ENVIRONMENTAL SITE ASSESSMENT
Red River Sediments Adjacent to the Former Sutherland Avenue Manufactured Gas Plant Winnipeg, MB Manitoba Hydro/Centra Gas

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EXECUTIVE SUMMARY

As requested by Manitoba Hydro/Centra Gas, Morrow Environmental Consultants Inc. (MECI) in association with Agassiz North Associates Limited (Agassiz North) has completed a Phase II Environmental Site Assessment (ESA) of the Red River sediments adjacent to and downstream of the Centra Gas Sutherland Operations Centre in Winnipeg, MB. The Centra Gas site is the location of a former Manufactured Gas Plant (MGP). The purpose of the assessment was to further investigate and document the extent of impacted sediments in the Red River identified during investigations completed by CH2M Hill (in 1994) and Agassiz North Associates Limited (since 1995). The results of the most recent sediment investigation are summarised in Agassiz North's report entitled: *Surficial Sediment Plume Study 1999*, December 2000.

The Phase II ESA completed by MECI included drilling 46 boreholes to depths ranging from 1.8 m to 6.4 m below the river bottom, sediment sample collection for visual observation, and laboratory analyses of selected samples.

The stratigraphy beneath the river bottom generally consisted of silt and clay which was encountered at depths ranging from 0 m to 5.3 m below river bottom, and/or fine sand and silt which was encountered at depths ranging from 0 m to 4.3 m below river bottom, and/or sand and gravel which was encountered at depths ranging from 0 m to 2.5 m below river bottom. The above deposits were underlain by silt till or clay till which extended to the maximum depth of investigation (6.4 m below river bottom).

Liquid and/or plastic coal tar was observed in several boreholes located adjacent to the Disraeli Bridge at depths ranging from 0 m to 3.7 m below river bottom. Liquid and/or plastic coal tar was observed in some boreholes located up to 700 m downstream of the bridge at depths ranging from 0 m to 1.2 m below river bottom. Liquid and/or plastic coal tar was not observed in boreholes located more than 20 m upstream of the bridge. Mothball/naphthalene odour and/or trace staining were observed in boreholes located adjacent to the bridge at depths ranging from 0 m to 4.4 m below river bottom. Mothball/naphthalene odour and/or trace staining were observed in boreholes located up to 800 m downstream of the bridge at depths ranging from 0 m to 1.8 m below river bottom. Only trace staining was observed in boreholes located more than 20 m upstream of the bridge at depths ranging from 0 m to 0.3 m below river bottom.

Coal tar related hydrocarbons were detected at elevated concentrations in sediment samples recovered from boreholes located adjacent to the Disraeli Bridge and downstream of the bridge. Visual evidence of impact extended 800 m downstream of the bridge. The sediment samples were recovered from depths ranging from 0 m to 2.9 m below river bottom.

TABLE OF CONTENTS

TABLES

APPENDICES

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1. INTRODUCTION

The current Centra Gas Sutherland Operations Centre is located at 35, 37 and 38 Sutherland Avenue in Winnipeg, MB. The site is the location of a former Manufactured Gas Plant (MGP). The plant produced manufactured gas from coal and oil during the period from the late 1800s to the mid 1900s.

Previous studies have determined that the soil and groundwater beneath the Centra Gas site, and off of the site to the north and west, have been impacted by a number of constituents characteristic of products associated with manufactured gas plant operations. Previous studies have also determined that sediments on the bottom of the Red River have been impacted by hydrocarbons characteristic of products associated with manufactured gas plant operations.

In view of the nature and types of constituents found at the Site, Manitoba Hydro/Centra Gas retained Agassiz North Associates Limited and Morrow Environmental Consultants Inc. (MECI) to assist them in completing the environmental site assessment work to delineate the extent of impacted sediments in the Red River. This report summarizes the results of the environmental site assessment work completed by MECI on the Red River Sediments.

1.1. Project Team

The Phase II Environmental Site Assessment (ESA) of Centra Gas's former Manufactured Gas Plant Site in Winnipeg, MB was carried out by a project team consisting of MECI representatives: Alex Man, M.Sc., P.Eng., Roberta Dyck, P.Eng., Andrew Eason, P.Eng., and Ron Typliski, P.Eng. Site investigation work and report preparation were conducted by Alex Man, Roberta Dyck and Andrew Eason with senior technical review provided by Ron Typliski. Doug Ramsey of Agassiz North Associates Limited provided liaison between MECI and Manitoba Hydro/Centra Gas, and shared his knowledge of the area of investigation.

Manitoba Hydro/Centra Gas representatives, who provided invaluable assistance to the project team, were Dennis Windsor and Bob Gill.

1.2. Phase II ESA Objectives and Scope of Investigation

The purpose of the Phase II ESA was as follows.

- Delineate horizontal and vertical extent of impacted sediment identified during the surficial sediment studies undertaken by Agassiz North;

The scope of work completed for the Phase II ESA is summarized below.

- Determination of the ice thickness to ensure that the investigation could be undertaken;
- Forty-six boreholes were installed in the bottom of the Red River. Sediment samples were recovered from the boreholes and selected sediment samples were submitted for laboratory analysis of organic parameters.
- This report was prepared summarizing the findings of the investigation.

A separate investigation was undertaken by MECI on the Red River bank soil adjacent to the former MGP. The results of the investigation were presented to Manitoba Hydro/Centra Gas in a separate report dated 2001 09 17.

2. BACKGROUND

2.1. Site Description

The current Centra Gas Sutherland Operations Centre is the site of a former MGP. The site is bounded by the CPR tracks to the south, Annabella Street to the east, Rover Avenue to the north and Gladstone Street to the west. Surrounding land use includes commercial and residential to the east, commercial to the south, and the Disraeli Freeway to the west beyond which are recreational and residential areas. The Red River is located immediately north of Rover Avenue. The river flows northwest past the Centra Gas site. A Location Plan is presented as Drawing W1801B-001, Appendix I.

2.2. Previous Work

2.2.1. Agassiz North Surficial Sediment Plume Studies

In 1994, polycyclic aromatic hydrocarbon (PAH) impact was identified in the sediments of the Red River located to the north of the former manufactured gas plant site now owned by Centra Gas. Sediment studies were conducted by Agassiz North Associates Limited (Agassiz North) in 1995, 1996, 1997, 1998 and 1999. The 1999 study indicated that the river bottom sediments with visible evidence of PAH impact were located in two areas. The main area is approximately 125 m in length and is located adjacent to, and west of, the Disreali Bridge. The second area is located approximately 125 m downstream of the main area and extends about 150 m downstream. The extent of PAH impacted sediments in 1999 is shown on Drawing W1801B-002 in Appendix I.

2.2.1.1. River Bottom Sediments

Based on the Agassiz North 1999 investigation, the river bottom sediments generally consisted of silty clay underlain by clay over granular material; silty clay underlain by granular material over clay; granular material underlain by silty clay or clay over granular material; or hard bottom materials consisting of either granular or hardpan (i.e., till). Areas of visible PAH impact, in the form of tarry materials, and trace evidence of PAH impact, in the form of staining and odour, are shown on Drawing W1801B-002 in Appendix I.

2.2.1.2. Sediment Analytical Results

During the Agassiz North 1999 investigation, selected sediment samples were submitted to Philip Analytical Services in Mississauga, ON for analysis of polycyclic aromatic hydrocarbons (PAHs).

The analytical results were compared to guidelines and criteria presented in the documents entitled: *Canadian Environmental Quality Guidelines*, Canadian Council of Ministers of the Environment (CCME), 1999, *Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario*, Persaud et al, 1993, and *Criteres interimaires pour l'evaluation de la qualite des sediments du Saint-Laurent*, Environment Canada/Ministere de l'Environment du Quebec, 1992.

Residual PAHs were detected at concentrations exceeding one or more of the above referenced guidelines and criteria in samples recovered from sediments located in the areas with visible evidence of impact. Residual PAHs were generally not detected at concentrations exceeding the above referenced guidelines and criteria in samples recovered from sediments located adjacent to the areas with visible evidence of impact.

3. REGULATORY FRAMEWORK

Sediment quality for the current field investigation has been assessed within a regulatory framework of federal and provincial guidelines for the target parameters. The guidelines for sediment quality are discussed below, with respect to their application and relevance to the investigation and the data obtained. The guidelines presented below are for information purposes and are not presented as remediation objectives.

The document entitled *Canadian Environmental Quality Guidelines*, CCME, 1999 presents the Canadian Sediment Quality Guidelines for the Protection of Aquatic Life. The sediment quality guidelines present two assessment values. The Interim Sediment Quality Guideline (ISQG) represents the concentration below which adverse biological effects are expected to occur rarely. The Probable Effect Level (PEL) represents the concentration above which adverse effects are expected to occur frequently.

For PAH compounds not referenced in the CCME (1999) Canadian Sediment Quality Guidelines, the guidelines presented in the document entitled: *Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario*, Persaud et al, 1993 are presented. In the absence of a CCME (1999) ISQG guideline, the Ontario Lower Effect Level (LEL) guideline is presented. In the absence of a CCME (1999) PEL guideline, the Ontario Severe Effect Level (SEL) guideline is presented.

For benzene, toluene, ethylbenzene, and xylenes (BTEX) components not referenced in the CCME (1999) Canadian Sediment Quality Guidelines, the guidelines presented in the document entitled: *The Development of Canadian Marine Environment Quality Guidelines. Marine Environmental Quality Series No. 1.*, MacDonald et al 1992 are presented.

The sediment quality guidelines, as discussed above, are summarised in the table below.

Sediment Quality Guidelines

	Canadian Sediment Quality Guidelines for Protection of Aquatic Life[1]	
Parameter	**ISQG[2]**	**PEL[3]**
Acenaphthene	0.00671	0.0889
Acenaphthylene	0.00587	0.128
Anthracene	0.0469	0.245
Benzo(a)anthracene	0.0317	0.3850
Benzo(a)pyrene	0.0319	0.782
Benzo(b)flouranthene	NG	NG
Benzo(k)flouranthene	0.240[4]	38.2[4]
Bebzo(g,h,i)perylene	0.170[4]	9.120[4]
Chrysene	0.0571	0.8620
Dibenzo(a,h)anthracene	0.0062	0.1350
Fluoranthene	0.1110	2.3550
Fluorene	0.0212	0.1440
Indeno(1,2,3-cd)pyrene	0.200[4]	9.120[4]
Naphthalene	0.0346	0.3910
1-methyl naphthalene	0.0202	0.2010
2-methyl naphthalene	0.0202	0.2010
Phenanthrene	0.0419	0.5150
Pyrene	0.0530	0.8750
Total PAHs	4.000[4]	285.000[4]
Benzene	0.34[5]	-
Toluene	2.5[5]	-
Ethylbenzene	1.4[5]	-
Xylene(s)	>0.12[5]	-

Guidelines are expressed in milligrams per dry kilogram
[1] - *Canadian Environmental Quality Guidelines*, CCME, 1999
[2] - Interim Sediment Quality Guideline
[3] - Probable Effect Level
[4] - *Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario*, Persaud et al, 1993
[5] - *The Development of Canadian Marine Environment Quality Guidelines. Marine Environmental Quality Series No. 1.*, MacDonald et al 1992

4. FIELD INVESTIGATION

Prior to commencing the drilling investigation on the Red River, the thickness of ice was determined by MECI and Maple Leaf Drilling personnel. Holes were cored through the ice at each proposed borehole location. The proposed boreholes were located relative to the reference point established by Agassiz North during the previous studies. The minimum ice thickness measured was 0.43 m (17 inches), which was sufficient to support the drill rig, equipment and personnel. Permits to undertake the work on the ice were requested and obtained from the Winnipeg Police Service, River Patrol Unit, under the City of Winnipeg By-Law #6581/95.

The drilling investigation was conducted by MECI personnel on 2001 02 21 to 2001 03 16 and included the supervision of the drilling of 46 boreholes and the collection of soil samples for field screening and potential laboratory analysis. Prior to initiating the drilling program, utilities crossing the Red River in the area of investigation including telecommunications, natural gas, power, and water and sewer lines were identified by representatives of the appropriate utilities and/or by drawings provided by the appropriate utility companies.

Boreholes 01-01 to 01-46 were drilled from the ice of the Red River to delineate the horizontal and vertical extent of impact in the river bottom sediments. The area of investigation extended generally from Annabella Street downstream to the former Pritchard Boat Yard at Manitoba Avenue. The locations of the boreholes are presented on the Site Plan, Drawing W1801B-003, Appendix I.

Boreholes were drilled to depths ranging from 1.8 m to 6.4 m below river bottom using a skid mounted drilling rig operated by Maple Leaf Drilling of Winnipeg, MB. As soft sediments were anticipated on the river bottom, the boreholes were advanced using 230 mm diameter hollow stem continuous flight augers. Once the hollow stem augers were socketted into cohesive material, solid stem augers were advanced through the hollow stem augers to facilitate the collection of samples. Boreholes 01-01 to 01-13, 01-27, 01-28 and 01-29 were drilled under and immediately adjacent to the Disraeli Bridge in an area where Agassiz North (1999) had identified river bottom sediments with visible evidence of PAH impact. Boreholes 01-23, 01-24 and 01-25 were drilled on the upstream side of the bridge and natural gas pipeline crossing to establish upstream extent of the impact. Boreholes 01-14 to 01-22, 01-26 and Boreholes 01-30

to 01-46 were drilled downstream in the second area where Agassiz North (1999) had identified river bottom sediments with visible or trace evidence of PAH impact.

Each borehole was advanced in 0.75 m to 1.5 m intervals to allow for the collection of samples of the sediments. Representative sediment samples were collected at various depth intervals using split spoon samplers and/or using continuous coring for field screening of sample headspace vapour concentrations, visual observation and potential laboratory analysis. As the boreholes were advanced, the stratigraphic conditions were logged in detail with respect to sediment composition, relative density, moisture content, and any visual and/or olfactory evidence of impact.

The sediment samples were handled in accordance with the following protocols:

- Samples were collected and placed into a sealable polyethylene bag for field screening. Selected samples were collected in duplicate, with a portion of the sample being transferred to laboratory supplied sample containers. Prior to transferring the samples to the polyethylene bags and/or sampling containers, the samples were trimmed to remove any smeared or loose materials which may have contacted the sampling devices;

- The bagged portion of the sample was field screened for hydrocarbon vapour concentrations using a standardized headspace technique. The headspace analysis of samples involved allowing the bagged sample to warm to a consistent air temperature throughout the investigation. The bag was then punctured using the monitoring probe and screened for hydrocarbon vapours using a portable hydrocarbon vapour analyser (calibrated to a hexane standard) set for no methane response. The results were recorded in parts per million (ppm); and

- The samples collected for potential laboratory analyses were placed into laboratory supplied sample containers. The soil samples were stored in ice-chilled coolers, and shipped, via courier, to Philip Analytical Services Corp. (Philip) in Mississauga, ON within 48 hours of sample collection. Selection of samples for laboratory analyses was based on several factors including the location, depth, visual evidence of impact, and/or headspace screening results. A description of the analytical methodologies and procedures is included in the methodologies section of the Laboratory Reports presented in Appendix II.

Cuttings generated during drilling were screened for evidence of hydrocarbon impact (visible staining, sheen, combustible vapours identified using a hydrocarbon vapour analyser). Surplus cuttings were stored in barrels adjacent to the Centra Gas site and the area of investigation. Following confirmatory laboratory analysis, the cuttings were transported to the MidCanada Environmental Services Ltd. soil treatment facility in Ile des Chenes, MB for disposal. The boreholes were backfilled with bentonite grout which was pumped into the holes using a tremmy pipe.

To minimize the possibility of cross contamination, the sampling equipment was cleaned after the collection of each sample.

On 2001 03 16, the horizontal location of each borehole and the elevation of the ice at each borehole location were surveyed by MECI personnel, with assistance from a UMA survey crew. UTM (NAD83) coordinates for the boreholes and reference points in the area of investigation were obtained using a Trimble GPS Pathfinder Pro XRS. In the area under the Disreali Bridge where the GPS unit was not able to provide the coordinates due to insufficient satellite coverage, the horizontal location of each borehole was obtained using total station survey equipment. The ice elevation at each borehole location was also obtained using the total station survey equipment. The UTM coordinates and elevations are presented in Appendix III.

5. RESULTS OF INVESTIGATION

5.1. Stratigraphy

Based on MECI's drilling investigation, the stratigraphy beneath the river bottom generally consisted of silt and clay which was encountered at depths ranging from 0 m to 5.3 m below river bottom, and/or fine sand and silt which was encountered at depths ranging from 0 m to 4.3 m below river bottom, and/or sand and gravel which was encountered at depths ranging from 0 m to 2.5 m below river bottom. The above deposits were underlain by silt till or clay till which extended to the maximum depth of investigation (6.4 m below river bottom). Detailed stratigraphic information obtained during the drilling program can be found in the Borehole Logs in Appendix IV. Stratigraphic cross-sections of the area of investigation are presented on Drawings W1801B-004, W1801B-005 and W1801B-006, Appendix I. Selected photographs taken during the drilling investigation were included in Appendix V.

The estimated extent of sediments containing visible evidence impact, including liquid coal tar, plastic/viscous coal tar, significant staining and/or apparent hydrocarbon sheen, is presented on Drawing W1801B-003, Appendix I. Visible evidence of impact was associated with the presence of mothball/naphthalene odour in all cases (mothball odour being the characteristic odour of the PAH naphthalene). The visible evidence of impact is summarized on the following table.

Borehole	Depth below river bottom (m)	Stratigraphy	Visible Evidence of Impact
01-02	0 – 0.2 1.1 - 1.5	Silt and Clay	Sheen and black staining
01-04	0 – 3.7	Silty clay, Sand and silt	Liquid coal tar, sheen and black staining
01-05	0 – 1.8	Sand and silt	Liquid coal tar, sheen and black staining
01-07	0 – 0.6 2.1 – 2.4	Clay, Sand	Trace liquid coal tar, trace sheen and black staining
01-10	0 – 0.3 0.3 – 1.2	Silt, Sand and silt	Liquid coal tar and black staining
01-12	0 – 0.4 0.4 – 2.0	Gravel, Sand and silt	Liquid coal tar, sheen and black staining
01-13	1.5 – 1.8	Sand and gravel	Plastic coal tar, trace sheen and trace black staining
01-16	0 –0.2	Sand and gravel	Plastic coal tar chunks

Borehole	Depth below river bottom (m)	Stratigraphy	Visible Evidence of Impact
01-17	0 – 0.3	Sand and gravel	Sheen and black staining
01-19	0.6 – 0.8	Silt	Trace liquid coal tar and black staining
01-20	0 - 0.4 0.4 – 0.8	Silt, Sand	Liquid coal tar, plastic coal tar, sheen and black staining
01-21	0 – 0.8 0.8 – 1.1	Silt, Sand	Liquid coal tar, plastic coal tar, sheen and black staining
01-28	0-0.6 0.6 – 1.1 1.1 – 1.8	Silt and sand, Sand, Silt	Liquid coal tar, plastic coal tar, sheen and black staining
01-36	0.3 – 1.2	Sand	Liquid coal tar, plastic coal tar, sheen and black staining
01-38	0.6 – 1.2	Silt	Liquid coal tar, plastic coal tar and black staining
01-39	0 – 0.3	Gravel	Plastic coal tar chunk

The estimated extent of sediments containing trace evidence of impact, including staining and/or odour (mothball/naphthalene odour) is presented on Drawing W1801B-003, Appendix I. The trace evidence of impact is summarized on the following table.

Borehole	Depth below river bottom (m)	Stratigraphy	Trace Evidence of Impact
01-01	0 – 0.3	Silt and clay	Some black staining
01-03	0 - 1.5 1.5 – 2.1	Sand and silt Clay and silt	Trace black staining and odour
01-11	0 – 2.0	Clay	Trace black staining and odour
01-18	0.2 – 0.8	Silt	Trace black staining
01-22	0 – 0.3	Silt	Trace black staining
01-23	0.1 – 0.3	Sand and silt	Trace black staining
01-24	0.1 – 0.4	Silt and sand	Trace black staining
01-27	0 – 1.0	Sand and silt	Trace black staining
01-29	1.5 – 1.8	Sand	Odour
01-30	0 – 0.4	Silt	Trace black staining
01-34	0 – 0.3	Silt	Trace black staining
01-40	0.3 – 1.2	Silt and sand	Trace black staining

Cross-sections of the area of investigation showing the estimated extent of visible and trace impact are presented on Drawings W1801B-004, W1801B-005 and W1801B-006, Appendix I.

5.2. Analytical Results

Laboratory results are summarized in Table 1. The detailed analytical reports are provided in Appendix II, which include information on the laboratory analytical methodology.

A total of 23 sediment samples were recovered from Boreholes 01-03, 01-05, 01-11, 01-15, 01-17, 01-18, 01-19, 01-21, 01-24, 01-25, 01-26, 01-27, 01-28, 01-29, 01-30, 01-32, 01-34, 01-36, 01-37, 01-40 and 01-43 for laboratory analysis during the Red River drilling investigation. The samples were analysed for constituents including: benzene, toluene, ethylbenzene and xylenes (BTEX) and polycyclic aromatic hydrocarbons (PAHs). Additionally as requested by Manitoba Hydro/Centra Gas, hydrocarbon fractions F1 (C_6 - C_{10}), F2 (>C_{10} - C_{16}), F3 (>C_{16} - C_{34}), and F4 (>C_{34}) as described in the document: *Canada-Wide Standards (CWS) for Petroleum Hydrocarbons (PHC) in Soil,* CCME, April 2001, were included for informational purposes. There are no applicable guidelines for the F1 to F4 hydrocarbon fractions in sediment.

BTEX components were detected at elevated concentrations in sediment samples recovered from Boreholes 01-05 and 01-28, located adjacent to the Disraeli Bridge, and from Boreholes 01-21 and 01-36, located downstream of the Disraeli Bridge. BTEX components were not detected in the remaining samples at concentrations exceeding the laboratory estimated quantitation limits.

PAH components were detected at elevated concentrations in sediment samples recovered from Boreholes 01-03, 01-05, 01-27, 01-28 and 01-29, located adjacent to the Disraeli Bridge, and from Boreholes 01-15, 01-17, 01-18, 01-19, 01-21, 01-32, 01-34, 01-36, 01-37 and 01-40, located downstream of the Bridge. PAHs were not detected at concentrations greater than the practical quantitation limit (defined as five times the estimated quantitation limit) in the sediment samples recovered from Boreholes 01-11, 01-24, 01-25, 01-26, 01-30 and 01-43.

Elevated hydrocarbon fractions F1 to F4 were detected in sediment samples recovered from Boreholes 01-05 and 01-28, located adjacent to the Disraeli Bridge, and from Boreholes 01-17, 01-21 and 01-36, located downstream of the Bridge.

6. CONCLUSIONS

Based on the results of this Phase II ESA, the following conclusions are made regarding the Red River sediments adjacent to and downstream of the former MGP Site in Winnipeg, MB.

- The stratigraphy beneath the river bottom generally consisted of silt and clay which was encountered at depths ranging from 0 m to 5.3 m below river bottom, and/or fine sand and silt which was encountered at depths ranging from 0 m to 4.3 m below river bottom, and/or sand and gravel which was encountered at depths ranging from 0 m to 2.5 m below river bottom. The above deposits were underlain by silt till or clay till which extended to the maximum depth of investigation (6.4 m below river bottom).

- Liquid and/or plastic coal tar was observed in boreholes located adjacent to the Disraeli Bridge and up to 700 m downstream of the bridge. Liquid and/or plastic coal tar was not observed in boreholes located more than 20 m upstream of the bridge. Mothball/naphthalene odour and/or trace staining were observed in boreholes located adjacent to and up to 800 m downstream of the bridge. Only trace staining was observed in boreholes located more than 20 m upstream of the bridge.

- Coal tar related hydrocarbons were detected at elevated concentrations in sediment samples recovered from boreholes located adjacent to the Disraeli Bridge and downstream of the bridge. Visual evidence of impact extended 800 m downstream of the bridge. The sediment samples were recovered from depths ranging from 0 m to 2.9 m below river bottom.

- Significant coal tar impact does not appear to extend beyond Annabella Street upstream of the Disraeli Bridge, nor beyond the former Pritchard Boat Yard at Manitoba Avenue downstream of the bridge.

7. CLOSURE

This report has been prepared by Morrow Environmental Consultants Inc. (MECI) for the exclusive use of Manitoba Hydro/Centra Gas, who has been party to the development of the scope of work for this project and understands its limitations.

This report is intended to provide information to Manitoba Hydro/Centra Gas to assist it in making business decisions. MECI is not a party to the various considerations underlying the business decisions, and does not make recommendations regarding such business decisions. In providing this report, MECI accepts no liability or responsibility in respect of the site described in this report or for any business decisions relating to the site, including decisions in respect of the purchase, sale or investment in the site.

Any use, reliance on, or decision made by a third party based on this report is the sole responsibility of such third party. MECI accepts no liability or responsibility for any damages that may be suffered or incurred by any third party as a result of the use of, reliance on, or any decision made based on this report.

The findings, conclusions and recommendations in this report have been developed in a manner consistent with the level of skill normally exercised by environmental professionals currently practising under similar conditions in the area. The findings contained in this report are based, in part, upon information provided by others. If any of the information is inaccurate, modifications to the findings, conclusions and recommendations may be necessary.

The findings, conclusions and recommendations presented by MECI in this report reflect MECI's best judgement based on the site conditions at the time of the site inspection on the date(s) set out in this report and on information available at the time of preparation of this report. They have been prepared for specific application to this site and are based, in part, upon visual observation of the site, subsurface investigation at discrete locations and depths, and specific analysis of specific materials as described in this report during a specific time interval. The findings cannot be extended to previous or future site conditions or to portions of the site which were unavailable for direct observation, subsurface locations which were not investigated directly, or materials or analysis which were not specified. Substances other than those described may exist within the site, reported substance parameters may exist in areas of

the site not investigated, and concentrations of substances greater than those reported may exist between sample locations.

If site conditions change or if any additional information becomes available at a future date, modifications to the findings, conclusions and recommendations may be necessary.

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8. REFERENCES

- Agassiz North Associates Limited, 2000. *Surficial Sediment Plume Study 1999.* Report prepared for Centra Gas, Winnipeg, MB

- Canadian Council of Ministers of the Environment, 2000, *Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil.*

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- Persaud, D., R. Jaagumagi, A. Hayton, 1993. *Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario.* Queen's Printer for Ontario.

TABLE 1: Summary of Analytical Results for Hydrocarbons in Sediment - Centra Gas

Borehole No.:	BH01-03	BH01-05	BH01-05	BH01-11	BH01-15	BH01-17	
Location (NW/NE):	230m/50m	230m/30m	230m/30m	275m/15m	400m/45m	500m/35m	
Sample No.:	BH01-3-3B-010223	BH01-5-2-010226	BH01-5-4-010226	BH01-11-5-010228	BH01-15-6-010305	BH01-17-1-010305	
Depth below river bottom (m):	1.2	1.7	2.3	4.4	2.5	0.2	
Soil Vapour Concentration (ppm):	150	550	200	175	660	50	
Visual Soil Classification:	sand & silt	sand & silt	silt till	silt till	silt till	sand & gravel	
Visual Impact:	trace staining & odour	LPH, staining & sheen	slight mothball odour	none	none	some staining & sheen	
Parameter							EQL
Acenaphthene	1.06	419	0.14	<0.05	<0.05	58.90	0.05
Acenaphthylene	0.14	2160	0.58	<0.05	<0.05	4.63	0.05
Anthracene	0.90	1910	0.57	<0.05	<0.05	42.50	0.05
Benzo(a)anthracene	0.76	1260	0.34	<0.05	<0.05	37.30	0.05
Benzo(a)pyrene	0.79	1390	0.35	<0.05	<0.05	33.10	0.05
Benzo(b)flouranthene	0.95	1680	0.39	<0.05	<0.05	35.10	0.05
Benzo(k)flouranthene	0.32	538	0.14	<0.05	<0.05	15.10	0.05
Benzo(g,h,i)perylene	0.37	713	0.16	<0.05	<0.05	13.30	0.05
Chrysene	0.68	1230	0.30	<0.05	<0.05	31.90	0.05
Dibenzo(a,h)anthracene	0.08	159	<0.05	<0.05	<0.05	3.63	0.05
Fluoranthene	2.26	3150	1.23	<0.05	<0.05	96.80	0.05
Fluorene	0.69	1570	0.40	<0.05	<0.05	38.70	0.05
Indeno(1,2,3-cd)pyrene	0.43	877	0.16	<0.05	<0.05	17.10	0.05
Naphthalene	1.94	8990	2.84	<0.05	0.07	88.50	0.05
1-methyl naphthalene	0.35	965	0.24	<0.05	<0.05	20.10	0.05
2-methyl naphthalene	0.44	1800	0.46	<0.05	<0.05	33.00	0.05
Phenanthrene	2.64	5670	1.85	<0.05	0.05	148.00	0.05
Pyrene	1.93	2720	1.02	<0.05	<0.05	75.10	0.05
Total PAHs	16.73	37,201	11.17	-	0.12	793	
Benzene	<0.040	194.0	<0.040	<0.040	<0.040	<0.040	0.040
Toluene	<0.040	152.0	<0.040	<0.040	<0.040	<0.040	0.040
Ethylbenzene	<0.040	48.2	<0.040	<0.040	<0.040	<0.040	0.040
Xylene(s)	<0.120	188.7	<0.120	<0.040	<0.120	<0.120	0.040
CWS F1 (C_6 - C_{10})	<10.0	290	<10.0	<10.0	<10.0	<10.0	10.0
CWS F2 (>C_{10} - C_{16})	25.8	34,200	<10.0	<10.0	<10.0	391	10.0
CWS F3 (>C_{16} - C_{34})	127	69,400	12.6	<10.0	<10.0	1,730	10.0
CWS F4 (>C_{34})	54.9	15,100	<10.0	<10.0	<10.0	278	10.0

Results expressed in milligrams per dry kilogram (mg/kg)

EQL - Estimated quantitation limit

TABLE 1: Summary of Analytical Results for Hydrocarbons in Sediment - Centra Gas

Borehole No.:	BH01-18	BH01-19	BH01-21	BH01-24	BH01-25	BH01-26	
Location:	550m/40m	600m/40m	700m/40m	150m/10m	150m/45m	325m/50m	
Sample No.:	BH01-18-2-010306	BH01-19-4-010308	BH01-21-2-010308	BH01-24-2-010306	BH01-25-2-010306	BH01-26-2A-010307	
Depth below river bottom (m):	0.8	2.9	0.3	1.5	2.4	0.8	
Soil Vapour Concentration (ppm):	210	150	125	160	160	50	
Visual Soil Classification:	sandy silt	silt till	sand & silt	sand & silt	silt till	silt till	
Visual Impact:	trace staining	none	LPH & plastic coal tar	none	none	none	
Parameter							EQL
Acenaphthene	0.19	<0.05	295.0	0.06	<0.05	<0.05	0.05
Acenaphthylene	<0.05	<0.05	17.1	<0.05	<0.05	<0.05	0.05
Anthracene	0.49	<0.05	148.0	<0.05	<0.05	<0.05	0.05
Benzo(a)anthracene	0.07	<0.05	84.4	<0.05	<0.05	<0.05	0.05
Benzo(a)pyrene	<0.05	<0.05	83.4	<0.05	<0.05	<0.05	0.05
Benzo(b)flouranthene	0.05	<0.05	78.4	<0.05	<0.05	<0.05	0.05
Benzo(k)flouranthene	<0.05	<0.05	30.0	<0.05	<0.05	<0.05	0.05
Benzo(g,h,i)perylene	<0.05	<0.05	26.6	<0.05	<0.05	<0.05	0.05
Chrysene	0.06	<0.05	81.1	<0.05	<0.05	<0.05	0.05
Dibenzo(a,h)anthracene	<0.05	<0.05	7.1	<0.05	<0.05	<0.05	0.05
Fluoranthene	0.37	<0.05	247.0	0.11	<0.05	<0.05	0.05
Fluorene	0.27	<0.05	105.0	<0.05	<0.05	<0.05	0.05
Indeno(1,2,3-cd)pyrene	<0.05	<0.05	31.1	<0.05	<0.05	<0.05	0.05
Naphthalene	0.43	0.07	764.0	0.05	0.05	<0.05	0.05
1-methyl naphthalene	0.15	<0.05	117.0	<0.05	<0.05	<0.05	0.05
2-methyl naphthalene	0.14	<0.05	217.0	<0.05	<0.05	<0.05	0.05
Phenanthrene	1.07	<0.05	449.0	0.14	<0.05	<0.05	0.05
Pyrene	0.42	<0.05	244.0	0.10	<0.05	<0.05	0.05
Total PAHs	3.71	0.07	3,025	0.46	0.05	-	
Benzene	<0.040	<0.040	0.216	<0.040	<0.040	<0.040	0.040
Toluene	<0.040	<0.040	0.732	<0.040	<0.040	<0.040	0.040
Ethylbenzene	<0.040	<0.040	38.5	<0.040	<0.040	<0.040	0.040
Xylene(s)	<0.120	<0.120	33.1	<0.120	<0.120	<0.120	0.040
CWS F1 (C_6 - C_{10})	<10.0	<10.0	186	<10.0	<10.0	<10.0	10.0
CWS F2 (>C_{10} - C_{16})	<10.0	<10.0	5,100	<10.0	<10.0	<10.0	10.0
CWS F3 (>C_{16} - C_{34})	180	92.1	7,300	92.1	<10.0	<10.0	10.0
CWS F4 (>C_{34})	19.1	13.8	5,320	13.8	<10.0	<10.0	10.0

Results expressed in milligrams per dry kilogram (mg/kg)

EQL - Estimated quantitation limit

TABLE 1: Summary of Analytical Results for Hydrocarbons in Sediment - Centra Gas

Borehole No.:	BH01-27	BH01-28	BH01-29	BH01-30	BH01-32	BH01-34	
Location:	288m/40m	288m/30m	288m/10m	800m/55m	900m/50m	450m/50m	
Sample No.:	BH01-27-2-010307	BH01-28-2-010307	BH01-29-2-010307	BH01-30-2-010309	BH01-32-3-010309	BH01-34-1-010314	
Depth below river bottom (m):	0.6	0.8	1.8	0.4	0.9	0.2	
Soil Vapour Concentration (ppm):	75	550	75	165	450	75	
Visual Soil Classification:	silt	silty sand	sand	silt	silt till	sandy silt	
Visual Impact:	trace staining	LPH, staining & sheen	slight mothball odour	trace staining	none	trace staining	
Parameter							EQL
Acenaphthene	<0.05	62.4	0.71	<0.05	<0.05	0.18	0.05
Acenaphthylene	<0.05	12.3	0.25	<0.05	<0.05	0.06	0.05
Anthracene	<0.05	23.4	0.95	<0.05	<0.05	0.09	0.05
Benzo(a)anthracene	<0.05	13.5	0.96	<0.05	<0.05	0.09	0.05
Benzo(a)pyrene	<0.05	15.0	1.02	<0.05	<0.05	0.08	0.05
Benzo(b)flouranthene	<0.05	14.3	1.06	<0.05	<0.05	0.10	0.05
Benzo(k)flouranthene	<0.05	5.31	0.42	<0.05	<0.05	<0.05	0.05
Benzo(g,h,i)perylene	<0.05	4.94	0.57	<0.05	<0.05	<0.05	0.05
Chrysene	<0.05	15.2	0.88	<0.05	<0.05	0.07	0.05
Dibenzo(a,h)anthracene	<0.05	1.2	0.10	<0.05	<0.05	<0.05	0.05
Fluoranthene	<0.05	33.6	2.93	<0.05	<0.05	0.29	0.05
Fluorene	<0.05	18.7	0.67	<0.05	<0.05	0.13	0.05
Indeno(1,2,3-cd)pyrene	<0.05	5.13	0.64	<0.05	<0.05	0.05	0.05
Naphthalene	0.69	220.0	0.50	0.07	0.49	0.53	0.05
1-methyl naphthalene	<0.05	28.6	0.18	<0.05	<0.05	0.08	0.05
2-methyl naphthalene	<0.05	46.9	0.15	<0.05	<0.05	0.08	0.05
Phenanthrene	0.05	77.6	3.49	<0.05	<0.05	0.37	0.05
Pyrene	<0.05	38.3	2.39	<0.05	<0.05	0.23	0.05
Total PAHs	0.74	636	17.87	-	0.49	2.43	-
Benzene	<0.040	4.210	<0.040	<0.040	<0.040	<0.040	0.040
Toluene	<0.040	2.520	<0.040	<0.040	<0.040	<0.040	0.040
Ethylbenzene	<0.040	7.69	<0.040	<0.040	<0.040	<0.040	0.040
Xylene(s)	<0.120	8.66	<0.120	<0.120	<0.120	<0.120	0.040
CWS F1 (C_6 - C_{10})	<10.0	43.8	<10.0	<10.0	<10.0	<10.0	10.0
CWS F2 (>C_{10} - C_{16})	<10.0	942	<10.0	<10.0	<10.0	<10.0	10.0
CWS F3 (>C_{16} - C_{34})	<10.0	785	40.1	10.3	<10.0	82	10.0
CWS F4 (>C_{34})	<10.0	693	18.4	11.1	<10.0	263	10.0

Results expressed in milligrams per dry kilogram (mg/kg)

EQL - Estimated quantitation limit

TABLE 1: Summary of Analytical Results for Hydrocarbons in Sediment - Centra Gas

Borehole No.:	BH01-36	BH01-36	BH01-37	BH01-40	BH01-43	
Location:	500m/20m	500m/20m	500m/10m	450m/10m	700m/20m	
Sample No.:	BH01-36-1-010314	BH01-36-7-010314	BH01-37-2-010314	BH01-40-2-010315	BH01-43-0-010316	
Depth below river bottom (m):	0.9	2.9	0.8	0.8	0.3	
Soil Vapour Concentration (ppm):	500	550	200	60	400	
Visual Soil Classification:	sand	silt till	clay	sandy silt	clay	
Visual Impact:	LPH & plastic coal tar	none	none	trace staining	none	
Parameter						EQL
Acenaphthene	235	0.64	0.58	0.25	<0.05	0.05
Acenaphthylene	15.3	0.06	0.89	0.05	<0.05	0.05
Anthracene	107	0.42	2.40	0.26	<0.05	0.05
Benzo(a)anthracene	71.2	0.27	4.16	0.44	<0.05	0.05
Benzo(a)pyrene	62.5	0.27	5.32	0.44	<0.05	0.05
Benzo(b)flouranthene	70.7	0.29	5.27	0.64	<0.05	0.05
Benzo(k)flouranthene	24.6	0.11	1.65	0.21	<0.05	0.05
Benzo(g,h,i)perylene	26.7	0.14	3.19	0.25	<0.05	0.05
Chrysene	66.3	0.23	4.31	0.43	<0.05	0.05
Dibenzo(a,h)anthracene	5.03	<0.05	0.53	0.07	<0.05	0.05
Fluoranthene	242	0.92	6.32	1.13	<0.05	0.05
Fluorene	107	0.34	0.85	0.17	<0.05	0.05
Indeno(1,2,3-cd)pyrene	32.6	0.16	3.21	0.29	<0.05	0.05
Naphthalene	595	1.73	0.56	0.79	<0.05	0.05
1-methyl naphthalene	94.4	0.24	0.27	0.18	<0.05	0.05
2-methyl naphthalene	175	0.45	0.37	0.23	<0.05	0.05
Phenanthrene	348	1.38	4.14	0.80	<0.05	0.05
Pyrene	221	0.80	7.26	0.92	<0.05	0.05
Total PAHs	2499.33	8.45	51.28	7.55	-	-
Benzene	6.08	<0.040	<0.040	<0.040	<0.040	0.040
Toluene	10.4	<0.040	<0.040	<0.040	<0.040	0.040
Ethylbenzene	56.0	<0.040	<0.040	<0.040	<0.040	0.040
Xylene(s)	73.6	<0.120	<0.120	<0.120	<0.120	0.040
CWS F1 (C_6 - C_{10})	317	<10.0	<10.0	<10.0	<10.0	10.0
CWS F2 (>C_{10} - C_{16})	2150	<10.0	37.6	66	<10.0	10.0
CWS F3 (>C_{16} - C_{34})	2960	25.1	432	330	<10.0	10.0
CWS F4 (>C_{34})	1740	trace	64.2	306	<10.0	10.0

Results expressed in milligrams per dry kilogram (mg/kg)

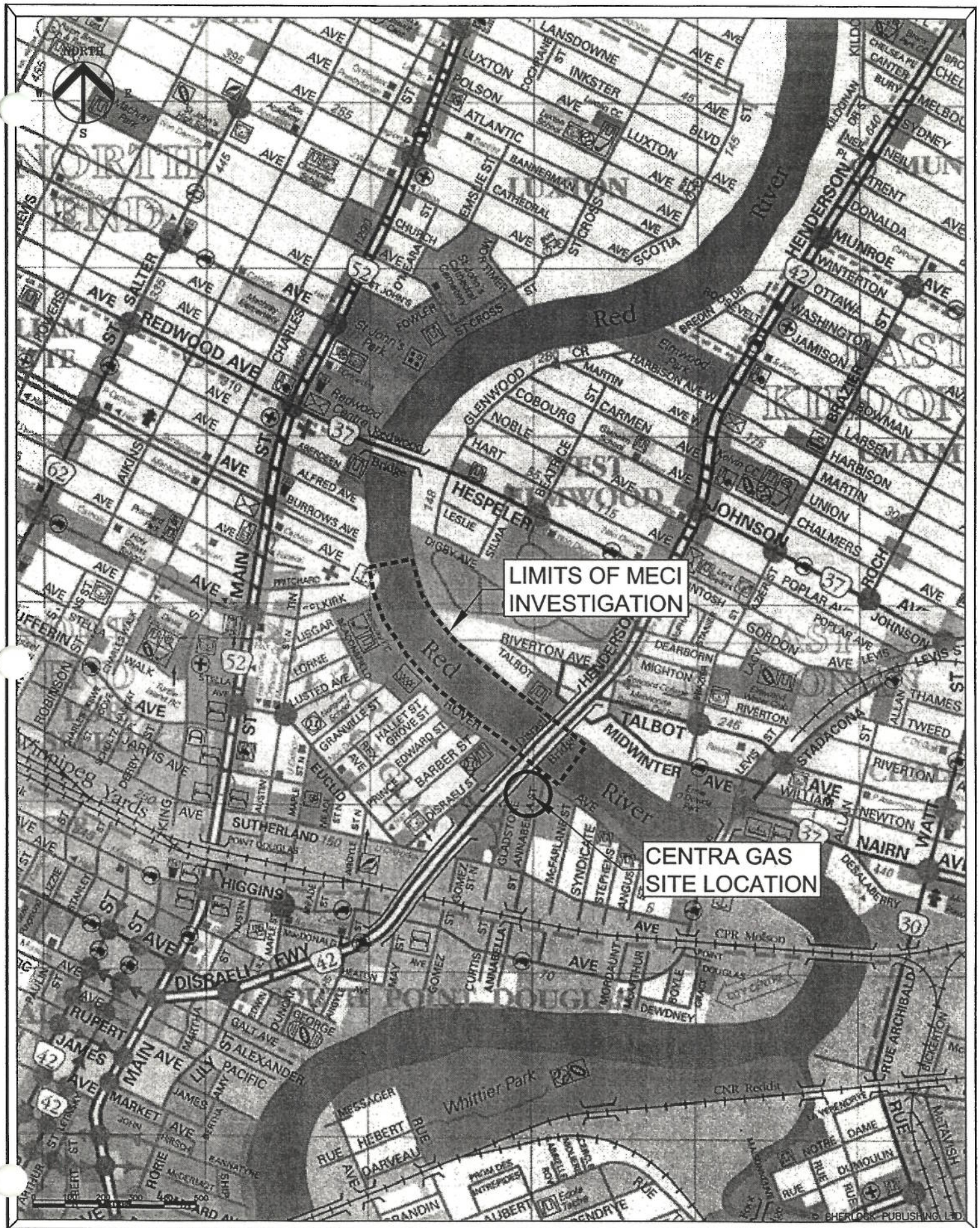
EQL - Estimated quantitation limit

W1801B / 2001 09 17

P:\W1\801B\Sediment Tables2.xls

APPENDIX I

Drawings



MORROW ENVIRONMENTAL CONSULTANTS INC.

KEY PLAN

DATE: 2001 09 17	DRAWN BY: CDC	CHECKED: AGM	CLIENT NAME: CENTRA GAS, SUTHERLAND OPERATIONS CENTRE	SITE ADDRESS: 35 SUTHERLAND AVENUE, WINNIPEG, MB	DRAWING NUMBER: W1801B-001

LEGEND

10 50 100 150

- ESTIMATED EXTENT OF RESIDUES WITH VISIBLE TARS (AGASSIZ NORTH, 1999)
- ESTIMATED EXTENT OF RESIDUES WITH TRACE CONTAMINATION (AGASSIZ NORTH, 1999)

NOTES

1. DRAWING WAS DERIVED FROM "FIGURE 2. EXTENT OF SEDIMENT PAH CONTAMINATION IN THE RED RIVER 1999, SURFICIAL SEDIMENT PLUME STUDY 1999", PROVIDED BY AGASSIZ NORTH ASSOCIATES LIMITED.

REVISIONS

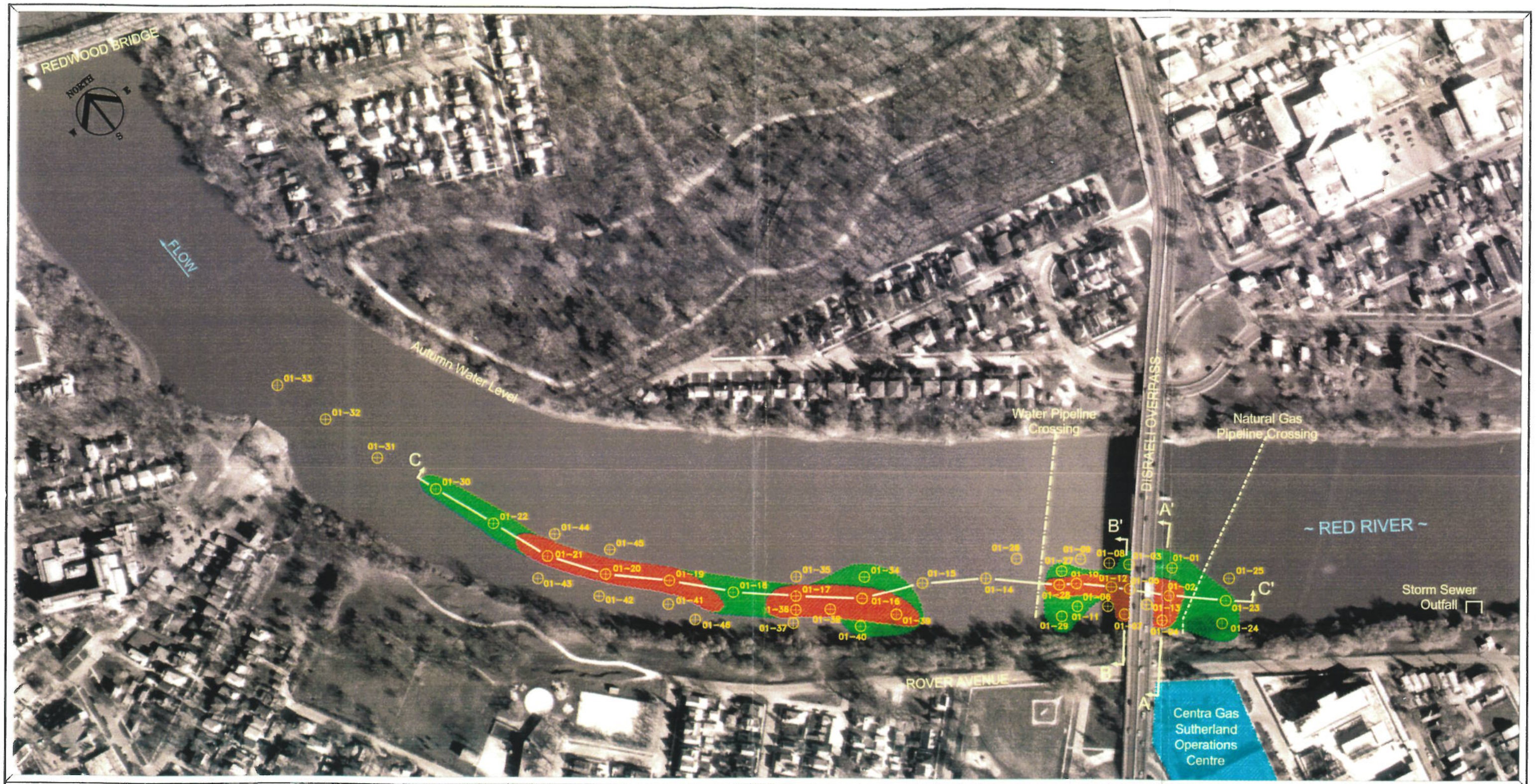
REV.	DATE	DESCRIPTION	BY	CHK

MORROW ENVIRONMENTAL CONSULTANTS INC.

SCALE: 1:3000	APPROVED BY		DRAWN BY: CDC
DATE: 2001 09 17	MECI:	CLIENT:	CHECKED: AGM
CLIENT NAME: CENTRA GAS SUTHERLAND OPERATIONS CENTRE	PROJECT LOCATION: 35 SUTHERLAND AVENUE WINNIPEG, MANITOBA		

EXTENT OF IMPACTED SEDIMENT IN THE RED RIVER, 1999

CADFILE: 1801R000 | DRAWING NUMBER: W1801B-002 | REV.: 0



LEGEND

10 50 100 150

- ⊕ BOREHOLE LOCATION
- ESTIMATED EXTENT OF SEDIMENTS CONTAINING VISIBLE IMPACT
- ESTIMATED EXTENT OF SEDIMENTS CONTAINING TRACE IMPACT

NOTES

1. DRAWING WAS DERIVED FROM SITE PLAN PROVIDED BY AGASSIZ NORTH ASSOCIATES LIMITED.

REVISIONS

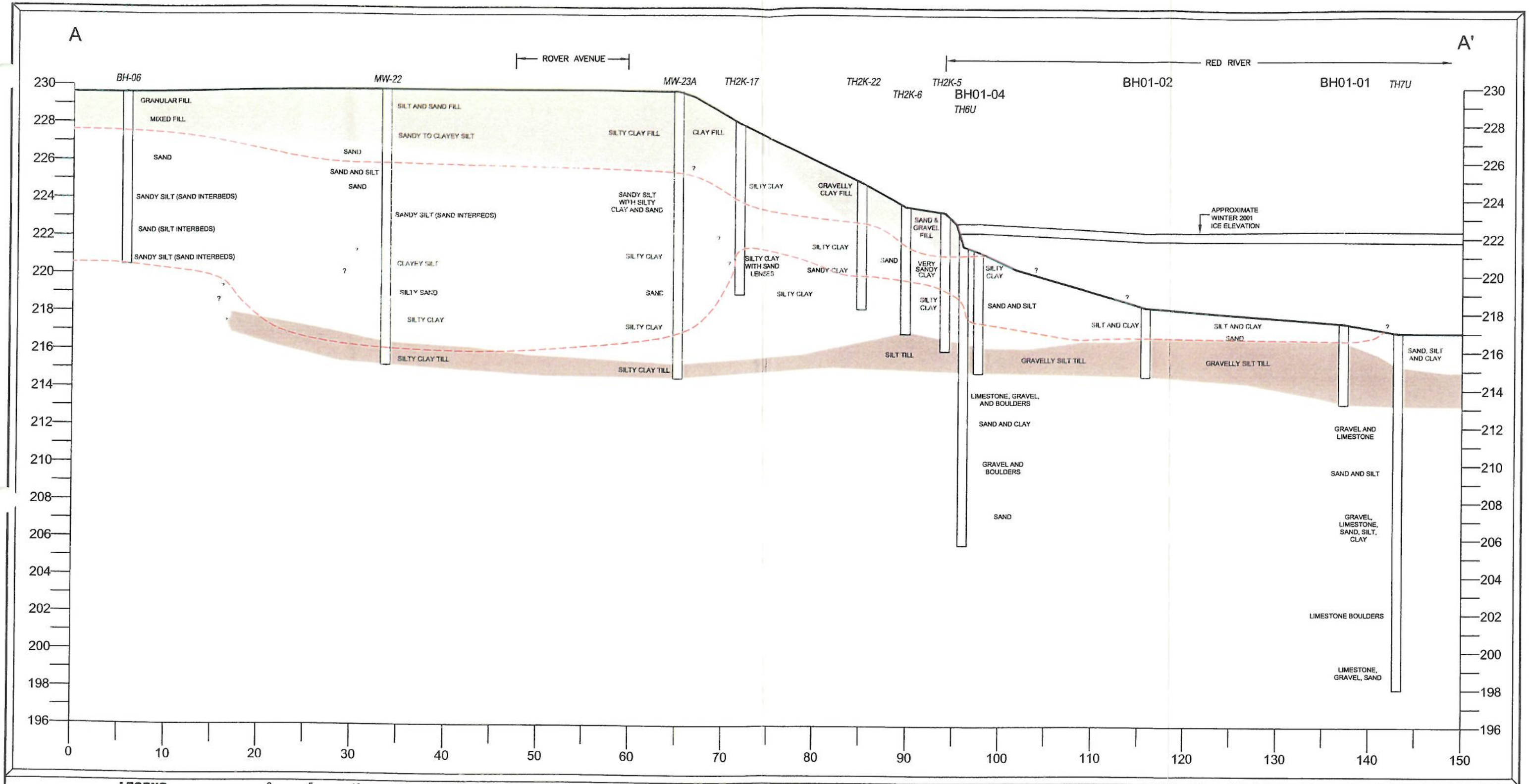
REV.	DATE	DESCRIPTION	BY	CHK

MORROW ENVIRONMENTAL CONSULTANTS INC.

SCALE: 1:3000	APPROVED BY MECI:	CLIENT:	DRAWN BY: CDC
DATE: 2001 09 17			CHECKED: AGM
CLIENT NAME: CENTRA GAS SUTHERLAND OPERATIONS CENTRE		PROJECT LOCATION: 35 SUTHERLAND AVENUE WINNIPEG, MANITOBA	

SITE PLAN

CADFILE: 1801R000 | DRAWING NUMBER: W1801B-003 | REV.: 0



LEGEND

0 5 10 15 20

- FILL (GRANULAR, CLAY, SILT)
- CLAY AND/OR SILT
- SAND AND/OR SAND AND SILT
- TILL
- ESTIMATED EXTENT OF VISIBLE TO TRACE IMPACT

BH01-07 BOREHOLE LOCATION (DRILLED BY MECI)

TH2K-20 BOREHOLE LOCATION (DRILLED BY OTHERS)

NOTES

1. THE STRATIGRAPHIC INFORMATION SHOWN ON THIS DRAWING HAS BEEN INTERPRETED FROM SITE-SPECIFIC BOREHOLE DATA. SUBSURFACE CONDITIONS ARE KNOWN WITH SOME DEGREE OF ACCURACY ONLY AT THE BOREHOLE LOCATIONS. ACTUAL STRATIGRAPHIC CONDITIONS BETWEEN BOREHOLES MAY VARY FROM THOSE INDICATED ON THIS DRAWING.

2. ADDITIONAL BOREHOLE INFORMATION WAS DERIVED FROM AMEC REPORT TITLED "CLOSURE REPORT, CENTRA GAS OPERATIONS FACILITY", NOVEMBER 2000.

REVISIONS

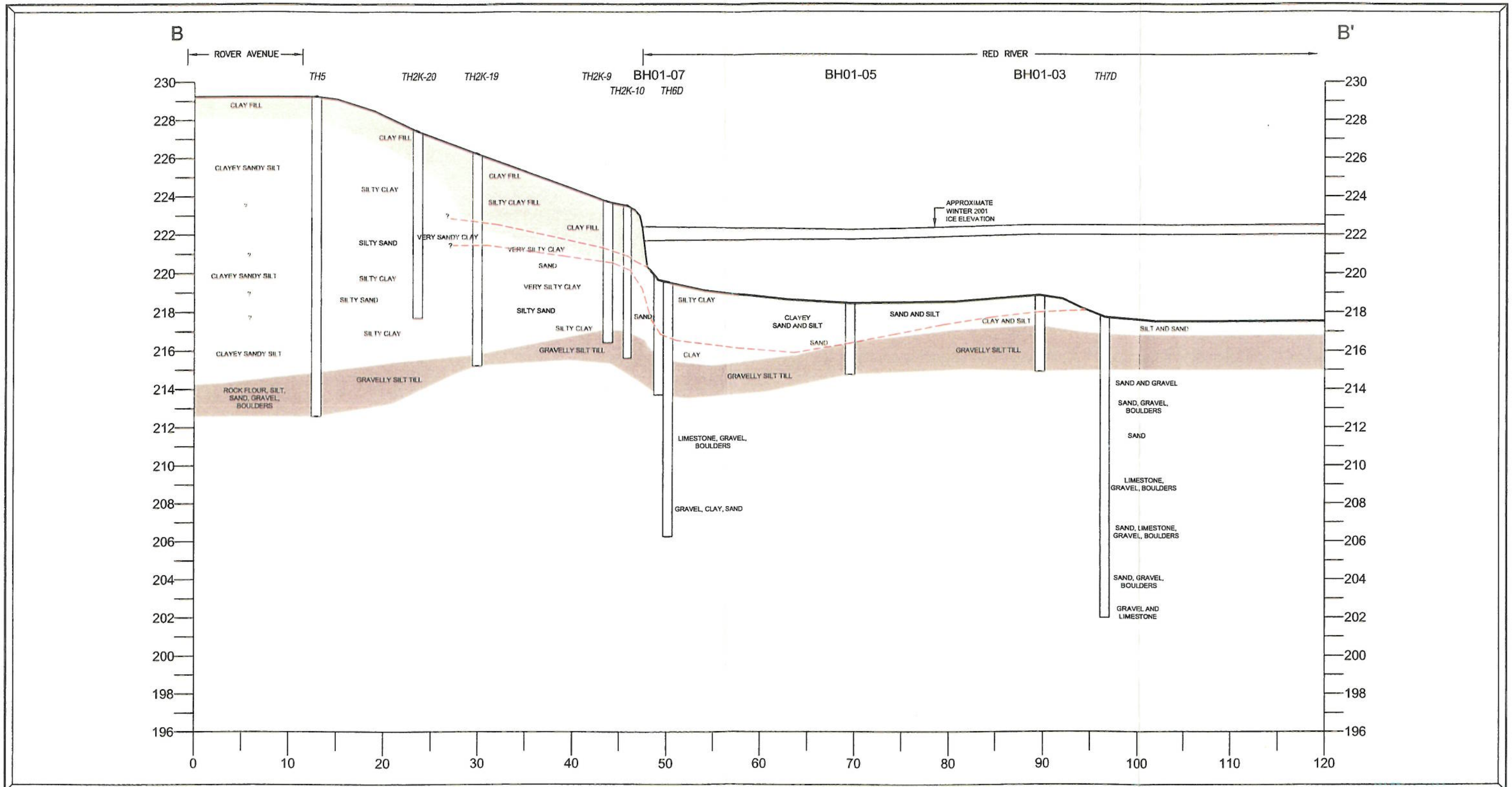
REV.	DATE	DESCRIPTION	BY	CHK

MORROW ENVIRONMENTAL CONSULTANTS INC.

SCALE: 1:400	APPROVED BY		DRAWN BY: CDC
DATE: 2001 09 17	MECI:	CLIENT:	CHECKED: AGM
CLIENT NAME: CENTRA GAS SUTHERLAND OPERATIONS CENTRE	PROJECT LOCATION: 35 SUTHERLAND AVENUE WINNIPEG, MANITOBA		

CROSS SECTION A-A'

CADFILE: 1801R000 DRAWING NUMBER: W1801B-004 REV.: 0



LEGEND

0 5 10 15 20 Metres

- FILL (GRANULAR, CLAY, SILT)
- CLAY AND/OR SILT
- SAND AND/OR SAND AND SILT
- TILL
- ESTIMATED EXTENT OF VISIBLE TO TRACE IMPACT

BH01-07 BOREHOLE LOCATION (DRILLED BY MECI)

TH2K-20 BOREHOLE LOCATION (DRILLED BY OTHERS)

NOTES

1. THE STRATIGRAPHIC INFORMATION SHOWN ON THIS DRAWING HAS BEEN INTERPRETED FROM SITE-SPECIFIC BOREHOLE DATA. SUBSURFACE CONDITIONS ARE KNOWN WITH SOME DEGREE OF ACCURACY ONLY AT THE BOREHOLE LOCATIONS. ACTUAL STRATIGRAPHIC CONDITIONS BETWEEN BOREHOLES MAY VARY FROM THOSE INDICATED ON THIS DRAWING.

2. ADDITIONAL BOREHOLE INFORMATION WAS DERIVED FROM AMEC REPORT TITLED "CLOSURE REPORT, CENTRA GAS OPERATIONS FACILITY", NOVEMBER 2000.

REVISIONS

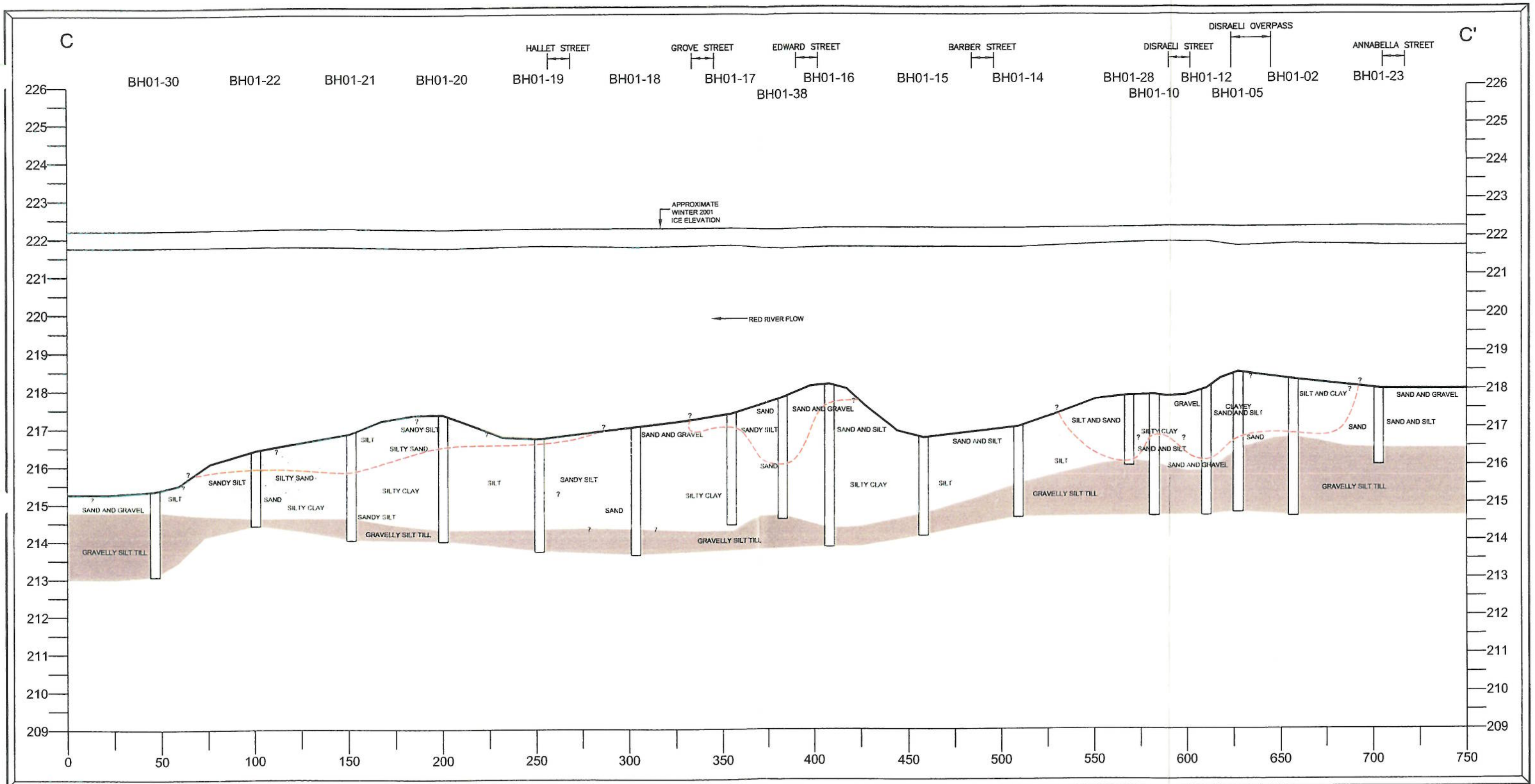
REV.	DATE	DESCRIPTION	BY	CHK

MORROW ENVIRONMENTAL CONSULTANTS INC.

SCALE: 1:400	APPROVED BY: MECI:	CLIENT:	DRAWN BY: CDC
DATE: 2001 09 17			CHECKED: AGM
CLIENT NAME: CENTRA GAS SUTHERLAND OPERATIONS CENTRE		PROJECT LOCATION: 35 SUTHERLAND AVENUE WINNIPEG, MANITOBA	

CROSS SECTION B-B'

CADFILE: 1801R000 | DRAWING NUMBER: W1801B-005 | REV.: 0



LEGEND

0 5 10 15 20

- FILL (GRANULAR, CLAY, SILT)
- CLAY AND/OR SILT
- SAND AND/OR SAND AND SILT
- TILL
- ESTIMATED EXTENT OF VISIBLE TO TRACE IMPACT

NOTES

1. THE STRATIGRAPHIC INFORMATION SHOWN ON THIS DRAWING HAS BEEN INTERPRETED FROM SITE-SPECIFIC BOREHOLE DATA. SUBSURFACE CONDITIONS ARE KNOWN WITH SOME DEGREE OF ACCURACY ONLY AT THE BOREHOLE LOCATIONS. ACTUAL STRATIGRAPHIC CONDITIONS BETWEEN BOREHOLES MAY VARY FROM THOSE INDICATED ON THIS DRAWING.

REVISIONS

REV.	DATE	DESCRIPTION	BY	CHK

MORROW ENVIRONMENTAL CONSULTANTS INC.

SCALE: 1:2000	APPROVED BY		DRAWN BY: CDC
DATE: 2001 09 17	MECI:	CLIENT:	CHECKED: AGM
CLIENT NAME: CENTRA GAS SUTHERLAND OPERATIONS CENTRE	PROJECT LOCATION: 35 SUTHERLAND AVENUE WINNIPEG, MANITOBA		

CROSS SECTION C–C'

CADFILE: 1801R000 | DRAWING NUMBER: W1801B–006 | REV.: 0

APPENDIX II

Laboratory Reports

ANALYTICAL SERVICES

Client: Morrow Environmental Consultants Inc.
Project Reference: W1801B
Work Order Number: G210660B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram (µg/g) dry weight

Date: 07-Mar-01

Compound	**EQL µg/g**	BH01-5-2 DF=1000
Naphthalene	50.0	8990
2-Methylnaphthalene	50.0	1800
1-Methylnaphthalene	50.0	965
Acenaphthylene	50.0	2160
Acenaphthene	50.0	419
Fluorene	50.0	1570
Phenanthrene	50.0	5670
Anthracene	50.0	1910
Fluoranthene	50.0	3150
Pyrene	50.0	2720
Benzo(a)anthracene	50.0	1260
Chrysene	50.0	1230
Benzo(b)fluoranthene	50.0	1680
Benzo(k)fluoranthene	50.0	538
Benzo(a)pyrene	50.0	1390
Indeno(1,2,3-cd)pyrene	50.0	877
Dibenzo(a,h)anthracene	50.0	159
Benzo(ghi)perylene	50.0	713
Surrogate Standard Recoveries (Control Limits)		
Acenaphthene-d10 (19-121%)		N/A
Anthracene-d10 (27-126%)		N/A
Benzo(a)pyrene-d12 (44-136%)		N/A

ANALYTICAL SERVICES

Client: Morrow Environmental Consultants Inc.
Project Reference: W1801B
Work Order Number: G210660B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram (µg/g) dry weight

Date: 07-Mar-01

		Method Blank			Spiked Method Blank			
Compound	**EQL µg/g**	**Result**	**Upper Limit**	**Accept**	**% Recovery**	**Lower Limit**	**Upper Limit**	**Accept**
Naphthalene	0.05	nd	0.05	yes	87	42	107	yes
2-Methylnaphthalene	0.05	nd	0.05	yes	81	44	114	yes
1-Methylnaphthalene	0.05	nd	0.05	yes	90	46	119	yes
Acenaphthylene	0.05	nd	0.05	yes	104	39	114	yes
Acenaphthene	0.05	nd	0.05	yes	102	34	113	yes
Fluorene	0.05	nd	0.05	yes	109	36	120	y[illegible]
Phenanthrene	0.05	nd	0.05	yes	109	40	120	yes
Anthracene	0.05	nd	0.05	yes	112	42	124	yes
Fluoranthene	0.05	nd	0.05	yes	119	47	126	yes
Pyrene	0.05	nd	0.05	yes	121	46	125	yes
Benzo(a)anthracene	0.05	nd	0.05	yes	106	45	142	yes
Chrysene	0.05	nd	0.05	yes	108	46	148	yes
Benzo(b)fluoranthene	0.05	nd	0.05	yes	160	40	135	(1)
Benzo(k)fluoranthene	0.05	nd	0.05	yes	127	40	129	yes
Benzo(a)pyrene	0.05	nd	0.05	yes	122	41	128	yes
Indeno(1,2,3-cd)pyrene	0.05	nd	0.05	yes	116	35	132	yes
Dibenzo(a,h)anthracene	0.05	nd	0.05	yes	120	34	137	yes
Benzo(ghi)perylene	0.05	nd	0.05	yes	112	38	130	yes
Surrogate Standard Recoveries (Control Limits)								
Acenaphthene-d10		96%			103	19	121	yes
Anthracene-d10		112%			122	27	126	yes
Benzo(a)pyrene-d12		112%			123	44	136	yes

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

Philip Analytical Services Corp

Report of Analysis

Client : Morrow Environmental Consultants Inc.
Contact: Alex Man

Report Date: March 7/2001
Lab Ref # : G210660
Lab Quote #: DEB809-0991

Analysis of Soil, expressed on a dry weight basis

Client Ref#: W1801B

Parameter	EQL	Units	BH01-5-2 2001/02/26	BH01-5-2 Replicate			
F2, C10-C16 Hydrocarbons	10.0	ug/g	34900	34200			
F3, C16-C34 Hydrocarbons	10.0	ug/g	70900	69400			
F4A, C34-C50 Hydrocarbons	10.0	ug/g	15200	15100			
Resemblance	na	na	EGDMO?	EGDMO?			
Benzene	0.040	mg/kg	176	194			
Ethylbenzene	0.040	mg/kg	43.8	48.2			
F1, C6-C10 Hydrocarbons	10.0	mg/kg	251	290			
mp-Xylenes	0.080	mg/kg	119	133			
o-Xylene	0.040	mg/kg	48.3	55.7			
Toluene	0.040	mg/kg	138	152			

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
EGDMO? Contaminant elutes across the gasoline/diesel/motor oil range but does not match our reference standards.
na Not Applicable

Philip Analytical Services Corp

Report of Analysis

Client : Morrow Environmental Consultants Inc.
Contact: Andrew Eason

Report Date: March 9/2001
Lab Ref # : G210722
Lab Quote #: DEB809-0991

Analysis of Soil, expressed on a dry weight basis

Client Ref#: W1801

Parameter	EQL	Units	BH01-11-5 2001/02/28	BH01-3-3B 2001/02/23	BH01-3-3B Replicate	BH01-5-4 2001/02/26	
F2, C10-C16 Hydrocarbons	10.0	ug/g	nd	25.8	24.7	nd	
F3, C16-C34 Hydrocarbons	10.0	ug/g	nd	127	102	12.6	
F4A, C34-C50 Hydrocarbons	10.0	ug/g	nd	54.9	38.0	nd	
Resemblance	na	na	na	EDMO?	EDMO?	UPD	
Benzene	0.040	mg/kg	nd	nd	nd	nd	
Ethylbenzene	0.040	mg/kg	nd	nd	nd	nd	
F1, C6-C10 Hydrocarbons	10.0	mg/kg	nd	nd	nd	nd	
mp-Xylenes	0.080	mg/kg	nd	nd	nd	nd	
o-Xylene	0.040	mg/kg	nd	nd	nd	nd	
Toluene	0.040	mg/kg	nd	nd	nd	nd	

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
EDMO? Contaminant elutes across the diesel/motor oil range but does not match reference standards.
na Not Applicable
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL
UPD Unidentified peaks in Diesel range.

ANALYTICAL SERVICES

Client: Morrow Environmental Consultants Inc.
roject Reference: W1801B
Vork Order Number: G210660B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Date: 07-Mar-01

Legend: EQL = Estimated Quantitation Limit
nd = Not detected above EQL
DF = Dilution Factor
N/A = Surrogate recovery could not be determined due to high dilution

Date received: February 28, 2001
Date extracted: March 2, 2001
Date analysed: March 5, 2001

NALYTICAL METHOD:

The soil sample (10 grams wet weight) was mixed with sodium sulfate and extracted with a 1:1 mixture of cetone:dichloromethane. The extract was cleaned up using alumina column chromatography. Analysis was performed by gas chromatography/mass spectrometry using U.S. EPA Method 8270C (modified).

Re t Discussion:

1) The recovery for benzo(b)fluoranthene in the spiked method blank was higher than our upper control limit. Consequently, the reported amount for benzo(b)fluoranthene may be biased high.

The sample was run at dilution factor due to elevated levels of target and nontarget compounds present which would exceed the calibration range of the instrument and cause contamination of the equipment if run undiluted. The quantitation limits for this sample are higher than the EQL's for undiluted samples as indicated above. The amounts reported have been corrected for the dilution factor that was used.

Note: Estimated quantitation limit is the lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

NOTE: All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analysis done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangement.

JOB APPROVED BY:

for .....
Kathy Horvat, B.Sc.
Chemist

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

ANALYTICAL SERVICES

Client: Morrow Environmental Consultants Inc.
Unit E, 1420 Clarence Ave
Winnipeg, MB, CANADA
R3T 1T6

Fax: 204-477-9194

Attn: Alex Man

Date Received: February 28/2001
Date Reported: March 7/2001
Lab Ref#: G210660
Lab Quote#: DEB809-0991

Client Ref#: W1801B
Sampled By: Alex Man

Certificate of Analysis

Analysis Performed: Extractable Hydrocarbons, C10-C50(CCME, F2 + F3 + F4A)
BTEX and Total Purgeable Hydrocarbons(C6-C10), CCME - F1

Methodology:

1) The characterization of HydroCarbon in soil by GC analysis, following a solvent extraction.
U.S. EPA Method No.8011(microextraction)
2) Analysis of Benzene, Toluene, Ethylbenzene, Xylenes & Purgeable Hydrocarbons by Purge & Trap Capillary GC-PID/FID. External std quantitation with Surrogate standards.
U.S. EPA Method No. 5030 & 8021
U.S. EPA Method No. 502.2
Ontario Ministry of Environment # E3099A

Instrumentation:

1) GC/FID/FID, Hewlett-PackardII GC, Dual injector, Dual FID, A/S
2) PT-GC-PID/FID, Hewlett Packard 5890II GC, O.I. 4560 P&T, A/S

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

ANALYTICAL SERVICES

Client: Morrow Environmental Consultants Inc.
Unit E, 1420 Clarence Ave
Winnipeg, MB, CANADA
R3T 1T6

Fax: 204-477-9194

Attn: Alex Man

Date Received: February 28/2001
Date Reported: March 7/2001
Lab Ref#: G210660
Lab Quote#: DEB809-0991

Client Ref#: W1801B
Sampled By: Alex Man

Certificate of Analysis

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

Certified By
Elaine Grant
Service Manager

Certified By
N. Boulton, B.Sc., C.Chem.
Customer Service Manager

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

Philip Analytical Services Corp

Certificate of Quality Control

Date Reported: March 7/2001
Lab Ref # : G210660
Lab Quote#: DEB809-0991

Client Ref#: W1801B

Client : Morrow Environmental Consultants Inc.
Contact: Alex Man

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
F2, C10-C16 Hydrocarbons	na	10.0	ug/g	nd	20.0	yes	100	70	120	yes	na	na	na	na	na	yes
F3, C16-C34 Hydrocarbons	na	10.0	ug/g	nd	20.0	yes	100	70	120	yes	na	na	na	na	na	yes
F4A, C34-C50 Hydrocarbons	na	10.0	ug/g	nd	20.0	yes	100	70	120	yes	na	na	na	na	na	yes
Benzene	na	0.040	mg/kg	nd	0.08	yes	96	70	120	yes	na	na	na	na	na	yes
Ethylbenzene	na	0.040	mg/kg	nd	0.08	yes	97	70	120	yes	na	na	na	na	na	yes
F1, C6-C10 Hydrocarbons	na	10.0	mg/kg	nd	10.0	yes	120	70	120	yes	na	na	na	na	na	yes
mp-Xylenes	na	0.080	mg/kg	nd	0.16	yes	86	70	120	yes	na	na	na	na	na	yes
o-Xylene	na	0.040	mg/kg	nd	0.08	yes	98	70	120	yes	na	na	na	na	na	yes
Toluene	na	0.040	mg/kg	nd	0.08	yes	96	70	120	yes	na	na	na	na	na	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Sample Name: 0660-35 100

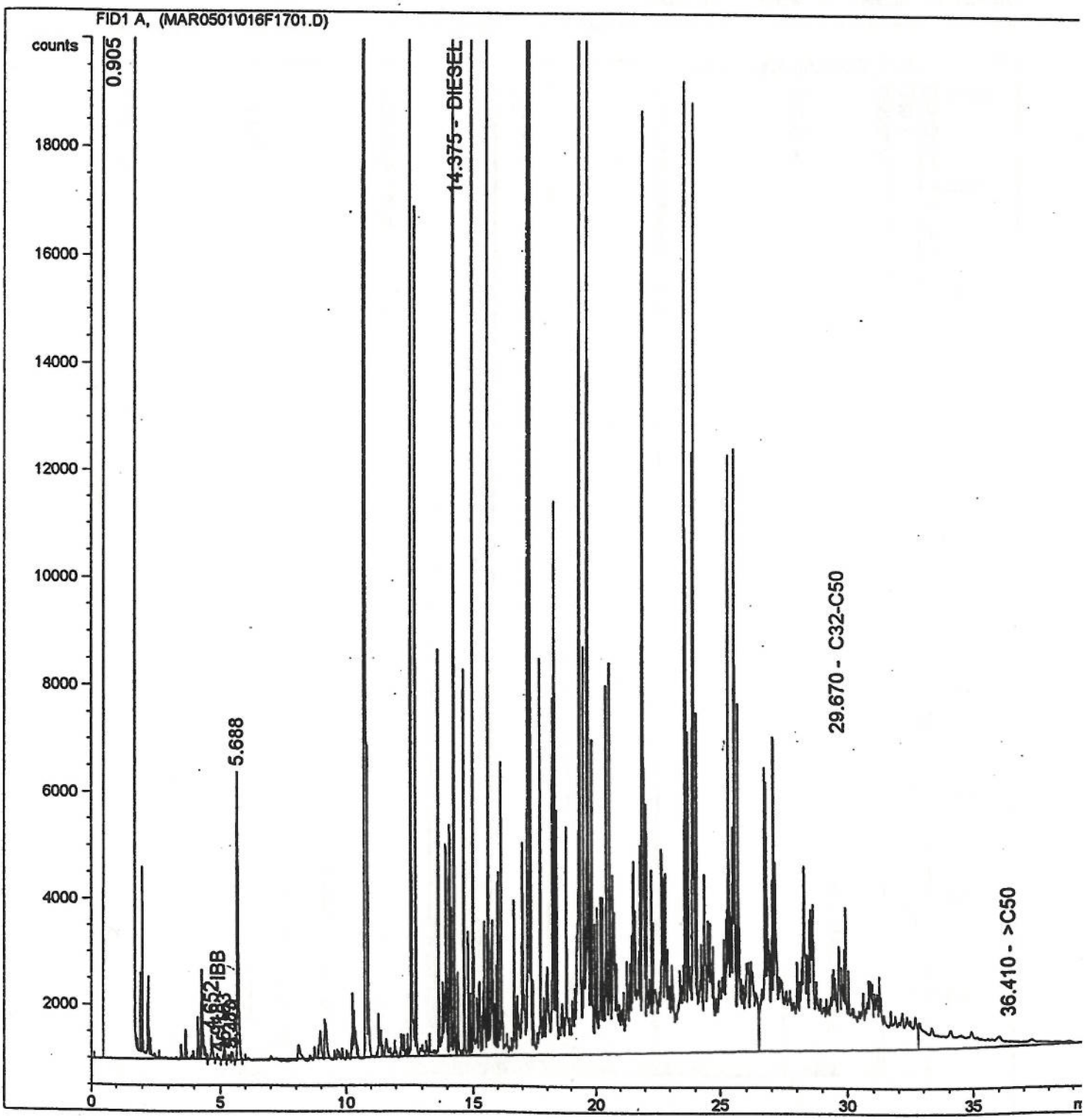
Injection Date : 03/06/2001 5:59:39 PM
Sample Name : 0660-35 100X
Acq. Operator : D. MCLEOD

Seq. Line : 17
Vial : 16
Inj : 1
Inj Volume : 1 µl

Sequence File : C:\HPCHEM\2\SEQUENCE\MAR0501.S
Method : C:\HPCHEM\2\METHODS\4C505F.M
Last changed : 03/05/2001 2:56:23 PM by D. MCLEOD

BH 01-5-2
QC Duplicate

4C505F METHOD FOR FRONT CHANNEL ON FID IV IS FOR THE QUANTITATION UP TO AND INCLUDING C50 HYDROCARBONS BASED ON THE SUGGESTED TEMPERATURE PROGRAM BY AMTAG/SQGTC.
DB-1HT, 15M, 0.25MM, 0.1UM



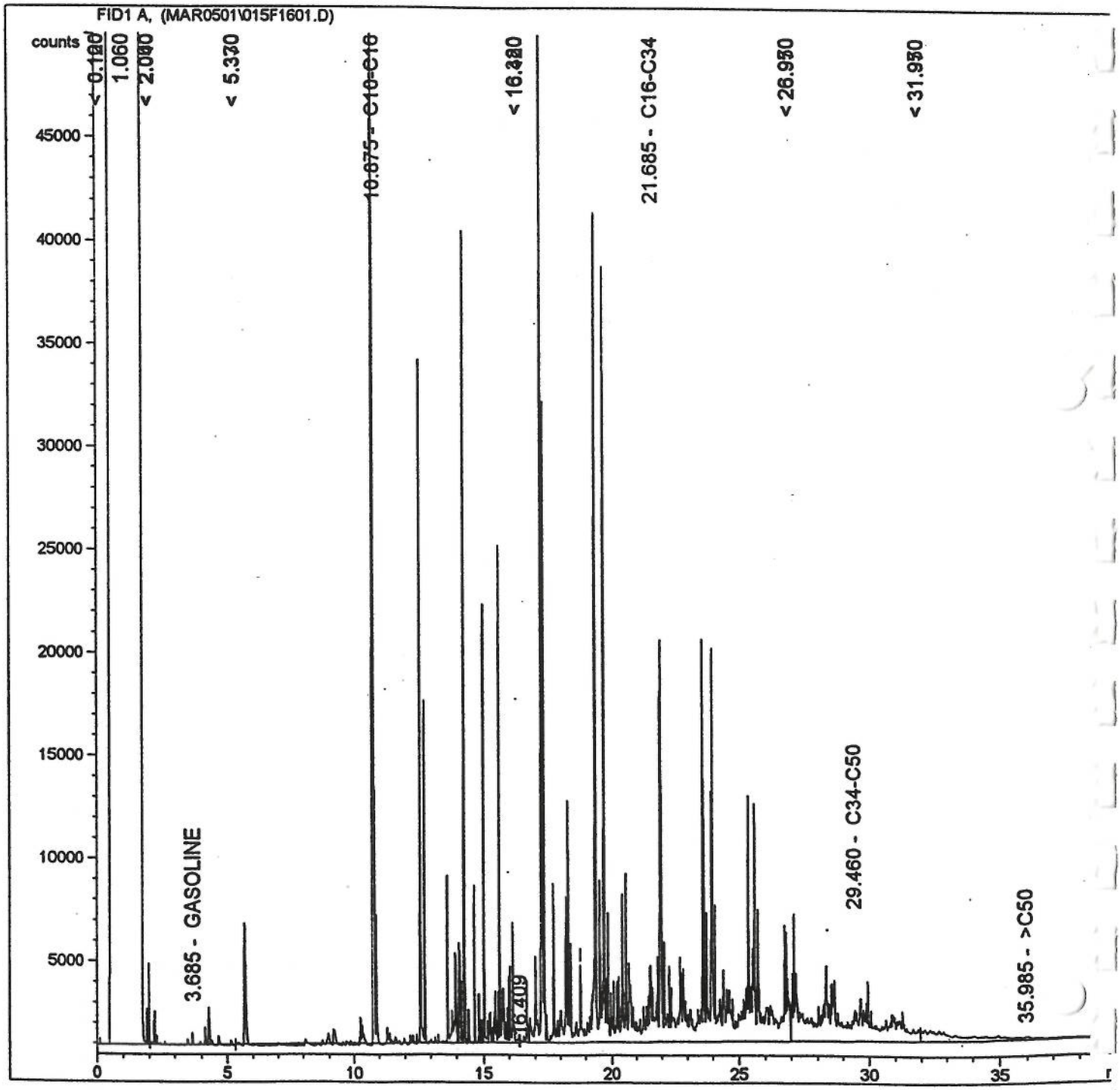
Injection Date : 03/06/2001 5:00:32 PM
Sample Name : 0660-34 100X
Acq. Operator : D. MCLEOD

Seq. Line : 16
Vial : 15
Inj : 1
Inj Volume : 1 µl

Acq. Method : C:\HPCHEM\2\METHODS\4C505F.M
Last changed : 03/05/2001 2:56:23 PM by D. MCLEOD
Analysis Method : C:\HPCHEM\2\METHODS\AMTAG1WF.M
Last changed : 03/07/2001 1:03:09 PM by D. MCLEOD
(modified after loading)

BH 01 -5-2

4C505F METHOD FOR FRONT CHANNEL ON FID IV IS FOR THE QUANTITATION UP TO A
INCLUDING C50 HYDROCARBONS BASED ON THE SUGGESTED TEMPERATURE PROGRAM BY
AMTAG/SQGTC.
DB-1HT, 15M, 0.25MM, 0.1UM



PHILIP ANALYTICAL SERVICES CORPORATION

PHILIP SERVICES

5735 McAdam Road
Mississauga, Ontario L4Z 1N9

Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

LABORATORY USE ONLY

Work Order: 6210660

Comments:

CHAIN OF CUSTODY RECORD

Client: Morrow Environmental Consultants Inc. (MECI)
Unit E - 1420 Clarence Av
Winnipeg MB, R3T 1T6
Contact: Alex Man
Phone: 204-475-4133 Fax: 204-477-9194

PASC Quote #: DEB809-0991

Client P.O. #: —

Client Project #: W1801B

Sampled by: Alex Man / Scott Davies

Please specify Guideline (if applicable) CWS / MB.

Page 1 of 1

FEB 28 '01 AM 9:31

Invoice to (if other than above): Doug Ramsey of:
Agassiz North Associates LTD.
1214-B Chevrier BLVD.
Winnipeg MB
R3T-1Y3

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

STD 5-7 Business Days [X]

*RUSH Specify Date

Time

Analysis Required:

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	BTEX	PAH	CWS (F1-F4)	Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1	BH01-5-2	2001/02/26		X	X	X	SOIL	2	Former MGP
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									

Samples Relinquished to PASC by (Client Signature)	Date: 2001 02 27	Time: 12:30	Method of Shipment
Samples Received in lab by:	Date: 02/26/01	Time: 12:35 pm	Condition of samples upon receipt at lab: (OK)

ANALYTICAL SERVICES

Client: Morrow Environmental Consultants Inc.
Unit E, 1420 Clarence Ave
Winnipeg, MB, CANADA
R3T 1T6

Fax: 204-477-9194

Attn: Andrew Eason

Date Received: March 3/2001
Date Reported: March 9/2001
Lab Ref#: G210722
Lab Quote#: DEB809-0991

Client Ref#: W1801
Sampled By: Alex Man

Certificate of Analysis

Analysis Performed: Extractable Hydrocarbons, C10-C50(CCME, F2 + F3 + F4A)
BTEX and Total Purgeable Hydrocarbons(C6-C10), CCME - F1

Methodology:

1) The characterization of HydroCarbon in soil by GC analysis, following a solvent extraction.
U.S. EPA Method No.8011(microextraction)
2) Analysis of Benzene, Toluene, Ethylbenzene, Xylenes & Purgeable Hydrocarbons by Purge & Trap Capillary GC-PID/FID. External std quantitation with Surrogate standards.
U.S. EPA Method No. 5030 & 8021
U.S. EPA Method No. 502.2
Ontario Ministry of Environment # E3099A

Instrumentation:

1) GC/FID/FID, Hewlett-PackardII GC, Dual injector, Dual FID, A/S
2) PT-GC-PID/FID, Hewlett Packard 5890II GC, O.I. 4560 P&T, A/S

ANALYTICAL SERVICES

Client:	Morrow Environmental Consultants Inc. Unit E, 1420 Clarence Ave Winnipeg, MB, CANADA R3T 1T6	Date Received: Date Reported: Lab Ref#: Lab Quote#:	March 3/2001 March 9/2001 G210722 DEB809-0991
Fax:	204-477-9194	Client Ref#: Sampled By:	W1801 Alex Man
Attn:	Andrew Eason		

Certificate of Analysis

Sample Description:	Soil
QA/QC:	Refer to CERTIFICATE OF QUALITY CONTROL report.
Results:	Refer to REPORT of ANALYSIS attached.

Certified By
Elaine Grant
Service Manager

Certified By
N. Boulton, B.Sc., C.Chem.
Customer Service Manager

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

Philip Analytical Services Corp

Certificate of Quality Control

Date Reported: March 9/2001
Lab Ref # : G210722
Lab Quote#: DEB809-0991

Client : Morrow Environmental Consultants Inc.
Contact: Andrew Eason

Client Ref#: W1801

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
F2, C10-C16 Hydrocarbons	na	10.0	ug/g	nd	20.0	yes	95	70	120	yes	na	na	na	na	na	yes
F3, C16-C34 Hydrocarbons	na	10.0	ug/g	nd	20.0	yes	95	70	120	yes	na	na	na	na	na	yes
F4A, C34-C50 Hydrocarbons	na	10.0	ug/g	nd	20.0	yes	95	70	120	yes	na	na	na	na	na	yes
Benzene	na	0.040	mg/kg	nd	0.08	yes	106	70	120	yes	na	na	na	na	na	yes
Ethylbenzene	na	0.040	mg/kg	nd	0.08	yes	97	70	120	yes	na	na	na	na	na	yes
F1, C6-C10 Hydrocarbons	na	10.0	mg/kg	nd	10.0	yes	120	70	120	yes	na	na	na	na	na	yes
mp-Xylenes	na	0.080	mg/kg	nd	0.16	yes	97	70	120	yes	na	na	na	na	na	yes
o-Xylene	na	0.040	mg/kg	nd	0.08	yes	96	70	120	yes	na	na	na	na	na	yes
Toluene	na	0.040	mg/kg	nd	0.08	yes	95	70	120	yes	na	na	na	na	na	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Data File C:\HPCHEM\2\DATA\MAR0701\016F1701.D Sample Name: 0722-33

==========

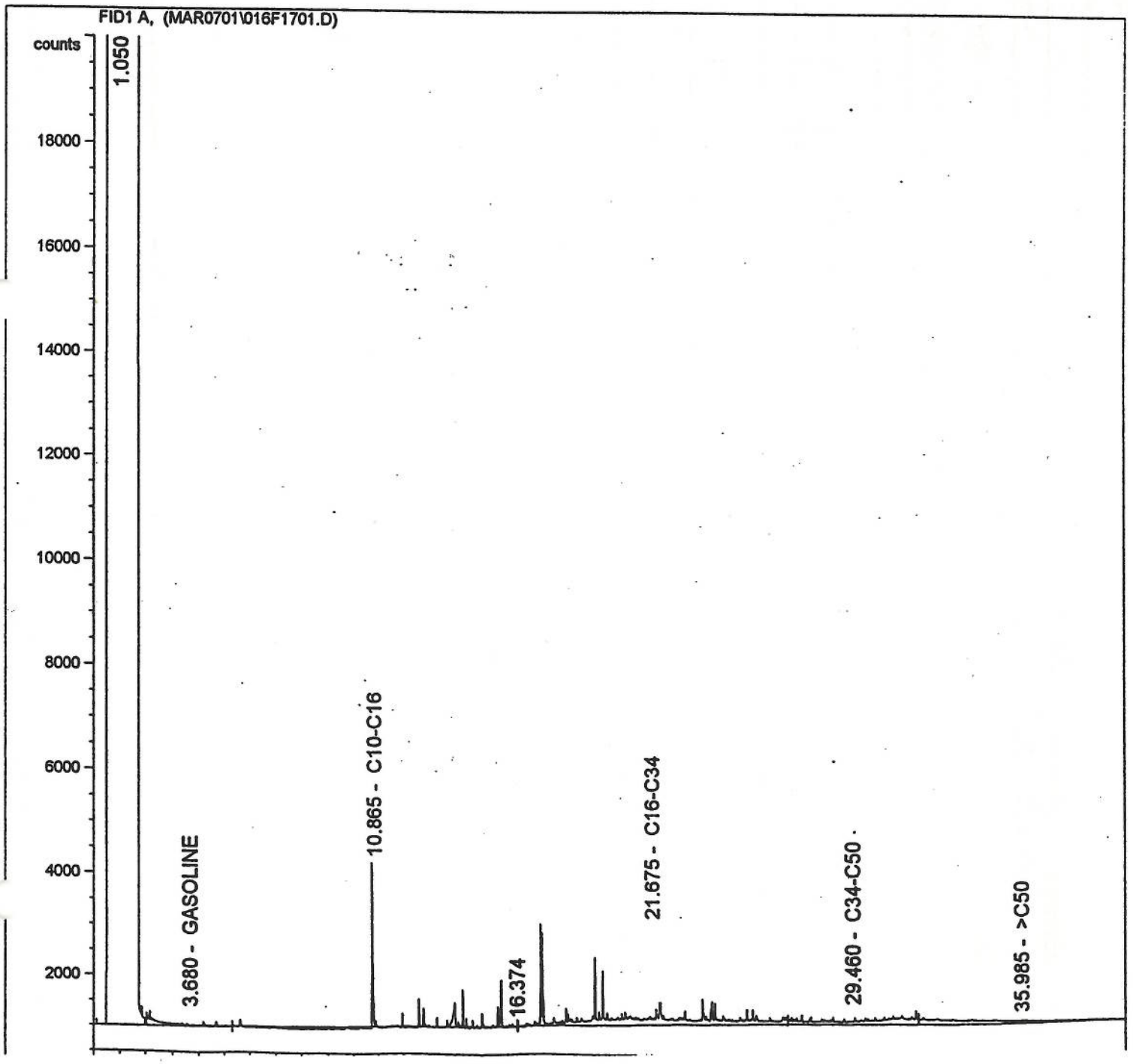
Injection Date : 03/08/2001 7:04:47 AM Seq. Line : 17
Sample Name : 0722-33 Vial : 16
Acq. Operator : D. MCLEOD BH01-5-4 Inj : 1
Inj Volume : 1 µl

Acq. Method : C:\HPCHEM\2\METHODS\4C505F.M
Last changed : 03/07/2001 3:45:22 PM by D. MCLEOD
Analysis Method : C:\HPCHEM\2\METHODS\AMTAG1WF.M
Last changed : 03/09/2001 11:35:24 AM by D. MCLEOD
(modified after loading)

4C505F METHOD FOR FRONT CHANNEL ON FID IV IS FOR THE QUANTITATION UP TO AND INCLUDING C50 HYDROCARBONS BASED ON THE SUGGESTED TEMPERATURE PROGRAM BY AMTAG/SQGTC.

DB-1HT, 15M, 0.25MM, 0.1UM

==========



MERIDIAN ENVIRONMENTAL CONSULTANTS INC
5151 CANADA WAY
BURNABY, BC
CANADA V5E 3N1
PHONE: (604) 515-5151
FAX: (604) 515-5150

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

PAGE 1 OF 1

LABORATORY: PASC
ADDRESS:
SAMPLING DATE: 01 02 23 - 28
PROJECT MANAGER: Andrew Eaton
SAMPLER NAME (PRINT): Alex Mann
MECI OFFICE LOCATION: Wpg
MECI PROJECT ID (#): W1801
PROJECT LOCATION: Sitherland
CLIENT: Ag. N.
LOCATION CODE:

ANALYSIS REQUEST

2/01/02

MAR 3'01 PM 12:52

FIELD SAMPLE ID	LABORATORY # (Lab Use Only)	SAMPLE TYPE	TYPE OF BOTTLES	PRESERVATION DETAILS	SAMPLING TIME	SAMPLING HEADSPACE VAPOUR	BTEX / VPH F1	VOCs	EPH F2/F3/F4	LEPH/HEPH PAHs	Min O +G SWOG	METALS LEVEL INCLUDING (pH) FIELD FILTERED YES / NO HARDNESS	pH CONDUCTIVITY ALKALINITY	TSS TDS TS	MAJOR ANIONS	TKN AMMONIA NITRATE & NITRITE							HOLD
BH01-3-3B-		Soil			23rd		X		X	X													
BH01-5-4		Soil			24th		X		X	X													
BH01-11-5-		Soil			28th		X		X	X													

TAT
0 Days
Days
Days
Hours
esults Due

CUSTODY RECORD

SPECIAL DETECTION LIMITS
AW - AQUATIC LIFE | AG - AGRICULTURE LAND USE | IL - INDUSTRIAL LAND USE
DW - DRINKING WATER | RL - RESIDENTIAL LAND USE | SRA - SCHEDULE 7

SPECIAL REPORTING OR BILLING INSTRUCTIONS/NOTES
PASC Quote # VG8040490

LAB USE ONLY

RELINQUISHED BY SAMPLER:	DATE: 01 03 02	TIME: 1:45	RECEIVED BY:
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY LABORATORY:

ANALYTICAL SERVICES

Client:	Morrow Environmental Consultants Inc. Unit E, 1420 Clarence Ave Winnipeg, MB, CANADA R3T 1T6	Date Received: Date Reported: Lab Ref#: Lab Quote#:	March 8/2001 March 15/2001 G210772 DEB809-0991
Fax:	204-477-9194	Client Ref#: Sampled By:	W1801B Alex Man
Attn:	Alex Man		

Attached are your results for PAH's

If you have any questions, please call Elaine Grant,
your Service U.S. EPA SW-846 Method No. 3640

ANALYTICAL SERVICES

Client: Morrow Environmental
Project Reference: W1801B
Work Order Number: G210772B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram (µg/g) dry weight

Date: 15-Mar-01

Compound	**EQL µg/g**	BH 01-15-6 010305	**EQL µg/g**	BH 01-17-1 010305 DF=20	**EQL µg/g**	BH 01-18-2 010306	BH 01-24-2 010306
Naphthalene	0.05	0.07	1.00	88.5	0.05	0.43	0.05
2-Methylnaphthalene	0.05	nd	1.00	33.0	0.05	0.14	nd
1-Methylnaphthalene	0.05	nd	1.00	20.1	0.05	0.15	nd
Acenaphthylene	0.05	nd	1.00	4.63	0.05	nd	nd
Acenaphthene	0.05	nd	1.00	58.9	0.05	0.19	0.06
Fluorene	0.05	nd	1.00	38.7	0.05	0.27	nd
Phenanthrene	0.05	0.05	1.00	148	0.05	1.07	0.14
Anthracene	0.05	nd	1.00	42.5	0.05	0.49	nd
Fluoranthene	0.05	nd	1.00	96.8	0.05	0.37	0.11
Pyrene	0.05	nd	1.00	75.1	0.05	0.42	0.10
Benzo(a)anthracene	0.05	nd	1.00	37.3	0.05	0.07	nd
Chrysene	0.05	nd	1.00	31.9	0.05	0.06	nd
Benzo(b)fluoranthene	0.05	nd	1.00	35.1	0.05	0.05	nd
Benzo(k)fluoranthene	0.05	nd	1.00	15.1	0.05	nd	nd
Benzo(a)pyrene	0.05	nd	1.00	33.1	0.05	nd	nd
Indeno(1,2,3-cd)pyrene	0.05	nd	1.00	17.1	0.05	nd	nd
Dibenzo(a,h)anthracene	0.05	nd	1.00	3.63	0.05	nd	nd
Benzo(ghi)perylene	0.05	nd	1.00	13.3	0.05	nd	nd
Surrogate Standard Recoveries (Control Limits)							
Acenaphthene-d10 (19-121%)		70%		96%		87%	80%
Anthracene-d10 (27-126%)		74%		91%		82%	80%
Benzo(a)pyrene-d12 (44-136%)		82%		79%		93%	90%

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

ANALYTICAL SERVICES

Client: Morrow Environmental
Project Reference: W1801B
Work Order Number: G210772B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram (µg/g) dry weight

Date: 15-Mar-01

		Method Blank			Spiked Method Blank			
Compound	**EQL µg/g**	**Result**	**Upper Limit**	**Accept**	**% Recovery**	**Lower Limit**	**Upper Limit**	**Accept**
Naphthalene	0.05	nd	0.05	yes	71	42	107	yes
2-Methylnaphthalene	0.05	nd	0.05	yes	73	44	114	yes
1-Methylnaphthalene	0.05	nd	0.05	yes	79	46	119	yes
Acenaphthylene	0.05	nd	0.05	yes	75	39	114	yes
Acenaphthene	0.05	nd	0.05	yes	74	34	113	yes
Fluorene	0.05	nd	0.05	yes	77	36	120	yes
Phenanthrene	0.05	nd	0.05	yes	84	40	120	yes
Anthracene	0.05	nd	0.05	yes	90	42	124	yes
Fluoranthene	0.05	nd	0.05	yes	95	47	126	yes
Pyrene	0.05	nd	0.05	yes	95	46	125	yes
Benzo(a)anthracene	0.05	nd	0.05	yes	90	45	142	yes
Chrysene	0.05	nd	0.05	yes	89	46	148	yes
Benzo(b)fluoranthene	0.05	nd	0.05	yes	94	40	135	yes
Benzo(k)fluoranthene	0.05	nd	0.05	yes	89	40	129	yes
Benzo(a)pyrene	0.05	nd	0.05	yes	98	41	128	yes
Indeno(1,2,3-cd)pyrene	0.05	nd	0.05	yes	91	35	132	yes
Dibenzo(a,h)anthracene	0.05	nd	0.05	yes	101	34	137	yes
Benzo(ghi)perylene	0.05	nd	0.05	yes	99	38	130	yes
Surrogate Standard Recoveries (Control Limits)								
Acenaphthene-d10		81%			72	19	121	yes
Anthracene-d10		85%			81	27	126	yes
Benzo(a)pyrene-d12		92%			93	44	136	yes

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

ANALYTICAL SERVICES

Client: Morrow Environmental
Project Reference: W1801B
Work Order Number: G210772B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Date: 15-Mar-(

Legend: EQL = Estimated Quantitation Limit
nd = Not detected above EQL
DF = Dilution Factor

Date received: March 8, 2001
Date extracted: March 12, 2001
Date analysed: March 12 - 14, 2001

ANALYTICAL METHOD:

The soil samples (10 grams wet weight) were mixed with sodium sulfate and extracted with a 1:1 mixture of acetone:dichloromethane. The extracts were cleaned up using alumina column chromatography. Analysis was performed by gas chromatography/mass spectrometry using U.S. EPA Method 8270C (modified).

REPORT DISCUSSION:

The sample BH 01-17-1-010305 was run at a dilution factor due to elevated levels of target and nontarget compounds present which would exceed the calibration range of the instrument and cause contamination of the equipment if run undiluted. The quantitation limits for this sample are higher than the EQL's for undiluted samples as indicated above. The amounts reported have been corrected for the dilution factor that was used.

Note: Estimated quantitation limit is the lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

NOTE: All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analysis done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangement.

JOB APPROVED BY:

Bilanin

.....

Mihai Bilanin, M.Sc.
Chemist

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

CONFIRMATION REPORT - MEMORY SEND

Time : MAR-15-01 15:32
Fax number: 9058908575
Name : PHILIP ANALYTICAL SERVICES CORPORATION

Job	:	273
Date	:	MAR-15 15:31
To	:	12044779194
Doc. pages	:	04
Start time	:	MAR-15 15:31
End time	:	MAR-15 15:32
Pages sent	:	04
Job:273		*** SEND SUCCESSFUL ***

PSC
ANALYTICAL SERVICES

Client: Morrow Environmental Consultants Inc.
Unit E, 1420 Clarence Ave
Winnipeg, MB, CANADA
R3T 1T6

Fax: 204-477-9194

Attn: Alex Man

Date Received: March 8/2001
Date Reported: March 15/2001
Lab Ref#: G210772
Lab Quote#: DEB809-0991

Client Ref#: W1801B
Sampled By: Alex Man

Attached are your results for PAH's

If you have any questions, please call Elaine Grant,
your Service U.S. EPA SW-846 Method No. 3640

PHILIP SERVICES

PHILIP ANALYTICAL SERVICES
5735 McAdam Road
Mississauga, Ontario L4Z 1N9

Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

LA TOR ONI

Work Order:

Comments: 6210472

CHAIN OF CUSTODY RECORD

report to:

Client: Morrow Environmental
Unit E 1420 Clarence Av.
Winnipeg MB R3T 1T6

Contact: Alex Man

Phone: 204 475 4133 Fax: 204 477 9194

PAS Quote #: DEB809-0991

Page 1 of 1

Client P.O. #: —

Client Project #: W1801B

MAR 8 '01 AM10:01

Sampled by: Alex Man.

Please specify Guideline (if applicable) CWS /MB.

Invoice to (if other than above): Doug Ramsey of:
Acassiz North Assurances Ltd
1274 - Chevrier Blvd
Winnipeg MB
R3T 1Y3

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

STD 5-7 Business Days

RUSH Specify Date

Time

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	BTEX	PAH	CWS (F1-F4)	Sample Matrix	No.of Containers	Comments/Contamination/ Site History
1	BH01-15-6-010305	010305	12:30p	x	x	x	SOIL	2	
2	BH01-17-1-010305	010305	4pm	x	x	x			
3	BH01-18-2-010306	010306	10 Am	x	x	x			
4	BH01-24-2-010306	010306	2pm	x	x	x			
5									
6									
7									
8									
9									
10									
11									
12									

Samples Relinquished to PAS by (Client Signature)	Date: 2001 03 07	Time: 12	Method of Shipment
Samples Received in lab by:	Date: 2001/03/07	Time: 12:35	Condition of samples upon receipt at lab: OK 0°C

Rev. COC03-10-00 White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

Nº 00-18867

ANALYTICAL SERVICES

RECEIVED
APR 2 2001
MORROW ENVIRONMENTAL CONSULTANTS

Client: Morrow Environmental Consultants Inc.
Unit E, 1420 Clarence Ave
Winnipeg, MB, CANADA
R3T 1T6

Fax: 204-477-9194

Attn: Alex Man

Date Received: March 8/2001
Date Reported: March 15/2001
Lab Ref#: G210772
Lab Quote#: DEB809-0991

Client Ref#: W1801B
Sampled By: Alex Man

Certificate of Analysis

Analysis Performed: Extractable Hydrocarbons, C10-C50(CCME, F2 + F3 + F4A)
BTEX and Total Purgeable Hydrocarbons(C6-C10), CCME - F1

Methodology:

1) The characterization of HydroCarbon in soil by GC analysis, following a solvent extraction.
U.S. EPA Method No.8011(microextraction)
2) Analysis of Benzene, Toluene, Ethylbenzene, Xylenes & Purgeable Hydrocarbons by Purge & Trap Capillary GC-PID/FID. External std quantitation with Surrogate standards.
U.S. EPA Method No. 5030 & 8021
U.S. EPA Method No. 502.2
Ontario Ministry of Environment # E3099A

Instrumentation:

1) GC/FID/FID, Hewlett-PackardII GC, Dual injector, Dual FID, A/S
2) PT-GC-PID/FID, Hewlett Packard 5890II GC, O.I. 4560 P&T, A/S

ANALYTICAL SERVICES

Client: Morrow Environmental Consultants Inc.
Unit E, 1420 Clarence Ave
Winnipeg, MB, CANADA
R3T 1T6

Fax: 204-477-9194

Attn: Alex Man

Date Received: March 8/2001
Date Reported: March 15/2001
Lab Ref#: G210772
Lab Quote#: DEB809-0991

Client Ref#: W1801B
Sampled By: Alex Man

Certificate of Analysis

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

Certified By
Elaine Grant
Service Manager

Certified By
N. Boulton, B.Sc., C.Chem.
Customer Service Manager

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

Philip Analytical Services Corp

Certificate of Quality Control

Client : Morrow Environmental Consultants Inc.
Contact: Alex Man

Date Reported: March 15/2001
Lab Ref # : G210772
Lab Quote#: DEB809-0991

Client Ref#: W1801B

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
F2, C10-C16 Hydrocarbons	na	10.0	ug/g	nd	20.0	yes	86	70	120	yes	na	na	na	na	na	yes
F3, C16-C34 Hydrocarbons	na	10.0	ug/g	nd	20.0	yes	86	70	120	yes	na	na	na	na	na	yes
F4A, C34-C50 Hydrocarbons	na	10.0	ug/g	nd	20.0	yes	86	70	120	yes	na	na	na	na	na	yes
Benzene	na	0.040	mg/kg	nd	0.08	yes	85	70	120	yes	na	na	na	na	na	yes
Ethylbenzene	na	0.040	mg/kg	nd	0.08	yes	84	70	120	yes	na	na	na	na	na	yes
F1, C6-C10 Hydrocarbons	na	10.0	mg/kg	nd	10.0	yes	114	70	120	yes	na	na	na	na	na	yes
mp-Xylenes	na	0.080	mg/kg	nd	0.16	yes	88	70	120	yes	na	na	na	na	na	yes
o-Xylene	na	0.040	mg/kg	nd	0.08	yes	94	70	120	yes	na	na	na	na	na	yes
Toluene	na	0.040	mg/kg	nd	0.08	yes	84	70	120	yes	na	na	na	na	na	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Report of Analysis

Client : Morrow Environmental Consultants Inc.
Contact: Alex Man

Report Date: March 15/2001
Lab Ref # : G210772
Lab Quote #: DEB809-0991

Analysis of Soil, expressed on a dry weight basis

Client Ref#: W1801B

Parameter	EQL	Units	BH01-15-6-010305 2001/03/05	BH01-17-1-010305 2001/03/05	BH01-17-1-010305 Replicate	BH01-18-2-010306 2001/03/06	BH01-24-2-010306 2001/03/06
F2, C10-C16 Hydrocarbons	10.0	ug/g	nd	391	378	TR	TR
F3, C16-C34 Hydrocarbons	10.0	ug/g	nd	1730	1710	180	92.1
F4A, C34-C50 Hydrocarbons	10.0	ug/g	nd	278	272	19.1	13.8
Resemblance	na	na	na	EDMO?	EDMO?	EDMO?	EDMO?
Benzene	0.040	mg/kg	nd	nd	nd	nd	nd
Ethylbenzene	0.040	mg/kg	nd	nd	nd	nd	nd
F1, C6-C10 Hydrocarbons	10.0	mg/kg	nd	nd	nd	nd	nd
mp-Xylenes	0.080	mg/kg	nd	nd	nd	nd	nd
o-Xylene	0.040	mg/kg	nd	nd	nd	nd	nd
Toluene	0.040	mg/kg	nd	nd	nd	nd	nd

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
EDMO? Contaminant elutes across the diesel/motor oil range but does not match reference standards.
na Not Applicable
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL
TR trace level less than EQL ! = EQL higher than listed due to dilution ( ) Adjusted EQL

ANALYTICAL SERVICES

RECEIVED
APR 6 2001
MORROW ENVIRONMENTAL CONSULTANTS INC. WINNIPEG

Client: Morrow Environmental Consultants Inc.
Unit E, 1420 Clarence Ave
Winnipeg, MB, CANADA
R3T 1T6

Fax: 204-477-9194

Attn: Alex Man

Date Received: March 20/2001
Date Reported: March 27/2001
Lab Ref#: G210933
Lab Quote#: VG804 0490

Client Ref#: W1801
Sampled By: Alex Man

Certificate of Analysis

Analysis Performed: Extractable Hydrocarbons, C10-C50(CCME, F2 + F3 + F4A)
BTEX and Total Purgeable Hydrocarbons(C6-C10), CCME - F1

Methodology:

1) The characterization of HydroCarbon in soil by GC analysis, following a solvent extraction.
U.S. EPA Method No.8011(microextraction)
2) Analysis of Benzene, Toluene, Ethylbenzene, Xylenes & Purgeable Hydrocarbons by Purge & Trap Capillary GC-PID/FID. External std quantitation with Surrogate standards.
U.S. EPA Method No. 5030 & 8021
U.S. EPA Method No. 502.2
Ontario Ministry of Environment # E3099A

Instrumentation:

1) GC/FID/FID, Hewlett-PackardII GC, Dual injector, Dual FID, A/S
2) PT-GC-PID/FID, Hewlett Packard 5890II GC, O.I. 4560 P&T, A/S

ANALYTICAL SERVICES

Client: Morrow Environmental Consultants Inc.
Unit B, 1420 Clarence Ave
Winnipeg, MB, CANADA
R3T 1T6

Fax: 204-477-9194

Attn: Alex Man

Date Received: March 20/2001
Date Reported: March 27/2001
Lab Ref#: G210933
Lab Quote#: VG804 0490

Client Ref#: W1801
Sampled By: Alex Man

Certificate of Analysis

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

Certified By
Elaine Grant
Service Manager

Certified By
N. Boulton, B.Sc., C.Chem.
Customer Service Manager

Philip Analytical Services Corp

Certificate of Quality Control

Client : Morrow Environmental Consultants Inc.
Contact: Alex Man

Date Reported: March 27/2001
Lab Ref # : G210933
Lab Quote#: VG804 0490

Client Ref#: W1801

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
F2, C10-C16 Hydrocarbons	na	10.0	ug/g	nd	20.0	yes	110	70	120	yes	na	na	na	na	na	yes
F3, C16-C34 Hydrocarbons	na	10.0	ug/g	nd	20.0	yes	110	70	120	yes	na	na	na	na	na	yes
F4A, C34-C50 Hydrocarbons	na	10.0	ug/g	nd	20.0	yes	110	70	120	yes	na	na	na	na	na	yes
Benzene	na	0.040	mg/kg	nd	0.08	yes	81	70	120	yes	na	na	na	na	na	yes
Ethylbenzene	na	0.040	mg/kg	nd	0.08	yes	84	70	120	yes	na	na	na	na	na	yes
F1, C6-C10 Hydrocarbons	na	10.0	mg/kg	nd	10.0	yes	81	70	120	yes	na	na	na	na	na	yes
mp-Xylenes	na	0.080	mg/kg	nd	0.16	yes	86	70	120	yes	na	na	na	na	na	yes
o-Xylene	na	0.040	mg/kg	nd	0.08	yes	90	70	120	yes	na	na	na	na	na	yes
Toluene	na	0.040	mg/kg	nd	0.08	yes	86	70	120	yes	na	na	na	na	na	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Report of Analysis

Client : Morrow Environmental Consultants Inc.
Contact: Alex Man

Report Date: March 27/2001
Lab Ref # : G210933
Lab Quote #: VG804 0490

Analysis of Soil, expressed on a dry weight basis

Client Ref#: W1801

Parameter	EQL	Units	BH01-34-1-010314 2001/03/14	BH01-34-1-010314 Replicate	BH01-36-1-010314 2001/03/14	BH01-36-7-010314 2001/03/14	BH01-37-2-010314 2001/03/14
F2, C10-C16 Hydrocarbons	10.0	ug/g	nd	nd	2150	TR	37.6
F3, C16-C34 Hydrocarbons	10.0	ug/g	82.3	86.3	2960	25.1	432
F4A, C34-C50 Hydrocarbons	10.0	ug/g	50.8	43.7	599	TR	64.2
Resemblance	na	na	EMO?	EMO?	EGDMO?	EDMO?	EDMO?
Benzene	0.040	mg/kg	nd	nd	6.08	nd	nd
Ethylbenzene	0.040	mg/kg	nd	nd	56.0	nd	nd
F1, C6-C10 Hydrocarbons	10.0	mg/kg	nd	nd	317	nd	nd
mp-Xylenes	0.080	mg/kg	nd	nd	53.2	nd	nd
o-Xylene	0.040	mg/kg	nd	nd	20.4	nd	nd
Toluene	0.040	mg/kg	nd	nd	10.4	nd	nd

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
EDMO? Contaminant elutes across the diesel/motor oil range but does not match reference standards.
EGDMO? Contaminant elutes across the gasoline/diesel/motor oil range but does not match our reference standards.
EMO? Contaminant elutes in the motor oil range but does not match reference standard.
na Not Applicable
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL
TR trace level less than EQL ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Morrow Environmental Consultants Inc.
Contact: Alex Man

Report Date: March 27/2001
Lab Ref # : G210933
Lab Quote #: VG804 0490

Analysis of Soil, expressed on a dry weight basis

Client Ref#: W1801

Parameter	EQL	Units	BH01-40-2-010315 2001/03/15	BH01-43-0-010316 2001/03/16			
F2, C10-C16 Hydrocarbons	10.0	ug/g	65.9	nd			
F3, C16-C34 Hydrocarbons	10.0	ug/g	330	nd			
F4A, C34-C50 Hydrocarbons	10.0	ug/g	134	nd			
Resemblance	na	na	PSWDMO	na			
Benzene	0.040	mg/kg	nd	nd			
Ethylbenzene	0.040	mg/kg	nd	nd			
F1, C6-C10 Hydrocarbons	10.0	mg/kg	nd	nd			
mp-Xylenes	0.080	mg/kg	nd	nd			
o-Xylene	0.040	mg/kg	nd	nd			
Toluene	0.040	mg/kg	nd	nd			

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
na Not Applicable
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL
PSWDMO Possible weathered diesel and motor oil.

Client:	Morrow Environmental Consultants Inc. Unit E, 1420 Clarence Ave Winnipeg, MB, CANADA R3T 1T6	Date Received: Date Reported: Lab Ref#: Lab Quote#:	March 20/2001 March 27/2001 G210933 VG804 0490
Fax:	204-477-9194	Client Ref#:	W1801
Attn:	Alex Man	Sampled By:	Alex Man

Interim Certificate of Analysis

Data Codes:

EDMO?	Contaminant elutes across the diesel/motor oil range but does not match reference standards.
EGDMO?	Contaminant elutes across the gasoline/diesel/motor oil range but does not match our reference standards.
EMO?	Contaminant elutes in the motor oil range but does not match reference standard.
na	Not Applicable
nd	parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL
PSWDMO	Possible weathered diesel and motor oil.
TR	trace level less than EQL ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Client:	Morrow Environmental Consultants Inc. Unit E, 1420 Clarence Ave Winnipeg, MB, CANADA R3T 1T6	Date Received: Date Reported: Lab Ref#: Lab Quote#:	March 20/2001 March 27/2001 G210933 VG804 0490
Fax:	204-477-9194	Client Ref#: Sampled By:	W1801 Alex Man
Attn:	Alex Man		

Certificate of Analysis

Additional Comments:

Extractable Hydrocarbons (CCME, F2, F3, F4) analysis of soils:
Please note that the FID profile did not come to baseline for samples BH01-34-1-010314, BH01-36-1-010314, and BH01-40-2-010315. Gravimetric determination (F4-Grav.) for heavy oil is recommended.

ANALYTICAL SERVICES

Client:	Morrow Environmental Consultants Inc. Unit E, 1420 Clarence Ave Winnipeg, MB, CANADA R3T 1T6	Date Received: Date Reported: Lab Ref#: Lab Quote#:	March 20/2001 March 30/2001 G210933 VG804 0490
Fax:	204-477-9194	Client Ref#: Sampled By:	W1801 Alex Man
Attn:	Alex Man		

Attached are your results for PAH's

If you have any questions, please call Elaine Grant,
your Service Manager at Philip Analytical Services Corp.

ANALYTICAL SERVICES

Client: Morrow Environmental
Project Reference: W1801
Work Order Number: G210933B
Matrix: Soil

Polynuclear Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram (µg/g) dry weight

Date: 30-Mar-01

Compound	EQL µg/g	BH01-34-1 010314	BH01-34-1 010314 Dup.	EQL µg/g	BH01-36-1 010314 DF=100	EQL µg/g	BH01-36-7 010314	BH01-37-2 010314
Naphthalene	0.05	0.53	0.50	5.00	595	0.05	1.73	0.56
2-Methylnaphthalene	0.05	0.08	0.08	5.00	175	0.05	0.45	0.37
1-Methylnaphthalene	0.05	0.08	0.08	5.00	94.4	0.05	0.24	0.27
Acenaphthylene	0.05	0.06	0.05	5.00	15.3	0.05	0.06	0.89
Acenaphthene	0.05	0.18	0.16	5.00	235	0.05	0.64	0.58
[illegible]orene	0.05	0.13	0.12	5.00	107	0.05	0.34	0.85
Phenanthrene	0.05	0.37	0.29	5.00	348	0.05	1.38	4.14
Anthracene	0.05	0.09	0.06	5.00	107	0.05	0.42	2.40
Fluoranthene	0.05	0.29	0.19	5.00	242	0.05	0.92	6.32
Pyrene	0.05	0.23	0.15	5.00	221	0.05	0.80	7.26
Benzo(a)anthracene	0.05	0.09	0.05	5.00	71.2	0.05	0.27	4.16
Chrysene	0.05	0.07	*0.04	5.00	56.3	0.05	0.23	4.31
Benzo(b)fluoranthene	0.05	0.10	0.06	5.00	70.7	0.05	0.29	5.27
Benzo(k)fluoranthene	0.05	nd	nd	5.00	24.6	0.05	0.11	1.65
Benzo(a)pyrene	0.05	0.08	0.05	5.00	62.5	0.05	0.27	5.32
Indeno(1,2,3-cd)pyrene	0.05	0.05	*0.04	5.00	32.6	0.05	0.16	3.21
Dibenzo(a,h)anthracene	0.05	nd	nd	5.00	5.03	0.05	nd	0.53
Benzo(ghi)perylene	0.05	nd	nd	5.00	26.7	0.05	0.14	3.19
Surrogate Standard Recoveries (Control Limits)								
Acenaphthene-d10 (19-121%)		71%	65%		N/A		79%	79%
Anthracene-d10 (27-126%)		64%	59%		N/A		67%	67%
Benzo(a)pyrene-d12 (44-136%)		79%	73%		N/A		83%	91%

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

ANALYTICAL SERVICES

Client: Morrow Environmental
Project Reference: W1801
Work Order Number: G210933B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram (µg/g) dry weight

Date: 30-Mar-01

Compound	**EQL µg/g**	BH01-40-2 010315	BH01-43-0 010316
Naphthalene	0.05	0.79	nd
2-Methylnaphthalene	0.05	0.23	nd
1-Methylnaphthalene	0.05	0.18	nd
Acenaphthylene	0.05	0.05	nd
Acenaphthene	0.05	0.25	nd
Fluorene	0.05	0.17	nd
Phenanthrene	0.05	0.80	nd
Anthracene	0.05	0.26	nd
Fluoranthene	0.05	1.13	nd
Pyrene	0.05	0.92	nd
Benzo(a)anthracene	0.05	0.44	nd
Chrysene	0.05	0.43	nd
Benzo(b)fluoranthene	0.05	0.64	nd
Benzo(k)fluoranthene	0.05	0.21	nd
Benzo(a)pyrene	0.05	0.44	nd
Indeno(1,2,3-cd)pyrene	0.05	0.29	nd
Dibenzo(a,h)anthracene	0.05	0.07	nd
Benzo(ghi)perylene	0.05	0.25	nd
Surrogate Standard Recoveries (Control Limits)			
Acenaphthene-d10 (19-121%)		68%	72%
Anthracene-d10 (27-126%)		62%	63%
Benzo(a)pyrene-d12 (44-136%)		80%	78%

PSC
ANALYTICAL SERVICES

Client: Morrow Environmental
Project Reference: W1801
Work Order Number: G210933B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram (µg/g) dry weight

Date: 30-Mar-01

Compound	EQL µg/g	Method Blank Result	Method Blank Upper Limit	Method Blank Accept	Spiked Method Blank % Recovery	Spiked Method Blank Lower Limit	Spiked Method Blank Upper Limit	Spiked Method Blank Accept
Naphthalene	0.05	nd	0.05	yes	66	42	107	yes
2-Methylnaphthalene	0.05	nd	0.05	yes	70	44	114	yes
1-Methylnaphthalene	0.05	nd	0.05	yes	75	46	119	yes
Acenaphthylene	0.05	nd	0.05	yes	74	39	114	yes
Acenaphthene	0.05	nd	0.05	yes	67	34	113	yes
[illegible]rene	0.05	nd	0.05	yes	74	36	120	yes
Phenanthrene	0.05	nd	0.05	yes	75	40	120	yes
Anthracene	0.05	nd	0.05	yes	78	42	124	yes
Fluoranthene	0.05	nd	0.05	yes	82	47	126	yes
Pyrene	0.05	nd	0.05	yes	83	46	125	yes
Benzo(a)anthracene	0.05	nd	0.05	yes	72	45	142	yes
Chrysene	0.05	nd	0.05	yes	73	46	148	yes
Benzo(b)fluoranthene	0.05	nd	0.05	yes	88	40	135	yes
Benzo(k)fluoranthene	0.05	nd	0.05	yes	86	40	129	yes
Benzo(a)pyrene	0.05	nd	0.05	yes	83	41	128	yes
Indeno(1,2,3-cd)pyrene	0.05	nd	0.05	yes	85	35	132	yes
Dibenzo(a,h)anthracene	0.05	nd	0.05	yes	88	34	137	yes
Benzo(ghi)perylene	0.05	nd	0.05	yes	85	38	130	yes
Surrogate Standard Recoveries (Control Limits)								
Acenaphthene-d10		76%			68	19	121	yes
Anthracene-d10		64%			64	27	126	yes
Benzo(a)pyrene-d12		77%			80	44	136	yes

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ANALYTICAL SERVICES

Client: Morrow Environmental
Project Reference: W1801
Work Order Number: G210933B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Date: 30-Mar-01

Spiked Sample:

Compound	EQL µg/g	Amount Spiked	% Recovery	Lower Limit	Upper Limit	Accept
Naphthalene	0.05	2.0	63	35	103	yes
2-Methylnaphthalene	0.05	2.0	69	33	123	yes
1-Methylnaphthalene	0.05	2.0	74	36	130	yes
Acenaphthylene	0.05	2.0	73	31	126	yes
Acenaphthene	0.05	2.0	69	26	120	yes
Fluorene	0.05	2.0	76	31	123	yes
Phenanthrene	0.05	2.0	74	36	118	yes
Anthracene	0.05	2.0	78	45	115	yes
Fluoranthene	0.05	2.0	81	29	130	yes
Pyrene	0.05	2.0	83	23	133	yes
Benzo(a)anthracene	0.05	2.0	70	38	138	yes
Chrysene	0.05	2.0	69	37	148	yes
Benzo(b)fluoranthene	0.05	2.0	89	22	147	yes
Benzo(k)fluoranthene	0.05	2.0	83	31	132	yes
Benzo(a)pyrene	0.05	2.0	81	38	123	yes
Indeno(1,2,3-cd)pyrene	0.05	2.0	88	20	135	yes
Dibenzo(a,h)anthracene	0.05	2.0	89	25	137	yes
Benzo(ghi)perylene	0.05	2.0	85	18	138	yes
Surrogate Standard Recoveries						
Acenaphthene-d10			70	19	121	yes
Anthracene-d10			63	29	126	yes
Benzo(a)pyrene-d12			79	40	130	yes

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ANALYTICAL SERVICES

Client: Morrow Environmental
Project Reference: W1801
Work Order Number: G210933B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Date: 30-Mar-01

Legend: EQL = Estimated Quantitation Limit
nd = Not detected above EQL
Dup. = Duplicate
DF = Dilution Factor
* = Detected below EQL but passed compound identification criteria
N/A = Surrogate recovery could not be determined due to high dilution

Date received: March 20, 2001
Date extracted: March 28, 2001
Date analysed: March 28 & 29, 2001

ANALYTICAL METHOD:

The soil samples (10 grams wet weight) were mixed with sodium sulfate and extracted with a 1:1 mixture of acetone:dichloromethane. The extracts were cleaned up using alumina column chromatography. Analysis was performed by gas chromatography/mass spectrometry using U.S. EPA Method 8270C (modified).

REPORT DISCUSSION:

The sample BH01-36-1 010314 was run at a dilution factor due to elevated levels of target and nontarget compounds present which would exceed the calibration range of the instrument and cause contamination of the equipment if run undiluted. The quantitation limits for this sample are higher than the EQL's for undiluted samples as indicated above. The amounts reported have been corrected for the dilution factors that were used.

Note: Estimated quantitation limit is the lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

NOTE: All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analysis done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangement.

JOB APPROVED BY:

Bilanin
.....
Mihai Bilanin, M.Sc.
Chemist

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

PHILIP SERVICES

PHILIP ANALYTICAL SERVICES

5735 McAdam Road
Mississauga, Ontario L4Z 1N9

Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

LABORATORY USE ONLY

Work Order: 621093

Comments:

CHAIN OF CUSTODY RECORD

Client: Morrow Environmental
Unit E - 1420 Clarence Ave
Wpg. MB. R3T 1T6

Contact: Alex Tam

Phone: (204) 475-4133 Fax: (204) 477-9194

PAS Quote # : VG 8040490

Page ____ of ____

Client P.O. # :

Client Project # : W1801

Sampled by: AT

MAR 20 '01 AM 10:49

Please specify Guideline (if applicable) CWS/MB

Invoice to (if other than above):

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

STD 5-7 Business Days

RUSH Specify Date ____

Time ____

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	BTEX	PAH	CWS (F1-F4)											Sample Matrix	No.of Containers	Comments/Contamination/ Site History
1	BH01-34-1-010314	010314		X	X	X											Soil	2	
2	BH01-36-1-010314	010314		X	X	X													
3	BH01-36-7-010314	010314		X	X	X													1 jar only :. PAH, BTEX, st
4	BH01-37-2-010314	010314		X	X	X													
5	BH01-40-2-010315	010315		X	X	X													
6	BH01-43-0-010316	010316		X	X	X													
7																			
8																			
9																			
10																			
11																			
12																			

Samples Relinquished to PAS by (Client Signature)	Date: 010319	Time: 3:30	Method of Shipment
Samples Receiv lab by:	Date: 1/03/19	Time: 15:30	Condition of samples upon receipt at l

PSC

ANALYTICAL SERVICES

RECEIVED

APR 6 2001

MORROW ENVIRONMENTAL
CONSULTANTS INC.
WINNIPEG

Client:	Morrow Environmental Consultants Inc. Unit E, 1420 Clarence Ave Winnipeg, MB, CANADA R3T 1T6	Date Received: Date Reported: Lab Ref#: Lab Quote#:	March 14/2001 March 22/2001 G210855 VG804-0490
Fax:	204-477-9194	Client Ref#: Sampled By:	W1801 A. Man
Attn:	Alex Man		

Attached are your results for PAH's

If you have any questions, please call ,
your Service Manager at Philip Analytical Services Corp.

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

ANALYTICAL SERVICES

Client: Morrow Environmental
Project Reference: W1801
Work Order Number: G210855B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram (µg/g) dry weight

Date: 22-Mar-0

Compound	EQL µg/g	BH01-19-4	EQL µg/g	BH01-21-2 DF=20	EQL µg/g	BH01-25-2	BH01-26-2A	BH01-26-[illegible] Dup.
Naphthalene	0.05	0.07	1.00	764	0.05	0.05	nd	nd
2-Methylnaphthalene	0.05	nd	1.00	217	0.05	nd	nd	nd
1-Methylnaphthalene	0.05	nd	1.00	117	0.05	nd	nd	nd
Acenaphthylene	0.05	nd	1.00	17.1	0.05	nd	nd	nd
Acenaphthene	0.05	nd	1.00	295	0.05	nd	nd	nd
Fluorene	0.05	nd	1.00	105	0.05	nd	nd	[illegible]
Phenanthrene	0.05	nd	1.00	449	0.05	nd	nd	nd
Anthracene	0.05	nd	1.00	148	0.05	nd	nd	nd
Fluoranthene	0.05	nd	1.00	247	0.05	nd	nd	nd
Pyrene	0.05	nd	1.00	244	0.05	nd	nd	nd
Benzo(a)anthracene	0.05	nd	1.00	84.4	0.05	nd	nd	nd
Chrysene	0.05	nd	1.00	81.1	0.05	nd	nd	nd
Benzo(b)fluoranthene	0.05	nd	1.00	78.4	0.05	nd	nd	nd
Benzo(k)fluoranthene	0.05	nd	1.00	30.0	0.05	nd	nd	nd
Benzo(a)pyrene	0.05	nd	1.00	83.4	0.05	nd	nd	nd
Indeno(1,2,3-cd)pyrene	0.05	nd	1.00	31.1	0.05	nd	nd	nd
Dibenzo(a,h)anthracene	0.05	nd	1.00	7.08	0.05	nd	nd	nd
Benzo(ghi)perylene	0.05	nd	1.00	26.6	0.05	nd	nd	nd
Surrogate Standard Recoveries (Control Limits)								
Acenaphthene-d10 (19-121%)		82%		101%		69%	92%	81%
Anthracene-d10 (27-126%)		96%		98%		87%	97%	96%
Benzo(a)pyrene-d12 (44-136%)		91%		98%		80%	91%	88%

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ANALYTICAL SERVICES

Client: Morrow Environmental
Project Reference: W1801
Work Order Number: G210855B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram (µg/g) dry weight

Date: 22-Mar-01

Compound	EQL µg/g	BH01-27-2	EQL µg/g	BH01-28-2 DF=5	EQL µg/g	BH01-29-2	BH01-30-2	BH01-32-2
Naphthalene	0.05	0.69	0.25	220	0.05	0.50	0.07	0.49
-Methylnaphthalene	0.05	nd	0.25	46.9	0.05	0.15	nd	nd
-Methylnaphthalene	0.05	nd	0.25	28.6	0.05	0.18	nd	nd
Acenaphthylene	0.05	nd	0.25	12.3	0.05	0.25	nd	nd
cenaphthene	0.05	nd	0.25	62.4	0.05	0.71	nd	nd
luorene	0.05	nd	0.25	18.7	0.05	0.67	nd	nd
Phenanthrene	0.05	0.05	0.25	77.6	0.05	3.49	nd	nd
Anthracene	0.05	nd	0.25	23.4	0.05	0.95	nd	nd
uoranthene	0.05	nd	0.25	33.6	0.05	2.93	nd	nd
Pyrene	0.05	nd	0.25	38.3	0.05	2.39	nd	nd
Benzo(a)anthracene	0.05	nd	0.25	13.5	0.05	0.96	nd	nd
hrysene	0.05	nd	0.25	15.2	0.05	0.88	nd	nd
enzo(b)fluoranthene	0.05	nd	0.25	14.3	0.05	1.06	nd	nd
Benzo(k)fluoranthene	0.05	nd	0.25	5.31	0.05	0.42	nd	nd
enzo(a)pyrene	0.05	nd	0.25	15.0	0.05	1.02	nd	nd
deno(1,2,3-cd)pyrene	0.05	nd	0.25	5.13	0.05	0.64	nd	nd
Dibenzo(a,h)anthracene	0.05	nd	0.25	1.15	0.05	0.10	nd	nd
enzo(ghi)perylene	0.05	nd	0.25	4.94	0.05	0.57	nd	nd
urrogate Standard Recoveries (Control Limits)								
Acenaphthene-d10 (19-121%)		91%		90%		63%	66%	61%
thracene-d10 (27-126%)		96%		90%		80%	82%	88%
enzo(a)pyrene-d12 (44-136%)		99%		86%		84%	84%	82%

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ANALYTICAL SERVICES

Client: Morrow Environmental
Project Reference: W1801
Work Order Number: G210855B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram (µg/g) dry weight

Date: 22-Mar-01

		Method Blank			Spiked Method Blank			
Compound	**EQL µg/g**	**Result**	**Upper Limit**	**Accept**	**% Recovery**	**Lower Limit**	**Upper Limit**	**Accept**
Naphthalene	0.05	nd	0.05	yes	71	42	107	yes
2-Methylnaphthalene	0.05	nd	0.05	yes	75	44	114	yes
1-Methylnaphthalene	0.05	nd	0.05	yes	82	46	119	yes
Acenaphthylene	0.05	nd	0.05	yes	79	39	114	yes
Acenaphthene	0.05	nd	0.05	yes	76	34	113	yes
Fluorene	0.05	nd	0.05	yes	84	36	120	yes
Phenanthrene	0.05	nd	0.05	yes	93	40	120	yes
Anthracene	0.05	nd	0.05	yes	97	42	124	yes
Fluoranthene	0.05	nd	0.05	yes	107	47	126	yes
Pyrene	0.05	nd	0.05	yes	105	46	125	yes
Benzo(a)anthracene	0.05	nd	0.05	yes	98	45	142	yes
Chrysene	0.05	nd	0.05	yes	102	46	148	yes
Benzo(b)fluoranthene	0.05	nd	0.05	yes	104	40	135	yes
Benzo(k)fluoranthene	0.05	nd	0.05	yes	112	40	129	yes
Benzo(a)pyrene	0.05	nd	0.05	yes	110	41	128	yes
Indeno(1,2,3-cd)pyrene	0.05	nd	0.05	yes	98	35	132	yes
Dibenzo(a,h)anthracene	0.05	nd	0.05	yes	120	34	137	yes
Benzo(ghi)perylene	0.05	nd	0.05	yes	116	38	130	yes
Surrogate Standard Recoveries (Control Limits)								
Acenaphthene-d10		82%			78	19	121	yes
Anthracene-d10		96%			101	27	126	yes
Benzo(a)pyrene-d12		88%			101	44	136	yes

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ANALYTICAL SERVICES

Client: Morrow Environmental
Project Reference: W1801
Work Order Number: G210855B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Date: 22-Mar-01

Spiked Sample: BH01-32-3

Compound	EQL µg/g	Amount Spiked	% Recovery	Lower Limit	Upper Limit	Accept
Naphthalene	0.05	2.0	88	35	103	yes
2-Methylnaphthalene	0.05	2.0	86	33	123	yes
1-Methylnaphthalene	0.05	2.0	93	36	130	yes
Acenaphthylene	0.05	2.0	90	31	126	yes
Acenaphthene	0.05	2.0	84	26	120	yes
Fl[illegible]ne	0.05	2.0	90	31	123	yes
Phenanthrene	0.05	2.0	97	36	118	yes
Anthracene	0.05	2.0	98	45	115	yes
Fluoranthene	0.05	2.0	108	29	130	yes
Pyrene	0.05	2.0	106	23	133	yes
Benzo(a)anthracene	0.05	2.0	98	38	138	yes
Chrysene	0.05	2.0	101	37	148	yes
Benzo(b)fluoranthene	0.05	2.0	102	22	147	yes
Benzo(k)fluoranthene	0.05	2.0	106	31	132	yes
Benzo(a)pyrene	0.05	2.0	106	38	123	yes
Indeno(1,2,3-cd)pyrene	0.05	2.0	97	20	135	yes
Dibenzo(a,h)anthracene	0.05	2.0	112	25	137	yes
Benzo(ghi)perylene	0.05	2.0	112	18	138	yes
Surrogate Standard Recoveries						
Acenaphthene-d10			86	19	121	yes
Anthracene-d10			100	29	126	yes
Benzo(a)pyrene-d12			97	40	130	yes

ANALYTICAL SERVICES

Client: Morrow Environmental
Project Reference: W1801
Work Order Number: G210855B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Date: 22-Mar-0

Legend: EQL = Estimated Quantitation Limit
nd = Not detected above EQL
Dup. = Duplicate
DF = Dilution Factor

Date received: March 14, 2001
Date extracted: March 19, 2001
Date analysed: March 20 & 21, 2001

ANALYTICAL METHOD:

The soil samples (10 grams wet weight) were mixed with sodium sulfate and extracted with a 1:1 mixture of acetone:dichloromethane. The extracts were cleaned up using alumina column chromatography. Analysis was performed by gas chromatography/mass spectrometry using U.S. EPA Method 8270C (modified).

REPORT DISCUSSION:

Some of the samples were run at a dilution factor due to elevated levels of target and nontarget compounds present which would exceed the calibration range of the instrument and cause contamination of the equipment if run undiluted. The quantitation limits for these samples are higher than the EQL's for undiluted samples as indicated above. The amounts reported have been corrected for the dilution factors that were used.

Note: Estimated quantitation limit is the lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

NOTE: All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analysis done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangement.

JOB APPROVED BY:

Bilanin

Mihai Bilanin, M.Sc.
Chemist

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

PSC

Client: Morrow Environmental Consultants Inc.
Unit E, 1420 Clarence Ave
Winnipeg, MB, CANADA
R3T 1T6

Fax: 204-477-9194

Attn: Alex Man

Date Received: March 14/2001
Date Reported: March 22/2001
Lab Ref#: G210855
Lab Quote#: VG804-0490

Client Ref#: W1801
Sampled By: A. Man

Certificate of Analysis

Analysis Performed:

Extractable Hydrocarbons, C10-C50(CCME, F2 + F3 + F4A)
BTEX and Total Purgeable Hydrocarbons(C6-C10), CCME - F1

Methodology:

1) The characterization of HydroCarbon in soil by GC analysis, following a solvent extraction.
U.S. EPA Method No.8011(microextraction)
2) Analysis of Benzene, Toluene, Ethylbenzene, Xylenes & Purgeable Hydrocarbons by Purge & Trap Capillary GC-PID/FID. External std quantitation with Surrogate standards.
U.S. EPA Method No. 5030 & 8021
U.S. EPA Method No. 502.2
Ontario Ministry of Environment # E3099A

Instrumentation:

1) GC/FID/FID, Hewlett-PackardII GC, Dual injector, Dual FID, A/S
2) PT-GC-PID/FID, Hewlett Packard 5890II GC, O.I. 4560 P&T, A/S

PHILIP ANALYTICAL SERVICES
5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575 Wats: 1-800-263-9040
www.philipanalytical.com

PSC

Client: Morrow Environmental Consultants Inc.
Unit E, 1420 Clarence Ave
Winnipeg, MB, CANADA
R3T 1T6

Fax: 204-477-9194

Attn: Alex Man

Date Received: March 14/2001
Date Reported: March 22/2001
Lab Ref#: G210855
Lab Quote#: VG804-0490

Client Ref#: W1801
Sampled By: A. Man

Certificate of Analysis

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

Certified By
Elaine Grant
Service Manager

Certified By
N. Boulton, B.Sc., C.Chem.
Customer Service Manager

PHILIP ANALYTICAL SERVICES
5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575 Wats: 1-800-263-9040
www.philipanalytical.com

Philip Analytical Services Corp

Certificate of Quality Control

Client : Morrow Environmental Consultants Inc.
Contact: Alex Man

Date Reported: March 22/2001
Lab Ref # : G210855
Lab Quote#: VG804-0490

Client Ref#: W1801

Analysis of Soil, expressed on a dry weight basis

				Process Blank			Process % Recovery				Matrix Spike					Overall
Parameter	SAMPLE ID (spike)	EQL	Units	Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	QC Acceptable
F2, C10-C16 Hydrocarbons	na	10.0	ug/g	nd	20.0	yes	82	70	120	yes	na	na	na	na	na	yes
F3, C16-C34 Hydrocarbons	na	10.0	ug/g	nd	20.0	yes	82	70	120	yes	na	na	na	na	na	yes
F4A, C34-C50 Hydrocarbons	na	10.0	ug/g	nd	20.0	yes	82	70	120	yes	na	na	na	na	na	yes
Benzene	na	0.040	mg/kg	nd	0.08	yes	86	70	120	yes	na	na	na	na	na	yes
Ethylbenzene	na	0.040	mg/kg	nd	0.08	yes	87	70	120	yes	na	na	na	na	na	yes
F1, C6-C10 Hydrocarbons	na	10.0	mg/kg	nd	10.0	yes	120	70	120	yes	na	na	na	na	na	yes
mp-Xylenes	na	0.080	mg/kg	nd	0.16	yes	88	70	120	yes	na	na	na	na	na	yes
o-Xylene	na	0.040	mg/kg	nd	0.08	yes	91	70	120	yes	na	na	na	na	na	yes
Toluene	na	0.040	mg/kg	nd	0.08	yes	88	70	120	yes	na	na	na	na	na	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Report of Analysis

Client : Morrow Environmental Consultants Inc.
Contact: Alex Man

Report Date: March 22/2001
Lab Ref # : G210855
Lab Quote #: VG804-0490

Analysis of Soil, expressed on a dry weight basis

Client Ref#: W1801

Parameter	EQL	Units	BH01-19-4-010308 2001/03/08	BH01-21-2-010308 2001/03/08	BH01-21-2-010308 Replicate	BH01-25-2-010306 2001/03/06	BH01-26-2A -010307 2001/03/07
F2, C10-C16 Hydrocarbons	10.0	ug/g	nd	6270	5100	nd	nd
F3, C16-C34 Hydrocarbons	10.0	ug/g	nd	8810	7300	nd	nd
F4A, C34-C50 Hydrocarbons	10.0	ug/g	nd	1590	1380	nd	nd
Resemblance	na	na	na	EGDMO?	EGDMO?	na	na
Benzene	0.040	mg/kg	nd	0.216	0.204	nd	nd
Ethylbenzene	0.040	mg/kg	nd	38.5	38.2	nd	nd
F1, C6-C10 Hydrocarbons	10.0	mg/kg	nd	185	186	nd	nd
mp-Xylenes	0.080	mg/kg	nd	20.9	20.6	nd	nd
o-Xylene	0.040	mg/kg	nd	12.2	12.0	nd	nd
Toluene	0.040	mg/kg	nd	0.732	0.732	nd	nd

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
EGDMO? Contaminant elutes across the gasoline/diesel/motor oil range but does not match our reference standards.
na Not Applicable
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Morrow Environmental Consultants Inc.
Contact: Alex Man

Report Date: March 22/2001
Lab Ref # : G210855
Lab Quote #: VG804-0490

Analysis of Soil, expressed on a dry weight basis

Client Ref#: W1801

Parameter	EQL	Units	BH01-27-2-010307 2001/03/07	BH01-28-2-010307 2001/03/07	BH01-29-2-010307 2001/03/07	BH01-30-2-010309 2001/03/09	BH01-32-3-010309 2001/03/09
F2, C10-C16 Hydrocarbons	10.0	ug/g	nd	942	TR	nd	nd
F3, C16-C34 Hydrocarbons	10.0	ug/g	TR	785	40.1	10.3	nd
F4A, C34-C50 Hydrocarbons	10.0	ug/g	TR	141	18.4	11.1	nd
Resemblance	na	na	EMO?	EGDMO?	EDMO?	EMO?	na
Benzene	0.040	mg/kg	nd	4.21	nd	nd	nd
Ethylbenzene	0.040	mg/kg	0.288	7.69	nd	nd	nd
F1, C6-C10 Hydrocarbons	10.0	mg/kg	nd	43.8	nd	nd	nd
mp-Xylenes	0.080	mg/kg	nd	6.66	nd	nd	nd
o-Xylene	0.040	mg/kg	0.048	2.60	nd	nd	nd
Toluene	0.040	mg/kg	nd	2.52	nd	nd	nd

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
EDMO? Contaminant elutes across the diesel/motor oil range but does not match reference standards.
EGDMO? Contaminant elutes across the gasoline/diesel/motor oil range but does not match our reference standards.
EMO? Contaminant elutes in the motor oil range but does not match reference standard.
na Not Applicable
d parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL
TR trace level less than EQL ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Client:	Morrow Environmental Consultants Inc. Unit E, 1420 Clarence Ave Winnipeg, MB, CANADA R3T 1T6	Date Received: Date Reported: Lab Ref#: Lab Quote#:	March 14/2001 March 22/2001 G210855 VG804-0490
Fax:	204-477-9194	Client Ref#: Sampled By:	W1801 A. Man
Attn:	Alex Man		

Certificate of Analysis

Additional Comments:

CCME F4 analysis of soil:
The FID profile for samples BH01-21-2-010308 and BH01-28-2-010307 did not come to a baseline at C-50. Gravimetric analysis for heavy oil (CCME F4 gravimetric) analysis based on Canada Wide Standard method protocol is recommended.

PHILIP SERVICES

PHILIP ANALYTICAL SERVICES
5735 McAdam Road
Mississauga, Ontario L4Z 1N9

Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

LABORATORY USE ONLY

Work Order: G210855

Comments:

CHAIN OF CUSTODY RECORD

Client: Norrow Environmental
Unit E - 1420 Clarence Ave
Wpg. MB R3T 1T6

Contact: Alex Fomm

Phone: (204) 475-4133 Fax: (204) 477-9194

PAS Quote #: VG8040490

Page 1 of 1

Client P.O. #:

Client Project #: W1801

Sampled by: AM

MAR 14 '01 AM10:12

Please specify Guideline (if applicable) CWS/MB

Invoice to (if other than above):

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

STD 5-7 Business Days

RUSH Specify Date

Time

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	BTEX	PAH	CWS (F1-F4)	Sample Matrix	No.of Containers	Comments/Contamination/ Site History
1	BH01-21-2-010308	03 08		X	X	X	Soil	2	
2	BH01-19-4-010308	03 08		X	X	X			
3	BH01-25-2-010306	03 06		X	X	X			
4	BH01-27-2-010307	03 07		X	X	X			
5	BH01-28-2-010307	03 07		X	X	X			
6	BH01-29-2-010307	03 07		X	X	X			
7	BH01-30-2-010309	03 09		X	X	X			
8	BH01-32-3-010309	03 09		X	X	X			
9	BH01-26-2A-010307	03 07		X	X	X			
10									
11									
12									

Samples Relinquished to PAS by (Client Signature)	Date: 01 03 13	Time: 2 pm	Method of Shipment
Samples Received in lab by: Benjamin	Date: 03/13/01	Time: 2:15 PM	Condition of samples upon receipt at lab:

Rev. COC03-10-00

White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

PSC

ANALYTICAL SERVICES

RECEIVED
MAR 19 2001
MORROW ENVIRONMENTAL CONSULTANTS INC.
WINNIPEG

Client:	Morrow Environmental Consultants Inc. Unit E, 1420 Clarence Ave Winnipeg, MB, CANADA R3T 1T6
Fax:	204-477-9194
Attn:	Alex Man

Date Received:	February 22/2001
Date Reported:	March 1/2001
Lab Ref#:	G210591
Lab Quote#:	DEB809-0991
Client Ref#:	W1801
Sampled By:	AM

Attached are your results for PAH's

If you have any questions, please call Elaine Grant,
your Service Manager at Philip Analytical Services Corp.

PSC
ANALYTICAL SERVICES

Client: Morrow Environmental Consultants Inc.
Project Reference: W1801
Work Order Number: G210591B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram (µg/g) dry weight

Date: 01-Mar-01

Compound	EQL µg/g	Base-CL 010220 DF=500	EQL µg/g	TP01-1-0.3m 010220 DF=2500	EQL µg/g	TP01-1-0.4m 010220	TP01-1-0.4m 010220 Dup.
Naphthalene	25.0	8890	125	4970	0.05	46.4	37.6
2-Methylnaphthalene	25.0	1860	125	1780	0.05	18.0	14.4
1-Methylnaphthalene	25.0	1000	125	1200	0.05	12.5	9.78
Acenaphthylene	25.0	255	125	248	0.05	3.08	2.41
Acenaphthene	25.0	1600	125	2820	0.05	27.9	22.7
Fl[illegible]ne	25.0	1300	125	1190	0.05	11.3	9.00
Phenanthrene	25.0	4890	125	4300	0.05	42.6	34.2
Anthracene	25.0	1150	125	1180	0.05	11.0	8.45
Fluoranthene	25.0	2560	125	1810	0.05	17.5	13.7
Pyrene	25.0	2050	125	2320	0.05	22.5	18.1
Benzo(a)anthracene	25.0	874	125	688	0.05	6.28	4.91
Chrysene	25.0	674	125	642	0.05	5.71	4.51
Benzo(b)fluoranthene	25.0	514	125	322	0.05	4.14	3.41
Benzo(k)fluoranthene	25.0	511	125	404	0.05	2.68	2.04
Benzo(a)pyrene	25.0	628	125	671	0.05	6.18	4.82
Indeno(1,2,3-cd)pyrene	25.0	291	125	266	0.05	2.98	2.28
Dibenzo(a,h)anthracene	25.0	60.6	125	*60.0	0.05	0.65	0.50
Benzo(ghi)perylene	25.0	211	125	314	0.05	3.11	2.43
Surrogate Standard Recoveries (Control Limits)							
Acenaphthene-d10 (19-121%)		N/A		N/A		77%	73%
Anthracene-d10 (27-126%)		N/A		N/A		70%	70%
Benzo(a)pyrene-d12 (44-136%)		N/A		N/A		68%	69%

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

ANALYTICAL SERVICES

Client: Morrow Environmental Consultants Inc.
Project Reference: W1801
Work Order Number: G210591B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram (µg/g) dry weight

Date: 01-Mar-01

Compound	**EQL µg/g**	TP01-1-0.6m 010220 DF=500
Naphthalene	25.0	1350
2-Methylnaphthalene	25.0	552
1-Methylnaphthalene	25.0	377
Acenaphthylene	25.0	111
Acenaphthene	25.0	1120
Fluorene	25.0	570
Phenanthrene	25.0	2160
Anthracene	25.0	1010
Fluoranthene	25.0	873
Pyrene	25.0	1100
Benzo(a)anthracene	25.0	332
Chrysene	25.0	369
Benzo(b)fluoranthene	25.0	178
Benzo(k)fluoranthene	25.0	190
Benzo(a)pyrene	25.0	346
Indeno(1,2,3-cd)pyrene	25.0	143
Dibenzo(a,h)anthracene	25.0	26.3
Benzo(ghi)perylene	25.0	164
Surrogate Standard Recoveries (Control Limits)		
Acenaphthene-d10 (19-121%)		N/A
Anthracene-d10 (27-126%)		N/A
Benzo(a)pyrene-d12 (44-136%)		N/A

PSC
ANALYTICAL SERVICES

Client: Morrow Environmental Consultants Inc.
Project Reference: W1801
Work Order Number: G210591B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram (µg/g) dry weight

Date: 01-Mar-01

Compound	EQL µg/g	Method Blank Result	Method Blank Upper Limit	Method Blank Accept	Spiked Method Blank % Recovery	Spiked Method Blank Lower Limit	Spiked Method Blank Upper Limit	Spiked Method Blank Accept
Naphthalene	0.05	nd	0.05	yes	51	42	107	yes
2-Methylnaphthalene	0.05	nd	0.05	yes	56	44	114	yes
1-Methylnaphthalene	0.05	nd	0.05	yes	61	46	119	yes
Acenaphthylene	0.05	nd	0.05	yes	60	39	114	yes
Acenaphthene	0.05	nd	0.05	yes	57	34	113	yes
Fluorene	0.05	nd	0.05	yes	63	36	120	yes
Phenanthrene	0.05	nd	0.05	yes	67	40	120	yes
Anthracene	0.05	nd	0.05	yes	70	42	124	yes
Fluoranthene	0.05	nd	0.05	yes	73	47	126	yes
Pyrene	0.05	nd	0.05	yes	71	46	125	yes
Benzo(a)anthracene	0.05	nd	0.05	yes	71	45	142	yes
Chrysene	0.05	nd	0.05	yes	69	46	148	yes
Benzo(b)fluoranthene	0.05	nd	0.05	yes	79	40	135	yes
Benzo(k)fluoranthene	0.05	nd	0.05	yes	71	40	129	yes
Benzo(a)pyrene	0.05	nd	0.05	yes	70	41	128	yes
Indeno(1,2,3-cd)pyrene	0.05	nd	0.05	yes	70	35	132	yes
Dibenzo(a,h)anthracene	0.05	nd	0.05	yes	71	34	137	yes
Benzo(ghi)perylene	0.05	nd	0.05	yes	66	38	130	yes
Surrogate Standard Recoveries (Control Limits)								
Acenaphthene-d10		59%			57	19	121	yes
Anthracene-d10		75%			78	27	126	yes
Benzo(a)pyrene-d12		68%			71	44	136	yes

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ANALYTICAL SERVICES

Client: Morrow Environmental Consultants Inc.
Project Reference: W1801
Work Order Number: G210591B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Date: 01-Mar-01

Legend: EQL = Estimated Quantitation Limit
nd = Not detected above EQL
Dup. = Duplicate
DF = Dilution Factor
N/A = Surrogate recovery could not be determined due to high dilution
* = Detected below EQL but passed compound identification criteria

Date received: February 22, 2001
Date extracted: February 27, 2001
Date analysed: February 27-28 & March 1, 2001

ANALYTICAL METHOD:

The soil samples (10 grams wet weight) were mixed with sodium sulfate and extracted with a 1:1 mixture of acetone:dichloromethane. The extracts were cleaned up using alumina column chromatography. Analysis was performed by gas chromatography/mass spectrometry using U.S. EPA Method 8270C (modified).

REPORT DISCUSSION:

Some of the samples were run at a dilution factor due to elevated levels of target and nontarget compounds present which would exceed the calibration range of the instrument and cause contamination of the equipment if run undiluted. The quantitation limits for these samples are higher than the EQL's for undiluted samples as indicated above. The amounts reported have been corrected for the dilution factors that were used.

Note: Estimated quantitation limit is the lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

NOTE: All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analysis done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangement.

JOB APPROVED BY:

Kathy Horvat

Kathy Horvat, B.Sc.
Chemist

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

PHILIP ANALYTICAL SERVICES CORPORATION

PHILIP SERVICES

5735 McAdam Road
Mississauga, Ontario L4Z 1N9

Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

LABORATORY USE

Work Order:

Comments: G210571

CHAIN OF CUSTODY RECORD

Client: Morrow for Agassiz North

PASC Quote # : DEB 809-0991

Page 1 of 1

Client P.O. # :

FEB 22 '01 PM 3:01

Client Project # : W1801

Contact: Alex Nam @ MECI

Sampled by: AN.

Phone: 204-475-4133 Fax: 477-9194

Please specify Guideline (if applicable)

Invoice to (if other than above):

Agassiz North

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

STD 5-7 Business Days ☐

RUSH Specify Date

Time

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	PAHs	Sample Matrix	No.of Containers	Comments/Contamination/ Site History
1	Base-CL-010220	010220		X	Soil	1	1 jar only
2	TP01-1-0.3m-010220	010220		X		1	1 jar only
3	TP01-1-0.4m-010220	010220		X			
4	TP01-1-0.6m-010220	010220		X		2	
5							
6							
7							
8							
9							
10							
11							
12							

Samples Relinquished to PASC by (Client Signature)	Date: 01 02 21	Time: 3:30	Method of Shipment
Samples Received in lab by:	Date: 02-21-01	Time: 15:30	Condition of samples upon receipt at lab: OK

White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

PSC

ANALYTICAL SERVICES

RECEIVED
MAY 1 2001
MORROW ENVIRONMENTAL CONSULTANTS INC. WINNIPEG

Client:	Morrow Environmental Consultants Inc. Unit E, 1420 Clarence Ave Winnipeg, MB, CANADA R3T 1T6
Fax:	204-477-9194
Attn:	Alex Man

Date Received:	April 12/2001
Date Reported:	April 19/2001
Lab Ref#:	G211309
Lab Quote#:	VG804 0490
Client Ref#:	W1801B
Sampled By:	AM

Attached are your results for PAHs

If you have any questions, please call Elaine Grant,
your Service Manager at Philip Analytical Services Corp.

ANALYTICAL SERVICES

Client: Morrow Environmental
Project Reference: W1801B
Work Order Number: G211309B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram (µg/g) dry weight

Date: 19-Apr-01

Compound	EQL µg/g	BH01-47-3 010410 DF=10	EQL µg/g	BH01-48-12 010410
Naphthalene	0.50	12.2	0.05	0.27
2-Methylnaphthalene	0.50	6.40	0.05	nd
1-Methylnaphthalene	0.50	4.37	0.05	nd
Acenaphthylene	0.50	1.82	0.05	nd
Acenaphthene	0.50	8.68	0.05	nd
[illegible]rene	0.50	5.03	0.05	nd
Phenanthrene	0.50	20.6	0.05	0.09
Anthracene	0.50	7.09	0.05	nd
Fluoranthene	0.50	8.97	0.05	0.08
Pyrene	0.50	11.8	0.05	0.11
Benzo(a)anthracene	0.50	3.13	0.05	0.05
Chrysene	0.50	3.55	0.05	0.06
Benzo(b)fluoranthene	0.50	3.11	0.05	0.09
Benzo(k)fluoranthene	0.50	1.13	0.05	nd
Benzo(a)pyrene	0.50	3.41	0.05	0.08
Indeno(1,2,3-cd)pyrene	0.50	2.26	0.05	0.11
Dibenzo(a,h)anthracene	0.50	*0.34	0.05	nd
Benzo(ghi)perylene	0.50	2.06	0.05	0.14
Surrogate Standard Recoveries (Control Limits)				
Acenaphthene-d10 (19-121%)		102%		80%
Anthracene-d10 (27-126%)		89%		74%
Benzo(a)pyrene-d12 (44-136%)		103%		96%

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

PSC
ANALYTICAL SERVICES

Client: Morrow Environmental
Project Reference: W1801B
Work Order Number: G211309B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram (µg/g) dry weight

Date: 19-Apr-01

Compound	EQL µg/g	Method Blank Result	Method Blank Upper Limit	Method Blank Accept	Spiked Method Blank % Recovery	Spiked Method Blank Lower Limit	Spiked Method Blank Upper Limit	Spiked Method Blank Accept
Naphthalene	0.05	nd	0.05	yes	85	42	107	yes
2-Methylnaphthalene	0.05	nd	0.05	yes	88	44	114	yes
1-Methylnaphthalene	0.05	nd	0.05	yes	90	46	119	yes
Acenaphthylene	0.05	nd	0.05	yes	87	39	114	yes
Acenaphthene	0.05	nd	0.05	yes	85	34	113	ye
Fluorene	0.05	nd	0.05	yes	90	36	120	ye
Phenanthrene	0.05	nd	0.05	yes	95	40	120	yes
Anthracene	0.05	nd	0.05	yes	97	42	124	yes
Fluoranthene	0.05	nd	0.05	yes	97	47	126	yes
Pyrene	0.05	nd	0.05	yes	97	46	125	yes
Benzo(a)anthracene	0.05	nd	0.05	yes	92	45	142	yes
Chrysene	0.05	nd	0.05	yes	92	46	148	yes
Benzo(b)fluoranthene	0.05	nd	0.05	yes	104	40	135	yes
Benzo(k)fluoranthene	0.05	nd	0.05	yes	103	40	129	yes
Benzo(a)pyrene	0.05	nd	0.05	yes	98	41	128	yes
Indeno(1,2,3-cd)pyrene	0.05	nd	0.05	yes	107	35	132	yes
Dibenzo(a,h)anthracene	0.05	nd	0.05	yes	110	34	137	yes
Benzo(ghi)perylene	0.05	nd	0.05	yes	109	38	130	yes
Surrogate Standard Recoveries (Control Limits)								
Acenaphthene-d10		93%			94	19	121	yes
Anthracene-d10		83%			77	27	126	yes
Benzo(a)pyrene-d12		106%			100	44	136	yes

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

ANALYTICAL SERVICES

Client: Morrow Environmental
Project Reference: W1801B
Work Order Number: G211309B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Date: 19-Apr-01

Legend: EQL = Estimated Quantitation Limit
nd = Not detected above EQL
DF = Dilution Factor
* = Detected below EQL but passed compound identification criteria

Date received: April 12, 2001
Date extracted: April 18, 2001
Date analysed: April 19, 2001

ANALYTICAL METHOD:

The soil samples (10 grams wet weight) were mixed with sodium sulfate and extracted with a 1:1 mixture of acetone:dichloromethane. The extracts were cleaned up using alumina column chromatography. Analysis was performed by gas chromatography/mass spectrometry using U.S. EPA Method 8270C (modified).

REPORT DISCUSSION:

Since some target compounds present were at a level above the calibration range of the instrument, the sample BH01-47-3-010110 was run at a dilution factor to avoid exceeding the calibration range and to reduce the contamination to the equipment. The quantitation limits for this sample are higher than the EQL's for undiluted samples as indicated above. The amounts reported have been corrected for the dilution factor that was used.

Note: Estimated quantitation limit is the lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

NOTE: All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analysis done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangement.

JOB APPROVED BY:

Bilanin

Mihai Bilanin, M.Sc.
Chemist

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

ANALYTICAL SERVICES

Client: Morrow Environmental Consultants Inc.
Unit E, 1420 Clarence Ave
Winnipeg, MB, CANADA
R3T 1T6

Fax: 204-477-9194

Attn: Alex Man

Date Received: April 12/2001
Date Reported: April 20/2001
Lab Ref#: G211309
Lab Quote#: VG804 0490

Client Ref#: W1801B
Sampled By: AM

Certificate of Analysis

Analysis Performed: Extractable Hydrocarbons, C10-C50(CCME, F2 + F3 + F4A)
BTEX and Total Purgeable Hydrocarbons(C6-C10), CCME - F1

Methodology:

1) The characterization of HydroCarbon in soil by GC analysis, following a solvent extraction.
U.S. EPA Method No.8011(microextraction)
2) Analysis of Benzene, Toluene, Ethylbenzene, Xylenes & Purgeable Hydrocarbons by Purge & Trap Capillary GC-PID/FID. External std quantitation with Surrogate standards.
U.S. EPA Method No. 5030 & 8021
U.S. EPA Method No. 502.2
Ontario Ministry of Environment # E3099A

Instrumentation:

1) GC/FID/FID, Hewlett-PackardII GC, Dual injector, Dual FID, A/S
2) PT-GC-PID/FID, Hewlett Packard 5890II GC, O.I. 4560 P&T, A/S

ANALYTICAL SERVICES

Client: Morrow Environmental Consultants Inc.
Unit E, 1420 Clarence Ave
Winnipeg, MB, CANADA
R3T 1T6

Fax: 204-477-9194

Attn: Alex Man

Date Received: April 12/2001
Date Reported: April 20/2001
Lab Ref#: G211309
Lab Quote#: VG804 0490

Client Ref#: W1801B
Sampled By: AM

Certificate of Analysis

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

Elaine Grant

Certified By
Elaine Grant
Account Manager

L. Matteo

Certified By
Laboratory Supervisor

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

Philip Analytical Services Corp

Certificate of Quality Control

Client : Morrow Environmental Consultants Inc.
Contact: Alex Man

Date Reported: April 20/2001
Lab Ref # : G211309
Lab Quote#: VG804 0490

Analysis of Soil, expressed on a dry weight basis

Client Ref#: W1801B

Parameter	SAMPLE ID (spike)	EQL	Units	Process Blank			Process % Recovery				Matrix Spike					Overall QC Acceptable
				Result	Upper Limit	Accept	Result	Lower Limit	Upper Limit	Accept	Result	Target	Lower Limit	Upper Limit	Accept	
F2, C10-C16 Hydrocarbons	na	10.0	ug/g	nd	20.0	yes	110	70	120	yes	na	na	na	na	na	yes
F3, C16-C34 Hydrocarbons	na	10.0	ug/g	nd	20.0	yes	110	70	120	yes	na	na	na	na	na	yes
F4A, C34-C50 Hydrocarbons	na	10.0	ug/g	nd	20.0	yes	110	70	120	yes	na	na	na	na	na	yes
Benzene	na	0.040	mg/kg	nd	0.08	yes	95	70	120	yes	na	na	na	na	na	yes
Ethylbenzene	na	0.040	mg/kg	nd	0.08	yes	94	70	120	yes	na	na	na	na	na	yes
F1, C6-C10 Hydrocarbons	na	10.0	mg/kg	nd	10.0	yes	120	70	120	yes	na	na	na	na	na	yes
mp-Xylenes	na	0.080	mg/kg	nd	0.16	yes	94	70	120	yes	na	na	na	na	na	yes
o-Xylene	na	0.040	mg/kg	nd	0.08	yes	93	70	120	yes	na	na	na	na	na	yes
Toluene	na	0.040	mg/kg	nd	0.08	yes	100	70	120	yes	na	na	na	na	na	yes

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence
* = Unavailable due to dilution required for analysis
na = Not Applicable
ns = Insufficient Sample Submitted
nd = parameter not detected
TR = trace level less than EQL

Philip Analytical Services Corp

Report of Analysis

Client : Morrow Environmental Consultants Inc.
Contact: Alex Man

Report Date: April 20/2001
Lab Ref # : G211309
Lab Quote #: VG804 0490

Analysis of Soil, expressed on a dry weight basis

Client Ref#: W1801B

Parameter	EQL	Units	BH01-47-3-010410 2001/04/10	BH01-47-3-010410 Replicate	BH01-48-12-010410 2001/04/10		
F2, C10-C16 Hydrocarbons	10.0	ug/g	321	290	nd		
F3, C16-C34 Hydrocarbons	10.0	ug/g	762	670	23.6		
F4A, C34-C50 Hydrocarbons	10.0	ug/g	190	148	16.4		
Resemblance	na	na	EGDMO?	EGDMO?	EMO?		
Benzene	0.040	mg/kg	0.092	0.115	0.473		
Ethylbenzene	0.040	mg/kg	1.55	2.06	nd		
F1, C6-C10 Hydrocarbons	10.0	mg/kg	TR	10.3	nd		
mp-Xylenes	0.080	mg/kg	1.70	2.44	0.121		
o-Xylene	0.040	mg/kg	1.25	1.59	nd		
Toluene	0.040	mg/kg	0.621	0.713	nd		

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
EGDMO? Contaminant elutes across the gasoline/diesel/motor oil range but does not match our reference standards.
EMO? Contaminant elutes in the motor oil range but does not match reference standard.
na Not Applicable
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL
TR trace level less than EQL ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Client:	Morrow Environmental Consultants Inc. Unit E, 1420 Clarence Ave Winnipeg, MB, CANADA R3T 1T6	Date Received: Date Reported: Lab Ref#: Lab Quote#:	April 12/2001 April 20/2001 G211309 VG804 0490
Fax:	204-477-9194	Client Ref#: Sampled By:	W1801B AM
Attn:	Alex Man		

Certificate of Analysis

Additional Comments:

Hydrocarbons analysis (CWS, F1 and F4) of soils:
Please note that the chromatographic profile came close to baseline at C50 for all samples. The F1 results reported are excluded of BTEX results. The difference between the sample and replicate results for BH101-47-3-010410 is possibly due to non-homogeniety of the sample containing high level (27%) moisture.

PHILIP SERVICES

PHILIP ANALYTICAL SERVICES

5735 McAdam Road
Mississauga, Ontario L4Z 1N9

Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

LABORATORY USE ONLY

Work Order: 6211307

Comments:

CHAIN OF CUSTODY RECORD

Client: Morrow Environmental

PAS Quote # : VG804 0490

Page 1 of 1

Client P.O. # :

Client Project # : W1801B

Contact: Alex Gunn

Sampled by: AG

Phone: (2021) 475-4133 Fax:

Please specify Guideline (if applicable) CWS

APR 12 '01 AM 11:48

Invoice to (if other than above):

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

STD 5-7 Business Days

RUSH Specify Date

Time

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	PAH	BTEX	F1 -> F4	Sample Matrix	No.of Containers	Comments/Contamination/ Site History
1	BH01-47-3-010410	010410		X	X	X	Soil	2	
2	BH01-47-6-010410							2	
3	BH01-47-10-010410							2	
4	BH01-47-12-010410							2	
5	BH01-47-13-010410							2	
6	BH01-48-7-010410							2	
7	BH01-48-10-010410							2	
8	BH01-48-12-010410			X	X	X		1	- small sample, please call if insufficient sample
9	BH01-48-15-010410							2	
10									
11									
12									

Samples Relinquished to PAS by (Client Signature)		Date: 010410	Time: 4:20	Method of Shipment
Samples Received in lab by:		Date:	Time:	Condition of samples upon receipt at lab:

PROJECT OPENING NOTICE

Client: Morrow Environmental Consultants Inc.

Address: Unit E, 1420 Clarence Ave

City/Province: Winnipeg MB CANADA

Postal Code: R3T 1T6

Contact: Andrew Eason

Telephone #: 204-475-4133 Fax #: 204-477-9194

Invoice to: Contact [Y] Accounting [ ] Other [ ]

Company:

Address:

City/Province:

Postal Code:

Attn of:

Project Number: G210722 Priority: P

Sample Arrival Date: 2001/03/03

Received: 2001/03/03 13:13:18

Defined: 2001/03/03 13:23:05

Defined By: EKS

Service Manager: EFG Sales Manager: VGE

Due Date: 2001/03/09

Last revised by: Revised Date:

Sampled by: Alex Man

Sampling dates: 2001/02/23 to 2001/02/28

Client PO #:

Client Reference #: W1801 B

Lab Quote #: VG804-0490

PON Generated: 2001/02/20 15:48:10

# of samp	# to bill	Test	Test Description	Due Date	Revised Date	List Cost Per	List Total	Adjusted Cost Per	Adjusted Total
3	3	DISP-FE-SO	Environmental Sample Disposal Fee	2001/03/09		$1.20	$3.60	$1.20	$3.60
3	3	EHB-CCM-SO	Extractable Hydrocarbons, C10-C50(	2001/03/09		$85.00	$255.00	$60.00	$180.0
3	3	PAH-CME-SO	Polynuclear Aromatic Hydrocarbons(	2001/03/09		$350.00	$1,050.00	$125.00	$375.00
3	3	VGC-CCM-SO	BTEX and Total Purgeable Hydrocarb	2001/03/09		$140.00	$420.00	$65.00	$195.00
							$1,728.60		$753.60

Yes, includes CWS PHC

Comments: OSA 130

Project Discount: 56.40% or $975.00

Analysis Discount: 0.00% or $0.00

Analysis Total: $753.6

Containers:	
Sub-contracting:	
Courier:	
Other:	
Professional Time:	

Elaine Grant

Service Mgr:

Customer:

Page 1 of 1

Project Total: $753.60

Prices to be reconciled to quote prior to invoicing. Please ensure quote number is properly referenced.

Philip Analytical Services Corp

5735 McAdam Road
Mississauga, Ontario, L4Z 1N9
tel:(905) 890-8566 fax:(905) 890-8575
Toll Free: 1-800-263-9040

Fax Cover Sheet

Pages: 2 (including cover sheet)

Please Deliver to: "Andrew Eason"

Morrow Environmental Consultants Inc.
Unit E, 1420 Clarence Ave
Winnipeg MB
R3T 1T6

Fax #: 1-204-477-9194

Service Manager: Elaine Grant

Fax #: (905) 890-8575
Phone:

Please review the following Project Opening Notice (PON) and contact indicated Service Manager regarding any errors or omissions.

PON210722

ANALYTICAL SERVICES

Client:	Morrow Environmental Consultants Inc. Unit E, 1420 Clarence Ave Winnipeg, MB, CANADA R3T 1T6	Date Received: Date Reported: Lab Ref#: Lab Quote#:	March 3/2001 March 9/2001 G210722 DEB809-0991
Fax:	204-477-9194	Client Ref#: Sampled By:	W1801 Alex Man
Attn:	Andrew Eason		

Attached are your results for PAH's

If you have any questions, please call Elaine Grant,
your Service Manager at Philip Analytical Services Corp.

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

PSC
ANALYTICAL SERVICES

Client: Morrow Environmental Consultants Inc.
Project Reference: W1801
Work Order Number: G210722B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram (µg/g) dry weight

Date: 08-Mar-01

Compound	EQL µg/g	BH01-3-3B	EQL µg/g	BH01-5-4	BH01-11-5	BH01-11-5 Dup.
Naphthalene	0.05	1.94	0.10	2.84	nd	nd
2-Methylnaphthalene	0.05	0.44	0.10	0.46	nd	nd
1-Methylnaphthalene	0.05	0.35	0.10	0.24	nd	nd
Acenaphthylene	0.05	0.14	0.10	0.58	nd	nd
naphthene	0.05	1.06	0.10	0.14	nd	nd
Fluorene	0.05	0.69	0.10	0.40	nd	nd
Phenanthrene	0.05	2.64	0.10	1.85	nd	nd
Anthracene	0.05	0.90	0.10	0.57	nd	nd
Fluoranthene	0.05	2.26	0.10	1.23	nd	nd
Pyrene	0.05	1.93	0.10	1.02	nd	nd
Benzo(a)anthracene	0.05	0.76	0.10	0.34	nd	nd
Chrysene	0.05	0.68	0.10	0.30	nd	nd
Benzo(b)fluoranthene	0.05	0.95	0.10	0.39	nd	nd
Benzo(k)fluoranthene	0.05	0.32	0.10	0.14	nd	nd
Benzo(a)pyrene	0.05	0.79	0.10	0.35	nd	nd
Indeno(1,2,3-cd)pyrene	0.05	0.43	0.10	0.16	nd	nd
Dibenzo(a,h)anthracene	0.05	0.08	0.10	nd	nd	nd
Benzo(ghi)perylene	0.05	0.37	0.10	0.16	nd	nd
Surrogate Standard Recoveries (Control Limits)						
Acenaphthene-d10 (19-121%)		91%		89%	84%	85%
Anthracene-d10 (27-126%)		93%		91%	87%	89%
Benzo(a)pyrene-d12 (44-136%)		123%		112%	113%	112%

5745 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

PSC
ANALYTICAL SERVICES

Client: Morrow Environmental Consultants Inc.
Project Reference: W1801
Work Order Number: G210722B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram (µg/g) dry weight

Date: 08-Mar-01

		Method Blank			Spiked Method Blank			
Compound	EQL µg/g	Result	Upper Limit	Accept	% Recovery	Lower Limit	Upper Limit	Accept
Naphthalene	0.05	nd	0.05	yes	86	42	107	yes
2-Methylnaphthalene	0.05	nd	0.05	yes	89	44	114	yes
1-Methylnaphthalene	0.05	nd	0.05	yes	98	46	119	yes
Acenaphthylene	0.05	nd	0.05	yes	94	39	114	yes
Acenaphthene	0.05	nd	0.05	yes	95	34	113	yes
Fluorene	0.05	nd	0.05	yes	103	36	120	yes
Phenanthrene	0.05	nd	0.05	yes	105	40	120	yes
Anthracene	0.05	nd	0.05	yes	109	42	124	yes
Fluoranthene	0.05	nd	0.05	yes	117	47	126	yes
Pyrene	0.05	nd	0.05	yes	118	46	125	yes
Benzo(a)anthracene	0.05	nd	0.05	yes	105	45	142	yes
Chrysene	0.05	nd	0.05	yes	106	46	148	yes
Benzo(b)fluoranthene	0.05	nd	0.05	yes	131	40	135	yes
Benzo(k)fluoranthene	0.05	nd	0.05	yes	123	40	129	yes
Benzo(a)pyrene	0.05	nd	0.05	yes	118	41	128	yes
Indeno(1,2,3-cd)pyrene	0.05	nd	0.05	yes	108	36	132	yes
Dibenzo(a,h)anthracene	0.05	nd	0.05	yes	112	34	137	yes
Benzo(ghi)perylene	0.05	nd	0.05	yes	104	38	130	yes
Surrogate Standard Recoveries (Control Limits)								
Acenaphthene-d10		99%			90	19	121	yes
Anthracene-d10		101%			93	27	126	yes
Benzo(a)pyrene-d12		123%			112	44	136	yes

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PSC
ANALYTICAL SERVICES

Client: Morrow Environmental Consultants Inc.
Project Reference: W1801
Work Order Number: G210722B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Date: 08-Mar-01

Spiked Sample: BH01-11-5

Compound	EQL µg/g	Amount Spiked	% Recovery	Lower Limit	Upper Limit	Accept
Naphthalene	0.05	2.0	86	35	103	yes
2-Methylnaphthalene	0.05	2.0	90	33	123	yes
1-Methylnaphthalene	0.05	2.0	98	36	130	yes
Acenaphthylene	0.05	2.0	93	31	126	yes
Acenaphthene	0.05	2.0	92	26	120	yes
Fluorene	0.05	2.0	97	31	123	yes
Phenanthrene	0.05	2.0	99	36	118	yes
Anthracene	0.05	2.0	101	45	116	yes
Fluoranthene	0.05	2.0	111	29	130	yes
Pyrene	0.05	2.0	111	23	133	yes
Benzo(a)anthracene	0.05	2.0	95	38	138	yes
Chrysene	0.05	2.0	93	37	148	yes
Benzo(b)fluoranthene	0.05	2.0	125	22	147	yes
Benzo(k)fluoranthene	0.05	2.0	116	31	132	yes
Benzo(a)pyrene	0.05	2.0	112	38	123	yes
Indeno(1,2,3-cd)pyrene	0.05	2.0	102	20	135	yes
Dibenzo(a,h)anthracene	0.05	2.0	104	25	137	yes
Benzo(ghi)perylene	0.05	2.0	96	18	138	yes
Surrogate Standard Recoveries						
Acenaphthene-d10			90	19	121	yes
Anthracene-d10			88	29	126	yes
Benzo(a)pyrene-d12			110	40	130	yes

5735 McADAM ROAD, MISSISSAUGA, ONTARIO, CANADA L4Z 1N9 TEL: (905) 890-8566 FAX: (905) 890-8575

ANALYTICAL SERVICES

Client: Morrow Environmental Consultants Inc.
Project Reference: W1801
Work Order Number: G210722B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Date: 08-Mar-01

Legend: EQL = Estimated Quantitation Limit
nd = Not detected above EQL
Dup. = Duplicate

Date received: March 3, 2001
Date extracted: March 6, 2001
Date analysed: March 6, 2001

ANALYTICAL METHOD:

The soil samples (10 grams wet weight) were mixed with sodium sulfate and extracted with a 1:1 mixture of acetone:dichloromethane. The extracts were cleaned up using alumina column chromatography. Analysis was performed by gas chromatography/mass spectrometry using U.S. EPA Method 8270C (modified).

REPORT DISCUSSION:

The EQL's for samples BH01-5-4 & BH01-11-5 were raised to account for the moisture content of the samples.

Note: Estimated quantitation limit is the lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

NOTE: All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analysis done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangement.

JOB APPROVED BY:

Kathy Horvat

Kathy Horvat, B.Sc.
Chemist

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

PSC
ANALYTICAL SERVICES

Client: Morrow Environmental Consultants Inc.
Project Reference: W1801B
Work Order Number: G210660B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram (µg/g) dry weight

Date: 07-Mar-01

Compound	EQL µg/g	BH01-5-2 DF=1000
Naphthalene	50.0	8990
2-Methylnaphthalene	50.0	1800
1-Methylnaphthalene	50.0	965
Acenaphthylene	50.0	2160
Acenaphthene	50.0	419
Fluorene	50.0	1570
Phenanthrene	50.0	5670
Anthracene	50.0	1910
Fluoranthene	50.0	3150
Pyrene	50.0	2720
Benzo(a)anthracene	50.0	1260
Chrysene	50.0	1230
Benzo(b)fluoranthene	50.0	1680
Benzo(k)fluoranthene	50.0	538
Benzo(a)pyrene	50.0	1390
Indeno(1,2,3-cd)pyrene	50.0	877
Dibenzo(a,h)anthracene	50.0	159
Benzo(ghi)perylene	50.0	713
Surrogate Standard Recoveries (Control Limits)		
Acenaphthene-d10 (19-121%)		N/A
Anthracene-d10 (27-126%)		N/A
Benzo(a)pyrene-d12 (44-136%)		N/A

5735 McADAM ROAD, MISSISSAUGA, ONTARIO, CANADA L4Z 1N9 TEL: (905) 890-8566 FAX: (905) 890-8575

ANALYTICAL SERVICES

Client: Morrow Environmental Consultants Inc.
Project Reference: W1801B
Work Order Number: G210660B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram (µg/g) dry weight

Date: 07-Mar-01

		Method Blank			Spiked Method Blank			
Compound	EQL µg/g	Result	Upper Limit	Accept	% Recovery	Lower Limit	Upper Limit	Accept
Naphthalene	0.05	nd	0.05	yes	87	42	107	yes
2-Methylnaphthalene	0.05	nd	0.05	yes	81	44	114	yes
1-Methylnaphthalene	0.05	nd	0.05	yes	90	46	119	yes
Acenaphthylene	0.05	nd	0.05	yes	104	39	114	yes
Acenaphthene	0.05	nd	0.05	yes	102	34	113	yes
Fluorene	0.05	nd	0.05	yes	109	36	120	yes
Phenanthrene	0.05	nd	0.05	yes	109	40	120	yes
Anthracene	0.06	nd	0.05	yes	112	42	124	yes
Fluoranthene	0.05	nd	0.05	yes	119	47	126	yes
Pyrene	0.05	nd	0.06	yes	121	46	125	yes
Benzo(a)anthracene	0.05	nd	0.05	yes	106	45	142	yes
Chrysene	0.05	nd	0.05	yes	108	46	148	yes
Benzo(b)fluoranthene	0.05	nd	0.05	yes	160	40	135	(1)
Benzo(k)fluoranthene	0.05	nd	0.05	yes	127	40	129	yes
Benzo(a)pyrene	0.05	nd	0.05	yes	122	41	128	yes
Indeno(1,2,3-cd)pyrene	0.05	nd	0.05	yes	116	35	132	yes
Dibenzo(a,h)anthracene	0.05	nd	0.05	yes	120	34	137	yes
Benzo(ghi)perylene	0.05	nd	0.05	yes	112	38	130	yes
Surrogate Standard Recoveries (Control Limits)								
Acenaphthene-d10		96%			103	19	121	yes
Anthracene-d10		112%			122	27	126	yes
Benzo(a)pyrene-d12		112%			123	44	136	yes

ANALYTICAL SERVICES

Client: Morrow Environmental Consultants Inc.
roject Reference: W1801B
Work Order Number: G210660B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Date: 07-Mar-01

Legend: EQL = Estimated Quantitation Limit
nd = Not detected above EQL
DF = Dilution Factor
N/A = Surrogate recovery could not be determined due to high dilution

Date received: February 28, 2001
Date extracted: March 2, 2001
Date analysed: March 5, 2001

NALYTICAL METHOD:

ne soil sample (10 grams wet weight) was mixed with sodium sulfate and extracted with a 1:1 mixture of :etone:dichloromethane. The extract was cleaned up using alumina column chromatography. Analysis was performed by gas chromatography/mass spectrometry using U.S. EPA Method 8270C (modified).

Report Discussion:

) The recovery for benzo(b)fluoranthene in the spiked method blank was higher than our upper control limit. Consequently, the reported amount for benzo(b)fluoranthene may be biased high.

ne sample was run at dilution factor due to elevated levels of target and nontarget compounds present which would exceed the calibration range of the instrument and cause contamination of the equipment if run undiluted. The quantitation limits for this sample are higher than the EQL's for undiluted samples as dicated above. The amounts reported have been corrected for the dilution factor that was used.

Note: Estimated quantitation limit is the lowest concentration that can be reliably achieved within specified nits of precision and accuracy during routine laboratory operating conditions.

NOTE: All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost the pertinent analysis done. Your samples will be retained by PASC for a period of 30 days following eporting or as per specific contractual arrangement.

OB APPROVED BY:

for .....
Kathy Horvat, B.Sc.
Chemist

ANALYTICAL SERVICES

Client:	Morrow Environmental Consultants Inc. Unit E, 1420 Clarence Ave Winnipeg, MB, CANADA R3T 1T6	Date Received: Date Reported: Lab Ref#: Lab Quote#:	February 28/2001 March 7/2001 G210660 DEB809-0991
Fax:	204-477-9194	Client Ref#: Sampled By:	W1801B Alex Man
Attn:	Alex Man		

Attached are your results for PAH's

If you have any questions, please call Elaine Grant,
your Service Manager at Philip Analytical Services Corp.

Philip Analytical Services Corp

5735 McAdam Road
Mississauga, Ontario, L4Z 1N9
tel:(905) 890-8566 fax:(905) 890-8575
Toll Free: 1-800-263-9040

Fax Cover Sheet

Pages: 2 (including cover sheet)

Please Deliver to: Alex Man

Morrow Environmental Cons
Unit E, 1420 Clarence Ave
Winnipeg MB
R3T 1T6

Fax #: 1-204-477-9194

Service Manager: Elaine Grant

Fax #: (905) 890-8575
Phone:

Final report will be mailed. If this fax is incomplete or unreadable, please call the above phone number.

REP21066001 SO

Philip Analytical Services Corp

Report of Analysis

Client : Morrow Environmental Consultants Inc.
Contact: Alex Man

Report Date: March 8/2001
Lab Ref # : G210660
Lab Quote #: DEB809-0991

Analysis of Soil, expressed on a dry weight basis

Client Ref#: W1801B

Parameter	EQL	Units	BH01-5-2 2001/02/26	BH01-5-2 Replicate			
F2, C10-C16 Hydrocarbons	10.0	ug/g	34900	34200			
F3, C16-C34 Hydrocarbons	10.0	ug/g	70900	69400			
F4A, C34-C50 Hydrocarbons	10.0	ug/g	15200	15100			
Resemblance	na	na	EGDMO?	EGDMO?			
Benzene	0.040	mg/kg	176	194			
Ethylbenzene	0.040	mg/kg	43.8	48.2			
F1, C6-C10 Hydrocarbons	10.0	mg/kg	251	290			
mp-Xylenes	0.080	mg/kg	119	133			
o-Xylene	0.040	mg/kg	48.3	55.7			
Toluene	0.040	mg/kg	138	152			

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
EGDMO? Contaminant elutes across the gasoline/diesel/motor oil range but does not match our reference standards.
na Not Applicable

Philip Analytical Services Corp

Report of Analysis

Client : Morrow Environmental Consultants Inc.
Contact: Andrew Eason

Report Date: March 9/2001
Lab Ref # : G210722
Lab Quote #: DEB809-0991

Analysis of Soil, expressed on a dry weight basis

Client Ref#: W1801

Parameter	EQL	Units	BH01-11-5 2001/02/28	BH01-3-3B 2001/02/23	BH01-3-3B Replicate	BH01-5-4 2001/02/26	
F2, C10-C16 Hydrocarbons	10.0	ug/g	nd	25.8	24.7	nd	
F3, C16-C34 Hydrocarbons	10.0	ug/g	nd	127	102	12.6	
F4A, C34-C50 Hydrocarbons	10.0	ug/g	nd	54.9	38.0	nd	
Resemblance	na	na	na	EDMO?	EDMO?	UPD	
Benzene	0.040	mg/kg	nd	nd	nd	nd	
Ethylbenzene	0.040	mg/kg	nd	nd	nd	nd	
F1, C6-C10 Hydrocarbons	10.0	mg/kg	nd	nd	nd	nd	
mp-Xylenes	0.080	mg/kg	nd	nd	nd	nd	
o-Xylene	0.040	mg/kg	nd	nd	nd	nd	
Toluene	0.040	mg/kg	nd	nd	nd	nd	

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
EDMO? Contaminant elutes across the diesel/motor oil range but does not match reference standards.
na Not Applicable
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL
UPD Unidentified peaks in Diesel range.

Philip Analytical Services Corp

5735 McAdam Road
Mississauga, Ontario, L4Z 1N9
tel:(905) 890-8566 fax:(905) 890-8575
Toll Free: 1-800-263-9040

Fax Cover Sheet

Pages: 2 (including cover sheet)

Please Deliver to: Andrew Eason

Morrow Environmental Cons
Unit E, 1420 Clarence Ave
Winnipeg MB
R3T 1T6

Fax #: 1-204-477-9194

Service Manager: Elaine Grant

Fax #: (905) 890-8575
Phone:

Final report will be mailed. If this fax is incomplete or unreadable, please call the above phone number.

REP21072201 SO

PSC

ANALYTICAL SERVICES

Client: Morrow Environmental Consultants Inc.
Unit E, 1420 Clarence Ave
Winnipeg, MB, CANADA
R3T 1T6

Fax: 204-477-9194

Attn: Alex Man

Date Received: March 8/2001
Date Reported: March 15/2001
Lab Ref#: G210772
Lab Quote#: DEB809-0991

Client Ref#: W1801B
Sampled By: Alex Man

Attached are your results for PAH's

If you have any questions, please call Elaine Grant,
your Service U.S. EPA SW-846 Method No. 3640

PSC
ANALYTICAL SERVICES

Client: Morrow Environmental
Project Reference: W1801B
Work Order Number: G210772B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram (µg/g) dry weight

Date: 15-Mar-01

Compound	EQL µg/g	BH 01-15-6 010305	EQL µg/g	BH 01-17-1 010305 DF=20	EQL µg/g	BH 01-18-2 010306	BH 01-24-2 010306
Naphthalene	0.05	0.07	1.00	88.5	0.05	0.43	0.05
2-Methylnaphthalene	0.05	nd	1.00	33.0	0.05	0.14	nd
1-Methylnaphthalene	0.05	nd	1.00	20.1	0.05	0.15	nd
Acenaphthylene	0.05	nd	1.00	4.63	0.05	nd	nd
Acenaphthene	0.05	nd	1.00	58.9	0.05	0.19	0.
Fluorene	0.05	nd	1.00	38.7	0.05	0.27	nd
Phenanthrene	0.05	0.05	1.00	148	0.05	1.07	0.14
Anthracene	0.05	nd	1.00	42.5	0.05	0.49	nd
Fluoranthene	0.05	nd	1.00	96.8	0.05	0.37	0.11
Pyrene	0.05	nd	1.00	75.1	0.05	0.42	0.10
Benzo(a)anthracene	0.05	nd	1.00	37.3	0.05	0.07	nd
Chrysene	0.05	nd	1.00	31.9	0.05	0.06	nd
Benzo(b)fluoranthene	0.05	nd	1.00	35.1	0.05	0.05	nd
Benzo(k)fluoranthene	0.05	nd	1.00	15.1	0.05	nd	nd
Benzo(a)pyrene	0.05	nd	1.00	33.1	0.05	nd	nd
Indeno(1,2,3-cd)pyrene	0.05	nd	1.00	17.1	0.05	nd	nd
Dibenzo(a,h)anthracene	0.05	nd	1.00	3.63	0.05	nd	nd
Benzo(ghi)perylene	0.05	nd	1.00	13.3	0.05	nd	nd
Surrogate Standard Recoveries (Control Limits)							
Acenaphthene-d10 (19-121%)		70%		96%		87%	80%
Anthracene-d10 (27-126%)		74%		91%		82%	80%
Benzo(a)pyrene-d12 (44-136%)		82%		79%		93%	90%

PSC
ANALYTICAL SERVICES

Client: Morrow Environmental
Project Reference: W1801B
Work Order Number: G210772B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram (µg/g) dry weight

Date: 15-Mar-01

		Method Blank			Spiked Method Blank			
Compound	EQL µg/g	Result	Upper Limit	Accept	% Recovery	Lower Limit	Upper Limit	Accept
Naphthalene	0.05	nd	0.05	yes	71	42	107	yes
2-Methylnaphthalene	0.05	nd	0.05	yes	73	44	114	yes
1-Methylnaphthalene	0.05	nd	0.05	yes	79	46	119	yes
naphthylene	0.05	nd	0.05	yes	75	39	114	yes
Acenaphthene	0.05	nd	0.05	yes	74	34	113	yes
Fluorene	0.05	nd	0.05	yes	77	36	120	yes
Phenanthrene	0.05	nd	0.05	yes	84	40	120	yes
Anthracene	0.05	nd	0.05	yes	90	42	124	yes
Fluoranthene	0.05	nd	0.05	yes	95	47	126	yes
Pyrene	0.05	nd	0.05	yes	95	46	125	yes
Benzo(a)anthracene	0.05	nd	0.05	yes	90	45	142	yes
Chrysene	0.05	nd	0.05	yes	89	46	148	yes
Benzo(b)fluoranthene	0.05	nd	0.05	yes	94	40	135	yes
Benzo(k)fluoranthene	0.05	nd	0.05	yes	89	40	129	yes
Benzo(a)pyrene	0.05	nd	0.05	yes	98	41	128	yes
Indeno(1,2,3-cd)pyrene	0.05	nd	0.05	yes	91	36	132	yes
Dibenzo(a,h)anthracene	0.05	nd	0.05	yes	101	34	137	yes
Benzo(ghi)perylene	0.05	nd	0.05	yes	99	38	130	yes
Surrogate Standard Recoveries (Control Limits)								
Acenaphthene-d10		81%			72	19	121	yes
Anthracene-d10		85%			81	27	126	yes
Benzo(a)pyrene-d12		92%			93	44	136	yes

ANALYTICAL SERVICES

Client: Morrow Environmental
Project Reference: W1801B
Work Order Number: G210772B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Date: 15-Mar-

Legend: EQL = Estimated Quantitation Limit
nd = Not detected above EQL
DF = Dilution Factor

Date received: March 8, 2001
Date extracted: March 12, 2001
Date analysed: March 12 - 14, 2001

ANALYTICAL METHOD:

The soil samples (10 grams wet weight) were mixed with sodium sulfate and extracted with a 1:1 mixture of acetone:dichloromethane. The extracts were cleaned up using alumina column chromatography. Analysis was performed by gas chromatography/mass spectrometry using U.S. EPA Method 8270C (modified).

REPORT DISCUSSION:

The sample BH 01-17-1-010305 was run at a dilution factor due to elevated levels of target and nontarget compounds present which would exceed the calibration range of the instrument and cause contamination of the equipment if run undiluted. The quantitation limits for this sample are higher than the EQL's for undiluted samples as indicated above. The amounts reported have been corrected for the dilution factor that was used.

Note: Estimated quantitation limit is the lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

NOTE: All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analysis done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangement.

JOB APPROVED BY:

Mihai Bilanin, M.Sc.
Chemist

Philip Analytical Services Corp

Report of Analysis

Client : Morrow Environmental Consultants Inc.
Contact: Alex Man

Report Date: March 15/2001
Lab Ref # : G210772
Lab Quote #: DEB809-0991

Analysis of Soil, expressed on a dry weight basis

Client Ref#: W1801B

Parameter	EQL	Units	BH01-15-6-010305 2001/03/05	BH01-17-1-010305 2001/03/05	BH01-17-1-010305 Replicate	BH01-18-2-010306 2001/03/06	BH01-24-2-010306 2001/03/06
F2, C10-C16 Hydrocarbons	10.0	ug/g	nd	391	378	TR	TR
F3, C16-C34 Hydrocarbons	10.0	ug/g	nd	1730	1710	180	92.1
F4A, C34-C50 Hydrocarbons	10.0	ug/g	nd	278	272	19.1	15.8
Resemblance	na	na	na	EDMO?	EDMO?	EDMO?	EDMO?
Benzene	0.040	mg/kg	nd	nd	nd	nd	nd
Ethylbenzene	0.040	mg/kg	nd	nd	nd	nd	nd
F1, C6-C10 Hydrocarbons	10.0	mg/kg	nd	nd	nd	nd	nd
mp-Xylenes	0.080	mg/kg	nd	nd	nd	nd	nd
o-Xylene	0.040	mg/kg	nd	nd	nd	nd	nd
Toluene	0.040	mg/kg	nd	nd	nd	nd	nd

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
EDMO? Contaminant elutes across the diesel/motor oil range but does not match reference standards.
na Not Applicable
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL
TR trace level less than EQL ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

5735 McAdam Road
Mississauga, Ontario, L4Z 1N9
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Fax Cover Sheet

Pages: 2 (including cover sheet)

Please Deliver to: Alex Man

Morrow Environmental Cons
Unit E, 1420 Clarence Ave
Winnipeg MB
R3T 1T6

Fax #: 1-204-477-9194

Service Manager: Elaine Grant

Fax #: (905) 890-8575
Phone:

Final report will be mailed. If this fax is incomplete or unreadable, please call the above phone number.

REP21077201 SO

Report of Analysis

Client : Morrow Environmental Consultants Inc.
Contact: Alex Man

Report Date: March 15/2001
Lab Ref # : G210772
Lab Quote #: DEB809-0991

Analysis on soil, expressed on a dry weight basis

Parameter	MDL	Units	BH01-15-6-2001/03/06	BH01-17-1-2001/03/06	BH01-17-1-Replicate	BH01-18-2-2001/03/06	BH01-24-2-2001/03/06
F2, C10-C16 Hydrocarbons	10.0	ug/g	nd	391	378	TR	TR
F3, C16-C34 Hydrocarbons	10.0	ug/g	nd	1730	1710	180	92.1
F4A, C34-C50 Hydrocarbons	10.0	ug/g	nd	278	272	19.1	13.8
Resemblance	na	na	na	EDMO?	EDMO?	EDMO?	EDMO?
Benzene	0.010	mg/kg	nd	nd	nd	nd	nd
Ethylbenzene	0.040	mg/kg	nd	nd	nd	nd	nd
F1, C6-C10 Hydrocarbons	10.0	mg/kg	nd	nd	nd	nd	nd
m/p-Xylenes	0.080	mg/kg	nd	nd	nd	nd	nd
o-Xylene	0.040	mg/kg	nd	nd	nd	nd	nd
Toluene	0.040	mg/kg	nd	nd	nd	nd	nd

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

EDMO? Contaminant elutes across the diesel/motor oil range but does not match reference standards.

nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

TR trace level less than EQL ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp
5735 McAdam Road
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tel:(905) 890 8566 fax:(905) 890 8575
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Please Deliver to: Alex Man

Morrow Environmental Cons
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Service Manager: Elaine Grant
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Phone:

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REP21077201 SO

NOTE: The following information is confidential. If you receive this Fax transmission in error, please fax it back, to Nick Boulton's attention and destroy the original. Thank you!

PSC
ANALYTICAL SERVICES

Facsimile Cover Sheet

To: Alex/Andrew Date: Mar 14/01 Fax No: 204 477 9194

Company:

From: PSC. Total Pages (incl. Cover):

Tel No: 905-890-8566 Fax: No: 905-890-8575

Urgent ☐ Reply ASAP ☐ For your review ☐

If you do not receive all pages, please call our office.

Alex/Andrew.

Fy gravimetric is not req'd.

Elaine
Grant

5735 McADAM RD., MISSISSAUGA, ONTARIO, CANADA L4Z 1N9 TEL: (800) 263-9040 FAX: (905) 890-8575

Philip Analytical Services Corp

Report of Analysis

Client : Morrow Environmental Consultants Inc.
Contact: Alex Man

Report Date: March 7/2001
Lab Ref # : G210660
Lab Quote #: DEB809-0991

Analysis of Soil, expressed on a dry weight basis

Client Ref#: W1801B

Parameter	EQL	Units	BH01-S-2 2001/02/26	BH01-S-2 Replicate			
F2, C10-C16 Hydrocarbons	10.0	ug/g	34900	34200			
F3, C16-C34 Hydrocarbons	10.0	ug/g	70900	69400			
F4A, C34-C50 Hydrocarbons	10.0	ug/g	15200	15100			
Resemblance	na	na	EGDMO?	EGDMO?			
Benzene	0.040	mg/kg	176	194			
Ethylbenzene	0.040	mg/kg	43.8	48.2			
F1, C6-C10 Hydrocarbons	10.0	mg/kg	251	290			
mp-Xylenes	0.080	mg/kg	119	133			
o-Xylene	0.040	mg/kg	48.3	55.7			
Toluene	0.040	mg/kg	138	152			

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
EGDMO? Contaminant elutes across the gasoline/diesel/motor oil range but does not match our reference standards.
na Not Applicable

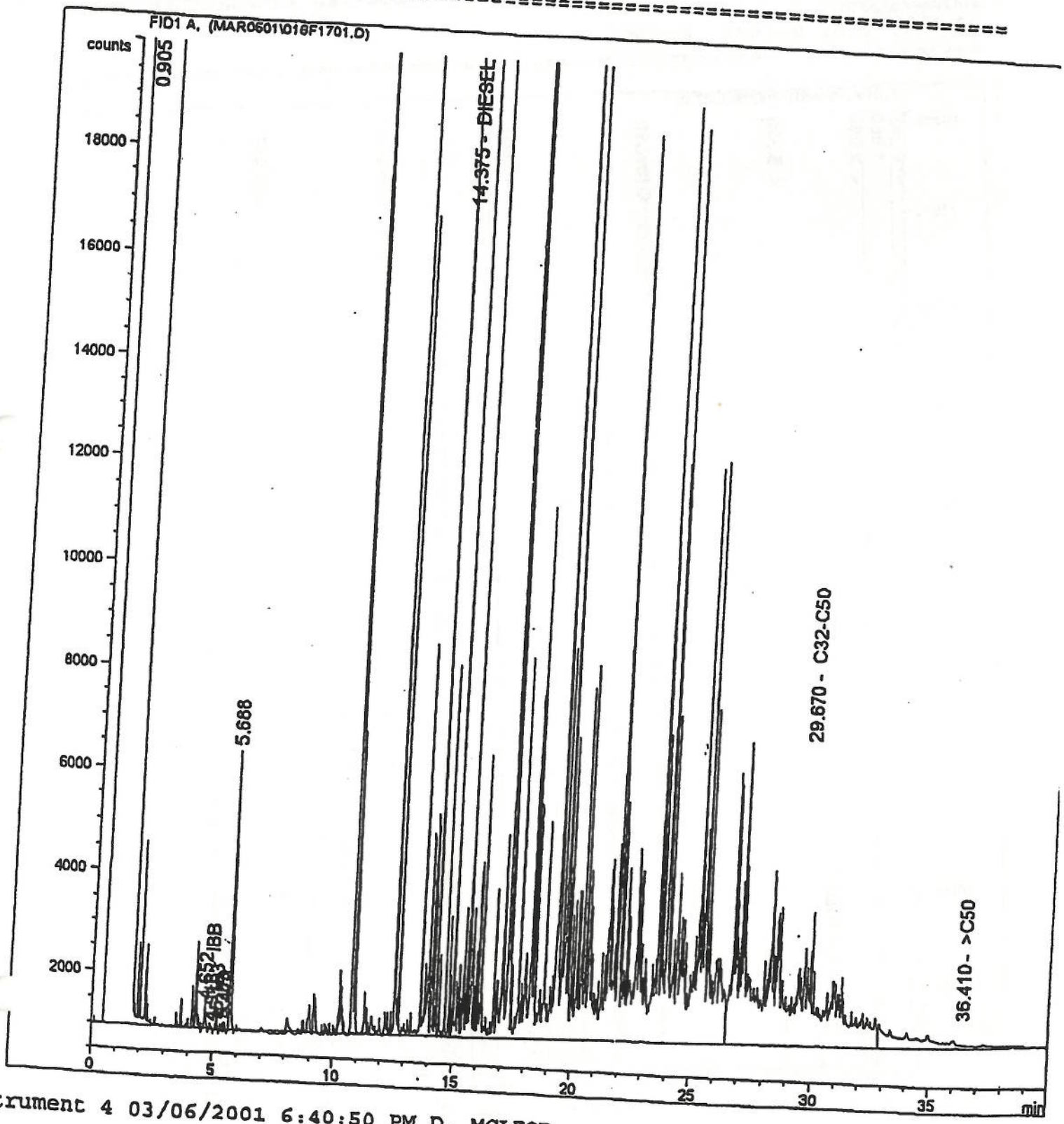
Injection Date : 03/06/2001 5:59:39 PM
Sample Name : 0660-35 100X
Acq. Operator : D. MCLEOD

Seq. Line : 17
Vial : 16
Inj : 1
Inj Volume : 1 µl

Sequence File : C:\HPCHEM\2\SEQUENCE\MAR0501.S
Method : C:\HPCHEM\2\METHODS\4C505F.M
Last changed : 03/05/2001 2:56:23 PM by D. MCLEOD

BH 01-5-2 QC Duplicate

4C505F METHOD FOR FRONT CHANNEL ON FID IV IS FOR THE QUANTITATION UP TO
INCLUDING C50 HYDROCARBONS BASED ON THE SUGGESTED TEMPERATURE PROGRAM BY
AMTAG/SQGTC.
DB-1HT, 15M, 0.25MM, 0.1UM



strument 4 03/06/2001 6:40:50 PM D. MCLEOD

Sample Name: 0660-34

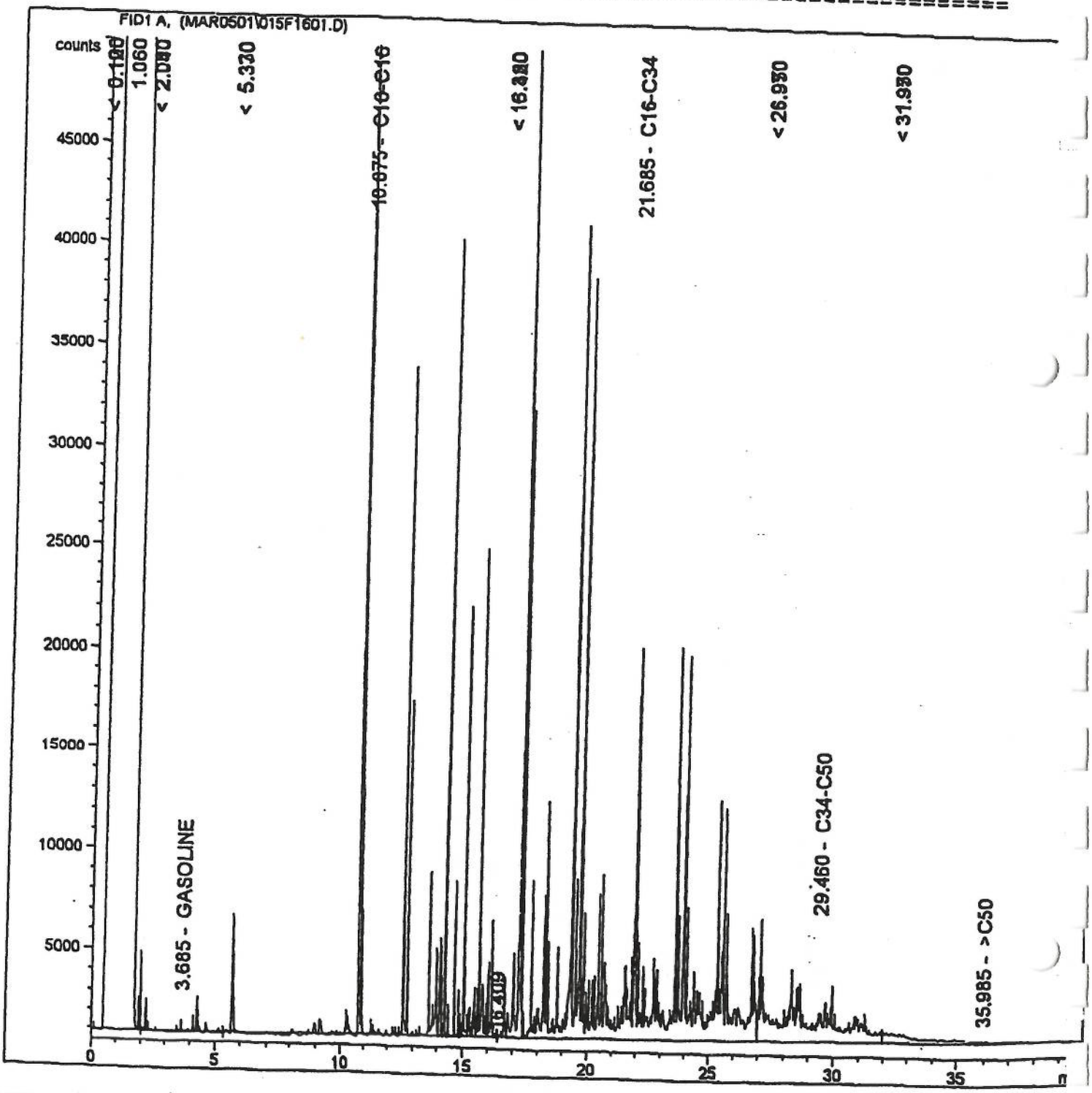
Injection Date : 03/06/2001 5:00:32 PM
Sample Name : 0660-34 100X
Acq. Operator : D. MCLEOD

Seq. Line : 16
Vial : 15
Inj : 1
Inj Volume : 1 µl

Acq. Method : C:\HPCHEM\2\METHODS\4C505F.M
Last changed : 03/05/2001 2:56:23 PM by D. MCLEOD
Analysis Method : C:\HPCHEM\2\METHODS\AMTAG1WF.M
Last changed : 03/07/2001 1:03:09 PM by D. MCLEOD
(modified after loading)

BH 01 -5-2

4C505F METHOD FOR FRONT CHANNEL ON FID IV IS FOR THE QUANTITATION UP TO ALL INCLUDING C50 HYDROCARBONS BASED ON THE SUGGESTED TEMPERATURE PROGRAM BY AMTAG/SQGTC.
DB-1HT, 15M, 0.25MM, 0.1UM



Instrument 4 03/07/2001 1:03:14 PM D. MCLEOD

ANALYTICAL SERVICES

Client:	Morrow Environmental Consultants Inc. Unit E, 1420 Clarence Ave Winnipeg, MB, CANADA R3T 1T6	Date Received: Date Reported: Lab Ref#: Lab Quote#:	March 14/2001 March 22/2001 G210855 VG804-0490
Fax:	204-477-9194	Client Ref#:	W1801
Attn:	Alex Man	Sampled By:	A. Man

Attached are your results for PAH's

If you have any questions, please call ,
your Service Manager at Philip Analytical Services Corp.

ANALYTICAL SERVICES

Client: Morrow Environmental
Project Reference: W1801
Work Order Number: G210855B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram (µg/g) dry weight

Date: 22-Mar-(

Compound	EQL µg/g	BH01-19-4	EQL µg/g	BH01-21-2 DF=20	EQL µg/g	BH01-25-2	BH01-26-2A	BH01-26 Dup.
Naphthalene	0.05	0.07	1.00	764	0.05	0.05	nd	nd
2-Methylnaphthalene	0.05	nd	1.00	217	0.05	nd	nd	nd
1-Methylnaphthalene	0.05	nd	1.00	117	0.05	nd	nd	nd
Acenaphthylene	0.05	nd	1.00	17.1	0.05	nd	nd	nd
Acenaphthene	0.05	nd	1.00	295	0.05	nd	nd	nd
Fluorene	0.05	nd	1.00	105	0.05	nd	nd	nd
Phenanthrene	0.05	nd	1.00	449	0.05	nd	nd	nd
Anthracene	0.05	nd	1.00	148	0.05	nd	nd	nd
Fluoranthene	0.05	nd	1.00	247	0.05	nd	nd	nd
Pyrene	0.05	nd	1.00	244	0.05	nd	nd	nd
Benzo(a)anthracene	0.05	nd	1.00	84.4	0.05	nd	nd	nd
Chrysene	0.05	nd	1.00	81.1	0.05	nd	nd	nd
Benzo(b)fluoranthene	0.05	nd	1.00	78.4	0.05	nd	nd	nd
Benzo(k)fluoranthene	0.05	nd	1.00	30.0	0.05	nd	nd	nd
Benzo(a)pyrene	0.05	nd	1.00	83.4	0.05	nd	nd	nd
Indeno(1,2,3-cd)pyrene	0.05	nd	1.00	31.1	0.05	nd	nd	nd
Dibenzo(a,h)anthracene	0.05	nd	1.00	7.08	0.05	nd	nd	nd
Benzo(ghi)perylene	0.05	nd	1.00	26.6	0.05	nd	nd	nd
Surrogate Standard Recoveries (Control Limits)								
Acenaphthene-d10 (19-121%)		82%		101%		69%	92%	81%
Anthracene-d10 (27-126%)		96%		98%		87%	97%	96%
Benzo(a)pyrene-d12 (44-136%)		91%		98%		80%	91%	88%

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

ANALYTICAL SERVICES

Client: Morrow Environmental
Project Reference: W1801
Work Order Number: G210855B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram (µg/g) dry weight

Date: 22-Mar-01

Compound	EQL µg/g	BH01-27-2	EQL µg/g	BH01-28-2 DF=5	EQL µg/g	BH01-29-2	BH01-30-2	BH01-32-3
Naphthalene	0.05	0.69	0.25	220	0.05	0.50	0.07	0.49
2-Methylnaphthalene	0.05	nd	0.25	46.9	0.05	0.15	nd	nd
1-Methylnaphthalene	0.05	nd	0.25	28.6	0.05	0.18	nd	nd
Acenaphthylene	0.05	nd	0.25	12.3	0.05	0.25	nd	nd
Acenaphthene	0.05	nd	0.25	62.4	0.05	0.71	nd	nd
Fluorene	0.05	nd	0.25	18.7	0.05	0.67	nd	nd
Phenanthrene	0.05	0.05	0.25	77.6	0.05	3.49	nd	nd
Anthracene	0.05	nd	0.25	23.4	0.05	0.95	nd	nd
Fluoranthene	0.05	nd	0.25	33.6	0.05	2.93	nd	nd
Pyrene	0.05	nd	0.25	38.3	0.05	2.39	nd	nd
Benzo(a)anthracene	0.05	nd	0.25	13.5	0.05	0.96	nd	nd
Chrysene	0.05	nd	0.25	15.2	0.05	0.88	nd	nd
Benzo(b)fluoranthene	0.05	nd	0.25	14.3	0.05	1.06	nd	nd
Benzo(k)fluoranthene	0.05	nd	0.25	5.31	0.05	0.42	nd	nd
Benzo(a)pyrene	0.05	nd	0.25	15.0	0.05	1.02	nd	nd
Indeno(1,2,3-cd)pyrene	0.05	nd	0.25	5.13	0.05	0.64	nd	nd
Dibenzo(a,h)anthracene	0.05	nd	0.25	1.15	0.05	0.10	nd	nd
Benzo(ghi)perylene	0.05	nd	0.25	4.94	0.05	0.57	nd	nd
Surrogate Standard Recoveries (Control Limits)								
Acenaphthene-d10 (19-121%)		91%		90%		63%	66%	61%
Anthracene-d10 (27-126%)		96%		90%		80%	82%	88%
Benzo(a)pyrene-d12 (44-136%)		99%		86%		84%	84%	82%

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ANALYTICAL SERVICES

Client: Morrow Environmental
Project Reference: W1801
Work Order Number: G2108558
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram (µg/g) dry weight

Date: 22-Mar-0

Compound	EQL µg/g	Method Blank Result	Method Blank Upper Limit	Method Blank Accept	Spiked Method Blank % Recovery	Spiked Method Blank Lower Limit	Spiked Method Blank Upper Limit	Spiked Method Blank Accept
Naphthalene	0.05	nd	0.05	yes	71	42	107	yes
2-Methylnaphthalene	0.05	nd	0.05	yes	75	44	114	yes
1-Methylnaphthalene	0.05	nd	0.05	yes	82	46	119	yes
Acenaphthylene	0.05	nd	0.05	yes	79	39	114	yes
Acenaphthene	0.05	nd	0.05	yes	76	34	113	yes
Fluorene	0.05	nd	0.05	yes	84	36	120	yes
Phenanthrene	0.05	nd	0.05	yes	93	40	120	yes
Anthracene	0.05	nd	0.05	yes	97	42	124	yes
Fluoranthene	0.05	nd	0.05	yes	107	47	126	yes
Pyrene	0.05	nd	0.05	yes	105	46	125	yes
Benzo(a)anthracene	0.05	nd	0.05	yes	98	45	142	yes
Chrysene	0.05	nd	0.05	yes	102	46	148	yes
Benzo(b)fluoranthene	0.05	nd	0.05	yes	104	40	135	yes
Benzo(k)fluoranthene	0.05	nd	0.05	yes	112	40	129	yes
Benzo(a)pyrene	0.05	nd	0.05	yes	110	41	128	yes
Indeno(1,2,3-cd)pyrene	0.05	nd	0.05	yes	98	35	132	yes
Dibenzo(a,h)anthracene	0.05	nd	0.05	yes	120	34	137	yes
Benzo(ghi)perylene	0.05	nd	0.05	yes	116	38	130	yes

Surrogate Standard Recoveries (Control Limits)

Acenaphthene-d10	82%	78	19	121	yes
Anthracene-d10	96%	101	27	126	yes
Benzo(a)pyrene-d12	88%	101	44	136	yes

5745 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

PSC ANALYTICAL SERVICES

Client: Morrow Environmental
Project Reference: W1801
Work Order Number: G210855B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Date: 22-Mar-01

Spiked Sample: BH01-32-3

Compound	EQL µg/g	Amount Spiked	% Recovery	Lower Limit	Upper Limit	Accept
Naphthalene	0.05	2.0	88	35	103	yes
2-Methylnaphthalene	0.05	2.0	86	33	123	yes
1-Methylnaphthalene	0.05	2.0	93	36	130	yes
Acenaphthylene	0.05	2.0	90	31	126	yes
Acenaphthene	0.05	2.0	84	26	120	yes
Fluorene	0.05	2.0	90	31	123	yes
Phenanthrene	0.05	2.0	97	36	118	yes
Anthracene	0.05	2.0	98	45	115	yes
Fluoranthene	0.05	2.0	108	29	130	yes
Pyrene	0.05	2.0	106	23	133	yes
Benzo(a)anthracene	0.05	2.0	98	38	138	yes
Chrysene	0.05	2.0	101	37	148	yes
Benzo(b)fluoranthene	0.05	2.0	102	22	147	yes
Benzo(k)fluoranthene	0.05	2.0	106	31	132	yes
Benzo(a)pyrene	0.05	2.0	106	38	123	yes
Indeno(1,2,3-cd)pyrene	0.05	2.0	97	20	135	yes
Dibenzo(a,h)anthracene	0.05	2.0	112	25	137	yes
Benzo(ghi)perylene	0.05	2.0	112	18	138	yes

Surrogate Standard Recoveries

Acenaphthene-d10	86	19	121	yes
Anthracene-d10	100	29	126	yes
Benzo(a)pyrene-d12	97	40	130	yes

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

ANALYTICAL SERVICES

Client: Morrow Environmental
Project Reference: W1801
Work Order Number: G210855B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Date: 22-Mar-

Legend: EQL = Estimated Quantitation Limit
nd = Not detected above EQL
Dup. = Duplicate
DF = Dilution Factor

Date received: March 14, 2001
Date extracted: March 19, 2001
Date analysed: March 20 & 21, 2001

ANALYTICAL METHOD:

The soil samples (10 grams wet weight) were mixed with sodium sulfate and extracted with a 1:1 mixture of acetone:dichloromethane. The extracts were cleaned up using alumina column chromatography. Analysis was performed by gas chromatography/mass spectrometry using U.S. EPA Method 8270C (modified).

REPORT DISCUSSION:

Some of the samples were run at a dilution factor due to elevated levels of target and nontarget compounds present which would exceed the calibration range of the instrument and cause contamination of the equipment if run undiluted. The quantitation limits for these samples are higher than the EQL's for undiluted samples as indicated above. The amounts reported have been corrected for the dilution factors that were used.

Note: Estimated quantitation limit is the lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

NOTE: All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analysis done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangement.

JOB APPROVED BY:

Mihai Bilanin, M.Sc.
Chemist

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

Philip Analytical Services Corp

Report of Analysis

Client : Morrow Environmental Consultants Inc.
Contact: Alex Man

Report Date: March 22/2001
Lab Ref # : G210855
Lab Quote #: VG804-0490

Analysis of Soil, expressed on a dry weight basis

Client Ref#: W1801

F4 ✓

Parameter	EQL	Units	BH01-19-4-010308 2001/03/08	BH01-21-2-010308 2001/03/08	BH01-21-2-010308 Replicate	BH01-25-2-010306 2001/03/06	BH01-26-2A -010307 2001/03/07
F2, C10-C16 Hydrocarbons	10.0	ug/g	nd	6270	5100	nd	nd
F3, C16-C34 Hydrocarbons	10.0	ug/g	nd	8810	7300	nd	nd
F4A, C34-C50 Hydrocarbons	10.0	ug/g	nd	1590	1380	nd	nd
Resemblance	na	na	na	EGDMO?	EGDMO?	na	na
Benzene	0.040	mg/kg	nd	0.216	0.204	nd	nd
Ethylbenzene	0.040	mg/kg	nd	38.5	38.2	nd	nd
F1, C6-C10 Hydrocarbons	10.0	mg/kg	nd	185	186	nd	nd
mp-Xylenes	0.080	mg/kg	nd	20.9	20.6	nd	nd
o-Xylene	0.040	mg/kg	nd	12.2	12.0	nd	nd
Toluene	0.040	mg/kg	nd	0.732	0.732	nd	nd

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
EGDMO? Contaminant elutes across the gasoline/diesel/motor oil range but does not match our reference standards.
na Not Applicable
nd parameter not detected 1 = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Morrow Environmental Consultants Inc.
Contact: Alex Man

Report Date: March 22/2001
Lab Ref # : G210855
Lab Quote #: VG804-0490

Analysis of Soil, expressed on a dry weight basis

F4 ✓

Client Ref#: W1801

Parameter	EQL	Units	BH01-27-2-010307 2001/03/07	BH01-28-2-010307 2001/03/07	BH01-29-2-010307 2001/03/07	BH01-30-2-010309 2001/03/09	BH01-32-3-010309 2001/03/09
F2, C10-C16 Hydrocarbons	10.0	ug/g	nd	942	TR	nd	nd
F3, C16-C34 Hydrocarbons	10.0	ug/g	TR	785	40.1	10.9	nd
F4A, C34-C50 Hydrocarbons	10.0	ug/g	TR	141	18.4	11.1	nd
Resemblance	na	na	EMO?	EODMO?	EDMO?	EMO?	na
Benzene	0.040	mg/kg	nd	4.21	nd	nd	nd
Ethylbenzene	0.040	mg/kg	0.288	7.69	nd	nd	nd
F1, C6-C10 Hydrocarbons	10.0	mg/kg	nd	43.8	nd	nd	nd
mp-Xylenes	0.080	mg/kg	nd	6.66	nd	nd	nd
o-Xylene	0.040	mg/kg	0.048	2.60	nd	nd	nd
Toluene	0.040	mg/kg	nd	2.52	nd	nd	nd

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
EDMO? Contaminant elutes across the diesel/motor oil range but does not match reference standards.
EGDMO? Contaminant elutes across the gasoline/diesel/motor oil range but does not match our reference standards.
EMO? Contaminant elutes in the motor oil range but does not match reference standard.
na Not Applicable
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL
TR trace level less than EQL. ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Client:	Morrow Environmental Consultants Inc. Unit B, 1420 Clarence Ave Winnipeg, MB, CANADA R3T 1T6	Date Received: Date Reported: Lab Ref#: Lab Quote#:	March 14/2001 March 22/2001 G210855 VG804-0490
Fax:	204-477-9194	Client Ref#: Sampled By:	W1801 A. Man
Attn:	Alex Man		

Certificate of Analysis

Additional Comments:

CCME F4 analysis of soil:
The FID profile for samples BH01-21-2-010308 and BH01-28-2-010307 did not come to a baseline at C-50. Gravimetric analysis for heavy oil (CCME F4 gravimetric) analysis based on Canada Wide Standard method protocol is recommended.

Philip Analytical Services Corp

Report of Analysis

Client : Morrow Environmental Consultants Inc.
Contact: Alex Man

Report Date: March 27/2001
Lab Ref # : G210933
Lab Quote #: VG804 0490

Analysis of Soil, expressed on a dry weight basis

F4 ✓

Client Ref#: W1801

F4 ✓

Parameter	EQL	Units	BH01-34-1-010314 2001/03/14	BH01-34-1-010314 Replicate	BH01-36-1-010314 2001/03/14	BH01-36-7-010314 2001/03/14	BH01-37-2-010314 2001/03/14
F2, C10-C16 Hydrocarbons	10.0	ug/g	nd	nd	2150	TR	37.6
F3, C16-C34 Hydrocarbons	10.0	ug/g	82.3	86.3	2960	25.1	432
F4A, C34-C50 Hydrocarbons	10.0	ug/g	50.8	43.7	599	TR	64.2
Resemblance	na	na	EMO?	EMO?	EGDMO?	EDMO?	EDMO?
Benzene	0.040	mg/kg	nd	nd	6.08	nd	nd
Ethylbenzene	0.040	mg/kg	nd	nd	56.0 76	nd	nd
F1, C6-C10 Hydrocarbons	10.0	mg/kg	nd	nd	317	nd	nd
mp-Xylenes	0.080	mg/kg	nd	nd	53.2	nd	nd
o-Xylene	0.040	mg/kg	nd	nd	20.4	nd	nd
Toluene	0.040	mg/kg	nd	nd	10.4	nd	nd

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
EDMO? Contaminant elutes across the diesel/motor oil range but does not match reference standards.
EGDMO? Contaminant elutes across the gasoline/diesel/motor oil range but does not match our reference standards.
EMO? Contaminant elutes in the motor oil range but does not match reference standard.
na Not Applicable
nd parameter not detected 1 = EQL higher than listed due to dilution ( ) Adjusted EQL
TR trace level less than EQL 1 = EQL higher than listed due to dilution ( ) Adjusted EQL

Philip Analytical Services Corp

Report of Analysis

Client : Morrow Environmental Consultants Inc.
Contact: Alex Man

Report Date: March 27/2001
Lab Ref # : G210933
Lab Quote #: VG804 0490
Client Ref#: W1801

Analysis of Soil, expressed on a dry weight basis

F4 ✓

Parameter	EQL	Units	BH01-40-2-010315 2001/03/15	BH01-43-0-010316 2001/03/16			
F2, C10-C16 Hydrocarbons	10.0	ug/g	65.9	nd			
F3, C16-C34 Hydrocarbons	10.0	ug/g	330	nd			
F4A, C34-C50 Hydrocarbons	10.0	ug/g	134	nd			
Resemblance	na	na	PSWDMO	na			
Benzene	0.040	mg/kg	nd	nd			
Ethylbenzene	0.040	mg/kg	nd	nd			
F1, C6-C10 Hydrocarbons	10.0	mg/kg	nd	nd			
mp-Xylenes	0.080	mg/kg	nd	nd			
o-Xylene	0.040	mg/kg	nd	nd			
Toluene	0.040	mg/kg	nd	nd			

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
na Not Applicable
nd parameter not detected 1 = EQL higher than listed due to dilution ( ) Adjusted EQL
PSWDMO Possible weathered diesel and motor oil.

Client:	Morrow Environmental Consultants Inc. Unit B, 1420 Clarence Ave Winnipeg. MB. CANADA R3T 1T6	Date Received: Date Reported: Lab Ref#: Lab Quote#:	March 20/2001 March 27/2001 G210933 VG804 0490
Fax:	204-477-9194		
Attn:	Alex Man	Client Ref#: Sampled By:	W1801 Alex Man

Interim Certificate of Analysis

Data Codes:

EDMO?	Contaminant elutes across the diesel/motor oil range but does not match reference standards.
EGDMO?	Contaminant elutes across the gasoline/diesel/motor oil range but does not match our reference standards.
EMO?	Contaminant elutes in the motor oil range but does not match reference standard.
na	Not Applicable
nd	parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL
PSWDMO	Possible weathered diesel and motor oil.
TR	trace level less than EQL ! = EQL higher than listed due to dilution ( ) Adjusted EQL

Client: Morrow Environmental Consultants Inc.
Unit E, 1420 Clarence Ave
Winnipeg, MB, CANADA
R3T 1T6

Fax: 204-477-9194

Attn: Alex Man

Date Received: March 20/2001
Date Reported: March 27/2001
Lab Ref#: G210933
Lab Quote#: VG804 0490

Client Ref#: W1801
Sampled By: Alex Man

Certificate of Analysis

Additional Comments:

Extractable Hydrocarbons (CCME, F2, F3, F4) analysis of soils:
Please note that the FID profile did not come to baseline for samples BH01-34-1-010314, BH01-36-1-010314, and BH01-40-2-010315. Gravimetric determination (F4-Grav.) for heavy oil is recommended.

PHILIP ANALYTICAL SERVICES (MISSISSAUGA) QUESTIONNAIRE

Dear Client:

Thank you for choosing Philip Analytical Services - Mississauga for your analytical requirements. We hope we have met your expectations. We now ask a little of your time to answer a few questions concerning our services. The answers you provide will help us to serve you better. Please complete the form and mail or fax it (905-890-8575) to us at your earliest convenience.

Please indicate on a scale of 0 (poor) to 5 (excellent), or NA (not applicable), how satisfied you were with the quality of the following:

BOTTLE ORDERS:

	Poor	Excellent	
Delivered on time.	0....1....2....3....4....5		NA
Condition of order.	0....1....2....3....4....5		NA

PERSONNEL:

	Sales & Service		Department Managers	
Availability	0....1....2....3....4....5	NA	0....1....2....3....4....5	NA
Ability to answer your technical inquiries.	0....1....2....3....4....5	NA	0....1....2....3....4....5	NA
Responsiveness in handling your requests.	0....1....2....3....4....5	NA	0....1....2....3....4....5	NA

ANALYTICAL REPORTS:

Received on the date initially requested.	0....1....2....3....4....5
Received on the date scheduled by the laboratory.	0....1....2....3....4....5
Presented in an acceptable format.	0....1....2....3....4....5

Based on your experience, would you recommend Philip Analytical Services to your colleagues?

YES _____ NO _____

Please use the space provided for any additional comments or suggestions.

_____

_____

_____

_____

ame: _____ Company: _____

·oject: _____ Date: _____

e thank you for your support and for taking the time to complete this survey.

PSC
ANALYTICAL SERVICES

Client: Morrow Environmental Consultants Inc.
Unit E, 1420 Clarence Ave
Winnipeg, MB, CANADA
R3T 1T6

Fax: 204-477-9194

Attn: Alex Man

Date Received: March 20/2001
Date Reported: March 30/2001
Lab Ref#: G210933
Lab Quote#: VG804 0490

Client Ref#: W1801
Sampled By: Alex Man

Attached are your results for PAH's

If you have any questions, please call Elaine Grant, your Service Manager at Philip Analytical Services Corp.

PSC
ANALYTICAL SERVICES

Client: Morrow Environmental
Project Reference: W1801
Work Order Number: G210933B
Matrix: Soil

Polynuclear Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram (µg/g) dry weight

Date: 30-Mar-01

Compound	EQL µg/g	BH01-34-1 010314	BH01-34-1 010314 Dup.	EQL µg/g	BH01-36-1 010314 DF=100	EQL µg/g	BH01-36-7 010314	BH01-37-2 010314
Naphthalene	0.05	0.53	0.50	5.00	595	0.05	1.73	0.56
2-Methylnaphthalene	0.05	0.08	0.08	5.00	175	0.05	0.45	0.37
1-Methylnaphthalene	0.05	0.08	0.08	5.00	94.4	0.05	0.24	0.27
Acenapnthylene	0.06	0.06	0.05	5.00	15.3	0.05	0.06	0.89
Acenaphthene	0.05	0.18	0.16	5.00	235	0.05	0.64	0.58
Fluorene	0.05	0.13	0.12	5.00	107	0.05	0.34	0.[illegible]
Phenanthrene	0.05	0.37	0.29	5.00	348	0.05	1.38	4.14
Anthracene	0.05	0.09	0.06	5.00	107	0.05	0.42	2.40
Fluoranthene	0.05	0.29	0.19	5.00	242	0.05	0.92	6.32
Pyrene	0.05	0.23	0.15	5.00	221	0.05	0.80	7.26
Benzo(a)anthracene	0.05	0.09	0.05	5.00	71.2	0.05	0.27	4.16
Chrysene	0.05	0.07	*0.04	5.00	66.3	0.05	0.23	4.31
Benzo(b)fluoranthene	0.05	0.10	0.06	5.00	70.7	0.05	0.29	5.27
Benzo(k)fluoranthene	0.05	nd	nd	5.00	24.6	0.05	0.11	1.65
Benzo(a)pyrene	0.05	0.08	0.05	5.00	62.5	0.05	0.27	5.32
Indeno(1,2,3-cd)pyrene	0.05	0.05	*0.04	5.00	32.6	0.05	0.16	3.21
Dibenzo(a,h)anthracene	0.05	nd	nd	5.00	5.03	0.05	nd	0.53
Benzo(ghi)perylene	0.05	nd	nd	5.00	26.7	0.05	0.14	3.19
Surrogate Standard Recoveries (Control Limits)								
Acenaphthene-d10 (19-121%)		71%	65%		N/A		79%	79%
Anthracene-d10 (27-126%)		64%	59%		N/A		67%	67%
Benzo(a)pyrene-d12 (44-136%)		79%	73%		N/A		83%	91%

ANALYTICAL SERVICES

Client: Morrow Environmental
Project Reference: W1801
Work Order Number: G210933B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram (µg/g) dry weight

Date: 30-Mar-01

Compound	EQL µg/g	BH01-40-2 010315	BH01-43-0 010316
Naphthalene	0.05	0.79	nd
2-Methylnaphthalene	0.05	0.23	nd
1-Methylnaphthalene	0.05	0.18	nd
Acenaphthylene	0.06	0.05	nd
Acenaphthene	0.05	0.25	nd
Fluorene	0.05	0.17	nd
Phenanthrene	0.05	0.80	nd
Anthracene	0.05	0.26	nd
Fluoranthene	0.05	1.13	nd
Pyrene	0.05	0.92	nd
Benzo(a)anthracene	0.05	0.44	nd
Chrysene	0.05	0.43	nd
Benzo(b)fluoranthene	0.05	0.64	nd
Benzo(k)fluoranthene	0.05	0.21	nd
Benzo(a)pyrene	0.05	0.44	nd
Indeno(1,2,3-cd)pyrene	0.05	0.29	nd
Dibenzo(a,h)anthracene	0.05	0.07	nd
Benzo(ghi)perylene	0.05	0.25	nd
Surrogate Standard Recoveries (Control Limits)			
Acenaphthene-d10 (19-121%)		68%	72%
Anthracene-d10 (27-126%)		62%	63%
Benzo(a)pyrene-d12 (44-136%)		80%	78%

PSC
ANALYTICAL SERVICES

Client: Morrow Environmental
Project Reference: W1801
Work Order Number: G210933B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram (µg/g) dry weight

Date: 30-Mar-01

Compound	EQL µg/g	Method Blank Result	Method Blank Upper Limit	Method Blank Accept	Spiked Method Blank % Recovery	Spiked Method Blank Lower Limit	Spiked Method Blank Upper Limit	Spiked Method Blank Accept
Naphthalene	0.05	nd	0.05	yes	66	42	107	yes
2-Methylnaphthalene	0.05	nd	0.05	yes	70	44	114	yes
1-Methylnaphthalene	0.05	nd	0.05	yes	75	46	119	yes
Acenaphthylene	0.05	nd	0.05	yes	74	39	114	yes
Acenaphthene	0.05	nd	0.05	yes	67	34	113	yes
Fluorene	0.05	nd	0.05	yes	74	36	120	yes
Phenanthrene	0.05	nd	0.05	yes	75	40	120	yes
Anthracene	0.05	nd	0.05	yes	78	42	124	yes
Fluoranthene	0.05	nd	0.05	yes	82	47	126	yes
Pyrene	0.05	nd	0.05	yes	83	46	125	yes
Benzo(a)anthracene	0.05	nd	0.05	yes	72	45	142	yes
Chrysene	0.05	nd	0.05	yes	73	46	148	yes
Benzo(b)fluoranthene	0.05	nd	0.05	yes	88	40	135	yes
Benzo(k)fluoranthene	0.05	nd	0.05	yes	86	40	129	yes
Benzo(a)pyrene	0.05	nd	0.05	yes	83	41	128	yes
Indeno(1,2,3-cd)pyrene	0.05	nd	0.05	yes	85	35	132	yes
Dibenzo(a,h)anthracene	0.05	nd	0.05	yes	88	34	137	yes
Benzo(ghi)perylene	0.05	nd	0.05	yes	85	38	130	yes
Surrogate Standard Recoveries (Control Limits)								
Acenaphthene-d10		76%			68	19	121	yes
Anthracene-d10		64%			64	27	126	yes
Benzo(a)pyrene-d12		77%			80	44	136	yes

PSC
ANALYTICAL SERVICES

Client: Morrow Environmental
Project Reference: W1801
Work Order Number: G210933B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Date: 30-Mar-01

Spiked Sample:

Compound	EQL µg/g	Amount Spiked	% Recovery	Lower Limit	Upper Limit	Accept
Naphthalene	0.05	2.0	63	35	103	yes
2-Methylnaphthalene	0.05	2.0	69	33	123	yes
1-Methylnaphthalene	0.05	2.0	74	36	130	yes
Acenaphthylene	0.05	2.0	73	31	126	yes
Acenaphthene	0.05	2.0	69	26	120	yes
Fluorene	0.05	2.0	76	31	123	yes
Phenanthrene	0.05	2.0	74	36	118	yes
Anthracene	0.05	2.0	78	45	115	yes
Fluoranthene	0.05	2.0	81	29	130	yes
Pyrene	0.05	2.0	83	23	133	yes
Benzo(a)anthracene	0.05	2.0	70	38	138	yes
Chrysene	0.05	2.0	69	37	148	yes
Benzo(b)fluoranthene	0.05	2.0	89	22	147	yes
Benzo(k)fluoranthene	0.05	2.0	83	31	132	yes
Benzo(a)pyrene	0.05	2.0	81	38	123	yes
Indeno(1,2,3-cd)pyrene	0.05	2.0	88	20	135	yes
Dibenzo(a,h)anthracene	0.05	2.0	89	25	137	yes
Benzo(ghi)perylene	0.05	2.0	85	18	138	yes
Surrogate Standard Recoveries						
Acenaphthene-d10			70	19	121	yes
Anthracene-d10			63	29	126	yes
Benzo(a)pyrene-d12			79	40	130	yes

5735 McADAM ROAD, MISSISSAUGA, ONTARIO, CANADA L4Z 1N9 TEL: (905) 890-8566 FAX: (905) 890-8575

ANALYTICAL SERVICES

Client: Morrow Environmental
Project Reference: W1801
Work Order Number: G210933B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Date: 30-Mar-01

Legend: EQL = Estimated Quantitation Limit
nd = Not detected above EQL
Dup. = Duplicate
DF = Dilution Factor
* = Detected below EQL but passed compound identification criteria
N/A = Surrogate recovery could not be determined due to high dilution

Date received: March 20, 2001
Date extracted: March 28, 2001
Date analysed: March 28 & 29, 2001

ANALYTICAL METHOD:

The soil samples (10 grams wet weight) were mixed with sodium sulfate and extracted with a 1:1 mixture of acetone:dichloromethane. The extracts were cleaned up using alumina column chromatography. Analysis was performed by gas chromatography/mass spectrometry using U.S. EPA Method 8270C (modified).

REPORT DISCUSSION:

The sample BH01-36-1 010314 was run at a dilution factor due to elevated levels of target and nontarget compounds present which would exceed the calibration range of the instrument and cause contamination of the equipment if run undiluted. The quantitation limits for this sample are higher than the EQL's for undiluted samples as indicated above. The amounts reported have been corrected for the dilution factors that were used.

Note: Estimated quantitation limit is the lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

NOTE: All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analysis done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangement.

JOB APPROVED BY:

Mihai Bilanin, M.Sc.
Chemist

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575

PHILIP ANALYTICAL SERVICES (MISSISSAUGA) QUESTIONNAIRE

r Client:

Thank you for choosing Philip Analytical Services - Mississauga for your analytical requirements. We hope we have met your expectations. We now ask a little of your time to answer a few questions concerning our services. The answers you provide will help us to serve you better. **Please complete the form and mail or fax it (905-890-6575) to us at your earliest convenience.**

Please indicate on a scale of 0 (poor) to 5 (excellent), or NA (not applicable), how satisfied you were with the quality of the following:

BOTTLE ORDERS:

	Poor ... Excellent	
Delivered on time.	0....1....2....3....4....5	NA
Condition of order.	0....1....2....3....4....5	NA

PERSONNEL:

	Sales & Service		Department Managers	
Availability	0....1....2....3....4....5	NA	0....1....2....3....4....5	NA
Ability to answer your technical inquiries.	0....1....2....3....4....5	NA	0....1....2....3....4....5	NA
Responsiveness in handling your requests.	0....1....2....3....4....5	NA	0....1....2....3....4....5	NA

ANALYTICAL REPORTS:

Received on the date initially requested.	0....1....2....3....4....5
R ved on the date scheduled by the laboratory.	0....1....2....3....4....5
Presented in an acceptable format.	0....1....2....3....4....5

Based on your experience, would you recommend Philip Analytical Services to your colleagues?

YES _____ NO _____

Please use the space provided for any additional comments or suggestions.

_____

_____

_____

_____

Name: _____ Company: _____

Project: _____ Date: _____

We thank you for your support and for taking the time to complete this survey.

Philip Analytical Services Corp

Report of Analysis

Client : Morrow Environmental Consultants Inc.
Contact: Alex Man

Report Date: April 3/2001
Lab Ref # : G211075
Lab Quote #: VG804-0490

Analysis of Soil, expressed on a dry weight basis

Client Ref#: W1801

Parameter	EQL	Units	BH01-21-2-010308 2001/03/08	BH01-21-2-010308 Replicate	BH01-28-2-010307 2001/03/07	BH01-34-1-010314 2001/03/14	BH01-36-1-010314 2001/03/14
F4 (Gravimetry)	100	mg/kg	5320	5460	693	263	1740

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

Philip Analytical Services Corp

Report of Analysis

Client : Morrow Environmental Consultants Inc.
Contact: Alex Man

Report Date: April 3/2001
Lab Ref # : G211075
Lab Quote #: VG804-0490

Analysis of Soil, expressed on a dry weight basis

Client Ref#: W1801

Parameter	EQL	Units	BH01-40-2-010315 2001/03/15				
F4 (Gravimetry)	100	mg/kg	306				

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

PHILIP ANALYTICAL SERVICES (MISSISSAUGA) QUESTIONNAIRE

Dear Client:

Thank you for choosing Philip Analytical Services - Mississauga for your analytical requirements. We hope we have met your expectations. We now ask a little of your time to answer a few questions concerning our services. The answers you provide will help us to serve you better. Please complete the form and mail or fax it (905-890-8575) to us at your earliest convenience.

Please indicate on a scale of 0 (poor) to 5 (excellent), or NA (not applicable), how satisfied you were with the quality of the following:

BOTTLE ORDERS:

	Poor ... Excellent	
Delivered on time.	0....1....2....3....4....5	NA
Condition of order.	0....1....2....3....4....5	NA

PERSONNEL:

	Sales & Service		Department Managers	
Availability	0....1....2....3....4....5	NA	0....1....2....3....4....5	NA
Ability to answer your technical inquiries.	0....1....2....3....4....5	NA	0....1....2....3....4....5	NA
Responsiveness in handling your requests.	0....1....2....3....4....5	NA	0....1....2....3....4....5	NA

ANALYTICAL REPORTS:

Received on the date initially requested.	0....1....2....3....4....5
Received on the date scheduled by the laboratory.	0....1....2....3....4....5
Presented in an acceptable format.	0....1....2....3....4....5

Based on your experience, would you recommend Philip Analytical Services to your colleagues?

YES _____ NO _____

Please use the space provided for any additional comments or suggestions.

_____

_____

_____

_____

Name: _____ Company: _____

Project: _____ Date: _____

We thank you for your support and for taking the time to complete this survey.

PHILIP SERVICES

PHILIP ANALYTICAL SERVICES CORPORATION

5735 McAdam Road
Mississauga, Ontario L4Z 1N9

Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

LABORATORY USE ONLY

Work Order:

Comments:

CHAIN OF CUSTODY RECORD

Client: [illegible]

Contact: [illegible]

Phone: [illegible] Fax: 2-4477-9194

PASC Quote # : [illegible]

Client P.O. # : —

Client Project # : [illegible]

Sampled by: [illegible]

Please specify Guideline (if applicable) [illegible]

Page 1 of 1

Invoice to (if other than above): [illegible]

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

STD 5-7 Business Days [X]

RUSH Specify Date

Time

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	BTEX	PAH	CWS (F1-F4)	Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1	BH 1-C-2	2001/12/26		X	X	X	Soil	2	[illegible] MFP
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									

Samples Relinquished to PASC by (Client Signature)	Date: 2001.12.27	Time: 12:30	Method of Shipment
Samples Received in lab by:	Date: 01/12/01	Time: 12:35 PM	Condition of samples upon receipt at lab: (OK)

MORROW ENVIRONMENTAL CONSULTANTS INC
5151 CANADA WAY
BURNABY, BC
CANADA V5E 3N1
PHONE: (604) 515-5151
FAX: (604) 515-5150

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

LABORATORY: PASC
ADDRESS:
SAMPLING DATE: 010223-28
PROJECT MANAGER: Andrew Emm
SAMPLER NAME (PRINT): Alex Mann
MECI OFFICE LOCATION: WPG
MECI PROJECT ID (#): W1801
PROJECT LOCATION: S. Inglewood
CLIENT: Ag. N.
LOCATION CODE:

ANALYSIS REQUEST

FIELD SAMPLE ID	LABORATORY # (Lab Use Only)	SAMPLE TYPE	TYPE OF BOTTLES	PRESERVATION DETAILS	SAMPLING TIME	SAMPLING HEADSPACE VAPOUR	BTEX / VPH F1	VOCs	EPH F2 / F3 / F4	LEPH/HEPH	PAHs	Min O +G	SWOG	METALS LEVEL	INCLUDING (pH)	FIELD FILTERED YES / NO HARDNESS	pH	CONDUCTIVITY	ALKALINITY	TSS	TDS	TS	MAJOR ANIONS	TKN	AMMONIA	NITRATE & NITRITE								HOLD
BH01-3-DB-		Soil			23rd		X		X	X																								
BH01-5-4		Soil			26th		X		X	X																								
BH01-11-5		Soil			28th		X		X	X																								

TAT
10 Days ☐
5 Days ☐
2 Days ☐
24 Hours ☐
Results Due

SPECIAL DETECTION LIMITS
AW - AQUATIC LIFE
AG - AGRICULTURE LAND USE
IL - INDUSTRIAL LAND USE
DW - DRINKING WATER
RL - RESIDENTIAL LAND USE
SRA - SCHEDULE 7

SPECIAL REPORTING OR BILLING INSTRUCTIONS/NOTES
PASC Quote # V68040490

LAB USE ONLY

RELINQUISHED BY SAMPLER:	DATE: 01 03 02	TIME: 1:15	RECEIVED BY:
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:

CUSTODY SEAL

PHILIP SERVICES

PHILIP ANALYTICAL SERVICES

5735 McAdam Road
Mississauga, Ontario L4Z 1N9

Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

LABORATORY USE ONLY

Work Order:

Comments:

CHAIN OF CUSTODY RECORD

Client: [illegible] Environmental
Expd to: [illegible] Clarence Ave.
[illegible] MB R3T 1T6

Contact: Alex [illegible]

Phone: [illegible] Fax: [illegible]

PAS Quote #: [illegible]

Page 1 of 1

Client P.O. #: —

Client Project #: [illegible]

Sampled by: [illegible]

Please specify Guideline (if applicable) [illegible]

Invoice to (if other than above): [illegible]
[illegible] Ltd
[illegible] Clarence Blvd
[illegible] MB
R3T 1N3

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

STD 5-7 Business Days

RUSH Specify Date

Time

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	ETEX	PAH	CVOC (F1-F4)												Sample Matrix	No.of Containers	Comments/Contamination/ Site History
1	[illegible]	[illegible]	[illegible]	X	X	X												[illegible]	[illegible]	
2	[illegible]	[illegible]	[illegible]	X	X	X														
3	[illegible]	[illegible]	[illegible]	X	X	X														
4	[illegible]	[illegible]	[illegible]	X	X	X														
5																				
6																				
7																				
8																				
9																				
10																				
11																				
12																				

Samples Relinquished to PAS by (Client Signature)	Date: [illegible]	Time: [illegible]	Method of Shipment
Samples Received in lab by:	Date: [illegible]	Time: [illegible]	Condition of samples upon receipt at lab:

Rev. COC03-10-00

White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

PHILIP SERVICES

PHILIP ANALYTICAL SERVICES

5735 McAdam Road
Mississauga, Ontario L4Z 1N9

Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

LABORATORY USE ONLY

Work Order: _____

Comments: _____

CHAIN OF CUSTODY RECORD

Client: [illegible]
[illegible]
[illegible]

Contact: [illegible]

Phone: [illegible] Fax: [illegible]

PAS Quote # : [illegible]

Page 1 of 1

Client P.O. # : _____

Client Project # : [illegible]

Sampled by: [illegible]

Please specify Guideline (if applicable) CCME

Invoice to (if other than above):

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

STD 5-7 Business Days

RUSH Specify Date _____

Time _____

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	[illegible]	[illegible]	[illegible]	Sample Matrix	No.of Containers	Comments/Contamination/ Site History
1	[illegible]	[illegible]		X	X	X	Soil	2	
2	[illegible] 19.4m	[illegible]		X	X	X			
3	[illegible]	[illegible]		X	X	X			
4	[illegible]	[illegible]		X	X	X			
5	[illegible]	[illegible]		X	X	X			
6	[illegible]	[illegible]		X	X	X			
7	[illegible]	[illegible]		X	X	X			
8	[illegible]	[illegible]		X	X	X			
9	[illegible]	[illegible]		X	X	X			
10									
11									
12									

Samples Relinquished to PAS by (Client Signature) [illegible]	Date: 01 03 13	Time: 2 pm	Method of Shipment
Samples Received [illegible] lab by:	Dr[illegible]	Time:	Condition of samples upon receipt at lab

PHILIP SERVICES

PHILIP ANALYTICAL SERVICES
5735 McAdam Road
Mississauga, Ontario L4Z 1N9

Tel: (905) 890-8566
Fax: (905) 890-8575
Wats: 1-800-263-9040

LABORATORY USE ONLY

Work Order: _____

Comments: _____

CHAIN OF CUSTODY RECORD

Client: Maxim Environmental
Unit E - 1420 Clarence Ave
Winn. MB. R3T 1T6

Contact: Al Gum

Phone: (204) 475-4133 Fax: (204) 477-9174

PAS Quote #: VC-[illegible]90

Page ____ of ____

Client P.O. #: _____

Client Project #: [illegible]1801

Sampled by: AM

Please specify Guideline (if applicable) CWS/MB

Invoice to (if other than above):

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

*some exceptions apply, please contact Lab

STD 5-7 Business Days

RUSH Specify Date _____

Time _____

Analysis Required:

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	BTEX	PAH	CWS (F1-F4)	Sample Matrix	No.of Containers	Comments/Contamination/ Site History
1	EH01-34-1-010314	01 03 14		X	X	X	Soil	2	
2	EH01-36-1-010314	01 03 14		X	X	X			
3	EH01-36-7-010314	01 03 14		X	X	X			
4	EH01-37-2-010314	01 03 14		X	X	X			1 jar only - PAH/BTEX int
5	EH01-40-2-010315	01 03 15		X	X	X			
6	EH01-43-2-010316	01 03 16		X	X	X			
7									
8									
9									
10									
11									
12									

Samples Relinquished to PAS by (Client Signature)	Date: 01 03 14	Time: 3:30	Method of Shipment
Samples Received in lab by:	Date:	Time:	Condition of samples upon receipt at lab:

Rev. COC03-10-00

White: Philip Yellow: Mail Pink: Receiver Goldenrod: Client

Philip Analytical Services Corp

5735 McAdam Road
Mississauga, Ontario, L4Z 1N9
tel:(905) 890-8566 fax:(905) 890-8575
Toll Free: 1-800-263-9040

Fax Cover Sheet

Pages: 2 (including cover sheet)

Please Deliver to: "Alex Man"

Morrow Environmental Consultants Inc.
Unit E, 1420 Clarence Ave
Winnipeg MB
R3T 1T6

Fax #: 1-204-477-9194

Service Manager: Elaine Grant

Fax #: (905) 890-8575
Phone:

Please review the following Project Opening Notice (PON) and contact indicated Service Manager regarding any errors or omissions.

PON210660

** REVISED ** PROJECT OPENING NOTICE

Client: Morrow Environmental Consultants Inc.

Address: Unit E, 1420 Clarence Ave

City/Province: Winnipeg MB CANADA

Postal Code: R3T 1T6

Contact: Alex Man

Telephone #: 204-475-4133 Fax #: 204-477-9194

Invoice to: Contact [ ] Accounting [ ] Other [Y]

Company: Agassiz North Associates Ltd.

Address: 1214-B Chevrier Boulevard

City/Province: Winnipeg MB CANADA

Postal Code: R3T 1Y3

Attn of: Doug Ramsey

Project Number: G210660 Priority: Normal

Sample Arrival Date: 2001/02/28

Received: 2001/02/28 09:50:20

Defined: 2001/02/28 12:59:49

Defined By: GLM

Service Manager: EFG Sales Manager: VGE

Due Date: 2001/03/07

Last revised by: GLM Revised Date: 2001/02/28

Sampled by: Alex Man

Sampling dates: 2001/02/26

Client PO #:

Client Reference #: W1801B

Lab Quote #: DEB809-0991

PON Generated: 2001/03/02 10:08:43

# of samp	# to bill	Test	Test Description	Due Date	Revised Date	List Cost Per	List Total	Adjusted Cost Per	Adjusted Total
1	1	DISP-FE-SO	Environmental Sample Disposal Fee	2001/03/07		$1.20	$1.20	$0.00	$0.00
1	1	EHB-CCM-SO	Extractable Hydrocarbons, C10-C50(	2001/03/07		$85.00	$85.00	$60.00	$60.00
1	1	PAH-001-SO	Polynuclear Aromatic Hydrocarbons(	2001/03/07		$330.00	$330.00	$125.00	$125.00
1	1	VGC-CCM-SO	BTEX and Total Purgeable Hydrocarb	2001/03/07		$140.00	$140.00	$65.00	$65.00
							$556.20		$250.00

Comments: OSA122.MB.CWS.

Project Discount: 55.05% or $306.20

Analysis Discount: 0.00% or $0.00

Analysis Total: $250.00

Containers:		
Sub-contracting:		
Courier:	Federal Express	$17.69
Other:		
Professional Time:		

Service Mgr: Elaine Grant

Customer:

Project Total: $267.69

Prices to be reconciled to quote prior to invoicing. Please ensure quote number is properly referenced.

PROJECT OPENING NOTICE

Client: Morrow Environmental Consultants Inc.

Address: Unit E, 1420 Clarence Ave

City/Province: Winnipeg MB CANADA

Postal Code: R3T 1T6

Contact: Alex Man

Telephone #: 204-475-4133 Fax #: 204-477-9194

Invoice to: Contact [Y] Accounting [ ] Other [ ]

Company:

Address:

City/Province:

Postal Code:

Attn of:

Project Number: G210933 Priority: P

Sample Arrival Date: 2001/03/20

Received: 2001/03/20 11:11:53

Defined: 2001/03/20 16:26:30

Defined By: GLM

Service Manager: EFG Sales Manager: VGE

Due Date: 2001/03/26

Last revised by: Revised Date:

Sampled by: Alex Man

Sampling dates: 2001/03/14 to 2001/03/16

Client PO #:

Client Reference #: W1801

Lab Quote #: VG804 0490

PON Generated: 2001/03/20 16:32:45

# of samp	# to bill	Test	Test Description	Due Date	Revised Date	List Cost Per	List Total	Adjusted Cost Per	Adjuste Total
6	6	DISP-FE-SO	Environmental Sample Disposal Fee	2001/03/26		$1.20	$7.20	~~$1.20~~	$7.2
6	6	EHB-CCM-SO	Extractable Hydrocarbons, C10-C50(	2001/03/26		$75.00	$450.00	$75.00	$450.0u
6	6	PAH-001-SO	Polynuclear Aromatic Hydrocarbons(	2001/03/26		$270.00	$1,620.00	$270.00	$1,620.0r
6	6	VGC-CCM-SO	BTEX and Total Purgeable Hydrocarb	2001/03/26		$115.00	$690.00	$115.00	$6.
							$2,767.20		$2,767.20

Comments: OSA178.CWS.MANITOBA.Only one jar for BH01-36-7-010314. Analyse for F1 and PAH first.

Project Discount: 0.00% or $0.00

Analysis Discount: 0.00% or $0.00

Analysis Total: $2,767.20

Containers:	
Sub-contracting:	
Courier:	
Other:	
Professional Time:	

Elaine Grant

Service Mgr:

Customer:

Page 1 of 1

Project Total: $2,767.20

Prices to be reconciled to quote prior to invoicing. Please ensure quote number is properly referenced.

PROJECT OPENING NOTICE

Client: Morrow Environmental Consultants Inc.

Address: Unit E, 1420 Clarence Ave

City/Province: Winnipeg MB CANADA

Postal Code: R3T 1T6

Contact: Alex Man

Telephone #: 204-475-4133 Fax #: 204-477-9194

Invoice to: Contact [Y] Accounting [ ] Other [ ]

Company:

Address:

City/Province:

Postal Code:

Attn of:

Project Number: G210855 Priority: Normal

Sample Arrival Date: 2001/03/14

Received: 2001/03/14 10:18:28

Defined: 2001/03/14 15:07:13

Defined By: ANH

Service Manager: EFG Sales Manager: VGE

Due Date: 2001/03/21

Last revised by: Revised Date:

Sampled by: A. Man

Sampling dates: 2001/03/06 to 2001/03/09

Client PO #:

Client Reference #: W1801B

Lab Quote #: VG804-0490

PON Generated: 2001/03/15 12:05:48

# of samp	# to bill	Test	Test Description	Due Date	Revised Date	List Cost Per	List Total	Adjusted Cost Per	Adjusted Total
9	9	DISP-FE-SO	Environmental Sample Disposal Fee	2001/03/21		$1.20	$10.80	$1.20	$10.80
9	9	EHB-CCM-SO	Extractable Hydrocarbons, C10-C50(	2001/03/21		$75.00	$675.00	$60.00	$540.00
9	9	PAH-CME-SO	Polynuclear Aromatic Hydrocarbons(	2001/03/21		$280.00	$2,520.00	$125.00	$1,125.00
9	9	VGC-CCM-SO	BTEX and Total Purgeable Hydrocarb	2001/03/21		$115.00	$1,035.00	$65.00	$585.00
							$4,240.80		$2,260.80

Comments: OSA157. CWS/MB

Project Discount: 46.69% or $1,980.00

Analysis Discount: 0.00% or $0.00

Analysis Total: $2,260.80

Containers:	
Sub-contracting:	
Courier:	
Other:	
Professional Time:	

Elaine Grant

Service Mgr:

Customer:

Page 1 of 1

Project Total: $2,260.80

Prices to be reconciled to quote prior to invoicing. Please ensure quote number is properly referenced.

Philip Analytical Services Corp

5735 McAdam Road
Mississauga, Ontario, L4Z 1N9
tel:(905) 890-8566 fax:(905) 890-8575
Toll Free: 1-800-263-9040

Fax Cover Sheet

Pages: 2 (including cover sheet)

Please Deliver to: "Alex Man"

Morrow Environmental Consultants Inc.
Unit E, 1420 Clarence Ave
Winnipeg MB
R3T 1T6

Fax #: 1-204-477-9194

Service Manager: Elaine Grant

Fax #: (905) 890-8575
Phone:

Please review the following Project Opening Notice (PON) and contact indicated Service Manager regarding any errors or omissions.

PON210855

PROJECT OPENING NOTICE

Client: Morrow Environmental Consultants Inc.
Address: Unit E, 1420 Clarence Ave
City/Province: Winnipeg MB CANADA
Postal Code: R3T 1T6
Contact: Alex Man
Telephone #: 204-475-4133 Fax #: 204-477-9194
Invoice to: Contact [Y] Accounting [ ] Other [ ]
Company:
Address:
City/Province:
Postal Code:
Attn of:

Project Number: G211075 Priority: RUSH
Sample Arrival Date: 2001/03/29
Received: 2001/03/29 14:25:43
Defined: 2001/03/30 09:31:45
Defined By: ANH
Service Manager: EFG Sales Manager: VGE
Due Date: 2001/04/03
Last revised by: Revised Date:
Sampled by:
Sampling dates: 2001/03/07 to 2001/03/15
Client PO #:
Client Reference #: W1801
Lab Quote #: VG804-0490
PON Generated: 2001/03/30 09:32:56

# of samp	# to bill	Test	Test Description	Due Date	Revised Date	List Cost Per	List Total	Adjusted Cost Per	Adjusted Total
5	5	F4-CCM-SO	Mineral Oil and Grease (CCME, F4 b	2001/04/03		$57.00	$285.00	~~$57.00~~	~~$285.00~~
							$285.00		$285.00

Comments: OSA217

Project Discount: 0.00% or $0.00

Analysis Discount: 0.00% or $0.00

Analysis Total: $285.00

Containers:	
Sub-contracting:	
Courier:	
Other:	
Professional Time:	

Service Mgr: Elaine Grant
Customer:

Project Total: ~~$285.00~~

Prices to be reconciled to quote prior to invoicing. Please ensure quote number is properly referenced.

APPENDIX III

Survey Data

Station	Northings (m)	Eastings (m)	Elevation (m)	Comments
GAS10	5530071.759	634919.121	222.363	Centra Gas line 10m from south shore
GAS40	5530082.222	634952.687	222.295	Centra gas line 40m from south shore
PIER6W	5530093.894	634890.874	223.286	West point of Pier 6
PIER7W	5530127.908	634921.481	223.302	West point of Pier 7
WATER10	5530146.016	634832.263	222.226	Water line 10m from south shore
WATER30	5530164.779	634850.826	222.191	Water line 30m from south shore
TOP	5530104.513	634858.055	223.615	Top of Sewer out fall
BH1	5530108.509	634942.19	222.334	
BH2	5530093.409	634926.893	222.244	
BH3	5530132.088	634918.217	222.514	
BH4	5530081.427	634910.276	222.709	
BH5	5530115.336	634906.909	222.25	
BH6	5530116.938	634883.508	222.243	
BH7	5530103.684	634889.631	222.415	
BH8	5530143.479	634905.986	222.265	
BH9	5530160.505	634889.381	222.253	
BH10	5530147.072	634874.404	222.258	
BH11	5530132.584	634863.907	222.246	
BH12	5530127.283	634895.135	222.268	
BH13	5530099.037	634908.589	222.217	
BH14	5530196.094	634820.266	222.211	
BH15	5530224.902	634778.122	222.229	
BH16	5530244.713	634732.105	222.233	
BH17	5530279.286	634691.606	222.22	
BH18	5530314.184	634654.082	222.217	
BH19	5530353.48	634619.524	222.208	
BH20	5530389.29	634582.406	222.188	
BH21	5530429.494	634554.754	222.218	
BH22	5530477.663	634537.401	222.211	
BH23	5530061.696	634961.257	222.254	
BH24	5530049.206	634947.529	222.386	
BH25	5530073.902	634974.218	222.271	
BH26	5530192.809	634849.496	222.241	
BH27	5530162.474	634871.764	222.25	
BH28	5530154.745	634862.982	222.243	
BH29	5530134.055	634849.463	222.175	
BH30	5530528.552	634518.241	222.21	
BH31	5530576.103	634497.042	222.204	
BH32	5530625.606	634483.723	222.182	
BH33	5530669.953	634470.438	222.202	
BH34	5530257.45	634744.848	222.202	
BH35	5530291.746	634701.673	222.203	
BH36	5530270.595	634684.69	222.188	
BH37	5530264.096	634676.917	222.166	
BH38	5530253.655	634706.654	222.185	
BH39	5530217.878	634745.729	222.195	
BH40	5530228.604	634717.983	222.18	
BH41	5530339.36	634607.169	222.2	
BH42	5530378.933	634567.542	222.144	
BH43	5530420.571	634537.965	222.176	
BH44	5530440.134	634570.429	222.195	
BH45	5530402.714	634597.354	222.222	
BH46	5530316.075	634616.594	222.369	
SS1	5530204.343	634762.581	222.193	SS = split spoon sample from surficial sediment
SS2	5530245.573	634703.993	222.176	
SS3	5530302.997	634644.766	222.287	
SS4	5530321.514	634660.065	222.194	
SS5	5530322.829	634624.461	222.211	
SS6	5530356.879	634590.317	222.185	

APPENDIX IV

Borehole Logs

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING	PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER / DIAMETER: 200/100 mm	BOREHOLE No.: 01-01
BOREHOLE LOG / PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY	

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER
0	**ICE**	
	WATER	
1		
2		
3		
4		
5	**SILT AND CLAY** – organic, dark grey/black, very soft, low plasticity, wet, some stained laminations	01-1-1, 01-1-2, 01-1-3
	SAND – medium grained, poorly graded, grey, loose, wet	
6	**SILT (TILL)** – gravelly (fine grained), some sand (coarse to fine grained), some clay, well graded, light brown, hard, low plasticity – trace gravel below 6.4m	01-1-4
7		01-1-5
8		01-1-6
9		01-1-7
	End of borehole at 4.3m below river bottom.	

STRATIGRAPHY PLOT / SAMPLE TYPE

SOIL VAPOUR CONCENTRATION (ppm): 100, 1000, 10000

WATER LEVEL

MONITORING WELL INSTALLATION

LEGEND: bentonite grout

MORROW ENVIRONMENTAL CONSULTANTS INC.	ICE SURFACE ELEVATION (m): 222.334	DATE DRILLED: 2001 02 22
	RIVER BOTTOM ELEVATION (m): 217.454	OBSERVED WATER LEVEL: N/A
		LOGGED BY: AGM
		SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01–02
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY		

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER
0	**ICE**	
	WATER	
1		
2		
3		
4	**SILT AND CLAY** – organic, trace fine grained gravel, dark grey, soft, low plasticity, wet, black staining, sheen, mothball odour	01-2-1
5		01-2-2
	SAND – medium grained, poorly graded, grey, loose	01-2-3
6	**SILT (TILL)** – gravelly, some sand, some clay, well graded, light brown, stiff, low plasticity, moist, slight mothball odour in top 10cm – medium to coarse grained gravel, hard below 6.1m	01-2-4
7		01-2-5
	End of borehole at 3.7 below river bottom.	
8		
9		

STRATIGRAPHY PLOT / SAMPLE TYPE / SAMPLE NUMBER / SOIL VAPOUR CONCENTRATION (ppm) 100 1000 10000 / WATER LEVEL / MONITORING WELL INSTALLATION

LEGEND: bentonite grout

* submitted for laboratory analysis

MORROW ENVIRONMENTAL CONSULTANTS INC.

ICE SURFACE ELEVATION (m): 222.244	DATE DRILLED: 2001 02 23
RIVER BOTTOM ELEVATION (m): 218.284	OBSERVED WATER LEVEL: N/A
	LOGGED BY: AGM
	SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-03
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY		

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER
0	**ICE**	
	WATER	
1		
2		
3		
	SAND AND SILT – fine grained, trace organics, poorly graded, dark grey, loose, very wet, trace black stained pockets	01-3-3A
4		*01-3-3B
5	**CLAY AND SILT** – organic, dark grey, soft, low plasticity, wet, mothball odour	01-3-3C
	SILT (TILL) – gravelly (fine grained), some sand, some clay, light brown, hard, low plasticity, moist	
6		01-3-1
7		01-3-2
	End of borehole at 4.0m below river bottom.	
8		
9		

STRATIGRAPHY PLOT | SAMPLE TYPE | SOIL VAPOUR CONCENTRATION (ppm) 100 1000 10000 | WATER LEVEL | MONITORING WELL INSTALLATION

LEGEND: bentonite grout

* submitted for laboratory analysis

MORROW ENVIRONMENTAL CONSULTANTS INC.

ICE SURFACE ELEVATION (m): 222.514	DATE DRILLED: 2001 02 23
RIVER BOTTOM ELEVATION (m): 218.854	OBSERVED WATER LEVEL: N/A
	LOGGED BY: AGM

SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-04

BOREHOLE LOG

PLOTTED:
CAD FILE No.:

SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER
0	**ICE**	
	WATER	
1	**CLAY** – silty, trace organics, soft, medium plasticity, black staining, strong mothball odour	01-4-1
2		01-4-2
3	**SAND AND SILT** –fine grained sand, some clay, poorly graded, laminated, grey, medium dense, black staining, sheen, strong mothball odour, pockets of visible LPH to 3.7m – increased clay content with depth below 3.8m	
4		01-4-3, 01-4-4
		01-4-5
5		01-4-6
	CLAY – silty seams, brown, firm, high plasticity, moist	01-4-7
6	**CLAY (TILL)** – silty, some gravel, some sand, brown, soft, medium plasticity, moist	01-4-8
	SILT (TILL) – gravelly (fine to medium grained), some clay, some sand, light brown, hard, low plasticity, moist	01-4-9
7		01-4-10
8	End of borehole at 6.4m below river bottom.	
9		

SOIL VAPOUR CONCENTRATION (ppm): 100, 1000, 10000

WATER LEVEL

MONITORING WELL INSTALLATION

LEGEND: bentonite grout

MORROW ENVIRONMENTAL CONSULTANTS INC.

ICE SURFACE ELEVATION (m): 222.709	DATE DRILLED: 2001 02 23
	OBSERVED WATER LEVEL: N/A
RIVER BOTTOM ELEVATION (m): 221.849	LOGGED BY: AGM

SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-05
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY		

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER
0	**ICE**	
	WATER	
1		
2		
3		
4	**SAND AND SILT** – fine grained sand, clayey, trace organics, poorly graded, laminated, grey, wet, black staining, sheen, strong mothball odour, visible LPH to 5.6m	01-5-1
5		*01-5-2
	SAND – fine grained, trace silt, poorly graded, grey, wet	01-5-3
6	**SILT (TILL)** – gravelly (fine to coarse grained), some sand, some clay, light brown, firm, low plasticity – stiffer with depth below 6.2m – hard below 6.9m	*01-5-4
7		01-5-5
	End of borehole at 3.7m below river bottom.	
8		
9		

STRATIGRAPHY PLOT / SAMPLE TYPE

SOIL VAPOUR CONCENTRATION (ppm): 100 — 1000 — 10000

WATER LEVEL

MONITORING WELL INSTALLATION

LEGEND: bentonite grout

* submitted for laboratory analysis

MORROW ENVIRONMENTAL CONSULTANTS INC.	ICE SURFACE ELEVATION (m): 222.250	DATE DRILLED: 2001 02 26
	RIVER BOTTOM ELEVATION (m): 218.440	OBSERVED WATER LEVEL: N/A
		LOGGED BY: AGM — SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-06

BOREHOLE LOG

PLOTTED:
CAD FILE No.:

SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER
0	**ICE**	
	WATER	
1		
2	**CLAY** – silty, trace organics, brown, soft, wet – moist below 2.7m	01-6-1
3		
4	**SAND** – fine grained, some silt, trace coarse grained rounded gravel, poorly graded, grey, loose, wet, shell fragments, wood fragments, rootlets	01-6-2, 01-6-3
	CLAY – silty, brown, stiff, moist – firm below 4.6m	
5		01-6-4
6		
7	**SILT (TILL)** – gravelly (fine to coarse grained), some sand, some clay, light brown, firm, low plasticity – stiffer with depth – hard below 7.8m	01-6-5
8		01-6-6
	End of borehole at 6.1m below river bottom.	
9		

SOIL VAPOUR CONCENTRATION (ppm): 100, 1000, 10000

WATER LEVEL

MONITORING WELL INSTALLATION

LEGEND: bentonite grout

* submitted for laboratory analysis

MORROW ENVIRONMENTAL CONSULTANTS INC.

ICE SURFACE ELEVATION (m): 222.243	DATE DRILLED: 2001 02 26
RIVER BOTTOM ELEVATION (m): 219.803	OBSERVED WATER LEVEL: N/A
	LOGGED BY: AGM

SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-07
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY		

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER
0	**ICE**	
	WATER	
1		
2		
3	**CLAY** – silty, trace organics, brown, firm, wet, some black staining, trace visible LPH to 3.4m – 75mm fine grained sand lenses, silty, some clay, trace organics and shell fragments, poorly graded, grey, wet at 0.3m, 0.6m, 0.9m and 1.2m	01-7-1 01-7-2
4		01-7-3
5	**SAND** – fine grained, silty, poorly graded, loose, wet, trace sheen, mothball odour **CLAY** – trace organics, brown, stiff, high plasticity, moist – 25mm fine grained sand lenses, silty, poorly graded, loose, wet every 0.3m	01-7-4 01-7-5
6		01-7-6
7	**CLAY (TILL)** – silty, some fine grained sand, some fine to coarse grained gravel, well graded, firm, moist, trace black staining to 7.2m – increased coarse grained gravel with depth – stiffer with depth	01-7-7
8	– gravelly, hard below 8.2m	01-7-8
9	End of borehole at 5.9m below river bottom (auger refusal).	

SOIL VAPOUR CONCENTRATION (ppm): 100 — 1000 — 10000

WATER LEVEL

MONITORING WELL INSTALLATION

LEGEND: bentonite grout

MORROW ENVIRONMENTAL CONSULTANTS INC.	ICE SURFACE ELEVATION (m): 222.415	DATE DRILLED: 2001 02 26
	RIVER BOTTOM ELEVATION (m): 219.675	OBSERVED WATER LEVEL: N/A
		LOGGED BY: AGM
		SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-08
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY		

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER
0	**ICE**	
	WATER	
1		
2		
3		
4		
5		
6	**GRAVEL** – fine to coarse grained, sandy, some silt, well graded, grey, dense, wet	01-8-1
	SILT (TILL) – gravelly (fine grained), some sand, some clay, light brown, hard, low plasticity, moist	
7		01-8-2
8		01-8-3
	End of borehole at 2.3m below river bottom (auger refusal).	
9		

STRATIGRAPHY PLOT / SAMPLE TYPE / SOIL VAPOUR CONCENTRATION (ppm) 100 1000 10000 / WATER LEVEL / MONITORING WELL INSTALLATION

LEGEND: bentonite grout

* submitted for laboratory analysis

MORROW ENVIRONMENTAL CONSULTANTS INC.	ICE SURFACE ELEVATION (m): 222.265	DATE DRILLED: 2001 02 27
	RIVER BOTTOM ELEVATION (m): 216.325	OBSERVED WATER LEVEL: N/A
		LOGGED BY: AGM — SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-09
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY		

DEPTH (m)	SOIL DESCRIPTION	STRATIGRAPHY PLOT	SAMPLE TYPE	SAMPLE NUMBER	SOIL VAPOUR CONCENTRATION (ppm) 100 1000 10000	WATER LEVEL	MONITORING WELL INSTALLATION
0	**ICE**						
	WATER						
1							
2							
3							
4							
5							
6	**GRAVEL** – fine to coarse grained, some sand, trace cobbles, trace silt, well graded, dense, wet, shell fragments – increased silt with depth			01-9-1 01-9-2			
7	**SILT (TILL)** – gravelly (fine grained), some sand, trace clay, light brown, hard, low plasticity, moist			01-9-3 01-9-4			
8	End of borehole at 1.8m below river bottom (auger refusal).						
9							

LEGEND
bentonite grout

MORROW ENVIRONMENTAL CONSULTANTS INC.	ICE SURFACE ELEVATION (m): 222.253	DATE DRILLED: 2001 02 27
	RIVER BOTTOM ELEVATION (m): 216.157	OBSERVED WATER LEVEL: N/A
		LOGGED BY: AGM
		SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01–10

BOREHOLE LOG

PLOTTED:
CAD FILE No.:

SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER
0	**ICE**	
	WATER	
4	**SILT** – sandy, some clay, trace organics, dark grey, soft, low plasticity, moist, visible LPH, black staining, strong mothball odour	01-10-1
5	**SAND AND SILT** – fine grained sand, some clay, poorly graded, grey, loose, wet, visible layers/pockets of LPH, black staining, strong mothball odour	01-10-2
	CLAY – silty, brown, soft, moist, strong mothball odour	
6	**SAND AND SILT** – fine grained sand, some clay, poorly graded, grey, loose, moist – clayey with depth	01-10-3
	SILT (TILL) – gravelly (fine to medium grained), some sand, some clay, hard, low plasticity, moist	01-10-4
7		01-10-5
	End of borehole at 3.2m below river bottom.	

STRATIGRAPHY PLOT | SAMPLE TYPE | SAMPLE NUMBER | SOIL VAPOUR CONCENTRATION (ppm) 100 1000 10000 | WATER LEVEL | MONITORING WELL INSTALLATION

LEGEND
bentonite grout

MORROW ENVIRONMENTAL CONSULTANTS INC.

ICE SURFACE ELEVATION (m): 222.258	DATE DRILLED: 2001 02 27
RIVER BOTTOM ELEVATION (m): 217.838	OBSERVED WATER LEVEL: N/A
	LOGGED BY: AGM

SHEET 1 OF

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-11
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY		

DEPTH (m)	SOIL DESCRIPTION	STRATIGRAPHY PLOT	SAMPLE TYPE	SAMPLE NUMBER	SOIL VAPOUR CONCENTRATION (ppm) 100 / 1000 / 10000	WATER LEVEL	MONITORING WELL INSTALLATION
0	**ICE**						
	WATER						
1							
2							
	SILT – some clay, some gravel, trace organics, brown, loose, trace black staining			01-11-A 01-11-B			
3	**CLAY** – silty, silt inclusions, brown, firm, moist – slight mothball odour from 3.4m to 4.6m			01-11-1			
4				01-11-2			
	– less silt with depth						
5				01-11-3			
				01-11-4			
6							
	SILT (TILL) – gravelly (fine grained), trace sand, trace clay, grey, moist			*01-11-5			
7				01-11-6			
	End of borehole at 5.0m below river bottom.						
8							
9							

* submitted for laboratory analysis

LEGEND: bentonite grout

MORROW ENVIRONMENTAL CONSULTANTS INC.	ICE SURFACE ELEVATION (m): 222.246	DATE DRILLED: 2001 02 28
	RIVER BOTTOM ELEVATION (m): 219.806	OBSERVED WATER LEVEL: N/A
		LOGGED BY: SAD
		SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-12

BOREHOLE LOG

PLOTTED:
CAD FILE No.:

SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER
0	**ICE**	
	WATER	
4	**GRAVEL** – some silt, some fine grained sand, some clay, trace organics, well graded, grey, loose, wet, visible LPH, black staining, strong mothball odour – 50mm silt lense, clayey, grey, soft, moist to wet at 4.7m	01-12-1
5	**SAND AND SILT** – fine grained sand, well graded, loose, moist, black staining, strong mothball odour – visible LPH from 5.3m to 5.8m – 50mm silt lenses, clayey, grey, soft, moist to wet at 5.8m and 6.1m – sheen from 6.1m to 6.2m	01-12-2 01-12-3 01-12-4 01-12-5
6	**SAND AND GRAVEL** – fine to coarse grained sand, fine grained gravel, well graded, dense	01-12-6
7	**SILT (TILL)** – gravelly (fine grained), trace sand, trace clay, hard, moist	
	End of borehole at 3.4m below river bottom.	
8		
9		

STRATIGRAPHY PLOT | SAMPLE TYPE | SAMPLE NUMBER | SOIL VAPOUR CONCENTRATION (ppm) 100 1000 10000 | WATER LEVEL | MONITORING WELL INSTALLATION

LEGEND
bentonite grout

MORROW ENVIRONMENTAL CONSULTANTS INC.

ICE SURFACE ELEVATION (m): 222.268	DATE DRILLED: 2001 02 28
RIVER BOTTOM ELEVATION (m): 217.998	OBSERVED WATER LEVEL: N/A
	LOGGED BY: AGM

SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING	PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER / DIAMETER: 200/100 mm	BOREHOLE No.: 01-13
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY	

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER
0	**ICE**	
	WATER	
1		
2		
3	**GRAVEL** – fine to coarse grained, sandy, well graded, grey, dense, wet, slight mothball odour	01-13-1
	SILT – sandy, some clay, trace organics, well graded, grey, soft, low plasticity, moist, mothball odour	
4	– 50mm layers with less clay, trace black staining	01-13-2, 01-13-3
	SAND – fine grained, silty, trace fine grained gravel, well graded, grey, wet, trace visible LPH, trace black staining, trace sheen	01-13-4
5	**SILT** – some clay, some sand, trace coarse grained gravel, grey, soft, low plasticity, moist – 50mm sand lense at 5.6m	
	CLAY – silty, grey, soft, low plasticity, moist	
	SAND – fine grained, silty, poorly graded, grey, wet	01-13-5
6	**CLAY AND SILT** – grey, soft, moist	
	GRAVEL – fine to coarse grained, some sand, some silt, some clay, well graded, grey, dense, wet	01-13-6
7	**SILT (TILL)** – gravelly (fine grained), some sand, well graded, light brown, hard, low plasticity, moist	01-13-7
	End of borehole at 4.3m below river bottom.	
8		
9		

SOIL VAPOUR CONCENTRATION (ppm): 100 — 1000 — 10000

WATER LEVEL

MONITORING WELL INSTALLATION

LEGEND: bentonite grout

MORROW ENVIRONMENTAL CONSULTANTS INC.

ICE SURFACE ELEVATION (m): 222.217	DATE DRILLED: 2001 02 28
RIVER BOTTOM ELEVATION (m): 218.867	OBSERVED WATER LEVEL: N/A
	LOGGED BY: AGM

SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-14
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY		

DEPTH (m)	SOIL DESCRIPTION	STRATIGRAPHY PLOT / SAMPLE TYPE	SAMPLE NUMBER	SOIL VAPOUR CONCENTRATION (ppm) 100 1000 10000	WATER LEVEL	MONITORING WELL INSTALLATION
0	**ICE**					
	WATER					
1						
2						
3						
4						
5	**SAND AND SILT** – fine grained sand, poorly graded, olive grey, loose, wet		01-14-1			
	SILT – sandy, trace organics, olive grey, soft, low plasticity, moist		01-14-2			
6						
	SILT (TILL) – gravelly (fine to coarse grained), some sand, some clay, light brown, hard, low plasticity, moist		01-14-3			
7						
	End of borehole at 2.4m below river bottom.					
8						
9						

LEGEND

bentonite grout

MORROW ENVIRONMENTAL CONSULTANTS INC.	ICE SURFACE ELEVATION (m): 222.211	DATE DRILLED: 2001 03 05
	RIVER BOTTOM ELEVATION (m): 217.031	OBSERVED WATER LEVEL: N/A
		LOGGED BY: AGM
		SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-15
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY		

DEPTH (m)	SOIL DESCRIPTION	STRATIGRAPHY PLOT	SAMPLE TYPE	SAMPLE NUMBER	SOIL VAPOUR CONCENTRATION (ppm) 100 1000 10000	WATER LEVEL	MONITORING WELL INSTALLATION
0	**ICE**						
	WATER						
1							
2							
3							
4							
5	**SAND** – fine grained, silty, trace fine grained gravel, trace organics, poorly graded, olive grey, wet			01-15-1			
				01-15-2			
6	**SILT** – some fine grained sand, trace organics, olive grey, soft, low plasticity, moist – 50mm sand lenses at 6.2m and 6.4m			01-15-3			
				01-15-4			
7	**SILT (TILL)** – gravelly (fine to coarse grained), some sand, some clay, light brown, hard, low plasticity, moist			01-15-5			
				*01-15-6			
8	End of borehole at 2.6m below river bottom (auger refusal).						
9							

* submitted for laboratory analysis

LEGEND: bentonite grout

MORROW ENVIRONMENTAL CONSULTANTS INC.	ICE SURFACE ELEVATION (m): 222.229	DATE DRILLED: 2001 03 05
	RIVER BOTTOM ELEVATION (m): 216.739	OBSERVED WATER LEVEL: N/A
		LOGGED BY: AGM
		SHEET 1 OF 1

CLIENT:	DRILLING CONTRACTOR:	PROJECT No.:
AGASSIZ NORTH ASSOCIATES LIMITED	MAPLE LEAF DRILLING	W1801B

LOCATION:	DRILLING METHOD:	DIAMETER:	BOREHOLE No.:
CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	HOLLOW/SOLID STEM AUGER	200/100 mm	01-16

BOREHOLE LOG

PLOTTED:
CAD FILE No.:

SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER
0	**ICE**	
	WATER	
1		
2		
3		
4	**SAND AND GRAVEL** – fine to coarse grained sand, fine to coarse grained gravel, well graded, brown, loose, wet, chunks of plastic tar, slight mothball odour	01-16-1
5	**SAND AND SILT** – fine grained sand, some clay, poorly graded, brown, loose, wet	0 01-16-1B
	CLAY – silty, brown, firm, high plasticity, moist	
6		01-16-2
7		01-16-3
	SILT (TILL) – gravelly (fine to coarse grained), some sand, some clay, light brown, hard, low plasticity, moist	
8		01-16-4
	End of borehole at 4.3m below river bottom.	
9		

SOIL VAPOUR CONCENTRATION (ppm): 100, 1000, 10000

WATER LEVEL

MONITORING WELL INSTALLATION

LEGEND: bentonite grout

MORROW ENVIRONMENTAL CONSULTANTS INC.

ICE SURFACE ELEVATION (m):	DATE DRILLED: 2001 03 05
222.233	OBSERVED WATER LEVEL: N/A
RIVER BOTTOM ELEVATION (m):	LOGGED BY:
218.123	AGM

SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-17

BOREHOLE LOG

PLOTTED:
CAD FILE No.:

SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER
0	**ICE**	
	WATER	
1		
2		
3		
4		
5	**SAND AND GRAVEL** – fine to coarse grained sand, fine grained gravel, trace organics well graded, grey brown, loose, wet, some black staining, sheen, slight mothball odour	*01-17-1, 01-17-2A
	CLAY (TILL) – silty, some gravel, brown to light brown, firm, moist, slight mothball odour	01-17-2
6	– trace gravel below 6.4m	01-17-3
7	**CLAY** – silty, brown, firm, high plasticity, moist	01-17-4
8	End of borehole at 2.9m below river bottom (auger refusal).	
9		

SOIL VAPOUR CONCENTRATION (ppm): 100 – 1000 – 10000

WATER LEVEL

MONITORING WELL INSTALLATION

LEGEND: bentonite grout

* submitted for laboratory analysis

MORROW ENVIRONMENTAL CONSULTANTS INC.

ICE SURFACE ELEVATION (m): 222.220	DATE DRILLED: 2001 03 05
RIVER BOTTOM ELEVATION (m): 217.340	OBSERVED WATER LEVEL: N/A
	LOGGED BY: AGM

SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-18
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY		

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER
0	**ICE**	
	WATER	
5	**SAND AND GRAVEL** – fine to coarse grained sand, fine grained gravel, well graded, grey, loose, wet	01-18-1
	SILT – sandy (fine grained), some clay, trace organics, olive grey, soft, moist, trace black staining – 50mm fine grained sand lense, poorly graded, loose, wet at 5.9m	*01-18-2
6	**SAND** – medium grained, trace silt, poorly graded, brown, loose, wet	01-18-3
7	– trace shell fragments at 7.8m	
	SILT (TILL) – gravelly (fine to coarse grained), some sand, some clay, light brown, hard, low plasticity, moist – less coarse grained gravel below 8.2m	01-18-4
8	End of borehole at 3.4m below river bottom.	
9		

SOIL VAPOUR CONCENTRATION (ppm): 100, 1000, 10000

WATER LEVEL

MONITORING WELL INSTALLATION

LEGEND: bentonite grout

* submitted for laboratory analysis

MORROW ENVIRONMENTAL CONSULTANTS INC.	ICE SURFACE ELEVATION (m): 222.217	DATE DRILLED: 2001 03 06
	RIVER BOTTOM ELEVATION (m): 217.037	OBSERVED WATER LEVEL: N/A
		LOGGED BY: AGM
		SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING	PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER / DIAMETER: 200/100 mm	BOREHOLE No.: 01-19
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY	

DEPTH (m)	SOIL DESCRIPTION	STRATIGRAPHY PLOT	SAMPLE TYPE	SAMPLE NUMBER	SOIL VAPOUR CONCENTRATION (ppm) 100 1000 10000	WATER LEVEL	MONITORING WELL INSTALLATION
0	**ICE**						
	WATER						
1							
2							
3							
4							
5							
	SILT – some sand, some gravel, trace organics, olive grey, very soft, low plasticity, wet, trace black staining, slight mothball odour			01-19-1			
6	– sandy, soft, moist, trace visible brown LPH, some black staining, mothball odour from 6.1m to 6.4m			01-19-1B			
	– and fine grained sand from 6.6m to 6.7m			01-19-2			
7	– and fine grained sand from 7.3m to 7.6m			01-19-3			
8	**SILT (TILL)** – some fine grained gravel, some fine to coarse grained sand, some clay, light brown, hard, low plasticity, moist			*01-19-4			
	End of borehole at 3.0m below river bottom (auger refusal).						
9							

* submitted for laboratory analysis

LEGEND: bentonite grout

MORROW ENVIRONMENTAL CONSULTANTS INC.	ICE SURFACE ELEVATION (m): 222.208	DATE DRILLED: 2001 03 08
	RIVER BOTTOM ELEVATION (m): 216.718	OBSERVED WATER LEVEL: N/A
		LOGGED BY: AGM
		SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-20
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY		

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER
0	**ICE**	
	WATER	
1		
2		
3		
4		
5	**SILT** – sandy, trace organics, olive grey, wet, some visible brown LPH, sheen, black staining, strong mothball odour – plastic/viscous tar and visible LPH from 5.0m to 5.1m	01-20-1 01-20-2
6	**SAND** – fine grained, silty, well graded, brown grey, loose, wet, some plastic/viscous tar, trace pockets of visible LPH, mothball odour **CLAY** – silty, trace fine grained sand, brown, firm, high plasticity, moist – trace organics from 6.4m to 6.7m	01-20-3 01-20-4
7	– soft below 7.2m	01-20-5
8	**SILT (TILL)** – gravelly, some sand, some clay, light brown, hard, low plasticity, moist End of borehole at 3.4m below river bottom.	01-20-6
9		

STRATIGRAPHY PLOT / SAMPLE TYPE

SOIL VAPOUR CONCENTRATION (ppm): 100 — 1000 — 10000

WATER LEVEL

MONITORING WELL INSTALLATION

LEGEND: bentonite grout

MORROW ENVIRONMENTAL CONSULTANTS INC.	ICE SURFACE ELEVATION (m): 222.188	DATE DRILLED: 2001 03 08
	RIVER BOTTOM ELEVATION (m): 217.308	OBSERVED WATER LEVEL: N/A
		LOGGED BY: AGM
		SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-21
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY		

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER
0	**ICE**	
	WATER	
1		
2		
3		
4		
5	**SILT** – some fine grained sand, trace organics, olive brown, very soft, low plasticity, wet, mothball odour – 75mm sand lense, visible brown LPH, black staining, sheen at 5.5m – sandy, olive grey, soft, moist, visible brown LPH, black staining below 5.7m – 50mm sand lense, plastic/viscous tar, black staining at 5.8m – and fine grained sand below 5.8m	01-21-1 *01-21-2 01-21-3
6	**SAND** – fine grained, silty, poorly graded, loose, wet, pockets of brown LPH, sheen, mothball odour	01-21-4
	CLAY – silty, trace organics, brown, firm, high plasticity, moist – 50mm sand lense at 7.1m	01-21-5
7	**SILT** – sandy, olive grey, soft, low plasticity, moist, shell fragments	01-21-6
	SILT (TILL) – gravelly (fine to coarse grained), some sand, some clay, light brown, hard, low plasticity, moist	01-21-7
8	End of borehole at 2.9m below river bottom (auger refusal).	
9		

SOIL VAPOUR CONCENTRATION (ppm): 100 — 1000 — 10000

WATER LEVEL

MONITORING WELL INSTALLATION

LEGEND: bentonite grout

* submitted for laboratory analysis

MORROW ENVIRONMENTAL CONSULTANTS INC.	ICE SURFACE ELEVATION (m): 222.218	DATE DRILLED: 2001 03 08
	RIVER BOTTOM ELEVATION (m): 216.888	OBSERVED WATER LEVEL: N/A
		LOGGED BY: AGM
		SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-22
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY		

DEPTH (m)	SOIL DESCRIPTION	STRATIGRAPHY PLOT	SAMPLE TYPE	SAMPLE NUMBER	SOIL VAPOUR CONCENTRATION (ppm) 100 1000 10000	WATER LEVEL	MONITORING WELL INSTALLATION
0	**ICE**						
	WATER						
1							
2							
3							
4							
5							
6	**SILT** – sandy, trace fine grained gravel, trace organics, olive grey, very soft, low plasticity, wet, trace black staining to 6.1m – no gravel, soft, moist below 6.1m – 50mm fine grained sand lense, poorly graded, loose at 6.6m			01-22-1 01-22-2			
7	**SAND**– fine grained, some silt, trace organics, poorly graded, olive grey, loose, wet **CLAY** – silty, brown, firm, high plasticity, moist **BOULDERS**			01-22-3			
8	End of borehole at 2.0m below river bottom (auger refusal).						
9							

LEGEND
bentonite grout

MORROW ENVIRONMENTAL CONSULTANTS INC.	ICE SURFACE ELEVATION (m): 222.211	DATE DRILLED: 2001 03 08
	RIVER BOTTOM ELEVATION (m): 216.421	OBSERVED WATER LEVEL: N/A
		LOGGED BY: AGM
		SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-23
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY		

DEPTH (m)	SOIL DESCRIPTION	STRATIGRAPHY PLOT	SAMPLE TYPE	SAMPLE NUMBER	SOIL VAPOUR CONCENTRATION (ppm) 100 / 1000 / 10000	WATER LEVEL	MONITORING WELL INSTALLATION
0	**ICE**						
	WATER						
1							
2							
3							
4	**SAND AND GRAVEL** – fine to coarse grained sand, fine grained gravel, well graded, grey, loose, wet, trace black staining			01-23-1			
5	**SILT AND SAND** – fine grained sand, trace clay, trace organics, trace clay, poorly graded, olive grey, loose/soft, moist, trace black staining to 4.6m			01-23-2			
6	**SILT (TILL)** – gravelly (fine grained), some fine to coarse grained sand, some clay, light brown, hard, low plasticity, moist			01-23-3			
	End of borehole at 2.0m below river bottom (auger refusal).						
7							
8							
9							

LEGEND
bentonite grout

MORROW ENVIRONMENTAL CONSULTANTS INC.

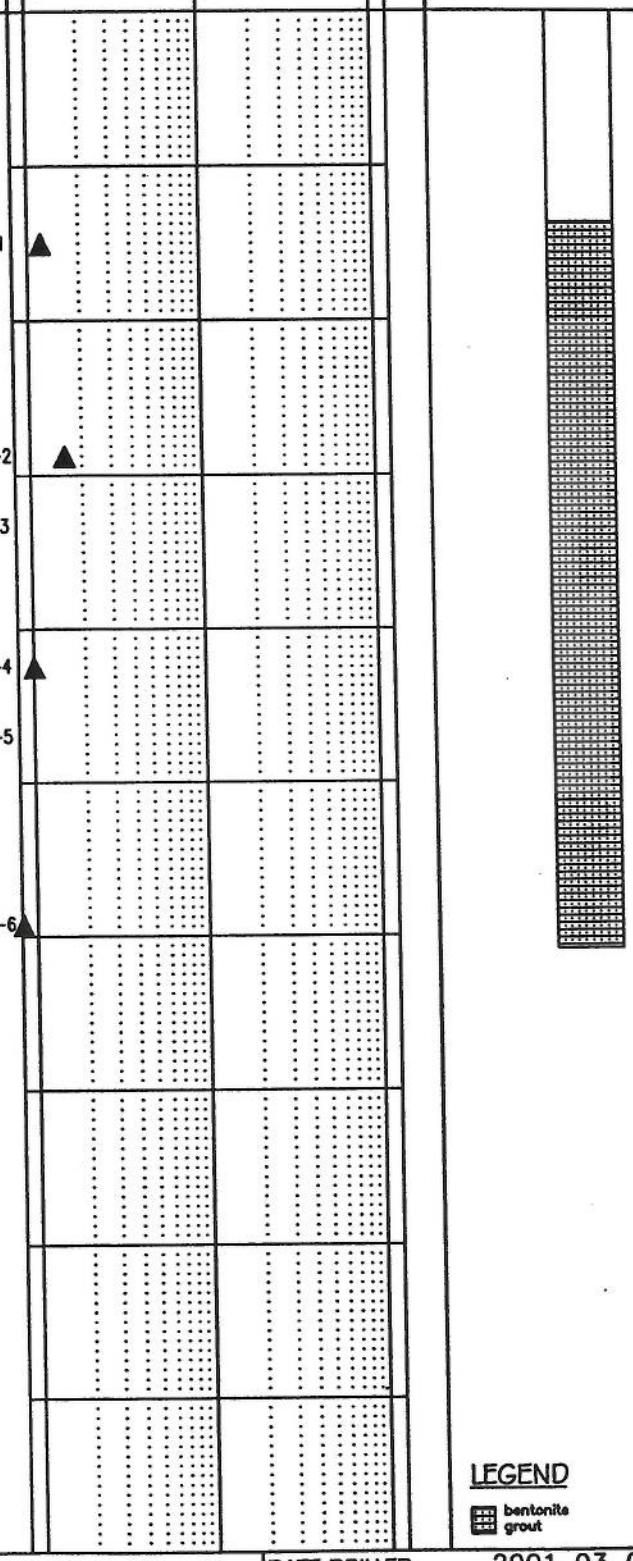
ICE SURFACE ELEVATION (m): 222.254	DATE DRILLED: 2001 03 06
RIVER BOTTOM ELEVATION (m): 217.984	OBSERVED WATER LEVEL: N/A
	LOGGED BY: AGM

SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-24
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY		

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER
0	**ICE**	
	WATER	
1	**SAND AND GRAVEL** – fine grained gravel, coarse grained sand, poorly graded, grey, loose, wet	01-24-1
2	**SILT AND SAND** – fine grained sand, trace organics, poorly graded, olive grey, soft, moist, black staining to 1.8m – interbedded silt and sand, wet below 2.6m	*01-24-2
3		01-24-3
4	**SAND** – fine to medium grained, some silt, well graded, grey, wet – trace gravel below 4.4m	01-24-4 01-24-5
5	**CLAY (TILL)** – silty, some coarse grained gravel, firm, high plasticity, moist **SILT (TILL)** – gravelly (fine grained), some fine to coarse grained sand, some clay, light brown, hard, low plasticity, moist	01-24-6
6	End of borehole at 4.7m below river bottom.	
7		
8		
9		

STRATIGRAPHY PLOT | SAMPLE TYPE | SOIL VAPOUR CONCENTRATION (ppm) 100 1000 10000 | WATER LEVEL | MONITORING WELL INSTALLATION



* submitted for laboratory analysis

MORROW ENVIRONMENTAL CONSULTANTS INC.

ICE SURFACE ELEVATION (m): 222.386	DATE DRILLED: 2001 03 06
	OBSERVED WATER LEVEL: N/A
RIVER BOTTOM ELEVATION (m): 221.016	LOGGED BY: AGM
	SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-25
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY		

DEPTH (m)	SOIL DESCRIPTION	STRATIGRAPHY PLOT	SAMPLE TYPE	SAMPLE NUMBER	SOIL VAPOUR CONCENTRATION (ppm) 100 1000 10000	WATER LEVEL	MONITORING WELL INSTALLATION
0	**ICE**						
	WATER						
1							
2							
3							
4	**NO RECOVERY**						
5	**SILT (TILL)** – gravelly to some gravel, some sand, some clay, light brown, hard, low plasticity, moist			01-25-1			
6				*01-25-2			
7				01-25-3			
	End of borehole at 3.2m below river bottom.						
8							
9							

* submitted for laboratory analysis

LEGEND: bentonite grout

MORROW ENVIRONMENTAL CONSULTANTS INC.	ICE SURFACE ELEVATION (m): 222.271	DATE DRILLED: 2001 03 06
	RIVER BOTTOM ELEVATION (m): 217.051	OBSERVED WATER LEVEL: N/A
		LOGGED BY: AGM

SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-26
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY		

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER
0	**ICE**	
	WATER	
1		
2		
3		
4		
5		
	SAND – fine to medium grained, trace medium grained gravel, well graded, grey, loose, wet	01-26-1, 01-26-2
6	**SILT (TILL)** – gravelly, some sand, some clay, light brown, hard, low plasticity, moist	01-26-2A
7		01-26-2B
8		01-26-3
	End of borehole at 2.6m below river bottom (auger refusal).	
9		

SOIL VAPOUR CONCENTRATION (ppm): 100 — 1000 — 10000

WATER LEVEL

MONITORING WELL INSTALLATION

LEGEND: bentonite grout

* submitted for laboratory analysis

MORROW ENVIRONMENTAL CONSULTANTS INC.	ICE SURFACE ELEVATION (m): 222.241	DATE DRILLED: 2001 03 07
	RIVER BOTTOM ELEVATION (m): 216.451	OBSERVED WATER LEVEL: N/A
		LOGGED BY: AGM
		SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES, LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-27
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY		

DEPTH (m)	SOIL DESCRIPTION	STRATIGRAPHY PLOT	SAMPLE TYPE	SAMPLE NUMBER	SOIL VAPOUR CONCENTRATION (ppm) 100 1000 10000	WATER LEVEL	MONITORING WELL INSTALLATION
0	**ICE**						
	WATER						
1							
2							
3							
4							
5	**SAND AND SILT** – fine grained sand, trace organics, poorly graded, olive grey, loose, wet, trace black staining			01-27-1			
6	**SILT** – sandy (fine grained), olive grey, soft, low plasticity, moist, trace black staining			*01-27-2			
	SAND – fine grained, poorly graded, grey, loose, wet			01-27-3			
7	**SILT (TILL)** – gravelly, light brown, very hard, low plasticity, moist			01-27-4			
	End of borehole at 1.5m below river bottom (auger refusal).						
8							
9							

* submitted for laboratory analysis

LEGEND

bentonite grout

MORROW ENVIRONMENTAL CONSULTANTS INC.	ICE SURFACE ELEVATION (m): 222.250	DATE DRILLED: 2001 03 07
	RIVER BOTTOM ELEVATION (m): 216.460	OBSERVED WATER LEVEL: N/A
		LOGGED BY: AGM

SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-28

BOREHOLE LOG

PLOTTED:
CAD FILE No.:

SAMPLE TYPE: CORE SPLIT SPOON SHELBY DISTURBED NO RECOVER

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER
0	**ICE**	
	WATER	
4	**SILT AND SAND** – fine grained sand, trace organics, soft/loose, moist, layered with plastic tar, black staining, strong mothball odour	
	SAND – fine to medium grained, silty, well graded, grey, wet, black staining, sheen, strong mothball odour – visible brown LPH from 5.2m to 5.3m – and silt below 5.3m	01-28-1
5	**SILT** – sandy (fine grained), olive grey, soft, low plasticity, moist, black staining	*01-28-2
	NO RECOVERY	01-28-3
	SILT – sandy (fine grained), olive grey, soft, low plasticity, moist, black staining, mothball odour	01-28-4
6	End of borehole at 1.8m below river bottom (auger refusal).	

SOIL VAPOUR CONCENTRATION (ppm): 100 1000 10000

WATER LEVEL

MONITORING WELL INSTALLATION

LEGEND: bentonite grout

* submitted for laboratory analysis

MORROW ENVIRONMENTAL CONSULTANTS INC.

ICE SURFACE ELEVATION (m): 222.243	DATE DRILLED: 2001 03 07
RIVER BOTTOM ELEVATION (m): 217.823	OBSERVED WATER LEVEL: N/A
	LOGGED BY: AGM

SHEET 1 OF

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-29

BOREHOLE LOG

PLOTTED:
CAD FILE No.:

SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER
0	**ICE**	
	WATER	
1		
2	**NO RECOVERY**	
3	**CLAY** – silty, trace fine grained sand, olive brown, firm, high plasticity, moist	01-29-1
	SAND – fine to medium grained, well graded, grey, loose, wet, slight mothball odour	*01-29-2
4	– 75mm clay lense, silty, olive brown, firm, high plasticity, moist at 4.1m	
	SAND AND GRAVEL – fine to coarse grained sand, fine grained gravel, well graded, grey, dense, wet	01-29-3
5	**NO RECOVERY**	
	CLAY – silty, silt pockets, trace fine grained gravel, brown, firm, high plasticity, moist	01-29-4
6		
7	**SILT (TILL)** – some gravel, some sand, some clay, light brown, hard, low plasticity, moist	01-29-5
	End of borehole at 5.5m below river bottom.	
8		
9		

SOIL VAPOUR CONCENTRATION (ppm): 100, 1000, 10000

WATER LEVEL

MONITORING WELL INSTALLATION

LEGEND: bentonite grout

* submitted for laboratory analysis

MORROW ENVIRONMENTAL CONSULTANTS INC.

ICE SURFACE ELEVATION (m): 222.175	DATE DRILLED: 2001 03 07
RIVER BOTTOM ELEVATION (m): 219.127	OBSERVED WATER LEVEL: N/A
	LOGGED BY: AGM

SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-30
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY		

DEPTH (m)	SOIL DESCRIPTION	STRATIGRAPHY PLOT	SAMPLE TYPE	SAMPLE NUMBER	SOIL VAPOUR CONCENTRATION (ppm) 100 1000 10000	WATER LEVEL	MONITORING WELL INSTALLATION
0	**ICE**						
	WATER						
1							
2							
3							
4							
5							
6							
7	**SILT** – some sand, trace organics, olive grey, very soft, low plasticity, wet, trace black staining to 7.0m – soft, moist below 7.0m			01-30-1 *01-30-2 01-30-3A 01-30-3			
	SAND AND GRAVEL – coarse to fine grained sand, fine to coarse grained gravel, some silt, well graded, grey, wet, shell fragments						
8	**SILT (TILL)** – gravelly, some sand, some clay, light brown, hard, low plasticity, moist			01-30-4 01-30-5			
9	End of borehole at 2.3m below river bottom. * submitted for laboratory analysis						

LEGEND
bentonite grout

MORROW ENVIRONMENTAL CONSULTANTS INC.	ICE SURFACE ELEVATION (m): 222.210	DATE DRILLED: 2001 03 09
	RIVER BOTTOM ELEVATION (m): 215.350	OBSERVED WATER LEVEL: N/A
		LOGGED BY: AGM
		SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-31

BOREHOLE LOG

PLOTTED:
CAD FILE No.:

SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER
0	**ICE**	
	WATER	
7	**SILT** – some fine grained sand, trace organics, olive grey, soft, wet – 25mm sand lense, fine to coarse grained, well graded at 7.3m and 7.5m	01-31-1 01-31-2
8	**SILT (TILL)** – gravelly (fine to coarse grained), some fine to coarse grained sand, some clay, light brown, stiff, moist	01-31-3
	End of borehole at 1.2m below river bottom (auger refusal).	

SOIL VAPOUR CONCENTRATION (ppm): 100, 1000, 10000

WATER LEVEL

MONITORING WELL INSTALLATION

LEGEND: bentonite grout

MORROW ENVIRONMENTAL CONSULTANTS INC.

ICE SURFACE ELEVATION (m): 222.204	DATE DRILLED: 2001 03 09
	OBSERVED WATER LEVEL: N/A
RIVER BOTTOM ELEVATION (m): 215.194	LOGGED BY: AGM

SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-32
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY		

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER
0	**ICE**	
	WATER	
1		
2		
3		
4		
5		
6		
7	**SAND AND GRAVEL** – coarse grained sand, fine grained gravel, some silt, grey, loose, wet	01-32-1
		01-32-2
	SILT (TILL) – some fine grained sand, some fine to coarse grained gravel, trace clay, light brown, very stiff, low plasticity, moist	*01-32-3
8	– and gravel below 8.4m	
9	End of borehole at 2.1m below river bottom (auger refusal). * submitted for laboratory analysis	

STRATIGRAPHY PLOT / SAMPLE TYPE / SOIL VAPOUR CONCENTRATION (ppm) 100 1000 10000 / WATER LEVEL / MONITORING WELL INSTALLATION

LEGEND: bentonite grout

MORROW ENVIRONMENTAL CONSULTANTS INC.

ICE SURFACE ELEVATION (m): 222.182	DATE DRILLED: 2001 03 09
RIVER BOTTOM ELEVATION (m): 215.022	OBSERVED WATER LEVEL: N/A
	LOGGED BY: AGM

SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-33

BOREHOLE LOG

PLOTTED:
CAD FILE No.:

SAMPLE TYPE: ■ CORE ▨ SPLIT SPOON ■ SHELBY ☒ DISTURBED ⊙ NO RECOVERY

DEPTH (m)	SOIL DESCRIPTION	STRATIGRAPHY PLOT	SAMPLE TYPE	SAMPLE NUMBER	SOIL VAPOUR CONCENTRATION (ppm) 100 1000 10000	WATER LEVEL	MONITORING WELL INSTALLATION
0	**ICE**						
	WATER						
1							
2							
3							
4							
5							
6							
7	**GRAVEL** – fine grained, some coarse grained sand, well graded, brown–grey, loose, wet			01-33-1 01-33-2			
	SILT (TILL) – gravelly, some sand, some clay, light brown, hard, low plasticity, moist			01-33-3			
8	End of borehole at 0.8m below river bottom (auger refusal).						
9							

LEGEND
▦ bentonite grout

MORROW ENVIRONMENTAL CONSULTANTS INC.

ICE SURFACE ELEVATION (m): 222.202	DATE DRILLED: 2001 03 09
RIVER BOTTOM ELEVATION (m): 215.042	OBSERVED WATER LEVEL: N/A
	LOGGED BY: AGM

SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-34
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY		

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER
0	**ICE**	
	WATER	
1		
2		
3		
4	**SILT** – sandy, trace organics, olive grey, soft, low plasticity, wet, trace black staining	*01-34-1
	SAND – fine to medium grained, some fine grained gravel, well graded, grey, loose, wet, shell fragments	01-34-2
5	**CLAY** – silty, trace organics, brown, stiff, high plasticity, moist	01-34-3
6		01-34-4
7	**SILT (TILL)** – gravelly (fine grained), some sand, some clay, light brown, hard, moist	01-34-5
	End of borehole at 3.2m below river bottom (auger refusal).	
8		
9		

STRATIGRAPHY PLOT | SAMPLE TYPE | SAMPLE NUMBER | SOIL VAPOUR CONCENTRATION (ppm) 100 1000 10000 | WATER LEVEL | MONITORING WELL INSTALLATION

LEGEND: bentonite grout

* submitted for laboratory analysis

MORROW ENVIRONMENTAL CONSULTANTS INC.	ICE SURFACE ELEVATION (m): 222.202	DATE DRILLED: 2001 03 14
	RIVER BOTTOM ELEVATION (m): 217.632	OBSERVED WATER LEVEL: N/A
		LOGGED BY: AGM
		SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-35
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY		

DEPTH (m)	SOIL DESCRIPTION	STRATIGRAPHY PLOT	SAMPLE TYPE	SAMPLE NUMBER	SOIL VAPOUR CONCENTRATION (ppm) 100 1000 10000	WATER LEVEL	MONITORING WELL INSTALLATION
0	**ICE**						
	WATER						
1							
2							
3							
	GRAVEL – fine to medium grained, well graded, brown, loose, wet			01-35-1			
	CLAY – silty, trace fine grained gravel, brown, firm, high plasticity, moist						
4				01-35-2			
5							
				01-35-3			
6							
7				01-35-4			
	End of borehole at 4.1m below river bottom.						
8							
9							

LEGEND

bentonite grout

MORROW ENVIRONMENTAL CONSULTANTS INC.	ICE SURFACE ELEVATION (m): 222.203	DATE DRILLED: 2001 03 14
	RIVER BOTTOM ELEVATION (m): 218.693	OBSERVED WATER LEVEL: N/A
		LOGGED BY: AGM
		SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-36
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY		

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER
0	**ICE**	
	WATER	
1		
2		
3		
4		
5	**SILT** – sandy (fine grained), trace clay, trace organics, olive grey, soft, low plasticity, wet	01-36-3
	SAND – fine grained, some silt, grey/brown, loose, wet, slight mothball odour – visible LPH, black staining at 5.5m – plastic tar from 6.0m to 6.3m	01-36-2 *01-36-1
6	– some black staining, sheen from 6.3m to 6.6m – silty, olive grey below 6.9m – 50mm fine to medium grained gravel lense, some sand, brown/grey, shell fragments at 7.5m	01-36-4 01-36-5 01-36-6
7	**CLAY** – trace silt, olive grey, soft, medium plasticity, moist	
	SILT (TILL) – gravelly (fine to medium grained), some silt, some clay, light brown, hard, low plasticity, moist	*01-36-7
8	End of borehole at 3.0m below river bottom (auger refusal).	
9		

SOIL VAPOUR CONCENTRATION (ppm): 100 — 1000 — 10000

WATER LEVEL

MONITORING WELL INSTALLATION

LEGEND: bentonite grout

* submitted for laboratory analysis

MORROW ENVIRONMENTAL CONSULTANTS INC.	ICE SURFACE ELEVATION (m): 222.188	DATE DRILLED: 2001 03 14
	RIVER BOTTOM ELEVATION (m): 217.158	OBSERVED WATER LEVEL: N/A
		LOGGED BY: RAD
		SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-37

BOREHOLE LOG

PLOTTED:
CAD FILE No.:

SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER
0	**ICE**	
	WATER	
1		
2		
3	**SAND** – fine to coarse grained, some fine grained gravel, grey, loose, wet	01-37-1
4	**CLAY** – sandy (fine grained), silty, olive grey, soft, moist – 50mm sand lenses, fine grained, loose, wet at 4.1m and 4.4m	*01-37-2
	– 100mm sand lense, fine grained, silty, dry at 4.7m	01-34-3
5	– silty, some sand below 4.9m – 175mm sand lense at 5.2m	01-37-4
	– 25mm sand lense at 5.8m	
6		01-37-5
7		01-37-6
	SILT (TILL) – gravelly (fine to medium grained), some sand, some clay, light brown, hard, moist	01-37-7
8		01-37-8
	End of borehole at 4.9m below river bottom (auger refusal).	
9		

* submitted for laboratory analysis

SOIL VAPOUR CONCENTRATION (ppm): 100 – 1000 – 10000

WATER LEVEL

MONITORING WELL INSTALLATION

LEGEND: bentonite grout

MORROW ENVIRONMENTAL CONSULTANTS INC.

ICE SURFACE ELEVATION (m): 222.166	DATE DRILLED: 2001 03 14
RIVER BOTTOM ELEVATION (m): 218.816	OBSERVED WATER LEVEL: N/A
	LOGGED BY: RAD

SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-38
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY		

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER
0	**ICE**	
	WATER	
1		
2		
3		
4	**SILT** – sandy (fine to medium grained), trace clay, trace organics, olive grey, soft, low plasticity, wet, trace black staining	
	SAND – fine to coarse grained, trace silt, well graded, grey, loose, wet, shell fragments, slight mothball odour	01-38-1A, 01-38-1B
5	**SILT** – sandy (fine to medium grained), dark grey, soft, low plasticity, moist, plastic tar layers, trace visible LPH, black staining, strong mothball odour	01-38-2
	SAND – fine to medium grained, trace fine grained gravel, olive grey, loose, wet, shell fragments, mothball odour	01-38-3, 01-38-4
6	**CLAY (TILL)** – silty, some sand, some fine grained gravel, light brown, firm, high plasticity, moist	
	CLAY – silty, brown, firm, high plasticity, moist – 75mm fine grained gravel lense at 7.5m	01-38-5
7	**SILT (TILL)** – gravelly (fine grained), some sand, some clay, light brown, hard, low plasticity, moist	01-38-6
	End of borehole at 3.2m below river bottom.	
8		
9		

STRATIGRAPHY PLOT / SAMPLE TYPE / SAMPLE NUMBER / SOIL VAPOUR CONCENTRATION (ppm) 100 1000 10000 / WATER LEVEL / MONITORING WELL INSTALLATION

LEGEND: bentonite grout

MORROW ENVIRONMENTAL CONSULTANTS INC.	ICE SURFACE ELEVATION (m): 222.185	DATE DRILLED: 2001 03 15
	RIVER BOTTOM ELEVATION (m): 217.765	OBSERVED WATER LEVEL: N/A
		LOGGED BY: AGM
		SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-39
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY		

DEPTH (m)	SOIL DESCRIPTION	STRATIGRAPHY PLOT	SAMPLE TYPE	SAMPLE NUMBER	SOIL VAPOUR CONCENTRATION (ppm) 100 / 1000 / 10000	WATER LEVEL	MONITORING WELL INSTALLATION
0	**ICE**						
	WATER						
1							
2							
3							
	GRAVEL – poor recovery, shell fragements, chunks of plastic tar			01-39-1			
4	**CLAY** – silty, brown, firm, high plasticity, moist			01-36-1			
5				01-39-2			
6							
7	**SILT (TILL)** – gravelly (fine grained), some sand, light brown, hard, low plasticity, moist			01-39-3, 01-39-4			
	End of borehole at 4.0m below river bottom.						
8							
9							

LEGEND: bentonite grout

MORROW ENVIRONMENTAL CONSULTANTS INC.

ICE SURFACE ELEVATION (m): 222.195	DATE DRILLED: 2001 03 15
RIVER BOTTOM ELEVATION (m): 218.535	OBSERVED WATER LEVEL: N/A
	LOGGED BY: AGM

SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-40
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY		

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER
0	**ICE**	
	WATER	
1		
2		
3	**SILT** – clayey, some fine grained sand, trace organics, brown, very soft, low plasticity, wet	01-40-1
	SILT AND SAND – fine grained sand, trace clay, well graded, olive grey, soft, moist, trace black staining	*01-40-2
4	**CLAY** – silty, brown, stiff, high plasticity, moist	01-40-3
5	– softer with depth below 5.2m – 50mm gravel lense at 5.3m	01-40-4
	– soft below 5.8m	01-40-5
6		01-40-6
7	End of borehole at 3.8m below river bottom (auger refusal).	
8		
9		

SOIL VAPOUR CONCENTRATION (ppm): 100 — 1000 — 10000

WATER LEVEL

MONITORING WELL INSTALLATION

LEGEND: bentonite grout

* submitted for laboratory analysis

MORROW ENVIRONMENTAL CONSULTANTS INC.	ICE SURFACE ELEVATION (m): 222.180	DATE DRILLED: 2001 03 15
	RIVER BOTTOM ELEVATION (m): 219.132	OBSERVED WATER LEVEL: N/A
		LOGGED BY: AGM
		SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-41
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY		

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER
0	**ICE**	
	WATER	
1		
2		
3	**SILT** – some sand, trace clay, trace organics, olive grey, very soft, low plasticity, wet	01-41-1
		01-41-2
4	**SAND** – fine grained, silty, some clay, trace organics, poorly graded, olive grey, loose, wet	01-41-3
	CLAY – sandy (fine grained), some silt, trace organics, olive grey, brown, firm, high plasticity, moist	01-41-4
5		01-41-5
6		01-41-6
7	– gravelly (fine grained) below 7.6m **SILT (TILL)** – sandy (coarse grained), some clay, trace fine grained gravel, light olive brown, very stiff, low plasticity, moist	
8	End of borehole at 4.6m below river bottom (auger refusal).	01-41-7
9		

STRATIGRAPHY PLOT / SAMPLE TYPE

SOIL VAPOUR CONCENTRATION (ppm): 100 — 1000 — 10000

WATER LEVEL

MONITORING WELL INSTALLATION

LEGEND: bentonite grout

MORROW ENVIRONMENTAL CONSULTANTS INC.	ICE SURFACE ELEVATION (m): 222.200	DATE DRILLED: 2001 03 15
	RIVER BOTTOM ELEVATION (m): 218.540	OBSERVED WATER LEVEL: N/A
		LOGGED BY: AGM
		SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-42
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY		

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER
0	**ICE**	
	WATER	
1		
2		
3	**SILT** – some clay, trace fine grained sand, trace organics, olive grey, very soft, low plasticity, wet – clayey, some fine grained sand, trace organics, firm, moist below 3.4m – clayey with depth	01-42-1 01-42-2
4	**CLAY** – silty, trace organics, brown, firm, high plasticity, moist	
5		01-42-3
6	– wood chunks at 6.1m – orange oxidations below 6.4m – and silt from 6.7m to 7.0m	01-42-4
7	**SILT (TILL)** – gravelly (fine to coarse grained), some fine to coarse grained sand, some clay, light brown, stiff, low plasticity, moist	01-42-5
	End of borehole at 4.6m below river bottom.	
8		
9		

STRATIGRAPHY PLOT / SAMPLE TYPE

SOIL VAPOUR CONCENTRATION (ppm): 100 — 1000 — 10000

WATER LEVEL

MONITORING WELL INSTALLATION

LEGEND: bentonite grout

MORROW ENVIRONMENTAL CONSULTANTS INC.	ICE SURFACE ELEVATION (m): 222.144	DATE DRILLED: 2001 03 16
	RIVER BOTTOM ELEVATION (m): 219.096	OBSERVED WATER LEVEL: N/A
		LOGGED BY: AGM
		SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-43
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY		

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER
0	**ICE**	
	WATER	
1		
2		
3	**CLAY** – silty, trace fine grained sand, trace organics, brown, soft to firm, moist	*01-43-0
4		01-43-1
5	– and silt, some sand from 5.3m to 6.1m	01-43-2
6	– silty, trace fine grained sand, stiff below 6.1m	01-43-3
	SILT (TILL) – gravelly (fine grained), some fine to coarse grained sand, well graded, light brown, stiff, moist	01-43-4
7	End of borehole at 4.4m below river bottom.	
8		
9		

SOIL VAPOUR CONCENTRATION (ppm): 100 — 1000 — 10000

WATER LEVEL

MONITORING WELL INSTALLATION

LEGEND: bentonite grout

* submitted for laboratory analysis

MORROW ENVIRONMENTAL CONSULTANTS INC.	ICE SURFACE ELEVATION (m): 222.176	DATE DRILLED: 2001 03 16
	RIVER BOTTOM ELEVATION (m): 218.976	OBSERVED WATER LEVEL: N/A
		LOGGED BY: AGM
		SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-44
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY		

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER
0	**ICE**	
	WATER	
1		
2		
3		
4		
5	**SILT** – sandy (fine grained), some clay, some organics, olive grey, soft, wet	01-44-1
	SAND AND SILT – fine to medium grained sand, olive grey, soft, moist	01-44-2, 01-44-3
6	**CLAY** – silty, olive grey, soft, high plasticity, moist – siltier with depth – some fine grained sand below 6.4m	
	SAND – fine to medium grained, trace silt, poorly graded, grey/brown, loose, moist	01-44-4
7	**CLAY** – some fine grained sand, trace silt, olive grey, soft, medium to high plasticity, moist	01-44-5
	GRAVEL – coarse grained	
8	**SILT (TILL)** – some fine to coarse grained sand and gravel, trace clay, very stiff, low plasticity, moist	01-44-6
	End of borehole at 3.2m below river bottom (auger refusal).	
9		

STRATIGRAPHY PLOT / SAMPLE TYPE / SAMPLE NUMBER

SOIL VAPOUR CONCENTRATION (ppm): 100 — 1000 — 10000

WATER LEVEL

MONITORING WELL INSTALLATION

LEGEND: bentonite grout

MORROW ENVIRONMENTAL CONSULTANTS INC.	ICE SURFACE ELEVATION (m): 222.195	DATE DRILLED: 2001 03 16
	RIVER BOTTOM ELEVATION (m): 217.015	OBSERVED WATER LEVEL: N/A
		LOGGED BY: RAD
		SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-45
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY		

DEPTH (m)	SOIL DESCRIPTION	STRATIGRAPHY PLOT	SAMPLE TYPE	SAMPLE NUMBER	SOIL VAPOUR CONCENTRATION (ppm) 100 / 1000 / 10000	WATER LEVEL	MONITORING WELL INSTALLATION
0	**ICE**						
	WATER						
1							
2							
3							
4							
5	**SILT** – some clay, some fine grained sand, trace organics, olive grey, soft, low plasticity, wet			01-45-1			
	CLAY – trace silt, olive brown, soft, high plasticity, moist – 50mm fine to medium grained sand lenses at 5.5m and 5.9m			01-45-2 01-45-3			
6							
	GRAVEL – coarse grained			01-45-4			
7	**SILT (TILL)** – some fine to coarse grained sand and gravel, trace clay, very stiff, low plasticity, moist			01-45-5			
	End of borehole at 2.6m below river bottom (auger refusal).						
8							
9							

LEGEND
bentonite grout

MORROW ENVIRONMENTAL CONSULTANTS INC.	ICE SURFACE ELEVATION (m): 222.222	DATE DRILLED: 2001 03 16
	RIVER BOTTOM ELEVATION (m): 217.192	OBSERVED WATER LEVEL: N/A
		LOGGED BY: RAD
		SHEET 1 OF 1

CLIENT: AGASSIZ NORTH ASSOCIATES LIMITED	DRILLING CONTRACTOR: MAPLE LEAF DRILLING		PROJECT No.: W1801B
LOCATION: CENTRA GAS, RED RIVER, WINNIPEG, MANITOBA	DRILLING METHOD: HOLLOW/SOLID STEM AUGER	DIAMETER: 200/100 mm	BOREHOLE No.: 01-46
BOREHOLE LOG — PLOTTED: / CAD FILE No.:	SAMPLE TYPE: CORE, SPLIT SPOON, SHELBY, DISTURBED, NO RECOVERY		

DEPTH (m)	SOIL DESCRIPTION	SAMPLE NUMBER
0	**ICE**	
	WATER	
1		
2	**SILT AND CLAY** – some fine to medium grained sand, olive grey, soft, low plasticity, wet	01-46-1, 01-46-2
3	**CLAY** – some silt, some fine grained sand, olive grey, soft, medium plasticity – <25mm sand lense, fine to medium grained at 2.9m – fine to medium grained sand lense, some silt, trace clay, olive grey, dense, moist from 3.2m to 3.4m	01-46-3, 01-46-4
4	**SAND** – fine to medium grained, some silt, trace clay, olive grey, dense, moist **CLAY** – laminated, some silt, some fine grained sand, olive grey, soft, medium plasticity	01-46-5, 01-46-6
5		01-46-7
6		01-46-8
7	– some gravel and organics below 7.0m **SILT (TILL)** – some fine to coarse grained sand and gravel, trace clay, very stiff, low plasticity, moist	01-46-9, 01-46-10
8	End of borehole at 5.5m below river bottom (auger refusal).	
9		

STRATIGRAPHY PLOT / SAMPLE TYPE

SOIL VAPOUR CONCENTRATION (ppm): 100, 1000, 10000

WATER LEVEL

MONITORING WELL INSTALLATION

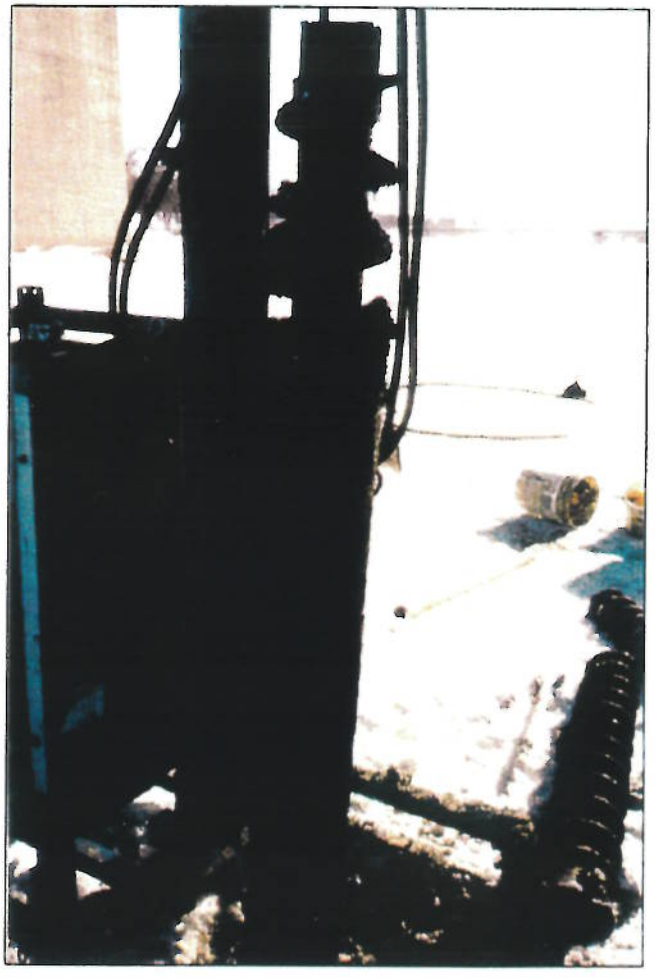
LEGEND: bentonite grout

MORROW ENVIRONMENTAL CONSULTANTS INC.	ICE SURFACE ELEVATION (m): 222.369	DATE DRILLED: 2001 03 16
	RIVER BOTTOM ELEVATION (m): 220.079	OBSERVED WATER LEVEL: N/A
		LOGGED BY: RAD
		SHEET 1 OF 1

APPENDIX V

Photographs

PHOTOGRAPH 1: VIEW OF THE DRILL RIG USED DURING THE INVESTIGATION DRILLING BH01-01 ADJACENT TO THE DISRAELI BRIDGE.



PHOTOGRAPH 2: VIEW OF THE TOP 1.5m OF SOIL FROM BH01-05. NOTE THE HYDROCARBON SHEEN AND LPH IN THE SAND AND SILT.

PHOTOGRAPH 3: VIEW OF LIQUID PHASE HYDROCARBONS AND HYDROCARBON SHEEN IN A SAND LENSE IN BH01-28.

PHOTOGRAPH 4: VIEW OF LIQUID PHASE HYDROCARBONS IN A SAND LENSE IN BH01-28. NOTE BLACK PLASTIC COAL TAR IN SILT AND SAND AT THE RIGHT END OF THE SAMPLE.