Geotechnical Evaluation of Options for Improvements to the Water Reservoir, Wastewater Lagoon, and Solid Waste Disposal Facility Supplement to the Schematic Design Report (September 2005) The Hamlet of Qikiqtarjuaq, Nunavut

Prepared by

Nuna Burnside Engineering and Environmental Ltd.
Box 175, 25 Third Avenue Rankin Inlet NU X0C 0G0 Canada
15 Townline Orangeville ON L9W 3R4 Canada

November 2005

File No: N-O 09439

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1.0 Introduction

Nuna Burnside Engineering and Environmental Ltd. (Nuna Burnside) was retained by the Government of Nunavut (GN), to conduct a design for improvement to the water reservoir, wastewater lagoon, and solid waste disposal facilities for the Hamlet of Qikiqtarjuaq, Nunavut. In order to evaluate the various options for expansion/rehabilitation or relocation of the facilities, a geotechnical evaluation was undertaken.

The geotechnical evaluation outlined in this report is presented as a supplement to the report entitled “Schematic Design for the Improvements to the Water Reservoir, Wastewater Lagoons, and Solid Waste Disposal Facility, the Hamlet of Qikiqtarjuaq”, dated September 2005.

The geotechnical evaluation focused on the existing sites and the optional sites outlined in the Schematic Design Report, to assist in evaluating the viability and potential construction/rehabilitation costs for the various options.

2.0 Background

The original proposal for this study submitted to the Government of Nunavut (GN) dated May 2005, included a Geotechnical Analysis as a supplement to the Schematic Design Phase.

Nuna Burnside staff conducted an initial site investigation of all three facilities during a field visit July 7th to 11th, 2005.

The information obtained during the fieldwork and background review were evaluated, and potential options for each facility were prepared. The results were documented in a report entitled "Schematic Design for the Improvements of the Water Reservoir, Wastewater Lagoon, and Solid Waste Disposal facility, the Hamlet of Qikiqtarjuaq, Nunavut" by Nuna Burnside dated September 2005.

The geotechnical evaluation was conducted to support the Schematic Design Report and to assist with the evaluation of the options presented.

3.0 Current Work Program

During the period of September 13th through 17th, 2005, Nuna Burnside staff visited the Hamlet of Qikiqtarjuaq. The following work was conducted:

- Presentation of the Schematic Design Report to the Hamlet of Qikiqtarjuaq administration staff and GN staff
- Field reconnaissance of the facilities
- Geotechnical studies and acquisition of surficical and subsurface rock and soil samples
- Terrain mapping
- Arrangements for detailed topographic surveying of the sites
- Submission of representative soil samples for laboratory analysis
- Evaluation of background data and collection of samples from drums of liquid waste relating to the former tannery facility.

The findings of the liquid waste evaluation are presented in a separate document.

4.0 Geotechnical Evaluation

4.1 Overview

The Schematic Design Report identified potential options to rehabilitate or relocate the existing facilities. The potential feasibility and costs for each option is partially dependent on the physical characteristics of the site. Each facility has specific siting requirements and will need specific quantities of construction materials. The geotechnical evaluation focused on the suitability of the site for the proposed facility and the availability of the required construction materials.

4.2 Bedrock Geology

The Hamlet is located on the east side of Broughton Island as shown on Figure 1.

The area lies within the Churchill Province of the Canadian Shield. The east side of Broughton Island is predominately underlain by the Middle Paleo-Proterozoic (Precambrian) Age intrusive sequences of the Cumberland Batholith. Locally, as shown on Figure 2, the area has been mapped as charnockite within a unit of felsic and mafic plutonic rocks. An older unit of migmatite has also been mapped within the plutonic rocks. Field examination of hand specimens found predominately medium to coarse-grained reddish brown quartz and feldspar rich rocks matching the description of the mapped charnockite.

Very little outcrop was observed in the immediate vicinity of the existing facilities being evaluated and in the optional areas for relocation as outlined in the Schematic Design Report (Figure 2).

Excavation through the overburden was restricted to approximately 2.0 m by permafrost. Bedrock was not encountered in the test-pitting program.

4.3 Surficial Geology

The available surficial geology mapping is displayed on Figure 3. The mapping was conducted at a coarse scale and provides only a broad overview of the surficial conditions. In general, the surficial geology in the areas of interest consists of tightly spaced cobbles and boulders armoring the surface underlain by mixed medium to coarse sand and gravel with varying amounts and of sizes of cobbles and boulders. An increasing amount of silt was noted near the permafrost contact (at approximately 2.0 m) in several areas.

4.4 Quarry Area

Several areas northwest of the Hamlet have been used as a quarry for sand and gravel resources for the community. Quarry areas are visible as surfacial disturbances and excavations in the tundra on Figures 2 and 3. Excavations are also evident in the immediate vicinity of the wastewater lagoon (Figure 4), landfill (Figure 5), and water reservoir (Figure 6).

Currently an area north of the water reservoir (quarry site) is being used for excavation, sorting, and stockpiling of sand and gravel resources for various road and construction requirements.

The quarry has been excavated sufficiently to create vertical excavation faces exceeding 2.0 m, which can be excavated easily as water drains and the permafrost melts back. See photographs in Appendix B.

Screening equipment, an excavator, a loader, and a dump truck were noted in operation at the quarry site.

The quarry site has sufficient available resources to supply the Hamlet for the foreseeable future.

5.0 Existing Wastewater Lagoon

Figure 4 displays the existing wastewater lagoon and surrounding area. The existing lagoon currently operates by discharging from an outfall through the berm in the late summer. The discharge is confined to a meandering stream and shows strong green vegetation growth around its course.

The Schematic Design Report indicates the wastewater lagoon capacity needs to be increased. This could be accomplished at the existing site or a new site. A potential location for constructing additional capacity south of the existing lagoon is displayed on Figure 4.

A geotechnical investigation in the area of the existing site was undertaken to determine the potential depth below surface to which a new lagoon could be excavated and the availability of suitable on site construction materials.

The entire area was traversed on foot and features examined. The surface is typically covered with scattered boulders and cobbles. An examination of the topography and slope faces identified several meters of poorly sorted glacially deposited coarse sand and gravel with abundant cobbles and boulders.

Two test pits were excavated using a rubber-tired backhoe as shown on Figure 4. Test pit logs are included in Appendix A. The test pits revealed poorly sorted medium to coarse sand and gravel, with cobbles and small boulders to approximately 2.0 m where digging was halted by permafrost. Photographs are included in Appendix B. The results of the laboratory analysis for a representative soil sample (Soil 2) are included in Appendix C.

Surficial material in the area south of the existing wastewater lagoon appears to be very similar to the material used to construct the existing lagoon. Sufficient resources of overburden material are available on site to create a second similar sized lagoon using a similar construction technique.

6.0 Existing Landfill Site

A description of the landfill site and solid waste management is included in the Schematic Design Report.
The landfill and area around the landfill was traversed, and the soil and topography mapped. See Figure 5 for site details and Appendix B for photographs.

The site is operated in two parts. The putresable waste disposal area is enclosed by a fence, and an open bulky metals disposal area is located immediately to the north of the fenced area. This results in two active fill faces. Both areas operate by filling outwards on a down slope on top of the original ground surface.

The landfill currently has operational issues with exposed waste and steep tipping faces. The landfill site and the surrounding area consists of boulder and cobble armored tundra surface, underlain by a poorly sorted till consisting of medium to coarse sand and gravel, with abundant cobbles and small boulders.

The excavated slope face east of the bulky metal waste disposal area was examined. This area has been excavated into the hillside to acquire cover material for the landfill. An estimated 2.0 m of overburden is able to be quarried above the permafrost line. Excavation into the hillside indicates the soil is coarse and well drained. It appears the permafrost retreats as the excavation advances. Although the material is coarse with many boulders, it is easily excavated and is suitable for landfill cover. There appears to be an abundant amount of available cover material, as the hillside can be excavated eastwards for many hundreds of meters. The results of the laboratory analysis of a representative soil sample (Soil 1) is included in Appendix C.

Within the landfill enclosure, the unfilled areas on the south side and the west side (in front of the waste face) are the original ground surface. Based on local test pitting, these areas could be excavated to approximately 2.0 m to the top of the permafrost. Excavation of a fill footprint below surface would greatly increase the vertical thickness of deposited waste without creating a steep slope face.

From a geotechnical point, the site can be rehabilitated fairly easily as there are no significant land availability and cover availability constraints.

The landfill site area is on a long slope, which tends to be well drained. The upgradient slope to the east was observed to be covered with sheet flow during spring run off. This requires effective ditching to control the flow around the landfill rather than across it.

An examination of the existing ditching and surface water flow indicates that interception and diversion of the upgradient overland flow can be accomplished.

Sufficient excavatable material is available on site to create berms to better enclose the fill area and reduce problems such as:

- Blown litter
- Steep tipping face
- Expanding footprint of the waste
- Visual appearance.

The fencing could be established on top of the berms to increase the height of the fence and achieve better capture of wind blown litter.

From the geotechnical view point the site can be effectively redeveloped and managed to serve the long-term needs of the Hamlet.

If keeping the landfill and bulky metals disposal area in its current location is the option selected by the Hamlet, there are a number of different layout and operational scenarios, which could be developed. These would be evaluated in concert with the Hamlet during the Detailed Design stages. The Operations and Development Plan will be created as part of the Detailed Design, and will need to be vetted by the Hamlet's public works and landfill operations staff, to ensure the proposed operational methodology and layout is suitable of the equipment, staff, and budget that is available

7.0 Existing Water Reservoir

7.1 Reservoir

Figure 6 displays the existing water reservoir and surrounding area. The Schematic Design Report outlines three potential viable options to address the need for expanded reservoir capacity. All of the options involve developing increased storage capacity at the existing site. Regardless of whether the existing reservoir is expanded in some fashion or if an entire new reservoir is constructed, berm material and a suitable base is required.

The area around the reservoir was traversed and the soil and bedrock mapped.

The existing reservoir was created by excavation of the footprint area to obtain maximum depth and the creation of berms using the excavated material and bulldozing material from the surrounding tundra. The area north west of the existing lagoon was examined. Test pits and bulldozed piles of overburden from previous quarrying activities indicates the availability of up to 2 m of poorly sorted medium to coarse grained sand and gravel, with varying amounts of cobbles and small boulders.

The area slopes towards the northwest away from the existing reservoir. Sufficient area exists to place another similar sized reservoir next to the existing reservoir. An examination of the soil around the potential new reservoir identified sufficient suitable overburden material to create the berms, and provide the raw material that could be crushed and sorted to provide the needed sand and gravel. The laboratory results of the analysis of a representative soil sample (Soil-3) are included in Appendix C.

Geotechnical conditions are favourable for the construction of a second reservoir at the site using the same techniques as was used to construct the first reservoir.

7.2 Water Supply to the Reservoir

Currently the reservoir is filled during the summer by laying pipe over the ground up hill to the Tulugak River as shown on Figure 6. Filling was observed underway September 15, 2005, however the flow in the river and resulting flow through the pipe was low. Hamlet staff indicated the river should continue to flow sufficiently to fill the reservoir until early October.

Discussions were held with Government of Nunavut staff and Hamlet staff regarding the filling process. The following were discussed:

- Continue using the current method of filling

- Establish a reservoir or filling area in the stream itself with a permanent intake in a created pool. This was considered difficult due to the violence of spring run-off with rafted ice moving down hill.

Possible modifications to the filling procedure will be addressed further as part of the detailed design phase of the project.

8.0 Alternative Locations for the Wastewater Lagoon and Landfill

The Schematic Design Report identified one new potential site for relocating the wastewater lagoon, and three potential sites for relocating the landfill (A, B, and C) as shown on Figures 2 and 3.

A potential new wastewater lagoon site is located in the same area as Potential Landfill Site A. This location is on the south side of the Dew Line site access road.

The area was traversed and examined. On the surface the tundra is covered with abundant moderate to large boulders and bedrock float. The large float is derived from a steep ridge of bedrock to the southeast. The site is sloped to a similar degree as the existing landfill and wastewater lagoon site. The underlying overburden could not be examined in detail due to the rough boulder covered surface. What could be determined from field examination and traverse, was that this area would be very difficult to work with heavy equipment due to the preponderance of boulders and large bedrock float. Construction would be difficult, and Operation and Maintenance (O&M) costs for the landfill would be high due to the difficulty of excavating cover material.

This site is geotechnically less favourable than the existing site and still within sight of the community.

Potential Landfill Site B is located approximately 1.7 km further up the Dew Line site access road than the existing landfill site.

Although the area is mapped as bedrock on Figure 3, Potential Site B consists of overburden above permafrost. Depth to bedrock is unknown. The area slopes to the northwest, and is constrained to the south by a northeast trending ridge and a boulder choked run off channel at the base of the slope. Site B is the only potential location examined that is out of sight of the community.

The area is covered with cobbles and small boulders. The underlying overburden is predominately coarse grained sand and gravel with poorly sorted cobbles and boulders.

The site is sufficiently large enough to host a landfill.

Geotechnically there is sufficient area and available cover material to create and operate a landfill. There are concerns with spring runoff at the base of the ridge, and overland flow from up gradient. This could be controlled with ditching.

From an O&M cost perspective, the site requires traveling a further 1.7 km from the existing landfill access road and up a significant grade. See topographic contours on

Figure 3. While the site may be geotechnically possible, the economics and O&M issues make it less suitable than the existing site.

Potential Landfill Site C is located north of the Dew Line site access road. The site is not visible to the community and would require the construction of approximately 1 km of new access road.

The site is located on a shallow slope with boulder-covered tundra. Access was not possible with test pitting equipment at the time of the fieldwork due to the distance from the existing road network.

Development of a landfill site in this location appears geotechnically feasible, however the capital and O&M costs would be much higher than for the other sites, with no significant advantages.

In summary, based on the geotechnical evaluation the most suitable option for the landfill site is the rehabilitation of the existing site. The most suitable option for the wastewater lagoon is adding additional lagoon capacity at the existing location through construction of another lagoon.

Maintaining the wastewater lagoon and landfill in their current locations in close proximity to each other, minimizes the need for additional roads and minimizes the land area required for infrastructure development, and minimizes the footprint of environmental impacts.

9.0 Summary

The geotechnical evaluation found the existing wastewater lagoon site, landfill site, and water reservoir site to be suitable for rehabilitation and/or expansion.

No compelling geotechnical reasons were found to relocate the landfill or wastewater lagoons. A qualitative evaluation of capital costs and O&M indicates the current locations are the most favourable, due to:

- No new access road needed
- No new site development needed
- No new disturbance of the natural tundra required other than in the immediate vicinity of existing disturbed areas
- Sufficient construction material resources have been identified at each location for the type of construction that is planned..

10.0 Recommendations

1. No further geotechnical study is required at this time.

2. Detailed topographic contours are required for the areas selected for rehabilitation/ expansion in order to develop the Detailed Designs and Operation and Maintenance Plans.

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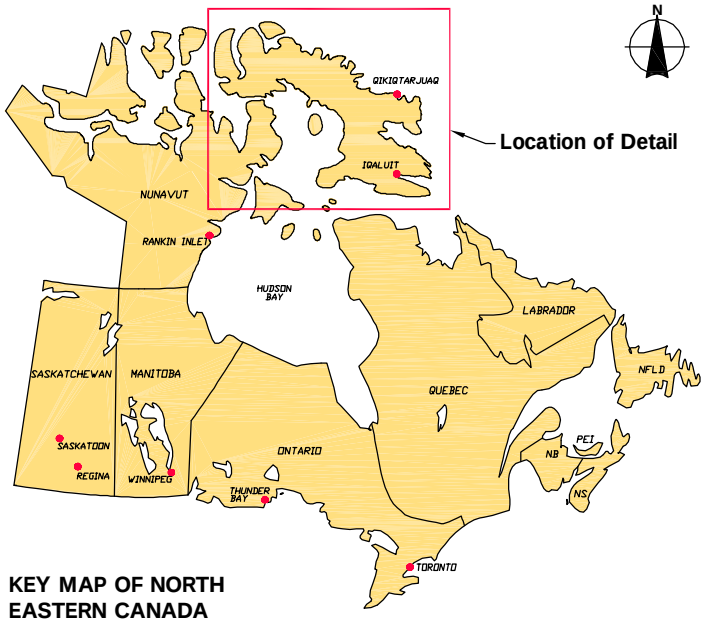
Figures

Map Reference:
Map of Canada
Published by the CAA



KEY MAP OF NORTH EASTERN CANADA

FIGURE 1 - SITE LOCATION MAP

THE HAMLET OF QIKIQTARJUAQ, NUNAVUT

GEOTECHNICAL EVALUATION

September 2005
Project Number: N-O 09439.0

Prepared by: C. Sheppard

Verified by: J. Walls

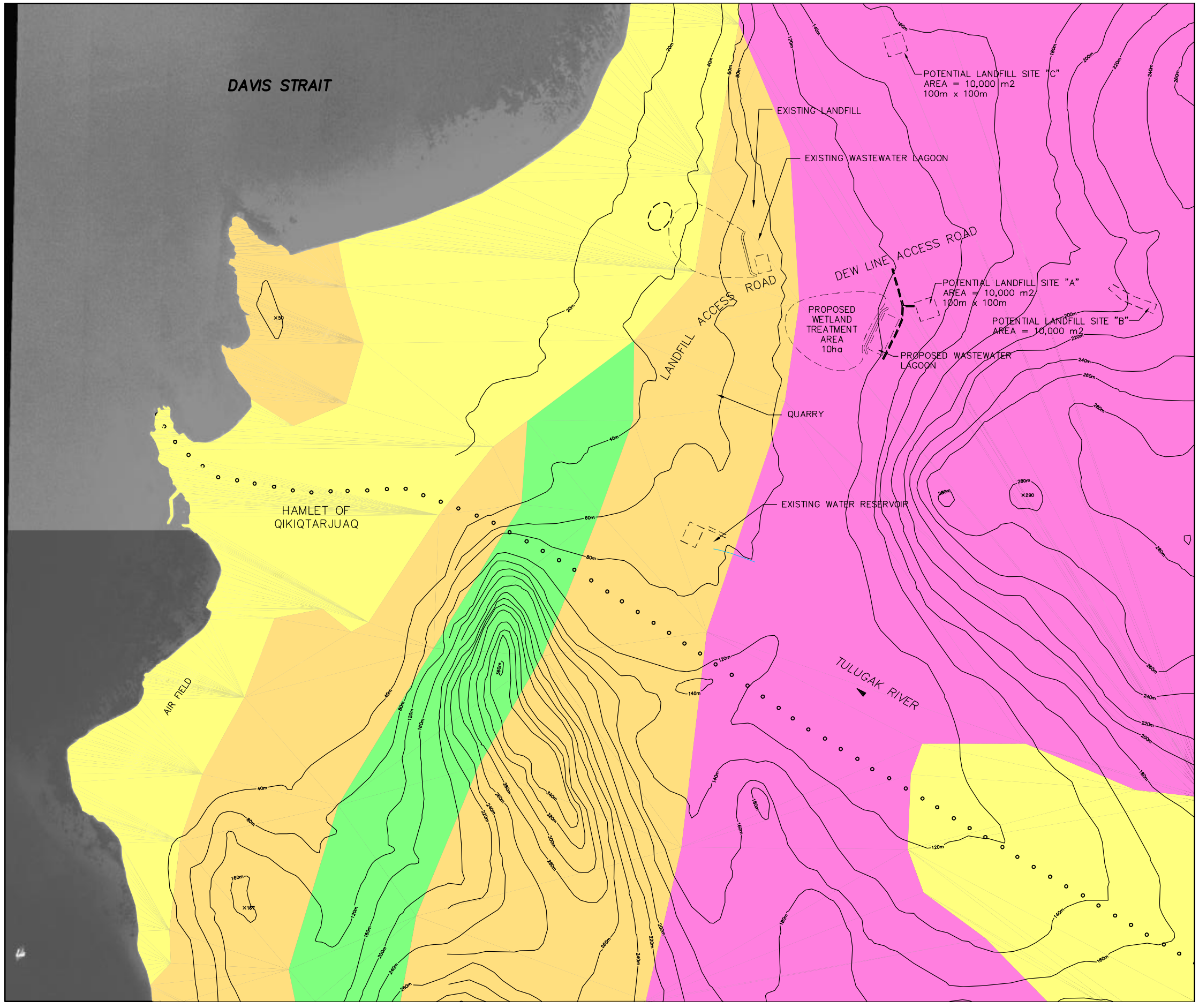
BURNSIDE

FOE08983 GEOTECH SL.DWG

FIGURE 2

THE HAMLET OF QIKIQTARJUAQ
GEOTECHNICAL EVALUATION

SATELLITE IMAGERY OF ENTIRE COMMUNITY AND BEDROCK GEOLOGY



Legend

- CHARNOCKITE
- FELSIC & RARE MAFIC PLUTONIC ROCKS
- MIGMATITE
- CLAY TO COARSE GRAVEL & BOULDERS
- DIP
- LINEAMENT
- DYKE

Satellite Imagery Source:
September 2004 Satellite Image obtained from DigitalGlobe Inc.

Geology
Bedrock Geology data obtained from Jackson, G.D., 1998, Okoa Bay - Padloping Island Area, District of Franklin, Northwest Territories, Geological Survey of Canada, Open File 3532, Scale 1:250,000

N

0 200 400 600 800 1000 1200 1400 1600
Meters

1:20,000
September 2005
Project Number: N-O 09439.0

Projection: UTM Zone 20
Datum: NAD83

Prepared by: C. Sheppard

Verified by: J. Walls

BURNSIDE

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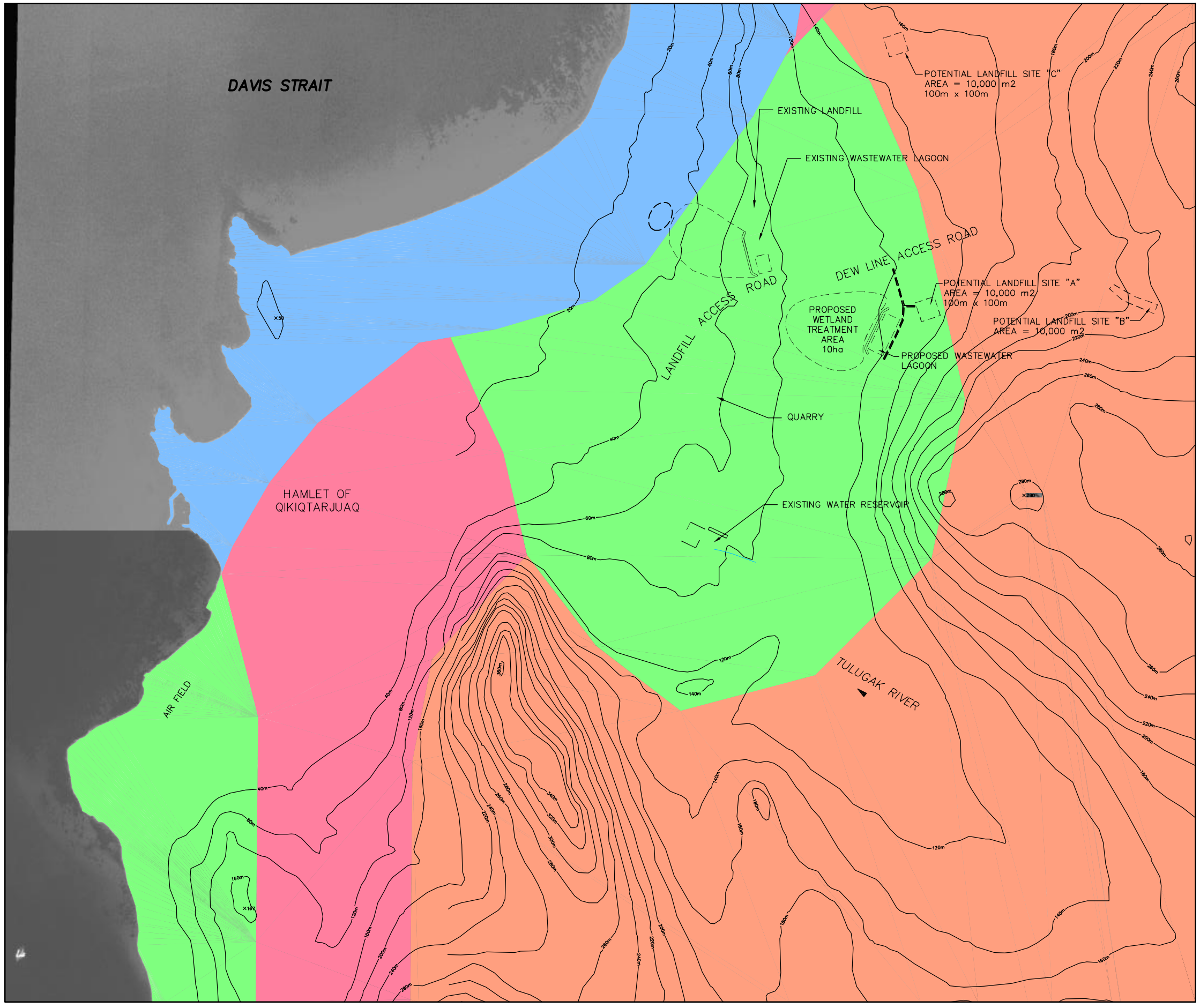

FIGURE 3

THE HAMLET OF QIKIQTARJUAQ
GEOTECHNICAL EVALUATION

SATELLITE IMAGERY OF ENTIRE COMMUNITY AND SURFICIAL GEOLOGY

Legend

- EMERGED MARINE SEDIMENT
- TILL
- BEDROCK
- RESIDUUM

Satellite Imagery Source:
September 2004 Satellite Image obtained from DigitalGlobe Inc.

Geology
Surficial Geology data obtained from Geological Survey of Canada, Surficial Materials and Landforms, Cumberland Penninsula, Baffin Island, Map 1536A.

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Meters

1:20,000
September 2005
Project Number: N-O 09439.0

Projection: UTM Zone 20
Datum: NAD83

Prepared by: C. Sheppard

Verified by: M. Paznar

BURNSIDE

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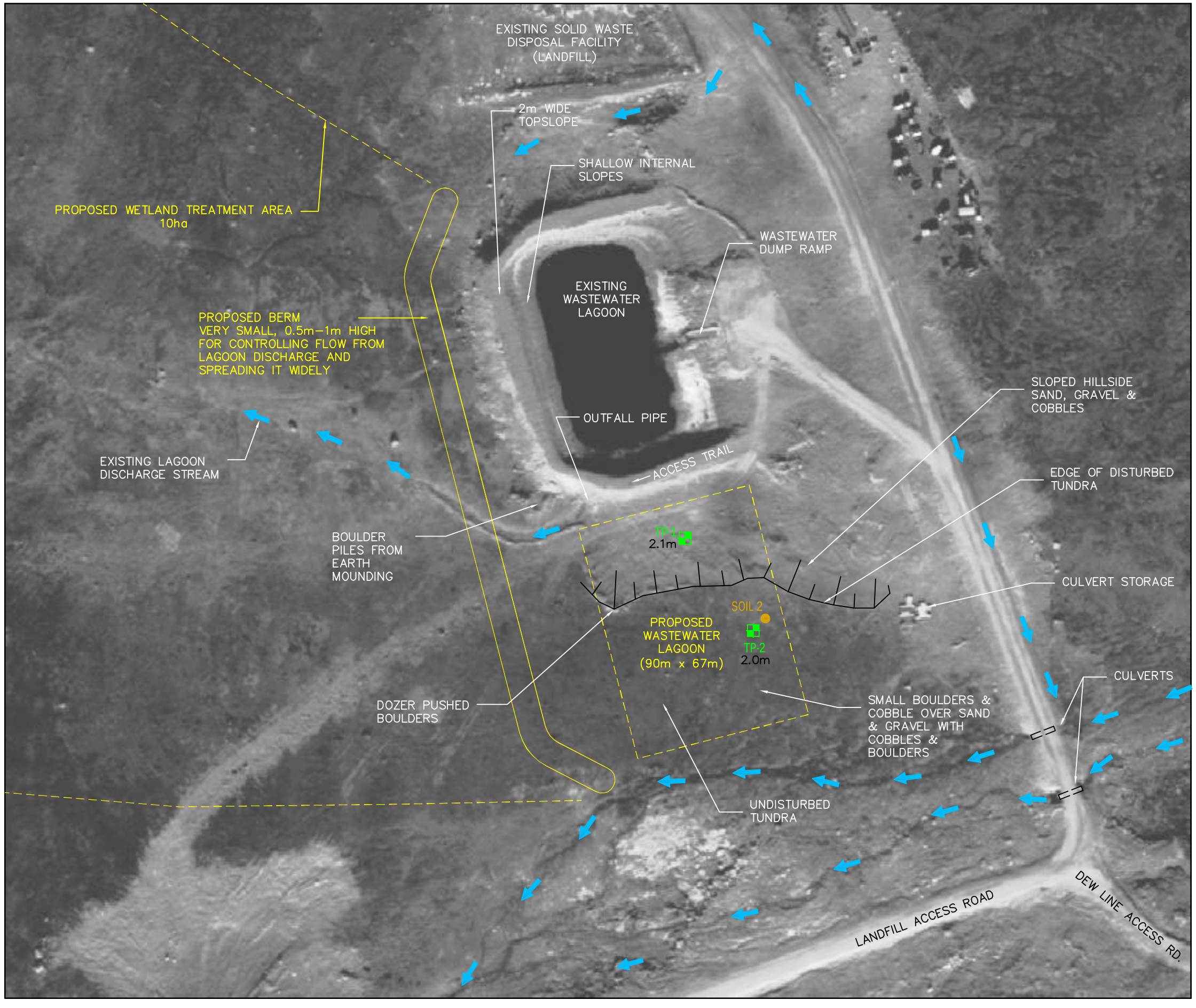

FIGURE 4

THE HAMLET OF QIKIQTARJUAQ
GEOTECHNICAL EVALUATION

EXISTING WASTEWATER LAGOON

Legend

- INTERPRETED EXISTING SURFACE WATER FLOW DIRECTION
- TP-1 2.1m — TEST PIT LOCATION & DEPTH IN METRES
- SOIL 1 — SOIL SAMPLE LOCATION

Satellite Imagery Source:
September 2004 Satellite Image obtained from DigitalGlobe Inc.

N

0 10 20 30 40 50 60 70 80 90 100 110 120

Meters

1:1,500
September 2005
Project Number: N-O 09439.0

Projection: UTM Zone 20
Datum: NAD83

Prepared by: C. Sheppard

Verified by: J. Walls

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FOE08983 GEOTECH EXISTING WWL.DWG

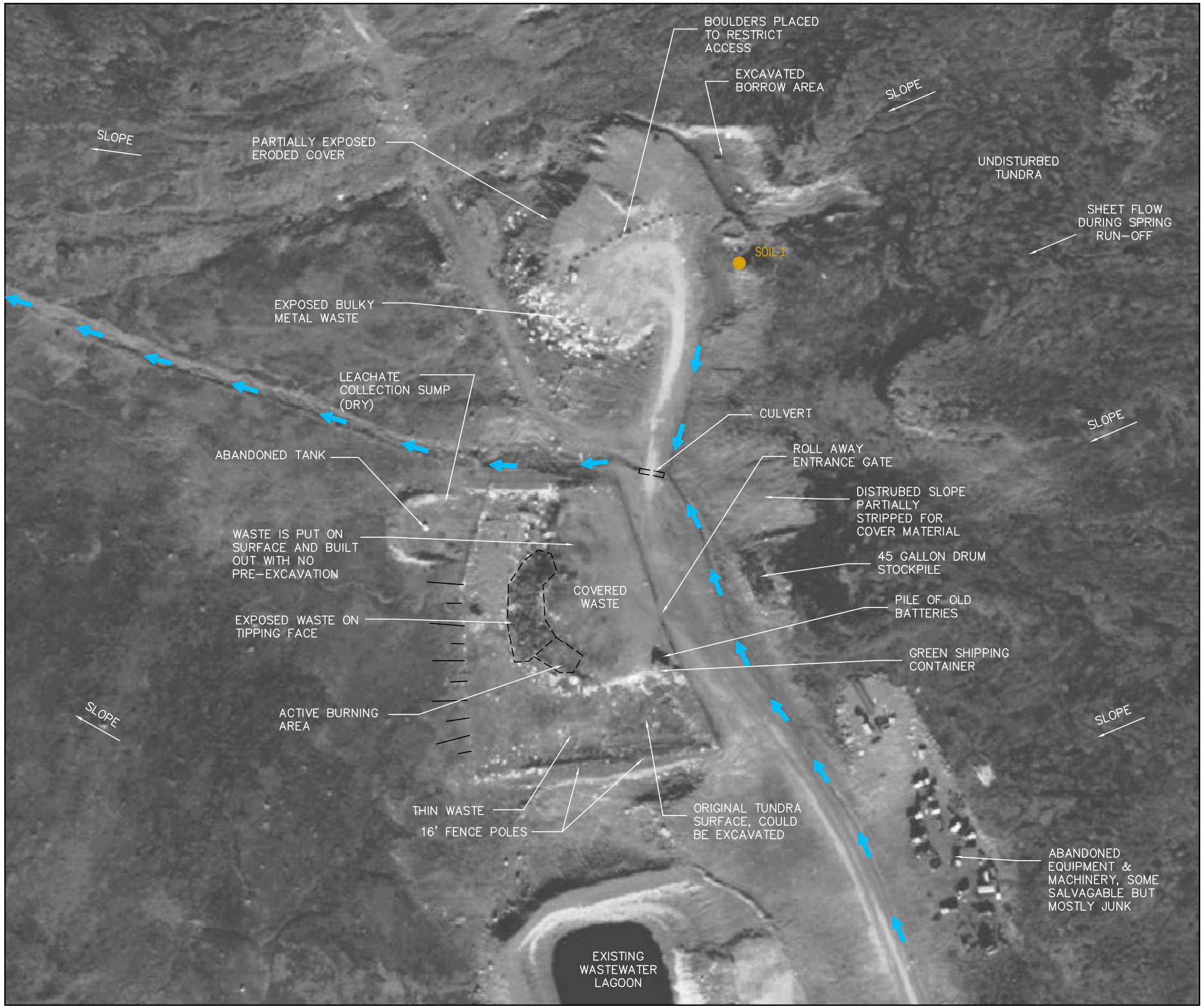

FIGURE 5

THE HAMLET OF QIKIQTARJUAQ
GEOTECHNICAL EVALUATION

EXISTING LANDFILL

Legend

INTERPRETED EXISTING SURFACE WATER FLOW DIRECTION

SOIL-1 SOIL SAMPLE LOCATION

Satellite Imagery Source:
September 2004 Satellite Image obtained from DigitalGlobe Inc.

N

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Meters

1:1,500
September 2005
Project Number: N-O 09439.0

Projection: UTM Zone 20
Datum: NAD83

Prepared by: C. Sheppard

Verified by: J. Walls

BURNSIDE

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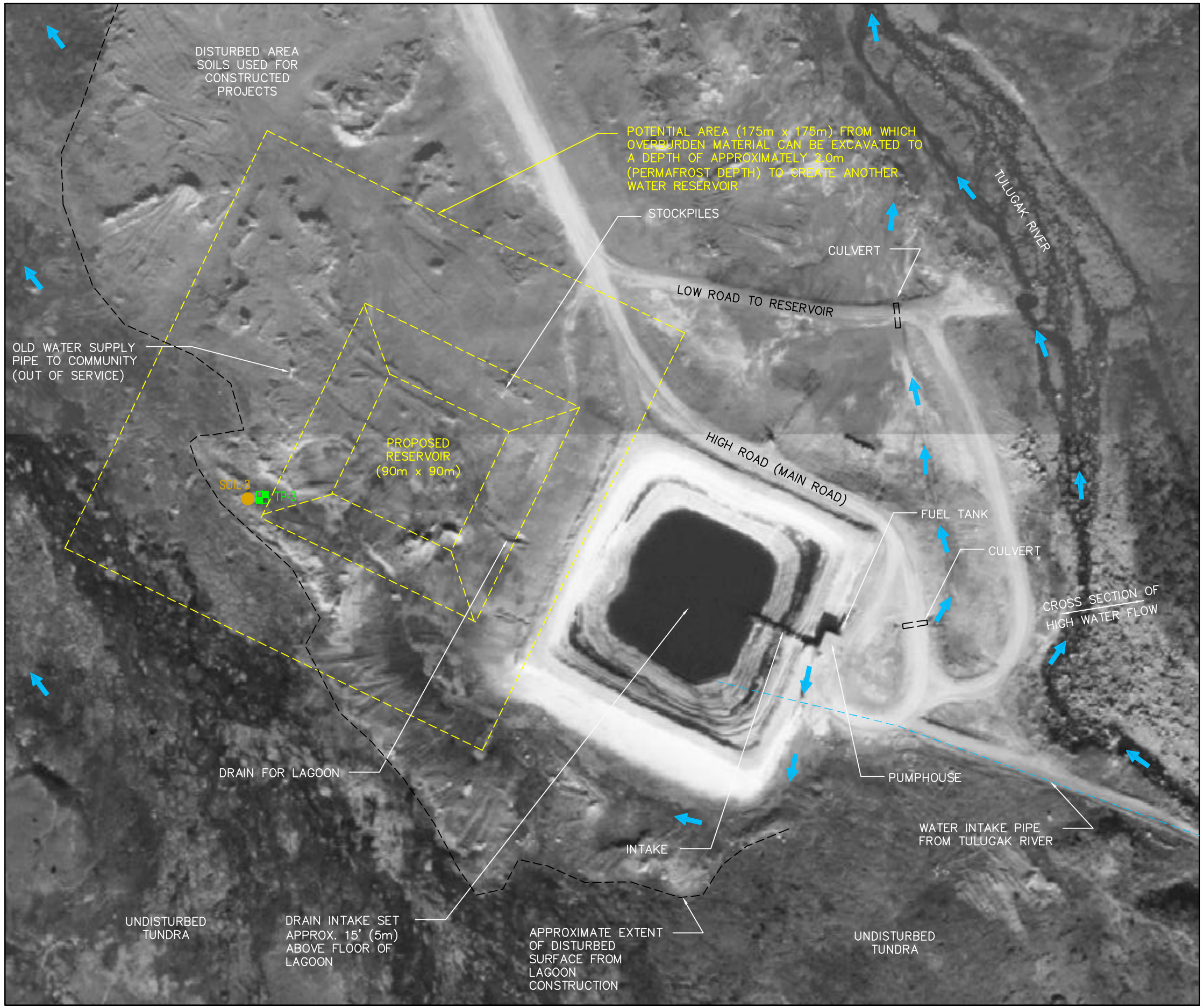

FIGURE 6

THE HAMLET OF QIKIQTARJUAQ
GEOTECHNICAL EVALUATION

EXISTING WATER RESERVOIR

Legend

- INTERPRETED EXISTING SURFACE WATER FLOW DIRECTION
- TP-3 — TEST PIT LOCATION & DEPTH IN METRES
- SOIL-1 — SOIL SAMPLE LOCATION

Satellite Imagery Source:
September 2004 Satellite Image obtained from DigitalGlobe Inc.

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Meters

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September 2005
Project Number: N-O 09439.0

Projection: UTM Zone 20
Datum: NAD83

Prepared by: C. Sheppard

Verified by: J. Walls

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Appendix A
Test Pit Logs

Appendix A
Test Pit Logs

FOE 08983
Field Program September 13 – 16, 2005
Qikiqtarjuaq, Nunavut

Test Pit 1 – next to sewage lagoon

Tundra surface covered with cobble and small boulders.

0 – 1.0 m	Sand, medium to coarse grained with scattered gravel, cobbles, and small boulders. Loose, damp, poorly sorted. Hard digging for backhoe.
1.0 – 2.1 m	Sand, medium to coarse grained with various sized gravel and cobbles. Less cobbles and boulders. Loose, damp easier digging with backhoe.
2.1 m	Refusal – Perma Frost. Slightly more sility near perma frost contact. Wet and frozen hard. Unable to dig with backhoe.

Embankment Face in Quarry

Cobble and boulder armored surface of tundra.

0 – 0.2 m	Topsoil and humic horizon with boulders. Band dark black with roots.
0.2 – 2.0 m	Sand and gravel with cobbles and boulders. Medium brown, loose, damp, poorly sorted mixture. Some angular fragments of weathered bedrock float.
2.0 m	Bedrock – weathered charnockite. Medium to coarse grained, quartz, feldspar and pyroxene. Weathers readily to coarse sand and gravel.

Test Pit 2 – proposed waste water lagoon

Cobble and boulder tundra surface.

0 – 0.5 m	cobbles and small boulders. Dry loose, fines have been winnowed away.
0.5 – 2.0 m	Sand and gravel with scattered cobbles and small boulders. Poorly sorted, loose, dark brown, damp. Small amount of silty 1.8 – 2.0 m. Water seeping into hole at approximately 1.8 m and poorly.
2.0 – 2.1 m	Refusal on permafrost.

Test Pit 3 – in area of proposed water reservoir

Tundra surface armoured with cobbles and small boulders. Some local disturbance caused by bulldozing for water reservoir.

0 – 2.0 m	Medium to coarse grained sand and gravel with various sized cobbles and odd small boulder. Medium brown, poorly sorted, loose, damp.
2.0 m	Refusal – permafrost – water seepage into hole just above contact with permafrost.

Appendix B
Photographs

Photo 1 Overburden stockpiled in quarry area.

Photo 2 Close up of broken bedrock float weathering to sand and gravel at the quarry site.

Photo 3 Screening equipment at the quarry site.

Photo 4 Typical excavation face at the quarry site.
Permafrost at approximately 2.0 m below surface.

Photo 5 Test Pit #1 near existing wastewater lagoon.

Photo 6 Face of borrow area behind landfill.

Photo 7 South side of landfill site.

Photo 8 South side of landfill site.

Photo 9 Looking south across tipping face of landfill.

Photo 10 Dry leachate collection pond at base of landfill.

Photo 11 South side of wastewater lagoon.

Photo 12 Bull dozed surface and test pits west of the water reservoir. Approximately 2.0 m of overburden to permafrost.

Photo 13 Looking west from wastewater lagoon across disturbed area of overburden from which existing lagoon berms were constructed.

Appendix C

Soil Testing Results

alston associates inc.
consulting engineers

EMAIL

Fax to	:	Jim Walls, R.J. Burnside & Associates Limited	Fax Number	:	(519) 941-8120
From	:	Jonathan Bond	Date	:	3 November 2005
Ref. No.	:	05-090	Page 1 of 4		
Subject	:	Laboratory Results Burnside File No. FEO 09439 Qikiqtarjuaq			

We enclose the Grain Size Distribution Test Reports for the samples received in our office on 17 October 2005. Originals will follow by mail.

If you have any questions please do not hesitate to contact our office.

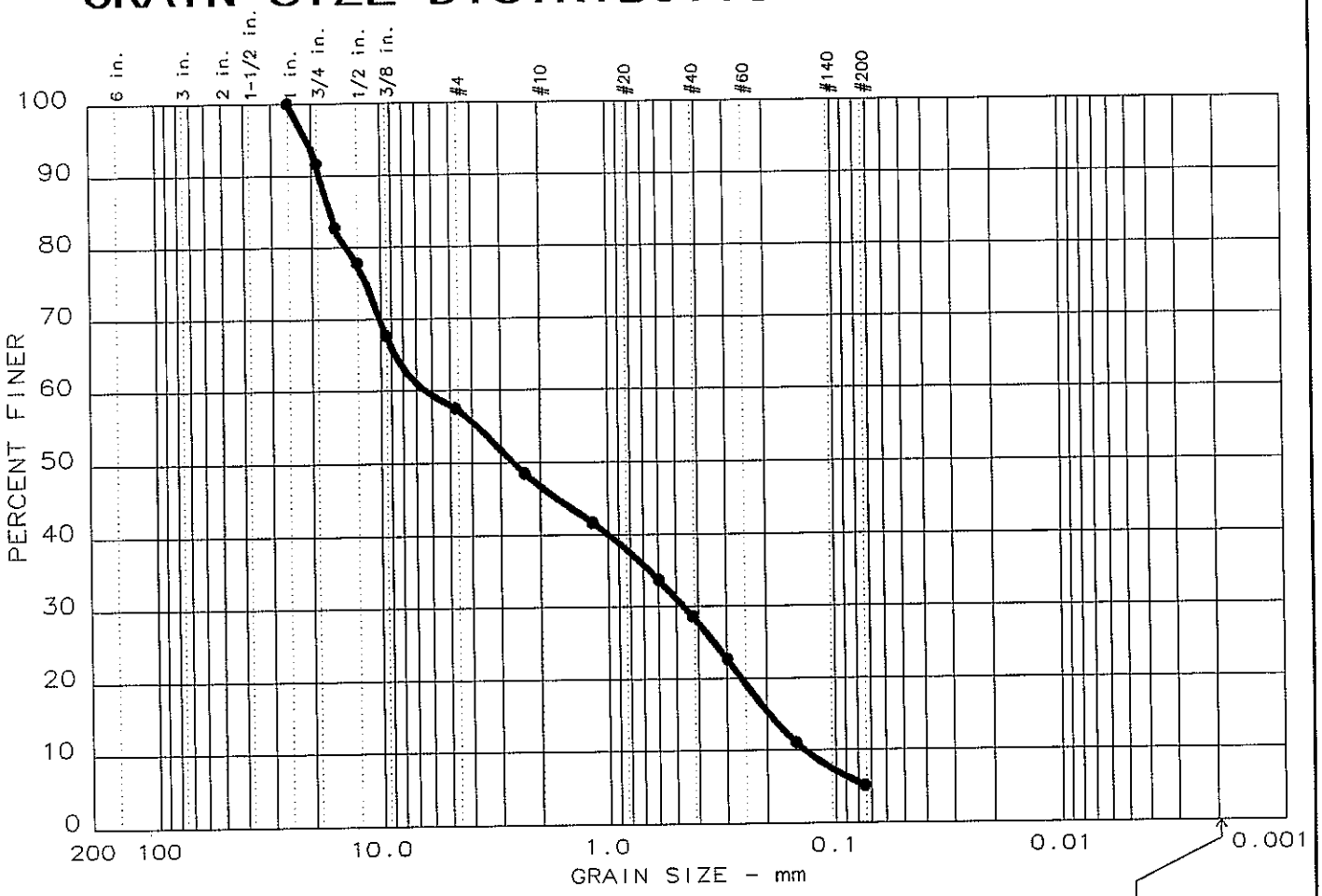
Regards

J Bond

85 citizen court, unit 1
markham, ontario
L6G 1A8

telephone (905) 474-5265
fax (905) 474-2825
e-mail alston@alston.ca

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	5	0.0	42.5	52.4	5.1	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			16.71	6.43	2.62	0.460	0.1941	0.1358	0.24	47.3

MATERIAL DESCRIPTION	USCS	AASHTO
● SAND and GRAVEL, trace silt	SP-SM	

Project No.: 05-090
Project: Burnside File FEO 09439 Qikiqtarjuaq
● Location: Soil 1

Date: 3 November 2005

GRAIN SIZE DISTRIBUTION TEST REPORT

alston associates inc.

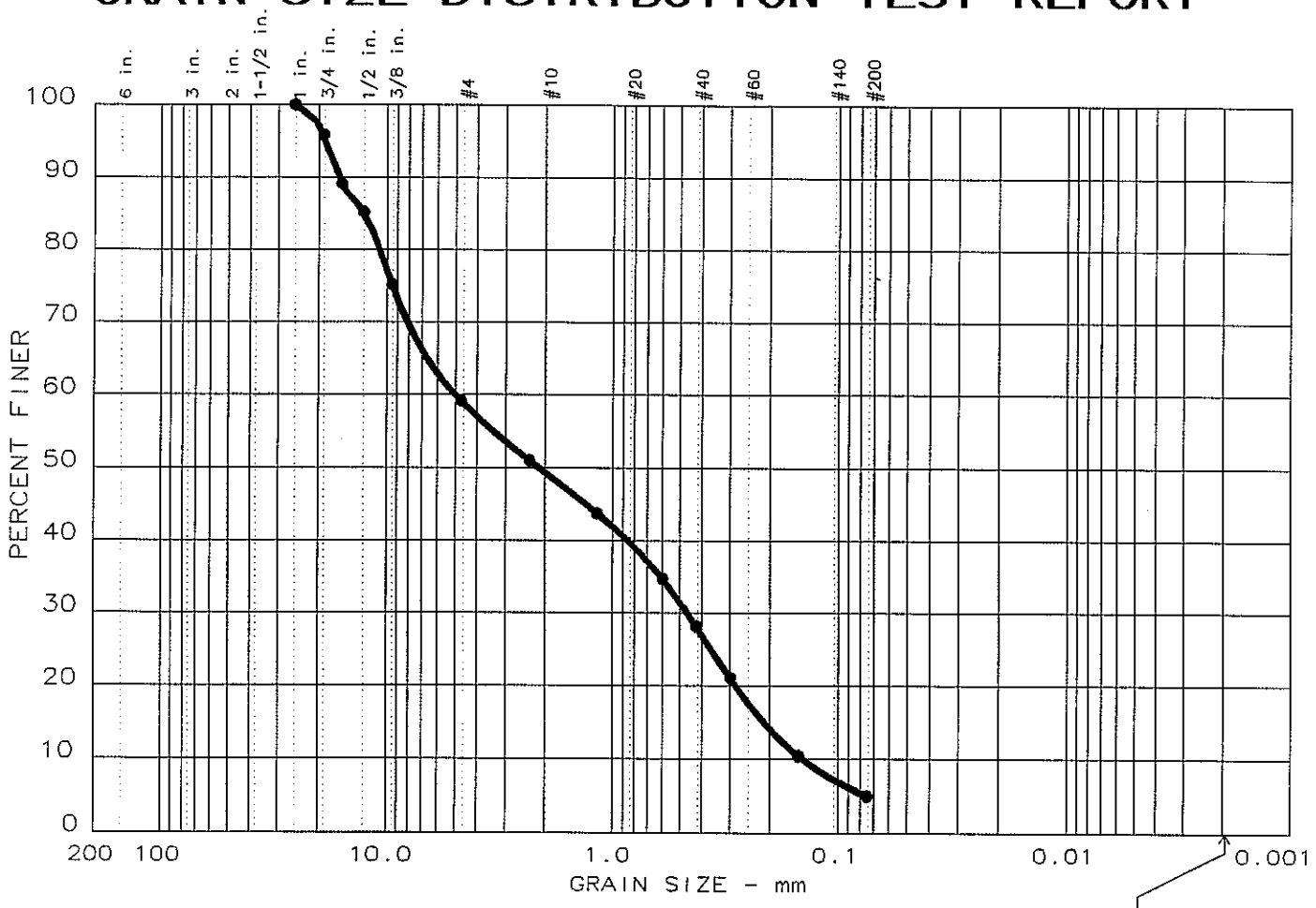
Remarks:

Prepared for:

Burnside

Figure No. 1

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	6	0.0	40.8	54.2	5.0	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			12.59	4.95	2.14	0.462	0.2113	0.1429	0.30	34.7

MATERIAL DESCRIPTION	USCS	AASHTO
● SAND and GRAVEL, trace silt	SP-SM	

Project No.: 05-090
Project: Burnside File FEO 09439 Qikiqtarjuaq
● Location: Soil 2

Date: 3 November 2005

GRAIN SIZE DISTRIBUTION TEST REPORT

alston associates inc.

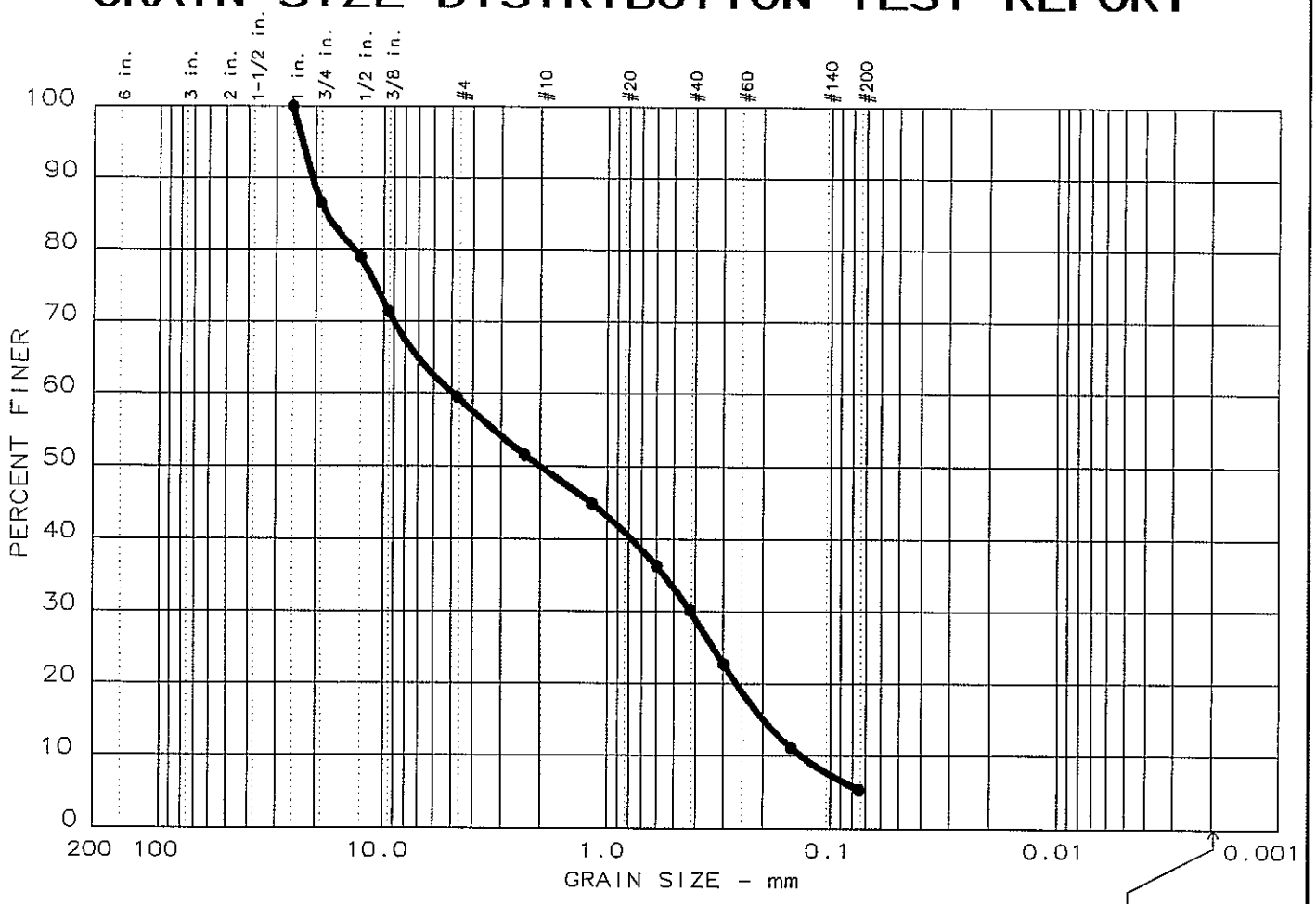
Remarks:

Prepared for:

Burnside

Figure No. 2

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	7	0.0	40.5	54.2	5.3	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			17.99	4.90	2.00	0.417	0.1972	0.1334	0.27	36.7

MATERIAL DESCRIPTION	USCS	AASHTO
● SAND and GRAVEL, trace silt	SP-SM	

Project No.: 05-090
Project: Burnside File FEO 09439 Qikiqtarjuaq
● Location: Soil 3

Date: 3 November 2005

Remarks:

Prepared for:
Burnside

GRAIN SIZE DISTRIBUTION TEST REPORT

alston associates inc.

Figure No. 3