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PRELIMINARY GEOTECHNICAL INVESTIGATION REPORT
PROPOSED MARTISON PHOSPHATE MINE SITE DEVELOPMENT
HEARST, ONTARIO

Submitted to:

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EXECUTIVE SUMMARY

AMEC Earth & Environmental, a division of AMEC Americas Limited (AMEC), was retained by PhosCan Chemical Corp. (PhosCan) to provide engineering services for a preliminary geotechnical investigation for a proposed mine site development.

The proposed mine site is located approximately 90 km to the Northeast of Hearst, Ontario. A part of the geotechnical investigation was conducted in tandem with exploration work conducted by PhosCan. AMEC's scope of work was derived from the PhosCan's Request for Proposal of January 14, 2008, and was outlined in the AMEC's proposal PY86006 of January 29, 2008.

The site is currently undeveloped, and is mainly covered by wet muskeg, along with spruce forested areas. The area is generally low lying with poor drainage. Small ponds and creeks occur throughout the area.

The fieldwork for the current investigation consisted of 12 shallow boreholes outside the proposed open pit footprint, 6 deeper boreholes within the open pit footprint, and 37 test pits. The boreholes were advanced to depths of up to 115.5 m below existing grade. The boreholes were put down by truck and track mounted drills between January 31st and March 11th, 2008. The test pits were excavated with an excavator between 10th and 15th of February 2008.

The general soil stratigraphy revealed in the boreholes and test pits comprised a surficial muskeg and swamp deposit, underlain by glacial deposits, preglacial deposits, and then the weathered Precambrian bedrock. The glacial soils consist primarily of sequences of fine to coarse grained tills, with fine-grained silty clay to silt and sand interlayers. The preglacial deposits, described as Cretaceous sediments, consist of heterogeneous silt with some clay to silty sand layers with occasional to frequent organic material (lignite). In general the deep boreholes encountered weathered bedrock, underlying the preglacial heterogeneous silt deposit. A high water table exists across the site with water levels located within the surficial muskeg.

Based on the above soil and groundwater condition information, it is considered that excavations below the groundwater table and in swampy areas will require dewatering and drainage of the muskeg layer (e.g., construction of isolation berms and pumping). The excavation within the existing silty till soils will be straightforward provided groundwater flow from the muskeg layers is adequately controlled. Significant groundwater flow is likely to occur in excavations intersecting pockets and/or layers of water bearing soil layers encountered within the deeper preglacial deposits. In this regard, dewatering within the excavation will require a combination of pumping from strategically located sumps and/or other suitable methods, such as filter drains, pump wells or well points, etc.

Dewatering of the overburden soils will be crucial to ensure pit slope and basal stability, and allow for suitable working conditions within the open pit. Seepage and runoff control at the pit walls will be required both during development of the open pit as well as during the mining operations.

The use of imported fill materials of specified geotechnical characteristics will likely be required for specific applications (e.g. drainage, road and slab-on-grade base, etc), where the on-site materials may not be appropriate.

Further geotechnical investigation, including detailed field in-situ and laboratory testing, will be required to characterize the nature and geotechnical characteristics of the soil strata to carry out the detailed geotechnical design.

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1.0 INTRODUCTION

AMEC Earth & Environmental, a division of AMEC Americas Limited (AMEC), has been retained by PhosCan Chemical Corp. (Phoscan) to assist with a preliminary geotechnical investigation for the proposed Martison Phosphate Mine Site project, north of Hearst, Ontario (Figure 1).

1.1 Geotechnical Investigation

AMEC's scope of work was based on the Phoscan's Request for Proposal of 14 January 2008 and was responded to in AMEC's proposal PY86006 of January 2008 (re. D-1[1]). The scope of work for this preliminary investigation included the following:

- Brief review of the existing background information.
- Site reconnaissance by a geotechnical engineer.
- Supervision of the winter 2008 investigation fieldwork.
- Carry out sample examination and routine laboratory testing.
- Assess the baseline geotechnical conditions (pre-feasibility level) for the planned main facilities:
  - Open Pit
  - Waste Rock dumps
  - Beneficiation Plant
  - Tailings Management Area
  - All season access roads

It should be noted that the investigation program, including selection of drilling contractors and type of drill rigs, was developed prior to our involvement. Our understanding of our scope of work was to supervise the drilling fieldwork, review the available historical information, obtain geotechnical samples, prepare geotechnical logs of the boreholes and provide a preliminary discussion regarding the geotechnical concerns, with the missing information and recommendations gaps to be filled during the next phase(s) of investigation.

Environmental considerations were not part of the scope of work for this geotechnical investigation.

This report presents the details of the preliminary geotechnical investigation, including details of fieldwork procedures, laboratory testing and interpretative comments from geotechnical engineering standpoint as they affect the development of the mine facilities.

1.2 Hydrogeological Study

In addition to the preliminary geotechnical investigation, a preliminary hydrogeological study was also undertaken to determine groundwater regime and flow conditions, as they relate to the construction of the proposed open pit. The results of the preliminary hydrogeological study are presented in a separate report.

1 References are listed in the last section of this report.

2.0 SITE AND GEOLOGICAL SETTING

2.1 Site Description

The proposed mine site is located approximately 90 km northeast of Hearst, Ontario. It is understood that the proposed development consists of an open pit mine, waste rock storage areas, tailings management areas, and various plant and mine offices. The site is generally low lying with poor drainage and is covered with muskeg and some treed areas. Small ponds, swamps and creeks exist through out the area. The grade variation within the pit area is approximately 2.6 m.

Currently, the access to the site includes a 30 to 40 km long winter road. The proposed development will include construction of an all-season access road, improvements to the existing road and installation of a pipeline and utilities.

Historically, the majority of subsurface investigations have taken place on-site since the early 1980's with one investigation in 1965 (re. R-3). The investigation reports (re. R-3 to R-8) are listed in the list of references at the end of this report.

Existing known drill hole locations are shown on Figure 2, based on information available from various sources.

2.2 Geology

2.2.1 Introduction

The following geological background is based on published information primarily available from the Ministry of Northern Development and Mines (MNDM). Specific references are provided and the reader is encouraged to seek out each reference for further information. Open File Report 5597 and Open File Report 5708 (re. GP-5 and GP-7) were reviewed during the preparation of this history. Additional geological information was made available from the Technical Report of April 1, 2007, titled "Martison Phosphate Project – South Ridge Lake Area, prepared by J.S. Spalding (re. GP-9). The primary focus of this section is to understand the findings of the field investigations and assessing the soil and rock characteristics within the geologic framework.

2.2.2 Bedrock and Preglacial Geology

The project site is located within the physiographic region called Hudson Bay Lowland area (Fig. 20.1, Easton R.M. 1992, re. GP-1), which is underlain by Palaeozoic and Mesozoic bedrock and soil material, over a Precambrian base.

Reportedly, regional tectonic events occurred in Paleozoic and Mesozoic. A particular outcome of these events of a direct interest for the project site was the creation of a relatively small subsidence (depression) in the Precambrian base, identified as Moose River Basin, which facilitated the deposition of one of the only two small depo-centres of Paleozoic and Mesozoic sediments present in Ontario. In the Moose River Basin, the depth reach of the Precambrian depression is about 500 m below sea level (Fig 20.2, Easton R.M. 1992, re. GP-1).

The southern margin of the Moose River Basin is, in part, bounded by a dominantly east-west major fault and displays a number of smaller-scale structural features, the most significant being the Pivabiska Ridge, Grand Rapids High, and Moose River High. It appears that the project site is located within, or in the immediate vicinity of the Pivabiska Ridge (Fig 20.6, Easton R.M. 1992, re. GP-1). While the height of this structural feature is relatively small, it influenced at certain times the sedimentation. Thus, the strata display steeper dips away from the ridge and from the southern faulted flank than the slopes along the northern flank of the basin. The Cretaceous (late Mesozoic era) sediments show themselves faulting features indicating that tectonic movements continued in this platform after the Mesozoic time (re. GP-1)

The oldest sediments discovered in the deeper depressions in the Hudson Platform would originate in Middle to Upper Ordovician (Bad Cache Rapids Group) but do not necessarily appear in the shallower depression of the Moose River Basin, where, the lowest elevation of the Precambrian depression base is only about 500 m below sea level. This "shallowness" of the Moose River basin could be the reason that the oldest sediment overlying the Precambrian in this shallow depression appears to be the Middle Devonian age, called Moose River Formation and consisting of limestone, dolostone and shale. In turn, younger layers (later Devonian) are topped in sequences described as William Island Formation (limestone, dolostone, shale) and then Long Rapids Shale Formation. Then, the Devonian base is "abruptly" (disconformably) covered by a Cretaceous formation, with only occasional lenses from Middle Jurassic, thus marking a geological "gap" of about 200 Million Years (Ma), or more between the two successive layers. The Cretaceous deposits are described as Mattagami and Mistuskwia Beds differentiated by the distribution and proportions of kaolinitic clays, clay, sand and lignite.

In accordance with an ESRI bedrock map, the area of the proposed pit seems to coincide with a small "speck" on top of the Precambrian base which northern projection was described previously as Pivabiska Ridge. The ESRI map describes this speck as "Intrusion of Unknown Age" consisting of Carbonatite – intrusive suite of early Paleozoic within the surrounding mass of Archean age. Hence, all, or most, of the bulk of the Paleozoic deposits mentioned earlier seem to be completely missing underneath the localized perimeter of this project site.

Instead, as referred to in various references (Spalding J.S. 2007 (re. GP-8), and the Ontario Geological Survey [OGS] materials (re. GP-1 to GP-6) the Precambrian – early Paleozoic base seem to be overlain by weathered parent bedrock material described as Residuum. The Residuum seems to have been concentrated within 3 neighbouring sub-zones described as Anomalies A, B, and C. In turn, the Residuum would be overlain by Mesozoic materials.

It is largely assumed that no Mesozoic material would be present west of Burstall-McBrien Township (OGS, 1982, GP-3). However, this appears to be refuted by boreholes PT08-03 and PT08-04, completed at the site. A very limited review of historic holes completed in 1983 indicated that some holes also encountered Mezozoic – Cretaceous deposits at the site. The material encountered in the current boreholes, below the glaciated soils, seem to be very similar with the reported Cretaceous soils encountered by historical drilling within the Mattagami Formation and/or Mistuskwia Beds basin extending easterly of the present site.

A more detailed description of the Cretaceous materials provided in Easton R.M., 1992 (re. Gp-1) is presented as follows:

Table 1 – Description of Cretaceous Materials, as per Easton R.M. 1992

Unit	Distribution	Deposition Environment	Thickness Range	Description
Mattagami Formation	Central & Southern Moose River Basin	River flood plain, lacustrine, swamp and bog component	14 to 166 m	Weakly consolidated kaolinitic mudrock with lesser silica sand, gravel and lignite. Mudstones are grey, black, white, yellow or red and may be organic rich and laminated, or may contain pebbles. Silica sand is white, massive, flat bedded or planar cross-stratified and associated with stacked gravel or silt deposits. Upper contact with Pleistocene is difficult to determine. Lower contact is sharp and disconformable with Mistuskwia Formation and unconformable with older strata.
Mistuskwia Beds	Central Moose Basin	Lacustrine, shoreline, deltaic	19 m (max)	Varicolored (grey, brown, green, pink, red) calcareous clays with thin beds of medium-grained unconsolidated calcareous quartz sands. Basal 2 m is a conglomerate with abundant limestone and red sandstone fragments, pyrite concretions, quartz, chert and volcanic pebble in sandy or silty matrix. Upper contact is sharp and disconformable with either Mattagami Fm. or Pleistocene deposits. Lower contact is sharp and disconformable with William Island FM.

2.2.3 Quaternary Geology

Twenty thousand years ago Ontario was completely covered by the Laurentide Ice Sheet. There are no Tertiary deposits known in Ontario, which led to the assumption that the repeated advancement and retreat of the glaciers in Pleistocene have scrapped these deposits completely. The older deposits of unconsolidated Paleozoic and Mesozoic material may have survived the erosion from glaciers due to some particular ground features that have prevented the removal of the material completely.

While the entire Great Ice Age began some 1.8 Ma ago, the Quaternary deposits in Ontario would not be older than 190,000 years, which includes 2 main glacial stages: the Illinoian and the Wisconsinan, separated by the interglacial Sangamonian Stage.

The glacial deposits in the Hudson Bay Lowland physiographic area (Fig. 21.23 Easton R.M. 1992, re Gp-1) are considered to be among the oldest Illinoian deposits in Ontario. There are three or more layers of tills. Texturally, all these tills are stony sand tills that seem to have been deposited in preglacial lakes.

The Interglaciar Sangamonian material overtopping the Illionian Till sequence in this region is described as Missinaibi Formation which would incorporate a lower marine layer topped by a fluvial member, a forest bed member, and finally an upper glaciolacustrine layer.

The last Wisconsinian glaciation began some 110,000 years ago and has left controversial records. Some researchers support the idea of a continual ice cover over the entire Hudson Bay Lowland area during the entire Wisconsinan period. As such, the tills deposited over the Missinaibi Formation would all have a subglacial origin explaining the stratified structure of the till encountered today below the much younger postglacial deposits.

Another group of researchers suggests that the area was not continuously covered by the continental ice sheet. It is believed that the lowland was ice-free at least twice; some 74 ka and again some 36 ka ago. Accordingly, at least two different major till depositions might have occurred as ice-marginal retreat / readvancement lakes.

The above debates are based on interpretations of the amino-acid dating method, or other similar techniques that all require some level of judgment.

At the end of last glaciation, apparently the entire area has been inundated by the Tyrell Sea which is believed to have deposited up to 7 m, or more, of marine sediments (clays and silts that coarsen upward into near-shore and beach deposits of sand and gravel in the vicinity of the Pivabiska River). Closer to James Bay, the marine sediments thickness increases to up to 60 m.

Muskeg blankets most of the Hudson Bay Lowland. Up to 4 m of muskeg cover has been observed, but the cover is considerably thinner, or absent, near riverbanks and on raised shoreline deposits.

2.2.4 Summary of the Geological Setting

In summary, the following general geological traits are anticipated to have a tangible impact on the geotechnical design of the proposed open pit:

- While no active faults are described in the region, the site seem to be located in the zone of confluence of geological structures and materials of extremely wide genesis and age from Precambrian migmatites, basalts and andesites, to early Paleozoic carbonitites, to Devonian limestone, dolostone and shale, to Cretaceous. The entire region is flattened out by a mantle of Quaternary material know for its records thicknesses (50 m +) compared to most of the Ontario surface.

- While most of the Moose River Precambrian depression base is covered by Paleozoic deposits, within the localized area of the site there seems to be a geological 'anomaly' whereby the bulk of the Paleozoic mantle is missing. Over limited areas, the surface of the Precambrian (or early Paleozoic) was weathered and generated the so-called Residuum deposit.
- The Paleozoic material (claystone, shale, mudstone, dolomitic and brecciated limestone) is in general lithified. It is expected to offer a relatively weak strength and low resilience to weathering when exposed to the elements. The thickness of the Paleozoic deposits would vary from zero to not more than 200 m.
- The Mesozoic deposit seems to be highly erratic with respect to the composition and consolidation. The material is essentially unlithified and presents a prevalent loose condition. The thickness of the deposit varies from zero to possibly over 50 m (OGS 1982, re. GP-3). Trace to significant organic soils and lignite are present. In the local area of interest, the Mesozoic deposit bears in part on the Residuum, and probably in part over intact Precambrian, or Paleozoic base.
- The glaciation from Pleistocene may have eroded the Tertiary deposits but could not completely erode the unlithified Mesozoic deposits.
- The Quaternary deposit is mostly dense fine-to-medium grained densely packed till with occasional thin interlayers of glaciolacustrine and glaciofluvial lenses. Occasional seams of Pleistocene peat occur sometime within or below the till.
- Earlier postglacial deposits are of a marine origin (clay-silts topped by and near-shore sand and gravel).
- Most of the area is blanketed by a muskeg mantle of 0 to in excess of 4 m thickness.

3.0 INVESTIGATION PROGRAM AND PROCEDURES

The fieldwork for this project was carried out from January 31 to March 12, 2008, when 6 deep sampled boreholes (numbered PT08-01 to 06) were advanced to 40 to 115.5 m depth and 12 medium-depth sampled boreholes (numbered GT08-1 to GT08-12) were put down to 12.8 to 16.6 m depth. The deep boreholes (PT08-01 to PT08-06) were located around the perimeter of and within the proposed outline of the open pit. The shallow boreholes (GT08-01 to GT08-12) were located on the northwest, west and southwest areas outside the open pit area. In addition to these boreholes, 37 test pits (TP08-01 to TP08-27), from 4.3 to 4.9 m deep, were excavated. The borehole and test pit locations were determined by PhosCan and are shown on Figure 2.

The boreholes were advanced with track and truck mounted soils drill rigs and the borehole logs with details of sampling, testing and inferred stratigraphy are presented in Appendix A. The test pits were excavated with a track mounted hydraulic excavator and their findings are summarized in a table in Appendix B. The drilling and backhoe contractors were retained by PhosCan.

Boreholes PT08-01, PT08-02A, PT08-03B, PT08-04, PT08-05 and PT08-06 were equipped with monitoring wells, installed on completion of the boreholes. The groundwater levels were measured at different dates in February and March 2008, and readings are indicated on the borehole logs (Appendix A).

In addition, information was provided by Davidson Well Drilling (Davidson), who installed and logged four wells for a pump test. This information is presented in Appendix C.

The sampled boreholes (PT and GT series) provided information such as, soil identification, relative density or consistency, as well as indications about the engineering properties of the soils. The sampled boreholes were advanced using hollow stem augers and wireline coring. Tricone drilling techniques were utilized in Borehole PT08-03A to a depth of 83.5 m, prior to coring.

Soil samples were recovered at predetermined depth intervals using split spoon samplers. Standard Penetration Tests (SPT) were carried out in conjunction with split spoon sampling according to ASTM D-1586 procedure. The SPT results are recorded on the borehole logs (Appendix A) as 'N'-values. The soil samples were placed in plastic bags and delivered to our office for further examination and testing.

Due to the generally dense to very dense nature of the existing fine-grained till deposit, hammer or auger refusal occurred at relatively shallow depths (less than 14 m below grade). Coring was undertaken in all deeper drill holes, except in Boreholes GT08-04, GT08-05, GT08-10, GT08-11, and GT08-12. Cores of the very dense soil were logged in the field and delivered to our office for further examination and testing.

Field vane tests were also carried out in the boreholes to assess the in-situ shear strength of the cohesive soils; however, due to the dense nature of the insitu material, the use of field vanes was limited. Field vane tests were carried out in Boreholes GT08-02 and GT08-05.

Ground surface elevations at the borehole and test pit locations were interpolated from a topographic survey of the site. Borehole locations were geo-referenced to UTM co-ordinates using a handheld Global Positioning System (GPS). Elevations and GPS co-ordinates of the borehole locations are summarized in Appendix A. Elevations and GPS co-ordinates for the test pits are given in Appendix B.

4.0 SOIL CONDITIONS

A summary of the subsurface conditions encountered in the boreholes and test pits is presented below.

4.1 Surficial Layers

A 0.3 to 3.5 m thick surficial layer of organics (muskeg) was encountered in all boreholes and test pits. The muskeg is expected to be in a moist to wet or saturated condition depending on the prevalent weather, thickness and relative elevation, at a particular location. The muskeg is expected to vary in quality and thickness across the site.

4.2 Upper Clayey Silt to Silty Clay

An upper layer of clayey silt to silty clay with some gravel, was encountered in several boreholes (Boreholes GT08-03, GT08-04, GT08-05,GT08-08, GT08-11, PT08-03, PT08-05, TP08-06, TP08-10, TP08-11, TP08-15, TP08-17, TP08-21, TP08-22, TP08-23, TP08-24, TP08-25, TP08-31, and TP08-32) right below the muskeg. The encountered thickness of this layer ranged from 0.3 to 2.3 m. The SPT 'N' values determined in this stratum varied between 1 and 24, indicating a very soft to very stiff consistency. The natural moisture content varied from 13% to 35 %. The consistency of this deposit was generally very soft immediately below the muskeg and increased rapidly with depth.

It is likely that this upper and relatively shallow deposit has a postglacial origin related to the assumed marine or freshwater floods and accordingly, it is anticipated to present increased sensitivity to remoulding.

A grain size analysis test was run on a selected sample. The test results, presented on Figure 3, indicated silt plus clay fractions of 80%.

4.3 Heterogeneous Sand and Silt Till

An extensive deposit of predominantly grey and damp to moist sand and silt till was encountered in all boreholes. The till layer is characterized by varying gravel and clay content, and occasional presence of cobbles and boulders within the sand and silt matrix. The till deposit was found to be very heterogeneous, varying between cohesive soils that are very stiff in nature, to cohesionless soils in a very dense state. Occasional to frequent sand and gravel pockets are expected throughout the till soils. The till soils extended to depths of between 31.7 m to 67.1 m and overlay preglacial soils (unlithified material). The till soils in PT08-02 extended to 33.2 m below grade, overlying fractured bedrock.

The SPT 'N' values within the stratum varied from 5 to in excess of 50, indicating a loose to very dense condition. The relative density of the material increases with depth, to a prevalent very dense condition. Below a maximum depth varying from about 3 m to a maximum of 14 m, the SPT testing was no longer practical due to extreme denseness of the material. Sampling in the extremely dense material was carried out using wireline coring.

A grain size analysis tests conducted selected representative samples (Figure 4) indicated silt plus clay fractions ranging between 59% and 92%.

Atterberg limit testing done on select soil samples resulted in liquid limit values ranging between 33% to 18% and plastic limits of between 26% and 10%. The Atterberg test results, plotted on the borehole logs, show CL to CI soils, which indicate soils with low to intermediate plasticity.

4.4 Lower Silty Clay Layers

Although, thin seams of silty clay to clayey silt were encountered randomly within the till soils, there were some distinct varved silty clay layers present at different horizons in the boreholes. Such a layer was encountered in 7 of the 19 boreholes at a depth of between 5.5 to 9.5 m and its thickness

ranged from 0.5 to 1.3 m. Another 0.2 to 2.2 m thick varved silty clay layer was encountered in 11 of the 19 boreholes at a depth of 10.5 to 15.5 m. The varved silty clay seam may be thicker than 1.1 m in Borehole GT08-02, as the borehole was terminated in this layer.

A varved silt and clay layer was also encountered over the preglacial Cretaceous deposits, or over residuum layers in Boreholes PT08-01, PT08-05 and PT08-06. A varved silt and clay layer, overlaying an organic soil layer, was encountered in Borehole PT08-03.

4.5 Organic Silt Layer

A 12 m thick deposit of an organic soil (40% organic content in a spot sample) was encountered in Borehole PT08-04 at a depth of 57.8 m, within the Cretaceous and/or Residuum layer. Similarly, a 0.8 m thick organic material layer was present at 67.8 m depth in Borehole PT08-03, and below 60 m depth in Borehole PT08-01, as traces and seams dispersed within the assumed Cretaceous deposit of sand and silt. It should be noted that an organic layer in this area has been also identified in previous investigations carried out in 1983 and 1984.

While this layer has been primarily identified as organic silt, there is the possibility that some samples contained lignite. Organic content was measured in selected sampled between 5 and 40% in two samples tested.

A grain size analysis test was run on one sample. The test results, presented on Figure 5, indicate the material comprises 45% of fraction passing Sieve #200 (silt plus clay size fractions).

Atterberg limit testing done on a select soil sample indicated liquid limit, plastic limit and plasticity index values of 78%, 60% and 18, respectively. The results indicate a MH-OH soil, which typically have high compressibility.

4.6 Residuum Stratum

From a geotechnical perspective, the Residuum deposit appears as a heterogeneous mixture of sand and silt with varying sand, silt and clay content and occasional gravel. The Residuum has mostly a red to dark brown colour but is occasional greenish to olive colour, with pockets of cemented, or lithified Residuum that is typically yellow to white in colour. Carbonatite fragments are present, along with discrete organics, possible lignite particles. The Residuum name seems to have been attributed by the geologist, to the geological deposit that incorporate the minerals of mining interest, in association with the inferred genesis of the deposit from weathering of the parent bedrock. However, as mentioned earlier, from geotechnical perspective this material is expected to behave as a generally non-cohesive, heterogeneous sand and silt deposit, with associated potential for erosion and piping, where conditions exist.

The Residuum was likely present in all PT series boreholes, except Borehole PT08-02, as unlithified or lithified (re-cemented) material, at depths of 31.7 to 68.6 m. The Residuum deposit thickness ranged between 15.5 and over 59.6 m, and it was encountered overlying bedrock, except in Borehole PT08-01 (the thickest Residuum deposit) which was terminated within the deposit.

A grain size analysis test was run on selected samples. The test results, presented in Figure 6, show the material to vary from clayey silt to predominantly silty sand with some silt and trace gravel. The results of the grain size analysis testing indicated silt plus clay size fractions varying between 30% and 90%.

Atterberg limit testing done on select soil samples of the Residuum deposit indicated liquid limit, plasticity limit and plasticity index values of 52% to 23%, 28 to 18%, and 24% to 5%, respectively. The Atterberg test results show primarily CI to CH soils (i.e., soils with intermediate to high plasticity), as well as ML and MI soils (i.e., silts with low to medium compressibility).

It was difficult to make a clear, visual distinction between the cretaceous and unlithified Residuum, except when the carbonatite component is obvious in the Residuum.

4.7 Weathered Bedrock – Cemented Residuum

Weathered bedrock was encountered in all PT series boreholes, except Borehole PT 08-01, at depths of between 33.4 to 108.4 m below the existing grade. Bedrock was not encountered in Borehole PT 08-01, which was terminated at a depth of 115.4 m.

The bedrock quality ranged from very poor to good (RQD values from 0% to 80%). RQD values were not calculated for all bedrock samples due to poor core quality or sample disturbance.

In the absence of specific mineralogic and textural analysis in some cases, it is not obvious whether the bedrock samples obtained during this investigation represent weathered parent bedrock, or re-cemented Residuum. Bedrock type is noted on the borehole logs and ranges from recemented Residuum, carbonatite and a wacke/conglomerate hybrid.

4.8 Groundwater

Groundwater readings were taken towards the end of fieldwork on March 14 and 15, 2008, within the monitoring wells installed in the PT series boreholes. The water levels were measured to be between 4 to 6.8 m below the existing grade. The long term groundwater level is expected to fluctuate, being lower during extended dry periods and higher during wet periods.

Indications of water bearing zones in the sand and silt layer were observed during drilling, especially within the cretaceous and residuum deposits. There is little data available with regard to the extent and therefore the transmissivity and storage capacity of these zones, however, the evidence of washouts at some cored samples, as well as occasional 'sinking', or dropping of the casing experienced at some locations, allude to potential challenges with excavations intersecting such buried aquifers (see Table 2).

A perched groundwater table is also present within the muskeg deposit. Based on the limited observations during test pitting, the flow rates and transmissivity of the perched groundwater could be significant.

More information about the groundwater is provided in the hydrogeological report.

Table 2 – Drilling Condition Observations

Borehole	Depth m	Soil Strata	Drilling Observations
PT08-01	62	Residuum	Casing dropped 600 mm while coring.
PT08-01	66.5	Residuum	Casing sank 150 mm.
PT08-01	68.9	Residuum	Casing sank 50 mm.
PT08-02	23.6	Till	Core barrel jammed.
PT08-02A	18.0	Till	Plugged bit.
PT08-02A	37.8	Residuum	All fines washed away.
PT08-02A	49.5	Residuum	Core barrel jammed
PT08-03	9.76	Till	Fines washed out.
PT08-03	10.7	Till	Fines washed out during drilling for CS#2. Attached sand trap to barrel for next run.
PT08-03	85.3	Bedrock	Casing jammed.
PT08-03	88.4	Bedrock	Casing remained in hole. Hole abandoned.
PT08-04	16.6	Till	Core barrel jammed.
PT08-04	19.7	Till	Sand washed out from barrel was collected from drilling mud.
PT08-04	22.7	Till	All fines washed out from CS 16
PT08-04	30.3	Till	Core barrel sanded in at 30.3 and 33.3 m.
PT08-04	39.5	Till	Core barrel sanded in at 39.5 m.
PT08-04	102	Residuum	Barrel jammed at 102 m. Sample from cuttings.
PT08-04	109.7	Bedrock or Cemented Residuum	Casing sanded in. No water return.
PT08-05	13.6	Till	300 mm of sand heave up rods. Spoon refusal at 14.2 m. Start coring.
PT08-05	70.8	Cemented Residuum	Casing remained in hole. Bottom of casing 70.84m.
PT08-06	10.7	Till	All fines washed out.
PT08-06	12.9	Till	All fines washed out.
PT08-06	18.3	Till	Artesian water pressure noted
PT08-06	19.5	Till	All fines washed out.

5.0 DISCUSSION OF INVESTIGATION RESULTS

The following section presents general discussions and interpretative comments and recommendations as they affect the design and construction of the plant structures, the open pit mine and other mine structures.

The detailed design to be developed for all mine components will be governed by economic considerations, site specific design considerations, design criteria (including regulatory requirements), and site conditions and limitations.

For construction work, appropriate technical specifications will have to be developed for all clearing, grubbing, stripping, seepage control and dewatering, earthwork construction, including use of geosynthetics (if required), concrete structures, pumping stations, etc. All construction will have to be carried out as per the requirements of the technical specifications and other contract documents.

Further detailed subsurface investigation, analyses and testing will be required as the design of the aforementioned mine components evolves. The following discussion is based on the preliminary data obtained from the current investigation and from the available background information.

5.1 Plant Facilities and Structures

Once the site plant building layout is developed, AMEC should review the final design layout in terms of our recommendations and perform additional geotechnical investigations at the finalized plant locations.

Most likely, the beneficiation plant and its infrastructures and supporting facilities will be built on an engineered fill pad placed over stripped intact till, or intact marine/lacustrine silty clay to clayey silt deposits.

5.1.1 Site Grading and Stripping

It is recommended that all the muskeg and other unsuitable soils be removed within the plant area. Any structure or facility founded on the muskeg deposit will experience excessive long-term total and differential settlements.

Based on the flat, poorly draining areas of the site, consideration should be given to raising site grade (using compactable inorganic soil) within the mine plant area to ensure that damage due to possible flooding is minimized. If the high clay content soils are not removed from these areas, a grade increase and the subsequent weight from the soil could cause long term settlements of these soils.

5.1.2 Earthquake Considerations

In conformance to the criteria in Table 4.1.8.4A, Part 4, Division B of the National Building Code (NBC 2005), the project site is classified as Site Class "D - Stiff Soil". The four values of the Spectral response acceleration S_a (T) for different periods and the Peak Ground Acceleration (PGA) can be obtained from Table C-2 in Appendix C, Division B of the NBC (2005). The design values of F_a and F_v for the project site should be calculated in accordance to Table 4.1.8.4 B and C.

Consideration should be given to conducting in-situ testing to determine the actual seismic site classification of the site. Based on the results of the field testing, an improved site classification is possible,"

5.1.3 Shallow Foundations – Conventional Spread Footings

Conventional spread footings would be suitable to support some the associated site plant and building structures. The footings should be founded on the native, undisturbed, inorganic soil deposit, or on engineered fills built over competent, inorganic subgrade soils.

Footings within unheated areas, or perimeter footings should be founded below the depth of frost penetration. Based on the Ministry of Transportation (MTO) guidelines, the depth of frost penetration at this site and in areas subjected to frequent snow removal is about 2.8 m below finished grade.

The stiff to very stiff glacio-marine silty clays or compact to dense tills will be able to sustain footing loads of 250 kPa net bearing pressures.

The soft zones of the silty clays, encountered immediately below the muskeg deposit are not suitable to support footings, or structural fill, and should be removed from the foundation limits. These should be stockpiled and examined for possible use elsewhere.

Engineered fill forming the building pad will also be competent to support structural loads. Using standard procedures of compaction, in conjunction with approved, compactable materials (imported well-grade granular, on-site select till, etc.) footings placed on such engineered fill will support loads of 200 kPa net bearing pressures.

The above recommendations are general in nature; the foundation design for each building or mine facility will have to be developed based on considerations of nature of foundation deposit, loading magnitudes, settlement sensitiveness, depth of embedment, and the like.

Prior to pouring foundation concrete, an engineer should examine the foundation surfaces. This is necessary to confirm the assumed founding conditions and to review the foundation construction procedures, etc. The subgrade should be protected from freezing, inundation and disturbance from seepage inflow, equipment traffic, and the like, at all times.

5.1.4 Reuse of Excavated Soil

The existing muskeg and organic material should be properly separated and stockpiled for reuse for pit closure or landscaping purposes.

Due to the lack of on-site aggregate sources, and the requirements for berm, roads, and building pads, the large amounts of local soils obtained from the main pit excavation should be considered for reuse. The excavated, native, inorganic, till soils should be stockpiled separately. For example

materials that are primarily silt and clay, as discussed above, should be set aside for the construction of berms and potential pond liners. Materials that contain more coarse material, such as the (conditioned) till, may be utilized for building pads and roadway construction.

The reuse of these materials will depend strongly on the time of year of construction and the moisture content of the material. Frozen or excessively wet material should not be utilized for construction purposes.

5.1.5 Service Trenches

Service trenches are expected to be cut within native inorganic subgrade or within engineered fill pads and/or embankments.

Protection against freezing is an integral part of buried service pipe design. The standard protective measure is to bury the service lines below the anticipated frost penetration depth (2.6 m for heated structures plus 0.2 m because of snow removal and no heat loss).

The bedding and cover of service lines will have to follow the manufacturer's specifications and the applicable provincial specifications (OPSS). The bulk of the trench backfill should be completed with material similar to the soils abutting the utility trench.

In the case of high hydraulic conductivity bedding and / or cover materials, cut-off collars consisting of less pervious soils, or grout, should be implemented at strategic locations to limit the potential, uncontrolled flows of perched groundwater accumulated within such conduits.

5.1.6 Conventional Excavations

All excavations must comply with the Occupational Health & Safety Act and Regulations for Construction Projects (the Act). As such, the side slopes of any excavations deeper than 1.2 m must be sloped as outlined in the Act.

Based on the criteria in the Act, the existing muskeg should be considered to be a Type 4 soil. The underlying dense till soil should be classified as a Type 2 Soil, while the firm to stiff silt and clay should be classified as Type 3, if ground water control methods are implemented to eliminate seepage. Exposure to weathering of the trench walls, without due protection, in general, would cause a downgrading of the soil behaviour.

Seepage from adjacent muskeg deposits is expected to be significant and should be diverted away from the excavations via berms and / or interceptor ditches.

Groundwater seepage thru the native inorganic soils should be moderate and can be handled with conventional dewatering methods from collection sumps and pumping.

5.2 Open Pit Development

The following section presents general comments and recommendations relative to the development of the open pit mine. Further detailed subsurface investigation, analyses and testing will be required to develop the pit slope designs. The following comments are based on the preliminary data obtained from the current investigation and from the available background information.

It is our understanding that pit development will be carried out in phases according to the development plan and its inter-relationship with other development activities, including the necessary infrastructure construction.

Table 3 – Anticipated Steps of Pit Development

Objective	Anticipated associated works	Geotechnical Issues
1. Stripping	• Stripping the muskeg under and inside the surface isolation berms • Stockpiling stripped organics for use at closure	• Stability of the access & haul roads and working surfaces
2. Pit excavation and drainage of the pit area	• Excavating slopes as per the design geometry (inclination and benches) • Seepage collection and removal at selected sections of benches • Protection of weak or excessive seepage outflow areas	• Stability of slope segments, including suitable instrumentation • Ditches, sumps & berm construction • Long-term stability of the berms
3. Maintenance of the slopes	• Monitoring • Dewatering and runoff management • Periodic repairs	• Instrumentation, monitoring, interpretation & developing corrective measures • Control surface erosion • Control weathering, especially from freezing-thawing and wetting-desiccation • Control groundwater seepage and piping
4. Mining of the ore	• Excavations & transport	• All issues discussed in Items 1 and 3
5. Water Management	• Pumping, holding, reclaim, treatment and release to environment	• Geotechnical, geochemistry, hydrology and hydraulics support as required
6. Pit Closure	• Design in consideration of the overall closure plan and regulatory requirements	• Geotechnical, hydrology, hydraulics and hydrogeological support, as required

5.2.1 Stripping and Diversion Berm Construction

The site within the footprint limits of the open pit and the surface water diversion berm around the site perimeter should be stripped to allow effective surface water diversion and dewatering at the construction sites.

Diversion or site isolation berms to limit perched groundwater and surface water inflow into the open pit will be required. It is largely anticipated that select native soil materials should be suitable for berm construction. However, the reuse of these materials will depend on the time of year during construction and the moisture content of the material. Frozen or excessively wet material should not be utilized for construction purposes. During initial construction operations, suitable on-site material may not be available for berm construction and imported material or appropriate liners may be required.

The strength and permeability requirements for berms entail the need for carefully engineered structures to ensure acceptable performance for the entire life span of the facility, under the anticipated severe weather. The compactable, local, inorganic materials would require berm slopes of 2H:1V, or flatter and a compactive effort of at least 95% Standard Proctor Maximum Dry Density (SPMDD) in order to generate acceptable levels of performance.

The slope faces should be stabilized against erosion from runoff, seepage, and particularly freezing-thawing cycles.

Based on the heterogeneous nature of the native soil material, adequate monitoring during construction and long term monitoring of the berms will be required to ensure that the berms integrity and functionality are maintained during the lifetime of the open pit mining operations.

5.2.2 Overburden Excavation

The overburden over the ore deposit and the underlying Residuum deposits will be excavated using appropriate open pit development procedures.

The crucial geotechnical concerns for this operation are:

- Short-Term Stability
- Long-Term Stability
- Stability of the access routes and working surfaces

The pit slopes should be designed in consideration of the soil stratigraphic and pore pressure variations encountered in the perimeter sectors of the open pit. Due consideration should also be given to dewatering measures and provision of ramp/roads for construction and mining traffic.

It should be noted that both the sand and silt till and (especially) the cretaceous materials will be susceptible to lose strength due to disturbance, and thus are expected to be essentially unsuitable for heavy tire traffic, until they are fully frozen. In addition, in adverse groundwater conditions, areas

of cretaceous soils may become also inaccessible to heavy track mounted equipment due to localized softening/liquefactions. Therefore, surface treatment of the traffic and working surfaces with granular or fine rockfill mat, with or without geosynthetic reinforcement, may be necessary.

It is recommended that selected slope segments be instrumented and monitored for vertical and horizontal deformation (with inclinometer and settlement points), pore pressure generation and/or dissipation (with piezometers), seepage quantities, etc. Also, a regular program of visual inspections and surveys of the pit slopes would be necessary.

Permanent groundwater control is an intrinsic component of the slope design, stability and safety, as well as of the entire mining operation. There are two major geotechnical aspects related with the groundwater control:

- To ensure that pore water pressures within the slope soil and the underlying rock mass do not trigger deep-seated slope failures, or basal instability; and,
- To ensure that groundwater seepage, that may daylight on the slope surface, does not cause unacceptable erosion and/or sloughing.

The dewatering will be required both at the surface (e.g., seepage collection and pumping out from sumps located at slope benches) and deep within the soil and/or bedrock. A number of potential options may be considered for dewatering to control pore water pressure from slope stability standpoint. These options may include: deep well pumping, vertical relief wells, filtered horizontal drains drilled into slope or slope toe, filtered horizontal drains (covered with toe berm) installed at selected bench segments, well points, etc. The drainage system will have to be designed based on detailed geotechnical and additional hydrogeological investigations, and optimized during early stages of open pit excavation.

As described earlier, the till deposit is heterogeneous and may contain water bearing sand and gravel seams. The installation of horizontal drains or other suitable drainage measures may be required to drain or control water pressure in these seams.

5.3 Service Corridor

The following discussion is limited to the construction of the "causeway" embankment within the low-land area covered by muskeg.

As no geotechnical information is available along the corridor, the preliminary discussion given hereafter is based on information available at the project site, and should be considered preliminary, subject to revision in the future.

5.3.1 Access Road Foundation

Generally thin and essentially non-submerged muskeg or other unsuitable soils can be stripped to expose sound subgrade for building the road embankment.

Thick and submerged muskeg covering large areas may be impractical and/or uneconomical to remove, and may require the use of "displacement" technique to build the road foundation. Overloading may be helpful in reducing subsequent settlements. Alternatively, or in conjunction with the displacement technique, corduroy type construction (depending on the availability of suitable material) or the use of geogrids may also be considered to float the embankment. Both methods would keep the existing muskeg in place, which will lead to long-term settlements and frequent road maintenance issues.

Once the road foundation (subgrade) is completed to the desired elevation, the road structure can be placed. The road base should consist of at least 600 mm of well graded crushed aggregate meeting the specifications of a Granular B Type II, placed in lifts not exceeding 250 mm and compacted to 100% SPMDD. Blast rock, with proper gradation and sufficient aggregate strength may be used to reduce the importation of Granular B Type II.

If a smoother riding surface is intended, a final lift consisting of least 150 mm of well graded crushed aggregate meeting the specifications of a Granular A, compacted to 100%, may be placed over the above noted base. However, it should be noted that the Granular A surface loses most of its strength during the spring thaw and load restrictions may be necessary during such the spring seasons.

Any of the construction phase which is weather and frost sensitive, should not be completed during adverse weather conditions. No frozen materials should be used for the road base, or foundation, where controlled compaction is required. The 'displacement' of the muskeg by oversized rock may be conducted in part during the winter time, if the contractor proves that freezing of the exposed muskeg does not prevent the "sinking" of the rock. It should be noted that during the excavation of test pits in mid February 2008, frost depth in the muskeg was noted to be as little as 200 mm in Test Pit TP 08-25.

5.3.2 Culverts and Bridge Abutments

Further geotechnical investigations involving stream or creek crossings will be required once the roadway alignment has been chosen. Recommendations regarding culverts and bridge abutments will be presented at a future date.

5.4 Pipeline Corridor

It is understood that approximately 90 km of slurry pipeline will be constructed. The slurry pipeline will consist of a coated steel pipe and either buried approximately 2 m below grade (Jacobs 2008) or installed in protective berm.

Consideration should be given to placing the pipeline within the all-season access road, and to allow adequate access for repairs. The bedding and cover of the service lines will have to follow the manufacturer's specifications and the applicable OPSS. The bulk of the trench backfill should be completed with material similar to the soils abutting the utility trench.

Culverts, pipelines or concrete placed within the muskeg environment, may experience excessive corrosion leading to reduced life expectancy. Future testing of the organics (muskeg) and associated groundwater is recommended to provide sufficient information in regards to the corrosion potential of the soils and groundwater.

The use of alternative products, such as HDPE pipelines and culverts should be considered.

6.0 CLOSURE

The Limitations of Report, as presented in Appendix F, forms an integral part of this report.

The recommendations included in this report, although site specific, have a general nature. It is recommended that the soil conditions described in this report be interpreted by a geotechnical designer in view of the applicable design requirements and the adopted construction methodologies.

The investigation work presented in this report was conducted under the technical guidance of Dr. Dan Dimitriu, P.Eng. This report has been prepared by Mr. Tommi Leinala and Dr. Dimitriu, and reviewed by Dr. Narendra S. Verma, P.Eng.

We trust that the information presented in this report is complete within our terms of reference. If you have any questions, please do not hesitate to contact our office.

Respectfully submitted,

AMEC Earth & Environmental

Dan Cacciotti
Project Manager

7.0 REFERENCES

Government Publications:

GP-1. Easton, R.M. 1992. The Grenville Province and the Proterozoic history of central and southern Ontario; in Geology of Ontario, Ontario Geological Survey, Special Volume 4, Part 2, p.714-904

GP-2. OGS, *March 2000, Erlis Data Sets #6 and #14*

GP-3. OGS. 1982. Mesozoic Geology and Mineral Potential of the Moose River Basin, edited by P.G.

GP-4. Telford and H.M. Verma,Ontario Geological Survey, Study 21,193p.

GP-5. Open File Report 5597, Palynological Analyses of Drillhole Series OGS83-01 to 83-08D and

GP-6. OGS 84-01 to 84-11, Moose River Basin, Ontario, 1986

GP-7. Open File Report 5708, The Onakawana B Drillhole (OGS 85D), District of Cochrane, 1989.

GP-8. Spalding, J.S. 2007. Martison Phosphate Project – South Ridge Lake Area. Unpublished.

Technical Reports:

R-1. Golder Associates, 1983. Preliminary Geotechnical Assessment of a Martison-Phosphate Deposit. Report to Camchib. Part of MNDM AFRI File 42J06SW001.

R-2. Golder Assoicates Ltd 2007. Preliminary Pit Slope Design Criteria. Unpublished.

R-3. South Ridge Mining and Exploration, 1965. Drill logs. MNDM AFRI File 42J06SW0019

R-4. Selco Mining Corporation Ltd. 1980. Drill logs. MNDM AFRI File 42J06SW8032

R-5. Selco Mining Corporation Ltd. 1982. Drill logs. MNDM AFRI File 42J06SW0500

R-6. Selco Mining Corporation Ltd. May 1982. Drill logs. MNDM AFRI File 42J06SW006

R-7. Camchib Mines Inc. 1983. Drill logs. MNDM AFRI File 42J06SW0341

R-8. Camchib Mines Inc. 1984. Drill logs. MNDM AFRI File 42J06SW0001

Other Documents:

D-1. AMEC Earth and Environmental, 2008. Proposal for Engineering Services, Geotechnical and Hydrogeological Study, Martison Phosphate Project, Hearst, Ontario, Project No. PY86006

EXPLANATION OF BOREHOLE LOG

This form describes some of the information provided on the borehole logs, which is based primarily on examination of the recovered samples, and the results of the field and laboratory tests. Additional description of the soil/rock encountered is given in the accompanying geotechnical report.

GENERAL INFORMATION

Project details, borehole number, location coordinates and type of drilling equipment used are given at the top of the borehole log.

SOIL LITHOLOGY

Elevation and Depth

This column gives the elevation and depth of inferred geologic layers. The elevation is referred to the datum shown in the Description column.

Lithology Plot

This column presents a graphic depiction of the soil and rock stratigraphy encountered within the borehole.

Description

This column gives a description of the soil stratums, based on visual and tactile examination of the samples augmented with field and laboratory test results. Each stratum is described according to the *Modified Unified Soil Classification System.*

The compactness condition of cohesionless soils (SPT) and the consistency of cohesive soils (undrained shear strength) are defined as follows *(Ref. Canadian Foundation Engineering Manual)*:

Compactness of Cohesionless Soils	SPT N-Value
Very loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	> 50

Consistency of Cohesive Soils	Undrained Shear Strength kPa	Undrained Shear Strength psf
Very soft	0 to 12	0 to 250
Soft	12 to 25	250 to 500
Firm	25 to 50	500 to 1000
Stiff	50 to 100	1000 to 2000
Very stiff	100 to 200	2000 to 4000
Hard	Over 200	Over 4000

Soil Sampling

Sample types are abbreviated as follows:

SS	Split Spoon	TW	Thin Wall Open (Pushed)	RC	Rock Core	GS	Grab Sample
AS	Auger Sample	TP	Thin Wall Piston (Pushed)	WS	Washed Sample	AR	Air Return Sample

Additional information provided in this section includes sample numbering, sample recovery and numerical testing results.

Field and Laboratory Testing

Results of field testing (e.g., SPT, pocket penetrometer, and vane testing) and laboratory testing (e.g., natural moisture content, and limits) executed on the recovered samples are plotted in this section.

Instrumentation Installation

Instrumentation installations (monitoring wells, piezometers, inclinometers, etc.) are plotted in this section. Water levels, if measured during fieldwork, are also plotted. These water levels may or may not be representative of the static groundwater level depending on the nature of soil stratum where the piezometer tips are located, the time elapsed from installation to reading and other applicable factors.

Comments

This column is used to describe non-standard situations or notes of interest.

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MODIFIED * UNIFIED CLASSIFICATION SYSTEM FOR SOILS

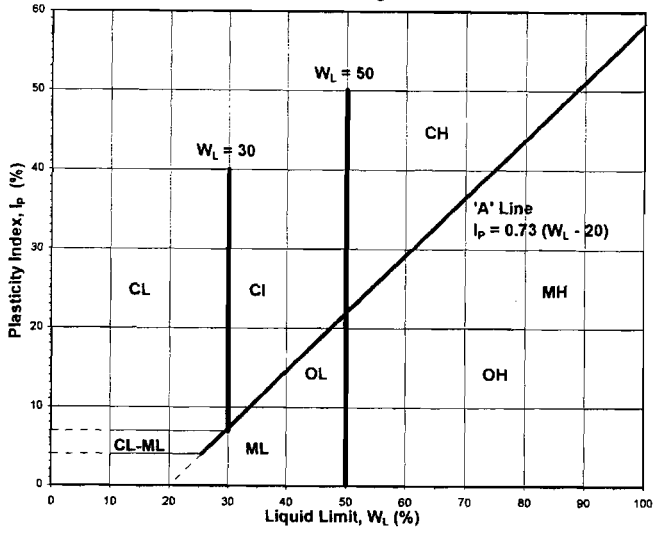
*The soil of each stratum is described using the Unified Soil Classification System (Technical Memorandum 36-357 prepared by Waterways Experiment Station, Vicksburg, Mississippi, Corps of Engineers, U.S Army. Vol 1 March 1953.) modified slightly so that an inorganic clay of "medium plasticity" is recognized.

MAJOR DIVISION			GROUP SYMBOL	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA
COARSE GRAINED SOILS (MORE THAN HALF BY WEIGHT LARGER THAN 75µm)	GRAVELS MORE THAN HALF THE COARSE FRACTION LARGER THAN 4.75mm	CLEAN GRAVELS (TRACE OR NO FINES)	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	$C_u = \frac{D_{60}}{D_{10}} > 4$; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$
			GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	NOT MEETING ABOVE REQUIREMENTS
		DIRTY GRAVELS (WITH SOME OR MORE FINES)	GM	SILTY GRAVELS, GRAVEL-SAND- SILT MIXTURES	ATTERBERG LIMITS BELOW "A" LINE OR P.I MORE THAN 4
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES	ATTERBERG LIMITS BELOW "A" LINE OR P.I MORE THAN 7
	SANDS MORE THAN HALF THE COARSE FRACTION SMALLER THAN 4.75mm	CLEAN SANDS (TRACE OR NO FINES)	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	$C_u = \frac{D_{60}}{D_{10}} > 6$; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$
			SP	POORLY GRADED GRAVELS, GRAVEL- SAND MIXTURES, LITTLE OR NO FINES	NOT MEETING ABOVE REQUIREMENTS
		DIRTY SANDS (WITH SOME OR MORE FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES	ATTERBERG LIMITS BELOW "A" LINE OR P.I MORE THAN 4
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES	ATTERBERG LIMITS BELOW "A" LINE OR P.I MORE THAN 7
FINE-GRAINED SOILS (MORE THAN HALF BY WEIGHT SMALLER THAN 75µm)	SILTS BELOW "A" LINE NEGLIGIBLE ORGANIC CONTENT	W_L < 50%	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY SANDS OF SLIGHT PLASTICITY	CLASSIFICATION IS BASED UPON PLASTICITY CHART (SEE BELOW)
		W_L < 50%	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOILS	
	CLAYS ABOVE "A" LINE NEGLIGIBLE ORGANIC CONTENT	W_L < 30%	CL	INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY OR SILTY CLAYS, LEAN CLAYS	
		30% < W_L < 50%	CI	INORGANIC CLAYS OF MEDIUM PLASTICITY, SILTY CLAYS	
		W_L < 50%	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	
	ORGANIC SLITS & CLAYS BELOW "A" LINE	W_L < 50%	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	WHENEVER THE NATURE OF THE FINES CONTENT HAS NOT BEEN DETERMINED, IT IS DESIGNATED BY THE LETTER "F", E G SF IS A MIXTURE OF SAND WITH SILT OR CLAY
		W_L < 50%	OH	ORGANIC CLAYS OF HIGH PLASTICITY	
HIGH ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS	STRONG COLOUR OR ODOUR, AND OFTEN FIBROUS TEXTURE

SOIL COMPONENTS

FRACTION	U.S STANDARD SIEVE SIZE		DEFINING RANGES OF PERCENTAGE BY WEIGHT OF MINOR COMPONENTS		
		PASSING	RETAINED	PERCENT	DESCRIPTOR
GRAVEL	COARSE	76 mm	19 mm	35-50	AND
				20-35	Y/EY
	FINE	19 mm	4.75 mm	10-20	SOME
				1-10	TRACE
SAND	COARSE	4 75 mm	2.00 mm		
	MEDIUM	2.00 mm	425 µm		
	FINE	425 µm	75 µm		
FINES (SILT OR CLAY BASED ON PLASTICITY)		75 µm			
OVERSIZED MATERIAL					
ROUNDED OR SUBROUNDED: COBBLES 76 mm TO 200 mm BOULDERS > 200 mm			NOT ROUNDED: ROCK FRAGMENTS > 76 mm ROCKS > 0.76 CUBIC METRE IN VOLUME		

Plasticity Chart for Soil Passing 425 Micron Sieve



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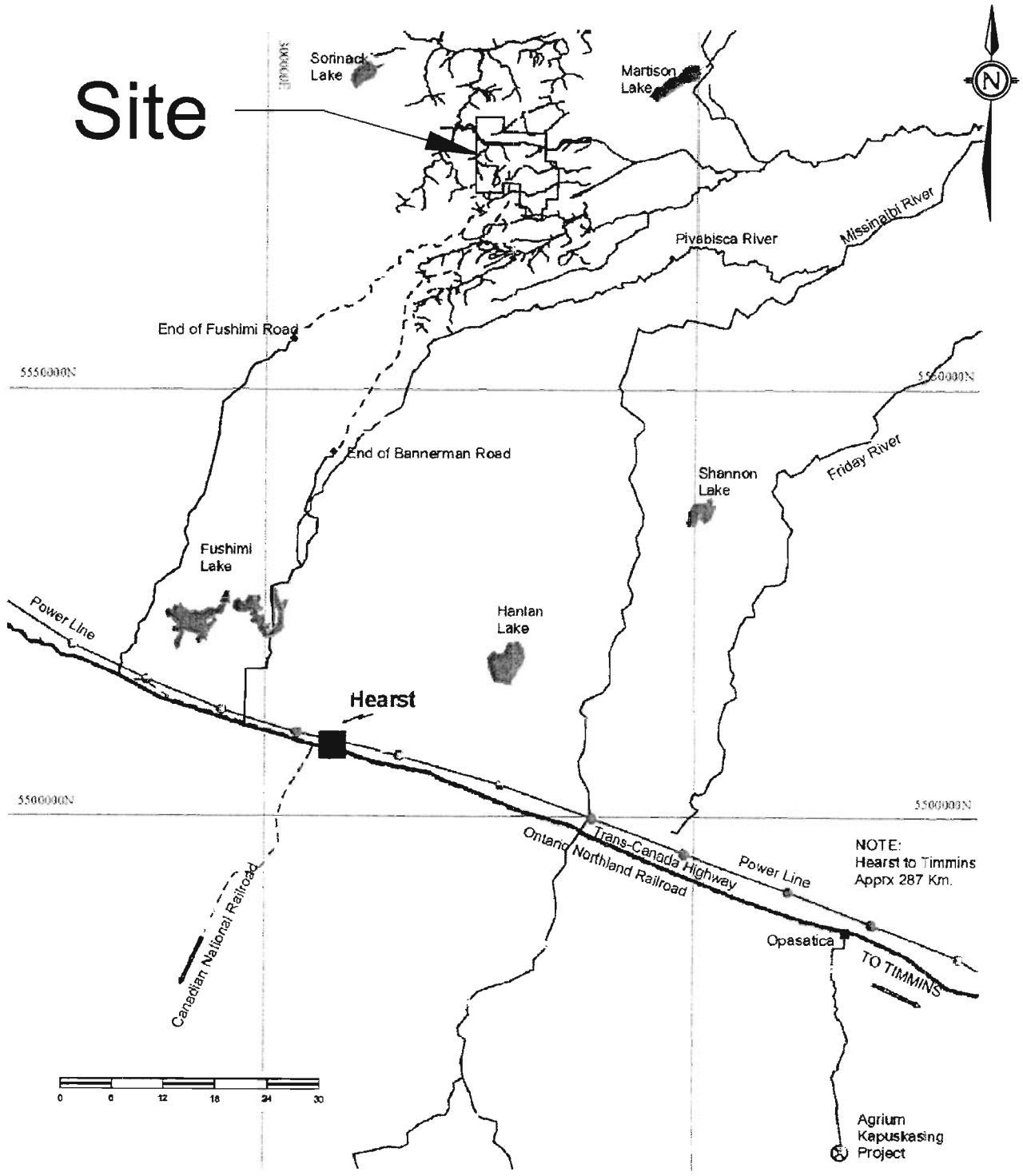
Note 1: Soils are classified and described according to their engineering properties and behaviour.

Note 2: The modifying adjectives used to define the actual or estimated percentage range by weight of minor components are consistent with the Canadian Foundation Engineering Manual (3rd Edition, Canadian Geotechnical Society, 1992.)

Rev. 5 Nov. '06



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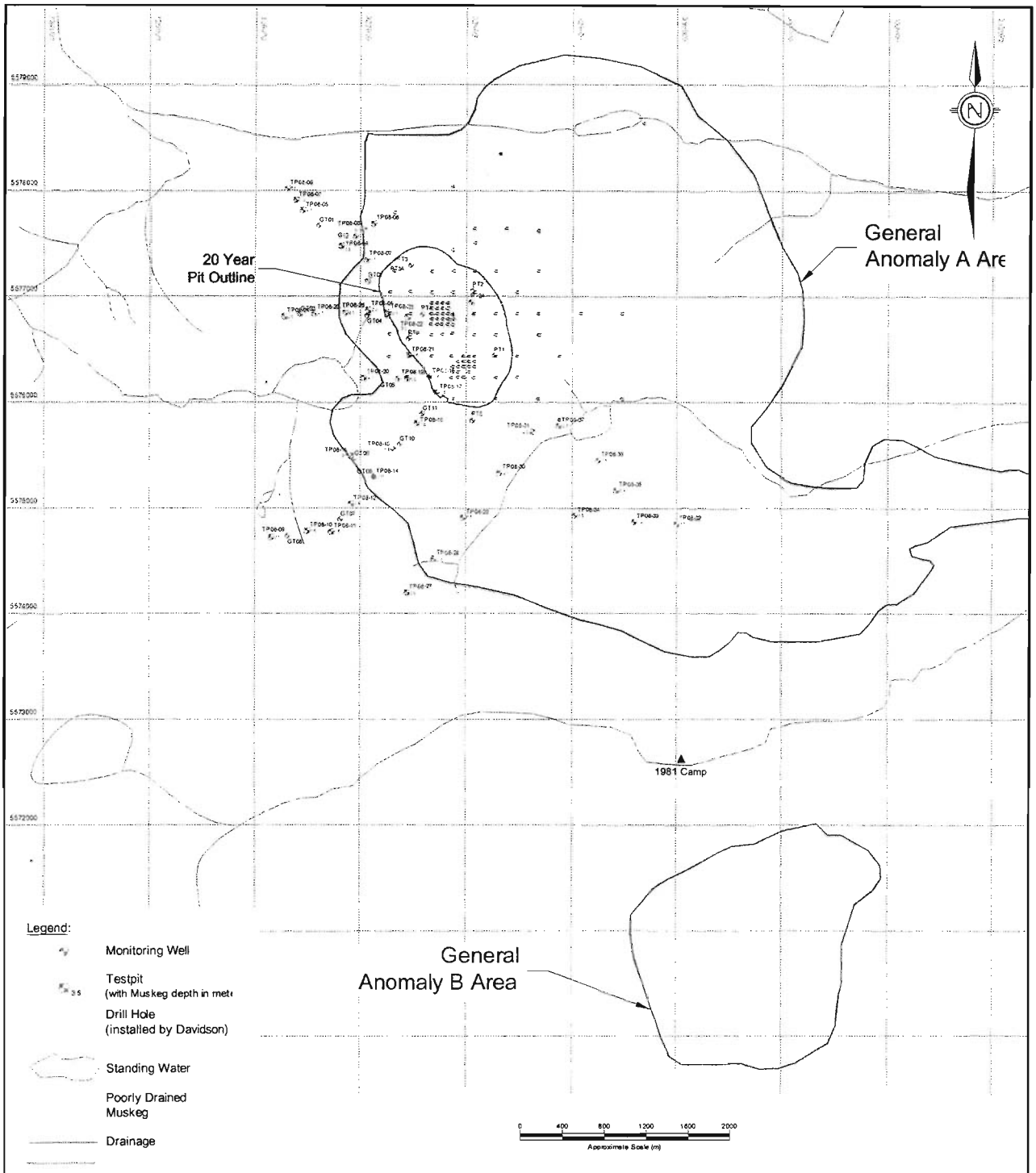
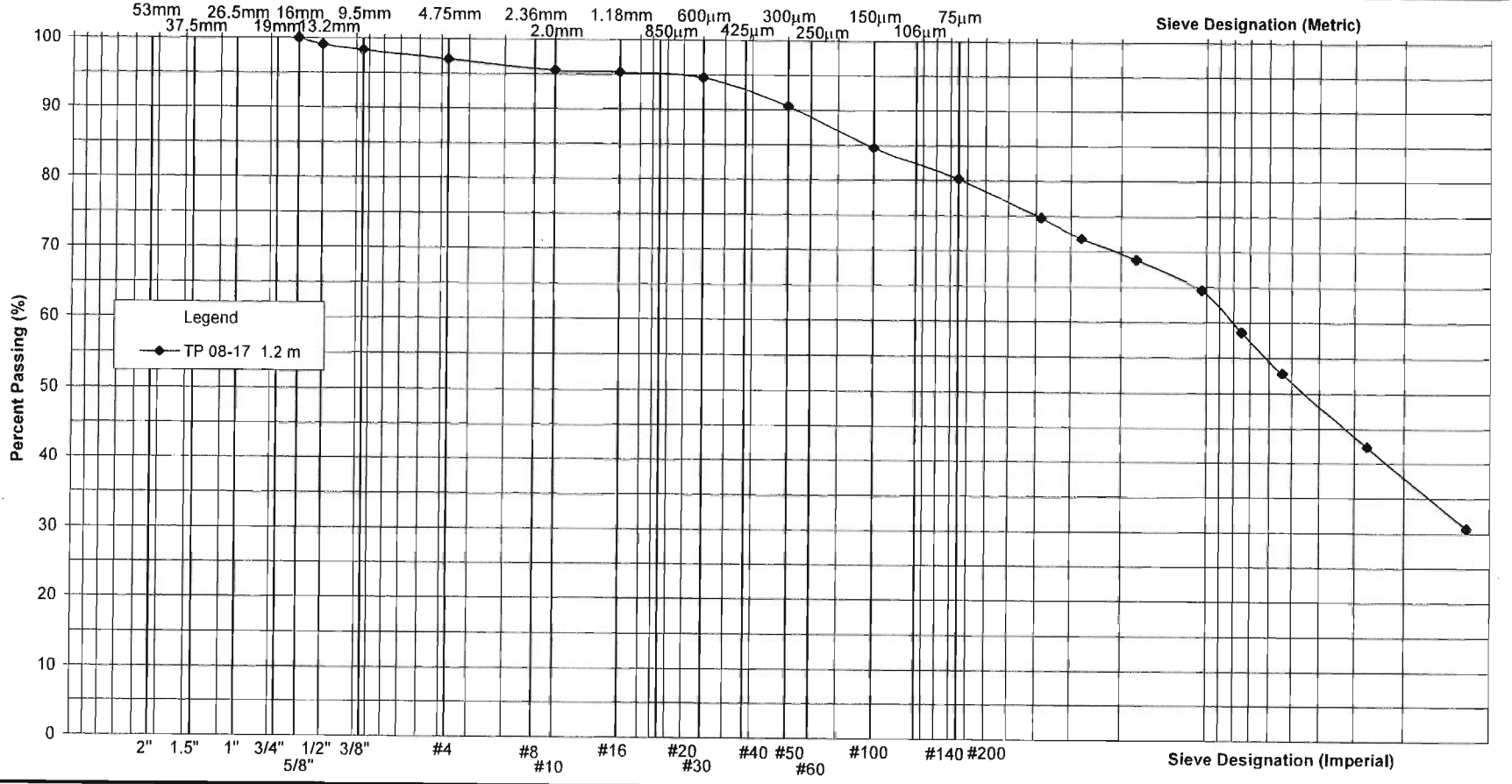
CLIENT: PhosCan Chemical Corporation				
PROJECT: Martison Phosphate Project Hearst, Ontatrio, Canada	DWN BY: KKJ	REV. NO.: A	DATE: September 2008	
			PROJECT NO: TY86002	
TITLE: Site Location Map	CHK'D BY: TJL	SCALE: as shown	FIGURE No. 1	



AMEC Earth & Environmental 131 Fielding Road Lively, Ontario P3Y 1L7 705-682-2632	amec	CLIENT PhosCan Chemical Corporation		
PROJECT Martison Phosphate Project Hearst, Ontario, Canada		DWN BY: KKJ	REV. NO.: A	DATE: September 2008
TITLE Test Hole Location Plan		CHK'D BY: TJL	SCALE: as shown	PROJECT NO: TY86002 FIGURE No. 2

UNIFIED SOIL CLASSIFICATION SYSTEM
GRAIN SIZE DISTRIBUTION ANALYSIS ASTM D 422

GRAVEL		SAND			FINES
Coarse	*Fine*	*Coarse*	*Medium*	*Fine*	*Silt and Clay*



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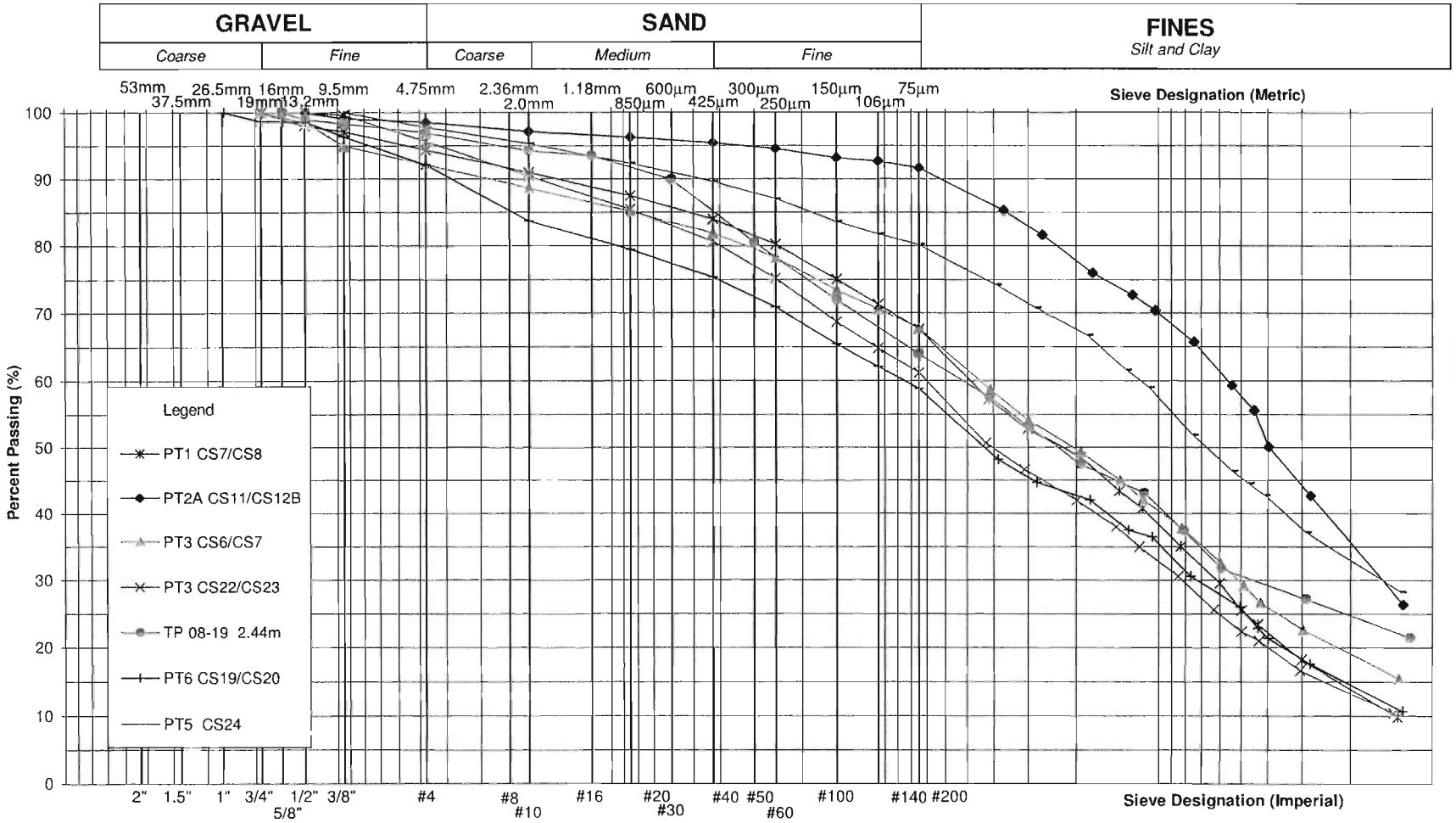
CLIENT: PhosCan Chemical Corp.	SAMPLED BY: AMEC	PROJECT: Martison Phosphate Project North of Hearst, Ontario	REV. No.: 1
	RECIEVED BY: AMEC		LAB No.: NA
	TESTED BY: AMEC	Sample Location: OPEN PIT AREA	PROJECT No.: TY86002
	DATE: September 2008	Sample Identification: SILTY CLAY	FIGURE No.: 3

UNIFIED SOIL CLASSIFICATION SYSTEM
GRAIN SIZE DISTRIBUTION ANALYSIS ASTM D 422



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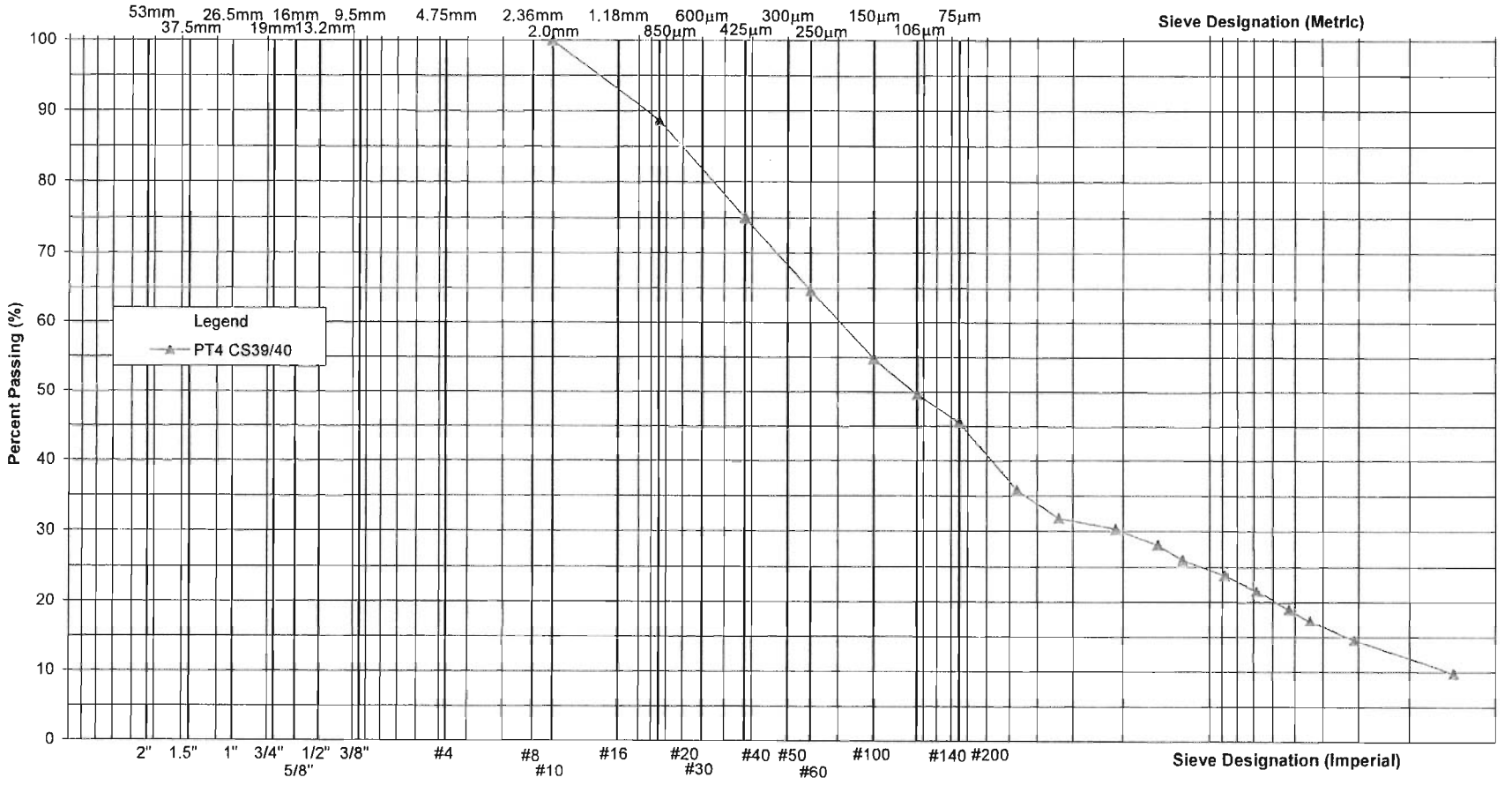
CLIENT: PhosCan Chemical Corp.	SAMPLED BY: AMEC	PROJECT: Martison Phosphate Project North of Hearst, Ontario	REV. No.: 1	
	RECIEVED BY: AMEC		LAB No.: Various	
	TESTED BY: AMEC	Sample Location: OPEN PIT AREA	PROJECT No.: TY86002	
	DATE: September 2008	Sample Identification: Sand and Silt Till	FIGURE No.: 4	

UNIFIED SOIL CLASSIFICATION SYSTEM
GRAIN SIZE DISTRIBUTION ANALYSIS ASTM D 422

GRAVEL		SAND			FINES
Coarse	*Fine*	*Coarse*	*Medium*	*Fine*	*Silt and Clay*



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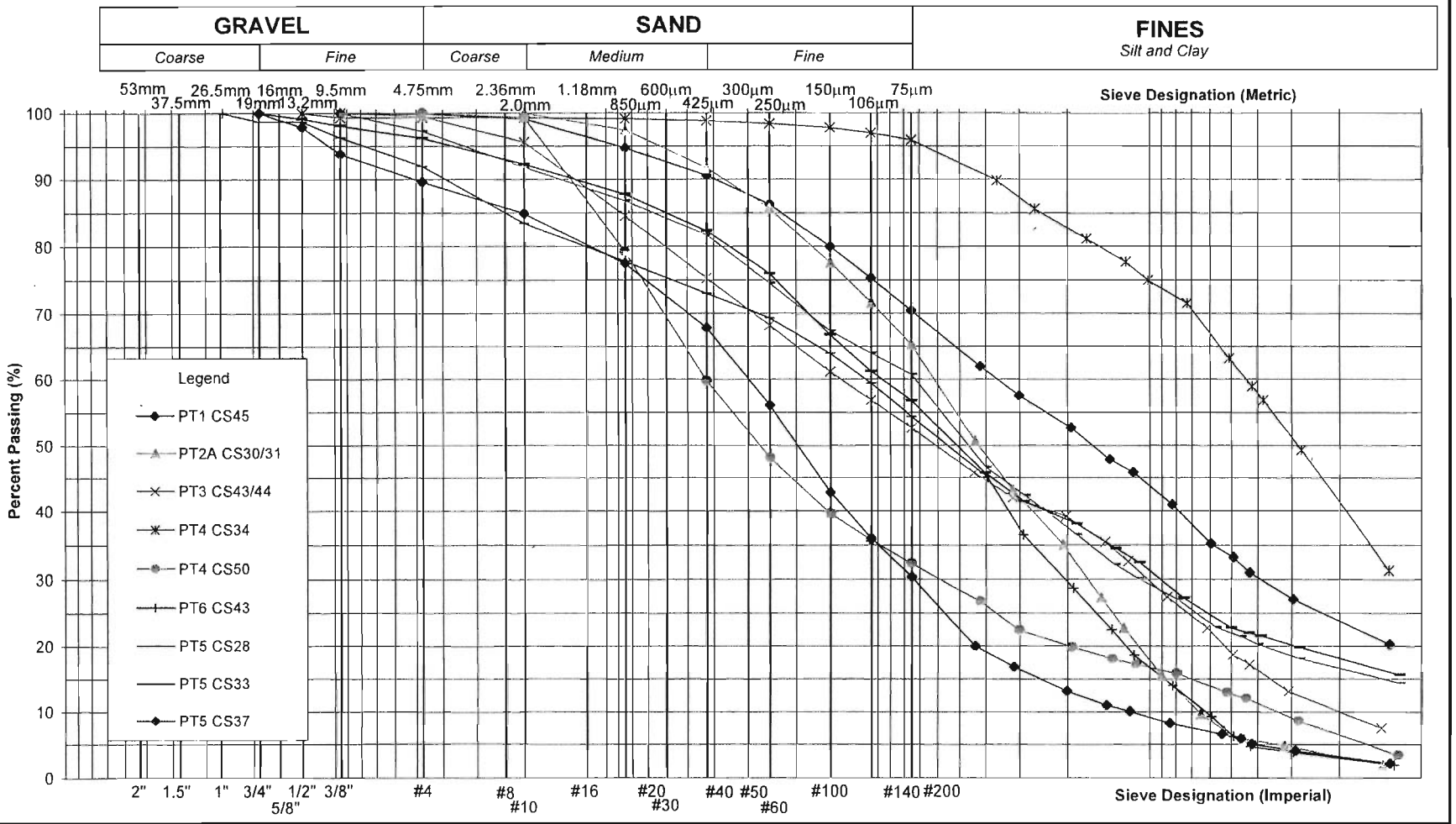
CLIENT: PhosCan Chemical Corp.	SAMPLED BY: AMEC	PROJECT: Martison Phosphate Project North of Hearst, Ontario	REV. No.: 1
	RECIEVED BY: AMEC		LAB No.: AdS046
	TESTED BY: AMEC	Sample Location: OPEN PIT AREA	PROJECT No.: TY86002
	DATE: September 2008	Sample Identification: Organic Silt	FIGURE No.: 5

UNIFIED SOIL CLASSIFICATION SYSTEM
GRAIN SIZE DISTRIBUTION ANALYSIS ASTM D 422



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CLIENT: PhosCan Chemical Corp.	SAMPLED BY: AMEC	PROJECT: Martison Phosphate Project, North of Hearst, Ontario	REV. No.: 1
	RECIEVED BY: AMEC		LAB No.: Various
	TESTED BY: AMEC	Sample Location: OPEN PIT AREA	PROJECT No.: TY86002
	DATE: September 2008	Sample Identification: Sand and Silt (Probably Residuum)	FIGURE No.: 6

APPENDIX A

BOREHOLE LOGS

RECORD OF BOREHOLE No. GT08-01 Co-Ord. 0326602 E, 5577666 N

amec

Project Number:	TY86002	Drilling Location:	See Figure 2	Logged by:	PRL
Project Client:	PhosCan Chemical Corp.	Drilling Method:	200 mm Hollow Stem Auger and Coring	Compiled by:	ETB
Project Name:	Martison Phosphate Project	Drilling Machine:	Truck Mounted Drill	Reviewed by:	TJL
Project Location:	Hearst, Ontario	Date Started:	06 Mar 08	Date Completed: 06 Mar 08	Revision No.: 4, 17/09/08

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION Local Ground Surface Elevation: 187.6 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_p W W_l Plastic Liquid; * Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	
	black ORGANICS (MUSKEG) fibrous							187				
			SS	1	8	2	1		○			
		185.9						186				
	brown to grey SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, very dense	1.7	SS	2	79	24	2		○	○11		
			SS	3	100	50/ 100mm		185		○9		
			SS	4	100	50/ 125mm	3		⊠	○12		
								184				
			SS	5	95	88	4		88 ○	○10		
								183				
			SS	6	100	67	5		○	○10		
	Boulders from 5.2m to 5.5m.	182.1	CS	7	57			182		○14		Start coring at 5.2 m.
	grey SILTY CLAY varved moist to wet, stiff	5.5 181.0	CS	8	100		6	181		○14		
	grey SAND and SILT varying gravel and clay content, occasional cobble or boulder (TILL) moist to wet, very dense	6.6	CS	9	100		8	179		○9		
			CS	10	82		9 10	178		○10		
		176.9						177				
	grey SILTY CLAY varved *moist to wet, stiff*	10.7	CS	11	83		11	176		○20		
		174.7	CS	12	50		12 13	175		○14		
	grey SAND and SILT varying gravel and clay content, occasional cobble or boulder (TILL) moist to wet, very dense	12.9	CS	13	100		14	174 173		○14		
		171.8	CS	14A	100		15	172		○12		
	grey SAND some silt, moist	15.9 171.0	CS	14B	57		16			○22		
	END OF BOREHOLE (no refusal)	16.6										

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☒ No freestanding groundwater measured in open borehole on completion of drilling.

▼ Groundwater depth observed on 07/03/2008 at a depth of 1.5 m. ⊠ Cave in depth recorded 07/03/2008 at a depth of 3.2 m.

Scale: 1 : 100

RECORD OF BOREHOLE No. GT08-02 Co-Ord. 0327067 E, 5577151 N

amec

Project Number: TY86002 | Drilling Location: See Figure 2 | Logged by: PRL

Project Client: PhosCan Chemical Corp. | Drilling Method: 200 mm Hollow Stem Auger and Coring | Compiled by: ETB

Project Name: Martison Phosphate Project | Drilling Machine: Truck Mounted Drill | Reviewed by: TJL

Project Location: Hearst, Ontario | Date Started: 07 Mar 08 | Date Completed: 07 Mar 08 | Revision No.: 4, 17/09/08

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION Local Ground Surface Elevation: 189.9 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_p W W_L; Plastic Liquid; ✳ Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	
	black ORGANICS (MUSKEG) fibrous										
	188.4	SS	1	25	0	1	189				
	probably SILTY CLAY 1.5	VT	1								
		VT	2			2	188				
		VT	3								
		VT	4								
	186.9					3	187				
	grey 3.1 SAND varying gravel, silt and clay content, occasional cobble or boulder (TILL) moist to wet, very dense	SS	2	87	33						
		SS	3	92	56	4	186				
		SS	4	8	65	5	185				
		SS	5	100	50 / 75mm						
		CS	6	100		6	184				Start of coring at 5.5 m.
		CS	7	34		7	183				
		CS	8	65		8	182				
	Cobbles from 9.3 m to 9.5 m	CS	9	30		9	181				
		CS	10	100		10	180				
	Thin dark grey silt and clay seam	CS	11	50		11	179				
		CS	12	81		12	178				
	174.4					13	177				
	dark grey 15.5 SILTY CLAY varved, moist	CS	13	40		14	176				
	173.3					15	175				
	END OF BOREHOLE 16.6 (no refusal)					16	174				

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☒ No freestanding groundwater measured in open borehole on completion of drilling.

▼ Groundwater depth observed on 08/03/2008 at a depth of 0.3 m. ☒ Cave in depth recorded 08/03/2008 at a depth of 8.2 m.

RECORD OF BOREHOLE No. GT08-03 Co-Ord. 0326424 E, 5576833 N

Project Number: TY86002 | Drilling Location: See Figure 2 | Logged by: PRL

Project Client: PhosCan Chemical Corp. | Drilling Method: 200 mm Hollow Stem Auger and Coring | Compiled by: ETB

Project Name: Martison Phosphate Project | Drilling Machine: Truck Mounted Drill | Reviewed by: TJL

Project Location: Hearst, Ontario | Date Started: 07 Mar 08 | Date Completed: 08 Mar 08 | Revision No.: 4, 17/09/08

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION Local Ground Surface Elevation: 189.5 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_p W W_L Plastic Liquid; * Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	
	black ORGANICS (MUSKEG) fibrous					0	189				
		SS	1	8	0	1	188				
		SS	2	8	1	2					
	187.0	SS	3A		1		187		○16		
	grey 2.5 SILTY CLAY 186.5 increasing silt with depth, wet, very soft 3.1	SS	3B	100	1	3					
	brown to grey SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, very dense	SS	4	87	35		186		○12		
		SS	5	67	56	4			○12		
		SS	6	100	50 / 100mm	5	185		○11		
		CS	7	122		6	184		○8		Start of coring at 5.2 m.
		CS	8	96		7	183		○10		
	181.6					8	182				
	grey to dark grey 7.9 SILTY CLAY varved, moist	CS	9	100					○12		
	180.4					9	181				
	grey 9.2 SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, very dense	CS	10	89		10	180		○8		
		CS	11	97		11	179		○9		
	177.2					12	178				
	grey to dark grey 12.4 SILTY CLAY varved, moist	CS	12	99			⊠ 177		○26		
	176.1					13	176				
	grey 13.4 SAND and SILT varying gravel and clay content (TILL) moist to wet, very dense	CS	13	53		14	175		○11		
	174.3					15					
	END OF BOREHOLE 15.2 (no refusal)										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

▼ Groundwater depth observed on 09/03/2008 at a depth of 0.2 m. ⊠ Cave in depth recorded 09/03/2008 at a depth of 12.3 m.

Scale: 1 : 100

RECORD OF BOREHOLE No. GT08-04 Co-Ord. 0327062 E, 5576821 N

amec

Project Number: TY86002 | Drilling Location: See Figure 2 | Logged by: PRL

Project Client: PhosCan Chemical Corp. | Drilling Method: 200 mm Hollow Stem Auger | Compiled by: ETB

Project Name: Martison Phosphate Project | Drilling Machine: Truck Mounted Drill | Reviewed by: TJL

Project Location: Hearst, Ontario | Date Started: 11 Mar 08 | Date Completed: 11 Mar 08 | Revision No.: 4, 17/09/08

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Local Ground Surface Elevation: 189.7 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits: W_P W W_L; Plastic Liquid; ⊠ Passing 75 um (%); ○ Moisture Content (%); 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS
	black ORGANICS (MUSKEG) fibrous					0	189				
		SS	1	8	1	1		○			
	187.4	SS	2	16	0	2	188	○			
	2.3 grey SILTY CLAY trace sand, wet, soft to stiff increasing in silt content with depth	SS	3	51	1	3	187				
		SS	4	75	24	4	186	○			
	185.1										
	4.6 brown to grey SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, compact to very dense	SS	5	100	99	5	185		99 ○		
		SS	6	100	50/125mm	6	184				
		SS	7	100	93	8	182		93 ○		
		SS	8	100	50/125mm	9	181				
		SS	9	100	50/100mm	11	179				
		SS	10	93	50/125mm	12	178				
		SS	11	74	50/125mm	14	176				
	175.4 END OF BOREHOLE (no refusal)										
	14.3										

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⊻ No freestanding groundwater measured in open borehole on completion of drilling.

▼ Groundwater depth observed on 12/03/2008 at a depth of 0.3 m. ⊠ Cave in depth recorded 12/03/2008 at a depth of 5.0 m.

RECORD OF BOREHOLE No. GT08-05 Co-Ord. 0327358 E, 5576228 N

amec

Project Number:	TY86002	Drilling Location:	See Figure 2	Logged by:	PRL
Project Client:	PhosCan Chemical Corp.	Drilling Method:	200 mm Hollow Stem Auger	Compiled by:	ETB
Project Name:	Martison Phosphate Project	Drilling Machine:	Truck Mounted Drill	Reviewed by:	TJL
Project Location:	Hearst, Ontario	Date Started:	11 Mar 08 Date Completed: 11 Mar 08	Revision No.:	4, 17/09/08

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION Local Ground Surface Elevation: 189.1 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_p w W_l; Plastic Liquid; ✳ Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	
	black ORGANICS (MUSKEG) fibrous	187.8	SS	1A	17	1	1	188				
			SS	1B	53	1						
	grey SILT with some clay, trace sand and gravel moist to wet, stiff	1.3 186.9	VT	1			2	187	▲5	85		
			VT	2					▲39	△95		
	grey SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, compact to very dense	2.2	SS	2	51	51	3	186				
			SS	3	100	57			⊠			
			SS	4	100	48	5	184				
			SS	5	100	29	6	183				
		181.0	SS	6	95	65	8	181				
	grey SILTY CLAY varying silt content, wet	8.1 180.6 8.6										
	grey SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, very dense		SS	7	100	50 / 25mm	9	180				
			SS	8	100	50 / 25mm	11	178				
			SS	9	100	50 / 50mm	12	177				
			SS	10	80	50 / 100mm	14	175				
		174.8										
	END OF BOREHOLE (no refusal)	14.3										Note: Residum depth inferred to be at 31.0 m deoth by Goldder 1983

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

▼ Groundwater depth observed on 12/03/2008 at a depth of 0.6 m. ⊠ Cave in depth recorded 12/03/2008 at a depth of 3.4 m.

RECORD OF BOREHOLE No. GT08-06 Co-Ord. 0327121 E, 5575292 N

amec

Project Number:	TY86002	Drilling Location:	See Figure 2	Logged by:	PRL
Project Client:	PhosCan Chemical Corp.	Drilling Method:	200 mm Hollow Stem Auger and Coring	Compiled by:	ETB
Project Name:	Martison Phosphate Project	Drilling Machine:	Truck Mounted Drill	Reviewed by:	TJL
Project Location:	Hearst, Ontario	Date Started:	10 Mar 08 Date Completed: 10 Mar 08	Revision No.:	4, 17/09/08

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION Local Ground Surface Elevation: 192.0 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_p W W_l Plastic Liquid; ✕ Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	
	black ORGANICS (MUSKEG) fibrous 190.5	SS	1	13	0	1	191				
	No Recovery 1.5 189.0	ST		0		2	190				
		ST	1			3	189		13		
	grey SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, compact to very dense 3.1 187.4	SS	2	38	11				30		
		SS	3	92	42	4	188		13		
	grey SILTY CLAY varying silt content, wet 4.6 186.7	SS	4	75	33	5	187		20		
	grey SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, very dense 5.3	SS	5	87	81				81 14		
		SS	6	100	80	6	186		80 13		
						7	185				
		SS	7	100	56	8	184		13		
						9	183				
		SS	8	100	79				79 13		
						10	182				
		SS	9	100	50 / 25mm	11	181		11		
		CS	10	62					12		Start of coring at 11.3 m.
	178.3					12	180				
		CS	11	27		13	179		9		
	grey SILTY CLAY varying silt content, wet, stiff 13.7 177.7					14	178				
	grey SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, very dense 14.3 176.8	CS	12	100		15	177		10		
	END OF BOREHOLE 15.2 (no refusal)										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

▼ Groundwater depth observed on 11/03/2008 at a depth of 0.5 m. ☒ Cave in depth recorded 11/03/2008 at a depth of 5.5 m.

RECORD OF BOREHOLE No. GT08-07 Co-Ord. 0326809 E, 5574894 N

Project Number: TY86002 | Drilling Location: See Figure 2 | Logged by: PRL

Project Client: PhosCan Chemical Corp. | Drilling Method: 200 mm Hollow Stem Auger and Coring | Compiled by: ETB

Project Name: Martison Phosphate Project | Drilling Machine: Truck Mounted Drill | Reviewed by: TJL

Project Location: Hearst, Ontario | Date Started: 09 Mar 08 | Date Completed: 09 Mar 08 | Revision No.: 4, 17/09/08

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION Local Ground Surface Elevation: 191.6 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits: W_p W W_L; Plastic Liquid; * Passing 75 um (%); ○ Moisture Content (%); 20 40 60 80	INSTRUMENTATION INSTALLATION	
	black ORGANICS (MUSKEG) fibrous 190.1	SS	1	8	2	1	191	○			
	grey 1.5 SAND and SILT varying gravel and clay content, occasional cobble or boulder (TILL) moist to wet, loose to very dense	SS	2	84	6	2	190	○	○15		
		SS	3	100	50 / 125mm		189		○13		
	187.8	SS	4	100	74	3	188		○10		
	grey 3.8 SAND varying silt and gravel and clay content (TILL) moist to wet, very dense	SS	5	100	59	4	187	○	○11		
		SS	6	89	>90 / 300mm	5			○9		
		CS	7	86		6	186		○9		Start of coring at 5.2 m.
		CS	8	12		7	185		○11		
		CS	9	0		8	184				No Recovery Sample washed out of core barrel.
		CS	10	0		9	183				
		CS	11	0		10	182				
		CS	12	0		11	181				
		SS	13	16	>50 for 150mm	12	180		○13		
	177.3 END OF BOREHOLE 14.3 (no refusal)					13	179				
						14	178				

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

▼ Groundwater depth observed on 10/03/2008 at a depth of 0.3 m. ⊠ Cave in depth recorded 10/03/2008 at a depth of 4.3 m.

RECORD OF BOREHOLE No. GT08-08 Co-Ord. 0326306 E, 5574734 N

Project Number: TY86002 | Drilling Location: See Figure 2 | Logged by: PRL

Project Client: PhosCan Chemical Corp. | Drilling Method: 200 mm Hollow Stem Auger and Coring | Compiled by: ETB

Project Name: Martison Phosphate Project | Drilling Machine: Truck Mounted Drill | Reviewed by: TJL

Project Location: Hearst, Ontario | Date Started: 09 Mar 08 | Date Completed: 09 Mar 08 | Revision No.: 4, 17/09/08

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION Local Ground Surface Elevation: 191.3 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_p W W_l Plastic Liquid; ✳ Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	
	black ORGANICS (MUSKEG) fibrous 189.8	SS	1	13	2	1	190				
	brown 1.5 CLAYEY SILT some sand 189.1 wet, soft to firm 2.2	SS	2	84	1	2	189		30		
	brown to grey SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, dense to very dense	SS	3	100	38	3	188		17		
		SS	4	100	50/125mm				13		
		CS	5	42		4	187		8		Start coring at 3.6 m.
	186.4 dark grey to grey 186.9 SILTY CLAY 5.2 moist, firm, varved grey SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, dense 10 cm thick dark brown SILT, varying clay content at 5.94 m increased gravel content with depth	CS	6	73		5	186		17		
		CS	7	13		6	185		14		
		CS	8	5		7	184		23		
		CS	9	0		8	183				
		CS	10	0		9	182				No sample recovered from CS 10.
		CS	11	10		10	181				
		CS	12	10		11	180				
	176.1 END OF BOREHOLE 15.2 (no refusal)					12	179		28		
						13	178				
						14	177				
						15					

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

▼ Groundwater depth observed on 10/03/2008 at a depth of 0.30 m. ⊠ Cave in depth recorded 10/03/2008 at a depth of 2.8 m.

Scale: 1 : 100

RECORD OF BOREHOLE No. GT08-09 Co-Ord. 0326939 E, 5575464 N

Project Number: TY86002 | Drilling Location: See Figure 2 | Logged by: PRL

Project Client: PhosCan Chemical Corp. | Drilling Method: 200 mm Hollow Stem Auger and Coring | Compiled by: ETB

Project Name: Martison Phosphate Project | Drilling Machine: Truck Mounted Drill | Reviewed by: TJL

Project Location: Hearst, Ontario | Date Started: 08 Mar 08 | Date Completed: 08 Mar 08 | Revision No.: 4, 17/09/08

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION Local Ground Surface Elevation: 191.4 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits: W_P W W_L; Plastic Liquid; * Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	
	black ORGANICS (MUSKEG) fibrous					0	191				
		SS	1	13	2	1	190	○			
		SS	2	13	0	2		○			
	189.1						189				
	brown to grey 2.3 SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, compact to very dense	SS	3	79	18	3		○	○11		
		SS	4	0	57		188	○			
		CS	5	109		4	187		○11		Start of coring at 3.7 m.
	Dark grey, silt and clay seam	CS	6	99		5	186		○11		
		CS	7	99		6	185		○11		
		CS	8	100		7	184		○11		
	181.8					8	183				
	grey to dark grey 9.6 SILTY CLAY varved, moist	CS	9	74		9	182		○9		
	180.9					10	181				
	grey 10.5 SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, dense to very dense	CS	10	100		11	180		○10		
		CS	11A	100		12	179		○11		
	178.3					13					
	grey to dark grey 13.1 SILTY CLAY varved, moist	CS	11B	100			178		○27		
	177.7					14					
	grey 13.7 SAND and SILT varying gravel and clay content, (TILL), moist, dense 20 cm grey silt and clay seam at 14.0 m 15 cm grey to dark grey silt and clay seam at 14.5 m	CS	12	100			177		○14		
	176.2					15					
	END OF BOREHOLE (no refusal)										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

▼ Groundwater depth observed on 09/03/2008 at a depth of 0.7 m. ⊠ Cave in depth recorded 09/03/2008 at a depth of 3.3 m.

Scale: 1 : 100

RECORD OF BOREHOLE No. GT08-10 Co-Ord. 0327378 E 5575605 N

Project Number: TY86002
Project Client: PhosCan Chemical Corp.
Project Name: Martison Phosphate Project
Project Location: Hearst, Ontario

Drilling Location: See Figure 2
Drilling Method: 200 mm Hollow Stem Auger
Drilling Machine: Truck Mounted Drill
Date Started: 10 Mar 08 Date Completed: 10 Mar 08

Logged by: PRL
Compiled by: ETB
Reviewed by: TJL
Revision No.: 4, 17/09/08

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION Local Ground Surface Elevation: 194.4 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_p W W_L Plastic Liquid; ✳ Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	
	black ORGANICS (MUSKEG) fibrous	193.5	SS	1A	240			194				
	brown to grey SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) wet to moist, loose to very dense	0.9	SS	1B	78	5	1	193	○			
			SS	2	100	14	2	192	○			
			SS	3	100	25	3	191	○			
	red SANDY SILT trace clay, (TILL) very dense, moist	191.4 3.1 190.4	SS	4	100	50/ 125 mm						
	grey SAND and SILT varying gravel content, occasional cobbles or boulders (TILL) occasional sand seam wet to moist, compact to very dense	4.0	SS	5A	100		4					
			SS	5B	100	58	5	190	○			
			SS	6	100	35	6	189	○			
			SS	7	100	26	7	188	○			
			SS	8	100	50 / 75mm	8	187				
			SS	9	100	78	9	186	○	78		
			SS	10	100	90 / 275mm	10	185				
			SS	11	100	69	11	184	○			
			SS	12	100	82	12	183	○	82		
	END OF BOREHOLE (no refusal)	180.1 14.3					13	182				
							14	181				

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

▼ Groundwater depth observed on 11/03/2008 at a depth of 4.5 m. ☒ Cave in depth recorded 11/03/2008 at a depth of 9.0 m.

Scale: 1 : 100

RECORD OF BOREHOLE No. GT08-11 Co-Ord. 0327594 E, 5575898 N

amec

Project Number: TY86002
Project Client: PhosCan Chemical Corp.
Project Name: Martison Phosphate Project
Project Location: Hearst, Ontario

Drilling Location: See Figure 2
Drilling Method: 200 mm Hollow Stem Auger
Drilling Machine: Truck Mounted Drill
Date Started: 11 Mar 08 Date Completed: 11 Mar 08

Logged by: PRL
Compiled by: ETB
Reviewed by: TJL
Revision No.: 4, 17/09/08

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION Local Ground Surface Elevation: 193.5 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L Plastic Liquid; ✳ Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	
	black ORGANICS (MUSKEG) fibrous	192.6	SS	1A	320	8	0	193	○			
	brown SILTY CLAY trace sand, firm, wet	0.9	SS	1B	104	8	1		○			
		191.2	SS	2	100	11	2	192	○			
	brown to grey SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) wet to moist, compact to very dense	2.3	SS	3	100	20	3	191	○			
			SS	4	100	32	4	190	○			
			SS	5	100	40	5	189	○			
			SS	6	100	50 / 125mm	6	188				
			SS	7	100	50 / 125mm	7	187				
			SS	8	100	50 / 125mm	8	186				
			SS	9	100	90 / 225mm	9	185				
			SS	10	100	50 / 125mm	10	184				
							11	183				
							12	182				
			SS	11	0		13	181				
		179.2					14	180				
	END OF BOREHOLE (no refusal)	14.3										Note: Residum depth inferred to be at 32.0 m deoth by Goldder 1983

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

▼ Groundwater depth observed on 11/03/2008 at a depth of 10.4 m. ⊠ Cave in depth recorded 11/03/2008 at a depth of 10.8 m.

RECORD OF BOREHOLE No. GT08-12 Co-Ord. 0326952 E, 5577566 N

amec

Project Number: TY86002
Project Client: PhosCan Chemical Corp.
Project Name: Martison Phosphate Project
Project Location: Hearst, Ontario

Drilling Location: See Figure 2
Drilling Method: 200 mm Hollow Stem Auger
Drilling Machine: Truck Mounted Drill
Date Started: 11 Mar 08 Date Completed: 11 Mar 08

Logged by: PRL
Compiled by: ETB
Reviewed by: TJL
Revision No.: 4, 17/09/08

Local Ground Surface Elevation: 198.3 m

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)
	black ORGANICS (MUSKEG) fibrous	GS	1			0	198
	196.8					1	197
	brown to grey SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) wet to moist, dense to very dense 1.5	SS	2	100	38	2	196
		SS	3	100	51	3	195
		SS	4	25	46	4	194
		SS	5	89	50 / 125mm	5	193
		SS	6	100	50 / 130mm	6	192
		SS	7	50	50 / 50 mm	7	191
		SS	8	100	50 / 25 mm	8	190
		SS	9	100	50 / 75 mm	9	189
						10	188
						11	187
		SS	10	41		12	186
	185.5						
	END OF BOREHOLE (no refusal) 12.8						

FIELD TESTING

Penetration Testing: ○ SPT ● DCPT

MTO Vane*: △ Intact ▲ Remould
Nilcon Vane*: ◇ Intact ◆ Remould
* Undrained Shear Strength (kPa) 15 30 45 60

LAB TESTING

Atterberg Limits: W_P W W_L — Plastic — Liquid
* Passing 75 um (%)
○ Moisture Content (%)
20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS

Borehole had been backfilled before water level or depth of cave could be determined.

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 100

RECORD OF BOREHOLE No. PT08-01 Co-Ord. 0328265 E, 5576446 N

Project Number: TY86002
Project Client: PhosCan Chemical Corp.
Project Name: Martison Phosphate Project
Project Location: Hearst, Ontario
Drilling Location: See Figure 2
Drilling Method: 200 mm Hollow Stem Auger and Coring
Drilling Machine: Track Mounted Drill
Date Started: 14 Feb 08 Date Completed: 20 Feb 08
Logged by: PRL
Compiled by: ETB
Reviewed by: TJL
Revision No.: 4, 17/09/08

Lithology Plot	DESCRIPTION (Local Ground Surface Elevation: 189.1 m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)
	Not Sampled						
	187.6						
	brown 1.5 CLAYEY SILT trace sand, wet, dense 186.9	SS	1	97	34	1	188
	grey 2.2 SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, compact to very dense	SS	2	100	28	2	187
						3	186
		SS	3	84	100	4	185
						5	184
		CS	4	100		6	183
	180.9	CS	5	47		7	182
	grey to dark grey 8.2 SILTY CLAY varved, moist, firm 180.1					8	181
	grey 9.0 SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, compact to very dense	CS	6	67		9	180
		CS	7	7		10	179
		CS	8	100		11	178
		CS	9	100		12	177
		CS	10	100		13	176
		CS	11	92		14	175
		CS	12	88		15	174
						16	173
						17	172
						18	171
						19	

FIELD TESTING

Penetration Testing: ○ SPT ● DCPT
MTO Vane*: △ Intact ▲ Remould
Nilcon Vane*: ◇ Intact ◆ Remould
* Undrained Shear Strength (kPa) 15 30 45 60

LAB TESTING

Atterberg Limits: W_P W W_L — Plastic — Liquid
✱ Passing 75 um (%)
○ Moisture Content (%)
20 40 60 80

18
12
100 13
68

INSTRUMENTATION INSTALLATION

COMMENTS

1 riser pipe in bentonite
1 riser pipe in backfill
1 riser pipe in sand
1 slotted pipe in sand
no installation, only bentonite

Start coring at 6.7 m.
SPMDD 1,757 kg/m3, OMC 17.7%

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Groundwater depth recorded on completion at a depth of 4.0 m.
Groundwater depth observed on 14/03/2008 at a depth of 4.0 m
Cave in depth recorded on completion of drilling 103 m.

Scale: 1 : 100

Continued on Next Page

RECORD OF BOREHOLE No. PT08-01 Co-Ord. 0328265 E, 5576446 N

Project Number: TY86002 Drilling Location: See Figure 2 Logged by: PRL

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LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits: W_p W W_l; Plastic Liquid; * Passing 75 um (%); C Moisture Content (%); 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite; 1 riser pipe in backfill; 1 riser pipe in sand; 1 slotted pipe in sand; no installation, only bentonite
	grey SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, compact to very dense dark grey silt and clay seam at 19.2 m some gravel grey silt seam at 19.8 m	CS	13	100		20	169				
	varved dark grey silt and clay	CS	14	100		21	168				
	varved dark grey silt and clay	CS	15	47		22	167				
		CS	16	100		23	166				
		CS	17	96		24	165				
		CS	18	34		25	164				
		CS	19	96		26	163				
	boulder encountered in CS20	CS	20	87		27	162				
	cobble encountered in CS21	CS	21	80		28	161				
		CS	22	53		29	160				
		CS	23	89		30	159				
		CS	24	93		31	158				
		CS	25	100		32	157				
		CS	26	20		33	156				
						34	155				
						35	154				
						36	153				
						37	152				
						38	151				
						39	150				
						40	149				

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

Scale: 1 : 100

Continued on Next Page

RECORD OF BOREHOLE No. PT08-01 Co-Ord. 0328265 E, 5576446 N

Project Number: TY86002 Drilling Location: See Figure 2 Logged by: PRL

amec

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_p W W_l Plastic Liquid; * Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite; 1 riser pipe in backfill; 1 riser pipe in sand; 1 slotted pipe in sand; no installation, only bentonite
	grey SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, compact to very dense	CS	27	100		41	148				
		CS	28	100		42	147				
		CS	29	100		43	146				
	cobble encountered in CS29	CS	30	97		44	145				
		CS	31	100		45	144				
		CS	32	100		46	143				
	increase in gravel content	CS	33	100		47	142				
		CS	34	100		48	141				
	Note: Residum depth inferred to be at 53.0 m depth by Golder 1983	CS	35	100		49	140				
	133.8					50	139				
	grey to dark grey SILTY CLAY varved, moist, firm 55.3 / 133.2	CS	36	52		51	138				
	red to dark brown SAND and SILT varying sand, silt and clay content, trace to some gravel occasional organics (lignite?), wet, dense (probably residuum) trace organics 55.9					52	137				
		CS	37	100		53	136				
		CS	38	80		54	135				
		CS	39	68		55	134				
	white calcium carbonate inclusions	CS	40	92		56	133				
						57	132				
						58	131				
						59	130				
						60	129				
						61	128				
						62					

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

Scale: 1 : 100

Continued on Next Page

RECORD OF BOREHOLE No. PT08-01 Co-Ord. 0328265 E, 5576446 N

Project Number: TY86002 Drilling Location: See Figure 2 Logged by: PRL

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L Plastic Liquid; × Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80		1 riser pipe in bentonite; 1 riser pipe in backfill; 1 riser pipe in sand; 1 slotted pipe in sand; no installation, only bentonite
	red to dark brown SAND and SILT varying sand, silt and clay content, trace to some gravel occasional organics (lignite?), wet, dense (probably residuum) trace organics white calcium carbonate inclusions trace lignite	CS	41	100		63	126				Casing dropped 600 mm while coring at 62 m.
		CS	42	92		64	125				
		CS	43	100		65	124				
						66	123				Casing sank 150 mm at 66.5 m.
	decreased organic content	CS	44	90		67	122				
		CS	45	100		68	121		× 70		Specific Gravity = 3.16 Casing sank 50 mm at 68.9 m.
		CS	46	16		69	120				
		CS	47	7		70	119				
		CS	48	47		71	118		○ 31		
		CS	49	67		72	117		○ 29		
		CS	50	2		73	116				
		CS	51	27		74	115		○ 25		
		CS	52	55		75	114		○ 41		
	white calcium carbonate inclusions	CS	53	86		76	113		○ 36		
		CS	54	0		77	112				No recovery from samples CS 54 to 57 (82 to 86.7 m)
						78	111				
						79	110				
						80	109				
						81	108				
						82	107				
						83	106				

Scale: 1 : 100

Continued on Next Page

RECORD OF BOREHOLE No. PT08-01 Co-Ord. 0328265 E, 5576446 N

Project Number: TY86002 Drilling Location: See Figure 2 Logged by: PRL

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LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L Plastic Liquid; ⊠ Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite; 1 riser pipe in backfill; 1 riser pipe in sand; 1 slotted pipe in sand; no installation, only bentonite
	red to dark brown SAND and SILT varying sand, silt and clay content, trace to some gravel occasional organics (lignite?), wet, dense (probably residuum)	CS	55	0		84	105				
		CS	56	0		85	104				
		CS	57	0		86	103				
	102.5										
	reddish brown 86.6 SILTY CLAY 101.9 varying sand, silt and clay content 87.2 moist, dense (probable residuum)	CS	58	55		87	102		63		
	red to dark brown SAND and SILT varying sand, silt and clay content, occasional gravel and cobble, occasional black organics (lignite?), wet, dense (probably residuum)	CS	59	70		88	101			109	
		CS	60	70		89	100		38		
		CS	61	40		90	99		44		
		CS	62	10		91	98		37		
		CS	63	40		92	97		42		
		CS	64	26		93	96		46		
	white calcium carbonate inclusions	CS	65	13		94	95		18		
		CS	66	52		95	94		45		
	boulder encountered in CS67	CS	67	30		96	93		35		
	cobble encountered in CS68	CS	68	75		97	92		42		
	sand lense	CS	69	52		98	91		38		
						99	90				
						100	89				
						101	88				
						102	87				
						103	86				
						104	85				
						105					

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

Scale: 1 : 100

Continued on Next Page

RECORD OF BOREHOLE No. PT08-01 Co-Ord. 0328265 E, 5576446 N

Project Number: TY86002 Drilling Location: See Figure 2 Logged by: PRL

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ intact ▲ Remould; Nilcon Vane* ◇ intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L Plastic Liquid; * Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80		1 riser pipe in bentonite; 1 riser pipe in backfill; 1 riser pipe in sand; 1 slotted pipe in sand; no installation, only bentonite
	red to dark brown SAND and SILT varying sand, silt and clay content, occasional gravel and cobble, occasional black organics (lignite?), wet, dense (probably residuum)	CS	70	67		106	83		○35		No recovery from CS 71 (106.4 to 107.9)
		CS	71	87		107	82				
	boulders encountered in CS72	CS	72	68		108 / 109	81 / 80		○38		
	79.4 reddish brown SILTY CLAY varying sand, silt and clay content moist, dense (probably residuum) 109.7 / 78.8 / 110.3	CS	73	68		110	79		○30		
	red to dark brown SAND and SILT varying sand, silt and clay content, occasional gravel wet, dense (probably residuum)	CS	74	92		111 / 112	78 / 77		○35		
		CS	75	73		113	76		○24		
	73.6 END OF BOREHOLE (no refusal) 115.5	CS	76	52		114 / 115	75 / 74		○40		

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

Scale: 1 : 100

RECORD OF BOREHOLE No. PT08-02 Co-Ord. 0328063 E, 5577054 N

Project Number: TY86002
Project Client: PhosCan Chemical Corp.
Project Name: Martison Phosphate Project
Project Location: Hearst, Ontario
Drilling Location: See Figure 2
Drilling Method: 200 mm Hollow Stem Auger and Coring
Drilling Machine: Track Mounted Drill
Date Started: 22 Feb 08 Date Completed: 23 Feb 08
Logged by: AMEC
Compiled by: ETB
Reviewed by: TJL
Revision No.: 4, 17/09/08

Lithology Plot	DESCRIPTION (Local Ground Surface Elevation: 190.2 m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	FIELD TESTING: Penetration Testing (○ SPT ● DCPT); MTO Vane* (△ Intact ▲ Remould); Nilcon Vane* (◇ Intact ◆ Remould); * Undrained Shear Strength (kPa) 15 30 45 60	LAB TESTING: Atterberg Limits (W_P W W_L Plastic Liquid); * Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS
	black ORGANICS (MUSKEG) fibrous										
	188.5 1.7 grey SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, loose to very dense	SS	1A	116	4	1	189				
		SS	1B	120	4	2	188		12	343	
		SS	2	84	20	3	187		11		
		SS	3	3443	54	4	186		10		
		SS	4	98	44	5	185		11		
		CS	1	9		6	184		11		Start of coring at 6.7 m.
	cobbles encountered in CS2	CS	2	9		7	183		7		
		SS	5	75	43	8	182		12		
		SS	6	100	56	9	181		10		
		SS	7	46	73	10	180		16		
	cobble encountered in CS3	CS	3	5		11	179		15		
	increased gravel content cobbles	CS	4	10		12	178		6		
	173.4 16.8 grey to dark grey SILTY CLAY 173.0 17.2 varved, moist	CS	5	80		13	177		10		
	grey SAND and SILT 172.2 18.0 varying gravel and clay content, (TILL) moist to wet, very dense					14	176				
	171.6 18.6	CS	6	100		15	175		13		
						16	174				
						17	173				
						18	172				
						19					

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Groundwater depth recorded on completion at a depth of 2.5 m.

Cave in depth recorded on completion of drilling 33.6 m.

Scale: 1 : 100

Continued on Next Page

RECORD OF BOREHOLE No. PT08-02 Co-Ord. 0328063 E, 5577054 N

Project Number: TY86002 Drilling Location: See Figure 2 Logged by: AMEC

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits: W_p W W_l Plastic Liquid; * Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	
	grey to dark grey SILT some clay, varved, moist					20	171				
	grey SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, very dense	CS	7	100			170		○7		
		CS	8	33		21	169		○7		
		CS	9	16		22	168		○8		
		CS	10	12		23	167		○11		Core barrel jammed at 23.6 m.
		CS	11	93		24	166		○6		
		CS	12	99		25	165		○9		
		CS	13	100		26	164		○7		
		CS	14	100		27	163		○8		
		CS	15	99		28	162		○10		
	- becoming olive in colour					29	161				
	156.8					30	160				
	Olive to grey 33.4 BEDROCK, likely Carbonatite Silt filled seams	CS	16	45		31	159				RQD=50% for CS 16
		CS	17	99		32	158				RQD=45% for CS 17
		CS	18	32		33	157				RQD=0% for CS 18
		CS	19	100		34	156				RQD=80% for CS 19
		CS	20	84		35	155				RQD=43% for CS 20 Density 2.82 Mg/m3
	150.1					36	154				
	END OF BOREHOLE 40.1					37	153				
						38	152				
						39	151				
						40					

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

Scale: 1 : 100

RECORD OF BOREHOLE No. PT08-02A Co-Ord. 0328045 E, 5576446 N

Project Number: TY86002 | Drilling Location: See Figure 2 | Logged by: AMEC

Project Client: PhosCan Chemical Corp. | Drilling Method: 200 mm Hollow Stem Auger and Coring | Compiled by: ETB

Project Name: Martison Phosphate Project | Drilling Machine: Track Mounted Drill | Reviewed by: TJL

Project Location: Hearst, Ontario | Date Started: 24 Feb 08 | Date Completed: 28 Feb 08 | Revision No.: 4, 17/09/08

Lithology Plot	DESCRIPTION (Local Ground Surface Elevation: 189.7 m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	FIELD TESTING: Penetration Testing (○ SPT ● DCPT; △ MTO Vane Intact ▲ MTO Vane Remould ◇ Nilcon Vane Intact ◆ Nilcon Vane Remould; * Undrained Shear Strength (kPa) 15 30 45 60)	LAB TESTING: Atterberg Limits (W_p W W_L Plastic Liquid; * Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80)	INSTRUMENTATION INSTALLATION	COMMENTS
	black ORGANICS (MUSKEG) fibrous					0	189				1 riser pipe in bentonite 1 riser pipe in backfill 1 riser pipe in sand 1 slotted pipe in sand no installation, only bentonite
	187.6	SS	1	21	2	1	188				
	grey 2.1 SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, compact to very dense					2	187				
		SS	2	54	27	3	186		11		
						4					
		SS	3	95	31	5	185		11		
						6	184				
		SS	4						9		Attempted Shelby Tube at 6.1 m. Tube was crushed.
						7	183				
		SS	5	100	61	8	182		11		
						9	181				
		SS	6	41					9		
		CS	7	16		10	180		15		Start of coring at 9.8 m.
	cobbles encountered in CS8	CS	8	3		11	179				
		CS	9I	15		12	178		26		
		CS	9II	30		13	177				
	174.5					14	176		15		
	grey to dark grey 175.2 SILTY CLAY 15.5 trace gravel, moist	CS	10	100		15	175		7		
	grey SAND and SILT varying gravel, silt and clay content, occasional cobbles or boulders (TILL) moist to wet, very dense *trace organics*	CS	11	35		16	174		6		Specific Gravity = 2.73 SPMDD 1973 kg/m3 at OMC 10.2%
						17	173			* 92	
	poorly graded sand	CS	12A	76		18	172		8		Plugged bit.
		CS	12B	10			171		7		

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▽ Groundwater depth recorded on completion at a depth of 4.7 m.

▼ Groundwater depth observed on 14/03/2008 at a depth of 4.8 m.

Scale: 1 : 100

Continued on Next Page

RECORD OF BOREHOLE No. PT08-02A Co-Ord. 0328045 E, 5576446 N

Project Number: TY86002 Drilling Location: See Figure 2 Logged by: AMEC

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_p W W_l Plastic Liquid; × Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80		1 riser pipe in bentonite; 1 riser pipe in backfill; 1 riser pipe in sand; 1 slotted pipe in sand; no installation, only bentonite
	grey SAND and SILT varying gravel, silt and clay content, occasional cobbles or boulders (TILL) moist to wet, very dense										
	cobbles encountered in CS13	CS	13	20		20	170		○9		
		CS	14	15		21	169		○7		
		CS	15	99		22	168		○8		
		CS	16	95		23	167		○8		
		CS	17	81		24	166		○9		
		CS	18	100		25	165		○9		
		CS	19	35		26	164		○14		
		CS	20	7		27	163		○15		
	158.0					28	162				
	red to dark brown 31.7 SAND and SILT varying sand, silt and clay content, occasional gravel wet, dense occasional calcium carbonate inclusions (probably Residuum)	CS	21	7		29	161		○42		
		CS	22	20		30	160		○48		
		CS	23	34		31	159		○24		
		CS	24	93		32	158		○15		
	152.2					33	157				
	light brown to yellow to light grey 37.5 SAND and SILT cemented, porous, dense	CS	25	3		34	156				All fines washed away.
		CS	26	35		35	155		○25		
						36	154				
						37	153				
						38	152				
						39	151				
						40	150				

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

Scale: 1 : 100

Continued on Next Page

RECORD OF BOREHOLE No. PT08-02A Co-Ord. 0328045 E, 5576446 N

Project Number: TY86002 Drilling Location: See Figure 2 Logged by: AMEC

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_p W W_L; Plastic Liquid; ⁎ Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	
	light brown to yellow to light grey SAND and SILT cemented, porous, dense					41	149				
		CS	27	0		42	148				No recovery at 41. 5 m.
		CS	28	16		43	147				
	145.8					44	146				
	red to dark brown 43.9 SAND and SILT varying sand, silt and clay content, occasional gravel wet, dense (probably Residuum)	CS	29	50		45	145		○35		
	trace organics	CS	30	70		46	144		○19		
	143.1					47	143				
	greenish to red 46.6 SILTY GRAVEL varying sand and silt content (probably Residuum)	CS	31	51		48	142		○17 ⁎65		Specific Gravity = 3.19
		CS	32	13		49	141				
	139.7					50	140				Core barrel jammed at 49.5 m.
	grey to white 50.0 BOULDERS and COBBLES poor sample recovery	CS	33	16		51	139		○30		
		CS	34	5		52	138		○31		
		CS	35	10		53	137				
	135.1					54	136				
	red to dark brown 54.6 SAND and SILT varying sand, silt and clay content, occasional gravel wet, dense (probably Residuum)	CS	36	0		55	135		○24		No recovery at 54.5 m
	133.6					56	134				
	reddish brown 56.1 SILTY SAND damp (probably Residuum)	CS	37	80		57	133		○44		
	131.3	CS	38	0		58	132		○51		
	grey 58.4 Bedrock, weathered, carbonatite cobble to silt sized particles moist	CS	39	99		59	131				
		CS	40	45		60	130				
						61	129				
						62	128				

COMMENTS: 1 riser pipe in bentonite; 1 riser pipe in backfill; 1 riser pipe in sand; 1 slotted pipe in sand; no installation, only bentonite

Scale: 1 : 100

Continued on Next Page

RECORD OF BOREHOLE No. PT08-02A Co-Ord. 0328045 E, 5576446 N

Project Number: TY86002 Drilling Location: See Figure 2 Logged by: AMEC

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L; Plastic Liquid; × Passing 75 um (%); ○ Moisture Content (%); 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite; 1 riser pipe in backfill; 1 riser pipe in sand; 1 slotted pipe in sand; no installation, only bentonite
	grey Bedrock, weathered, carbonatite cobble to silt sized particles moist	CS	41	34		63	127				
		CS	42	73		64	126				
	124.5					65	125				
	END OF BOREHOLE 65.2										

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

Scale: 1 : 100

RECORD OF BOREHOLE No. PT08-03 Co-Ord. 0327483 E, 5577297 N

amec

Project Number: TY86002 | Drilling Location: See Figure 2 | Logged by: AMEC

Project Client: PhosCan Chemical Corp. | Drilling Method: 200 mm Hollow Stem Auger and Coring | Compiled by: ETB

Project Name: Martison Phosphate Project | Drilling Machine: Track Mounted Drill | Reviewed by: TJL

Project Location: Hearst, Ontario | Date Started: 09 Feb 08 | Date Completed: 21 Feb 08 | Revision No.: 4, 17/09/08

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION Local Ground Surface Elevation: 189.4 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_p W W_L Plastic Liquid; ✱ Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	▫ no installation, only backfill; ▨ no installation, only bentonite
	Not Sampled 187.8					0	189				
	light brown / light grey SILTY CLAY moist, stiff 1.6 186.4	SS	1	75	8	1	188	○	○ 26		
	grey SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, compact to very dense 3.1	SS	2	75	40	2	187	○	○ 10		
		SS	3	51	50	3	186	○	○ 10		
		SS	4	25	53	4 ▽	185	○	○ 12		
		SS	5	51	50	5	184	○	○ 12		
	180.3					6	183				
	grey SAND and GRAVEL occasional cobbles or boulders (TILL) moist to wet, compact to very dense (fines washed out during drilling) 9.2	SS	6	28		7	182		○ 11		
		CS	1	22		8	181				Start coring at 9.7 m. Fines washed out.
		CS	2	13		9	180				Fines washed out during drilling for CS#2. Attached sand trap to barrel for next run.
		CS	3	24		10	179				
	174.2					11	178				
	grey SILTY CLAY varved, moist 15.2	CS	4	20		12	177				
	grey SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, compact to very dense	CS	5	16		13	176				
		CS	6	20		14	175				Sand trap removed.
						15	174				
						16	173				
						17	172				
						18	171				

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▽ Groundwater depth recorded on completion at a depth of 4.0 m.

Scale: 1 : 100

Continued on Next Page

RECORD OF BOREHOLE No. PT08-03 Co-Ord. 0327483 E, 5577297 N

Project Number: TY86002 Drilling Location: See Figure 2 Logged by: AMEC

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L Plastic Liquid; * Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	
	grey SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, compact to very dense	CS	7	72		20	170				no installation, only backfill; no installation, only bentonite
	cobble	CS	8	97		21	169				
		CS	9	100		22	168				SPMDD 1,959 kg/m3 at OMC 11.5%
		CS	10	100		23	167		* 68		
		CS	11	90		24	166				
		CS	12	50		25	165				
	cobble	CS	13	100		26	164				
		CS	14	30		27	163				
		CS	15	15		28	162				
		CS	16	88		29	161				
		CS	17	93		30	160				
		CS	18	5		31	159				
		CS	19	0		32	158				No recovery for CS 19.
		CS	20	13		33	157				
		CS	21	29		34	156				
						35	155				
						36	154				
						37	153				
						38	152				
						39	151				
						40	150				
							149				

Scale: 1 : 100

Continued on Next Page

RECORD OF BOREHOLE No. PT08-03 Co-Ord. 0327483 E, 5577297 N

Project Number: TY86002 Drilling Location: See Figure 2 Logged by: AMEC

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L Plastic Liquid; ✳ Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	no installation, only backfil; no installation, only bentonite
	grey SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, compact to very dense	CS	22	0		41	148				
		CS	23	42		42	147				
		CS	24	49		43	146				
		CS	25	97		44	145				
		CS	26	1		45	144				
	poorly graded sand seam (0.3 m thick)	CS	27	27		46	143		✳ 61		Specific Gravity = 2.76 SPMDD 2,040 kg/m3 at OMC 9.3%
		CS	28	56		47	142				
		CS	29	99		48	141		○ 11		
		CS	30	100		49	140		○ 11		
		CS	31	22		50	139		○ 11		
	increased silt content	CS	32	89		51	138		○ 12		
		CS	33	98		52	137		○ 10		
		CS	34	93		53	136		○ 12		
		CS	35	100		54	135		○ 11		
						55	134		○ 12		
						56	133		○ 10		
						57	132		○ 12		
						58	131		○ 11		
						59	130		○ 11		
						60	129				
						61	128				
						62					

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

Scale: 1 : 100

Continued on Next Page

RECORD OF BOREHOLE No. PT08-03 Co-Ord. 0327483 E, 5577297 N

Project Number: TY86002 Drilling Location: See Figure 2 Logged by: AMEC

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits: W_P W W_L; Plastic Liquid; × Passing 75 um (%); ○ Moisture Content (%); 20 40 60 80	INSTRUMENTATION INSTALLATION	▫ no installation, only backfill; ▨ no installation, only bentonite
	grey SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, compact to very dense					63	127				
		CS	40	93		64	126		○11		
		CS	41	100		65	125		○13		
		CS	42A	20		66	124		○23		
	122.3					67	123				
	grey to dark grey 67.1 SILTY CLAY varved, moist, stiff 121.6	CS	42B	100		68	122		○16		
	dark brown 67.8 Organics sand and silt, damp 120.8					69	121				Specific Gravity = 3.93 Organic content 5%
	red to dark brown 68.6 SAND and SILT varying sand, silt and clay content, occasional gravel, occasional black organics (lignite?) wet, dense (probably Residuum)	CS	43	74		70	120		○24 ×53		
		CS	44	100		71	119		○21		
		CS	45	100		72	118		○24		
		CS	46	16		73	117		○33		
	lignite? 114.1					74	116				
	brown to grey, 75.3 SAND and SILT cemented, porous, dense (probably Residuum)	CS	47	75		75	115		○16		
		CS	48	20		76	114		○51		
		CS	49	43		77	113		○8		
		CS	50	3		78	112		○18		
		CS	51	10		79	111		○9		
		CS	52	92		80	110		○18		
						81	109				
						82	108				
						83	107				
							106				

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

Scale: 1 : 100

Continued on Next Page

RECORD OF BOREHOLE No. PT08-03 Co-Ord. 0327483 E, 5577297 N

Project Number: TY86002 Drilling Location: See Figure 2 Logged by: AMEC

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits: W_P W W_L; Plastic Liquid; ✕ Passing 75 um (%); ○ Moisture Content (%); 20 40 60 80	INSTRUMENTATION INSTALLATION	no installation, only backfill; no installation, only bentonite
	105.3										
grey to dark grey Weathered Bedrock, Probable cemented Residuum Cobble to Silt sized	84.1	CS	53	30		84	105				
		CS	54	55		85	104				Casing jammed at 85.3 m.
		CS	55	50		86	103				
	101.0					87	102				
END OF BOREHOLE	88.4					88					Casing remained in hole. Hole abandoned.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

Scale: 1 : 100

RECORD OF BOREHOLE No. PT08-03A Co-Ord. 0327481 E, 5577293 N

Project Number: TY86002
Project Client: PhosCan Chemical Corp.
Project Name: Martison Phosphate Project
Project Location: Hearst, Ontario

Drilling Location: 3.05 m west of PT3
Drilling Method: NQ mm Rock Coring
Drilling Machine: Track Mounted Drill
Date Started: 05 Mar 08 Date Completed: 06 Mar 08

Logged by: PRL
Compiled by: ETB
Reviewed by: TJL
Revision No.: 4, 17/09/08

LITHOLOGY PROFILE | **SOIL SAMPLING** | **FIELD TESTING** | **LAB TESTING** | **COMMENTS**

Lithology Plot | DESCRIPTION | Sample Type | Sample Number | Recovery (%) | SPT 'N' Value | DEPTH (m) | ELEVATION (m) | INSTRUMENTATION INSTALLATION

Local Ground Surface Elevation: 189.3 m

Tricone from surface to 85.3 m.

FIELD TESTING
Penetration Testing
○ SPT ● DCPT
MTO Vane* Nilcon Vane*
△ Intact ◇ Intact
▲ Remould ◆ Remould
* Undrained Shear Strength (kPa)
15 30 45 60

LAB TESTING
Atterberg Limits
W_p W W_L
Plastic Liquid
⁕ Passing 75 um (%)
□ Moisture Content (%)
20 40 60 80

COMMENTS
1 riser pipe in bentonite
1 riser pipe in backfill
1 slotted pipe in sand
no installation, only bentonite

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Groundwater depth recorded on completion at a depth of 4.3 m.
Groundwater depth observed on 14/03/2008 at a depth of 4.3 m.

Scale: 1 : 100

Continued on Next Page

RECORD OF BOREHOLE No. PT08-03A Co-Ord. 0327481 E, 5577293 N

Project Number: TY86002 Drilling Location: 3.05 m west of PT3 Logged by: PRL

amec

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L Plastic Liquid; × Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite; 1 riser pipe in backfill; 1 slotted pipe in sand; no installation, only bentonite
	Tricone from surface to 85.3 m.					20	169				
						21	168				
						22	167				
						23	166				
						24	165				
						25	164				
						26	163				
						27	162				
						28	161				
						29	160				
						30	159				
						31	158				
						32	157				
						33	156				
						34	155				
						35	154				
						36	153				
						37	152				
						38	151				
						39	150				
						40	149				

Scale: 1 : 100

Continued on Next Page

RECORD OF BOREHOLE No. PT08-03A Co-Ord. 0327481 E, 5577293 N

Project Number: TY86002 Drilling Location: 3.05 m west of PT3 Logged by: PRL

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_p W W_l Plastic Liquid; ⁎ Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80		1 riser pipe in bentonite; 1 riser pipe in backfill; 1 slotted pipe in sand; no installation, only bentonite
	Tricone from surface to 85.3 m.					41	148				
						42	147				
						43	148				
						44	145				
						45	144				
						46	143				
						47	142				
						48	141				
						49	140				
						50	139				
						51	138				
						52	137				
						53	136				
						54	135				
						55	134				
						56	133				
						57	132				
						58	131				
						59	130				
						60	129				
						61	128				
						62					

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

Scale: 1 : 100

Continued on Next Page

RECORD OF BOREHOLE No. PT08-03A Co-Ord. 0327481 E, 5577293 N

Project Number: TY86002 Drilling Location: 3.05 m west of PT3 Logged by: PRL

amec

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_p W W_L Plastic Liquid; ⁎ Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite; 1 riser pipe in backfill; 1 slotted pipe in sand; no installation, only bentonite
	Tricone from surface to 85.3 m.					63	127				
						64	126				
						65	125				
						66	124				
						67	123				
						68	122				
						69	121				
						70	120				
						71	119				
						72	118				
						73	117				
						74	116				
						75	115				
						76	114				
						77	113				
						78	112				
						79	111				
						80	110				
						81	109				
						82	108				
						83	107				
							106				

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

Scale: 1 : 100

Continued on Next Page

RECORD OF BOREHOLE No. PT08-03A Co-Ord. 0327481 E, 5577293 N

Project Number: TY86002 Drilling Location: 3.05 m west of PT3 Logged by: PRL

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_p W W_L Plastic Liquid; × Passing 75 um (%); ○ Moisture Content (%); 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite; 1 riser pipe in backfill; 1 slotted pipe in sand; no installation, only bentonite
	Tricone from surface to 85.3 m. 104.0					84	105				
	Dark Grey BEDROCK weathered to intact, Cemented Residuum, Poor rock quality. 85.3	CS	56	84		85	104				
		CS	57	89		86	103				RQD=55% CS 57
		CS	58	100		87	102				RQD=45% CS 58
		CS	59	93		88	101				RQD=47% CS 59
		CS	60	69		89	100				RQD=17% CS 59
		CS	61	97		90	99				RQD=32% CS 60
		CS	62	93		91	98				
		CS	63	59		92	97				
		CS	64	89		93	96				
		CS	65	80		94	95				
		CS	66	80		95	94				
		CS	67	72		96	93				
		CS	68	47		97	92				
						98	91				
						99	90				
						100	89				
						101	88				
						102	87				
						103	86				
						104	85				
						105					

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commisioned and the accompanying 'Explanation of Borehole Log'.

Scale: 1 : 100

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Continued on Next Page

RECORD OF BOREHOLE No. PT08-03A Co-Ord. 0327481 E, 5577293 N

Project Number: TY86002 Drilling Location: 3.05 m west of PT3 Logged by: PRL

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L Plastic Liquid; * Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite; 1 riser pipe in backfill; 1 slotted pipe in sand; no installation, only bentonite
	Dark Grey BEDROCK weathered to intact, Cemented Residuum, Poor rock quality.	CS	69	22		106	84 83				
	82.6										
	End of Borehole 106.7										

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

Scale: 1 : 100

RECORD OF BOREHOLE No. PT08-04 Co-Ord. 0327581 E, 5576834 N

amec

Project Number: TY86002
Project Client: PhosCan Chemical Corp.
Project Name: Martison Phosphate Project
Project Location: Hearst, Ontario

Drilling Location: See Figure 2
Drilling Method: 200 mm Hollow Stem Auger and Coring
Drilling Machine: Track Mounted Drill
Date Started: 22 Feb 08 Date Completed: 04 Mar 08

Logged by: PR/PRL
Compiled by: ETB
Reviewed by: TJL
Revision No.: 4, 17/09/08

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
Lithology Plot	DESCRIPTION Local Ground Surface Elevation: 190.4 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTC Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_p W W_l Plastic Liquid; ✳ Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80		
	black ORGANICS (MUSKEG) fibrous					0	190				1 riser pipe in bentonite 1 riser pipe in backfill 1 riser pipe in sand 1 slotted pipe in sand no installation, only bentonite
		ST	1	0		1	189				
						2	188				
	187.2 3.2	SS	2	67	5	3	187	○	○27		
	grey SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, compact to very dense					4	186				
		SS	3	100	56	5	185	○	○13		
						6	184				
		SS	4	40					○10		
		CS	5	100		7	183		○9		Start of coring at 6.7 m.
		CS	6	16		8	182		○10		
		CS	7	43		9	181		○17		
	179.9					10	180				
	grey SILTY CLAY varved	CS	8	35		11	179		○20		
	grey SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, compact to very dense silt and clay seam	CS	9	0		12	178				No recovering from CS 9.
	boulders and cobbles	CS	10	9		13	177				
		CS	11	10		14	176		○12		
		CS	12	20		15	175				Core barrel jammed.
		CS	13	0		16	174		○11		No sample recovered from CS 13.
						17	173				
						18	172				

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▽ Groundwater depth recorded on completion at a depth of 5.3 m.
▼ Groundwater depth observed on 15/03/2008 at a depth of 5.5 m.

Scale: 1 : 100

Continued on Next Page

RECORD OF BOREHOLE No. PT08-04 Co-Ord. 0327581 E, 5576834 N

Project Number: TY86002 Drilling Location: See Figure 2 Logged by: PR/PRL

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_p W W_L; Plastic Liquid; × Passing 75 um (%); ○ Moisture Content (%); 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite; 1 riser pipe in backfill; 1 riser pipe in sand; 1 slotted pipe in sand; no installation, only bentonite
	grey SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, compact to very dense					20	171				
		CS	14	15			170		○8		Sand washed out from barrel was collected from drilling mud.
		CS	15	12		21	169		○8		
		CS	16	12		22	168				All fines washed out from CS 16.
		CS	17	0		23	167				No sample recovered from CS 17.
	cobble in core barrel	CS	18	2		24	166				
		CS	19	0		25	165				No sample recovered from CS 19.
		CS	20	12		26	164		○7		Lost core barrel in casing. Trying to retrieve.
		CS	21	10		27	163		○5		Core barrel sanded in at 30.3 and 33.3 m.
		CS	22	90		28	162		○10		
	dark grey silt and clay varved (0.2 m thick)	CS	23	0		29	161				No sample recovered from CS 23 and CS 24.
		CS	24	0		30	160				
		CS	25	13		31	159		○12		
		CS	26	12		32	158		○12		
		CS	27	60		33	157		○12		Core barrel sanded in at 39.5 m.
						34	156				
						35	155				
						36	154				
						37	153				
						38	152				
						39	151				
						40	150				

Scale: 1 : 100

Continued on Next Page

RECORD OF BOREHOLE No. PT08-04 Co-Ord. 0327581 E, 5576834 N

Project Number: TY86002 | Drilling Location: See Figure 2 | Logged by: PR/PRL

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_p W W_L (Plastic – Liquid); * Passing 75 um (%); ○ Moisture Content (%); 20 40 60 60		1 riser pipe in bentonite; 1 riser pipe in backfill; 1 riser pipe in sand; 1 slotted pipe in sand; no installation, only bentonite
	grey SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, compact to very dense	CS	28	59		41	149		○10		
		CS	29	72		42	148		○12		
		CS	30	95		43	147		○9		
	144.2					44	146				
	olive to brown 46.3 SANDY SILT to SILT moist, very dense (probable Residuum) boulder at 46.3 m boulder at 47.1 m	CS	31	100		45	145		○14		
		CS	32	60		46	144		○20		
	141.2					47	143				
	olive to reddish brown 49.2 SAND and SILT varying silt and clay content moist, very dense (probably Residuum)	CS	33	100		48	142		○16		
		CS	34	100		49	141		○21		
		CS	35	100		50	140		○20		
		CS	36	75		51	139		○21		
		CS	37	63		52	138		○16		
		CS	38	100		53	137		○21		
	132.6					54	136				
	black 57.8 SILT increasing sand content with depth, possible lignite, moist, dense	CS	39	100		55	135				Organic content 40% Specific Gravity = 2.02
		CS	40	99		56	134		×46	○117	
		CS	41	100		57	133				
						58	132				
						59	131			○108	
						60	130				
						61	129			○132	
						62					

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

Scale: 1 : 100

Continued on Next Page

RECORD OF BOREHOLE No. PT08-04 Co-Ord. 0327581 E, 5576834 N

Project Number: TY86002 Drilling Location: See Figure 2 Logged by: PR/PRL

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L — Plastic — Liquid; ✱ Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite; 1 riser pipe in backfill; 1 riser pipe in sand; 1 slotted pipe in sand; no installation, only bentonite
	black SILT increasing sand content with depth, possible *lignite*, moist, dense	CS	42	99		63	127		○70		
	increased silt content	CS	43	100		64	126		○69		
		CS	44	100		65	125		○46		
		CS	45	99		66	124		○28		
		CS	46	100		67	123		○13		
	120.6					68	122				
	reddish brown changing to brown with depth 69.8 SAND and SILT varying silt and clay content moist, very dense (probably Residuum)	CS	47A	100		69	121		○28		
		CS	47B	75		70	120		○32		
		CS	48	90		71	119		○18		
		CS	49	99		72	118		○30		
		CS	50	99		73	117		○29 ✱32		
		CS	51	97		74	116		○21		
		CS	52	92		75	115		○17		
		CS	53	0		76	114				
		CS	54	80		77	113		○17		
		SS	55	87	50/75mm	78	112		○19		
		CS	56	100		79	111		○24		
						80	110				
						81	109				
						82	108				
						83	107				

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

Scale: 1 : 100

Continued on Next Page

RECORD OF BOREHOLE No. PT08-04 Co-Ord. 0327581 E, 5576834 N

Project Number: TY86002 Drilling Location: See Figure 2 Logged by: PR/PRL

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane*: △ Intact ▲ Remould; Nilcon Vane*: ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits: W_P W W_L; Plastic Liquid; ✳ Passing 75 um (%); ○ Moisture Content (%); 20 40 60 80		1 riser pipe in bentonite; 1 riser pipe in backfill; 1 riser pipe in sand; 1 slotted pipe in sand; no installation, only bentonite
	reddish brown changing to brown with depth SAND and SILT varying silt and clay content moist, very dense (probably Residuum)	CS	57	100		84	106		○19		
		CS	58	98		85	105		○18		
		SS	59	33	50/100mm	86	104		○31		
		CS	60	100		87	103		○20		
		CS	61	87		88	102		○22		
		CS	62	99		89	101		○23		
		SS	63	25	50/100mm	90	100		○23		
		CS	64	100		91	99		○30		
		CS	65	67		92	98		○28		
		CS	66	100		93	97		○50		
		CS	67	78		94	96		○16		
		CS	68	84		95	95		○20		
	boulder encountered at 100 m	CS	69	92		96	94		○16		
		CS	70	81		97	93		○21		Barrel jammed at 102 m. Sample from cuttings.
		WS	71			98	92				
		CS	72	78		99	91		○19		
						100	90				
						101	89				
						102	88				
						103	87				
						104	86				
						105					

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

Scale: 1 : 100

Continued on Next Page

RECORD OF BOREHOLE No. PT08-04 Co-Ord. 0327581 E, 5576834 N

Project Number: TY86002 Drilling Location: See Figure 2 Logged by: PR/PRL

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L; Plastic Liquid; ✳ Passing 75 um (%); ○ Moisture Content (%); 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite; 1 riser pipe in backfill; 1 riser pipe in sand; 1 slotted pipe in sand; no installation, only bentonite
	reddish brown changing to brown with depth SAND and SILT varying silt and clay content moist, very dense (probably Residuum)	CS	73	50		106	85 84		○22		
	82.0	CS	74	100		107	83		○14		
	Brown to Red 108.4 Possible weathered bedrock or cemented Residuum Significant sand and clay, wet 80.8	CS	75	86		108 109	82 81		○19		
	END OF BOREHOLE 109.6										Casing sanded in. No water return.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commisioned and the accompanying 'Explanation of Borehole Log'.

Scale: 1 : 100

RECORD OF BOREHOLE No. PT08-05 Co-Ord. 0328073 E, 5576053 N

amec

Project Number:	TY86002	Drilling Location:	See Figure 2	Logged by:	AM
Project Client:	PhosCan Chemical Corp.	Drilling Method:	200 mm Hollow Stem Auger and Coring	Compiled by:	ETB
Project Name:	Martison Phosphate Project	Drilling Machine:	Track Mounted Drill	Reviewed by:	TJL
Project Location:	Hearst, Ontario	Date Started:	31 Jan 08 Date Completed: 08 Feb 08	Revision No.:	4, 17/09/08

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
Lithology Plot	DESCRIPTION Local Ground Surface Elevation: 191.7 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane*: △ Intact ▲ Remould; Nilcon Vane*: ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits: W_p W W_l; Plastic Liquid; ✱ Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80		1 riser pipe in bentonite 1 riser pipe in backfill 1 riser pipe in sand 1 slotted pipe in sand
	Not Sampled 190.2										
	brown SILTY CLAY some sand, some gravel, very stiff 1.5 188.7	SS	1	92	17	2	190	○	○13		
	brown to grey SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, compact to very dense 3.1	SS	2	100	60	3	189	○	○12		
		SS	3	100	33 / 150mm	4	188		○12		
		SS	4	100	50 / 100mm	5	187		○9		
		SS	5	100	50 / 150mm	6	186		○11		
		SS	6	100	113	7	185	○	113 ○14		
		SS	7	100	89 / 230mm	8	184		○17		
		SS	8	100	109	9	183		109 ○19		
		SS	9	100	36	10	182	○	○11		300 mm of sand heave up rods. Spoon refusal at 14.2 m. Start coring.
		CS	1	100		11	181				
		CS	2	100		12	180				
		CS	3	100		13	179				
						14	178				
						15	177				
						16	176				
						17	175				
						18	174				
						19	173				

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

▼ Groundwater depth observed on 15/03/2008 at a depth of 6.8 m.

Scale: 1 : 100

Continued on Next Page

RECORD OF BOREHOLE No. PT08-05 Co-Ord. 0328073 E, 5576053 N

Project Number: TY86002 Drilling Location: See Figure 2 Logged by: AM

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L Plastic Liquid; ✳ Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80		1 riser pipe in bentonite; 1 riser pipe in backfill; 1 riser pipe in sand; 1 slotted pipe in sand
	brown to grey SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, compact to very dense	CS	4	100							
		CS	5	100		20	172				
		CS	6	100		21	171				
	thin silt some clay seam	CS	7	100		22	170				
		CS	8	100		23	169				
	thin sand seam (75 mm)					24	168				
	cobbles	CS	9	100		25	167				
		CS	10	100		26	166				
	thin silt seam trace organics @29.4 , 29.6, 30.0, 30.3 m	CS	11	100		27	165				
		CS	12	100		28	164				
		CS	13	100		29	163				
		CS	14	100		30	162				
		CS	15	100		31	161				
		CS	16	100		32	160				
		CS	17	100		33	159				
		CS	18	100		34	158				
						35	157				
						36	156				
						37	155				
						38	154				
						39	153				
						40	152				

Scale: 1 : 100

Continued on Next Page

RECORD OF BOREHOLE No. PT08-05 Co-Ord. 0328073 E, 5576053 N

Project Number: TY86002 Drilling Location: See Figure 2 Logged by: AM

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L Plastic Liquid; * Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite; 1 riser pipe in backfill; 1 riser pipe in sand; 1 slotted pipe in sand
	brown to grey SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, compact to very dense					41	151				
		CS	19	100		42	150				
	Note: Residum depth inferred to be at 42.5 m depth by Golder 1983	CS	20	100		43	149				
						44	148				
	cobbles encountered in CS21	CS	21	100		45	147				
		CS	22	77		46	146				
		CS	23	75		47	145				
	dark brown organic silt seam	CS	24	77		48	144				
		CS	25	92		49	143				
	139.6					50	142		* 80		
	grey to dark grey 52.1 SILTY CLAY varved, trace organics moist, stiff 138.6	CS	26	100		51	141				
	reddish brown to grey 53.1 SAND and SILT varying silt and clay content moist, very dense (probably Residuum)	CS	27	100		52	140				
		CS	28	100		53	139				
		CS	29	80		54	138		* 61		
	cobbles encountered in CS30	CS	30	25		55	137				
		CS	31	72		56	136				
		CS	32	80		57	135				
						58	134				
						59	133				
						60	132				
						61	131				
						62	130				

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

Scale: 1 : 100

Continued on Next Page

RECORD OF BOREHOLE No. PT08-05 Co-Ord. 0328073 E, 5576053 N

Project Number: TY86002 Drilling Location: See Figure 2 Logged by: AM

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_p W W_L; Plastic Liquid; × Passing 75 um (%); ○ Moisture Content (%); 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite; 1 riser pipe in backfill; 1 riser pipe in sand; 1 slotted pipe in sand
	reddish brown to grey SAND and SILT varying silt and clay content moist, very dense (probably Residuum)					63	120				Specific Gravity = 3.14
		CS	33	88							
						64	119				
		CS	34	90							
						65	118				
		CS	35	95							
						66	117				
		CS	36	97							
						67	116				
		CS	37	97							
						68	115				
		CS	38	100							
	120.1					69	114				
	dark grey / dark brown / dark orange Possible Cemented Residum, weathered SAND. varying silt and clay content moist, very dense	CS	39	92		70	113				Specific Gravity = 3.13
	118.6					71	112				Casing remained in hole. Bottom of casing 70.84m.
	END OF BOREHOLE 73.2					72	111				
						73					

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

Scale: 1 : 100

RECORD OF BOREHOLE No. PT08-06 Co-Ord. 0327462 E, 5576607 N

Project Number: TY86002 | Drilling Location: See Figure 2 | Logged by: PRL

Project Client: PhosCan Chemical Corp. | Drilling Method: 200 mm Hollow Stem Auger and Coring | Compiled by: ETB

Project Name: Martison Phosphate Project | Drilling Machine: Track Mounted Drill | Reviewed by: TJL

Project Location: Hearst, Ontario | Date Started: 08 Mar 08 | Date Completed: 11 Mar 08 | Revision No.: 4, 17/09/08

Lithology Plot	DESCRIPTION (Local Ground Surface Elevation: 189.8 m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	FIELD TESTING: Penetration Testing (○ SPT ● DCPT); MTO Vane* (△ Intact ▲ Remoulc); Nilcon Vane* (◇ Intact ◆ Remould); * Undrained Shear Strength (kPa) 15 30 45 60	LAB TESTING: Atterberg Limits (W_p W W_l Plastic Liquid); * Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS
	black ORGANICS (MUSKEG) fibrous					0	189				Approximately 0.9 m frost penetration
	187.6	SS	1	25	4	2	188	○	○ 9 35		
	grey 2.2 SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, compact to very dense	SS	2	84	12	3	187	○	○ 18		
		ST	1			4	186		○ 16		
		SS	3	100	53	5	185	○	○ 13		
						6	184				
		SS	4	53					○ 10		
		CS	5	42		7	183		○ 11		Start coring at 6.8 m.
	cobble	CS	6	30		8	182		○ 8		
	cobbles	CS	7	28		9	181		○ 7		
		CS	8	10		10	180		○ 13		All fines washed out.
		CS	9	46		11	179		○ 15		All fines washed out.
	175.0	CS	10	90		12	178		○ 10		
	dark grey 174.9 SILT and CLAY 15.1 varved, trace sand					13	177				
	grey SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) 173.5 moist to wet, very dense 16.3	CS	11	100		14	176		○ 14		
	dark grey 173.0 SILT and CLAY 16.8 varved, trace sand					15	175				
	grey SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, very dense	CS	12	85		16	174		○ 7		
						17	173				
						18	172				Artesian water pressure noted.
							171				

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▽ Groundwater depth recorded on completion at a depth of 5.4 m.

▼ Groundwater depth observed on 15/03/2008 at a depth of 4.6 m.

Scale: 1 : 100

Continued on Next Page

RECORD OF BOREHOLE No. PT08-06 Co-Ord. 0327462 E, 5576607 N

Project Number: TY86002 Drilling Location: See Figure 2 Logged by: PRL

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
	grey SAND and SILT varying gravel and clay content, occasional cobbles or boulders (TILL) moist to wet, very dense	CS	13	84		19	170	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L; Plastic Liquid; * Passing 75 um (%); ○ Moisture Content (%) 8 20 40 60 80		All fines washed out.
		CS	14	13		20	169		9		
		CS	15	30		22	168		18		
	cobbles	CS	16A	50		23	167		8		
		CS	16B	87		24	166		7		
		CS	17	99		25	165		8		
		CS	18	100		26	164		9		
	grey silt and clay seam	CS	19	99		28	162		8 * 59		*SPMDD 2,160 kg/m3 at OMC 8.1%*
		CS	20	22		29	161		12		
		CS	21	65		31	159		11		
		CS	22	27		32	158		10		
		CS	23	87		34	156		11		
	153.8	CS	24	92		36	154		13		
	dark grey SILTY CLAY trace sand and gravel, varved 36.0 / 152.6										
	greenish red to reddish brown SANDY SILT some clay, occasional cobbles wet (probably Residuum) 37.2	CS	25	22		37	153		15		
		CS	26	50		39	151		32		
		CS	27	56		40	150		34		

COMMENTS: 1 riser pipe in bentonite; 1 riser pipe in backfill; 1 riser pipe in sand; 1 slotted pipe in sand; no installation, only bentonite

Scale: 1 : 100

Continued on Next Page

RECORD OF BOREHOLE No. PT08-06 Co-Ord. 0327462 E, 5576607 N

Project Number: TY86002 Drilling Location: See Figure 2 Logged by: PRL

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_p W W_l Plastic Liquid; ✳ Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80		1 riser pipe in bentonite; 1 riser pipe in backfill; 1 riser pipe in sand; 1 slotted pipe in sand; no installation, only bentonite
	greenish red to reddish brown SANDY SILT some clay, occasional cobbles wet (probably Residuum)					41	149				
		CS	28	45		42	148				
		CS	29	48		43	147				
		CS	30	30		44	146				
		CS	31	24		45	145				
	boulders encountered in CS31	CS	32	37		46	144				
		CS	33	67		47	143				
	Note: Residum depth inferred to be at 42.5 m depth by Goldder 1983	CS	34	83		48	142				
		CS	35	55		49	141				
		CS	36	49		50	140				
		CS	37	20		51	139				
		CS	38	38		52	138				
		CS	39	18		53	137				
		CS	40	0		54	136				No recovery from CS 40.
		CS	41	72		55	135				
						56	134				
						57	133				
						58	132				
						59	131				
						60	130				
						61	129				
						62	128				

Scale: 1 : 100

Continued on Next Page

RECORD OF BOREHOLE No. PT08-06 Co-Ord. 0327462 E, 5576607 N

Project Number: TY86002 Drilling Location: See Figure 2 Logged by: PRL

amec

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits: W_P W W_L; Plastic Liquid; ✳ Passing 75 um (%); ○ Moisture Content (%); 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite; 1 riser pipe in backfill; 1 riser pipe in sand; 1 slotted pipe in sand; no installation, only bentonite
	greenish red to reddish brown SANDY SILT some clay, occasional cobbles wet (probably Residuum)					63	127				
	dark brown seam	CS	42	35		64	126				
		CS	43	70		65	125		✳ 54		
		CS	44	90		66	124				
		CS	45	100		67	123				
	trace gravel	CS	46	53		68	122				
		CS	47	25		69	121				
		CS	48	30		70	120				
		CS	49	0		71	119				
	115.1					72	118				
	brown to grey 74.7 Bedrock, weathered, significant sand and silt infilling	CS	50	42		73	117				
		CS	51	38		74	116				
		CS	52	46		75	115				
	110.6					76	114				
	grey to dark grey 79.3 Bedrock, probable wacke / conglomerate hybrid weathered, little infilling wet	CS	53	100		77	113				
		CS	54	43		78	112				
		CS	56	60		79	111				
						80	110				
						81	109				
						82	108				
						83	107				

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

Scale: 1 : 100

Continued on Next Page

RECORD OF BOREHOLE No. PT08-06 Co-Ord. 0327462 E, 5576607 N

Project Number: TY86002 Drilling Location: See Figure 2 Logged by: PRL

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L; Plastic Liquid; ⊗ Passing 75 um (%); ○ Moisture Content (%); 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite; 1 riser pipe in backfill; 1 riser pipe in sand; 1 slotted pipe in sand; no installation, only bentonite
	grey to dark grey Bedrock, probable wacke / conglomerate hybrid weathered, little infilling wet	CS	57	0		84	106				
		CS	58	46		85	105				
	102.8					86	104				
	grey 87.0 Bedrock, probable wacke / conglomerate hybrid	CS	59	100		87	103				RQD approximately 80%
		CS	60	99		88	102				
		CS	61	100		89	101				
	98.4					90	100				
	END OF BOREHOLE 91.4					91	99				

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

Scale: 1 : 100

APPENDIX B

TEST PIT TABLE

TEST PIT	DEPTH (m)	UTM	SOIL DESCRIPTIONS	Moisture Content (%)	Unit Weight (kN/m^3)	Standard Proctor Test Results
08-01	0 – 2.1 2.1 – 4.6	5576873N 0327069E	1 – ORGANICS (Muskeg) 2 – TILL, Sandy SILT, trace gravel, grey, dense moist	 27 %		
08-02	0 – 1.1 1.1 – 4.9	5577351N 0327063E	1 – ORGANICS (Muskeg) 2 – TILL, Sandy SILT, some gravel, grey, dense moist	 9 – 19%	 23.0	
08-03	0 – 0.8 0.8 – 4.6	5577627N 0327034E	1 – ORGANICS (Muskeg) 2 – TILL, Sandy SILT, some gravel and cobbles, trace clay, brown to grey, dense, moist	 9 – 17%	 24.0	
08-04	0 – 1.4 1.4 – 4.9	5577478N 0326816E	1 – ORGANICS (Muskeg) 2 – TILL, SILT, some clay, some gravel, grey, dense, wet to dry	 9 – 27%	 18.2	
08-05	0 – 2.1 2.1 – 4.7	5577813N 0326452E	1 – ORGANICS (Muskeg) 2 – TILL, SILT, some clay, some gravel, grey, dense, wet to dry	 9 – 24%	 17.9	
08-06	0 – 0.6 0.6 – 1.4 1.4 – 1.5 1.5 – 4.7	5578017N 0326298E	1 – ORGANICS (Muskeg) 2 – SILTY CLAY, some gravel, brown, firm, moist 3 – SAND, wet, brown 4 – TILL, Sandy SILT, trace gravel, brown to grey, dense, dry	 13 % 14 % 9 – 10%		
08-07	0 – 1.7 1.7 – 4.6	5577907N 0326382E	1 – ORGANICS (Muskeg) 2 – TILL, Sandy SILT, trace gravel, grey, dense, moist to dry	 9 – 12 %		
08-08	0 – 0.6 0.6 – 4.3 4.3 – 4.6 4.6 – 5.2	5577688N 0327125E	1 – ORGANICS (Muskeg) 2 – TILL, SILT, some clay, some gravel, grey, dense, wet to dry 3 – SAND, grey, wet 4 – TILL, Sandy SILT, trace gravel, grey, dense, moist to dry	 9 – 11% 12 % 11 %		
08-09	0 – 2.1 2.1 – 4.6	5574716N 0326152E	1 - ORGANICS (Muskeg) 2 – TILL, Sandy SILT, some gravel, grey, dense, dry	 9 – 10%		

TEST PIT	DEPTH (m)	UTM	SOIL DESCRIPTIONS	Moisture Content (%)	Unit Weight (kN/m^3)	Standard Proctor Test Results
08-10	0 – 0.6 0.6 – 1.4 1.4 – 4.6	5574784N 0326498E	1 – ORGANICS (Muskeg) 2 – SILTY CLAY, trace gravel, grey to brown, firm, moist 3 – TILL, Sandy SILT, trace gravel, grey, dense, *moist to dry*	 20 % 9 – 13%		
08-11	0 – 0.6 0.6 – 2.3 2.3 – 4.3	5574773N 0326727E	1 – ORGANICS (Muskeg) 2 – SILTY CLAY, some sand and gravel, brown, firm, moist 3 – TILL, Sandy SILT, trace gravel, brown to grey, dense, dry	 16 % 9 %	21.2	
08-12	0 – 2.4 2.4 – 4.7	5575045N 0326911E	1 - ORGANICS (Muskeg) 2 – TILL, Sandy SILT, trace gravel, grey, dense, moist	 10 – 14%		
08-13	0 – 2.0 2.0 – 4.6	5575493N 0326912E	1 - ORGANICS (Muskeg) 2 – TILL, Sandy SILT, trace gravel, grey, dense, moist	 11%	21.5	Sampled at 3.35 m SPMDD 2040 kg/m3 OMC 8.8%
08-14	0 – 2.1 2.1 – 4.7	5575295N 0327129E	1 - ORGANICS (Muskeg) 2 – TILL, Sandy SILT, trace gravel, grey, dense, dry	 10 – 12%		
08-15	0 – 0.6 0.6 – 2.1 2.1 – 4.7	5573559N 0327334E	1 – ORGANICS (Muskeg) 2 – SILTY CLAY, some gravel, brown, soft, moist 3 – TILL, Sandy SILT, *trace gravel, brown to grey*, dense, dry	 20 % 10 – 17%		
08-16	0 – 1.5 1.5 –2.4 2.4 – 4.6	5575806N 0327543E	1 – ORGANICS (Muskeg) 2 – SILTY CLAY, some sand and gravel, grey, firm, moist 3 – TILL, SANDY SILT, trace gravel, grey, dense, dry	 20 % 9 %		
08-17	0 – 0.6 0.6 – 1.5 1.5 – 4.6	5576094N 0327728E	1 – ORGANICS (Muskeg) 2 – SILTY CLAY, brown, firm, moist 3 – TILL, SANDY SILT, trace gravel, brown to grey, dense, dry	 20 % 11 – 12%		At 1.2 m SPMDD 1800 kg/m3 OMC 17.37 %

TEST PIT	DEPTH (m)	UTM	SOIL DESCRIPTIONS	Moisture Content (%)	Unit Weight (kN/m^3)	Standard Proctor Test Results
08-18	0 – 1.4	5576238N 0327655E	1 – ORGANICS (Muskeg)			
	1.4 – 1.8		2 – SILT, some clay and gravel, grey, firm, moist	13 %		
	1.8 – 4.6		3 – TILL, SANDY SILT, trace gravel, brown to grey, dense, dry	10 – 11%		
08-19	0 – 0.6	5576229N 0327440E	1 – ORGANICS (Muskeg)			At 2.4 m
	0.6 – 1.7		2 – Clayey SILT, some sand and gravel, brown, moist	19%		SPMDD 2030 kg/m3
	1.7 – 4.6		3 – TILL, SANDY SILT, trace gravel, brown to grey, dense, dry	9 – 10%		OMC 8.6%
08-20	0 – 2.1	5576235N 0327034E	1 – ORGANICS (Muskeg)			
	2.1 – 3.2		2 – CLAY, some gravel, grey, wet, soft	46 %		
	3.2 – 4.6		3 – TILL, SANDY SILT, trace gravel, grey, dense, dry	10 – 11%		
08-21	0 – 2.4	5576450N 0327462E	1 – ORGANICS (Muskeg)			
	2.4 – 3.4		2 – CLAY, trace gravel, grey, wet, soft	35 %		
	3.4 – 4.6		3 – TILL, SANDY SILT, trace gravel, grey, dense, dry	10 %		
08-22	0 – 2.3	5576808N 0327450E	1 – ORGANICS (Muskeg)			
	2.3 – 3.4		2 – CLAY, trace sand and gravel, grey, wet, firm	18 %		
	3.4 – 4.9		3 – TILL, SANDY SILT, trace gravel, grey, dense, dry to moist	12 %		
08-23	0 – 2.1	5576847N 0327264E	1 – ORGANICS (Muskeg)			
	2.1 – 2.7		2 – CLAY, trace gravel, grey, wet, soft			
	2.7 – 4.6		3 – TILL, SANDY SILT, trace gravel, grey, dense, dry	10 %		
08-24	0 – 2.0	5576813N 0326272E	1 – ORGANICS (Muskeg)			
	2.0 – 2.7		2 – CLAY, some gravel, grey, wet, firm	30 %		
	2.7 – 4.6		3 – TILL, SANDY SILT, trace gravel, grey, dense, dry	8 %		
08-25	0 – 2.1	5576841N 0326561E	1 – ORGANICS (Muskeg)			
	2.1 – 3.0		2 – CLAY, some gravel, grey, wet, firm	21 %		
	3.0 – 4.6		3 – TILL, SANDY SILT, trace gravel, grey, dense, dry	10 – 13%		

TEST PIT	DEPTH (m)	UTM	SOIL DESCRIPTIONS	Moisture Content (%)	Unit Weight (kN/m^3)	Standard Proctor Test Results
08-26	0 – 2.1	5576845N 0326857E	1 – ORGANICS (Muskeg)			
	2.1 – 3.0		2 – CLAY, some sand and gravel, grey, wet, firm	33 %	18.3	
	3.0 – 4.6		3 – TILL, SANDY SILT, trace gravel, grey, dense, dry	9 – 10 %		
08-27	0 – 3.0	5574191N 0327456E	1 – ORGANICS (Muskeg)			
	3.0 – 4.0		2 –TILL, SANDY SILT, trace gravel, grey, dense, dry	12 %		
08-28	0 – 1.2	5574525N 0327704E	1 – ORGANICS (Muskeg)			At 3.35 m
	1.2 – 2.4		2 – CLAY, some gravel, grey, wet, firm	22 %	17.2	SPMDD 1960 kg/m3
	2.4 – 4.9		3 – TILL, SANDY SILT, grey, dense, dry	9 – 13%		OMC 10.5%
08-29	0 – 1.8	5574915N 0327990E	1 – ORGANICS (Muskeg)			
	1.8 – 2.3		2 – Clay, some gravel, grey, wet, firm	20 %		
	2.3 – 4.3		3 –TILL, SANDY SILT, trace gravel, grey, dense, dry	7 %	17.4	
	4.3 – 4.6		4 – SILT (varved), grey, dense, dry	18 %		
08-30	0 – 2.1	5575338N 0328332E	1 – ORGANICS (Muskeg)			
	2.1 – 2.7		2 – Clay, some gravel, grey, wet, firm	12 %		
	2.7 - 4.9		3 –TILL, SANDY SILT, trace gravel, grey, dense, dry	11 – 13%		
08-31	0 – 3.5	5575718N 0328632E	1 – ORGANICS (Muskeg)			
	3.5 – 3.8		2 – Clay, some gravel, grey, wet, firm	31 %		
	3.8 – 4.6		3 –TILL, SANDY SILT, trace gravel, grey, dense, dry	12 %		
08-32	0 – 0.6	5574848N 0329993E	1 – ORGANICS (Muskeg)			
	0.6 – 2.1		2 – Clay, some gravel, brown, wet, firm	17 %		
	2.1 – 4.6		3 – TILL, SANDY SILT, some gravel, grey to brown, dense, dry	8 – 12%		

TEST PIT	DEPTH (m)	UTM	SOIL DESCRIPTIONS	Moisture Content (%)	Unit Weight (kN/m^3)	Standard Proctor Test Results
08-33	0 – 0.3	5574871N 0329590E	1 –ORGANICS (Muskeg)			
	0.3 – 1.8		2 – CLAY, brown, wet, firm	21 %		
	1.8 – 3.4		3 – TILL, SANDY SILT, trace gravel, grey to brown, dense, dry	7 – 14%		
08-34	0 – 1.8	5574930N 0329023E	1 – ORGANICS (Muskeg)			
	1.8 -2.3		2 – CLAY, some gravel, grey, wet, firm	12 %	20.5	
	2.3 – 4.0		3 – TILL, SANDY SILT, trace gravel, grey, dense, dry	8 – 13%		
	4.0 – 4.6		4 – SILT, grey, dense, dry to moist			
08-35	0 – 0.9	5575170N 0329418E	1 –ORGANICS (Muskeg)			
	0.9 – 1.2		2 – CLAY, some gravel, brown, wet, firm	23 %	17.8	
	1.2 – 4.6		3 – TILL, SANDY SILT, trace gravel, grey to brown, dense, dry	8 – 13%		
08-36	0 – 0.8	5575452N 0329238E	1 –ORGANICS (Muskeg)			
	0.8 – 2.3		2 – CLAY, some gravel, grey to brown, wet, firm	22 %	18.6	
	2.3 – 4.6		3 – TILL, SANDY SILT, trace gravel, grey, dense, dry	11 %		
08-37	0 – 2.7	5575779N 0328871E	1 –ORGANICS (Muskeg)			
	2.7 – 3.0		2 – CLAY, some gravel, grey to brown, wet, firm	14 %	19.9	
	3.0 – 4.5		3 – TILL, SANDY SILT, trace gravel, grey, dense, dry	11 %		

Notes: (1) SPMDD = Standard Proctor Maximum Dry Density
(2) OMC = Optimum Water Content (for SPMDD)

APPENDIX C

DAVIDSON WELL LOGS

RECORD OF MONITORING WELL No. MW-1 Co-Ord. 327943 E 5576750 N

amec

Project Number:	TY86002	Drilling Location:	See Figure 2	Logged by:	Davidson
Project Client:	PhosCan Chemical Corporation	Drilling Method:	150 mm	Compiled by:	ETB
Project Name:	Martison Phosphate Project	Drilling Machine:	Truck Mounted Drill	Reviewed by:	TJL
Project Location:	Hearst, Ontario	Date Started:	03 Mar 08	Date Completed:	Revision No.: 1, 07/07/08

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION Local Ground Surface Elevation:	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing ○ SPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L Plastic Liquid ⁎ Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite 1 riser pipe in backfill 1 riser pipe in sand 1 slotted pipe in sand no installation, only bentonite
	black ORGANICS (Muskeg) soft					1.0 2.0 3.0 4.0 5.0 ▼ 6.0 7.0 8.0 9.0					Water level is 5.5 m below top of casing.
	grey 10.0 CLAY trace sand till					10.0 11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0 19.0 20.0 21.0 22.0 23.0 24.0 25.0 26.0 27.0 28.0 29.0 30.0 31.0 32.0 33.0 34.0 35.0 36.0 37.0 38.0 39.0 40.0				
	brown-orange 41.1 SAND with cobbles					41.0 42.0 43.0 44.0 45.0 46.0 47.0 48.0 49.0 50.0 51.0 52.0 53.0 54.0 55.0					

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▼ Groundwater depth observed on March 16, 2008 at a depth of: 5.55 m.

Scale: 1 : 290

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RECORD OF MONITORING WELL No. MW-1 Co-Ord. 327943 E 5576750 N

Project Number: TY86002 Drilling Location: See Figure 2 Logged by: Davidson

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_p W W_L Plastic Liquid; ✱ Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite; 1 riser pipe in backfill; 1 riser pipe in sand; 1 slotted pipe in sand; no installation, only bentonite
	brown-orange SAND with cobbles					56.0 57.0 58.0 59.0 60.0 61.0 62.0 63.0 64.0 65.0 66.0					
	black PEAT 67.0					67.0 68.0 69.0 70.0 71.0 72.0 73.0 74.0 75.0 76.0 77.0 78.0 79.0 80.0 81.0 82.0 83.0 84.0 85.0 86.0 87.0 88.0					
	grey SILT & SAND 89.0					89.0 90.0 91.0 92.0 93.0 94.0 95.0 96.0 97.0 98.0 99.0 100.0 101.0 102.0 103.0					
	red-brown SAND with silty clay 103.6					104.0 105.0 106.0 107.0 108.0 109.0 110.0 111.0 112.0 113.0 114.0 115.0 116.0 117.0					

Scale: 1 : 290

Continued on Next Page

RECORD OF MONITORING WELL No. MW-1 Co-Ord. 327943 E 5576750 N

Project Number: TY86002 Drilling Location: See Figure 2 Logged by: Davidson

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_p W W_L; Plastic Liquid; ⁎ Passing 75 µm (%); ○ Moisture Content (%); 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite 1 riser pipe in backfill 1 riser pipe in sand 1 slotted pipe in sand no installation only bentonite
	red-brown SAND with silty clay						118.0					
							119.0					
							120.0					
							121.0					
							122.0					
							123.0					
							124.0					
							125.0					
							126.0					
							127.0					
							128.0					
							129.0					
							130.0					
							131.0					
							132.0					
							133.0					
							134.0					
							135.0					
							136.0					
							137.0					
	grey SAND trace clay	137.0					138.0					
							139.0					
							140.0					
	End of Hole (No refusal)	140.0										

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commisioned and the accompanying 'Explanation of Borehole Log'.

Scale: 1 : 290

RECORD OF MONITORING WELL No. MW-2 Co-Ord. 327848 E 5576635 N

amec

Project Number:	TY86002	Drilling Location:	See Figure 2	Logged by:	Davidson
Project Client:	PhosCan Chemical Corporation	Drilling Method:	150 mm	Compiled by:	ETB
Project Name:	Martison Phosphate Project	Drilling Machine:	Truck Mounted Drill	Reviewed by:	TJL
Project Location:	Hearst, Ontario	Date Started:	08 Mar 08	Date Completed:	Revision No.: 1, 07/07/08

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
Lithology Plot	DESCRIPTION Local Ground Surface Elevation:	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits: W_P W W_L; Plastic Liquid; ✱ Passing 75 um (%); ○ Moisture Content (%); 20 40 60 80		1 riser pipe in bentonite 1 riser pipe in backfill 1 riser pipe in sand 1 slotted pipe in sand no installation, only bentonite
	black ORGANICS (Muskeg) soft					1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0					Water level is 5.96 m below top of casing.
	grey 10.0 CLAY trace sand till					10.0 11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0 19.0 20.0 21.0 22.0 23.0 24.0 25.0 26.0 27.0 28.0 29.0 30.0 31.0 32.0 33.0 34.0 35.0 36.0 37.0 38.0 39.0 40.0 41.0 42.0 43.0 44.0 45.0 46.0 47.0 48.0 49.0 50.0 51.0 52.0 53.0 54.0 55.0				

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Continued on Next Page

▼ Groundwater depth observed on March 16, 2008 at a depth of: 5.96 mbtc m

Scale: 1 : 290

RECORD OF MONITORING WELL No. MW-2 Co-Ord. 327848 E 5576635 N

amec

Project Number: TY86002 Drilling Location: See Figure 2 Logged by: Davidson

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L Plastic Liquid; ✱ Passing 75 µm (%); ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite; 1 riser pipe in backfill; 1 riser pipe in sand; 1 slotted pipe in sand; no installation, only bentonite
	grey CLAY trace sand till						56.0					
	brown SAND	61.0					61.0					
	grey-brown SAND	68.6					68.6					
	red-brown SAND with silty clay	73.2					73.2					
	black PEAT	101.5					101.5					
	red-orange SAND	105.1					105.1					

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commisioned and the accompanying 'Explanation of Borehole Log'.

Scale: 1 : 290

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RECORD OF MONITORING WELL No. MW-2 Co-Ord. 327848 E 5576635 N

Project Number: TY86002 Drilling Location: See Figure 2 Logged by: Davidson

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits: W_p W W_L; Plastic Liquid; ✳ Passing 75 um (%); ○ Moisture Content (%); 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite 1 riser pipe in backfill 1 riser pipe in sand 1 slotted pipe in sand no installation, only bentonite
	red-orange SAND					118.0 119.0 120.0 121.0 122.0					
	End of Hole (No refusal) 122.0										

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commisioned and the accompanying 'Explanation of Borehole Log'.

Scale: 1 : 290

RECORD OF MONITORING WELL No. MW-3 Co-Ord. 327870 E 5576798 N

amec

Project Number:	TY86002	Drilling Location:	See Figure 2	Logged by:	Davidson
Project Client:	PhosCan Chemical Corporation	Drilling Method:	150 mm	Compiled by:	ETB
Project Name:	Martison Phosphate Project	Drilling Machine:	Truck Mounted Drill	Reviewed by:	TJL
Project Location:	Hearst, Ontario	Date Started:	11 Mar 08 Date Completed:	Revision No.:	1, 07/07/08

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION Local Ground Surface Elevation:	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits: W_p W W_L; Plastic Liquid; ✱ Passing 75 um (%); ○ Moisture Content (%); 20 40 60 80	INSTRUMENTATION INSTALLATION	no installation, only bentonite
	black ORGANICS (Muskeg) soft					1.0 2.0 3.0 4.0 5.0 6.0					
	grey CLAY 6.1					7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0 19.0 20.0 21.0 22.0 23.0 24.0 25.0 26.0 27.0				
	brown SAND glacial till 28.0					28.0 29.0 30.0 31.0 32.0 33.0 34.0 35.0 36.0 37.0 38.0 39.0 40.0 41.0 42.0 43.0 44.0 45.0 46.0 47.0 48.0 49.0 50.0 51.0 52.0 53.0 54.0 55.0				

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Continued on Next Page

RECORD OF MONITORING WELL No. MW-3 Co-Ord. 327870 E 5576798 N

Project Number: TY86002 Drilling Location: See Figure 2 Logged by: Davidson

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L; Plastic Liquid; ✱ Passing 75 um (%); ○ Moisture Content (%); 20 40 60 80	INSTRUMENTATION INSTALLATION	▨ no installation, only bentonite
	grey-brown SAND with cobbles 56.0					56.0					
						57.0					
						58.0					
						59.0					
						60.0					
						61.0					
						62.0					
						63.0					
						64.0					
						65.0					
						66.0					
	black PEAT 67.0					67.0					
						68.0					
						69.0					
						70.0					
						71.0					
						72.0					
						73.0					
						74.0					
						75.0					
						76.0					
						77.0					
						78.0					
						79.0					
						80.0					
						81.0					
						82.0					
	red-brown SAND with silty clay 83.0					83.0					
						84.0					
						85.0					
						86.0					
						87.0					
						88.0					
						89.0					
						90.0					
	End of Hole (No refusal) 90.0										

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commisioned and the accompanying 'Explanation of Borehole Log'.

Scale: 1 : 290

RECORD OF MONITORING WELL No. PW-1B Co-Ord. 327870 E 5576788 N

amec

Project Number:	TY86002	Drilling Location:	See Figure 2	Logged by:	Davidson
Project Client:	PhosCan Chemical Corporation	Drilling Method:	150 mm	Compiled by:	ETB
Project Name:	Martison Phosphate Project	Drilling Machine:	Truck Mounted Drill	Reviewed by:	TJL
Project Location:	Hearst, Ontario	Date Started:	10 Mar 08	Date Completed:	Revision No.: 1, 07/07/08

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION Local Ground Surface Elevation:	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L Plastic Liquid ✱ Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite 1 riser pipe in backfill 1 slotted pipe in sand no installation, only bentonite
	black ORGANICS (Muskeg) soft					1.0 2.0 3.0 4.0 5.0 ▼ 6.0 7.0 8.0 9.0					
	grey 10.0 CLAY trace sand, gravel, soft					10.0 11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0 19.0 20.0 21.0 22.0 23.0 24.0 25.0 26.0 27.0 28.0 29.0 30.0				
	brown/black 30.0 GLACIAL TILL soft					31.0 32.0 33.0 34.0 35.0 36.0 37.0 38.0 39.0 40.0 41.0 42.0 43.0 44.0 45.0 46.0 47.0 48.0 49.0 50.0 51.0 52.0 53.0 54.0 55.0				

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▼ Groundwater depth observed on March 16, 2008 at a depth of: 5.14 m.

Scale: 1 : 290

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RECORD OF MONITORING WELL No. PW-1B Co-Ord. 327870 E 5576788 N

Project Number: TY86002 | Drilling Location: See Figure 2 | Logged by: Davidson

amec

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits: W_p W W_L; Plastic — Liquid; ✱ Passing 75 µm (%); ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite; 1 riser pipe in backfill; 1 slotted pipe in sand; no installation, only bentonite
	brown/black GLACIAL TILL soft					56.0					
	brown SAND trace gravel — 61.0					57.0					
	black PEAT soft — 68.5					58.0					
	red-brown SAND soft — 70.1					59.0					
						60.0					
						61.0					
						62.0					
						63.0					
						64.0					
						65.0					
						66.0					
						67.0					
						68.0					
						69.0					
						70.0					
						71.0					
						72.0					
						73.0					
						74.0					
						75.0					
						76.0					
						77.0					
						78.0					
						79.0					
						80.0					
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						82.0					
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						85.0					
						86.0					
						87.0					
						88.0					
						89.0					
						90.0					
						91.0					
						92.0					
						93.0					
						94.0					
						95.0					
						96.0					
						97.0					
						98.0					
						99.0					
	white-black CARBONITITE ROCK hard — 99.1					100.0					
						101.0					
						102.0					
						103.0					
						104.0					
						105.0					
						106.0					
						107.0					
						108.0					
						109.0					
						110.0					
						111.0					
						112.0					
	End of Hole (No refusal) — 113.0					113.0					

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance *from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was* commisioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 290

APPENDIX D

LIMITATIONS OF REPORT

AMEC EARTH & ENVIRONMENTAL

LIMITATIONS OF REPORT

The conclusions and recommendations given in this report are based on information determined at the test hole locations. The information contained herein in no way reflects on the environmental aspects of the project, unless otherwise stated. Subsurface and groundwater conditions between and beyond the test holes may differ from those encountered at the test hole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. It is recommended practice that the geotechnical engineer be retained during construction to confirm that the subsurface conditions throughout the site do not deviate materially from those encountered in boreholes.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report. Since all details of the design may not be known, we recommend that we be retained during the final design stage to verify that the design is consistent with our recommendations, and that assumptions made in our analysis are valid.

The comments made in this report on potential construction problems and possible methods are intended only for the guidance of the designer. The number of test holes may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of surficial topsoil or fill layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work. This work has been undertaken in accordance with normally accepted geotechnical engineering practices. No other warranty is expressed or implied.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. AMEC accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Memo

To	**Ian Pritchard**	File no	**TY86002**
From	**Dan Cacciotti**	cc	**Tim Horner** **Janet Lowe** **Tony Copland** **Gary Pigg** **Dave Simms** **Derek Wilson** **Narendra Verma** **Dan Dimitriu** **Tommi Leinala**
Tel	**1 (705) 682-AMEC**		
Fax	**1 (705) 682-2260**		
Date	**August 18, 2008**		

Subject **Draft Geotechnical Report Comments**
Proposed Martison Phosphate Mine
Hearst, Ontario

1.0 INTRODUCTION

AMEC Earth & Environmental, a division of Americas Limited (AMEC), was retained by PhosCan Chemical Corp. (PhosCan) to carry out preliminary geotechnical and hydrogeological investigations for a proposed mine site development.

AMEC was contacted midway of January 2008 and requested to provide an estimate to supervise previously contracted drill rigs which were required to complete a predetermined investigation program in late January. Up to that stage, AMEC had not participated in the development of the investigation program, nor had we been involved in the borehole location selection planning. Our draft proposal was not finalized and the estimated costs were to be invoiced on a time and materials basis. Our understanding for our scope of work was to supervise the drilling fieldwork, review the available historical information, obtain geotechnical samples, prepare geotechnical logs the boreholes and provide a preliminary discussion about the geotechnical concerns, with primary recommendations gaps to be filled during the next phases of investigation.

We trust that our component of the field work has been completed in accordance with our scope of work. The report submitted was a first draft for review and discussion. It had not gone through our internal senior review. Your review comments are much appreciated and will allow us to complete the report in consideration of these comments and in compliance with our scope of work. Prior to revising the report, we are pleased to provide the following responses to your review comments on our draft report; the responses (in red text) are inserted within the review comment text.

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2.0 TIM HORNER COMMENTS

1. The report is bottom heavy with 700 pages, the majority of which are appendices as historical drill logs. Our intent was to provide one document with everything in it. We will delete the appendices.

2. For the most part the document is light weight in content with regard to recommendations, however, the one section where some detail is added (Section 7.1) it is in conflict with our own road construction design. I would recommend that most of this section is amended / deleted, this is not how we're going to build it. Our understanding of this phase was to primarily supervise drilling fieldwork and provide general recommendations from geotechnical engineering standpoint. This section will be deleted.

3. Since we are planning to move to an Advanced Exploration stage in winter 2009 then Section 8.0 should be modified, since it is based only on a drill and test pit programme rather than the large scale excavations proposed, which will provide far better in situ geotechnical and hydroG information. We were asked to include our plan for future work but agree with this comment that it should be left to the individual designers. This section will be deleted. We will be glad to participate in the planning.

4. To reduce the size of the document to make it easier to carry in hardcopy. We do not need Appendix D & E which make up the bulk, they can be referenced as they already occur in other documents, copies of these appendices can be placed on the FTP for viewing if required. Appendices D and E will be deleted.

5. For the most part AMEC have covered everything that they set out in their proposal with three exceptions :
   - In AMEC's proposal they included a $6000 budget allowance to complete some preliminary slope stability modelling, but there is no slope modelling included here. We did complete preliminary slope stability modelling, to provide the pit slopes included in the report. The borehole program fell short of expectations and did not provide the anticipated information. For detailed modelling, more soils information, including strength characteristics and their susceptibility to change with time or future site conditions, will be required.
   - Secondly they have not classified the site for earthquake parameters. We will provide a table of site earth quake classifications, as they relate to buildings, which will depend on foundation systems selected.
   - We are still waiting on the HydroG portion of the report which will now be issued separately. I have asked that some preliminary data be released for the HydroG report instead of waiting several more weeks for them to complete the model simulations. As discussed during our meeting in Oakville, the groundwater modelling will be done following a longer (possibly 7 day) pump test and once the block model is finalized. Therefore, the memo promised has grown into more of a report. It will be ready early next week.

3.0 IAN PRITCHARD

The report is very high level and somewhat generic, also in our meeting on Tuesday with Dan Cacciotti he made the point on more than 3 occasions that the till would be suitable for all the construction pads, I do not see this verified in the report. The discussion (Section 4.2) on the use of till will be expanded.

The appendices are unnecessary and we should only reference previous work and not include as part of the document. These will be deleted.

4.0 RAY DUJARDIN

Attached is an extract of the report (i.e. minus appendices) with some rough comments I have inserted (see yellow icons). These comments will be incorporated into the next version. I also attach a report on pit slopes prepared by Golder in July of last year which seems to have been ignored. Discussions with respect to the information in the Golder report will be added.

My comments boil down to the following (some are a bit picky I admit):

1. There are a lot of generalizations in this report i.e. it is very short on specifics and to my mind is more of a list of alternatives and what-if's rather than recommendations. The report reflects our original scope of work and as this project progresses with AMEC's involvement, appropriate engineering recommendations will be provided based on appropriate field investigations. If this report is viewed as just interim and direction-pointing it is OK but for an "outside reader" it could be confusing and even misleading e.g. as Tim points out the road construction recommendation is out of line with what has already been laid out. Our report is a factual report and recommendations given are general in nature to cover the possible options that the designer may consider; also as noted, the road design was given to us after the report was written. So much depends on what PhosCan intends to do with the report.

2. Starting with the Executive Summary the geological side is very generic. There seems little attempt to use established names for the lithological units so that the reader can get a sense of where the materials fit in the mining plan – what is residuum ore and waste etc. I note that in the borehole logs in Appendix A only Till and Muskeg are given names – the rest of the material is described generically. The term bedrock is also used generically – it would really help to know the geological nature (name) of the bedrock. Golder's 1983 logs do at least identify residuum as well as the till and muskeg. We did have difficulty identifying layers but at no time were we were asked to log for geology, as we thought this was being done by the PhosCan geologist. We will however, make an attempt to improve the logs, using PhosCan logging as guide for geological information.

3. It would have been helpful to get an opinion of Golder's 1983 work as well as just adding it as an appendix. We were not asked to provide an opinion on the 1983 Golder work. In fact we found this report on our own when searching MNDM files. AMEC undertook to review previous work so where are the comments? Our intention for the document review

was to acquire understanding of previous work and not to critique. We will be glad to provide comments on the said report, if requested, in a review memo (i.e., separate from our report). The same applies to the attached report by Golder dated July 2007. They may be short in some areas but Golder are one of the leaders in pit slope design so I think their comments are pertinent. We will consider the information of the Golder report in our next version.

4. Section 1.3 Site Quaternary History is too academic and not very helpful. It's based on work by Easton R.M in 1992 which is too generalized and speculative for me. More specific would be the data in Ontario Geological Survey Study 24 by R.P.Sage published in 1987: "Geology of the Carbonatite-Alkalic Complexes in Ontario". PhosCan likely knows more and has more data on local geology so we propose to delete this section making reference to the appropriate document(s).

5. Section 3.3 Till Soils does not mention the frequency of large boulders in the Till. We need to know if boulders will be a challenge during overburden stripping so this should be raised as a potential issue. We will add commentary based on the number of "hits" in the boreholes.

6. Section 3 Soil Conditions does not make it clear where the Cretaceous overburden fits in. We will add commentary.

7. Section 3.5 Organic Silt Soil Layer could be an issue as an indication of sources of humic acid-producing waste. It is also a potential source of concentrated trace elements including radon. We need to determine how much of this organic material comes into play. We will add commentary.

8. Section 3.6 Residuum Stratum indicates difficulty in distinguishing Residuum from Cretaceous material. Was the material assayed for P2O5 etc. We should glean every bit of data we can from the samples even if they are outside the pit. Also we can then use the assays to log the material accurately and describe results more meaningfully to an outsider. This is outside our scope of the investigation work, and requires specialty lab testing and interpretation. We would gladly incorporate results into the classifications on our logs.

9. Section 4.2 Reuse of Excavated Soil certainly offers the opportunity to use the Till for berms, liners etc. This comes up again in the report but I cannot find the rationale. We will add commentary.

10. Section 5.1.4 Stripping Overburden Soils raises the issue of "rideability" of roads in Till and Cretaceous materials and the possibility of having to import granular material and geogrids and/or geofabric in some areas. This seems like a candidate for careful further study as this would an expensive option. Again though this only another possibility raised. This is outside our scope of work but can be completed.

11. Section 5.1.5 Slope Maintenance raises the spectre of having to drill deep drainage wells to depressurize the rocks before excavation. This sounds like Victor but there the diamond pipe intersects a strong limestone aquifer which has to be drained for mining to be possible. This would hugely increase Martison's capital cost if the same applies. I don't think it does but it is still to proved. I think the problem we ran into during the geotech drilling was with perched aquifers which may or may not intersect the pit area. My experience with such aquifers in Chile was that they tend to have a finite volume and water capacity so what we find may not impact on the pit directly. This whole section raises just about all the pit-drainage schemes possible without saying what is most likely. We need to do more field work and modelling (including aquifer identification, size, etc.) to come to any type of conclusion.

12. Section 5.1.6 Mining of the Ore raises some key questions about stability within the pit during miming. This has always been an issue with me: how will the benches stand up in this gravel-pit-like setting for work in the pit, grade control and traffic. In our mine scheduling we assume the ability to practice ore-control methods usually applicable to hard rock mines. This section rightly draws attention to the challenges in the Martison pit. The next phase of fieldwork and involvement with specialists in this field will help focus recommendations.

13. Section 6.2 Site Stripping will attract some comments from Hank I'm sure since he advocates building on the muskeg i.e. not removing it where feasible based on the Victor experience. This issue is raised again in Section 7.0 Access Road Foundation where the possibility of using the "displacement" technique is described for areas where muskeg is deep or submerged. The overall site development plan, along with specifics for each component must be reviewed to make decisions on when it can remain.

14. Section 7.0 Service Corridor does not make observations on the methods used to build the forestry road in place already. We just got these drawings and have provided comments but have to investigate the soils in this route. This section will be deleted.

15. Section 7.2 Pipeline Corridor raises alternatives to burying the pipeline which were Phoscan originally preferred. However the possibility of vandalism of above-ground pipe has been raised – a target for hunters! Pipeline design is beyond our scope and geotechnical discussions can be provide after appropriate investigations..

16. Table 2 (page 13) Anticipated Steps of Pit Development and Table 3 Recommended Future Geotechnical Fieldwork (page 20) are very general and are just a starting point for future planning. It would add some punch to include a summary of what the main issues are in each area (in addition to the reasons already stated). Although we were asked for this, we will delete it and leave it to each designer to determine.

17. Section 8.0 Recommended Future Geotechnical Fieldwork discusses the suitability of various drilling methods for sampling. Mention should also be made of Triple Tube drilling which we have use with some success – room for improvement though maybe with a more

competent driller than Norcan. We will modify, and recognize that this requires serious consideration.

18. Figure 3 Bedrock Geology could be left out – it's very regional and does not bring out the structural relationships of the carbonatite complexes of Ontario. Figure 3 will be deleted.

5.0 HANK GIEGERICH

Ray D. has covered this rather general report very well, and there is not much to add.

However, a few general comments, as follows:

1. I noted your comment re the report's lack of verification of the suitability of till for construction pads. I believe that this may be covered if we assume that AMEC's definition of till is "on-site, native, inorganic soils" or "the stiff to very stiff glacio-marine silty clays or compact to dense tills". This should be confirmed by AMEC. We will confirm.

   The report noted that this material is usable as long as it is "not excessively wet or oversized". We should be able to handle the oversize with a screen/grizzly operation where required. Agreed. However, excessive moisture may require some time to drain or dry out, which needs to be considered in the construction schedule. As well, if the material is frozen, time and temperature will be required to thaw. However, depending on the rate of excavation, frost penetration, ambient temperature, and the moisture content, this material could possibly be excavated, spread and compacted in the winter period. Agreed.

2. The report indicates that "deep vertical wells may be required to allow for reduction of water pressure within the residuum and weathered bedrock layers". This could significantly increase the dewatering costs, as the allowance in the PFS was only for horizontal gravity drains in the toes of the benches, flowing to an in-pit pumping station. However, Ray has noted that this high water pressure may be due to perched aquifers, which needs to be confirmed. This will be reviewed and commented after completion of hydrogeology study.

3. The erratic behaviour of the mining faces in the pit due to the heterogeneous nature of the ore types has been recognized, and the mining method will, of necessity, be required to allow for this. This will not be a normal open-pit operation, due to the characteristics of the granular, loose, type 2A material. Where this is encountered, it will not be conducive to stable benches and ramps. This will be complicated by the deep overburden, up to 95 metres, and total pit depths of at least 180 metres (as shown in the 2008 drilling). The key factor will be a haulage system that can handle both of these complications. Agreed

4. AMEC's comments in regard to the placing of the slurry pipeline within the road corridor or in an above-ground location could be of interest, and should be considered, as it would result in better access for maintenance, and possibly lower capital cost. Protection from freezing will be a prime concern in this concept. As discussed above, we will delete comments on the road and pipeline until we investigate these areas.

5. The section on Waste Rock and Tailings Areas appears to be recommending that all underlying muskeg be removed, although the wording is not completely clear on this point. It is agreed that this should be done in the tailing containment areas, including under the berms, but it is questioned if this is necessary under the waste rock sites, on the assumption that the waste rock can be left in place, with reclamation limited to re-sloping and re-vegetation. This should be confirmed with Janet Lowe. The recommendations will be revised; the final choice will be dictated by design evolution.

6.0 GARRY PIGG

I have not seen the subject report but I am assuming from your comments below that

4. An above ground slurry pipeline is being recommended by AMEC. As discussed above, we will delete comments on the road and pipeline until we investigate these areas. Informal conversation with PSI clearly indicated that, in the Martison environment, an above-ground pipe line would not only cost more to operate but would also be quite a bit higher in capital. Concrete supports down to firm ground or closely spaced spread footings will be required, expansion loop designs more complicated because of the much, much wider ambient temperature range and erosive characteristics on pipe elbows, steam tracing will be required for winter conditions and construction time much longer. Assuming the "road corridor" means in or on the road structure, including shoulders and drainage ditches, building the pipeline, underground or above ground in this area could subject the pipeline to heavy truck vibration and resulting ground shifts. PSI proposed to lay the pipeline during the winter months so it will not be necessary to be on or in the "road corridor" — it will be basically running parallel within the "service corridor". Slurry piping in Florida is laid on top of the ground in 20 ft or longer sections that can be rotated and replaced by section as required. Also the lines can be moved, lengthened or shortened as dictated by the movement of the mine slurry pit relovation. That is mined rock and not fine concentrate, and PSI has worked with AMEC on several projects, according to PSI, so I assume that there is a line of communication there somewhere. Agreed, this will be removed from the geotechnical report.

7. My files clearly indicate that the muskeg was to be left in place under both the waste piles and under the tailings ponds. Only the berms would be built on firm glacial till. The cost of removing the muskeg under these large areas was deemed to be greater than designing for the lower storage volumes to compensate for the in-place muskeg. These design related comments and recommendations will be revised in consultation with our dam and waste pile designers.