
ENVIRONMENTAL ASSESSMENT PUBLIC MARKETS SITE

REPORT TO

DS-LEA Associates Ltd.

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Tetr*ES*
CONSULTANTS INC.

In Association with:

WARDROP
ENGINEERING INC.

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1.0 SUMMARY

TetrES Consultants Inc. was retained by DS-Lea Consultants to provide an assessment of environmental conditions at the Public Markets site. This Environmental Assessment was part of the investigation into the suitability of this site for the relocation of the City of Winnipeg's Ross Avenue Public Works Yard.

In the course of the Environmental Assessment, 28 boreholes were drilled, six monitoring wells were installed, and 54 soil samples and six ground water samples were analyzed for chemical parameters. The locations from which the soils and ground water were sampled were selected to detect possible contamination resulting from past on- and off-site uses as well as to test representative background conditions from large open areas at the site.

The work completed to assess environmental conditions at the Public Markets indicates that the site should be suitable for the relocation of the City of Winnipeg's public works facilities. Only soil samples from three boreholes drilled in the northwestern corner of the property contained detectable contamination. Two of these were drilled at the location of the former Public Markets garage and fuelling station and soils from the boreholes contained gasoline hydrocarbons (BTEX) and oil and grease at levels below Manitoba limits for industrial sites. A third borehole which was drilled adjacent to an abandoned Canada Packers abattoir and food processing facility contained soil with oil and grease, Freon and lead at levels below Manitoba limits for industrial sites. Manitoba Environment has been notified of the evidence of contamination found in these three boreholes and has determined that further delineation or remediation at the site was not required.

Ground water samples obtained from two monitoring wells in the shallow till aquifer beneath the site contained levels of lead in excess of Canadian Drinking Water Quality Guidelines. Ground water sampled from a third monitoring well contained sulphate concentrations in excess of Canadian Drinking Water Quality Guidelines. These ground water conditions may be naturally occurring.

Manure and straw were found in uncertain quantities in clay fill material to a depth of nine metres in one location at the southwest portion of the site. There is a potential that methane produced from the decomposition of this material could be of significance when locating structures in this area.

2.0 INTRODUCTION

The property presently occupied by the City of Winnipeg's Ross Avenue Works Yard has been proposed for the location of a Federal Government Laboratory Centre for Disease Control. The Public Markets site in St. Boniface is being considered for the relocation of the City of Winnipeg's Central Public Works Yard. Prior to purchasing this property, the City of Winnipeg conducted a site investigation to determine the suitability of this property for the relocation of the Works Yard. Part of this investigation was an environmental assessment of the site.

The environmental assessment of the Public Market Site was performed to determine if any hazardous materials are present at the site in amounts that may impact the development of the property. The assessment of the site consisted primarily of soil and ground water sampling and chemical analysis. Additional information to aid in assessing environmental conditions at the site was acquired through a review of the history of the site and surrounding properties performed by DS-Lea Consultants Ltd., current and historic photographs of the site, site inspections and results of a concurrent geotechnical study of the site performed by Dyregrov Consultants.

3.0 BACKGROUND INFORMATION

3.1 SURFICIAL GEOLOGY

The geological setting of the former Public Markets site in Winnipeg consists of up to 21 metres of silt, clay and till overlying carbonate bedrock. These strata are generally classified into three units; the Complex zone, the Glaciolacustrine Clay and the Tills.

The Complex zone is the surficial unit and is about 3 metres thick. This unit is composed mainly of stratified silty clay and silt, with varying amounts of organic soils, alluvial clays and sands and anthropogenic fill.

The Glaciolacustrine Clays below the Complex zone are 12-15 metres thick in this area. The upper 4 metres are usually a weathered brown or mottled grey-brown clay, while the clay below is grey with occasional rock fragments near its base.

The Tills in the area are approximately 3 metres thick and are composed largely of silt, sand, and gravel. The upper part of the Till unit is soft, loose, and water-bearing, while the lower part is much denser.

The underlying bedrock is composed largely of dolomitic limestone. As a result of preglacial weathering, the bedrock surface is highly fractured, disturbed, and intermixed with sand and gravel. The bedrock surface is highly irregular and contains numerous local highs.

3.2 HYDROGEOLOGY

Ground water beneath the Public Markets site can be found in three separate strata, as follows:

- Within the Complex zone, perched aquifers are found in the silt. This ground water generally occurs in isolated pools, therefore, quantities are limited and flow is minimal.
- Sand and gravel lenses within the Till form an aquifer with moderate to high transmissivities (i.e., ability of the formation to transmit water). Flow within the aquifer is generally governed by gradient.
- The carbonate bedrock constitutes the major aquifer beneath the City of Winnipeg, with a high but variable fracture permeability. The aquifer transmissivity beneath the

site is approximately 620 m³ per day. Historical industrial use of the aquifer in the St. Boniface area has produced a cone of depression in the water table in the vicinity of the Public Markets site and industrial properties adjacent to the west of the site.

3.3 SITE SETTING

The Public Market Site was used from early this century until 1988 as a livestock holding, selling and transfer facility. Stock barns and pens occupied much of the Northern half of the site. Manure from barns and holding pens was removed and stored to the south of the pens where it was sold as fertilizer. A garage and fuelling station as well as hay barns were located at the east of the property between the presently-abandoned Canada Packers and Swift plants. The Public Markets powerhouse and office building are located at the north of the property. Numerous railroad tracks serviced the Public Markets, and at the height of activity in the early 1970s up to 25,000 railcars were unloaded at the site each year.

All stock holding pens, auction buildings, the garage and fuelling station and barns were removed in the years from 1983 to 1988. The only remaining structures consist of the administration building, powerhouse and water tower. A tunnel connecting the administration building and the powerhouse still contains asbestos-covered pipes.

The northern portion of the site that previously contained the stock holding pens remains largely covered with concrete. This area was serviced with sewer lines and some of the manholes were partially filled with debris when the livestock operations were discontinued, while others have been left uncovered. An additional uncovered manhole has been identified to the south east of the concrete-surfaced area. No complete inventory of uncovered manholes has been conducted at the site.

Railroad lines surrounding the Public Market site remain in use. Additional lines that had been used to bring livestock into the yard have been removed, only the gravel beds remain.

Underground storage tanks at the fuelling station were removed in 1987. These tanks were installed in 1985 and had replaced older tanks at the same location.

Throughout the past several decades, many truck-loads of fill material from construction projects throughout the City of Winnipeg were unloaded in previously marshy south-central and south-western portions of the property. Debris from the removal of Public Markets structures, mainly concrete fragments, timber and railroad ties is located primarily in piles in the south central portion of the property (Figure 1). Large piles containing significant amounts of straw and manure in addition to concrete fragments and soil are located in the south-central portion of the property (Figure 1).

The Public Market site is adjacent to industries that include: hide treatment, abattoir, meat processing, feed lots and vehicle repair, maintenance and transfer facilities. The adjacent businesses with the greatest potential for having influenced environmental quality at the Public Markets include a hide treatment facility, currently the St. Boniface Hyde and Wool Company Ltd., and two abandoned abattoir and food processing plants, formerly in operation as the Swifts and Canada Packers Plants (Figure 1). The hide treatment facility has apparently only been used to salt hides which have then been sold to tanning firms. The former Swifts and Canada Packers plants contained large and diverse operations which included slaughtering, rendering, margarine production and hydrogen production. These two plants maintained their own sewage treatment facilities, water wells, boilers, above and below-ground fuel storage tanks and vehicle maintenance facilities.

4.0 SOIL SAMPLING AND MONITORING WELL INSTALLATION

A total of 28 boreholes were drilled at the Public Markets site as part of the environmental assessment, as shown on Figure 1. Drilling was performed by Maple Leaf Enterprises Ltd., of Winnipeg, on two separate occasions; September 11 to 13, and October 19, 1990. Three soil samples were collected from each borehole at depths of 0.5, 1.5 and 3 metres for laboratory analysis. General hydrocarbon vapour readings were taken from air at the top of

boreholes during drilling with a portable photo-ionization detector. Drill logs for these boreholes are presented in Appendix B. Soil sample collection methodologies are described in Appendix A and sample descriptions are presented in Appendix D.

In September, four boreholes (MW1, MW2, MW3 and MW4), were drilled into till, with depths ranging from 14.4 to 18.9 metres below grade. These boreholes were then completed as monitoring wells to allow for sampling of the ground water within the till aquifer. Three of the monitoring wells were located around the perimeter of the site to aid in determining ground water flow direction beneath the site and possible contaminant migration from off-site industry. MW4 was located in the centre of the site to enable sampling that would show effects of Public Market livestock handling activities and manure storage on ground water quality.

Sixteen additional boreholes were drilled throughout the site in locations chosen to detect the environmental impact of historic uses of the Public Markets and adjacent properties. BH1 and BH2 were located adjacent to the Public Markets powerhouse. BH3, BH6, BH16 were located adjacent to the abandoned Canada Packers plant. BH4 and BH5 were drilled at the location of the former Public Markets garage and fuelling station. BH6, BH16, BH7, BH8 and BH9 were located adjacent to an abandoned Swift's food-processing plant.

Following a review of the chemical analysis and drill logs from the first round of chemical and geotechnical exploration borehole drilling, additional chemical exploration drilling and soil and ground water testing was performed to gain a better understanding of conditions of the centre of the site.

In October, a fifth monitoring well (MW5) was installed, along with nine additional chemical exploration boreholes (BH17 to BH23, MW2A and MW3A). The drill logs from these boreholes are presented in Appendix B.

Five boreholes (BH18, BH20 to BH23), were drilled to a depth of 3 metres in the southern half of the site. Borehole BH17 was drilled to a depth of 3.5 metres in the vicinity of existing

boreholes BH4 and BH5 which were known to contain hydrocarbon contamination. This borehole was then equipped with a 50 mm diameter PVC casing and screen for the monitoring of the perched ground water table for hydrocarbons.

Borehole BH19 was drilled to a depth of 9 metres into an area which appeared to have been previously excavated and backfilled. Clay fill in this area contained manure and straw fragments.

Boreholes MW2A and MW3A were drilled to a depth of 3 metres next to existing monitoring wells MW2 and MW3, for re-sampling of soil at these locations.

4.1 FIELD OBSERVATIONS

During the drilling of all chemical exploration boreholes and geotechnical testholes TH25 to TH35, all unusual soil characteristics were noted and air from the tops of boreholes was tested for the presence of combustible gas. During site visits potential on- and off-site hazards were noted and a map was prepared showing surface features of the site (Figure 1).

Petroleum smell was evident on samples from BH4, BH5 and BH17. High combustible vapour readings were recorded from BH3.

Uncertain amounts of straw and manure in clay fill material were encountered at depths between 3 m and 9 m in BH19, TH13, TH25, TH27, TH28 and TH29 that were drilled close together in the southwest corner of the site (Figure 1). This fill material apparently extends for 90 m from north to south and is up to 40 m wide in a east to west direction, though it is less than 40 m wide along some of its north-south extent. A brief description of the stratigraphy encountered in the Test Holes is given in Appendix C, the log for BH19 appears in Appendix B.

5.0 ANALYSIS OF LABORATORY RESULTS

In total, 90 soil samples were collected from the Public Markets site. Descriptions of the samples are provided in Appendix D. Selection of the samples to be analyzed was based on the historical review, observations made while drilling, and the combustible gas concentrations recorded in boreholes. Soil samples were analyzed for chemical parameters listed on Table 1. A list of the 54 soil samples analyzed is given in Table 2. The samples not submitted for laboratory analysis are being stored in a frozen state to preserve them, should future chemical analyses be required.

Ground water samples collected from each of the six monitoring wells installed at the Public Market Site were analyzed for the chemical parameters listed on Table 3.

Soil and ground water samples were analyzed by Enviroclean Laboratory Services in London, Ontario.

Soil chemistry was compared to the Manitoba Environment Guidelines for acceptable concentrations of various chemical parameters on industrial property. Where no Manitoba Guidelines were evident, Manitoba Environment advised that using the Quebec or British Columbia Guidelines was acceptable. In some instances, a comparison to the Ontario Guidelines for decommissioning industrial sites was made.

Ground water chemistry was compared to the Canadian Water Quality Guidelines for Drinking Water, as well as to Manitoba Guidelines (adapted from Quebec or British Columbia), for decommissioning industrial sites.

Several of the above guidelines apply to the decommissioning of industrial sites. In some instances, higher concentrations of some contaminants may be acceptable to Manitoba Environment if the site continues to be used for industrial purposes. In these instances, remediation levels are normally site specific and are set by Manitoba Environment. In these cases, migration of on-site contamination off property to adjacent lands is the primary

concern. Further, it is recognized that some elements and compounds that appear in the above guidelines may naturally occur in the soil and water at concentrations in excess of the stipulated maximum acceptable concentrations. In these circumstances, remediation is not required, however, the occupants of the property or consumers of the water are advised of the potential risks.

5.1 SOIL LABORATORY ANALYSIS

Only soil samples from three of the 27 boreholes from which soil samples were analyzed contained detectable concentrations of contamination. None of the contamination encountered exceeded Manitoba Environment Guidelines. A copy of the laboratory report is contained in Appendix E.

Soil samples from boreholes BH4 and BH5 which were drilled at the former location of the Public Markets garage and fuelling station contained small amounts of the volatile organic compounds benzene, ethylbenzene and xylene as well as oil and grease. Although none of the concentrations of these substances were in excess of the Manitoba Environment Guidelines, it is possible that hydrocarbon contamination could be present at higher concentrations elsewhere in this area.

Borehole BH3 located on an access road adjacent to the eastern boundary of the abandoned Canada Packers Plant contained elevated levels of oil and grease, copper and lead. In addition, trace quantities of Trichlorofluoromethane (a Freon) were found in soil from BH3. Trichlorofluoromethane is extremely volatile and of low toxicity and is used as a refrigerant or a solvent. Possible explanations for its presence are the loss of refrigerant or its use as a solvent. The highly volatile nature of Trichlorofluoromethane might have produced the high vapour concentration measurements observed in BH3 during drilling. (Refer to Appendix B.)

5.2 GROUND WATER LABORATORY ANALYSIS

Canadian Water Quality Guidelines for drinking water were exceeded in ground water samples from three of the six monitoring wells installed at the site. A copy of the laboratory analysis of ground water samples from the site is contained in Appendix F. Ground water from MW4 contained 130 ppb lead and MW2 contained 20 ppb lead, which exceeded the Canadian Drinking Water Guideline limit of 10 ppb. A sulphate level of 930 ppm in the ground water from MW3 exceed the Canadian Drinking Water Guideline limit of 500 ppm. The presence of lead in the water is most likely attributable to natural causes, such as the composition of the till surrounding the monitoring well. The high sulphate concentration is also likely naturally occurring and is found in similar concentrations throughout the City.

Water from the perched water table from BH17 was tested for fuel oil in water by the W.M. Ward Technical Services Laboratory. Fuel oil was not detected at a minimum detection limit of 0.7 ppm.

These results indicate that according to the Canadian Water Quality Guidelines for Drinking Water, the ground water in portions of the till aquifer is not fit for human consumption; however, the ground water could be suitable for industrial uses.

5.3 GROUND WATER MONITORING

In order to determine the direction and gradient of the ground water flow within the confined till aquifer, four monitoring wells were placed roughly in the four corners of the site. Another well was located near the centre of the site. Ground water elevation data was also obtained from the Province of Manitoba Water Resources Branch for three bedrock aquifer monitoring wells found at the abandoned Swift's and Canada Packers sites. Provincial monitoring wells located close to the east of the Public Market Site were also utilized. This data is summarized

in Table 4. Figure 2 shows monitoring well locations and the potentiometric surface beneath the site as defined on November 7, 1990.

Ground water elevations in monitoring well MW3 did not correspond with elevations obtained from the other monitoring wells. The ground water level in MW3 is over two metres higher than the other monitoring wells. The cause of this difference may be that MW3 does not extend into the till aquifer. Drilling of MW3 was completed immediately below the clay without penetrating a measurable thickness of glacial till. Refusal of the drill rig may have been caused by a boulder or a local bedrock high. The ground water found in this well most likely originates from silt and gravel lenses encountered near the bottom of the borehole. Because of this, the water level in MW3 was not incorporated in the potentiometric surface map on Figure 2.

Ground water flow direction in the till aquifer appears to be northerly and the gradient to be very shallow (1:2600). Long-term ground water elevation data collected over the past 20 months reveal a seasonal rise and fall of almost 4 metres. Ground water elevations in the bedrock aquifer and till aquifer indicate that the two are hydraulically linked.

6.0 CONCLUSIONS

The Public Market site appears largely uncontaminated and developable.

Hydrocarbon contamination exists along the west end of the property in quantities that Manitoba Environment has determined do not require further delineation or remediation.

Fill material encountered in an area at the southwestern corner of the property contains some straw and manure which could potentially produce methane gas. More work is needed to determine the amount of hydrocarbons in this fill before locating structures in this area.

Some ground water in the till aquifer beneath the Public Markets site contains elevated amounts of lead and sulphate. It is unknown, at present, if this condition is naturally occurring. The ground water does not meet the Canadian Water Quality Guidelines for Drinking Water and should not be used for human consumption.

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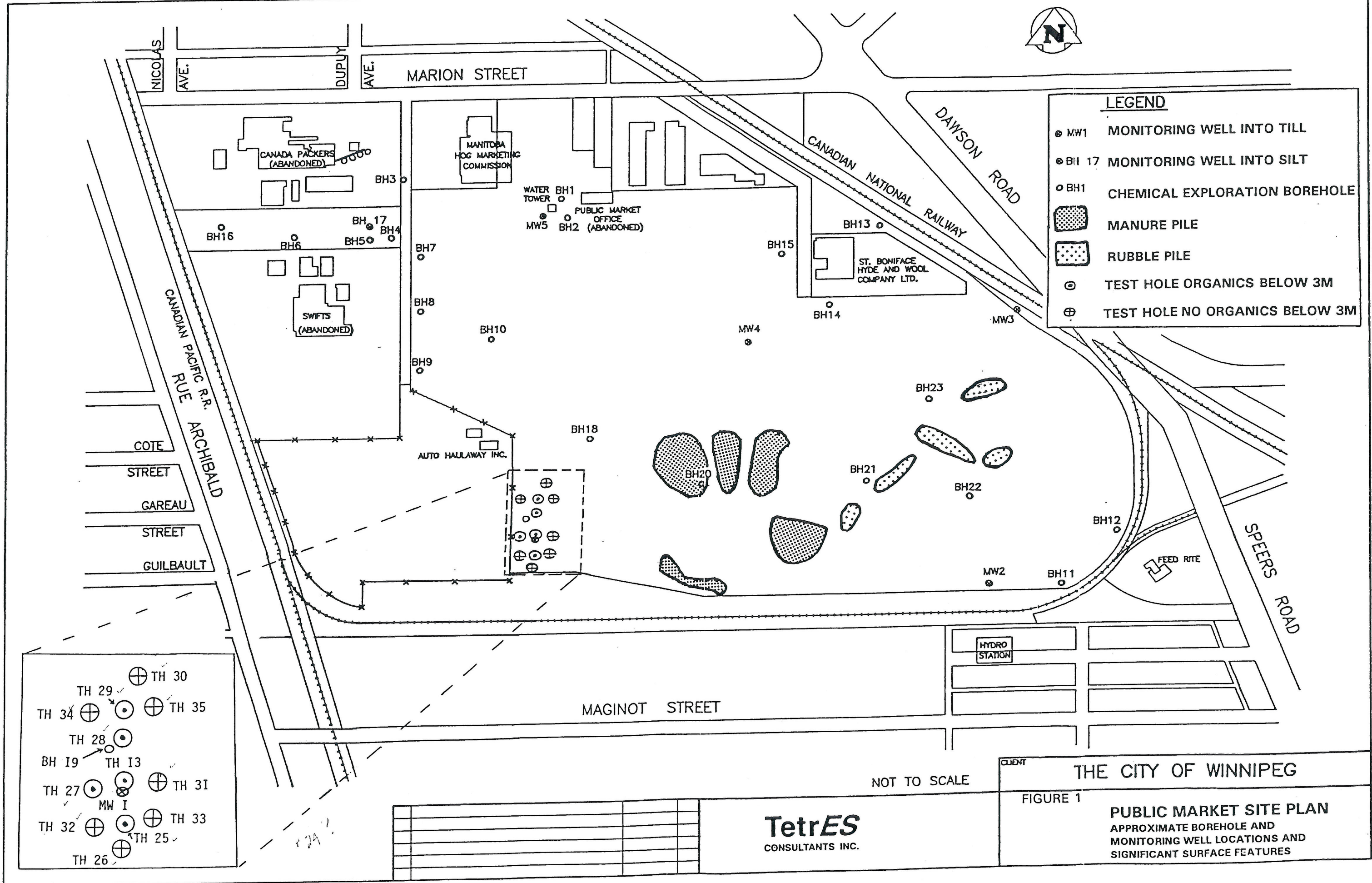
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FIGURES



LEGEND

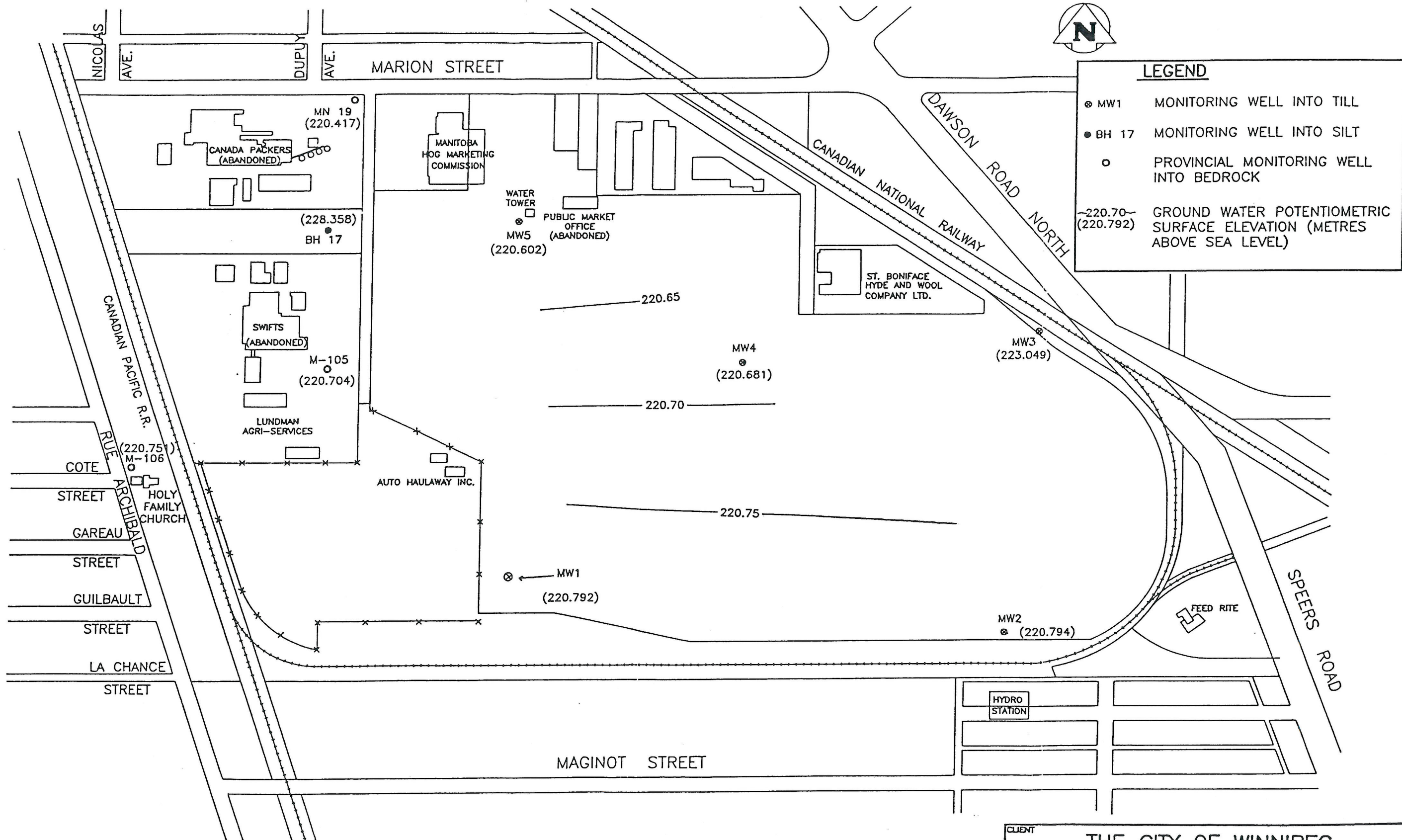
- MW1 MONITORING WELL INTO TILL
- BH 17 MONITORING WELL INTO SILT
- BH1 CHEMICAL EXPLORATION BOREHOLE
- ▨ MANURE PILE
- ▤ RUBBLE PILE
- ⊙ TEST HOLE ORGANICS BELOW 3M
- ⊕ TEST HOLE NO ORGANICS BELOW 3M



- TH 29 ⊕ TH 30
- TH 34 ⊕ TH 35
- TH 28 ⊙
- BH 19 ⊙ TH 13
- TH 27 ⊙ TH 31
- MW 1 ⊙
- TH 32 ⊕ TH 33
- TH 26 ⊕ TH 25

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CLIENT
THE CITY OF WINNIPEG
FIGURE 1
PUBLIC MARKET SITE PLAN
APPROXIMATE BOREHOLE AND
MONITORING WELL LOCATIONS AND
SIGNIFICANT SURFACE FEATURES



NOT TO SCALE

CLIENT

THE CITY OF WINNIPEG

FIGURE 2

PUBLIC MARKET SITE PLAN
MONITORING WELL LOCATIONS
AND PIEZOMETRIC SURFACE
FOR NOVEMBER 7, 1990

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TABLES

TABLE 1

SOIL SAMPLE TEST PARAMETERS

Maximum Allowable Concentration
for Industrial Sites
(Manitoba Guidelines where applicable
remainder are Ontario MOE Guidelines)

1.0. DECOMMISSIONING GUIDELINES

pH value	6 to 8 (recommended range)
Total Kjeldahl Nitrogen	6000 ppm
Electrical Conductivity	4000 us/cm
Oil and Grease	5000 ppm
Sodium Adsorption Ratio	12 ppm
Antimony	50 ppm
Arsenic	50 ppm
Barium	2000 ppm
Beryllium	10 ppm
Cadmium	20 ppm
Chromium (total)	800 ppm
Chromium (Cr6+)	10 ppm
Cobalt	300 ppm
Lead	1000 ppm
Mercury	10 ppm
Molybdenum	40 ppm
Nickel	500 ppm
Selenium	10 ppm
Silver	40 ppm
Vanadium	250 ppm
Zinc	1500 ppm

2.0 VOLATILE ORGANIC COMPOUNDS

2.1 EPA 624

Acrolein	-
Acrylonitrile	-
Benzene	5 ppm
Bromodichloromethane	-
Bromoform	-
Bromomethane	-
Carbon Tetrachloride	50 ppm
Chlorobenzene	10 ppm
Chlorobromomethane	-
Chlorodibromomethane	-
Chloroethane ¹	-
Chloroform	50 ppm
Chloromethane	-
Dibromomethane	-

TABLE 1 - SOIL SAMPLE TEST PARAMETERS (cont'd)

Maximum Allowable Concentration
for Industrial Site
(Manitoba Guidelines where applicable
remainder are Ontario MOE Guidelines)

2.1 EPA 624 (cont'd)

1,2 - Dichlorobenzene ²	10 ppm
1,3 - Dichlorobenzene ²	10 ppm
1,4 - Dichlorobenzene ²	10 ppm
1,1 - Dichloroethane ¹	50 ppm
1,2 - Dichloroethane ¹	50 ppm
1,1 - Dichloroethene ¹	50 ppm
t-1,2 - Dichloroethene ¹	50 ppm
Dichloromethane	50 ppm
1,2 - Dichloropropane ¹	50 ppm
cis 1,3 - Dichloropropene ¹	50 ppm
tr-1,2 - Dichloropropene ¹	50 ppm
Ethylbenzene	50 ppm
Methyl Ethyl Ketene	-
Styrene	50 ppm
1,1,1,2,2 - Tetrachloroethane ¹	50 ppm
Tetrachloroethane ¹	50 ppm
Toluene	30 ppm
1,1,1 - Trichloroethane ¹	50 ppm
1,1,2 - Trichloroethane ¹	50 ppm
Trichloroethane ¹	50 ppm
Trichlorofluoromethane	-
Vinyl chloride	-
m, p & o - Xylenes	50 ppm

2.2 BTEX

Benzene	5 ppm
Ethylbenzene	50 ppm
Styrene	50 ppm
Toluene	30 ppm
m, p & o - Xylenes	50 ppm

3.0 LOSS ON IGNITION

80 000 ppm (8%)

¹Total concentration of all ethane, ethene, propane and propene compounds may not exceed 70 ppm.

²Total concentration of all chlorinated benzenes may not exceed 20 ppm.

TABLE 2

SOIL SAMPLES ANALYZED

MW1-A	BH5-B	BH15-A
MW1-B	BH5-C	BH15-B
MW2A-A	BH6-B	BH16-A
MW2A-B	BH7-A	BH16-B
MW3A-A	BH7-B	BH18-B
MW3A-B	BH8-B	BH19-A
MW4-B	BH9-A	BH19-B
MW5-A	BH9-B	BH19-C
MW5-B	BH10-A	BH20-A
BH1-B	BH10-B	BH20-B
BH2-A	GH10-C	BH20-C
BH2-B	BH11-A	BH21-B
BH2-C	BH11-B	BH22-B
BH3-A	BH12-A	BH23-A
BH3-B	BH12-B	BH23-B
BH3-C	BH13-B	BH23-C
BH4-B	BH14-A	Field Blank 1 (Sep)
BH4-C	BH14-B	Field Blank 2 (Oct)

TABLE 3

GROUND WATER TEST PARAMETERS

	Manitoba Guidelines Where Applicable Remainder are Ontario <u>MOE Guidelines</u>	<u>Canadian Water Quality Guidelines</u>
1.0 GENERAL CHEMISTRY		
Alkalinity (CaCO ₃)	-	-
pH value	-	6.5 to 8.5
Calcium	-	-
Chloride	-	250 ppm
Magnesium	-	-
Nitrate	-	45 ppm
Nitrite	-	4.5 ppm
Potassium	-	-
Sodium	-	200 ppm
Sulphate (SO ₄)	-	500 ppm
2.0 CYANIDE	100 ppb	200 ppb
3.0 HYDRIDES		
Antimony	-	under review
Arsenic	50 ppb	50 ppb
Selenium	10 ppb	10 ppb

TABLE 3: GROUND WATER TEST PARAMETERS (cont'd)

	Manitoba Guidelines Where Applicable Remainder are Ontario <u>MOE Guidelines</u>	<u>Canadian Water Quality Guidelines</u>
4.0 METALS		
Aluminum	-	under review
Barium	1000 ppb	1000 ppb
Beryllium	-	-
Cadmium	5 ppb	5 ppb
Chromium	50 ppb	50 ppb
Cobalt	50 ppb	-
Copper	100 ppb	1000 ppb
Lead	50 ppb	10 ppb
Mercury	1 ppb	1 ppb
Molybdenum	500 ppb	-
Nickel	500 ppb	-
Selenium	10 ppb	10 ppb
Silver	50 ppb	10 ppb
Thallium	-	-
Tin	500 ppb	-
Vanadium	-	-
Zinc	200 ppb	5000 ppb
5.0 OIL AND GREASE	1500 ppm	-

TABLE 3: GROUND WATER TEST PARAMETERS (cont'd)

	Manitoba Guidelines Where Applicable Remainder are Ontario <u>MOE Guidelines</u>	<u>Canadian Water Quality Guidelines</u>
6.0 VOLATIVE ORGANIC COMPOUNDS		
6.1 <u>EPA 624</u>		
Acrolein		
Acrylonitrile		
Benzene	0.5 ppb	5 ppb
Bromodichlormethane		
Bromoform		
Bromomethane		
Carbon Tetrachloride	-	5 ppb
Chlorobezene		
Chlorobromomethane		
Chlorodebromomethane		
Chloromethane		
Chloroform		
Chloromethane		
Dilaomomethane		
1,2 - Dichlorobenzene	-	200 ppb
1,3 - Dichlorobenzene		
1,4 - Dichlorobenzene	-	50 ppb
1,1 - Dichloroethane		
1,2 - Dichloroethane		
1,1 - Dichloroethene		
6-1,2 - Dichloroethene		
Dichloromethane	-	50 ppb
1,2 - Dichloropropane		
cis-1,3 - Dichloropropene		
tr-1,3 - Dichloropropene		
Ethylbenzene	-	2.4 ppb
Methyl Ethyl Ketane		
Styrene		
1,1,2,2 - Tetrachloroethane		
Tetrachlorethene		
Toluene	-	24 ppb
1,1,1 - Trichlorethane	-	under review
1,1,2 - Trichlorethane		
Trichlorofluoromethane		
Vinyl Chloride	-	under review
m, p & o Xylenes	-	300 ppb

TABLE 3: GROUND WATER TEST PARAMETERS (cont'd)

	Manitoba Guidelines Where Applicable Remainder are Ontario <u>MOE Guidelines</u>	<u>Canadian Water Quality Guidelines</u>
6.2 <u>BTEX</u>		
Benzene	0.5 ppb	5 ppb
Ethylbenzene	-	2.4 ppb
Styrene	-	-
Toluene	-	24 ppb
m, p & o Xylene	-	300 ppb

TABLE 4

POTENTIOMETRIC SURFACE ELEVATIONS

TILL AQUIFER

WELL NO.	WELL ELEVATION (m ASL)	GROUND WATER ELEVATION (m ASL)			
		Sept. 26	Oct. 1	Oct 22	Nov. 7
MW1	232.098	219.688	219.689	-	220.792
MW2	231.197	219.397	219.784	-	220.794
MW3	231.618	218.608	220.180	-	223.049
MW4	231.160	219.220	219.665	-	220.681
MW5	231.322			219.665	220.602

UPPER LIMESTONE AQUIFER

M-105	232.136	219.282	219.580	220.241	220.751
M-106	231.694	219.240	219.319	220.460	220.704
MN-19	232.675				220.417

PERCHED SILT AQUIFER

BH17	231.191	-	-	-	228.358
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APPENDIX A

FIELD PROCEDURES

1.0 DRILLING METHODOLOGY

- Prior to the drilling of any borehole, the auger flights are pressure washed with fresh water.
- All borehole drilling to a depth of 3 m is performed with 400 mm diameter hollow stem auger flights.
- Borehole drilling between 3 m below grade and the till unit may be undertaken with 125 mm diameter solid stem auger flights.
- Backfilling of the 3 m deep boreholes consists of the drill cuttings to within 0.5 m of the surface. A near surface plug of bentonite pellets is then inserted to prevent subsurface contamination by surface runoff.
- Backfilling of any deep boreholes consists of sand to 1 m above the till unit, then a 1 m bentonite plug. The remainder of the hole is backfilled with drill cuttings.

2.0 MONITORING WELL CONSTRUCTION

- All monitoring wells are constructed of 1.5 m of slotted 50 mm diameter PVC screen, wrapped in a filter cloth, placed at the bottom of the borehole. Solid 50 mm diameter PVC casing extends to the surface where it is cut off and capped at grade.
- Backfill consists of 2 m of silica sand around the well screen at the bottom of the hole. Above this is a 2 m thickness of bentonite hole plug, followed by sand backfill to within 3 m of the surface. Above this is another 2 m thickness of bentonite hole plug. The final 1 m consists of sand and drill cuttings.

3. SOIL SAMPLING METHODOLOGY

- Soil samples are retrieved at depths of 0.5 m, 1.5 m and 3.0 m below grade, or where stratigraphy changes or visible contamination is present.
- Prior to sample collection, the combustible gas concentration is recorded in the open centre stem of the auger flights, using a Gastechtor Model 1238 Hydrocarbon Gas Surveyor.
- Soil samples are collected using 50 mm diameter split spoon samplers lowered down the centre of the hollow stem auger flights, and pushed into the untouched soil beneath the open borehole.
- Split spoon samplers are pressure washed after each sample.
- Soil samples are handled only by authorized sampling personnel wearing disposable latex or vinyl laboratory gloves. A new pair is worn for each sample.
- Soil samples are removed from the split spoon and placed into appropriate sample containers. These containers are then stored in coolers at approximately 4° C. Upon return to the office the samples are placed in a freezer for temporary storage.
- After all soil sampling is complete, the samples are sorted and some are packed in ice pack equipped coolers and shipped by air to the laboratory for analysis. The remaining soil samples are kept in a frozen state pending the result of the laboratory analyses.

4.0 GROUND WATER SAMPLING METHODOLOGY

Prior to ground water sample collection, the ground water monitoring wells are purged using the following procedure.

1. The M-scope end is rinsed with distilled water, wiped off using an unused latex glove and rinsed again with distilled water. The static water level is then recorded and the M-scope rinsed and wiped off once again.
2. Based on the depth to water and the depth of the well, the volume of ground water in the well casing is calculated.
3. A dedicated bailer for the well is rinsed with distilled water and lowered down the well.
4. The well is then bailed until dry or until a volume of well water in excess of that calculated to be in the well is removed. This water is poured into a pail as it is being removed from the well.
5. Using the S-C-T meter, the salinity, conductivity and temperature of the ground water in the pail are recorded along with the pH.
6. The well is then allowed to recover while this procedure is repeated on the remaining three wells.

Steps 3 through 6 are then repeated twice on the monitoring wells, or until the wells are dry.

The monitoring wells are then allowed to recover overnight. This also allows the suspended sediment in the ground water within the well to settle out, thereby eliminating the need for filtering in the field.

The actual ground water sample collection is performed the following day, as described below.

Upon arrival at the site, a field blank of distilled water is prepared in the following manner:

- . A bailer, along with a new bottom emptying device (BED) are rinsed thoroughly with distilled water three times.
- . Distilled water is then poured through the bailer and BED into the appropriate sample bottles, while wearing a new pair of latex gloves. These sample bottles include:
 - 2 - 40 ml glass vials for EPA 624 analysis;
 - 1 - 500 ml glass bottle for oil and grease analysis;
 - 1 - 500 ml plastic bottle for cyanide analysis; and
 - 2 - 200 ml plastic bottles for decommissioning guidelines analysis.
- . The filled sample bottles are then stored in a cooler equipped with ice packs.

A ground water sample is also collected for metals analysis. In order to ensure that this analysis is representative of those metals in solution and not those contained in the sediment, filtration is required in the field for all water samples; ground water as well as the field blank.

Filtration of the metals samples consists of passing the water sample through a 0.45 um filter membrane using a vacuum filtration system. The entire system is made of nalgene so metal contamination is not possible.

To ensure that no cross contamination occurs, the following methodology is followed while wearing latex gloves (one pair for each sample).

- . The funnel into which the water sample is poured is rinsed thoroughly with distilled water prior to use, as is the vacuum flask used to collect the filtered water.
- . A portion of the field sample is passed through the system and discarded after being used to rinse the equipment.
- . The water sample is then filtered and poured into the appropriate container; a 200 ml plastic bottle.
- . The filled bottle is then stored in the cooler with the rest of the samples.
- . The filter membrane is then discarded. The funnel is rinsed with distilled water and the flask exchanged for an unused one.

Ground water samples are then collected from each of the monitoring wells, according to the following procedure.

- . The dedicated bailer, used previously to dewater the well, is rinsed with distilled water.
- . A ground water sample is then retrieved from the well with the bailer, and both the bailer and a new bottom emptying device are rinsed thoroughly. This is performed a second time.
- . Ground water is then retrieved from the well and poured directly into the appropriate sample bottles through the bottom emptying device. Latex gloves are worn during the procedure.

- . A ground water sample is passed through the vacuum filtration system, as previously outlined.
- . The filled sample bottles are then stored in a cooler equipped with ice packs.

Upon completion of sample collection, the water samples are shipped in plastic coolers, equipped with ice packs, to the laboratory for chemical analyses.

APPENDIX B

DRILL LOGS

MARKET SITE
STRATIGRAPHIC LOGS

Monitoring Well - MW1

<u>Depth Below Surface (m)</u>	<u>Formation</u>	<u>Sample Depth (m)</u>	<u>Vapour Concentration (ppm)</u>
0.0 to 0.8	Fill; grey silt with rubble, dry	0.5	125
0.8 to 0.9	Fill; concrete rubble; larger blocks		
0.9 to 1.5	Fill; grey silt, dry		
1.5 to 1.7	Fill; clay; black, dry, minor organics	1.5	50
1.7 to 3.0	Silt; tan, moist, black clay seams	3.0	200
3.0 to 17.7	Clay; grey green, mottled, silt lenses and black clay stringers, moisture content increases from dry to damp with depth		
17.7 to 18.9	Till; gravelly silt, light brown, loose, moist		

Comments

Located in the southwest corner of the property, the area was likely used as a dumping area, therefore, contamination is possible. Somewhat elevated vapour readings support this.

Drill Date - September 12, 1990

Logged By - Brent Horning, Wardrop

Monitoring Well - MW2

<u>Depth Below Surface (m)</u>	<u>Formation</u>	<u>Sample Depth (m)</u>	<u>Vapour Concentration (ppm)</u>
0.0 to 0.6	Topsoil; black silt, highly organic (grass roots), dry	0.5	20
0.6 to 1.5	Clayey Silt; black, dry	1.5	25
1.5 to 1.8	Silt; tan, dry		
1.8 to 3.4	Clay; greyish green, mottled, with minor tan silt seams, moist	3.0	75
3.4 to 13.7	Clay; grey green, damp		
13.7 to 15.9	Till; gravelly silt, light brown to tan, very wet		

Comments

This borehole was located in the southeast corner of the site in what appeared to be virgin soils. Contamination is therefore unlikely however, a rail line is in close proximity.

Drill Date - September 12, 1990

Logged By - Brent Horning, Wardrop

Monitoring Well - MW2A

<u>Depth Below Surface (m)</u>	<u>Formation</u>	<u>Sample Depth (m)</u>	<u>Vapour Concentration (ppm)</u>
0.0 to 1.0	Silt; black, dry, highly organic (grass roots), beds of grey discoloration	0.5	5
1.0 to 2.0	Silty clay; black, dry, hard	1.5	10
2.0 to 3.0	Clay; dark grey, wet	3.0	50

Comments

This borehole was drilled approximately 2 m west of MW2.

Drill Date: October 19, 1990

Logged by: Brent Horning, Wardrop

Monitoring Well - MW3

<u>Depth Below Surface (m)</u>	<u>Formation</u>	<u>Sample Depth (m)</u>	<u>Vapour Concentration (ppm)</u>
0.0 to 0.5	Fill; gravel, poorly graded, dry		
0.5 to 1.0	Fill; clayey silt, black, dry	0.5	20
1.0 to 3.0	Silty Clay; grey green clay with tan silt lenses, damp	1.5	120
3.0 to 8.0	Clay; grey green, moist, stiff	3.0	45
8.0 to 11.9	Clay; grey, wet		
11.9 to 12.0	Gravel; lense		
12.0 to 14.4	Clay; grey, minor silt and gravel lenses, wet, free water present		
14.4	Auger Refusal		

Comments

This borehole was drilled on a former railway line bed along the east side of the property. No signs of contamination could be found, however, its location may be prone to surficial contamination.

Drill Date - September 11, 1990

Logged By - Brent Horning, Wardrop
Paul Brichta, TetrES

Monitoring Well - MW3A

<u>Depth Below Surface (m)</u>	<u>Formation</u>	<u>Sample Depth (m)</u>	<u>Vapour Concentration (ppm)</u>
0.0 to 0.8	Fill; sand and gravel, fine, dry	0.5	N.D.
0.8 to 1.3	Fill; gravel and silt		
1.3 to 2.8	Silt; tan, moist	1.5	10
2.8 to 3.0	Clay; grey and brown, mottled, damp	3.0	70

Comments

This borehole was drilled approximately 2 m west of MW3.

Drill Date: October 19, 1990

Logged by: Brent Horning, Wardrop

Notes: N.D. - non detectable

Monitoring Well - MW4

<u>Depth Below Surface (m)</u>	<u>Formation</u>	<u>Sample Depth (m)</u>	<u>Vapour Concentration (ppm)</u>
0.0 to 0.8	Fill; silt, dry, black, mixed with gravel, organics and wood chips, some concrete rubble	0.5	N.D.
0.8 to 1.5	Silt; light grey with orange mottles, dry		
1.5 to 2.0	Silty Clay; grey green	1.5	20
2.0 to 15.2	Clay; grey green, damp, stiff, moisture content increasing with depth	3.0	25
15.2 to 17.7	Till; gravelly silt, with cobbles, light brown, damp, loose		

Comments

The borehole was located near the southeast corner of the concrete pads on the site. No distinct signs of contamination were in evident.

Drill Date - September 11, 1990

Logged By - Brent Horning, Wardrop
Paul Brichta, TetrES

Notes - N.D. - Non-detectable

Monitoring Well - MW5

<u>Depth Below Surface (m)</u>	<u>Formation</u>	<u>Sample Depth (m)</u>	<u>Vapour Concentration (ppm)</u>
0.0 to 1.0	Silt; black, dry	0.5	75
1.0 to 2.5	Silty clay; tan, damp	1.5	110
2.5 to 5.0	Clay; mottled grey and tan, soft, moist	3.0	100
5.0 to 15.1	Clay; grey green, soft, moisture increases with depth; some sand near base		
15.1 to 16.8	Till; tan, clayey, coarse sand and gravel, very dense, damp		

Comments

This borehole was drilled approximately 10 m southwest of the water tower.
The area showed no observable indication of soil contamination.

Drill Date: October 19, 1990

Logged by: Brent Horning, Wardrop

Borehole - BH1

<u>Depth Below Surface (m)</u>	<u>Formation</u>	<u>Sample Depth (m)</u>	<u>Vapour Concentration (ppm)</u>
0.0 to 0.5	Fill; silt, black minor gravel and organics, dry	0.5	75
0.5 to 0.6	Clayey Silt; black, some organics, dense, dry		
0.6 to 1.3	Clay; grey green, damp		
1.3 to 1.7	Silt; tan, damp	1.5	30
1.7 to 3.0	Clay; grey green, with silt lenses, damp	3.0	N.D.

Comments:

Located to the north of the former power house, no distinct surface soil contamination observed.

Drill Date - September 13, 1990

Logged By - Brent Horning, Wardrop

Notes - N.D. - Non-detectable

Borehole - BH2

<u>Depth Below Surface (m)</u>	<u>Formation</u>	<u>Sample Depth (m)</u>	<u>Vapour Concentration (ppm)</u>
0.0 to 0.6	Fill; Gravel and silt, black, dry	0.5	25
0.6 to 0.8	Silt; grey, some discoloration, moist		
0.8 to 1.5	Silt; tan, moist	1.5	10
1.5 to 2.0	Clay; grey green, dry, stiff		
2.0 to 3.0	Clay; grey and brown mottled, moist	3.0	100

Comment

Located to the south of the powerhouse, some discoloration of a silt was encountered.

Drill Date - September 13, 1990

Logged By - Brent Horning, Wardrop

Borehole - BH3

<u>Depth Below Surface (m)</u>	<u>Formation</u>	<u>Sample Depth (m)</u>	<u>Vapour Concentration (ppm)</u>
0.0 to 0.05	Asphalt		
0.05 to 0.3	Gravel; subbase		
0.3 to 1.0	Fill; silt and gravel, black, dry, no detectable odors	0.5	> 100% LEL
1.0 to 1.5	Silty Clay; black, moist		
1.5 to 2.9	Silt; tan, moist, wet at base	1.5	60% LEL
2.9 to 3.0	Clay; grey, moist, stiff	3.0	10% LEL

Comment

This borehole was located along the west edge of the lane running behind the abandoned Canada Packers plant.

Very high vapor readings were encountered, however, no noticeable odor or discoloration was evident.

Drill Date - September 13, 1990

Logged By - Brent Horning, Wardrop

Borehole - BH4

<u>Depth Below Surface (m)</u>	<u>Formation</u>	<u>Sample Depth (m)</u>	<u>Vapour Concentration (ppm)</u>
0.0 to 0.5	Fill; silt and concrete rubble, black		
0.5 to 1.4	Fill; silt and gravel, black, moist, distinct fuel oil smell	0.5	80
1.4 to 1.6	Silt; grey, minor clay, damp, fuel oil smell	1.5	110
1.6 to 2.6	Silt; deep blue grey, damp, very strong fuel oil odor		
2.6 to 3.0	Clay; grey and brown, mottled, no odor	3.0	280

Comment

This borehole was drilled approximately 20 m west of the lane running behind Canada Packers and in a vacant area to the south of the plant.

Fuel oil contamination is obvious. The thickness and degree of contamination in the silt suggests that the contamination is quite extensive.

Drill Date - September 13, 1990

Logged By - Brent Horning, Wardrop

Borehole - BH5

<u>Depth Below Surface (m)</u>	<u>Formation</u>	<u>Sample Depth (m)</u>	<u>Vapour Concentration (ppm)</u>
0.0 to 0.4	Fill; limestone cobbles and sand		
0.4 to 1.2	Fill; silt with sand and gravel, black	0.5	220
1.2 to 1.4	Clayey Silt; grey		
1.4 to 1.7	Silt; tan and grey, some clay	1.5	250
1.7 to 2.5	Silty Clay; grey, distinct fuel oil smell		
2.5 to 3.0	Clay; grey and brown	3.0	325

Comment

This borehole is located approximately 10 m west of Borehole BH4. Soil contamination by fuel oil is evident through odor and visible discoloration, however, contamination appears less than in BH4.

Drill Date - September 13, 1990

Logged By - Brent Horning, Wardrop

Borehole - BH6

<u>Depth Below Surface (m)</u>	<u>Formation</u>	<u>Sample Depth (m)</u>	<u>Vapour Concentration (ppm)</u>
0.0 to 0.4	Fill; crushed limestone gravel, yellow silt, concrete rubble		
0.4 to 1.2	Fill; silt, tan with some grey clay and organics	0.5	N.D.
1.2 to 2.2	Silt; tan, moist	1.5	30
2.2 to 3.0	Clay; grey and brown	3.0	50

Comment

This borehole was located near the center of the vacant area between the abandoned Canada Packers and Swift plants in a low disturbed area. No signs of contamination were evident.

Drill Date - September 13, 1990

Logged By - Brent Horning, Wardrop

Notes - N.D. - Non-detectable

Borehole - BH7

<u>Depth Below Surface (m)</u>	<u>Formation</u>	<u>Sample Depth (m)</u>	<u>Vapour Concentration (ppm)</u>
0.0 to 1.0	Topsoil; silt, grey, dry	0.5	55
1.0 to 1.1	Gravel		
1.1 to 1.4	Silty Clay; grey, moist, dense	1.5	85
1.4 to 2.0	Silt; tan, moist		
2.0 to 3.0	Clay; brown and grey, mottled, moist, stiff	3.0	30

Comment

The borehole was drilled in an overgrown area between the cement pads, approximately 10 m east of the lane behind the abandoned Swift plant. No signs of contamination were evident.

Drill Date - September 13, 1990

Logged By - Brent Horning, Wardrop

Borehole - BH8

<u>Depth Below Surface (m)</u>	<u>Formation</u>	<u>Sample Depth (m)</u>	<u>Vapour Concentration (ppm)</u>
0.0 to 1.2	Fill; sand and silt from former stables foundations	0.5	105
1.2 to 1.4	Fill; cobbles in silt, black, dry		
1.4 to 1.8	Silt; tan, moist	1.5	475
1.8 to 3.0	Clay; grey, moist, stiff	3.0	205

Comment

Located along the west edge of the property, between the concrete pads and the roadway behind the Swift plant, elevated vapor readings indicate the presence of contamination, however, it is most likely methane from manure.

Drill Date - September 13, 1990

Logged By - Brent Horning, Wardrop

Borehole - BH9

<u>Depth Below Surface (m)</u>	<u>Formation</u>	<u>Sample Depth (m)</u>	<u>Vapour Concentration (ppm)</u>
0.0 to 0.2	Topsoil; silt, black, dry		
0.2 to 0.5	Fill; silty clay, grey, trace gravel, dry		
0.5 to 0.6	Clay; black, highly organic, moist	0.5	N.D.
0.6 to 1.1	Silty Clay; grey, moist		
1.1 to 2.6	Silt; tan, minor grey silt streaks, damp	1.5	25
2.6 to 3.0	Clay; grey and brown mottled, moist, stiff	3.0	10

Comment

This borehole is located at the southwest corner of the concrete pad area and showed n signs of contamination.

Drill Date - September 13, 1990

Logged By - Brent Horning, Wardrop

Notes - N.D. - Non-detectable

Borehole - BH10

<u>Depth Below Surface (m)</u>	<u>Formation</u>	<u>Sample Depth (m)</u>	<u>Vapour Concentration (ppm)</u>
0.0 to 0.15	Concrete	0.5	75
0.15 to 1.7	Fill; sand and fine gravel	1.5	85
1.7 to 3.0	Clay; grey and brown mottled, moist	3.0	25

Comment

Located in one of the concrete pads, the fill underlying these pads appeared to be uncontaminated.

Drill Date - September 13, 1990

Logged By - Brent Horning, Wardrop

Borehole - BH11

<u>Depth Below Surface (m)</u>	<u>Formation</u>	<u>Sample Depth (m)</u>	<u>Vapour Concentration (ppm)</u>
0.0 to 0.5	Topsoil; silt, black, dry		
0.5 to 0.7	Silt; dry	0.5	15
0.7 to 2.0	Silt; tan with grey clay	1.5	10
2.0 to 3.0	Clay; grey and brown mottled, moist, stiff	3.0	20

Comments

Located in the southeast corner of the property. This borehole appeared to be in virgin soil with no evidence of contamination.

Drill Date - September 13, 1990

Logged By - Brent Horning, Wardrop

Borehole - BH12

<u>Depth Below Surface (m)</u>	<u>Formation</u>	<u>Sample Depth (m)</u>	<u>Vapour Concentration (ppm)</u>
0.0 to 0.7	Fill; gravel and silt	0.5	20
0.7 to 1.8	Silt and clay; grey and black, minor silt lenses, moist, very stiff	1.5	20
1.8 to 2.0	Silt; tan		
2.0 to 3.0	Clay; grey and brown, mottled, moist, stiff	3.0	15

Comment

This borehole was drilled in the southeast corner of the site in a drainage area along the railway lines. This location could result in contamination by materials from the rail line, however, no signs of this were encountered.

Drill Date - September 13, 1990

Logged By - Brent Horning, Wardrop

Borehole - BH13

<u>Depth Below Surface (m)</u>	<u>Formation</u>	<u>Sample Depth (m)</u>	<u>Vapour Concentration (ppm)</u>
0.0 to 0.5	Fill; gravel and black silt		
0.5 to 1.0	Fill; gravel and cobbles, possible railway ballast	0.5	20
1.0 to 1.6	Clay; grey green, minor tan silt lenses, stiff, moist	1.5	15
1.6 to 1.7	Clay; black, moist		
1.7 to 3.0	Clay; grey and brown mottled, stiff moist	3.0	20

Comment

This borehole was located in the northeast corner of the property along an abandoned railway line bed. Again, the location is likely to have been exposed to possible contamination, however, none was encountered.

Drill Date - September 13, 1990

Logged By - Brent Horning, Wardrop

Borehole - BH14

<u>Depth Below Surface (m)</u>	<u>Formation</u>	<u>Sample Depth (m)</u>	<u>Vapour Concentration (ppm)</u>
0.0 to 1.3	Fill; black silt	0.5	5
1.3 to 2.5	Silty Clay; tan, moist	1.5	15
2.5 to 3.0	Clay; brown and grey, mottled, small gravel lenses	3.0	10

Comment

Located to the south of the St. Boniface Hyde and Wool Company Ltd., this borehole was drilled along an old roadway. No signs of subsurface contamination were encountered.

Drill Date - September 13, 1990

Logged By - Brent Horning, Wardrop

Borehole - BH15

<u>Depth Below Surface (m)</u>	<u>Formation</u>	<u>Sample Depth (m)</u>	<u>Vapour Concentration (ppm)</u>
0.0 to 0.5	Fill; sand and gravel		
0.5 to 1.0	Clay; grey black, highly organic, dry	0.5	N.D.
1.0 to 2.0	Clay; grey green, minor silt	1.5	5
2.0 to 3.0	Clay; grey and brown, mottled	3.0	30

Comment

This borehole was located on the concrete pad to the west of the St. Boniface Hyde and Wool Company Ltd. No noticeable signs of subsurface contamination were encountered during drilling.

Drill Date - September 13, 1990
Logged By - Brent Horning, Wardrop
Notes - N.D. - Non-detectable

Borehole - BH16

<u>Depth Below Surface (m)</u>	<u>Formation</u>	<u>Sample Depth (m)</u>	<u>Vapour Concentration (ppm)</u>
0.0 to 0.1	Fill; silty clay, black, trace gravel, dry		
0.1 to 1.4	Clay; black, moist, highly organic	0.5	30
1.4 to 2.8	Silt; tan, moist	1.5	50
2.8 to 3.0	Clay; brown and grey mottled, moist, stiff	3.0	20

Comment

This borehole is located at the far west end of the property, between the abandoned Canada Packers and Swift plants, along an abandoned railway bed.

Drill Date - September 13, 1990
Logged By - Brent Horning, Wardrop

Monitoring Well - BH17

<u>Depth Below Surface (m)</u>	<u>Formation</u>	<u>Sample Depth (m)</u>	<u>Vapour Concentration (ppm)</u>
0.0 to 0.4	Rubble fill		
0.4 to 1.0	Silt fill		
1.0 to 2.5	Silt; discolored to a blue grey, perceptible fuel oil odour		
2.5 to 3.5	Clay; grey green		30% LEL

Comments

This hole was drilled in the vicinity of the boreholes BH4 and BH5. A piezometer was installed in order to determine if the fuel oil within the silt is concentrated enough to be leached out. No soil samples were collected from the borehole.

Drill Date: October 19, 1990

Logged by: Brent Horning, Wardrop

Borehole - BH18

<u>Depth Below Surface (m)</u>	<u>Formation</u>	<u>Sample Depth (m)</u>	<u>Vapour Concentration (ppm)</u>
0.0 to 0.8	Fill; black, dry silt and gravel	0.5	30
0.8 to 2.0	Silt; tan, moist	1.5	60
2.0 to 3.0	Clay; grey green, damp, stiff	3.0	9% LEL

Comments

The borehole was drilled immediately south of the concrete pads, to the north of a drainage ditch. The elevated vapour reading at the 3 m depth may be methane migrating from the ditch.

Drill Date: October 19, 1990

Logged by: Brent Horning, Wardrop

Borehole - BH19

<u>Depth Below Surface (m)</u>	<u>Formation</u>	<u>Sample Depth (m)</u>	<u>Vapour Concentration (ppm)</u>
0.0 to 1.5	Fill; black silt, minor gravel	1.5	20
1.5 to 2.0	Fill; silt and concrete rubble		
2.0 to 3.0	Fill; black silt and gravel		
3.0 to 9.0	Fill; highly organic black silt and clay, almost till-like with gravel and loose materials, straw and manure easily identifiable	4.5 9.0	5% LEL 9% LEL

Comments

This borehole was drilled in the "manure pit" area in the southwest corner of the site near geotechnical test hole TH28. As expected, large amounts of manure were found to depths of 9 m.

Drill Date: October 19, 1990

Logged by: Brent Horning, Wardrop -

Borehole - BH20

<u>Depth Below Surface (m)</u>	<u>Formation</u>	<u>Sample Depth (m)</u>	<u>Vapour Concentration (ppm)</u>
0.0 to 0.7	Silty clay, dry, grey	0.5	410
0.7 to 1.1	Clay; grey, damp		
1.1 to 2.8	Silty clay; orange and tan, mottled, damp, stiff	1.5	250
2.8 to 3.0	Silty clay; wet, orange and brown	3.0	310
3.0	Clay; dark in colour, dry		

Comments

This borehole was drilled near the centre of the western manure pile, in the soils underlying the pile. Contamination by leachate from the manure is evident as leachate could be seen on the walls of the excavated manure.

Drill Date: October 19, 1990

Logged by: Brent Horning, Wardrop

Borehole - BH21

<u>Depth Below Surface (m)</u>	<u>Formation</u>	<u>Sample Depth (m)</u>	<u>Vapour Concentration (ppm)</u>
0.0 to 0.6	Fill; dry, light grey silt and gravel	0.5	35
0.6 to 1.0	Fill; clay and manure		
1.0 to 1.5	Clay; grey green, stiff		
1.5 to 2.7	Silt; tan, moist	1.5	170
2.7 to 3.0	Clay; grey brown mottled, orange silt stringers, damp and stiff	3.0	220

Comments

This borehole was drilled on the eastern side of the above-ground manure piles, near the concrete rubble piles.

Drill Date: October 19, 1990

Logged by: Brent Horning, Wardrop

Borehole - BH22

<u>Depth Below Surface (m)</u>	<u>Formation</u>	<u>Sample Depth (m)</u>	<u>Vapour Concentration (ppm)</u>
0.0 to 0.3	Topsoil; black silt, highly organic (grass roots)	0.5	5
0.3 to 1.5	Silt; tan, dry, minor clay	1.5	25
1.5 to 3.0	Silty clay, grey and brown mottled, moist	3.0	10

Comments

This borehole was drilled in the wooded area in the southeast corner of the site, near piles of wooden rubble from buildings and railway ties. No signs of soil contamination were in evident.

Drill Date: October 19, 1990

Logged by: Brent Horning, Wardrop

Borehole - BH23

<u>Depth Below Surface (m)</u>	<u>Formation</u>	<u>Sample Depth (m)</u>	<u>Vapour Concentration (ppm)</u>
0.0 to 1.3	Topsoil; black silt, organics, (grass roots)	0.5	N.D.
1.3 to 2.5	Clay; grey and brown mottled, dry, dense	1.5	20
2.5 to 3.0	Clay; grey and brown mottled, wet	3.0	10

Comments

This borehole was drilled in the open area, in the central eastern portion of the site. No signs of contamination were visible.

Drill Date: October 19, 1990

Logged by: Brent Horning, Wardrop

Notes: N.D. - non detectable

APPENDIX C

OBSERVATIONS AND VAPOUR CONCENTRATIONS
NOTED DURING GEOTECHNICAL DRILLING

APPENDIX C
BOREHOLE STRATIGRAPHY AND VAPOUR CONCENTRATIONS

Testhole TH24

Location: East of the aboveground manure piles, near the concrete rubble pile

<u>Depth Below Surface</u> (m)	<u>Formation</u>	<u>Vapour Concentration Recorded</u> (ppm)	<u>Equivalent Methane Concentration</u> (ppm)
0.0 to 0.2	Topsoil		
0.2 to 0.7	Manure; brown, dry, decomposed		
0.7 to 3.0	Silt and Clay	100	240

Testhole TH25

Location: In "manure pit" area 10 m south of TH13

<u>Depth Below Surface</u> (m)	<u>Formation</u>	<u>Vapour Concentration Recorded</u> (ppm)	<u>Equivalent Methane Concentration</u> (ppm)
0.0 to 3.0	Fill; silt and clay, some rubble		
3.0 to 5.5	Manure Rich Fill; black, silt, clay and organics, moist red decomposed manure	220 (bagged sample)	528
	Black straw and clay mixture	60 (bagged sample)	144
5.5 to 6.0	Clay; brown and grey mottled	6% LEL	2.5% LEL

Testhole TH26

Location: 10 m south of TH25

<u>Depth Below Surface</u> (m)	<u>Formation</u>	<u>Vapour Concentration Recorded</u> (ppm)	<u>Equivalent Methane Concentration</u> (ppm)
0.0 to 3.0	Fill		
3.0 to 3.5	Clay	20	48

Testhole TH27

Location: 10 m west of TH13

<u>Depth Below Surface</u> (m)	<u>Formation</u>	<u>Vapour Concentration Recorded</u> (ppm)	<u>Equivalent Methane Concentration</u> (ppm)
0.0 to 2.8	Fill		
2.8 to 5.8	Manure Rich Fill		
5.8 to 6.7	Clay	200	480

Testhole TH28

Location: 10 m north of TH13

<u>Depth Below Surface</u> (m)	<u>Formation</u>	<u>Vapour Concentration Recorded</u> (ppm)	<u>Equivalent Methane Concentration</u> (ppm)
0.0 to 3.6	Fill		
3.6 to 8.6	Manure Rich Fill	400	960
8.6 to 9.1	Clay	16% LEL	6.7% LEL

Testhole TH29

Location: 10 m north of TH28

<u>Depth Below Surface</u> (m)	<u>Formation</u>	<u>Vapour Concentration Recorded</u> (ppm)	<u>Equivalent Methane Concentration</u> (ppm)
0.0 to 2.1	Fill		
2.1 to 6.5	Manure Rich Fill		
6.5 to 7.0	Clay	12% LEL	5.0% LEL

Testhole TH30

Location: 10 m north of TH29

<u>Depth Below Surface</u> (m)	<u>Formation</u>	<u>Vapour Concentration Recorded</u> (ppm)	<u>Equivalent Methane Concentration</u> (ppm)
0.0 to 1.8	Fill		
1.8 to 3.0	Silt and Clay	10	24

Testhole TH31

Location: 10 m east of TH13

<u>Depth Below Surface</u> (m)	<u>Formation</u>	<u>Vapour Concentration Recorded</u> (ppm)	<u>Equivalent Methane Concentration</u> (ppm)
0.0 to 0.2	Topsoil		
0.2 to 1.1	Fill		
1.1 to 2.1	Manure; brown, dry, decomposed		
2.1 to 3.3	Silt and Clay	175	420

Testhole TH32

Location: 10 m west of TH25

<u>Depth Below Surface</u> (m)	<u>Formation</u>	<u>Vapour Concentration Recorded</u> (ppm)	<u>Equivalent Methane Concentration</u> (ppm)
0.0 to 4.3	Fill; black, silt and clay, minor organics		
4.3 to 4.6	Clay	45	108

Testhole TH33

Location: 10 m east of TH25

<u>Depth Below Surface</u> (m)	<u>Formation</u>	<u>Vapour Concentration Recorded</u> (ppm)	<u>Equivalent Methane Concentration</u> (ppm)
0.0 to 3.2	Topsoil		
0.2 to 0.3	Manure; brown, dry, decomposed		
0.3 to 2.1	Fill; black, silt and clay, some manure		
2.1 to 2.9	Silt; tan		
2.9 to 3.3	Clay; mottled brown and grey	160	384

Testhole TH34

Location: 10 m west of TH29

<u>Depth Below Surface</u> (m)	<u>Formation</u>	<u>Vapour Concentration Recorded</u> (ppm)	<u>Equivalent Methane Concentration</u> (ppm)
0.0 to 2.9	Fill, manure below 1.1		
2.9 to 3.3	Clay	75	180

Testhole TH35

Location: 10 m east of TH29

<u>Depth Below Surface</u> (m)	<u>Formation</u>	<u>Vapour Concentration Recorded</u> (ppm)	<u>Equivalent Methane Concentration</u> (ppm)
0.0 to 2.6	Fill		
2.6 to 3.0	Silt and Clay	90	216

Testhole TH36

Location: Centre of western manure pile

<u>Depth Below Surface</u> (m)	<u>Formation</u>	<u>Vapour Concentration Recorded</u> (ppm)	<u>Equivalent Methane Concentration</u> (ppm)
0.0 to 1.0	Clay; grey	260	624
1.0 to 3.5	Silty Clay; mottled tan and orange		
3.5 to 3.8	Clay	475	1140

Testhole TH37

Location: Centre of southern manure pile

<u>Depth Below Surface</u> (m)	<u>Formation</u>	<u>Vapour Concentration Recorded</u> (ppm)	<u>Equivalent Methane Concentration</u> (ppm)
0.0 to 1.2	Clay		
1.2 to 2.1	Silt		
2.1 to 3.0	Clay	45	100

Testhole TH38

Location: Centralized between TH36, TH37 and TH38

<u>Depth Below Surface</u> (m)	<u>Formation</u>	<u>Vapour Concentration Recorded</u> (ppm)	<u>Equivalent Methane Concentration</u> (ppm)
0.0 to 0.6	Silt and Clay		
0.6 to 1.2	Silt		
1.2 to 3.0	Clay	180	432

Testhole TH39

Location: Centre of eastern manure pile

<u>Depth Below Surface</u> (m)	<u>Formation</u>	<u>Vapour Concentration Recorded</u> (ppm)	<u>Equivalent Methane Concentration</u> (ppm)
0.0 to 0.3	Clay		
0.3 to 0.9	Silt		
0.9 to 3.0	Clay	175	420

APPENDIX D

GROUND WATER SAMPLING DATA

GROUND WATER SAMPLING DATA

Monitoring Well MW1

Sampling Date: October 1 and 2, 1990
Approximate depth to bottom of well: 18.90 m below top of casing (TOC)
Depth to static water level: 12.409 m below top of casing (TOC)
Top of casing elevation: 232.098 m above sea level (ASL)
Ground water elevation: 219.689 m above sea level (ASL)

Ground Water Field Parameters:

	<u>First Dewatering</u>	<u>Second Dewatering</u>	<u>Third Dewatering</u>
Salinity (%)	1.0	1.0	
Conductivity (umhos)	1240	1295	dry
Temperature (°C)	8.1	9.3	
pH	7.4	7.4	

Monitoring Well MW2

Sampling Date: October 1 and 2, 1990
Approximate depth to bottom of well: 15.85 m below top of casing (TOC)
Depth to static water level: 11.413 m below top of casing (TOC)
Top of casing elevation: 231.197 m above sea level (ASL)
Ground water elevation: 219.784 m above sea level (ASL)

Ground Water Field Parameters:

	<u>First Dewatering</u>	<u>Second Dewatering</u>	<u>Third Dewatering</u>
Salinity (%)	0.9	1.0	1.0
Conductivity (umhos)	1100	1180	1195
Temperature (°C)	7.6	8.0	8.8
pH	7.6	7.5	7.5

Monitoring Well MW3

Sampling Date: October 1 and 2, 1990
Approximate depth to bottom of well: 14.43 m below top of casing (TOC)
Depth to static water level: 11.438 m below top of casing (TOC)
Top of casing elevation: 231.618 m above sea level (ASL)
Ground water elevation: 220.180 m above sea level (ASL)

Ground Water Field Parameters:

	<u>First Dewatering</u>	<u>Second Dewatering</u>	<u>Third Dewatering</u>
Salinity (%)	1.7		
Conductivity (umhos)	2095	dry	dry
Temperature (°C)	11.7		
pH	7.4		

Monitoring Well MW4

Sampling Date: October 1 and 2, 1990
Approximate depth to bottom of well: 17.68 m below top of casing (TOC)
Depth to static water level: 11.495 m below top of casing (TOC)
Top of casing elevation: 231.160 m above sea level (ASL)
Ground water elevation: 219.665 m above sea level (ASL)

Ground Water Field Parameters:

	<u>First Dewatering</u>	<u>Second Dewatering</u>	<u>Third Dewatering</u>
Salinity (%)	1.0	1.1	1.0
Conductivity (umhos)	1170	1300	1290
Temperature (°C)	8.0	8.8	8.2
pH	7.3	7.3	7.3

Field Blank

Sampling Date: October 1 and 2, 1990

Ground Water Field Parameters:

Salinity (%)	0.0
Conductivity (umhos)	21
Temperature (°C)	22.0
pH	9.1

Monitoring Well MW5

Sampling Date:	October 22 and 23, 1990
Approximate depth to bottom of well:	16.77 m below top of casing (TOC)
Depth to static water level:	11.338 m below top of casing (TOC)
Top of casing elevation:	231.322 m above sea level (ASL)
Ground water elevation:	219.984 m above sea level (ASL)

Ground Water Field Parameters:

	<u>First Dewatering</u>	<u>Second Dewatering</u>	<u>Third Dewatering</u>
Salinity ‰	1.8	1.9	1.9
Conductivity (umhos)	2020	2100	2040
Temperature (°C)	9.1	9.2	9.0
pH	7.5	7.5	7.3

APPENDIX D

SAMPLE LOGS

MARKET SITE
SAMPLE LOG

<u>Sample #</u>	<u>Depth (m)</u>	<u>Description</u>	<u>Condition</u>
<u>Monitoring Well MW1</u>			
MW1-A	0.5	Fill; silt, grey, some gravel and concrete rubble, trace organic matter (roots)	Good/test
MW1-B	1.5	Fill; silt and clay, grey, trace organic matter (wood chips)	Good/test
MW1-C	3.0	Clay; greenish grey, moist	Good/hold
<u>Monitoring Well MW2</u>			
MW2-A	0.5	Topsoil; silt, black, organic	Unknown/hold
MW2-B	1.5	Silt; clayey, tan, moist	Unknown/hold
MW2-C	3.0	Clay; grey, mottled, moist	Unknown/hold
<u>Monitoring Well MW3</u>			
MW3-A	0.5	Fill; silty, clay and gravel, black	Unknown/hold
MW3-B	1.5	Clay; silty, grey, moist	Unknown/hold
MW3-C	3.0	Clay; grey, moist	Unknown/hold
<u>Monitoring Well MW4</u>			
MW4-A	0.5	Fill; silt, black, dry, trace wood chips, trace gravel, trace concrete rubble, trace organic matter	Unknown/hold
MW4-B	1.5	Silt; clayey, light grey, dry	Good/test
MW4-C	3.0	Clay; grey, moist	Good/hold
<u>Monitoring Well MW5</u>			
MW1-A	0.5	Silt; black, 2% organics (grass roots) 5% gravel	Good/test
MW1-B	1.5	Silty clay; tan, moist, stiff	Good/test
MW1-C	3.0	Clay; mottled, moist, stiff	Good/hold

<u>Sample #</u>	<u>Depth (m)</u>	<u>Description</u>	<u>Condition</u>
<u>Borehole BH1</u>			
BH1-A	0.5	Fill; silt, black, dry, trace organics, trace gravel, trace of orange paint from surface may be present	Unknown/hold
BH1-B	1.5	Silt; tan, moist	Good/test
BH1-C	3.0	Clay; grey, moist	Unknown/hold
<u>Borehole BH2</u>			
BH2-A	0.5	Fill; silt, black, some gravel	Good/test
BH2-B	1.5	Silt; tan and grey clay, moist	Good/test
BH2-C	3.0	Clay; grey, mottled, moist	Good/test
<u>Borehole BH3</u>			
BH3-A	0.5	Fill; silt, black and gravel	Good/test
BH3-B	1.5	Silt; tan, moist, some clay, grey	Good/test
BH3-C	3.0	Silt; tan, wet, with clay, grey	Good/test
<u>Borehole BH4</u>			
BH4-A	0.5	Fill; silt, black with gravel, fine	Unknown/hold
BH4-B	1.5	Silt; grey, trace clay, grey, trace gravel, fuel oil smell	Good/test
BH4-C	3.0	Clay; grey, mottled, moist, stiff, no odour	Good/test
<u>Borehole BH5</u>			
BH5-A	0.5	Fill; silt, black and gravel	Good/hold
BH5-B	1.5	Silt; tan and silt, grey, clayey	Good/test
BH5-C	3.0	Clay; grey and brown, mottled (fuel oil smell at 2.5 m)	Good/test
<u>Borehole BH6</u>			
BH6-A	0.5	Fill; silt, tan and clay; grey, trace gravel, trace organic matter	Good/hold
BH6-B	1.5	Silt; tan, moist	Good/test
BH6-C	3.0	Clay; grey and brown, mottled	Good/hold

<u>Sample #</u>	<u>Depth (m)</u>	<u>Description</u>	<u>Condition</u>
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Borehole BH7

BH7-A	0.5	Topsoil; silt, grey and black	Good/test
BH7-B	1.5	Silt; tan, moist	Good/test
BH7-C	3.0	Clay; brown and grey, mottled, moist	Good/hold

Borehole BH8

BH8-A	0.5	Fill; silt and gravel	Good/hold
BH8-B	1.5	Silt; tan, moist	Good/test
BH8-C	3.0	Clay; grey, moist	Good/hold

Borehole BH9

BH9-A	0.5	Clay; silty, grey, dry with topsoil, organic, trace gravel	Good/test
BH9-B	1.5	Silt; tan, moist, trace silt, grey	Good/test
BH9-C	3.0	Clay; grey and brown, mottled, moist	Good/hold

Borehole BH10

BH10-A	0.5	Fill; sand, some fine gravel, dry	Good/test
BH10-B	1.5	Fill; sand, some fine gravel, dry	Good/test
BH10-C	3.0	Clay; grey and brown, mottled, moist	Good/test

Borehole BH11

BH11-A	0.5	Silt; tan	Good/test
BH11-B	1.5	Clay; grey and silt, tan	Good/test
BH11-C	3.0	Clay; grey and brown, mottled	Good/hold

Borehole BH12

BH12-A	0.5	Fill; gravel and silt	Good/test
BH12-B	1.5	Clay; silty, grey and black, stiff, moist with trace silt lenses	Good/test
BH12-C	3.0	Clay; grey and brown, mottled, moist	Good/hold

<u>Sample #</u>	<u>Depth (m)</u>	<u>Description</u>	<u>Condition</u>
<u>Borehole BH13</u>			
BH13-A	0.5	Fill; silt, black, trace gravel	Good/hold
BH13-B	1.5	Clay; grey, stiff, moist, some silt, tan	Good/test
BH13-C	3.0	Clay; grey and brown, mottled, moist, stiff	Good/hold
<u>Borehole BH14</u>			
BH14-A	0.5	Fill; silt, black	Good/test
BH14-B	1.5	Clay; silty, tan	Good/test
BH14-C	3.0	Clay; grey and brown, mottled, moist	Good/hold
<u>Borehole BH15</u>			
BH15-A	0.5	Fill; sandy gravel	Good/test
BH15-B	1.5	Clay; grey with silt	Good/test
BH15-C	3.0	Clay; grey and brown, mottled	Good/hold
<u>Borehole BH16</u>			
BH16-A	0.5	Clay; silty, dark grey, trace organics, trace gravel	Good/test
BH16-B	1.5	Silt; tan, moist	Good/test
BH16-C	3.0	Clay; grey and brown, mottled, moist	Good/hold
<u>Borehole BH17</u>		No samples collected	
<u>Borehole BH18</u>			
BH18-A	0.5	Silt; black dry, 10% gravel with 2% pebbles	Good/hold
BH18-B	1.5	Silt; tan, moist	Good/test
BH18-C	3.0	Clay; grey green, damp, stiff	Good/hold
<u>Borehole BH19</u>			
BH19-A	1.5	Fill; black silt, dry, 1% gravel, trace clay	Good/test
BH19-B	4.5	Clay; dark grey, dry, silty, highly organic with straw and manure (easily identified)	Good/test
BH19-C	9.0	Silty clay; relatively dry, trace coarse sand, highly organic	Good/test

<u>Sample #</u>	<u>Depth (m)</u>	<u>Description</u>	<u>Condition</u>
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Borehole BH20

BH20-A	0.5	Silty clay; grey, dry	Good/test
BH20-B	1.5	Silty clay; orange and tan mottled	Good/test
BH20-C	3.0	Silty clay; orange and tan, wet	Good/test

Borehole BH21

BH21-A	0.5	Silt; black, dry, 10% gravel	Good/hold
BH21-B	1.5	Silt; tan, moist	Good/test
BH21-C	3.0	Clay; grey and brown, mottled, damp stiff	Good/hold

Borehole BH22

BH22-A	0.5	Silt; tan, fine, dry	Good/hold
BH22-B	1.5	Silt; tan, damp, minor clay	Good/test
BH22-C	3.0	Clay; grey and brown mottled, moist	Good/hold

Borehole BH23

BH23-A	0.5	Silt; black, dry	Good/test
BH23-B	1.5	Clay; grey and brown mottled, dry	Good/test
BH23-C	3.0	Clay; grey and brown, wet	Good/test

Monitoring Well MW2A

MW2A-A	0.5	Silt; dry, black, some organics	Good/test
MW2B-B	1.5	Clay; damp	Good/test
MW2A-C	3.0	Clay; grey-black, wet	Good/hold

Monitoring Well MW3A

MW3A-A	0.5	Sand; dry, fine	Good/test
MW3A-B	1.5	Silt; tan, moist	Good/test
MW3A-C	3.0	Clay; grey and brown mottled	Good/hold

APPENDIX E

SOIL SAMPLE ANALYSIS

LABORATORY RESULTS

**ENVIROCLEAN**

A UNIT OF LAVALIN ENGINEERS INC.
921 Leathorne Street, London, Ontario N5Z 3M7
(519) 686-7558 Fax: (519) 686-6374

RECEIVED

OCT 04 1990

Reported: 90- 9-28

ANALYTICAL REPORT**WARDROP**

Page: 1

Client: WARDROP ENGINEERING INC

WINNIPEG

Project Number: 50901/2

P.O.:

Attention: MR ED WOOLWICH

Date Received: 90- 9-24

Client Ref. #: PROJECT # 9013950300

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A016130 Sample Description: MW1-A

Date Sampled: 90- 9-12 Time Sampled:

pH Value (Sat. Paste)	0.1	7.50	pH units
Total Kjeldahl Nitrogen	5	960.	mg/kg
Elect. Cond. on Extract	10.0	414.	us/cm
Oil & Grease (Freon)	10.0	203.	mg/kg
Sodium Absorption Ratio		0.17	mg/kg
Arsenic As	0.1	8.2	mg/kg
Barium Ba	2.0	200.	mg/kg
Beryllium Be	1.0	1.	mg/kg
Cadmium Cd	1.0	1.0	mg/kg
Chromium Cr	2.0	33.	mg/kg
Chromium Cr6+	0.1	ND	mg/kg
Cobalt Co	2.0	11.	mg/kg
Copper Cu	2.0	39.	mg/kg
Lead Pb	1.0	69.	mg/kg
Mercury Hg	0.01	0.15	mg/kg
Molybdenum Mo	2.0	ND	mg/kg
Nickel Ni	2.0	30.	mg/kg
Selenium Se	0.2	0.3	mg/kg
Silver Ag	1.0	ND	mg/kg
Vanadium V	2.0	48.	mg/kg
Zinc Zn	1.0	139.	mg/kg
Antimony Sb	1.0	0.2	mg/kg

DL: Denotes Method Detections Limit

ND: Denotes Not Detected

M. Neaves M.Sc., C.Chem



ENVIROCLEAN

A UNIT OF LAVALIN ENGINEERS INC.
921 Leathorne Street, London, Ontario N5Z 3M7
(519) 686-7558 Fax: (519) 686-6374

ANALYTICAL REPORT

Reported: 90- 9-28

Page: 1

Client: WARDROP ENGINEERING INC

WINNIPEG

Project Number: 50901/2

P.O.:

Attention: MR ED WOOLWICH

Date Received: 90- 9-24

Client Ref. #: PROJECT # 9013950300

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
----------	----------------------	-----	--------	-------	---------

90-A016131 Sample Description: MWI-B

Date Sampled: 90- 9-12 Time Sampled:

pH Value (Sat. Paste)	0.1	7.30	pH units
Total Kjeldahl Nitrogen	5	5140	mg/kg
Elect. Cond. on Extract	10.0	1960	us/cm
Oil & Grease (Freon)	10.0	160.	mg/kg
Sodium Absorption Ratio		2.78	mg/kg
Arsenic As	0.1	5.7	mg/kg
Barium Ba	2.0	203.	mg/kg
Beryllium Be	1.0	1.	mg/kg
Cadmium Cd	1.0	ND	mg/kg
Chromium Cr	2.0	33.	mg/kg
Chromium Cr6+	0.1	ND	mg/kg
Cobalt Co	2.0	11.	mg/kg
Copper Cu	2.0	31.	mg/kg
Lead Pb	1.0	37.	mg/kg
Mercury Hg	0.01	0.04	mg/kg
Molybdenum Mo	2.0	3.	mg/kg
Nickel Ni	2.0	31.	mg/kg
Selenium Se	0.2	0.7	mg/kg
Silver Ag	1.0	ND	mg/kg
Vanadium V	2.0	43.	mg/kg
Zinc Zn	1.0	93.	mg/kg
Antimony Sb	1.0	ND	mg/kg

MDL: Denotes Method Detections Limit

D: Denotes Not Detected

J.M. Neaves M.Sc., C.Chem



ENVIROCLEAN

A UNIT OF LAVALIN ENGINEERS INC.
921 Leathorne Street, London, Ontario N5Z 3M7
(519) 686-7558 Fax: (519) 686-6374

ANALYTICAL REPORT

Reported: 90-11-02

Page: 1

Client: WARDROP ENGINEERING INC

WINNIPEG

Project Number: 50901/2

P.O.:

Attention: Mr Ed Wolowich

Date Received: 90-10-24

Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
90-A019202	Sample Description: MW 2-A			Date & Time Sampled: 90-10-19	
	pH Value (Sat. Paste)	0.1	8.20	pH units	
	Total Kjeldahl Nitrogen	5	1660	mg/kg	
	Elect. Cond. on Extract	10.0	944.	us/cm	
	Oil & Grease (Freon)	10.0	108.	mg/kg	
	Sodium Absorption Ratio		2.98	mg/kg	
	Arsenic As	0.1	2.6	mg/kg	
	Barium Ba	2.0	179.	mg/kg	
	Beryllium Be	1.0	ND	mg/kg	
	Cadmium Cd	1.0	ND	mg/kg	
	Chromium Cr	2.0	33.	mg/kg	
	Chromium Cr6+	0.1	ND	mg/kg	
	Cobalt Co	2.0	12.	mg/kg	
	Copper Cu	2.0	38.	mg/kg	
	Lead Pb	1.0	38.	mg/kg	
	Mercury Hg	0.01	0.02	mg/kg	
	Molybdenum Mo	2.0	ND	mg/kg	
	Nickel Ni	2.0	38.	mg/kg	
	Selenium Se	0.2	0.2	mg/kg	
	Silver Ag	1.0	ND	mg/kg	
	Vanadium V	2.0	44.	mg/kg	
	Zinc Zn	1.0	80.	mg/kg	
	Antimony Sb	1.0	ND	mg/kg	

MDL: Denotes Method Detections Limit

ND: Denotes Not Detected

U.M. Neaves M.Sc., C.Chem



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ANALYTICAL REPORT

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Client: WARDROP ENGINEERING INC

WINNIPEG

Project Number: 50901/2

P.O.:

Attention: Mr Ed Wolowich

Date Received: 90-10-24

Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
90-A019203	Sample Description: MW 2-B			Date & Time Sampled: 90-10-19	
	pH Value (Sat. Paste)	0.1	7.50	pH units	
	Total Kjeldahl Nitrogen	5	490.	mg/kg	
	Elect. Cond. on Extract	10.0	5010	us/cm	
	Oil & Grease (Freon)	10.0	171.	mg/kg	
	Sodium Absorption Ratio		2.10	mg/kg	
	Arsenic As	0.1	5.4	mg/kg	
	Barium Ba	2.0	196.	mg/kg	
	Beryllium Be	1.0	1.	mg/kg	
	Cadmium Cd	1.0	ND	mg/kg	
	Chromium Cr	2.0	36.	mg/kg	
	Chromium Cr6+	0.1	ND	mg/kg	
	Cobalt Co	2.0	16.	mg/kg	
	Copper Cu	2.0	36.	mg/kg	
	Lead Pb	1.0	33.	mg/kg	
	Mercury Hg	0.01	0.04	mg/kg	
	Molybdenum Mo	2.0	ND	mg/kg	
	Nickel Ni	2.0	39.	mg/kg	
	Selenium Se	0.2	0.4	mg/kg	
	Silver Ag	1.0	ND	mg/kg	
	Vanadium V	2.0	49.	mg/kg	
	Zinc Zn	1.0	81.	mg/kg	
	Antimony Sb	1.0	ND	mg/kg	

MDL: Denotes Method Detections Limit

ND: Denotes Not Detected

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Client: WARDROP ENGINEERING INC

WINNIPEG

Project Number: 50901/2

P.O.:

Attention: Mr Ed Wolowich
Client Ref. #:

Date Received: 90-10-24

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
90-A019204	Sample Description: MW 3-A			Date & Time Sampled: 90-10-19	
	pH Value (Sat. Paste)	0.1	8.20	pH units	
	Total Kjeldahl Nitrogen	5	850.	mg/kg	
	Elect. Cond. on Extract	10.0	336.	us/cm	
	Oil & Grease (Freon)	10.0	214.	mg/kg	
	Sodium Absorption Ratio		0.01	mg/kg	
	Arsenic As	0.1	1.2	mg/kg	
	Barium Ba	2.0	67.	mg/kg	
	Beryllium Be	1.0	ND	mg/kg	
	Cadmium Cd	1.0	ND	mg/kg	
	Chromium Cr	2.0	5.	mg/kg	
	Chromium Cr6+	0.1	ND	mg/kg	
	Cobalt Co	2.0	3.	mg/kg	
	Copper Cu	2.0	11.	mg/kg	
	Lead Pb	1.0	44.	mg/kg	
	Mercury Hg	0.01	0.02	mg/kg	
	Molybdenum Mo	2.0	ND	mg/kg	
	Nickel Ni	2.0	8.	mg/kg	
	Selenium Se	0.2	ND	mg/kg	
	Silver Ag	1.0	ND	mg/kg	
	Vanadium V	2.0	6.	mg/kg	
	Zinc Zn	1.0	48.	mg/kg	
	Antimony Sb	1.0	ND	mg/kg	

MDL: Denotes Method Detections Limit

ND: Denotes Not Detected

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Client: WARDROP ENGINEERING INC

WINNIPEG

Project Number: 50901/2

P.O.:

Attention: Mr Ed Wolowich

Date Received: 90-10-24

Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A019205 Sample Description: MW 3-B

Date & Time Sampled: 90-10-19

pH Value (Sat. Paste)	0.1	7.90	pH Units
Total Kjeldahl Nitrogen	5	140.	mg/kg
Elect. Cond. on Extract	10.0	406.	us/cm
Oil & Grease (Freon)	10.0	173.	mg/kg
Sodium Absorption Ratio		0.28	mg/kg
Arsenic As	0.1	2.8	mg/kg
Barium Ba	2.0	57.	mg/kg
Beryllium Be	1.0	ND	mg/kg
Cadmium Cd	1.0	ND	mg/kg
Chromium Cr	2.0	13.	mg/kg
Chromium Cr6+	0.1	ND	mg/kg
Cobalt Co	2.0	5.	mg/kg
Copper Cu	2.0	13.	mg/kg
Lead Pb	1.0	9.	mg/kg
Mercury Hg	0.01	0.01	mg/kg
Molybdenum Mo	2.0	ND	mg/kg
Nickel Ni	2.0	14.	mg/kg
Selenium Se	0.2	ND	mg/kg
Silver Ag	1.0	ND	mg/kg
Vanadium V	2.0	17.	mg/kg
Zinc Zn	1.0	26.	mg/kg
Antimony Sb	1.0	ND	mg/kg

MDL: Denotes Method Detections Limit

ND: Denotes Not Detected

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Client: WARDROP ENGINEERING INC

WINNIPEG

Project Number: 50901/2

P.O.:

Attention: MR ED WOOLWICH

Date Received: 90- 9-24

Client Ref. #: PROJECT # 9013950300

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A016132 Sample Description: MW4-B

Date Sampled: 90- 9-11 Time Sampled:

pH Value (Sat. Paste)	0.1	8.00	pH units
Total Kjeldahl Nitrogen	5	250.	mg/kg
Elect. Cond. on Extract	10.0	500.	us/cm
Oil & Grease (Freon)	10.0	111.	mg/kg
Sodium Absorption Ratio		0.67	mg/kg
Arsenic As	0.1	3.6	mg/kg
Barium Ba	2.0	96.	mg/kg
Beryllium Be	1.0	ND	mg/kg
Cadmium Cd	1.0	ND	mg/kg
Chromium Cr	2.0	20.	mg/kg
Chromium Cr6+	0.1	ND	mg/kg
Cobalt Co	2.0	6.	mg/kg
Copper Cu	2.0	16.	mg/kg
Lead Pb	1.0	19.	mg/kg
Mercury Hg	0.01	0.02	mg/kg
Molybdenum Mo	2.0	ND	mg/kg
Nickel Ni	2.0	15.	mg/kg
Selenium Se	0.2	ND	mg/kg
Silver Ag	1.0	ND	mg/kg
Vanadium V	2.0	27.	mg/kg
Zinc Zn	1.0	30.	mg/kg
Antimony Sb	1.0	0.2	mg/kg

MDL: Denotes Method Detections Limit

ND: Denotes Not Detected

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Attention: Mr Ed Wolowich

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Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A019200 Sample Description: MW 5-A

Date & Time Sampled: 90-10-19

pH Value (Sat. Paste)	0.1	7.90	pH units
Total Kjeldahl Nitrogen	5	3150	mg/kg
Elect. Cond. on Extract	10.0	926.	us/cm
Oil & Grease (Freon)	10.0	178.	mg/kg
Sodium Absorption Ratio		1.11	mg/kg
Arsenic As	0.1	3.9	mg/kg
Barium Ba	2.0	318.	mg/kg
Beryllium Be	1.0	ND	mg/kg
Cadmium Cd	1.0	ND	mg/kg
Chromium Cr	2.0	10.	mg/kg
Chromium Cr6+	0.1	ND	mg/kg
Cobalt Co	2.0	5.	mg/kg
Copper Cu	2.0	75.	mg/kg
Lead Pb	1.0	139.	mg/kg
Mercury Hg	0.01	0.76	mg/kg
Molybdenum Mo	2.0	3.	mg/kg
Nickel Ni	2.0	19.	mg/kg
Selenium Se	0.2	0.4	mg/kg
Silver Ag	1.0	ND	mg/kg
Vanadium V	2.0	16.	mg/kg
Zinc Zn	1.0	83.	mg/kg
Antimony Sb	1.0	ND	mg/kg

MDL: Denotes Method Detections Limit

ND: Denotes Not Detected

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Project Number: 50901/2

P.O.:

Attention: Mr Ed Wolowich

Date Received: 90-10-24

Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
90-A019201	Sample Description: MW 5-B			Date & Time Sampled: 90-10-19	
	pH Value (Sat. Paste)	0.1	7.90	pH units	
	Total Kjeldahl Nitrogen	5	530.	mg/kg	
	Elect. Cond. on Extract	10.0	804.	us/cm	
	Oil & Grease (Freon)	10.0	111.	mg/kg	
	Sodium Absorption Ratio		1.02	mg/kg	
	Arsenic As	0.1	5.9	mg/kg	ND
	Barium Ba	2.0	223.	mg/kg	
	Beryllium Be	1.0	1.	mg/kg	
	Cadmium Cd	1.0	ND	mg/kg	
	Chromium Cr	2.0	45.	mg/kg	
	Chromium Cr6+	0.1	ND	mg/kg	
	Cobalt Co	2.0	18.	mg/kg	
	Copper Cu	2.0	42.	mg/kg	
	Lead Pb	1.0	33.	mg/kg	
	Mercury Hg	0.01	0.02	mg/kg	
	Molybdenum Mo	2.0	ND	mg/kg	
	Nickel Ni	2.0	47.	mg/kg	
	Selenium Se	0.2	ND	mg/kg	
	Silver Ag	1.0	ND	mg/kg	
	Vanadium V	2.0	63.	mg/kg	
	Zinc Zn	1.0	96.	mg/kg	
	Antimony Sb	1.0	ND	mg/kg	

MDL: Denotes Method Detection Limit

ND: Denotes Not Detected

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Client: WARDROP ENGINEERING INC

WINNIPEG

Project Number: 50901/2

P.O.:

Attention: MR ED WOOLWICH

Date Received: 90- 9-24

Client Ref. #: PROJECT # 9013950300

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A016133 Sample Description: BHI-B

Date Sampled: 90- 9-11 Time Sampled:

pH Value (Sat. Paste)	0.1	7.40	pH units
Total Kjeldahl Nitrogen	5	210.	mg/kg
Elect. Cond. on Extract	10.0	444.	us/cm
Oil & Grease (Freon)	10.0	99.6	mg/kg
Sodium Absorption Ratio		0.60	mg/kg
Arsenic As	0.1	3.5	mg/kg
Barium Ba	2.0	117.	mg/kg
Beryllium Be	1.0	1.	mg/kg
Cadmium Cd	1.0	ND	mg/kg
Chromium Cr	2.0	29.	mg/kg
Chromium Cr6+	0.1	ND	mg/kg
Cobalt Co	2.0	10.	mg/kg
Copper Cu	2.0	25.	mg/kg
Lead Pb	1.0	13.	mg/kg
Mercury Hg	0.01	0.04	mg/kg
Molybdenum Mo	2.0	ND	mg/kg
Nickel Ni	2.0	24.	mg/kg
Selenium Se	0.2	0.3	mg/kg
Silver Ag	1.0	ND	mg/kg
Vanadium V	2.0	33.	mg/kg
Zinc Zn	1.0	47.	mg/kg
Antimony Sb	1.0	ND	mg/kg

DL: Denotes Method Detections Limit

ND: Denotes Not Detected

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ANALYTICAL REPORT

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Client: WARDROP ENGINEERING INC

WINNIPEG

Project Number: 50901/2

P.O.:

Attention: MR ED WOOLWICH

Date Received: 90- 9-24

Client Ref. #: PROJECT # 9013950300

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A016134 Sample Description: BH2-A

Date Sampled: 90- 9-11 Time Sampled:

pH Value (Sat. Paste)	0.1	7.60	pH units
Total Kjeldahl Nitrogen	5	500.	mg/kg
Elect. Cond. on Extract	10.0	430.	us/cm
Oil & Grease (Freon)	10.0	39.0	mg/kg
Sodium Absorption Ratio		1.10	mg/kg
Arsenic As	0.1	2.3	mg/kg
Barium Ba	2.0	112.	mg/kg
Beryllium Be	1.0	1.	mg/kg
Cadmium Cd	1.0	ND	mg/kg
Chromium Cr	2.0	24.	mg/kg
Chromium Cr6+	0.1	ND	mg/kg
Cobalt Co	2.0	8.	mg/kg
Copper Cu	2.0	17.	mg/kg
Lead Pb	1.0	9.	mg/kg
Mercury Hg	0.01	ND	mg/kg
Molybdenum Mo	2.0	ND	mg/kg
Nickel Ni	2.0	19.	mg/kg
Selenium Se	0.2	0.7	mg/kg
Silver Ag	1.0	ND	mg/kg
Vanadium V	2.0	29.	mg/kg
Zinc Zn	1.0	42.	mg/kg
Antimony Sb	1.0	ND	mg/kg

DL: Denotes Method Detections Limit

ND: Denotes Not Detected

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Client: WARDROP ENGINEERING INC

WINNIPEG

Project Number: 50901/2

P.O.:

Attention: MR ED WOOLWICH

Date Received: 90- 9-24

Client Ref. #: PROJECT # 9013950300

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A016135 Sample Description: BH2-B

Date Sampled: 90- 9-11 Time Sampled:

pH Value (Sat. Paste)	0.1	7.60	pH units
Total Kjeldahl Nitrogen	5	230.	mg/kg
Elect. Cond. on Extract	10.0	434.	us/cm
Oil & Grease (Freon)	10.0	72.5	mg/kg
Sodium Absorption Ratio		1.57	mg/kg
Arsenic As	0.1	5.5	mg/kg
Barium Ba	2.0	110.	mg/kg
Beryllium Be	1.0	1.	mg/kg
Cadmium Cd	1.0	ND	mg/kg
Chromium Cr	2.0	24.	mg/kg
Chromium Cr6+	0.1	ND	mg/kg
Cobalt Co	2.0	10.	mg/kg
Copper Cu	2.0	25.	mg/kg
Lead Pb	1.0	22.	mg/kg
Mercury Hg	0.01	ND	mg/kg
Molybdenum Mo	2.0	2.	mg/kg
Nickel Ni	2.0	25.	mg/kg
Selenium Se	0.2	0.4	mg/kg
Silver Ag	1.0	ND	mg/kg
Vanadium V	2.0	38.	mg/kg
Zinc Zn	1.0	41.	mg/kg
Antimony Sb	1.0	ND	mg/kg

MDL: Denotes Method Detections Limit

ND: Denotes Not Detected

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Client: WARDROP ENGINEERING INC

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P.O.:

Attention: MR ED WOOLWICH

Date Received: 90- 9-24

Client Ref. #: PROJECT # 9013950300

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A016136 Sample Description: BH2-C

Date Sampled: 90- 9-11 Time Sampled:

pH Value (Sat. Paste)	0.1	7.20	pH units
Total Kjeldahl Nitrogen	5	610.	mg/kg
Elect. Cond. on Extract	10.0	1080	us/cm
Oil & Grease (Freon)	10.0	129.	mg/kg
Sodium Absorption Ratio		1.57	mg/kg
Arsenic As	0.1	6.3	mg/kg
Barium Ba	2.0	214.	mg/kg
Beryllium Be	1.0	2.	mg/kg
Cadmium Cd	1.0	1.2	mg/kg
Chromium Cr	2.0	54.	mg/kg
Chromium Cr6+	0.1	ND	mg/kg
Cobalt Co	2.0	19.	mg/kg
Copper Cu	2.0	50.	mg/kg
Lead Pb	1.0	45.	mg/kg
Mercury Hg	0.01	0.02	mg/kg
Molybdenum Mo	2.0	2.	mg/kg
Nickel Ni	2.0	45.	mg/kg
Selenium Se	0.2	0.4	mg/kg
Silver Ag	1.0	ND	mg/kg
Vanadium V	2.0	71.	mg/kg
Zinc Zn	1.0	115.	mg/kg
Antimony Sb	1.0	ND	mg/kg

MDL: Denotes Method Detections Limit

ND: Denotes Not Detected

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Client: WARDROP ENGINEERING INC

WINNIPEG

Project Number: 50901/2

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Attention: MR ED WOOLWICH

Date Received: 90- 9-24

Client Ref. #: PROJECT # 9013950300

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A016137 Sample Description: BH3-A

Date Sampled: 90- 9-13 Time Sampled:

Cyanide	0.1	ND	mg/kg
pH Value (Sat. Paste)	0.1	7.40	pH units
Total Kjeldahl Nitrogen	5	1460	mg/kg
Elect. Cond. on Extract	10.0	620.	us/cm
Oil & Grease (Freon)	10.0	2680	mg/kg
Sodium Absorption Ratio		1.00	mg/kg
Arsenic As	0.1	4.3	mg/kg
Barium Ba	2.0	231.	mg/kg
Beryllium Be	1.0	ND	mg/kg
Cadmium Cd	1.0	ND	mg/kg
Chromium Cr	2.0	15.	mg/kg
Chromium Cr6+	0.1	ND	mg/kg
Cobalt Co	2.0	5.	mg/kg
Copper Cu	2.0	117.	mg/kg
Lead Pb	1.0	903.	mg/kg
Mercury Hg	0.01	0.06	mg/kg
Molybdenum Mo	2.0	ND	mg/kg
Nickel Ni	2.0	13.	mg/kg
Selenium Se	0.2	ND	mg/kg
Silver Ag	1.0	ND	mg/kg
Vanadium V	2.0	19.	mg/kg
Zinc Zn	1.0	43.	mg/kg
Antimony Sb	1.0	0.7	mg/kg

DL: Denotes Method Detections Limit

ND: Denotes Not Detected

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Client: WARDROP ENGINEERING INC

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Attention: MR ED WOOLWICH

Date Received: 90- 9-24

Client Ref. #: PROJECT # 9013950300

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A016138 Sample Description: BH3-B

Date Sampled: 90- 9-12 Time Sampled:

Cyanide	0.1	ND	mg/kg
pH Value (Sat. Paste)	0.1	7.30	pH units
Total Kjeldahl Nitrogen	5	590.	mg/kg
Elect. Cond. on Extract	10.0	696.	us/cm
Oil & Grease (Freon)	10.0	105.	mg/kg
Sodium Absorption Ratio		2.00	mg/kg
Arsenic As	0.1	7.4	mg/kg
Barium Ba	2.0	174.	mg/kg
Beryllium Be	1.0	1.	mg/kg
Cadmium Cd	1.0	ND	mg/kg
Chromium Cr	2.0	43.	mg/kg
Chromium Cr6+	0.1	ND	mg/kg
Cobalt Co	2.0	14.	mg/kg
Copper Cu	2.0	34.	mg/kg
Lead Pb	1.0	36.	mg/kg
Mercury Hg	0.01	ND	mg/kg
Molybdenum Mo	2.0	ND	mg/kg
Nickel Ni	2.0	37.	mg/kg
Selenium Se	0.2	ND	mg/kg
Silver Ag	1.0	ND	mg/kg
Vanadium V	2.0	60.	mg/kg
Zinc Zn	1.0	81.	mg/kg
Antimony Sb	1.0	ND	mg/kg

DL: Denotes Method Detections Limit

ND: Denotes Not Detected

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Attention: MR ED WOOLWICH

Date Received: 90- 9-24

Client Ref. #: PROJECT # 9013950300

Sample Type: Solids

Sample #	Analytical Parameter	MOL	Result	Units	Comment
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90-A016139 Sample Description: BH3-C

Date Sampled: 90- 9-12 Time Sampled:

Cyanide	0.1	ND	mg/kg
pH Value (Sat. Paste)	0.1	7.60	pH units
Total Kjeldahl Nitrogen	5	290.	mg/kg
Elect. Cond. on Extract	10.0	419.	us/cm
Oil & Grease (Freon)	10.0	106.	mg/kg
Sodium Absorption Ratio		2.48	mg/kg
Arsenic As	0.1	4.0	mg/kg
Barium Ba	2.0	334.	mg/kg
Beryllium Be	1.0	1.	mg/kg
Cadmium Cd	1.0	ND	mg/kg
Chromium Cr	2.0	58.	mg/kg
Chromium Cr6+	0.1	ND	mg/kg
Cobalt Co	2.0	20.	mg/kg
Copper Cu	2.0	48.	mg/kg
Lead Pb	1.0	37.	mg/kg
Mercury Hg	0.01	ND	mg/kg
Molybdenum Mo	2.0	2.	mg/kg
Nickel Ni	2.0	47.	mg/kg
Selenium Se	0.2	0.2	mg/kg
Silver Ag	1.0	ND	mg/kg
Vanadium V	2.0	62.	mg/kg
Zinc Zn	1.0	94.	mg/kg
Antimony Sb	1.0	ND	mg/kg

DL: Denotes Method Detections Limit

ND: Denotes Not Detected

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Client: WARDROP ENGINEERING INC

WINNIPEG

Project Number: 50901/2

P.O.:

Attention: MR ED WOOLWICH

Date Received: 90- 9-24

Client Ref. #: PROJECT # 9013950300

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-AC16140 Sample Description: BH4-B

Date Sampled: 90- 9-13 Time Sampled:

pH Value (Sat. Paste)	0.1	7.50	pH units	
Total Kjeldahl Nitrogen	5	350.	mg/kg	
Elect. Cond. on Extract	10.0	431.	us/cm	
Oil & Grease (Freon)	10.0	1050	mg/kg	
Sodium Absorption Ratio		0.56	mg/kg	duplicate
Arsenic As	0.1	4.1	mg/kg	
Barium Ba	2.0	164.	mg/kg	
Beryllium Be	1.0	1.	mg/kg	
Cadmium Cd	1.0	ND	mg/kg	
Chromium Cr	2.0	36.	mg/kg	
Chromium Cr6+	0.1	ND	mg/kg	
Cobalt Co	2.0	12.	mg/kg	
Copper Cu	2.0	27.	mg/kg	
Lead Pb	1.0	10.	mg/kg	
Mercury Hg	0.01	ND	mg/kg	
Molybdenum Mo	2.0	ND	mg/kg	
Nickel Ni	2.0	31.	mg/kg	
Selenium Se	0.2	0.9	mg/kg	
Silver Ag	1.0	ND	mg/kg	
Vanadium V	2.0	44.	mg/kg	
Zinc Zn	1.0	63.	mg/kg	
Antimony Sb	1.0	ND	mg/kg	

MDL: Denotes Method Detection Limit

ND: Denotes Not Detected

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WINNIPEG

Project Number: 50901/2

P.O.:

Attention: MR ED WOOLWICH

Date Received: 90- 9-24

Client Ref. #: PROJECT # 9013950300

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A016141 Sample Description: BH4-C

Date Sampled: 90- 9-13 Time Sampled:

pH Value (Sat. Paste)	0.1	7.40	pH units
Total Kjeldahl Nitrogen	5	760.	mg/kg
Elect. Cond. on Extract	10.0	696.	us/cm
Oil & Grease (Freon)	10.0	68.0	mg/kg
Sodium Absorption Ratio		1.14	mg/kg
Arsenic As	0.1	6.7	mg/kg
Barium Ba	2.0	229.	mg/kg
Beryllium Be	1.0	2.	mg/kg
Cadmium Cd	1.0	1.3	mg/kg
Chromium Cr	2.0	60.	mg/kg
Chromium Cr6+	0.1	ND	mg/kg
Cobalt Co	2.0	19.	mg/kg
Copper Cu	2.0	49.	mg/kg
Lead Pb	1.0	15.	mg/kg
Mercury Hg	0.01	0.02	mg/kg
Molybdenum Mo	2.0	3.	mg/kg
Nickel Ni	2.0	60.	mg/kg
Selenium Se	0.2	0.3	mg/kg
Silver Ag	1.0	ND	mg/kg
Vanadium V	2.0	80.	mg/kg
Zinc Zn	1.0	115.	mg/kg
Antimony Sb	1.0	ND	mg/kg

DL: Denotes Method Detections Limit

ND: Denotes Not Detected

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Attention: MR ED WOOLWICH

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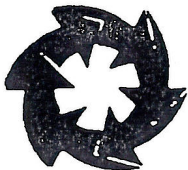
Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
90-A016142	Sample Description: BHS-B				Date Sampled: 90- 9-13 Time Sampled:
	pH Value (Sat. Paste)	0.1	8.10	pH units	
	Total Kjeldahl Nitrogen	5	700.	mg/kg	
	Elect. Cond. on Extract	10.0	676.	us/cm	
	Oil & Grease (Freon)	10.0	75.0	mg/kg	
	Sodium Absorption Ratio		0.97	mg/kg	
	Arsenic As	0.1	3.9	mg/kg	
	Barium Ba	2.0	99.	mg/kg	
	Beryllium Be	1.0	1.	mg/kg	
	Cadmium Cd	1.0	ND	mg/kg	
	Chromium Cr	2.0	21.	mg/kg	
	Chromium Cr6+	0.1	ND	mg/kg	
	Cobalt Co	2.0	9.	mg/kg	
	Copper Cu	2.0	20.	mg/kg	
	Lead Pb	1.0	13.	mg/kg	
	Mercury Hg	0.01	0.02	mg/kg	
	Molybdenum Mo	2.0	4.	mg/kg	
	Nickel Ni	2.0	21.	mg/kg	
	Selenium Se	0.2	0.3	mg/kg	
	Silver Ag	1.0	ND	mg/kg	
	Vanadium V	2.0	33.	mg/kg	
	Zinc Zn	1.0	38.	mg/kg	
	Antimony Sb	1.0	ND	mg/kg	

MDL: Denotes Method Detection Limit

ND: Denotes Not Detected

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Attention: MR ED WOOLWICH

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Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A016143 Sample Description: BH5-C

Date Sampled: 90- 9-13 Time Sampled:

pH Value (Sat. Paste)	0.1	7.40	pH units
Total Kjeldahl Nitrogen	5	790.	mg/kg
Elect. Cond. on Extract	10.0	780.	us/cm
Oil & Grease (Freon)	10.0	175.	mg/kg
Sodium Absorption Ratio		1.46	mg/kg
Arsenic As	0.1	5.8	mg/kg
Barium Ba	2.0	509.	mg/kg
Beryllium Be	1.0	2.	mg/kg
Cadmium Cd	1.0	1.3	mg/kg
Chromium Cr	2.0	46.	mg/kg
Chromium Cr6+	0.1	ND	mg/kg
Cobalt Co	2.0	15.	mg/kg
Copper Cu	2.0	56.	mg/kg
Lead Pb	1.0	43.	mg/kg
Mercury Hg	0.01	0.02	mg/kg
Molybdenum Mo	2.0	3.	mg/kg
Nickel Ni	2.0	50.	mg/kg
Selenium Se	0.2	1.0	mg/kg
Silver Ag	1.0	ND	mg/kg
Vanadium V	2.0	68.	mg/kg
Zinc Zn	1.0	102.	mg/kg
Antimony Sb	1.0	ND	mg/kg

MDL: Denotes Method Detections Limit

ND: Denotes Not Detected

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Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A016144 Sample Description: BH6-B

Date Sampled: 90- 9-13 Time Sampled:

Cyanide	0.1	ND	mg/kg
pH Value (Sat. Paste)	0.1	7.50	pH units
Total Kjeldahl Nitrogen	5	100.	mg/kg
Elect. Cond. on Extract	10.0	985.	us/cm
Oil & Grease (Freon)	10.0	58.0	mg/kg
Sodium Absorption Ratio		1.78	mg/kg
Arsenic As	0.1	4.5	mg/kg
Barium Ba	2.0	81.	mg/kg
Beryllium Be	1.0	ND	mg/kg
Cadmium Cd	1.0	ND	mg/kg
Chromium Cr	2.0	21.	mg/kg
Chromium Cr6+	0.1	ND	mg/kg
Cobalt Co	2.0	9.	mg/kg
Copper Cu	2.0	21.	mg/kg
Lead Pb	1.0	17.	mg/kg
Mercury Hg	0.01	ND	mg/kg
Molybdenum Mo	2.0	ND	mg/kg
Nickel Ni	2.0	23.	mg/kg
Selenium Se	0.2	0.5	mg/kg
Silver Ag	1.0	ND	mg/kg
Vanadium V	2.0	30.	mg/kg
Zinc Zn	1.0	41.	mg/kg
Antimony Sb	1.0	ND	mg/kg

DL: Denotes Method Detections Limit

ND: Denotes Not Detected

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Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A016145 Sample Description: BH7-A

Date Sampled: 90- 9-12 Time Sampled:

pH Value (Sat. Paste)	0.1	7.30	pH units
Total Kjeldahl Nitrogen	5	1590	mg/kg
Elect. Cond. on Extract	10.0	984.	us/cm
Oil & Grease (Freon)	10.0	53.0	mg/kg
Sodium Absorption Ratio		1.15	mg/kg
Arsenic As	0.1	5.2	mg/kg
Barium Ba	2.0	172.	mg/kg
Beryllium Be	1.0	2.	mg/kg
Cadmium Cd	1.0	1.0	mg/kg
Chromium Cr	2.0	54.	mg/kg
Chromium Cr6+	0.1	ND	mg/kg
Cobalt Co	2.0	17.	mg/kg
Copper Cu	2.0	32.	mg/kg
Lead Pb	1.0	44.	mg/kg
Mercury Hg	0.01	ND	mg/kg
Molybdenum Mo	2.0	ND	mg/kg
Nickel Ni	2.0	42.	mg/kg
Selenium Se	0.2	0.6	mg/kg
Silver Ag	1.0	ND	mg/kg
Vanadium V	2.0	72.	mg/kg
Zinc Zn	1.0	111.	mg/kg
Antimony Sb	1.0	ND	mg/kg

MDL: Denotes Method Detections Limit

ND: Denotes Not Detected

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Attention: MR ED WOOLWICH

Date Received: 90- 9-24

Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A016146 Sample Description: BH7-B

Date Sampled: 90- 9-12 Time Sampled:

pH Value (Sat. Paste)	0.1	7.40	pH units
Total Kjeldahl Nitrogen	5	690.	mg/kg
Elect. Cond. on Extract	10.0	1460	us/cm
Oil & Grease (Freon)	10.0	78.5	mg/kg
Sodium Absorption Ratio		1.03	mg/kg
Arsenic As	0.1	4.9	mg/kg
Barium Ba	2.0	126.	mg/kg
Beryllium Be	1.0	1.	mg/kg
Cadmium Cd	1.0	ND	mg/kg
Chromium Cr	2.0	46.	mg/kg
Chromium Cr6+	0.1	ND	mg/kg
Cobalt Co	2.0	16.	mg/kg
Copper Cu	2.0	33.	mg/kg
Lead Pb	1.0	10.	mg/kg
Mercury Hg	0.01	ND	mg/kg
Molybdenum Mo	2.0	2.	mg/kg
Nickel Ni	2.0	41.	mg/kg
Selenium Se	0.2	0.3	mg/kg
Silver Ag	1.0	ND	mg/kg
Vanadium V	2.0	67.	mg/kg
Zinc Zn	1.0	94.	mg/kg
Antimony Sb	1.0	ND	mg/kg

MDL: Denotes Method Detections Limit

ND: Denotes Not Detected

I.M. Heaves M.Sc., C.Chem



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Date Received: 90- 9-24

Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
90-A016147	Sample Description: B8-B				Date Sampled: 90- 9-12 Time Sampled:
	Cyanide	0.1	ND	mg/kg	
	pH Value (Sat. Paste)	0.1	7.70	pH units	
	Total Kjeldahl Nitrogen	5	220.	mg/kg	
	Elect. Cond. on Extract	10.0	1430	us/cm	
	Oil & Grease (Freon)	10.0	73.8	mg/kg	
	Sodium Absorption Ratio		1.06	mg/kg	
	Arsenic As	0.1	3.6	mg/kg	
	Barium Ba	2.0	125.	mg/kg	
	Beryllium Be	1.0	ND	mg/kg	
	Cadmium Cd	1.0	ND	mg/kg	
	Chromium Cr	2.0	19.	mg/kg	
	Chromium Cr6+	0.1	ND	mg/kg	
	Cobalt Co	2.0	6.	mg/kg	
	Copper Cu	2.0	15.	mg/kg	
	Lead Pb	1.0	9.	mg/kg	
	Mercury Hg	0.01	ND	mg/kg	
	Molybdenum Mo	2.0	ND	mg/kg	
	Nickel Ni	2.0	15.	mg/kg	
	Selenium Se	0.2	ND	mg/kg	
	Silver Ag	1.0	ND	mg/kg	
	Vanadium V	2.0	25.	mg/kg	
	Zinc Zn	1.0	29.	mg/kg	
	Antimony Sb	1.0	ND	mg/kg	

MDL: Denotes Method Detection Limit

ND: Denotes Not Detected

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Attention: MR ED WOOLWICH

Date Received: 90- 9-24

Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A016148 Sample Description: BH9-A

Date Sampled: 90- 9-12 Time Sampled:

pH Value (Sat. Paste)	0.1	7.30	pH units
Total Kjeldahl Nitrogen	5	1570	mg/kg
Elect. Cond. on Extract	10.0	4820	us/cm
Oil & Grease (Freon)	10.0	139.	mg/kg
Sodium Absorption Ratio		7.31	mg/kg
Arsenic As	0.1	7.6	mg/kg
Barium Ba	2.0	225.	mg/kg
Beryllium Be	1.0	1.	mg/kg
Cadmium Cd	1.0	1.2	mg/kg
Chromium Cr	2.0	44.	mg/kg
Chromium Cr6+	0.1	ND	mg/kg
Cobalt Co	2.0	15.	mg/kg
Copper Cu	2.0	34.	mg/kg
Lead Pb	1.0	34.	mg/kg
Mercury Hg	0.01	0.04	mg/kg
Molybdenum Mo	2.0	ND	mg/kg
Nickel Ni	2.0	39.	mg/kg
Selenium Se	0.2	ND	mg/kg
Silver Ag	1.0	ND	mg/kg
Vanadium V	2.0	73.	mg/kg
Zinc Zn	1.0	87.	mg/kg
Antimony Sb	1.0	ND	mg/kg

DL: Denotes Method Detections Limit

ND: Denotes Not Detected

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Date Received: 90- 9-24

Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A016149 Sample Description: BH9-B

Date Sampled: 90- 9-12 Time Sampled:

pH Value (Sat. Paste)	0.1	7.50	pH units
Total Kjeldahl Nitrogen	5	120.	mg/kg
Elect. Cond. on Extract	10.0	2860	us/cm
Oil & Grease (Freon)	10.0	44.7	mg/kg
Sodium Absorption Ratio		4.99	mg/kg
Arsenic As	0.1	3.8	mg/kg
Barium Ba	2.0	100.	mg/kg
Beryllium Be	1.0	ND	mg/kg
Cadmium Cd	1.0	ND	mg/kg
Chromium Cr	2.0	21.	mg/kg
Chromium Cr6+	0.1	ND	mg/kg
Cobalt Co	2.0	7.	mg/kg
Copper Cu	2.0	18.	mg/kg
Lead Pb	1.0	16.	mg/kg
Mercury Hg	0.01	ND	mg/kg
Molybdenum Mo	2.0	ND	mg/kg
Nickel Ni	2.0	17.	mg/kg
Selenium Se	0.2	ND	mg/kg
Silver Ag	1.0	ND	mg/kg
Vanadium V	2.0	28.	mg/kg
Zinc Zn	1.0	30.	mg/kg
Antimony Sb	1.0	ND	mg/kg

MDL: Denotes Method Detections Limit

ND: Denotes Not Detected

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Attention: MR ED WOOLWICH

Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A016150 Sample Description: BH10-A

Date Sampled: 90- 9-12 Time Sampled:

pH Value (Sat. Paste)	0.1	7.60	pH units	
Total Kjeldahl Nitrogen	5	1490	mg/kg	
Elect. Cond. on Extract	10.0	670.	us/cm	
Oil & Grease (Freon)	10.0	93.2	mg/kg	
Sodium Absorption Ratio		0.89	mg/kg	duplicate
Arsenic As	0.1	4.2	mg/kg	
Barium Ba	2.0	243.	mg/kg	
Beryllium Be	1.0	1.	mg/kg	
Cadmium Cd	1.0	ND	mg/kg	
Chromium Cr	2.0	25.	mg/kg	
Chromium Cr6+	0.1	ND	mg/kg	
Cobalt Co	2.0	8.	mg/kg	
Copper Cu	2.0	27.	mg/kg	
Lead Pb	1.0	29.	mg/kg	
Mercury Hg	0.01	0.04	mg/kg	
Molybdenum Mo	2.0	ND	mg/kg	
Nickel Ni	2.0	21.	mg/kg	
Selenium Se	0.2	0.2	mg/kg	
Silver Ag	1.0	ND	mg/kg	
Vanadium V	2.0	34.	mg/kg	
Zinc Zn	1.0	62.	mg/kg	
Antimony Sb	1.0	ND	mg/kg	

MDL: Denotes Method Detection Limit

ND: Denotes Not Detected

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Attention: MR ED WOOLWICH

Date Received: 90- 9-24

Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A016151 Sample Description: BH10-B

Date Sampled: 90- 9-12 Time Sampled:

pH Value (Sat. Paste)	0.1	8.00	pH units
Total Kjeldahl Nitrogen	5	190.	mg/kg
Elect. Cond. on Extract	10.0	656.	us/cm
Oil & Grease (Freon)	10.0	56.8	mg/kg
Sodium Absorption Ratio		0.50	mg/kg
Arsenic As	0.1	2.7	mg/kg
Barium Ba	2.0	48.	mg/kg
Beryllium Be	1.0	ND	mg/kg
Cadmium Cd	1.0	ND	mg/kg
Chromium Cr	2.0	12.	mg/kg
Chromium Cr6+	0.1	ND	mg/kg
Cobalt Co	2.0	5.	mg/kg
Copper Cu	2.0	11.	mg/kg
Lead Pb	1.0	4.	mg/kg
Mercury Hg	0.01	ND	mg/kg
Molybdenum Mo	2.0	ND	mg/kg
Nickel Ni	2.0	9.	mg/kg
Selenium Se	0.2	ND	mg/kg
Silver Ag	1.0	ND	mg/kg
Vanadium V	2.0	12.	mg/kg
Zinc Zn	1.0	24.	mg/kg
Antimony Sb	1.0	2.0	mg/kg

DL: Denotes Method Detections Limit

ND: Denotes Not Detected

M. Neaves M.Sc., C.Chem



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ANALYTICAL REPORT

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Client: WARDROP ENGINEERING INC

WINNIPEG

Project Number: 50901/2

P.O.:

Attention: MR ED WOOLWICH

Date Received: 90- 9-24

Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A016152 Sample Description: BH10-C

Date Sampled: 90- 9-12 Time Sampled:

pH Value (Sat. Paste)	0.1	7.50	pH units
Total Kjeldahl Nitrogen	5	540.	mg/kg
Elect. Cond. on Extract	10.0	1270	us/cm
Oil & Grease (Freon)	10.0	64.5	mg/kg
Sodium Absorption Ratio		0.98	mg/kg
Arsenic As	0.1	7.3	mg/kg
Barium Ba	2.0	225.	mg/kg
Beryllium Be	1.0	2.	mg/kg
Cadmium Cd	1.0	1.1	mg/kg
Chromium Cr	2.0	59.	mg/kg
Chromium Cr6+	0.1	ND	mg/kg
Cobalt Co	2.0	20.	mg/kg
Copper Cu	2.0	54.	mg/kg
Lead Pb	1.0	49.	mg/kg
Mercury Hg	0.01	0.04	mg/kg
Molybdenum Mo	2.0	4.	mg/kg
Nickel Ni	2.0	56.	mg/kg
Selenium Se	0.2	0.6	mg/kg
Silver Ag	1.0	ND	mg/kg
Vanadium V	2.0	78.	mg/kg
Zinc Zn	1.0	116.	mg/kg
Antimony Sb	1.0	ND	mg/kg

MDL: Denotes Method Detections Limit

ND: Denotes Not Detected

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Attention: MR ED WOOLWICH

Date Received: 90- 9-24

Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A016153 Sample Description: BH11-A

Date Sampled: 90- 9-12 Time Sampled:

pH Value (Sat. Paste)	0.1	8.00	pH units
Total Kjeldahl Nitrogen	5	630.	mg/kg
Elect. Cond. on Extract	10.0	1750	us/cm
Oil & Grease (Freon)	10.0	25.3	mg/kg
Sodium Absorption Ratio		3.98	mg/kg
Arsenic As	0.1	6.5	mg/kg
Barium Ba	2.0	208.	mg/kg
Beryllium Be	1.0	1.	mg/kg
Cadmium Cd	1.0	1.1	mg/kg
Chromium Cr	2.0	44.	mg/kg
Chromium Cr6+	0.1	ND	mg/kg
Cobalt Co	2.0	14.	mg/kg
Copper Cu	2.0	36.	mg/kg
Lead Pb	1.0	14.	mg/kg
Mercury Hg	0.01	0.04	mg/kg
Molybdenum Mo	2.0	2.	mg/kg
Nickel Ni	2.0	36.	mg/kg
Selenium Se	0.2	0.3	mg/kg
Silver Ag	1.0	ND	mg/kg
Vanadium V	2.0	67.	mg/kg
Zinc Zn	1.0	81.	mg/kg
Antimony Sb	1.0	ND	mg/kg

MDL: Denotes Method Detections Limit

ND: Denotes Not Detected

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Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A016154 Sample Description: BH11-B

Date Sampled: 90- 9-12 Time Sampled:

pH Value (Sat. Paste)	0.1	8.00	pH units
Total Kjeldahl Nitrogen	5	580.	mg/kg
Elect. Cond. on Extract	10.0	1880	us/cm
Oil & Grease (Freon)	10.0	63.3	mg/kg
Sodium Absorption Ratio		5.25	mg/kg
Arsenic As	0.1	6.9	mg/kg
Barium Ba	2.0	243.	mg/kg
Beryllium Be	1.0	1.	mg/kg
Cadmium Cd	1.0	1.0	mg/kg
Chromium Cr	2.0	45.	mg/kg
Chromium Cr6+	0.1	ND	mg/kg
Cobalt Co	2.0	18.	mg/kg
Copper Cu	2.0	44.	mg/kg
Lead Pb	1.0	33.	mg/kg
Mercury Hg	0.01	0.04	mg/kg
Molybdenum Mo	2.0	ND	mg/kg
Nickel Ni	2.0	44.	mg/kg
Selenium Se	0.2	0.3	mg/kg
Silver Ag	1.0	1.	mg/kg
Vanadium V	2.0	62.	mg/kg
Zinc Zn	1.0	94.	mg/kg
Antimony Sb	1.0	ND	mg/kg

MDL: Denotes Method Detections Limit

ND: Denotes Not Detected

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Attention: MR ED WOOLWICH

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Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A016155 Sample Description: BH12-A

Date Sampled: 90- 9-12 Time Sampled:

Cyanide	0.1	ND	mg/kg
pH Value (Sat. Paste)	0.1	7.60	pH units
Total Kjeldahl Nitrogen	5	970.	mg/kg
Elect. Cond. on Extract	10.0	470.	us/cm
Oil & Grease (Freon)	10.0	50.5	mg/kg
Sodium Absorption Ratio		1.31	mg/kg
Arsenic As	0.1	6.2	mg/kg
Barium Ba	2.0	194.	mg/kg
Beryllium Be	1.0	1.	mg/kg
Cadmium Cd	1.0	1.2	mg/kg
Chromium Cr	2.0	35.	mg/kg
Chromium Cr6+	0.1	ND	mg/kg
Cobalt Co	2.0	13.	mg/kg
Copper Cu	2.0	38.	mg/kg
Lead Pb	1.0	37.	mg/kg
Mercury Hg	0.01	0.04	mg/kg
Molybdenum Mo	2.0	ND	mg/kg
Nickel Ni	2.0	36.	mg/kg
Selenium Se	0.2	0.3	mg/kg
Silver Ag	1.0	ND	mg/kg
Vanadium V	2.0	50.	mg/kg
Zinc, Zn	1.0	80.	mg/kg
Antimony Sb	1.0	ND	mg/kg

DL: Denotes Method Detections Limit

ND: Denotes Not Detected

J.M. Neaves M.Sc., C.Chem



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Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A016156 Sample Description: BH12-B

Date Sampled: 90- 9-12 Time Sampled:

Cyanide	0.1	ND	mg/kg
pH Value (Sat. Paste)	0.1	7.60	pH units
Total Kjeldahl Nitrogen	5	270.	mg/kg
Elect. Cond. on Extract	10.0	601.	us/cm
Oil & Grease (Freon)	10.0	52.4	mg/kg
Sodium Absorption Ratio		3.97~	mg/kg
Arsenic As	0.1	4.4	mg/kg
Barium Ba	2.0	186.	mg/kg
Beryllium Be	1.0	1.	mg/kg
Cadmium Cd	1.0	1.0	mg/kg
Chromium Cr	2.0	69.	mg/kg
Chromium Cr6+	0.1	ND	mg/kg
Cobalt Co	2.0	25.	mg/kg
Copper Cu	2.0	52.	mg/kg
Lead Pb	1.0	17.	mg/kg
Mercury Hg	0.01	ND	mg/kg
Molybdenum Mo	2.0	ND	mg/kg
Nickel Ni	2.0	63.	mg/kg
Selenium Se	0.2	ND	mg/kg
Silver Ag	1.0	ND	mg/kg
Vanadium V	2.0	77.	mg/kg
Zinc Zn	1.0	123.	mg/kg
Antimony Sb	1.0	ND	mg/kg

MDL: Denotes Method Detections Limit

ND: Denotes Not Detected

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Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
90-A016157	Sample Description: BH13-B			Date Sampled: 90- 9-12 Time Sampled:	
	Cyanide	0.1	ND	mg/kg	
	pH Value (Sat. Paste)	0.1	7.60	pH units	
	Total Kjeldahl Nitrogen	5	240.	mg/kg	
	Elect. Cond. on Extract	10.0	1390	us/cm	
	Oil & Grease (Freon)	10.0	196.	mg/kg	
	Sodium Absorption Ratio		6.63	mg/kg	
	Arsenic As	0.1	8.0	mg/kg	
	Barium Ba	2.0	136.	mg/kg	
	Beryllium Be	1.0	1.	mg/kg	
	Cadmium Cd	1.0	ND	mg/kg	
	Chromium Cr	2.0	36.	mg/kg	
	Chromium Cr6+	0.1	ND	mg/kg	
	Cobalt Co	2.0	11.	mg/kg	
	Copper Cu	2.0	27.	mg/kg	
	Lead Pb	1.0	24.	mg/kg	
	Mercury Hg	0.01	ND	mg/kg	
	Molybdenum Mo	2.0	ND	mg/kg	
	Nickel Ni	2.0	31.	mg/kg	
	Selenium Se	0.2	0.2	mg/kg	
	Silver Ag	1.0	ND	mg/kg	
	Vanadium V	2.0	57.	mg/kg	
	Zinc Zn	1.0	55.	mg/kg	
	Antimony Sb	1.0	ND	mg/kg	

DL: Denotes Method Detections Limit

ND: Denotes Not Detected

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Attention: MR ED WOOLWICH

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Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MOL	Result	Units	Comment
90-A016158	Sample Description: BH14-A				Date Sampled: 90- 9-12 Time Sampled: .
	Cyanide	0.1	ND	mg/kg	
	pH Value (Sat. Paste)	0.1	7.30	pH units	
	Total Kjeldahl Nitrogen	5	1090	mg/kg	
	Elect. Cond. on Extract	10.0	15300	us/cm	
	Oil & Grease (Freon)	10.0	75.6	mg/kg	
	Sodium Absorption Ratio		6.55	mg/kg	
	Arsenic As	0.1	3.3	mg/kg	
	Barium Ba	2.0	197.	mg/kg	
	Beryllium Be	1.0	1.	mg/kg	
	Cadmium Cd	1.0	ND	mg/kg	
	Chromium Cr	2.0	43.	mg/kg	
	Chromium Cr6+	0.1	ND	mg/kg	
	Cobalt Co	2.0	15.	mg/kg	
	Copper Cu	2.0	36.	mg/kg	
	Lead Pb	1.0	33.	mg/kg	
	Mercury Hg	0.01	ND	mg/kg	
	Molybdenum Mo	2.0	ND	mg/kg	
	Nickel Ni	2.0	40.	mg/kg	
	Selenium Se	0.2	0.4	mg/kg	
	Silver Ag	1.0	ND	mg/kg	
	Vanadium V	2.0	48.	mg/kg	
	Zinc Zn	1.0	90.	mg/kg	
	Antimony Sb	1.0	ND	mg/kg	

DL: Denotes Method Detection Limit

ND: Denotes Not Detected

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Attention: MR ED WOOLWICH

Date Received: 90- 9-24

Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A016159 Sample Description: BH14-B

Date Sampled: 90- 9-12 Time Sampled:

Cyanide	0.1	NO	mg/kg
pH Value (Sat. Paste)	0.1	7.60	pH units
Total Kjeldahl Nitrogen	5	130.	mg/kg
Elect. Cond. on Extract	10.0	12100	us/cm
Oil & Grease (Freon)	10.0	97.3	mg/kg
Sodium Absorption Ratio		25.1	mg/kg
Arsenic As	0.1	4.3	mg/kg
Barium Ba	2.0	126.	mg/kg
Beryllium Be	1.0	1.	mg/kg
Cadmium Cd	1.0	NO	mg/kg
Chromium Cr	2.0	25.	mg/kg
Chromium Cr6+	0.1	NO	mg/kg
Cobalt Co	2.0	9.	mg/kg
Copper Cu	2.0	21.	mg/kg
Lead Pb	1.0	22.	mg/kg
Mercury Hg	0.01	NO	mg/kg
Molybdenum Mo	2.0	NO	mg/kg
Nickel Ni	2.0	23.	mg/kg
Selenium Se	0.2	NO	mg/kg
Silver Ag	1.0	NO	mg/kg
Vanadium V	2.0	35.	mg/kg
Zinc Zn	1.0	46.	mg/kg
Antimony Sb	1.0	NO	mg/kg

L: Denotes Method Detection Limit

ND: Denotes Not Detected

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Attention: MR ED WOOLWICH

Date Received: 90- 9-24

Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A016160 Sample Description: BH15-A

Date Sampled: 90- 9-12 Time Sampled:

Cyanide	0.1	ND	mg/kg
pH Value (Sat. Paste)	0.1	7.60	pH units
Total Kjeldahl Nitrogen	5	1640	mg/kg
Elect. Cond. on Extract	10.0	1520	us/cm
Oil & Grease (Freon)	10.0	120.	mg/kg
Sodium Absorption Ratio		3.52	mg/kg
Arsenic As	0.1	4.4	mg/kg
Barium Ba	2.0	162.	mg/kg
Beryllium Be	1.0	1.	mg/kg
Cadmium Cd	1.0	ND	mg/kg
Chromium Cr	2.0	28.	mg/kg
Chromium Cr6+	0.1	ND	mg/kg
Cobalt Co	2.0	9.	mg/kg
Copper Cu	2.0	25.	mg/kg
Lead Pb	1.0	13.	mg/kg
Mercury Hg	0.01	0.03	mg/kg
Molybdenum Mo	2.0	ND	mg/kg
Nickel Ni	2.0	27.	mg/kg
Selenium Se	0.2	ND	mg/kg
Silver Ag	1.0	ND	mg/kg
Vanadium V	2.0	42.	mg/kg
Zinc Zn	1.0	58.	mg/kg
Antimony Sb	1.0	ND	mg/kg

MDL: Denotes Method Detections Limit

ND: Denotes Not Detected

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Date Received: 90- 9-24

Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A016161 Sample Description: BH15-B

Date Sampled: 90- 9-12 Time Sampled:

Cyanide	0.1	NO	mg/kg
pH Value (Sat. Paste)	0.1	7.40	pH units
Total Kjeldahl Nitrogen	5	530.	mg/kg
Elect. Cond. on Extract	10.0	2490	us/cm
Oil & Grease (Freon)	10.0	73.5	mg/kg
Sodium Absorption Ratio		2.63	mg/kg
Arsenic As	0.1	6.6	mg/kg
Barium Ba	2.0	170.	mg/kg
Beryllium Be	1.0	1.	mg/kg
Cadmium Cd	1.0	NO	mg/kg
Chromium Cr	2.0	45.	mg/kg
Chromium Cr6+	0.1	NO	mg/kg
Cobalt Co	2.0	13.	mg/kg
Copper Cu	2.0	32.	mg/kg
Lead Pb	1.0	14.	mg/kg
Mercury Hg	0.01	0.04	mg/kg
Molybdenum Mo	2.0	NO	mg/kg
Nickel Ni	2.0	37.	mg/kg
Selenium Se	0.2	0.2	mg/kg
Silver Ag	1.0	NO	mg/kg
Vanadium V	2.0	68.	mg/kg
Zinc Zn	1.0	77.	mg/kg
Antimony Sb	1.0	NO	mg/kg

DL: Denotes Method Detection Limit

ND: Denotes Not Detected

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Date Received: 90- 9-24

Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A016162 Sample Description: BH16-A

Date Sampled: 90- 9-12 Time Sampled:

pH Value (Sat. Paste)	0.1	7.50	pH units
Total Kjeldahl Nitrogen	5	910.	mg/kg
Elect. Cond. on Extract	10.0	732.	us/cm
Oil & Grease (Freon)	10.0	133.	mg/kg
Sodium Absorption Ratio		3.67	mg/kg
Arsenic As	0.1	3.7	mg/kg
Barium Ba	2.0	274.	mg/kg
Beryllium Be	1.0	1.	mg/kg
Cadmium Cd	1.0	ND	mg/kg
Chromium Cr	2.0	36.	mg/kg
Chromium Cr6+	0.1	ND	mg/kg
Cobalt Co	2.0	15.	mg/kg
Copper Cu	2.0	26.	mg/kg
Lead Pb	1.0	12.	mg/kg
Mercury Hg	0.01	0.02	mg/kg
Molybdenum Mo	2.0	ND	mg/kg
Nickel Ni	2.0	35.	mg/kg
Selenium Se	0.2	ND	mg/kg
Silver Ag	1.0	ND	mg/kg
Vanadium V	2.0	55.	mg/kg
Zinc Zn	1.0	76.	mg/kg
Antimony Sb	1.0	ND	mg/kg

MDL: Denotes Method Detection Limit

ND: Denotes Not Detected

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P.O.:

Attention: MR ED WOOLWICH

Date Received: 90- 9-24

Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A016163 Sample Description: BH16-B

Date Sampled: 90- 9-12 Time Sampled:

pH Value (Sat. Paste)	0.1	7.70	pH units
Total Kjeldahl Nitrogen	5	40.	mg/kg
Elect. Cond. on Extract	10.0	958.	us/cm
Oil & Grease (Freon)	10.0	33.2	mg/kg
Sodium Absorption Ratio		2.84	mg/kg
Arsenic As	0.1	3.6	mg/kg
Barium Ba	2.0	77.	mg/kg
Beryllium Be	1.0	ND	mg/kg
Cadmium Cd	1.0	ND	mg/kg
Chromium Cr	2.0	12.	mg/kg
Chromium Cr6+	0.1	ND	mg/kg
Cobalt Co	2.0	3.	mg/kg
Copper Cu	2.0	10.	mg/kg
Lead Pb	1.0	10.	mg/kg
Mercury Hg	0.01	0.02	mg/kg
Molybdenum Mo	2.0	ND	mg/kg
Nickel Ni	2.0	10.	mg/kg
Selenium Se	0.2	ND	mg/kg
Silver Ag	1.0	ND	mg/kg
Vanadium V	2.0	22.	mg/kg
Zinc Zn	1.0	16.	mg/kg
Antimony Sb	1.0	ND	mg/kg

DL: Denotes Method Detections Limit

ND: Denotes Not Detected

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Client: WARDROP ENGINEERING INC

WINNIPEG

Project Number: 50901/2

P.O.:

Attention: Mr Ed Wolowich

Date Received: 90-10-24

Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A019215 Sample Description: BH 18-B

Date & Time Sampled: 90-10-19

pH Value (Sat. Paste)	0.1	7.80	pH units
Total Kjeldahl Nitrogen	5	ND	mg/kg
Elect. Cond. on Extract	10.0	3620	us/cm
Oil & Grease (Freon)	10.0	95.4	mg/kg
Sodium Absorption Ratio		2.11	mg/kg
Arsenic As	0.1	ND	mg/kg
Barium Ba	2.0	21.	mg/kg
Beryllium Be	1.0	ND	mg/kg
Cadmium Cd	1.0	ND	mg/kg
Chromium Cr	2.0	8.	mg/kg
Chromium Cr6+	0.1	ND	mg/kg
Cobalt Co	2.0	2.	mg/kg
Copper Cu	2.0	5.	mg/kg
Lead Pb	1.0	5.	mg/kg
Mercury Hg	0.01	0.02	mg/kg
Molybdenum Mo	2.0	ND	mg/kg
Nickel Ni	2.0	6.	mg/kg
Selenium Se	0.2	ND	mg/kg
Silver Ag	1.0	ND	mg/kg
Vanadium V	2.0	9.	mg/kg
Zinc Zn	1.0	10.	mg/kg
Antimony Sb	1.0	ND	mg/kg

MDL: Denotes Method Detections Limit

ND: Denotes Not Detected

W.M. Neaves M.Sc., C.Chem



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ANALYTICAL REPORT

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Client: WARDROP ENGINEERING INC

WINNIPEG

Project Number: 50901/2

P.O.:

Attention: Mr Ed Wolowich

Date Received: 90-10-24

Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
90-A019206	Sample Description: BH 19-A			Date & Time Sampled: 90-10-19	
	pH Value (Sat. Paste)	0.1	7.80	pH units	
	Total Kjeldahl Nitrogen	5	1270	mg/kg	
	Elect. Cond. on Extract	10.0	1260	us/cm	
	Loss on Ignition (600C)	0.1	7.90	%	
	Oil & Grease (Freon)	10.0	757.	mg/kg	
	Sodium Absorption Ratio		0.33	mg/kg	
	Arsenic As	0.1	3.5	mg/kg	
	Barium Ba	2.0	164.	mg/kg	
	Beryllium Be	1.0	1.	mg/kg	
	Cadmium Cd	1.0	ND	mg/kg	
	Chromium Cr	2.0	19.	mg/kg	
	Chromium Cr6+	0.1	ND	mg/kg	
	Cobalt Co	2.0	7.	mg/kg	
	Copper Cu	2.0	37.	mg/kg	
	Lead Pb	1.0	49.	mg/kg	
	Mercury Hg	0.01	0.06	mg/kg	
	Molybdenum Mo	2.0	ND	mg/kg	
	Nickel Ni	2.0	21.	mg/kg	
	Selenium Se	0.2	0.3	mg/kg	
	Silver Ag	1.0	ND	mg/kg	
	Vanadium V	2.0	27.	mg/kg	
	Zinc Zn	1.0	67.	mg/kg	
	Antimony Sb	1.0	ND	mg/kg	

MDL: Denotes Method Detections Limit

ND: Denotes Not Detected

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Project Number: 50901/2

P.O.:

Attention: Mr Ed Wolowich

Date Received: 90-10-24

Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A019207 Sample Description: BH 19-B

Date & Time Sampled: 90-10-19

pH Value (Sat. Paste)	0.1	7.80	pH Units
Total Kjeldahl Nitrogen	5	3500	mg/kg
Elect. Cond. on Extract	10.0	3310	us/cm
Loss on Ignition (600C)	0.1	11.6	%
Oil & Grease (Freon)	10.0	196.	mg/kg
Sodium Absorption Ratio		0.56	mg/kg
Arsenic As	0.1	2.5	mg/kg
Barium Ba	2.0	129.	mg/kg
Beryllium Be	1.0	ND	mg/kg
Cadmium Cd	1.0	ND	mg/kg
Chromium Cr	2.0	15.	mg/kg
Chromium Cr6+	0.1	ND	mg/kg
Cobalt Co	2.0	6.	mg/kg
Copper Cu	2.0	18.	mg/kg
Lead Pb	1.0	20.	mg/kg
Mercury Hg	0.01	0.03	mg/kg
Molybdenum Mo	2.0	ND	mg/kg
Nickel Ni	2.0	18.	mg/kg
Selenium Se	0.2	0.5	mg/kg
Silver Ag	1.0	ND	mg/kg
Vanadium V	2.0	20.	mg/kg
Zinc Zn	1.0	47.	mg/kg
Antimony Sb	1.0	ND	mg/kg

MDL: Denotes Method Detections Limit

ND: Denotes Not Detected

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WINNIPEG

Project Number: 50901/2

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Attention: Mr Ed Wolowich

Date Received: 90-10-24

Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
90-A019208	Sample Description: BH 19-C			Date & Time Sampled: 90-10-19	
	pH Value (Sat. Paste)	0.1	8.00	pH units	
	Total Kjeldahl Nitrogen	5	4920	mg/kg	
	Elect. Cond. on Extract	10.0	6060	us/cm	
	Loss on Ignition (600C)	0.1	15.6	%	
	Oil & Grease (Freon)	10.0	436.	mg/kg	
	Sodium Absorption Ratio		0.54	mg/kg	
	Arsenic As	0.1	3.0	mg/kg	
	Barium Ba	2.0	169.	mg/kg	
	Beryllium Be	1.0	ND	mg/kg	
	Cadmium Cd	1.0	ND	mg/kg	
	Chromium Cr	2.0	18.	mg/kg	
	Chromium Cr6+	0.1	ND	mg/kg	
	Cobalt Co	2.0	6.	mg/kg	
	Copper Cu	2.0	19.	mg/kg	
	Lead Pb	1.0	23.	mg/kg	
	Mercury Hg	0.01	0.13	mg/kg	
	Molybdenum Mo	2.0	ND	mg/kg	
	Nickel Ni	2.0	20.	mg/kg	
	Selenium Se	0.2	0.3	mg/kg	
	Silver Ag	1.0	ND	mg/kg	
	Vanadium V	2.0	23.	mg/kg	
	Zinc Zn	1.0	58.	mg/kg	
	Antimony Sb	1.0	ND	mg/kg	

MDL: Denotes Method Detections Limit

ND: Denotes Not Detected

W.H. Neaves M.Sc., C.Chem



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Attention: Mr Ed Wolowich

Date Received: 90-10-24

Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
90-A019209	Sample Description: BH 20-A			Date & Time Sampled: 90-10-19	
	pH Value (Sat. Paste)	0.1	8.80	pH units	
	Total Kjeldahl Nitrogen	5	2400	mg/kg	
	Elect. Cond. on Extract	10.0	10400	us/cm	
	Loss on Ignition (600C)	0.1	10.9	%	
	Oil & Grease (Freon)	10.0	149.	mg/kg	
	Sodium Absorption Ratio		0.35	mg/kg	
	Arsenic As	0.1	5.5	mg/kg	
	Barium Ba	2.0	145.	mg/kg	
	Beryllium Be	1.0	1.	mg/kg	
	Cadmium Cd	1.0	ND	mg/kg	
	Chromium Cr	2.0	24.	mg/kg	
	Chromium Cr6+	0.1	ND	mg/kg	
	Cobalt Co	2.0	10.	mg/kg	
	Copper Cu	2.0	26.	mg/kg	
	Lead Pb	1.0	24.	mg/kg	
	Mercury Hg	0.01	0.03	mg/kg	
	Molybdenum Mo	2.0	ND	mg/kg	
	Nickel Ni	2.0	30.	mg/kg	
	Selenium Se	0.2	ND	mg/kg	
	Silver Ag	1.0	ND	mg/kg	
	Vanadium V	2.0	42.	mg/kg	
	Zinc Zn	1.0	56.	mg/kg	
	Antimony Sb	1.0	ND	mg/kg	

MDL: Denotes Method Detections Limit

ND: Denotes Not Detected

M.H. Neaves M.Sc., C.Chem



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Client: WARDROP ENGINEERING INC

WINNIPEG

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Attention: Mr Ed Wolowich

Date Received: 90-10-24

Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
90-A019210	Sample Description: BH 20-B			Date & Time Sampled: 90-10-19	
	pH Value (Sat. Paste)	0.1	8.00	pH units	
	Total Kjeldahl Nitrogen	5	240.	mg/kg	
	Elect. Cond. on Extract	10.0	2600	us/cm	
	Loss on Ignition (600C)	0.1	4.80	%	
	Oil & Grease (Freon)	10.0	112.	mg/kg	
	Sodium Absorption Ratio		0.36	mg/kg	
	Arsenic As	0.1	3.4	mg/kg	
	Barium Ba	2.0	90.	mg/kg	
	Beryllium Be	1.0	ND	mg/kg	
	Cadmium Cd	1.0	ND	mg/kg	
	Chromium Cr	2.0	20.	mg/kg	
	Chromium Cr6+	0.1	ND	mg/kg	
	Cobalt Co	2.0	6.	mg/kg	
	Copper Cu	2.0	18.	mg/kg	
	Lead Pb	1.0	12.	mg/kg	
	Mercury Hg	0.01	0.07	mg/kg	
	Molybdenum Mo	2.0	ND	mg/kg	
	Nickel Ni	2.0	18.	mg/kg	
	Selenium Se	0.2	ND	mg/kg	
	Silver Ag	1.0	ND	mg/kg	
	Vanadium V	2.0	23.	mg/kg	
	Zinc Zn	1.0	37.	mg/kg	
	Antimony Sb	1.0	ND	mg/kg	

MDL: Denotes Method Detections Limit

ND: Denotes Not Detected

I.M. Neaves M.Sc., C.Chem



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Attention: Mr Ed Wolowich

Date Received: 90-10-24

Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A019211 Sample Description: BH 20-C

Date & Time Sampled: 90-10-19

pH Value (Sat. Paste)	0.1	7.50	pH units
Total Kjeldahl Nitrogen	5	30.	mg/kg
Elect. Cond. on Extract	10.0	1880	us/cm
Loss on Ignition (600C)	0.1	2.00	%
Oil & Grease (Freon)	10.0	115.	mg/kg
Sodium Absorption Ratio		0.50	mg/kg
Arsenic As	0.1	ND	mg/kg
Barium Ba	2.0	25.	mg/kg
Beryllium Be	1.0	ND	mg/kg
Cadmium Cd	1.0	ND	mg/kg
Chromium Cr	2.0	8.	mg/kg
Chromium Cr6+	0.1	ND	mg/kg
Cobalt Co	2.0	2.	mg/kg
Copper Cu	2.0	6.	mg/kg
Lead Pb	1.0	2.	mg/kg
Mercury Hg	0.01	0.01	mg/kg
Molybdenum Mo	2.0	ND	mg/kg
Nickel Ni	2.0	7.	mg/kg
Selenium Se	0.2	0.3	mg/kg
Silver Ag	1.0	ND	mg/kg
Vanadium V	2.0	10.	mg/kg
Zinc Zn	1.0	12.	mg/kg
Antimony Sb	1.0	ND	mg/kg

MDL: Denotes Method Detections Limit

ND: Denotes Not Detected

U.M. Neaves M.Sc., C.Chem



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Attention: Mr Ed Wolowich

Date Received: 90-10-24

Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
90-A019216	Sample Description: BH 21-B			Date & Time Sampled: 90-10-19	
	pH Value (Sat. Paste)	0.1	7.40	pH units	
	Total Kjeldahl Nitrogen	5	170.	mg/kg	
	Elect. Cond. on Extract	10.0	5680	us/cm	
	Oil & Grease (Freon)	10.0	154.	mg/kg	
	Sodium Absorption Ratio		1.79	mg/kg	
	Arsenic As	0.1	0.7	mg/kg	
	Barium Ba	2.0	96.	mg/kg	
	Beryllium Be	1.0	ND	mg/kg	
	Cadmium Cd	1.0	ND	mg/kg	
	Chromium Cr	2.0	20.	mg/kg	
	Chromium Cr6+	0.1	ND	mg/kg	
	Cobalt Co	2.0	6.	mg/kg	
	Copper Cu	2.0	17.	mg/kg	
	Lead Pb	1.0	21.	mg/kg	
	Mercury Hg	0.01	0.02	mg/kg	
	Molybdenum Mo	2.0	ND	mg/kg	
	Nickel Ni	2.0	18.	mg/kg	
	Selenium Se	0.2	0.2	mg/kg	
	Silver Ag	1.0	ND	mg/kg	
	Vanadium V	2.0	22.	mg/kg	
	Zinc Zn	1.0	33.	mg/kg	
	Antimony Sb	1.0	ND	mg/kg	

MDL: Denotes Method Detections Limit

ND: Denotes Not Detected

W.M. Neaves M.Sc., C.Chem



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Attention: Mr Ed Wolowich

Date Received: 90-10-24

Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
90-A019217	Sample Description: BH 22-B			Date & Time Sampled: 90-10-19	
	pH Value (Sat. Paste)	0.1	7.60	pH units	
	Total Kjeldahl Nitrogen	5	490.	mg/kg	
	Elect. Cond. on Extract	10.0	1400	us/cm	
	Oil & Grease (Freon)	10.0	207.	mg/kg	
	Sodium Absorption Ratio		1.61	mg/kg	
	Arsenic As	0.1	3.3	mg/kg	
	Barium Ba	2.0	242.	mg/kg	
	Beryllium Be	1.0	1.	mg/kg	
	Cadmium Cd	1.0	ND	mg/kg	
	Chromium Cr	2.0	47.	mg/kg	
	Chromium Cr6+	0.1	ND	mg/kg	
	Cobalt Co	2.0	17.	mg/kg	
	Copper Cu	2.0	36.	mg/kg	
	Lead Pb	1.0	33.	mg/kg	
	Mercury Hg	0.01	0.04	mg/kg	
	Molybdenum Mo	2.0	ND	mg/kg	
	Nickel Ni	2.0	47.	mg/kg	
	Selenium Se	0.2	ND	mg/kg	
	Silver Ag	1.0	ND	mg/kg	
	Vanadium V	2.0	54.	mg/kg	
	Zinc Zn	1.0	100.	mg/kg	
	Antimony Sb	1.0	ND	mg/kg	

MDL: Denotes Method Detection Limit

ND: Denotes Not Detected

J.M. Neaves M.Sc., C.Chem



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Attention: Mr Ed Wolowich

Date Received: 90-10-24

Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A019212 Sample Description: BH 23-A

Date & Time Sampled: 90-10-19

pH Value (Sat. Paste)	0.1	7.70	pH units
Total Kjeldahl Nitrogen	5	3190	mg/kg
Elect. Cond. on Extract	10.0	373.	us/cm
Oil & Grease (Freon)	10.0	153.	mg/kg
Sodium Absorption Ratio		0.07	mg/kg
Arsenic As	0.1	ND	mg/kg
Barium-Ba	2.0	103.	mg/kg
Beryllium Be	1.0	ND	mg/kg
Cadmium Cd	1.0	ND	mg/kg
Chromium Cr	2.0	16.	mg/kg
Chromium Cr6+	0.1	ND	mg/kg
Cobalt Co	2.0	6.	mg/kg
Copper Cu	2.0	15.	mg/kg
Lead Pb	1.0	18.	mg/kg
Mercury Hg	0.01	0.03	mg/kg
Molybdenum Mo	2.0	ND	mg/kg
Nickel Ni	2.0	17.	mg/kg
Selenium Se	0.2	ND	mg/kg
Silver Ag	1.0	ND	mg/kg
Vanadium V	2.0	20.	mg/kg
Zinc Zn	1.0	45.	mg/kg
Antimony Sb	1.0	ND	mg/kg

DL: Denotes Method Detections Limit

ND: Denotes Not Detected

J.M. Neaves M.Sc., C.Chem



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Attention: Mr Ed Wolowich

Date Received: 90-10-24

Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A019213 Sample Description: BH 23-B

Date & Time Sampled: 90-10-19

pH Value (Sat. Paste)	0.1	7.90	pH units
Total Kjeldahl Nitrogen	5	560.	mg/kg
Elect. Cond. on Extract	10.0	2810	us/cm
Oil & Grease (Freon)	10.0	160.	mg/kg
Sodium Absorption Ratio		2.60	mg/kg
Arsenic As	0.1	5.2	mg/kg
Barium Ba	2.0	93.	mg/kg
Beryllium Be	1.0	1.	mg/kg
Cadmium Cd	1.0	ND	mg/kg
Chromium Cr	2.0	26.	mg/kg
Chromium Cr6+	0.1	ND	mg/kg
Cobalt Co	2.0	11.	mg/kg
Copper Cu	2.0	32.	mg/kg
Lead Pb	1.0	24.	mg/kg
Mercury Hg	0.01	0.05	mg/kg
Molybdenum Mo	2.0	ND	mg/kg
Nickel Ni	2.0	34.	mg/kg
Selenium Se	0.2	0.6	mg/kg
Silver Ag	1.0	ND	mg/kg
Vanadium V	2.0	39.	mg/kg
Zinc Zn	1.0	80.	mg/kg
Antimony Sb	1.0	ND	mg/kg

MDL: Denotes Method Detections Limit

ND: Denotes Not Detected

W.M. Weaves M.Sc., C.Chem



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Client: WARDROP ENGINEERING INC

WINNIPEG

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Attention: Mr Ed Wolowich
Client Ref. #:

Date Received: 90-10-24

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
90-A019214	Sample Description: BH 23-C			Date & Time Sampled: 90-10-19	
	pH Value (Sat. Paste)	0.1	7.70	pH units	
	Total Kjeldahl Nitrogen	5	630.	mg/kg	
	Elect. Cond. on Extract	10.0	3260	us/cm	
	Oil & Grease (Freon)	10.0	149.	mg/kg	
	Sodium Absorption Ratio		1.85	mg/kg	
	Arsenic As	0.1	5.2	mg/kg	
	Barium Ba	2.0	67.	mg/kg	
	Beryllium Be	1.0	1.	mg/kg	
	Cadmium Cd	1.0	ND	mg/kg	
	Chromium Cr	2.0	32.	mg/kg	
	Chromium Cr6+	0.1	ND	mg/kg	
	Cobalt Co	2.0	15.	mg/kg	
	Copper Cu	2.0	38.	mg/kg	
	Lead Pb	1.0	30.	mg/kg	
	Mercury Hg	0.01	0.05	mg/kg	
	Molybdenum Mo	2.0	2.	mg/kg	
	Nickel Ni	2.0	44.	mg/kg	
	Selenium Se	0.2	0.7	mg/kg	
	Silver Ag	1.0	ND	mg/kg	
	Vanadium V	2.0	47.	mg/kg	
	Zinc Zn	1.0	90.	mg/kg	
	Antimony Sb	1.0	ND	mg/kg	

MDL: Denotes Method Detections Limit

ND: Denotes Not Detected

W.M. Neaves M.Sc., C.Chem



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Client: WARDROP ENGINEERING INC

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Project Number: 50901/2

P.O.:

Attention: MR ED WOOLWICH

Date Received: 90- 9-24

Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
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90-A016164 Sample Description: FIELD BLANK

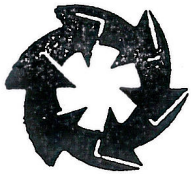
Date Sampled: 90- 9-12 Time Sampled:

Cyanide	0.1	ND	mg/kg	
pH Value (Sat. Paste)	0.1	7.50	pH units	
Total Kjeldahl Nitrogen	5	1230	mg/kg	
Elect. Cond. on Extract	10.0	600.	us/cm	
Oil & Grease (Freon)	10.0	50.3	mg/kg	
Sodium Absorption Ratio		0.76	mg/kg	duplicate
Arsenic As	0.1	5.8	mg/kg	
Barium Ba	2.0	201.	mg/kg	
Beryllium Be	1.0	1.	mg/kg	
Cadmium Cd	1.0	ND	mg/kg	
Chromium Cr	2.0	36.	mg/kg	
Chromium Cr6+	0.1	ND	mg/kg	
Cobalt Co	2.0	15.	mg/kg	
Copper Cu	2.0	34.	mg/kg	
Lead Pb	1.0	36.	mg/kg	
Mercury Hg	0.01	0.04	mg/kg	
Molybdenum Mo	2.0	ND	mg/kg	
Nickel Ni	2.0	38.	mg/kg	
Selenium Se	0.2	0.2	mg/kg	
Silver Ag	1.0	ND	mg/kg	
Vanadium V	2.0	56.	mg/kg	
Zinc Zn	1.0	78.	mg/kg	
Antimony Sb	1.0	ND	mg/kg	

MDL: Denotes Method Detections Limit

ND: Denotes Not Detected

M. Neaves M.Sc., C.Chem



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Reported: 90-11-02

ANALYTICAL REPORT

Page: 1

Client: WARDROP ENGINEERING INC

WINNIPEG

Project Number: 50901/2

P.O.:

Attention: Mr Ed Wolowich

Date Received: 90-10-24

Client Ref. #:

Sample Type: Solids

Sample #	Analytical Parameter	MDL	Result	Units	Comment
90-A019218	Sample Description: BLANK -2			Date & Time Sampled: 90-10-19	
	pH Value (Sat. Paste)	0.1	7.70	pH units	
	Total Kjeldahl Nitrogen	5	1200	mg/kg	
	Elect. Cond. on Extract	10.0	830.	us/cm	
	Oil & Grease (Freon)	10.0	153.	mg/kg	
	Sodium Absorption Ratio		0.51	mg/kg	
	Arsenic As	0.1	1.9	mg/kg	
	Barium Ba	2.0	135.	mg/kg	
	Beryllium Be	1.0	1.	mg/kg	
	Cadmium Cd	1.0	ND	mg/kg	
	Chromium Cr	2.0	22.	mg/kg	
	Chromium Cr6+	0.1	ND	mg/kg	
	Cobalt Co	2.0	8.	mg/kg	
	Copper Cu	2.0	22.	mg/kg	
	Lead Pb	1.0	26.	mg/kg	
	Mercury Hg	0.01	0.03	mg/kg	
	Molybdenum Mo	2.0	ND	mg/kg	
	Nickel Ni	2.0	25.	mg/kg	
	Selenium Se	0.2	0.3	mg/kg	
	Silver Ag	1.0	ND	mg/kg	
	Vanadium V	2.0	30.	mg/kg	
	Zinc Zn	1.0	60.	mg/kg	
	Antimony Sb	1.0	ND	mg/kg	

MDL: Denotes Method Detection Limit

ND: Denotes Not Detected

I.M. Neaves M.Sc., C.Chem



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ANALYTICAL REPORT

Volatile Analysis by Purge and Trap GC/MS, Full Scan

Client: Wardrop Engineering (Winnipeg)
Project No.: 50901

Date Sample Received: September 24, 1990
Date Analysis Started: September 24, 1990
Date Reported: September 27, 1990

Sample Description: 90/16130:MW1-A
90/16131:MW1-B
90/16132:MW4-B
90/16133:BH1-B
90/16134:BH2-A
90/16135:BH2-B
90/16136:BH2-C

Matrix: Soil

Note: Results based on dry weight

Compound	MDL (ug/Kg)	16130 (ug/Kg)	16131 (ug/Kg)	16132 (ug/Kg)	16133 (ug/Kg)	16134 (ug/Kg)	16135 (ug/Kg)	16136 (ug/Kg)
Benzene	5	ND	ND	ND	ND	ND	ND	ND
Toluene	5	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	5	ND	ND	ND	ND	ND	ND	ND
m&p-Xylenes	5	ND	ND	ND	ND	ND	ND	ND
o-Xylene	5	ND	ND	ND	ND	ND	ND	ND
Styrene	13	ND	ND	ND	ND	ND	ND	ND

ND-NOT DETECTED

MDL-METHOD DETECTION LIMIT

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ANALYTICAL REPORT

Volatile Analysis by Purge and Trap GC/MS, Full Scan

Client: Wardrop Engineering (Winnipeg)

Project No: 50901

Date Received: September 24, 1990

Date Analysis Started: September 24, 1990

Date Reported: September 27, 1990

Sample Description: 90/16137:BH3-A
90/16138:BH3-B
90/16139:BH3-C
90/16164:Field Blank

Matrix: Soil

NOTE: Results based on dry weight

Compound	MDL (ug/Kg)	90/16137 (ug/Kg)	90/16138 (ug/Kg)	90/16139 (ug/Kg)	90/16164 (ug/Kg)
Chloromethane	5	ND	ND	ND	ND
Vinyl Chloride	5	ND	ND	ND	ND
Bromomethane	80	ND	ND	ND	ND
Chloroethane	5	ND	ND	ND	ND
Acrolein	25	ND	ND	ND	ND
Trichlorofluoromethane	5	10	ND	ND	ND
Acrylonitrile	13	ND	ND	ND	ND
1,1-Dichloroethene	5	ND	ND	ND	ND
Dichloromethane	20	ND	ND	ND	ND
t-1,2-Dichloroethene	5	ND	ND	ND	ND
1,1-Dichloroethane	5	ND	ND	ND	ND
Methyl Ethyl Ketone	13	ND	ND	ND	ND
Chlorobromomethane	5	ND	ND	ND	ND
Chloroform	5	ND	ND	ND	ND
1,2-Dichloroethane	5	ND	ND	ND	ND
1,1,1-Trichloroethane	5	ND	ND	ND	ND
Benzene	5	ND	ND	ND	ND
Carbon Tetrachloride	5	ND	ND	ND	ND
1,2-Dichloropropane	5	ND	ND	ND	ND
Bromodichloromethane	10	ND	ND	ND	ND
Trichloroethene	13	ND	ND	ND	ND
Cis-1,3-Dichloropropene	25	ND	ND	ND	ND
tr-1,3-Dichloropropene	5	ND	ND	ND	ND
1,1,2-trichloroethane	5	ND	ND	ND	ND
Toluene	5	ND	ND	ND	ND
Chlorodibromomethane	5	ND	ND	ND	ND
1,2-Dibromoethane	5	ND	ND	ND	ND
Tetrachloroethene	5	ND	ND	ND	ND
Chlorobenzene	5	ND	ND	ND	ND
Ethylbenzene	5	ND	ND	ND	ND



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ANALYTICAL REPORT

Page 2

Volatile Analysis by Purge and Trap GC/MS, Full Scan

Client: Wardrop Engineering (Winnipeg)
Project No: 50901

Date Received: September 24, 1990
Date Analysis Started: September 24, 1990
Date Reported: September 27, 1990

Sample Description: 90/16137:BH3-A
90/16138:BH3-B
90/16139:BH3-C
90/16164:Field Blank

Matrix: Soil

NOTE: Results based on dry weight

Compound	MDL (ug/Kg)	90/16137 (ug/Kg)	90/16138 (ug/Kg)	90/16139 (ug/Kg)	90/16164 (ug/Kg)
m&p-Xylenes	5	ND	ND	ND	ND
Bromoform	5	ND	ND	ND	ND
Styrene	13	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	8	ND	ND	ND	ND
o-Xylene	5	ND	ND	ND	ND
1,2-Dichlorobenzene	13	ND	ND	ND	ND
1,3-Dichlorobenzene	15	ND	ND	ND	ND
1,4-Dichlorobenzene	25	ND	ND	ND	ND

ND-NOT DETECTED

MDL-METHOD DETECTION LIMIT

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Volatile Analysis by Purge and Trap GC/MS, Full Scan

Client: Wardrop Engineering (Winnipeg)
Project No.: 50901

Date Sample Received: September 24, 1990

Date Analysis Started: September 24, 1990

Date Reported: September 27, 1990

Sample Description: 90/16140:BH4-B

90/16141:BH4-C

90/16142:BH5-B

90/16143:BH5-C

90/16144:BH6-B

90/16145:BH7-A

90/16146:BH7-B

Matrix: Soil

Note: Results based on dry weight

Compound	MDL (ug/Kg)	16140 (ug/Kg)	16141 (ug/Kg)	16142 (ug/Kg)	16143 (ug/Kg)	16144 (ug/Kg)	16145 (ug/Kg)	16146 (ug/Kg)
Benzene	5	ND	ND	4 (ND)	40	ND	ND	ND
Toluene	5	ND	ND	10	ND	ND	ND	ND
Ethylbenzene	5	1800	ND	ND	10	ND	ND	ND
m&p-Xylenes	5	4500	ND	ND	5	ND	ND	ND
o-Xylene	5	1000	ND	ND	ND	ND	ND	ND
Styrene	13	ND	ND	ND	ND	ND	ND	ND

ND-NOT DETECTED

MDL-METHOD DETECTION LIMIT

NOTE: For sample 90/16140 multiply the listed MDL values by 40.

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ANALYTICAL REPORT

Volatile Analysis by Purge and Trap GC/MS, Full Scan

Client: Wardrop Engineering (Winnipeg)
Project No.: 50901

Date Sample Received: September 24, 1990
Date Analysis Started: September 24, 1990
Date Reported: September 28, 1990

Sample Description: 90/16147 :BH8-B
90/16148 :BH9-A
90/16149 :BH9-B
90/16150 :BH10-A
90/16151 :BH10-B
90/16152 :BH10-C
90/16153 :BH11-A

Matrix: Soil

Note: Results based on dry weight

Compound	MDL (ug/Kg)	16147 (ug/Kg)	16148 (ug/Kg)	16149 (ug/Kg)	16150 (ug/Kg)	16151 (ug/Kg)	16152 (ug/Kg)	16153 (ug/Kg)
Benzene	5	ND	ND	ND	ND	ND	ND	ND
Toluene	5	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	5	ND	ND	ND	ND	ND	ND	ND
m&p-Xylenes	5	ND	ND	ND	ND	ND	ND	ND
o-Xylene	5	ND	ND	ND	ND	ND	ND	ND
Styrene	13	ND	ND	ND	ND	ND	ND	ND

ND-NOT DETECTED

MDL-METHOD DETECTION LIMIT

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ANALYTICAL REPORT

Volatile Analysis by Purge and Trap GC/MS, Full Scan

Client: Wardrop Engineering
Project No.: 50901

Date Sample Received: September 24, 1990

Date Analysis Started: September 24, 1990

Date Reported: September 28, 1990

Sample Description: 90/16154 :BH11-B

90/16155 :BH12-A

90/16156 :BH12-B

90/16157 :BH13-B

90/16158 :BH14-A

90/16159 :BH14-B

90/16160 :BH15-A

Matrix: Soil

Note: Results based on dry weight

Compound	MDL (ug/Kg)	16154 (ug/Kg)	16155 (ug/Kg)	16156 (ug/Kg)	16157 (ug/Kg)	16158 (ug/Kg)	16159 (ug/Kg)	16160 (ug/Kg)
Benzene	5	ND	ND	ND	ND	ND	ND	ND
Toluene	5	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	5	ND	ND	ND	ND	ND	ND	ND
m&p-Xylenes	5	ND	ND	ND	ND	ND	ND	ND
o-Xylene	5	ND	ND	ND	ND	ND	ND	ND
Styrene	13	ND	ND	ND	ND	ND	ND	ND

ND-NOT DETECTED

MDL-METHOD DETECTION LIMIT

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ANALYTICAL REPORT

Volatile Analysis by Purge and Trap GC/MS, Full Scan

Client: Wardrop Engineering (Winnipeg)

Date Received: September 24, 1990

Date Analysis Started: September 24, 1990

Date Reported: September 28, 1990

Sample Description: 90/16161:BH15-B

90/16162:BH16-A

90/16163:BH16-B

Matrix: Soil

NOTE: Results based on dry weight

Compound	MDL (ug/Kg)	90/16161 (ug/Kg)	90/16162 (ug/Kg)	90/16163 (ug/Kg)
Benzene	5	ND	ND	ND
Toluene	5	ND	ND	ND
Ethylbenzene	5	ND	ND	ND
m&p-Xylenes	5	ND	ND	ND
o-Xylene	5	ND	ND	ND
Styrene	13	ND	ND	ND

ND-NOT DETECTED

MDL-METHOD DETECTION LIMIT

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ANALYTICAL REPORT

Volatile Analysis by Purge and Trap GC/MS, Full Scan

Client: Wardrop Engineering
Project No.: 50901

Date Sample Received: October 24, 1990
Date Analysis Started: October 24, 1990
Date Reported: October 31, 1990

Sample Description: 90/19200: MW5-A
90/19201: MW5-B
90/19202: MW2-A
90/19203: MW2-B
90/19204: MW3-A
90/19205: MW3-B
90/19206: BH19-A

Matrix: Soil

Note: Results based on dry weight

Compound	MDL (ug/Kg)	19200 (ug/Kg)	19201 (ug/Kg)	19202 (ug/Kg)	19203 (ug/Kg)	19204 (ug/Kg)	19205 (ug/Kg)	19206 (ug/Kg)
Benzene	5	ND	ND	ND	ND	ND	ND	ND
Toluene	5	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	5	ND	ND	ND	ND	ND	ND	ND
m&p-Xylenes	5	ND	ND	ND	ND	ND	ND	ND
Styrene	13	ND	ND	ND	ND	ND	ND	ND
o-Xylene	5	ND	ND	ND	ND	ND	ND	ND

ND-NOT DETECTED

MDL-METHOD DETECTION LIMIT

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ANALYTICAL REPORT

Volatile Analysis by Purge and Trap GC/MS, Full Scan

Client: Wardrop Engineering
Project No.: 50901

Date Sample Received: October 24, 1990
Date Analysis Started: October 24, 1990
Date Reported: October 31, 1990

Sample Description: 90/19207: BH19-B
90/19208: BH19-C
90/19209: BH20-A
90/19210: BH20-B
90/19211: BH20-C
90/19212: BH23-A
90/19213: BH23-B

Matrix: Soil
Note: Results based on dry weight

Compound	MDL (ug/Kg)	19207 (ug/Kg)	19208 (ug/Kg)	19209 (ug/Kg)	19210 (ug/Kg)	19211 (ug/Kg)	19212 (ug/Kg)	19213 (ug/Kg)
Benzene	5	ND	ND	ND	ND	ND	ND	ND
Toluene	5	ND	ND	ND	ND	ND	ND	6
Ethylbenzene	5	ND	ND	ND	ND	ND	ND	ND
m&p-Xylenes	5	ND	ND	ND	ND	ND	ND	ND
Styrene	13	ND	ND	ND	ND	ND	ND	ND
o-Xylene	5	ND	ND	ND	ND	ND	ND	ND

ND-NOT DETECTED

MDL-METHOD DETECTION LIMIT

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Volatile Analysis by Purge and Trap GC/MS, Full Scan

Client: Wardrop Engineering
Project No.: 50901

Date Sample Received: October 24, 1990
Date Analysis Started: October 24, 1990
Date Reported: October 31, 1990

Sample Description: 90/19214: BH23-C
90/19215: BH18-B
90/19216: BH21-B
90/19217: BH22-B
90/19218: BLANK-2

Matrix: Soil

Note: Results based on dry weight

Compound	MDL (ug/Kg)	19214 (ug/Kg)	19215 (ug/Kg)	19216 (ug/Kg)	19217 (ug/Kg)	19218 (ug/Kg)
Benzene	5	ND	ND	ND	ND	ND
Toluene	5	ND	ND	ND	ND	ND
Ethylbenzene	5	ND	ND	ND	ND	ND
m&p-Xylenes	5	ND	ND	ND	ND	ND
Styrene	13	ND	ND	ND	ND	ND
o-Xylene	5	ND	ND	ND	ND	ND

ND-NOT DETECTED

MDL-METHOD DETECTION LIMIT

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APPENDIX F

GROUND WATER SAMPLE ANALYSIS

LABORATORY RESULTS



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Reported: 90-10-18

ANALYTICAL REPORT

WARDROP

Page: 1

Client: WARDROP ENGINEERING INC

WINNIPEG

Project Number: 50901

P.O.:

Attention: MR Brent Horning

Date Received: 90-10-03

Client Ref. #: 901395-03-00;Public Market

Sample Type: Liquid

Sample #	Analytical Parameter	MOL	Result	Units	Comment
----------	----------------------	-----	--------	-------	---------

90-A016810 Sample Description: MW #1

Date & Time Sampled: 90-10-02

Cyanide	0.005	NO	mg/L
pH Value	0.1	7.7	pH units
Nitrate	0.01	0.06	mg/L
Sulphate SO ₄	0.5	270	mg/L
Alkalinity CaCO ₃	2.0	362.	mg/L
Chloride Cl	1	171.	mg/L
Aluminum Al	0.02	NO	mg/L
Antimony Sb	0.001	NO	mg/L
Arsenic As	0.001	0.018	mg/L
Beryllium Be	0.01	NO	mg/L
Cadmium Cd	0.005	NO	mg/L
Calcium Ca	0.1	130.	mg/L
Chromium Cr	0.02	NO	mg/L
Cobalt Co	0.02	NO	mg/L
Copper Cu	0.02	NO	mg/L
Lead Pb	0.02	NO	mg/L
Magnesium Mg	0.1	64.2	mg/L
Mercury Hg	0.1	NO	ug/L
Molybdenum Mo	0.02	NO	mg/L
Nickel Ni	0.02	NO	mg/L
Potassium K	0.01	6.60	mg/L
Selenium Se	0.002	NO	mg/L
Silver Ag	0.01	NO	mg/L
Sodium Na	0.1	98.6	mg/L
Thallium Tl	0.005	NO	mg/L
Vanadium V	0.01	0.01	mg/L
Zinc Zn	0.01	0.03	mg/L

MOL: Denotes Method Detections Limit

NO: Denotes Not Detected

U.M. Neaves M.Sc., C.Chem



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Reported: 90-10-18

ANALYTICAL REPORT

Page: 1

Client: WARDROP ENGINEERING INC

WINNIPEG

Project Number: 50901

P.O.:

Attention: MR Brent Horning

Date Received: 90-10-03

Client Ref. #: 901395-03-00;Public Market

Sample Type: Liquid

Sample #	Analytical Parameter	MDL	Result	Units	Comment
90-A016811	Sample Description: MW #2		Date & Time Sampled: 90-10-02		
	Cyanide	0.005	ND	mg/L	
	pH Value	0.1	8.0	pH units	
	Nitrate	0.01	0.88	mg/L	
	Sulphate SO ₄	0.5	280	mg/L	
	Alkalinity CaCO ₃	2.0	288.	mg/L	
	Chloride Cl	1	192.	mg/L	
	Fluoride F	0.1	1.0	mg/L	
	Aluminum Al	0.02	ND	mg/L	
	Antimony Sb	0.001	ND	mg/L	
	Arsenic As	0.001	0.004	mg/L	
	Beryllium Be	0.01	ND	mg/L	
	Cadmium Cd	0.005	ND	mg/L	
	Calcium Ca	0.1	92.5	mg/L	
	Chromium Cr	0.02	ND	mg/L	
	Cobalt Co	0.02	ND	mg/L	
	Copper Cu	0.02	0.03	mg/L	
	Lead Pb	0.02	0.02	mg/L	
	Magnesium Mg	0.1	60.4	mg/L	
	Mercury Hg	0.1	ND	ug/L	
	Molybdenum Mo	0.02	ND	mg/L	
	Nickel Ni	0.02	ND	mg/L	
	Potassium K	0.01	8.50	mg/L	
	Selenium Se	0.002	ND	mg/L	
	Silver Ag	0.01	ND	mg/L	
	Sodium Na	0.1	133.	mg/L	
	Thallium Tl	0.005	ND	mg/L	
	Vanadium V	0.01	ND	mg/L	
	Zinc Zn	0.01	0.03	mg/L	

MDL: Denotes Method Detections Limit

ND: Denotes Not Detected

J.M. Neaves M.Sc., C.Chem



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Reported: 90-10-18

ANALYTICAL REPORT

Page: 1

Client: WARDROP ENGINEERING INC

WINNIPEG

Project Number: 50901

P.O.:

Attention: MR Brent Morning

Client Ref. #: 901395-03-00;Public Market

Date Received: 90-10-03

Sample Type: Liquid

Sample #	Analytical Parameter	MDL	Result	Units	Comment
90-A016812	Sample Description: MW #3			Date & Time Sampled: 90-10-02	
	Cyanide	0.005	ND	mg/L	
	pH Value	0.1	7.7	pH units	
	Nitrate	0.01	1.06	mg/L	
	Sulphate SO ₄	0.5	930	mg/L	
	Alkalinity CaCO ₃	2.0	430.	mg/L	
	Chloride Cl	1	110.	mg/L	
	Aluminum Al	0.02	ND	mg/L	
	Antimony Sb	0.001	ND	mg/L	
	Arsenic As	0.001	0.002	mg/L	
	Beryllium Be	0.01	ND	mg/L	
	Cadmium Cd	0.005	ND	mg/L	
	Calcium Ca	0.1	310.	mg/L	
	Chromium Cr	0.02	ND	mg/L	
	Cobalt Co	0.02	ND	mg/L	
	Copper Cu	0.02	0.08	mg/L	
	Lead Pb	0.02	ND	mg/L	
	Magnesium Mg	0.1	93.5	mg/L	
	Mercury Hg	0.1	ND	ug/L	
	Molybdenum Mo	0.02	ND	mg/L	
	Nickel Ni	0.02	0.07	mg/L	
	Potassium K	0.01	7.80	mg/L	
	Selenium Se	0.002	ND	mg/L	
	Silver Ag	0.01	ND	mg/L	
	Sodium Na	0.1	157.	mg/L	
	Thallium Tl	0.005	ND	mg/L	
	Vanadium V	0.01	ND	mg/L	
	Zinc Zn	0.01	0.08	mg/L	

DL: Denotes Method Detections Limit

ND: Denotes Not Detected

J.M. Neaves M.Sc., C.Chem



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(519) 686-7558 Fax: (519) 686-6374

Reported: 90-10-18

ANALYTICAL REPORT

Page: 1

Client: WARDROP ENGINEERING INC

WINNIPEG

Project Number: 50901

P.O.:

Attention: MR Brent Horning

Client Ref. #: 901395-03-00;Public Market

Date Received: 90-10-03

Sample Type: Liquid

Sample #	Analytical Parameter	MDL	Result	Units	Comment
90-A016813	Sample Description: MW #4			Date & Time Sampled: 90-10-02	
	Cyanide	0.005	ND	mg/L	
	pH Value	0.1	7.7	pH units	
	Nitrate	0.01	0.42	mg/L	
	Sulphate SO ₄	0.5	340	mg/L	
	Alkalinity CaCO ₃	2.0	422.	mg/L	
	Chloride Cl	1	171.	mg/L	
	Aluminum Al	0.02	0.36	mg/L	
	Antimony Sb	0.001	ND	mg/L	
	Arsenic As	0.001	0.005	mg/L	
	Beryllium Be	0.01	ND	mg/L	
	Cadmium Cd	0.005	ND	mg/L	
	Calcium Ca	0.1	153.	mg/L	
	Chromium Cr	0.02	ND	mg/L	
	Cobalt Co	0.02	ND	mg/L	
	Copper Cu	0.02	ND	mg/L	
	Lead Pb	0.02	0.13	mg/L	
	Magnesium Mg	0.1	85.3	mg/L	
	Mercury Hg	0.1	ND	ug/L	
	Molybdenum Mo	0.02	ND	mg/L	
	Nickel Ni	0.02	ND	mg/L	
	Potassium K	0.01	7.40	mg/L	
	Selenium Se	0.002	ND	mg/L	
	Silver Ag	0.01	ND	mg/L	
	Sodium Na	0.1	103.	mg/L	
	Thallium Tl	0.005	ND	mg/L	
	Vanadium V	0.01	0.01	mg/L	
	Zinc Zn	0.01	0.04	mg/L	

MDL: Denotes Method Detections Limit

ND: Denotes Not Detected

W.M. Neaves M.Sc., C.Chem



ENVIROCLEAN

A UNIT OF LAVALIN ENGINEERS INC.
921 Leathorne Street, London, Ontario N5Z 3M7
(519) 686-7558 Fax: (519) 686-6374

RECEIVED

NOV 06 1990

Reported: 90-11-01

ANALYTICAL REPORT

WARDROP 1

Client: WARDROP ENGINEERING INC

WINNIPEG

Project Number: 50901/2

P.O.:

Attention: Mr Ed Wolowich

Date Received: 90-10-24

Client Ref. #:

Sample Type: Liquid

Sample #	Analytical Parameter	MDL	Result	Units	Comment
----------	----------------------	-----	--------	-------	---------

90-A019198 Sample Description: MWS

Date & Time Sampled: 90-10-23

Cyanide	0.005	ND	mg/L
pH Value	0.1	7.4	pH units
Total Kjeldahl Nitrogen N	0.02	1.55	mg/L
Conductivity	1.0	2780	us/cm
Oil & Grease - Total	1	ND	mg/L
Antimony Sb	0.001	0.004	mg/L
Arsenic As	0.001	0.023	mg/L
Barium Ba	0.02	0.04	mg/L
Beryllium Be	0.01	ND	mg/L
Cadmium Cd	0.005	ND	mg/L
Chromium Cr	0.02	ND	mg/L
Chromium Cr6+	0.01	ND	mg/L
Cobalt Co	0.02	ND	mg/L
Copper Cu	0.02	0.02	mg/L
Lead Pb	0.02	ND	mg/L
Mercury Hg	0.1	ND	ug/L
Molybdenum Mo	0.02	ND	mg/L
Nickel Ni	0.02	0.02	mg/L
Selenium Se	0.002	ND	mg/L
Silver Ag	0.01	ND	mg/L
Vanadium V	0.01	ND	mg/L
Zinc Zn	0.01	0.05	mg/L

MDL: Denotes Method Detections Limit

ND: Denotes Not Detected

M. Neaves M.Sc., C.Chem



ENVIROC CLEAN

A UNIT OF LAVALIN ENGINEERS INC.
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(519) 686-7558 Fax: (519) 686-6374

Reported: 90-10-18

ANALYTICAL REPORT

Page: 1

Client: WARDROP ENGINEERING INC

WINNIPEG

Project Number: 50901

P.O.:

Attention: MR Brent Morning

Client Ref. #: 901395-03-00; Public Market

Date Received: 90-10-03

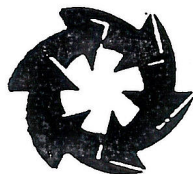
Sample Type: Liquid

Sample #	Analytical Parameter	MDL	Result	Units	Comment
90-A016814	Sample Description: Field Blank			Date & Time Sampled: 90-10-02	
	Cyanide	0.005	ND	mg/L	
	pH Value	0.1	6.8	pH units	
	Nitrate	0.01	0.46	mg/L	
	Sulphate SO ₄	0.5	ND	mg/L	
	Alkalinity CaCO ₃	2.0	ND	mg/L	
	Chloride Cl	1	ND	mg/L	
	Aluminum Al	0.02	ND	mg/L	
	Antimony Sb	0.001	ND	mg/L	
	Arsenic As	0.001	0.002	mg/L	
	Beryllium Be	0.01	ND	mg/L	
	Cadmium Cd	0.005	ND	mg/L	
	Calcium Ca	0.1	0.72	mg/L	
	Chromium Cr	0.02	ND	mg/L	
	Cobalt Co	0.02	ND	mg/L	
	Copper Cu	0.02	ND	mg/L	
	Lead Pb	0.02	ND	mg/L	
	Magnesium Mg	0.1	0.14	mg/L	
	Mercury Hg	0.1	ND	ug/L	
	Molybdenum Mo	0.02	ND	mg/L	
	Nickel Ni	0.02	ND	mg/L	
	Potassium K	0.01	ND	mg/L	
	Selenium Se	0.002	ND	mg/L	
	Silver Ag	0.01	ND	mg/L	
	Sodium Na	0.1	4.34	mg/L	
	Thallium Tl	0.005	0.006	mg/L	
	Vanadium V	0.01	ND	mg/L	
	Zinc Zn	0.01	0.02	mg/L	

MDL: Denotes Method Detection Limit

ND: Denotes Not Detected

J.M. Neaves M.Sc., C.Chem



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Page 1

ANALYTICAL REPORT

Volatile Analysis by Purge and Trap GC/MS, Full Scan

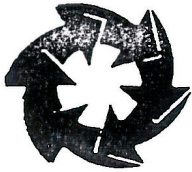
Client: Wardrop Engineering
Client Ref No.: 901395-03-00

Date Received: October 3, 1990
Date Analysis Started: October 4, 1990
Date Reported: October 18, 1990

Sample Description: 90/16810:MW #1
90/16811:MW #2
90/16812:MW #3
90/16813:MW #4
90/16814:Field Blank
90/16815:Travel Blank

Matrix: Water

Compound	MDL (ug/L)	90/16810 (ug/L)	90/16811 (ug/L)	90/16812 (ug/L)	90/16813 (ug/L)	90/16814 (ug/L)	90/16815 (ug/L)
Chloromethane	0.2	ND	ND	ND	ND	ND	ND
Vinyl Chloride	0.2	ND	ND	ND	ND	ND	ND
Bromomethane	3.2	ND	ND	ND	ND	ND	ND
Chloroethane	0.2	ND	ND	ND	ND	ND	ND
Acrolein	1.0	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	0.2	0.2	ND	ND	ND	ND	ND
Acrylonitrile	0.5	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	0.2	ND	ND	ND	ND	ND	ND
Dichloromethane	0.8	ND	ND	ND	ND	ND	2
t-1,2-Dichloroethene	0.2	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.2	ND	ND	ND	ND	ND	ND
Methyl Ethyl Ketone	0.5	ND	ND	ND	ND	ND	ND
Chlorobromomethane	0.2	ND	ND	ND	ND	ND	ND
Chloroform	0.2	ND	ND	ND	ND	5	ND
1,2-Dichloroethane	0.2	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	0.2	ND	ND	ND	ND	ND	ND
Benzene	0.2	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	0.2	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	0.2	ND	ND	ND	ND	ND	ND
Bromodichloromethane	0.4	ND	ND	ND	ND	ND	ND
Trichloroethene	0.5	ND	ND	ND	ND	ND	ND
Cis-1,3-Dichloropropene	1.0	ND	ND	ND	ND	ND	ND
tr-1,3-Dichloropropene	0.2	ND	ND	ND	ND	ND	ND
1,1,2-trichloroethane	0.2	ND	ND	ND	ND	ND	ND
Toluene	0.2	ND	ND	ND	ND	ND	ND
Chlorodibromomethane	0.2	ND	ND	ND	ND	ND	ND
1,2-Dibromoethane	0.2	ND	ND	ND	ND	ND	ND
Tetrachloroethene	0.2	ND	ND	ND	ND	ND	ND



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Page 2

ANALYTICAL REPORT

Volatile Analysis by Purge and Trap GC/MS, Full Scan

Client: Wardrop Engineering
Client Ref No.: 901395-03-00

Date Received: October 3, 1990
Date Analysis Started: October 4, 1990
Date Reported: October 18, 1990

Sample Description: 90/16810:MW #1
90/16811:MW #2
90/16812:MW #3
90/16813:MW #4
90/16814:Field Blank
90/16815:Travel Blank

Matrix: Water

Compound	MDL (ug/L)	90/16810 (ug/L)	90/16811 (ug/L)	90/16812 (ug/L)	90/16813 (ug/L)	90/16814 (ug/L)	90/16815 (ug/L)
Chlorobenzene	0.2	ND	ND	ND	ND	ND	ND
Ethylbenzene	0.2	ND	ND	ND	ND	ND	ND
m&p-Xylenes	0.2	ND	ND	ND	ND	ND	ND
Bromoform	0.2	ND	ND	ND	ND	ND	ND
Styrene	0.5	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.3	ND	ND	ND	ND	ND	ND
o-Xylene	0.2	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	0.5	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	0.6	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	1.0	ND	ND	ND	ND	ND	ND

ND-NOT DETECTED

MDL-METHOD DETECTION LIMIT

W.M. Neaves, MSc., C.Chem.

745 Logan Avenue
Winning Meadow
POE 215
POB, 045-2528 or 045-2503



SUBMITTER: *B. Manning* *KS*
LOCATION: *Public Markets Site*
REPORT TO: *E. Woloszewski*
FILE EA-1

SAMPLE - 10

From

Y	Sequent

To

Y	Sequent

Date Sampled

Y	M	D
9	1	01

Date Received

Y	M	D
9	1	01

L - Less than
G - Greater than

[illegible]

COMMENTS:

Ansatz: Brücken (94)

Nov 5/90.

g. Raudalir

Chemical Structures