Exposure Investigation

Walnut Grove
Clark County, Washington

December 18, 1997

Prepared by

The Washington State Department of Health
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

Washington State Department of Health

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Evaluation of Potential Health Risk Associated with Exposure to Heavy Metals and Petroleum Hydrocarbons in Soil and Drinking Water

FOREWORD

The Washington State Department of Health has prepared this exposure investigation report under cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), an agency of the U.S. Public Health Service. The goal of Washington State Department of Health and ATSDR is to identify and mitigate adverse human health effects resulting from exposure to hazardous substances in the environment. This report was prepared in accordance with methodologies and guidelines developed by ATSDR.

Exposure investigations are conducted to better characterize past, current, and potential future human exposures to hazardous substances in the environment and to more thoroughly evaluate existing and potential health effects related to those exposures. Three primary methods are used to collect information during an exposure investigation: (1) Biomedical testing, such as the collection of blood or urine samples, to provide information on current (and sometimes past) exposures to a contaminant, (2) Environmental testing, such as the collection of soil, water, air, or dust, to help determine possible exposure sources, and (3) Exposure-dose reconstruction which utilizes environmental sampling information and computer models to estimate the contaminant levels that people may have been exposed to in the past or may be exposed to in the future.

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LIST OF ACRONYMS

ATSDR	Agency for Toxic Substances and Disease Registry
DOH	Washington State Department of Health
EI	Exposure Investigation
EMEG	Environmental Media Evaluation Guide (ATSDR)
EPA	Environmental Protection Agency
EQL	Estimated quantitation limits
HCID	Hydrocarbon identification scan
IOCs	Inorganic compounds
LTHA	Lifetime Health Advisory for Drinking Water (EPA)
MCL	Maximum Contaminant Level (EPA)
MCLG	Maximum Contaminant Level Goal (EPA)
MDL	Method Detection Limit
MRL	Method Reporting Limit
MTCA	Model Toxics Control Act (Ecology)
OTS	Office of Toxic Substances (DOH)
PCBs	Polychlorinated biphenyls
ppm	Parts per million
ppb	Parts per billion
PAH	Polycyclic aromatic hydrocarbons
RMEG	Reference Dose Media Evaluation Guide
SHA	Site Hazard Assessment
SOC	Synthetic organic compounds
SWWHD	Southwest Washington Health District
TPH	Total petroleum hydrocarbons
VOCs	Volatile organic compounds
WAC	Washington Administrative Code

LIST OF DEFINITIONS

PQL: Practical Quantitation Limit is the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

MRL: Method Reporting Limit is the lab's minimum concentration a compound can be measured and reported with 99% confidence that the compound concentration is greater then zero.

EQL: Estimated Quantitation Limits are highly matrix dependent. The quantitation units listed are provided for guidance and may not always be achievable.

EMEG: ATSDR's Environmental Media Evaluation Guide. A concentration in air, soil, or water (or other environmental medium), which is derived from ATSDR's MRL, and below which adverse non-cancer health effects are not expected to occur. Separate EMEGs can be derived to account for acute, intermediate, or chronic exposure duration's.

RMEG: ATSDR's Reference Dose Media Evaluation Guide. A concentration in air, soil, or water (or other environmental medium), which is derived from EPA's RfD, and below which adverse non-cancer health effects are expected to occur to people. RMEGs account only for chronic exposure. The units for an RMEG can be in any units appropriate for a concentration (e.g., mg/kg, ug/L, ppm, ug/m^3).

CREG: ATSDR's Cancer Risk Evaluation Guide. A concentration in air, water, or soil (or other environmental media), which is derived from EPA's cancer slope factor and carcinogenic risk of 10E-6 for oral exposure. It is the concentration in an environmental media at which the risk for excess cancer is one in one million for a reasonable maximum exposure.

LOAEL: Lowest Observed Adverse Effect Level. LOAEL's have been classified into "less serious" or "serious" effects. In dose-response experiments, the lowest exposure level at which there are statistically or biologically significant increases in the frequency or severity of adverse effects between the exposed population and its appropriate control.

STATEMENT OF PURPOSE

Upon request of the Southwest Washington Health District (SWWHD), the Washington Department of Health (DOH) agreed to perform an exposure investigation to determine whether private drinking water wells, residential soils and industrial soils have been contaminated by operations at Walnut Grove Industrial Park. The purpose of this investigation is to better evaluate whether exposure to contaminants in soil and drinking water is occurring. This investigation does not evaluate the occurrence of adverse health effects but provides data with which to better predict the likelihood of any such effects.

BACKGROUND AND HISTORY

In 1968, Grimm Enterprises purchased the property that is now Walnut Grove Industrial Park. The property was previously used as a brick foundry. The park is located at 6123 NE 63rd Street, northeast of the city of Vancouver, in a mixed, semi-rural to suburban setting and covers approximately 20 acres. Much of the area is paved with several warehouse buildings on site occupied by various companies performing industrial operations such as metal fabrication and concrete cutting.

As many as nine tenants currently lease space from Grimm Enterprises at this facility. A short description of some tenants is included in Appendix B. A wetland marsh is located approximately 300 feet south of the nearest park facility and is primarily surrounded by residential homes. Several floor drains run from the industrial park to the marsh via two storm drainage pipes. The storm drainage pipes are broken part way between the park complex and the marsh, an area which has been contaminated with heavy metals and kerosene. Sanitary discharges from the facility are presently made to a municipal sewer.

The site area slopes to the southwest about three (3) percent. Soil permeability is considered “medium” (loam), and vertical depth to ground water is 125 feet with a southwest flow.[1] The distance from the area of contamination (broken storm drainage pipes) to the marsh is approximately 50 feet, the nearest residence is approximately 500 feet, and the nearest private drinking water well is approximately 1,100 feet to the south/southeast. No ground water monitoring data was available for the industrial park or nearby residences previous to this investigation. The facilities at the industrial park obtain water from City of Vancouver municipal supply.

From 1973 to 1980, Borden Chemical Ink Division, a tenant of Grimm Enterprises, occupied one of the warehouses and allegedly disposed of up to 55 gallons of solvents per week into an on-site septic drain field. Under the federal Superfund program, the Environmental Protection Agency (EPA) performed a site assessment of the former Borden Chemical site on September 25, 1987. EPA recommended no further action under Superfund, and deferred the site to state authority for further consideration.[2]

On September 25, 1987, the EPA, through it's contractor, Ecology and Environment (E&E), completed an inspection of the previous site of Borden Chemical. The purpose of the inspection was to determine whether hazardous substances were disposed at the site and to identify and evaluate any potential environmental or public health hazards. EPA suspected each of the following to have been discharged or buried on site: Up to 55 gallons of spent solvent per week, and 400 gallons of sludge per year which may have contained caustic wastes, heavy metals (including lead), bases, chlorinated solvents, acid-extractable organics, and PCBs. Since other pollution sources in the warehouse complex may have existed, EPA recommended further investigations include the entire Grimm complex as one site. EPA also concluded that since the area of the septic drain field must have been located in fairly permeable soils, the small quantities of waste were most likely dispersed. Therefore, EPA recommended no further action under Superfund and deferred the site to state authority for further consideration.[2]

In 1994, SWWHD responded to a complaint of sewage being discharged from a 6-8 inch storm drainage pipe into the wetlands behind the industrial park. Soil samples taken from broken segments of the storm drainage pipes showed contamination of metals, organic solvents, TPH-diesel, and TPH-oil.[3] SWWHD performed a site hazardous assessment in July 1995 to address a complaint of sewage discharge from two broken storm drainage pipes to a nearby marsh. The pipes were observed discharging liquid to the ground near a marsh adjacent to the industrial park. Soil/sediment test results from the east broken pipe indicated 10 ppm of cadmium, 29,000 ppm of TPH-oil, and 13,000 ppm TPH-diesel. Liquid test results from the east broken pipe indicated 18,000 ppb of TPH-oil, and 51,000 ppb of kerosene. The site was ranked by the Washington Ranking Method, by SWWHD, as a "1", which on a scale of 1-5 is of the most concern. A more detailed discussion of this report can be located in the December 1994 SHA.[4]

In January 1997, at the request of SWWHD, DOH agreed to conduct an exposure investigation and sample private drinking water wells, back yard surface soil and soil beneath the broken storm drainage pipes located at the industrial park. A public meeting was held on February 5, 1997, by the Clark County Hazardous Waste Citizen Task Force. Speakers included Steve Matthews (DOH) along with representatives from the Southwest Washington Health District and the Washington State Department of Ecology. The site hazardous assessment completed by SWWHD and upcoming EI sampling proposal by DOH were presented. The forum was taped by CVTV local television.[5]

Local residents are concerned about potential exposure to toxic materials that may exist in residential soil and drinking water at levels of health concern. Some residents are concerned with their children (or grand children) frequently playing in back yards which adjoin the marsh. Families living next to the marsh include seniors who have frequent visits from their grandchildren. The grandchildren spend time in their backyards next to the marsh where samples were taken. Thus far, there are no reported health effects from residents or visitors.

SITE VISIT

A site visit to residences and the industrial site was conducted on April 23, 1997, to collect surface yard soil and drinking water samples. A representative of the Division of Drinking Water and Steve Matthews of the Office of Toxic Substances performed the sampling. A total of three (in duplicate) residential soil samples, and two (in duplicate) industrial soil samples were collected. In addition, five off-site private drinking water wells, and one off-site private irrigation well were sampled. Soil and drinking water samples were collected in accordance with the protocols and procedures outlined in the Sampling Plan.[6] During the site visit, the weather was rainy and sunny. Most of the resident's yards were covered by grass, however, the lower yard samples were collected just below the yard line in the marsh itself (the marsh was dry at those locations).

Soil samples collected from the industrial area were at the location of the broken storm drainage pipes, the same areas as previously taken by SWWHD in 1994. The entire area was covered with heavy foliage. There was a trickle of liquid running out of the east broken pipe and a noxious odor. The west broken pipe was dry with no odor.

SAMPLING LOCATION/METHODOLOGY

The selection of private drinking water wells was based on their proximity to the source of contamination (the broken storm drainage pipes). Samples were collected from both up and down gradient locations. Soil sampling in the residential areas were selected based on their proximity to the marsh and where children are most likely to play. Soil sampling in the industrial area was selected in the areas which SWWHD had previously determined to be contaminated.

All soil samples were discrete (single location) and taken from surface down to three inches. Soil and water samples were analyzed by Edge Analytical Inc., Burlington, WA.

RESULTS

Residential soil was sampled for heavy metals, while industrial soil was sampled for heavy metals, HCID (hydrocarbon ID), and PCBs. Residential ground water was sampled for SOCs, VOCs, IOCs, and HCID. Results of this sampling are given in Appendix C.

Contaminants detected above health comparison values are discussed below. If a contaminant was found in more than one soil station or well, the highest result is listed. Health comparison values are developed by ATSDR to evaluate potential health hazards. Contaminants detected at levels below health comparison values are not considered to be a health hazard. Contaminants exceeding their respective health comparison value are not necessarily a health concern, but require further evaluation.

Drinking and Irrigation Water

A total of five private off-site drinking water wells were sampled along with one private irrigation well. Of all the contaminants detected only arsenic was detected at a level above its health comparison value. The maximum level of arsenic found in drinking water was 1.0 part per billion (ppb) which exceeds the Cancer Risk Evaluation Guideline (CREG) of 0.02 ppb. Arsenic in drinking water is evaluated below.

Residential Yard and Industrial Soil

Several metals were detected in the three residential and two industrial soil samples taken during the exposure investigation. Arsenic was the only metal detected above its comparison value. The maximum level of arsenic detected in residential soil (2.3 ppm) and industrial soil (5.8 ppm) both exceed the CREG for arsenic in soil of 0.5 ppm. The public health implications of arsenic in soil is discussed below.

There is currently no health comparison value for lead in soil. The maximum level of lead found in residential and industrial soil was 32.8 and 1, 050 ppm, respectively. Lead in soil is discussed below.

There is currently no health comparison value for heavy hydrocarbons in soil. The maximum level of heavy hydrocarbons found in residential and industrial soil was 6,570 ppm. The public health implications of heavy hydrocarbons in soil is discussed below.

DISCUSSION AND INTERPRETATION

This section discusses the contaminants that exceeded health comparison values. ATSDR health comparison values should not be used as a predictor of adverse health effects but indicate a need for further evaluation.

Arsenic in Drinking Water

Exposure to the maximum concentration of arsenic detected in residential drinking water wells (1 ppb) is not expected to result in any adverse health effects. The estimated dose associated with this level of arsenic is at least 5 times below ATSDR's Minimal Risk Level (MRL). MRLs are doses below which non-cancer adverse health effects are not anticipated.

The cancer risk associated with a long term exposure (30 years) to this level of arsenic in drinking water is considered to be insignificant. Although arsenic is classified by EPA as a Group A human carcinogen, the estimated dose associated with this level of arsenic comprises only a small percentage of the total arsenic ingested in the average diet. The source of this very low level of arsenic in drinking water is not known but may well come from naturally occurring sources in the soil.

The current regulatory standard for arsenic in drinking water (also know as the Maximum Contaminant Level or MCL) is 50 ppb. Drinking water that exceeds this standard may be of concern, because health effects have been observed in some people who drank water for many years containing between 50 and 200 ppb arsenic. Some evidence in laboratory animals suggests that small amounts of arsenic in the normal diet (10-50 ppb) may be beneficial to health. However, no cases of arsenic deficiency in humans have ever been reported.[7]

Arsenic in Soil

The highest concentration of arsenic detected in residential yard soil was 2.3 ppm while a maximum of 5.8 ppm arsenic was found in industrial soil near the broken east drainage pipe. These amounts are consistent with background levels of arsenic in Clark County soils.[8] *No adverse health effects are anticipated to result from exposure to this level of arsenic in soil.* The estimated dose for a young child frequently exposed via ingestion of and dermal contact with maximum levels of arsenic in residential or industrial soil is not expected to exceed the MRL.

As noted above, arsenic is classified as a Group A human carcinogen by EPA. The cancer risk associated with the maximum level of arsenic in soil is estimated to be insignificant since the levels are similar to what would naturally be found in area soils. Cancer risk is, therefore, not expected to be above what might occur from uncontaminated soils. The dose from soil is also considered to be a small percentage of what is consumed from dietary sources. It is important to note that although an estimate of cancer can be made for *any* level of arsenic in soil or drinking water, the only evidence of cancer in humans resulting from arsenic exposure has been at much higher levels.

There is the potential for some residents to be exposed to arsenic in both drinking water and soil. The combined exposure at the maximum levels of arsenic detected in soil and drinking water is not expected to be of health concern.

Lead in Soil

The highest concentration of lead in industrial soil was 1,050 mg/kg and the highest concentration in residential yards was 32.8 mg/kg. Levels of lead in resident yard soil are not likely to present a hazard for young children at levels found; however, levels found at the industrial side of the marsh could present a hazard for young children. *If children played frequently near the broken, east storm drainage pipe of the Walnut Grove Industrial Park, their blood lead level could approach a level of concern.* ATSDR considers a blood lead level of 10 micrograms/deciliter or greater as an indication of excessive lead exposure.[9]

EPA's Integrated Exposure Uptake Biokinetic Model (IEUBK - Version 0.99D) indicates that blood lead levels in children between 1 and 6 years of age could approach EPA's action level if children played frequently near the broken east drainage pipe.[10] Children between 1 and 2 years of age are the most susceptible to increased blood lead levels resulting from exposure to lead in soil. Evidence exists to indicate that health effects in young children may occur at blood lead levels as low as 6 ug/dl. The most sensitive toxic effect from lead exposure in children involves behavioral changes resulting from nervous system toxicity. Many of these behavioral changes involve impaired learning ability including decreased performance on IQ tests.[9]

<u>Heavy Hydrocarbons in Industrial Soil</u>

A maximum of 6,570 ppm heavy hydrocarbons was detected near the broken east drainage pipe located between the industrial park and the marsh. There is no MRL or RfD for the group of petroleum related compounds reported as heavy hydrocarbons. Heavy hydrocarbons are the less volatile, larger molecular component of the more commonly reported contaminant known as total petroleum hydrocarbons (TPH). The more volatile, smaller components of TPH, associated with the gasoline and diesel fuel, were not detected.

The Washington State Department of Ecology has adopted a surrogate approach for assessing the potential health effects resulting from exposure to TPH.[11] This means that the toxicity of a single chemical similar to those found in TPH analysis is used to evaluate the total dose of the TPH. Adapting this approach, DOH used the oral RfD for pyrene published by EPA in order to estimate the potential for non-cancer effects from exposure to heavy hydrocarbons in soil.

No non-cancer effects are expected to result from exposure of a child to heavy hydrocarbons in soil found near the broken east drainage pipe. It was assumed that an older child could play in the area during the summer months and be exposed by accidentally ingesting surface soil and contact of soil with skin. The estimated dose calculated from this scenario is below the oral RfD for pyrene.

It is possible that some contaminants knows as polycyclic aromatic hydrocarbons (PAH) could be present in the heavy hydrocarbon component of TPH. Some PAH have been classified by EPA as possible and probable human carcinogens. *The cancer risk associated with PAH in soil near the broken east drainage pipe cannot be estimated since soil samples were not analyzed for PAH.* It is likely, however, that the hydrocarbons identified in this soil came from motor or lube oil as noted in the laboratory report. Although motor and lube oils can contain PAH, levels are not expected to be high.

CONCLUSIONS

No adverse health effects are expected to occur as a result of exposure to contaminants in residential drinking water or soil.

Levels of lead in soil near the broken east drainage pipe are high enough to be of concern if children played frequently in this area. This area is not easily accessible, however, and not expected to be frequented by area children.

Levels of petroleum hydrocarbons (heavy hydrocarbons) in soil near the broken east drainage pipe may be of concern if cancer causing polycyclic aromatic hydrocarbons (PAH) are present in significant quantities. However, this area is not easily accessible and not expected to be frequented by area children.

RECOMMENDATIONS

Drinking Water

- The Ross well should be resampled to confirm the presence of 1,1,1-trichloroethane. The source of the the 1,1,1-trichlorethane is not clear but may be related to the materials used in the well casing. There are no identified sources of 1,1,1-trichloroethane contamination in the area.

- Due to slight pesticide contamination, the Pierce well should be retested for pesticides to confirm the previous detection.

- Results of future sampling of residential wells should be provided to DOH for evaluation of potential health impacts.

Residential Yard Soil

No recommendations are necessary with respect to contaminants in residential yard soil.

Industrial Soil

- Access to the broken east drainage pipe area north of the marsh should be restricted.

- The areas around the broken storm drainage pipes should be included in future site remediation.

- Lead concentrations in industrial soil exceed levels of health concern, therefore, children should be discouraged from playing near the north side of the marsh or the Grimm Industrial area.

REFERENCES

1. Clark County Hazardous Waste Citizen Task Force, minutes, C. Kraten, February 5, 1997.

2. Letter to J. Osborn, EPA from L. Guilford, E&E, Trip Report Borden Chemical, Ink Division, (December 1, 1997).

3. Clark County Hazardous Waste, Citizen Task Force, Winter 1997, vol. 1.

4. Southwest Washington Health District, Site Hazardous Assessment, T. White, December 19, 1994.

5. Clark County Hazardous Waste Citizen Task Force, minutes, C. Kraten, February 5, 1997.

6. Memo to V. Skeers from S. Matthews, Walnut Grove Sampling Plan, April 14, 1997.

7. Toxicological Profile for Arsenic, US Public Health Service, ATSDR, April 1993

8. National Background Soil Metals Concentrations in Washington State, Toxics Cleanup Program, Department of Ecology, October 1994.

9. Toxicological Profile for Lead, US Public Health Service, ATSDR, April 1993.

10. Environmental Protection Agency. March 8, 1994. Uptake Biokinetic Model for Lead. Version 0.99D

11. Interim Interpretive and Policy Statement Cleanup of Total Petroleum Hydrocarbons (TPH). Toxics Cleanup Program. Washington State Department of Ecology. January 1997.

12. Drinking Water and Health. National Research Council, Washington DC, 1986.

APPENDIX A: Tenants of Walnut Grove Industrial Park

Borden Chemical Ink Mixing Plant was located on-site from 1973 to 1980. Borden primarily blended ink for use on milk cartons. The ink was a nitro-cellulose based film with a shellac resin and methyl alcohol. Waste solvents generated from cleaning rollers were used to homogenize and remove air from inks. During this period as much as 55 gallons of solvent per week was generated from wastewater and cooling water (much of it for cleaning printing rollers) and was allegedly disposed of in an on-site septic drain field. The location of the drain field is unknown. Also during this period, sludge material consisting of heavy metals, chlorinated solvents, caustic materials, acid-extractable organics, and PCBs, may have been disposed of on site.

Fabrication Products, Inc. is a metal fabricator which has currently operated at this location since 1987. Operations include welding, sand blasting, (and sand blasting including painted metal). Piles of sand blast grit were present behind their facility. Hazardous materials used at this facility include arsenic, barium, chromium, lead, cadmium, mercury, selenium, nickel, and silver.

Concrete Coring Company is a concrete cutting company that has been operating since 1972. Hazardous materials used at this facility include solvents, rust buster, carb choke cleaner, Zep PLS, and battery acid. The industrial sink at this location was reported to have contributed to a release of coliform bacteria through the storm drainage pipe in 1994.

Attbar Plastics were tenants from 1972 to 1995. Attbar manufactured fiberglass air deflectors for semi tractor/trailers. Hazardous materials used at this facility include styrene, acetone, MIK (methyl isobutyl ketone), gasoline, and thinner.

Other tenants include Jet Pace Skies and Toboggans, MC Tool and Supply, GO Steel, Richard Family Construction, Paragram Players, Doctors of Medicine, and Jazzersize.

APPENDIX B: Sampling Results for Drinking Water, Irrigation Water and Soil

TABLE 1

RESIDENTIAL DRINKING AND IRRIGATION WATER CONCENTRATIONS (ppb)
(See list of definitions at the beginning of this report)

Contaminant	Drinking Water Well	Irrigation Water Well	Comparison Value	Comparison Value Reference	Laboratory PQL
*Arsenic	1.0	NA	0.02	CREG	1.0
Barium	25	32	700	RMEG child	1.0
Sodium	8,600	6,200	100,000	**	1,000
Fluoride	240	NA	4,000	MCL	500
Nitrate - n	6,800	2,300	10,000	MCL	500
Copper	9	3	1,300	MCLG	5
1,1,1-trichloroethane	0.2	ND	200	LTHA	0.12
Chromium (assume Cr-VI)	1.0	ND	50	RMEG child	1.0
Tetrachloro-ethylene	0.2	ND	0.7	CREG	0.08
Methyl Tert-butyl Ether	7.1	ND	20	LTHA	1.0
Nitrite - n	220	ND	1,000	RMEG child	500
Chloroform	ND	0.3	100	EMEG child	0.12
Total Trihalomethane	ND	0.3	100	MCL	NA
Prometon	ND	0.26	100	LTHA	0.1
Atrazine	ND	0.12	3	LTHA	0.02

* The concentration of this element exceeded comparison values, hence, will be discussed in the "Discussion and Interpretation" section.

** The comparison value reference was derived from the recommended limitation intake of sodium with adults on sodium-restricted diets in the United States. Adults consume an average of 2 liters/day of drinking water, and drinking water generally represents less than 10% of the habitual total intake of 3,500 mg of sodium as long as the sodium content of the water does not exceed 200 mg/l (or 200,000 ppb). However, approximately 3% if the population is on sodium-restricted diets calling for sodium intake of less than 2,000 mg/day. The proportion of this that can be allocated to water varies, depending on medical judgment for individual instances. Knowledge of the sodium-ion content of the water supply and maintenance of it at the lowest practicable concentration is clearly helpful in arranging diets with suitable sodium intake. In many diets, allowance is made for water to contain 100 mg/l (or 100,000 ppb) of sodium.[12]

TABLE 2

CONCENTRATION OF METALS IN RESIDENTIAL AND INDUSTRIAL SOIL (ppm)

(See list of definitions at the beginning of this report)

Element	Residential Yard	Industrial Site	Comparison Value	Comparison Value Reference	Method Detection Limit	Natural Soil Background
*Arsenic	2.3	5.8	0.5	CREG	0.5	5.8
Barium	211	127	4000	RMEG child	0.5	NA
Cadmium	ND	5.5	40	EMEG child	0.5	0.93
Chromium	15.5	33.6	300	RMEG child	0.5	26.6
*Lead	32.8	1,050	NA	NA	0.5	24.0
Nickel	12.9	334	1000	RMEG child	0.5	21.0
Silver	ND	7	10	RMEG child	0.5	NA

* The concentrations of these elements exceeded or do not have comparison values and are discussed in the "Discussion and Interpretation" section.

TABLE 3

HYDROCARBONS AND PCBS IN INDUSTRIAL SOIL (ppm)

(See list of definitions at the beginning of this report)

Contaminant	Total Concentration	Comparison Value	Comparison Value Reference	Laboratory Detection Limit
Heavy Hydrocarbons (Lube Oil)	6,570	200	MTCA Method A	100 (MRL)
PCBs	<0.5	1	EMEG child	0.1 (EQL)