2013 Annual Geotechnical Inspection – Lupin Mine Tailings Containment Area, Nunavut

Prepared for

Lupin Mines Incorporated

Prepared by

SRK Consulting (Canada) Inc.
1CL008.001
October 2013

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Lupin Mines Incorporated
201 – 750 West Pender Street
Vancouver, BC VC 2T8
Canada

Prepared by

SRK Consulting (Canada) Inc.
2200–1066 West Hastings Street
Vancouver, BC V6E 3X2
Canada

Project No: 1CL008.001

File Name: 1CL008 0001_2013 Lupin Annual Inspection Report_AT_PMH_20131024

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1 Introduction

The Lupin Mine site is currently under care and maintenance status and operating under Nunavut Water Licence 2AM-LUP0914 (NWB 2009) by Lupin Mines Incorporated, a wholly-owned indirect subsidiary of Elgin Mining Inc. Elgin acquired LMI from MMG Resources Inc. in July 2011. The mine is located on the west shore of Contwoyto Lake, approximately 285 km southeast of Kugluktuk, Nunavut and 400 km northeast of Yellowknife (Figure 1.1). As a part of the Water Licence requirement, an annual geotechnical inspection is required for the tailings containment area (TCA) perimeter dams, TCA Covers, including an assessment of any seepage from the TCA (NWB 2009). In fulfillment of the regulatory requirements, Mr. George Friesen, Manager of Technical Services of LMI has retained SRK Consulting (Canada) Inc. to conduct the 2013 geotechnical site inspection. Part E Item 6 of Water Licence (NWB 2009) applies to the inspection and stipulates the following:

> “6. The TCA shall be constructed, operated and maintained to engineering standards such that:
>
> a. A freeboard limit of 1.0 m shall be maintain at all times or as recommended by a Geotechnical Engineer and as approved by the Nunavut Water Board (the Board) in writing;
> b. Seepage from the TCA is minimized;
> c. Any seepage that occurs is collected and returned immediately to the TCA;
> d. Erosion of constructed facilities is addressed immediately;
> e. The solids fraction of the mill Tailings shall be permanently contained within the TCA or underground as Backfill;
> f. Weekly inspections of the dam(s), Tailings line(s), and catchment basin(s) shall be carried out and records of these inspections shall be kept for review upon the request of an Inspector, or as otherwise approved by the Board. More frequent inspections shall be performed at the request of an Inspector; and
> g. An inspection of the TCA shall be carried out annually during ice free, open water conditions by a Geotechnical Engineer. The Engineer’s report shall be submitted to the Board within sixty (60) days following the inspection and shall include a covering letter from the Licensee outlining an implementation plan to respond to the Engineer’s recommendations.”

This report summarizes SRK’s observations of the mine’s condition and our recommendations. Review of previous design, as-built and annual inspections reports made prior to 2012 were outside SRK’s scope for this inspection. These included:

- Inspections from 2009 to 2011 by TBT Engineering Consulting Group,
- Inspections from 2000 to 2008 by BGC Engineering and Golder Associates,
- Earlier design, as-built and annual inspections reports by Geocon Inc., and
- The 2004 Dam Safety Review of the perimeter tailings dams performed by Golder Associates.

Generally, the 2013 inspection revealed the dams are in good condition with the exception of two interior dams. Minor erosion issues around all the dams were observed but none of major concern.

J:\01_SITES\Lupin\1040_AutoCAD\Lupin-SiteFacil-utm-12_ATedits_RevA-20121030.dwg

srk consulting	**Lupin Mine Inc.**	2013 Geotechnical Inspection Location Plan
SRK JOB NO.: 1CL008.001 FILE NAME: Lupin-SiteFacil-utm-12_ATedits_RevA-20131018.dwg	Lupin Mine Incorporated	DATE: October 2013 / APPROVED: / FIGURE: 1.1

2 Site Conditions

2.1 History of the Lupin TCA

A brief summary of the development history of the TCA is listed in Table 2.1. A closure plan for the Tailings Containment Area (TCA) prepared by Holubec Consulting Inc. in 2005 and it provides a more detailed history of the TCA (Holubec 2005).

Table 2.1 – Lupin Mine TCA Development Historical Summary

Year	Comment
1960	Ore deposit discovered by Canadian Nickel Company Ltd.
1980	Property purchased by Echo Bay Mines Ltd.
1981	TCA developed by the construction of Dam 1A and Dam 2.
1982	Mining operations commenced in October and tailings slurry discharged from the northern edge of the TCA into future Cell 5. Dam 3 constructed.
1985	Tailings management strategy revised and tailings deposited within cells. Excess water from the cells is directed into two ponds in series within the TCA prior to discharge. Internal Dam 3C and Dam J constructed.
1990	Internal Dam K constructed and Cell 4 provides an additional clarification pond.
1992	Perimeter Dam 4, Dam 5 and Dam 6 and internal Dam L and Dam M constructed.
1997	Internal Dam N constructed.
1998	Production stopped and site placed on care and maintenance in January.
2000	Production resumed in April. Dam M raised.
2002	Echo Bay Mines Ltd., TVX Gold and Kinross Gold Corp. merged and Kinross assumed control of operations.
2003	Site placed on care and maintenance in August.
2004	Production resumed between March and December.
2005	Closure of operation announced in February and site placed on care and maintenance.
2006	Ownership is purchased by Lupin Mines Inorporated, a subsidiary of Wolfden Resources.
2007	Wolfden Resources acquired by Zinifex Ltd.
2008	Zinifex Ltd. merged with Oxiana Ltd. to form OZ Minerals Ltd.
2009	Canadian assets of OZ Minerals sold to China Minmetals Ltd. MMG Resources Inc., a wholly owned subsidiary of Minerals and Metals Group Ltd., was the Canadian operating company set up after that transaction to hold the Lupin Mine.
2011	Ownership of LMI purchased by Elgin Mining Inc. in July.

Covering the tailings with a gravelly sand esker commenced in 1998 with the covering of Cell 1A. In 1995, Cell 1 and part of Cell 2 were covered. In 2003, Cells 3A and 3B, two mini-cells in the westerly section of Cell 3, were covered. In 2004, the remainder of Cell 2 and part of Cell 3 were covered. In 2005, Cell 3, Cell 5 and the cell formed by Dam N were partially covered. About 75% of the tailings areas are covered with at least 1 m of sand/gravel (Holubec 2006). The winter supply road was closed prematurely to fuel deliveries in 2006; no cover program was undertaken that year. In 2007, ownership of the LMI was transferred. The property has remained in care and maintenance since 2005 and no tailings has been produce since then.

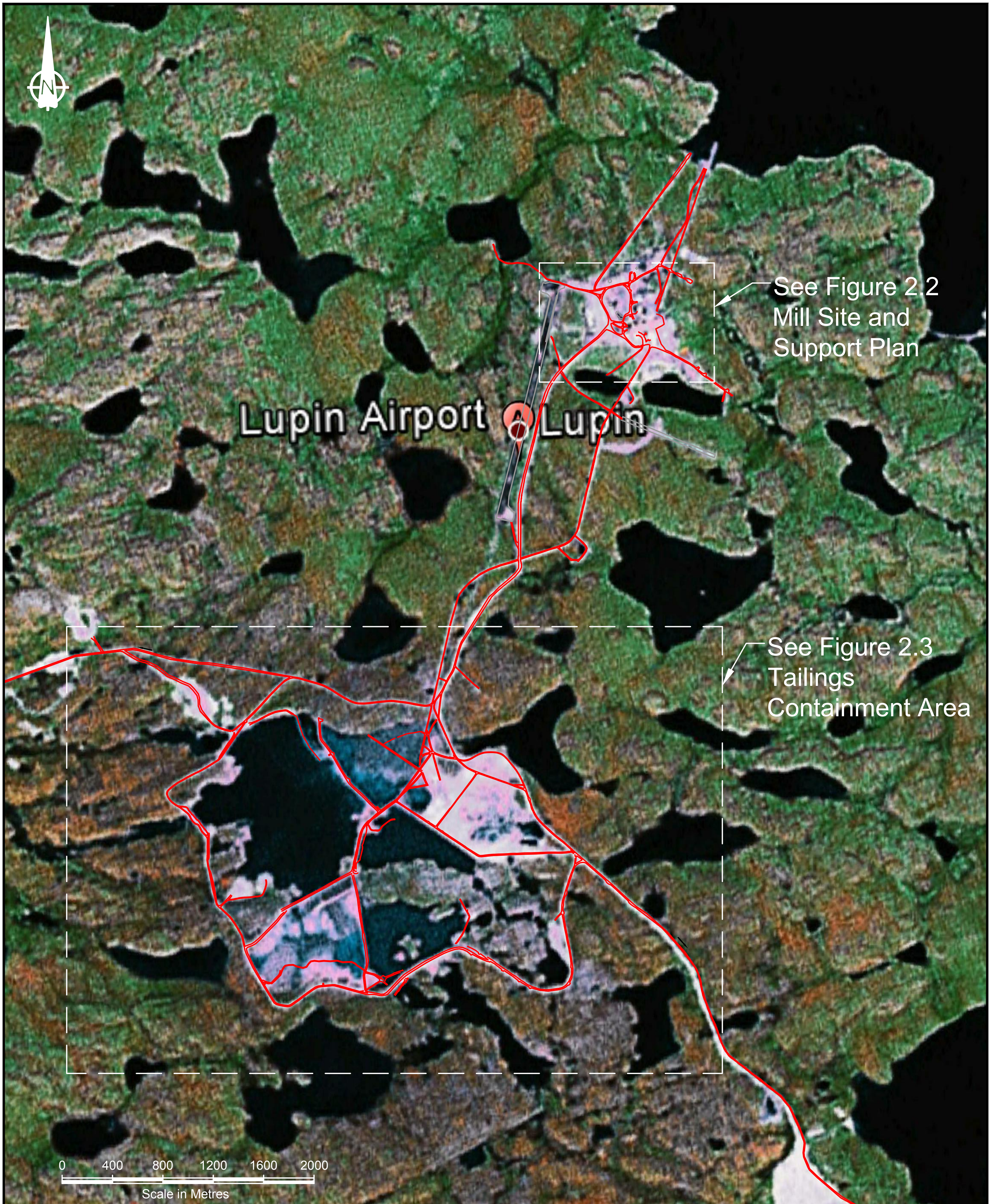
2.2 Site Infrastructures

Because of its isolated location, the mine site was constructed to be totally self-sufficient, with all (then) operation and (now) maintenance personnel living on site. The only year-round access to the site is via aircraft. Historically, the mine was annually resupplied in bulk via a 570 km ice-road from Tibbitt Lake during February and March.

The Lupin Mine site (Figure 2.1) consists of two major areas: an industrial complex and the TCA. The industrial complex consists of the administration buildings, mill, maintenance shops, fuel tank farms, camp buildings, and the airstrip (Figure 2.2).

The 2012 geotechnical inspection focused on the TCA as stipulated by the water licence (NWB 2009). The TCA is located approximately 6 km south of the industrial complex, and is divided into two main components: five solid retention cells and two settling ponds in series (Figure 2.3). The TCA is characterized by six main perimeter dams and nine internal dams for cell separation. The perimeter dams consist of Dam 1A, 1B, 1C, and Dams 2–6, and ranged from 1 to 8 m in height. The nine internal dams consist of 3C, 3D and 3E, J–N, and an unnamed dam between Cell 2 and Cell 5. Internal dams range from 5.7 to 11.2 m in height. All the dams are constructed from esker sands and gravels, with the perimeter dam including a liner for seepage control. All perimeter dams are frozen core structures founded on permafrost.

The care and maintenance procedures for water management at the TCA have runoff flowing from Cell 3 to Cell 4, where solids settle out prior to the water flowing to Pond 1. It is assumed water flows from Cell 4 to Pond 1, via a gated culvert and trench. Water in Pond 1 is then transferred by siphon to Pond 2 for clarification and settling and, if needed, treatment, prior to discharge into the environment. Prior to discharge by siphon from Pond 2 into the environment the quality of water is tested for pH, metals and toxicity to rainbow trout and *Daphnia* species. No tailings have been deposited since the cease of milling operations in 2006.



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Lupin Mine Inc.

2013 Geotechnical Inspection

General Site Plan

SRK JOB NO.: 1CL008.001

FILE NAME: Lupin-SiteFacil-utm-12_ATedits_RevA-20131018.dwg

Lupin Mine Incorporated

DATE: October 2013

APPROVED:

FIGURE: 2.1

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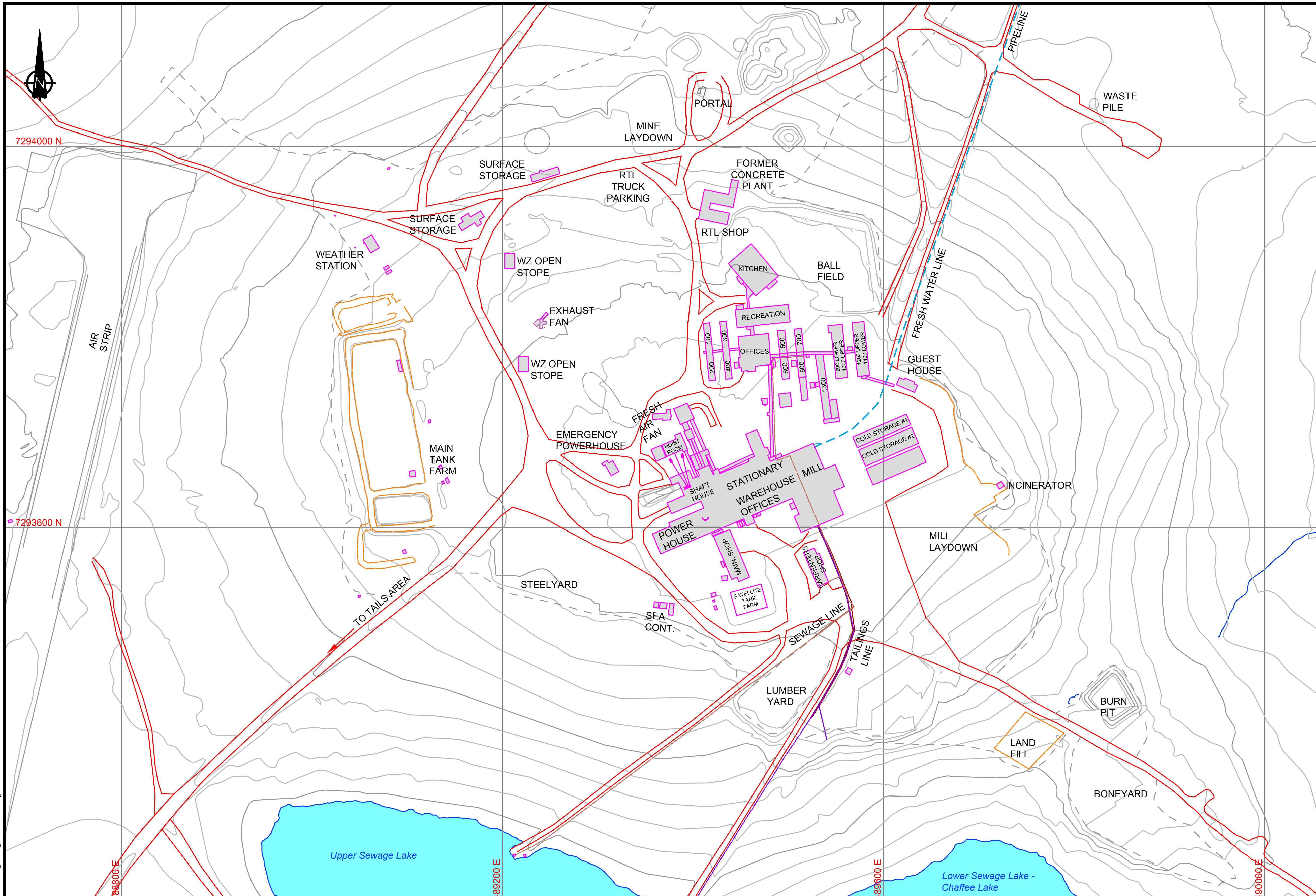

LEGEND

- Lake Pond
- Tank Farm Berm Outline
- Building
- Water Pipeline (8 in Diam) (Not in Use)
- Tailings Line Route (Not in Use)
- Sewage Pipeline (6 in Diam) (Not in Use)
- Lake Shore, Drainage
- Contour 1 m
- Contour 5 m
- Roads
- Site Features Miscellaneous
- Cleared Area
- Berm Area
- Slope Toe
- Slope Top
- Culvert
- Fence

NOTES

1. Topographic information and facilities outline provided by Lupin Mine Inc. on August 13, 2012.

0 40 80 120 160 200

Scale in Metres

Coordinate System: Nad_1983_UTM_Zone_12N
NTS Map Sheets 076E11 and 076E14

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SRK JOB NO.: 1CL008.001

FILE NAME: Lupin-SiteFacil-utm-12-ATedits_RevA-20131018.dwg

Lupin Mine Inc.

Lupin Mine Incorporated

2013 Geotechnical Inspection

Mill Site and Support Facility Plan

DATE: October 2013

APPROVED:

FIGURE: 2.2

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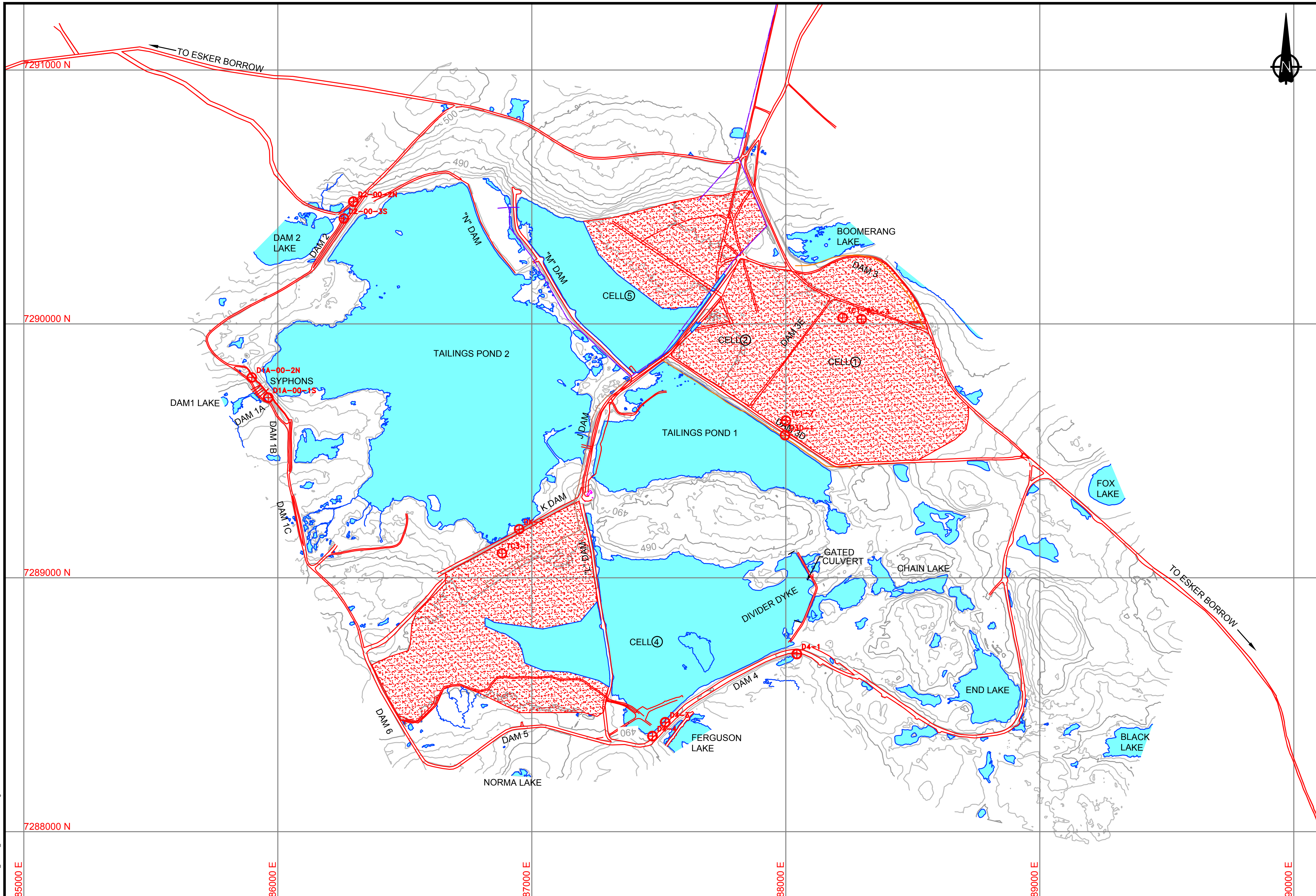


LEGEND

- Water Body
- Granular Tailings Cover
- Lake Shore, Drainage
- Tailings Line Route (Not in Use)
- Contour 1 m
- Contour 5 m
- Roads
- Berm Area
- Thermistor

NOTES

1. Topographic information and facilities outline provided by Lupin Mine Inc. on August 13, 2012.

0 100 200 300 400 500
Scale in Metres

Coordinate System: Nad_1983_UTM_Zone_12N
NTS Map Sheets 076E11 and 076E14

srk consulting

SRK JOB NO.: 1CL008.001
FILE NAME: Lupin-SiteFacil-utm-12_ATedits_RevA-20131018.dwg

Lupin Mine Inc.

Lupin Mine Incorporated

2013 Geotechnical Inspection

Tailings Containment Area

DATE:	APPROVED:	FIGURE:
October 2013		2.3

2.3 Climate

Climate conditions were recorded at the Lupin manned weather station until October 2006. An automated weather station known as Lupin (MAPS) (CWIJ) has recorded data intermittently at the site. Reviewing the data from the end of October 2006 to the present, the station has reported an arctic climate with a mean annual temperature of -9.8°C. Winter is considered to last from October to May and summer is considered to last from June to September. The summer daily temperature averaged at 6.8°C and winter daily temperature averaged at -18.5°C. There are persistent winds at an annual mean of 18.0 km/h and gusts up to 95 km/h. Measured site precipitation is reported at an annual mean of around 388 mm. The data does not breakdown the precipitation into rain and snow (WU 2012).

2.4 Site Geology

The Lupin gold deposit is situated in an Archean metaturbidite sequence of the Contwoyto Formation, part of the Yellowknife Supergroup of supracrustal metasedimentary and metavolcanic rocks of the Slave Geologic Province. The rocks have been subjected to both regional and contact metamorphism and to several phases of deformation and intrusion.

The Contwoyto Lake area lies within the Upland unit of the Kazan physiographic region of the Canadian Shield. The area was glaciated during the Pleistocene Epoch. Isostatic rebound after ice melt resulted in emergent landforms, and during this process all parts of the land were washed by runoff and lakes. The easily erodible glaciolacustrine sediment, till and glacio-fluvial sand and gravels were subsequently reworked by melts and runoff. This has resulted in the present day outcrops with thin soil veneers, abandoned beaches and esker formations (Kinross 2005).

Tailings are primarily composed of the gangue minerals amphibole and quartz, which account for over 80% of the volume. Pyrrhotite and arsenopyrite make up an additional 17% (Klohn-Crippen 1995). The tailings have been shown through various studies to be capable of generating acid upon oxidation (Kinross 2005).

2.5 Permafrost and Dam Geotechnical Conditions

The area is completely within Canada’s cold continuous permafrost region. The active layer is somewhat variable between 1.3 m to 3.1m. There has been long-term discontinuous monitoring of the permafrost conditions in dams at the Lupin TCA since 1982 and since 1985 in the cover. The recordings are made by thermistors installed in various dam and cover locations. While a number of thermistors are defunct and others have suffered physical damages, some are read regularly during inspections. They still show the presence of permafrost through the dams and foundations. While there are some fluctuations in recorded ground temperature readings, no obvious thaw trend has been found.

3 TCA Inspection

3.1 General

Mr. Alvin Tong, P.Eng., a Senior Consultant with SRK, conducted the geotechnical inspection on September 12, 2013. After a general overview of the site in the air, the detailed site inspection was carried out using ground transportation with frequent stops for thorough visual inspections. Mr. George Friesen of LMI did not accompany SRK on the inspection, but was available for comment and discussion through telephone and email.

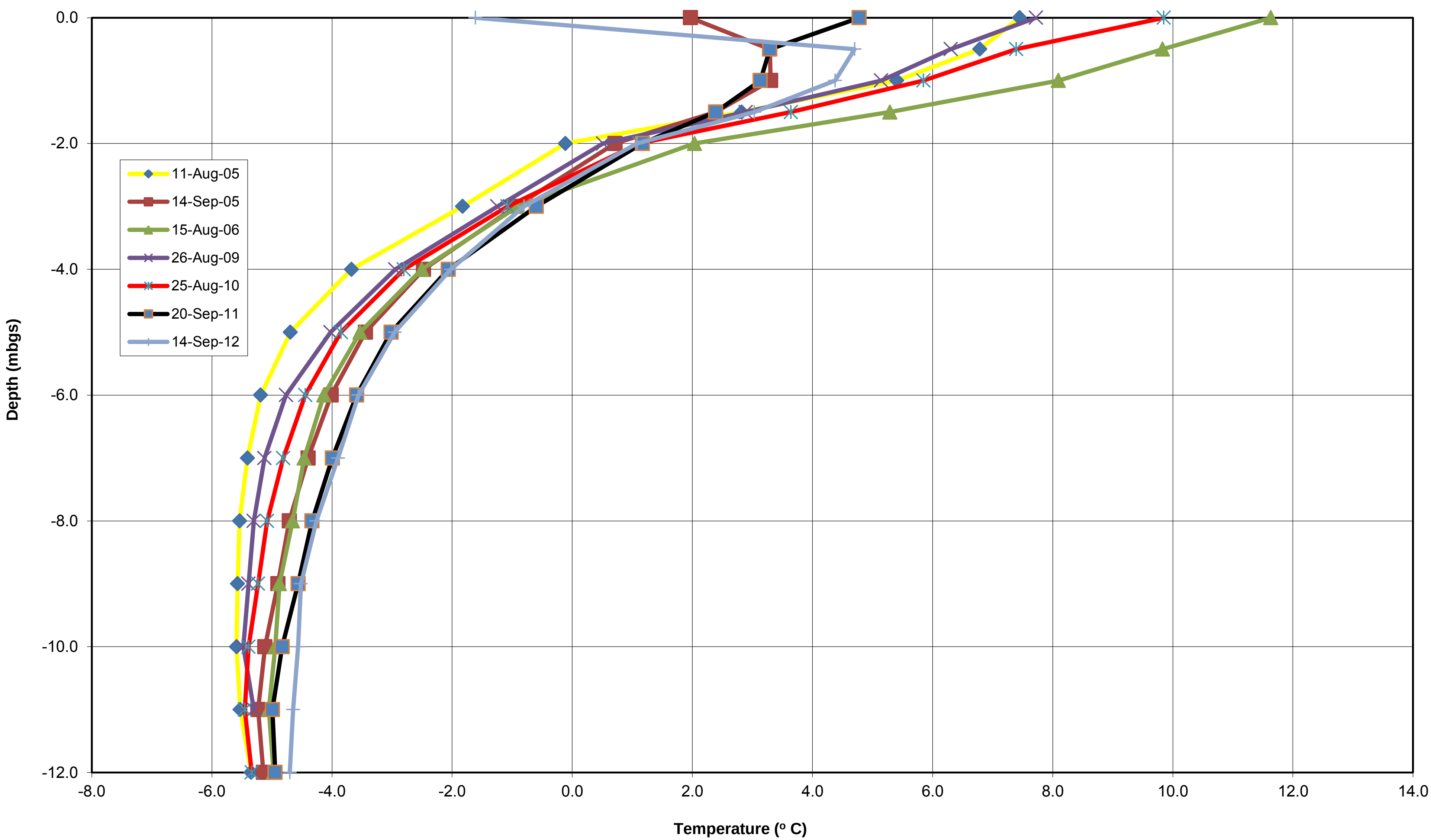
Weather conditions during the inspection were cool and sunny with periods of fog, high winds and rain. A detailed photographic log of the inspection is included in Appendix A.

Generally, the inspection revealed the dams are typically in good condition with two exceptions discussed below. There are minor erosion issues around all the dams but no major concerns were identified.

3.2 Thermistors

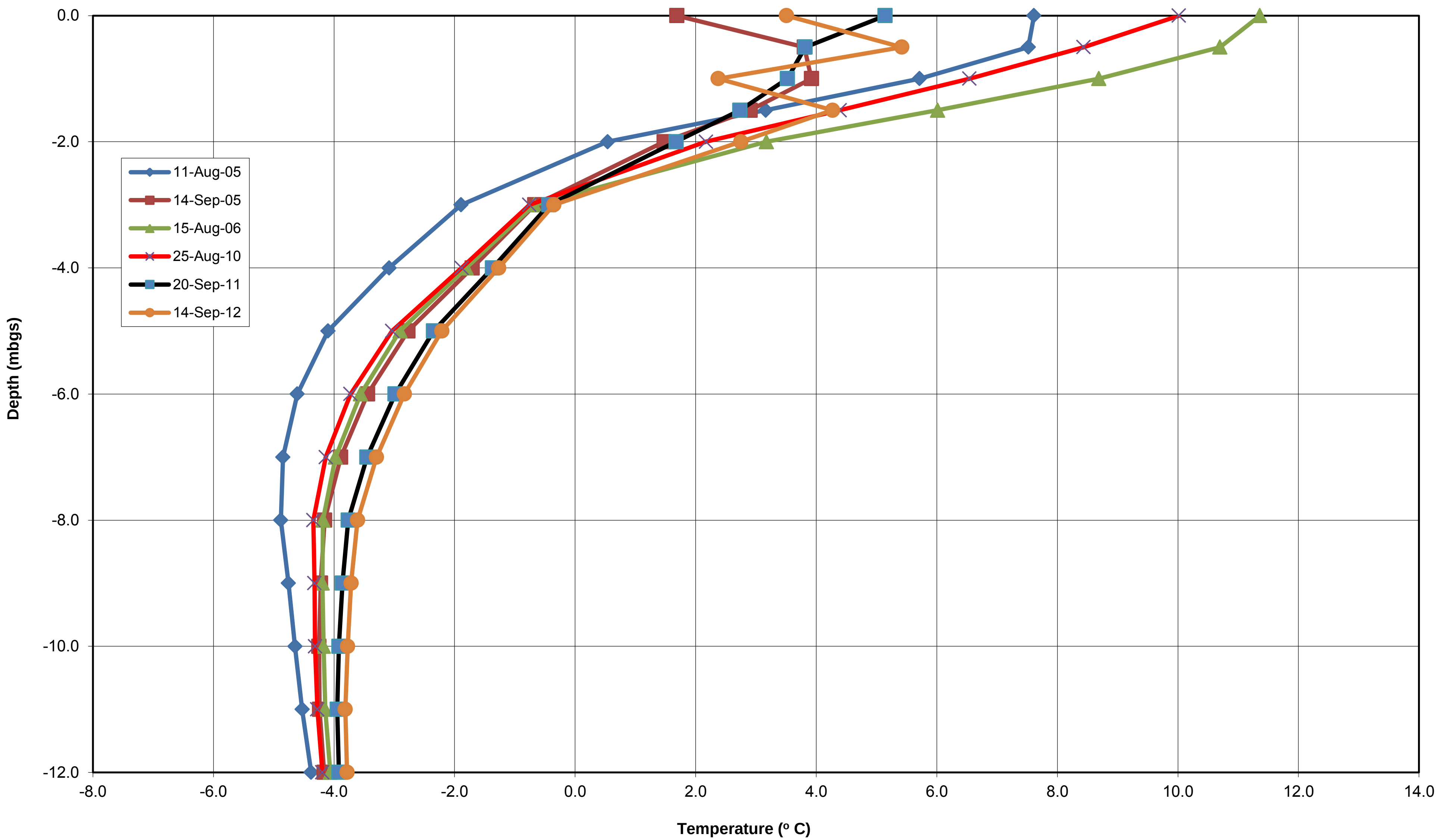
Figure 2.3 presents the locations of five functioning TCA thermistors that were installed between 1985 and 2000. In addition to the thermistor strings shown, there are a number of historical thermistor installations that are no longer functional. Furthermore, only thermistor data recorded after cease of production in 2005 are presented in this document, as this data best reflects the current care and maintenance status. The thermistors were not read during this year's inspection.

In the TCA, all five of the thermistors are less than 20 m deep. Based on the data between 2005 and 2012, taking into account annual climatic variations, there is no trend showing permafrost degradation. The largest variation occurs in Dam 1A, of 3°C in the given data set, at approximately 5 m below dam crest. This variation occurs below -3°C; and the -1°C gradient occurs at approximately 3 m below the surface. This concurs with the regional active zone. These records indicate the frozen core in the dam is performing satisfactorily, and the general trends and visual physical inspection support that permafrost is not degrading. Figure 3.1 to Figure 3.5 show the thermistor data read during summer periods from 2005 to 2012 (SRK 2012a). Thermistor readings will be done in 2014.



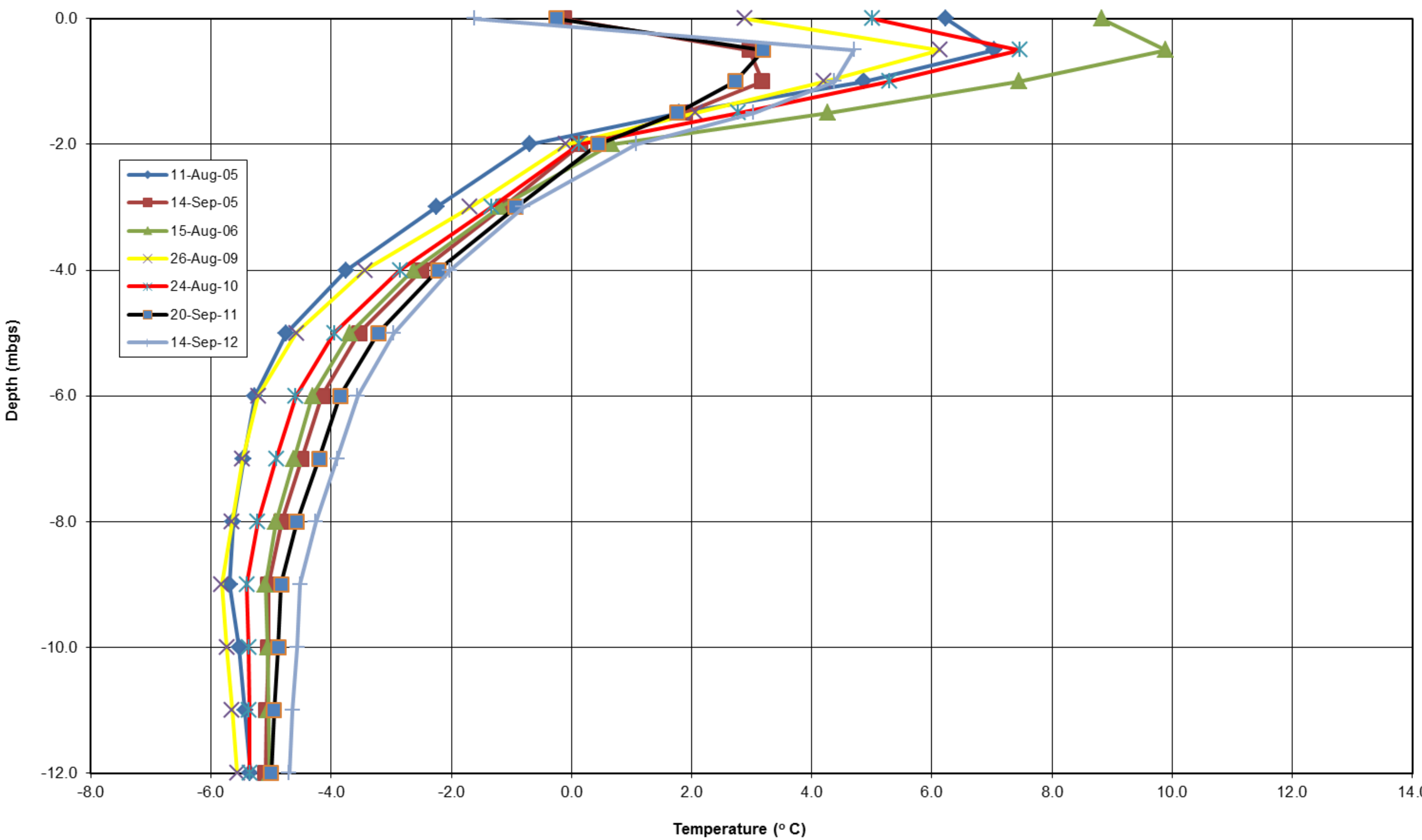
Note: Reading was not done in 2013.

srk consulting	**Lupin Mines Incorporated**	2013 Annual Geotechnical Inspection on Perimeter Dams **Thermistor Reading D4-1**
Job No: 1CL008.001 Filename: Lupin Annual Inspection_Figure 3.1_3.5.pptx	Lupin Mine	Date: October 2013 / Approved: AT / Figure: **3.1**



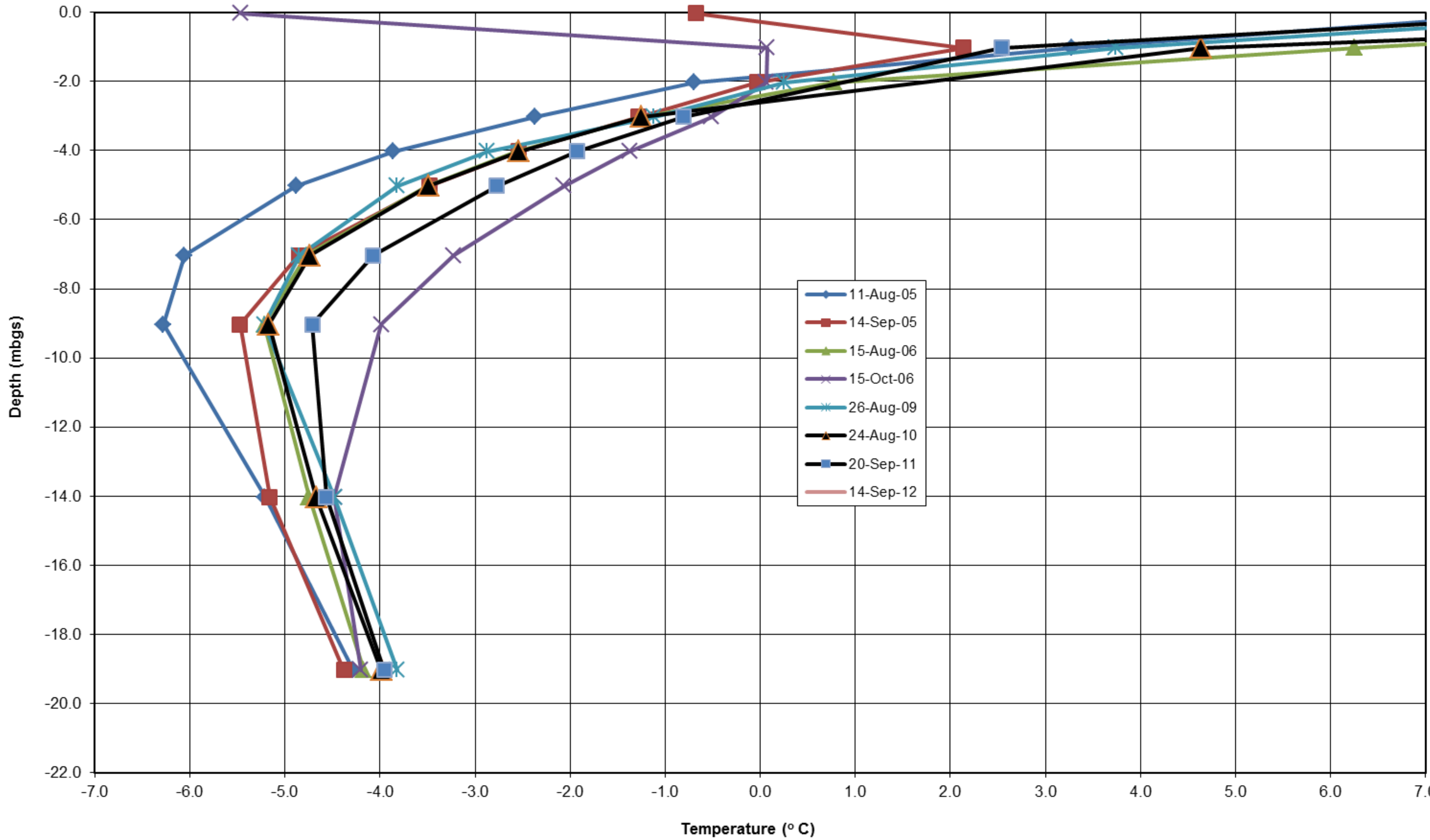
Note: Reading was not done in 2013.

srk consulting	Lupin Mines Incorporated	2013 Annual Geotechnical Inspection on Perimeter Dams
		Thermistor Reading D4-3
Job No: 1CL008.001 Filename: Lupin Annual Inspection_Figure 3.1_3.5.pptx	Lupin Mine	Date: October 2013 / Approved: AT / Figure: 3.2



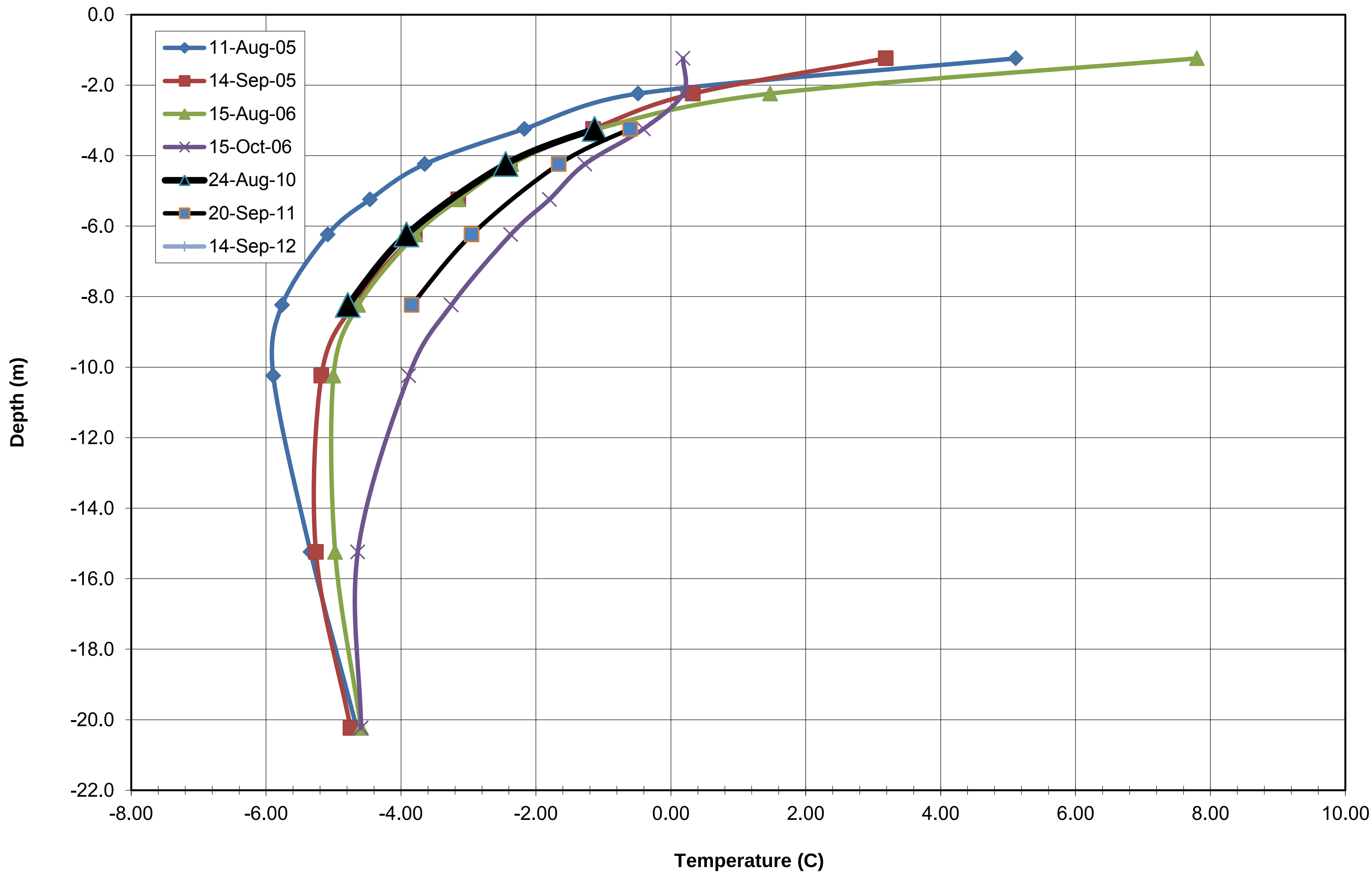
Note: Reading was not done in 2013.

srk consulting	Lupin Mines Incorporated	2013 Annual Geotechnical Inspection on Perimeter Dams **Thermistor Reading D4-4**
Job No: 1CL008.001 Filename: Lupin Annual Inspection_Figure 3.1_3.5.pptx	Lupin Mine	Date: October 2013 | Approved: AT | Figure: **3.3**



Note: Reading was not done in 2013.

srk consulting	Lupin Mines Incorporated	2013 Annual Geotechnical Inspection on Perimeter Dams
		Thermistor Reading D1A-00-01
Job No: 1CL008.001 Filename: Lupin Annual Inspection_Figure 3.1_3.5.pptx	Lupin Mine	Date: October 2013 / Approved: AT / Figure: 3.4



Note: Reading was not done in 2013.

srk consulting	**Lupin Mines Incorporated**	2013 Annual Geotechnical Inspection on Perimeter Dams
		Thermistor Reading D2-00-2
Job No: 1CL008.001 Filename: Lupin Annual Inspection_Figure 3.1_3.5.pptx	Lupin Mine	Date: October 2013 · Approved: AT · Figure: **3.5**

3.3 TCA Perimeter Dams

The perimeter dams are generally in good condition in terms of stability and performance. There are minor erosion issues which are typically associated with sand and gravel construction material. These should be monitored and repaired as required to prevent continuous erosion that could worsen and impair the dam. While most of the erosion is minor, some along Dam 1A is more serious and should be addressed in 2014.

A previous annual inspection found seepage in the western buttress toe of Dam 4 into Ferguson Lake and the northern buttress toe of Dam 2 into Dam 2 Lake. It was not observed during the current and 2012 inspections. A cofferdam was placed at the toe of Dam 2 to collect seepage to be pumped back into Pond 2 when it pooled. This pool is observed to be quite full and should be pump back to Pond 2 during maintenance in 2014.

The storm ditch built within top 2 m of Dam 3 was suffered minor damages from the 2012 freshet. The damage has since been repaired and additional grade work was completed in an attempt to allow the freshet runoff water to free drain. Pond in this ditch appears to be the main cause of the previous damage. Because of the poor grading, the water pooled, froze, and created an ice dam; which in turn forced the freshet water to breach the ditch and a small portion of Dam 3. At the time of the inspection in 2013, minor ponding are observed in the ditch. Additional earthwork should be carried out to improve the ditch grade to limit these ponding.

The observed freeboard on the perimeter dams ranges from 2.5 m to 4 m depending on the individual perimeter dam elevations. The site has treated and discharged water in 2012 hence the freeboard on the perimeter dams has increased since last reported in 2012.

3.4 Internal Dams

The internal dams are generally in good condition with the exception of Dam L and Dam M. The majority of the internal dams have typical erosion issues associated with dam constructed from esker sand material. Continued repair and maintenance can help mitigate further damage in terms of widening and deepening of erosion gullies.

During the 2012 inspection, a substantial erosion breach was observed at the south end of Dam L. It is appears that the erosion was caused by the 2012 freshet where the water from the uncovered portion of Cell 3 breached into Cell 4. Cell 3 water level was reduced in 2012 from the treatment process and it is unlikely that Cell 3 water could breach this location again in 2014 freshet. However it is still recommended that this erosion to be repaired. Section 4 of this report provides recommendations to deal with the breached section in Dam L. The slope facing Cell 3 is observed to have considerable erosion near the toe. Monitoring should be carried out to prioritize the repair on the erosion to minimize propagation to the crest of the dam.

Four significant tension cracks observed on Dam M are a cause for concern in term of geotechnical stability. Potentially, this failed portion of the dam could breach and allow the supernatant water and tailings from Cell 5 into Pond 2. Visual comparison between 2012 and 2013 photographs showed the cracks are widening. Because of the severity of the cracks and potential breach, Mr. George Friesen was advised that all vehicle traffic should avoid this section for safety reasons. A risk assessment was completed to outline the potential water quality impact in the event of a breach (SRK 2013b). Section 4.1 provides recommendations to address the potential risks in the event of a full breach.

The observed freeboard during inspection on the internal dams ranged from 1 m to 5 m depending on individual internal dam elevations.

4 Recommendations

Table 4.1 summarizes observations and recommendations from the inspections performed in 2013 and 2012.

Table 4.1 – Inspection Observations and Recommendations

Inspection Item	2012 Inspection		2013 Inspection	
	Observations	**Recommendations**	**Observations**	**Recommendations**
Perimeter Dams				
Dam 1A	Minor erosion on series and some deep erosion gullies.	Repair deep erosion gullies.	Minor erosion on series and some deep erosion gullies.	Repair deep erosion gullies.
Dam 1B	Minor surface erosions.	Consider surface maintenance.	Minor surface erosions.	Consider surface maintenance with grading and placement of fill erosions.
Dam 1C	Minor surface erosions. No cracks observed.	Consider surface maintenance.	Minor surface erosions. No cracks observed.	Consider surface maintenance with grading and placement of fill erosions.
Dam 2	Minor surface erosion. Estimated seepage at the northern buttress is less than 0.5 L/min. Re-establish coffer dam to collect seepage.	Consider surface maintenance. Monitor regularly to pump the collected seepage back into Pond 2.	Minor surface erosion. Estimated seepage at the northern buttress is less than 0.1 L/min. Seepage collection pond is nearly full.	Consider surface maintenance. Pump the collected seepage back into Pond 2.
Dam 3	Minor surface erosion. Despite repairs to the storm ditch, it does not yet have a free-draining grade.	Consider surface maintenance. Regrade ditch to minimize ponding and monitor during freshet to prevent ice blockages.	Despite repairs to the storm ditch, there are still some ponding.	Consider re-grading ditch to minimize ponding and monitor during freshet to prevent ice blockages.
Dam 4	Surface erosion with a number of deep erosion gullies. Exposed geogrid or similar synthetic reinforcements observed near the eastern downstream toe of the dam.	Repair the deep erosion gullies and maintain the surface. Monitor the exposed geogrid for erosion and water seepage.	Surface erosion with a number of deep erosion gullies. Exposed geogrid or similar synthetic reinforcements observed near the eastern downstream toe of the dam.	The geogrid exposure does not seem to be degrading, hence immediate remedial action is not required. Repair the deep erosion gullies and maintain the surface. Monitor for erosion and water seepage.

Inspection Item	2012 Inspection		2013 Inspection	
	Observations	Recommendations	Observations	Recommendations
Dam 5	Minor surface erosions.	Consider surface maintenance.	Minor surface erosions.	Consider surface maintenance with grading and placement of fill erosions.
Dam 6	Surface erosion with some gullies. No seepage or ponding.	Repair the deep erosion gullies and maintain surface. Monitor for potential seepage.	Surface erosion with some gullies. No seepage or ponding.	Repair the deep erosion gullies and maintain surface.
Internal Dams(1)				
Dam J	Reduced crest width due to erosion and placement of siphon pipes. Toe erosion likely due to wave action from Pond 2.	Repair eroded section and siphon pipes base. Rebuild crest width where possible. Place riprap above and below the Pond 2 water line to protect against erosion.	Freeboard around 1 m. Toe erosion likely due to wave action from Pond 2.	Consider the followings: repair eroded section and siphon pipes base; rebuild crest width where possible; place riprap above and below the Pond 2 water line to protect against erosion.
Dam K	Minor downstream slope surface erosion and some undercutting at toe; appears to be tailings material, from Pond 2 wave action.	Consider surface maintenance. Monitor regularly to ensure dam toe is not undercut. If so, place riprap there for protection.	Minor downstream slope surface erosion and some undercutting at toe; appears to be tailings material, from Pond 2 wave action.	Consider surface maintenance with grading and placement of fill erosions. Monitor to ensure dam toe is not undercut. If so, place riprap there for protection.
Dam L	Minor slope surface erosions and some minor undercutting at toe. Breach at southern section of dam near buttress. Seepage observed at 0.5 L/min below breach.	Consider surface maintenance. Monitor regularly to ensure dam toe is not undercut. If so, place riprap at the problematic area for protection. Repair with compacted well-graded esker material. Monitor and manage water in Cell 3 to prevent freshet overflow.	Slope surface erosions and undercutting at toe.	Consider surface maintenance with grading and placement of fill erosions. Monitor to ensure dam crest is not undercut by toe erosion. If so, place riprap at the problematic area for protection. Consider repair the breach with compacted well-graded esker material.
Dam M	Slope surface erosion. Major tension crack observed over an approximate 15 m section near Dam N. Cracks are up to 6 m long and deeper than 30 cm.	Consider surface maintenance. Reference section 4.1 for detailed mitigation measures.	Major tension crack observed over an approximate 15 m section near Dam N. Cracks are up to 6 m long, 5 cm wide, and deeper than 50 cm.	Consider surface maintenance. Reference section 4.1 for detailed mitigation measures.

Note [1]: Dam 3C, 3D and 3E are considered closed as they have been intergraded with the tailings granular cover.

4.1 Mitigation for Tension Cracks on Dam M

Based on a visual inspection of the tension cracks in Dam M, possible causes could include pore water pressure from Cell 5, and/or foundation “creep” (movement between the active layer and permafrost). If LMI wants to better understand the mechanism behind the tension cracks to better determined the rate and risks of failure, then a detailed investigation would be required.

In the short term, all vehicles should avoid this section of the dam for safety reasons. SRK further recommends that a monitoring program be established to determine the rate of movement. The program should include three pairs of monitoring monuments placed perpendicular to the cracks: one at each end and one in the middle of the failing section, each with a matching monitor on the stable section of the crest. Site personnel should measure and record the distances between each set of monuments on a seasonal basis. Results should be compiled and reviewed each year.

The risk assessment and water quality review (SRK 2012b) provided a summary of potential impact in the event of these cracks resulted in a full breach of Dam M. In the event of a full breach, resulting water quality impact would not prevent discharge from Pond 2 to the receiving environment. Thus, the risks associated to a dam breach are mainly related geotechnical stability where personnel health and safety, and accessibility for traffic around site are of concerns rather than environmental concerns. To mitigate some of the stability risks, SRK recommends that one of these measures should involve the construction of a toe buttress with a minimum crest width of 3m. The buttress should be constructed of compacted, well-graded esker material, and placed with a downstream slope of 2H:1V (horizontal to vertical) and extend up to half the height to the existing dam crest. The buttress should extend a minimum of 5 m beyond the failing section at each end. LMI should make preparations for the placement of this buttress in 2014 if stability failure of the dam is deemed unacceptable.

4.2 General Recommendations

With the exception of Dam M, the majority of the dams were generally found to be performing well and stable. SRK recommends that the observed erosion on Dams 1A, 3, 4, 6, L and J be monitored and repaired as required to reduce the risk of instability.

Clause E.6.f of the Water Licence (NWB 2009) states that:

> "Weekly inspections of the dam(s), tailings line(s), and catchment basin(s) shall be carried out and records of these inspections shall be kept for review upon the request of an Inspector, or as otherwise approved by the Board."

SRK understands that compliance with this clause is difficult while the site is under care and maintenance. SRK suggests that LMI submit a request to the Nunavut Water Board for an amendment to the schedule. Given the lack of mining activities and loading, we suggest that a schedule consisting of bi-weekly inspections during May and June (during freshet), and monthly inspections for the remaining open water period July to October would be adequate. However, if water levels in the ponds are allowed to rise, then inspections should be carried out bi-weekly. The inspections would specifically cover:

- Collection of and return of seepage in Dam 2,
- The water levels in Ponds 1 & 2 and Cells 3 & 5,

- General surface erosion and anomalies on dams, and
- The tension crack in Dam M.

Observations and findings from site inspections should be included in the annual inspection records.

This report "2013 Annual Geotechnical Inspection of Lupin Mine Tailings Containment Area, Nunavut" has been prepared by SRK Consulting (Canada) Inc.

Prepared by

REGISTERED PROFESSIONAL ENGINEER
C.A. TONG
LICENSEE
NT/NU

Oct 29, 2013

Alvin Tong, P.Eng.

Senior Consultant

Reviewed by

This signature was scanned with the author's approval for exclusive use in this document; any other use is not authorized.

Peter Healey, P.Eng.

Project Reviewer

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The opinions expressed in this report have been based on the information available to SRK at the time of preparation. SRK has exercised all due care in reviewing information supplied by others for use on this project. Whilst SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information, except to the extent that SRK was hired to verify the data.

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Appendix A: Photo Log

Lupin Dam 1A DS surface

Lupin Dam 1A Crest and DS surface

Lupin Dam 1A Crest and DS surface, view further south

Lupin Dam 1B Crest

Lupin Dam 1B DS Slope

Lupin Dam 1C DS Slope

Lupin Dam 1C US Slope

Lupin Dam 2 DS slope and seepage collection pond

Lupin Dam 2 DS surface

Lupin Dam 2 North abutment seepage

Lupin Dam 2 North abutment seepage

Lupin Dam 3 Crest with ponding in ditch

Lupin Dam 3 Diversion Ditch

Lupin Dam 3D DS slope

Lupin Dam 4 eastern DS slope exposed geogrid

Lupin Dam 4 eastern DS slope erosion

Lupin Dam 4 western DS Slope

Lupin Dam 5 DS Slope

Lupin Dam 5 US Slope

Lupin Dam 6 DS Minor Erosion

Lupin Dam 6 DS Slope

Lupin Dam J

Lupin Dam K Crest

Lupin Dam L erosion channel

Lupin Dam L erosion channel, Cell 3 view

Lupin Dam L erosion channel, Cell 4 view

Lupin Dam L crest

Lupin Dam L DS erosion, Cell 4 view.

Lupin Dam L crest erosion

Lupin Dam M DS slope of tension crack, Pond 2 view.

Lupin Dam M DS tension crack, Pond 2 view

Lupin Dam M tension crack

Lupin Dam M tension crack

Lupin Dam M tension crack

Lupin Dam M tension crack

Lupin Dam M tension crack