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**PHASE II ENVIRONMENTAL SITE ASSESSMENT
MAPLE LEAF CONSTRUCTION
1600 ERIN STREET
WINNIPEG, MANITOBA**

January 28, 2000
KGS Group Project 99-570-02

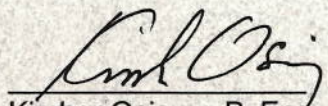
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January 28, 2000

File No. 99-570-02

Maple Leaf Construction
777 Erin Street
Winnipeg, Manitoba
R3G 2W2

ATTENTION: Mr. Blake Fitzpatrick

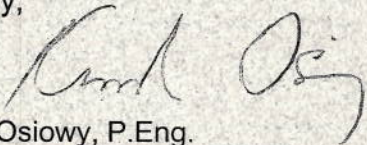
RE: Phase II Environmental Site Assessment
Maple Leaf Construction
1600 Erin Street
Winnipeg, Manitoba

Dear Mr. Fitzpatrick:

Please find enclosed three (3) copies of the report for the Phase II Environmental Site Assessment for Maple Leaf Construction located at 1600 Erin Street, Winnipeg, Manitoba.

KGS Group sincerely appreciates the opportunity to have been of service on this project. If you have any further questions regarding this report please contact myself.

Sincerely,



Kimber Osiowy, P.Eng.
Project Manager

DBK/
Enclosure

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EXECUTIVE SUMMARY

A Phase II Environmental Site Assessment (ESA) was performed at 1600 Erin Street in Winnipeg, Manitoba by KGS Group. The Phase II ESA's mandate was to evaluate soil and groundwater conditions in the area prior to sale for commercial land use. Subsurface investigations were conducted in areas of former aboveground storage tanks (ASTs), underground storage tank (UST), pump island, fuel unloading areas, warehouses and a garage.

KGS Group personnel were on-site November 25, 26, 30 and December 1, 1999, to conduct a subsurface investigation on the subject property, which included the drilling of twenty-one (21) testholes, and the conversion of six (6) of the testholes to monitoring wells. Utility locates were performed November 23, 1999.

The site stratigraphy within the subject property was typically characterized by a thin (0.05 to 0.45 m thick) upper layer of granular fill present in all testholes. The layer of granular fill was underlain by mixed fill layers. A very stiff silty clay was encountered below the fill layers and extended to the maximum depth of investigation of 9.14 m below grade. Within the silty clay unit a low plastic clayey silt unit was detected at a depth of 1.2 to 2.0 m below grade for most testholes.

The water table was located at a depth of 1.19 to 1.74 m below the ground surface. The general direction of groundwater flow was southeast across the site with an estimated velocity of 0.6 m/yr based on groundwater elevations within the monitoring wells.

Hydrocarbon impacted soil was detected throughout the site including such areas as the former lube oil storage, former AST storage area, former truck unloaders, former warehouse and former pump island. Hydrocarbon levels in soil samples at a depth of 0.45 to 2.45 m below grade obtained from these locations exceeded CCME criteria for Industrial Land Use and Manitoba Environment Level III criteria. PAH parameters were all below applicable criteria except for naphthalene in one testhole, which had concentrations that exceeded CCME criteria. Hydrocarbon vapours decreased significantly within the upper two meters in the lower silty clay unit.

Groundwater hydrocarbon impacts were detected in one monitoring well, with benzene concentrations elevated above relevant criteria. however no criteria currently exists for these parameters. Four of five other groundwater wells indicated hydrocarbon impacts however concentrations were below relevant criteria.

Based upon field and laboratory results, soil was petroleum hydrocarbon impacted above applicable criteria throughout the site, with only the far north and south portions of the site along with areas along the west side of the property having low to non-detectable levels. Based upon present land use the risk to human health is considered low and it is our opinion that no remediation is required at the present time unless land use at the property changes or remediation is required as part of a property transfer agreement.

Potential off-site impacts have not been identified however the possibility exists that hydrocarbons may have migrated off-site. The estimated volume of impacted soil on site ranges from 10,000 to 18,000 tonnes. This volume of soil however can be more accurately determined with the addition of testholes in areas where impacts were detected.

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1.0 INTRODUCTION

1.1 TERMS OF REFERENCE

Kontzamanis, Graumann, Smith and MacMillan Inc., KGS Group, was retained by Mr. Blake Fitzpatrick to conduct a Phase II Environmental Site Assessment (ESA) for the property located at 1600 Erin Street in Winnipeg, Manitoba (Figure 1). The site is currently in use by Maple Leaf Construction as an equipment storage site and was historically used as a bulk fuelling facility by Gulf Canada. The areas of investigation included the area surrounding former fuel unloaders, a former pump island, a former drum-filling warehouse and the locations of aboveground storage tanks (ASTs) and an underground storage tank (UST). The purpose of the Phase II investigation was to determine the current environmental status of the property prior to sale of the property for commercial land use.

The objectives of the KGS Group investigation were as follows:

- Investigate and characterize the soils and groundwater within areas of concern previously identified to determine the presence and/or absence of soil and/or groundwater hydrocarbon impacts, as well as the presence of any free phase product;
- Identify all underground infrastructure which could act as migration pathways;
- Determine the groundwater flow direction and gradient. In the case where dissolved phase hydrocarbons above the applicable criteria and/or free product have been identified, evaluate the probability of migration off property.

This report summarizes the results of field investigations conducted by KGS Group on November 25, 26, 30 and December 1, 1999 and results of the laboratory analyses conducted by Philip Analytical Services. The investigation was conducted in accordance with ASTM Standard E1903-97 (1997).

1.2 SCOPE OF WORK

The scope of work to be conducted at 1600 Erin Street was outlined in a proposal submitted to Mr. Blake Fitzpatrick by KGS group on November 9, 1999 (KGS Group File No. 99-000-440). The investigation was to include the following:

- Contact the appropriate authorities and locate and mark out all underground utilities.
- Drill a minimum of nineteen (19) testholes in areas where subsurface contamination may have occurred, such as in the area of the aboveground storage tanks (AST's), underground storage tank (UST) and in areas of visible surface staining.
- Convert a minimum of six (6) of the testholes to groundwater monitoring wells by installing threaded, 50 mm diameter solid and slotted screen (No. 20) PVC pipe to determine the groundwater elevation and flow direction.
- Describe the soil profile encountered in the drill holes, especially for evidence of contamination.
- Collect soil samples at regular intervals for field screening for the presence of hydrocarbon vapours and submit selected soil samples for laboratory analysis.
- Collect six (6) groundwater samples for laboratory analysis to determine if there has been any impact to the local groundwater.
- Measure groundwater levels to determine flow direction and gradient.
- Prepare a report detailing the results of the investigation, complete with a site plan showing the locations of all testholes and monitoring wells, testhole logs, laboratory certificates of analysis, and recommendations with respect to the extent of remediation required if any.

The results of the investigation are discussed in subsequent sections of this report. Tables summarizing the results of the laboratory analyses are provided following the text, as is a site plan illustrating the location of the study area (Figure 1). Testhole logs are provided in Appendix A, and laboratory certificates of analyses are in Appendix B.

1.3 SITE DESCRIPTION

The subject property is located at 1600 Erin Street in Winnipeg, Manitoba, as shown on Figure 1. The property is currently being used by Maple Leaf Construction as an equipment storage site (Figure 2). Machinery, trailers, piping and various other construction equipment surrounded by a wire fence, were present on-site. Some surface staining was visible throughout the subject property, and some empty 45-gallon drums were present. The site was previously occupied by Gulf Canada (now Petro Canada) as a bulk fueling facility from the early 1960's to the early 1980's. A site plan, dated 1961 and obtained from Gulf Canada, indicated that a drum-filling warehouse was present in the center of the yard, a three (3) bay garage was present on the west-central boundary and a truck unloading facility was present on-site (Figure 1). Gasoline and diesel pump islands were

located on the north central portion of the site. A number of ASTs (aboveground storage tanks), including thirteen (13) 10,000 to 92,000 gallon gasoline ASTs, six (6) 10,000 gallon ASTs containing fuel oil, diesel or kerosene, one (1) 15,000 gallon naphtha AST, one (1) 15,000 gallon solvent AST and two (2) 12,000 gallon aviation gas ASTs, were formerly present on-site (Figure 1). One (1) diesel UST (unknown size) was located in the south west corner of the site, however Manitoba Conservation (formerly Manitoba Environment) has no record of a diesel UST being removed from this site. Equipment and construction materials on site made drilling of testholes in some areas of concern difficult, therefore testholes were drilled as close to these areas as possible.

Surrounding land uses include:

- North: Railway tracks, followed by vacant land.
- East: Petro Canada Cardlock Station and a used car dealership.
- South: Commercial land use.
- West: Commercial land use.

1.4 PREVIOUS STUDIES

No previous environmental studies are known to have been conducted at this Maple Leaf Construction site in Winnipeg, Manitoba.

2.0 FIELD INVESTIGATION AND LABORATORY PROGRAM

2.1 TESTHOLE DRILLING AND SOIL SAMPLING

Testhole Drilling

Testhole drilling and soil sampling were conducted on November 25 and 26, 1999 under the supervision of Mr. Dean Kasur of KGS Group. Underground utility locates were completed on November 23, 1999, prior to the commencement of drilling. Twenty-one (21) testholes were advanced at the site (Figure 2) using a Canterra CT-250 truck mounted rotary auger rig with 125 mm diameter solid stem continuous flight augers, owned and operated by Paddock Drilling Ltd. of Brandon, Manitoba. Six (6) of the testholes were converted to monitoring wells. Stratigraphic logs of subsurface conditions were recorded at the time of drilling and are included in Appendix A. Testhole locations were chosen in areas of greatest potential for hydrocarbon contamination (i.e. storage tank locations and areas of surface staining) based on the information provided by the client, a historical site plan and visual observations made prior to drilling.

Soil Sampling

Soil samples were recovered directly from auger flights at approximately 0.75 m intervals, with additional sampling at stratigraphic changes, and at the discretion of the KGS Group site personnel. Soil samples were placed into heavy polyethylene bags, and tested for volatile hydrocarbon vapour concentrations, using a Photovac Photo-Ionization Detector (PID), calibrated in the field with an isobutylene standard. Duplicate soil samples were placed into EPA approved, 250 ml clear glass sample containers and stored at 4°C in a cooler chest. The cooler chest was transported to Philip Analytical Services in Mississauga, Ontario, an accredited analytical testing laboratory.

Monitoring Well Installation

Groundwater monitoring wells were installed in six (6) of the twenty-one (21) testholes advanced at the Maple Leaf Construction site. Monitoring well locations were selected to provide information on the groundwater flow direction and rate, and the potential for encountering any liquid petroleum hydrocarbon (LPH).

Monitoring well construction consisted of threaded, 50 mm diameter, No. 20 slotted screen fitted with a filter fibre sock and solid threaded Schedule 40 PVC pipe. End plugs and top caps were friction-fitted to the ends of each monitoring well. The annulus of each monitoring well was filled with silica sand to approximately 0.3 m above the slotted screen. The remainder of the annulus was backfilled with bentonite chips. Each monitoring well was fitted with a steel casing flush with the ground surface. All monitoring well materials and installation techniques conformed with ASTM Standard D 5092-90. Details of the monitoring well construction are shown on the logs in Appendix A. All monitoring wells were developed by surging with a weighted bailer and purging the well.

Groundwater Monitoring and Sampling

Groundwater sampling and monitoring was performed on November 30 and December 1, 1999 at the Maple Leaf Construction site. At the location of each well, the depth to groundwater was measured and the well was checked for the presence of any LPH using an interface probe.

Groundwater samples were obtained using dedicated polyethylene disposable bailers. Prior to collecting the groundwater samples, the monitoring wells were purged a minimum of three (3) well volumes or bailed until dry. This procedure was used to ensure the water samples collected were representative of the natural groundwater conditions. Each groundwater sample collected was immediately placed into an appropriate sample container and stored in a cooler at approximately 4°C. The cooler was then transported to Philip Analytical Services, an accredited analytical testing laboratory.

Elevation Survey

An elevation survey was conducted on November 26, 1999, to establish elevations of the ground surface and water elevations at each monitoring well. The reference point for the survey was the top of a concrete wall directly east of MW4, using an assumed elevation of 100.00 m (Figure 2). Standard survey practices were followed and the circuit was closed with an acceptable error. A summary of the surface and groundwater elevations measured at the six (6) monitoring wells are presented in Table 1.

2.2 LABORATORY ANALYSES

Soil Samples

A total of twenty-one (21) soil samples collected from the Maple Leaf Construction storage site were submitted to Philip Analytical Services in Mississauga, Ontario for analysis. The laboratory analysis included benzene, toluene, ethylbenzene and xylene (BTEX), total volatile hydrocarbon (TVH), and total semivolatile hydrocarbon (TSVH) concentrations, along with one (1) field duplicate submitted for Quality Assurance/Quality Control (QA/QC). Three (3) of the twenty-one (21) soil samples were also analyzed for polyanuclear aromatic hydrocarbons (PAH) and one (1) soil sample was submitted for analysis of volatile organic compounds (VOC). The laboratory results are discussed in Section 4.3.

Groundwater Samples

A total of seven (7) groundwater samples were collected from monitoring wells located within the property at the Maple Leaf Construction storage site. One of the samples was retrieved as a QA/QC sample. The samples were submitted to Philip Analytical Services in Mississauga, Ontario for BTEX, TPH, and TEH analyses, along with one (1) sample submitted for polyanuclear aromatic hydrocarbons (PAHs) and one (1) sample submitted for volatile organic compounds (VOCs). The laboratory results are discussed in Section 4.4.

3.0 PHYSICAL CHARACTERISTICS OF THE SITE

3.1 PHYSIOGRAPHIC SETTING AND CLIMATE

The City of Winnipeg is located at the junction of the Red and Assiniboine Rivers. The land in and around the city is predominantly a flat lying to slightly undulating plain composed primarily of ancient glaciolacustrine clays and silts ⁽⁸⁾.

The mean monthly air temperature in Winnipeg ranges from approximately +19.8°C in July to - 8.3°C in January. The average annual precipitation is approximately 504 mm with 404 mm falling as rain. Weather data is for the Winnipeg International Airport weather station ⁽³⁾.

3.2 REGIONAL GEOLOGY

The City of Winnipeg is located within the Manitoba Lowlands where relief is generally less than eight (8) meters. The western edge of the Manitoba Lowlands is bounded by the Manitoba Escarpment, and the eastern edge by the Canadian Shield. Bedrock beneath the subject site is encountered at approximately 17 to 20 m depth, and is composed of Red River Formation limestones and dolomites ⁽⁵⁾. The bedrock is overlain by highly calcareous glacial silt till derived primarily from Paleozoic carbonate rock. The till varies in thickness from approximately 1 to 10 m, which in turn is overlain by deep basin glaciolacustrine deposits of silt, clay and sand ranging in thickness from about 1 to 20 m ⁽⁸⁾. Within the City of Winnipeg, approximately the upper three (3) m of the glaciolacustrine sediments form a complex assemblage, consisting of stratified silty clay and silt, with variable amounts of alluvial silts, sands, and in many places man-made fill.

3.3 REGIONAL HYDROGEOLOGY

In the Winnipeg region, a potable supply of groundwater is available from the upper carbonate aquifer. The upper carbonate aquifer is the general term for all bedrock aquifers located within the Ordovician Red River Formation through the overlying Silurian Interlake Group. Wells drilled into this aquifer will almost invariably obtain sufficient yields for household use, and yields in excess of 50 L/s can be developed in many areas. Groundwater quality in the carbonate rock aquifer generally occurs as a magnesium-calcium-bicarbonate type groundwater, and is generally developed primarily

for industrial uses in the Greater Winnipeg area. Potable water for human consumption is obtained from Shoal Lake, located on the Manitoba-Ontario border.

Regional groundwater flow of potable water in bedrock aquifers in the Winnipeg region is westerly from an extensive recharge zone of glaciofluvial sand and gravel located in the Sandilands region of southeastern Manitoba. Easterly bedrock aquifer groundwater flow of relatively saline waters originates at potentiometrically high recharge areas atop the Manitoba Escarpment.

3.4 HYDROLOGY

Local surface drainage is primarily easterly and westerly, towards the property lines of the subject property. The closest major body of water is Omands Creek, located approximately 750 m west of the subject site. The Assiniboine River is located approximately 3 km south of the subject site.

3.5 SITE GEOLOGY

The site stratigraphy within the subject property was characterized by a thin (0.05 to 0.45 m thick) layer of granular fill which was present at the surface in all testholes. The layer of granular fill was underlain by mixed fill layers consisting of sand and gravel fill, silty clay fill, sand fill, clayey silt fill and cinder fill. A very stiff silty clay was encountered below the fill layers at a depth of 0.75 to 2.4 m. Within the silty clay unit a low plastic clayey silt unit (0.6 to 1.5 m thick) was detected at a depth of 1.2 to 2.0 m below grade. Exceptions to this were MW5 and TH3, where the clayey silt unit was detected immediately below the fill layers, and MW6, which had fill layers for the entire length of the testhole (4.57 m). The basal silty clay unit extended to the maximum depth of investigation of 9.14 m below grade.

3.6 SITE HYDROGEOLOGY

Groundwater elevations at 1600 Erin Street ranged from 97.83 to 97.33 m (local elevation) throughout the site. This corresponds to a depth of 1.19 to 1.74 m below the ground surface, within the clayey silt unit within MW1 and MW4, the silty clay unit within MW2 and MW3, and within the silty clay fill and clayey silt fill units in MW5 and MW6. The groundwater gradient was approximately 0.01 m/m with a calculated hydraulic conductivity of 2.83×10^{-7} m/s. Typical hydraulic conductivities

for a clayey silt unit are low at 10^{-6} to 10^{-7} m/s. The groundwater contours indicate that the overall groundwater flow pattern appears to be southeast across the site (Figure 3).

Based upon field measurements, the average calculated hydraulic conductivity, hydraulic gradient and an estimated porosity of 0.15 for the clayey silt unit, the groundwater velocity was estimated at approximately 0.6 m/yr.

4.0 FIELD AND LABORATORY RESULTS

4.1 ASSESSMENT CRITERIA

4.1.1 Federal and Provincial Criteria

Soil

For the Province of Manitoba, the Federal industrial land use criteria from the Canadian Council of Ministers of the Environment (CCME) Recommended Canadian Soil Quality Guidelines for the Protection of Environment and Human Health (1999), were used to assess BTEX and VOC concentrations in the soil ⁽²⁾. As there are no CCME criteria for TVH, or TSVH concentrations in soil, Level III criteria from Manitoba Environment's A Guideline for the Environmental Investigation and Remediation of Petroleum Contaminated Sites in Manitoba (July 1993) were used to assess TVH and TSVH concentrations in soil ⁽⁴⁾. PAH concentrations in soil are compared to the 1997 Ontario Ministry of Environment (MOE) Guideline for Use at Contaminated Sites (Industrial/Commercial) and the Federal industrial land use criteria from the Recommended Canadian Soil Quality Guidelines for the Protection of Environment and Human Health (1999).

Groundwater

At present there are no Manitoba Environment remediation criteria for groundwater, therefore assessment criteria default to the CCME guidelines. Manitoba Environment has indicated that for a non-potable groundwater condition, criteria should default to Ontario's Ministry of Environment (MOE) *Guideline for Use at Contaminated Sites in Ontario – Groundwater Criteria for a Nonpotable Groundwater Condition* (1997) ⁽⁶⁾. For situations where a body of surface water is nearby, CCME Freshwater Aquatic Life Criteria should apply.

Potable water for human consumption within the City of Winnipeg is obtained from Shoal Lake, located on the Manitoba/Ontario border, via the Shoal Lake aquaduct. There are no bodies of open water near the subject property. Therefore, for hydrocarbons including BTEX, TVH, TSVH, PAH and VOC's, the MOEE guidelines were used to assess groundwater quality at 1600 Erin Street.

4.1.2 Manitoba Environment Site Sensitivity Assessment

The Manitoba Environment guideline utilizes a site sensitivity classification to determine which level of soil remediation criteria to apply to a site. The site sensitivity depends upon the receptor, the sensitivity of the receptor and the likelihood of impact on the receptor. In the guideline, a site is ranked as high sensitivity (Level I), medium sensitivity (Level II) or low sensitivity (Level III). Based on the site sensitivity assessment conducted, the subject site is classified as a Level III site (Low Risk). The corresponding TVH and TSVH assessment criteria are included in the appropriate tables. The site sensitivity assessment is included in Appendix C.

4.2 FIELD OBSERVATIONS

Liquid phase petroleum hydrocarbons were not detected within any of the monitoring wells installed at 1600 Erin Street during groundwater monitoring on November 30, 1999. Hydrocarbon sheens in groundwater were detected in MW3, MW5 and MW6. Hydrocarbon staining of soil was observed in every testhole except MW1, MW6, TH8 and TH12. The staining was mainly within the silty clay and clayey silt units except for TH10 and TH11 where the staining also occurred in the silty clay fill unit. Trace amounts of liquid phase hydrocarbons in soils were detected within MW4, TH5, TH6, TH10 and TH15. Hydrocarbon vapours ranged from 0 ppm to 1,803 ppm across the site, with maximum values detected in TH3 at a depth of 2.0 m to 2.3 m within the clayey silt and silty clay units.

During the drilling investigation, small areas of visible surface staining (black) were observed throughout the site.

General Groundwater Chemistry

Electrical conductivity values in groundwater ranged from 1,380 to >1,990 $\mu\text{S}/\text{cm}$ with maximum values detected at MW1 and MW6. pH values ranged from 6.9 to 9.1, while dissolved oxygen concentrations ranged from 6.84 to 10.5 mg/L. Groundwater temperatures ranged from 8.1 to 9.9 °C. General groundwater chemistry results are shown on Table 2.

4.3 RESULTS OF LABORATORY SOIL ANALYSIS

Twelve (12) of the twenty (20) testholes that had samples collected for BTEX, TVH and TSVH contained levels that were in exceedance of Manitoba Environment Level III criteria and CCME Commercial Land Use criteria. Mineral oil and grease concentrations were elevated in MW6 and TH7, but were below Manitoba Environment Level III criteria. VOC concentrations in the sample submitted from MW2 were all non-detectable and well below applicable criteria. Samples sent for PAH analyses were all below applicable criteria except for Naphthalene concentrations in MW5, which exceeded CCME Industrial Land Use criteria. Analytical results are shown in Tables 3, 4, 5 and on Figure 3.

4.4 RESULTS OF LABORATORY GROUNDWATER ANALYSIS

BTEX concentrations were elevated within MW3, MW4, MW5 and MW6 with only benzene (12,700 µg/L) concentrations in the MW5 field duplicate slightly exceeding MOEE Nonpotable Groundwater Criteria. Levels of TVH and TSVH were elevated in MW3, MW4, MW5 and MW6, however no groundwater criteria currently exists for these parameters. Concentrations of BTEX, TVH and TSVH in MW1 and MW2 were all low and well below applicable criteria. PAH and VOC concentrations from groundwater in MW4 and MW3 respectively were all low to non-detectable and well below MOEE criteria. Detailed analytical results are shown in Table 6, 7 and 8 and on Figure 4.

5.0 DISCUSSION

5.1 SOIL

The results of the field investigation and laboratory analyses at 1600 Erin Street indicated that soil has been impacted above criteria by hydrocarbons in several areas of the site (Figure 3). These areas are discussed separately below.

Former Warehouse Area

No evidence of petroleum hydrocarbon impacts above criteria in soil were found in the former warehouse area at the north section of the site (TH9 and TH10). Auger refusal occurred in areas of the former warehouse and the lube oil storage area. In TH10 and TH11 (former warehouse area), wood debris was encountered at a depth of approximately 1.7 m, followed by a small void with water seeping in. This could have possibly been a former crawl space below the warehouse or an old sewer line.

Former Lube Oil Storage Area

Hydrocarbon impact in soils was detected at a depth of 1.2 to 2.3 m within the clayey silt fill and silty clay fill units at MW6 and TH12. Levels of xylenes and TSVH in the soil samples obtained exceeded the CCME criteria for Industrial Land Use and Manitoba Environment Level III Criteria. The sample chromatographs indicate that impacts are likely related to lube oil range hydrocarbons, which were historically present at this location. Vapour concentrations dropped off within the silty clay at MW6, thus confirming that impacts are confined to the fill units in this area. Within TH12 (former lube oil storage area) auger refusal occurred on concrete at a depth of approximately 2.4 m. The drill rig was moved west and MW6 was installed without any auger refusal.

Former Drum Filling Warehouse and Pump Island

Evidence of hydrocarbon impacts were detected within TH7, TH8 and MW5, located around a former warehouse and pump island. The impacts were detected at a shallow depth of 0.45 to 0.75m within the silty clay fill at TH7 and a depth of 2.15 to 2.45 m within the clayey silt unit at TH8 and MW5. Concentrations of BTEX, TVH and TSVH in MW5 were all in exceedance of applicable criteria and TH8 exceeded criteria in all parameters except TSVH. TH7 had levels of xylenes, TVH and TSVH

which were elevated above CCME and Manitoba Environment Criteria. Corresponding chromatographs indicate that the impacts are related to gasoline and diesel range hydrocarbons in TH8 and MW5, and motor oil range hydrocarbons in TH7. Vapour concentrations decreased significantly in the silty clay unit in all three holes indicating that the impacts are mainly confined to the clayey silt unit. Of the three samples sent for PAH analysis, naphthalene from sample MW5 was the only parameter that exceeded CCME Industrial Land Use Criteria, with all other samples having low to non-detectable levels.

Former AST Storage Area

Three of the six testholes drilled within the former AST storage area had concentrations that exceeded applicable criteria. Xylene, TVH and TSVH concentrations were all elevated above CCME Industrial Land Use and Manitoba Environment Level III Criteria in TH15 and MW3. TH6, in the south east corner of the former AST area, had concentrations of TVH that exceeded criteria. All impacts in this area were from within the clayey silt unit at a depth ranging from 1.85 to 2.45 m. TSVH concentrations in TH2 and MW4 were elevated however were below the applicable criteria. Chromatographs indicate that the impacts from TH15 and MW3 are similar to gasoline and diesel range hydrocarbons, while impacts from TH6 are related to gasoline range hydrocarbons. Vapours dropped off significantly within the underlying silty clay in every testhole within the former AST area except for TH15, which continued to have detectable hydrocarbon vapours extending to a depth of approximately 7.5 m.

Former Truck Unloading Area

Within the southern portion of the site, three samples exceeded criteria, TH4, TH5 (both located within the former truck unloaders) and TH3 (north of the former diesel UST). Shallow surficial soil (silty clay fill) at a depth of 0.45 to 0.75 m in TH4 exceeded criteria in all parameters tested except ethylbenzene. The silty clay at a depth of 1.2 to 1.5 m in TH5 only exceeded applicable criteria for xylenes. In the south west corner of the site, TH3 also had concentrations of xylenes in the silty clay that exceeded criteria at a depth of 2 to 2.3 m. Petroleum hydrocarbon vapours then dropped off to background levels within the silty clay unit in all three testholes. All three samples had chromatographs that indicated to gasoline and diesel range hydrocarbons. Volatile organic hydrocarbons for the soil sample collected from the silty clay within MW2 had levels below the laboratory detection limits for all parameters. Manitoba Conservation has no record of removal of

the diesel UST indicated in the historical site mapping. If still present, the UST should be removed as present regulations state that UST's must be removed after one year of disuse.

5.2 GROUNDWATER

Groundwater impacts were detected in the field duplicate at MW5 in the area of the former drum filling warehouse, with concentrations of benzene in excess of MOE Nonpotable Groundwater Criteria (Figure 4). The original sample from MW5 had concentrations of benzene that were slightly below criteria. Groundwater impacts at MW5 are likely related to the soil impacts detected within the clayey silt unit at the former drum filling warehouse location. Elevated levels of BTEX, TVH and TSVH were detected within MW3, 4, 5 and 6, however the concentrations did not exceed the relevant criteria. Groundwater in MW1 and MW2 in the south portion of the site showed minor hydrocarbon impacts.

5.3 OFF-SITE IMPACTS

Potential off-site impacts have not been defined since no off-site drilling was conducted. Based upon the results of the site investigation and the assumed direction of groundwater flow, the possibility exists that hydrocarbons may have migrated eastward towards commercial property on the east side of Erin Street (used car dealership and Petro Canada Cardlock) or to the west of the former lube oil storage area.

5.4 MANAGEMENT CONSIDERATIONS

Based upon present land use (open air equipment storage) at the subject property, the risk to human health at the site posed by hydrocarbons is considered to be low. However, if a building were to be constructed on site without any remediation measures taken, then some vapour control measures will have to be implemented, such as a geo-membrane.

Based upon our experience with Manitoba Conservation (formerly Manitoba Environment) they would likely not require remediation of the site based upon present land use, however this should be verified with Manitoba Conservation prior to development of land. If the present land use were to

change and commercial or industrial buildings were planned for the site, site remediation may be required. At a minimum, vapour control measures would be required as part of new building design to prevent exposure of workers to hydrocarbon vapours.

For budgetary purposes, the removal and disposal price for impacted soil at the BFI landfill is approximately \$60.00 per tonne. The estimated volume of impacted soil at 1600 Erin Street ranges from 10,000 to 18,000 tonnes, for an estimated landfilling cost of \$600,000 to \$1,080,000. A second option for disposal after excavation would be remediation at a single-use site. If Maple Leaf has other properties with sufficient area available, impacted soil could be remediated by land farming or biopiling on their own property. After remediation to levels below criteria the soil could be disposed of at any landfill. Single use sites require special permission from Manitoba Conservation. Additional testholes would be required to reduce uncertainties regarding the volume of soil exceeding guideline levels.

6.0 CONCLUSIONS

From the site investigations and subsequent assessment completed for 1600 Erin Street, the following conclusions can be drawn.

- Soils were impacted by hydrocarbons throughout the site at depths of approximately 0.5 to 2.5m within the fill, silty clay and clayey silt units. BTEX, TVH and TSVH concentrations were elevated above the CCME Industrial Land Use and Manitoba Environment Level III guideline levels at the former lube oil storage, pump island and warehouse, truck unloaders, AST and UST areas. Soil was petroleum hydrocarbon impacted above applicable criteria throughout the site except for areas on the north, south and west borders of the site. The estimated quantity of soil exceeding guideline levels is 10,000 to 18,000 tonnes.
- Groundwater hydrocarbon concentrations were elevated above guideline levels in one monitoring well. The remaining five wells all showed some evidence of hydrocarbon impact although below guideline levels.
- It is possible that impacts may have migrated off site, however without further investigations this cannot be confirmed.
- Manitoba Conservation has no record of a former diesel UST being removed from the site. If still present, it should be removed as prescribed by regulation since it has been abandoned for more than one year.
- Based upon present land use the risk to human health at the site posed by hydrocarbons is considered to be low.
- If land use were to change, possible remediation or vapour control measures may be necessary.

7.0 CLOSURE

The conclusions presented in this report are based upon the field and laboratory results completed for this study. The number, locations, and depths of the monitoring wells and testholes were completed within the site in order to obtain the information used to formulate our conclusions. Since the investigation was based on a limited scope of work, if any modifications at the site area are made or additional information becomes available, KGS Group recommends that we be provided the opportunity to review the findings provided herein to determine whether any changes are appropriate.

8.0 REFERENCES

1. American Society for Testing and Materials, D5092-90, Standard Practice for Design and Installation of Groundwater Monitoring Wells in Aquifers, June 1990.
2. Canadian Council of Ministers of the Environment. 1997. Recommended Canadian Soil Quality Guidelines.
3. Environment Canada. 1961 - 1990. Canadian Climate Normals; Prairie Provinces.
4. Manitoba Environment. 1993. A Guideline for the Environmental Investigation and Remediation of Petroleum Storage Sites in Manitoba.
5. Manitoba Energy and Mines. 1990. Bedrock Geology Compilation Map Series. Winnipeg, NTS 62 H. Scale 1:250,000.
6. Ontario Ministry of Environment and Energy. 1997. Guideline for Use at Contaminated Sites in Ontario, Table B – Groundwater Criteria for a Nonpotable Groundwater Condition.
7. University of Manitoba Department of Engineering. 1983. Geological Engineering Maps & Report for Urban Development of Winnipeg. Plate 4, Depth to Bedrock. Scale 1:50,000.
8. University of Manitoba Department of Engineering. 1983. Geological Engineering Maps & Report for Urban Development of Winnipeg. Plate 5, North-South Stratigraphic Cross-Section. Scale 1:50,000.
9. University of Manitoba Department of Engineering. 1983. Geological Engineering Maps & Report for Urban Development of Winnipeg. Plate 8, Waste Disposal Sites. Scale 1:50,000.
10. University of Manitoba Department of Engineering. 1983. Geological Engineering Maps & Report for Urban Development of Winnipeg. Plate 12, Potentiometric Surface Upper Carbonate Aquifer, September 1980. Scale 1:50,000.

TABLES

TABLE 1
GROUNDWATER MONITORING DATA
1600 ERIN STREET, WINNIPEG

Well No.	Surface Elevation (1)	Reference Elevation(1)/(2)	Screen Zone		Groundwater Elevation (1)	Free Product Thickness
			Elevation (1)	Soil Type		
					30-Nov-99	
MW1	98.993	98.858	98.08 - 94.42	Silty Clay/Clayey Silt	97.48	-
MW2	98.994	98.848	97.77 - 94.42	Silty Clay/Clayey Silt	97.57	-
MW3	99.246	99.131	98.03 - 93.46	Silty Clay/Clayey Silt	97.51	sheen
MW4	99.071	98.921	97.85 - 92.97	Silty Clay/Clayey Silt	97.33	-
MW5	98.994	98.835	97.77 - 92.89	Silty Clay Fill/Clayey Silt/Silty Clay	97.49	slight sheen
MW6	99.016	98.954	97.80 - 94.45	Clayey Silt Fill/Silty Clay Fill	97.83	slight sheen

Notes:

1. All measurements in metres.
2. Top of plastic well casing surveyed as well elevation. Depth to groundwater measured from the top of plastic casing.
3. For location of monitoring wells, See Figure 3.

TABLE 2
GENERAL GROUNDWATER CHEMISTRY
1600 ERIN STREET, WINNIPEG

Location	Sampling Date	pH	Electrical Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	Temperature (°C)
MW1	01/12/99	6.9	>1,990	10.5	8.4
MW2	01/12/99	7.3	1,740	10.4	8.1
MW3	01/12/99	7.1	1,480	6.84	9.9
MW4	01/12/99	7.2	1,460	10.4	8.4
MW5	01/12/99	6.9	1,380	9.38	9.3
MW6	01/12/99	9.1	>1,990	7.73	9.4

TABLE 3
PETROLEUM HYDROCARBONS IN SOIL
1600 ERIN STREET, WINNIPEG

Sample No. (1)	Depth (m)	Soil Type	Field Vapour Reading (ppm)	Parameter (1,2)						
				Benzene	Toluene	Ethyl-benzene	Xylenes (o, -m, -p)	Total Volatile (<C ₁₀) Hydrocarbons	Total Semivolatile (C ₁₁ -C ₃₂) Hydrocarbons	Mineral Oil and Grease
MW1-3 (7)	2.15-2.45	Silty Clay	40	nd	nd	nd	nd	nd	133	—
MW2-5	3.65-3.95	Silty Clay	307	nd	nd	nd	nd	nd (6)	nd	—
MW2-5 Lab Dup.				nd	nd	nd	nd	nd (6)	nd	—
MW3-3 (8)	2.15-2.45	Clayey Silt	1,477	2.44	1.02	9.86	29.6	2,350	3,180	—
MW4-4 (8)	2.75-3.05	Clayey Silt	1,457	0.52	0.26	1.46	5.09	209	1,180	—
MW7-3 (8) Field Dup. MW4-4				0.97	0.56	4.02	14	672	1,290	—
MW5-3 (8)	2.15-2.45	Clayey Silt	1,561	85.4	250	103	494	9,680	10,100	—
MW6-2 (9)	1.2-1.5	Clayey Silt Fill	311	nd	0.33	1.89	40.8	280	4,980	2,860
TH1-4 (8)	2.75-3.05	Silty Clay	1,043	nd	nd	0.43	0.43	62	156	—
TH1-4 Lab Dup.				nd	nd	0.38	0.42	64	152	—
TH2-4 (9)	2.75-3.05	Silty Clay	1,002	nd	nd	0.96	1.47	213	1,560	—
TH3-3 (8)	2.0-2.3	Silty Clay	1,803	0.74	0.39	12.8	22.4	314	730	nd
TH4-1 (8)	0.45-0.75	Silty Clay Fill	1,483	46.7	15.7	164	1,180	9,740	14,800	—
TH5-2 (9)	1.2-1.5	Silty Clay	513	0.49	3.42	9.44	20.8	541	14,900	—
TH6-3 (8)	1.85-2.15	Clayey Silt	1,663	nd	0.34	5.2	13.8	1,500	166	—
TH7-1 (9)	0.45-0.75	Silty Clay Fill	1,506	2.56	2.9	10.9	77.9	1,320	4,500	3,290
TH8-3 (9)	2.15-2.45	Clayey Silt	1,597	16.7	26.2	28.3	123	3,250	1,700	—
TH9-3 (10)	1.85-2.15	Clayey Silt	33	nd	nd	0.11	0.40	nd	44.3	—
TH10-3 (10)	2.6-2.9	Silty Clay	128	nd	nd	0.05	0.17	nd	153	—
TH12-3 (9)	2.0-2.3	Silty Clay Fill	535	0.93	5.96	5.10	20.6	202	4,820	—
TH13-3 (8)	1.85-2.15	Clayey Silt	1,100	nd	nd	1.21	3.54	182	542	—
TH14-3 (9)	2.15-2.45	Clayey Silt	534	nd	0.07	1.33	1.13	143	1,870	—

TABLE 3 (CONT'D)
PETROLEUM HYDROCARBONS IN SOIL
1600 ERIN STREET, WINNIPEG

Sample No. (1)	Depth (m)	Soil Type	Field Vapour Reading (ppm)	Parameter (1,2)					Total Semivolatiles (C ₁₁ -C ₃₂) Hydrocarbons	Mineral Oil and Grease
				Benzene	Toluene	Ethylbenzene	Xylenes (o, -m, -p)	Total Volatile (<C ₁₀) Hydrocarbons		
TH15-3 (3)	2.0-2.3	Clayey Silt	861	0.41	0.78	8.67	23	1,210	11,900	
Estimated Quantitation Limit				0.02	0.02	0.02	0.04	10	10	100
CCME Environmental Quality Guidelines (3)										
Industrial Land Use				5	25 (11)	20	20	800 (5)	2,000 (5)	5,000 (5)

Notes:

nd - not detected

1. All values are expressed in milligrams per kilogram mg/kg.

2. Soil samples obtained on November 25 and 26, 1999.

3. CCME - Canadian Council of Ministers of the Environment, Canadian Environmental Quality Guidelines, 1999.

Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health

4. Manitoba Environment, "Guideline for The Environmental Investigation and Remediation of Petroleum Storage Sites in Manitoba", July 1993.

5. Level III - Low Risk

6. Analysed as Total Purgeable Hydrocarbons

7. Contaminant elutes in the diesel range, but does not match lab reference standard.

8. Contaminant elutes in the gasoline/diesel range, but does not match lab reference standard.

9. Contaminant elutes across the gasoline/diesel/motor oil range, but does not match lab reference standard.

10. Contaminant elutes in the motor oil range, but does not match lab reference standard.

11. Value of 25 mg/kg applied, because groundwater in this area is neither used for drinking, nor recharges to surface water.

- Exceedance of CCME and Manitoba Environment Guidelines

TABLE 4
VOLATILE ORGANIC COMPOUNDS IN SOIL
1600 ERIN STREET, WINNIPEG

Parameter (^{1,2})	Estimated Quantitation Limit	Method Blank	MW2-5 Silty Clay 3.7-4.0 m	Lab. Dup. of MW2-5	Canadian Soil Quality Guidelines (*) Industrial Land Use
Chloromethane	1.0	nd	nd	nd	50
Vinyl Chloride	0.5	nd	nd	nd	50
Bromomethane	1.0	nd	nd	nd	-
Chloroethane	1.0	nd	nd	nd	50
Trichlorofluoromethane	0.2	nd	nd	nd	-
Acetone	10.0	nd	nd	nd	
1,1-Dichloroethene	0.1	nd	nd	nd	50
Dichloromethane (Methylene Chloride)	0.5	nd	nd	nd	50
trans-1,2-Dichloroethene	0.1	nd	nd	nd	50
Methyl-t-Butyl Ether	0.1	nd	nd	nd	-
1,1-Dichloroethane	0.1	nd	nd	nd	50
Methyl Ethyl Ketone (MEK)	0.5	nd	nd	nd	-
cis-1,2-Dichloroethene	0.1	nd	nd	nd	50
Chloroform	0.1	nd	nd	nd	50
1,2-Dichloroethane	0.1	nd	nd	nd	50
1,1,1-Trichloroethane	0.1	nd	nd	nd	50
Carbon Tetrachloride	0.1	nd	nd	nd	50
Benzene	0.05	nd	nd	nd	5
1,2-Dichloropropane	0.1	nd	nd	nd	50
Trichloroethene	0.1	nd	nd	nd	31
Bromodichloromethane	0.1	nd	nd	nd	-
cis-1,3-Dichloropropene	0.1	nd	nd	nd	50
Methyl Isobutyl Ketone (MIBK)	5.0	nd	nd	nd	-
trans-1,3-Dichloropropene	0.1	nd	nd	nd	50
1,1,2-Trichloroethane	0.1	nd	nd	nd	50
Toluene	0.1	nd	nd	nd	0.8
2-Hexanone	5.0	nd	nd	nd	-
Dibromochloromethane	0.1	nd	nd	nd	-
1,2-Dibromoethane (Ethylene Dibromide)	0.1	nd	nd	nd	-
Tetrachloroethene (Perchloroethylene)	0.1	nd	nd	nd	0.6
1,1,1,2-Tetrachloroethane	0.1	nd	nd	nd	50

TABLE 4 (CONT'D)
VOLATILE ORGANIC COMPOUNDS IN SOIL
1600 ERIN STREET, WINNIPEG

Parameter (^{1,2})	Estimated Quantitation Limit	Method Blank	MW2-5 Silty Clay 3.7-4.0 m	Lab. Dup. of MW2-5	Canadian Soil Quality Guidelines (³) Industrial Land Use
Chlorobenzene	0.1	nd	nd	nd	10
Ethyl Benzene	0.1	nd	nd	nd	20
m,p-xylenes	0.1	nd	nd	nd	20
Bromoform	0.1	nd	nd	nd	-
Styrene	0.1	nd	nd	nd	50
1,1,2,2-Tetrachloroethane	0.1	nd	nd	nd	50
o-xylene	0.1	nd	nd	nd	20
1,3-Dichlorobenzene	0.1	nd	nd	nd	10
1,4-Dichlorobenzene	0.1	nd	nd	nd	10
1,2-Dichlorobenzene	0.1	nd	nd	nd	10

Notes:

nd - Not Detected

1. All concentrations in µg/g dry weight.

2. Soil sampled on November 25, 1999.

3. Canadian Council of Ministers of the Environment (CCME), Canadian Environmental Quality Guidelines, 1999.
Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health

- Exceedance of CCME Soil Criteria for Industrial Land Use

TABLE 5
POLYNUCLEAR AROMATIC HYDROCARBONS IN SOIL
1600 ERIN STREET, WINNIPEG

Parameter (¹)	Estimated Quantitation Limit	Method Blank	Sample No. (²)			Canadian Soil Quality Guidelines for Industrial Land Use (³)	MOEE (1997) (⁴) Industrial/Commercial Land Use, Nonpotable Groundwater Condition, Surface Soil
			MW5-3 Clayey Silt 2.1-2.4 m	TH12-3 Clayey Silt 2.0-2.3 m	Lab. Dup. of TH12-3	TH15-3 Clayey Silt 2.0-2.3 m	
Naphthalene	0.05	nd	43.6	4.97	5.26	18.4	40
2-Methylnaphthalene	0.05	nd	121	17.4	14.5	49.1	280 (1,600)
1-Methylnaphthalene	0.05	nd	69.6	11.9	10.1	37.6	280 (1,600)
Acenaphthylene	0.05	nd	nd	nd	nd	nd	840
Acenaphthene	0.05	nd	2.53	0.56	0.58	1.61	1,300
Fluorene	0.05	nd	3.74	0.99	0.95	3.16	350
Phenanthrene	0.05	nd	3.91	1.07	1.07	2.5	40
Anthracene	0.05	nd	0.34	0.13	1.05	0.29	28
Fluoranthene	0.05	nd	0.23	0.1	0.14	0.73	40
Pyrene	0.05	nd	0.26	0.2	0.21	0.49	250
Benzo(a)anthracene	0.05	nd	0.07	0.42	0.4	0.17	40
Chrysene	0.05	nd	0.08	0.46	0.46	0.18	19
Benzo(b)fluoranthene	0.05	nd	nd	nd	nd	nd	19
Benzo(k)fluoranthene	0.05	nd	nd	nd	nd	nd	19
Benzo(a)pyrene	0.05	nd	nd	nd	nd	nd	1.9
Indeno(1,2,3-c,d)pyrene	0.05	nd	nd	nd	nd	nd	19
Dibenzo(a,h)pyrene	0.05	nd	nd	nd	nd	nd	-
Benzo(g,h,i)perylene	0.05	nd	nd	nd	nd	nd	40

Notes:

nd - not detected

1. All values are expressed in µg/g dry weight.

2. Soil sample obtained on November 25-26, 1999.

3. Canadian Council of Ministers of the Environment (CCME), Canadian Environmental Quality Guidelines, 1999. Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health

4. MOEE 1997 - Ontario Ministry of Environment and Energy. Guideline for Use at Contaminated Sites in Ontario.

Table B - Surface Soil Criteria for Industrial/Commercial Land Use for a Nonpotable Groundwater Condition.

Criteria in brackets applies to medium and fine textured soils.

- Exceedance of Canadian Soil Quality Guidelines

TABLE 6
PETROLEUM HYDROCARBONS IN GROUNDWATER
1600 ERIN STREET, WINNIPEG

Sample No.	Date	Parameter (1)					Total Volatile Hydrocarbons	Total Semivolatile (C ₁₁ - C ₃₂) Hydrocarbons
		Benzene	Toluene	Ethylbenzene	Xylenes (o, -m, -p)			
MW1 (5)	01-Dec-99	0.80	0.6	0.8	0.6		Trace	Trace
MW1 Lab Rep. (5)	01-Dec-99	0.70	0.6	0.8	0.6		Trace	Trace
MW2 (4)	01-Dec-99	7.40	1.1	17.3	0.5		340	848
MW3 (4)	01-Dec-99	4,750	1410	363	2,016		9,100 (3)	22,200
MW3 Lab Rep.	01-Dec-99	4,680	1380	380	2,117		10,000 (3)	-
MW4 (4)	01-Dec-99	2,820	197	296	1,300		12,000	4,010
MW5 (6)	01-Dec-99	11,700	8,830	763	4,290		51,000	3,730
MW7 (6) Field Dup. of MW5		12,700	9,800	833	4,730		37,000	4,400
MW6 (6)	01-Dec-99	109	553	257	1,150		8,100	5,630
Estimated Quantitation Limit		0.2	0.2	0.2	0.4		100	100
MOEE (2) (1997)								
Nonpotable Groundwater Criteria		1,900 (12,000)	5,900 (37,000)	28,000 (50,000)	5,600 (35,000)		N/V	

Notes:

N/V - No value

1. All concentrations in µg/L.

2. MOEE 1997 - Ontario Ministry of Environment and Energy. Guideline for Use at Contaminated Sites in Ontario, Table B - Groundwater Criteria for a Nonpotable Groundwater Condition. () - Groundwater criterion value in brackets applies to medium and fine textured soils.

3. Analysed as Total Purgeable Hydrocarbons

4. Contaminant elutes in the gasoline/diesel range, but does not match lab reference standard.

5. Contaminant elutes across the gasoline/kerosene range, but does not match lab reference standard.

6. Contaminant elutes across the gasoline/diesel/motor oil range, but does not match lab reference standard.

- Exceedance of MOEE Nonpotable Groundwater Criteria

TABLE 7
POLYNUCLEAR AROMATIC HYDROCARBONS IN GROUNDWATER
1600 ERIN STREET, WINNIPEG

Parameter (¹)	EQL	Method Blank	MW4 (²)	MOEE (1997) (³) Nonpotable Groundwater Condition
Naphthalene	0.2	nd	60.6	(6,200) 5,900
2-Methylnaphthalene	0.2	nd	69.7	13,000
1-Methylnaphthalene	0.2	nd	47.9	13,000
Acenaphthylene	0.2	nd	0.4	2,000
Acenaphthene	0.2	nd	1.5	1,700
Fluorene	0.2	nd	2.5	290
Phenanthrene	0.2	nd	1.1	63
Anthracene	0.2	nd	nd	12
Fluoranthene	0.2	nd	nd	130
Pyrene	0.2	nd	nd	40
Benzo(a)anthracene	0.2	nd	nd	5
Chrysene	0.2	nd	nd	3
Benzo(b)fluoranthene	0.2	nd	nd	7
Benzo(k)fluoranthene	0.2	nd	nd	0.4
Benzo(a)pyrene	0.2	nd	nd	1.9
Indeno(1,2,3-c,d)pyrene	0.2	nd	nd	0.27
Dibenzo(a,h)anthracene	0.2	nd	nd	0.25
Benzo(g,h,i)perylene	0.2	nd	nd	0.2

Notes:

EQL - Estimated Quantitation Limit

nd - Not detected above EQL

1. All values are expressed in micrograms per litre (µg/L).

2. Groundwater samples obtained on December 1, 1999.

3. MOEE 1997 - Ontario Ministry of Environment and Energy. Guideline for Use at Contaminated Sites in Ontario, Table B - Groundwater Criteria for a Nonpotable Groundwater Condition.

() - Criterion value in brackets applies to medium and fine textured soils.

- Exceedance of MOEE Nonpotable Groundwater Criteria

TABLE 8
VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER
1600 ERIN STREET, WINNIPEG

Parameter (^{1,2})	Estimated Quantitation Limit	Method Blank	Sample Location (²)		MOEE (1997) (³) Nonpotable Groundwater Condition
			MW3 DF=500	MW3 Lab Dup. DF=500	
Chloromethane	1.0	nd	nd	nd	-
Vinyl Chloride	0.5	nd	nd	nd	0.5 (1.3)
Bromomethane	0.5	nd	nd	nd	3.7 (16)
Chloroethane	0.5	nd	nd	nd	-
Trichlorofluoromethane	0.5	nd	nd	nd	-
Acetone	10.0	nd	nd	nd	3,300
1,1-Dichloroethene	0.2	nd	nd	nd	0.66 (4.1)
Dichloromethane (Methylene Chloride)	1.0	nd	nd	nd	50,000
trans-1,2-Dichloroethene	0.2	nd	nd	nd	100
Methyl-t-Butyl Ether	0.2	nd	nd	nd	50,000
1,1-Dichloroethane	0.2	nd	nd	nd	9,000 (50,000)
Methyl Ethyl Ketone (MEK)	5.0	nd	nd	nd	50,000
cis-1,2-Dichloroethene	0.2	nd	nd	nd	70
Chloroform	0.2	nd	nd	nd	430 (2,700)
1,2-Dichloroethane	0.2	nd	nd	nd	17 (110)
1,1,1-Trichloroethane	0.2	nd	nd	nd	200
Carbon Tetrachloride	0.2	nd	nd	nd	17 (100)
Benzene	0.1	nd	4,750	4,680	1,900 (12,000)
1,2-Dichloropropane	0.2	nd	nd	nd	9.3 (58)
Trichloroethene	0.2	nd	nd	nd	50
Bromodichloromethane	0.2	nd	nd	nd	50,000
cis-1,3-Dichloropropene	0.2	nd	nd	nd	-
Methyl Isobutyl Ketone (MIBK)	5.0	nd	nd	nd	50,000
trans-1,3-Dichloropropene	0.2	nd	nd	nd	-
1,1,2-Trichloroethane	0.2	nd	nd	nd	16,000 (50,000)
Toluene	0.2	nd	1,410	1,380	5,900 (37,000)
2-Hexanone	5.0	nd	nd	nd	-
Dibromochloromethane	0.2	nd	nd	nd	50,000
1,2-Dibromoethane (Ethylene Dibromide)	0.2	nd	nd	nd	3.3 (21)
Tetrachloroethene (Perchloroethylene)	0.2	nd	nd	nd	5.0
1,1,1,2-Tetrachloroethane	0.2	nd	nd	nd	6.0 (38)
Chlorobenzene	0.2	nd	nd	nd	500

TABLE 8 (CONT'D)
VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER
1600 ERIN STREET, WINNIPEG

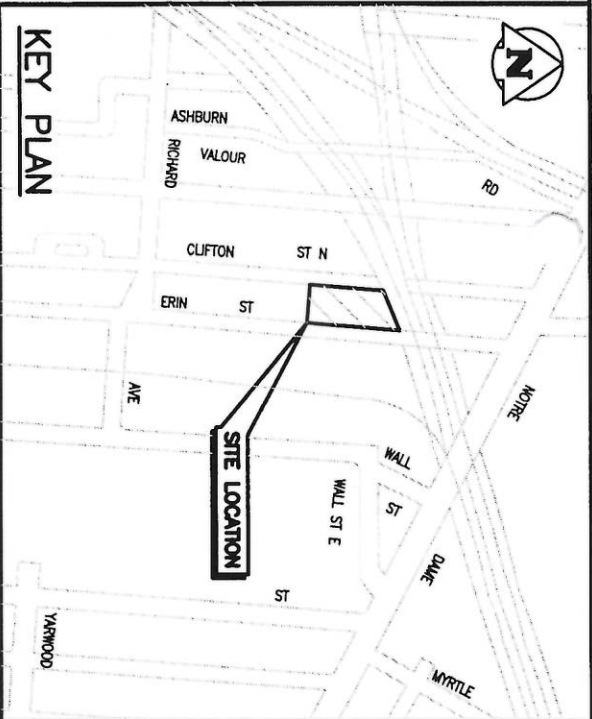
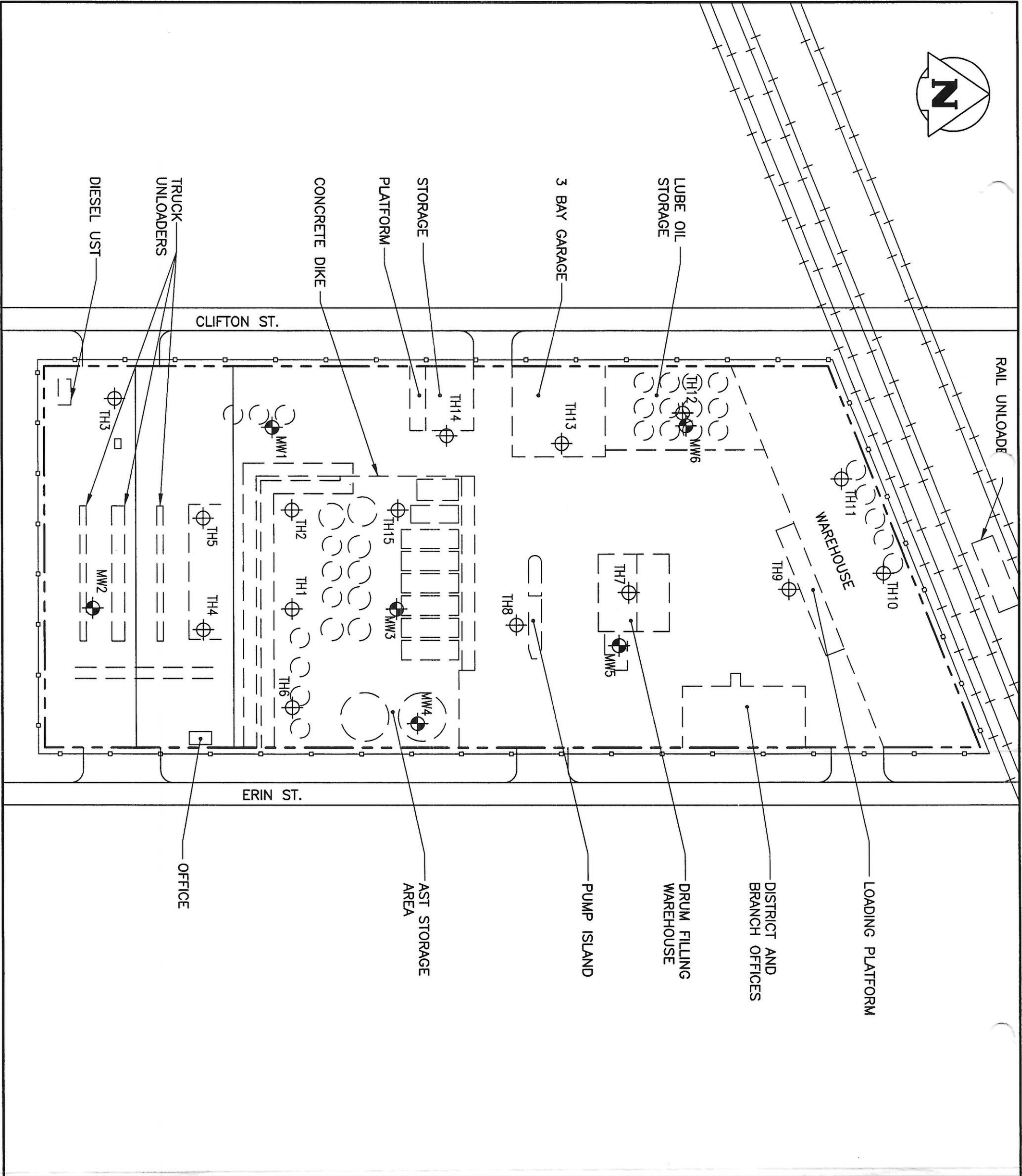
Parameter (^{1,2})	Estimated Quantitation Limit	Method Blank	Sample Location (²)		MOEE (1997) (³) Nonpotable Groundwater Condition
			MW3 DF=500	MW3 Lab Dup. DF=500	
Ethylbenzene	0.2	nd	363	380	28,000 (50,000)
m,p-Xylenes	0.2	nd	1,570	1,650	5,600 (35,000) (⁴)
Bromoform	0.2	nd	nd	nd	840 (5,200)
Styrene	0.2	nd	nd	nd	940 (5,900)
1,1,2,2-Tetrachloroethane	0.2	nd	nd	nd	22 (140)
o-Xylene	0.2	nd	446	467	5,600 (35,000) (⁴)
1,3-Dichlorobenzene	0.2	nd	nd	nd	7,600
1,4-Dichlorobenzene	0.2	nd	nd	nd	7,600
1,2-Dichlorobenzene	0.2	nd	nd	nd	7,600

Notes:

1. All values are expressed in micrograms per litre (µg/L).
2. Water sampled on December 1, 1999.
3. MOEE 1997 - Ontario Ministry of Environment and Energy. Guideline for Use at Contaminated Sites in Ontario, Table B - Groundwater Criteria for a Nonpotable Groundwater Condition.
() - Criterion value in brackets applies to medium and fine textured soils.
4. As for m-,o-,p-xylenes

 - Exceedance of MOEE Nonpotable Groundwater Criteria

FIGURES



- LEGEND**
- PROPERTY BOUNDARY
 - FORMER STRUCTURE
 - FORMER ASTS
 - MONITORING WELL
 - TESTHOLE
 - FENCE LINE



KGS GROUP

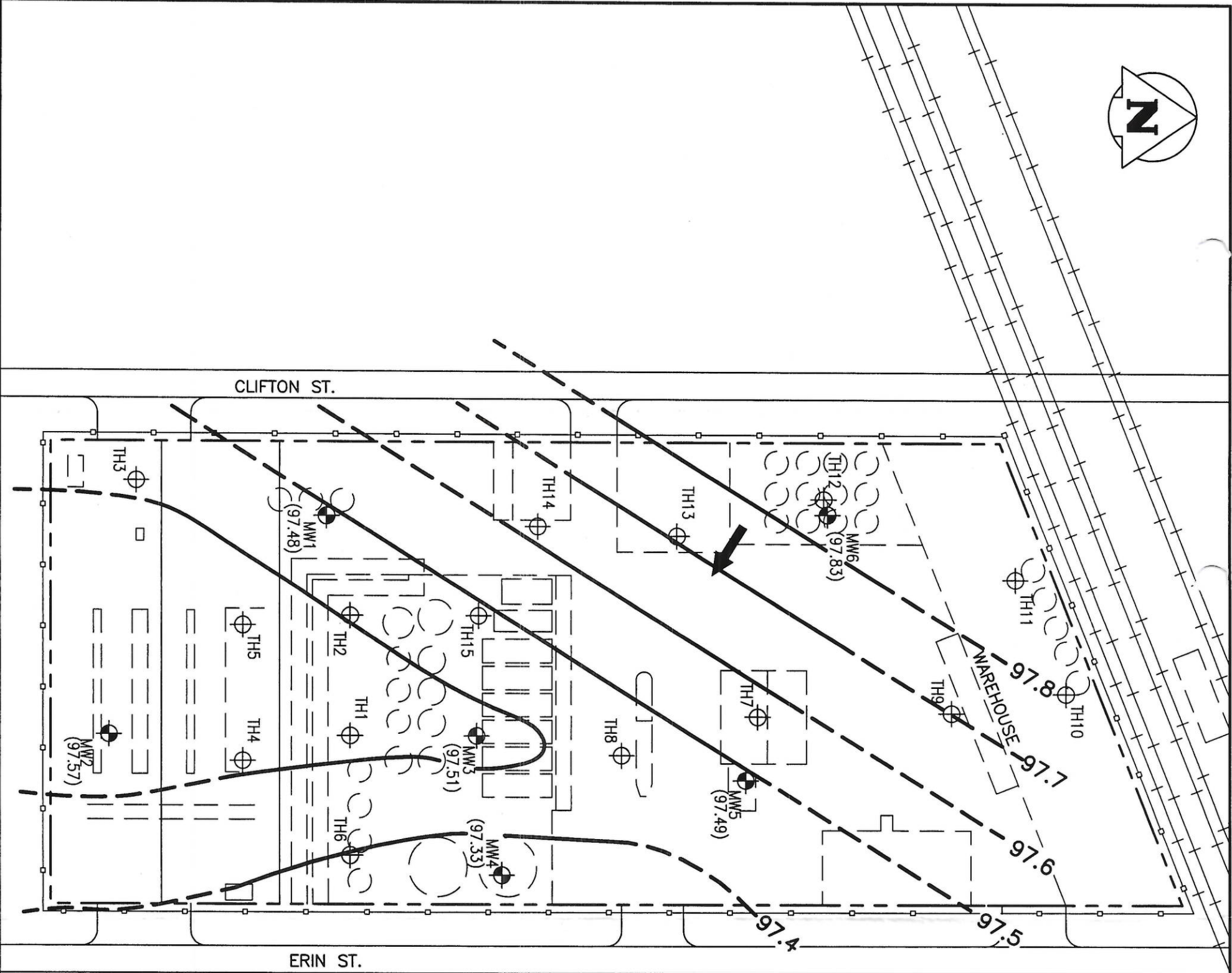
1999 PHASE II ESA - 1600 ERIN STREET

MAPLE LEAF CONSTRUCTION

SITE LOCATION PLAN - MONITORING WELL AND TESTHOLE LOCATIONS AND FORMER STRUCTURES

JANUARY 2000

FIGURE 1



LEGEND

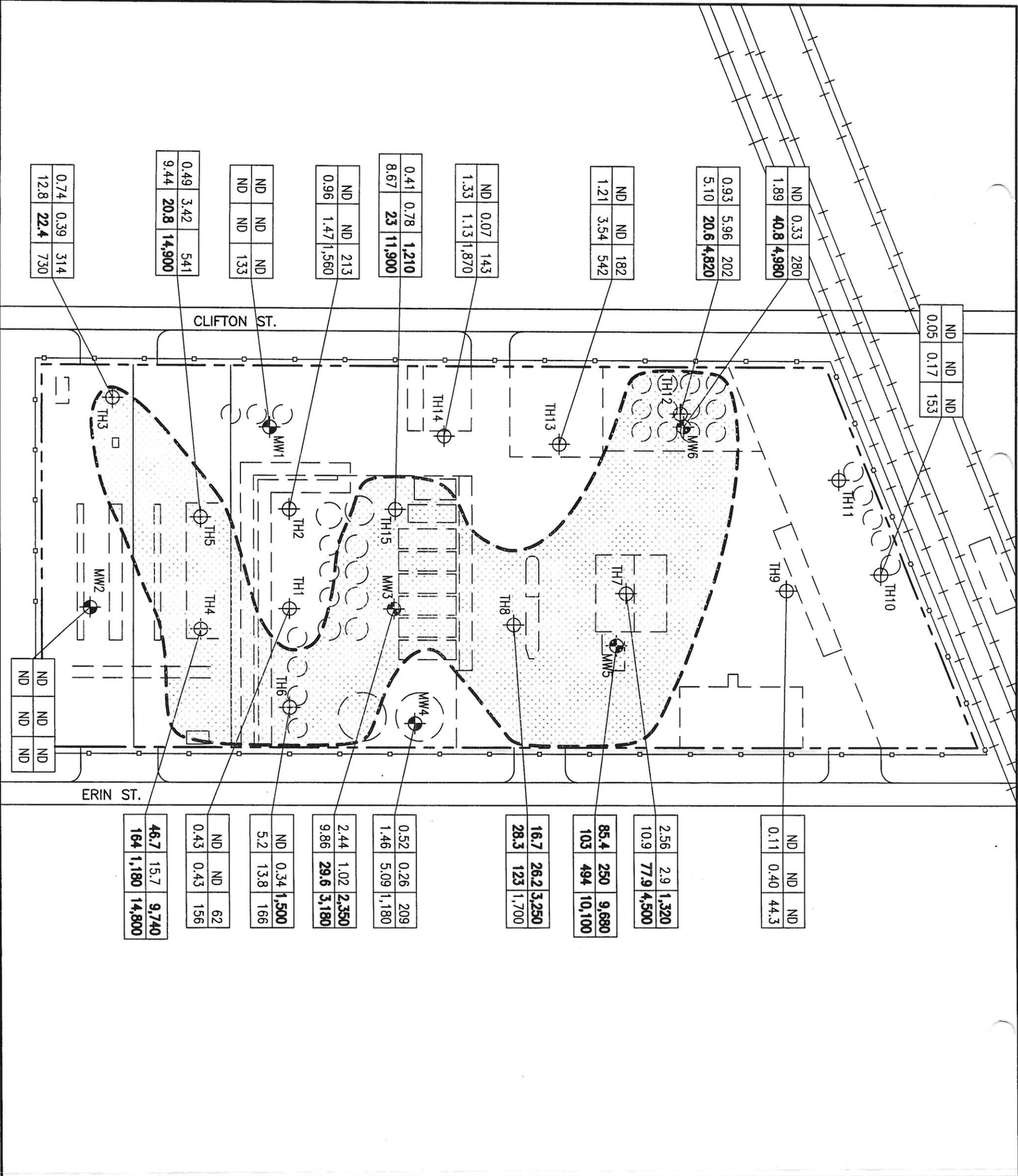
- PROPERTY BOUNDARY
- FORMER STRUCTURE
- FORMER ASTs
- MONITORING WELL
- TESTHOLE
- FENCE LINE
- LOCAL GROUNDWATER ELEVATIONS (m)
- 98.2 — LOCAL GROUNDWATER CONTOURS
- ASSUMED DIRECTION OF GROUNDWATER FLOW



KGS GROUP MAPLE LEAF CONSTRUCTION

1999 PHASE II ESA — 1600 ERIN STREET

GROUNDWATER CONTOURS & ELEVATIONS



LEGEND

- PROPERTY BOUNDARY
- FORMER STRUCTURE
- FORMER ASTs
- MONITORING WELL
- TESTHOLE
- FENCE LINE

B	T	TVH
E	X	TSVH

BTEX CONCENTRATION TOTAL VOLATILE HYDROCARBONS (TVH) AND TOTAL SEMIVOLATILE HYDROCARBON (TSVH) CONCENTRATIONS IN SOIL (mg/kg)

ND
PARAMETER CONCENTRATION BELOW MINIMUM DETECTABLE CONCENTRATION

4,500
BTEX, AND/OR TVH, AND/OR TSVH CONCENTRATION IN SOIL ELEVATED ABOVE MANITOBA ENVIRONMENT LEVEL III AND/OR CCME, INDUSTRIAL LAND USE CRITERIA

CONCENTRATION OF BTEX, AND/OR TVH, AND/OR TSVH IN SOIL ELEVATED ABOVE APPLICABLE CRITERIA

0 10 20 30 40m

SCALE 1:600

KGS GROUP

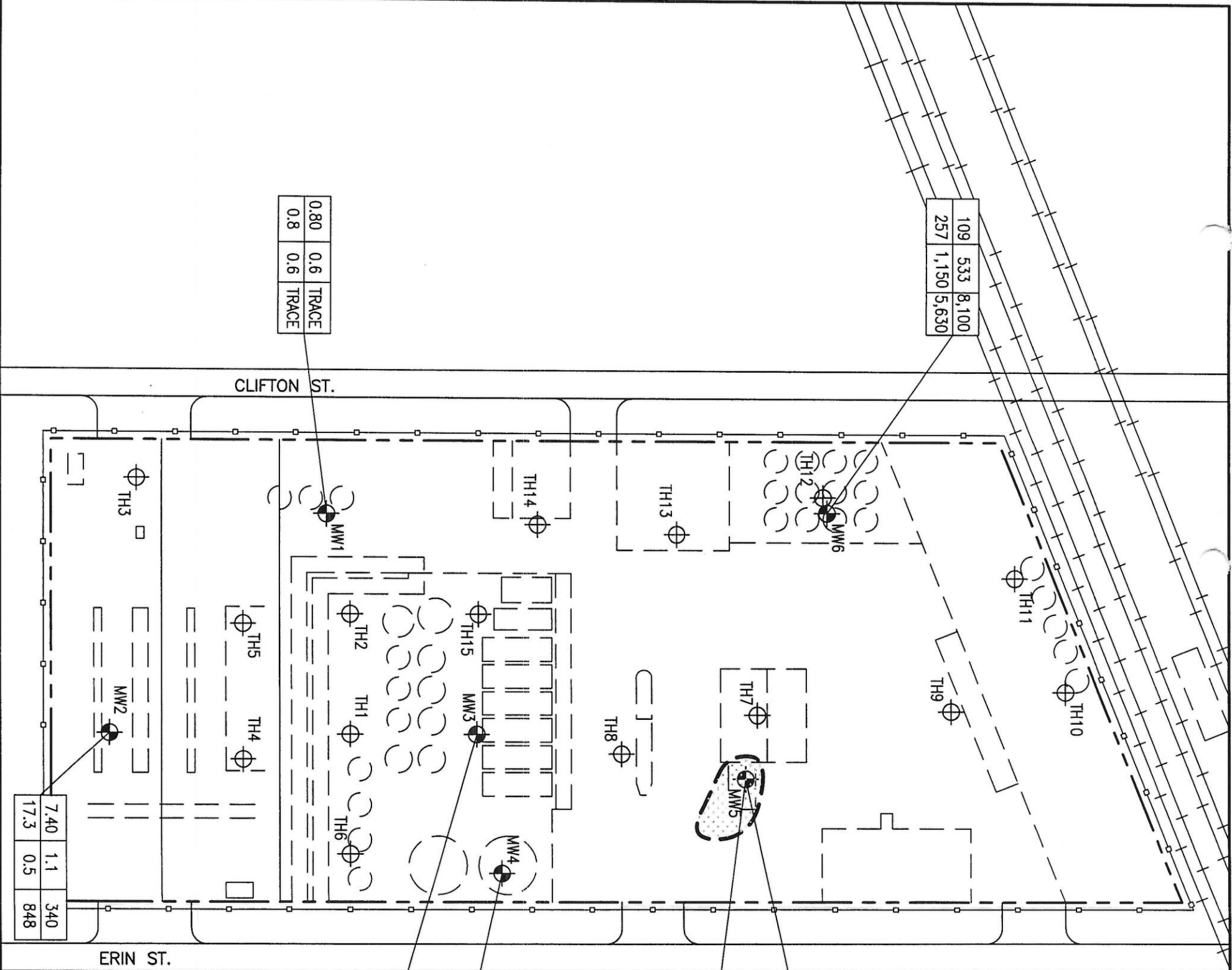
MAPLE LEAF CONSTRUCTION

1999 PHASE II ESA - 1600 ERIN STREET

HYDROCARBON IMPACTED SOIL

JANUARY 2000

FIGURE 3



FIELD DUPLICATE			
12,700	9,800	37,000	
833	4,730	4,400	

11,700	8,830	51,000	
763	4,290	3,730	

2,820	197	12,000	
296	1,300	4,010	

4,750	1,410	9,100	
363	2,016	22,200	

- LEGEND**
- PROPERTY BOUNDARY
 - FORMER STRUCTURE
 - FORMER ASTs
 - MONITORING WELL
 - TESTHOLE
 - FENCE LINE

B	T	TVH
E	X	TSVH

BTEX CONCENTRATION TOTAL VOLATILE HYDROCARBONS (TVH) AND TOTAL SEMIVOLATILE HYDROCARBON (TSVH) CONCENTRATIONS IN GROUNDWATER (ug/L)

4,500
BTEX, AND/OR TVH, AND/OR TSVH CONCENTRATION IN GROUNDWATER ABOVE MOEE NONPOTABLE GROUNDWATER CRITERIA

CONCENTRATION OF BENZENE IN GROUNDWATER ELEVATED ABOVE APPLICABLE CRITERIA



KGS GROUP
MAPLE LEAF CONSTRUCTION
1999 PHASE II ESA - 1600 ERIN STREET
HYDROCARBON IMPACTED GROUNDWATER

APPENDIX A
TESTHOLE LOGS

CLIENT MAPLE LEAF CONSTRUCTION
PROJECT PHASE II ENVIRONMENTAL SITE ASSESSMENT
SITE 1600 ERIN STREET, WINNIPEG

JOB NO. 99-570-02

DATE
DRILLED 25/11/1999 - 26/11/1999

ELEV. (m)	DEPTH (m)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	PIEZ. LOG	DEPTH (m)	SAMPLE TYPE NUMBER	FIELD HEADSPACE TEST			
							Photoionizable Vapours (ppm) ●			
							500	1000	1500	2000
SOIL DESCRIPTION										
			<u>ASPHALT</u>							
			<u>CONCRETE</u>							
			<u>GRANULAR FILL/SAND AND GRAVEL FILL</u>							
			<u>SILTY CLAY FILL</u>							
			<u>CLAYEY SILT FILL</u>							
			<u>CINDER FILL</u>							
			<u>SAND FILL</u>							
			<u>SILTY CLAY</u>							
			<u>CLAYEY SILT</u>							
PIEZOMETRIC LOG										
			Solid pipe with bentonite plug backfill -Pipe consists of Schedule 40 PVC 50 mm dia., threaded joints							
			Pipe with silica sand backfill							
			Slotted pipe with 0.65 mm silica sand backfill -No. 10 slotted screen PVC pipe with filter sock, and friction fit PVC end plugs							
			Sloughed material							
			Bentonite plug backfill							

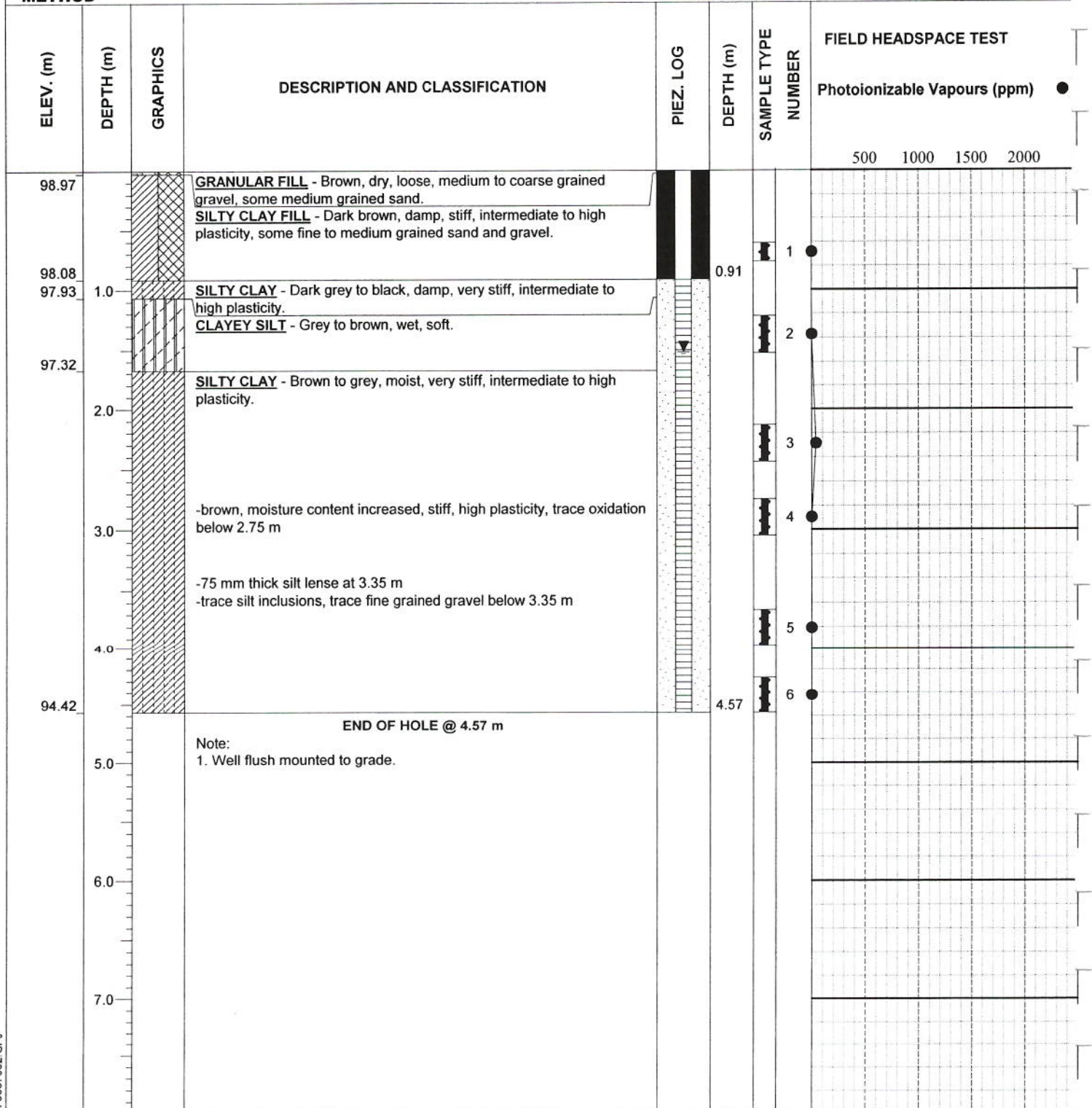
SAMPLE TYPE  GRAB FROM BUCKET  SHELBY  SPLIT BARREL  AUGER GRAB

CONTRACTOR _____ **INSPECTOR** _____

APPROVED *LBV* **DATE** 28/01/00

CLIENT MAPLE LEAF CONSTRUCTION
PROJECT PHASE II ENVIRONMENTAL SITE ASSESSMENT
SITE 1600 ERIN STREET, WINNIPEG
LOCATION Former Lube Oil Storage - Southwest Corner
DRILLING METHOD 125 mm dia. Solid Stem Auger, CT 250 Canterra

JOB NO. 99-570-02
GROUND ELEV. 98.99 m, local
TOP OF PVC ELEV. 98.86 m
WATER ELEV. 97.48 m, 30/11/99
DATE DRILLED 25/11/99



SAMPLE TYPE ☒ GRAB FROM BUCKET ☐ SHELBY ☐ SPLIT SPOON ☐ SPLIT BARREL ☐ AUGER GRAB

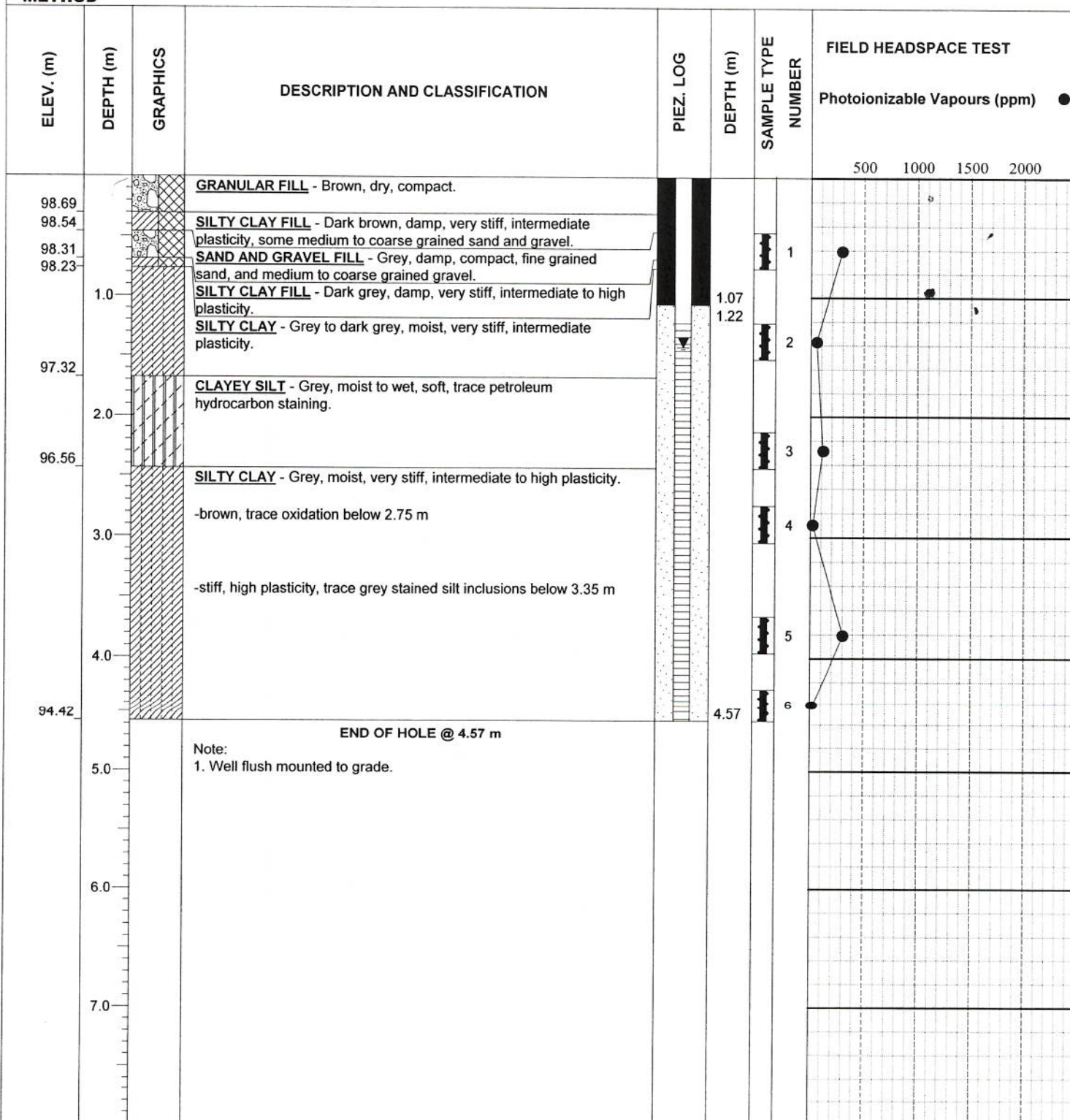
CONTRACTOR
Paddock Drilling Ltd.

INSPECTOR
D. KASUR

APPROVED *LBO* DATE 28/01/00

CLIENT MAPLE LEAF CONSTRUCTION
PROJECT PHASE II ENVIRONMENTAL SITE ASSESSMENT
SITE 1600 ERIN STREET, WINNIPEG
LOCATION Former Truck Unloading Area
DRILLING METHOD 125 mm dia. Solid Stem Auger, CT 250 Canterra

JOB NO. 99-570-02
GROUND ELEV. 98.99 m, local
TOP OF PVC ELEV. 98.85 m
WATER ELEV. 97.57 m, 30/11/99
DATE DRILLED 25/11/99



SAMPLE TYPE ☒ GRAB FROM BUCKET ☒ SHELBY ☒ SPLIT SPOON ☒ SPLIT BARREL ☒ AUGER GRAB

CONTRACTOR
 Paddock Drilling Ltd.

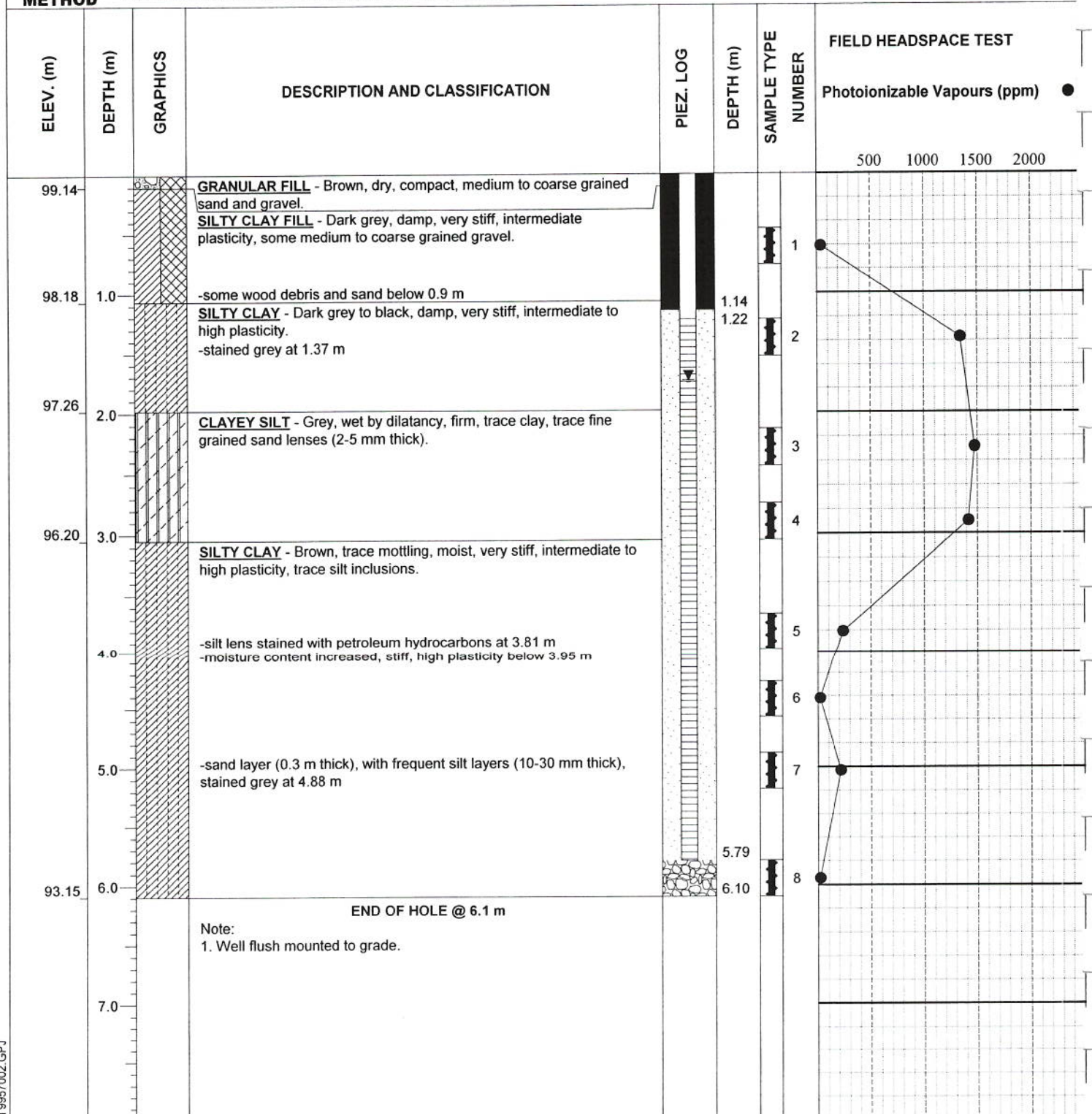
INSPECTOR
 D. KASUR

APPROVED *KBU* **DATE** 28/01/00

CLIENT MAPLE LEAF CONSTRUCTION
PROJECT PHASE II ENVIRONMENTAL SITE ASSESSMENT
SITE 1600 ERIN STREET, WINNIPEG
LOCATION Former AST Area

JOB NO. 99-570-02
GROUND ELEV. 99.25 m, local
TOP OF PVC ELEV. 99.13 m
WATER ELEV. 97.51 m, 30/11/99
DATE DRILLED 25/11/99

DRILLING METHOD 125 mm dia. Solid Stem Auger, CT 250 Canterra



SAMPLE TYPE ☒ GRAB FROM BUCKET ☒ SHELBY ☒ SPLIT SPOON ☒ SPLIT BARREL ☒ AUGER GRAB

CONTRACTOR
Paddock Drilling Ltd.

INSPECTOR
D. KASUR

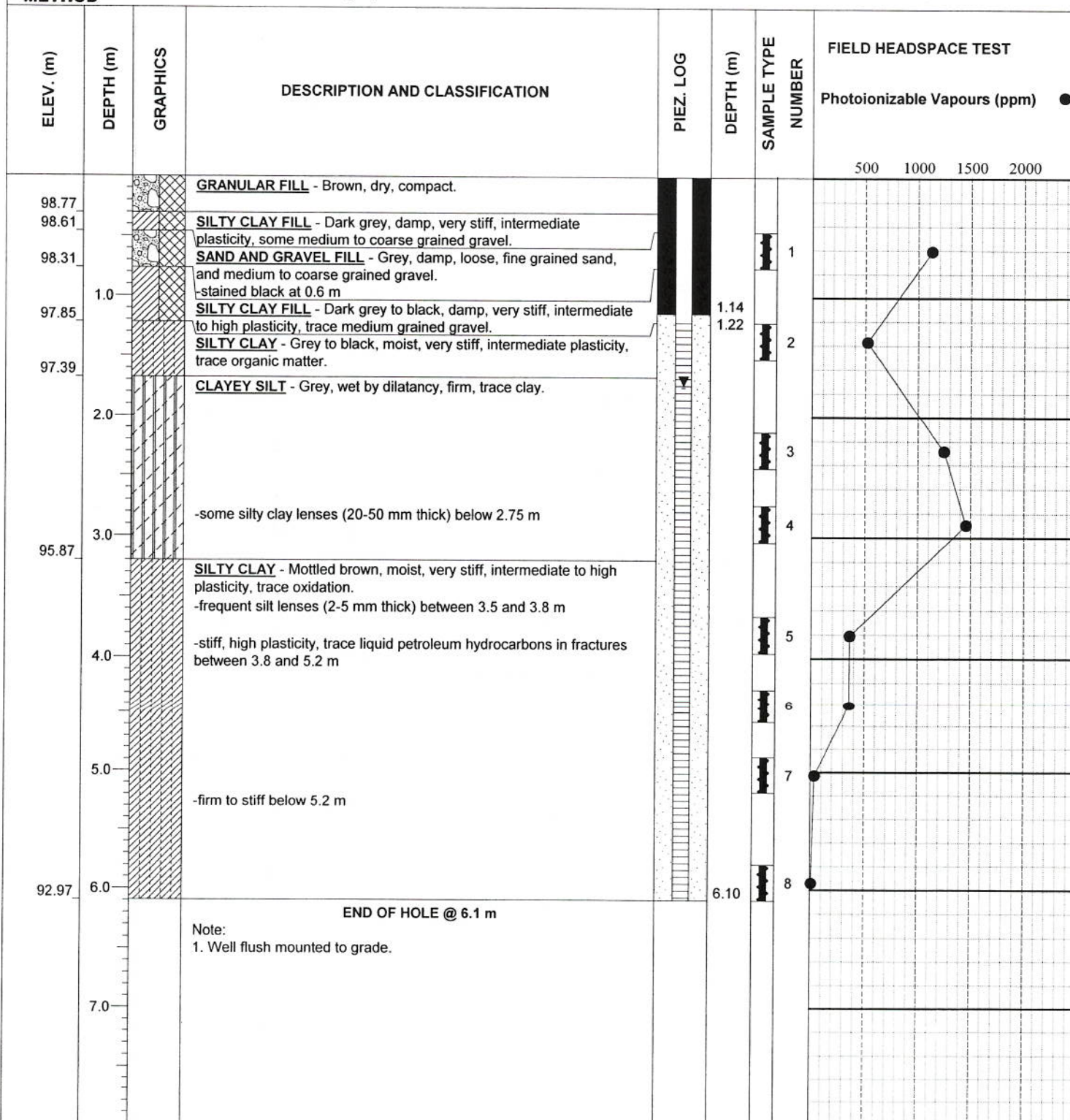
APPROVED

[Signature]

DATE **28/01/00**

CLIENT MAPLE LEAF CONSTRUCTION
PROJECT PHASE II ENVIRONMENTAL SITE ASSESSMENT
SITE 1600 ERIN STREET, WINNIPEG
LOCATION Former AST Area
DRILLING METHOD 125 mm dia. Solid Stem Auger, CT 250 Canterra

JOB NO. 99-570-02
GROUND ELEV. 99.07 m, local
TOP OF PVC ELEV. 98.92 m
WATER ELEV. 97.33 m, 30/11/99
DATE DRILLED 25/11/99



SAMPLE TYPE ☒ GRAB FROM BUCKET ☒ SHELBY ☒ SPLIT SPOON ☒ SPLIT BARREL ☒ AUGER GRAB

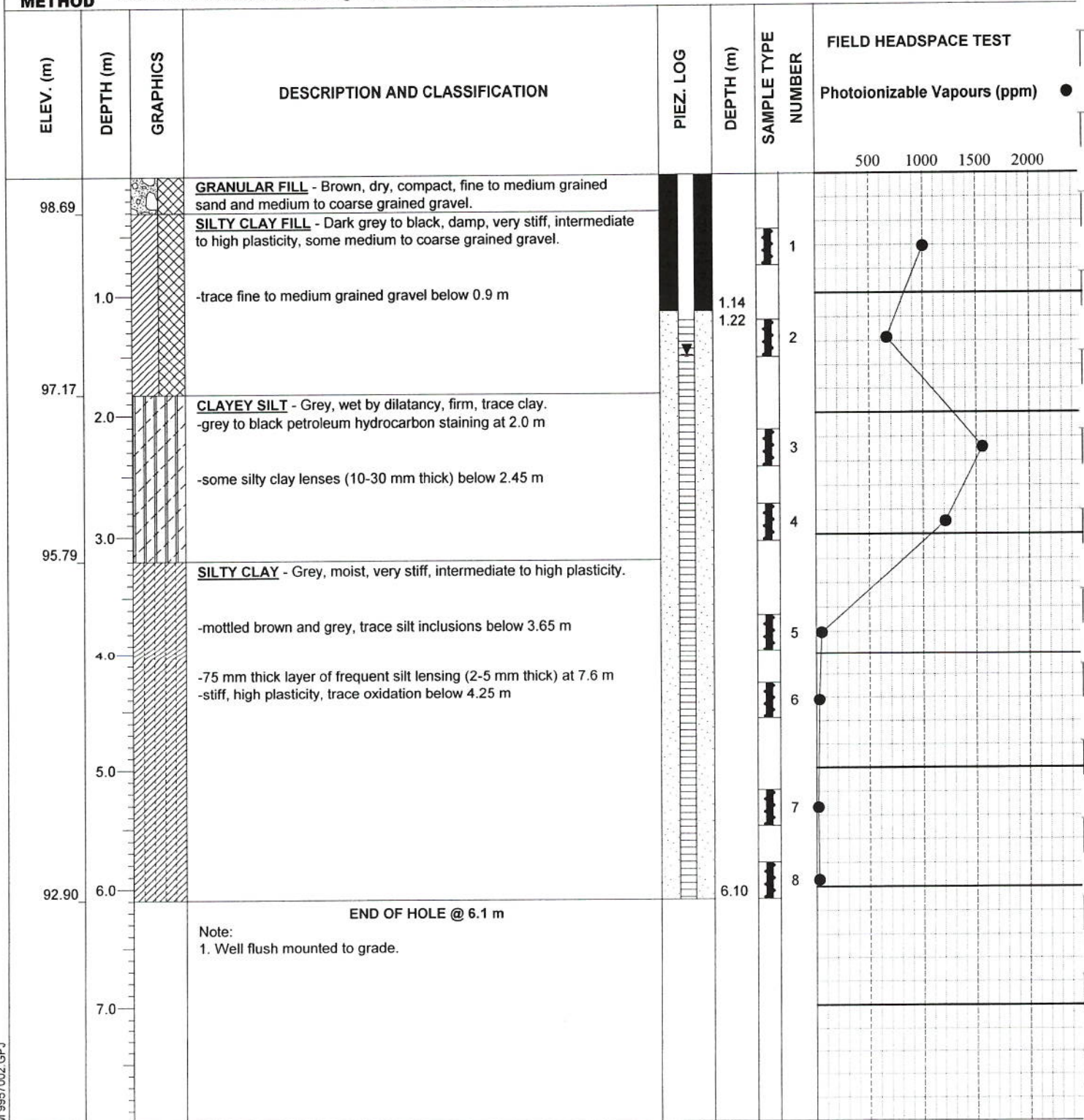
CONTRACTOR
Paddock Drilling Ltd.

INSPECTOR
D. KASUR

APPROVED *KSD* DATE 28/01/00

CLIENT MAPLE LEAF CONSTRUCTION
PROJECT PHASE II ENVIRONMENTAL SITE ASSESSMENT
SITE 1600 ERIN STREET, WINNIPEG
LOCATION East of Drum Filling Warehouse
DRILLING METHOD 125 mm dia. Solid Stem Auger, CT 250 Canterra

JOB NO. 99-570-02
GROUND ELEV. 98.99 m, local
TOP OF PVC ELEV. 98.83 m
WATER ELEV. 97.49 m, 30/11/99
DATE DRILLED 25/11/99



SAMPLE TYPE ☒ GRAB FROM BUCKET ☒ SHELBY ☒ SPLIT SPOON ☐ SPLIT BARREL ☐ AUGER GRAB

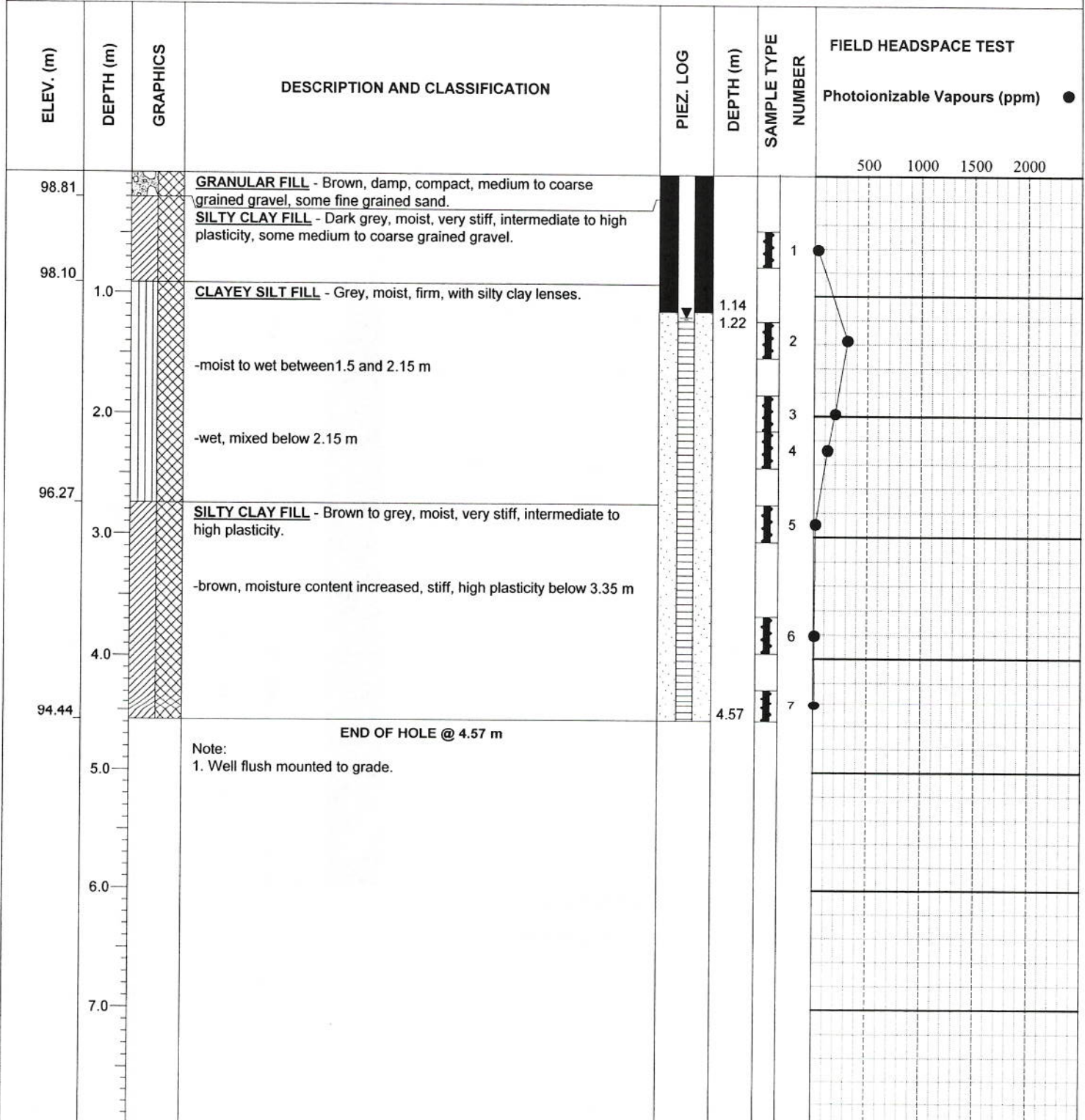
CONTRACTOR
Paddock Drilling Ltd.

INSPECTOR
D. KASUR

APPROVED *KBO* DATE 28/01/00

CLIENT MAPLE LEAF CONSTRUCTION
PROJECT PHASE II ENVIRONMENTAL SITE ASSESSMENT
SITE 1600 ERIN STREET, WINNIPEG
LOCATION Former Lube Oil Warehouse - Northeast Corner
DRILLING METHOD 125 mm dia. Solid Stem Auger, CT 250 Canterra

JOB NO. 99-570-02
GROUND ELEV. 99.02 m, local
TOP OF PVC ELEV. 98.95 m
WATER ELEV. 97.83 m, 30/11/99
DATE DRILLED 26/11/99



SAMPLE TYPE ☒ GRAB FROM BUCKET ☐ SHELBY ☐ SPLIT SPOON ☐ SPLIT BARREL ☐ AUGER GRAB

CONTRACTOR Paddock Drilling Ltd. INSPECTOR D. KASUR APPROVED *KBO* DATE 28/01/00

CLIENT MAPLE LEAF CONSTRUCTION
PROJECT PHASE II ENVIRONMENTAL SITE ASSESSMENT
SITE 1600 ERIN STREET, WINNIPEG
LOCATION Former AST Area

JOB NO. 99-570-02

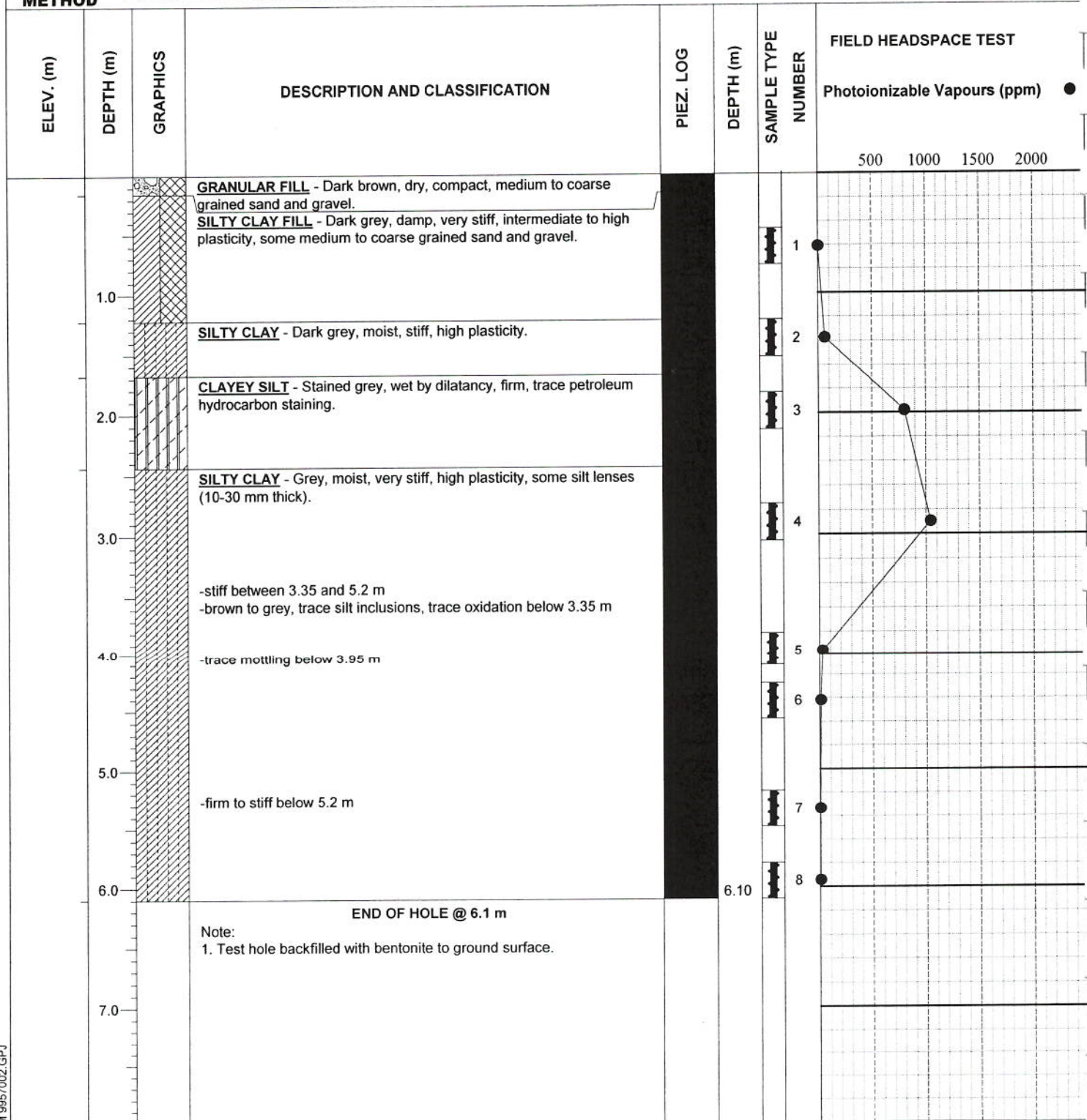
GROUND ELEV. -

TOP OF PVC ELEV. -

WATER ELEV. -

DATE DRILLED 25/11/99

DRILLING METHOD 125 mm dia. Solid Stem Auger, CT 250 Canterra



SAMPLE TYPE



GRAB FROM BUCKET



SHELBY



SPLIT SPOON



SPLIT BARREL



AUGER GRAB

CONTRACTOR

Paddock Drilling Ltd.

INSPECTOR

D. KASUR

APPROVED

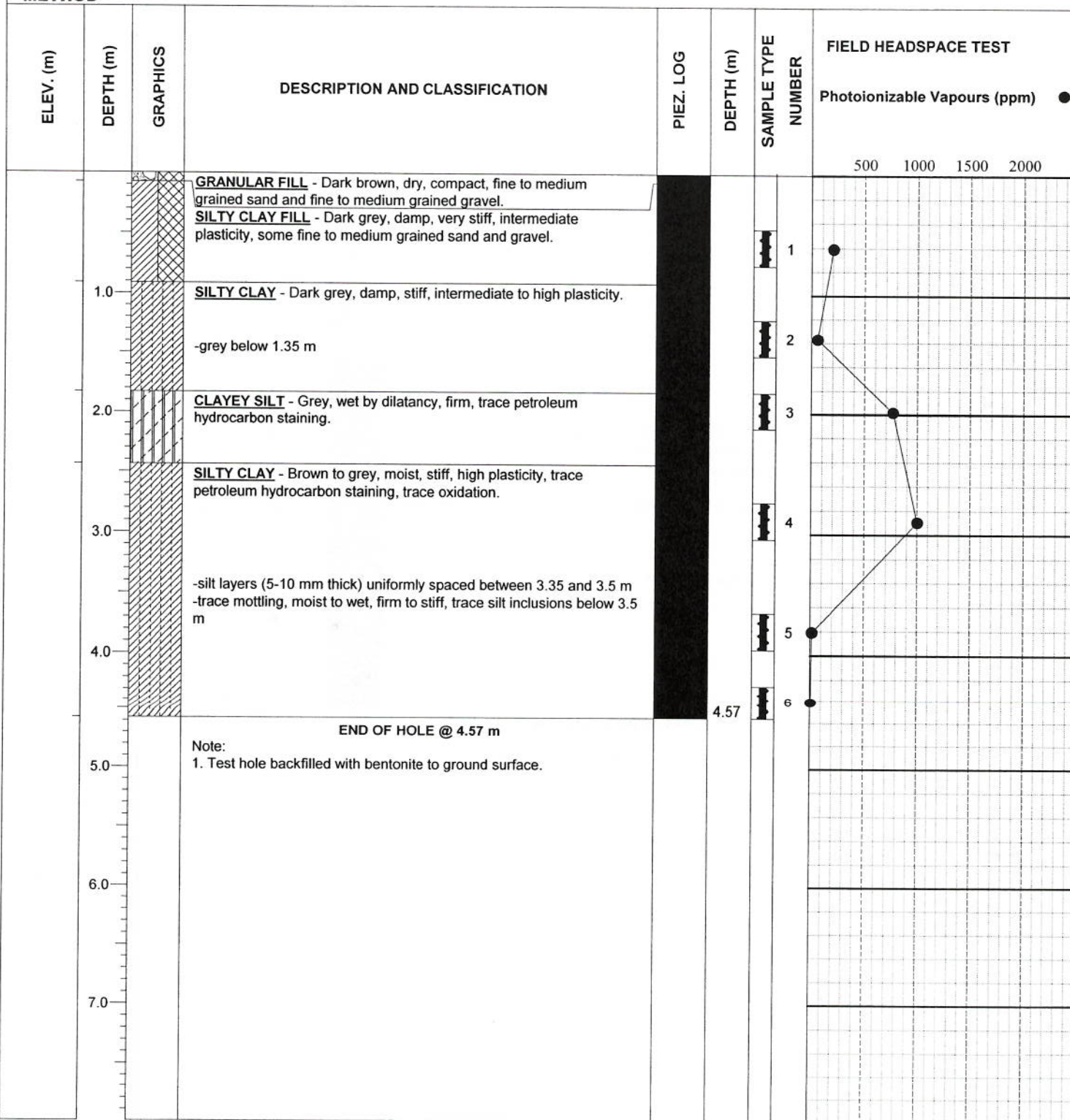
[Signature]

DATE

28/01/00

CLIENT MAPLE LEAF CONSTRUCTION
PROJECT PHASE II ENVIRONMENTAL SITE ASSESSMENT
SITE 1600 ERIN STREET, WINNIPEG
LOCATION Former AST Area
DRILLING METHOD 125 mm dia. Solid Stem Auger, CT 250 Canterra

JOB NO. 99-570-02
GROUND ELEV. -
TOP OF PVC ELEV. -
WATER ELEV. -
DATE DRILLED 25/11/99



SAMPLE TYPE ☒ GRAB FROM BUCKET ☐ SHELBY ☐ SPLIT SPOON ☐ SPLIT BARREL ☐ AUGER GRAB

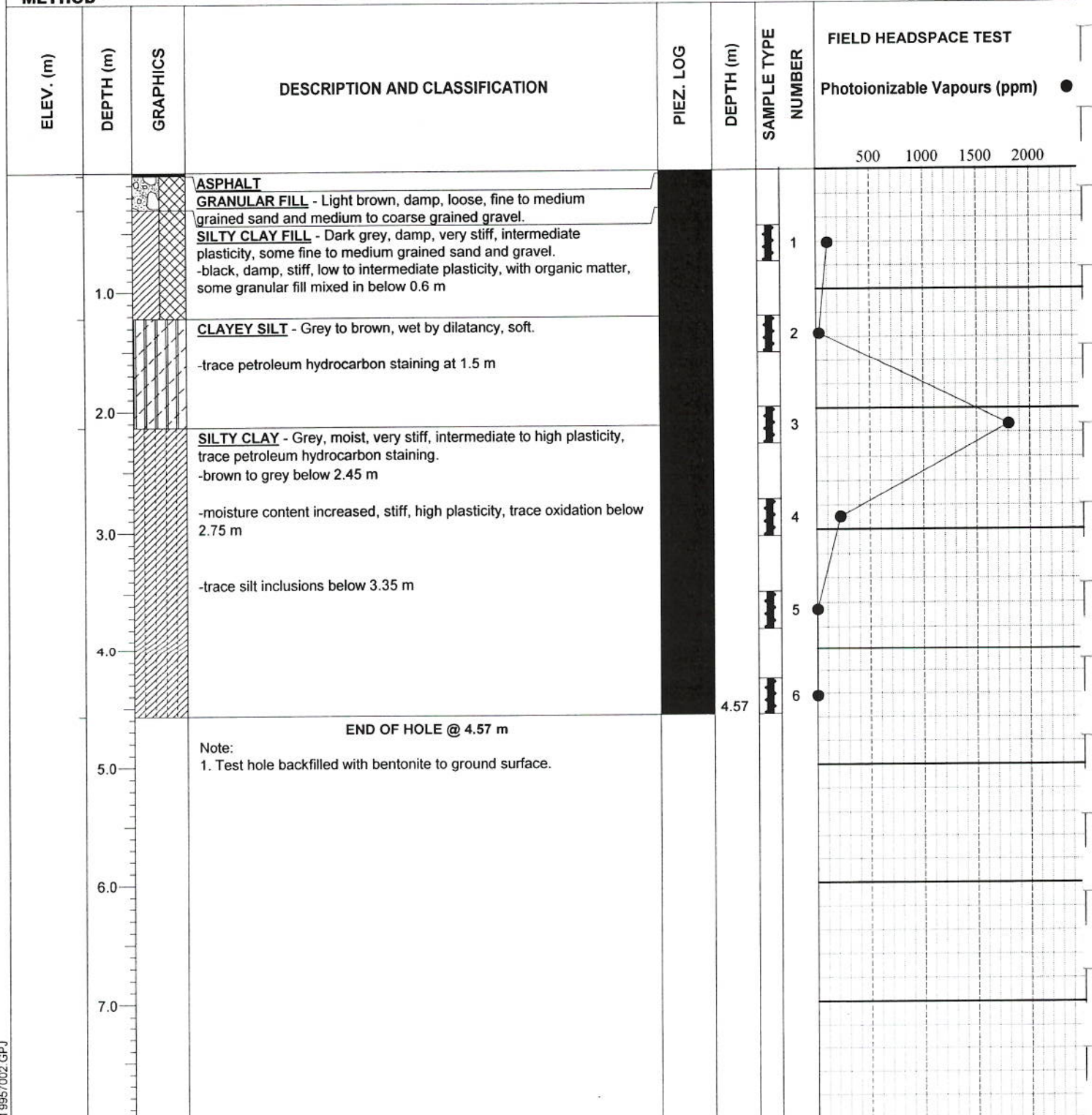
CONTRACTOR
Paddock Drilling Ltd.

INSPECTOR
D. KASUR

APPROVED *KB* DATE 28/01/00

CLIENT MAPLE LEAF CONSTRUCTION
PROJECT PHASE II ENVIRONMENTAL SITE ASSESSMENT
SITE 1600 ERIN STREET, WINNIPEG
LOCATION Near Former Diesel UST
DRILLING METHOD 125 mm dia. Solid Stem Auger, CT 250 Canterra

JOB NO. 99-570-02
GROUND ELEV. -
TOP OF PVC ELEV. -
WATER ELEV. -
DATE DRILLED 25/11/99



VAPOURS_FT_M 9957002 GPJ

SAMPLE TYPE ☒ GRAB FROM BUCKET ☒ SHELBY ☒ SPLIT SPOON ☐ SPLIT BARREL ☐ AUGER GRAB

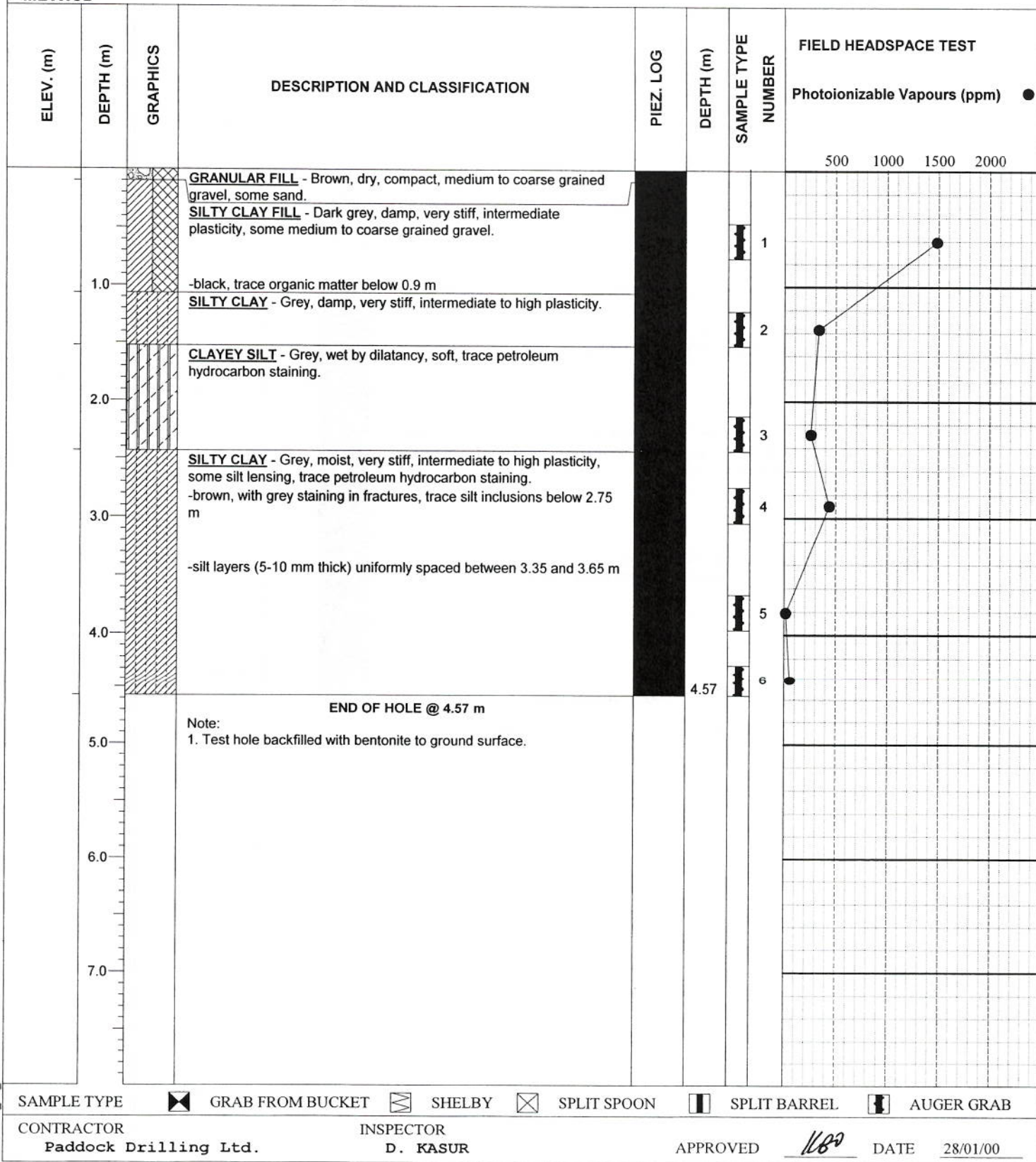
CONTRACTOR
Paddock Drilling Ltd.

INSPECTOR
D. KASUR

APPROVED *KB* DATE 28/01/00

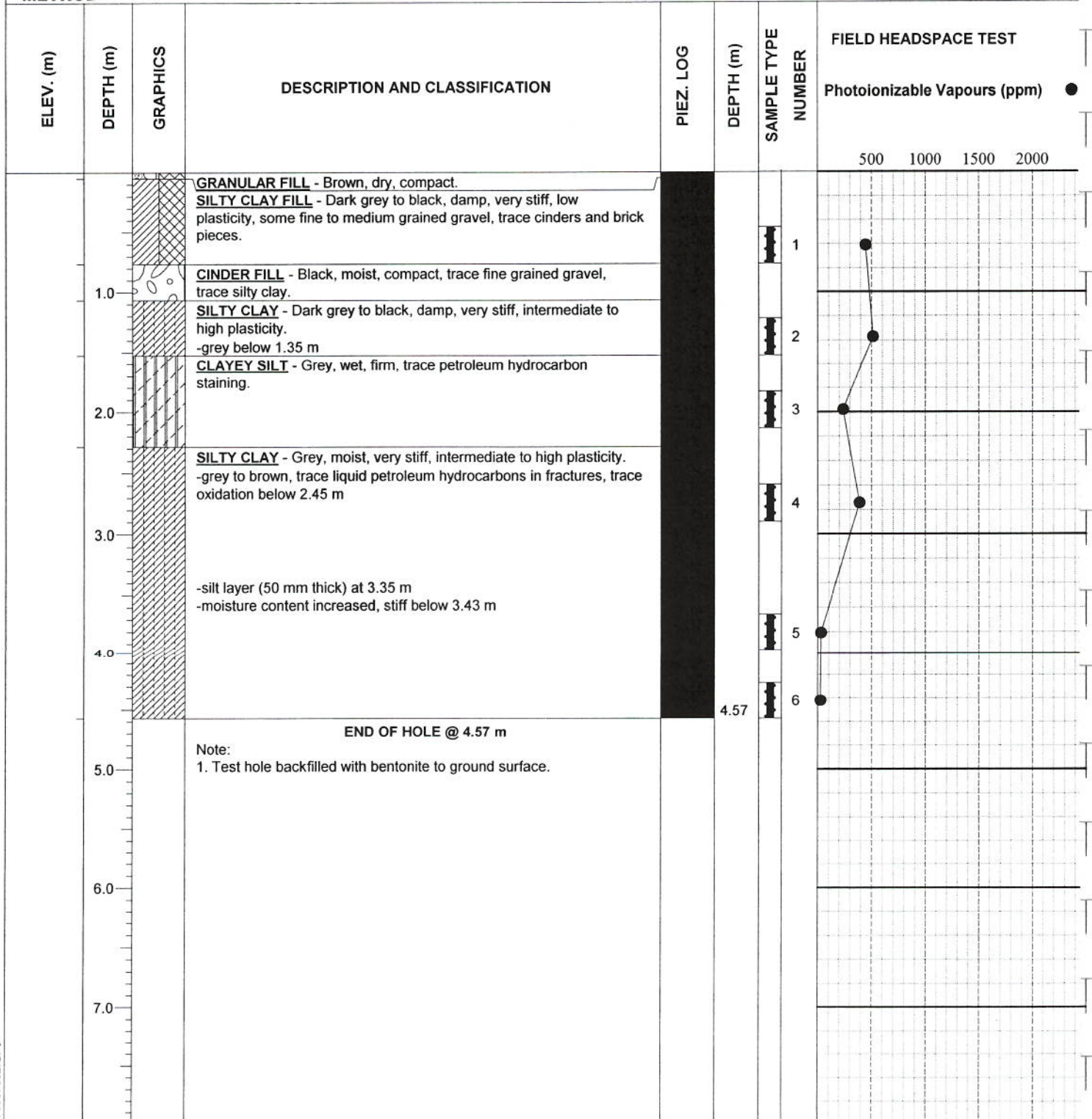
CLIENT MAPLE LEAF CONSTRUCTION
PROJECT PHASE II ENVIRONMENTAL SITE ASSESSMENT
SITE 1600 ERIN STREET, WINNIPEG
LOCATION Former Truck Unloading Area
DRILLING METHOD 125 mm dia. Solid Stem Auger, CT 250 Canterra

JOB NO. 99-570-02
GROUND ELEV. -
TOP OF PVC ELEV. -
WATER ELEV. -
DATE DRILLED 25/11/99



CLIENT MAPLE LEAF CONSTRUCTION
PROJECT PHASE II ENVIRONMENTAL SITE ASSESSMENT
SITE 1600 ERIN STREET, WINNIPEG
LOCATION Former Truck Unloading Area
DRILLING METHOD 125 mm dia. Solid Stem Auger, CT 250 Canterra

JOB NO. 99-570-02
GROUND ELEV. -
TOP OF PVC ELEV. -
WATER ELEV. -
DATE DRILLED 25/11/99



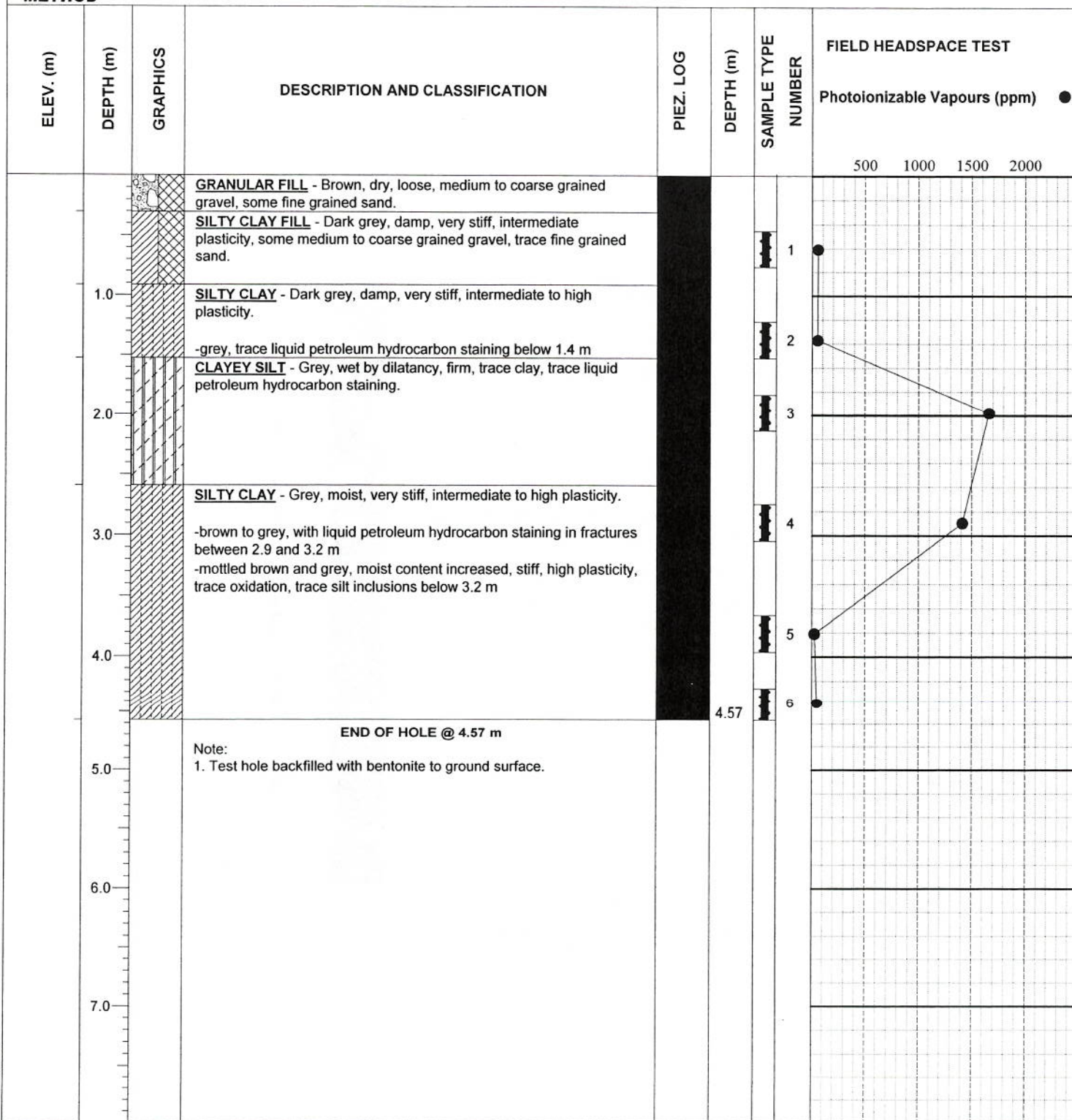
VAPOURS_FT_M 9957002.GPJ

SAMPLE TYPE ☒ GRAB FROM BUCKET ☒ SHELBY ☒ SPLIT SPOON ☐ SPLIT BARREL ☐ AUGER GRABCONTRACTOR
Paddock Drilling Ltd.INSPECTOR
D. KASUR

APPROVED DATE 28/01/00

CLIENT MAPLE LEAF CONSTRUCTION
PROJECT PHASE II ENVIRONMENTAL SITE ASSESSMENT
SITE 1600 ERIN STREET, WINNIPEG
LOCATION Former AST Area
DRILLING METHOD 125 mm dia. Solid Stem Auger, CT 250 Canterra

JOB NO. 99-570-02
GROUND ELEV. -
TOP OF PVC ELEV. -
WATER ELEV. -
DATE DRILLED 25/11/99



SAMPLE TYPE ☒ GRAB FROM BUCKET ☒ SHELBY ☒ SPLIT SPOON ☐ SPLIT BARREL ☐ AUGER GRAB

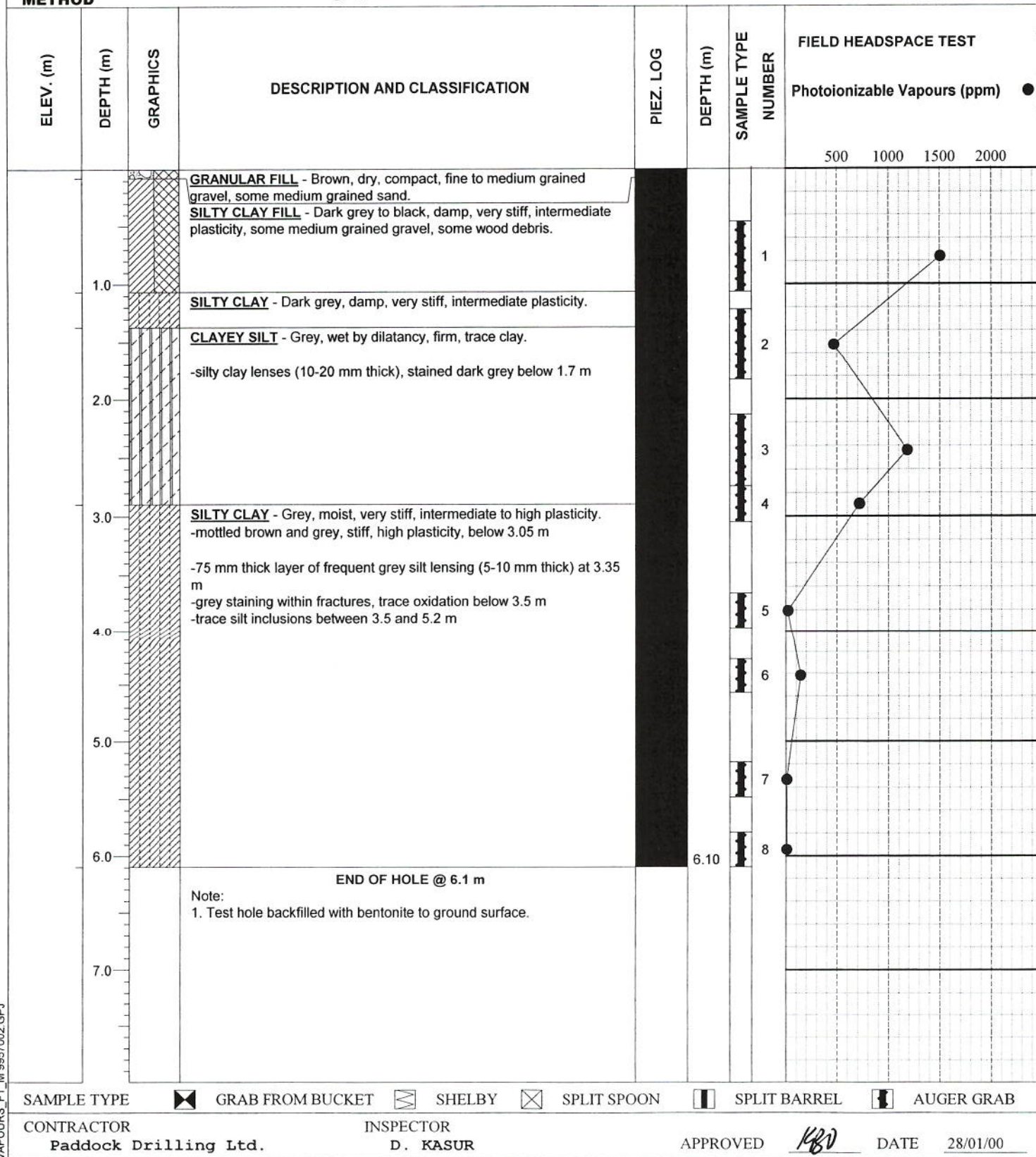
CONTRACTOR
Paddock Drilling Ltd.

INSPECTOR
D. KASUR

APPROVED *K80* DATE 28/01/00

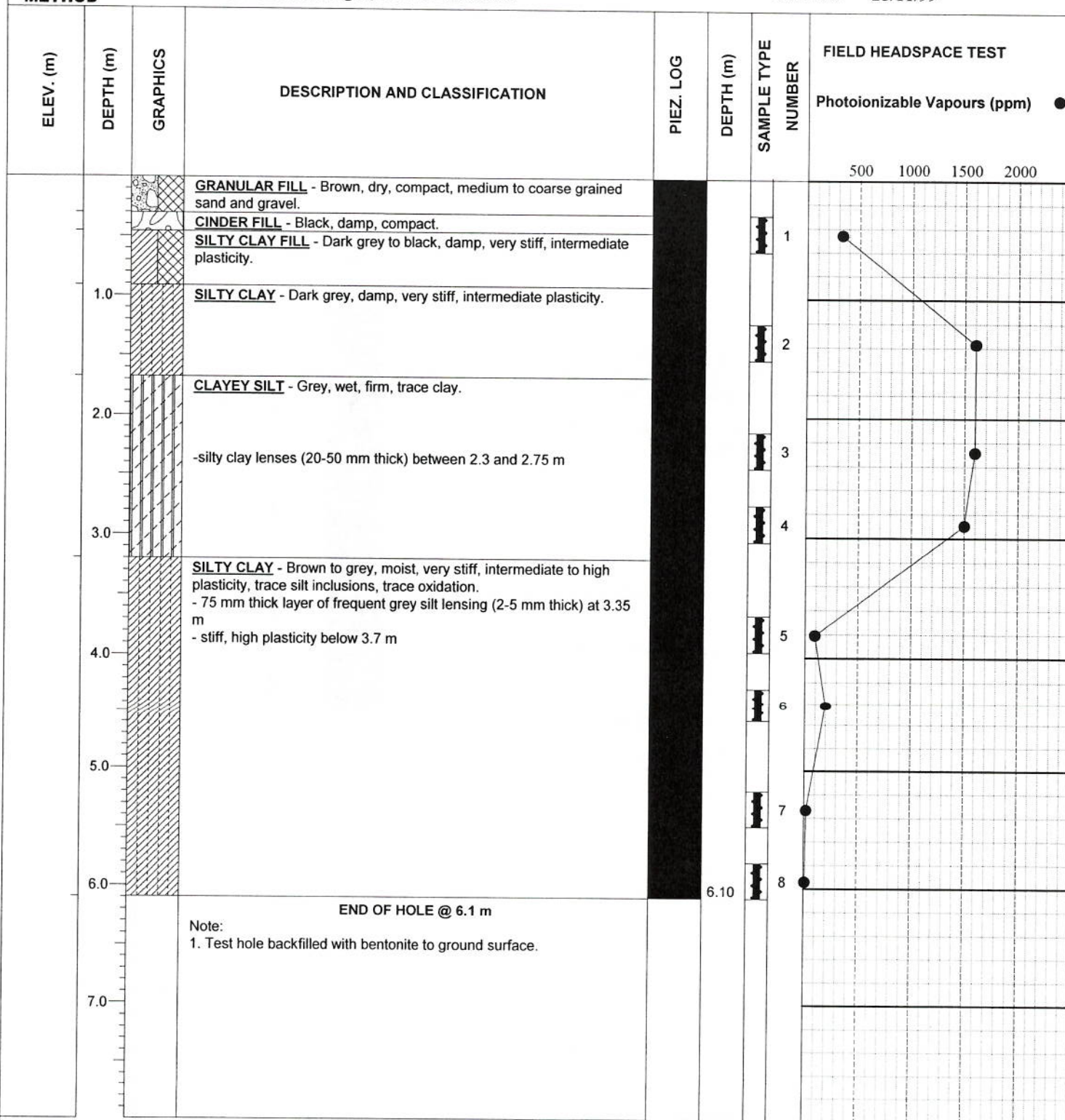
CLIENT MAPLE LEAF CONSTRUCTION
PROJECT PHASE II ENVIRONMENTAL SITE ASSESSMENT
SITE 1600 ERIN STREET, WINNIPEG
LOCATION Former Drum Filling Warehouse
DRILLING METHOD 125 mm dia. Solid Stem Auger, CT 250 Canterra

JOB NO. 99-570-02
GROUND ELEV. -
TOP OF PVC ELEV. -
WATER ELEV. -
DATE DRILLED 25/11/99



CLIENT MAPLE LEAF CONSTRUCTION
PROJECT PHASE II ENVIRONMENTAL SITE ASSESSMENT
SITE 1600 ERIN STREET, WINNIPEG
LOCATION North of Former AST Area
DRILLING METHOD 125 mm dia. Solid Stem Auger, CT 250 Canterra

JOB NO. 99-570-02
GROUND ELEV. -
TOP OF PVC ELEV. -
WATER ELEV. -
DATE DRILLED 25/11/99



SAMPLE TYPE ☒ GRAB FROM BUCKET ☐ SHELBY ☐ SPLIT SPOON ☐ SPLIT BARREL ☐ AUGER GRAB

CONTRACTOR
Paddock Drilling Ltd.

INSPECTOR
D. KASUR

APPROVED 1/036 DATE 28/01/00

CLIENT MAPLE LEAF CONSTRUCTION
PROJECT PHASE II ENVIRONMENTAL SITE ASSESSMENT
SITE 1600 ERIN STREET, WINNIPEG
LOCATION Former Loading Platform
DRILLING METHOD 125 mm dia. Solid Stem Auger, CT 250 Canterra

JOB NO. 99-570-02
GROUND ELEV. -
TOP OF PVC ELEV. -
WATER ELEV. -
DATE DRILLED 26/11/99

ELEV. (m)	DEPTH (m)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	PIEZ. LOG	DEPTH (m)	SAMPLE TYPE NUMBER	FIELD HEADSPACE TEST Photoionizable Vapours (ppm)
							500 1000 1500 2000
			GRANULAR FILL - Brown, dry, compact, medium to coarse grained gravel. CONCRETE SAND FILL - Light brown, damp, loose, poorly graded, fine grained. CINDER FILL - Dark brown to black, damp, compact, with silty clay, with wood debris.			1	
	1.0		SILTY CLAY - Mottled light and dark brown, damp, very stiff, intermediate to high plasticity.			2	
	2.0		CLAYEY SILT - Brown, wet by dilatancy, firm, trace clay. -grey, trace black liquid petroleum hydrocarbon staining, some silty clay lenses (2-5 mm thick) below 1.7 m			3	
	3.0		SILTY CLAY - Dark brown, moist, very stiff, intermediate to high plasticity, trace oxidation.			4	
	4.0		-75 mm thick layer with frequent silt lensing (2-5 mm thick) at 3.5 m -moisture content increased, stiff, high plasticity below 3.95 m			5	
	4.57		END OF HOLE @ 4.57 m			6	
	5.0		Note: 1. Test hole backfilled with bentonite to ground surface.				
	6.0						
	7.0						

VAPOURS FT M 9957002 GPJ

SAMPLE TYPE ☒ GRAB FROM BUCKET ☒ SHELBY ☒ SPLIT SPOON ☒ SPLIT BARREL ☒ AUGER GRAB

CONTRACTOR **Paddock Drilling Ltd.** INSPECTOR **D. KASUR** APPROVED **1180** DATE **28/01/00**

CLIENT MAPLE LEAF CONSTRUCTION
PROJECT PHASE II ENVIRONMENTAL SITE ASSESSMENT
SITE 1600 ERIN STREET, WINNIPEG
LOCATION Former Lube Oil Storage at Warehouse
DRILLING METHOD 125 mm dia. Solid Stem Auger, CT 250 Canterra

JOB NO. 99-570-02
GROUND ELEV. -
TOP OF PVC ELEV. -
WATER ELEV. -
DATE DRILLED 26/11/99

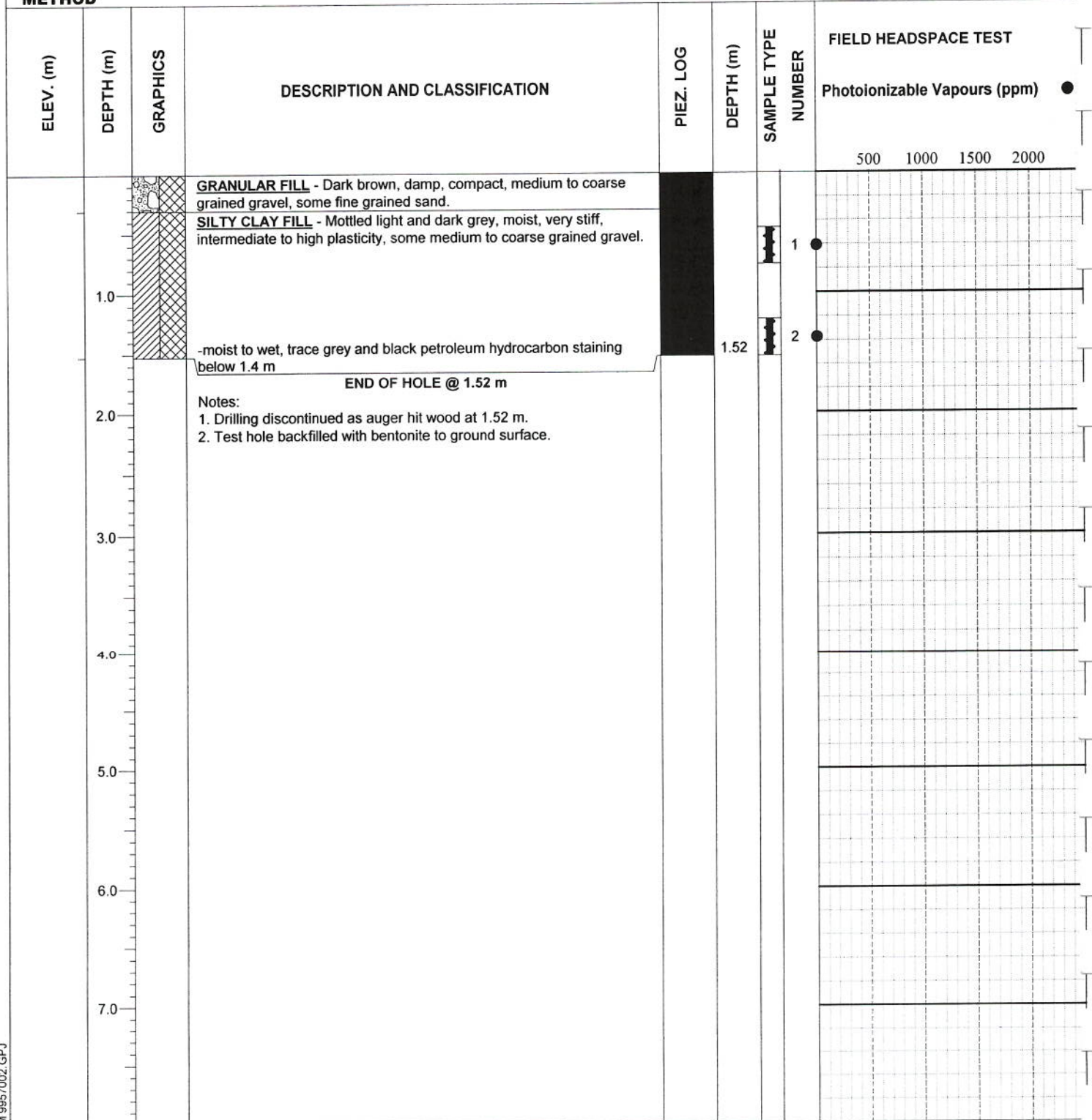
ELEV. (m)	DEPTH (m)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	PIEZ. LOG	DEPTH (m)	SAMPLE TYPE NUMBER	FIELD HEADSPACE TEST Photoionizable Vapours (ppm) ●
							500 1000 1500 2000
	1.0		GRANULAR FILL - Dark brown, damp, compact, medium to coarse grained gravel, some fine grained sand.			1	
			SILTY CLAY FILL - Dark grey, damp, very stiff, intermediate to high plasticity, trace medium grained gravel, trace liquid petroleum hydrocarbon staining.			2	
	2.0		-some wood debris below 1.4 m -wet, auger refusal at 1.7 m, then rubber like material below 1.7 m				
	3.0		SILTY CLAY - Grey, moist to wet, very stiff, intermediate to high plasticity, trace liquid petroleum hydrocarbons in fractures. -brown below 2.75 m			3	
			END OF HOLE @ 3.05 m		3.05		
	4.0		Notes: 1. Test hole backfilled with bentonite to ground surface. 2. Second drilling attempt at location 3 m North and 6 m East of original test hole. Wood and rubber like material at 1.68 m depth.				
	5.0						
	6.0						
	7.0						

VAPOURS_FT_M 9957002.GPJ

SAMPLE TYPE ☒ GRAB FROM BUCKET ☐ SHELBY ☐ SPLIT SPOON ☐ SPLIT BARREL ☐ AUGER GRAB
 CONTRACTOR Paddock Drilling Ltd. INSPECTOR D. KASUR APPROVED *KSD* DATE 28/01/00

CLIENT MAPLE LEAF CONSTRUCTION
PROJECT PHASE II ENVIRONMENTAL SITE ASSESSMENT
SITE 1600 ERIN STREET, WINNIPEG
LOCATION Former Lube Oil Storage at Warehouse
DRILLING METHOD 125 mm dia. Solid Stem Auger, CT 250 Canterra

JOB NO. 99-570-02
GROUND ELEV. -
TOP OF PVC ELEV. -
WATER ELEV. -
DATE DRILLED 26/11/99



VAPOURS_FT_M 9957002.GPJ

SAMPLE TYPE ☒ GRAB FROM BUCKET ☒ SHELBY ☒ SPLIT SPOON ☐ SPLIT BARREL ☐ AUGER GRAB

CONTRACTOR
 Paddock Drilling Ltd.

INSPECTOR
 D. KASUR

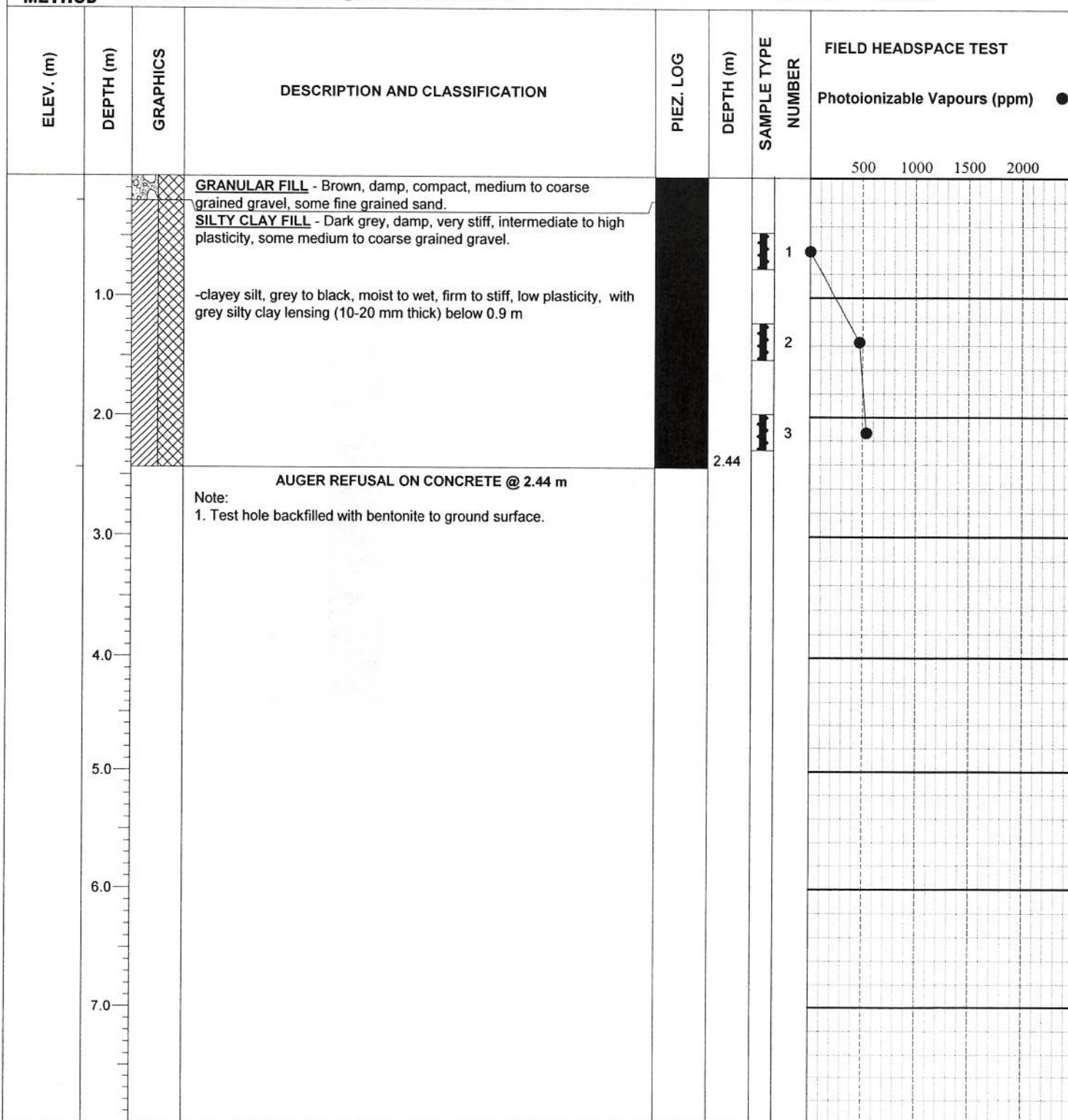
APPROVED

JCB

DATE 28/01/00

CLIENT MAPLE LEAF CONSTRUCTION
PROJECT PHASE II ENVIRONMENTAL SITE ASSESSMENT
SITE 1600 ERIN STREET, WINNIPEG
LOCATION Former Lube Oil AST Area - Northwest Corner
DRILLING METHOD 125 mm dia. Solid Stem Auger, CT 250 Canterra

JOB NO. 99-570-02
GROUND ELEV. -
TOP OF PVC ELEV. -
WATER ELEV. -
DATE DRILLED 26/11/99



SAMPLE TYPE ☒ GRAB FROM BUCKET ☐ SHELBY ☐ SPLIT SPOON ☐ SPLIT BARREL ☐ AUGER GRAB

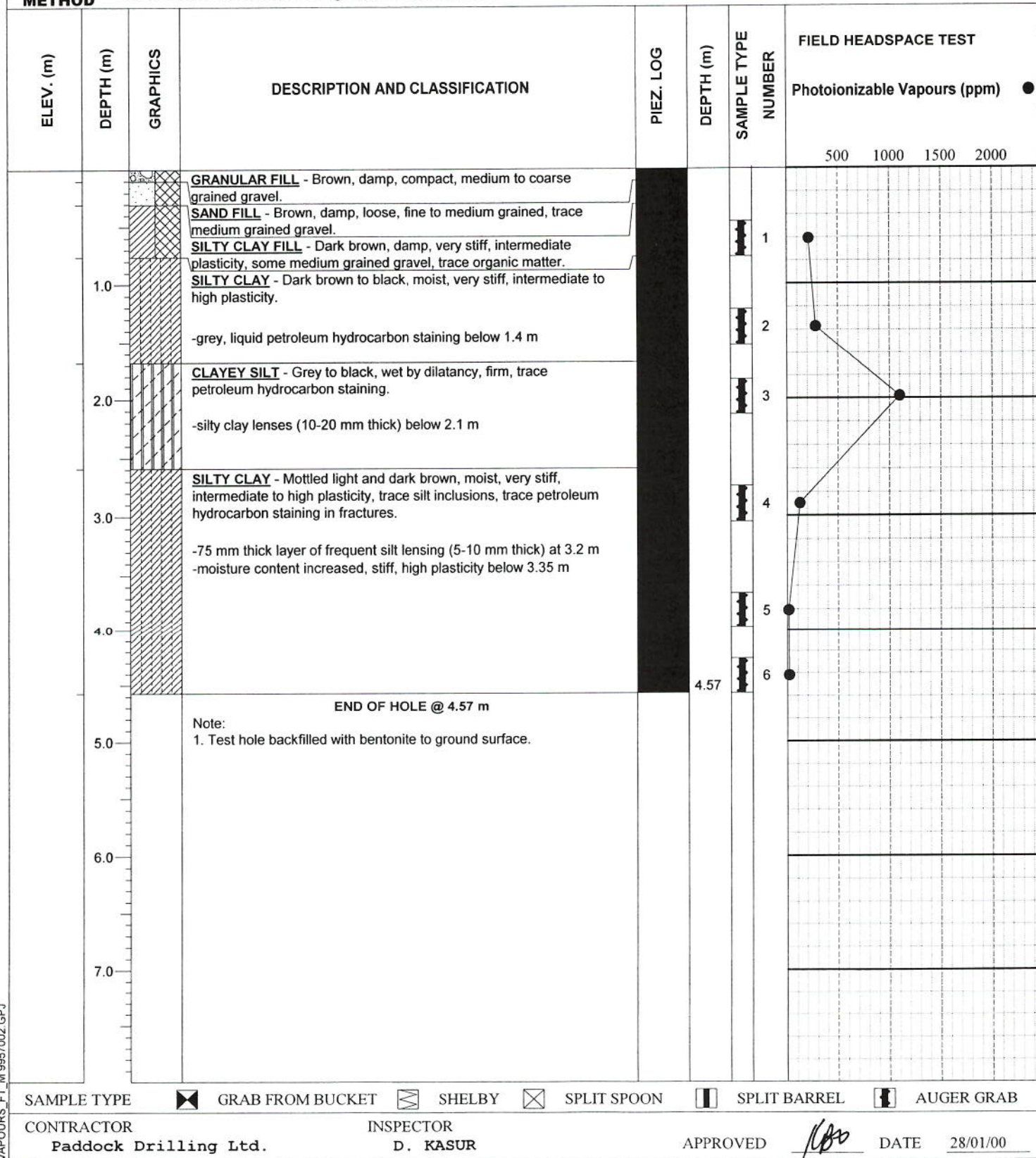
CONTRACTOR
Paddock Drilling Ltd.

INSPECTOR
D. KASUR

APPROVED  DATE 28/01/00

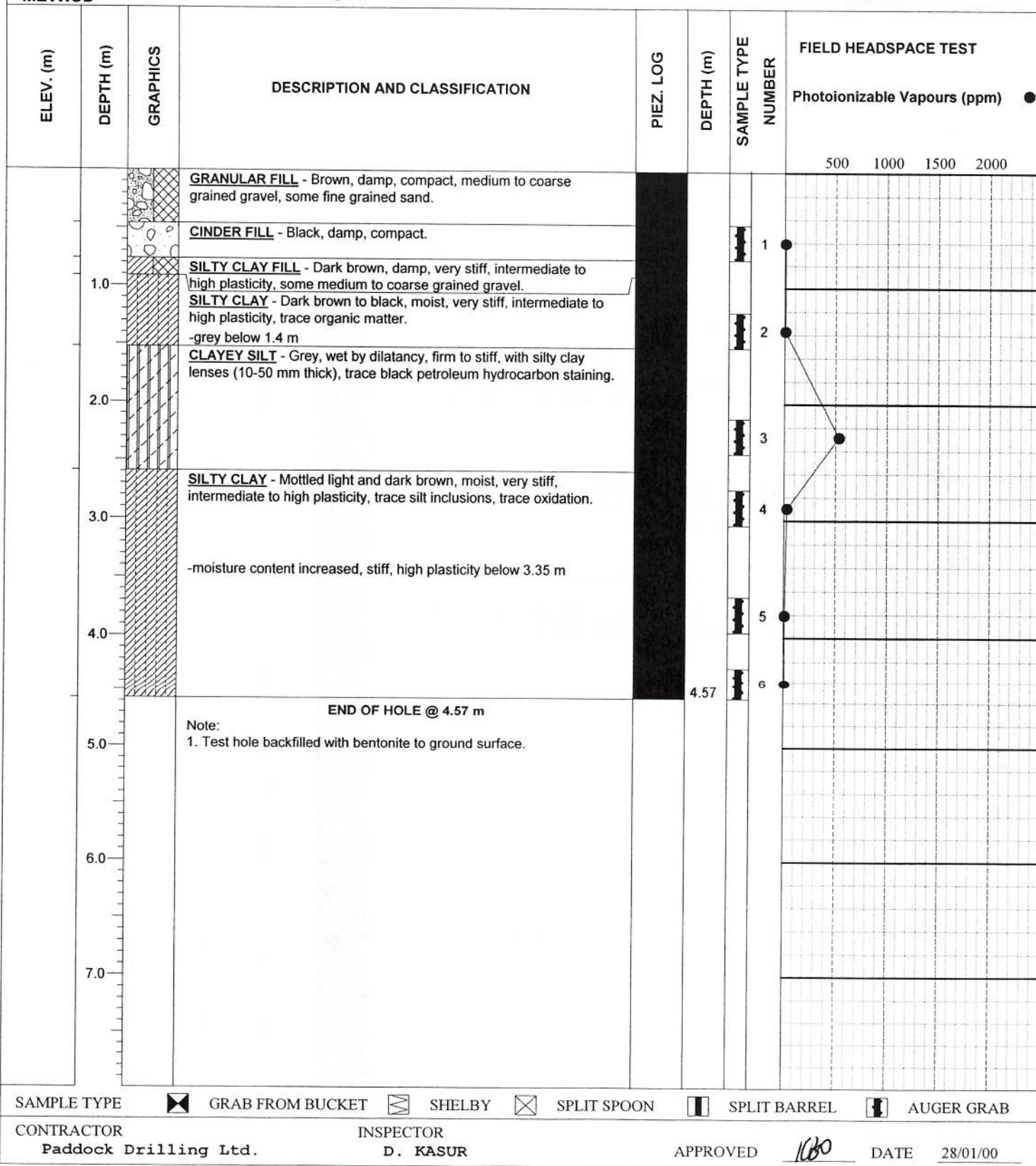
CLIENT MAPLE LEAF CONSTRUCTION
PROJECT PHASE II ENVIRONMENTAL SITE ASSESSMENT
SITE 1600 ERIN STREET, WINNIPEG
LOCATION Former 3 Bay Garage
DRILLING METHOD 125 mm dia. Solid Stem Auger, CT 250 Canterra

JOB NO. 99-570-02
GROUND ELEV. -
TOP OF PVC ELEV. -
WATER ELEV. -
DATE DRILLED 26/11/99



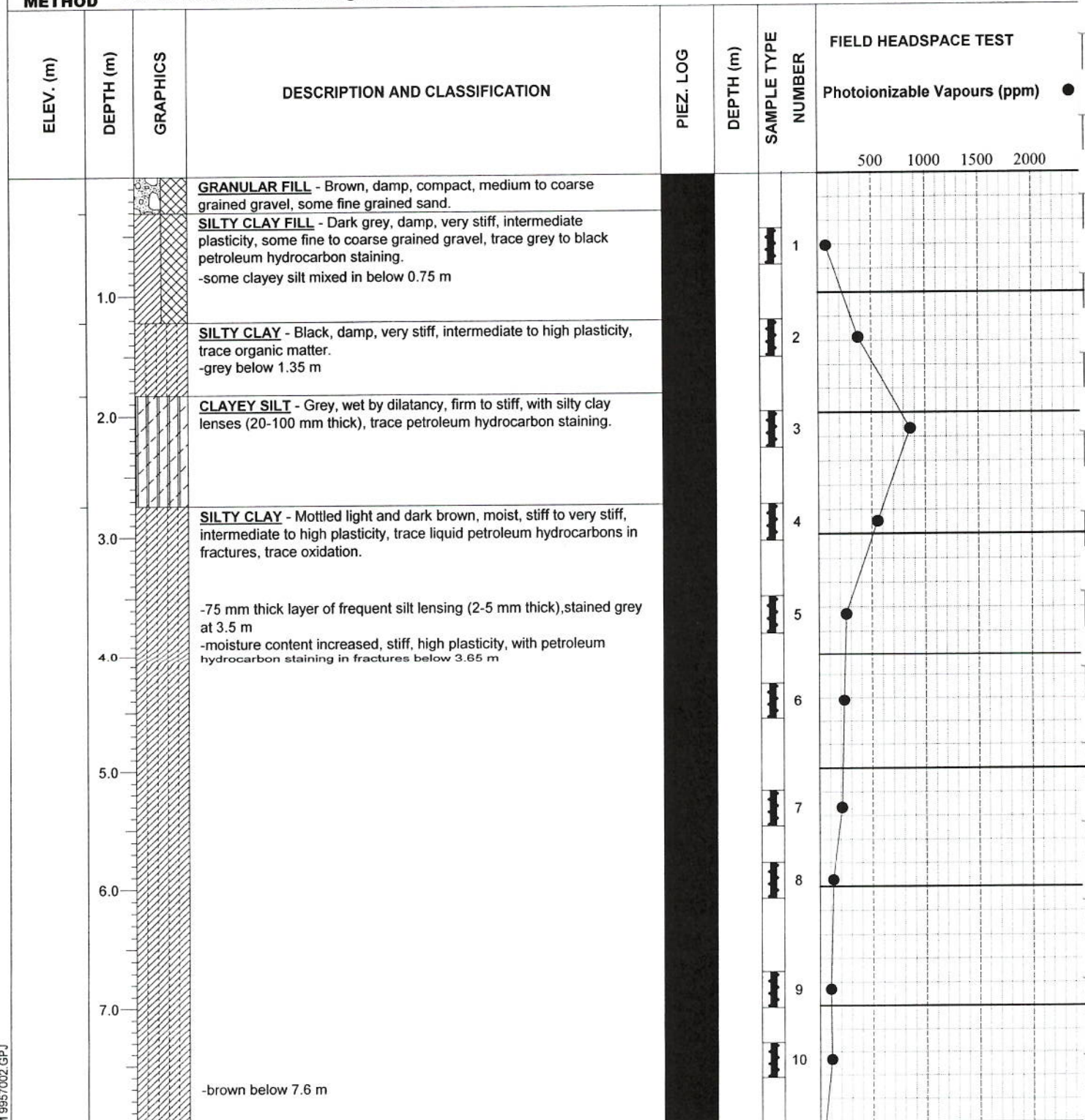
CLIENT MAPLE LEAF CONSTRUCTION
PROJECT PHASE II ENVIRONMENTAL SITE ASSESSMENT
SITE 1600 ERIN STREET, WINNIPEG
LOCATION Former Storage Area
DRILLING METHOD 125 mm dia. Solid Stem Auger, CT 250 Canterra

JOB NO. 99-570-02
GROUND ELEV. -
TOP OF PVC ELEV. -
WATER ELEV. -
DATE DRILLED 26/11/99



CLIENT MAPLE LEAF CONSTRUCTION
PROJECT PHASE II ENVIRONMENTAL SITE ASSESSMENT
SITE 1600 ERIN STREET, WINNIPEG
LOCATION Former AST Area
DRILLING METHOD 125 mm dia. Solid Stem Auger, CT 250 Canterra

JOB NO. 99-570-02
GROUND ELEV. -
TOP OF PVC ELEV. -
WATER ELEV. -
DATE DRILLED 26/11/99



VAPOURS_FT_M 9957002.GPJ

SAMPLE TYPE ☒ GRAB FROM BUCKET ☒ SHELBY ☒ SPLIT SPOON ☐ SPLIT BARREL ☐ AUGER GRAB

CONTRACTOR
 Paddock Drilling Ltd.

INSPECTOR
 D. KASUR

APPROVED

DATE 28/01/00

ELEV. (m)	DEPTH (m)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	PIEZ. LOG	DEPTH (m)	SAMPLE TYPE NUMBER	FIELD HEADSPACE TEST Photoionizable Vapours (ppm) ●
							500 1000 1500 2000
	9.0					11	●
						12	●
			END OF HOLE @ 9.14 m		9.14		
			Note: 1. Test hole backfilled with bentonite to ground surface.				
	10.0						
	11.0						
	12.0						
	13.0						
	14.0						
	15.0						
	16.0						
	17.0						

VAPOURS_FT_M 9957002.GPJ

APPENDIX B
LABORATORY CERTIFICATES OF ANALYSIS

JAN 5 - 2000

Client: KGS Group Consulting Engineers
3227 Roblin Blvd.
Winnipeg, MA, CANADA
R3R 0C2

Fax: 204-896-0754

Attn: Kimber Osiowy

Date Received: November 30/1999
Date Reported: December 15/1999
Lab Ref#: G995555
Lab Quote#: NB911-0894
Client PO#: 99-570-02
Client Ref#: 99-570-02
Sampled By: Dean kasur

Certificate of Analysis

Analysis Performed: Extractable Hydrocarbons(Manitoba Guidelines), C11-C32
BTEX and Total Volatile Hydrocarbons(Manitoba Criteria)
Total Purgeable Hydrocarbons

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 & Volatile Hydrocarbons by Static Headspace Capillary GC-PID/FID. External std quantitation with Surrogate stds.
U.S. EPA Method No. 3810(Modification)
- 3) Purge & Trap capillary GC/MS analysis of Soil samples for Total Purgeables.
U.S. EPA Method No. 5030

Instrumentation:

- 1) GC/FID/FID, Hewlett-PackardII GC, Dual injector, Dual FID, A/S
- 2) Varian 3400 GC PID/FID, Genesis Headspace Analyzer
- 3) Purge & Trap-GC/MS

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.



Client: KGS Group Consulting Engineers
3227 Roblin Blvd.
Winnipeg, MA, CANADA
R3R 0C2

Fax: 204-896-0754

Attn: Kimber Osiowy

Date Received: November 30/1999
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Client PO#: 99-570-02
Client Ref#: 99-570-02
Sampled By: Dean kasur

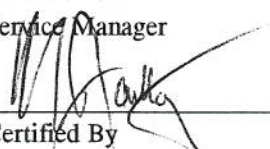
Certificate of Analysis

Sample Description: Soil

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

Results: Refer to REPORT of ANALYSIS attached.


Certified By
Nick Boulton
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.



Certificate of Quality Control

Client : KGS Group Consulting Engineers
Contact: Kimber Ostowy

Date Reported: December 15/1999
Lab Ref # : G995555
Lab Quote#: NB911-0894
Client PO#: 99-570-02
Client Ref#: 99-570-02

Analysis of Soil, expressed on a dry weight basis

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
Total SemiVolatile Hydrocarbons(C11-C32)	na	10.0	mg/kg	nd	20.0	yes	93	70	120	yes	na	na	na	na	na	yes
Total SemiVolatile Hydrocarbons(C11-C32)	na	10.0	mg/kg	nd	20.0	yes	93	70	120	yes	na	na	na	na	na	yes
Benzene	na	0.02	mg/kg	nd	0.04	yes	104	60	120	yes	na	na	na	na	na	yes
Benzene	na	0.02	mg/kg	nd	0.04	yes	94	60	120	yes	na	na	na	na	na	yes
Ethylbenzene	na	0.02	mg/kg	nd	0.04	yes	102	60	120	yes	na	na	na	na	na	yes
Ethylbenzene	na	0.02	mg/kg	nd	0.04	yes	92	60	120	yes	na	na	na	na	na	yes
Toluene	na	0.02	mg/kg	nd	0.04	yes	100	60	120	yes	na	na	na	na	na	yes
Toluene	na	0.02	mg/kg	nd	0.04	yes	92	60	120	yes	na	na	na	na	na	yes
Total Volatile Hydrocarbons	na	10	mg/kg	nd	10	yes	110	60	120	yes	na	na	na	na	na	yes
Total Volatile Hydrocarbons	na	10	mg/kg	nd	10	yes	92	60	120	yes	na	na	na	na	na	yes
Xylenes(Total)	na	0.04	mg/kg	nd	0.08	yes	106	60	120	yes	na	na	na	na	na	yes
Xylenes(Total)	na	0.04	mg/kg	nd	0.08	yes	94	60	120	yes	na	na	na	na	na	yes
Total Purgeable Hydrocarbons	na	10	ug/g	nd	20	yes	na	na	na	na	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

Report of Analysis

Client : KGS Group Consulting Engineers
Contact: Kimber Osiowy

Report Date: December 15/1999
Lab Ref # : G995555
Lab Quote #: NB911-0894
Client PO#: 99-570-02
Client Ref#: 99-570-02

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	MW1-3	MW2-5	MW2-5	MW3-3	MW3-3
			1999/11/25	1999/11/25	Replicate	1999/11/25	Replicate
Resemblance	na	na	ED?	na	na	EGD?	-
Total SemiVolatile Hydrocarbons(C11-C32)	10.0	mg/kg	133	nd	nd	3180	-
Benzene	0.02	mg/kg	nd	-	-	2.44	-
Ethylbenzene	0.02	mg/kg	nd	-	-	9.86	-
Toluene	0.02	mg/kg	nd	-	-	1.02	-
Total Volatile Hydrocarbons	10	mg/kg	nd	-	-	2350	-
Xylenes(Total)	0.04	mg/kg	nd	-	-	29.6	-
Total Purgeable Hydrocarbons	10	ug/g	-	nd	nd	-	-

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

- Not Requested

ED? Contaminant elutes in the diesel range but does not match reference standard.

EGD? Contaminant elutes in the gasoline/diesel range but does not match our reference standards.

na Not Applicable

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

Report of Analysis

Client : KGS Group Consulting Engineers
Contact: Kimber Osiowy

Report Date: December 15/1999
Lab Ref # : G995555
Lab Quote #: NB911-0894
Client PO#: 99-570-02
Client Ref#: 99-570-02

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	MW4-4	MW5-3	MW6-2	MW7-3	TH1-4
			1999/11/25	1999/11/25	1999/11/25	1999/11/25	1999/11/25
Resemblance	na	na	EGD?	EGD?	EGDMO?	EGD?	EGD?
Total SemiVolatile Hydrocarbons(C11-C32)	10.0	mg/kg	1180	10100	4980	1290	156
Benzene	0.02	mg/kg	0.52	85.4	nd	0.97	nd
Ethylbenzene	0.02	mg/kg	1.46	103	1.89	4.02	0.43
Toluene	0.02	mg/kg	0.26	250	0.33	0.56	nd
Total Volatile Hydrocarbons	10	mg/kg	209	9680	280	672	62
Xylenes(Total)	0.04	mg/kg	5.09	494	40.8	14.0	0.43
Total Purgeable Hydrocarbons	10	ug/g	-	-	-	-	-

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

- Not Requested

EGD? Contaminant elutes in the gasoline/diesel range but does not match our reference standards.

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

Report of Analysis

Client : KGS Group Consulting Engineers
Contact: Kimber Osiowy

Report Date: December 15/1999
Lab Ref # : G995555
Lab Quote #: NB911-0894
Client PO#: 99-570-02
Client Ref#: 99-570-02

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TH1-4	TH10-3	TH12-3	TH13-3	TH14-3
			Replicate	1999/11/25	1999/11/25	1999/11/25	1999/11/25
Resemblance	na	na	EGD?	EMO?	EGDMO?	EGD?	EGDMO?
Total SemiVolatile Hydrocarbons(C11-C32)	10.0	mg/kg	152	153	4820	542	1870
Benzene	0.02	mg/kg	nd	nd	0.93	nd	nd
Ethylbenzene	0.02	mg/kg	0.38	0.05	5.10	1.21	1.33
Toluene	0.02	mg/kg	nd	nd	5.96	nd	0.07
Total Volatile Hydrocarbons	10	mg/kg	64	nd	202	182	143
Xylenes(Total)	0.04	mg/kg	0.42	0.17	20.6	3.54	1.13
Total Purgeable Hydrocarbons	10	ug/g	-	-	-	-	-

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

- Not Requested

EGD? Contaminant elutes in the gasoline/diesel range but does not match our 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

Philip Analytical Services Corp

Report of Analysis

Client : KGS Group Consulting Engineers
Contact: Kimber Osiowy

Report Date: December 15/1999
Lab Ref # : G995555
Lab Quote #: NB911-0894
Client PO#: 99-570-02
Client Ref#: 99-570-02

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	TH15-3	TH2-4	TH3-3	TH4-1	TH5-2
			1999/11/25	1999/11/25	1999/11/25	1999/11/25	1999/11/25
Resemblance	na	na	EGDMO?	EGDMO?	EGD?	EGD?	EGDMO?
Total SemiVolatile Hydrocarbons(C11-C32)	10.0	mg/kg	11900	1560	730	14800	14900
Benzene	0.02	mg/kg	0.41	nd	0.74	46.7	0.49
Ethylbenzene	0.02	mg/kg	8.67	0.96	12.8	164	9.44
Toluene	0.02	mg/kg	0.78	nd	0.39	15.7	3.42
Total Volatile Hydrocarbons	10	mg/kg	1210	213	314	9740	541
Xylenes(Total)	0.04	mg/kg	23.0	1.47	22.4	1180	20.8
Total Purgeable Hydrocarbons	10	ug/g	-	-	-	-	-

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

- Not Requested

EGD? Contaminant elutes in the gasoline/diesel range but does not match our reference standards.

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

Report Date: December 15/1999
Lab Ref # : G995555
Lab Quote #: NB911-0894
Client PO#: 99-570-02
Client Ref#: 99-570-02

Analysis of Soil, expressed on a dry weight basis

[illegible]

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

Client: KGS Group Consulting Engineers
3227 Roblin Blvd.
Winnipeg, MA, CANADA
R3R 0C2

Fax: 204-896-0754

Attn: Kimber Osiowy

Date Received: November 30/1999
Date Reported: December 15/1999
Lab Ref#: G995555
Lab Quote#: NB911-0894
Client PO#: 99-570-02
Client Ref#: 99-570-02
Sampled By: Dean kasur

Certificate of Analysis

Additional Comments:

BTEX analysis of soils:

Please view the BTEX results, especially the Benzene and Toluene results for all samples with discretion; results may be biased high due to overlapping matrix background.



Client: KGS Group Consulting Engineers
3227 Roblin Blvd.
Winnipeg, MA, CANADA
R3R 0C2

Fax: 204-896-0754

Attn: Kimber Osiowy

Date Received: November 30/1999
Date Reported: December 7/1999
Lab Ref#: G995555
Lab Quote#: NB911-0894
Client PO#: 99-570-02
Client Ref#: 99-570-02
Sampled By: Dean kasur

Certificate of Analysis

Analysis Performed: Mineral Oil and Grease(Gravimetric)

Methodology: 1) Analysis of Mineral Oil and Grease gravimetrically in soil.
U.S. EPA Method No. 413.1

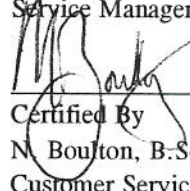
Instrumentation: 1) Sartorius Research Balance, Model R200D

Sample Description: Soil

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

Results: Refer to REPORT of ANALYSIS attached.

 Certified By
Nick Boulton
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 : KGS Group Consulting Engineers
Contact: Kimber Ostowy

Date Reported: December 7/1999
Lab Ref # : G995555
Lab Quote#: NB911-0894
Client PO#: 99-570-02
Client Ref#: 99-570-02

Analysis of Soil, expressed on a dry weight basis

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
Mineral Oil & Grease	na	100	mg/kg	nd	200	yes	92	78	122	yes	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

Report Date: December 7/1999
Lab Ref # : G995555
Lab Quote #: NB911-0894
Client PO#: 99-570-02
Client Ref#: 99-570-02

Analysis of Soil, expressed on a dry weight basis

Parameter	EQL	Units	MW6-2 1999/11/25	TH3-3 1999/11/25	TH3-3 Replicate	TH7-1 1999/11/25	
Mineral Oil & Grease	100	mg/kg	2860	nd	-	3290	

Page 1 of 1

Client: KGS Group Consulting Engineers
3227 Roblin Blvd.
Winnipeg, MA, CANADA
R3R 0C2

Fax: 204-896-0754

Attn: Kimber Osiowy

Date Received: November 30/1999
Date Reported: December 7/1999
Lab Ref#: G995555
Lab Quote#: NB911-0894
Client PO#: 99-570-02
Client Ref#: 99-570-02
Sampled By: Dean kasur

Certificate of Analysis

Additional Comments:

BTEX analysis of soils:

Please view the BTEX results, especially the Benzene and Toluene results for all samples with discretion; results may be biased high due to overlapping matrix background.



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Winnipeg, MA, CANADA
R3R 0C2

Fax: 204-896-0754

Attn: Kimber Osiowy

Date Received: November 30/1999
Date Reported: December 7/1999
Lab Ref#: G995555
Lab Quote#: NB911-0894
Client PO#: 99-570-02
Client Ref#: 99-570-02
Sampled By: Dean kasur

Attached are your results for PAH's

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



Client: KGS Group
Project Reference: 99-570-02
Work Order Number: G995555B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram ($\mu\text{g/g}$) dry weight

Date: 07-Dec-99

Compound	EQL $\mu\text{g/g}$	MW5-3	TH12-3	TH12-3 Dup.	TH15-3
Naphthalene	0.05	43.6	4.97	5.26	18.4
2-Methylnaphthalene	0.05	121	17.4	14.5	49.1
1-Methylnaphthalene	0.05	69.6	11.9	10.1	37.6
Acenaphthylene	0.05	nd	nd	nd	nd
Acenaphthene	0.05	2.53	0.56	0.58	1.61
Fluorene	0.05	3.74	0.99	0.95	3.16
Phenanthrene	0.05	3.91	1.07	1.07	2.50
Anthracene	0.05	0.34	0.13	1.05	0.29
Fluoranthene	0.05	0.23	0.10	0.14	0.73
Pyrene	0.05	0.26	0.20	0.21	0.49
Benzo(a)anthracene	0.05	0.07	0.42	0.40	0.17
Chrysene	0.05	0.08	0.46	0.46	0.18
Benzo(b)fluoranthene	0.05	nd	nd	nd	nd
Benzo(k)fluoranthene	0.05	nd	nd	nd	nd
Benzo(a)pyrene	0.05	nd	nd	nd	nd
Indeno(1,2,3-cd)pyrene	0.05	nd	nd	nd	nd
Dibenzo(a,h)anthracene	0.05	nd	nd	nd	nd
Benzo(ghi)perylene	0.05	nd	nd	nd	nd
Surrogate Standard Recoveries (Control Limits)					
Acenaphthene-d10 (25-125%)		118%	110%	117%	100%
Anthracene-d10 (30-125%)		124%	109%	113%	107%
Benzo(a)pyrene-d12 (35-130%)		130%	114%	120%	116%

Client: KGS Group
Project Reference: 99-570-02
Work Order Number: G995555B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram ($\mu\text{g/g}$) dry weight

Date: 07-Dec-99

Compound	EQL $\mu\text{g/g}$	Method Blank			Spiked Method Blank			
		Result	Upper Limit	Accept	% Recovery	Lower Limit	Upper Limit	Accept
Naphthalene	0.05	nd	0.05	yes	80	35	105	yes
2-Methylnaphthalene	0.05	nd	0.05	yes	93	30	100	yes
1-Methylnaphthalene	0.05	nd	0.05	yes	94	30	105	yes
Acenaphthylene	0.05	nd	0.05	yes	97	35	110	yes
Acenaphthene	0.05	nd	0.05	yes	95	35	105	yes
Fluorene	0.05	nd	0.05	yes	104	40	110	yes
Phenanthrene	0.05	nd	0.05	yes	105	50	110	yes
Anthracene	0.05	nd	0.05	yes	109	50	110	yes
Fluoranthene	0.05	nd	0.05	yes	121	50	120	(1)
Pyrene	0.05	nd	0.05	yes	116	50	120	yes
Benzo(a)anthracene	0.05	nd	0.05	yes	116	55	120	yes
Chrysene	0.05	nd	0.05	yes	120	55	125	yes
Benzo(b)fluoranthene	0.05	nd	0.05	yes	118	50	125	yes
Benzo(k)fluoranthene	0.05	nd	0.05	yes	113	50	115	yes
Benzo(a)pyrene	0.05	nd	0.05	yes	114	50	120	yes
Indeno(1,2,3-cd)pyrene	0.05	nd	0.05	yes	111	50	125	yes
Dibenzo(a,h)anthracene	0.05	nd	0.05	yes	116	50	125	yes
Benzo(ghi)perylene	0.05	nd	0.05	yes	112	50	125	yes

Surrogate Standard Recoveries (Control Limits)

Acenaphthene-d10	92%	103%	25	125	yes
Anthracene-d10	106%	116%	30	125	yes
Benzo(a)pyrene-d12	121%	129%	35	130	yes

Client: KGS Group
Project Reference: 99-570-02
Work Order Number: G995555B
Matrix: Soil

Polynuclear Aromatic Hydrocarbons (PAH's)

Date: 07-Dec-99

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

Date received: November 30, 1999
Date extracted: December 2, 1999
Date analysed: December 3 & 7, 1999

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 8270B (modified).

REPORT DISCUSSION:

(1) The recovery for flouranthene in the spiked method blank was outside our inhouse tolerance limits. However, it is well within the allowable range of the reference method U.S. EPA Method 8270B. It has been evaluated as having no significant impact on the data quality.

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:



Floyd Mayede, B.A.Sc., C.Chem.
Chemist



Client: KGS Group Consulting Engineers
3227 Roblin Blvd.
Winnipeg, MA, CANADA
R3R 0C2

Fax: 204-896-0754

Attn: Kimber Osiowy

Date Received: November 30/1999
Date Reported: December 8/1999
Lab Ref#: G995555
Lab Quote#: NB911-0894
Client PO#: 99-570-02
Client Ref#: 99-570-02
Sampled By: Dean kasur

Attached are your results for VOC's

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



Client: KGS Group
Project Reference: 99-570-02
Work Order: G995555V
Matrix: Soil

VOLATILE ORGANIC COMPOUNDS

Date: 08-Dec-99

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

Compound	EQL µg/g	MW2-5	MW2-5 Dup.
Chloromethane	1.0	nd	nd
Vinyl chloride	0.5	nd	nd
Bromomethane	1.0	nd	nd
Chloroethane	1.0	nd	nd
Trichlorofluoromethane	0.2	nd	nd
Acetone	10.0	nd	nd
1,1-Dichloroethene	0.1	nd	nd
Dichloromethane (Methylene Chloride)	0.5	nd	nd
trans-1,2-Dichloroethene	0.1	nd	nd
Methyl-t-Butyl Ether	0.1	nd	nd
1,1-Dichloroethane	0.1	nd	nd
Methyl Ethyl Ketone (MEK)	5.0	nd	nd
cis-1,2-Dichloroethene	0.1	nd	nd
Chloroform	0.1	nd	nd
1,2-Dichloroethane	0.1	nd	nd
1,1,1-Trichloroethane	0.1	nd	nd
Carbon Tetrachloride	0.1	nd	nd
Benzene	0.05	nd	nd
1,2-Dichloropropane	0.1	nd	nd
Trichloroethene	0.1	nd	nd
Bromodichloromethane	0.1	nd	nd
cis-1,3-Dichloropropene	0.1	nd	nd
Methyl Isobutyl Ketone (MIBK)	5.0	nd	nd
trans-1,3-Dichloropropene	0.1	nd	nd
1,1,2-Trichloroethane	0.1	nd	nd
Toluene	0.1	nd	nd
2-Hexanone	5.0	nd	nd
Dibromochloromethane	0.1	nd	nd
1,2-Dibromoethane (Ethylene dibromide)	0.1	nd	nd
Tetrachloroethene (Perchloroethylene)	0.1	nd	nd
1,1,1,2-Tetrachloroethane	0.1	nd	nd
Chlorobenzene	0.1	nd	nd
Ethylbenzene	0.1	nd	nd
m-Xylene & p-Xylene	0.1	nd	nd
Bromoform	0.1	nd	nd
Styrene	0.1	nd	nd
1,1,2,2-Tetrachloroethane	0.1	nd	nd
o-Xylene	0.1	nd	nd
1,3-Dichlorobenzene	0.1	nd	nd
1,4-Dichlorobenzene	0.1	nd	nd
1,2-Dichlorobenzene	0.1	nd	nd

Surrogate Standard Recoveries: Control Limits: 70-130%

Dibromofluoromethane	114%	115%
Toluene-d8	90%	92%
4-Bromofluorobenzene	96%	96%

Client: KGS Group
Project Reference: 99-570-02
Work Order: G995555V
Matrix: Soil

VOLATILE ORGANIC COMPOUNDS

Date: 08-Dec-99

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

Method Blank

Spiked Method Blank

Compound	EQL µg/g	Result	Upper Limit	Accept	% Recovery	Lower Limit	Upper Limit	Accept
Chloromethane	1.0	nd	1.0	yes	84	60	140	yes
Vinyl chloride	0.5	nd	0.5	yes	81	60	140	yes
Bromomethane	1.0	nd	1.0	yes	93	60	140	yes
Chloroethane	1.0	nd	1.0	yes	89	60	140	yes
Trichlorofluoromethane	0.2	nd	0.2	yes	96	70	130	yes
Acetone	10.0	nd	10.0	yes	91	60	140	yes
1,1-Dichloroethene	0.1	nd	0.1	yes	94	70	130	yes
Dichloromethane (Methylene Chloride)	0.5	nd	0.5	yes	103	70	130	yes
trans-1,2-Dichloroethene	0.1	nd	0.1	yes	103	70	130	yes
Methyl-t-Butyl Ether	0.1	nd	0.1	yes	113	70	130	yes
1,1-Dichloroethane	0.1	nd	0.1	yes	98	70	130	yes
Methyl Ethyl Ketone (MEK)	5.0	nd	5.0	yes	96	60	140	yes
cis-1,2-Dichloroethene	0.1	nd	0.1	yes	108	70	130	yes
Chloroform	0.1	nd	0.1	yes	107	70	130	yes
1,2-Dichloroethane	0.1	nd	0.1	yes	111	70	130	yes
1,1,1-Trichloroethane	0.1	nd	0.1	yes	104	70	130	yes
Carbon Tetrachloride	0.1	nd	0.1	yes	103	70	130	yes
Benzene	0.05	nd	0.05	yes	105	70	130	yes
1,2-Dichloropropane	0.1	nd	0.1	yes	110	70	130	yes
Trichloroethene	0.1	nd	0.1	yes	108	70	130	yes
Bromodichloromethane	0.1	nd	0.1	yes	109	70	130	yes
cis-1,3-Dichloropropene	0.1	nd	0.1	yes	108	70	130	yes
Methyl Isobutyl Ketone (MIBK)	5.0	nd	5.0	yes	103	60	140	yes
trans-1,3-Dichloropropene	0.1	nd	0.1	yes	108	70	130	yes
1,1,2-Trichloroethane	0.1	nd	0.1	yes	115	70	130	yes
Toluene	0.1	nd	0.1	yes	113	70	130	yes
2-Hexanone	5.0	nd	5.0	yes	110	60	140	yes
Dibromochloromethane	0.1	nd	0.1	yes	112	70	130	yes
1,2-Dibromoethane (Ethylene dibromide)	0.1	nd	0.1	yes	110	70	130	yes
Tetrachloroethene (Perchloroethylene)	0.1	nd	0.1	yes	110	70	130	yes
1,1,1,2-Tetrachloroethane	0.1	nd	0.1	yes	110	70	130	yes
Chlorobenzene	0.1	nd	0.1	yes	110	70	130	yes
Ethylbenzene	0.1	nd	0.1	yes	113	70	130	yes
m-Xylene & p-Xylene	0.1	nd	0.1	yes	111	70	130	yes
Bromoform	0.1	nd	0.1	yes	103	70	130	yes
Styrene	0.1	nd	0.1	yes	106	70	130	yes
1,1,2,2-Tetrachloroethane	0.1	nd	0.1	yes	104	70	130	yes
o-Xylene	0.1	nd	0.1	yes	111	70	130	yes
1,3-Dichlorobenzene	0.1	nd	0.1	yes	106	70	130	yes
1,4-Dichlorobenzene	0.1	nd	0.1	yes	102	70	130	yes
1,2-Dichlorobenzene	0.1	nd	0.1	yes	105	70	130	yes

Surrogate Standard Recoveries:

Dibromofluoromethane	117%	yes	102	70	130	yes
Toluene-d8	96%	yes	104	70	130	yes
4-Bromofluorobenzene	92%	yes	99	70	130	yes

Client: KGS Group
Project Reference: 99-570-02
Work Order: G995555V
Matrix: Soil

VOLATILE ORGANIC COMPOUNDS

Date: 08-Dec-99

Legend: EQL = Estimated Quantitation Limit
nd = Not Detected Above EQL
Dup. = Duplicate

Date of sample receipt: November 30, 1999
Date of sample analysis: December 7, 1999

Analytical Method:

Due to a level of petroleum hydrocarbon compounds beyond the appropriate range, the sample could not be analysed by the low level direct purge method. The sample was preextracted in methanol and the extract analysed by medium level purge & trap (US EPA Method 5035) gas chromatography/mass spectrometry using US EPA Method 8260B (modified).

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:



.....
Ron Corkum, M.Sc., C.Chem.
Manager, Mass Spectrometry Services



File 99-~~570~~ 570-02

Client: KGS Group Consulting Engineers
3227 Roblin Blvd.
Winnipeg, MA, CANADA
R3R 0C2

Fax: 204-896-0754

Attn: Kimber Osiowy

Date Received: December 2/1999
Date Reported: December 13/1999
Lab Ref#: G995594
Lab Quote#: NB911-0894
Client PO#: 99-570-02
Client Ref#: 99-570-02
Sampled By: Dean Kasur

Attached are your results for PAH's

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



Client: KGS Group
Project Reference: 99-570-02
Work Order Number: G995594B
Matrix: Water

Polynuclear Aromatic Hydrocarbons (PAH's)

Date: 13-Dec-99

Units: Micrograms/Liter (µg/L)

Compound	EQL µg/L	MW4
Naphthalene	0.2	60.6
2-Methylnaphthalene	0.2	69.7
1-Methylnaphthalene	0.2	47.9
Acenaphthylene	0.2	0.4
Acenaphthene	0.2	1.5
Fluorene	0.2	2.5
Phenanthrene	0.2	1.1
Anthracene	0.2	nd
Fluoranthene	0.2	nd
Pyrene	0.2	nd
Benzo(a)anthracene	0.2	nd
Chrysene	0.2	nd
Benzo(b)fluoranthene	0.2	nd
Benzo(k)fluoranthene	0.2	nd
Benzo(a)pyrene	0.2	nd
Indeno(1,2,3-cd)pyrene	0.2	nd
Dibenzo(a,h)anthracene	0.2	nd
Benzo(ghi)perylene	0.2	nd

Surrogate Standard Recoveries (Control Limits)

Acenaphthene-d10 (25-120%)	51%
Anthracene-d10 (30-120%)	67%
Benzo(a)pyrene-d12 (30-115%)	76%

Client: KGS Group
Project Reference: 99-570-02
Work Order Number: G995594B
Matrix: Water

Polynuclear Aromatic Hydrocarbons (PAH's)

Date: 13-Dec-99

Units: micrograms/liter ($\mu\text{g/L}$)

Compound	EQL $\mu\text{g/L}$	Method Blank			Spiked Method Blank			
		Result	Upper Limit	Accept	% Recovery	Lower Limit	Upper Limit	Accept
Naphthalene	0.2	nd	0.2	yes	81	30	110	yes
2-Methylnaphthalene	0.2	nd	0.2	yes	82	20	105	yes
1-Methylnaphthalene	0.2	nd	0.2	yes	90	30	110	yes
Acenaphthylene	0.2	nd	0.2	yes	77	35	115	yes
Acenaphthene	0.2	nd	0.2	yes	82	35	105	yes
Fluorene	0.2	nd	0.2	yes	87	40	110	yes
Phenanthrene	0.2	nd	0.2	yes	88	45	110	yes
Anthracene	0.2	nd	0.2	yes	90	45	110	yes
Fluoranthene	0.2	nd	0.2	yes	95	50	115	yes
Pyrene	0.2	nd	0.2	yes	92	50	115	yes
Benzo(a)anthracene	0.2	nd	0.2	yes	107	55	110	yes
Chrysene	0.2	nd	0.2	yes	110	55	115	yes
Benzo(b)fluoranthene	0.2	nd	0.2	yes	106	50	115	yes
Benzo(k)fluoranthene	0.2	nd	0.2	yes	103	45	120	yes
Benzo(a)pyrene	0.2	nd	0.2	yes	101	45	115	yes
Indeno(1,2,3-cd)pyrene	0.2	nd	0.2	yes	108	35	130	yes
Dibenzo(a,h)anthracene	0.2	nd	0.2	yes	110	30	135	yes
Benzo(ghi)perylene	0.2	nd	0.2	yes	107	35	125	yes

Surrogate Standard Recoveries

Acenaphthene-d10	61%	63	25	120	yes
Anthracene-d10	69%	73	30	120	yes
Benzo(a)pyrene-d12	73%	81	30	115	yes

Client: KGS Group
Project Reference: 99-570-02
Work Order Number: G995594B
Matrix: Water

Polynuclear Aromatic Hydrocarbons (PAH'S)

Date: 13-Dec-99

Legend: EQL = Estimated Quantitation Limit
nd = Not detected above LOQ

Date received: December 2, 1999
Date extracted: December 7, 1999
Date analysed: December 8, 1999

ANALYTICAL METHOD:

The water sample was prepared by liquid-liquid extraction and analysed by gas chromatography/mass spectrometry using U.S. EPA Method 8270B (modified).

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:


Tasha Sutherland-Hill
Chemist



Client: KGS Group Consulting Engineers
3227 Roblin Blvd.
Winnipeg, MA, CANADA
R3R 0C2

Fax: 204-896-0754

Attn: Kimber Osiowy

Date Received: December 2/1999
Date Reported: December 14/1999
Lab Ref#: G995594
Lab Quote#: NB911-0894
Client PO#: 99-570-02
Client Ref#: 99-570-02
Sampled By: Dean Kasur

Attached are your results for VOC's

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

Client: KGS Group
Project Reference: 99-570-02
Work Order: G995594V
Matrix: Water

VOLATILE ORGANIC COMPOUNDS

Date: 14-Dec-99

Units: micrograms/liter (µg/L)

Compound	EQL µg/L	MW3 DF=500	MW3 DF=500 Dup.
Chloromethane	1.0	nd	nd
Vinyl chloride	0.5	nd	nd
Bromomethane	0.5	nd	nd
Chloroethane	0.5	nd	nd
Trichlorofluoromethane	0.5	nd	nd
Acetone	10.0	nd	nd
1,1-Dichloroethene	0.2	nd	nd
Dichloromethane (Methylene Chloride)	1.0	nd	nd
trans-1,2-Dichloroethene	0.2	nd	nd
Methyl-t-Butyl Ether	0.2	nd	nd
1,1-Dichloroethane	0.2	nd	nd
Methyl Ethyl Ketone (MEK)	5.0	nd	nd
cis-1,2-Dichloroethene	0.2	nd	nd
Chloroform	0.2	nd	nd
1,2-Dichloroethane	0.2	nd	nd
1,1,1-Trichloroethane	0.2	nd	nd
Carbon Tetrachloride	0.2	nd	nd
Benzene	0.1	4750	4680
1,2-Dichloropropane	0.2	nd	nd
Trichloroethene	0.2	nd	nd
Bromodichloromethane	0.2	nd	nd
cis-1,3-Dichloropropene	0.2	nd	nd
Methyl Isobutyl Ketone (MIBK)	5.0	nd	nd
trans-1,3-Dichloropropene	0.2	nd	nd
1,1,2-Trichloroethane	0.2	nd	nd
Toluene	0.2	1410	1380
2-Hexanone	5.0	nd	nd
Dibromochloromethane	0.2	nd	nd
1,2-Dibromoethane (Ethylene Dibromide)	0.2	nd	nd
Tetrachloroethene (Perchloroethylene)	0.2	nd	nd
1,1,1,2-Tetrachloroethane	0.2	nd	nd
Chlorobenzene	0.2	nd	nd
Ethylbenzene	0.2	363	380
m-Xylene & p-Xylene	0.2	1570	1650
Bromoform	0.2	nd	nd
Styrene	0.2	nd	nd
1,1,2,2-Tetrachloroethane	0.2	nd	nd
o-Xylene	0.2	446	467
1,3-Dichlorobenzene	0.2	nd	nd
1,4-Dichlorobenzene	0.2	nd	nd
1,2-Dichlorobenzene	0.2	nd	nd

Surrogate Standard Recoveries: Control Limits: 70-130%

Dibromofluoromethane	97%	99%
Toluene-d8	102%	100%
4-Bromofluorobenzene	96%	97%

Client: KGS Group
Project Reference: 99-570-02
Work Order: G995594V
Matrix: Water

VOLATILE ORGANIC COMPOUNDS

Date: 14-Dec-99

Units: micrograms/liter (µg/L)

Compound	EQL µg/L	Method Blank			Spiked Method Blank			
		Result	Upper Limit	Accept	% Recovery	Lower Limit	Upper Limit	Accept
Chloromethane	1.0	nd	1.0	yes	126	60	140	yes
Vinyl chloride	0.5	nd	0.5	yes	110	60	140	yes
Bromomethane	0.5	nd	0.5	yes	113	60	140	yes
Chloroethane	0.5	nd	0.5	yes	112	60	140	yes
Trichlorofluoromethane	0.5	nd	0.5	yes	93	70	130	yes
Acetone	10.0	nd	10.0	yes	92	60	140	yes
1,1-Dichloroethene	0.2	nd	0.2	yes	99	70	130	yes
Dichloromethane (Methylene Chloride)	1.0	nd	1.0	yes	103	70	130	yes
trans-1,2-Dichloroethene	0.2	nd	0.2	yes	104	70	130	yes
Methyl-t-Butyl Ether	0.2	nd	0.2	yes	100	70	130	yes
1,1-Dichloroethane	0.2	nd	0.2	yes	103	70	130	yes
Methyl Ethyl Ketone (MEK)	5.0	nd	5.0	yes	89	60	140	yes
cis-1,2-Dichloroethene	0.2	nd	0.2	yes	103	70	130	yes
Chloroform	0.2	nd	0.2	yes	100	70	130	yes
1,2-Dichloroethane	0.2	nd	0.2	yes	96	70	130	yes
1,1,1-Trichloroethane	0.2	nd	0.2	yes	97	70	130	yes
Carbon Tetrachloride	0.2	nd	0.2	yes	95	70	130	yes
Benzene	0.1	nd	0.1	yes	104	70	130	yes
1,2-Dichloropropane	0.2	nd	0.2	yes	102	70	130	yes
Trichloroethene	0.2	nd	0.2	yes	102	70	130	yes
Bromodichloromethane	0.2	nd	0.2	yes	97	70	130	yes
cis-1,3-Dichloropropene	0.2	nd	0.2	yes	100	70	130	yes
Methyl Isobutyl Ketone (MIBK)	5.0	nd	5.0	yes	98	60	140	yes
trans-1,3-Dichloropropene	0.2	nd	0.2	yes	96	70	130	yes
1,1,2-Trichloroethane	0.2	nd	0.2	yes	103	70	130	yes
Toluene	0.2	nd	0.2	yes	106	70	130	yes
2-Hexanone	5.0	nd	5.0	yes	95	60	140	yes
Dibromochloromethane	0.2	nd	0.2	yes	102	70	130	yes
1,2-Dibromoethane (Ethylene Dibromide)	0.2	nd	0.2	yes	102	70	130	yes
Tetrachloroethene (Perchloroethylene)	0.2	nd	0.2	yes	102	70	130	yes
1,1,1,2-Tetrachloroethane	0.2	nd	0.2	yes	102	70	130	yes
Chlorobenzene	0.2	nd	0.2	yes	104	70	130	yes
Ethylbenzene	0.2	nd	0.2	yes	103	70	130	yes
m-Xylene & p-Xylene	0.2	nd	0.2	yes	103	70	130	yes
Bromoform	0.2	nd	0.2	yes	102	70	130	yes
Styrene	0.2	nd	0.2	yes	102	70	130	yes
1,1,2,2-Tetrachloroethane	0.2	nd	0.2	yes	102	70	130	yes
o-Xylene	0.2	nd	0.2	yes	101	70	130	yes
1,3-Dichlorobenzene	0.2	nd	0.2	yes	102	70	130	yes
1,4-Dichlorobenzene	0.2	nd	0.2	yes	100	70	130	yes
1,2-Dichlorobenzene	0.2	nd	0.2	yes	101	70	130	yes

Surrogate Standard Recoveries:

Dibromofluoromethane	106%	yes	98	70	130	yes
Toluene-d8	98%	yes	103	70	130	yes
4-Bromofluorobenzene	98%	yes	98	70	130	yes

Client: KGS Group
Project Reference: 99-570-02
Work Order: G995594V
Matrix: Water

VOLATILE ORGANIC COMPOUNDS

Date: 14-Dec-99

Legend: EQL = Estimated Quantitation Limit
nd = Not Detected Above EQL
Dup. = Duplicate
DF = Dilution Factor

Date of sample receipt: December 2, 1999
Date of sample analysis: December 12, 1999

Analytical Method:

The water sample was analysed in duplicate by purge & trap gas chromatography/mass spectrometry using US EPA Method 8260B (modified).

Report Discussion:

Since some target compounds were present at a level above the calibration range of the instrument, the sample was run at a dilution factor to avoid exceeding the calibration range and causing excessive contamination of the purge & trap equipment. The quantitation limits for the 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.

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Job Approved By:


.....
Ron Corkum, M.Sc., C.Chem.
Manager, Mass Spectrometry Services



Client: KGS Group Consulting Engineers
3227 Roblin Blvd.
Winnipeg, MA, CANADA
R3R 0C2

Fax: 204-896-0754

Attn: Kimber Osiowy

Date Received: December 2/1999
Date Reported: December 14/1999
Lab Ref#: G995594
Lab Quote#: NB911-0894
Client PO#: 99-570-02
Client Ref#: 99-570-02
Sampled By: Dean Kasur

Certificate of Analysis

Analysis Performed: Extractable Hydrocarbons(Manitoba Guidelines), C11-C32
BTEX and Total Volatile Hydrocarbons(Manitoba Criteria)
Total Purgeable Hydrocarbons

Methodology:

- 1) The characterization of HydroCarbon in water by GC analysis, following a solvent extraction.
U.S. EPA Method No.8011(microextraction)
- 2) Analysis of Benzene, Toluene, Ethylbenzene, Xylenes & volatile Hydrocarbons by Static Headspace capillary GC-PID/FID. External std quantitation with surrogate stds.
U.S. EPA Method No. 3810(Modification)
- 3) Analysis of total purgeables in water by Purge & Trap capillary GC/MS.
U.S. EPA Method No. 5030

Instrumentation:

- 1) GC/FID/FID, Hewlett-PackardII GC, Dual injector, Dual FID, A/S
- 2) Varian 3400 GC PID/FID, Genesis Headspace Analyzer
- 3) Purge & Trap-GC/MS

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.





Client: KGS Group Consulting Engineers
3227 Roblin Blvd.
Winnipeg, MA, CANADA
R3R 0C2

Fax: 204-896-0754

Attn: Kimber Osiowy

Date Received: December 2/1999
Date Reported: December 14/1999
Lab Ref#: G995594
Lab Quote#: NB911-0894
Client PO#: 99-570-02
Client Ref#: 99-570-02
Sampled By: Dean Kasur

Certificate of Analysis

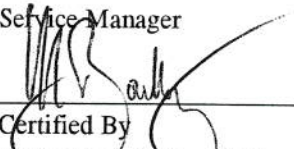
Sample Description: Water

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

Results: Refer to REPORT of ANALYSIS attached.



Certified By
Nick Boulton
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.



Certificate of Quality Control

Client : KGS Group Consulting Engineers
Contact: Kimber Osiowy

Date Reported: December 14/1999
Lab Ref # : G995594
Lab Quote#: NB911-0894
Client PO#: 99-570-02
Client Ref#: 99-570-02

Analysis of Water

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
Total SemiVolatile Hydrocarbons(C11-C32)	na	0.100	mg/L	nd	0.200	yes	104	70	120	yes	na	na	na	na	na	yes
Benzene	na	0.0002	mg/L	nd	0.0004	yes	96	60	120	yes	na	na	na	na	na	yes
Ethylbenzene	na	0.0002	mg/L	nd	0.0004	yes	98	60	120	yes	na	na	na	na	na	yes
Toluene	na	0.0002	mg/L	nd	0.0004	yes	98	60	120	yes	na	na	na	na	na	yes
Total Volatile Hydrocarbons	na	0.100	mg/L	nd	0.200	yes	120	60	120	yes	na	na	na	na	na	yes
Xylenes(Total)	na	0.0004	mg/L	nd	0.0008	yes	100	60	120	yes	na	na	na	na	na	yes
Total Purgeable Hydrocarbons	na	100.0	ug/L	nd	200.0	yes	na	na	na	na	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 : KGS Group Consulting Engineers
 Contact: Kimber Osiowy

Report Date: December 14/1999
 Lab Ref # : G995594
 Lab Quote #: NB911-0894
 Client PO#: 99-570-02
 Client Ref#: 99-570-02

Analysis of Water

Parameter	EQL	Units	MW 1	MW 1	MW 2	MW 3	MW 3
			1999/12/01	Replicate	1999/12/01	1999/12/01	Replicate
Resemblance	na	na	EGK?	EGK?	EGD?	EGD?	-
Total SemiVolatile Hydrocarbons(C11-C32)	0.100	mg/L	TR	TR	0.848	22.2	-
Benzene	0.0002	mg/L	0.0008	0.0007	0.0074	-	-
Ethylbenzene	0.0002	mg/L	0.0008	0.0008	0.0173	-	-
Toluene	0.0002	mg/L	0.0006	0.0006	0.0011	-	-
Total Volatile Hydrocarbons	0.100	mg/L	TR	TR	0.340	-	-
Xylenes(Total)	0.0004	mg/L	0.0006	0.0006	0.0005	-	-
Total Purgeable Hydrocarbons	100.0	ug/L	-	-	-	9100	10000

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.
 - Not Requested
 EGD? Contaminant elutes in the gasoline/diesel range but does not match our reference standards.
 EGK? Contaminant elutes in the gasoline/kerosene range, but does not match reference standards.
 na Not Applicable
 TR trace level less than EQL ! = EQL higher than listed due to dilution () Adjusted EQL

Report of Analysis

Report Date: December 14/1999
Lab Ref # : G995594
Lab Quote #: NB911-0894
Client PO#: 99-570-02
Client Ref#: 99-570-02

Analysis of Water

Parameter	EQL	Units	MW 4	MW 5	MW 6	MW 7	
			1999/12/01	1999/12/01	1999/12/01	1999/12/01	
Resemblance	na	na	EGD?	EGDMO?	EGDMO?	EGDMO?	
Total SemiVolatile Hydrocarbons(C11-C32)	0.100	mg/L	4.01	3.73	5.63	4.40	
Benzene	0.0002	mg/L	2.82	11.7	0.1090	12.7	
Ethylbenzene	0.0002	mg/L	0.2960	0.7630	0.2570	0.8330	
Toluene	0.0002	mg/L	0.1970	8.83	0.5530	9.80	
Total Volatile Hydrocarbons	0.100	mg/L	12.0	51.0	8.10	37.0	
Xylenes(Total)	0.0004	mg/L	1.30	4.29	1.15	4.73	
Total Purgeable Hydrocarbons	100.0	ug/L	-	-	-	-	

na Not Applicable

APPENDIX C

MANITOBA ENVIRONMENT SITE SENSITIVITY ASSESSMENT

**MANITOBA ENVIRONMENT
REMEDATION CRITERIA
SITE SENSITIVITY ASSESSMENT**

1. SITE INFORMATION

SITE DESCRIPTION

- Construction equipment storage

SURROUNDING LAND USE

North: Rail line and vacant land
East: Petro Canada Cardlock and used car dealership
South: Commercial land use
West: Commercial land use

GROUNDWATER USAGE

- Groundwater is not used as a potable source of water.

SURFACE WATER

- Omands Creek is located approximately 750 m to the west
- Surface drainage is primarily towards roads located west and east of the subject property

NEARBY UNDERGROUND STRUCTURES

- None

OTHER SPECIAL ENVIRONMENTAL CONDITIONS

- None

SUBSURFACE CONDITIONS

Soil type: Fill layers (granular, sand and gravel, silty clay, clayey silt, cinder), silty clay and clayey silt.

Water table: Occurs approximately at 1.19 m to 1.74 m below surface.

2. SENSITIVITY ASSESSMENT

a) Ingestion

RECEPTOR	RECEPTOR SENSITIVITY	LIKELIHOOD OF IMPACT	SENSITIVITY RANKING
Groundwater	High	Low	Medium

SITE SENSITIVITY RANKING - MEDIUM

b) Inhalation (Vapours From Soil)

RECEPTOR	RECEPTOR SENSITIVITY	LIKELIHOOD OF IMPACT	SENSITIVITY RANKING
Commercial / Industrial	Medium	Low	Low

SITE SENSITIVITY RANKING - INHALATION (SOIL): LOW

c) Inhalation (Vapours From Groundwater)

RECEPTOR	RECEPTOR SENSITIVITY	LIKELIHOOD OF IMPACT	SENSITIVITY RANKING
Commercial/ Industrial	Medium	Low	Low

SITE SENSITIVITY RANKING - INHALATION (GROUNDWATER): LOW

3. CLEAN-UP CRITERIA - SOIL

Site sensitivity ranking is LOW
-soil remediation to Level III

APPENDIX D
SITE RECONNAISSANCE CHECKLIST

SITE RECONNAISSANCE CHECKLIST

Client: Maple Leaf Construction

Location of Site: 1600 Erin St.

Date of Visit: 99/11/26

Climatic Conditions: -5°C snowing

1.0 PRESENT SITE DEVELOPMENT

Site Description: fenced in equip. storage area

Roads: none

Dwellings: none

Underground Utilities: none

Power Lines: O/H - outside fence

Structures: none

Public Buildings: none

Right-of-ways: none

Underground storage tanks: none

Wells: none

Accessibility of drilling equipment: fair - good

2.0 SURFACE CONDITIONS

Topography: relatively flat, sloping towards edges of property

Direction of runoff: towards property lines

Vegetation: none

4.0 INSIDE BUILDINGS(S) INSPECTION

Ceiling tile:

Pipe wrap:

Wall board:

Floor tile:

Electrical equipment:

Insulation:

Chemical and/or fuel storage:

} N/A

5.0 ADJACENT LAND USE

North: railway line followed by vacant land

South: commercial

East: Petro-Canada Cardlock station, used car dealer

West: commercial

Ponded water: none

Dwellings: none

Roads/utilities: to the east + west

Structures: none

Public buildings: none

Right-of-ways: railway line to the north

APPENDIX E
HYDRAULIC CONDUCTIVITY GRAPH

	MAPLE LEAF CONSTRUCTION MW4 Data Set: <u>C:\AQTM\9957002.aqt</u> Date: <u>01/28/00</u> Time: <u>13:57:59</u>
	PROJECT INFORMATION Company: <u>KGS Group</u> Client: <u>Maple Leaf Construction</u> Project: <u>99-570-02</u> Test Location: <u>1600 Erin Street</u> Test Well: <u>MW4</u> Test Date: <u>December 1/99</u>
	SOLUTION Aquifer Model: <u>Unconfined</u> Solution Method: <u>Bouwer-Rice</u> $K = 2.826E-07$ m/sec $y0 = 3.762$ m
	AQUIFER DATA Saturated Thickness: <u>1.593</u> m Anisotropy Ratio (K_z/K_r): <u>0.1</u>
	WELL DATA (MW4) Initial Displacement: <u>4.012</u> m Casing Radius: <u>0.025</u> m Screen Length: <u>1.593</u> m Water Column Height: <u>1.593</u> m Wellbore Radius: <u>0.0635</u> m Gravel Pack Porosity: <u>0.3</u>

