Control Rules (IWPCR) - IAC Title 35 - Environmental Protection; Subtitle C: Water Pollution; Chapter 1: Pollution Control Board; Part 302 - Water Quality Standards; Subpart B: General Use Water Quality Standards, Sections 302.201 - 302.212 | Surface Water Quality Standards | Establishes surface water quality standards for general use waters for which there is no specific designation. Not applicable or relevant and appropriate because surface water will not be utilized for general use at the site. | | | | | | |
| 4. IWPCR -IAC Title 35 - Environmental Protection; Subtitle C: Water Pollution; Chapter 1: Pollution Control Board; Part 303 - Water Use Designations and Site Specific Water Quality Standards; Subpart B: Nonspecific Water Use Designations, Sections 303.200 - 303.204 | Water Quality Standards | Establishes underground and surface water quality standards for public and food processing use. Not applicable or relevent and appropriate because none of the alternatives involve utilizing underground or surface waters for potable supply or food processing. | | | | | | |
| 5. IWPCR -IAC Title 35 - Environmental Protection; Subtitle F: Public Water Supplies; Chapter 1: Pollution Control Board; Part 620 - Groundwater Quality | Groundwater Quality Standards | Defines groundwater quality standards appropriate to the groundwater's classification. Also provides groundwater monitoring, sampling and analyzing, and reporting requirements. Applicable to groundwater in the study area. | | X | X | X | X | X |

# TABLE 8

Summary of Potential ARARs
Blackwell Landfill NPL Site Feasibility Study
DuPage County, Illinois

| ARARs | Purpose | Requirement/Applicability | Alternatives 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|---|
| LOCATION SPECIFIC | | | | | | | | |
| Federal | | | | | | | | |
| 1. 40 CFR 6 - Clean Water Act - Section 304 | Protection of Wetlands | Agencies are required to avoid engaging in or assisting with new construction in a wetland area unless there is no practicable alternative and every attempt is made to mitigate adverse impacts. May be applicable because wetlands are located on and adjacent to potential construction areas. | | | | X | | X |
| 2. 40 CFR 6 - Protection of Floodplains | Protection of Floodplains | Establishes requirements for constructing in floodplains. Available for construction of groundwater extraction and treatment system. | | | | X | | X |
| 3. U.S. Army Corps of Engineers Permit - Activities Impacting Wetlands | Wetlands Permit | Established application requirements for a wetlands permit. May be applicable because wetlands are located on and adjacent to potential construction areas. | | | | X | | X |
| State | | | | | | | | |
| 1. Illinois Floodplains Construction Permits - Revised Statutes; Chapter 19, Paragraph 65(f) | Application for Floodplains Construction Permit | Established permit application requirements for constructing in a floodplain. Applicable for construction of groundwater extraction and treatment system. | | | | X | | X |
| County | | | | | | | | |
| 1. Dupage County Countywide Stormwater and Floodplain Ordinance | Discharge to Surface Waters | Establishes NPDES water quality criteria for discharge to Spring Brook. May be appropriate for discharge to Sand Pond. | | | | X | | X |

# TABLE 8
## Summary of Potential ARARs
## Blackwell Landfill NPL Site Feasibility Study
## DuPage County, Illinois

| ARARs | Purpose | Requirement/Applicability | Alternatives 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|---|
| LOCATION-SPECIFIC (CONT'D) | | | | | | | | |
| County (Cont'd) | | | | | | | | |
| 2. DuPage Cty Code - Chapter 36, The DuPage County Water Supply and Distribution and Wastewater Treatment Ordinance | Discharge to Sewer System | Establishes criteria for discharge of wastewater to a county POTW. Not applicable since nearest sewer connection point is one mile away and would not be utilized. | | | | | | |
| ACTION-SPECIFIC | | | | | | | | |
| Federal | | | | | | | | |
| 1. Occupational Safety and Health Act - General Industry Standards (29 CFR 1910) | General Industry Standards | Establishes general industry standards. May be applicable at the site for alternatives involving construction. | | X | X | X | X | X |
| 2. Occupational Safety and Health Act - Safety and Health Standards for Construction (29 CFR 1926) | Safety and Heath Standards for Construction | Establishes health and safety standards to be used in construction. May be applicable at the site for alternatives involving construction. | | X | X | X | X | X |
| 3. U.S. Army Corps of Engineers (33 CFR 320) - Permit Program Regulations, Permanent Discharge Structure | Discharge Structure Permits | Prescribes the statutory authorities, and general and special policies and procedures applicable to the review of applications for permits for controlling certain activities in waters or oceans of the United States. May be applicable at the site for alternatives requiring discharge to a surface water. | | | | X | | X |
| 4. Clean Air Act - National Ambient Air Quality Standards (40 CFR 50 and 60) | National Primary and Secondary Ambient Air Quality Standards | Establishes rules for implementation of regional air quality plans. EPA has not yet promulgated toxic air pollutant standards. | | | | | | |

# TABLE 8

Summary of Potential ARARs
Blackwell Landfill NPL Site Feasibility Study
DuPage County, Illinois

| ARARs | Purpose | Requirement/Applicability | Alternatives 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|---|
| ACTION SPECIFIC (CONT'D) | | | | | | | | |
| 5. National Emissions Standard for Hazardous Air Pollutants (40 CFR 61) | Organic Material Air Emissions | Verify that emissions do not exceed levels expected from sources in compliance with hazardous air pollution regulations. Not applicable to remediation projects. | | | | | | |
| 6. Guidelines Establishing Test Procedures for the Analysis of Pollutants (40 CFR 136) | Sample Preservation | Sample preservation procedures, container materials, and maximum allowable holding times are prescribed. | | X | X | X | X | X |
| 7. Federal Water Pollution Control Act (Clean Water Act) - National Pollutant Discharge Elimination System (40 CFR 122 and 126), Technology Based Effluent Limitations | NPDES Regulations | Establishes regulations for NPDES permits. May be applicable at the site for alternatives requiring discharge to a surface water. | | | | X | | X |
| 8. 40 CFR 125 Sections 301 - 317 | NPDES Criteria or Standards | Establishes criteria and standards for NPDES permits. May be applicable at the site for alternatives requiring discharge to a surface water. | | | | X | | X |
| 9. CWA - Water Quality Effluent Limitations (40 CFR 131) | Approving State Water Quality Standards | Allows for enforcement jurisdiction over discharges granted to states. May be applicable at the site for alternatives requiring discharge to a surface water. | | | | X | | X |
| 10. CWA - Effluent Guidelines and Standards: Pretreatment Standards (40 CFR 403) | Pretreatment Regulations for Discharges to a POTW | Establishes standards for discharges to POTWs. May be applicable at the site for alternatives requiring discharge of leachate to a POTW. | | X | X | X | X | X |
| 11. American Council of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) | Threshold Limit Values | Establishes safety standards for use in the construction industry. May be applicable at the site for alternatives involving construction and monitoring. | | X | X | X | X | X |

# TABLE 8

## Summary of Potential ARARs
## Blackwell Landfill NPL Site Feasibility Study
## DuPage County, Illinois

| ARARs | Purpose | Requirement/Applicability | Alternatives 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|---|
| ACTION SPECIFIC (CONT'D) | | | | | | | | |
| State | | | | | | | | |
| 1. Illinois Permits and General Air Pollution Regulations (IPGAPR) - IAC Title 35 - Environmental Protection; Subtitle B: Air Pollution; Chapter 1: Pollution Control Board; Part 201 - Subpart C: Prohibitions, Sections 201.141 - 201.151; Subpart D: Permit Applications and Review Process, Sections 201.152 - 201.165; Subpart J: Monitoring and Testing, Sections 201.281 - 201.283; Subpart K: Records and Reports, Section 201.301 - 201.302; and Subpart L: Continuous Monitoring, Sections 201.401 - 201.408 | General Air Pollution Regulations | Establishes permit, moitoring, and record keeping requirements for new air emission sources or air pollution control equipment. May be applicable for alternatives requiring leachate treatment systems and/or landfill gas systems which discharge air to the atmosphere. | | X | X | X | X | X |
| 2. IWPCR - IAC Title 35 - Environmental Protection; Subtitle C: Water Pollution; Chapter 1: Pollution Control Board; Part 304 - Effluent Standards; Subpart A - General Effluent Standards, Sections 304.101 - 304.141 | Surface Water Discharge Standards | Provides general effluent limits for discharging to a surface water. May be applicable at the site for alternatives requiring discharge to a surface water. | | | | X | | X |
| 3. Illinois Effluent Guidelines and Standards - IAC Title 35 - Environmental protection; Subtitle C: Water Pollution; Chapter 1: Pollution Control Board; Part 307 - Sewer Discharge Criteria; Subpart B -General and Specific Pretreatment Requirements, Sections 307.1101 - 307.1103 | Pretreatment Standards for Discharges to a POTW | Provides pretreatment standards for the discharge of contaminants to a POTW. Not applicable since the nearest sewer connection is over one mile away and would not be utilized. | | | | | | |

# TABLE 8
## Summary of Potential ARARs
## Blackwell Landfill NPL Site Feasibility Study
## DuPage County, Illinois

| ARARs | Purpose | Requirement/Applicability | Alternatives 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|---|
| ACTION SPECIFIC (CONT'D) | | | | | | | | |
| 4. IWPCR - IAC Title 35 - Environmental Protection; Subtitle C: Water Pollution; Chapter 1: Pollution Control Board; Part 309 - Permits; Subpart A - National Pollutant DIscharge Elimination System Permits, Sections 309.101 - 309.191 | NPDES Regulations | Provides instructions for NPDES permits for discharges into navigable waters of the state. Effluent limitations and monitoring requirements are established during the permitting process. May be applicable at the site for alternatives requiring discharge to a navigable surface water. | | | | X | | X |
| 5. Illinois Pretreatment Regulations (IPR) - IAC Title 35 - Environemntal Protection; Subtitle C: Water Pollution; Chapter 1: Pollution Control Board; Part 310 - Pretreatment Programs; Subpart B - Pretreatment Standards, Sections 310.201 - 310.233; Subpart D - Pretreatment Permits, Sections 310.400 - 310.444; and Subpart F - Reporting Requirements, Sections 310.601 - 310.634 | Pretreatment Standards, Permits, and Reporting Requirements for Discharges to a POTW | Provides pretreatment standards and instructions for pretreatment permits for all discharges to a POTW. Also outlines the reporting requirements for discharge to a POTW. Pretreatment standards for pollutants discharged to a POTW will be established by the POTW in addition to the requirements of 35 IAC 307, Subpart B. Pretreatment monitoring and reporting requirements are established during the permitting process. Pretreatment premits are required by the IEPA when the IEPA is acting as the control authority. This regulation does not apply if the POTW is the control authority. Not applicable since the nearest sewer connection is over one mile away and would not be utilized. | | | | | | |
| 6. IAC Title 35 - Environmental Protection; Subtitle C: Water Pollution; Chapter II: Environmental Protection Agency; Part 370 - Illinois Recommended Standards for Sewer Works | Sewer Standards | Provides criteria for the design and preparation of plans and specifications for sewage collection and treatment systems. Not applicable at the site since sltematives do not involve collection and treatment of sewage. | | | | | | |
| ACTION SPECIFIC (CONT'D) | | | | | | | | |

# TABLE 8
## Summary of Potential ARARs
## Blackwell Landfill NPL Site Feasibility Study
## DuPage County, Illinois

| ARARs | Purpose | Requirement/Applicability | Alternatives 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|---|
| 7. Illinois Solid and Special Waste Management Regulations (ISSWMR) - IAC Title 35 - Environmental Protection; Subtitle G: Waste Disposal; Chapter I: Pollution Control Board; Subchapter 1: Solid Waste and Special Waste Hauling; Part 807 - Solid Waste | Solid Waste Regulations | Provides requirements for permitting, design, closure and post-closure care, and financial assurance of solid waste landfills operating prior to September 18. 1990. May be applicable for alternatives involving cover repair because these regulations were in effect at the time the site was closed. | | | X | X | | |
| 8. ISSWMR - IAC Title 35 - Environmental Protection; Subtitle G: Waste Disposal; Chapter I: Pollution Control Board; Subchapter 1: Solid Waste and Special Waste Hauling; Part 811 - Standards for New Soild Waste Landfills | Standards for New Solid Waste Landfills | Establishes requirements for new landfills. May be applicable for alternatives involving RCRA Subtitle D cover upgrade. | | | | | | |
| 9. ISSWMR - IAC Title 35 - Environmental Protection; Subtitle G: Waste Disposal; Chapter I: Pollution Control Board; Subchapter 1: Solid Waste and Special Waste Hauling; Part 814 - Standards for Existing Landfills and Units | Standards for Existing Solid Waste Landfills | Establishes requirements for existing landfills not considered as new units or new landfills. Sections 814.106(a) and 814.302(a)(3) state that the requirements of 35 IAC 807 apply at this site. May be applicable for alternatives involving cover repair | | | | | X | X |

Notes:
ARAR = Applicable or Relevant and Appropriate Requirement
X = Potential ARAR for Alternative

## TABLE 9

**Summary of Cost Estimates**
**Blackwell Landfill Feasibility Study**
**DuPage County, Illinois**

| Alternative No. | Estimated Costs | | |
|---|---|---|---|
| | Initial Capital | Annual O&M | 30 yr PNW |
| 1. No Action | $0 | $0 | $0 |
| 2. Leachate Extraction and Off-Site Disposal, and Monitoring | $488,000 | $108,000 | $2,605,000 |
| 3. Leachate Extraction and Off-Site Disposal, Cap Repair, and Monitoring | $1,417,000 | $118,000 | $3,730,000 |
| 4. Leachate Extraction and Off-Site Disposal, Groundwater Extraction and Treatment, Cap Repair, and Monitoring | $2,144,000 | $201,000 | $5,953,000 |
| 5. Leachate Extraction and Off-Site Disposal, 35 IAC 811 Cap, and Monitoring | $6,953,000 | $125,000 | $9,403,000 |
| 6. Leachate Extraction and Off-Site Disposal, Groundwater Extraction and Treatment, 35 IAC 811 Cap, and Monitoring | $7,680,000 | $208,000 | $11,626,000 |

Note:

1. Present Net Worth Costs assume 30 years of operation and 3% discount rate. Not the correct rate.
2. O&M costs for Alternatives 4 and 6 are for first year of operation. Routine maintenance cost for groundwater extraction and treatment is assumed to be reduced after year one.

DLN/sls/MAL
J:3920\0014\Tables\Blackwel\sumcost.xls
6/23/95

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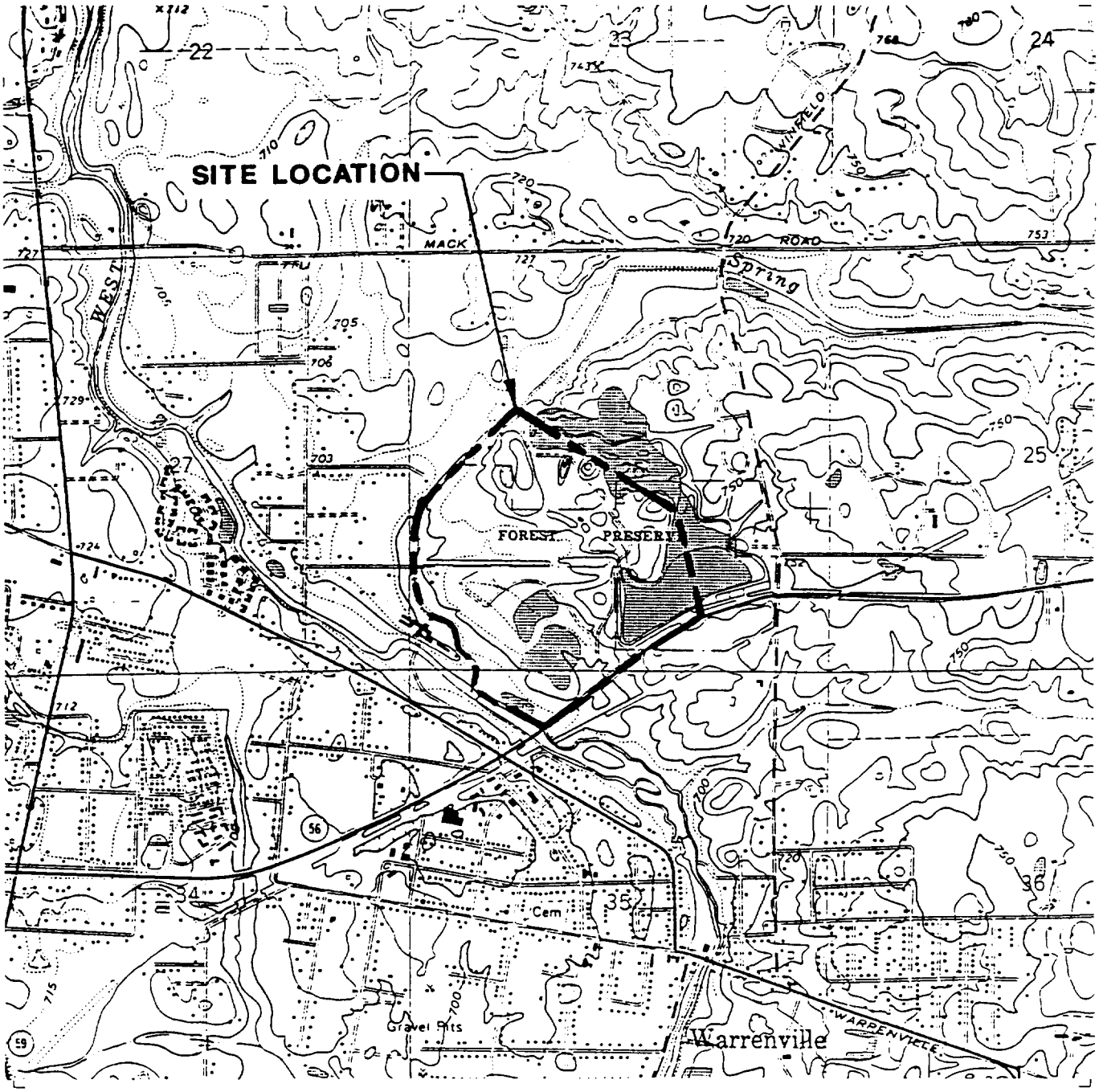



## NOTES

1. BASE MAP DEVELOPED FROM NAPERVILLE, ILLINOIS 7.5 MINUTE USGS TOPOGRAPHIC QUADRANGLE MAP DATED 1962, PHOTOREVISED 1972 AND 1980.

north

0 2000 4000

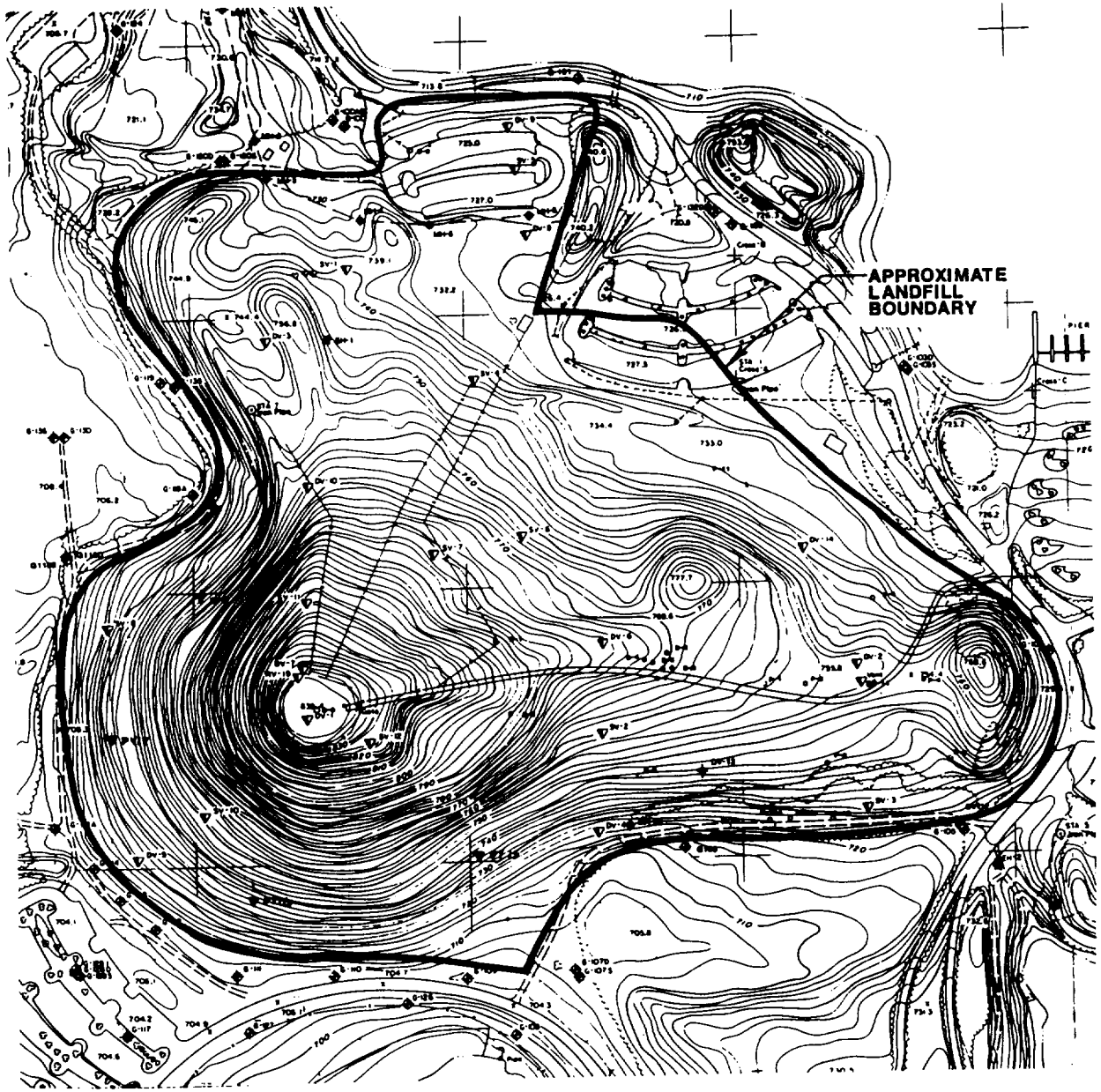
SCALE IN FEET

FIGURE 2-1

| | | |
|---|---|---|
| Developed By: JAW/DH Drawn By: ELR | SITE LOCATION MAP | Drawing Number 6072100 A12 |
| Approved By: Date: 11/19/92 | FEASIBILITY STUDY REPORT BLACKWELL LANDFILL SITE DU PAGE COUNTY, ILLINOIS | WARZYN |
| Reference: | | |
| Revisions: | | |

WARZYN INC.

QUALITY CONTROL — Graphic Standards DLL — Lead Professional DH — Technical Review JAW — Project Manager PJV — Management Review — Other




**NOTES**

1. BASE MAP DEVELOPED FROM CHICAGO AERIAL SURVEY TOPOGRAPHIC MAP OF BLACKWELL RECREATIONAL PRESERVE. AERIAL PHOTOGRAPH TAKEN ON APRIL 7, 1986.
2. CONTOUR INTERVAL = 2 FT.

north

0 200 400

SCALE IN FEET

FIGURE 2-2

Developed By: JCQ/DH Drawn By: ELR

Approved By: Date: 11-12-92

Reference:

Revisions:

SITE TOPOGRAPHIC MAP

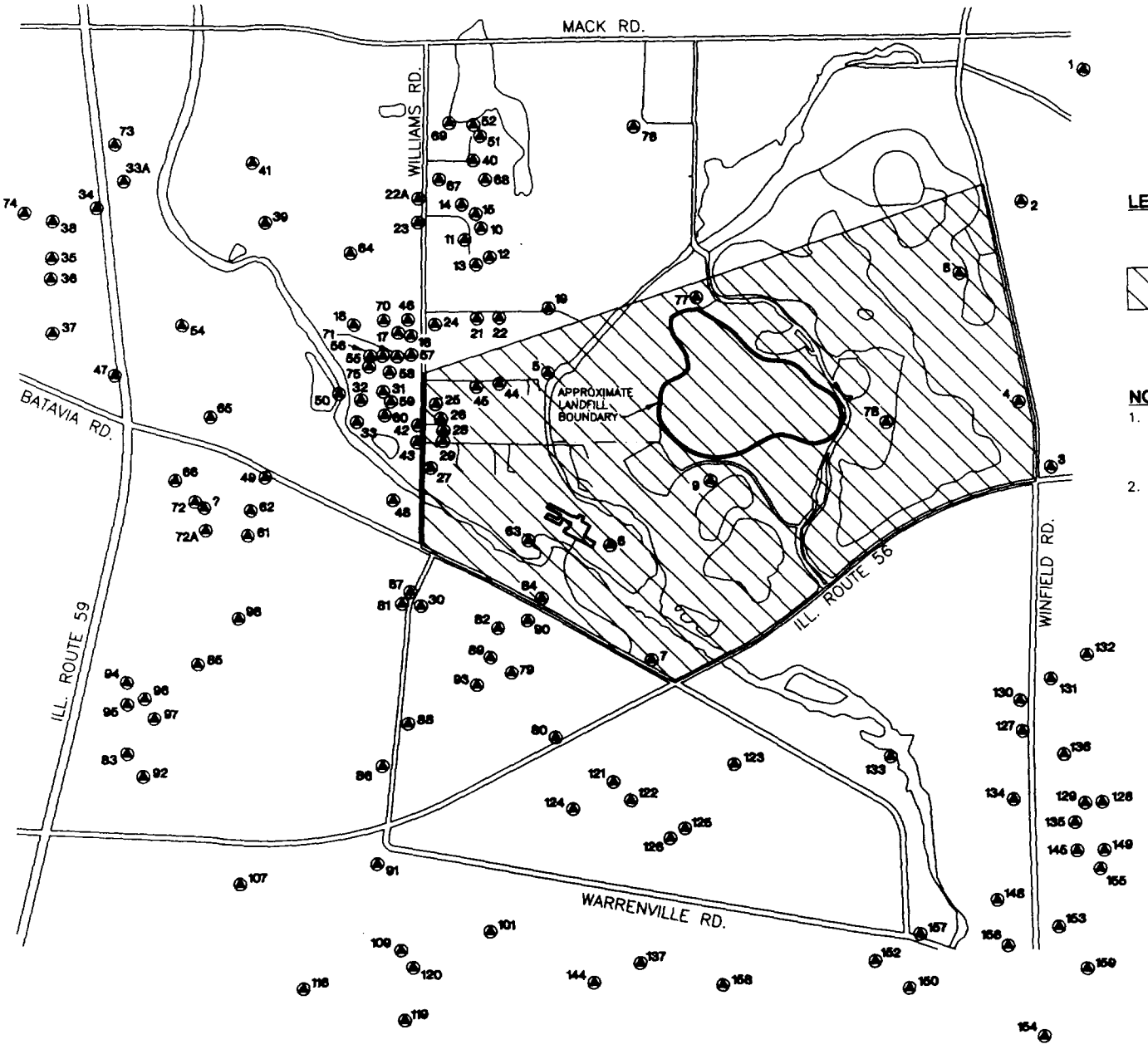
FEASIBILITY STUDY REPORT
BLACKWELL LANDFILL SITE
DU PAGE COUNTY, ILLINOIS

Drawing Number
6072100 B73

WARZYN

QUALITY CONTROL: Graphic Standards DL; Lead Professional DH; Technical Review JAW; Project Manager PJY; Management Review; Other

WARZYN INC.




**LEGEND**

PRIVATE WELL LOCATION AND NUMBER

DOOR-TO-DOOR PRIVATE WELL SURVEY AREA

**NOTES**

1. WELL LOCATIONS AND WELL INFORMATION OBTAINED FROM AVAILABLE ILLINOIS STATE WATER SURVEY LOGS.
2. PRIVATE WELLS PW53-PW57 ARE UPGRADIENT WELLS AND DO NOT FALL WITHIN THE BOUNDARIES OF THIS MAP.

north

0 1000 2000

SCALE IN FEET

FIGURE 2-3

Developed By: JCQ/DH Drawn By: ELR

Approved By: Date: 11-19-92

Reference:

Revisions

LOCATIONS OF WATER SUPPLY WELLS IN SITE VICINITY

FEASIBILITY STUDY REPORT
BLACKWELL LANDFILL SITE
DU PAGE COUNTY, ILLINOIS

Drawing Number 6072100 B74

WARZYN

QUALITY CONTROL | Graphic Standards | Lead Professional | Technical Review | Project Manager | Management Review | Other

WARZYN INC

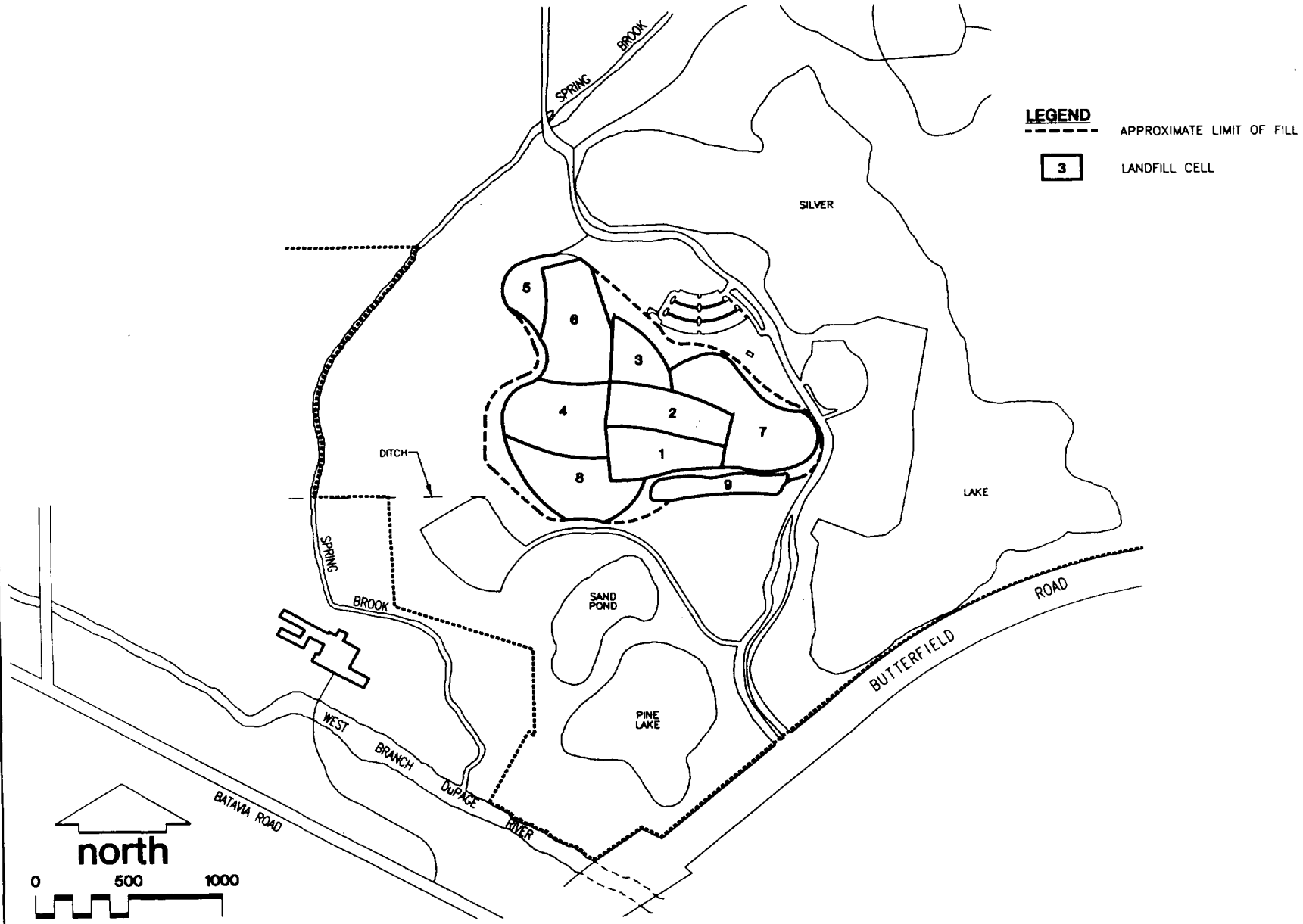



FIGURE 2-4

QUALITY CONTROL
Graphic Standards DLL
Lead Professional DH
Technical Review SAW
Project Manager PJV
Management Review
Other

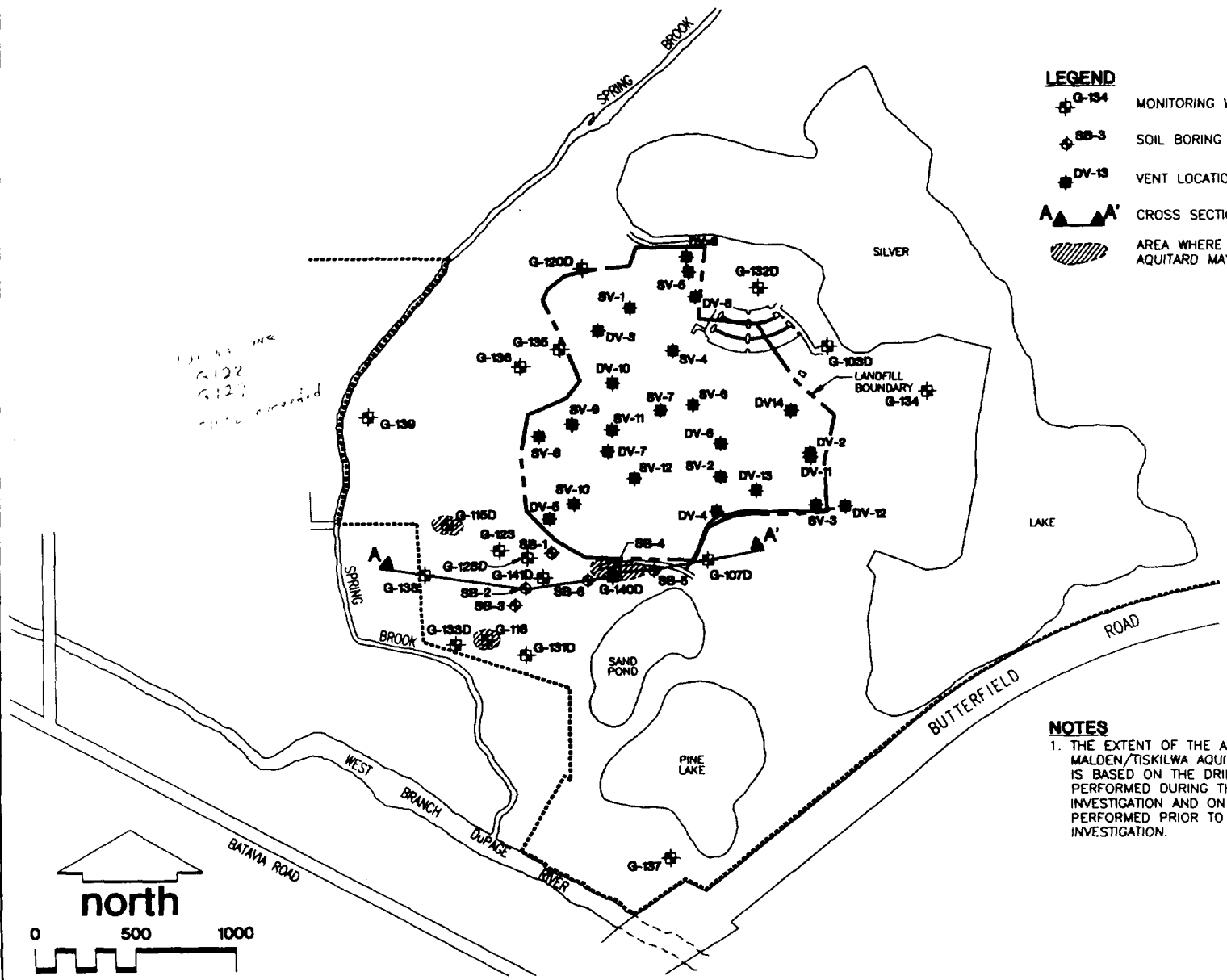
Developed By: JAW/DH
Drawn By: ELR
Approved By: Date: 11-13-92
Reference:
Revisions:

ORIGINAL CELL CONFIGURATION
FEASIBILITY STUDY REPORT
BLACKWELL LANDFILL SITE
DU PAGE COUNTY, ILLINOIS

Drawing Number
6072100 B75

WARZYN

WARZYN INC




## LEGEND

- G-134 — MONITORING WELL LOCATION AND NUMBER
- SB-3 — SOIL BORING LOCATION AND NUMBER
- DV-13 — VENT LOCATION AND NUMBER
- A ▲ ▲ A' — CROSS SECTION LOCATION
- AREA WHERE MALDEN/TISKILWA TILL AQUITARD MAY BE ABSENT

## NOTES

1. THE EXTENT OF THE AREA WHERE THE MALDEN/TISKILWA AQUITARD MAY BE ABSENT IS BASED ON THE DRILLING PROGRAM PERFORMED DURING THE REMEDIAL INVESTIGATION AND ON DRILLING ACTIVITIES PERFORMED PRIOR TO THE REMEDIAL INVESTIGATION.

FIGURE 2-5

Quality Control: Graphic Standards DLL; Lead Professional SW; Technical Review JAW; Project Manager PJV; Management Review; Other

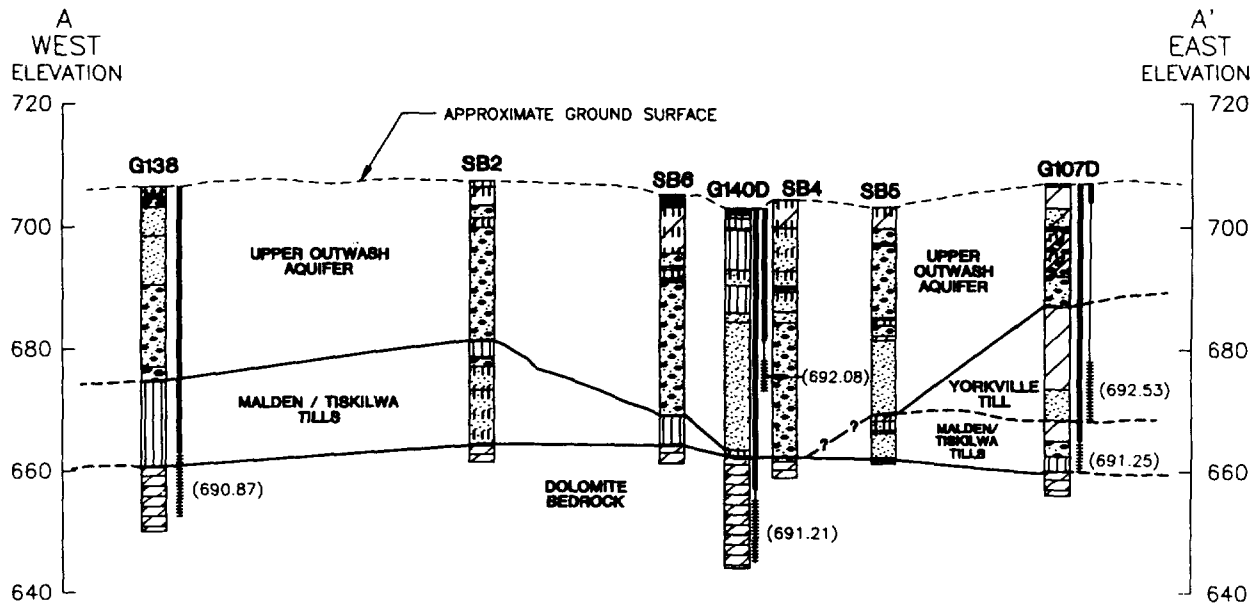
Developed By: JAW/JCQ/DRH Drawn By: ELR Date:
Approved By: Dean R Hoff
References:
Revisions:

CROSS SECTION LOCATION MAP
FEASIBILITY STUDY REPORT
BLACKWELL LANDFILL SITE
Du PAGE COUNTY, ILLINOIS

Drawing Number 6072100 B76

WARZYN

WARZYN INC



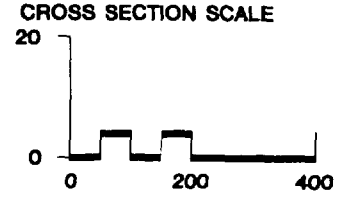

## NOTES

1. THE STRATUM LINES ARE BASED ON INTERPOLATION BETWEEN BORINGS AND MAY NOT REPRESENT ACTUAL SUBSURFACE CONDITIONS.
2. CROSS SECTION LOCATIONS ARE SHOWN ON FIGURE 2-5.
3. FOR THE PURPOSE OF ILLUSTRATING SUBSOIL CONDITIONS ON THE CROSS SECTIONS, SOME OF THE BORING LOGS HAVE BEEN SIMPLIFIED.
4. CROSS SECTIONS HAVE BEEN VERTICALLY EXAGGERATED TEN TIMES.
5. HORIZONTAL DISTANCES ARE MEASURED WITH RESPECT TO THE CENTER OF EACH SOIL BORING LOCATION.
6. ELEVATIONS ARE SHOWN IN REFERENCE TO U.S.G.S. DATUM.
7. QUESTION MARKS AND DASHED LINES AT THE CONTACTS BETWEEN SUBSOIL TYPES INDICATES THE CONTACTS ARE INFERRED.
8. THE WATER TABLE ELEVATIONS AND LEACHATE LEVELS ARE BASED ON MEASUREMENTS OBTAINED BY WARZYN INC. ON APRIL 9, 1992.

## LEGEND

- LEAN CLAY
- SILTY CLAY
- SANDY LEAN CLAY
- DOLOMITE
- FILL
- CLEAN GRAVEL
- CLAYEY GRAVEL
- SILTY GRAVEL
- SANDY GRAVEL
- SILT
- SILTY SAND
- PEAT OR ORGANIC SILT OR CLAY
- CLEAN SAND
- CLAYEY SAND
- GRAVELLY SAND
- TOPSOIL

**CROSS SECTION SCALE**




**SCALE IN FEET**

**VERTICAL EXAGGERATION: TEN TIMES**

**FIGURE 2-6**

Quality Control | Graphic Standards DLL | Lead Professional DH | Technical Review JAW | Project Manager RSV | Management Review | Other

WARZYN INC.

Developed By: JAW/JCO/DH Drawn By: ELR Date: 11-19-92

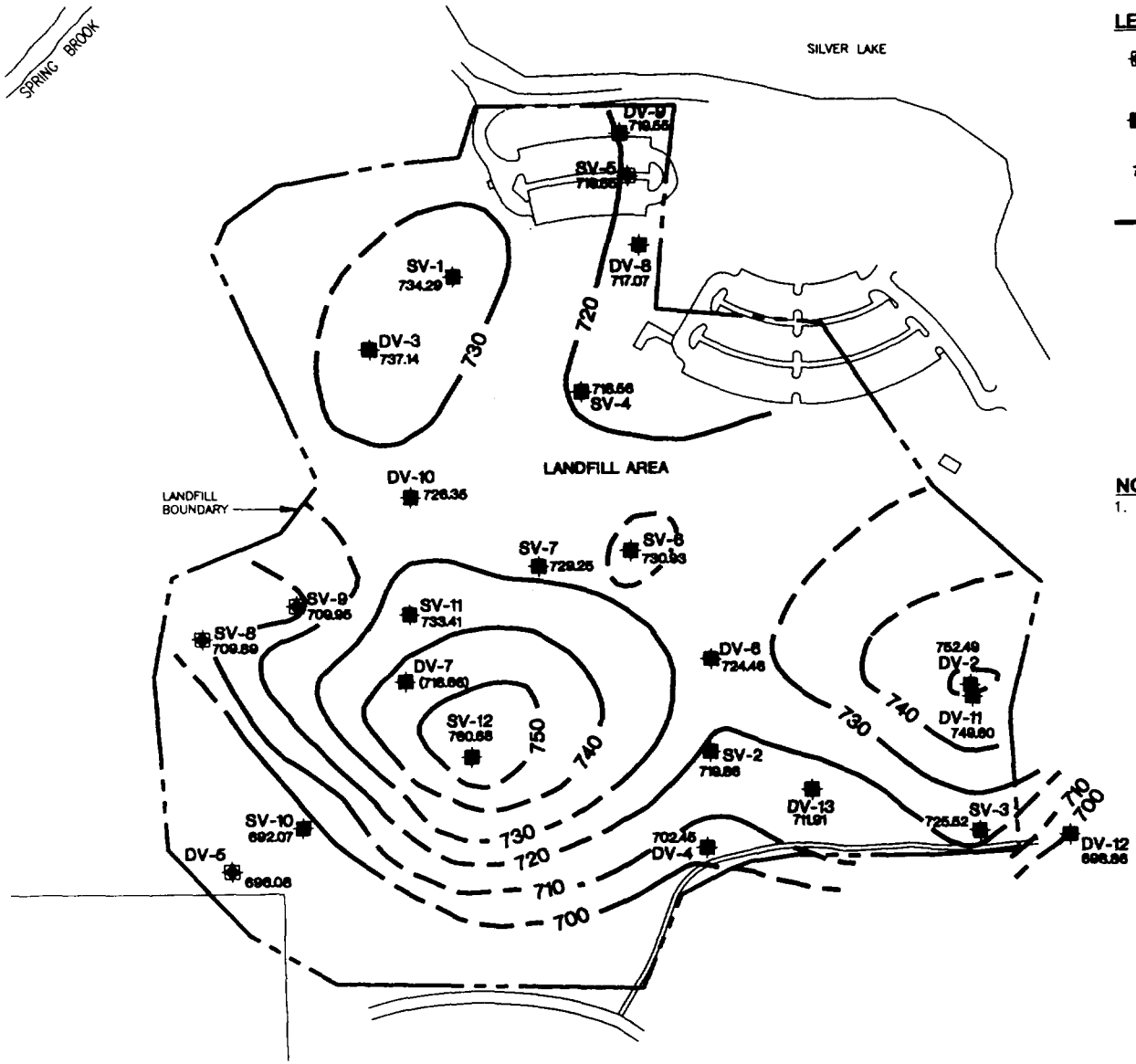
Approved By: Reference: Revisions:

CROSS SECTION A - A'

FEASIBILITY STUDY REPORT
BLACKWELL LANDFILL SITE
Du PAGE COUNTY, ILLINOIS

Drawing Number 6072100 B77

WARZYN




## LEGEND

| | |
|---|---|
| SV-5 | LEACHATE LEVEL MEASUREMENT AND SAMPLING LOCATION |
| SV-6 | LEACHATE LEVEL MEASUREMENT LOCATION |
| 749.80 | LEACHATE ELEVATION |
| —710— | LEACHATE LEVEL CONTOUR (DASHED WHERE INFERRED) |

## NOTES

1. LEACHATE ELEVATIONS NOT INCLUDED IN MAP CONSTRUCTION ARE ENCLOSED IN BRACKETS.

north

0 200 400

SCALE IN FEET

FIGURE 3-1

LEACHATE LEVEL MAP (JANUARY 2, 1992)

FEASIBILITY STUDY REPORT
BLACKWELL LANDFILL SITE
Du PAGE COUNTY, ILLINOIS

Developed By: JAW/DH
Drawn By: ELR
Approved By: DAW
Date: 11-13-92
Reference:
Revisions:

Drawing Number
6072100 B78

WARZYN

QUALITY CONTROL
Graphic Standards DLL
Lead Professional DH
Technical Review DAW
Project Manager PJV
Management Review
Other

WARZYN INC

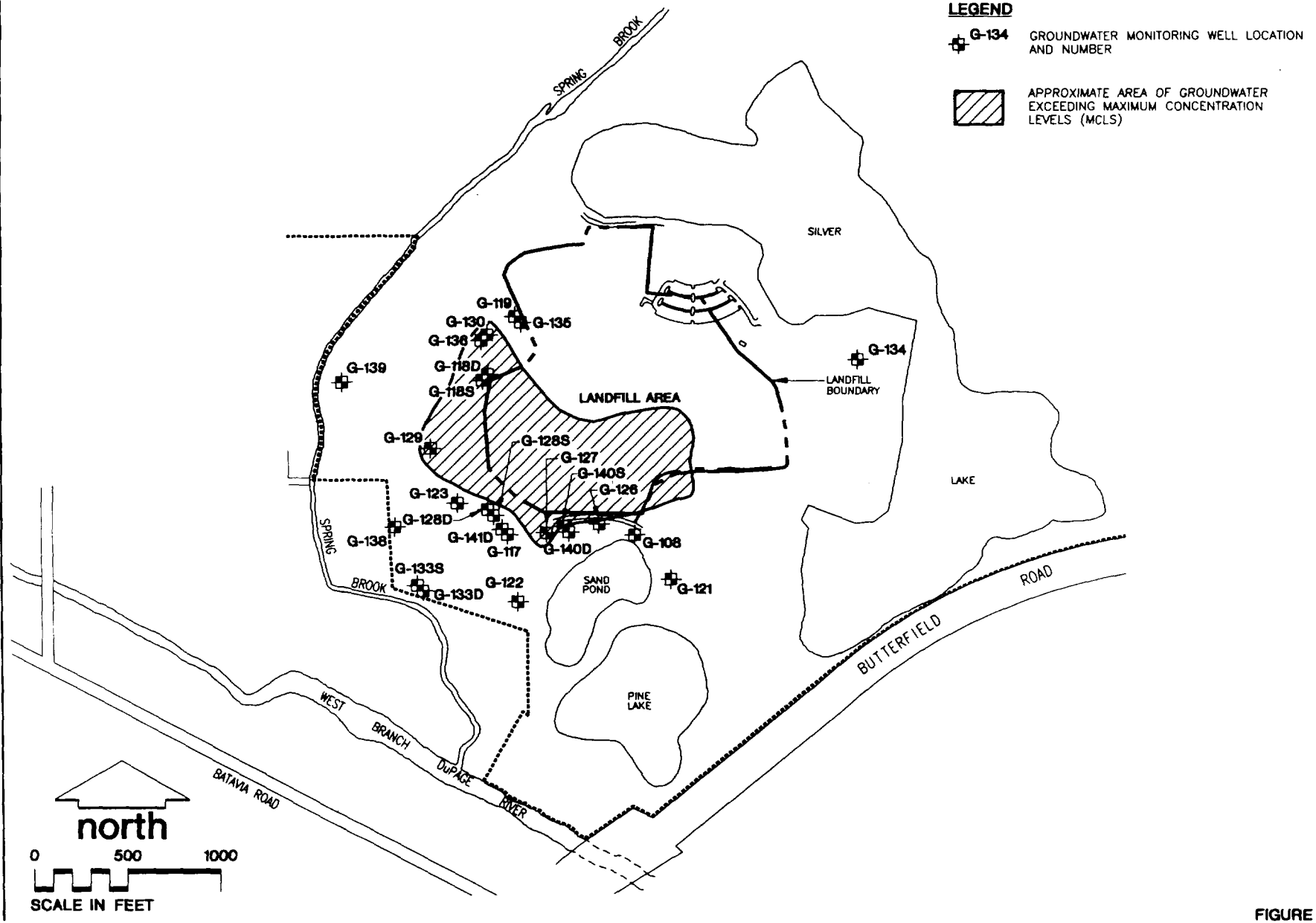



FIGURE 3-2

QUALITY CONTROL | Graphic Standards DLL | Lead Professional DH | Technical Review JAW | Project Manager PJW | Management Review | Other

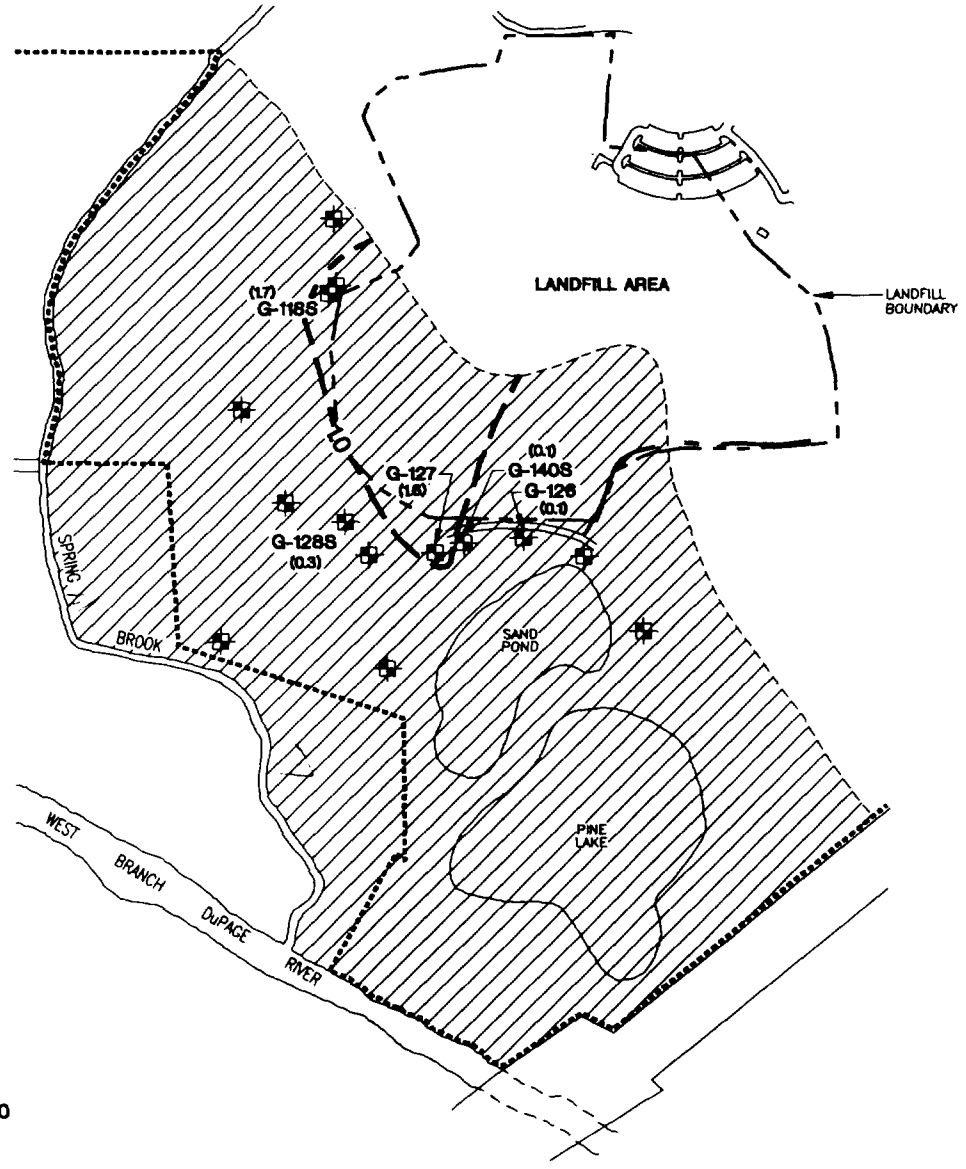
Developed By: JAW/SGW Drawn By: ELR
Approved By: Date: 11-19-92
Reference:
Revisions

APPROXIMATE AREA OF GROUNDWATER EXCEEDING MAXIMUM CONCENTRATION LEVELS (MCLS)
FEASIBILITY STUDY REPORT
BLACKWELL LANDFILL SITE
DU PAGE COUNTY, ILLINOIS

Drawing Number 6072100 B79

WARZYN

WARZYN, INC.




## LEGEND

- G-134 — GROUNDWATER MONITORING WELL LOCATION AND NUMBER
- GROUNDWATER MONITORING WELL LOCATION
- ESTIMATED ON-SITE EXTENT OF OUTWASH AQUIFER
- (1.7) — CONCENTRATION IN MONITORING WELL RELATIVE TO MCL
- —1.0— ISOCONCENTRATION CONTOUR WHERE 1,2-DCE CONCENTRATION=MCL

## NOTES

1. STRATIGRAPHIC UNITS SCREENED BY EACH WELL ARE NOTED IN TABLE 3-6 OF THE RI REPORT.
2. GROUNDWATER MONITORING WELLS WHICH WERE SAMPLED BUT CONTAINED NO DETECTABLE CONCENTRATIONS OF 1,2-DCE ARE SHOWN WITH A WELL SYMBOL ONLY.

north

0 400 800

SCALE IN FEET

FIGURE 4-1

QUALITY CONTROL | Graphic Standards: DLL | Lead Professional: JAW | Technical Review | Project Manager: PJV | Management Review | Other

WARZYN INC.

Developed By: JAW | Drawn By: ELR | Approved By: [signature] | Date: 11-19-92

Reference:

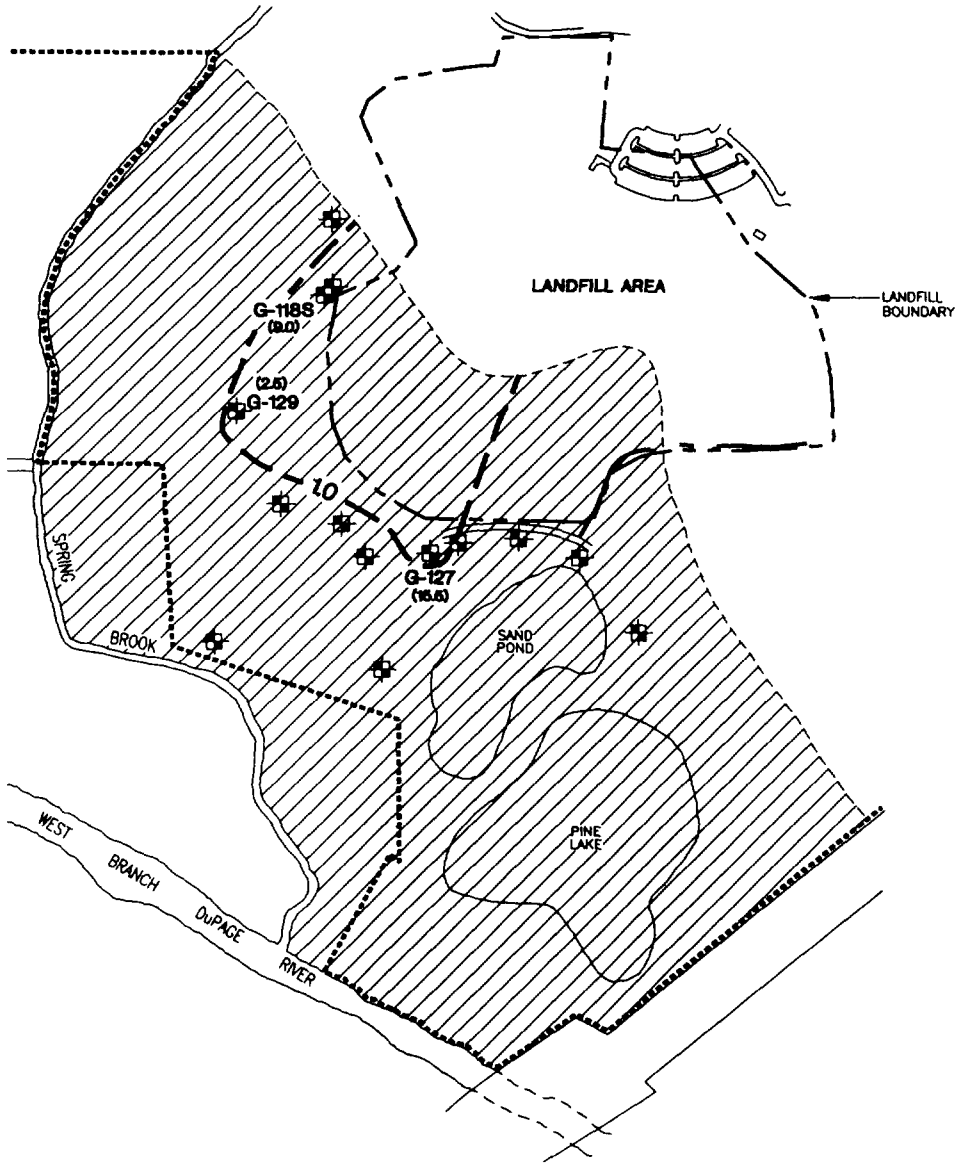
Revisions:

ESTIMATED AREA OF OUTWASH AQUIFER WHERE 1,2-DCE CONCENTRATION POTENTIALLY EXCEEDS MCL

FEASIBILITY STUDY REPORT
BLACKWELL LANDFILL SITE
DU PAGE COUNTY, ILLINOIS

Drawing Number 6072100B80

WARZYN




## LEGEND

- G-129 — GROUNDWATER MONITORING WELL LOCATION AND NUMBER
- GROUNDWATER MONITORING WELL LOCATION
- ESTIMATED ON-SITE EXTENT OF OUTWASH AQUIFER
- (9.0) — CONCENTRATION IN MONITORING WELL RELATIVE TO MCL
- —1.0— ISOCONCENTRATION CONTOUR WHERE VINYL CHLORIDE CONCENTRATION=MCL

## NOTES

1. STRATIGRAPHIC UNITS SCREENED BY EACH WELL ARE NOTED IN TABLE 3-6 OF THE RI REPORT.
2. GROUNDWATER MONITORING WELLS WHICH WERE SAMPLED BUT CONTAINED NO DETECTABLE CONCENTRATIONS OF VINYL CHLORIDE ARE SHOWN WITH A WELL SYMBOL ONLY.

north

0 400 800

SCALE IN FEET

FIGURE 4-2

QUALITY CONTROL: Graphic Standards PLL; Lead Professional JAW; Technical Review PJV; Project Manager; Management Review; Other

Developed By: JAW Drawn By: ELR Approved By: Date: 11-19-92

Reference:

Revisions

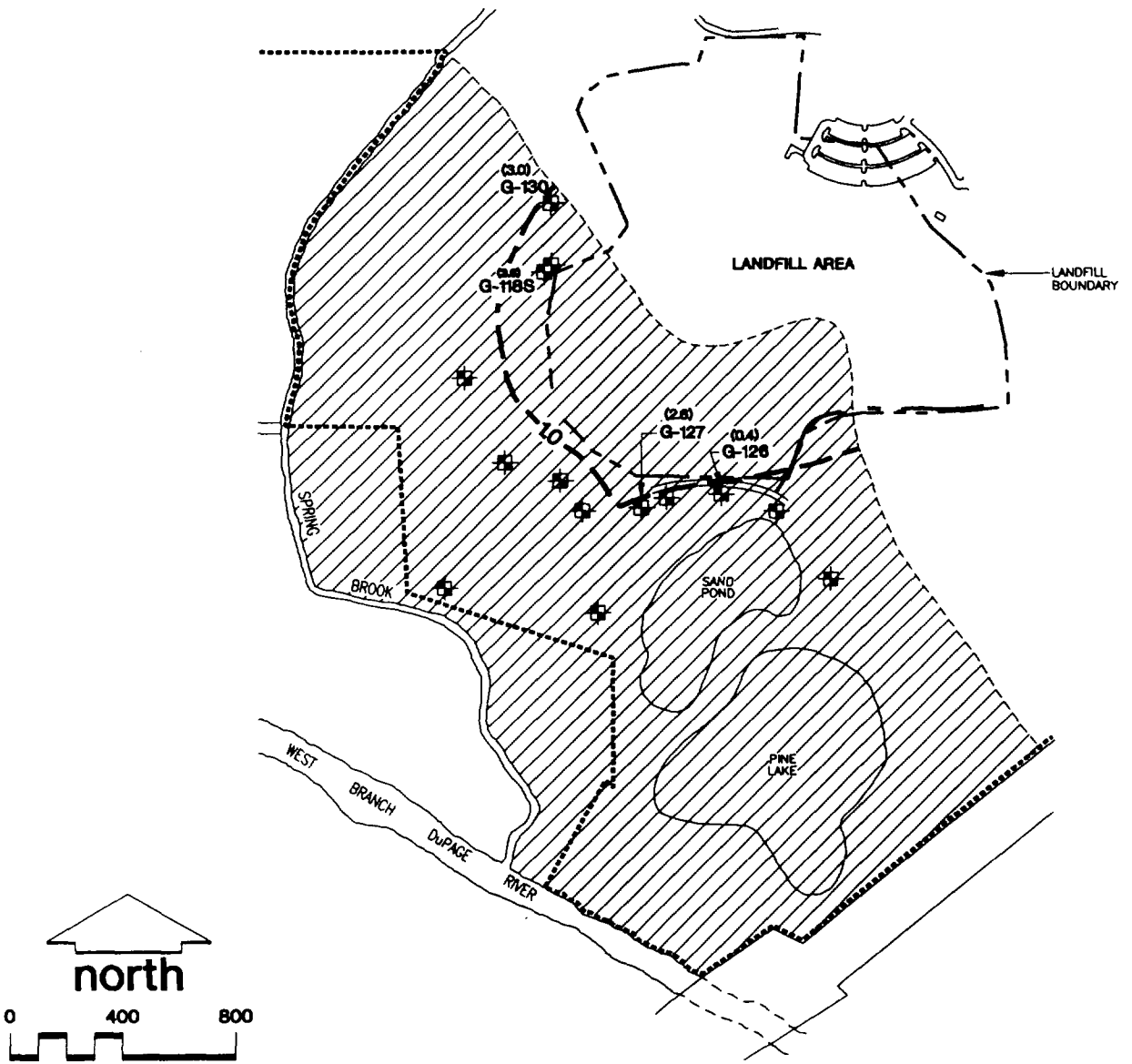
ESTIMATED AREA OF OUTWASH AQUIFER WHERE VINYL CHLORIDE CONCENTRATION POTENTIALLY EXCEEDS MCL

FEASIBILITY STUDY REPORT
BLACKWELL LANDFILL SITE
DU PAGE COUNTY, ILLINOIS

Drawing Number 6072100 B81

WARZYN

WARZYN INC.




## LEGEND

- G-127 — GROUNDWATER MONITORING WELL LOCATION AND NUMBER
- GROUNDWATER MONITORING WELL LOCATION
- ESTIMATED ON-SITE EXTENT OF OUTWASH AQUIFER
- (3.6) — CONCENTRATION IN MONITORING WELL RELATIVE TO MCL
- —1.0— ISOCONCENTRATION CONTOUR WHERE TCE CONCENTRATION=MCL

## NOTES

1. STRATIGRAPHIC UNITS SCREENED BY EACH WELL ARE NOTED IN TABLE 3-6 OF THE RI REPORT.
2. GROUNDWATER MONITORING WELLS WHICH WERE SAMPLED BUT CONTAINED NO DETECTABLE CONCENTRATIONS OF TCE ARE SHOWN WITH A WELL SYMBOL ONLY.

FIGURE 4-3

QUALITY CONTROL
Graphic Standards DLL
Lead Professional JAW
Technical Review
Project Manager PJV
Management Review
Other

Developed By: JAW
Drawn By: ELR
Approved By: Dod R Hall
Date: 11-19-92
Reference:
Revisions

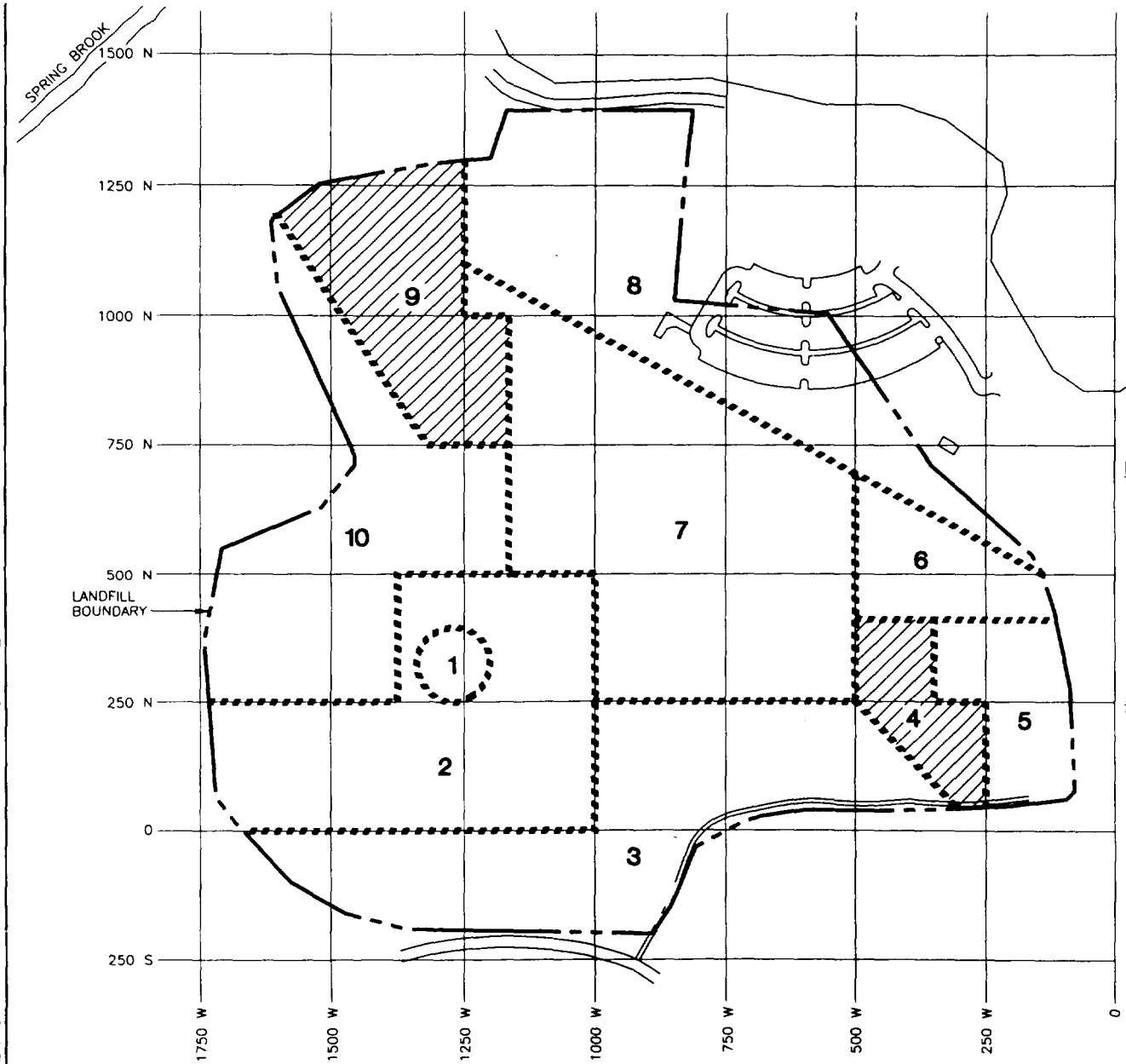
ESTIMATED AREA OF OUTWASH AQUIFER WHERE TCE CONCENTRATION POTENTIALLY EXCEEDS MCL

FEASIBILITY STUDY REPORT
BLACKWELL LANDFILL SITE
Du PAGE COUNTY, ILLINOIS

Drawing Number
6072100B82

WARZYN

WARZYN INC.




**LEGEND**

HELP MODEL EVALUATION AREA BOUNDARY

ESTIMATED AREA WITH CLAY COVER LESS THAN 2-FT. THICK

**NOTES**

1. HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE (HELP) MODELING PROGRAM(U.S.E.P.A., 1974, UPDATED 1989) EVALUATION AREAS BASED ON SOIL LOGS FROM LEACHATE VENT AND PIEZOMETER INSTALLATION AND TOPOGRAPHIC MAPS.

north

0 200 400

SCALE IN FEET

FIGURE 5-1

POTENTIAL CAP REPAIR AREAS

FEASIBILITY STUDY REPORT
BLACKWELL LANDFILL SITE
DU PAGE COUNTY, ILLINOIS

Drawing Number
6072100B83

WARZYN

Developed By: SGW
Drawn By: ELR
Approved By:
Date: 11-19-92
Reference:
Revisions

QUALITY CONTROL | Graphic Standards (and Professional) | Technical Review Project Manager | Management Review Other

WARZYN, INC.

# Appendices



MONTGOMERY WATSON

A

# A

# FOREST PRESERVE LEGAL OPINION
# BLACKWELL PRESERVE

Ray Soden
President

RECEIVED
JUN 20 1992

June 16, 1992

Warzyn Engineers
435 Devon Park Drive
Suite 702
Wayne, PA 19087

Attn: Peter J. Vagt, PH.D

RE: FOREST PRESERVE DISTRICT LEGAL OPINION
BLACKWELL PRESERVE

Dear Peter:

Attached is Legal Opinion on the sale of Forest Preserve property.

Very Truly Yours,

Richard L. Utt
Director
Government Services

Attachment

cc: R. Lance/USEPA
R. Lanham/IEPA

Forest Preserve District of DuPage County
P.O. Box 2339 • Glen Ellyn, IL 60138 • 708/790-4900 FAX 708/790-1071

Ray Soden, President Michael R.Formento, Vice-President Gary A. King, Secretary S. Patricia Trowbridge, Treasurer

Nadelhoffer, Campbell, Kuhn, Mitchell, Moss & Saloga, P.C.
Attorneys at Law

Carleton Nadelhoffer
Daniel L. Kuhn
Paul M. Mitchell
Jonathan Y. Moss
James E. Saloga
Gary E. Campbell

Alan E. Lechowicz
Robert I. Mork
John F. Argoudelis
Annette C. Kraus

June 12, 1992

Mr. Richard Utt
Forest Preserve District
of DuPage County
P.O. Box 2339
Glen Ellyn, IL 60138

Re: Sale of Blackwell to a Private Party

Dear Mr. Utt:

Pursuant to your request, I am writing to confirm the opinion that I gave during our telephone conversation of June 10, 1992, concerning the sale of District property. Specifically, you had asked whether the District can sell any portion of the Blackwell Forest Preserve to a private party. As I indicated in our conversation, the District lacks the power to sell any portion of the Blackwell Forest Preserve to a private party.

It is firmly established that units of government that do not possess home rule powers--such as the District--derive their authority solely from the legislature. Accordingly, they can exercise only the powers which have been expressly granted by statute, together with such implied powers that are necessarily incident to those expressly granted. Ill. Const. 1970, art. VII, sec. 8; Marquette Properties, Inc. v. City of Wood Dale (1987), 159 Ill. App. 3d 307, 512 N.E.2d 371, 373; Charlton v. Champaign Park District (1982), 110 Ill. App. 3d 554, 442 N.E.2d 915, 917.

The only statutory authority for selling forest preserve property to a private party is found in sections 6 and 6c of the Downstate Forest Preserve District Act, Ill. Rev. Stat. 1991, ch. 96-1/2, pars. 6309, 6311.1, neither of which has any application to the sale of a portion of the Blackwell Forest Preserve. Section 6 authorizes a forest preserve district to purchase a parcel of property and to sell a portion thereof within 30 days after the acquisition. Section 6c, on the other hand, deals with the sale of a golf course clubhouse when there are two clubhouses serving two contiguous golf courses owned by a forest preserve district.

111 East Jefferson Avenue, P.O. Box 359, Naperville, Illinois 60566-0359 (708) 355-1700
Fax: (708) 355-0458

Since the power to sell forest preserve property to a private party is limited to the two examples cited above, it is clear that the District has no authority to sell any portion of the Blackwell Forest Preserve. Such authority can only be conferred by action on the part of the legislature.

Please feel free to contact me if I can be of any further assistance in this matter.

Very truly yours,

Robert I. Mork

Robert I. Mork

RIM:tb

cc: H. C. Johnson

B

# B

# GROUNDWATER SAMPLING RESULTS
# JUNE 1995

**First Environmental Laboratories, Inc.**

1600 Shore Road • Naperville, Illinois 60563 • Phone (708) 778-1200 • Fax (708) 778-1233

Mr. Jerry Hartwig
Forest Preserve District of DuPage County
PO Box 2339
Glen Ellyn, IL 60138

21 June 1995

Dear Mr. Hartwig:

Enclosed are the analytical results for the samples received from the Blackwell Landfill by First Environmental Laboratories, Inc. on June 09, 1995.

Sample analysis included volatile and semi-volatile organics, pesticides, heavy metals and general water quality parameters. Analyses were performed in accordance with the methods outlined in the USEPA documents: "Test Methods for Evaluating Solid Waste", Physical/Chemical Methods, SW-846, Third Edition, July 1992, and its updates, and "Methods for Chemical Analysis of Water and Wastes", EPA -600-79-020.

All raw data and QA/QC documentation will remain on file for future reference.

It has been a pleasure providing you with analytical services, and we look forward to working with you again in the future. If you have any questions regarding this report, or need additional information, please contact me at (708) 778-1200.

Sincerely,

William H. Mottashed
Project Manager

First
Environmental
Laboratories, Inc.
1600 Shore Road • Naperville, Illinois 60563 • Phone (708) 778-1200 • Fax (708) 778-1233

# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17949 | Date Taken: | 06/09/95 |
| Sample Description: | G133D | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Date Analyzed | Method |
|---|---|---|---|---|
| Alkalinity | 12 | mg/L | 06/13/95 | 310.1 |
| COD | <10 | mg/L | 06/19/95 | 410.4 |
| Chloride | 178 | mg/L | 06/13/95 | 9252 |
| Nitrite + Nitrate Nitrogen | 0.16 | mg/L | 06/12/95 | 354.1 |
| Nitrogen, Ammonia | 0.22 | mg/L | 06/12/95 | 350.2 |
| Total Kjeldahl Nitrogen | <0.05 | mg/L | 06/16/95 | 351.1 |
| Solids, Total Dissolved | 567 | mg/L | 06/16/95 | 160.1 |
| Sulfate | 115 | mg/L | 06/09/95 | 9038 |

**First Environmental Laboratories, Inc.**

1600 Shore Road • Naperville, Illinois 60563 • Phone (708) 778-1200 • Fax (708) 778-1233

# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17949 | Date Taken: | 06/09/95 |
| Sample Description: | G133D | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Date Analyzed | Method |
|---|---|---|---|---|
| Aluminum | <0.05 | mg/L | 06/13/95 | 6010A |
| Antimony | <0.01 | mg/L | 06/13/95 | 6010A |
| Arsenic | <0.002 | mg/L | 06/13/95 | 6010A |
| Barium | 0.111 | mg/L | 06/13/95 | 6010A |
| Beryllium | <0.001 | mg/L | 06/13/95 | 6010A |
| Cadmium | <0.001 | mg/L | 06/13/95 | 6010A |
| Calcium | 114 | mg/L | 06/13/95 | 6010A |
| Chromium | <0.001 | mg/L | 06/13/95 | 6010A |
| Cobalt | <0.001 | mg/L | 06/13/95 | 6010A |
| Copper | <0.001 | mg/L | 06/13/95 | 6010A |
| Iron | <0.01 | mg/L | 06/13/95 | 6010A |
| Lead | <0.002 | mg/L | 06/13/95 | 6010A |
| Magnesium | 5.8 | mg/L | 06/13/95 | 6010A |
| Manganese | 0.006 | mg/L | 06/13/95 | 6010A |
| Mercury | <0.0005 | mg/L | 06/14/95 | 7470 |
| Nickel | 0.003 | mg/L | 06/13/95 | 6010A |
| Potassium | 5.7 | mg/L | 06/13/95 | 6010A |
| Selenium | <0.002 | mg/L | 06/13/95 | 6010A |
| Silver | <0.001 | mg/L | 06/13/95 | 6010A |
| Sodium | 49.5 | mg/L | 06/13/95 | 6010A |
| Thallium | <0.01 | mg/L | 06/13/95 | 6010A |
| Vanadium | <0.01 | mg/L | 06/13/95 | 6010A |
| Zinc | 0.030 | mg/L | 06/13/95 | 6010A |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17949 | Date Taken: | 06/09/95 |
| Sample Description: | G133D | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| **Volatile Organic Compounds Method 8240A** | | | |
| Analysis Date: 06/13/95 | | | |
| Acetone | < 10.0 | ug/L | |
| Benzene | < 5.0 | ug/L | |
| Bromodichloromethane | < 5.0 | ug/L | |
| Bromoform | < 5.0 | ug/L | |
| Bromomethane | < 10.0 | ug/L | |
| 2-Butanone | < 10.0 | ug/L | |
| Carbon disulfide | < 5.0 | ug/L | |
| Carbon tetrachloride | < 5.0 | ug/L | |
| Chlorobenzene | < 5.0 | ug/L | |
| Chlorodibromomethane | < 5.0 | ug/L | |
| Chloroethane | < 10.0 | ug/L | |
| Chloroform | < 5.0 | ug/L | |
| Chloromethane | < 10.0 | ug/L | |
| 1,1-Dichloroethane | < 5.0 | ug/L | |
| 1,2-Dichloroethane | < 5.0 | ug/L | |
| 1,1-Dichloroethene | < 5.0 | ug/L | |
| 1,2-Dichloroethene (total) | < 5.0 | ug/L | |
| 1,2-Dichloropropane | < 5.0 | ug/L | |
| cis-1,3-Dichloropropene | < 5.0 | ug/L | |
| trans-1,3-Dichloropropene | < 5.0 | ug/L | |
| Ethyl benzene | < 5.0 | ug/L | |
| 2-Hexanone | < 10.0 | ug/L | |
| 4-Methyl-2-pentanone | < 10.0 | ug/L | |
| Methylene chloride | < 5.0 | ug/L | |
| Styrene | < 5.0 | ug/L | |
| 1,1,2,2-Tetrachloroethane | < 5.0 | ug/L | |
| Tetrachloroethene | < 5.0 | ug/L | |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17949 | Date Taken: | 06/09/95 |
| Sample Description: | G133D | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| Toluene | < 5.0 | ug/L | |
| 1,1,1-Trichloroethane | < 5.0 | ug/L | |
| 1,1,2-Trichloroethane | < 5.0 | ug/L | |
| Trichloroethene | < 5.0 | ug/L | |
| Vinyl Acetate | < 10.0 | ug/L | |
| Vinyl Chloride | < 2.0 | ug/L | |
| Xylenes (total) | < 5.0 | ug/L | |

**Base-Neutral/Acid Compounds Method 8270A**

Analysis Date: 06/12/95
Preparation Date: 06/12/95

| | | |
|---|---|---|
| Acenaphthene | < 10 | ug/L |
| Acenaphthylene | < 10 | ug/L |
| Anthracene | < 10 | ug/L |
| Benzidine | < 10 | ug/L |
| Benzo[a]anthracene | < 10 | ug/L |
| Benzo[b]fluoranthene | < 10 | ug/L |
| Benzo[k]fluoranthene | < 10 | ug/L |
| Benzo[g,h,i]perylene | < 10 | ug/L |
| Benzo[a]pyrene | < 10 | ug/L |
| Benzoic Acid | < 50 | ug/L |
| Benzyl Alcohol | < 20 | ug/L |
| bis(2-chloroethoxy)methane | < 10 | ug/L |
| bis(2-chloroethyl)ether | < 10 | ug/L |
| bis(2-chloroisopropyl)ether | < 10 | ug/L |
| bis(2-ethylhexyl)phthalate | < 10 | ug/L |
| 4-Bromophenyl-phenylether | < 10 | ug/L |
| Butylbenzylphthalate | < 10 | ug/L |
| 4-Chloroaniline | < 10 | ug/L |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17949 | Date Taken: | 06/09/95 |
| Sample Description: | G133D | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| 4-Chloro-3-methylphenol | < 20 | ug/L | |
| 2-Chloronaphthalene | < 10 | ug/L | |
| 2-Chlorophenol | < 10 | ug/L | |
| 4-Chlorophenyl-phenylether | < 10 | ug/L | |
| Chrysene | < 10 | ug/L | |
| Dibenz[a,h]anthracene | < 10 | ug/L | |
| Dibenzofuran | < 10 | ug/L | |
| 1,2-Dichlorobenzene | < 10 | ug/L | |
| 1,3-Dichlorobenzene | < 10 | ug/L | |
| 1,4-Dichlorobenzene | < 10 | ug/L | |
| 3,3-Dichorobenzidine | < 20 | ug/L | |
| 2,4-Dichlorophenol | < 10 | ug/L | |
| Diethylphthalate | < 10 | ug/L | |
| 2,4-Dimethylphenol | < 10 | ug/L | |
| Dimethylphthalate | < 10 | ug/L | |
| Di-n-butylphthalate | < 10 | ug/L | |
| 4,6-Dinitro-2-methylphenol | < 50 | ug/L | |
| 2,4-Dinitrophenol | < 50 | ug/L | |
| 2,4-Dinitrotoluene | < 10 | ug/L | |
| 2,6-Dinitrotoluene | < 10 | ug/L | |
| Di-n-octylphthalate | < 10 | ug/L | |
| Fluoranthene | < 10 | ug/L | |
| Fluorene | < 10 | ug/L | |
| Hexachlorobenzene | < 10 | ug/L | |
| Hexachlorobutadiene | < 10 | ug/L | |
| Hexachlorocyclopentadiene | < 10 | ug/L | |
| Hexachloroethane | < 10 | ug/L | |
| Indeno[1,2,3-cd]pyrene | < 10 | ug/L | |
| Isophorone | < 10 | ug/L | |
| 2-Methylnaphthalane | < 10 | ug/L | |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17949 | Date Taken: | 06/09/95 |
| Sample Description: | G133D | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| 2-Methylphenol | < 10 | ug/L | |
| 4-Methylphenol | < 10 | ug/L | |
| Naphthalene | < 10 | ug/L | |
| 2-Nitroaniline | < 50 | ug/L | |
| 3-Nitroaniline | < 50 | ug/L | |
| 4-Nitroaniline | < 20 | ug/L | |
| Nitrobenzene | < 10 | ug/L | |
| 2-Nitrophenol | < 10 | ug/L | |
| 4-Nitrophenol | < 50 | ug/L | |
| N-Nitrosodimethylamine | < 10 | ug/L | |
| N-Nitroso-di-n-propylamine | < 10 | ug/L | |
| n-Nitrosodiphenylamine | < 10 | ug/L | |
| Pentachlorophenol | < 50 | ug/L | |
| Phenanthrene | < 10 | ug/L | |
| Phenol | < 10 | ug/L | |
| Pyrene | < 10 | ug/L | |
| 1,2,4-Trichlorobenzene | < 10 | ug/L | |
| 2,4,5-Trichlorophenol | < 10 | ug/L | |
| 2,4,6-Trichlorophenol | < 10 | ug/L | |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17949 | Date Taken: | 06/09/95 |
| Sample Description: | G133D | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| **Pesticides/PCBs Method 8080** | | | |
| Date Analyzed: 06/16/95 | | | |
| Aldrin | < 0.004 | ug/L | |
| Aroclor 1016 | < 0.050 | ug/L | |
| Aroclor 1221 | < 0.065 | ug/L | |
| Aroclor 1232 | < 0.065 | ug/L | |
| Aroclor 1242 | < 0.065 | ug/L | |
| Aroclor 1248 | < 0.090 | ug/L | |
| Aroclor 1254 | < 0.10 | ug/L | |
| Aroclor 1260 | < 0.10 | ug/L | |
| alpha-BHC | < 0.003 | ug/L | |
| beta-BHC | < 0.006 | ug/L | |
| delta-BHC | < 0.009 | ug/L | |
| Lindane (gamma-BHC) | < 0.004 | ug/L | |
| Chlordane | < 0.014 | ug/L | |
| 4,4'-DDD | < 0.011 | ug/L | |
| 4,4'-DDE | < 0.004 | ug/L | |
| 4,4-DDT | < 0.012 | ug/L | |
| Dieldrin | < 0.002 | ug/L | |
| Endosulfan I | < 0.014 | ug/L | |
| Endosulfan II | < 0.004 | ug/L | |
| Endosulfan sulfate | < 0.066 | ug/L | |
| Endrin | < 0.006 | ug/L | |
| Endrin aldehyde | < 0.023 | ug/L | |
| Heptachlor | < 0.003 | ug/L | |
| Heptachlor epoxide | < 0.083 | ug/L | |
| Methoxychlor | < 0.176 | ug/L | |
| Toxaphene | < 0.240 | ug/L | |

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1600 Shore Road • Naperville, Illinois 60563 • Phone (708) 778-1200 • Fax (708) 778-1233

# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17950 | Date Taken: | 06/09/95 |
| Sample Description: | G133S | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Date Analyzed | Method |
|---|---|---|---|---|
| Alkalinity | 340 | mg/L | 06/13/95 | 310.1 |
| COD | <10 | mg/L | 06/19/95 | 410.4 |
| Chloride | 104 | mg/L | 06/13/95 | 9252 |
| Nitrite + Nitrate Nitrogen | 0.97 | mg/L | 06/12/95 | 354.1 |
| Nitrogen, Ammonia | <0.10 | mg/L | 06/12/95 | 350.2 |
| Total Kjeldahl Nitrogen | <0.05 | mg/L | 06/16/95 | 351.1 |
| Solids, Total Dissolved | 632 | mg/L | 06/16/95 | 160.1 |
| Sulfate | 110 | mg/L | 06/09/95 | 9038 |

First
Environmental
Laboratories, Inc.
1600 Shore Road • Naperville, Illinois 60563 • Phone (708) 778-1200 • Fax (708) 778-1233

# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17950 | Date Taken: | 06/09/95 |
| Sample Description: | G133S | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Date Analyzed | Method |
|---|---|---|---|---|
| Aluminum | <0.05 | mg/L | 06/13/95 | 6010A |
| Antimony | <0.01 | mg/L | 06/13/95 | 6010A |
| Arsenic | <0.002 | mg/L | 06/13/95 | 6010A |
| Barium | 0.051 | mg/L | 06/13/95 | 6010A |
| Beryllium | <0.001 | mg/L | 06/13/95 | 6010A |
| Cadmium | <0.001 | mg/L | 06/13/95 | 6010A |
| Calcium | 101 | mg/L | 06/13/95 | 6010A |
| Chromium | <0.001 | mg/L | 06/13/95 | 6010A |
| Cobalt | <0.001 | mg/L | 06/13/95 | 6010A |
| Copper | <0.001 | mg/L | 06/13/95 | 6010A |
| Iron | <0.01 | mg/L | 06/13/95 | 6010A |
| Lead | <0.002 | mg/L | 06/13/95 | 6010A |
| Magnesium | 49.2 | mg/L | 06/13/95 | 6010A |
| Manganese | <0.001 | mg/L | 06/13/95 | 6010A |
| Mercury | <0.0005 | mg/L | 06/14/95 | 7470 |
| Nickel | <0.001 | mg/L | 06/13/95 | 6010A |
| Potassium | 2.7 | mg/L | 06/13/95 | 6010A |
| Selenium | <0.002 | mg/L | 06/13/95 | 6010A |
| Silver | <0.001 | mg/L | 06/13/95 | 6010A |
| Sodium | 45.0 | mg/L | 06/13/95 | 6010A |
| Thallium | <0.01 | mg/L | 06/13/95 | 6010A |
| Vanadium | <0.01 | mg/L | 06/13/95 | 6010A |
| Zinc | 0.008 | mg/L | 06/13/95 | 6010A |

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# Analytical Report

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|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17950 | Date Taken: | 06/09/95 |
| Sample Description: | G133S | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| **Volatile Organic Compounds Method 8240A** | | | |
| Analysis Date: 06/13/95 | | | |
| Acetone | < 10.0 | ug/L | |
| Benzene | < 5.0 | ug/L | |
| Bromodichloromethane | < 5.0 | ug/L | |
| Bromoform | < 5.0 | ug/L | |
| Bromomethane | < 10.0 | ug/L | |
| 2-Butanone | < 10.0 | ug/L | |
| Carbon disulfide | < 5.0 | ug/L | |
| Carbon tetrachloride | < 5.0 | ug/L | |
| Chlorobenzene | < 5.0 | ug/L | |
| Chlorodibromomethane | < 5.0 | ug/L | |
| Chloroethane | < 10.0 | ug/L | |
| Chloroform | < 5.0 | ug/L | |
| Chloromethane | < 10.0 | ug/L | |
| 1,1-Dichloroethane | < 5.0 | ug/L | |
| 1,2-Dichloroethane | < 5.0 | ug/L | |
| 1,1-Dichloroethene | < 5.0 | ug/L | |
| 1,2-Dichloroethene (total) | < 5.0 | ug/L | |
| 1,2-Dichloropropane | < 5.0 | ug/L | |
| cis-1,3-Dichloropropene | < 5.0 | ug/L | |
| trans-1,3-Dichloropropene | < 5.0 | ug/L | |
| Ethyl benzene | < 5.0 | ug/L | |
| 2-Hexanone | < 10.0 | ug/L | |
| 4-Methyl-2-pentanone | < 10.0 | ug/L | |
| Methylene chloride | < 5.0 | ug/L | |
| Styrene | < 5.0 | ug/L | |
| 1,1,2,2-Tetrachloroethane | < 5.0 | ug/L | |
| Tetrachloroethene | < 5.0 | ug/L | |

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# Analytical Report

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|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17950 | Date Taken: | 06/09/95 |
| Sample Description: | G133S | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| Toluene | < 5.0 | ug/L | |
| 1,1,1-Trichloroethane | < 5.0 | ug/L | |
| 1,1,2-Trichloroethane | < 5.0 | ug/L | |
| Trichloroethene | < 5.0 | ug/L | |
| Vinyl Acetate | < 10.0 | ug/L | |
| Vinyl Chloride | < 2.0 | ug/L | |
| Xylenes (total) | < 5.0 | ug/L | |

**Base-Neutral/Acid Compounds Method 8270A**

Analysis Date: 06/12/95
Preparation Date: 06/12/95

| | | |
|---|---|---|
| Acenaphthene | < 10 | ug/L |
| Acenaphthylene | < 10 | ug/L |
| Anthracene | < 10 | ug/L |
| Benzidine | < 10 | ug/L |
| Benzo[a]anthracene | < 10 | ug/L |
| Benzo[b]fluoranthene | < 10 | ug/L |
| Benzo[k]fluoranthene | < 10 | ug/L |
| Benzo[g,h,i]perylene | < 10 | ug/L |
| Benzo[a]pyrene | < 10 | ug/L |
| Benzoic Acid | < 50 | ug/L |
| Benzyl Alcohol | < 20 | ug/L |
| bis(2-chloroethoxy)methane | < 10 | ug/L |
| bis(2-chloroethyl)ether | < 10 | ug/L |
| bis(2-chloroisopropyl)ether | < 10 | ug/L |
| bis(2-ethylhexyl)phthalate | < 10 | ug/L |
| 4-Bromophenyl-phenylether | < 10 | ug/L |
| Butylbenzylphthalate | < 10 | ug/L |
| 4-Chloroaniline | < 10 | ug/L |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17950 | Date Taken: | 06/09/95 |
| Sample Description: | G133S | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| 4-Chloro-3-methylphenol | < 20 | ug/L | |
| 2-Chloronaphthalene | < 10 | ug/L | |
| 2-Chlorophenol | < 10 | ug/L | |
| 4-Chlorophenyl-phenylether | < 10 | ug/L | |
| Chrysene | < 10 | ug/L | |
| Dibenz[a,h]anthracene | < 10 | ug/L | |
| Dibenzofuran | < 10 | ug/L | |
| 1,2-Dichlorobenzene | < 10 | ug/L | |
| 1,3-Dichlorobenzene | < 10 | ug/L | |
| 1,4-Dichlorobenzene | < 10 | ug/L | |
| 3,3-Dichorobenzidine | < 20 | ug/L | |
| 2,4-Dichlorophenol | < 10 | ug/L | |
| Diethylphthalate | < 10 | ug/L | |
| 2,4-Dimethylphenol | < 10 | ug/L | |
| Dimethylphthalate | < 10 | ug/L | |
| Di-n-butylphthalate | < 10 | ug/L | |
| 4,6-Dinitro-2-methylphenol | < 50 | ug/L | |
| 2,4-Dinitrophenol | < 50 | ug/L | |
| 2,4-Dinitrotoluene | < 10 | ug/L | |
| 2,6-Dinitrotoluene | < 10 | ug/L | |
| Di-n-octylphthalate | < 10 | ug/L | |
| Fluoranthene | < 10 | ug/L | |
| Fluorene | < 10 | ug/L | |
| Hexachlorobenzene | < 10 | ug/L | |
| Hexachlorobutadiene | < 10 | ug/L | |
| Hexachlorocyclopentadiene | < 10 | ug/L | |
| Hexachloroethane | < 10 | ug/L | |
| Indeno[1,2,3-cd]pyrene | < 10 | ug/L | |
| Isophorone | < 10 | ug/L | |
| 2-Methylnaphthalane | < 10 | ug/L | |

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|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17950 | Date Taken: | 06/09/95 |
| Sample Description: | G133S | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| 2-Methylphenol | < 10 | ug/L | |
| 4-Methylphenol | < 10 | ug/L | |
| Naphthalene | < 10 | ug/L | |
| 2-Nitroaniline | < 50 | ug/L | |
| 3-Nitroaniline | < 50 | ug/L | |
| 4-Nitroaniline | < 20 | ug/L | |
| Nitrobenzene | < 10 | ug/L | |
| 2-Nitrophenol | < 10 | ug/L | |
| 4-Nitrophenol | < 50 | ug/L | |
| N-Nitrosodimethylamine | < 10 | ug/L | |
| N-Nitroso-di-n-propylamine | < 10 | ug/L | |
| n-Nitrosodiphenylamine | < 10 | ug/L | |
| Pentachlorophenol | < 50 | ug/L | |
| Phenanthrene | < 10 | ug/L | |
| Phenol | < 10 | ug/L | |
| Pyrene | < 10 | ug/L | |
| 1,2,4-Trichlorobenzene | < 10 | ug/L | |
| 2,4,5-Trichlorophenol | < 10 | ug/L | |
| 2,4,6-Trichlorophenol | < 10 | ug/L | |

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|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17950 | Date Taken: | 06/09/95 |
| Sample Description: | G133S | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| **Pesticides/PCBs Method 8080** | | | |
| Date Analyzed: 06/16/95 | | | |
| Aldrin | < 0.004 | ug/L | |
| Aroclor 1016 | < 0.050 | ug/L | |
| Aroclor 1221 | < 0.065 | ug/L | |
| Aroclor 1232 | < 0.065 | ug/L | |
| Aroclor 1242 | < 0.065 | ug/L | |
| Aroclor 1248 | < 0.090 | ug/L | |
| Aroclor 1254 | < 0.10 | ug/L | |
| Aroclor 1260 | < 0.10 | ug/L | |
| alpha-BHC | < 0.003 | ug/L | |
| beta-BHC | < 0.006 | ug/L | |
| delta-BHC | < 0.009 | ug/L | |
| Lindane (gamma-BHC) | < 0.004 | ug/L | |
| Chlordane | < 0.014 | ug/L | |
| 4,4'-DDD | < 0.011 | ug/L | |
| 4,4'-DDE | < 0.004 | ug/L | |
| 4,4-DDT | < 0.012 | ug/L | |
| Dieldrin | < 0.002 | ug/L | |
| Endosulfan I | < 0.014 | ug/L | |
| Endosulfan II | < 0.004 | ug/L | |
| Endosulfan sulfate | < 0.066 | ug/L | |
| Endrin | < 0.006 | ug/L | |
| Endrin aldehyde | < 0.023 | ug/L | |
| Heptachlor | < 0.003 | ug/L | |
| Heptachlor epoxide | < 0.083 | ug/L | |
| Methoxychlor | < 0.176 | ug/L | |
| Toxaphene | < 0.240 | ug/L | |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17951 | Date Taken: | 06/09/95 |
| Sample Description: | G138 | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Date Analyzed | Method |
|---|---|---|---|---|
| Alkalinity | 372 | mg/L | 06/13/95 | 310.1 |
| COD | <10 | mg/L | 06/19/95 | 410.4 |
| Chloride | 100 | mg/L | 06/13/95 | 9252 |
| Nitrite + Nitrate Nitrogen | 0.11 | mg/L | 06/12/95 | 354.1 |
| Nitrogen, Ammonia | <0.10 | mg/L | 06/12/95 | 350.2 |
| Total Kjeldahl Nitrogen | <0.05 | mg/L | 06/16/95 | 351.1 |
| Solids, Total Dissolved | 691 | mg/L | 06/16/95 | 160.1 |
| Sulfate | 136 | mg/L | 06/09/95 | 9038 |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17951 | Date Taken: | 06/09/95 |
| Sample Description: | G138 | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Date Analyzed | Method |
|---|---|---|---|---|
| **Dissolved Metals** | | | | |
| Aluminum | <0.05 | mg/L | 06/13/95 | 6010A |
| Antimony | <0.01 | mg/L | 06/13/95 | 6010A |
| Arsenic | <0.002 | mg/L | 06/13/95 | 6010A |
| Barium | 0.092 | mg/L | 06/13/95 | 6010A |
| Beryllium | <0.001 | mg/L | 06/13/95 | 6010A |
| Cadmium | <0.001 | mg/L | 06/13/95 | 6010A |
| Calcium | 107 | mg/L | 06/13/95 | 6010A |
| Chromium | <0.001 | mg/L | 06/13/95 | 6010A |
| Cobalt | <0.001 | mg/L | 06/13/95 | 6010A |
| Copper | <0.001 | mg/L | 06/13/95 | 6010A |
| Iron | <0.01 | mg/L | 06/13/95 | 6010A |
| Lead | <0.002 | mg/L | 06/13/95 | 6010A |
| Magnesium | 52.6 | mg/L | 06/13/95 | 6010A |
| Manganese | 0.008 | mg/L | 06/13/95 | 6010A |
| Mercury | <0.0005 | mg/L | 06/14/95 | 7470 |
| Nickel | 0.001 | mg/L | 06/13/95 | 6010A |
| Potassium | 3.5 | mg/L | 06/13/95 | 6010A |
| Selenium | <0.002 | mg/L | 06/13/95 | 6010A |
| Silver | <0.001 | mg/L | 06/13/95 | 6010A |
| Sodium | 53.1 | mg/L | 06/13/95 | 6010A |
| Thallium | <0.01 | mg/L | 06/13/95 | 6010A |
| Vanadium | <0.01 | mg/L | 06/13/95 | 6010A |
| Zinc | 0.025 | mg/L | 06/13/95 | 6010A |

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|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17951 | Date Taken: | 06/09/95 |
| Sample Description: | G138 | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Date Analyzed | Method |
|---|---|---|---|---|
| **Total Metals** | | | | |
| Aluminum | 0.05 | mg/L | 06/13/95 | 6010A |
| Antimony | <0.01 | mg/L | 06/13/95 | 6010A |
| Arsenic | <0.002 | mg/L | 06/13/95 | 6010A |
| Barium | 0.094 | mg/L | 06/13/95 | 6010A |
| Beryllium | <0.001 | mg/L | 06/13/95 | 6010A |
| Cadmium | <0.001 | mg/L | 06/13/95 | 6010A |
| Calcium | 108 | mg/L | 06/13/95 | 6010A |
| Chromium | <0.001 | mg/L | 06/13/95 | 6010A |
| Cobalt | 0.001 | mg/L | 06/13/95 | 6010A |
| Copper | <0.001 | mg/L | 06/13/95 | 6010A |
| Iron | 0.12 | mg/L | 06/13/95 | 6010A |
| Lead | <0.002 | mg/L | 06/13/95 | 6010A |
| Magnesium | 53.2 | mg/L | 06/13/95 | 6010A |
| Manganese | 0.036 | mg/L | 06/13/95 | 6010A |
| Mercury | <0.0005 | mg/L | 06/14/95 | 7470 |
| Nickel | <0.001 | mg/L | 06/13/95 | 6010A |
| Potassium | 3.5 | mg/L | 06/13/95 | 6010A |
| Selenium | <0.002 | mg/L | 06/13/95 | 6010A |
| Silver | <0.001 | mg/L | 06/13/95 | 6010A |
| Sodium | 54.8 | mg/L | 06/13/95 | 6010A |
| Thallium | <0.01 | mg/L | 06/13/95 | 6010A |
| Vanadium | <0.01 | mg/L | 06/13/95 | 6010A |
| Zinc | 0.025 | mg/L | 06/13/95 | 6010A |

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# Analytical Report

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|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17951 | Date Taken: | 06/09/95 |
| Sample Description: | G138 | Date Reported: | 06/21/95 |

**Volatile Organic Compounds Method 8240A**

Analysis Date: 06/13/95

| Analyte | Result | Units | Flags |
|---|---|---|---|
| Acetone | < 10.0 | ug/L | |
| Benzene | < 5.0 | ug/L | |
| Bromodichloromethane | < 5.0 | ug/L | |
| Bromoform | < 5.0 | ug/L | |
| Bromomethane | < 10.0 | ug/L | |
| 2-Butanone | < 10.0 | ug/L | |
| Carbon disulfide | < 5.0 | ug/L | |
| Carbon tetrachloride | < 5.0 | ug/L | |
| Chlorobenzene | < 5.0 | ug/L | |
| Chlorodibromomethane | < 5.0 | ug/L | |
| Chloroethane | < 10.0 | ug/L | |
| Chloroform | < 5.0 | ug/L | |
| Chloromethane | < 10.0 | ug/L | |
| 1,1-Dichloroethane | < 5.0 | ug/L | |
| 1,2-Dichloroethane | < 5.0 | ug/L | |
| 1,1-Dichloroethene | < 5.0 | ug/L | |
| 1,2-Dichloroethene (total) | < 5.0 | ug/L | |
| 1,2-Dichloropropane | < 5.0 | ug/L | |
| cis-1,3-Dichloropropene | < 5.0 | ug/L | |
| trans-1,3-Dichloropropene | < 5.0 | ug/L | |
| Ethyl benzene | < 5.0 | ug/L | |
| 2-Hexanone | < 10.0 | ug/L | |
| 4-Methyl-2-pentanone | < 10.0 | ug/L | |
| Methylene chloride | < 5.0 | ug/L | |
| Styrene | < 5.0 | ug/L | |
| 1,1,2,2-Tetrachloroethane | < 5.0 | ug/L | |
| Tetrachloroethene | < 5.0 | ug/L | |

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| Client: | FPD of DUPAGE COUNTY | | |
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| Sample Number: | 17951 | Date Taken: | 06/09/95 |
| Sample Description: | G138 | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| Toluene | < 5.0 | ug/L | |
| 1,1,1-Trichloroethane | < 5.0 | ug/L | |
| 1,1,2-Trichloroethane | < 5.0 | ug/L | |
| Trichloroethene | < 5.0 | ug/L | |
| Vinyl Acetate | < 10.0 | ug/L | |
| Vinyl Chloride | < 2.0 | ug/L | |
| Xylenes (total) | < 5.0 | ug/L | |

**Base-Neutral/Acid Compounds Method 8270A**

Analysis Date: 06/12/95
Preparation Date: 06/12/95

| | | |
|---|---|---|
| Acenaphthene | < 10 | ug/L |
| Acenaphthylene | < 10 | ug/L |
| Anthracene | < 10 | ug/L |
| Benzidine | < 10 | ug/L |
| Benzo[a]anthracene | < 10 | ug/L |
| Benzo[b]fluoranthene | < 10 | ug/L |
| Benzo[k]fluoranthene | < 10 | ug/L |
| Benzo[g,h,i]perylene | < 10 | ug/L |
| Benzo[a]pyrene | < 10 | ug/L |
| Benzoic Acid | < 50 | ug/L |
| Benzyl Alcohol | < 20 | ug/L |
| bis(2-chloroethoxy)methane | < 10 | ug/L |
| bis(2-chloroethyl)ether | < 10 | ug/L |
| bis(2-chloroisopropyl)ether | < 10 | ug/L |
| bis(2-ethylhexyl)phthalate | < 10 | ug/L |
| 4-Bromophenyl-phenylether | < 10 | ug/L |
| Butylbenzylphthalate | < 10 | ug/L |
| 4-Chloroaniline | < 10 | ug/L |

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|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17951 | Date Taken: | 06/09/95 |
| Sample Description: | G138 | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| 4-Chloro-3-methylphenol | < 20 | ug/L | |
| 2-Chloronaphthalene | < 10 | ug/L | |
| 2-Chlorophenol | < 10 | ug/L | |
| 4-Chlorophenyl-phenylether | < 10 | ug/L | |
| Chrysene | < 10 | ug/L | |
| Dibenz[a,h]anthracene | < 10 | ug/L | |
| Dibenzofuran | < 10 | ug/L | |
| 1,2-Dichlorobenzene | < 10 | ug/L | |
| 1,3-Dichlorobenzene | < 10 | ug/L | |
| 1,4-Dichlorobenzene | < 10 | ug/L | |
| 3,3-Dichorobenzidine | < 20 | ug/L | |
| 2,4-Dichlorophenol | < 10 | ug/L | |
| Diethylphthalate | < 10 | ug/L | |
| 2,4-Dimethylphenol | < 10 | ug/L | |
| Dimethylphthalate | < 10 | ug/L | |
| Di-n-butylphthalate | < 10 | ug/L | |
| 4,6-Dinitro-2-methylphenol | < 50 | ug/L | |
| 2,4-Dinitrophenol | < 50 | ug/L | |
| 2,4-Dinitrotoluene | < 10 | ug/L | |
| 2,6-Dinitrotoluene | < 10 | ug/L | |
| Di-n-octylphthalate | < 10 | ug/L | |
| Fluoranthene | < 10 | ug/L | |
| Fluorene | < 10 | ug/L | |
| Hexachlorobenzene | < 10 | ug/L | |
| Hexachlorobutadiene | < 10 | ug/L | |
| Hexachlorocyclopentadiene | < 10 | ug/L | |
| Hexachloroethane | < 10 | ug/L | |
| Indeno[1,2,3-cd]pyrene | < 10 | ug/L | |
| Isophorone | < 10 | ug/L | |
| 2-Methylnaphthalane | < 10 | ug/L | |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17951 | Date Taken: | 06/09/95 |
| Sample Description: | G138 | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| 2-Methylphenol | < 10 | ug/L | |
| 4-Methylphenol | < 10 | ug/L | |
| Naphthalene | < 10 | ug/L | |
| 2-Nitroaniline | < 50 | ug/L | |
| 3-Nitroaniline | < 50 | ug/L | |
| 4-Nitroaniline | < 20 | ug/L | |
| Nitrobenzene | < 10 | ug/L | |
| 2-Nitrophenol | < 10 | ug/L | |
| 4-Nitrophenol | < 50 | ug/L | |
| N-Nitrosodimethylamine | < 10 | ug/L | |
| N-Nitroso-di-n-propylamine | < 10 | ug/L | |
| n-Nitrosodiphenylamine | < 10 | ug/L | |
| Pentachlorophenol | < 50 | ug/L | |
| Phenanthrene | < 10 | ug/L | |
| Phenol | < 10 | ug/L | |
| Pyrene | < 10 | ug/L | |
| 1,2,4-Trichlorobenzene | < 10 | ug/L | |
| 2,4,5-Trichlorophenol | < 10 | ug/L | |
| 2,4,6-Trichlorophenol | < 10 | ug/L | |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17951 | Date Taken: | 06/09/95 |
| Sample Description: | G138 | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| **Pesticides/PCBs Method 8080** | | | |
| Date Analyzed: 06/16/95 | | | |
| Aldrin | < 0.004 | ug/L | |
| Aroclor 1016 | < 0.050 | ug/L | |
| Aroclor 1221 | < 0.065 | ug/L | |
| Aroclor 1232 | < 0.065 | ug/L | |
| Aroclor 1242 | < 0.065 | ug/L | |
| Aroclor 1248 | < 0.090 | ug/L | |
| Aroclor 1254 | < 0.10 | ug/L | |
| Aroclor 1260 | < 0.10 | ug/L | |
| alpha-BHC | < 0.003 | ug/L | |
| beta-BHC | < 0.006 | ug/L | |
| delta-BHC | < 0.009 | ug/L | |
| Lindane (gamma-BHC) | < 0.004 | ug/L | |
| Chlordane | < 0.014 | ug/L | |
| 4,4'-DDD | < 0.011 | ug/L | |
| 4,4'-DDE | < 0.004 | ug/L | |
| 4,4-DDT | < 0.012 | ug/L | |
| Dieldrin | < 0.002 | ug/L | |
| Endosulfan I | < 0.014 | ug/L | |
| Endosulfan II | < 0.004 | ug/L | |
| Endosulfan sulfate | < 0.066 | ug/L | |
| Endrin | < 0.006 | ug/L | |
| Endrin aldehyde | < 0.023 | ug/L | |
| Heptachlor | < 0.003 | ug/L | |
| Heptachlor epoxide | < 0.083 | ug/L | |
| Methoxychlor | < 0.176 | ug/L | |
| Toxaphene | < 0.240 | ug/L | |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17952 | Date Taken: | 06/09/95 |
| Sample Description: | FBB | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Date Analyzed | Method |
|---|---|---|---|---|
| Alkalinity | <5 | mg/L | 06/13/95 | 310.1 |
| COD | <10 | mg/L | 06/19/95 | 410.4 |
| Chloride | <5 | mg/L | 06/13/95 | 9252 |
| Nitrite + Nitrate Nitrogen | <0.10 | mg/L | 06/12/95 | 354.1 |
| Nitrogen, Ammonia | <0.10 | mg/L | 06/12/95 | 350.2 |
| Total Kjeldahl Nitrogen | <0.05 | mg/L | 06/16/95 | 351.1 |
| Solids, Total Dissolved | <10 | mg/L | 06/16/95 | 160.1 |
| Sulfate | <5 | mg/L | 06/09/95 | 9038 |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17952 | Date Taken: | 06/09/95 |
| Sample Description: | FBB | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Date Analyzed | Method |
|---|---|---|---|---|
| Aluminum | <0.05 | mg/L | 06/13/95 | 6010A |
| Antimony | <0.01 | mg/L | 06/13/95 | 6010A |
| Arsenic | <0.002 | mg/L | 06/13/95 | 6010A |
| Barium | <0.001 | mg/L | 06/13/95 | 6010A |
| Beryllium | <0.001 | mg/L | 06/13/95 | 6010A |
| Cadmium | <0.001 | mg/L | 06/13/95 | 6010A |
| Calcium | 0.3 | mg/L | 06/13/95 | 6010A |
| Chromium | <0.001 | mg/L | 06/13/95 | 6010A |
| Cobalt | <0.001 | mg/L | 06/13/95 | 6010A |
| Copper | <0.001 | mg/L | 06/13/95 | 6010A |
| Iron | <0.01 | mg/L | 06/13/95 | 6010A |
| Lead | <0.002 | mg/L | 06/13/95 | 6010A |
| Magnesium | <0.1 | mg/L | 06/13/95 | 6010A |
| Manganese | <0.001 | mg/L | 06/13/95 | 6010A |
| Mercury | <0.0005 | mg/L | 06/14/95 | 7470 |
| Nickel | <0.001 | mg/L | 06/13/95 | 6010A |
| Potassium | <0.1 | mg/L | 06/13/95 | 6010A |
| Selenium | <0.002 | mg/L | 06/13/95 | 6010A |
| Silver | <0.001 | mg/L | 06/13/95 | 6010A |
| Sodium | 0.2 | mg/L | 06/13/95 | 6010A |
| Thallium | <0.01 | mg/L | 06/13/95 | 6010A |
| Vanadium | <0.01 | mg/L | 06/13/95 | 6010A |
| Zinc | 0.004 | mg/L | 06/13/95 | 6010A |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17952 | Date Taken: | 06/09/95 |
| Sample Description: | FBB | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| **Volatile Organic Compounds Method 8240A** | | | |
| Analysis Date: 06/13/95 | | | |
| Acetone | < 10.0 | ug/L | |
| Benzene | < 5.0 | ug/L | |
| Bromodichloromethane | < 5.0 | ug/L | |
| Bromoform | < 5.0 | ug/L | |
| Bromomethane | < 10.0 | ug/L | |
| 2-Butanone | < 10.0 | ug/L | |
| Carbon disulfide | < 5.0 | ug/L | |
| Carbon tetrachloride | < 5.0 | ug/L | |
| Chlorobenzene | < 5.0 | ug/L | |
| Chlorodibromomethane | < 5.0 | ug/L | |
| Chloroethane | < 10.0 | ug/L | |
| Chloroform | < 5.0 | ug/L | |
| Chloromethane | < 10.0 | ug/L | |
| 1,1-Dichloroethane | < 5.0 | ug/L | |
| 1,2-Dichloroethane | < 5.0 | ug/L | |
| 1,1-Dichloroethene | < 5.0 | ug/L | |
| 1,2-Dichloroethene (total) | < 5.0 | ug/L | |
| 1,2-Dichloropropane | < 5.0 | ug/L | |
| cis-1,3-Dichloropropene | < 5.0 | ug/L | |
| trans-1,3-Dichloropropene | < 5.0 | ug/L | |
| Ethyl benzene | < 5.0 | ug/L | |
| 2-Hexanone | < 10.0 | ug/L | |
| 4-Methyl-2-pentanone | < 10.0 | ug/L | |
| Methylene chloride | < 5.0 | ug/L | |
| Styrene | < 5.0 | ug/L | |
| 1,1,2,2-Tetrachloroethane | < 5.0 | ug/L | |
| Tetrachloroethene | < 5.0 | ug/L | |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17952 | Date Taken: | 06/09/95 |
| Sample Description: | FBB | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| Toluene | < 5.0 | ug/L | |
| 1,1,1-Trichloroethane | < 5.0 | ug/L | |
| 1,1,2-Trichloroethane | < 5.0 | ug/L | |
| Trichloroethene | < 5.0 | ug/L | |
| Vinyl Acetate | < 10.0 | ug/L | |
| Vinyl Chloride | < 2.0 | ug/L | |
| Xylenes (total) | < 5.0 | ug/L | |

**Base-Neutral/Acid Compounds Method 8270A**

Analysis Date: 06/12/95
Preparation Date: 06/12/95

| | | | |
|---|---|---|---|
| Acenaphthene | < 10 | ug/L | |
| Acenaphthylene | < 10 | ug/L | |
| Anthracene | < 10 | ug/L | |
| Benzidine | < 10 | ug/L | |
| Benzo[a]anthracene | < 10 | ug/L | |
| Benzo[b]fluoranthene | < 10 | ug/L | |
| Benzo[k]fluoranthene | < 10 | ug/L | |
| Benzo[g,h,i]perylene | < 10 | ug/L | |
| Benzo[a]pyrene | < 10 | ug/L | |
| Benzoic Acid | < 50 | ug/L | |
| Benzyl Alcohol | < 20 | ug/L | |
| bis(2-chloroethoxy)methane | < 10 | ug/L | |
| bis(2-chloroethyl)ether | < 10 | ug/L | |
| bis(2-chloroisopropyl)ether | < 10 | ug/L | |
| bis(2-ethylhexyl)phthalate | < 10 | ug/L | |
| 4-Bromophenyl-phenylether | < 10 | ug/L | |
| Butylbenzylphthalate | < 10 | ug/L | |
| 4-Chloroaniline | < 10 | ug/L | |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17952 | Date Taken: | 06/09/95 |
| Sample Description: | FBB | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| 4-Chloro-3-methylphenol | < 20 | ug/L | |
| 2-Chloronaphthalene | < 10 | ug/L | |
| 2-Chlorophenol | < 10 | ug/L | |
| 4-Chlorophenyl-phenylether | < 10 | ug/L | |
| Chrysene | < 10 | ug/L | |
| Dibenz[a,h]anthracene | < 10 | ug/L | |
| Dibenzofuran | < 10 | ug/L | |
| 1,2-Dichlorobenzene | < 10 | ug/L | |
| 1,3-Dichlorobenzene | < 10 | ug/L | |
| 1,4-Dichlorobenzene | < 10 | ug/L | |
| 3,3-Dichorobenzidine | < 20 | ug/L | |
| 2,4-Dichlorophenol | < 10 | ug/L | |
| Diethylphthalate | < 10 | ug/L | |
| 2,4-Dimethylphenol | < 10 | ug/L | |
| Dimethylphthalate | < 10 | ug/L | |
| Di-n-butylphthalate | < 10 | ug/L | |
| 4,6-Dinitro-2-methylphenol | < 50 | ug/L | |
| 2,4-Dinitrophenol | < 50 | ug/L | |
| 2,4-Dinitrotoluene | < 10 | ug/L | |
| 2,6-Dinitrotoluene | < 10 | ug/L | |
| Di-n-octylphthalate | < 10 | ug/L | |
| Fluoranthene | < 10 | ug/L | |
| Fluorene | < 10 | ug/L | |
| Hexachlorobenzene | < 10 | ug/L | |
| Hexachlorobutadiene | < 10 | ug/L | |
| Hexachlorocyclopentadiene | < 10 | ug/L | |
| Hexachloroethane | < 10 | ug/L | |
| Indeno[1,2,3-cd]pyrene | < 10 | ug/L | |
| Isophorone | < 10 | ug/L | |
| 2-Methylnaphthalane | < 10 | ug/L | |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17952 | Date Taken: | 06/09/95 |
| Sample Description: | FBB | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| 2-Methylphenol | < 10 | ug/L | |
| 4-Methylphenol | < 10 | ug/L | |
| Naphthalene | < 10 | ug/L | |
| 2-Nitroaniline | < 50 | ug/L | |
| 3-Nitroaniline | < 50 | ug/L | |
| 4-Nitroaniline | < 20 | ug/L | |
| Nitrobenzene | < 10 | ug/L | |
| 2-Nitrophenol | < 10 | ug/L | |
| 4-Nitrophenol | < 50 | ug/L | |
| N-Nitrosodimethylamine | < 10 | ug/L | |
| N-Nitroso-di-n-propylamine | < 10 | ug/L | |
| n-Nitrosodiphenylamine | < 10 | ug/L | |
| Pentachlorophenol | < 50 | ug/L | |
| Phenanthrene | < 10 | ug/L | |
| Phenol | < 10 | ug/L | |
| Pyrene | < 10 | ug/L | |
| 1,2,4-Trichlorobenzene | < 10 | ug/L | |
| 2,4,5-Trichlorophenol | < 10 | ug/L | |
| 2,4,6-Trichlorophenol | < 10 | ug/L | |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17952 | Date Taken: | 06/09/95 |
| Sample Description: | FBB | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| **Pesticides/PCBs Method 8080** | | | |
| Date Analyzed: 06/16/95 | | | |
| Aldrin | < 0.004 | ug/L | |
| Aroclor 1016 | < 0.050 | ug/L | |
| Aroclor 1221 | < 0.065 | ug/L | |
| Aroclor 1232 | < 0.065 | ug/L | |
| Aroclor 1242 | < 0.065 | ug/L | |
| Aroclor 1248 | < 0.090 | ug/L | |
| Aroclor 1254 | < 0.10 | ug/L | |
| Aroclor 1260 | < 0.10 | ug/L | |
| alpha-BHC | < 0.003 | ug/L | |
| beta-BHC | < 0.006 | ug/L | |
| delta-BHC | < 0.009 | ug/L | |
| Lindane (gamma-BHC) | < 0.004 | ug/L | |
| Chlordane | < 0.014 | ug/L | |
| 4,4'-DDD | < 0.011 | ug/L | |
| 4,4'-DDE | < 0.004 | ug/L | |
| 4,4-DDT | < 0.012 | ug/L | |
| Dieldrin | < 0.002 | ug/L | |
| Endosulfan I | < 0.014 | ug/L | |
| Endosulfan II | < 0.004 | ug/L | |
| Endosulfan sulfate | < 0.066 | ug/L | |
| Endrin | < 0.006 | ug/L | |
| Endrin aldehyde | < 0.023 | ug/L | |
| Heptachlor | < 0.003 | ug/L | |
| Heptachlor epoxide | < 0.083 | ug/L | |
| Methoxychlor | < 0.176 | ug/L | |
| Toxaphene | < 0.240 | ug/L | |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17953 | Date Taken: | 06/09/95 |
| Sample Description: | G128S | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Date Analyzed | Method |
|---|---|---|---|---|
| Alkalinity | 400 | mg/L | 06/13/95 | 310.1 |
| COD | 61 | mg/L | 06/19/95 | 410.4 |
| Chloride | 26 | mg/L | 06/13/95 | 9252 |
| Nitrite + Nitrate Nitrogen | 0.84 | mg/L | 06/12/95 | 354.1 |
| Nitrogen, Ammonia | <0.10 | mg/L | 06/12/95 | 350.2 |
| Total Kjeldahl Nitrogen | <0.05 | mg/L | 06/16/95 | 351.1 |
| Solids, Total Dissolved | 548 | mg/L | 06/16/95 | 160.1 |
| Sulfate | 69 | mg/L | 06/09/95 | 9038 |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17953 | Date Taken: | 06/09/95 |
| Sample Description: | G128S | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Date Analyzed | Method |
|---|---|---|---|---|
| **Dissolved Metals** | | | | |
| Aluminum | <0.05 | mg/L | 06/13/95 | 6010A |
| Antimony | <0.01 | mg/L | 06/13/95 | 6010A |
| Arsenic | 0.009 | mg/L | 06/13/95 | 6010A |
| Barium | 0.125 | mg/L | 06/13/95 | 6010A |
| Beryllium | <0.001 | mg/L | 06/13/95 | 6010A |
| Cadmium | <0.001 | mg/L | 06/13/95 | 6010A |
| Calcium | 107 | mg/L | 06/13/95 | 6010A |
| Chromium | <0.001 | mg/L | 06/13/95 | 6010A |
| Cobalt | <0.001 | mg/L | 06/13/95 | 6010A |
| Copper | <0.001 | mg/L | 06/13/95 | 6010A |
| Iron | 41.4 | mg/L | 06/13/95 | 6010A |
| Lead | <0.002 | mg/L | 06/13/95 | 6010A |
| Magnesium | 38.1 | mg/L | 06/13/95 | 6010A |
| Manganese | 0.123 | mg/L | 06/13/95 | 6010A |
| Mercury | <0.0005 | mg/L | 06/14/95 | 7470 |
| Nickel | <0.001 | mg/L | 06/13/95 | 6010A |
| Potassium | 1.5 | mg/L | 06/13/95 | 6010A |
| Selenium | <0.002 | mg/L | 06/13/95 | 6010A |
| Silver | <0.001 | mg/L | 06/13/95 | 6010A |
| Sodium | 16.1 | mg/L | 06/13/95 | 6010A |
| Thallium | <0.01 | mg/L | 06/13/95 | 6010A |
| Vanadium | <0.01 | mg/L | 06/13/95 | 6010A |
| Zinc | 0.024 | mg/L | 06/13/95 | 6010A |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17953 | Date Taken: | 06/09/95 |
| Sample Description: | G128S | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Date Analyzed | Method |
|---|---|---|---|---|
| **Total Metals** | | | | |
| Aluminum | 0.18 | mg/L | 06/13/95 | 6010A |
| Antimony | <0.01 | mg/L | 06/13/95 | 6010A |
| Arsenic | 0.015 | mg/L | 06/13/95 | 6010A |
| Barium | 0.015 | mg/L | 06/13/95 | 6010A |
| Beryllium | <0.001 | mg/L | 06/13/95 | 6010A |
| Cadmium | <0.001 | mg/L | 06/13/95 | 6010A |
| Calcium | 126 | mg/L | 06/13/95 | 6010A |
| Chromium | 0.002 | mg/L | 06/13/95 | 6010A |
| Cobalt | <0.001 | mg/L | 06/13/95 | 6010A |
| Copper | 0.009 | mg/L | 06/13/95 | 6010A |
| Iron | 56.8 | mg/L | 06/13/95 | 6010A |
| Lead | 0.003 | mg/L | 06/13/95 | 6010A |
| Magnesium | 45.2 | mg/L | 06/13/95 | 6010A |
| Manganese | 0.156 | mg/L | 06/13/95 | 6010A |
| Mercury | <0.0005 | mg/L | 06/14/95 | 7470 |
| Nickel | 0.006 | mg/L | 06/13/95 | 6010A |
| Potassium | 1.9 | mg/L | 06/13/95 | 6010A |
| Selenium | <0.002 | mg/L | 06/13/95 | 6010A |
| Silver | <0.001 | mg/L | 06/13/95 | 6010A |
| Sodium | 18.3 | mg/L | 06/13/95 | 6010A |
| Thallium | <0.01 | mg/L | 06/13/95 | 6010A |
| Vanadium | <0.01 | mg/L | 06/13/95 | 6010A |
| Zinc | 0.023 | mg/L | 06/13/95 | 6010A |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17953 | Date Taken: | 06/09/95 |
| Sample Description: | G128S | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| **Volatile Organic Compounds Method 8240A** | | | |
| Analysis Date: 06/13/95 | | | |
| Acetone | < 10.0 | ug/L | |
| Benzene | < 5.0 | ug/L | |
| Bromodichloromethane | < 5.0 | ug/L | |
| Bromoform | < 5.0 | ug/L | |
| Bromomethane | < 10.0 | ug/L | |
| 2-Butanone | < 10.0 | ug/L | |
| Carbon disulfide | < 5.0 | ug/L | |
| Carbon tetrachloride | < 5.0 | ug/L | |
| Chlorobenzene | < 5.0 | ug/L | |
| Chlorodibromomethane | < 5.0 | ug/L | |
| Chloroethane | < 10.0 | ug/L | |
| Chloroform | < 5.0 | ug/L | |
| Chloromethane | < 10.0 | ug/L | |
| 1,1-Dichloroethane | < 5.0 | ug/L | |
| 1,2-Dichloroethane | < 5.0 | ug/L | |
| 1,1-Dichloroethene | < 5.0 | ug/L | |
| 1,2-Dichloroethene (total) | 8.1 | ug/L | |
| 1,2-Dichloropropane | < 5.0 | ug/L | |
| cis-1,3-Dichloropropene | < 5.0 | ug/L | |
| trans-1,3-Dichloropropene | < 5.0 | ug/L | |
| Ethyl benzene | < 5.0 | ug/L | |
| 2-Hexanone | < 10.0 | ug/L | |
| 4-Methyl-2-pentanone | < 10.0 | ug/L | |
| Methylene chloride | < 5.0 | ug/L | |
| Styrene | < 5.0 | ug/L | |
| 1,1,2,2-Tetrachloroethane | < 5.0 | ug/L | |
| Tetrachloroethene | < 5.0 | ug/L | |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17953 | Date Taken: | 06/09/95 |
| Sample Description: | G128S | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| Toluene | < 5.0 | ug/L | |
| 1,1,1-Trichloroethane | < 5.0 | ug/L | |
| 1,1,2-Trichloroethane | < 5.0 | ug/L | |
| Trichloroethene | < 5.0 | ug/L | |
| Vinyl Acetate | < 10.0 | ug/L | |
| Vinyl Chloride | < 2.0 | ug/L | |
| Xylenes (total) | < 5.0 | ug/L | |

**Base-Neutral/Acid Compounds Method 8270A**

Analysis Date: 06/12/95
Preparation Date: 06/12/95

| | | |
|---|---|---|
| Acenaphthene | < 10 | ug/L |
| Acenaphthylene | < 10 | ug/L |
| Anthracene | < 10 | ug/L |
| Benzidine | < 10 | ug/L |
| Benzo[a]anthracene | < 10 | ug/L |
| Benzo[b]fluoranthene | < 10 | ug/L |
| Benzo[k]fluoranthene | < 10 | ug/L |
| Benzo[g,h,i]perylene | < 10 | ug/L |
| Benzo[a]pyrene | < 10 | ug/L |
| Benzoic Acid | < 50 | ug/L |
| Benzyl Alcohol | < 20 | ug/L |
| bis(2-chloroethoxy)methane | < 10 | ug/L |
| bis(2-chloroethyl)ether | < 10 | ug/L |
| bis(2-chloroisopropyl)ether | < 10 | ug/L |
| bis(2-ethylhexyl)phthalate | < 10 | ug/L |
| 4-Bromophenyl-phenylether | < 10 | ug/L |
| Butylbenzylphthalate | < 10 | ug/L |
| 4-Chloroaniline | < 10 | ug/L |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17953 | Date Taken: | 06/09/95 |
| Sample Description: | G128S | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| 4-Chloro-3-methylphenol | < 20 | ug/L | |
| 2-Chloronaphthalene | < 10 | ug/L | |
| 2-Chlorophenol | < 10 | ug/L | |
| 4-Chlorophenyl-phenylether | < 10 | ug/L | |
| Chrysene | < 10 | ug/L | |
| Dibenz[a,h]anthracene | < 10 | ug/L | |
| Dibenzofuran | < 10 | ug/L | |
| 1,2-Dichlorobenzene | < 10 | ug/L | |
| 1,3-Dichlorobenzene | < 10 | ug/L | |
| 1,4-Dichlorobenzene | < 10 | ug/L | |
| 3,3-Dichorobenzidine | < 20 | ug/L | |
| 2,4-Dichlorophenol | < 10 | ug/L | |
| Diethylphthalate | < 10 | ug/L | |
| 2,4-Dimethylphenol | < 10 | ug/L | |
| Dimethylphthalate | < 10 | ug/L | |
| Di-n-butylphthalate | < 10 | ug/L | |
| 4,6-Dinitro-2-methylphenol | < 50 | ug/L | |
| 2,4-Dinitrophenol | < 50 | ug/L | |
| 2,4-Dinitrotoluene | < 10 | ug/L | |
| 2,6-Dinitrotoluene | < 10 | ug/L | |
| Di-n-octylphthalate | < 10 | ug/L | |
| Fluoranthene | < 10 | ug/L | |
| Fluorene | < 10 | ug/L | |
| Hexachlorobenzene | < 10 | ug/L | |
| Hexachlorobutadiene | < 10 | ug/L | |
| Hexachlorocyclopentadiene | < 10 | ug/L | |
| Hexachloroethane | < 10 | ug/L | |
| Indeno[1,2,3-cd]pyrene | < 10 | ug/L | |
| Isophorone | < 10 | ug/L | |
| 2-Methylnaphthalane | < 10 | ug/L | |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17953 | Date Taken: | 06/09/95 |
| Sample Description: | G128S | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| 2-Methylphenol | < 10 | ug/L | |
| 4-Methylphenol | < 10 | ug/L | |
| Naphthalene | < 10 | ug/L | |
| 2-Nitroaniline | < 50 | ug/L | |
| 3-Nitroaniline | < 50 | ug/L | |
| 4-Nitroaniline | < 20 | ug/L | |
| Nitrobenzene | < 10 | ug/L | |
| 2-Nitrophenol | < 10 | ug/L | |
| 4-Nitrophenol | < 50 | ug/L | |
| N-Nitrosodimethylamine | < 10 | ug/L | |
| N-Nitroso-di-n-propylamine | < 10 | ug/L | |
| n-Nitrosodiphenylamine | < 10 | ug/L | |
| Pentachlorophenol | < 50 | ug/L | |
| Phenanthrene | < 10 | ug/L | |
| Phenol | < 10 | ug/L | |
| Pyrene | < 10 | ug/L | |
| 1,2,4-Trichlorobenzene | < 10 | ug/L | |
| 2,4,5-Trichlorophenol | < 10 | ug/L | |
| 2,4,6-Trichlorophenol | < 10 | ug/L | |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17953 | Date Taken: | 06/09/95 |
| Sample Description: | G128S | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| **Pesticides/PCBs Method 8080** | | | |
| Date Analyzed: 06/16/95 | | | |
| Aldrin | < 0.004 | ug/L | |
| Aroclor 1016 | < 0.050 | ug/L | |
| Aroclor 1221 | < 0.065 | ug/L | |
| Aroclor 1232 | < 0.065 | ug/L | |
| Aroclor 1242 | < 0.065 | ug/L | |
| Aroclor 1248 | < 0.090 | ug/L | |
| Aroclor 1254 | < 0.10 | ug/L | |
| Aroclor 1260 | < 0.10 | ug/L | |
| alpha-BHC | < 0.003 | ug/L | |
| beta-BHC | < 0.006 | ug/L | |
| delta-BHC | < 0.009 | ug/L | |
| Lindane (gamma-BHC) | < 0.004 | ug/L | |
| Chlordane | < 0.014 | ug/L | |
| 4,4'-DDD | < 0.011 | ug/L | |
| 4,4'-DDE | < 0.004 | ug/L | |
| 4,4-DDT | < 0.012 | ug/L | |
| Dieldrin | < 0.002 | ug/L | |
| Endosulfan I | < 0.014 | ug/L | |
| Endosulfan II | < 0.004 | ug/L | |
| Endosulfan sulfate | < 0.066 | ug/L | |
| Endrin | < 0.006 | ug/L | |
| Endrin aldehyde | < 0.023 | ug/L | |
| Heptachlor | < 0.003 | ug/L | |
| Heptachlor epoxide | < 0.083 | ug/L | |
| Methoxychlor | < 0.176 | ug/L | |
| Toxaphene | < 0.240 | ug/L | |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17954 | Date Taken: | 06/09/95 |
| Sample Description: | G139 | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Date Analyzed | Method |
|---|---|---|---|---|
| Alkalinity | 308 | mg/L | 06/13/95 | 310.1 |
| COD | <10 | mg/L | 06/19/95 | 410.4 |
| Chloride | 10 | mg/L | 06/13/95 | 9252 |
| Nitrite + Nitrate Nitrogen | 0.56 | mg/L | 06/12/95 | 354.1 |
| Nitrogen, Ammonia | <0.10 | mg/L | 06/12/95 | 350.2 |
| Total Kjeldahl Nitrogen | <0.05 | mg/L | 06/16/95 | 351.1 |
| Solids, Total Dissolved | 353 | mg/L | 06/16/95 | 160.1 |
| Sulfate | 28 | mg/L | 06/09/95 | 9038 |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17954 | Date Taken: | 06/09/95 |
| Sample Description: | G139 | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Date Analyzed | Method |
|---|---|---|---|---|
| **Dissolved Metals** | | | | |
| Aluminum | <0.05 | mg/L | 06/13/95 | 6010A |
| Antimony | <0.01 | mg/L | 06/13/95 | 6010A |
| Arsenic | <0.002 | mg/L | 06/13/95 | 6010A |
| Barium | 0.056 | mg/L | 06/13/95 | 6010A |
| Beryllium | <0.001 | mg/L | 06/13/95 | 6010A |
| Cadmium | <0.001 | mg/L | 06/13/95 | 6010A |
| Calcium | 52.2 | mg/L | 06/13/95 | 6010A |
| Chromium | <0.001 | mg/L | 06/13/95 | 6010A |
| Cobalt | <0.001 | mg/L | 06/13/95 | 6010A |
| Copper | <0.001 | mg/L | 06/13/95 | 6010A |
| Iron | <0.01 | mg/L | 06/13/95 | 6010A |
| Lead | <0.002 | mg/L | 06/13/95 | 6010A |
| Magnesium | 40.8 | mg/L | 06/13/95 | 6010A |
| Manganese | 0.002 | mg/L | 06/13/95 | 6010A |
| Mercury | <0.0005 | mg/L | 06/14/95 | 7470 |
| Nickel | <0.001 | mg/L | 06/13/95 | 6010A |
| Potassium | 1.4 | mg/L | 06/13/95 | 6010A |
| Selenium | <0.002 | mg/L | 06/13/95 | 6010A |
| Silver | <0.001 | mg/L | 06/13/95 | 6010A |
| Sodium | 19.4 | mg/L | 06/13/95 | 6010A |
| Thallium | <0.01 | mg/L | 06/13/95 | 6010A |
| Vanadium | <0.01 | mg/L | 06/13/95 | 6010A |
| Zinc | 0.007 | mg/L | 06/13/95 | 6010A |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17954 | Date Taken: | 06/09/95 |
| Sample Description: | G139 | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Date Analyzed | Method |
|---|---|---|---|---|
| **Total Metals** | | | | |
| Aluminum | 0.09 | mg/L | 06/13/95 | 6010A |
| Antimony | <0.01 | mg/L | 06/13/95 | 6010A |
| Arsenic | <0.002 | mg/L | 06/13/95 | 6010A |
| Barium | 0.060 | mg/L | 06/13/95 | 6010A |
| Beryllium | <0.001 | mg/L | 06/13/95 | 6010A |
| Cadmium | <0.001 | mg/L | 06/13/95 | 6010A |
| Calcium | 53.5 | mg/L | 06/13/95 | 6010A |
| Chromium | 0.002 | mg/L | 06/13/95 | 6010A |
| Cobalt | <0.001 | mg/L | 06/13/95 | 6010A |
| Copper | <0.001 | mg/L | 06/13/95 | 6010A |
| Iron | 0.51 | mg/L | 06/13/95 | 6010A |
| Lead | <0.002 | mg/L | 06/13/95 | 6010A |
| Magnesium | 41.4 | mg/L | 06/13/95 | 6010A |
| Manganese | 0.026 | mg/L | 06/13/95 | 6010A |
| Mercury | <0.0005 | mg/L | 06/14/95 | 7470 |
| Nickel | <0.001 | mg/L | 06/13/95 | 6010A |
| Potassium | 1.3 | mg/L | 06/13/95 | 6010A |
| Selenium | <0.002 | mg/L | 06/13/95 | 6010A |
| Silver | <0.001 | mg/L | 06/13/95 | 6010A |
| Sodium | 19.1 | mg/L | 06/13/95 | 6010A |
| Thallium | <0.01 | mg/L | 06/13/95 | 6010A |
| Vanadium | <0.01 | mg/L | 06/13/95 | 6010A |
| Zinc | 0.015 | mg/L | 06/13/95 | 6010A |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17954 | Date Taken: | 06/09/95 |
| Sample Description: | G139 | Date Reported: | 06/21/95 |

**Volatile Organic Compounds Method 8240A**
Analysis Date: 06/13/95

| Analyte | Result | Units | Flags |
|---|---|---|---|
| Acetone | < 10.0 | ug/L | |
| Benzene | < 5.0 | ug/L | |
| Bromodichloromethane | < 5.0 | ug/L | |
| Bromoform | < 5.0 | ug/L | |
| Bromomethane | < 10.0 | ug/L | |
| 2-Butanone | < 10.0 | ug/L | |
| Carbon disulfide | < 5.0 | ug/L | |
| Carbon tetrachloride | < 5.0 | ug/L | |
| Chlorobenzene | < 5.0 | ug/L | |
| Chlorodibromomethane | < 5.0 | ug/L | |
| Chloroethane | < 10.0 | ug/L | |
| Chloroform | < 5.0 | ug/L | |
| Chloromethane | < 10.0 | ug/L | |
| 1,1-Dichloroethane | < 5.0 | ug/L | |
| 1,2-Dichloroethane | < 5.0 | ug/L | |
| 1,1-Dichloroethene | < 5.0 | ug/L | |
| 1,2-Dichloroethene (total) | < 5.0 | ug/L | |
| 1,2-Dichloropropane | < 5.0 | ug/L | |
| cis-1,3-Dichloropropene | < 5.0 | ug/L | |
| trans-1,3-Dichloropropene | < 5.0 | ug/L | |
| Ethyl benzene | < 5.0 | ug/L | |
| 2-Hexanone | < 10.0 | ug/L | |
| 4-Methyl-2-pentanone | < 10.0 | ug/L | |
| Methylene chloride | < 5.0 | ug/L | |
| Styrene | < 5.0 | ug/L | |
| 1,1,2,2-Tetrachloroethane | < 5.0 | ug/L | |
| Tetrachloroethene | < 5.0 | ug/L | |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17954 | Date Taken: | 06/09/95 |
| Sample Description: | G139 | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| Toluene | < 5.0 | ug/L | |
| 1,1,1-Trichloroethane | < 5.0 | ug/L | |
| 1,1,2-Trichloroethane | < 5.0 | ug/L | |
| Trichloroethene | < 5.0 | ug/L | |
| Vinyl Acetate | < 10.0 | ug/L | |
| Vinyl Chloride | < 2.0 | ug/L | |
| Xylenes (total) | < 5.0 | ug/L | |

**Base-Neutral/Acid Compounds Method 8270A**

Analysis Date: 06/12/95
Preparation Date: 06/12/95

| | | |
|---|---|---|
| Acenaphthene | < 10 | ug/L |
| Acenaphthylene | < 10 | ug/L |
| Anthracene | < 10 | ug/L |
| Benzidine | < 10 | ug/L |
| Benzo[a]anthracene | < 10 | ug/L |
| Benzo[b]fluoranthene | < 10 | ug/L |
| Benzo[k]fluoranthene | < 10 | ug/L |
| Benzo[g,h,i]perylene | < 10 | ug/L |
| Benzo[a]pyrene | < 10 | ug/L |
| Benzoic Acid | < 50 | ug/L |
| Benzyl Alcohol | < 20 | ug/L |
| bis(2-chloroethoxy)methane | < 10 | ug/L |
| bis(2-chloroethyl)ether | < 10 | ug/L |
| bis(2-chloroisopropyl)ether | < 10 | ug/L |
| bis(2-ethylhexyl)phthalate | < 10 | ug/L |
| 4-Bromophenyl-phenylether | < 10 | ug/L |
| Butylbenzylphthalate | < 10 | ug/L |
| 4-Chloroaniline | < 10 | ug/L |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17954 | Date Taken: | 06/09/95 |
| Sample Description: | G139 | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| 4-Chloro-3-methylphenol | < 20 | ug/L | |
| 2-Chloronaphthalene | < 10 | ug/L | |
| 2-Chlorophenol | < 10 | ug/L | |
| 4-Chlorophenyl-phenylether | < 10 | ug/L | |
| Chrysene | < 10 | ug/L | |
| Dibenz[a,h]anthracene | < 10 | ug/L | |
| Dibenzofuran | < 10 | ug/L | |
| 1,2-Dichlorobenzene | < 10 | ug/L | |
| 1,3-Dichlorobenzene | < 10 | ug/L | |
| 1,4-Dichlorobenzene | < 10 | ug/L | |
| 3,3-Dichorobenzidine | < 20 | ug/L | |
| 2,4-Dichlorophenol | < 10 | ug/L | |
| Diethylphthalate | < 10 | ug/L | |
| 2,4-Dimethylphenol | < 10 | ug/L | |
| Dimethylphthalate | < 10 | ug/L | |
| Di-n-butylphthalate | < 10 | ug/L | |
| 4,6-Dinitro-2-methylphenol | < 50 | ug/L | |
| 2,4-Dinitrophenol | < 50 | ug/L | |
| 2,4-Dinitrotoluene | < 10 | ug/L | |
| 2,6-Dinitrotoluene | < 10 | ug/L | |
| Di-n-octylphthalate | < 10 | ug/L | |
| Fluoranthene | < 10 | ug/L | |
| Fluorene | < 10 | ug/L | |
| Hexachlorobenzene | < 10 | ug/L | |
| Hexachlorobutadiene | < 10 | ug/L | |
| Hexachlorocyclopentadiene | < 10 | ug/L | |
| Hexachloroethane | < 10 | ug/L | |
| Indeno[1,2,3-cd]pyrene | < 10 | ug/L | |
| Isophorone | < 10 | ug/L | |
| 2-Methylnaphthalane | < 10 | ug/L | |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17954 | Date Taken: | 06/09/95 |
| Sample Description: | G139 | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| 2-Methylphenol | < 10 | ug/L | |
| 4-Methylphenol | < 10 | ug/L | |
| Naphthalene | < 10 | ug/L | |
| 2-Nitroaniline | < 50 | ug/L | |
| 3-Nitroaniline | < 50 | ug/L | |
| 4-Nitroaniline | < 20 | ug/L | |
| Nitrobenzene | < 10 | ug/L | |
| 2-Nitrophenol | < 10 | ug/L | |
| 4-Nitrophenol | < 50 | ug/L | |
| N-Nitrosodimethylamine | < 10 | ug/L | |
| N-Nitroso-di-n-propylamine | < 10 | ug/L | |
| n-Nitrosodiphenylamine | < 10 | ug/L | |
| Pentachlorophenol | < 50 | ug/L | |
| Phenanthrene | < 10 | ug/L | |
| Phenol | < 10 | ug/L | |
| Pyrene | < 10 | ug/L | |
| 1,2,4-Trichlorobenzene | < 10 | ug/L | |
| 2,4,5-Trichlorophenol | < 10 | ug/L | |
| 2,4,6-Trichlorophenol | < 10 | ug/L | |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17954 | Date Taken: | 06/09/95 |
| Sample Description: | G139 | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| **Pesticides/PCBs Method 8080** | | | |
| Date Analyzed: 06/16/95 | | | |
| Aldrin | < 0.004 | ug/L | |
| Aroclor 1016 | < 0.050 | ug/L | |
| Aroclor 1221 | < 0.065 | ug/L | |
| Aroclor 1232 | < 0.065 | ug/L | |
| Aroclor 1242 | < 0.065 | ug/L | |
| Aroclor 1248 | < 0.090 | ug/L | |
| Aroclor 1254 | < 0.10 | ug/L | |
| Aroclor 1260 | < 0.10 | ug/L | |
| alpha-BHC | < 0.003 | ug/L | |
| beta-BHC | < 0.006 | ug/L | |
| delta-BHC | < 0.009 | ug/L | |
| Lindane (gamma-BHC) | < 0.004 | ug/L | |
| Chlordane | < 0.014 | ug/L | |
| 4,4'-DDD | < 0.011 | ug/L | |
| 4,4'-DDE | < 0.004 | ug/L | |
| 4,4-DDT | < 0.012 | ug/L | |
| Dieldrin | < 0.002 | ug/L | |
| Endosulfan I | < 0.014 | ug/L | |
| Endosulfan II | < 0.004 | ug/L | |
| Endosulfan sulfate | < 0.066 | ug/L | |
| Endrin | < 0.006 | ug/L | |
| Endrin aldehyde | < 0.023 | ug/L | |
| Heptachlor | < 0.003 | ug/L | |
| Heptachlor epoxide | < 0.083 | ug/L | |
| Methoxychlor | < 0.176 | ug/L | |
| Toxaphene | < 0.240 | ug/L | |

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1600 Shore Road • Naperville, Illinois 60563 • Phone (708) 778-1200 • Fax (708) 778-1233

# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17955 | Date Taken: | 06/09/95 |
| Sample Description: | Trip Blank G133D | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| **Volatile Organic Compounds Method 8240A** | | | |
| Analysis Date: 06/13/95 | | | |
| Acetone | < 10.0 | ug/L | |
| Benzene | < 5.0 | ug/L | |
| Bromodichloromethane | < 5.0 | ug/L | |
| Bromoform | < 5.0 | ug/L | |
| Bromomethane | < 10.0 | ug/L | |
| 2-Butanone | < 10.0 | ug/L | |
| Carbon disulfide | < 5.0 | ug/L | |
| Carbon tetrachloride | < 5.0 | ug/L | |
| Chlorobenzene | < 5.0 | ug/L | |
| Chlorodibromomethane | < 5.0 | ug/L | |
| Chloroethane | < 10.0 | ug/L | |
| Chloroform | < 5.0 | ug/L | |
| Chloromethane | < 10.0 | ug/L | |
| 1,1-Dichloroethane | < 5.0 | ug/L | |
| 1,2-Dichloroethane | < 5.0 | ug/L | |
| 1,1-Dichloroethene | < 5.0 | ug/L | |
| 1,2-Dichloroethene (total) | < 5.0 | ug/L | |
| 1,2-Dichloropropane | < 5.0 | ug/L | |
| cis-1,3-Dichloropropene | < 5.0 | ug/L | |
| trans-1,3-Dichloropropene | < 5.0 | ug/L | |
| Ethyl benzene | < 5.0 | ug/L | |
| 2-Hexanone | < 10.0 | ug/L | |
| 4-Methyl-2-pentanone | < 10.0 | ug/L | |
| Methylene chloride | < 5.0 | ug/L | |
| Styrene | < 5.0 | ug/L | |
| 1,1,2,2-Tetrachloroethane | < 5.0 | ug/L | |
| Tetrachloroethene | < 5.0 | ug/L | |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17955 | Date Taken: | 06/09/95 |
| Sample Description: | Trip Blank G133D | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| Toluene | < 5.0 | ug/L | |
| 1,1,1-Trichloroethane | < 5.0 | ug/L | |
| 1,1,2-Trichloroethane | < 5.0 | ug/L | |
| Trichloroethene | < 5.0 | ug/L | |
| Vinyl Acetate | < 10.0 | ug/L | |
| Vinyl Chloride | < 2.0 | ug/L | |
| Xylenes (total) | < 5.0 | ug/L | |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17956 | Date Taken: | 06/09/95 |
| Sample Description: | Trip Blank G133S | Date Reported: | 06/21/95 |

**Volatile Organic Compounds Method 8240A**
Analysis Date: 06/13/95

| Analyte | Result | Units | Flags |
|---|---|---|---|
| Acetone | < 10.0 | ug/L | |
| Benzene | < 5.0 | ug/L | |
| Bromodichloromethane | < 5.0 | ug/L | |
| Bromoform | < 5.0 | ug/L | |
| Bromomethane | < 10.0 | ug/L | |
| 2-Butanone | < 10.0 | ug/L | |
| Carbon disulfide | < 5.0 | ug/L | |
| Carbon tetrachloride | < 5.0 | ug/L | |
| Chlorobenzene | < 5.0 | ug/L | |
| Chlorodibromomethane | < 5.0 | ug/L | |
| Chloroethane | < 10.0 | ug/L | |
| Chloroform | < 5.0 | ug/L | |
| Chloromethane | < 10.0 | ug/L | |
| 1,1-Dichloroethane | < 5.0 | ug/L | |
| 1,2-Dichloroethane | < 5.0 | ug/L | |
| 1,1-Dichloroethene | < 5.0 | ug/L | |
| 1,2-Dichloroethene (total) | < 5.0 | ug/L | |
| 1,2-Dichloropropane | < 5.0 | ug/L | |
| cis-1,3-Dichloropropene | < 5.0 | ug/L | |
| trans-1,3-Dichloropropene | < 5.0 | ug/L | |
| Ethyl benzene | < 5.0 | ug/L | |
| 2-Hexanone | < 10.0 | ug/L | |
| 4-Methyl-2-pentanone | < 10.0 | ug/L | |
| Methylene chloride | < 5.0 | ug/L | |
| Styrene | < 5.0 | ug/L | |
| 1,1,2,2-Tetrachloroethane | < 5.0 | ug/L | |
| Tetrachloroethene | < 5.0 | ug/L | |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17956 | Date Taken: | 06/09/95 |
| Sample Description: | Trip Blank G133S | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| Toluene | < 5.0 | ug/L | |
| 1,1,1-Trichloroethane | < 5.0 | ug/L | |
| 1,1,2-Trichloroethane | < 5.0 | ug/L | |
| Trichloroethene | < 5.0 | ug/L | |
| Vinyl Acetate | < 10.0 | ug/L | |
| Vinyl Chloride | < 2.0 | ug/L | |
| Xylenes (total) | < 5.0 | ug/L | |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17957 | Date Taken: | 06/09/95 |
| Sample Description: | Trip Blank G138 | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| **Volatile Organic Compounds Method 8240A** | | | |
| Analysis Date: 06/13/95 | | | |
| Acetone | < 10.0 | ug/L | |
| Benzene | < 5.0 | ug/L | |
| Bromodichloromethane | < 5.0 | ug/L | |
| Bromoform | < 5.0 | ug/L | |
| Bromomethane | < 10.0 | ug/L | |
| 2-Butanone | < 10.0 | ug/L | |
| Carbon disulfide | < 5.0 | ug/L | |
| Carbon tetrachloride | < 5.0 | ug/L | |
| Chlorobenzene | < 5.0 | ug/L | |
| Chlorodibromomethane | < 5.0 | ug/L | |
| Chloroethane | < 10.0 | ug/L | |
| Chloroform | < 5.0 | ug/L | |
| Chloromethane | < 10.0 | ug/L | |
| 1,1-Dichloroethane | < 5.0 | ug/L | |
| 1,2-Dichloroethane | < 5.0 | ug/L | |
| 1,1-Dichloroethene | < 5.0 | ug/L | |
| 1,2-Dichloroethene (total) | < 5.0 | ug/L | |
| 1,2-Dichloropropane | < 5.0 | ug/L | |
| cis-1,3-Dichloropropene | < 5.0 | ug/L | |
| trans-1,3-Dichloropropene | < 5.0 | ug/L | |
| Ethyl benzene | < 5.0 | ug/L | |
| 2-Hexanone | < 10.0 | ug/L | |
| 4-Methyl-2-pentanone | < 10.0 | ug/L | |
| Methylene chloride | < 5.0 | ug/L | |
| Styrene | < 5.0 | ug/L | |
| 1,1,2,2-Tetrachloroethane | < 5.0 | ug/L | |
| Tetrachloroethene | < 5.0 | ug/L | |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17957 | Date Taken: | 06/09/95 |
| Sample Description: | Trip Blank G138 | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| Toluene | < 5.0 | ug/L | |
| 1,1,1-Trichloroethane | < 5.0 | ug/L | |
| 1,1,2-Trichloroethane | < 5.0 | ug/L | |
| Trichloroethene | < 5.0 | ug/L | |
| Vinyl Acetate | < 10.0 | ug/L | |
| Vinyl Chloride | < 2.0 | ug/L | |
| Xylenes (total) | < 5.0 | ug/L | |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17958 | Date Taken: | 06/09/95 |
| Sample Description: | Trip Blank FBB | Date Reported: | 06/21/95 |

**Volatile Organic Compounds Method 8240A**

Analysis Date: 06/13/95

| Analyte | Result | Units | Flags |
|---|---|---|---|
| Acetone | < 10.0 | ug/L | |
| Benzene | < 5.0 | ug/L | |
| Bromodichloromethane | < 5.0 | ug/L | |
| Bromoform | < 5.0 | ug/L | |
| Bromomethane | < 10.0 | ug/L | |
| 2-Butanone | < 10.0 | ug/L | |
| Carbon disulfide | < 5.0 | ug/L | |
| Carbon tetrachloride | < 5.0 | ug/L | |
| Chlorobenzene | < 5.0 | ug/L | |
| Chlorodibromomethane | < 5.0 | ug/L | |
| Chloroethane | < 10.0 | ug/L | |
| Chloroform | < 5.0 | ug/L | |
| Chloromethane | < 10.0 | ug/L | |
| 1,1-Dichloroethane | < 5.0 | ug/L | |
| 1,2-Dichloroethane | < 5.0 | ug/L | |
| 1,1-Dichloroethene | < 5.0 | ug/L | |
| 1,2-Dichloroethene (total) | < 5.0 | ug/L | |
| 1,2-Dichloropropane | < 5.0 | ug/L | |
| cis-1,3-Dichloropropene | < 5.0 | ug/L | |
| trans-1,3-Dichloropropene | < 5.0 | ug/L | |
| Ethyl benzene | < 5.0 | ug/L | |
| 2-Hexanone | < 10.0 | ug/L | |
| 4-Methyl-2-pentanone | < 10.0 | ug/L | |
| Methylene chloride | < 5.0 | ug/L | |
| Styrene | < 5.0 | ug/L | |
| 1,1,2,2-Tetrachloroethane | < 5.0 | ug/L | |
| Tetrachloroethene | < 5.0 | ug/L | |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17958 | Date Taken: | 06/09/95 |
| Sample Description: | Trip Blank FBB | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| Toluene | < 5.0 | ug/L | |
| 1,1,1-Trichloroethane | < 5.0 | ug/L | |
| 1,1,2-Trichloroethane | < 5.0 | ug/L | |
| Trichloroethene | < 5.0 | ug/L | |
| Vinyl Acetate | < 10.0 | ug/L | |
| Vinyl Chloride | < 2.0 | ug/L | |
| Xylenes (total) | < 5.0 | ug/L | |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17959 | Date Taken: | 06/09/95 |
| Sample Description: | Trip Blank G128S | Date Reported: | 06/21/95 |

**Volatile Organic Compounds Method 8240A**
Analysis Date: 06/13/95

| Analyte | Result | Units | Flags |
|---|---|---|---|
| Acetone | < 10.0 | ug/L | |
| Benzene | < 5.0 | ug/L | |
| Bromodichloromethane | < 5.0 | ug/L | |
| Bromoform | < 5.0 | ug/L | |
| Bromomethane | < 10.0 | ug/L | |
| 2-Butanone | < 10.0 | ug/L | |
| Carbon disulfide | < 5.0 | ug/L | |
| Carbon tetrachloride | < 5.0 | ug/L | |
| Chlorobenzene | < 5.0 | ug/L | |
| Chlorodibromomethane | < 5.0 | ug/L | |
| Chloroethane | < 10.0 | ug/L | |
| Chloroform | < 5.0 | ug/L | |
| Chloromethane | < 10.0 | ug/L | |
| 1,1-Dichloroethane | < 5.0 | ug/L | |
| 1,2-Dichloroethane | < 5.0 | ug/L | |
| 1,1-Dichloroethene | < 5.0 | ug/L | |
| 1,2-Dichloroethene (total) | < 5.0 | ug/L | |
| 1,2-Dichloropropane | < 5.0 | ug/L | |
| cis-1,3-Dichloropropene | < 5.0 | ug/L | |
| trans-1,3-Dichloropropene | < 5.0 | ug/L | |
| Ethyl benzene | < 5.0 | ug/L | |
| 2-Hexanone | < 10.0 | ug/L | |
| 4-Methyl-2-pentanone | < 10.0 | ug/L | |
| Methylene chloride | < 5.0 | ug/L | |
| Styrene | < 5.0 | ug/L | |
| 1,1,2,2-Tetrachloroethane | < 5.0 | ug/L | |
| Tetrachloroethene | < 5.0 | ug/L | |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17959 | Date Taken: | 06/09/95 |
| Sample Description: | Trip Blank G128S | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| Toluene | < 5.0 | ug/L | |
| 1,1,1-Trichloroethane | < 5.0 | ug/L | |
| 1,1,2-Trichloroethane | < 5.0 | ug/L | |
| Trichloroethene | < 5.0 | ug/L | |
| Vinyl Acetate | < 10.0 | ug/L | |
| Vinyl Chloride | < 2.0 | ug/L | |
| Xylenes (total) | < 5.0 | ug/L | |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17960 | Date Taken: | 06/09/95 |
| Sample Description: | Trip Blank G139 | Date Reported: | 06/21/95 |

**Volatile Organic Compounds Method 8240A**
Analysis Date: 06/13/95

| Analyte | Result | Units | Flags |
|---|---|---|---|
| Acetone | < 10.0 | ug/L | |
| Benzene | < 5.0 | ug/L | |
| Bromodichloromethane | < 5.0 | ug/L | |
| Bromoform | < 5.0 | ug/L | |
| Bromomethane | < 10.0 | ug/L | |
| 2-Butanone | < 10.0 | ug/L | |
| Carbon disulfide | < 5.0 | ug/L | |
| Carbon tetrachloride | < 5.0 | ug/L | |
| Chlorobenzene | < 5.0 | ug/L | |
| Chlorodibromomethane | < 5.0 | ug/L | |
| Chloroethane | < 10.0 | ug/L | |
| Chloroform | < 5.0 | ug/L | |
| Chloromethane | < 10.0 | ug/L | |
| 1,1-Dichloroethane | < 5.0 | ug/L | |
| 1,2-Dichloroethane | < 5.0 | ug/L | |
| 1,1-Dichloroethene | < 5.0 | ug/L | |
| 1,2-Dichloroethene (total) | < 5.0 | ug/L | |
| 1,2-Dichloropropane | < 5.0 | ug/L | |
| cis-1,3-Dichloropropene | < 5.0 | ug/L | |
| trans-1,3-Dichloropropene | < 5.0 | ug/L | |
| Ethyl benzene | < 5.0 | ug/L | |
| 2-Hexanone | < 10.0 | ug/L | |
| 4-Methyl-2-pentanone | < 10.0 | ug/L | |
| Methylene chloride | < 5.0 | ug/L | |
| Styrene | < 5.0 | ug/L | |
| 1,1,2,2-Tetrachloroethane | < 5.0 | ug/L | |
| Tetrachloroethene | < 5.0 | ug/L | |

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# Analytical Report

| | | | |
|---|---|---|---|
| Client: | FPD of DUPAGE COUNTY | | |
| Project ID: | TSC #37579 | Date Received: | 06/09/95 |
| Sample Number: | 17960 | Date Taken: | 06/09/95 |
| Sample Description: | Trip Blank G139 | Date Reported: | 06/21/95 |

| Analyte | Result | Units | Flags |
|---|---|---|---|
| Toluene | < 5.0 | ug/L | |
| 1,1,1-Trichloroethane | < 5.0 | ug/L | |
| 1,1,2-Trichloroethane | < 5.0 | ug/L | |
| Trichloroethene | < 5.0 | ug/L | |
| Vinyl Acetate | < 10.0 | ug/L | |
| Vinyl Chloride | < 2.0 | ug/L | |
| Xylenes (total) | < 5.0 | ug/L | |

# CHAIN OF CUSTODY RECORD

**First Environmental Laboratories, Inc.**

1600 Shore Road • Naperville, Illinois 60563
Phone (708) 778-1200 • Fax (708) 778-1233
24 Hr. Pager (708) 569-7507

COMPANY NAME: TSC
ADDRESS:
PHONE: FAX:
CONTACT NAME
SAMPLED BY: Michael Billings & Michael Bessell

Project I.D. 37579
Send Report To:

ANALYSES: Blackwell Landfill Parameters

| DATE/TIME TAKEN | SAMPLE DESCRIPTION | | | | | | | | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|
| 6-9-95 8:06 | G133D | | X | X | | | | | 17949 |
| 8:35 | G133S | | | | | | | | 17950 |
| 10:45 | G138 | QA Split | | | | | | | 17951 |
| 12:50 | FBB | QA Split | | | | | | | 17952 |
| 13:05 | G128S | QA Split | | | | | | | 17953 |
| 15:50 | G139 | QA Split | | | | | | | 17954 |

**Condition of Samples**

Were the bottles intact? (Y) N  Were VOA vials free headspace? (Y) / N  Cooler Temperature: ____ °C on ice

Notes and Special Instructions:

Relinquished By: Michael D. Billings  Date/Time 6-9-95  Received By: [signature]  Date/Time 6/9/95 4:35 PM
Relinquished By:  Date/Time  Received By:  Date/Time
Relinquished By:  Date/Time  Received By:  Date/Time

COVER PAGE - CLP ANALYSIS DATA REPORT

Lab Name: Montgomery Watson Inc.

Project: Blackwell Landfill Monitoring Wells

Sampling Date: June 9, 1995

| Sample Description | Lab Sample ID | Analysis |
|---|---|---|
| G-128S | 950617503 | CLP Organic Compounds |
| G-138 | 950617501 | CLP Organic Compounds |
| G-139 | 950617502 | CLP Organic Compounds |
| FB01 | 950617505 | CLP Organic Compounds |
| TB01 | 950617504 | CLP Organic Compounds |
| G-128S | SD1920-003 | CLP Metals |
| G-138 | SD1920-001 | CLP Metals |
| G-139 | SD1920-002 | CLP Metals |
| FB01 | SD1920-004 | CLP Metals |
| G-128S | SD1920-007 | CLP Lead (unfiltered) |
| G-138 | SD1920-005 | CLP Lead (unfiltered) |
| G-139 | SD1920-006 | CLP Lead (unfiltered) |
| G-128S | 10920-003 | Indicator Parameters |
| G-138 | 10920-001 | Indicator Parameters |
| G-139 | 10920-002 | Indicator Parameters |
| FB01 | 10920-004 | Indicator Parameters |

NOT VALIDATED

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO

128S

Lab Name: INDUSTRIAL & ENVIRONMENTA Contract: SOW 1/91

Lab Code: IEA Case No.: 1589-069 SDG No.: 06175

Matrix: (soil/water) WATER Lab Sample ID: 950617503

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: 0613E13.D

Level: (low/med) LOW Date Received: 06/10/95

% Moisture: not dec. _____ Date Analyzed: 06/14/95

GC Column:DB-624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L | Q |
|---|---|---|---|
| 74-87-3 | Chloromethane | 10 | U |
| 74-83-9 | Bromomethane | 10 | U |
| 75-01-4 | Vinyl Chloride | 10 | U |
| 75-00-3 | Chloroethane | 10 | U |
| 75-09-2 | Methylene Chloride | 10 | U |
| 67-64-1 | Acetone | 10 | U |
| 75-15-0 | Carbon Disulfide | 10 | U |
| 75-35-4 | 1,1-Dichloroethene | 10 | U |
| 75-34-3 | 1,1-Dichloroethane | 3 | J |
| 540-59-0 | 1,2-Dichloroethene (total) | 9 | J |
| 67-66-3 | Chloroform | 10 | U |
| 107-06-2 | 1,2-Dichloroethane | 10 | U |
| 78-93-3 | 2-Butanone | 10 | U |
| 71-55-6 | 1,1,1-Trichloroethane | 10 | U |
| 56-23-5 | Carbon Tetrachloride | 10 | U |
| 75-27-4 | Bromodichloromethane | 10 | U |
| 78-87-5 | 1,2-Dichloropropane | 10 | U |
| 10061-01-5 | cis-1,3-Dichloropropene | 10 | U |
| 79-01-6 | Trichloroethene | 10 | U |
| 124-48-1 | Dibromochloromethane | 10 | U |
| 79-00-5 | 1,1,2-Trichloroethane | 10 | U |
| 71-43-2 | Benzene | 10 | U |
| 10061-02-6 | trans-1,3-Dichloropropene | 10 | U |
| 75-25-2 | Bromoform | 10 | U |
| 108-10-1 | 4-Methyl-2-Pentanone | 10 | U |
| 591-78-6 | 2-Hexanone | 10 | U |
| 127-18-4 | Tetrachloroethene | 10 | U |
| 79-34-5 | 1,1,2,2-Tetrachloroethane | 10 | U |
| 108-88-3 | Toluene | 10 | U |
| 108-90-7 | Chlorobenzene | 10 | U |
| 100-41-4 | Ethylbenzene | 10 | U |
| 100-42-5 | Styrene | 10 | U |
| 1330-20-7 | Xylene (total) | 10 | U |

NOT VALIDATED

1E

# VOLATILE ORGANICS ANALYSIS DATA SHEET
## TENTATIVELY IDENTIFIED COMPOUNDS

CLIENT SAMPLE NO.

128S

Lab Name: INDUSTRIAL & ENVIRONMENTA Contract: SOW 1/91

Lab Code: IEA Case No.: 1589-069 SDG No.: 06175

Matrix: (soil/water) WATER Lab Sample ID: 950617503

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: 0613E13.D

Level: (low/med) LOW Date Received: 06/10/95

% Moisture: not dec. _____ Date Analyzed: 06/14/95

GC Column:DB-624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 1

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

| CAS NUMBER | COMPOUND NAME | RT | EST. CONC. | Q |
|---|---|---|---|---|
| 1. 75456 | Methane, chlorodifluoro- | 2.850 | 15 | NJ |
| 2. | | | | |
| 3. | | | | |
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1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

NOT VALIDATED

CLIENT SAMPLE NO

138

Lab Name: INDUSTRIAL & ENVIRONMENTA Contract: SOW 1/91

Lab Code: IEA Case No.: 1589-069 SDG No.: 06175

Matrix: (soil/water) WATER Lab Sample ID: 950617501

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: 0613E09.D

Level: (low/med) LOW Date Received: 06/10/95

% Moisture: not dec. _____ Date Analyzed: 06/13/95

GC Column:DB-624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L | Q |
|---|---|---|---|
| 74-87-3 | Chloromethane | 10 | U |
| 74-83-9 | Bromomethane | 10 | U |
| 75-01-4 | Vinyl Chloride | 10 | U |
| 75-00-3 | Chloroethane | 10 | U |
| 75-09-2 | Methylene Chloride | 10 | U |
| 67-64-1 | Acetone | 10 | U |
| 75-15-0 | Carbon Disulfide | 10 | U |
| 75-35-4 | 1,1-Dichloroethene | 10 | U |
| 75-34-3 | 1,1-Dichloroethane | 10 | U |
| 540-59-0 | 1,2-Dichloroethene (total) | 10 | U |
| 67-66-3 | Chloroform | 10 | U |
| 107-06-2 | 1,2-Dichloroethane | 10 | U |
| 78-93-3 | 2-Butanone | 10 | U |
| 71-55-6 | 1,1,1-Trichloroethane | 10 | U |
| 56-23-5 | Carbon Tetrachloride | 10 | U |
| 75-27-4 | Bromodichloromethane | 10 | U |
| 78-87-5 | 1,2-Dichloropropane | 10 | U |
| 10061-01-5 | cis-1,3-Dichloropropene | 10 | U |
| 79-01-6 | Trichloroethene | 10 | U |
| 124-48-1 | Dibromochloromethane | 10 | U |
| 79-00-5 | 1,1,2-Trichloroethane | 10 | U |
| 71-43-2 | Benzene | 10 | U |
| 10061-02-6 | trans-1,3-Dichloropropene | 10 | U |
| 75-25-2 | Bromoform | 10 | U |
| 108-10-1 | 4-Methyl-2-Pentanone | 10 | U |
| 591-78-6 | 2-Hexanone | 10 | U |
| 127-18-4 | Tetrachloroethene | 10 | U |
| 79-34-5 | 1,1,2,2-Tetrachloroethane | 10 | U |
| 108-88-3 | Toluene | 10 | U |
| 108-90-7 | Chlorobenzene | 10 | U |
| 100-41-4 | Ethylbenzene | 10 | U |
| 100-42-5 | Styrene | 10 | U |
| 1330-20-7 | Xylene (total) | 10 | U |

NOT VALIDATED

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

CLIENT SAMPLE NO.

138

Lab Name: INDUSTRIAL & ENVIRONMENTA Contract: SOW 1/91

Lab Code: IEA Case No.: 1589-069 SDG No.: 06175

Matrix: (soil/water) WATER Lab Sample ID: 950617501

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: 0613E09.D

Level: (low/med) LOW Date Received: 06/10/95

% Moisture: not dec. _____ Date Analyzed: 06/13/95

GC Column:DB-624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

| CAS NUMBER | COMPOUND NAME | RT | EST. CONC. | Q |
|---|---|---|---|---|
| 1. | | | | |
| 2. | | | | |
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NOT VALIDATED

1A

# VOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

139

Lab Name: INDUSTRIAL & ENVIRONMENTA Contract: SOW 1/91

Lab Code: IEA Case No.: 1589-069 SDG No.: 06175

Matrix: (soil/water) WATER Lab Sample ID: 950617502

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: 0613E12.D

Level: (low/med) LOW Date Received: 06/10/95

% Moisture: not dec. _____ Date Analyzed: 06/14/95

GC Column:DB-624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L | Q |
|---|---|---|---|
| 74-87-3 | Chloromethane | 10 | U |
| 74-83-9 | Bromomethane | 10 | U |
| 75-01-4 | Vinyl Chloride | 10 | U |
| 75-00-3 | Chloroethane | 10 | U |
| 75-09-2 | Methylene Chloride | 10 | U |
| 67-64-1 | Acetone | 10 | U |
| 75-15-0 | Carbon Disulfide | 10 | U |
| 75-35-4 | 1,1-Dichloroethene | 10 | U |
| 75-34-3 | 1,1-Dichloroethane | 10 | U |
| 540-59-0 | 1,2-Dichloroethene (total) | 10 | U |
| 67-66-3 | Chloroform | 10 | U |
| 107-06-2 | 1,2-Dichloroethane | 10 | U |
| 78-93-3 | 2-Butanone | 10 | U |
| 71-55-6 | 1,1,1-Trichloroethane | 10 | U |
| 56-23-5 | Carbon Tetrachloride | 10 | U |
| 75-27-4 | Bromodichloromethane | 10 | U |
| 78-87-5 | 1,2-Dichloropropane | 10 | U |
| 10061-01-5 | cis-1,3-Dichloropropene | 10 | U |
| 79-01-6 | Trichloroethene | 10 | U |
| 124-48-1 | Dibromochloromethane | 10 | U |
| 79-00-5 | 1,1,2-Trichloroethane | 10 | U |
| 71-43-2 | Benzene | 10 | U |
| 10061-02-6 | trans-1,3-Dichloropropene | 10 | U |
| 75-25-2 | Bromoform | 10 | U |
| 108-10-1 | 4-Methyl-2-Pentanone | 10 | U |
| 591-78-6 | 2-Hexanone | 10 | U |
| 127-18-4 | Tetrachloroethene | 10 | U |
| 79-34-5 | 1,1,2,2-Tetrachloroethane | 10 | U |
| 108-88-3 | Toluene | 10 | U |
| 108-90-7 | Chlorobenzene | 10 | U |
| 100-41-4 | Ethylbenzene | 10 | U |
| 100-42-5 | Styrene | 10 | U |
| 1330-20-7 | Xylene (total) | 10 | U |

NOT VALIDATED

1E

# VOLATILE ORGANICS ANALYSIS DATA SHEET
## TENTATIVELY IDENTIFIED COMPOUNDS

CLIENT SAMPLE NO.

139

Lab Name: INDUSTRIAL & ENVIRONMENTA Contract: SOW 1/91

Lab Code: IEA Case No.: 1589-069 SDG No.: 06175

Matrix: (soil/water) WATER Lab Sample ID: 950617502

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: 0613E12.D

Level: (low/med) LOW Date Received: 06/10/95

% Moisture: not dec. _____ Date Analyzed: 06/14/95

GC Column:DB-624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

| CAS NUMBER | COMPOUND NAME | RT | EST. CONC. | Q |
|---|---|---|---|---|
| 1. | | | | |
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NOT VALIDATED

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO

FB01

Lab Name: INDUSTRIAL & ENVIRONMENTA Contract: SOW 1/91

Lab Code: IEA Case No.: 1589-069 SDG No.: 06175

Matrix: (soil/water) WATER Lab Sample ID: 950617505

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: 0613E15.D

Level: (low/med) LOW Date Received: 06/10/95

% Moisture: not dec. _____ Date Analyzed: 06/14/95

GC Column: DB-624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L | Q |
|---|---|---|---|
| 74-87-3 | Chloromethane | 10 | U |
| 74-83-9 | Bromomethane | 10 | U |
| 75-01-4 | Vinyl Chloride | 10 | U |
| 75-00-3 | Chloroethane | 10 | U |
| 75-09-2 | Methylene Chloride | 8 | J |
| 67-64-1 | Acetone | 10 | U |
| 75-15-0 | Carbon Disulfide | 10 | U |
| 75-35-4 | 1,1-Dichloroethene | 10 | U |
| 75-34-3 | 1,1-Dichloroethane | 10 | U |
| 540-59-0 | 1,2-Dichloroethene (total) | 10 | U |
| 67-66-3 | Chloroform | 10 | U |
| 107-06-2 | 1,2-Dichloroethane | 10 | U |
| 78-93-3 | 2-Butanone | 10 | U |
| 71-55-6 | 1,1,1-Trichloroethane | 10 | U |
| 56-23-5 | Carbon Tetrachloride | 10 | U |
| 75-27-4 | Bromodichloromethane | 10 | U |
| 78-87-5 | 1,2-Dichloropropane | 10 | U |
| 10061-01-5 | cis-1,3-Dichloropropene | 10 | U |
| 79-01-6 | Trichloroethene | 10 | U |
| 124-48-1 | Dibromochloromethane | 10 | U |
| 79-00-5 | 1,1,2-Trichloroethane | 10 | U |
| 71-43-2 | Benzene | 10 | U |
| 10061-02-6 | trans-1,3-Dichloropropene | 10 | U |
| 75-25-2 | Bromoform | 10 | U |
| 108-10-1 | 4-Methyl-2-Pentanone | 10 | U |
| 591-78-6 | 2-Hexanone | 10 | U |
| 127-18-4 | Tetrachloroethene | 10 | U |
| 79-34-5 | 1,1,2,2-Tetrachloroethane | 10 | U |
| 108-88-3 | Toluene | 10 | U |
| 108-90-7 | Chlorobenzene | 10 | U |
| 100-41-4 | Ethylbenzene | 10 | U |
| 100-42-5 | Styrene | 10 | U |
| 1330-20-7 | Xylene (total) | 10 | U |

NOT VALIDATED

1E

# VOLATILE ORGANICS ANALYSIS DATA SHEET
## TENTATIVELY IDENTIFIED COMPOUNDS

CLIENT SAMPLE NO.

FB01

Lab Name: INDUSTRIAL & ENVIRONMENTA Contract: SOW 1/91

Lab Code: IEA Case No.: 1589-069 SDG No.: 06175

Matrix: (soil/water) WATER Lab Sample ID: 950617505

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: 0613E15.D

Level: (low/med) LOW Date Received: 06/10/95

% Moisture: not dec. _____ Date Analyzed: 06/14/95

GC Column:DB-624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

| CAS NUMBER | COMPOUND NAME | RT | EST. CONC. | Q |
|---|---|---|---|---|
| 1. | | | | |
| 2. | | | | |
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| 29. | | | | |
| 30. | | | | |

NOT VALIDATED

1A

# VOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

TB01

Lab Name: INDUSTRIAL & ENVIRONMENTA Contract: SOW 1/91

Lab Code: IEA Case No.: 1589-069 SDG No.: 06175

Matrix: (soil/water) WATER Lab Sample ID: 950617504

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: 0613E14.D

Level: (low/med) LOW Date Received: 06/10/95

% Moisture: not dec. _____ Date Analyzed: 06/14/95

GC Column:DB-624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L | Q |
|---|---|---|---|
| 74-87-3 | Chloromethane | 10 | U |
| 74-83-9 | Bromomethane | 10 | U |
| 75-01-4 | Vinyl Chloride | 10 | U |
| 75-00-3 | Chloroethane | 10 | U |
| 75-09-2 | Methylene Chloride | 10 | U |
| 67-64-1 | Acetone | 10 | U |
| 75-15-0 | Carbon Disulfide | 10 | U |
| 75-35-4 | 1,1-Dichloroethene | 10 | U |
| 75-34-3 | 1,1-Dichloroethane | 10 | U |
| 540-59-0 | 1,2-Dichloroethene (total) | 10 | U |
| 67-66-3 | Chloroform | 10 | U |
| 107-06-2 | 1,2-Dichloroethane | 10 | U |
| 78-93-3 | 2-Butanone | 10 | U |
| 71-55-6 | 1,1,1-Trichloroethane | 10 | U |
| 56-23-5 | Carbon Tetrachloride | 10 | U |
| 75-27-4 | Bromodichloromethane | 10 | U |
| 78-87-5 | 1,2-Dichloropropane | 10 | U |
| 10061-01-5 | cis-1,3-Dichloropropene | 10 | U |
| 79-01-6 | Trichloroethene | 10 | U |
| 124-48-1 | Dibromochloromethane | 10 | U |
| 79-00-5 | 1,1,2-Trichloroethane | 10 | U |
| 71-43-2 | Benzene | 10 | U |
| 10061-02-6 | trans-1,3-Dichloropropene | 10 | U |
| 75-25-2 | Bromoform | 10 | U |
| 108-10-1 | 4-Methyl-2-Pentanone | 10 | U |
| 591-78-6 | 2-Hexanone | 10 | U |
| 127-18-4 | Tetrachloroethene | 10 | U |
| 79-34-5 | 1,1,2,2-Tetrachloroethane | 10 | U |
| 108-88-3 | Toluene | 10 | U |
| 108-90-7 | Chlorobenzene | 10 | U |
| 100-41-4 | Ethylbenzene | 10 | U |
| 100-42-5 | Styrene | 10 | U |
| 1330-20-7 | Xylene (total) | 10 | U |

NOT VALIDATED

1E

# VOLATILE ORGANICS ANALYSIS DATA SHEET
## TENTATIVELY IDENTIFIED COMPOUNDS

CLIENT SAMPLE NO.

TB01

Lab Name: INDUSTRIAL & ENVIRONMENTA Contract: SOW 1/91

Lab Code: IEA Case No.: 1589-069 SDG No.: 06175

Matrix: (soil/water) WATER Lab Sample ID: 950617504

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: 0613E14.D

Level: (low/med) LOW Date Received: 06/10/95

% Moisture: not dec. _____ Date Analyzed: 06/14/95

GC Column:DB-624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 1

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

| | CAS NUMBER | COMPOUND NAME | RT | EST. CONC. | Q |
|---|---|---|---|---|---|
| 1. | 75070 | Acetaldehyde | 3.590 | 5 | NJ |
| 2. | | | | | |
| 3. | | | | | |
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| 30. | | | | | |

NOT VALIDATED

1B

# SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

128S

Lab Name: INDUSTRIAL & ENVIRONMENTA Contract: SOW 1/91

Lab Code: IEA Case No.: 1589-069 SDG No.: 06175

Matrix: (soil/water) WATER Lab Sample ID: 950617503

Sample wt/vol: 1000 (g/mL) mL Lab File ID: 0615805.D

Level: (low/med) LOW Date Received: 06/10/95

% Moisture: _____ decanted: (Y/N)___ Date Extracted: 06/13/95

Concentrated Extract Volume: 1000(uL) Date Analyzed: 06/15/95

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH:

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L | Q |
|---|---|---|---|
| 108-95-2 | Phenol | 10 | U |
| 111-44-4 | bis(2-Chloroethyl)ether | 10 | U |
| 95-57-8 | 2-Chlorophenol | 10 | U |
| 541-73-1 | 1,3-Dichlorobenzene | 10 | U |
| 106-46-7 | 1,4-Dichlorobenzene | 10 | U |
| 95-50-1 | 1,2-Dichlorobenzene | 10 | U |
| 95-48-7 | 2-Methylphenol | 1 | J |
| 108-60-1 | 2,2'-oxybis(1-Chloropropane) | 10 | U |
| 106-44-5 | 4-Methylphenol | 1 | J |
| 621-64-7 | N-Nitroso-di-n-propylamine | 10 | U |
| 67-72-1 | Hexachloroethane | 10 | U |
| 98-95-3 | Nitrobenzene | 10 | U |
| 78-59-1 | Isophorone | 10 | U |
| 88-75-5 | 2-Nitrophenol | 10 | U |
| 105-67-9 | 2,4-Dimethylphenol | 10 | U |
| 111-91-1 | bis(2-Chloroethoxy)methane | 10 | U |
| 120-83-2 | 2,4-Dichlorophenol | 10 | U |
| 120-82-1 | 1,2,4-Trichlorobenzene | 10 | U |
| 91-20-3 | Naphthalene | 10 | U |
| 106-47-8 | 4-Chloroaniline | 10 | U |
| 87-68-3 | Hexachlorobutadiene | 10 | U |
| 59-50-7 | 4-Chloro-3-methylphenol | 10 | U |
| 91-57-6 | 2-Methylnaphthalene | 10 | U |
| 77-47-4 | Hexachlorocyclopentadiene | 10 | U |
| 88-06-2 | 2,4,6-Trichlorophenol | 10 | U |
| 95-95-4 | 2,4,5-Trichlorophenol | 25 | U |
| 91-58-7 | 2-Chloronaphthalene | 10 | U |
| 88-74-4 | 2-Nitroaniline | 25 | U |
| 131-11-3 | Dimethylphthalate | 10 | U |
| 208-96-8 | Acenaphthylene | 10 | U |
| 606-20-2 | 2,6-Dinitrotoluene | 10 | U |
| 99-09-2 | 3-Nitroaniline | 25 | U |
| 83-32-9 | Acenaphthene | 10 | U |

NOT VALIDATED

1C

# SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

128S

Lab Name: INDUSTRIAL & ENVIRONMENTA Contract: SOW 1/91

Lab Code: IEA Case No.: 1589-069 SDG No.: 06175

Matrix: (soil/water) WATER Lab Sample ID: 950617503

Sample wt/vol: 1000 (g/mL) mL Lab File ID: 0615805.D

Level: (low/med) LOW Date Received: 06/10/95

% Moisture: _____ decanted: (Y/N)___ Date Extracted: 06/13/95

Concentrated Extract Volume: 1000(uL) Date Analyzed: 06/15/95

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH:

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L | Q |
|---|---|---|---|
| 51-28-5 | 2,4-Dinitrophenol | 25 | U |
| 100-02-7 | 4-Nitrophenol | 25 | U |
| 132-64-9 | Dibenzofuran | 10 | U |
| 121-14-2 | 2,4-Dinitrotoluene | 10 | U |
| 84-66-2 | Diethylphthalate | 10 | U |
| 7005-72-3 | 4-Chlorophenyl-phenylether | 10 | U |
| 86-73-7 | Fluorene | 10 | U |
| 100-01-6 | 4-Nitroaniline | 25 | U |
| 534-52-1 | 4,6-Dinitro-2-methylphenol | 25 | U |
| 86-30-6 | N-Nitrosodiphenylamine (1) | 10 | U |
| 101-55-3 | 4-Bromophenyl-phenylether | 10 | U |
| 118-74-1 | Hexachlorobenzene | 10 | U |
| 87-86-5 | Pentachlorophenol | 25 | U |
| 85-01-8 | Phenanthrene | 10 | U |
| 120-12-7 | Anthracene | 10 | U |
| 86-74-8 | Carbazole | 10 | U |
| 84-74-2 | Di-n-butylphthalate | 10 | U |
| 206-44-0 | Fluoranthene | 10 | U |
| 129-00-0 | Pyrene | 10 | U |
| 85-68-7 | Butylbenzylphthalate | 10 | U |
| 91-94-1 | 3,3'-Dichlorobenzidine | 10 | U |
| 56-55-3 | Benzo(a)anthracene | 10 | U |
| 218-01-9 | Chrysene | 10 | U |
| 117-81-7 | bis(2-Ethylhexyl)phthalate | 10 | U |
| 117-84-0 | Di-n-octylphthalate | 10 | U |
| 205-99-2 | Benzo(b)fluoranthene | 10 | U |
| 207-08-9 | Benzo(k)fluoranthene | 10 | U |
| 50-32-8 | Benzo(a)pyrene | 10 | U |
| 193-39-5 | Indeno(1,2,3-cd)pyrene | 10 | U |
| 53-70-3 | Dibenz(a,h)anthracene | 10 | U |
| 191-24-2 | Benzo(g,h,i)perylene | 10 | U |

(1) - Cannot be separated from Diphenylamine

NOT VALIDATED

1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

CLIENT SAMPLE NO.

128S

Lab Name: INDUSTRIAL & ENVIRONMENTA Contract: SOW 1/91

Lab Code: IEA Case No.: 1589-069 SDG No.: 06175

Matrix: (soil/water) WATER Lab Sample ID: 950617503

Sample wt/vol: 1000 (g/mL) mL Lab File ID: 0615805.D

Level: (low/med) LOW Date Received: 06/10/95

% Moisture: _____ decanted: (Y/N)___ Date Extracted: 06/13/95

Concentrated Extract Volume: 1000(uL) Date Analyzed: 06/15/95

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH:_____

Number TICs found: 4

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

| CAS NUMBER | COMPOUND NAME | RT | EST. CONC. | Q |
|---|---|---|---|---|
| 1. 106263 | 2,6-Octadienal, 3,7-dimethyl | 13.580 | 5 | NJ |
| 2. | Unknown Branched Alkene | 19.430 | 3 | J |
| 3. | Unknown Hydrocarbon | 24.440 | 2 | J |
| 4. | Unknown Acid | 24.600 | 2 | J |
| 5. | | | | |
| 6. | | | | |
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| 29. | | | | |
| 30. | | | | |

NOT VALIDATED

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

138

Lab Name: INDUSTRIAL & ENVIRONMENTA Contract: SOW 1/91

Lab Code: IEA Case No.: 1589-069 SDG No.: 06175

Matrix: (soil/water) WATER Lab Sample ID: 950617501

Sample wt/vol: 500 (g/mL) mL Lab File ID: 0615804.D

Level: (low/med) LOW Date Received: 06/10/95

% Moisture: _____ decanted: (Y/N)___ Date Extracted: 06/13/95

Concentrated Extract Volume: 500(uL) Date Analyzed: 06/15/95

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH:

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L | Q |
|---|---|---|---|
| 108-95-2 | Phenol | 10 | U |
| 111-44-4 | bis(2-Chloroethyl)ether | 10 | U |
| 95-57-8 | 2-Chlorophenol | 10 | U |
| 541-73-1 | 1,3-Dichlorobenzene | 10 | U |
| 106-46-7 | 1,4-Dichlorobenzene | 10 | U |
| 95-50-1 | 1,2-Dichlorobenzene | 10 | U |
| 95-48-7 | 2-Methylphenol | 10 | U |
| 108-60-1 | 2,2'-oxybis(1-Chloropropane) | 10 | U |
| 106-44-5 | 4-Methylphenol | 10 | U |
| 621-64-7 | N-Nitroso-di-n-propylamine | 10 | U |
| 67-72-1 | Hexachloroethane | 10 | U |
| 98-95-3 | Nitrobenzene | 10 | U |
| 78-59-1 | Isophorone | 10 | U |
| 88-75-5 | 2-Nitrophenol | 10 | U |
| 105-67-9 | 2,4-Dimethylphenol | 10 | U |
| 111-91-1 | bis(2-Chloroethoxy)methane | 10 | U |
| 120-83-2 | 2,4-Dichlorophenol | 10 | U |
| 120-82-1 | 1,2,4-Trichlorobenzene | 10 | U |
| 91-20-3 | Naphthalene | 10 | U |
| 106-47-8 | 4-Chloroaniline | 10 | U |
| 87-68-3 | Hexachlorobutadiene | 10 | U |
| 59-50-7 | 4-Chloro-3-methylphenol | 10 | U |
| 91-57-6 | 2-Methylnaphthalene | 10 | U |
| 77-47-4 | Hexachlorocyclopentadiene | 10 | U |
| 88-06-2 | 2,4,6-Trichlorophenol | 10 | U |
| 95-95-4 | 2,4,5-Trichlorophenol | 25 | U |
| 91-58-7 | 2-Chloronaphthalene | 10 | U |
| 88-74-4 | 2-Nitroaniline | 25 | U |
| 131-11-3 | Dimethylphthalate | 10 | U |
| 208-96-8 | Acenaphthylene | 10 | U |
| 606-20-2 | 2,6-Dinitrotoluene | 10 | U |
| 99-09-2 | 3-Nitroaniline | 25 | U |
| 83-32-9 | Acenaphthene | 10 | U |

NOT VALIDATED

1C

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

138

Lab Name: INDUSTRIAL & ENVIRONMENTA Contract: SOW 1/91

Lab Code: IEA Case No.: 1589-069 SDG No.: 06175

Matrix: (soil/water) WATER Lab Sample ID: 950617501

Sample wt/vol: 500 (g/mL) mL Lab File ID: 0615804.D

Level: (low/med) LOW Date Received: 06/10/95

% Moisture: _____ decanted: (Y/N)___ Date Extracted: 06/13/95

Concentrated Extract Volume: 500(uL) Date Analyzed: 06/15/95

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH:

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L | Q |
|---|---|---|---|
| 51-28-5 | 2,4-Dinitrophenol | 25 | U |
| 100-02-7 | 4-Nitrophenol | 25 | U |
| 132-64-9 | Dibenzofuran | 10 | U |
| 121-14-2 | 2,4-Dinitrotoluene | 10 | U |
| 84-66-2 | Diethylphthalate | 10 | U |
| 7005-72-3 | 4-Chlorophenyl-phenylether | 10 | U |
| 86-73-7 | Fluorene | 10 | U |
| 100-01-6 | 4-Nitroaniline | 25 | U |
| 534-52-1 | 4,6-Dinitro-2-methylphenol | 25 | U |
| 86-30-6 | N-Nitrosodiphenylamine (1) | 10 | U |
| 101-55-3 | 4-Bromophenyl-phenylether | 10 | U |
| 118-74-1 | Hexachlorobenzene | 10 | U |
| 87-86-5 | Pentachlorophenol | 25 | U |
| 85-01-8 | Phenanthrene | 10 | U |
| 120-12-7 | Anthracene | 10 | U |
| 86-74-8 | Carbazole | 10 | U |
| 84-74-2 | Di-n-butylphthalate | 1 | J |
| 206-44-0 | Fluoranthene | 10 | U |
| 129-00-0 | Pyrene | 10 | U |
| 85-68-7 | Butylbenzylphthalate | 10 | U |
| 91-94-1 | 3,3'-Dichlorobenzidine | 10 | U |
| 56-55-3 | Benzo(a)anthracene | 10 | U |
| 218-01-9 | Chrysene | 10 | U |
| 117-81-7 | bis(2-Ethylhexyl)phthalate | 2 | JB |
| 117-84-0 | Di-n-octylphthalate | 10 | U |
| 205-99-2 | Benzo(b)fluoranthene | 10 | U |
| 207-08-9 | Benzo(k)fluoranthene | 10 | U |
| 50-32-8 | Benzo(a)pyrene | 10 | U |
| 193-39-5 | Indeno(1,2,3-cd)pyrene | 10 | U |
| 53-70-3 | Dibenz(a,h)anthracene | 10 | U |
| 191-24-2 | Benzo(g,h,i)perylene | 10 | U |

(1) - Cannot be separated from Diphenylamine

NOT VALIDATED

1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

CLIENT SAMPLE NO.

138

Lab Name: INDUSTRIAL & ENVIRONMENTA Contract: SOW 1/91

Lab Code: IEA Case No.: 1589-069 SDG No.: 06175

Matrix: (soil/water) WATER Lab Sample ID: 950617501

Sample wt/vol: 500 (g/mL) mL Lab File ID: 0615804.D

Level: (low/med) LOW Date Received: 06/10/95

% Moisture: _____ decanted: (Y/N)___ Date Extracted: 06/13/95

Concentrated Extract Volume: 500(uL) Date Analyzed: 06/15/95

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH:_____

Number TICs found: 9

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

| CAS NUMBER | COMPOUND NAME | RT | EST. CONC. | Q |
|---|---|---|---|---|
| 1. 124072 | Octanoic Acid | 12.380 | 2 | NJ |
| 2. 112050 | Nonanoic acid | 13.910 | 5 | NJ |
| 3. 134623 | Diethyltoluamide | 18.430 | 2 | NJ |
| 4. | Unknown Alkane | 27.540 | 2 | J |
| 5. | Unknown Alkane | 28.340 | 4 | J |
| 6. | Unknown Alkane | 29.120 | 5 | J |
| 7. | Unknown Alkane | 29.940 | 4 | J |
| 8. | Unknown Alkane | 30.840 | 4 | J |
| 9. | Unknown Alkane | 33.040 | 2 | J |
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1B

# SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

NOT VALIDATED

CLIENT SAMPLE NO.

139

Lab Name: INDUSTRIAL & ENVIRONMENTA Contract: SOW 1/91

Lab Code: IEA Case No.: 1589-069 SDG No.: 06175

Matrix: (soil/water) WATER Lab Sample ID: 950617502

Sample wt/vol: 1000 (g/mL) mL Lab File ID: 0615803.D

Level: (low/med) LOW Date Received: 06/10/95

% Moisture: _____ decanted: (Y/N)___ Date Extracted: 06/13/95

Concentrated Extract Volume: 1000(uL) Date Analyzed: 06/15/95

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH:

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L | Q |
|---|---|---|---|
| 108-95-2 | Phenol | 10 | U |
| 111-44-4 | bis(2-Chloroethyl)ether | 10 | U |
| 95-57-8 | 2-Chlorophenol | 10 | U |
| 541-73-1 | 1,3-Dichlorobenzene | 10 | U |
| 106-46-7 | 1,4-Dichlorobenzene | 10 | U |
| 95-50-1 | 1,2-Dichlorobenzene | 10 | U |
| 95-48-7 | 2-Methylphenol | 10 | U |
| 108-60-1 | 2,2'-oxybis(1-Chloropropane) | 10 | U |
| 106-44-5 | 4-Methylphenol | 10 | U |
| 621-64-7 | N-Nitroso-di-n-propylamine | 10 | U |
| 67-72-1 | Hexachloroethane | 10 | U |
| 98-95-3 | Nitrobenzene | 10 | U |
| 78-59-1 | Isophorone | 10 | U |
| 88-75-5 | 2-Nitrophenol | 10 | U |
| 105-67-9 | 2,4-Dimethylphenol | 10 | U |
| 111-91-1 | bis(2-Chloroethoxy)methane | 10 | U |
| 120-83-2 | 2,4-Dichlorophenol | 10 | U |
| 120-82-1 | 1,2,4-Trichlorobenzene | 10 | U |
| 91-20-3 | Naphthalene | 10 | U |
| 106-47-8 | 4-Chloroaniline | 10 | U |
| 87-68-3 | Hexachlorobutadiene | 10 | U |
| 59-50-7 | 4-Chloro-3-methylphenol | 10 | U |
| 91-57-6 | 2-Methylnaphthalene | 10 | U |
| 77-47-4 | Hexachlorocyclopentadiene | 10 | U |
| 88-06-2 | 2,4,6-Trichlorophenol | 10 | U |
| 95-95-4 | 2,4,5-Trichlorophenol | 25 | U |
| 91-58-7 | 2-Chloronaphthalene | 10 | U |
| 88-74-4 | 2-Nitroaniline | 25 | U |
| 131-11-3 | Dimethylphthalate | 10 | U |
| 208-96-8 | Acenaphthylene | 10 | U |
| 606-20-2 | 2,6-Dinitrotoluene | 10 | U |
| 99-09-2 | 3-Nitroaniline | 25 | U |
| 83-32-9 | Acenaphthene | 10 | U |

NOT VALIDATED

1C

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

139

Lab Name: INDUSTRIAL & ENVIRONMENTA Contract: SOW 1/91

Lab Code: IEA Case No.: 1589-069 SDG No.: 06175

Matrix: (soil/water) WATER Lab Sample ID: 950617502

Sample wt/vol: 1000 (g/mL) mL Lab File ID: 0615803.D

Level: (low/med) LOW Date Received: 06/10/95

% Moisture: _____ decanted: (Y/N)___ Date Extracted: 06/13/95

Concentrated Extract Volume: 1000(uL) Date Analyzed: 06/15/95

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH:

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L | Q |
|---|---|---|---|
| 51-28-5 | 2,4-Dinitrophenol | 25 | U |
| 100-02-7 | 4-Nitrophenol | 25 | U |
| 132-64-9 | Dibenzofuran | 10 | U |
| 121-14-2 | 2,4-Dinitrotoluene | 10 | U |
| 84-66-2 | Diethylphthalate | 10 | U |
| 7005-72-3 | 4-Chlorophenyl-phenylether | 10 | U |
| 86-73-7 | Fluorene | 10 | U |
| 100-01-6 | 4-Nitroaniline | 25 | U |
| 534-52-1 | 4,6-Dinitro-2-methylphenol | 25 | U |
| 86-30-6 | N-Nitrosodiphenylamine (1) | 10 | U |
| 101-55-3 | 4-Bromophenyl-phenylether | 10 | U |
| 118-74-1 | Hexachlorobenzene | 10 | U |
| 87-86-5 | Pentachlorophenol | 25 | U |
| 85-01-8 | Phenanthrene | 10 | U |
| 120-12-7 | Anthracene | 10 | U |
| 86-74-8 | Carbazole | 10 | U |
| 84-74-2 | Di-n-butylphthalate | 10 | U |
| 206-44-0 | Fluoranthene | 10 | U |
| 129-00-0 | Pyrene | 10 | U |
| 85-68-7 | Butylbenzylphthalate | 10 | U |
| 91-94-1 | 3,3'-Dichlorobenzidine | 10 | U |
| 56-55-3 | Benzo(a)anthracene | 10 | U |
| 218-01-9 | Chrysene | 10 | U |
| 117-81-7 | bis(2-Ethylhexyl)phthalate | 1 | JB |
| 117-84-0 | Di-n-octylphthalate | 10 | U |
| 205-99-2 | Benzo(b)fluoranthene | 10 | U |
| 207-08-9 | Benzo(k)fluoranthene | 10 | U |
| 50-32-8 | Benzo(a)pyrene | 10 | U |
| 193-39-5 | Indeno(1,2,3-cd)pyrene | 10 | U |
| 53-70-3 | Dibenz(a,h)anthracene | 10 | U |
| 191-24-2 | Benzo(g,h,i)perylene | 10 | U |

(1) - Cannot be separated from Diphenylamine

NOT VALIDATED

1F

CLIENT SAMPLE NO.

139

# SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
## TENTATIVELY IDENTIFIED COMPOUNDS

Lab Name: INDUSTRIAL & ENVIRONMENTA Contract: SOW 1/91

Lab Code: IEA Case No.: 1589-069 SDG No.: 06175

Matrix: (soil/water) WATER Lab Sample ID: 950617502

Sample wt/vol: 1000 (g/mL) mL Lab File ID: 0615803.D

Level: (low/med) LOW Date Received: 06/10/95

% Moisture: _____ decanted: (Y/N)___ Date Extracted: 06/13/95

Concentrated Extract Volume: 1000(uL) Date Analyzed: 06/15/95

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH:_____

Number TICs found: 9

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

| CAS NUMBER | COMPOUND NAME | RT | EST. CONC. | Q |
|---|---|---|---|---|
| 1. 108930 | Cyclohexanol | 7.020 | 4 | NJ |
| 2. | Unknown | 14.540 | 2 | J |
| 3. 134623 | Diethyltoluamide | 18.430 | 3 | NJ |
| 4. | Unknown Alkane | 27.530 | 2 | J |
| 5. | Unknown Alkane | 28.340 | 3 | J |
| 6. | Unknown Alkane | 29.130 | 5 | J |
| 7. | Unknown Alkane | 29.940 | 4 | J |
| 8. | Unknown Alkane | 30.830 | 3 | J |
| 9. | Unknown Alkane | 33.040 | 2 | J |
| 10. | | | | |
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NOT VALIDATED

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

FB01

Lab Name: INDUSTRIAL & ENVIRONMENTA Contract: SOW 1/91

Lab Code: IEA Case No.: 1589-069 SDG No.: 06175

Matrix: (soil/water) WATER Lab Sample ID: 950617505

Sample wt/vol: 500 (g/mL) mL Lab File ID: 0615806.D

Level: (low/med) LOW Date Received: 06/10/95

% Moisture: _____ decanted: (Y/N)___ Date Extracted: 06/13/95

Concentrated Extract Volume: 500(uL) Date Analyzed: 06/15/95

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH:

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L | Q |
|---|---|---|---|
| 108-95-2 | Phenol | 10 | U |
| 111-44-4 | bis(2-Chloroethyl)ether | 10 | U |
| 95-57-8 | 2-Chlorophenol | 10 | U |
| 541-73-1 | 1,3-Dichlorobenzene | 10 | U |
| 106-46-7 | 1,4-Dichlorobenzene | 10 | U |
| 95-50-1 | 1,2-Dichlorobenzene | 10 | U |
| 95-48-7 | 2-Methylphenol | 10 | U |
| 108-60-1 | 2,2'-oxybis(1-Chloropropane) | 10 | U |
| 106-44-5 | 4-Methylphenol | 10 | U |
| 621-64-7 | N-Nitroso-di-n-propylamine | 10 | U |
| 67-72-1 | Hexachloroethane | 10 | U |
| 98-95-3 | Nitrobenzene | 10 | U |
| 78-59-1 | Isophorone | 10 | U |
| 88-75-5 | 2-Nitrophenol | 10 | U |
| 105-67-9 | 2,4-Dimethylphenol | 10 | U |
| 111-91-1 | bis(2-Chloroethoxy)methane | 10 | U |
| 120-83-2 | 2,4-Dichlorophenol | 10 | U |
| 120-82-1 | 1,2,4-Trichlorobenzene | 10 | U |
| 91-20-3 | Naphthalene | 10 | U |
| 106-47-8 | 4-Chloroaniline | 10 | U |
| 87-68-3 | Hexachlorobutadiene | 10 | U |
| 59-50-7 | 4-Chloro-3-methylphenol | 10 | U |
| 91-57-6 | 2-Methylnaphthalene | 10 | U |
| 77-47-4 | Hexachlorocyclopentadiene | 10 | U |
| 88-06-2 | 2,4,6-Trichlorophenol | 10 | U |
| 95-95-4 | 2,4,5-Trichlorophenol | 25 | U |
| 91-58-7 | 2-Chloronaphthalene | 10 | U |
| 88-74-4 | 2-Nitroaniline | 25 | U |
| 131-11-3 | Dimethylphthalate | 10 | U |
| 208-96-8 | Acenaphthylene | 10 | U |
| 606-20-2 | 2,6-Dinitrotoluene | 10 | U |
| 99-09-2 | 3-Nitroaniline | 25 | U |
| 83-32-9 | Acenaphthene | 10 | U |

NOT VALIDATED

1C

# SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

FB01

Lab Name: INDUSTRIAL & ENVIRONMENTA Contract: SOW 1/91

Lab Code: IEA Case No.: 1589-069 SDG No.: 06175

Matrix: (soil/water) WATER Lab Sample ID: 950617505

Sample wt/vol: 500 (g/mL) mL Lab File ID: 0615806.D

Level: (low/med) LOW Date Received: 06/10/95

% Moisture: _____ decanted: (Y/N)___ Date Extracted: 06/13/95

Concentrated Extract Volume: 500(uL) Date Analyzed: 06/15/95

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH:

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L | Q |
|---|---|---|---|
| 51-28-5 | 2,4-Dinitrophenol | 25 | U |
| 100-02-7 | 4-Nitrophenol | 25 | U |
| 132-64-9 | Dibenzofuran | 10 | U |
| 121-14-2 | 2,4-Dinitrotoluene | 10 | U |
| 84-66-2 | Diethylphthalate | 10 | U |
| 7005-72-3 | 4-Chlorophenyl-phenylether | 10 | U |
| 86-73-7 | Fluorene | 10 | U |
| 100-01-6 | 4-Nitroaniline | 25 | U |
| 534-52-1 | 4,6-Dinitro-2-methylphenol | 25 | U |
| 86-30-6 | N-Nitrosodiphenylamine (1) | 10 | U |
| 101-55-3 | 4-Bromophenyl-phenylether | 10 | U |
| 118-74-1 | Hexachlorobenzene | 10 | U |
| 87-86-5 | Pentachlorophenol | 25 | U |
| 85-01-8 | Phenanthrene | 10 | U |
| 120-12-7 | Anthracene | 10 | U |
| 86-74-8 | Carbazole | 10 | U |
| 84-74-2 | Di-n-butylphthalate | 10 | U |
| 206-44-0 | Fluoranthene | 10 | U |
| 129-00-0 | Pyrene | 10 | U |
| 85-68-7 | Butylbenzylphthalate | 10 | U |
| 91-94-1 | 3,3'-Dichlorobenzidine | 10 | U |
| 56-55-3 | Benzo(a)anthracene | 10 | U |
| 218-01-9 | Chrysene | 10 | U |
| 117-81-7 | bis(2-Ethylhexyl)phthalate | 10 | U |
| 117-84-0 | Di-n-octylphthalate | 10 | U |
| 205-99-2 | Benzo(b)fluoranthene | 10 | U |
| 207-08-9 | Benzo(k)fluoranthene | 10 | U |
| 50-32-8 | Benzo(a)pyrene | 10 | U |
| 193-39-5 | Indeno(1,2,3-cd)pyrene | 10 | U |
| 53-70-3 | Dibenz(a,h)anthracene | 10 | U |
| 191-24-2 | Benzo(g,h,i)perylene | 10 | U |

(1) - Cannot be separated from Diphenylamine

NOT VALIDATED

1F

# SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
## TENTATIVELY IDENTIFIED COMPOUNDS

CLIENT SAMPLE NO.

FB01

Lab Name: INDUSTRIAL & ENVIRONMENTA Contract: SOW 1/91

Lab Code: IEA Case No.: 1589-069 SDG No.: 06175

Matrix: (soil/water) WATER Lab Sample ID: 950617505

Sample wt/vol: 500 (g/mL) mL Lab File ID: 0615806.D

Level: (low/med) LOW Date Received: 06/10/95

% Moisture: _____ decanted: (Y/N)___ Date Extracted: 06/13/95

Concentrated Extract Volume: 500(uL) Date Analyzed: 06/15/95

Injection Volume: 2.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH:_____

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

| CAS NUMBER | COMPOUND NAME | RT | EST. CONC. | Q |
|---|---|---|---|---|
| 1. | | | | |
| 2. | | | | |
| 3. | | | | |
| 4. | | | | |
| 5. | | | | |
| 6. | | | | |
| 7. | | | | |
| 8. | | | | |
| 9. | | | | |
| 10. | | | | |
| 11. | | | | |
| 12. | | | | |
| 13. | | | | |
| 14. | | | | |
| 15. | | | | |
| 16. | | | | |
| 17. | | | | |
| 18. | | | | |
| 19. | | | | |
| 20. | | | | |
| 21. | | | | |
| 22. | | | | |
| 23. | | | | |
| 24. | | | | |
| 25. | | | | |
| 26. | | | | |
| 27. | | | | |
| 28. | | | | |
| 29. | | | | |
| 30. | | | | |

NOT VALIDATED

1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.
128S

Lab Name: INDUSTRIAL & ENVIRONMENTA Contract: SOW 1/91

Lab Code: IEA Case No.: 1589-069 SDG No.: 06175

Matrix: (soil/water) WATER Lab Sample ID: 950617503

Sample wt/vol: 1000 (g/mL) ML Lab File ID: P3051295_299.D

% Moisture: _____ decanted: (Y/N)___ Date Received: 06/10/95

Extraction: (SepF/Cont/Sonc) SEPF Date Extracted: 06/13/95

Concentrated Extract Volume: 10000(uL) Date Analyzed: 06/15/95

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: ____ Sulfur Cleanup: (Y/N) Y

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L | Q |
|---|---|---|---|
| 319-84-6 | alpha-BHC | 0.050 | U |
| 319-85-7 | beta-BHC | 0.050 | U |
| 319-86-8 | delta-BHC | 0.050 | U |
| 58-89-9 | gamma-BHC (Lindane) | 0.050 | U |
| 76-44-8 | Heptachlor | 0.050 | U |
| 309-00-2 | Aldrin | 0.050 | U |
| 1024-57-3 | Heptachlor epoxide | 0.050 | U |
| 959-98-8 | Endosulfan I | 0.050 | U |
| 60-57-1 | Dieldrin | 0.10 | U |
| 72-55-9 | 4,4'-DDE | 0.10 | U |
| 72-20-8 | Endrin | 0.10 | U |
| 33213-65-9 | Endosulfan II | 0.10 | U |
| 72-54-8 | 4,4'-DDD | 0.10 | U |
| 1031-07-8 | Endosulfan sulfate | 0.10 | U |
| 50-29-3 | 4,4'-DDT | 0.10 | U |
| 72-43-5 | Methoxychlor | 0.50 | U |
| 53494-70-5 | Endrin ketone | 0.10 | U |
| 7421-93-4 | Endrin aldehyde | 0.10 | U |
| 5103-71-9 | alpha-Chlordane | 0.050 | U |
| 5103-74-2 | gamma-Chlordane | 0.050 | U |
| 8001-35-2 | Toxaphene | 5.0 | U |
| 12674-11-2 | Aroclor-1016 | 1.0 | U |
| 11104-28-2 | Aroclor-1221 | 2.0 | U |
| 11141-16-5 | Aroclor-1232 | 1.0 | U |
| 53469-21-9 | Aroclor-1242 | 1.0 | U |
| 12672-29-6 | Aroclor-1248 | 1.0 | U |
| 11097-69-1 | Aroclor-1254 | 1.0 | U |
| 11096-82-5 | Aroclor-1260 | 1.0 | U |

NOT VALIDATED

1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.
139

Lab Name: INDUSTRIAL & ENVIRONMENTA Contract: SOW 1/91

Lab Code: IEA Case No.: 1589-069 SDG No.: 06175

Matrix: (soil/water) WATER Lab Sample ID: 950617502

Sample wt/vol: 1000 (g/mL) ML Lab File ID: P3051295_287.D

% Moisture: _____ decanted: (Y/N)___ Date Received: 06/10/95

Extraction: (SepF/Cont/Sonc) SEPF Date Extracted: 06/13/95

Concentrated Extract Volume: 10000(uL) Date Analyzed: 06/15/95

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: ____ Sulfur Cleanup: (Y/N) N

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L | Q |
|---|---|---|---|
| 319-84-6 | alpha-BHC | 0.050 | U |
| 319-85-7 | beta-BHC | 0.050 | U |
| 319-86-8 | delta-BHC | 0.050 | U |
| 58-89-9 | gamma-BHC (Lindane) | 0.050 | U |
| 76-44-8 | Heptachlor | 0.050 | U |
| 309-00-2 | Aldrin | 0.050 | U |
| 1024-57-3 | Heptachlor epoxide | 0.050 | U |
| 959-98-8 | Endosulfan I | 0.050 | U |
| 60-57-1 | Dieldrin | 0.10 | U |
| 72-55-9 | 4,4'-DDE | 0.10 | U |
| 72-20-8 | Endrin | 0.10 | U |
| 33213-65-9 | Endosulfan II | 0.10 | U |
| 72-54-8 | 4,4'-DDD | 0.10 | U |
| 1031-07-8 | Endosulfan sulfate | 0.10 | U |
| 50-29-3 | 4,4'-DDT | 0.10 | U |
| 72-43-5 | Methoxychlor | 0.50 | U |
| 53494-70-5 | Endrin ketone | 0.10 | U |
| 7421-93-4 | Endrin aldehyde | 0.10 | U |
| 5103-71-9 | alpha-Chlordane | 0.050 | U |
| 5103-74-2 | gamma-Chlordane | 0.050 | U |
| 8001-35-2 | Toxaphene | 5.0 | U |
| 12674-11-2 | Aroclor-1016 | 1.0 | U |
| 11104-28-2 | Aroclor-1221 | 2.0 | U |
| 11141-16-5 | Aroclor-1232 | 1.0 | U |
| 53469-21-9 | Aroclor-1242 | 1.0 | U |
| 12672-29-6 | Aroclor-1248 | 1.0 | U |
| 11097-69-1 | Aroclor-1254 | 1.0 | U |
| 11096-82-5 | Aroclor-1260 | 1.0 | U |

NOT VALIDATED

1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

FB01

Lab Name: INDUSTRIAL & ENVIRONMENTA Contract: SOW 1/91

Lab Code: IEA Case No.: 1589-069 SDG No.: 06175

Matrix: (soil/water) WATER Lab Sample ID: 950617505

Sample wt/vol: 1000 (g/mL) ML Lab File ID: P3051295_289.D

% Moisture: _____ decanted: (Y/N)___ Date Received: 06/10/95

Extraction: (SepF/Cont/Sonc) SEPF Date Extracted: 06/13/95

Concentrated Extract Volume: 10000(uL) Date Analyzed: 06/15/95

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: ____ Sulfur Cleanup: (Y/N) N

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L | Q |
|---|---|---|---|
| 319-84-6 | alpha-BHC | 0.050 | U |
| 319-85-7 | beta-BHC | 0.050 | U |
| 319-86-8 | delta-BHC | 0.050 | U |
| 58-89-9 | gamma-BHC (Lindane) | 0.050 | U |
| 76-44-8 | Heptachlor | 0.050 | U |
| 309-00-2 | Aldrin | 0.050 | U |
| 1024-57-3 | Heptachlor epoxide | 0.050 | U |
| 959-98-8 | Endosulfan I | 0.050 | U |
| 60-57-1 | Dieldrin | 0.10 | U |
| 72-55-9 | 4,4'-DDE | 0.10 | U |
| 72-20-8 | Endrin | 0.10 | U |
| 33213-65-9 | Endosulfan II | 0.10 | U |
| 72-54-8 | 4,4'-DDD | 0.10 | U |
| 1031-07-8 | Endosulfan sulfate | 0.10 | U |
| 50-29-3 | 4,4'-DDT | 0.10 | U |
| 72-43-5 | Methoxychlor | 0.50 | U |
| 53494-70-5 | Endrin ketone | 0.10 | U |
| 7421-93-4 | Endrin aldehyde | 0.10 | U |
| 5103-71-9 | alpha-Chlordane | 0.050 | U |
| 5103-74-2 | gamma-Chlordane | 0.050 | U |
| 8001-35-2 | Toxaphene | 5.0 | U |
| 12674-11-2 | Aroclor-1016 | 1.0 | U |
| 11104-28-2 | Aroclor-1221 | 2.0 | U |
| 11141-16-5 | Aroclor-1232 | 1.0 | U |
| 53469-21-9 | Aroclor-1242 | 1.0 | U |
| 12672-29-6 | Aroclor-1248 | 1.0 | U |
| 11097-69-1 | Aroclor-1254 | 1.0 | U |
| 11096-82-5 | Aroclor-1260 | 1.0 | U |

BW-GW6138
6/9/95

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1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

192001

Lab Name: MWATS Contract: 3920.0016

Lab Code: Case No.: SAS No.: SDG No.: SD1920

Matrix (soil/water): WATER GW Lab Sample ID: 1920-001

Level (low/med): LOW Date Received: 06/10/95

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

| CAS No. | Analyte | Concentration | C | Q | M |
|---|---|---|---|---|---|
| 7429-90-5 | Aluminum | U 109 | B | | P |
| 7440-36-0 | Antimony | 50.0 | U | | P |
| 7440-38-2 | Arsenic | 1.0 | U | | F |
| 7440-39-3 | Barium | 94.0 | B | | P |
| 7440-41-7 | Beryllium | 5.0 | U | | P |
| 7440-43-9 | Cadmium | 5.0 | U | | P |
| 7440-70-2 | Calcium | 107000 | | | P |
| 7440-47-3 | Chromium | 10.0 | U | | P |
| 7440-48-4 | Cobalt | 10.0 | U | | P |
| 7440-50-8 | Copper | 10.0 | U | | P |
| 7439-89-6 | Iron | 21.0 | B | | P |
| 7439-92-1 | Lead | 1.5 | U | | F |
| 7439-95-4 | Magnesium | 54400 | | | P |
| 7439-96-5 | Manganese | 10.0 | U | | P |
| 7439-97-6 | Mercury | 0.20 | U | | CV |
| 7440-02-0 | Nickel | 20.0 | U | | P |
| 7440-09-7 | Potassium | 3640 | B | | A |
| 7782-49-2 | Selenium | 2.0 | U | | F |
| 7440-22-4 | Silver | 10.0 | U | | P |
| 7440-23-5 | Sodium | 73600 | | | P |
| 7440-28-0 | Thallium | 1.0 | U | | F |
| 7440-62-2 | Vanadium | 50.0 | U | | P |
| 7440-66-6 | Zinc | 19.0 | B | | P |
| | Cyanide | | | | |
| | | | | | |

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

BW-GW6139
6/9/95

# VALIDATED

U.S. EPA - CLP

1
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

192002

Lab Name: MWATS Contract: 3920.0016

Lab Code: Case No.: SAS No.: SDG No.: SD1920

Matrix (soil/water): WATER GW Lab Sample ID: 1920-002

Level (low/med): LOW Date Received: 06/10/95

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

| CAS No. | Analyte | Concentration | C | Q | M |
|---|---|---|---|---|---|
| 7429-90-5 | Aluminum | U 51.0 | B | | P |
| 7440-36-0 | Antimony | 50.0 | U | | P |
| 7440-38-2 | Arsenic | 1.0 | U | | F |
| 7440-39-3 | Barium | 56.0 | B | | P |
| 7440-41-7 | Beryllium | 5.0 | U | | P |
| 7440-43-9 | Cadmium | 5.0 | | | P |
| 7440-70-2 | Calcium | 52100 | | | P |
| 7440-47-3 | Chromium | 10.0 | U | | P |
| 7440-48-4 | Cobalt | 10.0 | U | | P |
| 7440-50-8 | Copper | 10.0 | U | | P |
| 7439-89-6 | Iron | 20.0 | U | | P |
| 7439-92-1 | Lead | 1.5 | U | | F |
| 7439-95-4 | Magnesium | 42900 | | | P |
| 7439-96-5 | Manganese | 10.0 | U | | P |
| 7439-97-6 | Mercury | 0.20 | U | | CV |
| 7440-02-0 | Nickel | 20.0 | U | | P |
| 7440-09-7 | Potassium | 1650 | B | | A |
| 7782-49-2 | Selenium | 2.0 | U | S | F |
| 7440-22-4 | Silver | 10.0 | U | | P |
| 7440-23-5 | Sodium | 23500 | | | P |
| 7440-28-0 | Thallium | 1.0 | U | | F |
| 7440-62-2 | Vanadium | 50.0 | U | | P |
| 7440-66-6 | Zinc | 10.0 | U | | P |
| | Cyanide | | | | |
| | | | | | |

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

BW-GWG128S
6/9/95

# VALIDATED

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

192003

Lab Name: MWATS Contract: 3920.0016

Lab Code: Case No.: SAS No.: SDG No.: SD1920

Matrix (soil/water): WATER GW Lab Sample ID: 1920-003

Level (low/med): LOW Date Received: 06/10/95

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

| CAS No. | Analyte | Concentration | C | Q | M |
|---|---|---|---|---|---|
| 7429-90-5 | Aluminum | U 102 | B | | P |
| 7440-36-0 | Antimony | 50.0 | U | | P |
| 7440-38-2 | Arsenic | 11.0 | | | F |
| 7440-39-3 | Barium | 139 | B | | P |
| 7440-41-7 | Beryllium | 5.0 | U | | P |
| 7440-43-9 | Cadmium | 10.0 | | | P |
| 7440-70-2 | Calcium | 115000 | | | P |
| 7440-47-3 | Chromium | 10.0 | U | | P |
| 7440-48-4 | Cobalt | 10.0 | U | | P |
| 7440-50-8 | Copper | 10.0 | U | | P |
| 7439-89-6 | Iron | 43900 | | | P |
| 7439-92-1 | Lead | 1.5 | U | | F |
| 7439-95-4 | Magnesium | 43200 | | | P |
| 7439-96-5 | Manganese | 134 | | | P |
| 7439-97-6 | Mercury | 0.20 | U | | CV |
| 7440-02-0 | Nickel | 20.0 | U | | P |
| 7440-09-7 | Potassium | 1800 | B | | A |
| 7782-49-2 | Selenium | 2.0 | U | | F |
| 7440-22-4 | Silver | 10.0 | U | | P |
| 7440-23-5 | Sodium | 18900 | | | P |
| 7440-28-0 | Thallium | 1.0 | U | | F |
| 7440-62-2 | Vanadium | 50.0 | U | | P |
| 7440-66-6 | Zinc | 24.0 | | | P |
| | Cyanide | | | | |
| | | | | | |

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: YELLOW Clarity After: CLEAR Artifacts:

Comments:

10920-004
BW-GWFB01
6/9/95

# VALIDATED

U.S. EPA - CLP

1
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

192004

Lab Name: MWATS Contract: 3920.0016

Lab Code: Case No.: SAS No.: SDG No.: SD1920

Matrix (soil/water): WATER GW Lab Sample ID: 1920-004

Level (low/med): LOW Date Received: 06/10/95

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

| CAS No. | Analyte | Concentration | C | Q | M |
|---|---|---|---|---|---|
| 7429-90-5 | Aluminum | 50.0 | U | | P |
| 7440-36-0 | Antimony | 50.0 | U | | P |
| 7440-38-2 | Arsenic | 1.0 | U | S | F |
| 7440-39-3 | Barium | 10.0 | U | | P |
| 7440-41-7 | Beryllium | 5.0 | U | | P |
| 7440-43-9 | Cadmium | 5.0 | U | | P |
| 7440-70-2 | Calcium | 1000 | U | | P |
| 7440-47-3 | Chromium | 10.0 | U | | P |
| 7440-48-4 | Cobalt | 10.0 | U | | P |
| 7440-50-8 | Copper | 10.0 | U | | P |
| 7439-89-6 | Iron | 20.0 | U | | P |
| 7439-92-1 | Lead | 1.5 | U | | F |
| 7439-95-4 | Magnesium | 1000 | U | | P |
| 7439-96-5 | Manganese | 10.0 | U | | P |
| 7439-97-6 | Mercury | 0.20 | U | | CV |
| 7440-02-0 | Nickel | 20.0 | U | | P |
| 7440-09-7 | Potassium | 100 | U | | A |
| 7782-49-2 | Selenium | 2.0 | U | | F |
| 7440-22-4 | Silver | 10.0 | U | | P |
| 7440-23-5 | Sodium | U 2480 | B | | P |
| 7440-28-0 | Thallium | 1.0 | U | | F |
| 7440-62-2 | Vanadium | 50.0 | U | | P |
| 7440-66-6 | Zinc | 10.0 | U | | P |
| | Cyanide | | | | |

olor Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

omments:

10920-005
BW-GWG138UF
6/9/95

# VALIDATED

U.S. EPA - CLP

1
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

192005

Lab Name: MWATS Contract: 3920.0016

Lab Code: Case No.: SAS No.: SDG No.: SD1920

Matrix (soil/water): WATER GW Lab Sample ID: 1920-005

Level (low/med): LOW Date Received: 06/10/95

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

| CAS No. | Analyte | Concentration | C | Q | M |
|---|---|---|---|---|---|
| 7429-90-5 | Aluminum | | | | |
| 7440-36-0 | Antimony | | | | |
| 7440-38-2 | Arsenic | | | | |
| 7440-39-3 | Barium | | | | |
| 7440-41-7 | Beryllium | | | | |
| 7440-43-9 | Cadmium | | | | |
| 7440-70-2 | Calcium | | | | |
| 7440-47-3 | Chromium | | | | |
| 7440-48-4 | Cobalt | | | | |
| 7440-50-8 | Copper | | | | |
| 7439-89-6 | Iron | | | | |
| 7439-92-1 | Lead | 1.5 | U | | F |
| 7439-95-4 | Magnesium | | | | |
| 7439-96-5 | Manganese | | | | |
| 7439-97-6 | Mercury | | | | |
| 7440-02-0 | Nickel | | | | |
| 7440-09-7 | Potassium | | | | |
| 7782-49-2 | Selenium | | | | |
| 7440-22-4 | Silver | | | | |
| 7440-23-5 | Sodium | | | | |
| 7440-28-0 | Thallium | | | | |
| 7440-62-2 | Vanadium | | | | |
| 7440-66-6 | Zinc | | | | |
| | Cyanide | | | | |

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

Total lead

10920-006
BW-GW6139UF
6/9/95

# VALIDATED

U.S. EPA - CLP

1
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

192006

Lab Name: MWATS Contract: 3920.0016

Lab Code: Case No.: SAS No.: SDG No.: SD1920

Matrix (soil/water): WATER GW Lab Sample ID: 1920-006

Level (low/med): LOW Date Received: 06/10/95

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

| CAS No. | Analyte | Concentration | C | Q | M |
|---|---|---|---|---|---|
| 7429-90-5 | Aluminum | | | | |
| 7440-36-0 | Antimony | | | | |
| 7440-38-2 | Arsenic | | | | |
| 7440-39-3 | Barium | | | | |
| 7440-41-7 | Beryllium | | | | |
| 7440-43-9 | Cadmium | | | | |
| 7440-70-2 | Calcium | | | | |
| 7440-47-3 | Chromium | | | | |
| 7440-48-4 | Cobalt | | | | |
| 7440-50-8 | Copper | | | | |
| 7439-89-6 | Iron | | | | |
| 7439-92-1 | Lead | 1.5 | U | | F |
| 7439-95-4 | Magnesium | | | | |
| 7439-96-5 | Manganese | | | | |
| 7439-97-6 | Mercury | | | | |
| 7440-02-0 | Nickel | | | | |
| 7440-09-7 | Potassium | | | | |
| 7782-49-2 | Selenium | | | | |
| 7440-22-4 | Silver | | | | |
| 7440-23-5 | Sodium | | | | |
| 7440-28-0 | Thallium | | | | |
| 7440-62-2 | Vanadium | | | | |
| 7440-66-6 | Zinc | | | | |
| | Cyanide | | | | |
| | | | | | |

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:
Total lead

10920-007
BW-GWG128S 1
6/9/95

# VALIDATED

U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

192007

Lab Name: MWATS Contract: 3920.0016

Lab Code: Case No.: SAS No.: SDG No.: SD1920

Matrix (soil/water): WATER GW Lab Sample ID: 1920-007

Level (low/med): LOW Date Received: 06/10/95

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

| CAS No. | Analyte | Concentration | C | Q | M |
|---|---|---|---|---|---|
| 7429-90-5 | Aluminum | | | | |
| 7440-36-0 | Antimony | | | | |
| 7440-38-2 | Arsenic | | | | |
| 7440-39-3 | Barium | | | | |
| 7440-41-7 | Beryllium | | | | |
| 7440-43-9 | Cadmium | | | | |
| 7440-70-2 | Calcium | | | | |
| 7440-47-3 | Chromium | | | | |
| 7440-48-4 | Cobalt | | | | |
| 7440-50-8 | Copper | | | | |
| 7439-89-6 | Iron | | | | |
| 7439-92-1 | Lead | 2.0 | B | | F |
| 7439-95-4 | Magnesium | | | | |
| 7439-96-5 | Manganese | | | | |
| 7439-97-6 | Mercury | | | | |
| 7440-02-0 | Nickel | | | | |
| 7440-09-7 | Potassium | | | | |
| 7782-49-2 | Selenium | | | | |
| 7440-22-4 | Silver | | | | |
| 7440-23-5 | Sodium | | | | |
| 7440-28-0 | Thallium | | | | |
| 7440-62-2 | Vanadium | | | | |
| 7440-66-6 | Zinc | | | | |
| | Cyanide | | | | |
| | | | | | |

Color Before: COLORLESS Clarity Before: CLOUDY Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

Total lead

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

BWGWG138

BW-GW6138
6/9/95

Lab Name: MWATS

Contract: 3920.0016

Lab Code: ___ Case No.: ___ SAS No.: ___

SDG No.: SD1920

Matrix (soil/water): WATER

Lab Sample ID: 10920-001

Level (low/med): LOW

Date Received: 06/10/95

% Solids: 0.0

Concentration Units: MG/L

| Analyte | Concentration | C | Q |
|---|---|---|---|
| Alkalinity | 364 | | |
| Chemical Oxygen Demand | 20 | U | |
| Chloride | 117 | | |
| Nitrogen, Ammonia | 0.10 | U | |
| Nitrogen, Nitrate+Nitrite | 0.02 | | |
| Nitrogen, Total Kjeldahl | 0.10 | U | |
| Solids, Total Dissolved | 718 | | |
| Sulfate | 113 | | |

Comments:

VALIDATED

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

BW-GWG139 6/9/95

BWGWG139

Lab Name: MWATS

Contract: 3920.0016

Lab Code: ___ Case No.: ___ SAS No.: ___

SDG No.: SD1920

Matrix (soil/water): WATER

Lab Sample ID: 10920-002

Level (low/med): LOW

Date Received: 06/10/95

% Solids: 0.0

Concentration Units: MG/L

| Analyte | Concentration | C | Q |
|---|---|---|---|
| Alkalinity | 312 | | |
| Chemical Oxygen Demand | 20 | U | |
| Chloride | 13 | | |
| Nitrogen, Ammonia | 0.10 | U | |
| Nitrogen, Nitrate+Nitrite | 0.29 | | |
| Nitrogen, Total Kjeldahl | 0.10 | U | |
| Solids, Total Dissolved | 376 | | |
| Sulfate | 22 | | |

Comments:

VALIDATED

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

BW-GWG128S
6/9/95

BWGWG128S

Lab Name: MWATS

Contract: 3920.0016

Lab Code: ___ Case No.: ___ SAS No.: ___

SDG No.: SD1920

Matrix (soil/water): WATER

Lab Sample ID: 10920-003

Level (low/med): LOW

Date Received: 06/10/95

% Solids: 0.0

Concentration Units: MG/L

| Analyte | Concentration | C | Q |
|---|---|---|---|
| Alkalinity | 301 | | |
| Chemical Oxygen Demand | 99 | | |
| Chloride | 28 | | |
| Nitrogen, Ammonia | 0.10 | U | |
| Nitrogen, Nitrate+Nitrite | 0.06 | | |
| Nitrogen, Total Kjeldahl | 0.69 | | |
| Solids, Total Dissolved | 676 | | |
| Sulfate | 67 | | |

Comments:

VALIDATED

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

BW-GWFBØ1 6/9/95

BWGWFB01

Lab Name: MWATS

Contract: 3920.0016

Lab Code: ___ Case No.: ___ SAS No.: ___

SDG No.: SD1920

Matrix (soil/water): WATER

Lab Sample ID: 10920-004

Level (low/med): LOW

Date Received: 06/10/95

% Solids: 0.0

Concentration Units: MG/L

| Analyte | Concentration | C | Q |
|---|---|---|---|
| Alkalinity | 10 | U | |
| Chemical Oxygen Demand | 20 | U | |
| Chloride | 2 | U | |
| Nitrogen, Ammonia | 0.10 | U | |
| Nitrogen, Nitrate+Nitrite | 0.02 | U | |
| Nitrogen, Total Kjeldahl | 0.10 | U | |
| Solids, Total Dissolved | 20 | U | |
| Sulfate | 10 | U | |

Comments:

VALIDATED

# C

# REMEDIAL ALTERNATIVE COST CALCULATIONS

## TABLE C-2b

**Estimated Annual O&M Costs**
**Alternative 2**
**Blackwell Landfill Feasibility Study**
**DuPage County, Illinois**

| Item | Qty. | Unit | Unit Cost | Extended Cost |
|---|---|---|---|---|
| A. Leachate Extraction and Off-Site Disposal | | | | |
| 1. System Inspections | 1 | ls | $5,000 | $5,000 |
| 2. Repairs, Maintenance | 1 | ls | $8,000 | $8,000 |
| 3. Hauling | 70 | trips | $300 | $21,000 |
| 4. WWTP Charges | 350,400 | gal | $0.06 | $21,024 |
| 5. Power | 190,000 | kwh | $0.08 | $15,200 |
| B. Monitoring | | | | |
| 1. Groundwater | 1 | ls | $15,791 | $15,791 |
| 2. Leachate | 1 | ls | $3,075 | $3,075 |
| C. Annual Report | 1 | ls | $5,000 | $5,000 |
| | | | **Subtotal** | $94,090 |
| | | | 15% Contingency | $14,114 |
| | | | **TOTAL** | **$108,000** |

Notes:

1. Annual O&M total cost is rounded to the nearest $1000.

DLN/sls/MAL
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6/23/95

## TABLE C-2c

**Present Net Worth Costs**
**Alternative 2**
**Blackwell Landfill Feasibility Study**
**DuPage County, Illinois**

| Year | Capital Cost | O&M Costs | Total | P/W Factor | Present Net Worth |
|---|---|---|---|---|---|
| 0 | $488,000 | $0 | $488,000 | 1.0000 | $488,000 |
| 1 | $0 | $108,000 | $108,000 | 0.9709 | $104,854 |
| 2 | $0 | $108,000 | $108,000 | 0.9426 | $101,801 |
| 3 | $0 | $108,000 | $108,000 | 0.9151 | $98,835 |
| 4 | $0 | $108,000 | $108,000 | 0.8885 | $95,957 |
| 5 | $0 | $108,000 | $108,000 | 0.8626 | $93,162 |
| 6 | $0 | $108,000 | $108,000 | 0.8375 | $90,448 |
| 7 | $0 | $108,000 | $108,000 | 0.8131 | $87,814 |
| 8 | $0 | $108,000 | $108,000 | 0.7894 | $85,256 |
| 9 | $0 | $108,000 | $108,000 | 0.7664 | $82,773 |
| 10 | $0 | $108,000 | $108,000 | 0.7441 | $80,362 |
| 11 | $0 | $108,000 | $108,000 | 0.7224 | $78,021 |
| 12 | $0 | $108,000 | $108,000 | 0.7014 | $75,749 |
| 13 | $0 | $108,000 | $108,000 | 0.6810 | $73,543 |
| 14 | $0 | $108,000 | $108,000 | 0.6611 | $71,401 |
| 15 | $0 | $108,000 | $108,000 | 0.6419 | $69,321 |
| 16 | $0 | $108,000 | $108,000 | 0.6232 | $67,302 |
| 17 | $0 | $108,000 | $108,000 | 0.6050 | $65,342 |
| 18 | $0 | $108,000 | $108,000 | 0.5874 | $63,438 |
| 19 | $0 | $108,000 | $108,000 | 0.5703 | $61,591 |
| 20 | $0 | $108,000 | $108,000 | 0.5537 | $59,797 |
| 21 | $0 | $108,000 | $108,000 | 0.5376 | $58,055 |
| 22 | $0 | $108,000 | $108,000 | 0.5219 | $56,364 |
| 23 | $0 | $108,000 | $108,000 | 0.5067 | $54,723 |
| 24 | $0 | $108,000 | $108,000 | 0.4919 | $53,128 |
| 25 | $0 | $108,000 | $108,000 | 0.4776 | $51,582 |
| 26 | $0 | $108,000 | $108,000 | 0.4637 | $50,079 |
| 27 | $0 | $108,000 | $108,000 | 0.4502 | $48,621 |
| 28 | $0 | $108,000 | $108,000 | 0.4371 | $47,205 |
| 29 | $0 | $108,000 | $108,000 | 0.4244 | $45,830 |
| 30 | $0 | $108,000 | $108,000 | 0.4120 | $44,495 |
| | | | | **TOTAL** | **$2,605,000** |

Notes:

1. PNW is based on 3% discount rate.
2. Total PNW cost is rounded to the nearest $1000.

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## TABLE C-3a

**Estimated Capital Costs**
**Alternative 3**
**Blackwell Landfill Feasibility Study**
**DuPage County, Illinois**

| Item | Qty. | Unit | Unit Cost | Extended Cost |
|---|---|---|---|---|
| A. Leachate Extraction and Off-Site Disposal | | | | |
| 1. Mobilization | 1 | ls | $25,000 | $25,000 |
| 2. Extraction Wells (incl. wellheads) | 600 | vlf | $100 | $60,000 |
| 3. Leachate Pumps | 8 | ea | $2,200 | $17,600 |
| 4. Compressor | 1 | ea | $6,000 | $6,000 |
| 5. Conveyance Piping System | 1 | ls | $106,200 | $106,200 |
| 6. Compressor Building | 1 | ea | $10,000 | $10,000 |
| 7. Power Drop | 1 | ea | $25,000 | $25,000 |
| 8. Gravel Access Road | 7200 | sf | $5 | $36,000 |
| 9. Seed, Fertilize, Mulch | 1 | ls | $6,000 | $6,000 |
| 10. Health and Safety | 1 | ls | $10,000 | $10,000 |
| 11. Leachate Tank/Controls | 1 | ls | $35,000 | $35,000 |
| B. Cap Repair | | | | |
| 1. Mobilization | 1 | ls | $20,000 | $20,000 |
| 2. Stockpile Topsoil | 9,000 | cy | $2.50 | $22,500 |
| 3. Stockpile Sand | 17,000 | cy | $3 | $51,000 |
| 4. Purchase & Haul Clay | 33,000 | cy | $10.00 | $330,000 |
| 5. Place & Compact Clay | 33,000 | cy | $4 | $132,000 |
| 6. Place Sand | 17,000 | cy | $2.50 | $42,500 |
| 7. Place Topsoil | 9,000 | cy | $2 | $18,000 |
| 8. Seed, Fertilize, & Mulch | 10 | acres | $1,700 | $17,000 |
| 9. Passive Gas Venting System | 1 | ls | $7,500 | $7,500 |
| | | | **Subtotal** | $977,300 |
| | | | 5% Administration | $48,865 |
| | | | 20% Engineering | $195,460 |
| | | | 20% Contingency | $195,460 |
| | | | **TOTAL** | **$1,417,000** |

Notes:

1. Total capital cost is rounded to the nearest $1000.
2. Passive gas venting cost is for replacement of gas vents in cap repair areas.

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## TABLE C-3b

**Estimated Annual O&M Costs**
**Alternative 3**
**Blackwell Landfill Feasibility Study**
**DuPage County, Illinois**

| Item | Qty. | Unit | Unit Cost | Extended Cost |
|---|---|---|---|---|
| A. Leachate Extraction and Off-Site Disposal | | | | |
| 1. System Inspections | 1 | ls | $5,000 | $5,000 |
| 2. Repairs, Maintenance | 1 | ls | $8,000 | $8,000 |
| 3. Hauling | 70 | trips | $300 | $21,000 |
| 4. WWTP Charges | 350,400 | gal | $0.06 | $21,024 |
| 5. Power | 190,000 | kwh | $0.08 | $15,200 |
| B. Landfill Cover | | | | |
| 1. Cap Maintenance | 40 | acre | $158 | $6,320 |
| 2. Passive Gas Venting Maintenance | 1 | ls | $2,000 | $2,000 |
| C. Monitoring | | | | |
| 1. Groundwater | 1 | ls | $15,791 | $15,791 |
| 2. Leachate | 1 | ls | $3,075 | $3,075 |
| D. Annual Report | 1 | LS | $5,000 | $5,000 |
| | | | **Subtotal** | $102,410 |
| | | | 15% Contingency | $15,362 |
| | | | **TOTAL** | **$118,000** |

Notes:

1. Annual O&M total cost is rounded to the nearest $1000.

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## TABLE C-3c

**Present Net Worth Costs**
**Alternative 3**
**Blackwell Landfill Feasibility Study**
**DuPage County, Illinois**

| Year | Capital Cost | O&M Costs | Total | P/W Factor | Present Net Worth |
|---|---|---|---|---|---|
| 0 | $1,417,000 | $0 | $1,417,000 | 1.0000 | $1,417,000 |
| 1 | $0 | $118,000 | $118,000 | 0.9709 | $114,563 |
| 2 | $0 | $118,000 | $118,000 | 0.9426 | $111,227 |
| 3 | $0 | $118,000 | $118,000 | 0.9151 | $107,987 |
| 4 | $0 | $118,000 | $118,000 | 0.8885 | $104,842 |
| 5 | $0 | $118,000 | $118,000 | 0.8626 | $101,788 |
| 6 | $0 | $118,000 | $118,000 | 0.8375 | $98,823 |
| 7 | $0 | $118,000 | $118,000 | 0.8131 | $95,945 |
| 8 | $0 | $118,000 | $118,000 | 0.7894 | $93,150 |
| 9 | $0 | $118,000 | $118,000 | 0.7664 | $90,438 |
| 10 | $0 | $118,000 | $118,000 | 0.7441 | $87,803 |
| 11 | $0 | $118,000 | $118,000 | 0.7224 | $85,246 |
| 12 | $0 | $118,000 | $118,000 | 0.7014 | $82,763 |
| 13 | $0 | $118,000 | $118,000 | 0.6810 | $80,352 |
| 14 | $0 | $118,000 | $118,000 | 0.6611 | $78,012 |
| 15 | $0 | $118,000 | $118,000 | 0.6419 | $75,739 |
| 16 | $0 | $118,000 | $118,000 | 0.6232 | $73,534 |
| 17 | $0 | $118,000 | $118,000 | 0.6050 | $71,392 |
| 18 | $0 | $118,000 | $118,000 | 0.5874 | $69,312 |
| 19 | $0 | $118,000 | $118,000 | 0.5703 | $67,294 |
| 20 | $0 | $118,000 | $118,000 | 0.5537 | $65,334 |
| 21 | $0 | $118,000 | $118,000 | 0.5376 | $63,431 |
| 22 | $0 | $118,000 | $118,000 | 0.5219 | $61,583 |
| 23 | $0 | $118,000 | $118,000 | 0.5067 | $59,789 |
| 24 | $0 | $118,000 | $118,000 | 0.4919 | $58,048 |
| 25 | $0 | $118,000 | $118,000 | 0.4776 | $56,358 |
| 26 | $0 | $118,000 | $118,000 | 0.4637 | $54,715 |
| 27 | $0 | $118,000 | $118,000 | 0.4502 | $53,122 |
| 28 | $0 | $118,000 | $118,000 | 0.4371 | $51,575 |
| 29 | $0 | $118,000 | $118,000 | 0.4244 | $50,073 |
| 30 | $0 | $118,000 | $118,000 | 0.4120 | $48,615 |
| | | | | **TOTAL** | **$3,730,000** |

Notes:

1. PNW is based on 3% discount rate.
2. Total PNW cost is rounded to the nearest $1000.

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6/23/95

**TABLE C-4a**

**Estimated Capital Costs**
**Alternative 4**
**Blackwell Landfill Feasibility Study**
**Dupage County, Illinois**

| Item | Qty. | Unit | Unit Cost | Extended Cost |
|---|---|---|---|---|
| A. Leachate Extraction and Off-Site Disposal | | | | |
| 1. Mobilization | 1 | ls | $25,000 | $25,000 |
| 2. Leachate Extraction Wells (incl. wellheads) | 600 | vlf | $100 | $60,000 |
| 3. Leachate Pumps | 8 | ea | $2,200 | $17,600 |
| 4. Compressor | 1 | ea | $6,000 | $6,000 |
| 5. Conveyance Piping System | 1 | ls | $106,200 | $106,200 |
| 6. Compressor Building | 1 | ea | $10,000 | $10,000 |
| 7. Power Drop | 1 | ea | $25,000 | $25,000 |
| 8. Gravel Access Road | 7200 | sf | $5 | $36,000 |
| 9. Seed, Fertilize, Mulch | 1 | ls | $6,000 | $6,000 |
| 10. Health and Safety | 1 | ls | $10,000 | $10,000 |
| 11. Leachate Tank/Controls | 1 | ls | $35,000 | $35,000 |
| B. Groundwater Extraction and Treatment | | | | |
| 1. Extraction System | | | | |
| a. Extraction Wells | 20 | ea | $6,000 | $120,000 |
| b. Well Pumps | 20 | ea | $1,400 | $28,000 |
| c. Well Head Construction | 20 | ea | $500 | $10,000 |
| d. Header Piping | 17,000 | ft | $5 | $85,000 |
| e. Trenching | 1,600 | ft | $25 | $40,000 |
| f. Electrical | 1 | ls | $10,000 | $10,000 |
| 2. Treatment System | | | | |
| a. O/W Separator | 1 | ls | $15,000 | $15,000 |
| b. Transfer Tank & Pump | 1 | ls | $10,000 | $10,000 |
| c. Air Stripper | 1 | ls | $45,000 | $45,000 |
| d. Building | 900 | sf | $100 | $90,000 |
| e. Controls | 1 | ls | $15,000 | $15,000 |
| f. Plumbing, Electrical, etc. | 1 | ls | $20,000 | $20,000 |
| 3. Discharge System | | | | |
| a. Piping, including trench | 150 | ft | $35 | $5,250 |
| b. Outfall Structure | 1 | ls | $3,000 | $3,000 |
| 4. Permitting | 1 | ls | $5,000 | $5,000 |
| C. Cap Repair | | | | |
| 1. Mobilization | 1 | ls | $20,000 | $20,000 |
| 2. Stockpile Topsoil | 9,000 | cy | $2.50 | $22,500 |
| 3. Stockpile Sand | 17,000 | cy | $3 | $51,000 |
| 4. Purchase & Haul Clay | 33,000 | cy | $10 | $330,000 |
| 5. Place & Compact Clay | 33,000 | cy | $4 | $132,000 |
| 6. Place Sand | 17,000 | cy | $2.50 | $42,500 |
| 7. Place Topsoil | 9,000 | cy | $2 | $18,000 |
| 8. Seed, Fertilize, & Mulch | 10 | acres | $1,700 | $17,000 |
| 9. Passive Gas Venting System | 1 | ls | $7,500 | $7,500 |
| | | | Subtotal | $1,478,550 |
| | | | 5% Administration | $73,928 |
| | | | 20% Engineering | $295,710 |
| | | | 20% Contingency | $295,710 |
| | | | TOTAL | $2,144,000 |

501,250

Notes:

1. Total capital cost is rounded to the nearest $1000.
2. Passive gas venting cost is for replacement of gas vents in cap repair areas.

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6/23/95

**TABLE C-4b**

**Estimated Annual O&M Costs**
**Alternative 4**
**Blackwell Landfill Feasibility Study**
**DuPage County, Illinois**

| Item | Qty. | Unit | Unit Cost | Extended Cost |
|---|---|---|---|---|
| A. Leachate Extraction and Off-Site Disposal | | | | |
| 1. System Inspections | 1 | ls | $5,000 | $5,000 |
| 2. Repairs, Maintenance | 1 | ls | $8,000 | $8,000 |
| 3. Hauling | 70 | trips | $300 | $21,000 |
| 4. WWTP Charges | 350,400 | gal | $0.06 | $21,024 |
| 5. Power | 190,000 | kwh | $0.08 | $15,200 |
| B. Groundwater Extraction and Treatment | | | | |
| 1. Power Requirements | | | | |
| a. Water Treatment | 44,600 | kwh | $0.08 | $3,568 |
| b. Well Pumps | 150,000 | kwh | $0.08 | $12,000 |
| c. Lights, Heater, Transfer Pump, etc. | 5,000 | kwh | $0.08 | $400 |
| 2. Maintenance | | | | |
| a. Routine Site Visits | 35 | trips | $750 | $26,250 |
| b. Parts Replacement & Repair | 1 | ls | $10,000 | $10,000 |
| c. Stripper Cleaning | 1 | ls | $10,000 | $10,000 |
| 3. Effluent Monitoring | 1 | ls | $4,000 | $4,000 |
| 4. Reporting | 1 | ls | $6,500 | $6,500 |
| C. Landfill Cover | | | | |
| 1. Cap Maintenance | 40 | acre | $158 | $6,320 |
| 2. Passive Gas Venting Maintenance | 1 | ls | $2,000 | $2,000 |
| D. Monitoring | | | | |
| 1. Groundwater | 1 | ls | $15,791 | $15,791 |
| 2. Leachate | 1 | ls | $3,075 | $3,075 |
| E. Annual Report | 1 | LS | $5,000 | $5,000 |
| | | | **Subtotal** | $175,128 |
| | | | 15% Contingency | $26,269 |
| | | | **TOTAL** | **$201,000** |

Notes:

1. Annual O&M total cost is rounded to the nearest $1000.
2. Annual groundwater extraction and treatment cost after year 1 assumes 26 site visits per year for routine maintenance.

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## TABLE C-4c

**Present Net Worth Costs**
**Alternative 4**
**Blackwell Landfill Feasibility Study**
**DuPage County, Illinois**

| Year | Capital Cost | O&M Costs | Total | P/W Factor | Present Net Worth |
|---|---|---|---|---|---|
| 0 | $2,144,000 | $0 | $2,144,000 | 1.0000 | $2,144,000 |
| 1 | $0 | $201,000 | $201,000 | 0.9709 | $195,145 |
| 2 | $0 | $194,000 | $194,000 | 0.9426 | $182,864 |
| 3 | $0 | $194,000 | $194,000 | 0.9151 | $177,537 |
| 4 | $0 | $194,000 | $194,000 | 0.8885 | $172,367 |
| 5 | $0 | $194,000 | $194,000 | 0.8626 | $167,346 |
| 6 | $0 | $194,000 | $194,000 | 0.8375 | $162,471 |
| 7 | $0 | $194,000 | $194,000 | 0.8131 | $157,739 |
| 8 | $0 | $194,000 | $194,000 | 0.7894 | $153,146 |
| 9 | $0 | $194,000 | $194,000 | 0.7664 | $148,685 |
| 10 | $0 | $194,000 | $194,000 | 0.7441 | $144,353 |
| 11 | $0 | $194,000 | $194,000 | 0.7224 | $140,149 |
| 12 | $0 | $194,000 | $194,000 | 0.7014 | $136,068 |
| 13 | $0 | $194,000 | $194,000 | 0.6810 | $132,104 |
| 14 | $0 | $194,000 | $194,000 | 0.6611 | $128,257 |
| 15 | $0 | $194,000 | $194,000 | 0.6419 | $124,521 |
| 16 | $0 | $194,000 | $194,000 | 0.6232 | $120,895 |
| 17 | $0 | $194,000 | $194,000 | 0.6050 | $117,374 |
| 18 | $0 | $194,000 | $194,000 | 0.5874 | $113,954 |
| 19 | $0 | $194,000 | $194,000 | 0.5703 | $110,636 |
| 20 | $0 | $194,000 | $194,000 | 0.5537 | $107,414 |
| 21 | $0 | $194,000 | $194,000 | 0.5376 | $104,285 |
| 22 | $0 | $194,000 | $194,000 | 0.5219 | $101,247 |
| 23 | $0 | $194,000 | $194,000 | 0.5067 | $98,298 |
| 24 | $0 | $194,000 | $194,000 | 0.4919 | $95,434 |
| 25 | $0 | $194,000 | $194,000 | 0.4776 | $92,656 |
| 26 | $0 | $194,000 | $194,000 | 0.4637 | $89,956 |
| 27 | $0 | $194,000 | $194,000 | 0.4502 | $87,337 |
| 28 | $0 | $194,000 | $194,000 | 0.4371 | $84,794 |
| 29 | $0 | $194,000 | $194,000 | 0.4244 | $82,324 |
| 30 | $0 | $194,000 | $194,000 | 0.4120 | $79,926 |
| | | | | **TOTAL** | **$5,953,000** |

Notes:

1. PNW is based on 3% discount rate.
2. Total PNW cost is rounded to the nearest $1000.
3. Annual groundwater extraction and treatment O&M cost is reduced after year 1.

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6/23/95

**TABLE C-5a**

**Estimated Capital Costs**
**Alternative 5**
**Blackwell Landfill Feasibility Study**
**DuPage County, Illinois**

| Item | Qty. | Unit | Unit Cost | Extended Cost |
|---|---|---|---|---|
| A. Leachate Extraction and Off-Site Disposal | | | | |
| 1. Mobilization | 1 | ls | $25,000 | $25,000 |
| 2. Extraction Wells (incl. wellheads) | 600 | vlf | $100 | $60,000 |
| 3. Leachate Pumps | 8 | ea | $2,200 | $17,600 |
| 4. Compressor | 1 | ea | $6,000 | $6,000 |
| 5. Conveyance Piping System | 1 | ls | $106,200 | $106,200 |
| 6. Compressor Building | 1 | ea | $10,000 | $10,000 |
| 7. Power Drop | 1 | ea | $25,000 | $25,000 |
| 8. Gravel Access Road | 7200 | sf | $5 | $36,000 |
| 9. Seed, Fertilize, Mulch | 1 | ls | $6,000 | $6,000 |
| 10. Health and Safety | 1 | ls | $10,000 | $10,000 |
| 11. Leachate Tank/Controls | 1 | ls | $35,000 | $35,000 |
| B. 35 IAC 811 Cap | | | | |
| 1. Mobilization | 1 | ls | $50,000 | $50,000 |
| 2. Clearing & Grubbing | 10 | acre | $2,500 | $25,000 |
| 3. Stockpile Topsoil | 40,000 | cy | $2.50 | $100,000 |
| 4. Regrade a Portion of Existing Cap | 110,000 | cy | $1.85 | $203,500 |
| 5. Stockpile a Portion of Existing Cap | 170,000 | cy | $2.50 | $425,000 |
| 6. Purchase & Haul Clay | 200,000 | cy | $10.00 | $2,000,000 |
| 7. Place & Compact Clay | 200,000 | cy | $5.00 | $1,000,000 |
| 8. Place Protective Layer | 170,000 | cy | $2.50 | $425,000 |
| 9. Place Topsoil | 40,000 | cy | $2.50 | $100,000 |
| 10. Seed, Fertilize, & Mulch | 40 | acre | $2,500 | $100,000 |
| 11. Passive Gas Venting System | 1 | ls | $30,000 | $30,000 |
| | | | **Subtotal** | $4,795,300 |
| | | | 5% Administration | $239,765 |
| | | | 20% Engineering | $959,060 |
| | | | 20% Contingency | $959,060 |
| | | | **TOTAL** | **$6,953,000** |

Notes:

1. Total capital cost is rounded to the nearest $1000.

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6/23/95

## TABLE C-5b

**Estimated Annual O&M Costs**
**Alternative 5**
**Blackwell Landfill Feasibility Study**
**DuPage County, Illinois**

| Item | Qty. | Unit | Unit Cost | Extended Cost |
|---|---|---|---|---|
| A. Leachate Extraction and Off-Site Disposal | | | | |
| 1. System Inspections | 1 | ls | $5,000 | $5,000 |
| 2. Repairs, Maintenance | 1 | ls | $8,000 | $8,000 |
| 3. Hauling | 70 | trips | $300 | $21,000 |
| 4. WWTP Charges | 350,400 | gal | $0.06 | $21,024 |
| 5. Power | 190,000 | kwh | $0.08 | $15,200 |
| B. Landfill Cover | | | | |
| 1. Cap Maintenance | 40 | acre | $158 | $6,320 |
| 2. Passive Gas Venting Maintenance | 1 | ls | $8,000 | $8,000 |
| C. Monitoring | | | | |
| 1. Groundwater | 1 | ls | $15,791 | $15,791 |
| 2. Leachate | 1 | ls | $3,075 | $3,075 |
| D. Annual Report | 1 | ls | $5,000 | $5,000 |
| | | | **Subtotal** | $108,410 |
| | | | 15% Contingency | $16,262 |
| | | | **TOTAL** | **$125,000** |

Notes:

1. Annual O&M total cost is rounded to the nearest $1000.

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# TABLE C-5c

## Present Net Worth Costs
## Alternative 5
## Blackwell Landfill Feasibility Study
## DuPage County, Illinois

| Year | Capital Cost | O&M Costs | Total | P/W Factor | Present Net Worth |
|---|---|---|---|---|---|
| 0 | $6,953,000 | $0 | $6,953,000 | 1.0000 | $6,953,000 |
| 1 | $0 | $125,000 | $125,000 | 0.9709 | $121,359 |
| 2 | $0 | $125,000 | $125,000 | 0.9426 | $117,825 |
| 3 | $0 | $125,000 | $125,000 | 0.9151 | $114,393 |
| 4 | $0 | $125,000 | $125,000 | 0.8885 | $111,061 |
| 5 | $0 | $125,000 | $125,000 | 0.8626 | $107,826 |
| 6 | $0 | $125,000 | $125,000 | 0.8375 | $104,685 |
| 7 | $0 | $125,000 | $125,000 | 0.8131 | $101,636 |
| 8 | $0 | $125,000 | $125,000 | 0.7894 | $98,676 |
| 9 | $0 | $125,000 | $125,000 | 0.7664 | $95,803 |
| 10 | $0 | $125,000 | $125,000 | 0.7441 | $93,011 |
| 11 | $0 | $125,000 | $125,000 | 0.7224 | $90,303 |
| 12 | $0 | $125,000 | $125,000 | 0.7014 | $87,673 |
| 13 | $0 | $125,000 | $125,000 | 0.6810 | $85,119 |
| 14 | $0 | $125,000 | $125,000 | 0.6611 | $82,640 |
| 15 | $0 | $125,000 | $125,000 | 0.6419 | $80,233 |
| 16 | $0 | $125,000 | $125,000 | 0.6232 | $77,896 |
| 17 | $0 | $125,000 | $125,000 | 0.6050 | $75,628 |
| 18 | $0 | $125,000 | $125,000 | 0.5874 | $73,424 |
| 19 | $0 | $125,000 | $125,000 | 0.5703 | $71,286 |
| 20 | $0 | $125,000 | $125,000 | 0.5537 | $69,210 |
| 21 | $0 | $125,000 | $125,000 | 0.5376 | $67,194 |
| 22 | $0 | $125,000 | $125,000 | 0.5219 | $65,236 |
| 23 | $0 | $125,000 | $125,000 | 0.5067 | $63,336 |
| 24 | $0 | $125,000 | $125,000 | 0.4919 | $61,491 |
| 25 | $0 | $125,000 | $125,000 | 0.4776 | $59,701 |
| 26 | $0 | $125,000 | $125,000 | 0.4637 | $57,961 |
| 27 | $0 | $125,000 | $125,000 | 0.4502 | $56,274 |
| 28 | $0 | $125,000 | $125,000 | 0.4371 | $54,635 |
| 29 | $0 | $125,000 | $125,000 | 0.4244 | $53,044 |
| 30 | $0 | $125,000 | $125,000 | 0.4120 | $51,499 |
| | | | | **TOTAL** | **$9,403,000** |

Notes:

1. PNW is based on 3% discount rate.
2. Total PNW cost is rounded to the nearest $1000.

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**TABLE C-6a**

**Estimated Capital Costs**
**Alternative 6**
**Blackwell Landfill Feasibility Study**
**DuPage County, Illinois**

| Item | Qty. | Unit | Unit Cost | Extended Cost |
|---|---|---|---|---|
| A. Leachate Extraction and Off-Site Disposal | | | | |
| 1. Mobilization | 1 | ls | $25,000 | $25,000 |
| 2. Leachate Extraction Wells (incl. wellheads) | 600 | vlf | $100 | $60,000 |
| 3. Leachate Pumps | 8 | ea | $2,200 | $17,600 |
| 4. Compressor | 1 | ea | $6,000 | $6,000 |
| 5. Conveyance Piping System | 1 | ls | $106,200 | $106,200 |
| 6. Compressor Building | 1 | ea | $10,000 | $10,000 |
| 7. Power Drop | 1 | ea | $25,000 | $25,000 |
| 8. Gravel Access Road | 7200 | sf | $5 | $36,000 |
| 9. Seed, Fertilize, Mulch | 1 | ls | $6,000 | $6,000 |
| 10. Health and Safety | 1 | ls | $10,000 | $10,000 |
| 11. Leachate Tank/Controls | 1 | ls | $35,000 | $35,000 |
| B. Groundwater Extraction and Treatment | | | | |
| 1. Extraction System | | | | |
| a. Extraction Wells | 20 | ea | $6,000 | $120,000 |
| b. Well Pumps | 20 | ea | $1,400 | $28,000 |
| c. Well Head Construction | 20 | ea | $500 | $10,000 |
| d. Header Piping | 17,000 | ft | $5 | $85,000 |
| e. Trenching | 1,600 | ft | $25 | $40,000 |
| f. Electrical | 1 | ls | $10,000 | $10,000 |
| 2. Treatment System | | | | |
| a. O/W Separator | 1 | ls | $15,000 | $15,000 |
| b. Transfer Tank & Pump | 1 | ls | $10,000 | $10,000 |
| c. Air Stripper | 1 | ls | $45,000 | $45,000 |
| d. Building | 900 | sf | $100 | $90,000 |
| e. Controls | 1 | ls | $15,000 | $15,000 |
| f. Plumbing, Electrical, etc. | 1 | ls | $20,000 | $20,000 |
| 3. Discharge System | | | | |
| a. Piping, including trench | 150 | ft | $35 | $5,250 |
| b. Outfall Structure | 1 | ls | $3,000 | $3,000 |
| 4. Permitting | 1 | ls | $5,000 | $5,000 |
| C. 35 IAC 811 Cap | | | | |
| 1. Mobilization | 1 | ls | $50,000 | $50,000 |
| 2. Clearing & Grubbing | 10 | acre | $2,500 | $25,000 |
| 3. Stockpile Topsoil | 40,000 | cy | $2.50 | $100,000 |
| 4. Regrade a Portion of Existing Cap | 110,000 | cy | $1.85 | $203,500 |
| 5. Stockpile a Portion of Existing Cap | 170,000 | cy | $2.50 | $425,000 |
| 6. Purchase & Haul Clay | 200,000 | cy | $10 | $2,000,000 |
| 7. Place & Compact Clay | 200,000 | cy | $5 | $1,000,000 |
| 8. Place Protective Layer | 170,000 | cy | $2.50 | $425,000 |
| 9. Place Topsoil | 40,000 | cy | $2.50 | $100,000 |
| 10. Seed, Fertilize, & Mulch | 40 | acre | $2,500 | $100,000 |
| 11. Passive Gas Venting System | 1 | ls | $30,000 | $30,000 |
| | | | **Subtotal** | $5,296,550 |
| | | | 5% Administration | $264,828 |
| | | | 20% Engineering | $1,059,310 |
| | | | 20% Contingency | $1,059,310 |
| | | | **TOTAL** | **$7,680,000** |

Notes:

1. Total capital cost is rounded to the nearest $1000.

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## TABLE C-6b

**Estimated Annual O&M Costs**
**Alternative 6**
**Blackwell Landfill Feasibility Study**
**DuPage County, Illinois**

| Item | Qty. | Unit | Unit Cost | Extended Cost |
|---|---|---|---|---|
| A. Leachate Extraction and Off-Site Disposal | | | | |
| 1. System Inspections | 1 | ls | $5,000 | $5,000 |
| 2. Repairs, Maintenance | 1 | ls | $8,000 | $8,000 |
| 3. Hauling | 70 | trips | $300 | $21,000 |
| 4. WWTP Charges | 350,400 | gal | $0.06 | $21,024 |
| 5. Power | 190,000 | kwh | $0.08 | $15,200 |
| B. Groundwater Extraction and Treatment | | | | |
| 1. Power Requirements | | | | |
| a. Water Treatment | 44,600 | kwh | $0.08 | $3,568 |
| b. Well Pumps | 150,000 | kwh | $0.08 | $12,000 |
| c. Lights, Heater, Transfer Pump, etc. | 5,000 | kwh | $0.08 | $400 |
| 2. Maintenance | | | | |
| a. Routine Site Visits | 35 | trips | $750 | $26,250 |
| b. Parts Replacement & Repair | 1 | ls | $10,000 | $10,000 |
| c. Stripper Cleaning | 1 | ls | $10,000 | $10,000 |
| 3. Effluent Monitoring | 1 | ls | $4,000 | $4,000 |
| 4. Reporting | 1 | ls | $6,500 | $6,500 |
| C. Landfill Cover | | | | |
| 1. Cap Maintenance | 40 | acre | $158 | $6,320 |
| 2. Passive Gas Venting Maintenance | 1 | ls | $8,000 | $8,000 |
| D. Monitoring | | | | |
| 1. Groundwater | 1 | ls | $15,791 | $15,791 |
| 2. Leachate | 1 | ls | $3,075 | $3,075 |
| E. Annual Report | 1 | ls | $5,000 | $5,000 |
| | | | **Subtotal** | $181,128 |
| | | | 15% Contingency | $27,169 |
| | | | **TOTAL** | **$208,000** |

Notes:

1. Annual O&M total cost is rounded to the nearest $1000.
2. Annual groundwater extraction and treatment cost after year 1 assumes 26 site visits per year for routine maintenance.

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# TABLE C-6c

## Present Net Worth Costs
## Alternative 6
## Blackwell Landfill Feasibility Study
## DuPage County, Illinois

| Year | Capital Cost | O&M Costs | Total | P/W Factor | Present Net Worth |
|---|---|---|---|---|---|
| 0 | $7,680,000 | $0 | $7,680,000 | 1.0000 | $7,680,000 |
| 1 | $0 | $208,000 | $208,000 | 0.9709 | $201,941 |
| 2 | $0 | $201,000 | $201,000 | 0.9426 | $189,463 |
| 3 | $0 | $201,000 | $201,000 | 0.9151 | $183,943 |
| 4 | $0 | $201,000 | $201,000 | 0.8885 | $178,586 |
| 5 | $0 | $201,000 | $201,000 | 0.8626 | $173,385 |
| 6 | $0 | $201,000 | $201,000 | 0.8375 | $168,333 |
| 7 | $0 | $201,000 | $201,000 | 0.8131 | $163,431 |
| 8 | $0 | $201,000 | $201,000 | 0.7894 | $158,671 |
| 9 | $0 | $201,000 | $201,000 | 0.7664 | $154,050 |
| 10 | $0 | $201,000 | $201,000 | 0.7441 | $149,562 |
| 11 | $0 | $201,000 | $201,000 | 0.7224 | $145,206 |
| 12 | $0 | $201,000 | $201,000 | 0.7014 | $140,977 |
| 13 | $0 | $201,000 | $201,000 | 0.6810 | $136,871 |
| 14 | $0 | $201,000 | $201,000 | 0.6611 | $132,885 |
| 15 | $0 | $201,000 | $201,000 | 0.6419 | $129,014 |
| 16 | $0 | $201,000 | $201,000 | 0.6232 | $125,257 |
| 17 | $0 | $201,000 | $201,000 | 0.6050 | $121,609 |
| 18 | $0 | $201,000 | $201,000 | 0.5874 | $118,065 |
| 19 | $0 | $201,000 | $201,000 | 0.5703 | $114,628 |
| 20 | $0 | $201,000 | $201,000 | 0.5537 | $111,290 |
| 21 | $0 | $201,000 | $201,000 | 0.5376 | $108,048 |
| 22 | $0 | $201,000 | $201,000 | 0.5219 | $104,900 |
| 23 | $0 | $201,000 | $201,000 | 0.5067 | $101,845 |
| 24 | $0 | $201,000 | $201,000 | 0.4919 | $98,878 |
| 25 | $0 | $201,000 | $201,000 | 0.4776 | $96,000 |
| 26 | $0 | $201,000 | $201,000 | 0.4637 | $93,202 |
| 27 | $0 | $201,000 | $201,000 | 0.4502 | $90,488 |
| 28 | $0 | $201,000 | $201,000 | 0.4371 | $87,853 |
| 29 | $0 | $201,000 | $201,000 | 0.4244 | $85,294 |
| 30 | $0 | $201,000 | $201,000 | 0.4120 | $82,810 |
| | | | | TOTAL | $11,626,000 |

Notes:

1. PNW is based on 3% discount rate.
2. Total PNW cost is rounded to the nearest $1000.
3. Annual groundwater extraction and treatment O&M cost is reduced after year one.

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