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Pfohl Brothers Landfill

Cheektowaga, Erie County, New York

Site No. 09-15-043

PROPOSED REMEDIAL ACTION PLAN

November 1991

Prepared by
New York State Department of Environmental Conservation
Division of Hazardous Waste Remediation

Appendix A

4.0 DEVELOPMENT OF TECHNOLOGY TYPES AND PROCESS OPTIONS

4.1 GENERAL RESPONSE ACTIONS

General Response Actions are categories of activities which are applied toward remediation of contaminated sites. The remedial action objectives developed for a site dictate which general response actions should be undertaken. Within each general response action (other than No Action) are several technology types and process options.

The general response actions identified for the Pfohl Brothers Landfill site which will meet the remedial action objectives for the site or will provide a baseline against which actions may be compared consist of the following:

No Action - This response is always identified for the purpose of establishing a baseline with which to compare other general response actions. There are no preventative or corrective actions taken as a result of this general response action, however, monitoring of the contamination may be prescribed.

Institutional Controls - These utilize actions which control contact with the contamination rather than remediating the contamination itself. These actions may be physical, such as fences or barriers, or legal such as deed restrictions, zoning changes or security restricted access.

Containment - As a general response action, containment prevents risk to human health and the environment by restricting contact to or migration of the contaminants via the soil, water or air pathways. A number of technologies and different materials are available for use in establishing migration barriers.

Removal/Collection - This response action physically removes or collects the existing contaminated media from the site. Other response actions are usually necessary in order to achieve remedial action goals and objectives for the removed or collected media. Collection and removal of solids/soils media is often associated with source control activities and eventually reduces contaminant concentrations in the surrounding surface water, ground water, biota and air media. Collection or removal actions in water and air media do not prevent continued migration of contaminants in those media, but do typically intercept the most contaminated portions of those media. Collection actions which completely intercept their respective media would be considered containment general response actions.

Treatment - These actions involve removal of the contaminant from the contaminated media or alteration of the contaminant. The result is a reduction in mobility, volume or toxicity of the contaminant. This general response action is usually preferred unless site or contaminant-specific characteristics make it unrealistic.

Disposal/Discharge - This general response action involves the transfer of contaminated media, concentrated contaminants, related or treated materials to a site reserved for long term storage of such materials or to an appropriate location. Disposal sites are strictly regulated in operation and the types of materials that they may accept.

The general response actions presented above provide the basis for identifying technology types and process options specific for the site, which are subsequently screened for technical feasibility.

4.2 DETERMINATION OF THE VOLUMES AND AREAS OF CONTAMINATED MEDIA

In order to apply the general response actions, an initial assessment of the quantity of contaminated media is necessary. This section describes the methods used to estimate quantities of soil/solids/sediments and groundwater/leachate/surface water.

4.2.1 LANDFILL SOILS/SOLIDS/SEDIMENTS

Based on information presented in the RI Report, it appears that contaminated soils and solids are located throughout the landfill. Thus, in calculating the volume of contaminated landfill soils and solids, it was assumed that all of the fill material is contaminated.

Sheet No. 1 in the RI report shows an AutoCAD-generated contour map depicting the depth of fill in the landfill based on soil boring data collected during the installation of the monitoring wells and excavation of test pits. This map was used in developing fill volumes and areas; the AutoCAD software package was used to calculate areas. Then based on the area and average depth, volumes of fill material were determined within each contour interval and then totaled. Total area for each geographical subdivision, average thickness of fill material, and total volumes of fill material, are presented in Table 4.1-1.

TABLE 4.1-1

ESTIMATED VOLUME OF CONTAMINATED LANDFILL SOLIDS AND SOILS

	Area (acres)	Ave Thickness (ft)	Volume (cy)
Area B	75	11.7	1,410,110
Area C	47	12.4	937,460
Total	122		2,347,570

Volumes of contaminated sediments from Aero Creek and the drainage ditches are expected to be a fraction of the contaminated soils and are estimated at an additional 200 cubic yards. This volume estimate is based on assuming that sediments are contaminated to a depth of 0.5 feet and three feet wide over a combined creek and ditch length of 3,600 feet.

4.2.2 GROUND WATER/LEACHATE/SURFACE WATER

Based on ground water sampling results collected to date, no significant/concentrated ground water plumes have been identified in the area. Data collected under the proposed Phase II Remedial Investigation will allow for a determination to be made on the volume of contaminated ground water. It is currently estimated that the volume of water within the site is 15,000,000 cubic feet.

4.3 CRITERIA FOR SCREENING OF GENERAL RESPONSE TECHNOLOGIES AND PROCESS OPTIONS

For each of the general response actions identified in Section 4.1, there exists a number of potentially effective technologies applicable to each medium of interest. These remedial technologies and associated process options are identified in the following sections and are initially screened on the basis of technical feasibility.

The evaluation of the technical feasibility of a technology or process option is based primarily upon the site conditions and the characteristics of the waste on the site. A technology/process option that cannot be implemented based on these criteria is eliminated from further evaluation.

4.3.1 LANDFILL SOLIDS/SOILS AND SEDIMENTS

Table 4.3-1 summarizes the general response technologies and process options identified for the landfill solids/soils and sediments media, provides a brief description of each technology/process option, and lists the results of the technical feasibility screening.

4.3.2 GROUND WATER AND LEACHATE

Table 4.3-2 summarizes the general response technologies and process options identified for the ground water and leachate media, provides a brief description of each technology/process option, and lists the results of the technical feasibility screening.

4.4 IDENTIFICATION AND INITIAL SCREENING OF REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS

In Section 4.3, the technical feasibility of the general response technologies were determined. In this section, the process options associated with these technically feasible technologies are evaluated relative to each other and screened in terms of their ability to meet medium-specific remedial action objectives, their short- and long-term effectiveness, and their implementability. Each of the evaluation criterion is described below:

Ability to meet remedial action objectives - Specific process options that have been identified should be evaluated on their ability to meet remedial action objectives relative to other process options within the same technology type.

TABLE 4.3-1
PFOHL BROTHERS LANDFILL FEASIBILITY STUDY
IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES
LANDFILL SOLIDS/SOIL AND SEDIMENTS

RESPONSE ACTION • Remedial Technology - Process Option	Description	Screening Status	Comments
NO ACTION	No remediation of hazards present on site. Monitoring may occur.	Technically Implementable	This option required by the NCP and is retained for comparison with other alternatives.
INSTITUTIONAL CONTROLS			
• Land Use Controls			
- Deed Restrictions	Restrictive covenants on deeds to the landfill property. Includes limitations on excavation and basements in contaminated solids/soils areas.	Technically Implementable	May be difficult to administer for this site.
- Zoning Change	Zoning change, administrative consent order, or judicial order prohibiting certain land uses.	Technically Implementable	
• Fencing	Restrict general public from on-site hazards	Technically Implementable	Already in place around most of landfill.
• Written Warnings	Place warning signs in area to warn local citizens of landfill hazards	Technically Implementable	Already in place around most of landfill.
CONTAINMENT ACTIONS			
• Capping			
- Native Soil Cap	Reduce exposure to, and migration of contaminated materials through use of a native soil cap.	Technically Implementable	Allows most of the existing infiltration to reach the landfill solids. Surface runoff likely to contain high sediment content, which would require detention basins prior to final discharge.
- Single Barrier Cap	Utilizes a single layer of media for the barrier; such as clay, flexible membrane liner, asphalt or concrete-based material.	Technically Implementable	Allows for some infiltration. Meets NYSDEC capping criteria.
- Composite Barrier Cap	Utilizes multiple layers of media for the barrier, such as soil, synthetics, and concrete.	Technically Implementable	Minimizes infiltration of existing precipitation. Creates relatively high volume of clean runoff. Meets NYSDEC capping criteria.

TABLE 4.3-1 (cont.)
PFOHL BROTHERS LANDFILL FEASIBILITY STUDY

IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES
LANDFILL SOLIDS/SOIL AND SEDIMENTS

RESPONSE ACTION • Remedial Technology - Process Option	Description	Screening Status	Comments
• Surface Controls			
- Grading	Modifies topography to manage surface water infiltration, run-on and runoff.	Technically Implementable	
- Revegetation	Stabilizes soil surface of landfill and promotes evapotranspiration.	Technically Implementable	
REMOVAL ACTIONS			
• Excavation	Physical removal of materials via backhoe or other suitable equipment.	Technically Implementable	Appropriate for isolated areas such as "hot spots" and areas where thickness of landfill deposits is low.
TREATMENT ACTIONS			
• Biological Treatment			
- Aerobic	Degradation of organics using acclimated microorganisms in an aerobic environment.	Technically Unimplementable	Although degradation of PAHs has been demonstrated and proven, degradation of PCBs may be difficult and has not been tried on a full scale. Inorganics would be unaffected by the process.
- Anaerobic	Degradation of organics using microorganisms in an anaerobic environment.	Technically Unimplementable	Not applicable to inorganic and some organic contaminants.
• Stabilization/Fixation	Contaminated soil mixed with a variety of stabilizing agents (cement-based, pozzolanic- or silicate-based, thermoplastic-based, or inorganic polymer-based) to reduce the mobility of hazardous constituents.	Technically Implementable	Bench scale testing would be required to develop the effective stabilizing mixture. Non-uniform composition of landfill solids makes the process difficult to implement as sorting of waste materials prior to treatment may be necessary. Treatment of homogeneous areas may be more implementable.

TABLE 4.3-1 (cont.)
PFOHL BROTHERS LANDFILL FEASIBILITY STUDY

IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES
LANDFILL SOLIDS/SOIL AND SEDIMENTS

RESPONSE ACTION • Remedial Technology - Process Option	Description	Screening Status	Comments
• Thermal Treatment			
- Rotary Kiln	Thermal treatment of contaminated soils by combustion on horizontally rotating cylinder designed for uniform heat transfer.	Technically Implementable	Non-uniform composition of landfill solids makes the process difficult to implement as sorting of waste materials prior to treatment may be necessary. Treatment of homogeneous areas may be more implementable.
- Circulating Fluidized Bed	Waste injected into hot bed of sand where combustion occurs.	Technically Implementable	Non-uniform composition of landfill solids makes the process difficult to implement as sorting of waste materials prior to treatment may be necessary. Treatment of homogeneous areas may be more implementable.
- Multiple Hearth	Waste injected into a vertical cylinder containing a series of solid, flat hearths.	Technically Implementable	Non-uniform composition of landfill solids makes the process difficult to implement as sorting of waste materials prior to treatment may be necessary. Treatment of homogeneous areas may be more implementable. Requires high level of maintenance.
- Pyrolysis	Thermal conversion of organic material into solid, liquid, and gaseous components in an oxygen deficient atmosphere.	Technically Unimplementable	Not applicable; wastes must contain pure organics. Some dioxin destruction achievable.
- Infrared Thermal Treatment	Uses silicon carbine elements to generate thermal radiation beyond the end of the visible spectrum for thermal destruction.	Technically Implementable	Applicable only for organic compounds. Non-uniform composition of landfill solids makes the process difficult to implement as sorting of waste materials prior to treatment may be necessary. Treatment of homogeneous areas may be more implementable.

TABLE 4.3-1 (cont.)
PFOHL BROTHERS LANDFILL FEASIBILITY STUDY

IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES
LANDFILL SOLIDS/SOIL AND SEDIMENTS

RESPONSE ACTION • Remedial Technology - Process Option	Description	Screening Status	Comments
- Supercritical Water Oxidation	Breaks down suspended and dissolved oxidizable inorganic and organic materials by oxidation in a high-temperature, high pressure, aqueous environment.	Technically Unimplementable	Waste must be pumpable.
- Low Temperature Thermal Desorption	Involves the volatilization of organics from soil without achieving soil combustion temperatures. Volatiles can be destroyed in an afterburner.	Technically Implementable	The technology has been developed for treating soils containing PCBs and PAHs. Non-volatile compounds are not removed. Must be used in combination with a vapor collection system.
• Physical/Chemical Treatment			
- Air Stripping/ Mechanical Aeration	Mechanical aeration of soils to remove volatile organics	Technically Unimplementable	Non applicable to inorganics and non volatiles, which are the primary contaminants of concern on the site.
- Soil Washing	Organic solvents are mixed with soils to extract organic contaminants. Liquid waste is produced.	Technically Implementable	Can remove PCBs and PAHs, however low concentrations in the soil may result in low removal efficiencies. Non-uniform composition of landfill solids makes the process difficult to implement as sorting of waste materials prior to treatment may be necessary. Treatment of homogeneous areas may be more implementable.
- Dechlorination	Use of potassium polyethylene glycolate (KPEG) and dimethyl sulfoxide to dechlorinate halogenated organic compounds, creating large numbers of nontoxic products.	Technically Unimplementable	Will not detoxify PAHs or inorganics.

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TABLE 4.3-1 (cont.)
PFOHL BROTHERS LANDFILL FEASIBILITY STUDY

IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES
LANDFILL SOLIDS/SOIL AND SEDIMENTS

RESPONSE ACTION • Remedial Technology - Process Option	Description	Screening Status	Comments
INSITU TREATMENT			
• Physical/Chemical			
- Vapor Extraction/and Thermally Enhanced Vapor Extraction	Vertical or horizontal vents used to extract contaminated soil gas and volatilize contaminant residuals from soils. Steam/hot gas can be used to enhance volatilization.	Technically Unimplementable	Not ammenable to non-volatile organics and inorganic contaminants or to contaminants mixed with trash/debris.
- Radio Frequency (RF)/ Microwave Heating	Electrodes are placed in contaminated soils. RF energy field heats soils and volatilizes contaminants which are collected in vents or at the surface.	Technically Unimplementable	Although system would vaporize volatile and semi-volatile contaminants, non-volatile and inorganic constituents would not be addressed. Applicability to contaminants mixed with trash/debris is limited and unproven.
- Vitrification	Electrodes are placed in soil and current is passed through soil to create resistive heating. Soil eventually melts, organics are volatilized or destroyed and inorganics are dissolved within vitrified mass.	Technically Unimplementable	Contaminants mixed in with trash and other demolition debris could limit the effectiveness of this process. Technology effectiveness in landfill media is unproven. Requires uniform composition of soil.
- Soil Flushing	Surfactant solution is percolated through contaminated soils and elutriate is brought to the surface for removal, recirculation or on-site treatment and reinjection. Amenable for removal of some organics.	Technically Unimplementable	Limited applicability to wastes mixed with trash/demolition debris due to inability to distribute solution to contaminated areas. Also requires effective collection system to prevent contaminant migration; fractured bedrock does not provide for effective recovery. Because of the variety of contaminants present, no one type of surfactant would remove all contaminants of concern. Lack of hydraulic control may create problems. Possible contamination due to surfactants used.

TABLE 4.3-1 (cont.)
PFOHL BROTHERS LANDFILL FEASIBILITY STUDY

IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES
LANDFILL SOLIDS/SOIL AND SEDIMENTS

RESPONSE ACTION • Remedial Technology - Process Option	Description	Screening Status	Comments
- Photolysis/UV	Photochemical reactions requiring the absorption of light energy, generally from sunlight in natural conditions. Because light does not penetrate very far into soils, photodegradation of contaminated soils is limited to soil surfaces.	Technically Unimplementable	Only applicable for surface soil contamination. Non-uniform composition of landfill solids makes the process difficult to implement as sorting of waste materials prior to treatment may be necessary. Treatment of homogeneous areas may be more implementable.
• Biological Treatment			
- Aerobic	Nutrients and cosubstrates, such as methane, are injected into soils to stimulate biological destruction of contaminants.	Technically Unimplementable	Proven in aqueous laboratory reactors, but unproven for soils application. Will not degrade chlorinated organics.
- Anaerobic	Cosubstrate such as acetate is added to subsurface. Anaerobic bacteria are stimulated to degrade chlorinated organics.	Technically Unimplementable	Will degrade chlorinated organics, but incomplete degradation forms vinyl chloride. Difficult to maintain anaerobic conditions insitu.
DISPOSAL ACTIONS			
• Offsite			
- RCRA Subtitle C	Disposal of contaminated soil at offsite RCRA "C" Landfill.	Technically Implementable	Soil may require treatment prior to disposal due to Land Ban restrictions. Radioactive and/or dioxin contaminated soils may require separate handling and disposal.
- RCRA Subtitle D	Disposal of treated solids/soils at an RCRA "D" landfill.	Technically Implementable	Requires treatment prior to disposal. Radioactive and/or dioxin contaminated soils may also require separate handling and disposal due to Land Ban Restrictions.
• Onsite	Involves the construction of an onsite containment vessel (RCRA landfill) or a Subtitle D vessel for the disposal of contaminated materials.	Technically Implementable	Contaminated material would be required to be excavated. Existing site structures may need to be removed. Would be difficult to implement in areas with a high water table or location within 100-year flood plain.

TABLE 4.3-2
PFOHL BROTHERS LANDFILL FEASIBILITY STUDY

IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES
GROUND WATER AND LEACHATE

RESPONSE ACTION • Remedial Technology - Process Option	Description	Screening Status	Comments
NO ACTION	No removal or reduction of risks from ground water or leachate. Continue monitoring of ground water and leachate.	Technically Implementable	This option has been retained for comparison with other alternatives, as required by NCP.
INSTITUTIONAL ACTIONS			
• Water Use Controls			
- Well Permit Regulation	Regulate drilling of new wells in contaminated shallow aquifer.	Technically Implementable	Applicable and feasible in this area since alternate water sources exist.
- Inspect and Seal Existing Wells	Voluntary abandonment of existing shallow wells in contaminated areas. Properly seal bedrock wells to prevent downward contaminant migration.	Technically Implementable	Could affect several private wells located off-site. Potentially important in protecting bedrock aquifer.
- Point of Use Treatment	Provide individual water treatment systems to all potentially affected well water systems.	Technically Implementable	Must be used with other institutional actions to prevent human contact with ground water.
• Public Education	Increase public awareness of site conditions and remedies through meetings, written notices, and news releases.	Technically Implementable	Provide forum for open discussion and may prevent unintended exposures.

TABLE 4.3-2 (cont.)
PFOHL BROTHERS LANDFILL FEASIBILITY STUDY

IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES
GROUND WATER AND LEACHATE

RESPONSE ACTION • Remedial Technology - Process Option	Description	Screening Status	Comments
CONTAINMENT ACTIONS			
• Hydraulic Controls			
- Passive Drainfields	Use of an interceptor trench containing perforated pipe and gravel for collection of ground water or leachate which is pumped to the surface. Trench is located downgradient of site.	Technically Implementable	Collected water must be treated prior to discharge. Existing underground utilities could pose problems. May not be technically feasible to install system deep enough within aquifer. Worker health and safety may be a concern during construction.
- Extraction Wells	Capture ground water in the shallow aquifer using a series of pumping wells which pump at high enough rates to reverse existing hydraulic gradient.	Technically Implementable	Collected water must be treated prior to discharge. Requires on-site studies to determine well capture zones. Requires constant monitoring to maintain system effectiveness.
• Physical Controls			
- Slurry Walls	Bentonite-filled trench. Reduces permeability and restricts ground water flow.	Technically Implementable	Provides consistent barrier to lateral flow. Does not address vertical migration of contaminants.
- Grout Curtain	Inject grout into soil to harden soils and form an impermeable wall.	Technically Implementable	Difficult to completely seal a large area. Does not address vertical migration of contamination.
- Sheet Piling	Metal sheets are driven into bedrock to form an impermeable wall.	Technically Implementable	Difficult to install in rocky soils or at depths greater than 30 feet.

TABLE 4.3-2 (cont.)
PFOHL BROTHERS LANDFILL FEASIBILITY STUDY

IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES
GROUND WATER AND LEACHATE

RESPONSE ACTION • Remedial Technology - Process Option	Description	Screening Status	Comments
- Bottom Sealing	Prevent vertical migration of contaminants using a horizontal layer of impermeable material injected beneath contaminated area.	Technically Implementable	To be implemented in areas where natural clay underlying landfill is absent. May be difficult to implement at the site since the areas are unknown and difficult to identify.
- Capping	Install a properly designed cap over the site. Cap could be asphalt/concrete, clay, synthetic or multi-layered.	Technically Implementable	Would minimize infiltration into landfill materials, thereby reducing leachate seep discharge and decrease downward hydraulic gradient between alluvial and bedrock aquifers.
COLLECTION ACTIONS			
• Hydraulic Collection			
- Passive Drainfields	Water is collected in a trench containing perforated pipe and gravel, and is pumped to the surface.	Technically Implementable	Construction difficulty increases with depth below water table surface. Worker health and safety may be a concern during construction in waste material.
- Extraction Wells	An array of wells is used to pump out ground water.	Technically Implementable	Can collect water over a large area. Pumping rates on individual wells can be varied to focus collection efforts in desired areas.

TABLE 4.3-2 (cont.)
PFOHL BROTHERS LANDFILL FEASIBILITY STUDY

IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES
GROUND WATER AND LEACHATE

RESPONSE ACTION • Remedial Technology - Process Option	Description	Screening Status	Comments
TREATMENT ACTIONS			
• Biological			
- Activated Sludge	Treat ground water/leachate using bacteria and other microbes in an aerated tank with biomass recirculation.	Technically Unimplementable	Organic compound concentrations are too weak to support a viable microbial population. Does not completely address inorganic removal.
- Activated Sludge and Powdered Activated Carbon	Treat ground water/leachate with microbes and powdered activated carbon in the same reactor.	Technically Unimplementable	Potentially applicable for treating organic contaminants. Does not completely address treatment of inorganic constituents.
- Aeration Tank	Biological treatment by microbes in an aerated tank with no recirculation.	Technically Unimplementable	Extremely difficult to sustain sufficient microbial population.
- Aerobic Fixed Film	Microbes attached to an inert media provide organic contaminant removal under aerobic conditions.	Technically Implementable	Possible application even for low strength waters. Incidental metals removal.
- Anaerobic Fixed Film	Microbes attached to an inert media provide organic contaminant removal under anaerobic conditions.	Technically Implementable	Generally not used for removal of low level organic compound concentrations.
- Aerobic/Anaerobic Fixed Film	Microbes attached to an inert media provide organic contaminant removal under spatially segregated aerobic and anaerobic zones.	Technically Unimplementable	Not applicable for waters with low organic compound concentrations.

TABLE 4.3-2 (cont.)
PFOHL BROTHERS LANDFILL FEASIBILITY STUDY

IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES
GROUND WATER AND LEACHATE

RESPONSE ACTION • Remedial Technology - Process Option	Description	Screening Status	Comments
- Anaerobic Digester/Tank	Organic contaminants are removed in an anaerobic digester.	Technically Unimplementable	Applicable for sludge; not applicable for ground water or leachate.
- Combined Biological	Both aerobic and anaerobic microbes are used for treatment.	Technically Unimplementable	Ground water/leachate organic compound concentrations too low to sustain a viable population.
- Fluidized Bed Reactor	Microbes attached to a fluidized bed of inert media provide organic contaminant removal.	Technically Implementable	Potentially applicable for ground water/leachate treatment. Does not address inorganic constituents.
- In-situ Biodegradation	Microbes present in the soil are used for biodegradation.	Technically Unimplementable	Not applicable for low concentration waters encountered at this site. Difficult to control environment in the fill material/soil found at this site.
- Land Treatment	Ground water/leachate is applied to land. Microbes present in soil provide treatment.	Technically Unimplementable	Potential for creating additional contamination. Potential RCRA Land-ban restrictions. Must be used in combination with a vapor collection system.
- Rock Reed Filters	Contaminants are absorbed in wetlands environment (natural or artificial).	Technically Implementable	Potentially applicable as a polishing stage when treated ground water/leachate is discharged to surface waters.
- Sequencing Batch Reactors	Ground water/leachate is treated under aerobic conditions in a sequencing batch reactor configuration.	Technically Unimplementable	Ground water and leachate concentrations are too weak to support a viable microbial populations. Does not completely address inorganic removal.

TABLE 4.3-2 (cont.)
PFOHL BROTHERS LANDFILL FEASIBILITY STUDY

IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES
GROUND WATER AND LEACHATE

RESPONSE ACTION • Remedial Technology - Process Option	Description	Screening Status	Comments
- Trickling Filters	Similar to a fixed film aerobic process.	Technically Implementable	Possible application for removing some of the organics. Not applicable for inorganics.
• Physical/Chemical			
- Activated Carbon	Granular activated carbon is used to adsorb organic contaminants. Spent carbon is regenerated and concentrated. Contaminants are destroyed or treated.	Technically Implementable	Proven technology for removal of most organics. Methylene chloride is poorly adsorbed. Metals removal is incidental.
- Air Stripping/Steam Stripping	Air or steam is used to strip volatile organic compounds from ground water/leachate. Vapor phase streams are treated for concentrated contaminant removal or destruction.	Technically Implementable	Proven technologies for removal of certain organic compounds, especially volatile organics.
- Alkaline Destruction	Remove inorganic constituents by raising pH to high values.	Technically Unimplementable	Not a proven technology and is not applicable for all inorganic constituents.
- Centrifugation	Remove inorganic constituents by raising pH to high values.	Technically Unimplementable	Not applicable for ground water/leachate with low solids contents. Can be used for sludge dewatering but minimal sludge processing is anticipated at this site.
- Chelation	Chelating agents are used for heavy metal removal.	Technically Unimplementable	Technology is not proven for such applications. Only some inorganics are treated.

TABLE 4.3-2 (cont.)
PFOHL BROTHERS LANDFILL FEASIBILITY STUDY

IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES
GROUND WATER AND LEACHATE

RESPONSE ACTION • Remedial Technology - Process Option	Description	Screening Status	Comments
- Coagulation/flocculation	Coagulating agents and flocculants are used for collecting precipitated metals to facilitate separation from waters.	Technically Implementable	Applicable and proven technology for assisting in removal of some inorganic constituents.
- Dechlorination/ Dehalogenation	Organic compounds are dechlorinated or dehalogenated using chemical addition.	Technically Unimplementable	Not effective in media with a wide range of organic constituents. No metals removals.
- Distillation	Organic constituents are removed from ground water/leachate	Technically Unimplementable	Not applicable to ground water with several contaminants and low concentrations of organics. No metals removal.
- Electrodialysis	Ion separation is achieved using electrodialysis techniques.	Technically Unimplementable	Only applicable for ion separation. Does not remove precipitates and most organics.
- Electrochemical	Electrochemical properties exhibited by heavy metals are used for separating them from waters.	Technically Implementable	Has been proven in pilot scale testing. Potentially applicable for metals removal. No organics removal.
- Evaporation	Dissolved solids are separated from water using evaporation. Volatile constituents are also removed.	Technically Unimplementable	Not applicable for treatment of dilute waters in the cool, humid conditions at the site.
- Filtration	Precipitated solids containing metals are filtered out.	Technically Implementable	Potential application as a secondary process during metals removal.
- Freeze Crystallization	Various organic constituents are separated from water by freezing.	Technically Unimplementable	Not proven for such large volumes and dilute concentrations. Metals removal incidental.
- Hydrolysis	Contaminants are hydrolyzed and destroyed.	Technically Unimplementable	Not a proven technology.

TABLE 4.3-2 (cont.)
PFOHL BROTHERS LANDFILL FEASIBILITY STUDY

IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES
GROUND WATER AND LEACHATE

RESPONSE ACTION • Remedial Technology - Process Option	Description	Screening Status	Comments
- Ion Exchange	Heavy metals are exchanged with sodium or hydrogen ions and removed from water as pass through an ion exchange column.	Technically Implementable	Potentially applicable and proven technology for heavy metals removal.
- Low Temperature Stripping	Volatile organic contaminants are removed from water through addition of heat and air.	Technically Implementable	Possible application for volatile organics removal.
- Magnetic Separation	Magnetic forces are used for removal of suspended metals which are magnetic.	Technically Unimplementable	Not applicable to non-magnetic nor dissolved ground water/leachate contaminants at the site. No organics removal.
- Mechanical Aeration	Organics are volatilized through aeration provided by mechanical mixers.	Technically Unimplementable	Very limited applicability to ground water/leachate at this site due to low concentrations.
- Neutralization	pH adjustment is made for treating waters outside the range of normal pH.	Technically Unimplementable	pH for ground water/leachate at this site is normal (within the range 6-9)
- Oil/Water Separation	Free floating oil or other phases are separated from water.	Technically Unimplementable	Applicable only when free product is found. No such products exist at this site.
- Oxidation/Reduction	Oxidation/reduction reactions are used to remove metals.	Technically Unimplementable	Limited application for selective metals only. No organics removal.
- Phases Separation	Immiscible phases are separated physically.	Technically Unimplementable	Multiple phases are not present at this site.

TABLE 4.3-2 (cont.)
PFOHL BROTHERS LANDFILL FEASIBILITY STUDY

IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES
GROUND WATER AND LEACHATE

RESPONSE ACTION • Remedial Technology - Process Option	Description	Screening Status	Comments
- Photolysis (UV)	UV energy is used to degrade organic contaminants.	Technically Unimplementable	Not applicable to the organic contaminants found at this site. Incomplete destruction of certain volatile organics.
- Precipitation	Heavy metals are precipitated out using chemical addition.	Technically Implementable	Proven and applicable technology used in metals removal process.
- Reverse Osmosis	Selective membranes utilize osmotic pressures for separation of organic and inorganic constituents.	Technically Implementable	Possible application as a polishing step depending on the treatment limits to be met. Only practical for achieving very low effluent dissolved solids.
- RF/Microwave In-situ	Microwave energy is used for destruction of contaminants.	Technically Unimplementable	Not applicable for ground water/leachate.
- Sedimentation	Settleable solids are separated from water in tanks.	Technically Implementable	Retained only as a technology in the metals removal process.
- Solvent Extraction	Solvents are used for removal of contaminants from water.	Technically Unimplementable	Concentration of various organics are too low to make this a viable technology.
- Supercritical Fluid Extraction	Solvents are used under supercritical conditions for contaminant removal.	Technically Unimplementable	Concentration of various organics are too low to make this a viable technology.
- UV/Hydrogen Peroxide/ Ozone Reactors	Contaminants are oxidized and dechlorinated using oxidizers in the presence of UV light.	Technically Implementable	Innovative technology. Effective for removal of some organic compounds.
- Ultrafiltration	Contaminants are removed from water using ultrafiltration membranes or columns.	Technically Implementable	May be applicable as a polishing step depending on the level of treatment required.

TABLE 4.3-2 (cont.)
PFOHL BROTHERS LANDFILL FEASIBILITY STUDY

IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES
GROUND WATER AND LEACHATE

RESPONSE ACTION • Remedial Technology - Process Option	Description	Screening Status	Comments
- Vacuum/Vapor Extraction	Vacuum or vapors are used for extracting contaminants from water.	Technically Unimplementable	Concentration of various organics are too low to make this a viable technology.
- Wet Air Oxidation	Thermal energy is used for destruction of contaminants.	Technically Unimplementable	Technology is too energy intensive. Not applicable for waters with insufficient organics and thermal values.
• Thermal Treatment Technologies	Heat energy is used to destroy organic and inorganic contaminants.	Technically Unimplementable	Not efficient and applicable for dilute ground water/leachate.
• In-Situ Treatment Technologies	Ground water/leachate is treated in place using biological or physical/chemical processes.	Technically Unimplementable	Not proven on a large scale, nor with the suite of compounds present at the site. Certain compounds resistant to degradation.
DISPOSAL TECHNOLOGIES			
• On-Site			
- Ground Water Reinjection	Inject treated ground water back into aquifer using injection wells.	Technically Implementable	Useful in flushing out additional contamination and in dilution. Potential plugging problems.
- Infiltration Trenches	Recharge treated ground water/leachate into the aquifer through gravel filled trenches.	Technically Implementable	Less plugging problems than with reinjection wells. Needs permeable soils. Underground utilities may limit locations; verification of locations required.
- Discharge to Surface Waters	Discharge to Elliott Creek after treatment.	Technically Implementable	Treatment standards are dictated by Class B surface water criteria. Permits needed.

TABLE 4.3-2 (cont.)
PFOHL BROTHERS LANDFILL FEASIBILITY STUDY

IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES
GROUND WATER AND LEACHATE

RESPONSE ACTION • Remedial Technology - Process Option	Description	Screening Status	Comments
	Discharge to Aero Lake after treatment.	Technically Implementable	Treatment standards are dictated by Class D surface water criteria. Permits needed.
• Off-Site			
- Ground Water Reinjection	Inject treated ground water back into aquifer using injection wells.	Technically Implementable	Useful in flushing out additional contamination and in dilution. Potential plugging problems.
- Infiltration Trenches	Recharge treated ground water/leachate into the aquifer through gravel filled trenches.	Technically Implementable	Less plugging problems than with reinjection wells. Needs permeable soils. Underground utilities may limit locations.
- Discharge to Surface Waters	Discharge to off-site surface water.	Technically Implementable	Appropriate permits needed. Treatment standards dictated by appropriate surface water criteria.
- Discharge to Sewers	Discharge to Buffalo Sewer Authority sanitary sewer system.	Technically Implementable	Pretreatment criteria established by the authority must be met. Requires local permits.

Long-term effectiveness - This evaluation focuses on:

1) The performance of the remediation;
2) The magnitude of the remaining risk;
3) The adequacy of the controls implemented to manage waste left on the site; and
4) The long-term reliability of the controls left on site.

Short-term effectiveness - This evaluation focuses on:

1) The protection of the community during the remedial action;
2) The environmental impacts from the implementation of the remedial action;
3) The time until remedial action objectives are achieved; and
4) The protection of workers during remedial actions.

Implementability - The implementability criteria encompasses both the technical and institutional feasibility of implementing a technology process.

Screening of the process options using these criteria was conducted to select one process option that is representative of each remedial technology. More than one process option may be selected for a remedial technology if the processes are sufficiently different in their performance.

The screening process is presented in Tables 4.4-1 for the Landfill Solids/Soils and Sediment, and Table 4.4-2 for Ground Water and Leachate. The remedial technologies and process option that were evaluated in Section 4.3 as being technically feasible are presented. Each process options was evaluated against the four criteria and, when compared to the other process options within their technology type as presented on the tables, were given a relative High, Moderate, or Low rating based on their performance in meeting each criteria. It is important to note that the ratings are only indicative of each process option's performance relative to the other process options within each technology type that were retained in the screening tables.

The process option within each technology type receiving the highest performance ratings for the four evaluation criteria was retained for possible incorporation into one or more remedial action alternatives, and the other process options within the technology type are eliminated, unless noted otherwise in the tables. It should be noted that any of the process options contained in Tables 4.4-1 and 4.4-2 could be

TABLE 4.4-1
PFOHL BROTHERS LANDFILL FEASIBILITY STUDY

REMEDIAL ACTION PROCESS OPTIONS EVALUATION
LANDFILL SOLIDS/SOIL AND SEDIMENTS

Response Action	Remedial Technology	Process Option	Achieve Remedial Action Objectives[a]	Long-Term Effectiveness[a]	Short-Term Effectiveness[a]	Implementation[a]	Evaluation Result
No Action	Monitoring	Monitoring	Low	N/A[b]	N/A[b]	N/A[b]	Retain
Institutional Controls	Land Use Restrictions	Deed Restrictions	Low	Low	Moderate	Low	Retain, because sufficiently different
		Zoning Change	Low	Moderate	Low	Moderate	Retain, because sufficiently different
		Fencing	Moderate	Moderate	Moderate	Moderate	Retain because sufficiently different
	Public Education	Written Warnings	Low	Low	Low	High	Retain
Containment	Capping	Native Soil Cap	Low	Low	High	High	Not retained
		Single Barrier	High	Moderate	High	Moderate	Retained
		Composite Barrier Cap	High	High	Low	Low	Not Retained
	Surface Controls	Grading	Low	Low	Moderate	Moderate	Not retained
		Revegetation	Low	Low	Low	High	Retain
Removal	Excavation	–	High	High	Moderate	Low	Retain for isolated regions
Treatment	Stabilization/ Fixation	–	N/A[b]	N/A[b]	N/A[b]	N/A[b]	Reject since hot spots being remediated separately
	Thermal Treatment	Rotary Kiln	High	High	High	High	Reject since hot spots being remediated separately
		Circulating Fluidized Bed	Moderate	Moderate	Moderate	Moderate	Not retained
		Multiple Hearth	Moderate	Moderate	Moderate	Low	Not retained
		Infrared Thermal Treatment	Moderate	Low	Low	Low	Not retained
		Low Temperature Thermal Desorption	Low	Low	Low	Low	Not retained
	Physical/Chemical Treatment	Soil Washing	Low	N/A[b]	N/A[b]	N/A[b]	Reject since hot spots being remediated separately

TABLE 4.4-1 (cont.)
PFOHL BROTHERS LANDFILL FEASIBILITY STUDY

REMEDIAL ACTION PROCESS OPTIONS EVALUATION
LANDFILL SOLIDS/SOIL AND SEDIMENTS

Response Action	Remedial Technology	Process Option	Achieve Remedial Action Objectives[a]	Long-Term Effectiveness[a]	Short-Term Effectiveness[a]	Implementation[a]	Evaluation Result
Disposal	Off-Site	RCRA Subtitle "C"	High	High	Low	Low	Retain for material requiring RCRA "C" disposal
		RCRA Subtitle "D"	Moderate	Moderate	Moderate	Moderate	Retain for material meeting RCRA "D" disposal requirements
	On-Site	--	Low	N/A[b]	N/A[b]	N/A[b]	Retain

[a] Process options were evaluated relative to only other process options within the same remedial technology according to the following:

Ability to achieve remedial action objectives.
Long Term Effectiveness:
1) Performance of the remediation
2) Magnitude of the remaining risk
3) Adequacy of controls
4) Reliability of controls
Short Term Effectiveness:
1) Protection of the community during remedial actions
2) Environmental impacts
3) Time until remedial objectives are achieved
4) Protection of workers during remedial actions
Implementability:
1) Technical feasibility
2) Administrative feasibility

[b] N/A = Evaluative ranking not applicable either because only one option exists for the technology or because the options were not comparable. See text for details.

Note that all of the above process options may be incorporated into alternatives during detailed design.

TABLE 4.4-2
PFOHL BROTHERS LANDFILL FEASIBILITY STUDY
REMEDIAL ACTION PROCESS OPTIONS EVALUATION
GROUND WATER AND LEACHATE

Response Action	Remedial Technology	Process Option	Achieve Remedial Action Objectives[a]	Long-Term Effectiveness[a]	Short-Term Effectiveness[a]	Implementation[a]	Evaluation Result
No Action	Monitoring	Monitoring	Low	N/A	N/A	N/A	Retain
Institutional Controls	Water Use Controls	Well Permit Regulation	Low	Moderate	Low	Moderate	Retain because sufficiently different
		Inspect/Seal Existing Wells	Low	Moderate	High	Moderate	Retain because sufficiently different
		Point of Use Treatment	Moderate	Moderate	High	High	Retain because sufficiently different
	Public Education	Written Warnings	Low	Low	Low	High	Retain
Containment	Hydraulic Controls	Drainfields	High	High	Moderate	Moderate	Retain
		Extraction Wells	Moderate	Moderate	High	Moderate	Not retained
	Physical Controls	Slurry Walls	High	Moderate	High	Moderate	Retain
		Grout Curtain	Moderate	Low	Moderate	Moderate	Not retained
		Sheet Piling	Moderate	Low	Moderate	Moderate	Not retained
		Bottom Sealing	Moderate	Low	Moderate	Low	Not retained
		Capping	High	Moderate	Moderate	Moderate	Retain because sufficiently different
Collection	Hydraulic Collection	Passive Drainfields	High	High	Moderate	High	Retain for near surface collection
		Extraction Wells	High	Moderate	High	Moderate	Retain
Treatment	Biological	Aerobic Fixed Film	High	Low	Moderate	Moderate	Not Retained
		Anaerobic Fixed Film	Moderate	Low	Low	Low	Not retained
		Fluidized Bed Reactor	Moderate	Low	Low	Low	Not retained
		Rock Reed Filters	Low	Moderate	Low	Low	Not retained
		Trickling Filters	Low	Low	Moderate	Low	Not retained

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TABLE 4.4-2 (cont.)
PFOHL BROTHERS LANDFILL FEASIBILITY STUDY

REMEDIAL ACTION PROCESS OPTIONS EVALUATION
GROUND WATER AND LEACHATE

Response Action	Remedial Technology	Process Option	Achieve Remedial Action Objectives[a]	Long-Term Effectiveness[a]	Short-Term Effectiveness[a]	Implementation[a]	Evaluation Result
	Physical/Chemical	Activated Carbon	High	High	High	High	Retain - for organics
		Air Stripping/Steam Stripping	Moderate	Moderate	Moderate	Moderate	Not retained
		Coagulation/Flocculation	High	Moderate	High	High	Retain - for inorganics
		Electrochemical	Moderate	Moderate	Moderate	Moderate	Not retained
		Filtration	Moderate	Moderate	Moderate	Moderate	Retain - for inorganics (use after coagulation/-flocculation)
		Ion Exchange	Moderate	Moderate	Moderate	Low	Retain - for inorganics
		Low Temperature Stripping	Moderate	Moderate	Moderate	Moderate	Not retained
		Precipitation	High	Moderate	Moderate	Moderate	Retain - for inorganics
		Reverse Osmosis	Moderate	Moderate	Moderate	Low	Not retained
		Sedimentation	Moderate	Moderate	Moderate	High	Retain - for inorganics
		UV/Hydrogen Peroxide/ Ozone Reactors	Moderate	Moderate	Moderate	Moderate	Retain - if polishing needed
		Ultra Filtration	Moderate	Moderate	Moderate	Low	Not retained
Disposal	On-Site	Ground Water Reinjection	Low	Low	Moderate	Moderate	Not retained
		Infiltration Trenches	Low	Moderate	Moderate	Moderate	Not retained
		Discharge to Surface Waters	Moderate	Moderate	Moderate	High	Retain
	Off-Site	Ground Water Reinjection	Low	Low	Moderate	Moderate	Not retained
		Infiltration Trenches	Low	Moderate	Moderate	Moderate	Not retained

TABLE 4.4-2 (cont.)
PFOHL BROTHERS LANDFILL FEASIBILITY STUDY

REMEDIAL ACTION PROCESS OPTIONS EVALUATION
GROUND WATER AND LEACHATE

Response Action	Remedial Technology	Process Option	Achieve Remedial Action Objectives[a]	Long-Term Effectiveness[a]	Short-Term Effectiveness[a]	Implementation[a]	Evaluation Result
		Discharge to Surface Waters	Moderate	Moderate	Moderate	High	Retain for uncontaminated and treated water
		Discharge to Sewers	High	High	High	High	Retain

[a] Process options were evaluated relative to only other process options within the same remedial technology according to the following:
Ability to achieve remedial action objectives.
Long Term Effectiveness:
1) Performance of the remediation
2) Magnitude of the remaining risk
3) Adequacy of controls
4) Reliability of controls
Short Term Effectiveness:
1) Protection of the community during remedial actions
2) Environmental impacts
3) Time until remedial objectives are achieved
4) Protection of workers during remedial actions
Implementability:
1) Technical feasibility
2) Administrative feasibility

[b] N/A = Evaluative ranking not applicable either because only one option exists for the technology or because the options were not comparable. See text for details.

Note that all of the above process options may be incorporated into alternatives during detailed design.

included as part of the remedial action at the site for those technology types which are part of the selected alternative.

4.4.1 TECHNOLOGY/PROCESS OPTIONS FOR LANDFILL SOLIDS/SOILS AND SEDIMENTS

General descriptions of the technologies, appropriate comments and their technical implementability are provided in Table 4.3-1. This section provides a brief summary of these options and provides justification for eliminating certain technologies.

4.4.1.1 No Action

The "no action" response allows for conditions to remain status quo, that is, no remedial actions are taken at the site. This option typically includes long-term monitoring and is maintained as a potential response action throughout the screening process.

4.4.1.2 Institutional Control Actions

Institutional controls represent general response actions that are intended to limit exposure to contaminated landfill solids, soils, and sediments. These actions include land use controls such as deed restrictions and removal of physical structures, and public education such as written warnings. Many of these actions have already been taken at the site and are also technically implementable.

Limited response actions, such as fencing, constitute a second category of remedial technologies and may be used alone for general site restrictions or as part of other remedial measures to reduce risks to public exposure. The Pfohl Brothers Landfill is currently fenced and this technology is technically implementable for future remediation also.

4.4.1.3 Containment Actions

Containment actions are intended to reduce dispersion and leaching of a hazardous substance to otherwise uncontaminated areas. Containment actions include placement of a constructed cap over the surface of the landfill, which minimizes exposure and reduces infiltration, and surface controls which alter surface runoff and evaporation at a site. As indicated in Table 4.3-1, all of the technologies under this category are technically implementable at the Pfohl Brothers landfill site.

The three capping technology process options present a large range in their ability to meet the criteria of achieving remedial action objectives, long-term effectiveness and short-term effectiveness. The native soil cap is the easiest to construct, so it ranks the highest in implementability and short-term effectiveness among the cap technologies in Table 4.4-1. The native soil cap, however, would also allow most of the water which currently infiltrates into the landfill to continue to do so. The production of contaminated landfill leachate and associated contamination of the alluvial aquifer would be expected to continue after this process option has been implemented. Although the amount of surface runoff is expected to be lower from the native soil cap than from the barrier caps, due to its higher infiltration characteristics, runoff from the native soil cap is likely to contain a large amount of sediment. The sediment would need to be removed before the surface runoff can be discharged to off-site streams, thus requiring construction of sediment detention basins.

The single and composite barrier caps would reduce infiltration through the landfill and sedimentation associated with surface runoff. Both barrier caps meet state capping regulations (6NYCRR, Part 360). The composite barrier cap is more difficult to construct and therefore receives a low rating for short-term effectiveness and implementation. The single barrier cap was selected as the preferred and representative process option for containment general response action capping technology.

The surface control technology process options are fairly easy to implement. Due to the large area the site covers and high annual rainfall, neither the revegetation nor grading process options would be effective in reducing infiltration. Neither process option would reduce exposure to contaminated landfill solids, so remedial action objectives would not be met. Revegetation is easier to implement than grading, so it has been retained as the representative and preferred process option for this technology type.

4.4.1.4 Removal Actions

The removal general response action consists of the technology type of excavation. Excavation is not implementable for the entire volume of landfill solids due to the thickness and depth of fill materials and shallow depth to water. Excavation has been retained, however, as an appropriate general response action for peripheral portions of the landfill where the fill materials are less thick. It is assumed that removal of localized landfill solids and soils containing high contaminant concentrations ("hot spots") is being undertaken separately, and therefore, will not be addressed in this evaluation.

4.4.1.5 Treatment Actions

This set of technology types consists of the collection, by excavation, of landfill solids and soils, as well as sediments, and subsequent treatment either at a facility located on-site or off-site. The remedial action categories of onsite and offsite treatment include biological (aerobic and anaerobic), stabilization/fixation, physical/chemical treatment and thermal treatment.

Due to the large quantity and heterogenous nature of the material in the Pfohl Brothers Landfill, source removal would require extensive excavation, handling and processing. Offsite treatment would also require handling and transport of the contaminated material, thereby creating a risk of exposure to the workers and general public. This technology type is, however, technically feasible. Therefore, the option of excavating the landfill and treating the soils and solids on or off site will be retained for further evaluation. Treatment of localized "hot spots" is being undertaken separately, and will therefore not be addressed in this evaluation.

Biological treatment, commonly referred to as bioremediation, is a process which uses soil microorganisms to chemically degrade organic constituents. Biodegradation can occur in the presence of oxygen (aerobic) or in the absence of oxygen (anaerobic). Available data suggest that halogenated aliphatic compounds, non-halogenated organic compounds, and nitrated compounds are treated successfully using this technology. However, this technology type has no record of demonstrated effectiveness in treating PCBs, dioxins or furans. In addition, bioremediation processes are not suitable for the treatment of wastes with high levels of metals, such as those found at the PBL site and were, therefore, not retained for further evaluation.

Stabilization/fixation is a physical/chemical process in which a stabilizing material is added to a liquid or semi-liquid waste to produce a solid. In general, this technology has been successful in immobilizing volatile metals and non-volatile metals in full-scale systems. Significant reductions in mobility of the leachate have not been demonstrated for many organic compounds. Stabilization has been most

FINAL

~~Draft~~ Remedial Investigation Report
Volume I

Pfohl Brothers Landfill

Cheektowaga, New York
Site Number 9-15-043

Prepared For:

New York State
Department Of Environmental Conservation
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Commissioner

Division Of Hazardous Waste Remediation

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January, 1991

PFOHL BROTHERS LANDFILL GROUND WATER DATA

TABLE 4-8 (contd)
SUMMARY OF CONSTITUENTS IN SHALLOW AQUIFER EXCEEDING ARARs
ROUNDS 1 AND 2

12/11/90

	ROUND 2	CONCENTRATIONS in ug/l
SAMPLE NUMBER :	GW ARARs	GW-17S-02
VOLATILES		
1,1-Dichloroethene	5 a	
1,1-Dichloroethane	5 a	
1,1,1-Trichloroethane	5 a	
Benzene	ND a	
Toluene	5 a	
Chlorobenzene	5 a	
Xylenes(total)	5 a	
SEMI VOLATILES		
Phenol *	1.0 a	4000.0 D
1,4-Dichlorobenzene	** a	
1,2-Dichlorobenzene	** a	
bis(2-Ethylhexyl)Phthalate	50 a	
PESTICIDES/PCBs		
Aroclor-1232 ****	.1 a	110.0 J
INORGANICS		
ANTIMONY	3 b	24.4 BJ
BARIUM	1000 a	1530.0 J
CADMIUM	10 a	12.0 J
CHROMIUM	50 a	
COPPER	200 a	
IRON ***	300 a	32500.0
LEAD	25 a	50.6
MAGNESIUM	35000 b	175000.0
MANGANESE ***	300 a	1320.0 J
MERCURY	2 a	
SODIUM	20000 a	201000.0
ZINC	300 a	

FOOTNOTES :
a = ARARs are 6 NYCRR Part 703.5 Class GA standards for potable water.
b = ARARs are 6 NYCRR Part 703.5 Class GA TOGS guidelines for potable ground water (ug/l).
ug/l (micrograms per liter) = ppb (parts per billion).
J is a data qualifier indicating estimated values (appendix A).
B = For organics, analyte was detected in the method blank.
B = Analyte value is between the contract required detection limit (CRDL) and the instrument detection limit (IDL) for inorganics.
* = The ARAR value shown includes a total of: phenol, pentachlorophenol, and 2,4-dichlorophenol.
** = ARARs indicate that the combined total for 1,4-dichlorobenzene and 1,2-dichlorobenzene may not exceed 4.7 ug/l.
*** = The combined total for Iron and Manganese exceeds 500 ug/l for all samples except GW-4S-02 and GW-11S-02.
**** = The ARAR value for total PCBs is .1 ug/l. Total PCBs include: Aroclor-1016, Aroclor-1221, Aroclor-1232, Aroclor-1242, Aroclor1248, Aroclor-1254, Aroclor-1260. Aroclor-1232 was the only PCB detected.
ND = Non-detect.

PFOHL BROTHERS LANDFILL GROUND WATER DATA

TABLE 4-8 (contd)
SUMMARY OF CONSTITUENTS IN SHALLOW AQUIFER EXCEEDING ARARs
ROUNDS 1 AND 2

12/11/90

		ROUND 2			CONCENTRATIONS in ug/l				
SAMPLE NUMBER :	GW ARARs	GW-9S-02	GW-10S-02	GW-11S-02	GW-12S-02	GW-13S-02	GW-14S-02	GW-15S-02	GW-16S-02
VOLATILES									
1,1-Dichloroethene	5 a								
1,1-Dichloroethane	5 a				5.6 J				
1,1,1-Trichloroethane	5 a				26.0				
Benzene	ND a	2.8 J					2.7		290.0
Toluene	5 a						43.0 J		
Chlorobenzene	5 a								11000.0 J
Xylenes(total)	5 a								400.0 J
SEMI VOLATILES									
Phenol *	1.0 a						6.0 J		
1,4-Dichlorobenzene	** a								38.0 J
1,2-Dichlorobenzene	** a								4.0 J
bis(2-Ethylhexyl)Phthalate	50 a								
PESTICIDES/PCBs									
Aroclor-1232 ****	.1 a							110.0 J	
INORGANICS									
ANTIMONY	3 b								33.0 BJ
BARIUM	1000 a						1220.0	1840.0 J	1220.0
CADMIUM	10 a								
CHROMIUM	50 a				196.0		115.0		99.7
COPPER	200 a						258.0 J		3060.0 J
IRON ***	300 a	7240.0	1170.0		1270.0	38000.0	131000.0 J	26300.0	176000.0
LEAD	25 a					39.1	369.0		331.0 J
MAGNESIUM	35000 b	45600.0	97000.0	46600.0	203000.0	52500.0	173000.0	79000.0	140000.0
MANGANESE ***	300 a	1920.0 J	375.0 J		1130.0 J	316.0 J	3450.0 J		2710.0 J
MERCURY	2 a								3.3
SODIUM	20000 a	31400.0	183000.0	53200.0	287000.0	60700.0	47500.0	97500.0	31100.0
ZINC	300 a						780.0 J		1490.0 J

FOOTNOTES :
a = ARARs are 6 NYCRR Part 703.5 Class GA standards for potable water.
b = ARARs are 6 NYCRR Part 703.5 Class GA TOGS guidelines for potable ground water (ug/l).
ug/l (micrograms per liter) = ppb (parts per billion).
J is a data qualifier indicating estimated values (appendix A).
B = For organics, analyte was detected in the method blank.
B = Analyte value is between the contract required detection limit (CRDL) and the instrument detection limit (IDL) for inorganics.
* = The ARAR value shown includes a total of: phenol, pentachlorophenol, and 2,4-dichlorophenol.
** = ARARs indicate that the combined total for 1,4-dichlorobenzene and 1,2-dichlorobenzene may not exceed 4.7 ug/l.
*** = The combined total for Iron and Manganese exceeds 500 ug/l for all samples except GW-4S-02 and GW-11S-02.
**** = The ARAR value for total PCBs is .1 ug/l. Total PCBs include: Aroclor-1016, Aroclor-1221, Aroclor-1232, Aroclor-1242, Aroclor-1248, Aroclor-1254, and Aroclor-1260. Aroclor-1232 was the only PCB detected.
ND = Non-detect.

successfully demonstrated on PAHs, where 99% reduction in mobility has been achieved. This technology type is therefore considered technically implementable for metals and some organics at the site, and has been retained for further consideration.

Thermal treatment is a very effective technology type for treating organic and inorganic contaminants through the application of heat. With the exception of polar aromatic compounds (i.e., chlorinated phenols and methoxychlor) this process generally achieves a removal efficiency of greater than 98%. Thermal treatment does not destroy volatile metals, such as lead and mercury, or non-volatile metals, such as iron and chromium. Several process options such as rotary kiln, multiple hearth, circulating fluidized bed, pyrolysis, infrared thermal treatment, supercritical water oxidation, vitrification and low temperature thermal desorption options are included in this category. Among these, pyrolysis and super critical water oxidation technologies are considered to be technically unimplementable for this site.

Physical and chemical treatment technologies, such as air stripping, soil washing and dechlorination represent another technology type which is potentially applicable to contaminants at the site. Air stripping is a process used to transfer volatile contaminants in water or soil to the gaseous phase. It is less effective in removing the heavier, less volatile compounds, such as PAHs, in the soils and is, therefore, not technically implementable on this site.

Soil washing as described in Table 4.3-1 is considered to be technically implementable at this site. Dechlorination is a destruction process which uses a chemical reaction to remove chlorine atoms in chlorinated molecules, thus converting more toxic compounds to less toxic, more soluble products. Transformation of these chemicals in the soil facilitates their removal and subsequent treatment. This process option is not expected to treat volatile and non-volatile metals. To date, no full-scale soil treatment programs have been undertaken using dechlorination, especially for mixed debris encountered at landfills. Because of the clayey nature of the soils at the PBL site and the type of contaminants present, this technology would not be technically implementable and is eliminated from further evaluation.

Insitu treatment is a subset of the treatment general response action which contains a large number of technology type/process options, so has been presented separately for discussion purposes. This includes physical/chemical or biological treatment technologies that are used to treat contaminants in soils, solids and sediments without having to excavate these materials. The category of physical/chemical treatment includes physical and chemical vapor extraction, microwave heating, vitrification, soil flushing, and photolysis. These technologies are not appropriate for conditions at the Pfohl Brothers site primarily because of the heterogenous mixture of the waste material and lack of proven effectiveness in landfill media. Soil flushing technology would be impractical because the mixture of waste material would require the application of a variety of surfactants to remove all the contaminants. Effective removal could not be accomplished because the presence of trash and demolition debris would preclude an even distribution of the solution. For these reasons, all physical/chemical insitu treatment technologies are considered to be technically unimplementable at this site and are not considered further.

Insitu biological treatment includes aerobic and anaerobic treatment technologies. Because of the limited application and lack of demonstrated performance for these technologies for mixed debris at this landfill, biological processes are technically unimplementable and are also eliminated from further evaluation.

4.4.1.6 Disposal Actions

The disposal general response action includes transport offsite to either a RCRA subtitle C or RCRA subtitle D facility, or construction of an onsite containment facility. Onsite disposal may include excavation of portions of the landfilled material. The radioactive and/or dioxin-contaminated landfill solids and soils may have to be separated prior to offsite disposal and disposed of separately. Dioxin contaminated soils may not be able to be disposed of offsite due to EPA Land Ban restrictions. All are considered technically implementable and are retained for further evaluation.

4.4.2 TECHNOLOGY/PROCESS OPTIONS FOR GROUND WATER AND LEACHATE

Several general response actions were identified for ground water and leachate remediation, as discussed in Section 4.1. A set of technology types and process options was evaluated based on the general remedial actions. These actions ranged from "no action" to collection and treatment. General descriptions of technologies, types, and process options, appropriate comments, and initial screening based on their technical implementability are provided in Table 4.3-2. This section provides a brief summary of the technology types and process options for each general response action and provides justification for additional screening.

4.2.2.1 No Action

The "no action" general response action allows for current conditions to remain as no remedial actions are taken at the site. This response action typically includes the technology type/process option of long-term monitoring, and is maintained as a potential response action throughout the screening process to provide a baseline condition upon which all of the other response actions are compared.

4.4.2.2 Institutional Control Actions

Institutional controls are implemented to control the exposure to contaminated or potentially contaminated ground water for drinking and domestic uses. Included are well permit regulation for new wells, inspection and sealing of existing wells in areas at risk of ground water contamination, point of use treatment and public education in the form of written warnings. All four institutional control options have been retained since they are sufficiently different and because each of these should be undertaken as part of this general response action.

4.4.2.3 Containment Actions

Containment general response actions are intended to reduce off-site migration of contaminated ground water. Technology types for containment of horizontal migration of contaminated ground water include hydraulic and physical containment. Hydraulic containment consists of the reversal of ground water gradients via pumping or passive drainfields. In aquifers with low hydraulic conductivity, drainfields are more effective than wells in intercepting groundwater. However, installation of drainfields through waste materials may pose considerable difficulties and would require extreme health and safety precautions during installation. In addition, in order to completely intercept alluvial ground water leaving the site, the drainfields would need to be installed near the base of the alluvial aquifer. The shallow depth to water creates additional construction difficulties. Physical containment consists of barriers such as a slurry wall, grout curtain, or sheet piling. The physical containment technologies considered for use at the site each extend from the ground surface to the base of the alluvial aquifer. Their continuous nature provides physical containment of contaminants migrating laterally in both the aqueous and gaseous phases. Lateral containment of gaseous phase contaminants, if present at the site, provides an extra degree of protection to offsite uncontaminated areas that does not exist with the hydraulic containment technology process options. The grout curtain, sheet piling, bottom sealing and extraction well process options of containment are more difficult to implement and less effective than other options, and so these have not been carried forward.

4.4.2.4 Collection Actions

The collection general response action for ground water and leachate consists of two hydraulic collection technology process options. These process options, passive drainfields and extraction wells, are similar to the process options described for the ground water/leachate hydraulic containment technology. Unlike the hydraulic containment process options, the hydraulic collection technology process options do not need to completely intercept the water that flows in the vicinity of the collection system. Hydraulic collection technologies are most appropriate for maintaining water levels below a specified elevation, such as in dewatering systems, or for collecting separate-phase contaminants that may be present at the top or bottom of an aquifer.

The drainfields are most effective in collecting floating contaminants and in uniformly decreasing the water table surface at the location of the drainfield. The groundwater extraction wells would be easier to install through the landfill solids, and are more effective than the drainfields in decreasing the water table surface over a larger geographical area. Both options are retained, as the drainfields could be used for near surface collection.

4.4.2.5 Treatment Actions

This general response action includes technology types that collect the ground water and subsequently treat it at an on-site facility. Technology type categories include biological (aerobic and anaerobic) and physical/chemical. On-site treatment involves construction of an on-site facility or use of a mobile treatment unit.

Biological treatment has been discussed in Section 4.4.1.5 Compounds which can be treated by this technology type are the halogenated aliphatic compounds, the nonhalogenated organic compounds, and the nitrated compounds. PCBs, dioxins, and furans have proven recalcitrant to biotreatment. Thus, biological treatment technologies were not retained for further evaluation.

Physical/chemical treatment process options physically separate contaminants from the aqueous waste stream by precipitation, absorption, ion exchange, filtration, or vapor extraction. In general, different process options are required for removal of organics and inorganics. Treatment options for removal of inorganics include coagulation/flocculation followed by filtration, ion exchange, precipitation, and/or sedimentation. Physical/chemical process options for removal of organics include activated carbon followed by a polishing step using UV/Hydrogen Peroxide/Ozone reactors. These process options were retained for further analysis.

A variety of physical/chemical treatment process options were not retained. Air stripping and low temperature stripping do not effectively remove the less volatile compounds, such as PAHs. Electrochemical separation of metals from aqueous waste streams has not been tested on a full-scale basis. Reverse osmosis for removal of both organic and inorganic contaminants has potential problems with clogging of the membrane, large wastewater sidestreams and high maintenance requirements.

4.4.2.6 Disposal/Discharge Actions

Treated and untreated water that is collected at the site can be disposed of via reinjection or recharge to ground water, discharge to on- or off-site surface water bodies, or discharge to the municipal Publicly Owned Treatment Works (POTW) sewer system. Recharge and reinjection process options are usually more effective when the source of contamination has been removed or isolated, the depth to ground water is great and the aquifer media receiving the recharge water has a relatively high hydraulic conductivity. Since removal of source materials will not be undertaken, the depth to water is so shallow, and the alluvial materials contain many low permeability deposits, reinjection or recharge to ground water is not practical, either on or off site. Due to the proximity of surface water bodies (Ellicott Creek, Aero Creek, and Aero Lake) and POTW lines to the site, the option of discharging to surface water bodies and/or to the Buffalo POTW system has been retained.

4.5 SUMMARY OF SCREENING PROCESS

Table 4.5-1 summarizes the technologies and process options that are retained for remedial action alternative development. These technologies/process options were evaluated as technically implementable in Section 4.3 and in Section 4.4 were rated the highest, relative to other process options within each technology type, when evaluated against the four evaluation criteria: ability to meet remedial action objectives; short-term effectiveness; long-term effectiveness; and implementability.

Table 4.5-1

PFOHL BROTHERS LANDFILL FEASIBILITY STUDY
SUMMARY OF REPRESENTATIVE PROCESS OPTIONS
RETAINED FOR ALTERNATIVES DEVELOPMENT

Landfill Solids/Soil and Sediment

No Action

Monitoring

Institutional Monitoring Controls

Deed and Land Use Zoning Restrictions
Fencing, Written Warnings

Containment

Single Barrier Cap
Revegetation Surface Control, Grading

Removal

Excavation

Disposal

RCRA Subtitle D Off-Site Disposal
RCRA Subtitle C Off-Site Disposal
On-Site Disposal

Ground Water and Leachate

No Action

Monitoring

Institutional Control

Well Permit Regulation, Well Inspections/Sealing
Point of Use Treatment

Table 4.5-1 (continued)

PFOHL BROTHERS LANDFILL FEASIBILITY STUDY
SUMMARY OF REPRESENTATIVE PROCESS OPTIONS
RETAINED FOR ALTERNATIVES DEVELOPMENT

Containment

Drainfield Hydraulic Control
Slurry Wall, and Capping Physical Control

Collection

Passive Drainfield Hydraulic Collection
Extraction Well Hydraulic Collection

Treatment

Activated Carbon Physical/Chemical Treatment for Organics
Coagulation/Flocculation Physical/Chemical Treatment for Inorganics
Filtration Physical/Chemical Treatment for Inorganics
Ion Exchange Physical/Chemical Treatment for Inorganics
Precipitation Physical/Chemical Treatment for Inorganics
Sedimentation Physical/Chemical Treatment for Inorganics
UV/Hydrogen Peroxide/Ozone Reactors Physical/Chemical Treatment for Polishing

Disposal

On- and Off-Site Discharge to Surface Water
Off-Site Discharge to POTW

Appendix B

APPENDIX B

LIST OF TABLES

LIST OF TABLES (Cont'd)

TABLE 2-1

SAMPLING AND ANALYSIS DATA SUMMARY
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

MEDIUM	PHASE I SAMPLING DATA 4/89 - 12/89					SUPPLEMENTAL SAMPLING DATA 6/90 - 12/90				
DATA EVALUATED IN QUANTITATIVE RISK ASSESSMENT	VOCs	SVOCs	Pests/PCBs	Metals	Dioxins/Furans	VOCs	SVOCs	Pests/PCBs	Metals	Dioxins/Furans
Surface Soils										
Area B								5	5	5 (2,3,7,8-TCDD and TCDF)
Residential								14	14	14 (isomer-specific)
On-site Truck Repair										1 (isomer-specific)
Sediments										
Leachate Seep Sediments	19	19	19	19	18 (2,3,7,8-TCDD)					
Aero Lake Sediments	3	3	3	3	3 (2,3,7,8-TCDD)					
Aero Creek Sediments						17	17	17	2	8 (isomer-specific) 17 (2,3,7,8-TCDD and TCDF)
Drainage Ditch Sediments	12	12	11-17	11	10 (2,3,7,8-TCDD)					
Area C Marsh					1 (2,3,7,8-TCDD)	5	5	5		5 (isomer-specific)
Ellicott Creek Sediments	3	3		3	3 (2,3,7,8-TCDD)	5	5	5	5	4 (2,3,7,8-TCDD and TCDF)

TABLE 2-1 (Cont'd)

SAMPLING AND ANALYSIS DATA SUMMARY
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

MEDIUM	PHASE I SAMPLING DATA 4/89 - 12/89					SUPPLEMENTAL SAMPLING DATA 6/90 - 12/90				
DATA EVALUATED IN QUANTITATIVE RISK ASSESSMENT	VOCs	SVOCs	Pests/PCBs	Metals	Dioxins/Furans	VOCs	SVOCs	Pests/PCBs	Metals	Dioxins/Furans
Surface Water										
Leachate Seeps	19-38	19	19	19						
Aero Lake	3	3	2	3	3 (2,3,7,8-TCDD)					
Ellicott Creek	1	1		1	3	7	7	7	7	
Drainage Ditch	11	11	11	10	10 ((2,3,7,8-TCDD)					
Groundwater										
Unconsolidated	25-90	11-26	21	26	17 (2,3,7,8-TCDD)	5				
Bedrock	12	10	10	11	7 (2,3,7,8-TCDD)					

TABLE 2-1 (Cont'd)

SAMPLING AND ANALYSIS DATA SUMMARY
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

MEDIUM	PHASE I SAMPLING DATA 4/89 - 12/89					SUPPLEMENTAL SAMPLING DATA 6/90 - 12/90				
DATA EVALUATED IN QUALITATIVE RISK ASSESSMENT	VOCs	SVOCs	Pests/PCBs	Metals	Dioxins/Furans	VOCs	SVOCs	Pests/PCBs	Metals	Dioxins/Furans
Surface Soil										
Aero Path								8	8	8 (isomer-specific)
Fish[(a)]										
Ellicott Creek										
Amherst			13							
Bowmansville			9					3	1(Hg)	
Airport								6	1(Hg)	
Tributary 11B								4	1(Hg)	
Aero Lake			13					5	1(Hg)	
Other										
Residential Sump						6	6	6	6	
Basement Floor								3	3	

TABLE 2-1 (Cont'd)

SAMPLING AND ANALYSIS DATA SUMMARY
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

MEDIUM	PHASE I SAMPLING DATA 4/89 - 12/89					SUPPLEMENTAL SAMPLING DATA 6/90 - 12/90				
DATA EVALUATED IN SUPPORT OF RISK ASSESSMENT[(b)]	VOCs	SVOCs	Pests/PCBs	Metals	Dioxins/Furans	VOCs	SVOCs	Pests/PCBs	Metals	Dioxins/Furans
Subsurface Soils										
Area A	2	6	6	6						
Area B										
(on-site)	21	21	21	23						
(off-site)	6	6	-	6						
Area C										
(on-site)	15	15	15	15						
(off-site)	1	1	1	1						
Drums										
Ruptured Drums	6	6	6	6						
Exposed Drums	3	3	-	3						
Buried Drums	3	3	-	3						
Test Pits										
Area B	6	5	5	5						
Area C	1	1	1	1						

(a) Phase I Fish Data collected 7/87-8/87.

(b) These data were not evaluated in qualitative or quantitative risk assessment as exposure to subsurface soils, drums and test pit materials is believed to be unlikely.

TABLE 2-2

CHEMICALS DETECTED IN ALL MEDIA
PFOHL BORTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

	SOILS			SEDIMENTS			SURFACE WATER				GROUNDWATER				
CHEMICALS	LAND-FILL SOILS	RESI-DENTIAL SOILS	AERO PATH SOILS	AERO LAKE	ELLICOTT CREEK	DRAINAGE DITCHES	AERO LAKE	ELLICOTT CREEK	DRAINAGE DITCHES	LEA-CHATE SEEPS	UNCON-SOLIDATED AQUIFER	BEDROCK AQUIFER	FISH	RESI-DENTIAL SUMP	BASE-MENT FLOORS
VOLATILES															
Acetone	X			X	X	X			X						
Benzene						X				X	X	X			
2-Butanone				X											
Chlorobenzene	X				X	X			X	X	X				
Chlorethane										X	X	X			
4-Chloro-3-methylphenol						X									
1,2-Dichlorobenzene	X					X			X	X	X				
1,3-Dichlorobenzene	X									X	X				
1,4-Dichlorobenzene	X					X				X	X				
1,1-Dichloroethane										X	X	X			
1,1-Dichloroethene											X				
1,2-Trans-dichloroethane									X	X		X			
Ethylbenzene										X					
Methylene Chloride	X			X		X									
1,1,1-Trichloroethane											X				
Trichloroethene	X				X					X				X	
Toluene											X	X			
Xylenes											X				
SEMIVOLATIES															
Benzoic Acid	X									X	X	X			
2-Chlorophenol											X				
2,4-Dimethylphenol									X	X	X				
2-Methylphenol											X				
4-Methylphenol											X				
Phenol						X			X	X	X	X			
Dibenzofuran	X					X				X	X				

TABLE 2-2 (Cont'd)

CHEMICALS DETECTED IN ALL MEDIA
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

CHEMICALS	SOILS			SEDIMENTS			SURFACE WATER				GROUNDWATER				
	LAND-FILL SOILS	RESI-DENTIAL SOILS	AERO PATH SOILS	AERO LAKE	ELLICOTT CREEK	DRAINAGE DITCHES	AERO LAKE	ELLICOTT CREEK	DRAINAGE DITCHES	LEA-CHATE SEEPS	UNCON-SOLIDATED AQUIFER	BEDROCK AQUIFER	FISH	RESI-DENTIAL SUMP	BASE-MENT FLOORS
Bis-(2-Ethylhexyl)-phthalate	X			X	X	X	X	X		X	X	X			
Dimethyl phthalate						X									
Di-n-octyl phthalate						X			X	X	X				
Di-n-butyl phthalate	X					X		X			X				
Diethyl phthalate	X				X	X									
Butyl benzyl phthalate	X					X					X				
N-Nitrosodiphenylamine						X				X					
PAHs (carcinogenic)	X				X	X				X					
PAHs (non-carcinogenic)	X				X	X				X					
PESTICIDES/PCBs															
Aldrin	X									X		X			
Beta-BHC	X					X									
Chlordane	X					X							X		
Dieldrin	X									X			X		
DDD	X									X			X		
DDT						X							X		
DDE													X		
Endrin										X			X		
Endosulfan II										X	X				
Heptachlor epoxide													X		
Hexachlorobenzene													X		
Mirex													X		
Transnonachlor													X		
Aroclor-1016													X		
Aroclor-1221	X												X		
Aroclor-1232											X				
Aroclor-1248	X														
Aroclor-1254	X												X		
Aroclor-1242						X									
Aroclor-1260													X		

TABLE 2-2 (Cont'd)

CHEMICALS DETECTED IN ALL MEDIA
PFOHL BORTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

	SOILS			SEDIMENTS			SURFACE WATER				GROUNDWATER				
CHEMICALS	LAND-FILL SOILS	RESI-DENTIAL SOILS	AERO PATH SOILS	AERO LAKE	ELLICOTT CREEK	DRAINAGE DITCHES	AERO LAKE	ELLICOTT CREEK	DRAINAGE DITCHES	LEA-CHATE SEEPS	UNCON-SOLIDATED AQUIFER	BEDROCK AQUIFER	FISH	RESI-DENTIAL SUMP	BASE-MENT FLOORS
INORGANICS															
Aluminum	X			X	X	X	X	X	X	X	X	X		X	X
Antimony					X	X					X	X			
Arsenic	X	X	X	X	X	X			X	X	X	X			
Barium	X	X	X	X	X	X	X	X	X	X	X	X		X	X
Beryllium	X			X	X	X			X	X	X				
Cadmium	X	X	X	X	X	X	X	X	X	X	X	X			
Calcium	X			X	X	X	X	X	X	X	X	X		X	X
Chromium	X	X	X	X	X	X				X	X	X			
Cobalt	X			X	X	X			X	X	X	X			
Copper	X	X	X	X	X	X	X	X	X	X	X	X		X	X
Iron	X			X	X	X	X		X	X	X	X		X	X
Lead	X	X	X	X	X	X	X	X	X	X	X	X			X
Magnesium	X			X	X	X	X	X	X	X	X	X			X
Manganese	X	X	X	X	X	X	X	X	X	X	X	X		X	X
Mercury	X	X	X		X	X	X			X	X	X	X		
Nickel	X			X	X	X			X	X	X	X		X	X
Potassium	X			X		X	X	X	X	X				X	X
Selenium	X	X				X				X	X	X			
Silver	X									X	X	X	X		
Sodium	X			X	X	X	X	X	X	X	X	X		X	X
Thallium	X														
Vanadium	X			X	X	X			X	X	X	X			X
Zinc	X	X	X	X	X	X	X	X	X	X	X	X		X	X
Cyanide	X					X				X	X			X	X
Dioxins/furans	X	X	X		X	X									

TABLE 2-3

CHEMICALS DETECTED IN SOIL BORINGS FROM AREA A
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

CHEMICALS	FREQUENCY OF DETECTION (a)	RANGE OF DETECTED CONCENTRATIONS (b)
VOLATILES		
Acetone	2/2	5 - 18
Methylene Chloride	2/2	25 - 35
SEMIVOLATILES		
Bis(2-ethylhexyl)-phthalate	1/5	3,008
Acenaphthene	1/6	75
Anthracene	2/6	72 - 320
Benzo(a)anthracene	2/6	99 - 940
Benzo(b)fluoranthene	2/6	170 - 610
Benzo(k)fluoranthene	1/6	400
Benzo(g,h,i)perylene	2/6	68 - 230
Benzo(a)pyrene	2/6	92 - 390
Chrysene	2/6	150 - 600
Dibenz(a,h)anthracene	1/6	31
Fluoranthene	3/6	160 - 910
Indeno(1,2,3-cd)pyrene	2/6	65 - 270
Naphthalene	1/6	120
Phenanthrene	3/6	230 - 350
Pyrene	3/6	110 - 940
PESTICIDES/PCBs	0/6	--
INORGANICS		
Aluminum	6/6	4,620 - 11,600
Antimony	2/6	13.4 - 20.3
Arsenic	6/6	2.2 - 3.8
Barium	6/6	35.4 - 93.5
Beryllium	2/6	0.39 - 0.44
Cadmium	0/6	-
Calcium	6/6	43,200 - 121,000
Chromium	6/6	6.5 - 16.0
Cobalt	6/6	3.1 - 8.0
Copper	6/6	13.9 - 21.3
Iron	6/6	7,920 - 18,700
Lead	6/6	10 - 49.1
Magnesium	6/6	13,400 - 60,000
Manganese	6/6	339 - 667
Mercury	2/6	0.31 - 0.71
Nickel	6/6	4.5 - 17.4
Potassium	6/6	769 - 2,190
Selenium	0/6	-
Silver	0/6	-
Sodium	6/6	161 - 263
Thallium	0/6	-
Vanadium	6/6	10.6 - 21.6
Zinc	6/6	50.1 - 97.2
Cyanide	0/6	-

a. The frequency of detection is the number of times the chemical was detected over the number of samples analyzed for that parameter (this does not include the data that were rejected).

b. Organics are in ug/kg and inorganics and in mg/kg.

TABLE 2-4

CHEMICALS DETECTED IN SOIL BORINGS IN AREA B
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

CHEMICALS	FREQUENCY OF DETECTION (a)	RANGE OF DETECTED CONCENTRATIONS (b)
VOLATILES		
Acetone	12/21	21 - 950
Benzene	2/21	52 - 3,700
Chlorobenzene	4/21	18 - 2,200
Chloroethane	1/21	75
1,1-Dichloroethane	2/21	110 - 2,100,000
1,1-Dichloroethene	1/21	910,000
1,2-Dichlorethene	1/21	4,600
Ethylbenzene	6/21	590 - 89,000
Methylene Chloride	3/21	12 - 690
Tetrachloroethene	1/21	31,000
Toluene	3/21	12 - 15,000
1,1,1-Trichloroethane	3/21	620 - 83,000,000
1,1,2-Trichloroethane	1/21	28,000
Trichloroethene	2/21	31 - 30,000
Xylenes	8/21	7 - 350,000
SEMIVOLATILES		
Benzoic Acid	1/18	1,800
2,4-Dimethylphenol	2/18	65,000 - 110,000
2-Methylphenol	1/18	4,400
4-Methylphenol	1/18	36,000
Phenol	2/18	1,800 - 150,000
Dibenzofuran	5/21	150 - 1,900,000
bis(2-Ethylhexyl)-phthalate	7/21	120 - 100,000
Butyl benzyl phthalate	4/7	140 - 31,000
Diethylphthalate	1/21	150
Acenaphthene	1/7	210
Antracene	3/7	150 - 1,900
Benzo(a)anthracene	4/21	550 - 24,000
Benzo(b)fluoranthene	4/21	480 - 32,000
Benzo(g,h,i)perylene	1/21	300
Benzo(a)pyrene	2/21	510 - 21,000
Chrysene	3/21	460 - 25,000
Fluoranthene	8/21	140 - 67,000
Fluorene	1/21	160
Indeno(1,2,3-cd)pyrene	1/21	390
Naphthalene	3/21	340 - 7,500
Phenanthrene	8/21	5 - 32,000
Pyrene	8/21	150 - 49,000
2-Methylnaphthalene	1/21	9,900
PESTICIDES/PCBs		
Aldrin	1/21	6.9

TABLE 2-4
(continued)

CHEMICALS DETECTED IN SOIL BORINGS IN AREA B
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

CHEMICALS	FREQUENCY OF DETECTION (a)	RANGE OF DETECTED CONCENTRATIONS (b)
g-Chlordane	1/21	4.8
DDE	1/21	560
DDT	3/20	30 - 320
Dieldrin	1/21	210
Endrin	1/20	220
Aroclor 1242	1/21	3,700
INORGANICS		
Aluminum	22/23	1,700 - 16,500
Antimony	0/23	-
Arsenic	22/22	0.77 - 29.7
Barium	23/23	12.6 - 5,080
Beryllium	14/23	0.06 - 1.4
Cadmium	3/23	1.5 - 5.5
Calcium	21/21	3,190 - 74,700
Chromium	23/23	4.7 - 82.8
Cobalt	23/23	0.99 - 44.6
Copper	23/23	11.5 - 573
Iron	23/23	5,400 - 104,000
Lead	23/23	10 - 633
Magnesium	23/23	1,070 - 27,300
Manganese	23/23	146 - 728
Mercury	10/23	0.14 - 1.3
Nickel	22/23	5.6 - 193
Potassium	23/23	189 - 3,560
Selenium	4/23	0.62 - 2.0
Silver	6/23	1.7 - 11.2
Sodium	23/23	174 - 837
Thallium	5/23	0.24 - 0.34
Vanadium	21/23	6.1 - 31.0
Zinc	22/22	63.2 - 1,000
Cyanide	3/19	0.74 - 1.3

a. The frequency of detection is the number of times the chemical was detected over the number of samples analyzed for that parameter (this does not include data that were rejected).

b. Organics are in ug/kg and inorganics are in mg/kg.

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TABLE 2-5

CHEMICALS DETECTED IN SOIL BORINGS OFFSITE - AREA B
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

CHEMICALS	FREQUENCY OF DETECTION (a)	RANGE OF DETECTED CONCENTRATIONS (b)
Volatiles		
Acetone	5/6	55- 220
2-Butanone	1/6	25
Methylene Chloride	4/6	6 - 19
4-Methyl-2-Pentanone	1/6	4
Toluene	2/6	1 - 3
Semivolatiles		
Bis(2-ethylhexyl)-phthalate	5/6	140 - 1,500
Inorganics		
Aluminum	6/6	4240 - 13100
Antimony	4/6	4.6 - 8.6
Arsenic	6/6	1.6 - 4.9
Barium	6/6	38.8 - 94.7
Beryllium	6/6	0.17 - 0.59
Cadmium	0/6	-
Calcium	6/6	65400 - 78300
Chromium	6/6	4.5 - 16.3
Cobalt	6/6	4.3 - 11.1
Copper	4/4	13.9 - 17.6
Iron	6/6	7470 - 21400
Lead	6/6	11.9 - 20.8
Magnesium	6/6	23400 - 31900
Manganese	6/6	323 - 520
Mercury	2/6	0.17 - 0.22
Nickel	6/6	10.3 - 22.3
Potassium	6/6	801 - 3010
Selenium	0/6	-
Silver	0/3	-
Sodium	6/6	155 - 239
Thallium	0/6	-
Vanadium	6/6	11.2 - 25.2
Zinc	6/6	64 - 92.6
Cyanide	0/6	-

a. The frequency of detection is the number of times a chemical was detected over the number of samples analyzed for that parameter (this does not include data that were rejected).

b. Organics are in ug/kg and inorganics and in mg/kg.

File: PRASBBOS (10-14-90)

TABLE 2-6

CHEMICALS DETECTED IN SOIL BORINGS IN AREA C
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

CHEMICALS	FREQUENCY OF DETECTION (a)	RANGE OF DETECTED CONCENTRATIONS (b)
VOLATILES		
Acetone	11/15	39 - 930
Carbon Disulfide	1/15	420
Methylene Chloride	11/13	7 - 200
Toluene	1/15	1
1,1,1-Trichloroethane	2/15	6 - 7
SEMIVOLATILES		
Phenol	3/15	310 - 3,300
Dibenzofuran	2/15	140 - 170
Bis(2-ethylhexyl)-phthalate	8/15	61 - 4,700
Benzo(a)anthracene	1/15	280
Benzo(b)fluoranthene	1/15	240
Benzo(a)pyrene	1/15	170
Chrysene	1/15	210
Fluoranthene	2/15	290 - 340
Indeno(1,2,3-cd)pyrene	1/15	95
Pyrene	2/15	310 - 340
PESTICDES/PCBs	0/15	--
INORGANICS		
Aluminum	15/15	2,570 - 14,900
Antimony	0/15	-
Arsenic	15/15	1.7 - 15.8
Barium	15/15	12.6 - 2,240
Beryllium	12/15	0.23 - 1.4
Cadmium	1/15	5.9
Calcium	15/15	7,150 - 71,400
Chromium	15/15	4.2 - 21.6
Cobalt	15/15	2.3 - 13.5
Copper	15/15	9.8 - 337
Iron	15/15	6,250 - 33,100
Lead	15/15	11.7 - 882
Magnesium	15/15	1,300 - 28,500
Manganese	15/15	202 - 508
Mercury	6/15	0.11 - 1.2
Nickel	15/15	7.4 - 34.8
Potassium	15/15	563 - 3,130
Selenium	2/15	0.59 - 2.0
Silver	1/15	2.40
Sodium	15/15	143 - 345
Thallium	1/15	0.45
Vanadium	15/15	8 - 36.6
Zinc	15/15	61.1 - 1,150
Cyanide	0/7	-

a. The frequency of detection is the number of times the chemical was detected over then number of smaples analyzed for that parameter (this does not include data that were rejected).

b. Organics are in ug/kg and inorganics and in mg/kg.

File: PRASBC (10-12-90)

TABLE 2-7

CHEMICALS DETECTED IN SOIL BORINGS OFFSITE - AREA C
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

CHEMICALS	FREQUENCY OF DETECTION (a)	RANGE OF DETECTED CONCENTRATIONS (b)
VOLATILES		
Methylene Chloride	1/1	7
SEMIVOLATILES		
Bis(2-ethylhexyl)-phthalate	1/1	150
Fluoranthene	1/1	190
PESTICIDES/PCBs		
DDT	1/1	35
INORGANICS		
Aluminum	1/1	4,200
Antimony	0/1	-
Arsenic	1/1	3.7
Barium	1/1	29.3
Beryllium	1/1	0.24
Cadmium	0/1	-
Calcium	1/1	55,400
Chromium	1/1	7.3
Cobalt	1/1	3.9
Copper	1/1	7.8
Iron	1/1	7,770
Lead	1/1	18.5
Magnesium	1/1	21,800
Manganese	1/1	321
Mercury	1/1	0.37
Nickel	1/1	6.1
Potassium	1/1	1,270
Selenium	0/1	-
Silver	0/1	-
Sodium	1/1	169
Thallium	0/1	-
Vanadium	1/1	11.6
Zinc	1/1	78.1
Cyanide	0/1	-

a. The frequency of detection is the number of times the chemical was detected over the number of samples analyzed for that parameter (this does not include data that was rejected).

b. Organics are in ug/kg and inorganics and in mg/kg.

File: PRASCBOS (10-14-90)

TABLE 2-8

CHEMICALS DETECTED IN RUPTURED DRUMS
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

CHEMICALS	FREQUENCY OF DETECTION (a)	RANGE OF DETECTED CONCENTRATIONS (b)
VOLATILES		
Acetone	2/6	11,000 - 79,600
Bromodichloromethane	1/6	1350
2-Butanone	4/6	159,000 - 169,000
Chlorobenzene	3/6	920 - 6940
Chloroform	1/6	1160
1,2-Dichlorobenzene	2/6	12,100 - 16,300
1,4-Dichlorobenzene	2/6	12,100 - 16,300
Methylene Chloride	1/6	2570
Toluene	4/6	1,450 - 9,300
Xylenes	2/6	18,000 - 25,000
SEMIVOLATILES		
Benzoic Acid	1/6	143,000
2-Methylphenol	3/6	498,000 - 1,100,000
4-Methylphenol	2/6	69,200 - 165,000
Phenol	5/6	22,000 - 27,000,000
Dibenzofuran	4/6	56,000 - 97,000
Bis(2-Ethylhexyl)-phthalate	1/6	69,200
Butyl benzyl phthalate	1/6	63,800
Di-n-butyl phthalate	3/6	3310 - 35,000
Di-n-octyl phthalate	1/6	18,600
N-Nitrosodiphenylamine	1/6	143,000
Anthracene	4/6	8,100 - 25,400
Fluoranthene	1/6	240 - 3,440
Naphthalene	1/6	1,300
Phenanthrene	6/6	85 - 27,500
Pyrene	1/6	3710
PESTICIDES/PCBs		
alpha-BHC	1/6	4,700
DIOXINS/FURANS	(e)	(e)
INORGANICS		
Aluminum (c)	5/5	70 - 2,010
Antimony	1/6	39.2
Arsenic	5/6	0.56 - 15.3
Barium	3/6	14 - 2,820
Beryllium	1/6	0.17
Cadmium	2/6	2.5 - 3.1
Calcium (c)	5/5	110 - 2,280
Chromium	6/6	13 - 39.3
Cobalt (d)	2/2	15.1 - 22.7
Copper	2/6	171 - 343
Iron	6/6	3,300 - 56,500
Lead	4/6	11 - 3,180

TABLE 2-8
(continued)

CHEMICALS DETECTED IN RUPTURED DRUMS
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

CHEMICALS	FREQUENCY OF DETECTION (a)	RANGE OF DETECTED CONCENTRATIONS (b)
Magnesium	4/6	48 - 541
Manganese	6/6	16 - 243
Mercury (d)	2/2	0.53 - 0.65
Nickel	3/6	4.2 - 59.8
Potassium (d)	2/2	205 - 402
Selenium (d)	1/2	0.72
Silver	4/6	1.0 - 2.1
Sodium	6/6	30 - 14,900
Vanadium	2/2	2.5 - 4.3
Zinc	2/6	30 - 2,030
Cyanide	2/6	1.2 - 2.8

a. The frequency of detection is the number of times the chemical was detected over the number of samples analyzed for that parameter (this does not include data that were rejected).

b. Organics are in ug/kg and inorganics and in mg/kg.

c. This compound was rejected in one sample.

d. Based on the data provided, it is assumed that four of these samples were not analyzed for these inorganics.

e. See Draft Remedial Investigation Report for dioxin/furan data.

TABLE 2-9

CHEMICALS DETECTED IN THE EXPOSED DRUMS
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

CHEMICALS	FREQUENCY OF DETECTION (a)	RANGE OF DETECTED CONCENTRATIONS (b)
VOLATILES		
Acetone	1/3	420,000
Methylene Chloride	1/2	12,000
Xylenes	1/3	6200
SEMIVOLATILES		
Phenol	1/3	2,600,000
Dibenzofuran	1/3	1,800,000
Diethylphthalate	1/3	129
Acenaphthene	1/3	130
Anthracene	2/3	590 - 84,000
Benzo(a)anthracene	2/3	1,300 - 140,000
Benzo(b)fluoranthene	2/3	2,100 - 190,000
Benzo(g,h,i)perylene	1/3	410
Benzo(a)pyrene	2/3	1,400 - 120,000
Cyrsene	2/3	1,400 - 170,000
Dibenz(a,h)anthracene	1/3	200
Fluoranthene	2/3	3,400 - 390,000
Fluorene	2/3	130 - 140,000
Indeno(1,2,3-cd)pyrene	1/3	570
Phenanthrene	2/3	1,600 - 350,000
Pyrene	2/3	2,100 - 270,000
DIOXINS/FURANS	(c)	(c)
INORGANICS		
Aluminum	3/3	9 - 2,120
Antimony	0/3	--
Arsenic	2/3	0.65 - 1.2
Barium	3/3	1.1 - 51.9
Beryllium	0/3	--
Cadmium	1/3	1.9
Calcium	3/3	42.4 - 12,000
Chromium	3/3	1.7 - 14.8
Cobalt	2/3	1.7 - 1.8
Copper	3/3	2.6 - 131
Iron	3/3	162 - 22,900
Lead	3/3	3 - 79
Magnesium	2/3	303 - 1,020
Manganese	2/3	51.4 - 134
Mercury	1/3	0.77
Nickel	2/3	11.1 - 14.4
Potassium	2/3	97.5 - 424
Selenium	1/3	0.52
Silver	1/3	1.9
Sodium	3/3	47.6 - 2,970
Vanadium	0/3	--
Zinc	1/3	2.7
Cyanide	3/3	7.1 - 174

a. The frequency of detection is the number of times the chemical was detected over the number of samples analyzed for that parameter (this does not include data that were rejected).

b. Organics are in ug/kg and inorganics are in mg/kg.

c. See Draft Remedial Investigation Report for dioxin/furan data.

TABLE 2-10

CHEMICALS DETECTED IN BURIED DRUMS, WASTE AND STAINED SOIL
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

CHEMICALS	FREQUENCY OF DETECTION (a)	RANGE OF DETECTED CONCENTRATIONS (b)
VOLATILES		
Acetone	11/38	150 - 11,000
Benzene	1/38	13
2-Butanone	3/38	26 -360
Carbon disulfide	1/38	63
Chlorobenzene	6/38	30 - 16,000
1,2-Dichlorobenzene	3/38	190 - 310
1,4-Dichlorobenzene	1/38	300
1,1-Dichloroethane	1/38	290
1,2-Dichlorethene	2/38	5 - 41,000
Ethylbenzene	11/38	38 - 310,000
Methylene chloride	19/38	19 - 140,000
Methyl-2-pentanone	1/38	240,000
Tetrachloroethene	2/38	47 - 22,000
Toluene	10/38	8 - 4,200,000
1,1,1-Trichloroethane	3/38	7 - 4900
Trichloroethene	1/38	150
Xylene	18/38	25 - 1,300,000
SEMIVOLATILES		
Benzyl alcohol	1/38	1000
2,4-Dimethylphenol	4/38	160 - 25,000
2-Methylphenol	2/38	190 - 120,000
4-Methylphenol	4/38	680 - 68,000
Pentachlorophenol	2/38	560 - 29,000
Phenol	16/38	8,500 - 4,000,000
Dibenzofuran	13/38	18 - 49,000,000
Bis(2-ethylhexyl)phthalate	12/38	4 - 28,000
Butyl benzyl phthalate	1/38	49,000
Di-n-butyl phthalate	1/38	170,000
Diethylphthalate	1/38	6,500
N-Nitrosodiphenylamine	1/38	5,900
2-Methylnaphthalene	8/38	12 - 230,000
Acenaphthene	2/38	2,500 - 36,000
Anthracene	2/38	4,000 - 17,000
Benzo(a)anthracene	4/38	1,900 - 11,000
Benzo(a)fluoranthene	4/38	3,000 - 12,000
Benzo(g,h,i)perylene	3/38	750 - 4,500
Benzo(a)pyrene	3/38	1,700 - 7,100
Chrysene	4/38	1,700 - 10,000
Fluoranthene	4/38	2,000 - 39,000
Fluorene	4/38	180 - 29,000
Indeno(1,2,3-cd)pynene	4/38	820 - 5,200
Naphthalene	12/38	3 - 150,000
Phenanthrene	3/38	150 - 86,000
Pyrene	4/38	2,000 - 11,000

TABLE 2-10
(continued)

CHEMICALS DETECTED IN BURIED DRUMS, WASTE AND STAINED SOIL
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

CHEMICALS	FREQUENCY OF DETECTION (a)	RANGE OF DETECTED CONCENTRATIONS (b)
DIOXINS/FURANS	(c)	(c)
PESTICIDES/PCBs		
Aldrin	1/38	4,700
alpha-BHC	2/38	680 - 430,000
gamma-BHC	3/38	1,700 - 69,000
Dieldrin	1/38	1,700
Endrin	1/38	710
Heptachlor	1/38	1,900
Heptachlor epoxide	1/38	1,200
Methoxychlor	1/38	14,000
Aroclor-1242	2/38	7,500 - 13,000
Aroclor-1248	1/38	9,600,000
Aroclor-1254	2/38	8,700 - 420,000
Aroclor-1260	1/38	31,000
INORGANICS		
Aluminum	33/37	43.3-108,000
Antimony	0/37	- -
Arsenic	25/37	0.72-575
Barium	37/37	0.53-8,860
Beryllium	13/37	0.28-2.2
Cadmium	25/37	0.99-39.4
Calcium	31/37	48.5-216,000
Chromium	36/37	1.0-18,100
Cobalt	25/37	2.4-378
Copper	37/37	1.9-29,400
Iron	36/37	155-465,000
Lead	35/37	2.8-36,000
Magnesium	37/37	11.3-28,900
Manganese	36/37	6.1-445
Mercury	13/37	0.14-4.4
Nickel	27/37	4.1 - 445
Potassium	20/37	75.1 - 33,000
Selenium	8/37	0.5 - 39.2
Silver	12/37	0.92 - 11.9
Sodium	37/37	29.7 - 19,500
Thallium	3/37	0.33 - 1.9
Vanadium	20/37	1.7 - 106
Zinc	37/37	13.1 - 35,300
Cyanide	10/37	0.53 - 33.4

a. The frequency of detection is the number of times the chemical was detected over the number of samples analyzed for that parameter (this does not include data that were rejected).

b. Organics are in ug/kg and inorganics and in mg/kg.

c. See Draft Remedial Investigation Report for dioxin/furan data.

TABLE 2-11

CHEMICALS DETECTED IN TEST PITS IN AREA B
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

CHEMICALS	FREQUENCY OF DETECTION (a)	RANGE OF DETECTED CONCENTRATIONS (b)
VOLATILES		
Acetone	1/6	640
2-Butanone	1/5	150
Chlorobenzene	1/6	52
1,4-Dichlorobenzene	1/5	3,200
Ethylbenzene	1/6	4,200
Methylene Chloride	2/6	40 - 46
Toluene	3/6	9 - 2,100
Xylenes (total)	4/6	6,700 - 17,000
SEMIVOLATILES		
2,4-Dimethylphenol	2/5	330 - 7,300
2-Methylphenol	1/5	14,000
Phenol	1/5	12,000
Dibenzofuran	3/5	800 - 18,000
4-Chloroaniline	1/5	1,800
Bis(2-ethylhexyl) phthalate	2/5	2,700 - 3,400
Acenaphthene	1/5	910
Benzo(a)anthracene	2/5	1,300 - 1,400
Benzo(b)fluoranthene	2/5	890 - 1,500
Benzo(a)pyrene	1/5	410
Chrysene	1/5	1,100
Fluoranthene	2/5	2,700 - 6,800
Fluorene	1/5	1,400
Naphthalene	2/5	1,600 - 5,200
Phenanthrene	2/5	2,100 - 9,400
Pyrene	2/5	1,900 - 4,200
2-Methylnaphthalene	2/5	1,600 - 4,000
PESTICIDES/PCBs		
Aldrin	1/5	89
gamma-BHC	1/5	38
DDD	1/5	240
DDT	1/5	190
Dieldrin	1/5	180
Endrin	1/5	230
Heptachlor	1/5	47
INORGANICS		
Aluminum	5/5	13.1 - 5,720
Antimony	0/5	-
Arsenic	4/5	0.44 - 15.9
Barium	5/5	0.66 - 452
Beryllium	2/5	0.51 - 0.57
Cadmium	2/5	5.9 - 8.1

TABLE 2-11
(continued)

CHEMICALS DETECTED IN TEST PITS IN AREA B
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

CHEMICALS	FREQUENCY OF DETECTION (a)	RANGE OF DETECTED CONCENTRATIONS (b)
Calcium	1/1	396
Chromium	5/5	1.6 - 63.9
Cobalt	2/5	6.6 - 8.9
Copper	5/5	2.3 - 222
Iron	5/5	2,970 - 102,000
Lead	5/5	3.5 - 2,340
Magnesium	4/5	13.9 - 2,170
Manganese	5/5	3.9 - 618
Mercury	1/5	0.55
Nickel	2/5	21.2 - 42.8
Potassium	2/5	658 - 918
Selenium	1/5	120
Silver	1/5	4.4
Sodium	5/5	22.1 - 493
Thallium	0/5	-
Vanadium	1/5	10.4
Zinc	5/5	13.6 - 5,850
Cyanide	2/4	3.1 - 5.9

a. The frequency of detection is the number of times the chemica was detected over the number of samples analyzed for that parameter (this does not include data that were rejected).

b. Organics are in ug/kg and inorganics are in mg/kg.

File: TPH6-20 (11-01-90)

TABLE 2-12

CHEMICALS DETECTED IN TEST PITS IN AREA C
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

CHEMICALS	FREQUENCY OF DETECTION (a)	RANGE OF DETECTED CONCENTRATIONS (b)
VOLATILES		
Acetone	1/1	30
SEMIVOLATILES	0/1	-
PESTICIDES/PCBs		
delta-BHC	1/1	1.8
Methoxychlor	1/1	4.0
INORGANICS		
Aluminum	1/1	7,250
Antimony	0/1	-
Arsenic	1/1	15.3
Barium	1/1	301
Beryllium	1/1	0.98
Cadmium	1/1	3.0
Calcium	1/1	10,300
Chromium	1/1	25.9
Cobalt	1/1	7.3
Copper	1/1	124
Iron	1/1	18,400
Lead	1/1	485
Magnesium	1/1	2,270
Manganese	1/1	223
Mercury	1/1	1.10
Nickel	1/1	22.3
Potassium	1/1	680
Selenium	1/1	2.00
Silver	1/1	0.68
Sodium	1/1	260
Thallium	0/1	-
Vanadium	1/1	26.2
Zinc	1/1	422
Cyanide	1/1	1.20

a. The frequency of detection is the number of times the chemical was detected over the number of samples analyzed for that parameter (this does not include data that was rejected).

b. Organic concentrations are in ug/kg and inorganics are in mg/kg.

File: TPH6-21 (11-01-90)

TABLE 2-13

CHEMICALS DETECTED IN LANDFILL SOILS[a]
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

Chemical	Frequency of Detection (b)	Range of Sample Quantitation Limits (c)	Range of Detected Concentrations (c)	Background Levels (c)(d)
VOLATILES				
Acetone	7/24	14	15-770	11
Chlorobenzene	2/24	7-41	10-23	ND
Methylene Chloride	12/24	11-32	9-150	4
Trichloroethylene	2/24	7-41	8-9	NA
SEMIVOLATILES				
Benzoic Acid	1/24	2,600-55,000	740	NA
bis(2-Ethylhexyl)phthalate	5/24	530-11,000	1,500-3,000	NA
Butylbenzyl phthalate	2/24	530-11,000	38-43	NA
Dibenzofuran	3/24	530-11,000	430-13,000	ND
Diethyl phthalate	4/24	530-11,000	18-990	23
1,3-Dichlorobenzene	1/24	530-11,000	14	NA
1,4-Dichlorobenzene	1/24	530-11,000	19	NA
1,2-Dichlorobenzene	1/24	530-11,000	33	NA
Di-n-butyl phthalate	2/24	530-11,000	75-250	40
Acenapthene	2/24	530-11,000	17-720	ND
Anthracene	7/24	530-11,000	11-2,500	ND
Benzo(a)anthracene	19/24	540-8,500	26-6,000	ND
Benzo(b)fluoranthene	15/24	530-7,900	20-9,200	24
Benzo(a)pyrene	10/24	530-8,500	21-6,000	34
Benzo(g,h,i)perylene	7/24	530-11,000	50-2,500	19
Chrysene	20/24	540-7,900	16-7,500	69
Dibenzo(a,h)anthracene	2/24	530-11,000	190-480	NA
Fluoranthene	23/24	7,900	35-13,000	66
Fluorene	2/24	530-11,000	23-880	NA
Indeno(1,2,3-cd)pyrene	4/24	530-11,000	30-2,000	ND
2-Methylnaphthalene	1/24	530-11,000	120	NA
Naphthalene	2/24	530-11,000	44-620	NA
Phenanthrene	12/24	540-11,000	17-10,000	ND
Pyrene	23/24	7,900	11-15,000	57
PESTICIDES/PCBs				
Aldrin	1/23	11-270	32	ND
beta-BHC	2/23	11-270	22-75	ND
gamma-Chlordane	5/19	110-2,100	6.3-92	ND
DDD	1/22	21-530	14	ND
Dieldrin	1/23	21-530	16	ND
Aroclor-1221	1/28	110-2,700	560	ND
Aroclor-1248	5/28	110-2,700	290-7,700	ND
Aroclor-1254	6/28	210-5,300	270-19,000	ND

TABLE 2-13 (Cont'd)

CHEMICALS DETECTED IN LANDFILL SOILS[(a)]
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

Chemical	Frequency of Detection (b)	Range of Sample Quantitation Limits (c)	Range of Detected Concentrations (c)	Background Levels (c)(d)
TCDF AND TCDD[(e)] (GENERAL LANDFILL)				
HxCDFs (total)	2/5	0.0059–0.015	0.11–0.5	0.011
HpCDFs (total)	3/5	0.017–0.022	0.02–0.7	0.015
1,2,3,4,6,7,8-HpCDF	3/5	0.017–0.022	0.02–0.29	0.0059
OCDF	2/5	0.034–0.079	0.32–1	0.014
PeCDDs (total)	1/5	0.011–0.014	0.13	0.0057
HxCDDs (total)	2/5	0.011–0.024	0.23–0.42	0.016
HpCDDs (total)	4/5	0.037	0.02–1.8	0.043
1,2,3,4,6,7,8-HpCDD	4/5	0.037	0.02–1.2	0.024
OCDD	5/5	NA	0.13–4	0.12
TCDF and TCDD (Truck Repair Service)				
TCDF (total)	1/1	NA	17,000	0.0078
2,3,7,8-TCDF	1/1	NA	1,000	0.00086
HxCDFs (total)	1/1	NA	3,200	0.011
1,2,3,4,7,8-HxCDF	1/1	NA	1,000	<0.002
1,2,3,6,7,8-HxCDF	1/1	NA	490	<0.00071
1,2,3,7,8,9-HxCDF	1/1	NA	76	<0.00067
2,3,4,6,7,8-HxCDF	1/1	NA	6	<0.0016
HpCDFs (total)	1/1	NA	3,400	0.015
1,2,3,4,6,7,8-PeCDD	1/1	NA	3,100	0.0059
1,2,3,4,7,8,9-HpCDF	1/1	NA	100	<0.00045
PeCDFs (total)	1/1	NA	6,600	0.0068
1,2,3,7,8-PeCDF	1/1	NA	690	<0.00063
2,3,4,7,8-PeCDF	1/1	NA	130	<0.0011
PeCDDs (total)	1/1	NA	55,000	0.0057
1,2,3,7,8-PeCDD	1/1	NA	930	--
HxCDD (total)	1/1	NA	26,000	0.016
1,2,3,4,7,8-HxCDD	1/1	NA	1,500	<0.00042
1,2,3,6,7,8-HxCDD	1/1	NA	3,700	<0.0018
2,3,4,6,7,8-HxCDD	1/1	NA	2,400	--
HpCDDs (total)	1/1	NA	23,000	0.043
1,2,3,4,6,7,8-HpCDD	1/1	NA	13,000	0.024
OCDD	1/1	Na	30,000	0.120
TCDD (total)	1/1	NA	20,000	0.0049
2,3,7,8-TCDD	1/1	NA	110	0.00046
INORGANICS				
Aluminum	18/18	-	1,260–11,000	12,000
Arsenic	22/23	NA	3–29.9	12.2
Barium	20/20	-	95.9–2,220	47.9
Beryllium	15/18	0.19–0.4	0.23–0.63	0.38

TABLE 2-13 (Cont'd)

CHEMICALS DETECTED IN LANDFILL SOILS[(a)]
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

Chemical	Frequency of Detection (b)	Range of Sample Quantitation Limits (c)	Range of Detected Concentrations (c)	Background Levels (c)(d)
Cadmium	23/23	-	2.2-27.6	0.77
Calcium	18/18	-	7,900-222,000	2,980
Chromium	23/23	-	4.8-84.0	12.7
Cobalt	16/18	1.6-1.7	2.4-17.8	5.5
Copper	23/23	-	14.8-1,057	15.4
Iron	18/18	-	14,000-317,000	17,900
Lead	23/23	-	24.2-985	741
Magnesium	18/18	-	2,150-19,400	2,380
Manganese	20/20	-	132-1,770	228
Mercury	22/23	0.17	0.1-6.2	<0.08
Nickel	18/18	-	10-125	14.1
Potassium	18/18	-	351-2,420	994
Selenium	9/18	0.65-5.6	0.67-5.3	0.46
Silver	9/23	0.84-3.1	1.8-4.8	<0.55
Sodium	18/18	-	125-4,490	173
Thallium	1/18	0.47-1.7	0.59	0.28
Vanadium	17/18	1.3	3.8-26.4	21.7
Zinc	20/20	-	69.1-2,770	75.2
Cyanide	13/14	1.4	1.5-7.3	<0.67

(a) Landfill soils represent surface samples from leachate seep sediments, Area C Marsh sediments, and Area B surface soil.

(b) The frequency of detection is the number of times the chemical was detected over the number of samples analyzed for that parameter (this does not include data that was rejected).

(c) Organic chemical concentrations and dioxin/furan concentrations are in µg/kg; inorganics are in mg/kg.

(d) Sample SUSL-4 collected by Dvirka and Bartilucci was used as a background sample for the landfill soils as directed by NYDEC. ND appears when the chemical was not detected in the background sample. It is not known what the detection limits were for every chemical in the sample. To provide an additional level of comparison, landfill soils were also compared to the background sediment samples SE-1 and SE-14. The lower concentration of lead and arsenic in these sediment samples were used for comparison because the concentrations in the Dvirka and Bartilucci were higher than normal.

(e) TCDF and TCDD data were collected from the following locations: five isomer-specific samples and one 2,3,7,8-TCDD sample from Area C Marsh; five 2,3,7,8-TCDD/TCDF samples from Area B; eighteen 2,3,7,8-TCDD samples from leachate seep sediments.

NOTE: Area C (Marsh) sediment samples were collected by NYSDEC and analyzed for volatiles, semivolatiles, pesticides, PCBs, and TCDFs/TCDDs.

TABLE 2-14

CHEMICALS DETECTED IN RESIDENTIAL SURFACE SOILS
PFOHL BROTHERS LANDFILL, CHEEKTOWAKA, NEW YORK

Chemical	Frequency of Detection (a)	Range of Sample Quantitation Limit (b)	Range of Detected Concentration (b)	Background Concentrations (b)
DIOXINS/FURANS				
TCDFs (total)	10/10	NA	0.0053-0.052	0.0078
2,3,7,8-TCDF	12/13	0.00068	0.00058-0.0051	0.00086
PeCDFs (total)	10/10	NA	0.0027-0.055	0.0068
1,2,3,7,8-PeCDF	7/10	0.00071-0.002	0.00037-0.0047	<0.00063
2,3,4,7,8-PeCDF	7/10	0.001-0.0013	0.00054-0.0085	<0.0011
HxCDFs (total)	10/10	NA	0.0081-0.22	0.011
1,2,3,4,7,8-HxCDF	6/10	0.00055-0.0029	0.0012-0.0074	<0.002
1,2,3,6,7,8-HxCDF	5/10	0.00041-0.00097	0.00042-0.0033	<0.00071
2,3,4,6,7,8-HxCDF	5/10	0.00076-0.0015	0.0013-0.0059	<0.0016
1,2,3,7,8,9-HxCDF	5/10	0.0003-0.0074	0.0003-0.029	<0.00067
HpCDFs (total)	10/10	NA	0.01-0.85	0.015
1,2,3,4,6,7,8-HpCDF	9/10	2.2	0.0034-0.19	0.0059
1,2,3,4,7,8,9-HpCDF	5/10	0.00066-0.004	0.00067-0.0022	<0.00045
OCDF	10/10	NA	0.011-0.49	0.014
TCDDs (total)	9/10	0.00021	0.00047-0.0093	0.0049
2,3,7,8-TCDD	7/13	0.0003-0.0009	0.00031-0.00058	0.00046
PeCDDs (total)	10/10	NA	0.00086-0.019	0.0057
1,2,3,7,8-PeCDD	5/10	0.00071-0.0028	0.00033-0.0015	<0.00075
HxCDDs (total)	10/10	NA	0.009-0.59	0.016
1,2,3,4,7,8-HxCDD	5/10	0.00034-0.0025	0.00054-0.0024	<0.00042
1,2,3,6,7,8-HxCDD	6/10	0.00069-0.0019	0.0011-0.06	<0.0018
1,2,3,7,8,9-HxCDD	6/10	0.00057-0.0019	0.0011-0.054	<0.0023
HpCDDs (total)	10/10	NA	0.04-3.5	0.043
1,2,3,4,6,7,8-HpCDD	10/10	NA	0.015-0.77	0.024
OCDD	10/10	NA	0.090-21	0.120
INORGANICS				
Arsenic	12/13	1.4	2.5-21.0	3.0
Barium	13/13	NA	67.2-801	<29
Cadmium	9/13	0.6-5	1.9-6.2	3.3
Chromium	12/13	10	1.6-14.9	2.3
Copper	13/13	NA	5.4-93.8	<25
Lead	13/13	NA	5.0-339	14.5
Manganese	13/13	NA	88.9-525	52.0
Mercury	10/13	0.1	0.1-0.9	<0.1
Silver	1/13	1.2-10	1.4	<1.4
Zinc	13/13	NA	47.1-969	49.6

(a) The frequency of detection is the number of times the chemical was detected over the number of samples analyzed for that parameter (this does not include data that were rejected).

(b) Inorganics are in mg/kg; dioxins/furans are in µg/kg (ppb).

(c) Background data from sample SSS-55.

NOTE: Data were collected by NYSDEC and were analyzed for inorganics, PCBs and dioxins/furans.

TABLE 2-15

CHEMICALS DETECTED IN AERO LAKE PATH SURFACE SOILS
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

Chemical	Frequency of Detection (a)	Range of Sample Quantitation Limit (b)	Range of Detected Concentration (b)	Background Concentrations (b)
DIOXINS/FURANS				
TCDFs (total)	8/8	NA	0.00055-0.016	0.0078
2,3,7,8-TCDF	5/8	0.36-0.69	0.00062-0.018	0.00086
PeCDFs (total)	7/8	0.22	0.0014-0.013	0.068
2,3,4,7,8-PeCDF	1/8	0.22-1.2	0.00041	<0.0011
HxCDFs (total)	8/8	NA	0.0032-0.014	0.011
HpCDFs (total)	8/8	NA	0.0032-0.019	0.015
1,2,3,4,6,7,8-HpCDF	6/8	0.52-1.2	0.002-0.0099	0.0059
OCDF	8/8	NA	0.006-0.017	0.014
TCDDs (total)	8/8	NA	0.00026-0.0068	0.0049
2,3,7,8-TCDD	2/8	0.27-0.37	0.00026-0.00052	0.00046
PeCDDs (total)	3/8	0.17-1.3	0.0014-0.0065	0.0057
HxCDDs (total)	8/8	NA	0.0022-0.014	<0.016
1,2,3,6,7,8-HxCDD	2/8	0.78-1.7	0.00076-0.0014	<0.0018
1,2,3,7,8,9-HxCDD	1/8	0.84-1.8	0.002	<0.0023
HpCDDs (total)	8/8	NA	0.026-0.057	0.043
1,2,3,4,6,7,8-HpCDD	7/8	12	0.014-0.028	0.024
OCDD	8/8	NA	0.046-0.130	0.120
INORGANICS				
Arsenic	8/8	NA	1.0-10.1	3.0
Barium	7/8	25	103-323	<29
Cadmium	4/8	0.57-0.72	1.9-3.0	3.3
Chromium	7/8	1.2	4.6-7.9	2.3
Copper	8/8	NA	6.6-12.0	<25
Lead	8/8	NA	1.6-58.0	14.5
Manganese	8/8	NA	59.2-313.0	52.0
Mercury	7/8	0.1	0.1-0.2	<0.1
Zinc	8/8	NA	35.7-110.0	49.6

(a) The frequency of detection is the number of times the chemical was detected over the number of samples analyzed for that parameter (this does not include data that were rejected).

(b) Inorganics are in mg/kg; dioxins/furans are in µg/kg (ppb).

(c) Background data from sample SSS-55.

NOTE: Data were collected by NYSDEC and were analyzed for inorganics, PCBs and dioxins/furans.

TABLE 2-16

CHEMICALS DETECTED IN THE DRAINAGE DITCH SEDIMENTS AND AERO CREEK SEDIMENTS(c)
PFOHL BROTHERS LANDFILL, CHEEKTOWAKA, NEW YORK

Chemical	Frequency of Detection (a)(c)	Range of Sample Quantitation Limit (b)(e)	Range of Detected Concentration (b)	Background Concentrations (b)(d)
VOLATILES				
Acetone	3/29	13-290	15-240	20
Benzene	1/29	6-45	15	<30
Chlorobenzene	3/29	6-45	5.5-87	<30
Methylene Chloride	6/29	22-140	7-120	<26
1,2-Dichlorobenzene	3/17	370-11,000	10-95	<2,000
1,4-Dichlorobenzene	6/29	370-11,000	17-70	<2,000
SEMIVOLATILES				
Acenaphthene	10/21	370-11,000	14-220	<2,000
Acenaphthylene	15/29	370-1,500	29-680	<2,000
Anthracene	20/29	440-11,000	18-3,100	440
Benzo(a)anthracene	21/29	370-3,100	47-1,200	1,500
Benzo(b/k)fuoranthene	22/28	370-11,000	340-5,700	2,900
Benzo(a)pyrene	20/29	370-11,000	59-1,300	1,300
Benzo(g,h,i)perylene	20/29	370-11,000	57-3,800	580
Benzoic Acid	5/29	1800-53,000	79-770	9,600
bis(2-Ethylhexyl)phthalate	18/29	370-1,500	190-4,200	780
Butylbenzylphthalate	3/29	370-11,000	23-53	<2,000
4-Chloro-3-methylphenol	1/29	370-11,000	11	<2,000
Chrysene	20/29	370-1,500	55-2,900	1,300
Dibenzo(a,h)anthracene	15/29	370-11,000	60-2,300	<2,000
Dibenzofuran	8/29	370-11,000	15-2,500	<2,000
Diethylphthalate	18/29	430-11,000	15-8,200	<2,000
Dimethylphthalate	2/29	370-11,000	26-140	<2,000
Di-n-butylphthalate	15/29	370-11,000	33-160	<2,000
Di-n-octylphthalate	1/17	370-11,000	32	<2,000
Fluoranthene	25/29	370-1,500	81-5,800	3,100
Fluorene	14/29	370-11,000	16-320	<2,000
Indeno(1,2,3-cd)pyrene	17/29	370-11,000	150-3,700	730
Naphthalene	1/29	370-11,000	180	<2,000
N-Nitrosodiphenylamine	4/29	370-11,000	45-1,900	<2,000
Phenanthrene	23/29	370-1,500	34-2,900	1,800
Pyrene	25/29	370-1,500	96-5,400	2,700
Phenol	2/29	370-11,000	74-76	<2,000

TABLE 2-16 (Cont'd)

CHEMICALS DETECTED IN THE DRAINAGE DITCH SEDIMENTS AND AERO CREEK SEDIMENTS[(c)]
PFOHL BROTHERS LANDFILL, CHEEKTOWAKA, NEW YORK

Chemical	Frequency of Detection (a)(c)	Range of Sample Quantitation Limit (b)(e)	Range of Detected Concentration (b)	Background Concentrations (b)(d)
PESTICIDES/PCBs				
Aroclor 1242	1/29	99-670	7	<96
Beta-BHC	3/11	10-67	19-62	13
DDT	1/9	20-130	520	<19
Gamma-Chlordane	1/12	99-670	5.3	<96
INORGANICS				
Aluminum	11/11	-	5,580-12,200	7,030
Antimony	5/11	9.3-18.2	9-15	8.7
Arsenic	13/13	-	2.8-29	3.5
Barium	13/13	-	46.9-280	54.8
Beryllium	11/11	-	0.36-0.89	0.46
Cadmium	12/13	0.9	1.7-6.2	2.3
Calcium	11/11	-	5,230-98,300	67,400
Chromium	13/13	-	5.1-49.1	13.2
Cobalt	11/11	-	1.8-14.2	4.6
Copper	13/13	-	11.4-107	27.8
Iron	11/11	-	10,200-37,200	10,800
Lead	13/13	-	11.5-1,180	131
Magnesium	11/11	-	1,470-27,500	14,900
Manganese	13/13	-	111-1,100	313
Mercury	9/13	0.13-0.21	0.2-0.6	<0.13
Nickel	11/11	-	5.7-117	12.8
Potassium	10/10	-	368-2,830	1,060
Selenium	2/11	0.61-4	0.85-0.93	<0.6
Sodium	11/11	-	201-3,770	545
Vanadium	11/11	-	10.9-33.4	14.6
Zinc	13/13	-	48.4-910	165
Cyanide	3/11	1.3-2.2	1.1-10	<1.3
DIOXINS/FURANS				
TCDFs (total)	8/8	-	0.0032-0.077	0.0078
2,3,7,8-TCDF	12/17	0.19-0.57	0.00053-0.0042	0.00086
PeCDFs (total)	8/8	-	0.00071-0.047	0.0068
1,2,3,7,8-PeCDF	5/8	0.62-1.0	0.00014-0.0022	<0.00063
2,3,4,7,8-PeCDF	8/8	-	0.00027-0.0039	<0.0011
HxCDFs (total)	8/8	-	0.0018-0.049	0.011
1,2,3,4,7,8-HxCDF	8/8	-	0.00027-0.0068	<0.002
1,2,3,6,7,8-HxCDF	4/8	087-1.1	0.00044-0.0025	<0.00071

TABLE 2-16 (Cont'd)

CHEMICALS DETECTED IN THE DRAINAGE DITCH SEDIMENTS AND AERO CREEK SEDIMENTS(c)
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

Chemical	Frequency of Detection (a)(c)	Range of Sample Quantitation Limit (b)(e)	Range of Detected Concentration (b)	Background Concentrations (b)(d)
2,3,4,6,7,8-HxCDF	5/8	0.19-2.6	0.00057-0.0038	<0.0016
1,2,3,7,8,9-HxCDF	4/8	0.18-0.94	0.0013-0.0058	<0.00067
HpCDFs (total)	8/8	-	0.0017-0.055	0.015
1,2,3,4,6,7,8-HpCDF	8/8	-	0.00038-0.020	0.0059
1,2,3,4,7,8,9-HpCDF	4/8	0.17-1.6	0.00083-0.018	<0.00045
OCDF	8/8	-	0.0019-0.091	0.014
TCDD (total)	7/8	0.21	0.0037-0.020	0.0049
2,3,7,8-TCDD	6/27	0.21-0.77	0.00045-0.0018	0.00046
PeCDDs (total)	8/8	-	0.00025-0.028	0.0057
1,2,3,7,8-PeCDD	5/8	0.55-0.68	0.00025-0.0017	<0.00075
HxCDDs (total)	8/8	-	0.0021-0.046	0.016
1,2,3,4,7,8-HxCDD	4/8	0.26-0.73	0.00047-0.0015	<0.00042
1,2,3,6,7,8-HxCDD	6/8	0.26-1.1	0.0014-0.004	<0.0018
1,2,3,7,8,9-HxCDD	6/8	0.41-2.6	0.00054-0.0044	<0.0023
HpCDDs (total)	8/8	-	0.008-0.130	0.043
1,2,3,4,6,7,8-HpCDD	8/8	-	0.0043-0.066	0.034
OCDD	8/8	-	0.035-0.460	0.120

NA - Not available. This data was collected by NYSDEC, detection limits were not provided.

(a) The frequency of detection is the number of times the chemical was detected over the number of samples analyzed for that parameter (this does not include data that was rejected).

(b) Organic chemical concentrations and dioxin/furan concentrations are in µg/kg; inorganic chemical concentrations are in mg/kg.

(c) Seventeen samples were collected from Aero Creek. All samples were analyzed for volatiles, semivolatiles, pesticides and PCBs. Only two samples were analyzed for inorganics, 8 samples were analyzed for dibenzofurans (TCDF) and dioxins (TCDD) (several isomers) and 9 samples were analyzed only for the 2,3,7,8 isomer of TCDF and TCDD.

(d) Background data were collected from sediment sample SE-1, west of Transit Road; sediment sample SE-14, an intermittent stream east of Aero Lake; and residential soil sample SSS-55 for dioxins/furans.

(e) Detection limits for Aero Creek sediment samples not available.

TABLE 2-17

CHEMICALS DETECTED IN AERO LAKE SEDIMENTS
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

Chemical	Frequency of Detection (a)	Range of Sample Quantitation Limit (b)	Range of Detected Concentration (b)	Background Concentrations (b)(c)
VOLATILES				
Acetone	2/3	12	62-360	20
2-Butanone	1/3	12-16	54	<60
Methylene chloride	3/3	--	13-54	<26
INORGANICS				
Aluminum	3/3	--	4,670-11,200	7,030
Arsenic	3/3	--	1.8-5.9	3.5
Barium	3/3	--	43.3-117	54.8
Beryllium	3/3	--	0.24-0.44	0.46
Cadmium	2/3	1.3	1.3-4.7	2.3
Calcium	3/3	--	4,850-66,000	67,400
Chromium	3/3	--	8.3-18.6	13.2
Cobalt	3/3	--	4.4-7	4.6
Copper	3/3	--	10.7-26.1	27.8
Iron	3/3	--	8,870-19,800	10,800
Lead	3/3	--	10.2-73.6	131
Magnesium	3/3	--	2,190-16,500	14,900
Manganese	3/3	--	129-438	313
Nickel	3/3	--	9.3-20.3	12.8
Potassium	3/3	--	409-1,810	1,060
Silver	2/3	0.79	1.2-1.7	<0.78
Sodium	3/3	--	177-585	545
Vanadium	3/3	--	10.6-22.8	14.6
Zinc	3/3	--	55.2-145	165

(a) The frequency of detection is the number of times the chemical was detected over the number of samples analyzed for that parameter (this does not include data that was rejected).

(b) Organics are in ug/kg and inorganics are in mg/kg.

(c) Background data from 2 stream sediment samples (SE-1 and SE-14) north of Area B.

TABLE 2-18

CHEMICALS DETECTED IN ELLICOTT CREEK SEDIMENTS
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

Chemical	Frequency of Detection (a)	Range of Sample Quantitation Limit (b)	Range of Detected Concentration (b)	Background Concentrations (b)
VOLATILES				
Acetone	2/5	13	24-50	240
Chlorobenzene	3/5	5	13-20	<26
Trichloroethylene	2/5	-	8-9	9
SEMIVOLATILES				
Acenaphthylene	1/5	400-1,000	63	<1,500
Fluorene	1/5	400-1,000	16	33
Diethylphthalate	2/5	400-1,000	21-28	35
Phenanthrene	2/5	400-1,000	42-200	230
Anthracene	2/5	400-1,000	14-89	93
Fluoranthene	3/5	870-1,000	81-420	340
Pyrene	3/5	870-1,000	91-290	200
Chrysene	2/5	400-1,000	61-170	170
Benzo(a)anthracene	2/5	400-1,000	54-130	120
bis(2-Ethylhexyl)phthalate	2/5	400-1,000	800-950	1,600
Benzo(b,k)fluoranthene	3/5	870-1,000	28-73	370
Benzo(a)pyrene	2/5	400-1,000	53-94	140
Indeno(1,2,3-cd)pyrene	2/5	400-1,000	41-170	273
Dibenz(a,h)anthracene	1/5	400-1,000	17	257
Benzo(g,h,i)perylene	2/5	400-1,000	63-220	190
DIOXINS/FURANS				
2,3,7,8-TCDF	1/5	-	0.56-1.4	-
INORGANICS				
Aluminum	3/3	-	5,120-9,010	7,030 (d)
Arsenic	5/5	-	2.2-7.4	9.5 (c)
Barium	5/5	-	21.9-301	271 (c)
Beryllium	3/3	-	0.33-0.57	0.46 (d)
Cadmium	4/5	0.3	0.33-3.7	3.1 (c)
Calcium	3/3	-	6,480-14,000	67,400 (d)
Chromium	5/5	-	4.9-14	35.6 (c)
Cobalt	3/3	-	4.7-5.7	4.6 (d)
Copper	5/5	-	13.4-2,160	68.9 (c)
Iron	3/3	-	12,600-14,500	10,800 (d)
Lead	5/5	-	14.8-51	462 (c)

TABLE 2-18 (Cont'd)

CHEMICALS DETECTED IN ELLICOTT CREEK SEDIMENTS
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

Chemical	Frequency of Detection (a)	Range of Sample Quantitation Limit (b)	Range of Detected Concentration (b)	Background Concentrations (b)
Magnesium	3/3	-	2,820-5,690	14,900 (d)
Manganese	5/5	-	130-311	284 (c)
Mercury	5/5	-	0.10-0.25	0.57 (c)
Nickel	3/3	-	14.2-18.7	12.8 (d)
Potassium	3/3	-	456-1,210	1,060 (d)
Sodium	3/3	-	130-144	545 (d)
Vanadium	3/3	-	13.1-16	14.6 (d)
Zinc	5/5	-	61.2-144	315 (c)

(a) The frequency of detection is the number of times the chemical was detected over the number of samples analyzed for that parameter (this does not include data that was rejected).

(b) Organic chemical concentrations are in µg/kg; inorganic chemical concentrations are in mg/kg; and dioxins/furans are in ng/kg (ppt).

(c) Background data from 3 upgradient Ellicott Creek samples collected by CDM 12/90 and NYSDOH 6/90 (SE17-001, STR-19 and STR-20). See text for discussion.

(d) Background data from 2 stream sediment samples (SE-1 and SE-14) north of Area B collected by CDM 1987. See text for discussion.

TABLE 2-19

CHEMICALS DETECTED IN DRAINAGE DITCH SURFACE WATERS
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

Chemical	Frequency of Detection (a)	Range of Sample Quantitation Limit (b)	Range of Detected Concentration (b)	Background Concentrations (b)(c)
VOLATILES				
Acetone	1/11	10-17	18	<10
Chlorobenzene	1/11	5-10	10	<5
1,2-Dichlorobenzene	1/11	10	4	<10
1,2-Dichloroethylene	3/11	5	3-6	<5
SEMIVOLATILES				
2,4-Dimethylphenol	1/11	10	4	<10
Di-n-octyl phthalate	1/11	10	14	<10
INORGANICS				
Aluminum	10/10	—	33.7-1,090	77
Arsenic	3/10	2.2	3.1-3.7	<2.2
Barium	10/10	—	18.8-393	77
Beryllium	1/10	0.4	0.46	<0.4
Cadmium	5/10	3.5	5-13.8	<3.5
Calcium	10/10	—	56,800-233,000	99,000
Cobalt	1/10	2.8	3	<2.8
Copper	10/10	—	5.4-26.8	6.8
Iron	10/10	—	294-4,000	507
Lead	9/10	2.1	2.1-20.1	10.6
Magnesium	10/10	—	15,000-43,000	25,300
Manganese	10/10	—	54.3-427	244
Mercury	3/10	0.2	0.25-0.3	<0.2
Nickel	1/10	12.8	13.8	<12.8
Potassium	10/10	—	1,680-24,200	2.740
Sodium	10/10	—	19,000-269,000	308,000
Vanadium	2/10	2.4	3-3.6	<2.4
Zinc	10/10	—	17-98.6	33.3

(a) The frequency of detection is the number of times the chemical was detected over the number of samples analyzed for that parameter (this does not include data that was rejected).

(b) Organics are in ug/l and inorganics are in ug/l.

(c) Background data from surface water samples SW-1 and SW-14 were collected from the western side of Transit Road ditch and an intermittent stream east of Aero Lake (same locations as SE-1 and SE-14).

TABLE 2-20

CHEMICALS DETECTED IN AERO LAKE SURFACE WATERS
PFOHL BROTHERS LANDFILL, CHEEKTOWAKA, NEW YORK

Chemical	Frequency of Detection (a)	Range of Sample Quantitation Limit (b)	Range of Detected Concentration (b)	Background Concentrations (b)(c)
SEMIVOLATILES				
bis(2-Ethylhexyl) phthalate	1/3	50-55	22	<10
INORGANICS				
Aluminum	3/3	--	58.2-62.2	77
Barium	3/3	--	93.6-96.4	77
Cadmium	1/3	3.5	6	<3.5
Calcium	3/3	--	57,100-59,300	115,000
Copper	3/3	--	3.7-6.7	6.8
Iron	2/2	--	148-187	507
Lead	2/3	2.6	2.5-3.9	10.6
Magnesium	3/3	--	14,300-14,900	25,300
Manganese	3/3	--	18.1-19.9	244
Mercury	3/3	--	0.25-0.48	<0.2
Potassium	3/3	--	3,540-4.090	2,740
Sodium	3/3	--	132,000-138,000	308,000
Zinc	3/3	--	11-18.3	33.3

(a) The frequency of detection is the number of times the chemical was detected over the number of samples analyzed for that parameter (this does not include data that was rejected).

(b) Organics are in ug/l and inorganics are in ug/l.

(c) Background data from surface water samples SW-1 and SW-14 were collected from the western side of Transit Road and an intermittent stream east of Aero Lake (same locations as SE-1 and SE-14).

TABLE 2-21

CHEMICALS DETECTED IN LEACHATE SEEPS
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

Chemical	Frequency of Detection (a)	Range of Sample Quantitation Limit (b)	Range of Detected Concentration (b)	Background Concentrations (b)(c)
VOLATILES				
Benzene	5/19	2	3-8	<2
Chlorobenzene	9/38	3.7-10	2-110	<3.7
Chloroethane	2/19	5.9	11-31	<5.9
1,2-Dichlorobenzene	4/38	10-40	17-18	<5
1,3-Dichlorobenzene	3/38	10-40	4-89	<5
1,4-Dichlorobenzene	3/19	10-40	2-6	<5
1,1-Dichloroethylene	3/19	1.1	2.3-4.9	<1.1
1,2-trans-Dichloroethylene	2/19	1.6	64-85	<1.6
Ethylbenzene	1/19	3	6	<3
Trichloroethylene	1/19	1.4	2.2	<1.4
SEMIVOLATILES				
Benzoic Acid	1/19	50-100	22	<50
2,4-Dimethylphenol	2/19	10-40	30	<10
Phenol	2/19	10-40	7-10	<10
Dibenzofuran	2/19	10-40	20-63	<10
bis(2-Ethylhexyl) phthalate	5/19	6-20	9/60	25
Di-n-octyl phthalate	2/19	10-40	9-11	<10
Benzo(b)fluoranthene	1/19	10-40	7	<10
Benzo(a)anthracene	1/19	10-40	5	<10
Benzo(b)pyrene	1/19	10-40	5	<10
Chrysene	1/19	10-40	5	<10
Fluoranthene	3/19	10	3-9	<10
Fluorene	1/19	10-40	2	<10
Phenanthrene	2/19	10-40	2-5	<10
Pyrene	3/19	10	3-11	<10
PESTICIDES/PCBs				
Aldrin	2/19	0.005-0.05	0.0074-0.0081	<0.05
Dieldrin	4/19	0.01-0.1	0.0032-0.02	<0.1
DDD	1/19	0.01-0.1	0.011	<0.1
Endrin	1/19	0.02-0.1	0.028	<0.1
Endosulfan II	3/19	0.01-0.1	0.032-0.054	<0.1

TABLE 2-21 (Cont'd)

CHEMICALS DETECTED IN LEACHATE SEEPS
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

Chemical	Frequency of Detection (a)	Range of Sample Quantitation Limit (b)	Range of Detected Concentration (b)	Background Concentrations (b)(c)
INORGANICS				
Aluminum	19/19	—	39.8-303,000	227
Arsenic	12/19	2.2	3.5-16.7	<2.1
Barium	19/19	—	80.3-10,000	35.5
Beryllium	4/19	0.4	0.46-14.8	<0.1
Cadmium	16/19	3.5	3.7-122	4
Calcium	19/19	—	145,000-603,000	116,000
Chromium	15/19	3.4	3.5-426	<3
Cobalt	10/19	2.8	3.4-157	<4.2
Copper	19/19	—	13.9-784	14.8
Iron	10/10	—	44,000-494,000	2,140
Lead	19/19	--	6.7-1,640	5.9
Magnesium	19/19	—	26,500-165,000	35,600
Manganese	19/19	—	123-16,100	1,670
Mercury	18/19	0.2	0.75-4.7	<0.2
Nickel	14/19	12.8	20.4-521	20.00
Potassium	19/19	--	5,500-54,200	3,350
Selenium	2/19	2.4-24	12-12.8	<2.3
Silver	9/19	3.1	3.4-16.6	<2.8
Sodium	19/19	—	16,600-209,000	130,000
Vanadium	6/19	2.4	33-471	<3.2
Zinc	18/18	—	66-8,270	9.9
Cyanide	3/10	10	18-31	<10

(a) The frequency of detection is the number of times the chemical was detected over the number of samples analyzed, including duplication, analyzed for that parameter (this does not include the data that were rejected). For chlorobenzene and the dichlorobenzenes, the denomenator is equal to the number of samples times the number of analysis performed.

(b) Organics are in ug/l and inorganics are in ug/l.

(c) Background data derived from upgradient well MW-6S.

TABLE 2-22

CHEMICALS DETECTED IN ELLICOTT CREEK SURFACE WATERS
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

Chemical	Frequency of Detection (a)	Range of Sample Quantitation Limit (b)	Range of Detected Concentration (b)	Background Concentrations (b)
SEMIVOLATILES				
Di-n-butylphthalate	2/3	10	1	6(c)
Bis(2-ethylhexyl)phthalate	2/3	10	11-17	13(c)
INORGANICS				
Aluminum	1/1	-	190	77(d)
Barium	3/3	-	38.5-870	670(c)
Cadmium	2/3	5	8.6-9	8(c)
Calcium	1/1	-	133,000	115,000(d)
Copper	1/3	25	6.7	<25(c)
Iron	1/1	-	462	507(d)
Lead	1/3	5	4.8	<5(c)
Magnesium	1/1	-	16,600	25,300(d)
Manganese	3/3	-	37-46	37(c)
Potassium	1/1	-	2,840	2,740(d)
Sodium	1/1	-	33,600	308,000(d)
Zinc	1/3	20	48	59(c)

(a) The frequency of detection is the number of times the chemical was detected over the number of samples analyzed for that parameter (this does not include data that was rejected).

(b) Organic and inorganic chemical concentrations are in μg/l.

(c) Background data from 5 upgradient Ellicott Creek samples (SW-17-001, SW-18-001, SW-19-001, SWT-45 and SWT-46). See text for discussion.

(d) Background data from 2 stream samples (SW-1 and SW-14) north of Area B. See text for discussion.

TABLE 2-23

CHEMICALS DETECTED IN THE BEDROCK AQUIFER
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

Chemical	Frequency of Detection (a)	Range of Sample Quantitation Limit (b)	Range of Detected Concentration (b)	Background Concentrations (b)(c)
VOLATILES				
Benzene	1/15	2.0	23	<2
Chloroethane	1/15	5.9	3.7	<5.9
1,1-Dichloroethane	1/15	1.1	4.1	<1.1
1,2-trans-Dichloroethylene	1/14	1.6	9.2	<1.6
Toluene	1/13	3.0	3	<3
SEMIVOLATILES				
Benzoic Acid	1/10	50	8	<50
Phenol	1/10	10	16	<10
bis(2-Ethylhexyl) phthalate	9/12	16-24	3-42	<3
PESTICIDES/PCBs				
Aldrin	1/11	0.05-0.25	0.05	<0.05
INORGANICS				
Aluminum	11/11	-	56.1-1,630	326
Antimony	1/11	24-53.1	35.1	<53.1
Arsenic	5/11	1.9-2	2.4-4.7	<2
Barium	11/11	-	24.9-240	60
Cadmium	6/11	1-3.6	1.1-4.2	4
Calcium	11/11	-	30,300-244,000	118,000
Chromium	10/11	1	2.4-728	191
Cobalt	1/11	2-4.2	7.1	<4.2
Copper	8/11	1-2.6	3.7-28.4	13
Iron	11/11	-	161-5,270	1,200
Lead	5/9	2	2.3-6.8	<2
Magnesium	11/11	-	156-44,400	26,700
Manganese	7/8	0.5	5.9-428	17.3
Mercury	1/8	0.2	0.48	<0.2
Nickel	7/11	10.7-20	17.4-198	33
Potassium	11/11	-	2,670-23,300	5,110
Silver	1/11	2-2.8	2	<2.8
Sodium	11/11	-	34,300-354,000	127,000
Vanadium	4/11	1-3.2	1.4-35.3	<3.2
Zinc	8/8	-	1.1-4.4	"R"

(a) The frequency of detection is the number of times the chemical was detected over the number of samples analyzed for that parameter (this does not include data that was rejected).

(b) Organics are in ug/l and inorganics are in ug/l.

(c) Background data from MW-6D located offsite of Area A east of Transit Road.

TABLE 2-24

CHEMICALS DETECTED IN THE UNCONSOLIDATED AQUIFER
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

Chemical	Frequency of Detection (a)	Range of Sample Quantitation Limit (b)	Range of Detected Concentration (b)	Background Concentrations (b)(c)
VOLATILES				
Benzene	4/31	2.0	2.7-290	<2
Chlorobenzene	2/58	3.0-3.7	1,200-11,000	<3
Chloroethane	1/31	5.9	900	<5.9
1,3-Dichlorobenzene	1/56	5.0-100	82	<5
1,4-Dichlorobenzene	3/56	5.0-100	2-240	<5
1,2-Dichlorobenzene	1/50	5.0-100	4	<5
1,1-Dichloroethane	2/21	1.1	5.6-4,900	<1.1
1,1-Dichloroethene	1/31	1.8	240	<1.8
1,1,1-Trichloroethane	2/31	1.3	26-15,000	<1.3
Toluene	3/31	3.0	4.1-43	<3
Xylenes (m-, p-)	1/31	3.0-6.0	400	<3
SEMIVOLATILES				
Benzoic Acid	1/12	50-500	3	<50
2-Chlorophenol	1/11	10-100	13	<10
2,4-Dimethylphenol	2/11	10-50	630-940	<10
2-Methylphenol	1/11	10-50	72	<10
4-Methylphenol	1/11	10-50	75	<10
Phenol	2/11	10-50	6-4,000	<10
Dibenzofuran	2/27	10-100	15-20	<10
Bis(2-ethylhexyl) phthalate	11/26	10-100	3-840	25
Di-n-octyl phthalate	3/27	10-100	30-73	<10
Di-n-butyl phthalate	1/27	10-100	2	<10
Butyl benzyl phthalate	1/27	10-100	150	<10
PESTICIDES/PCBs				
Endosulfan II	1/24	0.05-0.1	0.69	<0.05
Aroclor-1232	2/21	0.5	110	<0.5
INORGANICS				
Aluminum	26/26	-	59,5-74,000	227
Antimony	2/26	24-53.1	24.4-33	<53.1
Arsenic	19/26	1.9-2	2.3-22.3	<2.1
Barium	26/26	-	52.2-1,530	35.5
Beryllium	3/26	0.1-1	1.5-1.7	<1.0
Cadmium	10/26	1-4	1.3-12	4

TABLE 2-24 (Cont'd)

CHEMICALS DETECTED IN THE UNCONSOLIDATED AQUIFER
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

Chemical	Frequency of Detection (a)	Range of Sample Quantitation Limit (b)	Range of Detected Concentration (b)	Background Concentrations (b)(c)
Calcium	26/26	-	28,200-593,000	116,000
Chromium	22/26	1-3	2-196	<3
Cobalt	7/26	2-5	2-46.9	<4.2
Copper	26/26	-	2.7-3,070	14.8
Iron	26/26	-	160-176,000	2,140
Lead	20/21	2	2.8-369	5.9
Magnesium	26/26	-	20,300-203,000	35,600
Manganese	26/26	-	62.1-3,450	1,670
Mercury	6/26	0.2	0.23-3.3	<0.2
Nickel	16/26	10.7-23	11.8-141	13.1
Potassium	26/26	-	761-83,500	3,350
Silver	7/26	2-3	2.1-23.7	<2.8
Sodium	26/26	-	12,700-287,000	130,000
Vanadium	18/26	1-4	1.4-124	<3.2
Zinc	17/17	-	7.5-1,490	9.9
Cyanide	1/25	10-20	30	<10

(a) The frequency of detection is the number of times the chemical was detected over the number of samples analyzed for that parameter (this does not include data that was rejected). For chlorobenzene and the dichlorobenzenes, the denomenator is equal to the number of samples times the number of analyses performed.

(b) Background data derived from MW-6S.

TABLE 2-25a

PCBs/PESTICIDES AND MERCURY DETECTED IN FISH COLLECTED FROM ELLICOTT CREEK - AMHERST PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

Location/Compound	Frequency of Detection (a)	Range (µg/g)	Arithmetic Mean (µg/g)
ELLICOTT CREEK - AMHERST			
Aroclor - 1016	12/13	0.01-0.02	0.0096
Aroclor - 1254	13/13	0.05-0.33	0.12
Aroclor - 1260	13/13	0.03-0.29	0.85
DDT	13/13	0.0005-0.0091	0.0036
DDE	13/13	0.0062-0.0622	0.0034
DDD	13/13	0.0031-0.0349	0.015
Alpha - Chlordane	13/13	0.001-0.0101	0.004
Gamma - Chlordane	11/13	0.001-0.0045	0.0019
Oxychlordane	13/13	0.001-0.005	0.0018
Transnonachlor	13/13	0.0022-0.0195	0.0086
Heptachlor epoxide	11/13	0.001-0.0038	0.0015
Mirex	1/13	0.001	0.007
Endrin	6/13	0.001	0.0074
Dieldrin	13/13	0.001-0.0140	0.0046
Hexachlorobenzene	3/13	0.001	0.0006

a) The frequency of detection is equal to the number of times the chemical was detected over the number of samples analyzed for that parameter.

TABLE 2-25b

PCBs/PESTICIDES AND MERCURY DETECTED IN FISH COLLECTED FROM ELLICOTT CREEK - AIRPORT PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

Location/Compound	Frequency of Detection (a)	Range (µg/g)	Arithmetic Mean (µg/g)
ELLICOTT CREEK - AIRPORT			
Aroclor - 1254/1260	4/6	0.026-0.232	0.095
Alpha - BHC	NA	NA	NA
Beta - BHC	NA	NA	NA
Gamma - BHC (lindane)	NA	NA	NA
Delta - BHC	NA	NA	NA
DDT	4/6	0.004-0.008	0.0047
DDE	6/6	0.01-0.056	0.0335
DDD	4/6	0.002-0.015	0.0067
Alpha - Chlordane	1/6	0.006	0.0031
Gamma - Chlordane	0/6	<0.005	-
Oxychlordane	0/6	<0.005	-
Transnonachlor	4/6	0.008-0.013	0.008
Heptachlor epoxide	NA	NA	NA
Mirex	0/6	<0.002	-
Endrin	NA	NA	NA
Dieldrin	0/6	<0.005	-
Hexachlorobenzene	0/6	<0.002	-
Mercury	3/6	0.133-0.177	0.0903

a) The frequency of detection is equal to the number of times the chemical was detected over the number of samples analyzed for that parameter.

b) NA indicates samples from this location were not analyzed for this chemical.

TABLE 2-25c

PCBs/PESTICIDES AND MERCURY DETECTED IN FISH COLLECTED FROM ELLICOTT CREEK - BOWMANSVILLE PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

Location/Compound	Frequency of Detection (a)	Range (µg/g)	Arithmetic Mean (µg/g)
ELLICOTT CREEK - BOWMANSVILLE			
Aroclor - 1016	8/9	0.01	0.01
Aroclor - 1254	9/9	0.04-0.10	0.07
Aroclor - 1260	9/9	0.04-0.08	0.051
Aroclor - 1054/1260	2/3	0.041-0.124	0.0583
DDT	12/12	0.001-0.008	0.0025
DDE	12/12	0.001-0.0242	0.0109
DDD	9/12	0.0017-0.0070	0.0028
Alpha - Chlordane	9/12	0.001-0.0025	0.0019
Gamma - Chlordane	9/12	0.001-0.0019	0.0015
Transnonachlor	10/12	0.0017-0.009	0.0026
Heptachlor epoxide	5/9	0.001	0.00078
Endrin	5/9	0.001	0.00078
Dieldrin	9/12	0.0012-0.0024	0.0019
Mercury	3/3	0.088-0.357	0.191

a) The frequency of detection is equal to the number of times the chemical was detected over the number of samples analyzed for that parameter.

TABLE 2-25d

PCBs/PESTICIDES AND MERCURY DETECTED IN FISH COLLECTED FROM TRIBUTARY 11B TO ELLICOTT CREEK PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

Location/Compound	Frequency of Detection (a)	Range (µg/g)	Arithmetic Mean (µg/g)
TRIBUTARY 11B TO ELLICOTT CREEK			
Aroclor - 1016/1248	1/4	0.121	0.0378
Aroclor - 1254/1260	4/4	0.0028-0.165	0.098
Alpha - BHC	NA(b)	NA	NA
Beta - BHC	NA	NA	NA
Gamma - BHC (lindane)	NA	NA	NA
Delta - BHC	NA	NA	NA
DDT	1/4	0.002	0.0013
DDE	4/4	0.003-0.021	0.011
DDD	3/4	0.002-0.006	0.0035
Heptachlor epoxide	NA	NA	NA
Endrin	NA	NA	NA
Mercury	1/4	0.055	0.0325

a) The frequency of detection is equal to the number of times the chemical was detected over the number of samples analyzed for that parameter.

b) NA indicates samples from this location were not analyzed for this chemical.

TABLE 2-26

PCBs/PESTICIDES AND MERCURY DETECTED IN FISH
COLLECTED FROM AERO LAKE
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

Location/Compound	Frequency of Detection (a)	Range (μg/g)	Arithmetic Mean (μg/g)
AERO LAKE			
Aroclor - 1016	8/13	0.01-0.05	0.0119
Aroclor - 1254	13/13	0.02-0.17	0.07
Aroclor - 1260	13/13	0.04-0.033	0.13
Aroclor - 1254/1260[b]	5/5	0.097-0.393	0.22
Alpha - BHC	2/13	0.0013-0.0021	0.00069
DDT	11/18	0.001-0.0033	0.00126
DDE	18/18	0.0036-0.046	0.019
DDD	18/18	0.0027-0.0369	0.009
Alpha - Chlordane	10/18	0.001-0.0019	0.00142
Gamma - Chlordane	4/18	0.001-0.0023	0.00148
Oxychlordane	4/18	0.001-0.0018	0.00122
Transnonachlor	13/13	0.001-0.0029	0.0019
Heptachlor epoxide	4/13	0.001-0.0062	0.00125
Mirex	3/18	0.001	0.00128
Dieldrin	7/18	0.001-0.0017	0.00133
Hexachlorobenzene	2/18	0.001-0.0036	0.00084
Mercury	1/5	0.176	0.0552

(a) The frequency of detection is equal to the number of times the chemical was detected over the number of samples analyzed for that parameter.

(b) PCB data collected 7/87 - 8/87 were reported as Aroclor 1016/1248 and Aroclor 1254/1260.

TABLE 2-27

PCBs/PESTICIDES DETECTED IN
FISH COLLECTED FROM NEW YORK STATE LAKES (a)

Lake and Date	Fish		Avg. PCB	PCB Range	Avg. DDT	DDT Range	Avg. Dieldrim	Dieldrin Range	Avg. Endrin	Endrin Range	Avg. HCB	HCB Range
CANADICE LAKE												
1980	LT	4	4.46	1.37-9.18	0.17	0.08-0.34	0.03	<.01-0.12	<0.01	-	<0.01	-
1985	BT	9	2.71	0.24-4.14	0.22	0.02-0.3	0.01	<0.01-0.01	0.01	<0.01-0.01	<0.01	-
1985	RT	2	1.44	0.68-2.20	0.12	0.05-0.2	0.01	<0.01-0.01	0.01	<0.01-0.01	<0.01	-
CANANDIAGUA LAKE												
1980	RT	1	0.067	-	0.29	-	<0.01	-	<0.01	<0.01	<0.01	<0.01
1980	LT	3	1.43	1.2-2.91	0.97	0.79-2.46	0.01	0.01-0.02	<0.01	<0.01	<0.01	<0.01
1983	LT	43	1.45	0.31-5.07	1.02	0.18-3.43	0.02	<0.01-0.07	-	-	<0.01	-
1985	LT	20	0.49	0.07-1.69	0.36	0.08-1.72	0.01	<0.01-0.01	<0.01	-	<0.01	-
CHAUTAUGUA LAKE												
1982	LMB	1	0.15	-	0.14	-	<0.01	-	<0.01	-	<0.01	-
1982	WE	2	0.14	0.12-0.17	0.09	0.08-0.1	<0.01	-	<0.01	-	<0.01	-
1982	BB	1	0.13	-	0.05	-	<0.01	-	<0.01	-	<0.01	-
KEUKA												
1980	RT	1	0.12	-	2.5	-	0.02	-	<0.01	-	<0.01	-
1980	LT	3	0.44	0.08-1.97	6.20	2.04-19.75	0.04	0.01-0.08	<0.01	-	<0.01	-
1983	LT-M	5	0.34	0.19-0.42	3.63	1.61-6.91	0.03	0.01-0.04	-	-	<0.01	-
1983	LT-F	4	0.49	0.22-0.87	6.25	2.16-14.17	0.04	0.02-0.06	-	-	<0.01	-
DEC. 1983	LT-M	23	0.35	0.05-0.89	4.88	0.42-14.18	0.02	<0.01-0.04	-	-	<0.01	-
DEC. 1983	LT-F	9	0.41	0.18-0.74	6.47	1.7-16.54	0.02	0.01-0.03	-	-	<0.01	-
1985	LT	27	0.17	0.04-0.52	2.54	0.7-8.09	0.01	<0.01-0.01	0.01	<0.01-0.02	<0.01	-
OCT. 1985	BT	10	0.19	0.11-0.31	2.20	0.54-3.83	0.01	<0.01-0.02	<0.01	-	<0.08	-
SENECA LAKE												
1980	RT	2	0.13	0.12-0.14	0.19	0.18-0.2	0.02	0.01-0.02	<0.01	-	<0.01	-
1980	LT	8	0.66	0.15-2.17	1.10	0.27-2.07	0.04	0.01-0.08	<0.01	-	<0.01	-
1983	LT-M	9	0.59	0.28-1.12	0.36	0.17-0.54	0.02	<0.01-0.03	-	-	<0.01	-
1983	LT-F	10	0.60	0.28-1.20	0.40	0.20-0.61	0.02	<0.01-0.03	-	-	<0.01	-
1985	LT	27	0.40	0.08-1.05	0.21	0.04-0.76	0.01	<0.01-0.04	0.01	<0.01-0.03	0.01	<0.01-0.01
CAYUGA LAKE												
1980	LT	4	0.44	0.23-0.60	0.35	0.14-0.43	0.01	0.01-0.02	<0.01	-	<0.01	-
1985	LT	27	0.7	0.13-1.86	0.28	0.04-0.83	0.01	<0.01-0.01	<0.01	-	<0.01	-

(a) NYSDEC 1987 : Concentrations are in ug/gram (ppm)
LT = Lake Trout
RT = Rainbow Trout
LMB = Large Mouth Bass
BT = Brook Trout
WE = Walleye
LT-F = Lake Trout - Female
LT-M = Lake Trout - Male

TABLE 2-27 (continued)

PCBs/PESTICIDES DETECTED IN
FISH COLLECTED FROM NEW YORK STATE LAKES (a)

Lake and Date	Fish		Avg Lindane	Lindane Range	Avg. Mirex	Mirex Range	Avg. Hg	Hg Range	Avg Chlordane	Chlordane Range
CANADICE LAKE										
1980	LT	4	<0.01	-	<0.01	-	0.27	0.18-0.36	0.05	0.03-0.08
1985	BT	9	-	-	-	-	-	-	0.07	0.01-0.1
1985	RT	2	-	-	-	-	-	-	0.04	0.02-0.06
CANANDIAGUA LAKE										
1980	RT	1	<0.01	<0.01	<0.01	-	0.25	-	0.02	-
1980	LT	3	<0.01	<0.01	<0.01	-	0.31	0.28-0.54	0.08	0.05-0.16
1983	LT	43	-	-	-	-	-	-	-	-
1985	LT	20	-	-	-	-	-	-	0.09	0.02-0.26
CHAUTAUGUA LAKE										
1982	LMB	1	<0.01	-	<0.01	-	0.3	-	0.03	-
1982	WE	2	<0.01	-	<0.01	-	0.65	0.62-0.68	0.02	0.02-0.02
1982	BB	1	<0.01	-	<0.01	-	0.13	-	0.02	-
KEUKA										
1980	RT	1	<0.01	-	<0.01	-	0.22	-	0.03	-
1980	LT	3	<0.01	-	<0.01	-	0.37	0.23-0.57	0.08	0.03-0.32
1983	LT-M	5	-	-	-	-	-	-	-	-
1983	LT-F	4	-	-	-	-	-	-	-	-
DEC. 1983	LT-M	23	-	-	-	-	-	-	-	-
DEC. 1983	LT-F	9	-	-	-	-	-	-	-	-
1985	LT	27	-	-	-	-	-	-	0.11	0.04-0.24
OCT. 1985	BT	10	-	-	-	-	-	-	0.12	0.04-0.16
SENECA LAKE										
1980	RT	2	<0.01	-	<0.01	-	0.16	0.16-0.16	0.02	0.02-0.02
1980	LT	8	<0.01	-	<0.01	-	0.45	0.10-0.66	0.11	0.03-0.18
1983	LT-M	9	-	-	-	-	-	-	-	-
1983	LT-F	10	-	-	-	-	-	-	-	-
1985	LT	27	-	-	-	-	-	-	0.06	0.01-0.15
CAYUGA LAKE										
1980	LT	4	<0.01	-	<0.01	-	0.34	0.26-0.48	0.07	0.04-0.09
1985	LT	27	-	-	-	-	-	-	0.09	0.03-0.28

(a) NYSDEC 1987: Concentrations are in ug/gram (ppm)

LT + Lake Trout
RT = Rainbow Trout
LMB = Large Mouth Bass
BT = Brook Trout
WE = Walleye
LT-F = Lake Trout - Female
LT-M = Lake Trout - Male

TABLE 2-28

PCBs/PESTICIDES DETECTED IN FISH
COLLECTED FROM NEW YORK STATE RIVERS (a)

River and Date	Fish		Avg. PCB	PCB Range	Avg. DDT	DDT Range	Avg. Dieldrin	Dieldrin Range	Avg. Endrin	Endrin Range	Avg. HCB	HCB Range
NIAGRA RIVER BELOW BUFFALO												
1981	SMB	2	1.01	0.59-1.29	0.14	0.06-0.19	0.02	0.01-0.02	<0.01	<0.01	<0.01	<0.01
1981	CARP	2	2.91	2.01-3.45	0.21	0.14-0.26	0.03	0.01-0.05	0.01	<0.01-0.02	0.01	<0.01-0.01
Below Lewiston												
1981	SMB	2	0.9	0.82-1.07	0.1	0.09-0.14	0.01	0.01-0.01	<0.01	-	<0.01	-
1981	CARP	1	4.44	-	0.96	-	0.02	-	0.02	-	0.02	-
BUFFALO RIVER												
1980	CARP	2	0.75	0.69-0.82	0.3	0.29-0.3	<0.01	<0.01	<0.01	-	<0.01	-
1983	PS	2	0.4	0.38-0.41	0.04	0.03-0.04	<0.01	<0.01	<0.01	-	<0.01	-
1983	CARP	2	4.72	3.63-14.5	0.5	0.46-0.88	0.01	0.01-0.02	<0.01	-	<0.01	-
1984	CARP	1	6.67		1.63		0.04	-	<0.01	-	<0.01	-
1984	BB	1	0.87		0.3		0.01	-	<0.01	-	<0.01	-
NIAGRA RIVER LEWISTON												
1984	SMB	2	3.16	2.08-4.25	0.38	0.22-0.55	0.02	0.01-0.02	<0.01	-	<0.01	-
1984	RB	1	1.25	-	0.12	-	<0.01	-	<0.01	-	<0.01	-
TONAWANDA CREEK ABOVE WCP												
1985	RB	2	0.27	0.26-0.28	0.02	0.01-0.02	<0.01	-	<0.01	-	<0.01	-
1985	BB	2	0.92	0.84-1.00	0.08	0.07-0.10	<0.01	-	<0.01	-	<0.01	-
Below WCP												
1985	RB	2	0.3	0.29-0.32	0.01	0.01-0.01	<0.01		<0.01		<0.01	
1985	BB	2	0.75	0.64-0.86	0.06	0.05-0.06	<0.01		<0.01		<0.01	

(a) NYSDEC 1987 : Concentrations are in ug/gram (ppm).

SMB = Small mouth bass
PS = Pumpkinseed
BB = Brown bullhead
RR = Rock Bass
Carp = Carp

PH-RVFIS

TABLE 2-28 (continued)

PCBs/PESTICIDES DETECTED IN FISH
COLLECTED FROM NEW YORK STATE RIVERS (a)

River and Date	Fish		Avg Lindane	Lindane Range	Avg. Mirex	Mirex Range	Avg. Hg	Hg Range	Avg Chlordane	Chlordane Range
NIAGRA RIVER BELOW BUFFALO										
1981	SMB	2	<0.01	<0.01	<0.01		0.34	0.24-0.4	0.03	0.02-0.03
1981	CARP	2	0.01	<0.01-0.01	<0.01		0.28	0.12-0.38	0.04	0.04-0.04
Below Lewiston										
1981	SMB	2	<0.01	-	0.02	0.02-0.02	0.32	0.24-0.48	0.04	0.04-0.04
1981	CARP	1	0.01	-	0.04	-	0.36	-	0.1	-
BUFFALO RIVER										
1980	CARP	2	<0.01	-	<0.01	-	0.15	0.14-0.16	0.05	0.05-0.06
1983	PS	2	<0.01	-	<0.01	-	0.16	0.14-0.17	0.01	0.01-0.01
1983	CARP	2	<0.01	-	<0.01	-	0.10	0.1-0.12	0.12	0.11-0.12
1984	CARP	1	<0.01	-	<0.01	-	NA	NA	0.53	-
1984	BB	1	<0.01	-	<0.01	-	NA	NA	0.10	-
NIAGRA RIVER LEWISTON										
1984	SMB	2	0.01	-	0.07	0.03-0.11	NA	NA	0.09	0.06-0.12
1984	RB	1	<0.01	-	0.03	-	NA	NA	0.03	-
TONAWANDA CREEK ABOVE WCP										
1985	RB	2	<0.01	-	<0.01	-	NA	NA	<0.01	-
1985	BB	2	<0.01	-	<0.01	-	NA	NA	0.04	0.03-0.04
Below WCP										
1985	RB	2	<0.01		<0.01		NA	NA	<0.01	-
1985	BB	2	<0.01		<0.01		NA	NA	0.04	0.02-0.03

(a) NYSDEC 1987 : Concentrations are in ug/gram (ppm)

SMB = Small mouth bass
PS = Pumpkinseed
BB = Brown bullhead
RR = Rock Bass
Carp = Carp

PH-RVFIS

TABLE 2-29

PHYSICAL - CHEMICAL PROPERTIES OF CHEMICALS DETECTED IN SURFACE SAMPLES

	Molecular Weight (gl/mol)	Water Solubility (mg/l)	Vapor Pressure (mm Hg)	Henry's Law Constant (atm-m3/mol)	KOC (ml/g)	LOG (KOW)	BCF (l/kg)
CHLORINATED ALIPHATICS							
Choroethane (a)	64.52	5.74 E+3	1.00 E+3	2.0 E-3	15	1.43	—
1,1-Dichloroethane	98.97	5.5 E+3	1.82 E+2	4.31 E-3	30	1.79	—
1,2-Dichlorosehene	96.94	6.3 E+3	3.24 E+2	6.56 E-3	59	0.48	1.6
Mehylene chloride	84.93	2.0 E+4	3.62 E+2	2.03 E-3	8.8	1.3	5
1,1,1-Trichloroethane	133.41	1.5 E+3	1.23 E+2	1.44 E-2	152	2.5	5.6
Trichloroethene	131.29	1.50 E+3	5.79 E+1	9.1 E-3	126	2.42	10.6
SIMPLE AROMATIC COMPOUNDS							
Benzene	78.12	1.75 E+3	9.52 E+1	5.59 E-3	83	2.12	5.2
Ehylbenzene	106.17	1.52 E+2	7.0 E+0	6.43 E-3	1100	3.15	37.5
Toluene	92.15	5.35 E+2	2.81 E+1	6.34 E-3	300	2.73	10.7
Xylene (total)	106.17	1.98 E+2	1.0 E+1	7.04 E-3	240	3.26	--
CHLORINATED AROMATICS							
Chlorobenzene	112.56	4.66 E+2	1.17 E+1	3.72 E-3	330	2.84	10
1,2-Dichlorobenzene	147	1.0 E+2	1.0 E+0	1.93 E-3	1700	3.6	56
1,3-Dichlorobenzene	147	1.23 E+2	2.28 E+0	3.59 E-3	1700	3.6	56
1,4-Dichlorobenzene	147	7.9 E+1	1.18 E+0	2.89 E-3	1700	3.6	56
KETONES							
Acetone	58	1.0 E+6	2.7 E+2	3.67 E-5	2.2	-0.24	--
2-Butanone	72.12	2.68 E+5	7.75 E+1	5.14 E-5	4.51	0.26	0
PHENOLIC COMPOUNDS							
Phenol	94	9.3 E+4	3.41 E-1	4.54 E-7	14.2	1.46	1.4
2-Chlorophenol							
2,4-Demethylphenol	122.16	6.47 E+3	7.5 E-2	--	10.4	2.3	150
2-Methylphenol	108	3.1 E+4	2.4 E-1	1.1 E-6	500	1.97	0
4-Methylphenol							

TABLE 2-29
(CONTINUED)

PHYSICAL - CHEMICAL PROPERTIES OF CHEMICALS
DETECTED IN SURFACE SAMPLES

	Molecular Weight (gl/mol)	Water Solubility (mg/l)	Vapor Pressure (mm Hg)	Henry's Law Constant (atm-m3/mol)	KOC (ml/g)	LOG (KOW)	BCF (l/kg)
NITROGEN COMPOUNDS							
N-Nitrosodiphenylamine (b)	198.23	3.5 E+1	6.69 E-4	5.0 E-6	—	3.13	--
PHATHALATE ESTERS							
Bis(2-ethylhexyl)phthalate (a)	391	4.0 E-1	2.0 E-7	4.4 E-7	87,400	5.11	
Di-n-butylphthalate (a)	278	9.2 E+0	1.0 E-5	1.3 E-6	1,390	3.75	--
Diethylphthalate (a)	222.2	6.8 E+2	3.5 E-3	1.5 E-6	69	2.46	--
Di-n-octylphthalate (a)	391	3.4 E-1	1.4 E-4	5.5 E-6	19,000	5.22	--
Benzyl butyl phthalate	312					> 4.42	--
ORGANIC ACIDS							
Benzoic Acid (a)	122.4	2.9 E+3	7.05 E-3	3.92 E-7	54.4	1.87	--
POLYAROMATIC HYDROCARBONS (c)							
Dibenzofuran							
Acenaphthylene	154.21	Insoluble	4.47 E-3	--	4,600	5.98	--
Anthracene	178.2	4.5 E-2	1.7 E-5	8.6 E-5	14,000	4.45	
Benzo(a) anthracene	228.29	5.7 E-3	2.2 E-8	1.16 E-6	1,380,000	5.6	--
Benzo(b) fluoranthene	252.3	1.4 E-2	5.0 E-7	1.19 E-5	550,000	6.06	--
Benzo(g,h,i) perylene	276.34	7.0 E-4	1.03 E-10	1.44 E-7	1,600,000	6.51	--
Benzo(a) pyrene	252.3	1.2 E-3	5.6 E-9	4.9 E-7	5,500,000	6.06	--
Chrysene	228.3	1.8 E-3	6.3 E-9	1.05 E-6	200,000	5.61	--
Fluoranthene	202.26	2.06 E-1	5.0 E-6	6.46 E-6	38,000	4.9	1,500
Fluorene	116.2	1.69 E+0	7.1 E-4	6.42 E-5	7,300	4.2	1,300
Indeno (1,2,3-cd) pyrene	276.3	5.3 E-4	1.0 E-10	6.95 E-8	1,600,000	6.58	--
Naphthalene (a)	128.16	3.17 E+1	7.8 E-2	4.2 E-4	940	3.36	--
Phenanthrene	178.2	1.0 E+0	6.8 E-4	2.26 E-4	14,000	4.46	2,630
Pyrene	202.3	1.32 E-1	2.5 E-6	5.1 E-6	38,000	4.88	--
POLYCHLORINATED BIPHENYLS	328	3.1 E-2	7.7 E-5	1.07 E-3	530,000	6.04	100,000

TABLE 2-29
(CONTINUED)

PHYSICAL - CHEMICAL PROPERTIES OF CHEMICALS
DETECTED IN SURFACE SAMPLES

	Molecular Weight (gl/mol)	Water Solubility (mg/l)	Vapor Pressure (mm Hg)	Henry's Law Constant (atm-m3/mol)	KOC (ml/g)	LOG (KOW)	BCF (l/kg)
DIOXINS/FURANS							
2,3,7,8-TCDD	322	2.0E-04	1.7E-06	3.6E-03	3,300,000	6.72	5000
CHLORINATED PESTICIDES							
Aldrin	364.93	1.8 E-1	6.0 E-6	1.6 E-5	96,000	5.3	28
Beta-BHC (d)	291	2.4 E-1	2.8 E-7	4.47 E-7	3,800	3.9	--
Chlordane	409.81	5.6 E-1	1.0 E-5	9.63 E-6	140,000	3.32	14,000
DDD	320.05	1.0 E-1	1.89 E-6	7.96 E-6	770,000	6.2	
DDT	354.49	5.0 E-3	5.5 E-6	5.13 E-4	243,000	6.19	54,000
Dieldrin	380.93	1.95 E-1	1.78 E-7	4.58 E-7	1,700	3.5	4,760
Endrin	380.93		2.0 E-7				
Endosulfan II	406.95						

Source: Except as noted, data were obtained from EPA 1986.

a. Source: Clements 1989.
b. Source: ADSTR 1987 (a)
c: Source: ATSDR 1989. Vapor pressure is in torr for temperatures ranging from 20 to 25 C.
d: Source: Clements 1988.
e. Source: Merck 1983.

FILE: PH-CHSUR

TABLE 2-30

COMPARISON OF FDA ACTION LEVELS TO THE CONCENTRATION DETECTED IN FISH COLLECTED IN 1987 AND 1990

Compound	FDA Action Level (ppm)	Aero Lake			Ellicott Creek - Bowmansville			Ellicott Creek - Amherst		
		Arithmetic Mean (ppm)	Maximum Conc. (ppm)	Minimum Conc. (ppm)	Arithmetic Mean (ppm)	Maximum Conc. (ppm)	Minimum Conc. (ppm)	Arithmetic Mean (ppm)	Maximum Conc. (ppm)	Minimum Conc. (ppm)
Total PCBs (a)	2	0.253	0.259	0.07	0.131	0.19	0.09	0.22	0.64	0.09
Alpha - BHC	NE (e)	0.00069	0.0021	0.0013	-	-	<0.001	0.007	0.001	0.001
Delta - BHC	NE	-	-	<0.001	-	-	<0.001	-	-	<0.001
Total DDT (b)	5	0.0293	0.0862	0.0063	0.0162	0.0392	0.0037	0.0532	0.101	0.0098
Chlordane (c)	0.3	0.006	0.0089	0.001	0.006	0.0134	0.0037	0.0163	0.0391	0.0052
Heptachlor epoxide	0.3	0.00125	0.0062	0.001	0.00078	0.001	0.001	0.0015	0.0038	0.001
Mirex	0.1	0.00128	0.001	0.001	-	-	<0.002	0.007	0.001	0.001
Endrin	0.3	-	-	<0.001	0.00078	0.001	0.001	0.0074	0.0011	0.001
Aldrin/Dieldrin (d)	0.3	0.00133	0.0017	0.001	0.0019	0.0024	0.0012	0.0065	0.014	0.0011
HCB	NE	0.00084	0.0036	0.001	-	-	<0.002	0.00062	0.0011	0.001
Mercury	1.0	0.0552	0.176	<0.05	0.191	0.357	0.088	NA	NA	NA

(a) Total PCBs equals the sum of the following three Aroclor: Aroclor 1016; Aroclor 1254; Aroclor 1260.
(b) Total DDT equals the sum of DDT and its metabolites (DDE and DDD).
(c) Chlordane concentrations are the sum of the detected concentrations of cis- and trans- chlordane, oxychlordane, and trans-nonachlordane.
(d) The concentrations shown equal the concentrations for dieldrin.
(e) NE = None established.
(f) Because the compound was detected only one time, a mean could not be established.

NA - Not Available

TABLE 2-30 (Cont'd)

COMPARISON OF FDA ACTION LEVELS TO THE CONCENTRATION DETECTED IN FISH COLLECTED IN 1987 AND 1990

Compound	FDA Action Level (ppm)	Ellicott Creek - Airport			Tributary 11B to Ellicott Creek		
		Arithmetic Mean (ppm)	Maximum Conc. (ppm)	Minimum Conc. (ppm)	Arithmetic Mean (ppm)	Maximum Conc. (ppm)	Minimum Conc. (ppm)
Total PCBs (a)	2	0.095	0.232	0.026	0.1358	0.286	0.028
Alpha - BHC	NE (e)	NA	NA	NA	NA	NA	NA
Delta - BHC	NE	NA	NA	NA	NA	NA	NA
Total DDT (b)	5	0.045	0.079	0.01	0.0158	0.029	0.003
Chlordane (c)	0.3	0.011	0.019	0.014	-	-	<0.005
Heptachlor Epoxide	0.3	NA	NA	NA	NA	NA	NA
Mirex	0.1	-	-	<0.002	-	-	<0.002
Endrin	0.3	NA	NA	NA	NA	NA	NA
Aldrin/Dieldrin (d)	0.3	-	-	<0.005	-	-	<0.005
HCB	NE	-	-	<0.002	-	-	<0.002
Mercury	1.0	0.09	0.177	0.133	0.0325	0.055	0.055

(a) Total PCBs equals the sum of the following Aroclor 1016/1248 and Aroclor 1254/1260.
(b) Total DDT equals the sum of DDT and its metabolites (DDE and DDD).
(c) Chlordane concentrations are the sum of the detected concentrations of cis- and trans- chlordane, oxychlordane, and trans-nonachlordane.
(d) The concentrations shown equal the concentrations for dieldrin.
(e) NE = None established.
(f) Because the compound was detected only one time, a mean could not be established.

NA - Not Available

TABLE 2-31

SELECTED CHEMICALS OF CONCERN - SOILS
LANDFILL SOILS, RESIDENTIAL SOILS, AERO PATH SOILS
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

CHEMICAL CLASS	LANDFILL SOILS	REASON FOR SELECTION (a)	RESIDENTIAL SOIL	REASON FOR SELECTION (a)
ORGANICS				
Acetone	X	F		
Chlorobenzene	X	O		
Methylene Chloride	X	F		
bis(2-Ethylhexyl)phthalate	X	F		
Dibenzofuran	X	F		
Diethyl phthalate	X	F		
Anthracene	X	F		
Benzo(a)anthracene	X	F		
Benzo(b)fluoranthene	X	F		
Benzo(g,h,i)perylene	X	F		
Benzo(a)pyrene	X	F		
Chrysene	X	F		
Dibenzofuran	X	F		
Fluoranthene	X	F		
Indeno(1,2,3-cd)pyrene	X	F		
Phenanthrene	X	F		
Pyrene	X	F		
PCBs	X	F		
PESTICIDES				
Aldrin	X	O		
beta-BHC	X	F		
gamma-Chlordane	X	F		

TABLE 2-31

SELECTED CHEMICALS OF CONCERN - SOILS
LANDFILL SOILS, RESIDENTIAL SOILS, AERO PATH SOILS
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK
(CONTINUED)

CHEMICAL CLASS	LANDFILL SOILS	REASON FOR SELECTION [(a)]	RESIDENTIAL SOIL	REASON FOR SELECTION [(a)]
INORGANICS				
Arsenic	X	F,B	X	F,B
Barium	X	F,B	X	F,B
Beryllium	X	F,B		
Cadmium	X	F,B		
Chromium	X	F,B	X	F,B
Lead	X	F,B	X	F,B
Manganese	X	F,B	X	F,B
Mercury	X	F,B	X	F,B
Nickel	X	F,B		
Silver	X	F,B		
Zinc	X	F,B	X	F,B
Cyanide	X	F,B		
DIOXINS/FURANS	X	B	X	B

TABLE 2-31

SELECTED CHEMICALS OF CONCERN - SEDIMENTS
DRAINGE DITCH AND AERO CREEK SEDIMENTS
AERO LAKE SEDIMENTS AND ELLICOTT CREEK SEDIMENTS
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK

CHEMICAL CLASS	DRAINAGE DITCH AND AERO CREEK	REASON FOR SELECTION[a]	AERO LAKE SEDIMENTS	REASON FOR SELECTION[a]	ELLICOTT CREEK SEDIMENTS	REASON FOR SELECTION[a]
ORGANICS						
Acetone	X	F	X	F	X	F
Chlorobenzene	X	F			X	F
1,2-Dichlorobenzene	X	F				
1,4-Dichlorobenzene	X	F	X	F		
Methylene Chloride	X	F				
Trichloroethylene					X	F
Diethylphthalate	X	F			X	F
bis(2-Ethylhexyl)phthalate	X	F			X	F
Butylbenzyl phthalate	X	F				
Di-n-butylphthalate	X	F			X	F
N-Nitrosodiphenylamine	X	F				
Acenaphthene	X	F				
Acenaphthylene	X	F				
Anthracene	X	F			X	F
Benzo(a)anthracene	X	F			X	F
Benzo(b)fluoranthene	X	F			X	F
Benzo(g,h,i)perylene	X	F			X	F
Benzo(a)pyrene	X	F			X	F
Chrysene	X	F			X	F
Dibenzo(a,h)anthracene	X	F				
Dibenzofuran	X	F				
Fluoranthene	X	F			X	F
Fluorene	X	F				
Indeno(1,2,3-cd)pyrene	X	F			X	F
Naphthalene						
Phenanthrene	X	F			X	F

TABLE 2-31

SELECTED CHEMICALS OF CONCERN - SEDIMENTS
DRAINAGE DITCH AND AERO CREEK SEDIMENTS
AERO LAKE SEDIMENTS AND ELLICOTT CREEK SEDIMENTS
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK
(CONTINUED)

CHEMICAL CLASS	DRAINAGE DITCH AND AERO CREEK	REASON FOR SELECTION	ELLICOTT CREEK SEDIMENTS	REASON FOR SELECTION
ORGANICS (Cont'd)				
Phenol	X	O		
Pyrene	X	F	X	F
PESTICIDES				
beta-BHC	X	F		
PCBs				
INORGANICS				
Arsenic	X	F,B		
Barium	X	F,B	X	F,B
Cadmium	X	F,B	X	F,B
Chromium	X	F,B		
Copper				
Lead	X	F,B	X	F,B
Manganese	X	F,B		
Mercury	X	F,B	X	F,B
Nickel	X	F,B		
Vanadium				
Zinc	X	F,B	X	F,B
Cyanide	X	F,B		
DIOXINS/FURANS	X	B		

TABLE 2-31

SELECTED CHEMICALS OF CONCERN - SURFACE WATER
DRAINAGE DITCH, AERO LAKE, LEACHATE SEEPS, ELLICOTT CREEK
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK
(CONTINUED)

CHEMICAL CLASS	DRAINAGE DITCH	REASON FOR SELECTION (a)	AERO LAKE	REASON FOR SELECTION (a)	LEACHATE SEEPS	REASON FOR SELECTION (a)	ELLICOTT CREEK	REASON FOR SELECTION (a)
ORGANICS								
Benzene					X	F		
Chlorobenzene					X	F		
1,2-Dichlorobenzene	X	O			X	F		
1,3-Dichlorobenzene					X	F		
1,4-Dichlorobenzene					X	F		
1,1-Dichloroethane					X	F		
1,2-Dichloroethylene	X	O						
1,2-trans-Dichloroethane					X	F		
1,2-Dichloroethane	X	F			X	F		
Trichloroethylene					X	T		
bis(2-Ethylhexyl)phthalate			X	T	X	F	X	F
Diethyl phthalate								
Di-n-butylphthalate								
2,4-Dimethylphenol	X	O			X	F		
N-Nitrosodiphenylamine								
Phenol					X	O		
Dibenzofuran					X	F		
Fluoranthene					X	F		
Fluorene					X	F		
Pyrene					X	F		
PCBs								
PESTICIDES								
Dieldrin					X	F		
Endosulfan					X	F		

TABLE 2-31

SELECTED CHEMICALS OF CONCERN - SURFACE WATER
DRAINGE DITCH, AERO LAKE, LEACHATE SEEPS, ELLICOTT CREEK
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK
(CONTINUED)

CHEMICAL CLASS	DRAINAGE DITCH	REASON FOR SELECTION	AERO LAKE	REASON FOR SELECTION	LEACHATE SEEPS	REASON FOR SELECTION	ELLICOTT CREEK	REASON FOR SELECTION
INORGANICS								
Arsenic								
Barium								
Beryllium								
Cadmium			X	F,B				
Chromium								
Lead								
Manganese								
Mercury			X	F,B				
Nickel								
Vanadium								
Zinc								
Cyanide								

TABLE 2-31

SELECTED CHEMICALS OF CONCERN - GROUNDWATER
UNCONSOLIDATED AQUIFER, BEDROCK AQUIFER
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK
(CONTINUED)

CHEMICAL CLASS	UNCONSOLIDATED AQUIFER	REASON FOR SELECTION [a]	BEDROCK AQUIFER	REASON FOR SELECTION [a]
ORGANICS				
Benzene	X	G,O	X	G,O
Chlorobenzene	X	G,O		
1,3-Dichlorobenzene	X	G,O		
1,4-Dichlorobenzene	X	G,O		
1,1-Dichloroethane	X	G,O	X	G,O
1,1-Dichloroethylene	X	G,O	X	G,O
1,2-trans-Dichloroethylene			X	G,O
Toluene		X	G,O	
1,1,1-Trichloroethane	X	G,O		
Xylene	X	G,O		
bis-(2-Ethylhexyl)phthalate	X	G,O	X	G,O
2-Chlorophenol	X	G,O		
2,4-Dimethylphenol	X	G,O		
2-Methylphenol	X	G,O		
4-Methylphenol	X	G,O		
Phenol	X	G,O	X	G,O
PESTICIDES				
Aldrin			X	G,P
Endosulfan II	X	G,P		
PCBs	X	G,PCBs		

TABLE 2-31

SELECTED CHEMICALS OF CONCERN - GROUNDWATER
UNCONSOLIDATED AQUIFER, BEDROCK AQUIFER
PFOHL BROTHERS LANDFILL, CHEEKTOWAGA, NEW YORK
(CONTINUED)

CHEMICAL CLASS	UNCONSOLIDATED AQUIFER	REASON FOR SELECTION	BEDROCK AQUIFER	REASON FOR SELECTION
INORGANICS				
Arsenic	X	B	X	B
Barium	X	B	X	B
Cadmium	X	B	X	B
Chromium	X	B	X	B
Lead	X	B	X	B
Manganese	X	B	X	B
Mercury	X	B	X	B
Nickel	X	B	X	B
Silver	X	B		
Vanadium	X	B	X	B
Zinc	X	B	X	B

(a) Reasons for selection are as follows (see text for further descriptions of selection criteria):

F = Frequency
O = Other Media
B = Background
T = Toxicity
G,O = Groundwater, organic
G,P = Groundwater, pesticide
G,PCBs = Groundwater, PCBs

TABLE 2.3-1

COMPILATION OF NUMERICAL SCGs FOR SOILS, SEDIMENTS AND LANDFILL SOLIDS

PARAMETER	SCGs
Acetone	-
Chlorobenzene	5.5
1,2-Dichlorobenzene	1.0
1,4-Dichlorobenzene	1.0
Methylene Chloride	-
Trichloroethylene	1.0
Bis(2-ethyl hexyl) phthalate	4.35
Butylbenzyl phthalate	2.0
Di-n-butyl phthalate	8.0
Diethyl phthalate	7.0
N-nitrosodiphenylamine	
Acenaphthene	1.6
Acenaphthylene	-
Anthracene	7.0
Benzo(a) anthracene	-
Benzo(b) fluoranthene	0.33
Benzo(b,k) fluoranthene	0.33
Benzo(g,h,i) perylene	80.0
Benzo(a) pyrene	0.33
Chrysene	0.33
Dibenzo(a,h) anthracene	0.33
Dibenzofuran	2.0
Fluoranthene	19.0
Indeno(1,2,3-cd) pyrene	0.33
Naphthalene	1.0
Phenanthrene	2.2
Phenol	0.33

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TABLE 2.3-1 (Cont.)

COMPILATION OF NUMERICAL SCGs FOR SOILS, SEDIMENTS AND LANDFILL SOLIDS

PARAMETER	SCGs
Pyrene	6.65
Aldrin	0.041
Beta - BHC	0.010
Gamma-chlordane	0.20
Dioxins/Furans	-
PCBs	10 a
Arsenic	7.5
Barium	300 or S.B.
Beryllium	0.14
Cadmium	1.0
Chromium	10.0
Copper	25.0
Lead	32.5 or S.B.
Manganese	S.B.
Mercury	0.1
Nickel	13.0
Silver	200.0
Vanadium	150 or S.B.
Zinc	20.0
Cyanide	-

NOTES:

All units in mg/kg or ppm.

a Value shown is subsurface soil guideline values. Value for surface soil criteria is 1 ppm.

S.B. Site Background

SCGs shown are based on draft soil cleanup criteria issued by Technology Section, Bureau of Program Management, Division of Hazardous Waste Remediation, NYSDEC and are guideline values, only.

185\PFOHL\T2-3-1.tbl
09/12/91 lat

TABLE 2.3-2

OBSERVED CONTAMINANT RANGES AND GUIDELINE VALUES FOR SOILS AND SEDIMENTS

Parameter	Range of Detected Concentrations in Landfill Soils	Range of Detected Concentrations in Sediments	SCGs
Acetone	21 - 950	15 - 770	—
Chlorobenzene	18 - 2200	10 - 23	5.5
Methylene Chloride	5 - 690	9 - 150	—
Bis(2-ethyl hexyl) phthalate	51 - 100,000	—	4.35
Diethyl phthalate	150	—	7.0
Di-n-butylphthalate	—	250	8.0
Acenaphthylene	—	310	—
Anthracene	39 - 1900	370 - 2,500	7.0
Benzo(a) anthracene	55 - 24,000	150 - 6,000	—
Benzo(b) fluoranthene	70 - 32,000	—	0.33
Benzo(g,h,i) perylene	68 - 300	1,500 - 2,500	80.0
Benzo(a) pyrene	92 - 21,000	280 - 6,000	0.33
Chrysene	53 - 25,000	170 - 7,500	0.33
Dibenzofuran	120 - 1,900,000	2,400 - 13,000	2.0
Fluoranthene	120 - 67,000	160 - 13,000	19.0
Indeno(1,2,3-cd) pyrene	65 - 390	200	0.33
Phenanthrene	5 - 32,000	200 - 10,000	2.2
Pyrene	100 - 49,000	240 - 15,000	6.65
Aldrin	5 - 9	—	0.041
Beta - BHC	9.0	22 - 75	0.010
Gamma-chlordane	4.8 - 9	—	0.20
Dioxins/Furans		—	—
PCBs	3,700 - 8,700	4,000 - 7,700	10 a
Arsenic	3.1 - 575	3.0 - 29.9	7.5
Barium	34.9 - 12,500	95.5 - 2,220	300 or S.B.
Beryllium	0.17 - 2.3	0.23 - 0.63	0.14
Cadmium	1.3 - 39.4	2.2 - 18.5	1.0

TABLE 2.3-2 (cont.)

OBSERVED CONTAMINANT RANGES AND GUIDELINE VALUES FOR SOILS AND SEDIMENTS

Parameter	Range of Detected Concentrations in Landfill Soils	Range of Detected Concentrations in Sediments	SCGs
Chromium	7.8 - 18,100	9.4 - 43.1	10.0
Copper	—	14.8 - 270	25.0
Lead	12 - 36,200	27.8 - 985	32.5 or S.B.
Manganese	198 - 4,430	132 - 1,770	S.B.
Mercury	0.14 - 4.4	0.18 - 1.2	0.1
Nickel	0.0061 - 565	10.0 - 125	13.0
Silver	0.68 - 11.2	—	200.0
Zinc	64 - 35,300	69.1 - 2,770	20.0
Cyanide	0.74 - 33.4	1.5 - 8	—

NOTES: All units in mg/kg or ppm.
SCGs shown are based on draft soil cleanup criteria issued by Technology Section, Bureau of Program Management, Division of Hazardous Waste Remediation, NYSDEC.

[a] Value shown is subsurface soil guideline values. Value for surface soil criteria is 1 ppm.

TABLE 2.3-3

PFOHL BROTHERS - FEASIBILITY STUDY

COMPILATION OF NUMERICAL ARARs/SCGs FOR GROUND WATER, LEACHATE AND SURFACE WATERS

PARAMETER	NYSDEC CLASS GA GW	NYSDEC CLASS B SW	NYSDEC CLASS D SW	NYSDOH MCLs (C)	EPA NIPOWR	SDWA MCLG	NYS MCL	7-DAY NAS SNARLS	FWQC (W & FISH INGEST.)
Benzene	ND(2)	6	6	5	-	ZERO	ND(5)	250	0.66
Chlorobenzene	5	5	50	5	-	-	5	-	-
Chloroethane	-	-	-	5	-	-	-	-	-
1,2-Dichlorobenzene				5	-	600	-	300	-
1,4-Dichlorobenzene	4.7	5	50	5	-	75	-	300	400
1,3-Dichlorobenzene	5			5	-	600	-	300	400
1,1-Dichloroethane	5	-	-	5	-	-	-	-	400
1,1-Dichloroethylene	5	-	-	5	-	7	-	-	-
trans-1,2-Dichloroethylene	5	-	-	5	-	-	-	-	-
Ethylbenzene	5	-	-	5	-	700	-	-	1400
Trichloroethylene	5	11	11	5	-	ZERO	-	15000	2.7
1,1,1-Trichloroethane	-	-	-	5	-	200	-	70000	0.6
Toluene	5	-	-	5	-	2000	-	-	14300
Xylenes	5	-	-	5(each)	-	10000	-	11200	-
2-Chlorophenol	-	-	-	50	-	-	-	-	-
2,4-Dimethylphenol	-	-	-	50	-	-	-	-	-
2-Methylphenol	-	-	-	50	-	-	-	-	-
4-Methylphenol	-	-	-	50	-	-	-	-	-
N-nitrosodiphenylamine	50	-	-	50	-	-	-	-	0.0008

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TABLE 2.3-3 (Cont.)

PFOHL BROTHERS - FEASIBILITY STUDY
COMPILATION OF NUMERICAL ARARs/SCGs FOR GROUND WATER, LEACHATE AND SURFACE WATERS

PARAMETER	NYSDEC CLASS GA GW	NYSDEC CLASS B SW	NYSDEC CLASS D SW	NYSDOH MCLs (C)	EPA NIPOWR	SDWA MCLG	NYS MCL	7-DAY NAS SNARLS	PWQC (W & FISH INGEST.)
Phenol	1 a	5 b	5 b	50	-	-	-	-	30
Dibenzofuran	-	-	-	50	-	-	-	-	-
Diethylhexylphthalate (DEHP)	50	0.6	-	50	-	ZERO	-	-	-
Aldrin	ND(0.05)			-	-	-	-	-	0.074
Dieldrin	ND(0.05)	0.001	0.001	-	-	-	-	-	.000071
DDD	ND(0.05)	0.001	0.001	-	-	-	-	-	-
Endrin	NC(0.005)	0.002	0.002	0.0002	0.2	2	0.0002	-	1
Endosulfan II	-	0.009	0.22	50	-	-	-	-	-
PAHs	-	-	-	-	-	-	-	-	0.0028
PCBs	0.1	0.001	0.001	-	-	-	-	50	.000079
Aluminum	-	100	-	-	-	-	-	5000	-
Arsenic	25	190	360	-	50	ZERO	50	-	2.2
Barium	1000	-	-	-	1000	5000	1000	4700	1000
Beryllium	3	11,1100	-	-	-	ZERO	-	-	0.004
Cadmium	10	1.7	7	-	10	10	10	5	10
Chromium	50	318?	-	-	50	100	50	-	50
Cobalt	-	5	29	-	-	-	-	-	-
Copper	200	18.5	2688	-	-	1300	1000	-	170000
Lead	25	6.3	160.5	-	50	ZERO	50	-	50

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TABLE 2.3-3 (Cont.)

PFOHL BROTHERS - FEASIBILITY STUDY
COMPILATION OF NUMERICAL ARARs/SCGs FOR GROUND WATER, LEACHATE AND SURFACE WATERS

PARAMETER	NYSDEC CLASS GA GW	NYSDEC CLASS B SW	NYSDEC CLASS D SW	NYSDOH MCLs (C)	EPA NIPDWR	SDWA MCLG	NYS MCL	7-DAY NAS SNARLS	FWQC (W & FISH INGEST.
Endosulfan II	-	0.009	0.22	50	-	-	-	-	-
PAHs	-	-	-	-	-	-	-	-	0.0028
PCBs	0.1	0.001	0.001	-	-	-	-	50	.000079
Aluminum	-	100	-	-	-	-	-	5000	-
Arsenic	25	190	360	-	50	ZERO	50	-	2.2
Barium	1000	-	-	-	1000	5000	1000	4700	1000
Beryllium	3	11,1100	-	-	-	ZERO	-	-	0.004
Cadmium	10	1.7	7	-	10	10	10	5	10
Chromium	50	318?	-	-	50	100	50	-	50
Cobalt	-	5	29	-	-	-	-	-	-
Copper	200	18.5	2688	-	-	1300	1000	-	170000
Lead	25	6.3	160.5	-	50	ZERO	50	-	50
Manganese	300	-	-	-	-	-	300	-	50
Mercury	2	0.2	0.2	-	2	2	2	-	0.144
Nickel	-	142	2748	-	-	100	-	-	13.4
Selenium	10	1.0	-	-	10	50	10	-	10
Silver	50	0.1	10	-	50	-	50	-	50
Vanadium	-	14	190	-	-	-	-	-	-
Zinc	300	30	497	-	-	-	5000	-	5000
Cyanide	100	5.2	22	-	-	200	-	-	200

NOTES:

a - Includes penta and 2,4-dichlorophenols
b - Total unchlorinated phenols
c - Total organics not to exceed 100 µg/L
d - New Jersey DEP criteria for total volatile organic compounds - 10 µg/L
ZERO - Implies nondetect criteria
FWQC - Federal Water Quality Criteria
Effluent limits from 6NYCRR, Parts 702 and 703
MCLG - Maximum Contaminant Limit Goal
SNARLS - Suggest No Adverse Response Levels

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TABLE 2.3-4

GROUND WATER AND LEACHATE SEEPS: COMPARISON OF OBSERVED CONCENTRATION RANGES WITH CLASS GA STANDARDS

Parameter	Range of Detected Concentrations in Shallow Ground Water	Range of Detected Concentrations in Bedrock Ground Water	Range of Detected Concentrations in Leachate Seeps	Class GA Standards
Benzene	2.7 - 290	23	3 - 8	ND(2)
Chlorobenzene	1,200 - 11,000	—	2 - 140	5
Chloroethane	900	3.7	1 - 31	—
1,2-Dichlorobenzene	4	—	4 - 57	
1,4-Dichlorobenzene	2 - 240	—	2 - 6	4.7
1,3-Dichlorobenzene	82	—	4 - 89	5
1,1-Dichloroethane	5.6 - 4900	4.1	2.3 - 4.9	5
1,1-Dichloroethylene	240	—		5
trans-1,2-Dichloroethylene	9.2	9.2	64 - 85	5
Ethylbenzene	—	—	6	5
1,1,1-Trichloroethane	26 - 15,000	—	—	—
Toluene	3 - 43	3	—	5
Xylenes	400	—	—	5
2-Chlorophenol	13	—	—	—
2,4-Dimethylphenol	630 - 940	—	30	—
2-Methylphenol	72	—	—	—
4-Methylphenol	75	—	—	—
Phenol	6 - 4,000	16	7 - 10	1 a
Dibenzofuran	15 - 20	—	20 - 63	—
Diethylhexylphthalate (DEHP)	3 - 66	3 - 42	9 - 60	50
Endosulfan II	0.69	—	0.032 - 0.054	—
PCBs	110	0.05	—	0.1
PAHs	—	—	2 - 39	—
Aldrin	—	—	0.007 - 0.008	ND(0.05)
Dieldrin	—	—	0.007 - 0.028	ND(0.05)
DDD	—	—	0.011	ND(0.05)
Endrin	—	—	0.028	ND(0.05)

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TABLE 2.3-4 (cont.)

GROUND WATER AND LEACHATE SEEPS: COMPARISON OF OBSERVED CONCENTRATION RANGES WITH CLASS GA STANDARDS

Parameter	Range of Detected Concentrations in Shallow Ground Water	Range of Detected Concentrations in Bedrock Ground Water	Range of Detected Concentrations in Leachate Seeps	Class GA Standards
Aluminum	224-74,000	56.1 - 1,630	39 - 303,000	—
Arsenic	2.1 - 22.3	2.4 - 4.7	2.2 - 16.7	25
Barium	52.2 - 1,530	24.9 - 240	80.3 - 10,000	1000
Cadmium	1.3 - 12	1.1 - 4.2	3.7 - 122	10
Chromium	2 - 196	2.4-728	3.5 - 426	50
Cobalt	2 - 46.9	7.1	3.4 - 157	—
Copper	2.7 - 3,060	3.7 - 28.4	13.9 - 784	200
Lead	2.3 - 369	2.3 - 6.8	6.7 - 1,640	25
Manganese	62.1 - 3450	5.9 - 428	123 - 16,100	300
Mercury	0.23 - 3.3	0.48	0.25 - 4.7	2
Nickel	11.8 - 141	10.7 - 198	20.4 - 521	—
Silver	2.1 - 23.7	2	3.4 - 16.6	50
Vanadium	1.4 - 124	1.4 - 35.3	3.3 - 471	—
Zinc	7.5 - 1490	1.4 - 44	66 - 8,270	300
Cyanide	30	—	18 - 31	100

NOTES: Effluent limits from 6NYCRR Parts 702 and 703.
All units in micrograms per liter (µg/L).

Appendix C

Table 3-1

ARAR VALUES:
CHEMICALS EXCEEDING ARARs AND/OR CONTRIBUTING SIGNIFICANTLY TO RISK

Media	Exposure Pathway	Chemicals contributing to significant risk	ARAR	Chemicals exceeding ARARs (ppb)	ARAR
Surface Water (Ellicott Creek & Aero Lake)	• Ingestion of surface water and dermal contact with Aero Lake surface water while swimming • Dermal adsorption of drainage ditch surface waters and Ellicott Creek surface water			Chlorobenzene	5[a]
				Aluminum	100[a]
				Cadmium	1.7[a]/7[b]
				Iron	300[a]/300[b]
				Lead	6.3[a]
				Zinc	30[a]
				Mercury	0.2[a]/0.2[b]
Leachate Seeps	• Dermal exposure by children and workers	Bis (2-ethylhexyl)phthalate	50[c]	1,2 trans dichloroethene	5[c]
		PAHs (Carc)	0.8[d]	phenol	1[c]
				1,2 dichlorobenzene	4.7[c]
				Aldrin	0.05[c]
				Endrin	0.05[c]
				4,4 - DDD	0.05[c]
				Barium	1,000[c]
				Beryllium	3[c]
				Cadmium	10[c]
				Chromium	50[c]
				Copper	200[c]
				Iron	300[c]
				Lead	25[c]
				Magnesium	35,000[c]
				Manganese	300[c]
				Zinc	300[c]

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TABLE 3-1 (cont.)

ARAR VALUES:
CHEMICALS EXCEEDING ARARs AND/OR CONTRIBUTING SIGNIFICANTLY TO RISK

Media	Exposure Pathway	Chemicals contributing to significant risk	ARAR	Chemicals exceeding ARARs (ppb)	ARAR
Drainage Ditches, Aero Creek & Ellicott Creek Sediments	• Dermal absorption • Ingestion	PAHs (carc)	1.32[f] mg/kg		
Landfill Soils	• Dermal absorption • Ingestion	PAHs (carc) PCBs 2,3,7,8 TCDD TEQ Arsenic Lead	1.32[f]mg/kg 1[g] 0.001[g] 7.5[g] 32.5[g]	Chlorobenzene BEHP PAHs (noncarc) b-BHC Chlordane	5.5[g] 4.4[g] 114.8[g] 0.01[g] 0.2[g]
Groundwater (Unconsolidated Aquifer)	• Ingestion of drinking water • Dermal contact • Inhalation of airborne contaminants	Benzene 1,4 dichlorobenzene Bis(2-ethylhexyl)phthalate PCBs Arsenic Chlorobenzene 1,1,1-Trichloroethene 2,4 dimethylphenol Barium Manganese 1,4 dichlorobenzene	2[c] 4.7[c] 50[c] 0.1[c] 25[c] 5[c] 5[c] 50[c] 100[c] 300[c] 4.7[c]	Xylenes Chromium Iron Magnesium Sodium	5[c] 50[c] 300[c] 35,000[c] 20,000[c]

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TABLE 3-1 (cont.)

ARAR VALUES:
CHEMICALS EXCEEDING ARARs AND/OR CONTRIBUTING SIGNIFICANTLY TO RISK

Media	Exposure Pathway	Chemicals contributing to significant risk	ARAR	Chemicals exceeding ARARs (ppb)	ARAR
- Bedrock Aquifer	• Ingestion of drinking water	Benzene	2[c]		
	• Dermal contact while showering	Bis(2-ethylhexyl) phthalate	50[c]		
	• Inhalation of airborne contaminants while showering	Aldrin	0.05[c]		
		Arsenic	25[c]		
		Barium	1,000[c]		
		Cadmium	10[c]		
		Nickel	100[h]		
		Vanadium	14[a]		
		Lead	25[a]		

[a] Class B Standards
[b] Class D Standards
[c] 6NYCRR Part 703.5 Class GA Standards/BA TOGS
[d] EPA 1990: Drinking Water Regs and Health Advisories
[e] NYSDOH MCL
[f] Guideline Values from Technology Section Division of Hazardous Waste
[g] Draft Soil Cleanup Guideline Values (TBC's) issued by Technology Section, Division of Hazardous Waste Remediation, NYSDEC.
[h] SDWA MCLG

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