APPENDIX 9

2008

Annual Geotechnical Inspection Report

Gartner Lee Ltd. (AECOM)

AECOM

Teck Cominco Metals Ltd.

Report on Post-Closure Geotechnical Inspection of Polaris Mine Site in 2008

Prepared by:

Gartner Lee Limited doing business as AECOM
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Date: November 11, 2008

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Distribution:

6 Teck Cominco Metals Ltd.
2 Gartner Lee Limited doing business as AECOM

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November 11, 2008 Project Number: 80325

Mr. Bruce Donald. P.Eng.
Reclamation Manager, Polaris Mine
Teck Cominco Metals Ltd.
Bag 2000
Kimberley, BC V1A 3E1

Dear Mr. Donald:

Re: Report on 2008 Polaris Mine Post-Closure Geotechnical Inspection

Gartner Lee doing business as AECOM is pleased to present our report on the 2008 Polaris mine site geotechnical inspection. Areas included in the inspection included Garrow Lake, Little Red Dog Quarry, the Operational Landfill, the dock site shoreline, Frustration Lake water intake jetty, the North Quarry, closed mine portals, and the subsidence area.

This report presents photo documentation of the inspection, observations and recommendations. Related information on ground temperature measurements and topographic surveying conducted by Teck Cominco Metals Ltd. during the summer of 2008 is reported separately.

Should you have any questions regarding the inspection please contact the undersigned.

Sincerely,
Gartner Lee Limited doing business as AECOM

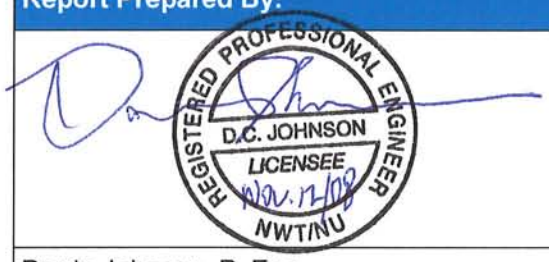
Darrin Johnson, P.Eng.
darrin.johnson@aecom.com

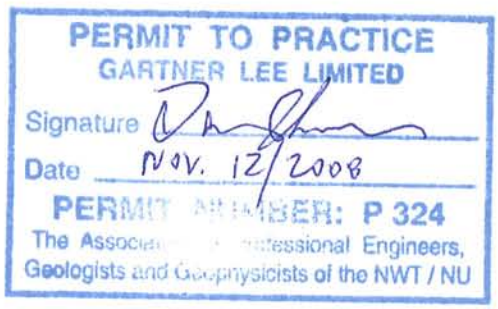
DCJ:km

Revision Log

Revision #	Revised By	Date	Issue / Revision Description
1	D. Johnson	November 3, 2008	Draft for Review
2	D. Johnson	November 11, 2008	Final

Signature Page

Report Prepared By:	Report Reviewed By:
	
Darrin Johnson, P. Eng. Senior Geotechnical Engineer	Arlene Laudrum, P. Geol. Project Manager



Executive Summary

The 2008 post-closure geotechnical inspection of the Polaris mine site was carried out by Mr. Darrin Johnson, P.Eng., Senior Geotechnical Engineer, AECOM on July 17 and 18, 2008. Mr. Johnson was accompanied by Mr. Bruce Donald, P.Eng., Reclamation Manager, Teck Cominco Metals Ltd. (Teck) and Mr. Simon Idlout, an Inuit resident of Resolute who provided wildlife monitoring services. The site inspection was conducted in fair to good weather conditions, affording good visibility and coverage of all areas across the mine site.

With few exceptions, the overall condition of the site was good, with no signs of major slope instability or significant erosion of concern being observed that pose a threat to human or wildlife safety. Minor erosion was observed where surface water drainage crosses roads or has channelled down a slope, however most eroded areas appear to be self-armouring. Some thaw settlement was observed along the shoreline of the former dock area. Natural wave and ice processes continue to form a small berm of gravel across the breached section of the Garrow Lake wave break structure.

No immediate action or repairs were identified at the time of the July 2008 inspection. However, a subsequent inspection conducted by Teck and Indian and Northern Affairs Canada (INAC) on August, 24 2008 observed a slope failure at the closed main portal. The area where the slope failure occurred was covered with snow during the July 2008 inspection. The backfilled slope over the main portal will be repaired and stabilized by Teck in 2009.

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1. Introduction

The 2008 Polaris mine post-closure geotechnical inspection was carried out by Mr. Darrin Johnson, P.Eng., Senior Geotechnical Engineer, Gartner Lee Limited doing business as AECOM on July 17 and 18, 2008. Mr. Johnson was accompanied by Mr. Bruce Donald, P.Eng., Reclamation Manager, Teck Cominco Metals Ltd. (Teck) and Mr. Simon Idlout, an Inuit resident of Resolute, Nunavut who provided wildlife monitoring services.

The decommissioned Polaris mine site is located on Little Cornwallis Island, at 75 deg 23'North, 96 deg 57' West, some 120 km northwest of Resolute, Nunavut. The overall layout of the Polaris site, based on surveys conducted during decommissioning, is shown on Figures 1 and 2.

Current conditions were compared with baseline conditions established during previous visual inspections. A summary of current site conditions and recommendations are presented in the following sections of this report. Photographs of current site conditions are presented in Appendix A.

The site has been sub-divided into eight areas to facilitate the inspection of the site as follows:

- Area 1 – Garrow Lake, Creek and Former Dam;
- Area 2 – Frustration Lake Jetty and Access Road;
- Area 3 – New Quarry Area;
- Area 4 – Subsidence Area;
- Area 5 – Operational Landfill;
- Area 6 – Little Red Dog Quarry Landfill;
- Area 7 – Mine Portals; and
- Area 8 – Marine Foreshore Adjacent to Former Dock and the former tank farm area.

This inspection was conducted in accordance with requirements under Section H (6) of the Water Licence and under the requirements of the Decommissioning and Reclamation Plan approvals.

2. Site Conditions and History

The Polaris mine was operated by Teck between 1981 and 2002 and decommissioned in 2003 and 2004. Site facilities comprised an underground mine, concentrator plant, concentrate storage shed, dock, airstrip, tailings impoundment, freshwater intake on Frustration Lake, various site access roads, a limestone quarry for mine backfilling, a shale quarry, and various items of infrastructure such as fuel storage, camp, warehousing, etc. Upon completion of decommissioning and reclamation activities all structures had been demolished, soils contaminated by metals and hydrocarbons had been excavated and placed underground and/or in engineered landfills. At this time only the airstrip and a small portable camp with container storage remains, located adjacent to Loon Lake. Access roads between Garrow Lake, Frustration Lake and in the immediate vicinity of the previously active mining operations were decommissioned by rounding the shoulders of the road, removing culverts, and re-establishing natural drainage patterns. The general arrangement of the site is shown in Figure 1.

The marine foreshore area and slope in the vicinity of the former concentrate storage shed on the west side of the island now comprise relatively gentle uniform slopes that were graded as part of decommissioning. The graded slopes are interrupted by access roads and ramps. The area in the immediate vicinity of the former dock structure is almost flat. The shoreline has been restored to a consistent gently sloping area. Four portals for mine access and exploration activities have been sealed, backfilled and re-graded to match the surrounding slopes. The sideslopes of two small pads located at the south end of the marine foreshore area were flattened in 2006 to approximately 2H:1V.

Little Red Dog Quarry, located at the northwest end of the airstrip was backfilled partially with demolition debris and metals contaminated soils and subsequently capped with rockfill. The remnant quarry walls above the level of the capping layer are benched and serve to catch ravelling material as the slopes gradually weather. Safety berms extend around the quarry perimeter, and additional safety measures in the form of a ditch and a high berm exist at the end of the airstrip. Thermistors have been installed through the rockfill capping layer and underlying landfilled materials. In 2006, Teck carried out improvements to the data collection system for these thermistors and to the insulation of the upper parts of the thermistor installations.

The Operational Landfill, located at the south end of the former facility area, was regraded and capped with rockfill during decommissioning. Thermistors were installed in the landfill at four locations during operations. In 2005, attempts to replace the thermistors were made with thermistors designed to monitor the new cap. Difficulties were encountered removing the existing thermistors and only two of the four installations were successfully replaced. In 2006, renewed efforts were successful in restoring the function of all four thermistor installations, together with improvements to data collection and insulation at ground surface. Starting in 2007, thermistor data is being downloaded and reported annually by Teck.

East of the airstrip, the main features of disturbance are the Subsidence Area and the New Quarry. The Subsidence Area is located over top of former underground mine workings and experienced significant deformations during mine operations. Subsequently, the area has been regraded and the rate of subsidence has been decreasing since the cessation of mining. Detailed topographic survey measurements across this area are being collected annually by Teck.

The New Quarry area measures some 800 m by 400 m, and was a source of shale for construction purposes. It has been reclaimed by regrading stripped materials and quarry faces. Much of the floor of the New Quarry remains as exposed shale bedrock. In 2005, several erosion gullies were identified and in 2006 two significant gullies were repaired extensively. Limestone rockfill was used to form an erosion resistant channel where Loon Lake drainage crosses erosion-susceptible soils.

A network of access roads has been decommissioned (but are still functional) across the site. As part of site decommissioning, all culverts were removed and natural drainage crossings restored. The access roads continue to provide important access for ongoing inspection and monitoring activities.

A rockfill jetty, approximately 100 m long by 10 m wide, constructed for the freshwater supply intake remains at Frustration Lake.

At Garrow Lake, the former tailings disposal area, the main impoundment dam and wave break structure were breached during decommissioning to return water levels to pre-mining levels. The central part of the main dam was removed and replaced with a rip-rap lined channel. Decommissioning of the main dam lowered the water level in Garrow Lake by approximately two and one half metres to its former level. The condition and stability of the reinstated Garrow Lake shoreline has been monitored since the dam was breached.

3. Approach to Geotechnical Inspection

The primary purpose of the geotechnical inspection is to assess the physical condition of decommissioned mine areas for evidence of slope instability, erosion or other landform instabilities that could present a safety hazard to either humans or wildlife. The visual inspections documented in this report are supplemented by other information including thermistor data and topographic surveys reported separately by Teck. As the inspection is primarily visual, a series of annotated photographs with their locations established using a hand-held Global Positioning System (GPS) have been appended to this report. Photographs were generally taken at the same locations as previous annual inspections for comparison purposes. Photograph locations are shown in plan on Figures 1 and 2. Approximate Northing and Easting coordinates are listed in Table 1 and below each photograph in Appendix A.

Where significant erosion has been observed, the maximum observed depth and width of the erosion gully has been recorded to facilitate assessment of the rate of progression (i.e., from previous years and in the future). This will allow informed decisions as to whether to intervene or to allow nature to take its course.

4. Inspection Observations and Comments

4.1 Area 1 – Garrow Lake, Creek and Dam

Garrow Lake

The water level in Garrow Lake has been lowered for the past five years and the shoreline has been exposed to several annual seasonal cycles. The perimeter beach of Garrow Lake was inspected in 2008 with no evidence of significant instability or erosion. Minor erosion was observed where surface water drains into the lake, however no significant erosion or indications of slope instability were observed. Photographs 91 through 105 in Appendix A illustrate typical conditions observed around the lake perimeter. Monitoring of erosion pins was discontinued in 2007 as a result of several years of unchanged measurements indicating stable conditions. Routine sampling of Garrow Creek (i.e., Garrow Lake effluent) for suspended sediment continues as part of the Garrow Creek water quality monitoring program.

Garrow Lake Wave Break Structure

The original intent of the wave break structure was to extend an energy-dissipating barrier above the surface of the lake to reduce the fetch of the lake and protect the face of the main dam from wave action. To ensure the lake could drain back down to its original elevation a section of the wave break structure was excavated in the area of the original creek channel in early spring 2004. The lake elevation is surveyed each year to confirm that the lake outlet channel is not eroding.

A ridge of gravel deposited across the breached outlet channel was initially observed during the 2006 inspection. The ridge or berm of gravel across the lake outlet appears to be increasing in size each year as a result of additional gravel accumulation. Photographs 78 to 82 in Appendix A document the size and height of the gravel berm at the time of the July 2008 inspection. The mechanism creating the ridge of gravel is likely ice and wave action. It is assumed that ice on the lake is pushed by the wind towards the south shoreline and outlet of the lake relocating gravel from the lake bottom to form a ridge or berm. The relatively coarse nature of the gravel permits a steady flow of water through the gravel ridge from the lake into the creek channel during the summer. However, the gravel ridge appears to be retaining some water and may be influencing the lake water level. Photograph 82 (Appendix A) illustrates a location where seepage through the gravel berm has caused some settlement from piping of the underlying soils. As the gravel berm grows higher and wider, the lake outlet may naturally relocate (e.g., move towards the east end of the wave break structure). The growth of the berm and lake outlet location should continue to be monitored, however this appears to be a natural process that likely also occurred prior to development at the site.

Garrow Lake Dam

The sideslopes of the breach excavated through the main dam structure are in good condition, free of erosion or signs of major instability. Minor localised slumping observed in 2005 and 2006 appears unchanged. The condition of the dam breach slopes during the July 2008 inspection is documented in Photographs 83 through 87 (Appendix A). A localised section of the invert of the breach channel had a piece of exposed geotextile that was first observed in 2005. The exposed geotextile was cut away and removed in 2008. Photograph 86 (Appendix A) documents the current conditions where the exposed geotextile was removed.

4.2 Area 2 – Frustration Lake Jetty and Access Road

During mining operations, a jetty extending into Frustration Lake supported the mine's freshwater supply pump station. The pump house and associated water lines were removed during reclamation. The site monitoring program includes a requirement to inspect the jetty on an annual basis to ensure that the rate of jetty erosion is gradual and does not contribute significant sediment loading to the lake. During the July 2008 inspection, the embankment forming the jetty was observed to be in a stable condition. Minor erosion consistent with previous inspections was observed at the end and along the sides of the embankment (Photographs 72 through 74 in Appendix A).

The Frustration Lake access road is generally in good condition, with some localised erosion at drainage crossings. Significant erosion gullies identified during previous inspections were repaired in July 2006. Remedial work included regrading slopes, placement of gravel/rip-rap and construction of water bars. The repaired areas appear to be performing well as documented in Photographs 60 through 71 (Appendix A).

4.3 Area 3 – New Quarry Area

The perimeter sideslopes and floor of the New Quarry area appear to be stable and do not pose a safety hazard to humans or wildlife. Photographs 106 through 115 (Appendix A) illustrate the overall condition of the New Quarry area during the 2008 inspection.

Erosion gullies at two locations along the adjacent road were stabilized in July 2006 by slope regrading and placement of well-graded limestone rockfill as rip-rap protection. The rip-rapped lined ditches appear to be performing well (Photographs 106, 107 and 109 in Appendix A). Erosion gullies (maximum 2 m wide and 0.5 m deep) have formed below the rip-rap lined ditches that appear to be self-armouring (Photographs 108 and 110 in Appendix A).

An erosion gully that is about 3 m wide and 1.5 m deep and extends from the crest to toe on the east perimeter slope (Photograph 111 in Appendix A) appears to be unchanged from previous inspections. An area of settlement approximately 1.5 m deep was observed in one location at the toe of the east perimeter slope (Photograph 112 in Appendix A) with an associated tension crack at the crest of the slope above. Sink holes were observed at various locations over the lower half of the west perimeter slope (Photographs 113 and 114 in Appendix A). The sink holes appear to be the result of buried snow and ice that has melted and are not a concern. Meandering erosion gullies were observed over the quarry floor in the vicinity of Photograph 115 (Appendix A). None of the conditions observed during the July 2008 inspection represent an immediate cause for concern but should be monitoring for increased erosion or indications of slope instability.

4.4 Area 4 – Subsidence Area

The mine subsidence area was inspected during the July 2008 inspection and there are no apparent visual changes from previous geotechnical inspections. Teck retained Focus Engineering to conduct a topographic survey in 2008 (reported under separate cover by Teck) that will be compared to previous topographic surveys by Teck. No features in the area were observed during the July 2008 inspection that present a risk to either humans or wildlife.

A 1 m diameter metal culvert (Photograph 44 in Appendix A) and a thaw settlement area about 1 m deep and 2 m wide (Photograph 45 in Appendix A) were observed northwest of the subsidence area. Thaw settlement up to 1 m deep was observed in the area of Photographs 46 and 47 (Appendix A). Ponded water in the subsidence area is documented in Photographs 49 and 52 (Appendix A). Previously observed tension cracks around the perimeter of the subsidence area (Photographs 48, 50, 51, 53 and 54 in Appendix A) were less than 0.15 m wide and appear unchanged from previous inspections.

4.5 Area 5 – Operational Landfill

No indications of slope instability were observed at the Operational Landfill during the July 2008 inspection. No tension cracks or settlement depressions were observed on the landfill crest (Photographs 1 through 7 in Appendix A). No indications of erosion or slope instability were observed on the landfill slope (Photographs 8 through 16 in Appendix A).

Some minor seepage and associated orange staining was observed along the south toe of the landfill during the July 2008 inspection (Panoramic of Photographs 9 through 11 in Appendix A). A minor erosion gully about 0.5 m wide and 0.3 m deep was observed directly upslope of Waypoint #6 (Panoramic of Photographs 12, 13 and 14 in Appendix A).

The temperature profile of the landfill cover and waste is monitored by means of thermistors installed at four locations. The purpose of the thermistors is to monitor the establishment of permafrost through the full thickness of landfilled waste and to verify that the active layer does not extend into waste (i.e., below the final cover). Thermistor results are reported by Teck under separate cover.

4.6 Area 6 – Little Red Dog Quarry Landfill

The rockfill cover at the Little Red Dog Quarry Landfill was inspected and shows no indications of instability or settlement. The quarry walls above the final cover do not exhibit indications of instability. Photographs 35 through 42 (Appendix A) documents the conditions observed during the July 2008 inspection. The previously observed 1 m wide by 1 m deep gap along the northeast quarry wall will be filled to grade with rockfill when the collected stockpile of debris is being buried.

The temperature profiles of the landfill cover and waste is monitored by means of thermistors installed at four locations. The purpose of the thermistors is to monitor the establishment of permafrost through the full thickness of the landfilled waste and to verify that the active layer does not extend into waste (i.e., below the final cover). Thermistor results are reported by Teck under separate cover.

4.7 Area 7 – Mine Portals

The Polaris Mine was an underground mining operation. There were four portals used to access the mine and/or to convey ore out of the mine. As part of the mine decommissioning and reclamation activities, the portals were sealed and covered with rockfill to prevent the public from accessing the underground mine workings.

The objective of the annual geotechnical inspection is to look for evidence of settlement, erosion, or slope instability at the four mine portals that might present a safety risk to humans or wildlife. During the July 2008 inspection all of the portals appeared to be in good condition, free of any signs of instability or erosion, as documented on Photographs 30, 31, 34, 43 (Appendix A). Some snow was covering the

lower half of the main portal slope during the July 2008 inspection. The conveyor portal, exploration portal and north portal were clear of snow during the July 2008 inspection.

During a subsequent inspection of the site conducted by Teck and Indian and Northern Affairs Canada (INAC) on August 24, 2008 a slope failure was observed at the main portal. Some of the rockfill slope covering the sealed portal appears to have slumped since the July 2008 inspection. The slope failure did not expose the portal seal and access to underground is not possible. Two photographs in Appendix B (taken by Teck) document the condition of the main portal slope during the August 24, 2008 inspection by Teck and INAC. The backfilled slope over the main portal will be repaired and stabilized by Teck in 2009. Placement of additional rockfill at the toe of the slope (i.e., a toe berm) and/or slope flattening is recommended to prevent future slope failures.

4.8 Area 8 – Marine Foreshore Adjacent to Former Dock

The shoreline and slopes adjacent to the former dock structure were inspected in July 2008. No signs of slope instability or significant erosion of concern were observed (Photographs 17 through 29, 32 and 33 in Appendix A). Gravel bars and thaw settlement along the shoreline were first observed during the July 2007 inspection and changes in response to ocean wave and ice action appear to be ongoing. The water adjacent to the shoreline was very clear indicating suspended sediment as a result of erosion or wave action is not a concern.

5. Summary and Recommendations

Conditions observed during the July 2008 inspection had not changed significantly from previous geotechnical inspections. The July 2008 geotechnical inspection identified some minor erosion features that appear to be self-armouring. At the time of the July 2008 inspection no immediate action or repairs were identified, however a slope failure was observed at the main portal during a subsequent inspection conducted by Teck on August 24, 2008. Ongoing annual geotechnical inspections of the closed landfills and regraded areas at the site are recommended. The following is a summary of observations and comments for each area inspected.

Area 1 – Garrow Lake, Creek and Dam
Previously observed exposed geotextile downstream of Garrow Lake dam was removed in 2008. The ridge of gravel being deposited across the wave break outlet appears to be increasing in size each year as a result of additional gravel accumulation. It is recommended that Teck carry out annual topographic surveys of the wave break structure to monitor material deposition and lake water levels.

Area 2 – Frustration Lake Jetty and Access Road
Rip-rap lined drainage crossings and water bars across the Frustration Lake access road appear to be performing well.

Area 3 – New Quarry Area
Previously repaired erosion gullies crossing a decommissioned access road near the New Quarry appear to be performing well. New erosion gullies have formed below the rip-rap lined ditches, however they have a flatter gradient (i.e., are at the base of the slope) and appear to be self-armouring. A previously observed erosion gully about 3 m wide and 1.5 m deep on the east perimeter slope of the New Quarry (Waypoint 56) appears unchanged and stable. Also on the New Quarry east perimeter slope, an area of settlement approximately 1.5 m deep was observed at one location (Waypoint 57) with an associated tension crack at the crest of the slope above. Although this settlement feature may be related to snow/ice melt it should be monitored for potential slope instability.

Area 4 – Subsidence Area
No features in the subsidence area were observed during the July 2008 inspection that present a risk to either humans or wildlife. There do not appear to be any apparent visual changes from last year.

Area 5 – Operational Landfill
No major erosion or indications of slope instability were observed on the landfill slope. Some minor seepage and associated orange staining was observed along the south toe of the landfill during the July 2008 inspection.

Area 6 – Little Red Dog Quarry Landfill
A previously observed 1 m wide by 1 m deep gap along the Little Red Dog quarry wall should be filled to grade with rockfill when the collected stockpile of debris is being buried.

Area 7 – Mine Portals

A slope failure was observed at the main portal during an inspection conducted by Teck and INAC on August 24, 2008. The slope failure did not expose the portal seal and therefore is not an immediate cause for concern. The slope failure at main portal will be repaired and stabilized by Teck in 2009. Placement of additional rockfill at the toe of the slope (i.e., a toe berm) and/or slope flattening is recommended to prevent future slope failures.

Area 8 – Marine Foreshore Adjacent to Former Dock

Previously observed gravel bar formation and thaw settlement along the former dock area shoreline appears to be an ongoing response to ocean wave and ice action.

Figures

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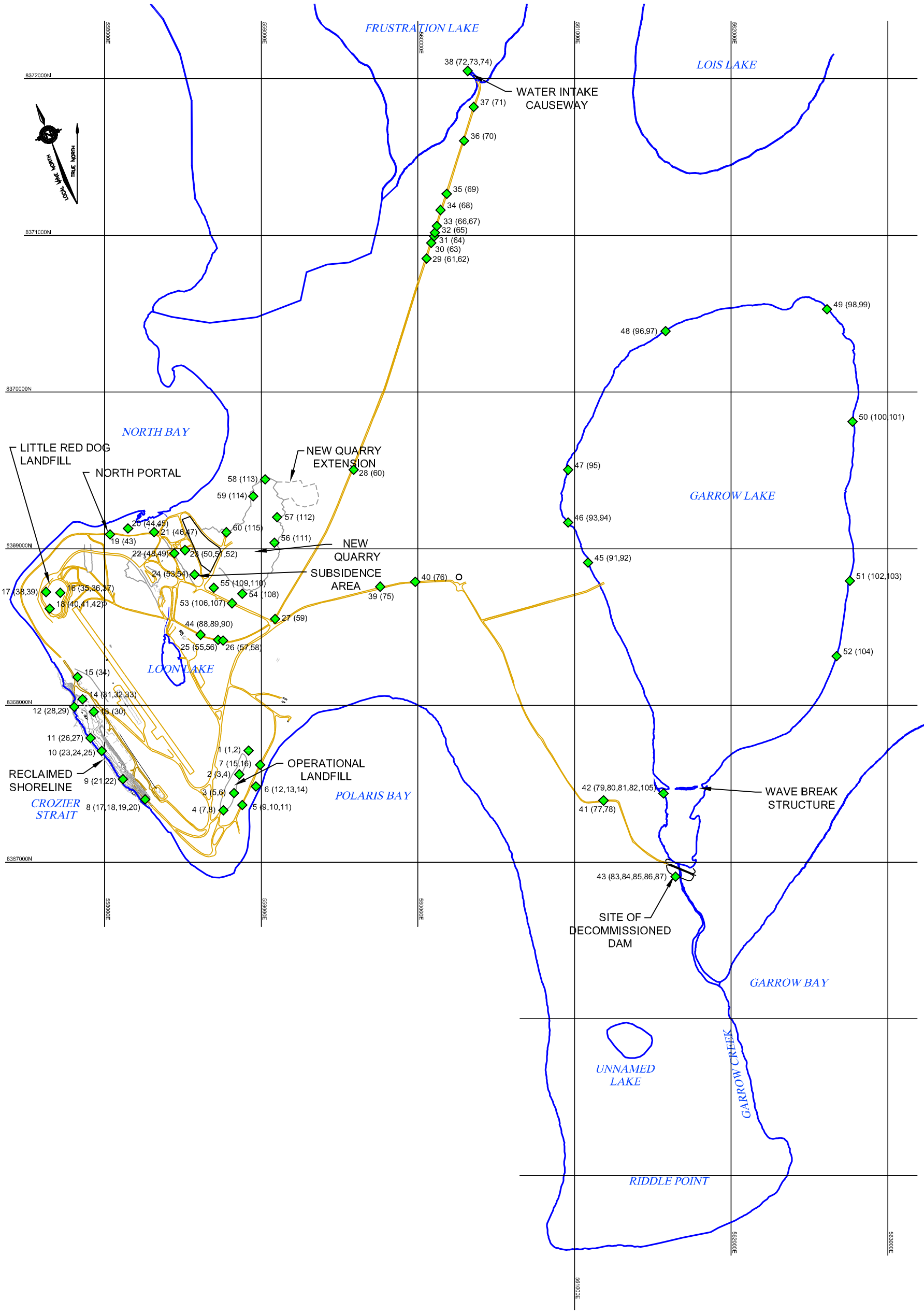

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Reviewed by: DJ Prepared by: JEP
Date Issued: Nov, 2008 Project Number: 80325

Legend

ROADS

1 (1,2) 2008 FIELD INSPECTION LOCATION
PHOTO #
WAYPOINT #

teckcominco

Project: Polaris Mine
Location: Nunavut

Polaris Mine 2008
Geotechnical Site Inspection

AECOM

Figure 1
Version 1

.

Date Revised: month dd, yyyy Revision 0

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8370000N

8369000N

8368000N

8367000N

558000E

559000E

NORTH BAY

LOCAL MINE NORTH

TRUE NORTH

NEW QUARRY EXTENSION

NEW QUARRY

NORTH PORTAL

SUBSIDENCE AREA

TEMPORARY CAMP

LITTLE RED DOG LANDFILL

LOON LAKE

EXPLORATION PORTAL

MAIN PORTAL

CONVEYOR PORTAL

AIRSTRIP

RECLAIMED SHORELINE

CROZIER STRAIT

POLARIS BAY

OPERATIONAL LANDFILL

19 (43)
20 (44,45)
21 (46,47)
23 (50,51,52)
22 (48,49)
24 (53,54)
58 (113)
59 (114)
57 (112)
60 (115)
56 (111)
28 (60)
39 (75)
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54 (108)
53 (106,107)
27 (59)
16 (35,36,37)
17 (38,39)
18 (40,41,42)
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25 (55,56)
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8 (17,18,19,20)
1 (1,2)
7 (15,16)
2 (3,4)
6 (12,13,14)
3 (5,6)
5 (9,10,11)
4 (7,8)

Map Sources / Notes:

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UTM Zone 14N, NAD83

File Name: 80325-F01.dwg
Reviewed by: DJ Prepared by: JEP
Date Issued: Nov, 2008 Project Number: 80325

Legend

ROADS

1 (1,2) 2008 FIELD INSPECTION LOCATION
PHOTO #
WAYPOINT #

teckcominco

Project: Polaris Mine
Location: Nunavut

Polaris Mine 2008 Geotechnical Site Inspection - Detail of Mine Area

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Figure 2
Version 1

Tables

Table 1. 2008 Polaris Geotechnical Inspection Waypoints

Waypoint Number	Northing (m)[1]	Easting (m)[1]	Elevation (m)[2]	Area	Photographs
1	8,367,713	558,920	37	Operational Landfill	1, 2
2	8,367,561	558,861	33	Operational Landfill	3, 4
3	8,367,442	558,828	42	Operational Landfill	5, 6
4	8,367,331	558,759	33	Operational Landfill	7, 8
5	8,367,366	558,880	16	Operational Landfill	Pan (9, 10, 11)
6	8,367,484	558,968	15	Operational Landfill	Pan (12, 13, 14)
7	8,367,621	558,995	12	Operational Landfill	Pan (15&16)
8	8,367,401	558,260	5	Foreshore	Pan (17&18), 19, 20
9	8,367,531	558,119	8	Foreshore	21, 22
10	8,367,710	557,983	8	Foreshore	23, 24, 25
11	8,367,793	557,912	7	Foreshore	26, 27
12	8,367,992	557,807	2	Foreshore	28, 29
13	8,367,961	557,932	9	Conveyor Portal	30
14	8,368,041	557,860	7	Main Portal	31,
14	8,368,041	557,860	7	Foreshore	Pan (32&33)
15	8,368,182	557,829	23	Exploration Portal	34
16	8,368,720	557,718	35	Little Red Dog Quarry	35, 36, 37
17	8,368,725	557,628	36	Little Red Dog Quarry	38, 39
18	8,368,618	557,650	43	Little Red Dog Quarry	40, 41, 42
19	8,369,093	558,035	14	North Portal	43
20	8,369,131	558,151	12	Subsidence Area	44, 45
21	8,369,107	558,318	11	Subsidence Area	46, 47
22	8,368,972	558,447	13	Subsidence Area	48, 49
23	8,368,992	558,515	17	Subsidence Area	50, 51, 52
24	8,368,837	558,576	28	Subsidence Area	53, 54
25	8,368,420	558,725	41	Road Drainage Ditches	55, 56
26	8,368,415	558,758	41	Road Drainage Ditches	57, 58
27	8,368,552	559,090	34	Road Drainage Ditches	59
28	8,369,505	559,591	72	Road Drainage Ditches	60
29	8,370,853	560,057	62	Road Drainage Ditches	61, 62
30	8,370,952	560,086	59	Road Drainage Ditches	63
31	8,370,995	560,105	55	Road Drainage Ditches	64
32	8,371,019	560,110	54	Road Drainage Ditches	65
33	8,371,061	560,123	49	Road Drainage Ditches	66, 67
34	8,371,163	560,146	42	Road Drainage Ditches	68
35	8,371,265	560,185	42	Road Drainage Ditches	69
36	8,371,605	560,296	21	Road Drainage Ditches	70
37	8,371,821	560,358	19	Road Drainage Ditches	71
38	8,372,050	560,320	16	Frustration Lake Jetty	72, 73, 74
39	8,368,759	559,761	47	Road Drainage Ditches	75
40	8,368,790	559,984	49	Road Drainage Ditches	76
41	8,367,394	561,186	26	Road Drainage Ditches	77
41	8,367,394	561,186	26	Wave Break Structure	78
42	8,367,440	561,569	8	Wave Break Structure	79, 80, 81, 82
43	8,366,909	561,646	15	Garrow Lake Dam	83, 84, 85, 86, 87
44	8,368,452	558,613	39	New Quarry	Pan (88, 89, 90)
45	8,368,913	561,088	13	Garrow Lake Perimeter	91, 92
46	8,369,168	560,960	9	Garrow Lake Perimeter	93, 94
47	8,369,504	560,961	8	Garrow Lake Perimeter	95
48	8,370,389	561,583	8	Garrow Lake Perimeter	96, 97
49	8,370,530	562,614	13	Garrow Lake Perimeter	98, 99
50	8,369,812	562,776	16	Garrow Lake Perimeter	100, 101
51	8,368,796	562,759	14	Garrow Lake Perimeter	102, 103
52	8,368,316	562,675	18	Garrow Lake Perimeter	104
42	8,367,440	561,569	8	Garrow Lake Perimeter	105
53	8,368,653	558,815	29	New Quarry	106, 107
54	8,368,714	558,880	25	New Quarry	108
55	8,368,752	558,699	28	New Quarry	109, 110
56	8,369,039	559,086	17	New Quarry	111
57	8,369,202	559,102	15	New Quarry	112
58	8,369,443	559,027	20	New Quarry	113
59	8,369,335	558,950	15	New Quarry	114
60	8,369,106	558,779	9	New Quarry	115

Notes:

1) Northing and Easting coordinates are referenced to UTM NAD83 projection.
2) Elevations are referenced to geodetic datum.

Appendix A

Photographic Record of 2008 Geotechnical Inspection

Photograph Scale Legend:	
The following dimensions can be used to estimate scale where included in the inspection photographs.	
Field manual:	0.2 x 0.15 m
Wheel diameter of ATV:	0.6 m
ATV width:	1.15 m
ATV length:	2 m
ATV height:	1.15 m
Person (height):	1.8 m

Photo 1- Northing 558920 Easting 8367713 Elevation 37 m
Operational landfill: looking north along crest

Photo 2- Northing: 558920 Easting 8367713 Elevation 37 m
Operational landfill: looking south along crest

Photo 3- Northing 558861 Easting 8367561 Elevation 33 m
Operational landfill: looking north

Photo 4- Northing 558861 Easting 8367561 Elevation 33 m
Operational landfill: looking south

Photo 5- Northing 558828 Easting 8367442 Elevation 42 m
Operational landfill: looking north

Photo 6- Northing 558828 Easting 8367442 Elevation 42 m
Operational landfill: looking south

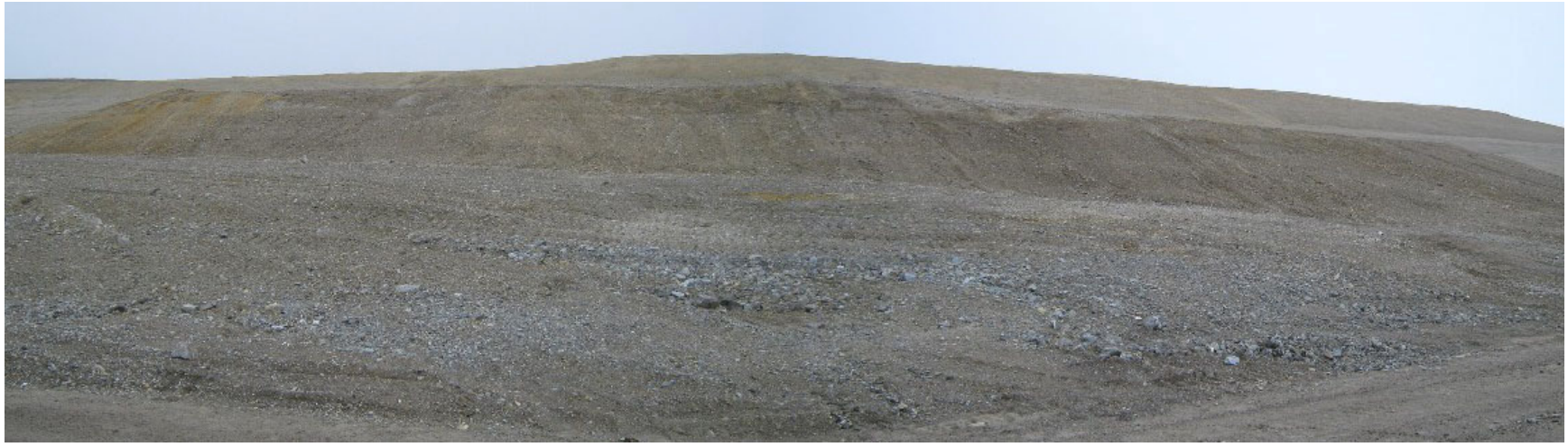
Photo 7- Northing 558759 Easting 8367331 Elevation 33 m
Operational landfill: south end of landfill looking towards crest

Photo 8- Northing 558759 Easting 8367331 Elevation 33 m
Operational landfill: south end of landfill looking towards slope

Panoramic (Photos 9,10,11)
Northing 558880 Easting 8367366 Elevation 16 m
Operational landfill

Panoramic (Photos 12,13,14)
Northing 558968 Easting 8367484 Elevation 15 m
Operational landfill: central, along toe

Panoramic (Photos 15&16)
Northing 558995 Easting 8367621 Elevation 12 m
Operational landfill: north toe of slope to crest



Panoramic (Photos 17&18)
Northing 558260 Easting 8367401 Elevation 5 m
Foreshore: regraded tank farm slope

Photo 19- Northing 558260 Easting 8367401 Elevation 5 m
Foreshore: shoreline at south end, view looking south

Photo 20- Northing 558260 Easting 8367401 Elevation 5 m
Foreshore: shoreline at south end, view looking north

Photo 21- Northing 558119 Easting 8367531 Elevation 8 m
Foreshore: looking south

Photo 22- Northing 558119 Easting 8367531 Elevation 8 m
Foreshore: looking north

Photo 23- Northing 557983 Easting 8367710 Elevation 8 m
Foreshore: looking south


Photo 24- Northing 557983 Easting 8367710 Elevation 8 m
Foreshore: looking north

Photo 25- Northing 557983 Easting 8367710 Elevation 8 m
Foreshore: 1 m diameter thaw sinkhole about 40 m from shoreline

Photo 26- Northing 557912 Easting 8367793 Elevation 7 m
Foreshore: looking south

Photo 27- Northing 557912 Easting 8367793 Elevation 7 m
Foreshore: looking north

Photo 28- Northing 557807 Easting 8367992 Elevation 2 m
North end of foreshore looking south

Photo 29- Northing 557807 Easting 8367992 Elevation 2 m
North end of foreshore looking north


Photo 30- Northing 557932 Easting 8367961 Elevation 9 m
Conveyor portal: covered slope

Photo 31- Northing 557860 Easting 8368041 Elevation 7 m
Main portal: snow-covered slope


Panoramic (Photos 32&33)- Northing 557860 Easting 8368041 Elevation 7 m
Foreshore: view from slope above main portal

Photo 34- Northing 557829 Easting 8368182 Elevation 23 m
Exploration portal: black hole pipe drain covered with wire mesh

Photo 35- Northing 557718 Easting 8368720 Elevation 35 m
Little Red Dog Quarry: view from debris pile facing ocean

Photo 36- Northing 557718 Easting 8368720 Elevation 35 m
Little Red Dog Quarry: view from debris pile facing ocean

Photo 37- Northing 557718 Easting 8368720 Elevation 35 m
Little Red Dog Quarry: view from debris pile facing ocean

Photo 38- Northing 557628 Easting 8368725 Elevation 36 m
Little Red Dog Quarry: near entrance to quarry

Photo 39- Northing 557628 Easting 8368725 Elevation 36 m
Little Red Dog Quarry: near entrance to quarry

Photo 40- Northing 557650 Easting 8368618 Elevation 43 m
Little Red Dog Quarry: south end

Photo 41- Northing 557650 Easting 8368618 Elevation 43 m
Little Red Dog Quarry: south end

Photo 42- Northing 557650 Easting 8368618 Elevation 43 m
Little Red Dog Quarry: south end facing exit

Photo 43- Northing 558035 Easting 8369093 Elevation 14 m
North Portal

Photo 44- Northing 558151 Easting 8369131 Elevation 12 m
Subsidence Area: metal vent (about 1 m diameter)

Photo 45- Northing 558151 Easting 8369131 Elevation 12 m
Subsidence Area: thaw settlement (about 1 m deep and 2 m wide)

Photo 46- Northing 558318 Easting 8369107 Elevation 11 m
Subsidence Area: view of thaw settlement towards ocean

Photo 47- Northing 558318 Easting 8369107 Elevation 11 m
Subsidence Area: view of thaw settlement

Photo 48- Northing 558447 Easting 8368972 Elevation 13 m
Subsidence Area: view of tension crack

Photo 49- Northing 558447 Easting 8368972 Elevation 13 m
Subsidence Area: view of ponded water

Photo 50- Northing 558515 Easting 8368992 Elevation 17 m
Subsidence Area: view of tension crack near bench mark

Photo 51- Northing 558515 Easting 8368992 Elevation 17 m
Subsidence Area: view of another tension crack near bench mark

Photo 52- Northing 558515 Easting 8368992 Elevation 17 m
Subsidence Area: view facing ocean near bench mark


Photo 53- Northing 558576 Easting 8368837 Elevation 28 m
View of tension crack upslope of subsidence area

Photo 54- Northing 558576 Easting 8368837 Elevation 28 m
Close up of tension crack upslope of subsidence area

Photo 55- Northing 558725 Easting 8368420 Elevation 41 m
View up the drainage ditch through the road near camp

Photo 56- Northing 558725 Easting 8368420 Elevation 41 m
View down the drainage ditch through the road near camp

Photo 57- Northing 558758 Easting 8368415 Elevation 41 m
View up the second drainage ditch through the road near camp

Photo 58- Northing 558758 Easting 8368415 Elevation 41 m
View down the second drainage ditch through the road near camp


Photo 59- Northing 559090 Easting 8368552 Elevation 34 m
View of the gully downstream in the third ditch

Photo 60- Northing 559591 Easting 8369505 Elevation 72 m
First ditch on the road to Frustration Lake

Photo 61- Northing 560057 Easting 8370853 Elevation 62 m
Second ditch on the road to Frustration Lake

Photo 62- Northing 560057 Easting 8370853 Elevation 62 m
Third ditch on the road to Frustration Lake

Photo 63- Northing 560086 Easting 8370952 Elevation 59 m
Fourth ditch on the road to Frustration Lake

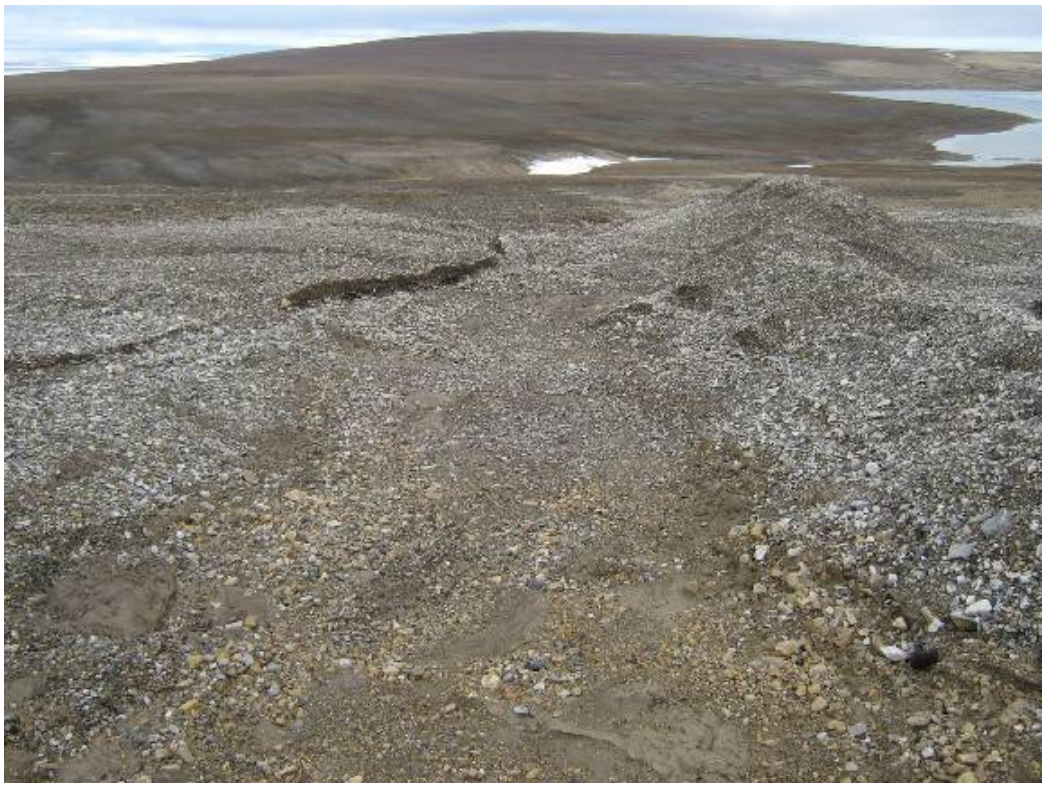


Photo 64- Northing 560105 Easting 8370995 Elevation 55 m
Fifth ditch on the road to Frustration Lake

Photo 65- Northing 560110 Easting 8371019 Elevation 54 m
Sixth ditch on the road to Frustration Lake

Photo 66- Northing 560123 Easting 8371061 Elevation 49 m
Seventh ditch on the road to Frustration Lake, looking upstream

Photo 67- Northing 560123 Easting 8371061 Elevation 49 m
Seventh ditch on the road to Frustration Lake, looking downstream

Photo 68- Northing 560146 Easting 8371163 Elevation 42 m
Eighth ditch on the road to Frustration Lake, looking upstream

Photo 69- Northing 560185 Easting 8371265 Elevation 42 m
Eighth ditch on the road to Frustration Lake, looking downstream

Photo 70- Northing 560296 Easting 8371605 Elevation 21 m
Thirteenth ditch on the road to Frustration Lake, looking downstream

Photo 71- Northing 560358 Easting 8371821 Elevation 19 m
Fourteenth ditch on the road to Frustration Lake, looking downstream

Photo 72- Northing 560320 Easting 8372050 Elevation 16 m
Frustration Lake Jetty: view of the north shore

Photo 73- Northing 560320 Easting 8372050 Elevation 16 m
Frustration Lake Jetty: view of tip with boulders

Photo 74- Northing 560320 Easting 8372050 Elevation 16 m
Frustration Lake Jetty: view of the south shore

Photo 75- Northing 559761 Easting 8368759 Elevation 47 m
Road to Garrow Lake, looking downstream from ditch crossing #1

Photo 76- Northing 559984 Easting 8368790 Elevation 49 m
Road to Garrow Lake, looking downstream from ditch crossing #2

Photo 77- Northing 561186 Easting 8367394 Elevation 26 m
Road to Garrow Lake, view from ditch crossing #5

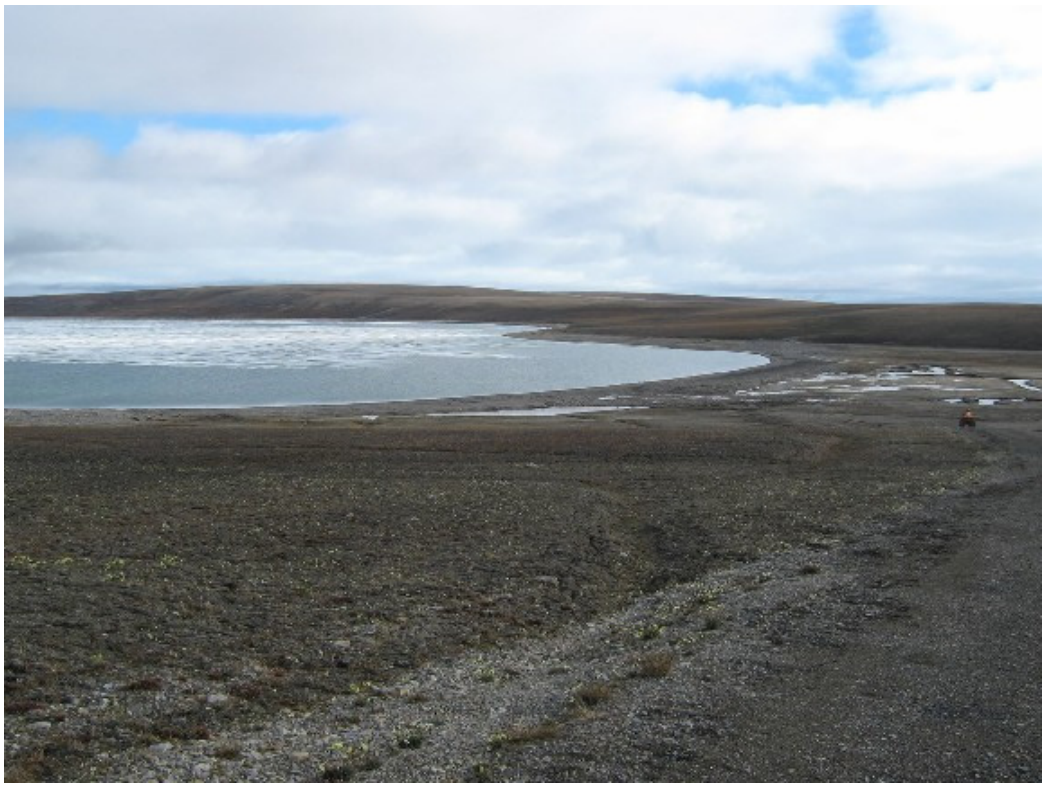


Photo 78- Northing 561186 Easting 8367394 Elevation 26 m
View of Garrow Lake wave break structure

Photo 79- Northing 561569 Easting 8367440 Elevation 8 m
Deposited gravel berm at breached outlet of wave break structure

Photo 80- Northing 561569 Easting 8367440 Elevation 8 m
Crest of deposited gravel berm along wave break structure

Photo 81- Northing 561569 Easting 8367440 Elevation 8 m
Crest of deposited gravel berm along wave break structure

Photo 82- Northing 561569 Easting 8367440 Elevation 8 m
Seepage through wave break structure causing some settlement from piping

Photo 83- Northing 561646 Easting 8366909 Elevation 15 m
Garrow Lake Dam: East dam abutment facing upstream to lake

Photo 84- Northing 561646 Easting 8366909 Elevation 15 m
Garrow Lake Dam: west abutment facing upstream to lake

Photo 85- Northing 561646 Easting 8366909 Elevation 15 m
Garrow Creek facing downstream towards ocean and sampling point

Photo 86- Northing 561646 Easting 8366909 Elevation 15 m
Garrow Creek: area of previously exposed geotextile

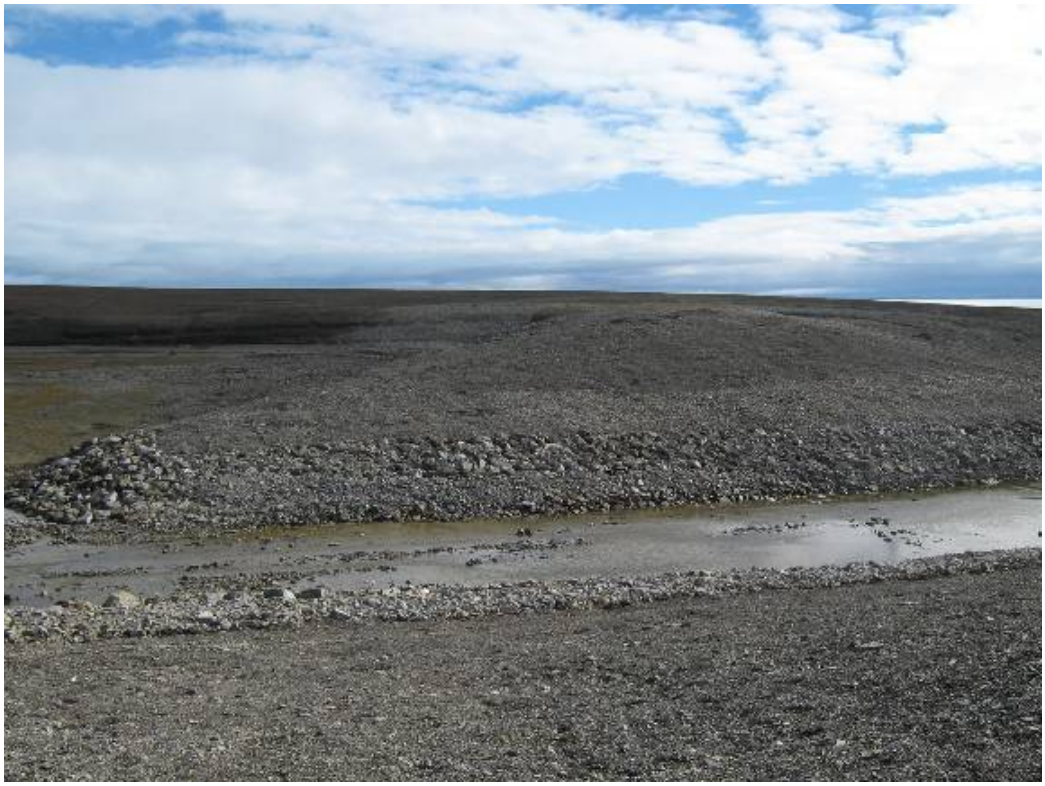
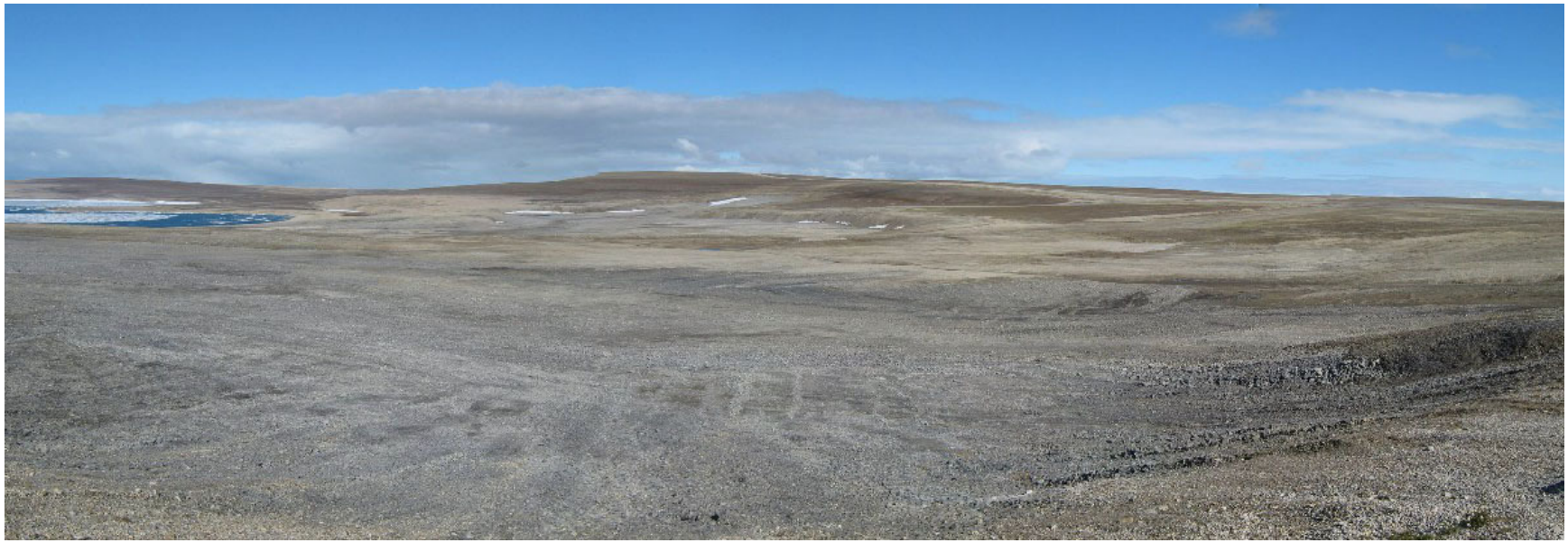


Photo 87- Northing 561646 Easting 8366909 Elevation 15 m
Garrow Lake Dam facing east abutment from west abutment



Panoramic (Photos 88,89,90) Northing 558613 Easting 8368452 Elevation 39 m
New quarry: view from behind camp

Photo 91- Northing 561088 Easting 8368913 Elevation 13 m
Garrow Lake perimeter, west shore facing south near boat launch

Photo 92- Northing 561088 Easting 8368913 Elevation 13 m
Garrow Lake perimeter, erosion gullies near boat launch

Photo 93- Northing 560960 Easting 8369168 Elevation 9 m
Garrow Lake perimeter: north of boat launch, west shore facing north

Photo 94- Northing 560960 Easting 8369168 Elevation 9 m
Garrow Lake perimeter: erosion gully north of boat launch

Photo 95- Northing 560961 Easting 8369504 Elevation 8 m
Garrow Lake perimeter: erosion gully in the NW corner

Photo 96- Northing 561583 Easting 8370389 Elevation 8 m
Garrow Lake perimeter: north shore facing east

Photo 97- Northing 561583 Easting 8370389 Elevation 8 m
Garrow Lake perimeter: north shore facing west

Photo 98- Northing 562614 Easting 8370530 Elevation 13 m
Garrow Lake perimeter: NE corner facing east

Photo 99- Northing 562614 Easting 8370530 Elevation 13 m
Garrow Lake perimeter: NE corner facing west

Photo 100- Northing 562776 Easting 8369812 Elevation 16 m
Garrow Lake perimeter: north end of east shore facing south

Photo 101- Northing 562776 Easting 8369812 Elevation 16 m
Garrow Lake perimeter: north end of east shore facing north

Photo 102- Northing 562759 Easting 8368796 Elevation 14 m
Garrow Lake perimeter: east shore facing south

Photo 103- Northing 562759 Easting 8368796 Elevation 14 m
Garrow Lake perimeter: east shore facing north towards erosion gully

Photo 104- Northing 562675 Easting 8368316 Elevation 18 m
Garrow Lake perimeter: SE shore facing south

Photo 105- Northing 561569 Easting 8367440 Elevation 8 m
Garrow Lake perimeter: south shore east of wave break structure

Photo 106- Northing 558815 Easting 8368653 Elevation 29 m
New quarry area: repaired drainage ditch

Photo 107- Northing 558815 Easting 8368653 Elevation 29 m
New quarry area: view looking up channel slope

Photo 108- Northing 558880 Easting 8368714 Elevation 25 m
New quarry area: self-armouring erosion gully

Photo 109- Northing 558699 Easting 8368752 Elevation 28 m
New quarry area: rip-rap lined drainage ditch

Photo 110- Northing 558699 Easting 8368752 Elevation 28 m
New quarry area: erosion gully below rip-rap lined ditch

Photo 111- Northing 559086 Easting 8369039 Elevation 17 m
New quarry area: erosion gully down quarry perimeter slope


Photo 112- Northing 559102 Easting 8369202 Elevation 15 m
New quarry area: settlement area at toe of perimeter slope

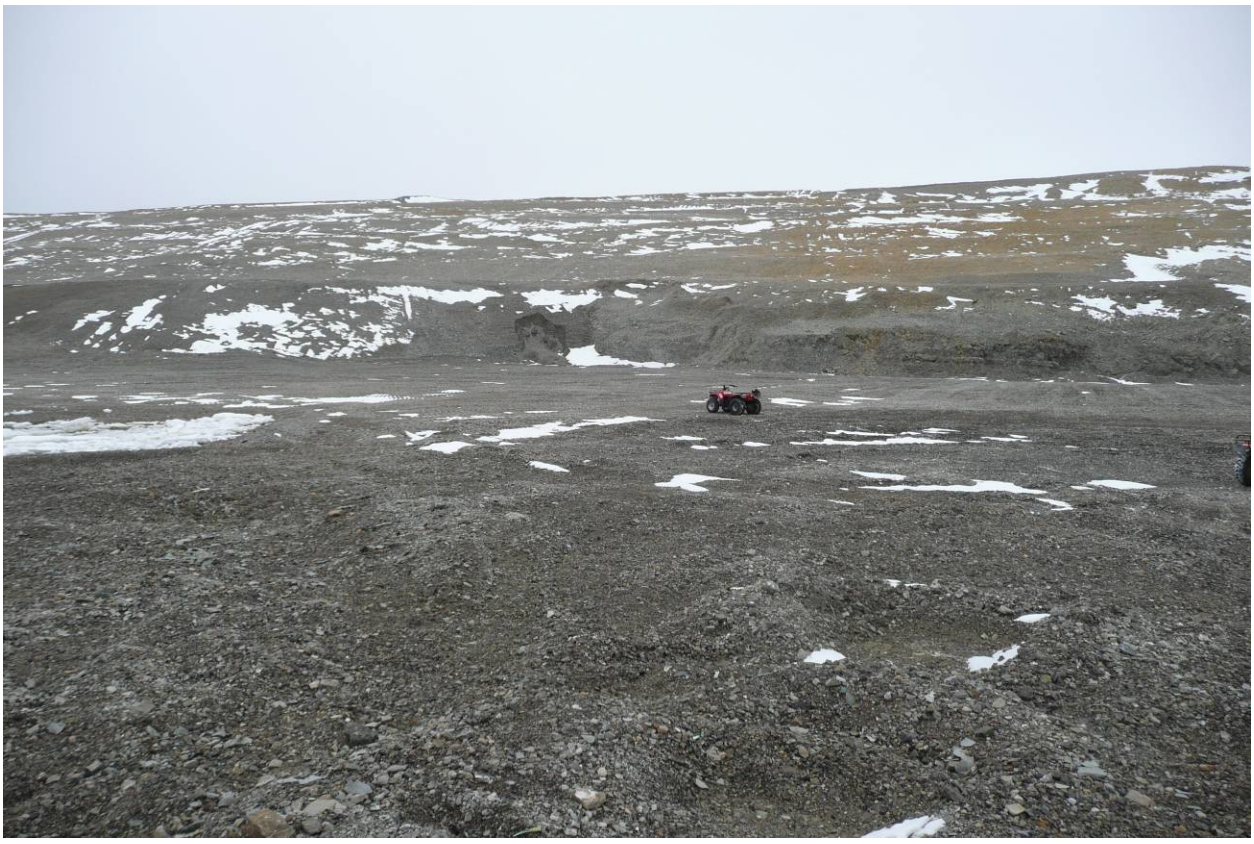
Photo 113- Northing 559027 Easting 8369443 Elevation 20 m
New quarry area: sink holes on slope potentially caused by snow/ice melt.

Photo 114- Northing 558950 Easting 8369335 Elevation 15 m
New quarry area: sink holes on slope potentially caused by snow/ice melt.

Photo 115- Northing 558779 Easting 8369106 Elevation 9 m
New quarry area: erosion gullies meandering over floor of quarry

Appendix B

August 2008 Main Portal Slope Failure Photographs



Main Portal Slope Failure (ATV for scale) – August 24, 2008

Main Portal Slope Failure (Close-up) – August 24, 2008