TETRA TECH EBA

March 31, 2016

ISSUED FOR USE
FILE: ENG.WARC03039-01.004
Via Email: erik.pit@gov.yk.ca

Assessment and Abandoned Mines
Energy Mines and Resources
Room 2C – Royal Centre
PO Box 2703
Whitehorse, YT Y1A 2C6

Attention: Mr. Erik Pit
A / Senior Project Manager

Subject: Geotechnical Monitoring Program Review
Abandoned Clinton Creek Asbestos Mine Site, Yukon

1.0 INTRODUCTION

Government of Yukon, Assessment and Abandoned Mines (AAM) have retained Tetra Tech EBA Inc. (Tetra Tech EBA) to assist with the summary and evaluation of geotechnical information related to closure of the Clinton Creek asbestos mine near Dawson City, Yukon. This report presents a review of the existing geotechnical monitoring program along with recommendations for consideration in future programs.

1.1 Scope

Tetra Tech EBA has been retained to provide engineering services for the above captioned project in an attempt to better understand the mechanisms driving the slope instability of the waste rock and tailings piles. The general scope of work includes summarizing existing information and data gaps, evaluating the data and monitoring programs, as well as assessing stability, site access mitigations, and fish passage for the five short listed closure options. This work is being conducted to guide project parties in making decisions regarding future design and implementation of short listed closure options.

1.2 References

Table 1-1 presents the deliverables which either have been, or will be,submitted to AAM as part of this scope of work, and indicates a reference number for each report which will be used when referring to any of those documents in this report.

Tetra Tech EBA Inc.
61 Wasson Place
Whitehorse, YT Y1A 0H7 CANADA
Tel 867.668.3068 Fax 867.668.4349

Table 1-1: Tetra Tech EBA Report Submissions to AAM

Report No.	Report Name	Status
R124	Existing Geotechnical Subsurface and Monitoring Data Summary Report	Issued for Use February 25, 2016
R125	Preliminary Dam Classification – Mine Waste Structures Memo	Issued for Use March 7, 2016
R126	Data Gap Assumption Report	Issued for Use March 31, 2016
R127	Correlation of Existing Movement Rates and Seasonality Report	Issued for Use March 24, 2016
R128	Geotechnical Analysis Report and Dam Breach Update	Issued for Use March 31, 2016
R129	Geotechnical Monitoring Program Review Memo	Issued for Use March 31, 2016
R130	Geotechnical Investigations Program Scope of Work Memo	Issued for Use March 31, 2016
R131	Site Access Geotechnical Engineering Review and Mitigation Memo	Issued for Use March 31, 2016
R132	Fish Passage Memo	Issued for Use March 31, 2016

2.0 EXISTING MONITORING PROGRAM

2.1 General

The existing monitoring program has been undertaken to monitor the condition and performance of the various site components through qualitative (i.e., visual inspection) and quantitative (i.e., movement rates) practices (Worley Parsons 2015). Monitoring of the site has been performed by various engineering consultants since re-instatement of the program in 1999, as presented in Table 2-1.

Table 2-1: Previous Survey Programs

Monitoring Period	Engineering Consultant	Reference Document No.
1999 to 2007	UMA	R20, R22, R23, R24, R47
2008 to 2011	AECOM	R15, R51, R103
2012 to 2013	Associated Engineering	R55, R104
2014 to 2015	Worley Parsons	R118, R120

Available raw data from the survey programs noted in Table 2-1 is included in the data compiled by Tetra Tech EBA and is presented in R124 (as Appendix D).

2.2 Purpose

The purpose of the monitoring program is to track the performance of various components of the mine site. The monitoring programs conducted for the Clinton Creek mine site were first initiated in 1976 and over the years have grown to include data collection for the following site components:

- Access Road;
- Gabion Drop Structures;

- Clinton Creek channel from outlet to confluence with Wolverine Creek – centreline;
- Wolverine Creek channel – centreline;
- Clinton Creek and Wolverine Creek sections – various;
- Open Pit Area;
- Clinton Creek waste rock pile; and
- Wolverine Creek tailings pile (north and south lobes).

Tracking the performance of the above listed site components enables AAM to identify changes that may indicate instabilities or degradation that could potentially impact the surrounding environment or health and safety of those in the area.

All applicable components are currently considered in the long term monitoring program.

2.3 Frequency

The original monitoring program ended in 1986 and collection of survey data was not resumed until 1999. A biennial long term performance monitoring program began in 2006 (UMA 2007). The program frequency was increased following the 2010 flood event in order to capture the effects on the creek and other components of the mine site on an annual basis.

The 2012 monitoring program report (AE 2013) made recommendations with regard to the scope of future monitoring programs, including alternating between small and large Long Term Monitoring Programs (LTMPs). The small LTMP includes site-wide visual inspections of the site components as well as survey of the drop structures and creek channel alignment/profile to be conducted on an annual basis. The 2015 small LTMP also included the "upper slope" monitoring points on the waste rock and tailings piles. The large LTMP includes site-wide visual inspections of the site components as well as survey of all of the components listed in Section 2.2. The small and large LTMPs alternate years so that site-wide survey data is collected every two years. The next large LTMP is scheduled to be completed in 2016. Discussion with regard to frequency and seasonality is presented in Section 3.0.

2.4 Timing

In the early years of the monitoring program (1970s & 1980s) data was occasionally collected during winter months; however, since the monitoring program was re-instated in 1999 a review of the survey data indicates that survey data collection occurs in the summer months. It is beneficial to keep the data collection period consistent (in the summer) to avoid potential influence from frozen ground which could skew the survey analysis.

2.5 Triggers

Various triggers have been established and linked to site components. A trigger is defined as a quantitative value assigned to a specific attribute of a site component that, when exceeded, should prompt a pre-defined response to address the stability of the component (Worley Parsons 2014a). The most recent summary of triggers for the site was prepared by Worley Parsons during the 2015 monitoring program. Assessment of the triggers included the following steps (Worley Parsons 2015):

1. Evaluate whether the trigger has been exceeded.

2. Evaluate whether appropriate action was taken and, if not, identify any factors that prevented action from being taken.

3. Determine whether the trigger is appropriate or requires revision.

Triggers were not reviewed in detail as part of this monitoring program review as it is outside the requested scope of work.

2.6 Monitoring Points and Benchmarks

Based on the most recent site-wide survey conducted in 2014, the monitoring program comprises 166 monitoring points and 4 benchmarks, as well as many other points surveyed which include natural ground surfaces, tension cracks, rip-rap, water edges, Hudgeon outlet, culvert inlets, and gabions among others.

The program entails surveying monitoring points at the site which comprise monitoring pins and rebar. The horizontal accuracy of the GPS survey has been reported by Underhill Geomatics Ltd. to be within 2 to 3 cm, with an average horizontal precision of 1.4 cm.

The location of the monitoring points and benchmarks capture data for the waste rock and tailings piles quite well and sufficiently serve their purpose for ground surface monitoring; however, there are areas which form data gaps and additional points should be added as discussed in the following section.

3.0 RECOMMENDATIONS FOR THE MONITORING PROGRAM

Recommendations for the monitoring program are aimed at ensuring all relevant geotechnical information is being captured in the program. Improvements focus on collection of information necessary for the current care and maintenance of the site as well as considerations for design and construction of the selected remedial option.

The importance of assessing seasonal movement as opposed to general movement differs for the waste rock pile and tailings pile:

- **Clinton Creek Waste Rock Pile**: Based on review of site stability and contributing factors, surficial movements as a result of seasonal impacts has a low likelihood of impacting the overall stability of the waste rock pile. Evaluating seasonality for the waste rock pile lends itself more to long-term management of the site as-is.

- **Wolverine Tailings Pile**: Instabilities of the tailings pile tend to present themselves as more of a shallow/infinite slope failure. As a result, seasonality is likely to have more of an impact in this area of the site.

Monitoring of the site with regards to overall stability can best be improved to facilitate future analysis and design by installing deep instruments (slope inclinometers, thermistors, and piezometers). The details of these proposed installations are discussed in Tetra Tech EBA's report R130. The locations of the proposed instrumentation are presented on Figure 1. Performance, long-term management, and impacts of precipitation can best be facilitated by continued survey monitoring of the site.

Previous recommendations, additional recommendations, and optional recommendations regarding the monitoring program are presented in the following sections.

3.1 Previous Recommendations

A recent summary of previous monitoring recommendations was prepared by Worley Parsons as part of the 2015 Long-Term Monitoring Program. Recommendations have historically been assessed using the following steps (Worley Parsons 2015):

1. Confirm that the recommendation has been implemented.
2. Identify any factors that prevented the implementation.
3. Determine whether the recommendation remains valid or requires revision.

The most recent summary of recommendations for the site was prepared by Worley Parsons during the 2015 monitoring program and is appended to this report as Appendix B.

The number and location of monitoring points and benchmarks which are included in the large 2016 LTMP provide valuable information on the ground surface movements of the site; however, there are a few areas in which additional monitoring points should be installed this year. Recommendations to the current program are discussed in the following sections.

3.2 Additional Recommendations

Based on review of the existing monitoring program and an understanding of available movement data, Tetra Tech EBA is in agreement with current recommendations presented by Worley Parsons (2015). In addition to the recommendations made in the LTMP 2015 report, the following comments are made with regard to improving effectiveness of data collection and to facilitate the detailed design of the selected closure option(s):

- The large LTMP includes a site-wide survey of components listed in Section 2.2. The small LTMP in 2015 included a survey of “upper slope” monitoring points on the waste rock and tailings pile. Since these points are showing the least movement, it is more valuable to capture monitoring points in the small LTMP that are showing the most movement.
  - Monitoring points which are moving the most are typically located “mid slope” on the tailings pile. These points are recommended to be included in the small LTMP for annual survey.
  - Monitoring points on the waste rock pile which showed movement greater than 5 cm/year in the previous large LTMP survey results are recommended to be included in the small LTMP.
- Although an annual survey helps to establish general trends in rate and direction of movement, it makes it difficult to correlate movements with seasonality. Assessing the effect of seasonality on movements requires an increased frequency of surveys. An initial survey should take place as early in the year as feasible to establish a baseline for the year. A supplementary survey should be conducted as soon as practicably possible following any large rainfall event in order to capture the effects the rainfall has had on the surficial movements at the site.
- Additional monitoring points are recommended as follows:
  - The area near Section C-C’ has very few monitoring points and as such forms an information gap – these monitoring points should be installed to establish movement patterns in the area, as well as contribute to evaluating the movement along Section F-F’.

  - The toe of the Clinton Creek north valley slope was excavated below original grade as part of the creek diversion works that took place in the 1970s. The impacts on stability from cutting into the side slopes and unloading at the toe are currently unknown. Similarly, some monitoring points should be located on the east side of the Wolverine Creek valley slope, to provide information showing movement (or lack there of) along the east valley slope. Survey of the proposed monitoring points along the north valley and east valley slopes as shown on Figure 1 would allow for an evaluation of any movements detected, and any potential effect they may have on design or construction of remedial options.

- Some monitoring points will likely be destroyed during construction of the selected short-listed option. Short-listed options were provided by AAM and details were pulled out of the Lifeycle Cost Analysis report (Worley Parsons 2014b). Depending on the selected option and the earthworks associated with each option the number of impacted monitoring points will vary. It is assumed that most monitoring points affected by construction will be re-installed once remedial works have been completed.

3.3 Optional Recommendations

In addition to the recommendations made in the previous section, the following recommendations could be considered to provide additional information on movement rate patterns and/or seasonality correlations:

- A few additional monitoring points along Section B-B' would provide supplementary data to those already in the area, which could be useful in assessing cross-valley movement, as well as movement along Section F-F'. There are some existing monitoring points in this area, however the proposed monitoring points are located nearer Section B-B', and could be used to better establish cross-valley movement trends along the primary section which was used for the stability analyses. The location of all proposed monitoring points are shown on Figure 1.

- Frequency of surveys for the small and large LTMPs could be increased to three times per year (spring, summer, and fall) to better understand the effects of seasonality on site movements. The same monitoring points would be surveyed for the large and small LTMPs as recommended in the previous section, but frequency would be increased each year to provide data which lends itself to seasonal trends.

- Review of aerial photos reveals the northwest area of the Wolverine Tailngs Pile is actively moving. Although this area appears to be moving in a north-northwesterly direction (likely following natural underlying topography), it is presumably inconsequential to the condition of Wolverine Creek. If there are concerns with the movement in this area from a site management perspective, additional monitoring points could be installed to quantify the movement in this area. The area of discussion has been highlighted on Figure 1.

4.0 LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of Government of Yukon, Assessment and Abandoned Mines and their agents. Tetra Tech EBA Inc. (Tetra Tech EBA) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Government of Yukon, Assessment and Abandoned Mines, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Tetra Tech EBA's General Conditions are provided in Appendix A of this report.

5.0 CLOSURE

We trust this report meets your present requirements. If you have any questions or comments, please contact the undersigned.

Tetra Tech EBA Inc.

Prepared by:

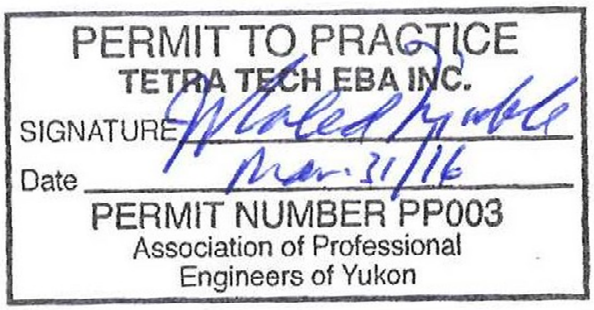
Shelly E. Bratke, E.I.T. (Alberta)
Geotechnical Enginee
Direct Line: 780.451.2130 x278
Shelly.Bratke@tetratech.com

Reviewed by:

Justin Pigage, P.Eng.
Geotechnical Engineer – Arctic Region
Direct Line: 867.668.9213
Justin.Pigage@tetratech.com

Reviewed by:

A.F. (Tony) Ruban, M.Eng., P.Eng. (Alberta)
Principal Consultant
Direct Line: 780.451.2130 x236
Tony.Ruban@tetratech.com



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AECOM (2009a). R14: “Former Clinton Creek Asbestos Mine Overview Report”.

AECOM (2009b). R15: “Long Term Peformance Monitoring 2008”.

AECOM (2011). R51: “Long Term Peformance Monitoring 2010”.

AECOM (2012). R103: “Long Term Peformance Monitoring 2011”.

Associated Engineering (2013). R104: “Long Term Performance Monitoring 2012”.

Associated Engineering (2013). R55: “Long Term Performance Monitoring 2013”.

Tetra Tech EBA (2016a). R124: “Existing Geotechnical Subsurface and Monitoring Data Summary Report”.

Tetra Tech EBA (2016b). R130: “Geotechnical Investigations Program Scope of Work Memo”.

UMA Engineering (2002). R47: “Abandoned Clinton Creek Asbestos Mine – Conceptual Design Report”.

UMA Engineering (2006). R20: “Engineering Services Site Inspection and Monitoring Results 2005”.

UMA Engineering (2006). R22: “Long Term Performance Monitoring 2005”.

UMA Engineering (2007). R24: “Long Term Performance Monitoring 2006”.

UMA Engineering (2008). R23: “Long Term Performance Monitoring 2007”.

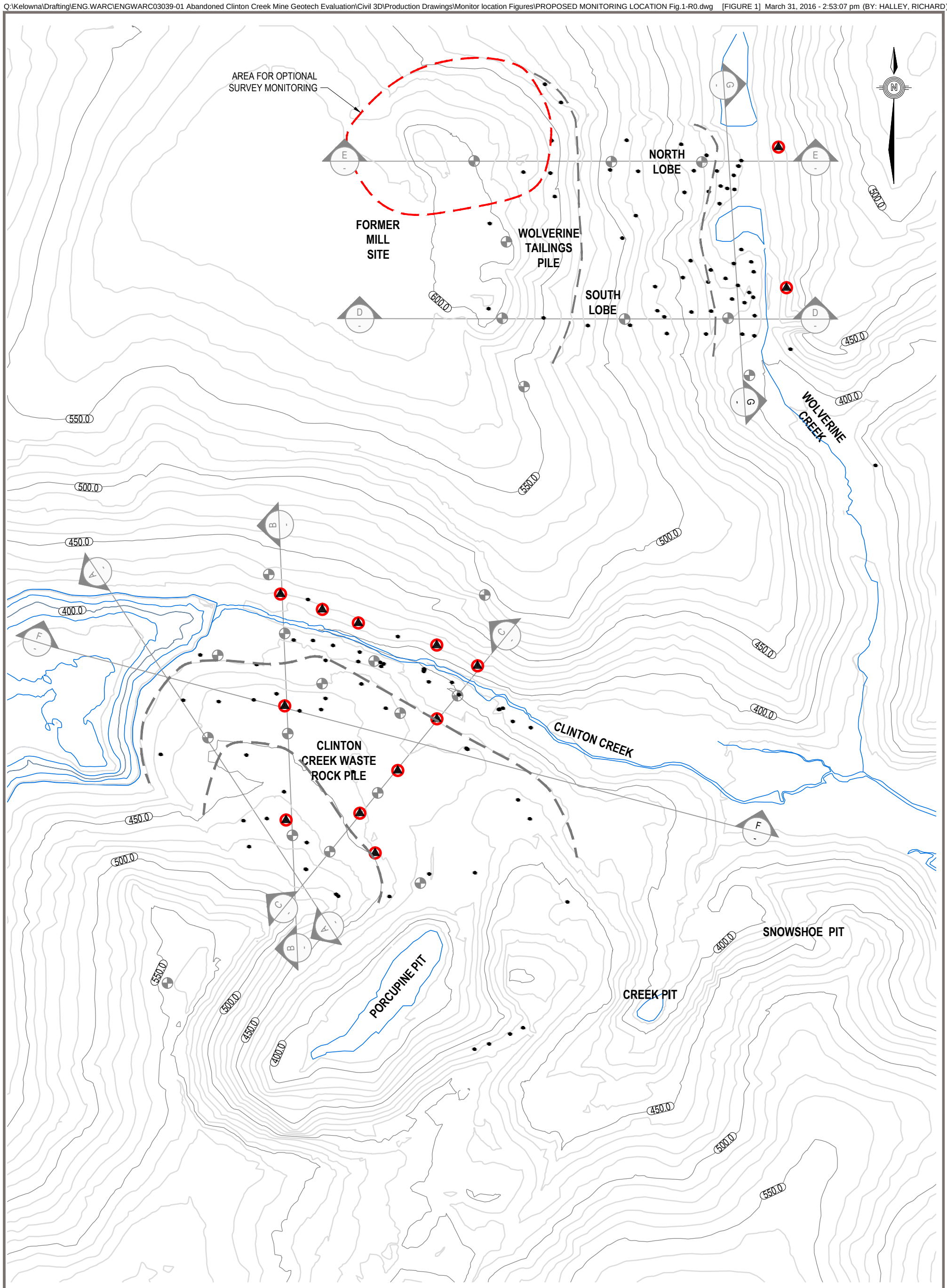
WorleyParsons Group (2014a). R118: “Clinton Creek Long Term Monitoring Program 2014”.

WorleyParsons Group (2014b). R56: “Lifecycle Cost Analysis for Remediation Options”.

WorleyParsons Group (2015). R120: “Clinton Creek Long Term Monitoring Program 2015”.

FIGURE

Figure 1 Proposed Monitoring Locations Site Plan



NOTES :
- ONSITE TOPOGRAPHY CONTOURS PROVIDED BY CLIENT (DATED 2012), AND ARE SET TO INTERVALS OF 10 m

0 250m

Scale: 1:7,500 @ 11"x17"

LEGEND

- PROPOSED INSTRUMENTATION LOCATION
- EXISTING MONITORING POINT LOCATION
- APPROXIMATED LOCATION OF PROPOSED MONITORING POINT

CLIENT

Yukon Government
Energy, Mines & Resources
Assessment & Abandoned Mines Branch

TETRA TECH EBA

MONITORING PROGRAM REVIEW
ABANDONED CLINTON CREEK MINE, YUKON

PROPOSED MONITORING LOCATIONS SITE PLAN

PROJECT NO.	DWN	CKD	REV
ENGWARC03039	RERH	SB/JP	0
OFFICE	DATE		
EBA-WHSE	March 30, 2016		

Figure 1

APPENDIX A
TETRA TECH EBA'S GENERAL CONDITIONS

GENERAL CONDITIONS

GEOTECHNICAL REPORT – YUKON GOVERNMENT

This report incorporates and is subject to these “General Conditions”.

1.0 USE OF REPORT AND OWNERSHIP

This geotechnical report pertains to a specific site, a specific development and a specific scope of work. It is not applicable to any other sites nor should it be relied upon for types of development other than that to which it refers. Any variation from the site or development would necessitate a supplementary geotechnical assessment.

This report and the recommendations contained in it are intended for the sole use of Tetra Tech EBA’s Client, the Yukon Government. Tetra Tech EBA does not accept any responsibility for the accuracy of any of the data, the analyses or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than Tetra Tech EBA’s Client unless otherwise authorized in writing by Tetra Tech EBA. Any unauthorized use of the report is at the sole risk of the user.

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2.0 ALTERNATE REPORT FORMAT

Where Tetra Tech EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed Tetra Tech EBA’s instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by Tetra Tech EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of Tetra Tech EBA’s instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except Tetra Tech EBA. Tetra Tech EBA’s instruments of professional service will be used only and exactly as submitted by Tetra Tech EBA.

Electronic files submitted by Tetra Tech EBA have been prepared and submitted using specific software and hardware systems. Tetra Tech EBA makes no representation about the compatibility of these files with the Client’s current or future software and hardware systems.

3.0 ENVIRONMENTAL AND REGULATORY ISSUES

Unless stipulated in the report, Tetra Tech EBA has not been retained to investigate, address or consider and has not investigated, addressed or considered any environmental or regulatory issues associated with development on the subject site.

4.0 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

Classification and identification of soils and rocks are based upon commonly accepted systems and methods employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from the system or method prevail, they are specifically mentioned.

Classification and identification of geological units are judgmental in nature as to both type and condition. Tetra Tech EBA does not warrant conditions represented herein as exact, but infers accuracy only to the extent that is common in practice.

Where subsurface conditions encountered during development are different from those described in this report, qualified geotechnical personnel should revisit the site and review recommendations in light of the actual conditions encountered.

5.0 LOGS OF TESTHOLES

The testhole logs are a compilation of conditions and classification of soils and rocks as obtained from field observations and laboratory testing of selected samples. Soil and rock zones have been interpreted. Change from one geological zone to the other, indicated on the logs as a distinct line, can be, in fact, transitional. The extent of transition is interpretive. Any circumstance which requires precise definition of soil or rock zone transition elevations may require further investigation and review.

6.0 STRATIGRAPHIC AND GEOLOGICAL INFORMATION

The stratigraphic and geological information indicated on drawings contained in this report are inferred from logs of test holes and/or soil/rock exposures. Stratigraphy is known only at the locations of the test hole or exposure. Actual geology and stratigraphy between test holes and/or exposures may vary from that shown on these drawings. Natural variations in geological conditions are inherent and are a function of the historic environment. Tetra Tech EBA does not represent the conditions illustrated as exact but recognizes that variations will exist. Where knowledge of more precise locations of geological units is necessary, additional investigation and review may be necessary.

7.0 PROTECTION OF EXPOSED GROUND

Excavation and construction operations expose geological materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance which can cause severe deterioration. Unless otherwise specifically indicated in this report, the walls and floors of excavations must be protected from the elements, particularly moisture, desiccation, frost action and construction traffic.

8.0 SUPPORT OF ADJACENT GROUND AND STRUCTURES

Unless otherwise specifically advised, support of ground and structures adjacent to the anticipated construction and preservation of adjacent ground and structures from the adverse impact of construction activity is required.

9.0 INFLUENCE OF CONSTRUCTION ACTIVITY

There is a direct correlation between construction activity and structural performance of adjacent buildings and other installations. The influence of all anticipated construction activities should be considered by the contractor, owner, architect and prime engineer in consultation with a geotechnical engineer when the final design and construction techniques are known.

10.0 OBSERVATIONS DURING CONSTRUCTION

Because of the nature of geological deposits, the judgmental nature of geotechnical engineering, as well as the potential of adverse circumstances arising from construction activity, observations during site preparation, excavation and construction should be carried out by a geotechnical engineer. These observations may then serve as the basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein.

11.0 DRAINAGE SYSTEMS

Where temporary or permanent drainage systems are installed within or around a structure, the systems which will be installed must protect the structure from loss of ground due to internal erosion and must be designed so as to assure continued performance of the drains. Specific design detail of such systems should be developed or reviewed by the geotechnical engineer. Unless otherwise specified, it is a condition of this report that effective temporary and permanent drainage systems are required and that they must be considered in relation to project purpose and function.

12.0 BEARING CAPACITY

Design bearing capacities, loads and allowable stresses quoted in this report relate to a specific soil or rock type and condition. Construction activity and environmental circumstances can materially change the condition of soil or rock. The elevation at which a soil or rock type occurs is variable. It is a requirement of this report that structural elements be founded in and/or upon geological materials of the type and in the condition assumed. Sufficient observations should be made by qualified geotechnical personnel during construction to assure that the soil and/or rock conditions assumed in this report in fact exist at the site.

13.0 SAMPLES

Tetra Tech EBA will retain all soil and rock samples for 30 days after this report is issued. Further storage or transfer of samples can be made at the Client's expense upon written request, otherwise samples will be discarded.

14.0 INFORMATION PROVIDED TO TETRA TECH EBA BY OTHERS

During the performance of the work and the preparation of the report, Tetra Tech EBA may rely on information provided by persons other than the Client. While Tetra Tech EBA endeavours to verify the accuracy of such information when instructed to do so by the Client, Tetra Tech EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

APPENDIX B

WORLEY PARSONS 2015 MONITORING RECOMMENDATIONS SUMMARY

Table 1 Compilation of Recommendations

ID	Description	Implementation	Validity
AR-A (R51)	Monitor (i.e., inspect and survey) the tension cracks along the closed portion of the site access road on an annual basis.	Inspection and survey completed in 2015.	Valid – practice should continue.
AR-B (R104)	Install depth gauge at Clinton Creek Ford No. 1.	Completed – refer to recommendation AR-E below.	Requires re-establishment.
AR-C (new)	Extend the baseline to the north and south by 15 m.	Completed in 2015.	Completed.
AR-D (new)	Survey points recorded at the start, end, and changes in direction (greater than 30 deg.) of each tension crack.	Completed in 2015.	Valid – practice should continue.
AR-E (new)	Re-survey depth gauge at Ford Crossing No. 1 as part of 2016 LTMP to re-establish elevation.	To be implemented in 2016.	Required to determine whether ford crossing can be safely used based on water depth.
DS-A (R51)	Monitor (i.e., inspect and survey) drop structures on an annual basis.	Ongoing - inspection and survey of all drop structures completed in 2014 and 2015.	Valid – practice should continue.
DS-B (R104)	Undertake further geotechnical investigation and evaluation to provide a more in-depth discussion on possible causes for differing movement rates between the gabion monitors and waste rock dump monitors.	Not implemented.	Valid – should be completed prior to site-wide remediation.
DS-C (2014)	Install additional monitoring points along the waste rock dump toe aligned with the drop structures. A total of eight points should be installed with each point located 20 m south of the monitoring point on the south creek embankment.	Not completed due to construction activities. Should be implemented during 2016 LTMP survey.	Improve understanding of influence of waste rock movement on drop structures.

ID	Description	Implementation	Validity
DS-D (2014)	Establish new monitoring points and cross-section downstream of DS4 that can be safely accessed.	Not completed due to construction activities.	Not needed – DS4 repaired in 2015 requiring the re-establishment of new monitoring points (nos. 1462 to 1465) in 2016.
DS-E (2014)	Future survey should include the clear and explicit identification of break points (e.g., toe and top of embankment) through drop structure cross-sections and the edges of each course of gabion baskets along the drop structure centerline.	Implemented as part of 2015 survey.	To facilitate the measurement of drop structure cross-section parameters and the review of drop structure profiles.
DS-F (2014)	Change trigger DS-2 from <0.2 m freeboard to <0.3 m freeboard during conveyance of the 50-year peak flow and adopt revised design flows shown on Figure Nos. 1009 to 1012, Appendix 1.	Included on 2015 LTMP drawings.	To reflect revised peak flow depth and current hydraulic design practices.
DS-G (2014)	Change trigger DS3 to measure the drop structure width between the upstream and downstream monitoring points rather than at the upstream drawdown weir and between the downstream monitoring points.	Completed in 2015.	Only DS1 was installed with a drawdown weir.
DS-H (new)	Re-establish drop structure monitoring point Nos. 1462 to 1465.	To be implemented in 2016.	Require to monitor movement at DS4.
DS-I (new)	Change DS-3 trigger value to a change of drop structure width greater than 1.0 m.	To be implemented in 2016.	DS-2 downstream at trigger threshold and appears to be in stable condition.
CC-A (R51)	Environmental assessment to determine the impacts of stabilization measures at Clinton Creek Channel.	Not completed.	Valid – should be completed prior to site-wide remediation.
CC-B (R51)	Inspect and survey the Clinton Creek channel on an annual basis.	Inspection of channel up to confluence with Wolverine Creek and survey of upper and mid-creek portions of channel completed in 2015.	Refer to recommendation CC-H below.

ID	Description	Implementation	Validity
CC-C (R104)	Survey of cross-sections A-E along Clinton Creek should be completed on a biennial basis.	Should be completed as part of 2016 LTMP.	Valid – practice should continue.
CC-D (R104)	Install additional monitoring pins adjacent to where Clinton Creek has relocated closer to the waste rock area.	Completed in 2015.	Valid – refer to recommendation CC-G below.
CC-E (R104)	Complete geotechnical investigation of Clinton Creek waste rock dump.	Not completed.	Valid – should be completed prior to site wide remediation.
CC-F (2014)	Survey of Cross-Section F along Clinton Creek should be completed on a biennial basis.	Should be completed in subsequent LTMPs.	Survey required to compare cross-section to previous years and identify geomorphological/ topographical changes.
CC-G (2014)	AAM should consider installing monitoring pins along south slope of Clinton Creek near Station Nos. 0+700, 0+800, and 0+900.	Completed in 2015.	Completed.
CC-H (New)	The upper creek (Sta. 0+200 to Sta. 0+680) and mid-creek (Sta. 0+680 to Sta. 0+913) portions of the channel should be surveyed annually, with the lower creek (Sta. 0+913 to confluence with Wolverine Creek) portion of the channel surveyed on a biennial basis.	Survey of upper creek and portion of mid-creek surveyed in 2015, upper, mid-, and lower creek portions should be surveyed as part of 2016 LTMP.	Lower creek is stable compared to upper and mid-creek portions of channel and does not require annual survey.
WR-A (R51)	Visual inspection of the waste rock dump should be completed on an annual basis with survey completed on a biennial basis.	Inspection and survey completed in 2015.	Valid – practice should continue.
WR-B (R104)	Trigger level for waste rock monitors should be further investigated and implemented.	Included in 2014 report.	Completed.
WR-C (2014)	Survey upper slope monitoring points in 2015 and compare to 2014 data.	Completed in 2015.	Completed.

ID	Description	Implementation	Validity
WR-F (New)	Excluded monitoring point BH-4 Cable from future LTMPs.	Should be implemented as part of 2016 LTMP.	BH-4 Cable cannot be surveyed consistently as it is not considered to be stable (i.e., it consists of a flexible cable rather than a piece of rebar driven into the ground).
WR-G (New)	Change WR-1 trigger value to: movement rate (cm/y) > movement rate from previous monitoring cycle plus standard deviation of all movement rates between 2003 and current year, exclusive of July to September 2010.	Should be implemented as part of 2016 LTMP.	Required to take into account survey error and movement variability.
TP-A (R104)	Visual inspection and survey of the Wolverine Creek tailings pile should be completed on a biennial basis.	Inspection and survey of the north upper lobe completed in 2015 with full survey of tailings pile completed in 2014.	Valid – but clarification required, refer to recommendations TP-C and TP-D below.
TP-B (R104)	Complete geotechnical investigation and assessment of the north and south lobes of the Wolverine Creek tailings pile.	Not completed.	Valid – required to improve understanding of variance in average movement rates between north and south lobes; however this investigation is not considered urgent (i.e., required within the next year) and can be completed prior to site wide remediation unless required sooner due to tailings slope acceleration (see above).
TP-C (2014)	Visual inspection of the Wolverine Creek tailings pile should be completed on an annual basis.	Completed in 2015.	Required to identify visible tension cracks and slumping to determine if further investigation is required in that year.

ID	Description	Implementation	Validity
TP-D (2014)	Survey of the Wolverine Creek tailings pile should be completed on a biennial basis.	North upper lobe completed in 2015, full survey to be completed in 2016.	Required to monitor movement rates through the tailings pile.
TP-E (New)	Change TP-1 trigger value to: movement rate (cm/y) > movement rate from previous monitoring cycle plus standard deviation of all movement rates between 2003 and current year, exclusive of July to September 2010.	Should be implemented as part of 2016 LTMP.	Required to take into account survey error and movement variability.
SP-A (New)	Do not establish monitoring points at the top of Snowshoe Pit.	Not applicable.	The top of the pit is not easily accessible and monitoring movement at these locations provides limited value.
SP-B (New)	Visual inspection of the Snowshoe Pit should be completed on an annual basis with survey of the two monitoring pins at the bottom of the pit completed on a biennial basis.	Inspection and establishment of the two monitoring pins completed in 2015.	Valid - practice should continue.