BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

NYRSTAR

NANISIVIK MINE

UPDATED POST CLOSURE GEOTECHNICAL MONITORING CONTINGENCY PLAN

PROJECT NO.:	0255-024-04	DISTRIBUTION:	
DATE:	March 17, 2015	Nyrstar:	1 copy
DOCUMENT NO.:		BGC (Calgary):	2 copies
		BGC (Vancouver):	e-copy

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY
Suite 200 - 1121 Centre St. NW
Calgary, AB Canada T2E 7K6
Telephone (403) 250-5185
Fax (403) 250-5330

March 17, 2015
Project No.: 0255-024-04

Mr. Johan Skoglund
Group Environment Manager, Americas
Nyrstar
Tessinerplatz 7
8002 Zurich, Switzerland

Dear Johan,

Re: Updated Geotechnical Contingency Plan, Nanisivik Mine, Nunavut

Please find attached our updated Geotechnical Contingency Plan developed for geotechnical reclamation measures undertaken during the closure of Nanisivik Mine. This document is an updated version of the plan previously issued to the Nunavut Water Board in 2009. The document fulfills requirement Part I, Item 12a of the Water License (AR-NAN1419) recently issued to Nyrstar for Nanisivik Mine. If there are any questions or comments regarding this report, please contact the undersigned at your convenience.

Yours sincerely,

BGC ENGINEERING INC.
per:

Geoff Claypool, M.Eng., P.Eng.
Senior Geological Engineer

EXECUTIVE SUMMARY

This document provides an updated contingency plan for post closure geotechnical monitoring program at the Nanisivik Mine site for the duration of the current Water License (1AR-NAN1419). The geotechnical monitoring program consists of regular monitoring of geotechnical instruments between July 1 and September 1 and an annual inspection of reclamation measures by a geotechnical engineer. The report describes a number of potential issues that could arise during the post closure monitoring program, which may warrant implementation of contingency measures. The issues are separated into those related to physical integrity of the reclamation measures and those related to geotechnical monitoring data collected for various purposes at different areas of the mine site. The report provides the following for each potential issue:

- A description of what each issue involves.
- How each issue can be recognized.
- The significance of each issue.
- How prevalent each issue has been during the post closure geotechnical monitoring undertaken to-date.
- A description of potential contingency measures to be considered should each occurrence be observed.

The discussion provided in the report utilizes observations made during post closure geotechnical monitoring undertaken annually at the site since completion of many of the reclamation measures in 2005. Hence, the proposed contingency plans benefit from the nearly 10 years of observed performance. These annual geotechnical monitoring reports should be reviewed in conjunction with this contingency plan document for complete context.

TABLE OF CONTENTS

LIST OF APPENDICES

LIMITATIONS

BGC Engineering Inc. (BGC) prepared this document for the account of Nyrstar. The material in it reflects the judgment of BGC staff in light of the information available to BGC at the time of document preparation. Any use which a third party makes of this document or any reliance on decisions to be based on it is the responsibility of such third parties. BGC accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this document.

As a mutual protection to our client, the public, and ourselves, all documents and drawings are submitted for the confidential information of our client for a specific project. Authorization for any use and/or publication of this document or any data, statements, conclusions or abstracts from or regarding our documents and drawings, through any form of print or electronic media, including without limitation, posting or reproduction of same on any website, is reserved pending BGC's written approval. A signed and sealed copy of this document is on file at BGC. That copy is the record document, and takes precedence over any other copy or reproduction of this document.

1.0 INTRODUCTION

Nanisivik Mine is currently owned by Nyrstar, who obtained the property through its purchase of Breakwater Resources Ltd. (Breakwater) in 2011. The Nanisivik Mine began production of zinc and lead concentrates in 1976. After 27 years of successful operations, the economic mineral deposit was depleted in 2002 and the mine entered the Closure and Reclamation phase in September 2002.

The Final Closure and Reclamation Plan (FCRP) for the Nanisivik Mine was submitted to the Nunavut Water Board (NWB) by CanZinco in March 2004 (CanZinco 2004). The NWB conveyed its approval of the FCRP for Nanisivik Mine in a letter to Breakwater dated July 6, 2004 (NWB 2004).

The reclamation of the mine site has been ongoing since August 2004, with the bulk of reclamation completed between 2004 and 2008. Since then, the post closure geotechnical and water quality monitoring programs have been undertaken annually as outlined in the Water License for the site issued to Nyrstar and the NWB.

Water License 1AR-NAN1419 (the License) was recently issued by the NWB to Nyrstar which covers site operations between December 23, 2014, and December 22, 2019. Included in the License is a requirement (Part I, Item 12a.) to update the previously submitted post closure geotechnical monitoring contingency plan (BGC 2009b). To address this regulatory requirement, Mr. Johan Skoglund, Group Manager Environment, for Nyrstar requested that BGC Engineering Inc. (BGC) update the noted document. This document addresses this requirement of the License and provides an updated contingency plan for geotechnical monitoring to be undertaken at site for the duration of the current License. The water quality monitoring program contingency plan is also being updated, by others, as requested in the License.

2.0 POST-CLOSURE GEOTECHNICAL MONITORING PROGRAM

The approved post-closure geotechnical monitoring program (Schedule I, Table 3 in the License) consists of regular monitoring of geotechnical instruments (thermistors, thermocouples, frost gauges and piezometers) and an annual inspection of reclamation measures by a geotechnical engineer. The instruments are typically monitored bi-weekly or monthly between July 1 and Sept 1. Shortly after collection, the data is forwarded to a geotechnical engineer for review.

The results of the monitoring program are assessed by a qualified geotechnical engineer on an ongoing basis and the results are summarized in an annual geotechnical monitoring report. The annual geotechnical monitoring report includes a comprehensive review of observations recorded during the annual geotechnical site inspection, as well as a detailed assessment of the geotechnical monitoring data collected throughout the year. The most recent report was submitted by BGC to Nyrstar in February, 2015 (BGC 2015). The annual geotechnical monitoring report is forwarded to the NWB by Nyrstar as part of their annual environmental monitoring report.

3.0 CONTINGENCY PLANS

The following sections describe a number of potential issues that could arise during the post closure monitoring program, which may warrant implementation of contingency measures. The issues are separated into those related to physical integrity of the reclamation measures and those related to geotechnical monitoring data collected for various purposes at different areas of the mine site. The following sections provide the following for each potential issue:

- A description of what each issue involves
- How each issue can be recognized
- The significance of each issue
- How prevalent each issue has been during the post closure geotechnical monitoring undertaken to-date
- A description of potential contingency measures to be considered should each occurrence be observed.

The discussion provided in the following sections utilizes observations made during post closure geotechnical monitoring undertaken annually at the site since completion of many of the reclamation measures in 2005. Hence, the proposed contingency plans benefit from the nearly 10 years of observed performance. The observations are documented annually in the geotechnical monitoring report. These annual geotechnical monitoring reports should be reviewed in conjunction with this contingency plan document for complete context.

3.1. Physical Integrity

The following section describes a number of potential issues related to the physical integrity of the reclamation works which may be observed during a visual inspection of the site.

3.1.1. Erosion of Covers

Surface erosion of the covers involves loss of cover material due to the movement of surface water. It can generally be recognized by the development of a channelized feature such as a gully or rill on the surface of the cover. Surface erosion is significant due to the potential to reduce the cover thickness or, in an extreme case, expose the underlying waste materials. Either of these events have the potential to locally affect the geothermal performance of the cover and, thus, have the potential to negatively impact surface water quality. The covers have generally been constructed using shallow surface grades and erosion resistant materials. As such, significant surface erosion is not anticipated, but this will be function of performance under extreme climatic events. Since construction of most of the covers was completed in 2005, only minor rill erosion has been observed in select areas of the East Open Pit and Oceanview open pit cover systems, both of which were overbuilt in anticipation of minor erosion. If significant surface erosion is observed, potential mitigation measures include additional placement of coarser surface armour at select locations, re-grading of the slope to a shallower angle or development of armoured drainage swales, potentially including berms and/or water bars, to accommodate observed surface flows. Given no stockpiles of armour material remain at site, additional armour material would need to be generated for use as needed.

3.1.2. Development of Thermokarst Features on Covers

Thermokarst features can develop due to melting of ice that is either entrained within the cover materials or in the underlying mine waste. It can generally be recognized by a circular depression in the surface of the cover. The size can vary, but the features observed to date typically range from 30 to 200 cm in diameter and from 30 to 60 cm in depth. Thermokarst features are significant due to the localized thinning of cover and a local negative impact to the geothermal performance of the cover. Due to the ice encountered in the shale borrow areas during construction, thermokarst features were common in the first year following construction as the ice entrained within the shale fill melted. These features were repaired as they were observed throughout the site. Since then, the frequency of thermokarst development has lessened and is not anticipated to be a long term issue. However, if thermokarst features are observed, the recommended mitigation measure involves backfilling the thermokarst feature with additional armour material.

3.1.3. Sloughing / Slumping of Sloped Covers

Surficial instability of sloping covers can involve sloughing or slumping of material where the material slides downslope due to weak material properties or saturated conditions. It can generally be recognized by the development of a head scarp (usually near vertical), with an associated semi-circular crack demonstrating some vertical and/or lateral / downslope movement. Sloughing or slumping of the cover systems can be significant due to the potential to expose the underlying mine waste. Due to the overall gentle sloping nature of most of the cover systems and the coarse granular particle size of the cover materials, sloughing and slumping of the cover systems has not been observed since construction of the cover systems. However, should sloughing of the cover systems be observed in the future, potential mitigation measures may include buttressing of the unstable area with additional material or improving surface drainage to reduce near-surface moisture conditions.

3.1.4. Erosion of Shoreline Protection in Reservoir

Shoreline protection was constructed along the perimeter of the cover system at the edge of the Reservoir in the West Twin Disposal Area. The shoreline protection comprises dolostone rip rap which was applied to the surface of the regular sand and gravel armour material to protect the cover materials from wave erosion and to provide some protection from ice plucking. The rip rap extends approximately 1 m below the normal water level in the Reservoir. Erosion of the shoreline protection can be significant due to the potential to expose the underlying cover materials which would then be subject to wave erosion and ice-plucking. This could eventually lead to exposure of the underlying tailings. No erosion of the shoreline protection has been observed since completion of construction in 2005. However, if erosion of the shoreline protection is observed, potential mitigation measures could include increasing the particle size, thickness or angle of the face of the rip rap layer.

3.1.5. Erosion of Hydraulic Channels

The West Twin Dyke Spillway and the East Twin Creek Diversion Channel are the two significant hydraulic channels that function as part of the reclamation of the West Twin Disposal Area (WTDA). The spillway conveys water from the Surface Cell cover into the Reservoir and the diversion channel conveys water between East Twin Lake and the confluence with the outflow from the WTDA at the West Twin Outlet Channel. Both channels have bank armouring to reduce potential for erosion. The potential significance of erosion is unique to each structure. If the banks of the spillway experience significant erosion leading to localized bank instability, the flow within the spillway could become temporarily impeded. However, given the flow volumes relative to the channel capacity, it is unlikely that the flow would exit the spillway channel. If erosion of the left bank of the diversion channel occurs, the performance of the diversion dyke could become compromised and, in an extreme case, the flow from the creek may enter the polishing pond. Erosion of a portion of the left bank of the spillway has been observed periodically since construction due to flows during spring freshet. Similarly erosion of a portion of the left bank of the diversion channel has been observed in recent years also related to spring freshet flows. The observed erosion at each structure has been moderate, which some efforts undertaken to address the spillway erosion in 2012. Should additional erosion be observed, enhanced armouring (extent, width, fragment size, etc.) of the banks would be required. Given no stockpiles of armour material remain at site, additional armour material would need to be generated for use as needed.

3.1.6. Lower than anticipated water level in Reservoir

The water level in the Reservoir is maintained by the West Twin Outlet Structure which includes an armoured channel and concrete weir. Water from the WTDA passes through this channel and proceeds over the weir, prior to entering Twin Lakes Creek. The structure is designed to maintain the water level in the Reservoir at 370.2 m elevation. This maintains a water cover of minimum 1 m thickness over the tailings that remain in the Reservoir. It should be noted that the hydraulic design of the WTDA accounted for the water level in the Reservoir to fluctuate between a low of 370.0 m and a high of 370.8 m, corresponding to the extreme drought conditions and the probable maximum precipitation event, respectively. If the water level in the Reservoir were lower than the design low water level, potential negative impacts to water quality in the Reservoir may occur. Based on observations during the annual geotechnical inspections since construction of the outlet structure, the water level in the Reservoir during open water season has been observed to fluctuate, within the expected range, in response to inflows of surface water, evaporation and seepage losses through the base of the remnant polishing pond. Should the water level in the Reservoir be observed to be below the design low water level, water quality monitoring would be reviewed to see if a correlation existed whereby effluent quality was degrading. Should this be the case, seepage losses at the West

Twin Outlet Structure and polishing pond may need to be addressed. This could be addressed by backfilling a portion of the remnant polishing pond immediately upstream of the outlet structure. Additional options may also be considered depending on the observations at that time.

3.1.7. Crown Pillar Collapse

Openings to the underground mine workings were closed during reclamation of the mine site by construction of rockfill plugs in the portals and raises. During construction of these plugs, additional backfill was also placed beneath the crown pillar to provide support for these areas. If crown pillar collapse were to occur, surficial cracking may occur but the backfill would prevent an opening to the underground mine workings from developing. If an opening to the underground mine workings were to develop, it could pose safety concerns for people passing through the area. Given the additional support provided by the portal plugs, settlement of the crown pillars, to the point where access to the underground workings is created, is thought to be unlikely. Since the closure of the portals in 2005, only some settlement and cracking of the East Open Pit crown pillar has been observed. Should a crown pillar collapse be observed in the future, potential mitigation measures may include backfilling the opening to the underground with additional fill to prevent access and provide additional support to the remaining crown pillar.

3.2. Trigger Levels for Monitoring Data

The following section provides trigger levels and recommended actions should specific data be collected during the monitoring of the geotechnical instrumentation at various locations around the mine site.

3.2.1. Ground Temperatures

The unfrozen portion of the tailings deposit (talik) in the Surface Cell and Test Cell is anticipated to freeze-back with time. The ground temperatures in the Surface Cell and Test Cell taliks are currently being monitored with thermistors and thermocouples. Modeling of the progress of the freezing front into the Surface Cell talik was conducted during the original reclamation plan development and the results were conveyed in BGC (2004a). The results of this study suggested that the -0.2°C isotherm[1] in the Surface Cell talik should progress to the bottom of the dike between 7 and 8 years following construction of the cover system. The results also suggested that the entire Surface Cell tailings deposit would be colder than -0.2°C between 27 and 32 years following construction of the cover system. This anticipated freeze-back envelope is illustrated on Figure 1. The current geothermal conditions in the Surface Cell

[1] The -0.2°C isotherm was selected during the initial modelling to account for the effects of freezing point depression. Based on recent monitoring results, it is likely that the freezing point is closer to -1°C, especially at depth. However, -0.2°C was used in Figure 1 for comparison purposes with the original modeling results.

talik are also illustrated on Figure 1 by plotting the estimated depth of the -0.2°C isotherm from select thermistors in the Surface Cell. As illustrated on Figure 1, the freeze-back of the Surface Cell talik is currently progressing faster than originally anticipated. Slower than anticipated freeze-back is not thought to be of significant concern due to the lack of a hydraulic connection between the Surface Cell talik and the Reservoir. However, should the pace of freeze-back slow, or should the cooling trend reverse, a detailed review of the monitoring results should be undertaken to determine a cause and assess the need for further remedial efforts.

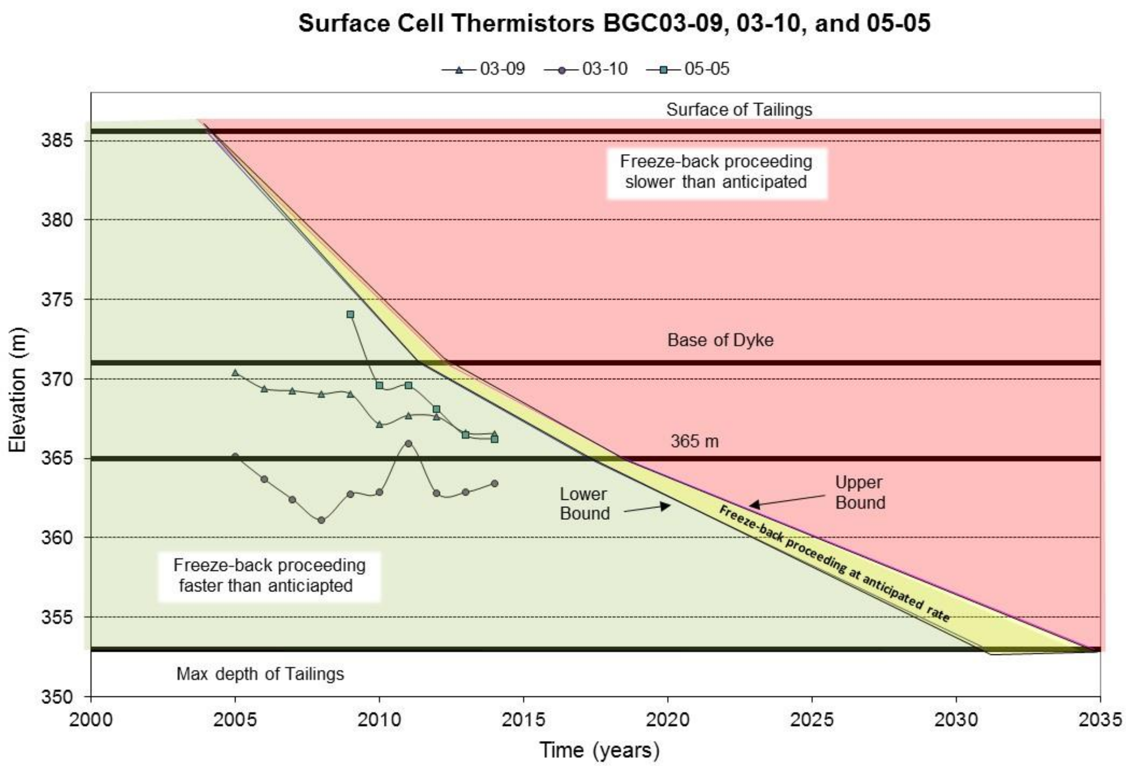


Figure 1. **Freezeback envelope of Surface Cell talik from original geothermal model compared to monitoring data (2005-2014) using location of -0.2°C isotherm.**

3.2.2. Pore Pressures

As the Surface Cell and Test Cell taliks freeze-back, the pore water pressures in each of the taliks are expected to increase due to the pore water expulsion effect. The pore pressures in each of these taliks are being monitored using vibrating wire piezometers. The monitoring data collected to-date supports the original assumption that the pore pressures would increase as the freeze-back progressed. This is especially true in the Surface Cell which is not hydro-geologically connected to the Reservoir, as evidenced by the increasing pore pressures recorded in the remnant Surface Cell talik. High pore pressures in the Surface Cell talik can be significant due to their potentially negative impact on the stability of the West Twin Dike. Should pore pressures increase sufficiently such that dike instability were to occur, tailings could be exposed and/or tailings pore water, potentially high in metals concentration, could be released to the environment. As such, the pore pressures observed in the Surface Cell talik need to be reviewed to ensure they are not approaching a level which may initiate dike instability. Since the geothermal conditions in the talik are changing over time (i.e. the pore pressures are being confined further and further away from the dike due to downward progression of the freezing front), the pore pressures levels which would provide concern, or "trigger levels", are constantly changing with time as well. Thus, the trigger levels must be evaluated using the geometry of the talik and its pore pressures relative to the frozen depth of tailings.

A stability analysis was conducted to determine the piezometric trigger levels for the current piezometric and geothermal conditions in the Surface Cell and Test Cell. The results are provided in Figure 2. Schematics illustrating the model geometry and piezometric conditions are provided in Appendix B. Rather than a single trigger level, a combination of pore pressures in the Surface Cell and Test Cell are provided. For the stability analysis, it was conservatively assumed that the remnant taliks in the Surface Cell and Test Cell are hydraulically connected. This is not believed to be the case, especially given the response of the piezometers in the Surface Cell to talik freezeback. A freezing point depression of -1.0°C was also assumed to define the leading edge of the freezing front at approximately 370 m elevation. This is thought to be appropriate for deeper depths where the freezing point depression appears to be greater, as indicated by monitoring results discussed in BGC (2015).

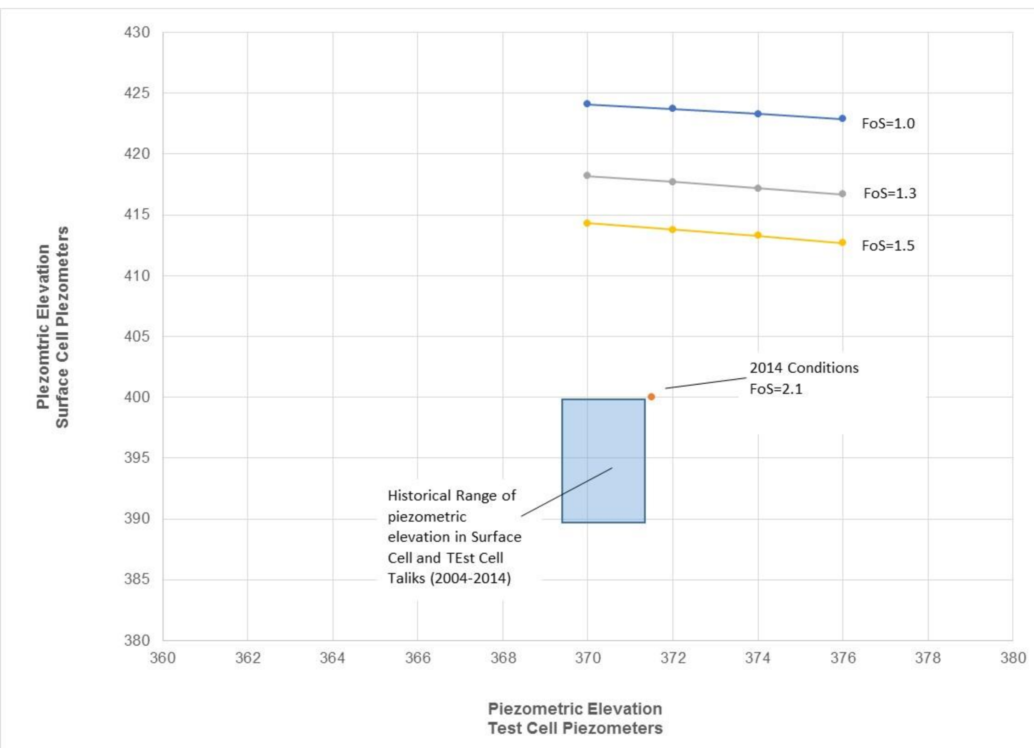


Figure 2. Pore Pressure Trigger Levels for Surface Cell and Test Cell piezometers and corresponding Factors of Safety for Stability of West Twin Dyke.

The results suggest that the current factor of safety against sliding is 2.1, under static loading conditions. This compares to a factor of safety of 1.9 calculated in 2009, using the geothermal and piezometric conditions observed at that time. Hence, the static stability has marginally increased despite the 6 m increase in piezometric elevation recorded in the remnant Surface Cell talik between 2009 and 2014. This increase in static stability is related to the 8 m downward migration in the freezing front also recorded over that time. The results suggest that as the freezing front continues to migrate downwards, the pore pressures in the remnant talik have less potential to impact the stability of the dike.

Should the combination of pore pressures reach the line indicating a factor of safety of the dike was approaching 1.5, a detailed review of the geothermal and piezometric conditions in the Surface Cell should be undertaken. This would require an increase in the piezomertic elevation of approximately 13 m from current conditions. If it is determined that dike stability is a concern, pore pressure relief wells may be required to reduce the pore pressures in the remnant talik to acceptable levels.

It should be noted that as the freeze-back of the Surface Cell and Test Cell taliks progresses, and the freezing front continues to advance downwards, it is anticipated that the piezometers will all freeze-back with time. Given the results of the stability analysis presented herein which suggest that the current factor of safety is greater than 2 and increases as the freezing front migrates downwards, replacement of the piezometers will not necessarily be required. When freeze-back occurs, the monitoring results as a whole will be reviewed to determine the appropriate course of action. At a minimum, continued monitoring of the frozen in piezometers to monitor the temperature of the piezometer tip and to determine if pore pressures become re-established is recommended.

Care needs to be taken when reviewing pore pressure data from the taliks to ensure that the pore pressures are reflective of a wide area. As the freezing front progresses to, and beyond, the elevation of the piezometer tip, pore pressures locally increase due to pore water expulsion effects in the confined area around the piezometer tip. This local increase in pore pressures is not reflective of wide spread conditions within the talik.

3.2.3. Active Layer Thaw

The cover systems are designed to confine the annual active layer thaw within the cover system and maintain a perennially frozen state in the underlying mine wastes (BGC 2004b). The progression of the active layer thaw is currently being monitored using frost gauges and thermistors. Depending on the underlying mine waste, the cover systems vary in thickness (1.25 m minimum over tailings at the WTDA and 2.35 m minimum over waste rock and landfill debris). Monitoring to-date indicates that the active layer thickness has generally been confined within the cover materials throughout the year and the geothermal performance of the cover systems is continuing to improve with time. If the active layer were to progress into the underlying mine wastes, negative impacts on surface water quality could occur. If the monitoring data suggests that the active layer exceeds the minimum cover thickness (provided in Table 2), a detailed review of the monitoring data, including water quality, should be initiated. If additional remedial measures are considered to be warranted, they may include thickening of the cover materials in select locations.

4.0 DECISION MAKING / REPORTING RESPONSIBILITY

The contingency measures and trigger levels provided in the preceding sections are to be used only as a guide when reviewing the results of the on-going post closure geotechnical monitoring of the Nanisivik Mine site. Prior to the implementation of any of the proposed remedial actions, a qualified professional geotechnical engineer with appropriate permafrost experience should be consulted to review the monitoring results and current site conditions. Any decision to implement remedial measures requires the input of both the owner and the geotechnical engineer. Any remedial measures undertaken should be documented to an appropriate level of detail such that they can be included within the annual geotechnical report.

5.0 CLOSURE

This report provides a summary of a number of contingency plans related to the reclamation works undertaken at the Nanisivik Mine. The report has been completed to address Water License requirement Part I, Item 12a as it relates to the geotechnical monitoring program.

We trust the above satisfies your requirements at this time. Should you have any questions or comments, please do not hesitate to contact us.

Yours sincerely,

BGC ENGINEERING INC.
per:

REGISTERED PROFESSIONAL ENGINEER
G.K. CLAYPOOL
LICENSEE
17-Mar-15
NWT/NU

Geoff Claypool, M.Eng., P.Eng.
Senior Geological Engineer

Mitchell Latimer, B.Sc., E.I.T.
Geoenvironmental Engineer

Reviewed by:

James W. Cassie, M.Sc., P.Eng.
Principal Geotechnical Engineer

GC/MCL/jwc/cs

PERMIT TO PRACTICE
BGC ENGINEERING INC.
Signature
Date 17-Mar-15
PERMIT NUMBER: P 285
The Association of Professional Engineers,
Geologists and Geophysicists of the Northwest Territories

REFERENCES

BGC Engineering Inc. 2004a. Assessment of Surface Cell and Test Cell Taliks. Submitted to CanZinco Ltd. February 6, 2004.

BGC Engineering Inc. 2004b. Engineering Design of Surface Reclamation Covers. Submitted to CanZinco Ltd. February 6, 2004.

BGC Engineering Inc. 2009a. Nanisivik Mine Reclamation – Project Completion Report. Submitted to Breakwater Resources Ltd. January 30, 2009.

BGC Engineering Inc. 2009b. Nanisivik Mine Reclamation – Post Closure Geotechnical Monitoring Contingency Plan. Submitted to Breakwater Resources Ltd. September 28, 2009.

BGC Engineering Inc. 2015. 2014 Annual Geotechnical Inspection – Nanisivik Mine, Nunavut. Submitted to Nyrstar, February 2015.

CanZinco Ltd. 2004. 2004 Reclamation and Closure Plan. Submitted to Nunavut Water Board. March 2004.

Nunavut Water Board. 2004. Nunavut Water Board's Letter of Approval for Terms and Conditions Applying to the Nanisivik Mine 2004 Reclamation Plan and Closure Plan. Memorandum addressed to Breakwater Resources Ltd. July 6, 2004.

APPENDIX A
CONTINGENCY PLAN TABLES

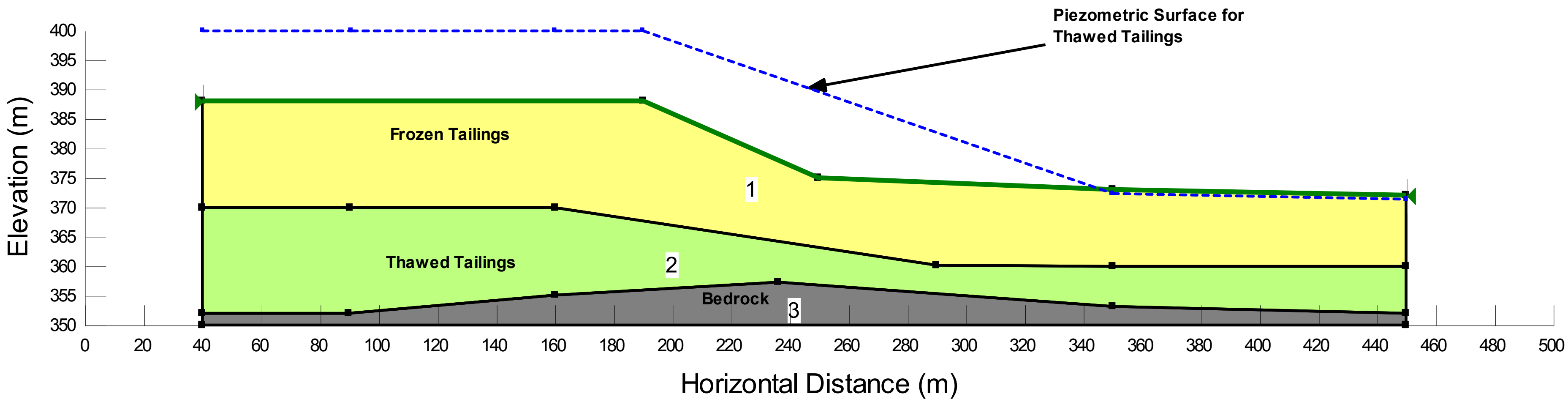
Table AI-1 – Contingency Measures for Physical Integrity Issues

Issues	Recognizable Characteristics	Potential Consequences	Potential Contingency Measures
Erosion of Covers	Channelized feature (rills to gullies) on the surface of the cover formed as a result of material loss due to running surface water.	Thinning of cover locally affecting geothermal performance of cover. In extreme case, exposure of underlying mine waste.	Additional placement of larger diameter surface armour at select locations,re-grading of the slope to a shallower angle or construction of armoured drainage swales to handle water.
Development of Thermokarst Features	Circular depression in surface of cover related to thawing of entrained ice in cover materials or underlying mine wastes. Generally, 30 to 200 cm in diameter and 30 to 60 cm in depth.	Localized thinning of cover and a local negative impact to geothermal performance of cover.	Backfill with additional armour material to original surface grade.
Sloughing/ Slumping of Sloped Covers	Development of a headscarp, a semi-circular crack demonstrating some vertical and/or lateral/downslope movement.	Exposure of underlying mine waste.	Buttressing of unstable area. Improving surface drainage to reduce near surface moisture conditions.
Erosion of Shoreline Protection in Reservoir	Downslope movement or loss of rip rap materials.	Exposure of underlying cover materials to erosive effects of waves and ice.	Increase particle size, layer thickness or slope angle of rip rap layer.
Erosion of Side Slopes of Hydraulic Channels	Disturbance/removal of bank armouring materials.	If occurs in spillway, could temporarily interrupt flow between Surface Cell and Reservoir, but likely that flow would still be confined in channel. If occurs in East Twin Creek Diversion Channel, potential to combine with outflow from Reservoir in Polishing Pond.	Increasing armour sizing/thickness and/or re-grading of side-slopes to a shallower slope angle.
Low Water Levels in the Reservoir	Water level below 370.0 m elevation.	Thinning or loss of water cover over tailings high points under water cover in Reservoir. Negative impacts on water quality in Reservoir.	Address seepage losses at West Twin Outlet Structure by backfilling a portion of the polishing pond upstream of the outlet structure.
Crown Pillar Collapse	Creating of an opening into the underground mine workings due to collapse of crown pillar around former portals.	Safety concerns for people and wildlife passing through area.	Backfilling opening to prevent access, grade to prevent water infiltration and provide additional support to remaining portion of crown pillar if movement on-going.

Table AI-2 – Trigger Levels and Contingency Measures for Geotechnical Monitoring Data

Issues	Trigger Levels	Potential Consequences	Potential Contingency Measures
Ground Temperatures	Vertical location of -0.2°C isotherm from thermistors 03-09, 03-10 and 03-11 on freeze-back envelop plot (Figure 1).	Slower than anticipated freeze-back.	Extend post-closure monitoring program.
Pore Pressures	Piezometers in Surface Cell and Test Cell Taliks: Location of the combination of pore pressures observed in the Surface Cell and Test Cell talik piezometers with respect to the FofS=1.5 line provided on Figure 2.	Potential negative effect on dike stability.	Review geothermal and piezometric conditions. Pore pressure relief wells, in extreme case.
Active Layer Thaw	Tailings Covers at WTDA. Active layer thickness exceeds 1.25 m, as indicated by data from frost gauges and thermistors. Covers over waste rock. Active layer thickness exceeds 2.35 m, as indicated by data from frost gauges and thermistors.	Potential negative impacts on quality of surface water run-off.	Review of monitoring data, including water quality. Local thickening of cover materials in select locations, in extreme case.

APPENDIX B
SLOPE STABILITY ANALYSIS SCHEMATICS



SCALE:	AS SHOWN
DATE:	MAR 2015
DESIGNED:	GKC
DRAWN:	MCL
CHECKED:	JWC
APPROVED:	GKC

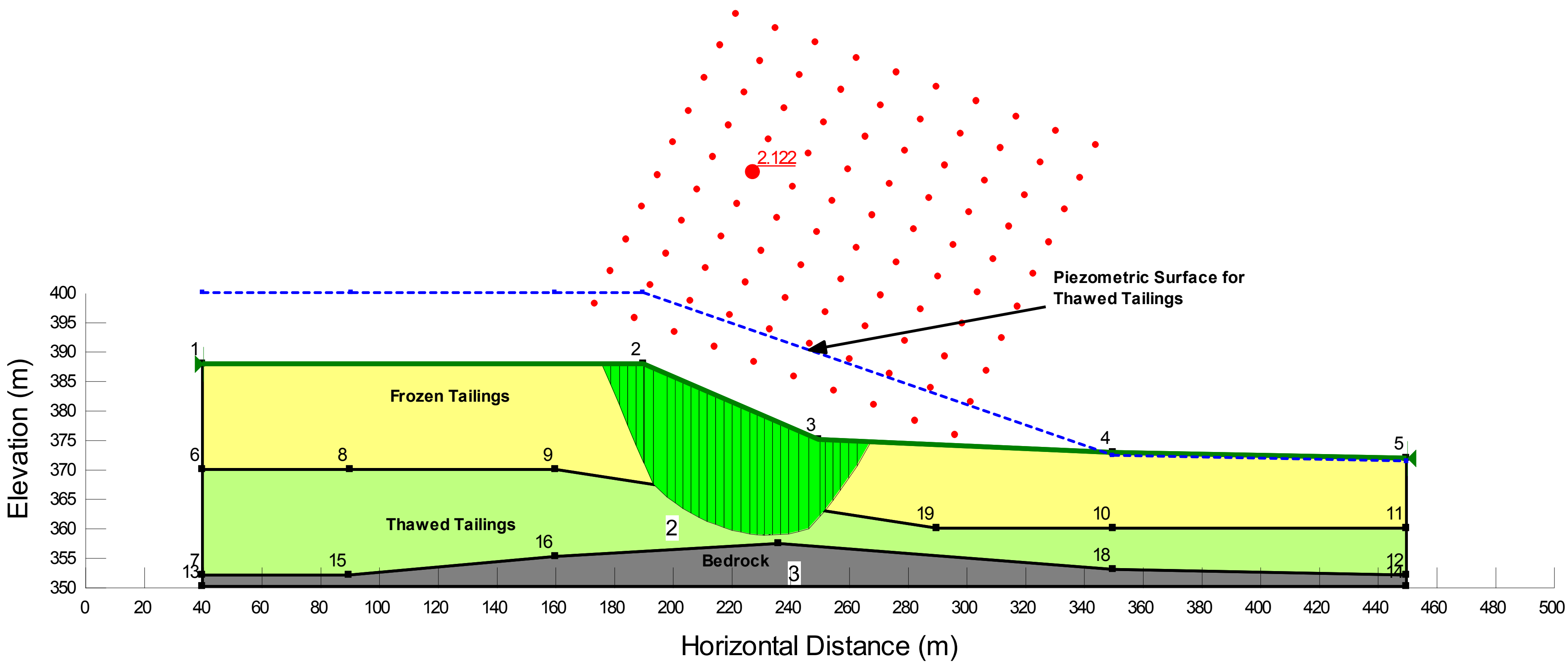
BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: nyrstar

PROJECT: NANISIVIK MINE: UPDATED POST CLOSURE GEOTECHNICAL MONITORING CONTINGENCY PLAN

TITLE: STABILITY ANALYSIS MODEL GEOMETRY

DWG No.:	PROJ No.:	REV:
B-1	0255-024-04	



SCALE:	AS SHOWN
DATE:	MAR 2015
DESIGNED:	GKC
DRAWN:	MCL
CHECKED:	JWC
APPROVED:	GKC

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: nyrstar

PROJECT: NANISIVIK MINE: UPDATED POST CLOSURE GEOTECHNICAL MONITORING CONTINGENCY PLAN

TITLE: STABILITY ANALYSIS RESULT BASED ON CURRENT CONDITIONS

DWG No.:	PROJ No.:	REV:
B-2	0255-024-04	