2010 Annual Geotechnical Inspection
Perimeter Dams Tailings
Containment Area
Lupin Mine, Nunavut

Prepared For:

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TBT ENGINEERING
CONSULTING GROUP

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Re: 2010 Annual Geotechnical Inspection
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Lupin Mine, Nunavut

Introduction

As a part of the requirements for the Water Licence 2AM-LUP0914, Annual Geotechnical Inspections are to be undertaken for the perimeter dams of the Tailings Containment Area (TCA) at the Lupin Mine project. These inspections were undertaken by TBT Engineering Limited on August 24 and 25th, 2010. This report provides a summary of these inspections and documents the findings. Recommendations for upgrading and future investigations have been provided where appropriate.

The Lupin Mine is located 285 km southeast of Kugluktuk, Nunavut and 400 km north-northeast of Yellowknife, Northwest Territories on the south shore of Contwoyto Lake. Access to the mine in the summer months is by air only. Mine locations and layout have been illustrated on Enclosures 1-2.

The mine operates under Nunavut Water Board Licence 2AM-LUP0914 which was transferred from a previous owner to Lupin Mines Inc., a subsidiary of Wolfden Resources. Ownership of Wolfden was acquired by Zinifex Limited of Melbourne, Australia in 2007. In 2008, Zinifex merged with Oxiana Ltd. of Australia to form OZ Minerals Ltd. In 2009, the Canadian assets of OZ Minerals were sold to China Minmetals Ltd. The Canadian operating company set up after that transaction is MMG Resources Inc., which is a wholly owned subsidiary of Minerals and Metals Group Ltd. of Melbourne Australia. The mine continues to be held by the corporation Lupin Mines Inc., which is a wholly owned subsidiary of MMG Resources Inc.

The mine discontinued production in 2005 and is currently operated on care and maintenance status. There has been no tailings deposition since 2005.

The relevant conditions of the Nunavut Water Licence which apply to the annual inspection are:

- A freeboard limit of 1.0 m at Dam 1A should be maintained at all times
- Seepage from the TCA is to minimized
- Any seepage that occurs should be collected and returned to the TCA immediately
- Any erosion of the facilities should be addressed immediately
- Inspection of the dams and related infrastructure should be carried out weekly; and
- The Annual Inspection report should be forwarded to the Water Board within 60 days of the inspection date.

The 2010 inspection was undertaken following the authorization of Andrew Mitchell of MMG. The inspection was carried out by Gordon Maki, P.Eng. and Ernie Krause, Sr. Technologist of TBT Engineering. Conditions and any points of concern were discussed with Andrew Mitchell via teleconference.

Dam Inspection /Review History

Previous dam design, construction inspection and annual inspection reports should be reviewed for data regarding the design and history of prior recommendations for the dams. The following reports may be referenced:

Geocon (1982)	As built information regarding Dam 1A, 1B, 1C, 2 and 4A (later 4) Dams constructed to elev. 485 during 1981 Dams constructed of silty sand till with an upstream synthetic liner keyed to permafrost
Golder (1992)	Design information regarding Dams 4, 5, 6. Dams constructed of silty sand till with upstream liner keyed to permafrost Dam 4 liner extends 15 m upstream from toe. Dam 4 has a downstream rockfill toe drain All liners reported to extend to 0.5 below crest
Golder (2004)	Dam Safety Review Dam Failure Consequence reported to be Very Low for Dams 1A, 2 and 4 Failure Consequence reported to be Low for Dams 1B, 1C, 3, 5, and 6 Slope Stability analysis was carried out by Golder for Dams 1A, 2 and 4. Minimum Factory of Safety 1.6 for static conditions Minimum Factory of Safety 1.3 for seismic conditions An Operations, Maintenance and Surveillance Manual was included
BGC (2007)	2007 Annual Geotechnical Inspection of Perimeter Dams Perimeter embankments found to be in satisfactory condition Minor erosion gullies to be repaired No evidence of permafrost warming in available instrumentation Thermistor and pond level monitoring program suggested
BGC (2008)	2008 Annual Geotechnical Inspection of Perimeter Dams Perimeter embankment crests found to be in good condition Trend for increasing erosion noted. Erosion gullies to be repaired Thermistor and pond level monitoring program suggested Application to Water Board for revised monitoring program suggested
TBT Eng. (2009)	2009 Annual Geotechnical Inspection of Perimeter Dams Recommendation to address toe seepage at Dam 4. Recommendation to flatten slope of toe berm at Dam 1A. Recommendation to investigate minor cracking near downstream toe. Recommendation to infill small pond upstream of Dam 6. Placement of Riprap upstream of Dam 2 to be completed. Improve upstream ditch and storm gully at Dam 3. Minor erosion noted.

Tailings Containment Area

The tailings dams at the Lupin site consist of earth fill dams which rely on ground freezing (permafrost aggradation) to reduce seepage. A secondary liner was keyed into the underlying permafrost during construction. A system of thermistors has been installed in the dams to monitor the temperatures in the dam cores.

The Tailings Containment Area (TCA) uses several low dams to contain the tailings solids. The five cells at the site (illustrated on Figure 2) provide storage for historically deposited tailings and process water as well as accumulations of runoff water. Discharge to the environment from Pond 2 normally occurs every 1 or 2 years.

Prior to discharge, the quality of water is verified and the water treated if required, typically through the addition of lime to increase the pH. Discharge is through the siphons at Dam 2. When water levels in Pond 2 allow, water is transferred from Pond 1 using siphons at J Dam.

Tailings production and deposition ceased in 2005. The mine is currently closed and mine site activities are limited to maintenance of the water levels in the TCA.

Climatic Conditions

Climatic conditions at the site were recorded at the Lupin weather site until 2006. Since then, an automated system has been present at the site. However the nearest site with available climatic data is now located at Kugluktuk, approximately 250 km northwest. The historic Mean Average Annual Temperature (MAAT) at the site is reported to be -11.0 ℃, with a long term MAAT of -10.6℃ at Kugluktuk. The measured MAAT (Kugluktuk) for 2008 was -10.8 ℃ during 2008 which is consistent with long term averages.

Site Inspections

The perimeter dams at the Lupin Mine were inspected by TBT Engineering on August 24 and 25, 2010. The inspections were completed by Gordon Maki, P.Eng. and Ernie Krause, Sr. Technologist from TBT Engineering. Each of the embankments was visually reviewed, photographed and a standardized site inspection form was completed. Areas of concern were discussed with the MMG representative via telephone.

A number of thermistor string readings located along the various perimeter structures were taken by TBT Engineering during the inspection trip. The calibrated results of these readings have provided and have been attached in Appendix B. It should be noted that not all of the perimeter structures have thermistor strings, or where there are thermistor strings, some of the data could not be obtained due to improper connections to the cables, or damaged cables. At some locations, one or more of the thermistors within the string were not operational.

Findings and Conclusions

Details of the various site inspections have been documented on the attached individual site reports (Appendix A). These have been updated in a standardized format to be consistent with previous Annual Inspections.

A review of the thermistor data available indicates the dams continue to maintain frozen conditions below the active zone, located approximately 2 m below grade. Many of the thermistor strings are now damaged and/or not readable. It is recommended that the thermistor monitoiring program be reviewed and updated. Damaged thermistors should be replaced and additional thermistor strings may be warranted.

Except as noted blow, the inspections confirm the dams are generally in satisfactory condition. However, in general, erosion of the downstream slopes has worsened over the last year (possibly due to a heavy precipitation event). Downstream erosion conditions at each of the structures inspected is summarized as follows:

- Dam 1A: Widspread shallow erosion gullies and cracking near downstream crest
- Dam 1B: Minor runoff erosion rills and a few deeper erosion gullies, no cracking.
- Dam 1C: Minor erosion gullies with two cracks noted along downstream slope.
- Dam 2: Extensive erosion gullies, appears to be more extensive than last year.
- Dam 3: Minor erosion rills and sloughing.
- Dam 4: Extensive and deep erosion gullies (3 of which are upto 1 m deep).
- Dam 5: Two small surface cracks and a few small 150 mm deep erosion gullies.
- Dam 6: Extensive erosion gullies (up to 0.5 m deep).

A maintenance program to address and repair downstream erosion along all of the perimeters dams should be implemented to prevent further and eventually destabilizing erosion of the downstream slopes. A design of the erosion measures should be carried out and should consider various options to improve the erodability of the downstream slopes.
Additional recommendations for the various structures other than downstream erosion maintenance are as follows:

Dam 2:

One small area of light seepage was noted along the downstream toe. At the time of this inspection, the seepage water was free of sediment and piping conditions were not evident. It is possible the seepage conditions may become worse over time and with an increase in level of Pond 2. It is possible that some of the water ponding on the downstream side of the dam

originates from seepage through the dam and/or under the dam, through the foundation soils. Seepage may also be related to recent precipitation that may have infiltrated the downstream portion of the dam. A sample of the seepage water should be collected to assess if the source can be Pond 2.

The geotechnical conditions at Dam 2 should be investigated to determine the in situ fill conditions and to measure pore water levels in the dam. In addition, an additional thermistor string may be considered at the seepage location to review the depth of frozen ground. Once conditions at the site are determined, remediation of the downstream slope should be undertaken. Remediation options may involve construction of suitable granular filter zones and / or construction of a suitable impermeable barrier to significantly reduce seepage losses. Widening of the base of the dam to attract the aggradation of permafrost conditions into the deep foundation of the dam may also be considered as a design alternative.

The investigation and design and approvals work should be undertaken in 2011. With suitable monitoring and some temporary remediation efforts, construction of the slope improvements may be scheduled for 2012. In the interim, the water ponded downstream of the dam should be sampled to ensure environmental compliance and may require containment and pump back over the dam. The water level in Pond 2, should be lowered as much as possible to reduce seepage gradients until such time as the seepage conditions are understood and/or corrective measures can be implemented. The seepage conditions at Dam 2 should be monitored and the mine should be prepared to implement immediate temporary repair to the dam should conditions deteriorate.

Dam 3:

Recent upgrades included relocation and construction of the existing upstream ditch spillway across the dam. In addition, the upstream ditch was extended to the new spillway location. Although the new spillway has significantly more capacity than the original, the new spillway was not constructed in strict accordance with the geometry recommended and may have slightly reduced flow capacity. It also appears the upstream ditch extension included the placement of riprap along the invert without the use of geotextile. The newly constructed ditch alignment and the new spillway should be monitored / inspected for signs of erosion and/or insufficient capacity. In addition, the existing upstream ditch (located south of the newly constructed portion) should be cleaned out.

In addition to the above upgrades, it appears that the crest of the dam was also resurfaced with new esker fill. However, it appears that this was placed without compaction. Compaction should be considered to improve erodabilty of the crest surface.

Dam 4:

Measures to address a seepage issues noted last year along Dam 4 (in the area of the downstream coffer dam) have been carried out. This involved in filling the area between the downstream toe and coffer dam, thus flattening the downstream slope. However, the fill material appears to have been placed in a loose manner. As a minimum, surface compaction of the newly placed fill should be considered to improve erodabilty of the new fill surface.

Frequency of Inspections

Clause D.6.f of the Water License (Clause D.6.f) requires weekly inspections of tailings dams, ponds (and associated infrastructure) be undertaken by site staff and records kept on these inspections. This is impractical given the closed condition of the site. However, there are currently seepage issues at Dam 2, it should monitored regularly until such time as the issue is resolved.

A revised inspection schedule should be considered once seepage at Dam 2 has been remediated, with an appropriate amendment to the Water Licence. In addition, revisions to the thermistor reading schedule are appropriate. A suggested schedule was provided in previous Annual Inspection Reports as follows:

- November to April – monthly would be helpful but not critical
- May to June – weekly
- July to October – every two weeks.

The monitoring data is to provide proactive assessment of potentially deteriorating performance of the dams. Instrumentation and monitoring data from the various dams should be reviewed immediately after collection.

Closure

We trust the above addresses your requirements at this time. We enjoyed working with you on this project. Please contact us at your convenience should you have any questions.

Yours truly,
For TBT Engineering

REGISTERED PROFESSIONAL ENGINEER
G.C. MAKI
LICENSEE
NWT/NU

Gordon Maki, P. Eng.
Manager of Geotechnical Engineering

Wayne Hurley
Principal

PERMIT TO PRACTICE
TBT ENGINEERING LIMITED
Signature
Date Nov 3/10
PERMIT NUMBER: P561
NWT/NU Association of Professional Engineers and Geoscientists

APPENDIX “A”

2010 GEOTECHNICAL INSPECTION
PERIMETER TAILINGS DAMS

DAM 1A

LOCATION:	West side of Pond 2.
FUNCTION:	Major perimeter closure for water retention; siphon pipes for water decant system on the crest of the dam. Pond level presently being lowered using siphons
LENGTH:	250 +/- m
MAX HEIGHT:	8 m +/- above d/s tundra.
AS-BUILT CREST ELEVATION:	486.27 m
CURRENT CREST ELEVATION:	486.1 – 486.4 m
POND ELEV.:	481.8 m
FREEBOARD :	4.3 m
CREST WIDTH AND CONDITION:	7 to 8 m; surfaced with esker material, but not traveled because of the siphons. No significant cracking evident; condition remains good.
RIPRAP:	Run of Mine rockfill; broadly graded; good condition.
BACKSLOPE:	Approx. 1.5H; 1V; variably armored with cobbles and boulders. Of the 5 siphon pipes in place last year, only 2 remain in service. The most northerly 3 siphon pipes have been completely removed while the 2 most southerly siphon piles have been left in-place below the access road. In the area of the two remaining siphon pipes, the pipe supports along the stream slope have been removed and the slope flattened with granular fill to support the siphon pipes. This slope flattening was carried out over a length of approximately 26 m. Slope flattening was not carried out in the area of the three abandoned siphon pipes. Two ,1 m long cracks noted near the downstream crest, likely due to shallow sloughing as a result of the formation of widespread shallow erosion gullies along downstream slope. Erosion is most predominant south of the remaining 2 siphon pipes.
ACCESS ROAD TOE BERM	As per recommendations made last year, the downstream slope of the access road toe berm was regraded and provided with riprap over a 48 m long section. The downstream slope of the access road toe berm is approximately 2.5H:1V

SEEPAGE: No evidence of seepage.

INSTRUMENTATION: Thermistor D1A-00-1 is located in the crest, just south of the mid-point of the dam. However, this thermistor was not operational.

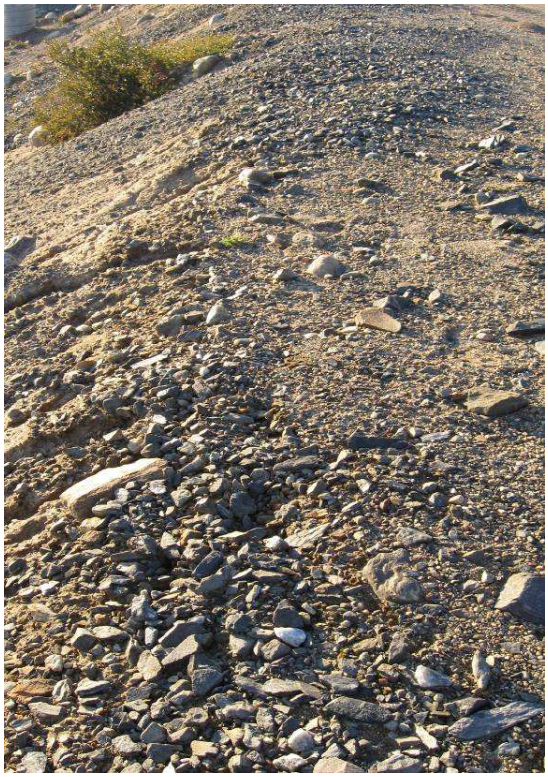
MAINTENANCE RECOMMENDATIONS: Maintenance is recommended to repair erosion along areas of the downstream slope.

CONCLUSIONS: The dam is appears to be in a stable condition. Maintenance of downstream erosion is recommended.

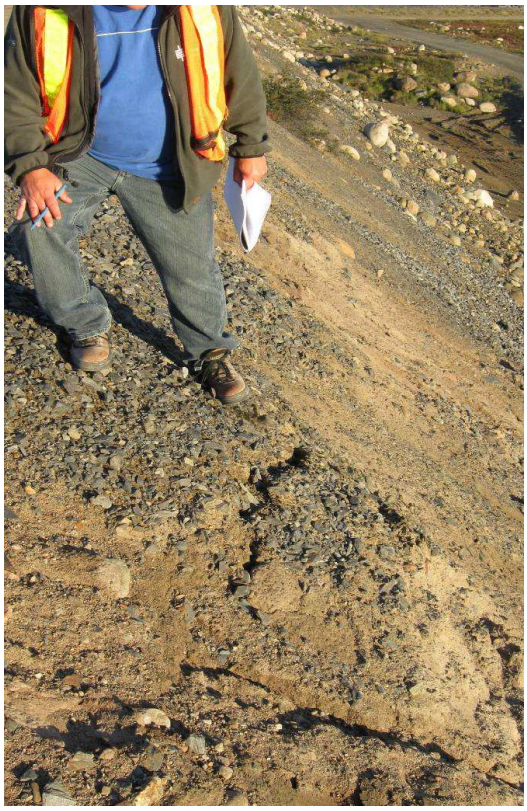
Dam 1A Overview

Dam 1A: Downstream – Looking South (north side of siphons)

Dam 1A – Downstream Slope (south side of Siphons) Erosion Gullies



Downstream Crest: 1 m long narrow crack



Downstream Crest: 1 m long narrow crack

Dam 1A: Downstream Access Road toe Berm Looking South (Note, Downstream Slope Regraded and Covered with Riprap in 2010).

Dam 1A: Downstream Access Road toe Berm Looking North (Note, Downstream Slope Regraded and Covered with Riprap in 2010).

Dam 1A: Upstream Looking North

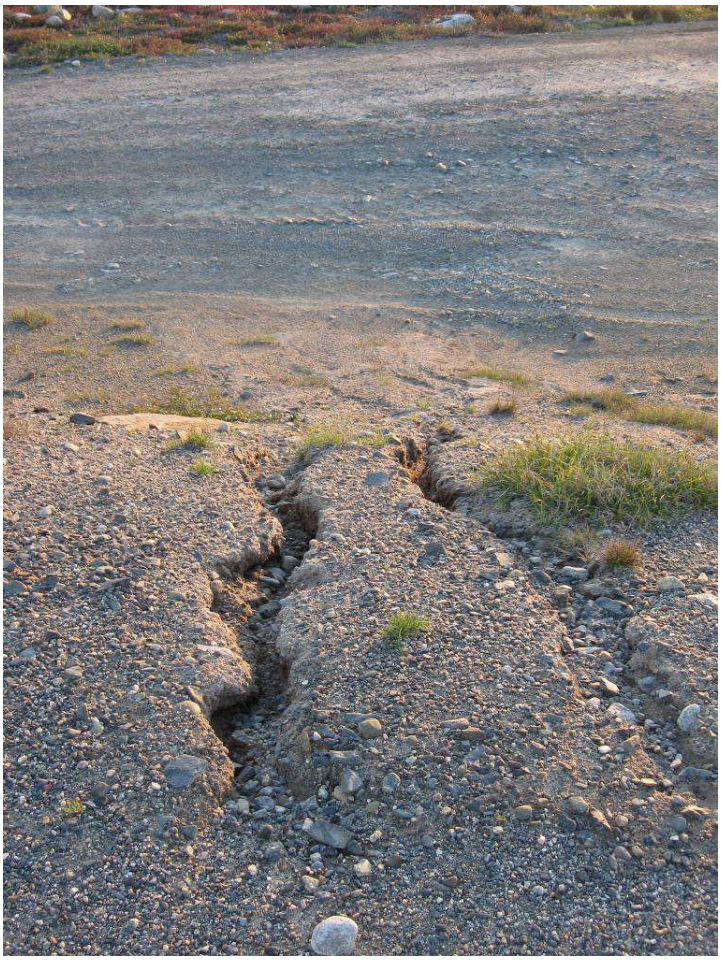
Dam 1A: Upstream Looking South

DAM 1B

LOCATION:	West side of Pond 2.
FUNCTION:	Major perimeter closure for water retention; pond level is below dam base elevation thus currently functioning only as a road embankment.
LENGTH:	250 +/- m
MAX HEIGHT:	2.5 +/- m above d/s tundra.
AS-BUILT CREST ELEVATION:	485.83 m
CURRENT CREST ELEVATION:	485.4 – 485.6 m
POND ELEV.:	481.8 m
FREEBOARD :	3.6 m
CREST WIDTH AND CONDITION:	5 to 6 m wide; surfaced with esker material. Downstream berm provides roadway for access around the perimeter of the TCA. Crest condition is good.
RIPRAP:	Run of Mine rockfill; variable sizes in good condition overall.
BACKSLOPE: toe-of-	Approx. 1.5H; 1V with minor runoff erosion rills and gullies and a slope roadway berm. No cracking observed..
SEEPAGE:	No seepage observed
INSTRUMENTATION:	None.
MAINTENANCE RECOMMENDATIONS:	Maintenance of downstream surface erosion should be considered.
CONCLUSIONS:	The dam appears to be in a stable condition. Maintenance of downstream erosion is recommended.

Dam 1B: Upstream

Dam 1B: Downstream



Dwonstream Slope: Erosion Gullies

DAM 1C

LOCATION:	West side of Pond 2.
FUNCTION:	Major perimeter closure for water retention
LENGTH:	230 +/- m
MAX HEIGHT:	2.2 +/- m above d/s tundra.
AS-BUILT CREST ELEVATION:	485.88 m
CURRENT CREST ELEVATION:	485.3 m
POND ELEV.:	481.8 m
FREEBOARD :	3.5 m
CREST WIDTH AND CONDITION:	9 +/- wide; surfaced with esker material, this dam also functions as a roadway, Crest condition is good. Animals are starting to burrow into the dam body.
RIPRAP:	Run of Mine rockfill; Southerly 2/3 of dam length has been regraded/extended with rip rap and esker material. Minor erosion gullies noted along upstream side near the crest/shoulder (above rip rap).
BACKSLOPE:	Approx. 3H; 1V, smooth slope. Access road berm appears in good condition. Two cracks (one 7 m long and one 12 m long) were observed along the downstream slope. The cracks were 75 to 150 mm deep. Surface sloughing along the downstream slope is visible.
SEEPAGE:	No seepage observed.
INSTRUMENTATION:	None
MAINTENANCE RECOMMENDATIONS:	Maintenance of cracking/sloughing conditions along downstream slope is recommended.
CONCLUSIONS:	The dam appears to be in a stable condition. Maintenance of downstream erosion and sloughing is recommended.

Dam 1C: Upstream (Minor Erosion Gullies on Shoulder of Granular Surfacing)

Dam 1C: Upstream (Minor Erosion Gullies on Shoulder of Granular Surfacing) Souther 2/3 of Upstream Slope Has Been Regraded/Extended with a Mixture of Rip Rap and Esker Material

Dam 1C: Downstream Slope (Some Minor Erosion Gullies)

Dam 1C: Downstream Slope (Some Minor Erosion Gullies)

Downstream Slope (7 m long crack, 75 mm deep, north end of dam)

Downstream Slope (12 m long crack, middle of dam, 150 mm deep)

DAM 2

LOCATION:	North end of Pond 2.
FUNCTION:	Major perimeter closure for water retention; natural pond downstream of the dam.
LENGTH:	350 +/- m
MAX HEIGHT:	5.5 +/- m above d/s tundra.
AS-BUILT CREST ELEVATION:	486.30 m
CURRENT CREST ELEVATION:	485.6 – 486.0 m
POND ELEV.:	481.8 m
FREEBOARD :	3.8m
CREST WIDTH AND CONDITION:	Approx. 6 m; surfaced with esker material and used as the primary traffic route for TCA. Crest relatively uniform and level.
RIPRAP:	Upstream slope as been regraded (flattened) to approximately 4.5H:1V above el. 483 m and 1.5H:1V below el. 483 to the pond level. Regraded with a mixture of riprap and esker material.
BACKSLOPE:	Variable materials but comprised mostly of esker granular material. Erosion gullies and rills appear to be more extensive than last year.
SEEPAGE:	Seepage was observed at one location along the downstream toe (located approximately 20 m south of thermistor D2-00-02). Seepage was estimated at a rate of 2 litres/min. Seepage appeared to be free of any sediment.
INSTRUMENTATION:	Thermistor D2-00-02 is located at the north end of the crest. Several of the thermal couples are not operational. Thermistor D2-00-03 has a broken cable.
MAINTENANCE RECOMMENDATIONS:	Erosion rills and gullies along downstream slope are more extensive than last year. Maintenance of erosion is recommended. One small area of light seepage was observed along the downstream toe. Currently, the seepage rate does not appear to be causing internal erosion. The seepage may be a result of thawing conditions near the northeast abutment, or from recent precipitation events. A sample of the seepage may be collected to possibly determine if seepage is from Pond 2. This

area should be monitored to identify if seepage stops, or for signs of erosion. Should seepage continue and/or worsen, additional investigation and/or remedial measures should be considered.

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CONCLUSIONS:

The dam currently appears to be in a stable condition. However, should seepage conditions continue and/or worsen, stability could be compromised. Further inspection and/or investigation with possible remediation may be required. In addition, the extensive downstream erosion should be repaired. Current seepage conditions should be monitored and investigated further or repaired if seepage continues are worsens.

Dam 2: Upstream Slope Looking Northeast, Regraded with Riprap and Esker Material (graded at approx. 4.5H:1V upper portion, and at 1.5H:1V below about el. 483 m to pond level).

Dam 2: Upstream Looking Southwest

Dam 2: Downstream Slope

Dam 2: Downstream Slope Erosion Gullies and Rills

Dam 2: Downstream Toe (approx. 20 m South of D2-00-02) Clear Seepage at a Rate of Approx. 2 liters/min.

DAM 3

LOCATION:	East end of now-covered tailings storage area, east of Cells 1 and 2.
FUNCTION:	Minor perimeter closure for tailings retention; Boomerange Lake downstream of the dam. The dam retains tailings covered with an esker material cap
LENGTH:	600 +/- m
MAX HEIGHT:	2.5 +/- m above d/s tundra.
AS-BUILT CREST ELEVATION:	488.4 m
CREST WIDTH AND CONDITION:	Approx. 8 m; surfaced with esker material. In 2010, a new upstream ditch outlet spillway was constructed across the dam to replace the existing spillway which did not appear to have sufficient capacity. While the new spillway has a significant increase in capacity over the original spillway, the new spillway was constructed smaller than specified and as such may have less capacity than designed for. In addition, a portion of the upstream ditch has been reconstructed between the old and new spillway locations has been lined with riprap (without geotextile) over a length of approx. 100 m. The existing ditch upstream of the reconstructed section has experienced some erosion and deposition of sediment. Between the old and new spillway locations, the crest of the dam has been recovered with esker material in a loose condition.
RIPRAP:	Not applicable: Inside slope buried with cover comprised of esker sand and gravel.
BACKSLOPE:	Variable in inclination; locally meets the shoreline of Boomerang Lake. Some minor erosion rills and sloughing were noted.
SEEPAGE:	None observed.
MAINTENANCE RECOMMENDATIONS:	The loosely placed esker material along the crest should be compacted to improve resistance to erosion. The existing ditch southeast of the regraded section should be cleaned out to remove accumulated material. The newly regarded portion of the upstream ditch should be inspected for future signs of erosion. The new spillway performance should be monitored for signs of erosion and/or inadequate capacity.
CONCLUSIONS:	The dam appears to be in a stable condition. Maintenance and inspection as recommended above should be carried out.

Dam 3: Overview

Dam 3: Upstream slope looking northwest at area of recent ditch regrading leading to reconstructed spillway. Ditch invert graded at about 3.5%. Tailings side ditch slope at about 4H:1, lake side ditch slope at about 3H:1V. Ditch invert lined with riprap (no geotextile observed).

DAM 3: Usptream crest looking southeast. Loose fill on crest. End of ditch regrading. Ditching upstream of ditch regrading treatment contains some sediment.

Dam 3: Spillway crossing dam at end of upstream ditch. Recently re-constructed with a grade of about 20H:1V (was specified at 30H:1V through the dam and 7H:1V along downstream slope). Through the dam crest, the new spillway has a channel base width of 2 m, not the specified 4 m. The spillway is lined with riprap and geotextile.

Dam 3: Downstream side of spillway (splash pad). Spillway side slope constructed at about 2.5H:1V (steeper than 3H:1V specified). Slopes on the outside of the spillway channel are also steeper than specified.

DAM 4

LOCATION:	South end of Cell 4 for K Dam sub-pond.
FUNCTION:	Perimeter closure for water retention at present; natural pond downstream of the dam at its west end.
LENGTH:	900 +/- m
MAX HEIGHT:	6 +/- m above u/s native ground elevation.
AS-BUILT CREST ELEVATION:	489.59 m
CURRENT CREST ELEVATION:	489.2 – 489.5 m
POND ELEV.:	484.8 m
FREEBOARD :	4.4 m
CREST WIDTH AND CONDITION:	Approximately 12 m wide crest width in generally good condition.
RIPRAP:	Run of Mine rockfill in generally good condition on upstream slope. Occasional small void in riprap and minor sloughing at some locations.
BACKSLOPE:	Esker sand. At the west end of the dam, the area between the dam and the old cofferdam has been infilled (treating oversteeped slope and seepage zone observed last year). The esker fill in this area appears to be placed in loose conditions and may be subject to erosion (as evident by new shallow erosion gullies). The downstream slope east of the old coffer dam has extensive and deep erosion gullies (3 of which are up to 1 m deep).
SEEPAGE:	No seepage observed.
INSTRUMENTATION:	Three of the original four thermistors remain Dam 4. From east to west across the crest, the four cables are numbered TD4-1 to 4. Thermistor TD4-2 was reported destroyed.
MAINTENANCE RECOMMENDATIONS:	Corrective measures have been implemented to address seepage in area of coffer dam noted last year. However, infilling appears to be in a loose manner and may be subject to erosion. Surface compaction is recommended to improve erodability. Extensive erosion with gullies up to 1 m deep have formed along the eastern 2/3 of the dam and should be repaired.

CONCLUSIONS: Dam appears to be in a stable condition. Maintenance of extensive downstream erosion should be carried out to prevent further deterioration of the dam.

Dam 4: Overview

Dam 4: Downstream side, west end of dam. Area between Dam and downstream coffer dam recently infilled with esker material to mitigate seepage conditions note in last years inspection. Base on inspection of completed surface, fill appears to be placed in a loose manner.

Dam 4: Downstream slope. Loose surface and erosion gullies on new infill between dam and cofferdam.

Dam 4: Downstream slope in area of old coffer dam (cobble stone).

Dam 4: Downstream slope, east of cofferdam. Extensive erosion gullies (exposed geogrid).

Dam 4: Downstream slope, east of cofferdam. Extensive erosion gullies

Dam 4: Downstream slope, east of cofferdam. Extensive erosion gullies

Dam 4: Downstream slope, east of cofferdam. Extensive erosion gullies.

Dam 4: Downstream slope, east of cofferdam (looking west). Extensive erosion gullies

Dam 4: Upstream slope

Dam 4: Upstream slope.

DAM 5

LOCATION:	Southeast corner of Cell 3, just northwest of Dam 4.
FUNCTION:	Minor perimeter closure intended for future tails and water retention; currently functioning as a road embankment.
LENGTH:	250 +/- m
MAX HEIGHT:	1.5 +/- m above d/s tundra.
AS-BUILT CREST ELEVATION:	491.54 m
CREST WIDTH AND CONDITION:	Approximately 8 m wide and esker surfaced so that the dam may also function as roadway. Crest is in generally good condition.
RIPRAP:	Approximate slope of 3H:1V and in good condition.
BACKSLOPE:	About 1.5 to 2H:1V with till and esker sand. 2 small cracks noted along downstream shoulder along east half of dam (indication of possible shallow sloughing). A few small 150 mm deep erosion gullies have formed along downstream slope.
SEEPAGE:	No seepage observed. No water head being retained by the majority of structure.
MAINTENANCE RECOMMENDATIONS:	Downstream erosion should be maintained.
CONCLUSIONS:	The dam appears to be in a stable condition. Maintenance of downstream erosion recommended.

Dam 5: Upstream

Dam 5: Downstream

Dam 5: Downstream. Erosion gullies.

Dam 5: Downstream. Erosion gullies.

Dam 5: small crack near downstream shoulder

Dam 5: small crack near downstream shoulder

DAM 6

LOCATION:	West side of Cell 3 retaining tailings.
FUNCTION:	Minor perimeter closure. Retaining some tailing beach and ponded water on the northern portion of the dam.
LENGTH:	300 +/- m
MAX HEIGHT:	2.5 +/- m above d/s tundra.
AS-BUILT CREST ELEVATION:	490.25 m previously
CREST WIDTH AND CONDITION:	Approximately 10 m wide and esker surfaced to function as a roadway. Crest in good condition.
RIPRAP:	Not applicable for most of dam. Upstream side tailings have been covered with esker sand and gravel. Riprap along upstream slope in area of small upstream pond.
BACKSLOPE:	About 2H:1V with till and esker sand; extensive erosion gullies have now formed along downstream slope (up to 0.5 m deep).
SEEPAGE:	No seepage observed.
MAINTENANCE RECOMMENDATIONS:	Backfilling of ponded area may be considered (as previously recommended). Maintenance of downstream erosion is recommended.
CONCLUSIONS:	The dam appears to be in a stable condition. Maintenance of downstream erosion is recommended.

Dam 6: Upstream

Dam 6: Upstream. Riprap in area of small pond.

Dam 6: Upstream

Dam 6: Downstream. Erosion gullies.

Dam 6: Down stream erosion gullies.

REFERENCES

TBT Engineering Limited, 2009 Annual Geotechnical Inspection, Perimeter Dams Tailing Containment Area, Lupin Mine, Nunavut, Prepared for MMG Rsources Inc., Reference No. 09-161, December 1, 2009.

BGC Engineering Inc.,2008 Geotechnical Inspection fo Perimeter Tailings Dams, Lupin Mine Nunavut, Report submitted to OZ Minerals Canada Ltd., Project No. 0385-007-03, December 17, 2008, 14 pages plus figures and appendices.

BGC Engineering Inc.,2007 Geotechnical Inspection fo Perimeter Tailings Dams, Lupin Mine Nunavut, Report submitted to Zinafex Canada Inc., Project No. 0385-006-03, October 31, 2007, 14 pages plus figures and appendices

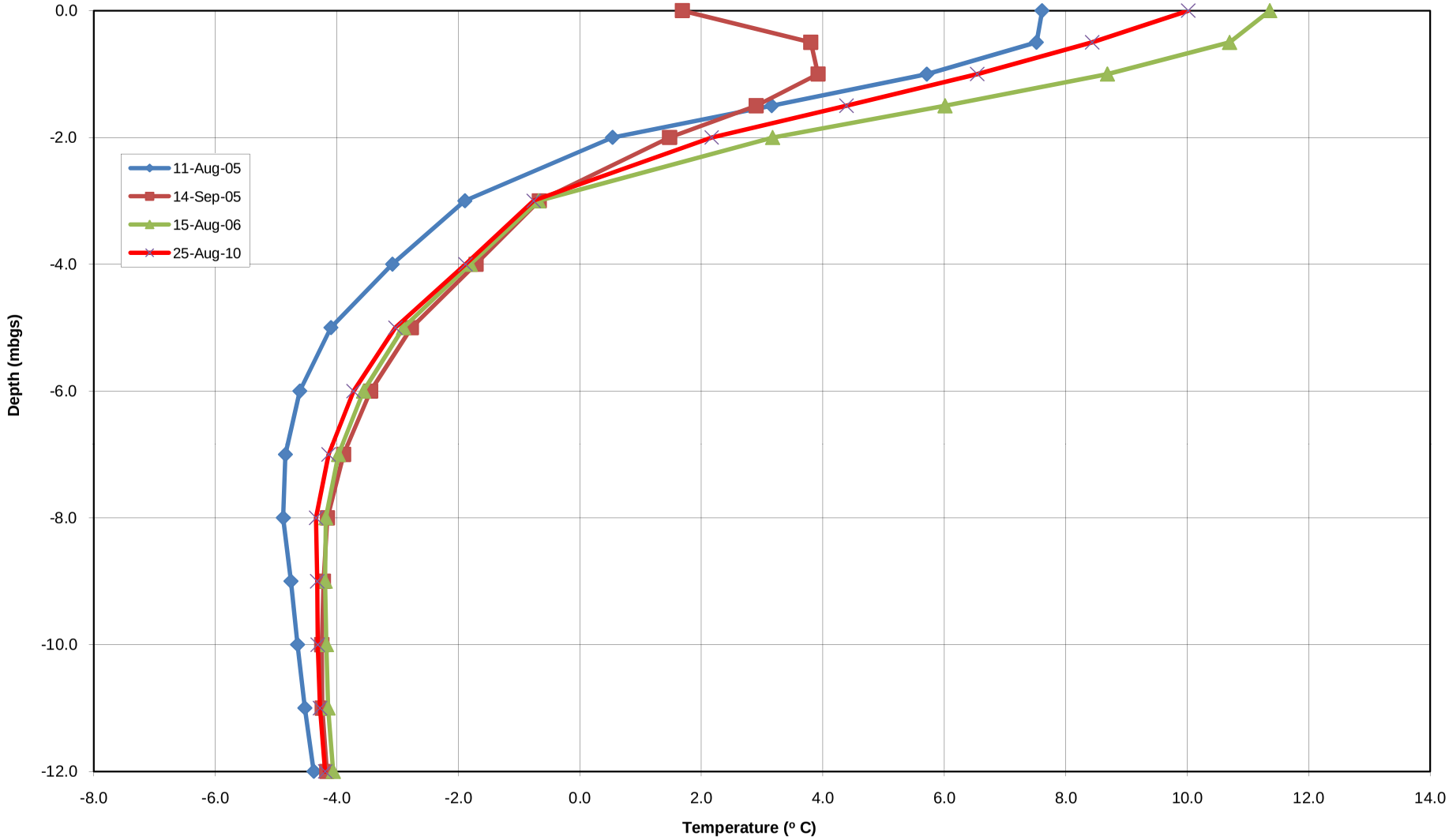
BGC Engineering Inc. 2003. Dam 6 Site Investigation and Raise Design, Lupin Mine, Nunavut. Report submitted to Kinross Gold Corporation, Project No. 0256-006, July 25, 2003, 31 pages plus figures and appendicies.

Golder Associated Ltd. 2004. 2004 Dam Safety Review, Perimeter Tailings Dams, Lupin Mine, Nunavut. Report submitted to Kinross Gold Corporation, Project No. 04-1321-022,December 2004, 36 pages plus figures and appendix.

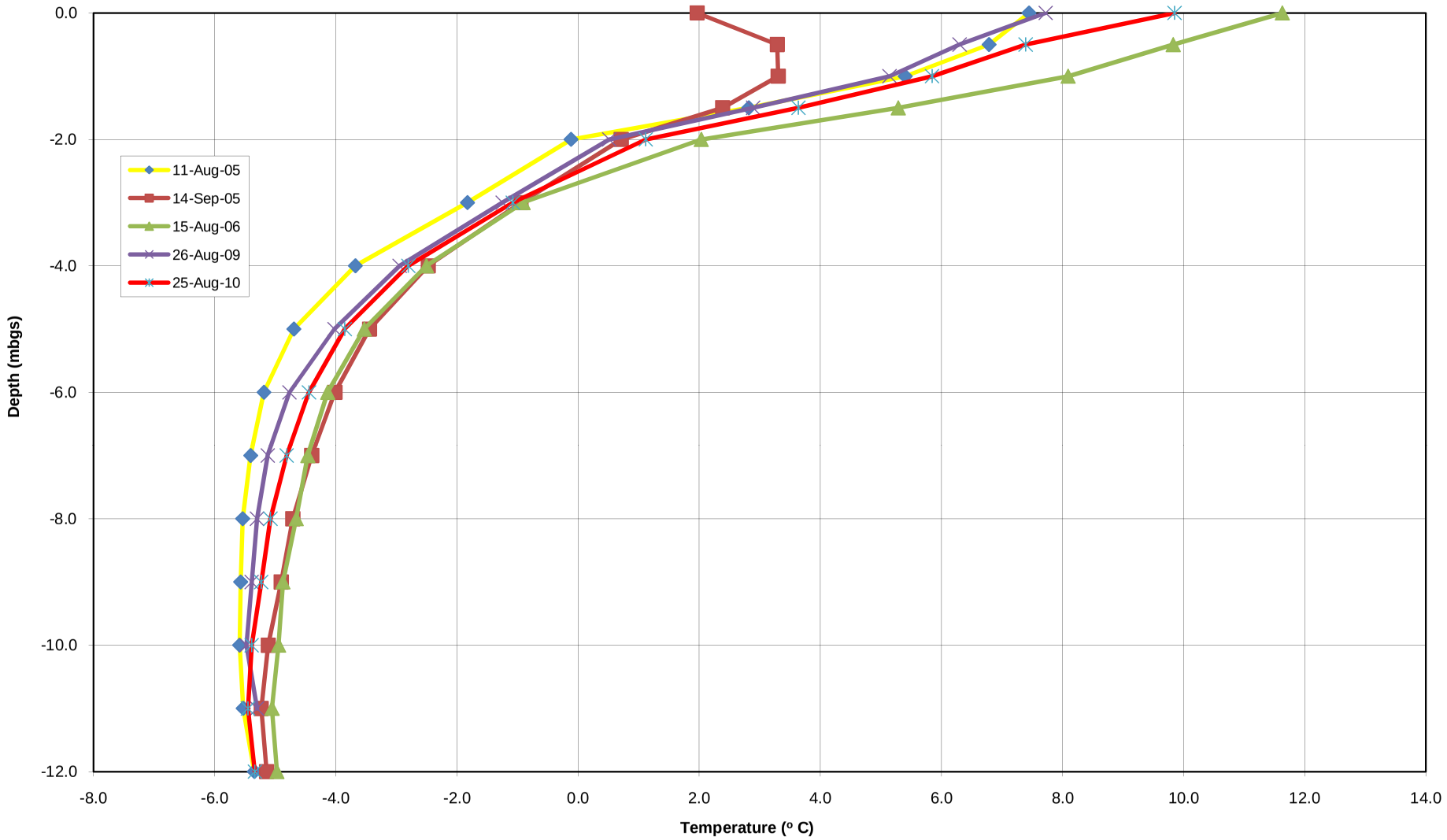
APPENDIX “B”

THERMISTOR DATA

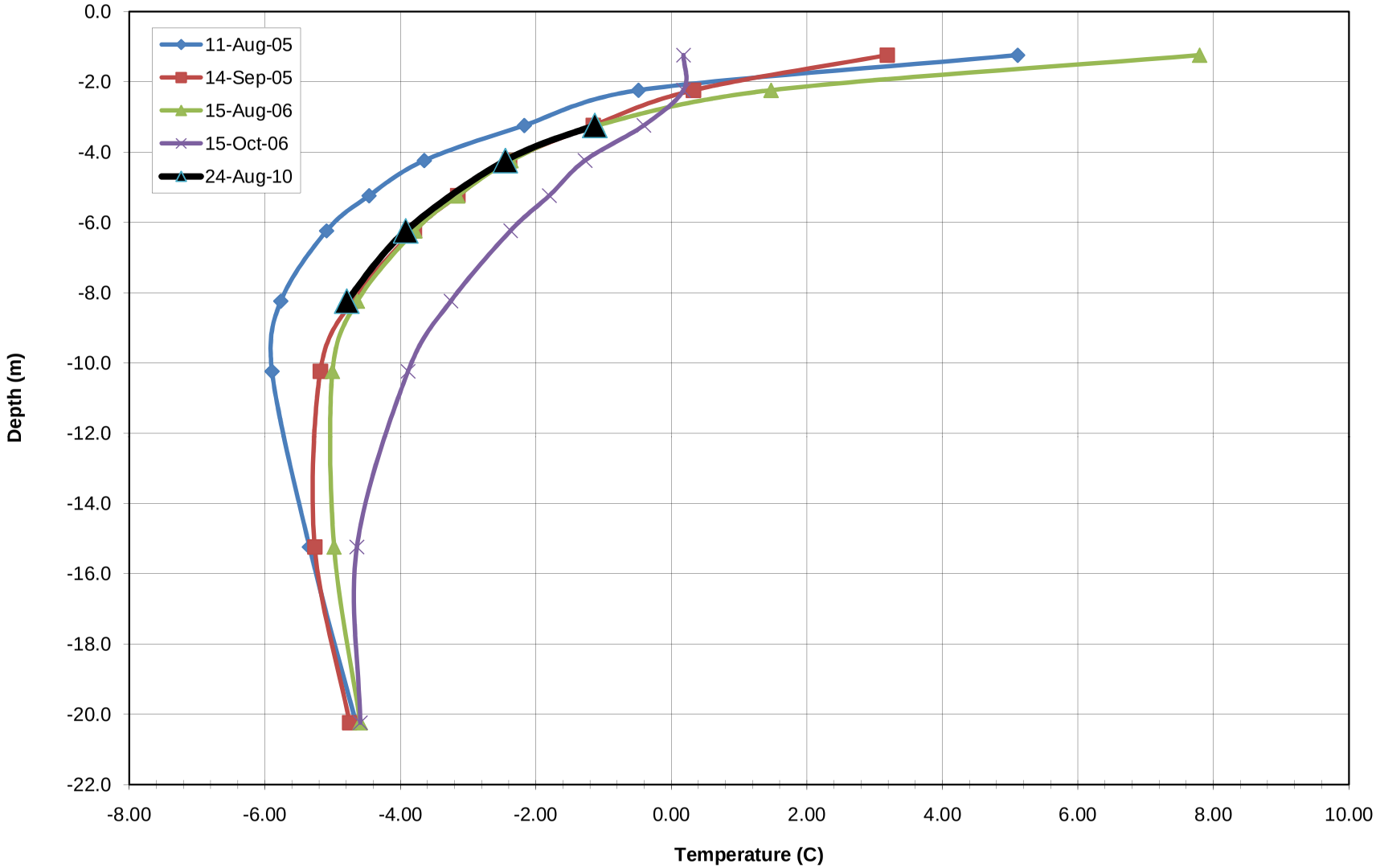
Thermistor D4-3 - Installed October 25, 1995
(Vertical Thermistor installed on the crest of Dam 4, West End, Just East of TD4-4)



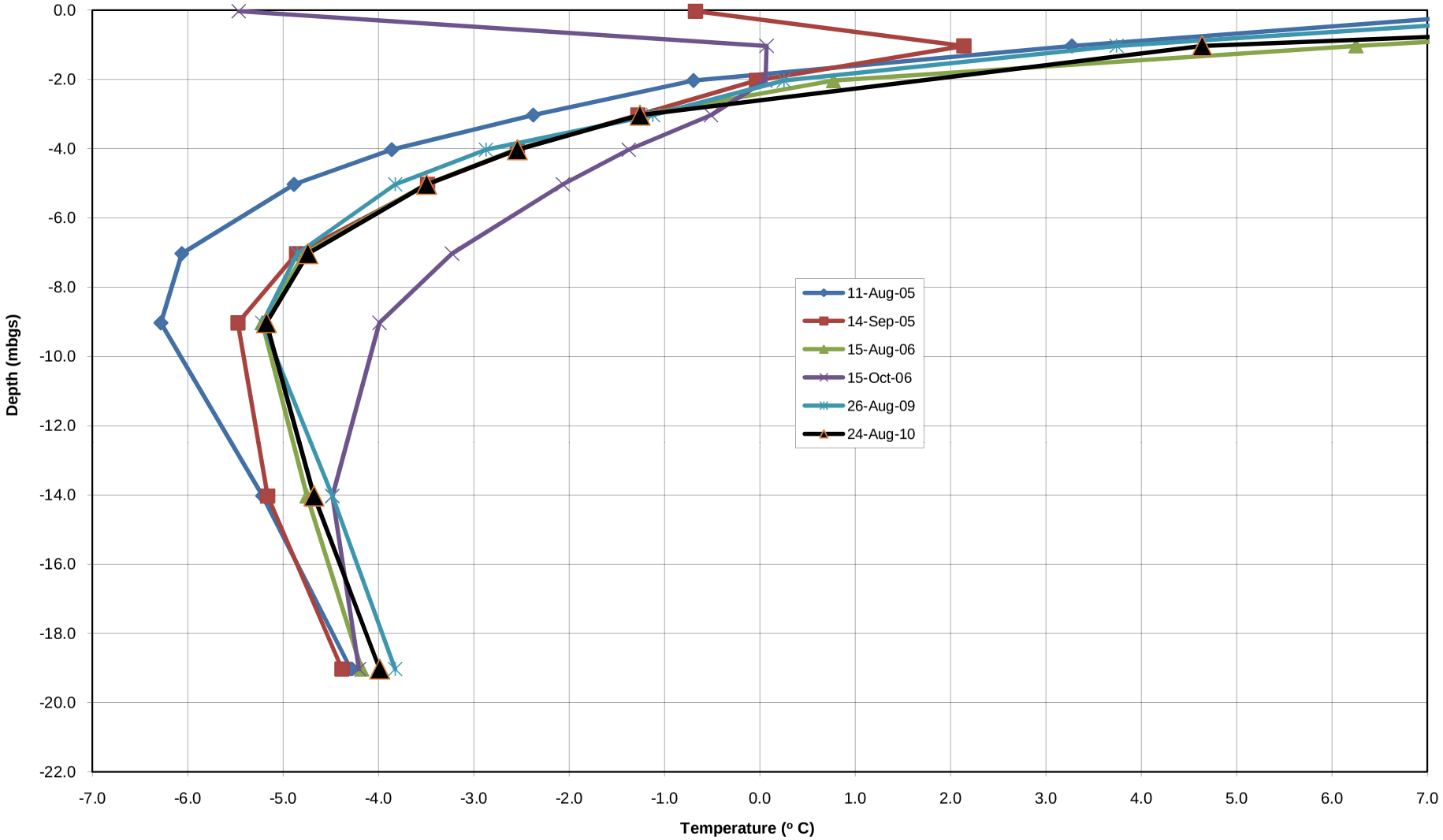
Thermistor D4-1 - Installed October 24, 1995
(Vertical Thermistor installed on the crest of Dam 4, Far East End)

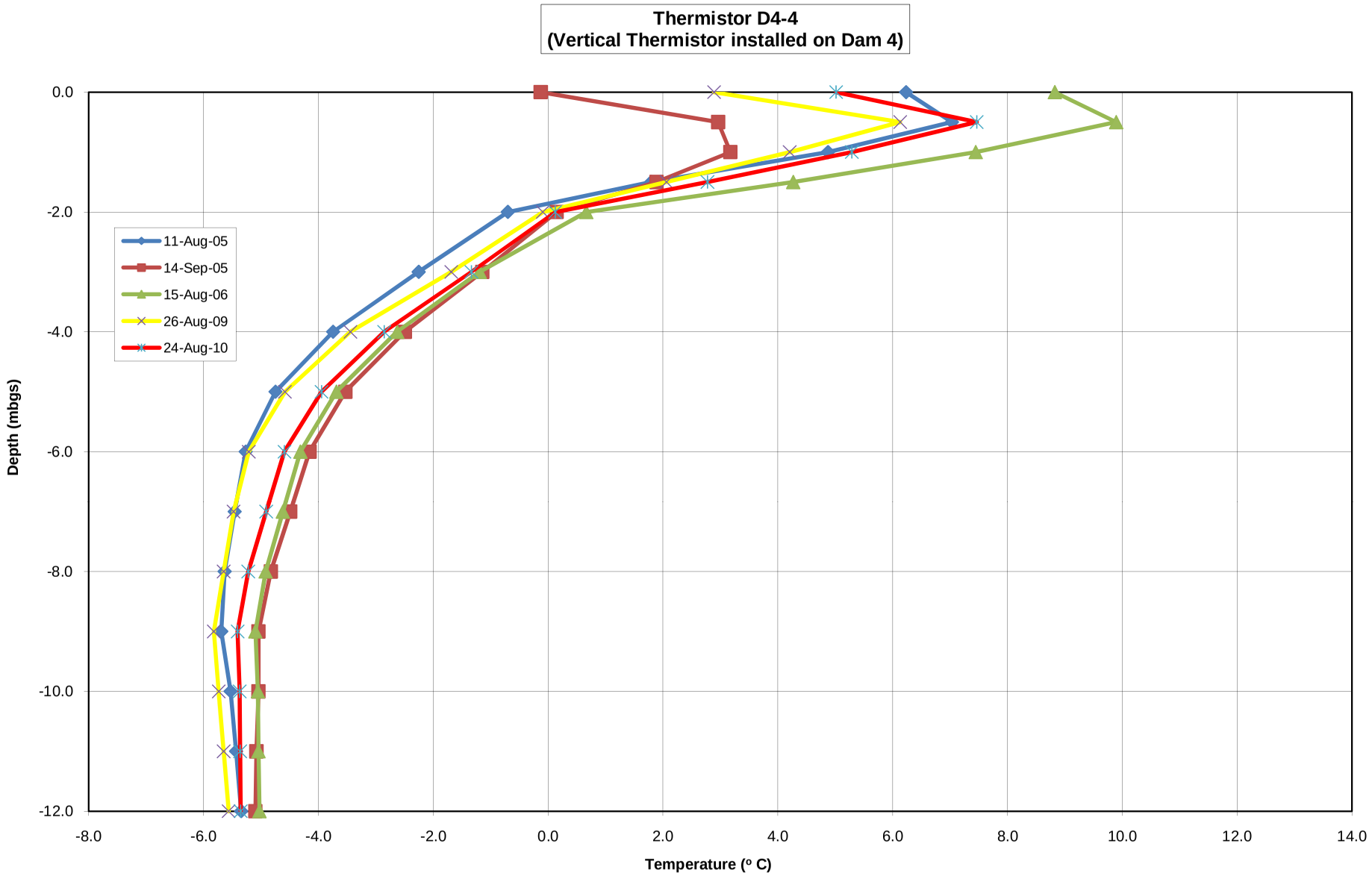


Thermistor D2-00-2 n- Installed November 8, 2000
(Vertical Termistor Installed on the crest of Dam 2, at the north end)



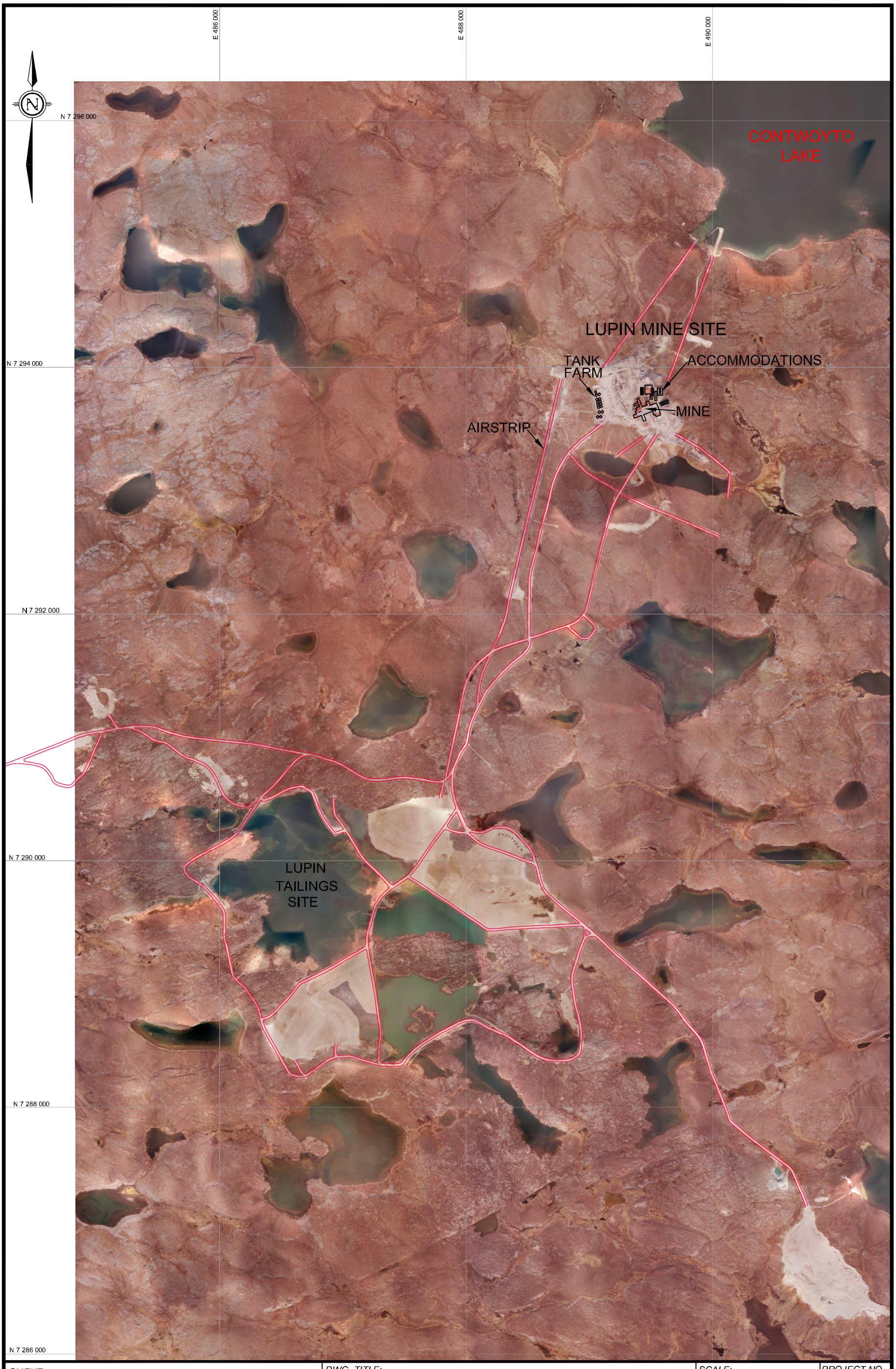
Thermistor D1A-00-01 - Installed November 9, 2000
(Vertical Thermistor installed on the crest of Dam 1A, south of Syphons)




Thermistor D4-4
(Vertical Thermistor installed on Dam 4)
Depth (mbgs)
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
-12.0
11-Aug-05
14-Sep-05
15-Aug-06
26-Aug-09
24-Aug-10
-8.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
Temperature (º C)

ENCLOSURES

CLIENT: MIN METALS GROUP LTD	DWG. TITLE: LUPIN FACILITY - OVERVIEW MAP	SCALE: 1:7,500	PROJECT NO. 10-069
TBT ENGINEERING CONSULTING GROUP	PROJECT: LUPIN MINE ANNUAL INSPECTION LUPIN FACILITY, NUNAVUT		DATE: OCT.2010
			ENCLOSURE 1



CLIENT:

MIN METALS GROUP

MMG

TBT ENGINEERING CONSULTING GROUP

DWG. TITLE:

LUPIN FACILITY AREA PLAN

SCALE:

1 : 30,000

PROJECT NO.

10-069

PROJECT:

LUPIN ANNUAL INSPECTION

LUPIN FACILITY, NUNAVUT

DATE:

OCT.2010

ENCLOSURE

2