

Taurus Mine Tailings Storage Facilities Operation, Maintenance and Surveillance Manual



PRESENTED TO
Cassiar Gold Corporation

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Transport Canada (Pacific Region)		1-866-995-9737
BC Dam Safety Officer – Jeff Grass, P.Eng.		1-250-893-6951
BC Ministry of Environment and Climate Change Strategy		1-800-663-7867
BC Ministry of Energy, Mines and Petroleum Resources		1-800-663-7867
BC Ministry of Forests, Lands, and Natural Resource Operations		1-800-663-7867
BC Northern Health		1-250-565-2649
BC Water Management Branch		1-778-698-7344
BC Spill Line		1-800-663-3456
BC Report a Wildfire		1-800-663-5555
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	Dease Lake RCMP	1-250-771-4111
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ACRONYMS & ABBREVIATIONS

Acronyms/Abbreviations	Definition
BC	British Columbia
CDA	Canadian Dam Association
CGC	Cassiar Gold Corporation
DERP	Dam Emergency Response Plan
DSI	Dam Safety Inspection
DSO	Dam Safety Officer
DSR	Dam Safety Review
EMBC	Emergency Management British Columbia
EPRP	Emergency Preparedness and Response Plan
HSRC	Health, Safety, and Reclamation Code for Mines in British Columbia
KP	Knight Piésold Consulting
MAC	Mining Association of Canada
MEMPR	Ministry of Energy, Mines, and Petroleum Resources
MFLNRO	Ministry of Forests, Lands and Natural Resource Operations
OMS	Operations, Maintenance and Surveillance
Regulation	British Columbia Water Sustainability Act, Dam Safety Regulation
Tetra Tech	Tetra Tech Canada Inc.
TSF	Tailings Storage Facility

LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of Cassiar Gold Corporation and their agents. Tetra Tech Canada Inc. (Tetra Tech) 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 Cassiar Gold Corporation, 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. Use of this document is subject to the Limitations on the Use of this Document attached in the Appendix or Contractual Terms and Conditions executed by both parties.

1.0 INTRODUCTION

1.1 General

Tetra Tech Canada Inc. (Tetra Tech) was retained by Cassiar Gold Corporation (CGC) to prepare an Operation, Maintenance, and Surveillance (OMS) Manual for the Tailings Storage Facilities (TSFs) at the closed Taurus Mine Site, located north of Jade City, British Columbia (BC) along the Stewart-Cassiar Highway.

This OMS manual has been prepared in accordance with the BC Water Sustainability Act, Dam Safety Regulation (Regulation) and the Health, Safety, and Reclamation Code for Mines in BC (HSRC) as well as guidelines published by the Mining Association of Canada (MAC 2011) and the Canadian Dam Association (CDA 2013, CDA 2014).

1.2 Purpose of the OMS Manual

This OMS Manual provides a framework for the maintenance and monitoring (surveillance) of the TSFs and associated water management structures, including the following items:

- Roles and responsibilities of parties associated with maintenance and monitoring at the site;
- Procedures for managing changes in personnel, site conditions or facility performance, and corresponding updates to the OMS Manual;
- Identification of key components of the TSFs;
- Procedures to monitor performance of the TSFs and implement maintenance activities as required to ensure that the TSFs function in accordance with their design and applicable regulatory requirements;
- Documentation and reporting requirements; and
- Emergency planning and response procedures.

1.3 OMS Manual Updates

This OMS Manual is the property of CGC, which holds sole authority of distribution of this document.

It is the responsibility of CGC to update this OMS Manual when required, or to retain a third party to update the OMS Manual on their behalf.

This OMS Manual should be reviewed as part of routine monitoring, Dam Safety Inspections (DSI) and Dam Safety Reviews (DSR), and/or if significant changes occur at the site, to assess the applicability of the content to existing site conditions. Revisions to the manual should be undertaken within a reasonable timeframe and re-issued.

Revisions to the OMS Manual should be made with consideration of major changes to applicable maintenance or monitoring plans or regulations. If changes to these plans or regulations are required, the OMS Manual should be updated.

The revision history of the OMS Manual is summarized on Table 1-1.

Table 1-1: OMS Manual Revision History

Revision No.	Revision Date	Prepared By	Primary Author(s)	Description of Revisions
0	May 31, 2018	Tetra Tech Canada Inc.	Richard Trimble, M.Sc., P.Eng., FEC	Issued for Review
1	March 21, 2019	Tetra Tech Canada Inc.	J. Richard Trimble, M.Sc., P.Eng., FEC.	Issued for Use
2	March 18, 2020	Kaesy Gladwin Margaux Resources Ltd	J. Richard Trimble, M.Sc., P.Eng., FEC.	Updates to QP, Manager Update 6.3.3 Water quality sampling
3	October 6, 2020	Taylor Pasloski, P.Eng. Tetra Tech Canada Inc.	J. Richard Trimble, M.Sc., P.Eng., FEC	Update emergency contact list. Update owner

The OMS Manual is to be distributed as follows:

- One copy to the CGC Site Manager;
- One copy to the Engineer-of-Record; and
- One copy to the Government of BC.

2.0 ROLES AND RESPONSIBILITIES

2.1 Individual Responsibilities

Implementation of the procedures described in this OMS Manual will be undertaken by the personnel identified in Table 2-1.

Table 2-1: Individual Responsibilities for Implementation of the OMS Program

Name and Role	Responsibilities
Kaesy Gladwin Site Manager and Site Owner (CGC)'s Representative Ph: 250.239.3301 Cel: 705.351.2601 Email: kaesy@cassiargold.com	Overall management of the site and OMS program; Ensure that the site is maintained and inspected in accordance with BC regulations; Preparation and implementation of a Health and Safety Plan for the site; Preparation of specific work instructions for the geotechnical inspector; Administer contracts and supervise designated personnel for the site or the hired contractor responsible for maintenance and repairs; Implementation of Dam Safety Reviews and reporting, as required; Annual updates to the emergency preparedness and response plans; Coordinate environmental monitoring programs; and Implement the Health and Safety plan during site visits.
J. Richard Trimble, P.Eng. (Tetra Tech) Engineer of Record Ph: 867.668.9216 Email: Richard.trimble@tetrattech.com	Carry out Dam Safety Inspections; Confirm that changes to the design of the TSFs satisfy applicable design standards, codes and guidelines; and Implement the Health and Safety plan during site visits.

2.2 Competency and Training

The site manager must ensure that all OMS Program personnel are familiar with the contents of this Manual, have received appropriate training, are competent, and have a clear understanding of their roles and responsibilities. Competency and training requirements for OMS Program personnel are summarized on Table 2-2.

Table 2-2: Competency and Training Requirements for OMS Program Personnel

Position	Required Competency and Training
Site Manager	<p>Have a background in permitting, design, construction and performance assessment of tailings management facilities, with an emphasis on mine closure;</p> <p>Have thorough knowledge of general and site-specific environmental permitting, water quality requirements, monitoring requirements, and other applicable regulatory requirements;</p> <p>Have thorough knowledge of sampling locations and procedures applicable to the site;</p> <p>Have training and be fully aware of the emergency planning and response procedures;</p> <p>Have extensive experience preparing spill incident reports and annual environmental report; and</p> <p>Have the ability and authority to coordinate and implement maintenance activities.</p>
Engineer-of-Record	Professional Engineer, registered to practice in BC, with at least 10 years of prior experience in mine waste management, including tailings management.
Field Environmental Technician	<p>Have experience sampling water using appropriate techniques;</p> <p>Have thorough knowledge of site sampling locations;</p> <p>Have experience with handling, packaging, and chain of custody for water samples; and</p> <p>Have data management and reporting skills.</p>
Geotechnical Inspector	Have experience with the geotechnical design aspects of the site structures, and training/experience to recognize stability or seepage issues that could affect long term performance of the structures

2.3 Managing Changes

Revisions to an OMS Manual can be triggered by changes in operational performance, personnel or organizational structure, regulatory or social considerations, dam classification, or the life cycle of design philosophy of the facility.

This OMS Manual should be formally reviewed by the Engineer-of-Record as part of DSIs, and by third parties as part of DSRs, as required. These inspections and reviews may result in recommendations to update the OMS Manual.

In addition to updating the OMS Manual when required, CGC will be responsible for the following:

- Ensure that the standards used for the TSFs are consistent with applicable legislation, codes, standards and guidelines, and with sound engineering practice;
- Appropriate training for all new personnel assigned to tasks related to the OMS Program;
- Communication of any changes to the OMS Manual to all appropriate personnel; and
- Ensure that updated OMS Manuals are distributed to all parties listed in Section 1.3.

2.4 Document Control

The Site Manager should ensure that the following documents are securely stored and are accessible to OMS Program personnel:

- This OMS Manual;
- Applicable site inspection reports, DSI reports, and DSR reports;
- As-built records for the Tailings Facilities and associated site components;
- As-built records for maintenance completed at the site;
- Incident Reports; and
- Record of staff training.

Revisions to this OMS Manual should be documented on the revision control table (Table 1-1). When revisions are made, the updated OMS Manual should be immediately distributed to the to all parties listed in Section 1.3; superseded versions of the OMS Manual should be removed from circulation and archived.

3.0 FACILITY DESCRIPTION

3.1 Facility Overview and Site History

The Taurus mine site is located approximately three kilometres north of Jade City, BC as shown on Figure 1. There are two TSFs at the site, TA-TSF 1 and TA-TSF 2, as shown on Figure 2.

TA-TSF 1 is a valley impoundment structure comprised of two cross valley dams (Dam 1 and Dam 2) to contain tailings. The area of TA-TSF 1 is approximately 4,000 m² and the only source of water inflow into the TSFs is rainfall and snowmelt within the 1.5 ha catchment area.

TA-TSF 2 is located downstream of TA-TSF 1 and is impounded by Dam 3. The surface area of TA-TSF 2 is approximately 4,700 m². Water inflows for TA-TSF 2 include discharge from TA-TSF 1 and rainfall and snowmelt within the 5.0 ha catchment area.

The mine was operated by Taurus Resources Inc. from 1981 to 1988. During that time 288,863 tons were mined at the site. The mine has not been active since 1988 and the mill has been removed.

There is no instrumentation installed at the site.

3.2 Site Conditions

3.2.1 Climate

The British Columbia Ministry of Transportation and Infrastructure has recorded climate data from a station located in Jade City since 1988. Tetra Tech downloaded this data for period from 1988 to 2008 from the Pacific Climate Impacts Consortium. The temperature data recorded by this weather station is presented in Table 3-1.

Table 3-1: Temperature Data from Jade City Station (1988 to 2008)

Parameter	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Daily Maximum Temp (°C)	10.6	9.5	13.5	22.5	26.3	36.2	34.1	34.0	20.7	16.0	8.5	9.0
Daily Minimum Temp (°C)	-48.5	-48.7	-41.3	-28.7	-8.9	-3.3	-0.8	-2.6	-8.6	-24.0	-41.4	-46.8
Daily Mean Temp (°C)	-16.6	-12.6	-8.9	-0.7	5.2	11.1	12.6	16.9	5.5	-0.9	-9.1	-15.2

Precipitation data from the Jade City weather station was found to be inaccurate and as a result was not included in this document. The next nearest active weather station is located in Dease Lake, BC, but historic climate data (1971-2000) is available from a weather station that is no longer operated in Cassiar. The historic Cassiar precipitation data is considered to better represent hydraulic conditions on site because the station was located closer to the site and the annual precipitation is greater than at Dease Lake. The historic Cassiar precipitation data is summarized in Table 3-2.

Table 3-2: Cassiar Historic Climate Normals (1971-2000)

Parameter	Mean Annual Precipitation
Rainfall	337 mm
Snowfall	4,140 mm
Total equivalent precipitation	750 mm

3.2.2 Hydrology

The TSFs are located within the drainage of Snowy Creek. There are no named lakes near the TSFs.

Ponded water has been observed within the TSFs. This water is believed to come from precipitation and runoff.

3.2.3 Vegetation

Vegetation (shrubs and bushes) is well established on the downstream faces and is beginning to grow on the crests of Dams 1 and 2 in TA-TSF 1. Some grasses are growing on the tailings surfaces. The Dam 2 spillway was observed to be heavily overgrown in 2017 (Tetra Tech, 2017).

Minimal vegetation, primarily grasses, began to grow on the tailings surface of TA-TSF 2. Vegetation (shrubs and bushes) is well established on the downstream face and is beginning to grow in the spillway (Tetra Tech, 2017).

Dam crests and 3 m down-slope on the faces, as well as spillways, were cleared of woody vegetation in 2019.

Overall, the site is covered by a sub-alpine forest and alpine fir is the primary species (Taurus, 1998).

3.2.4 Aquatic Biota, Fish and Wildlife Resources

3.2.4.1 Aquatic Biota and Fish

There is no known literature relating to aquatic biota at the Taurus site. Previous studies have determined that Snowy Creek had strong limitations on resident or spawning fish (Taurus, 1998).

3.2.4.2 Wildlife

There is no known literature relating to wildlife surveys at the Taurus site. Wildlife likely to occur in the area include moose, caribou, bear, wolf, coyote, fox, rabbit, squirrels, and other small mammals. Various species of birds are likely to be present around the site.

3.2.5 Tailings Properties

3.2.5.1 Geotechnical Properties

There is no known literature relating to the geotechnical properties of the tailings.

3.2.5.2 Geochemical Properties

TA-TSF 1 is reported to contain a small pod of pyritic tailings, and TA-TSF 2 is reported to contain only quartz vein tailings that are highly acid-consuming and pyrite-reduced (Taurus, 1998).

3.2.6 Surrounding Soils and Fill Materials

There is no known literature regarding baseline surficial geology mapping. The TSF area is believed to be underlain by a clay-rich glacial till, which extends to 10 m in thickness (Taurus, 1998).

3.2.7 Hydrogeology

There is no known literature regarding the hydrogeological conditions at the Taurus mine site.

3.3 Facility Components

The Taurus TSFs are comprised of the following key site components:

- Dam 1 (in TA-TSF 1);
- Dam 2 and spillway (in TA-TSF 1);
- Dam 3 and spillway (in TA-TSF 2); and
- Site access road.

3.4 Regulatory Requirements

The Taurus Mine Site is currently operated under BC Ministry of Energy, Mines, and Petroleum Resources (BC MEMPR) exploration permit MX-1-655. The two TSFs are under BC MEMPR permit M-149. Tetra Tech has no record of a water license for the Taurus Mine.

3.5 Dam Classification

The CDA (2014) defines a mining dam as a structure at a mine site or metallurgical plant site that retains solids (which may or may not be contaminated) or contaminated liquids; the three dams within TA-TSF1 and TA-TSF2 satisfy these conditions and therefore should be considered mining dams.

The CDA Guidelines (CDA 2013) and the HSRC (2016) require that dams be assigned a classification, which is based on the consequences of dam failure with respect to loss of life, and economic and environmental impacts.

A dam classification of “Low” was designated for the Taurus mine site by Knight Piésold Consulting (KP) in the 2002 DSI, and was confirmed by Tetra Tech in the 2015, 2017, 2019, and 2020 DSIs. This OMS Manual is based on the assumed dam classification of “Low” and should be updated if a different dam classification is established as a result of a Dam Safety Review or other study.

3.6 Basis of Design and Design Criteria

Design criteria for mining dams (CDA 2014) vary depending on the dam classification and the current phase of the dam’s life cycle. The Taurus TSF has undergone some remediation (“transition” phase) and is currently closed. The life cycle of closed dams includes a Closure - Active Care phase, followed by a Closure - Passive Care phase.

The Taurus TSF can be considered to be in the Active Care Phase, since it remains subject to regular site visits and annual DSIs; this provides regular opportunity to monitor the condition and performance of the dam.

Applicable CDA design criteria for a dam classification of “Low” are presented on Table 3-2.

Table 3-2: Design Criteria – “Low” Dam Classification (CDA, 2014 and HSRC, 2016)

Design Criterion	Value
Annual Exceedance Probability (AEP) – Flood	1/3 between 1/975 and PMF
Annual Exceedance Probability (AEP) – Earthquake	1/2475
Dam Stability – Static	FS > 1.5
Dam Stability – Seismic (Pseudo-Static)	FS > 1.0
Dam Stability – Post-Seismic (Liquefaction/Cyclic Softening)	FS > 1.2

4.0 OPERATION

The Taurus Mine is closed and currently in long term care and maintenance, and there has been no mining related activity at the TSFs since 1988.

As such, there are currently no active operations at the site, and therefore no guidance is provided with respect to Operations in this OMS Manual.

5.0 MAINTENANCE

5.1 Objective

The objective of the maintenance program within the overall OMS Program is provide a framework for completing maintenance activities at the site.

Since the site is not currently operational, and there is no full-time presence of personnel at the site, it is expected that maintenance requirements will be identified primarily by way of the surveillance program (Section 6).

5.2 Responsibility

The Site Manager is responsible for coordinating all maintenance activities.

5.3 List of Components Requiring Maintenance

Site components that may require periodic maintenance are listed below:

- Dams 1 and 2 and Dam 2 spillway in TA-TSF 1;
- Dam 3 and spillway in TA-TSF 2; and
- Site access road.

5.4 Maintenance Schedule and Triggers

The site is in long-term care and maintenance, and there is no full-time presence of personnel on site, and no regularly scheduled maintenance is required.

Inspections should be undertaken during snow-free months (in conjunction with other site visits to collect water samples, etc.) and site components requiring maintenance should be identified and reported as needed.

Maintenance requirements will also be identified during other scheduled inspections completed by CGC and/or other qualified personnel (e.g., DSIs), as described in Section 6 (Surveillance).

Maintenance may also be required following event driven surveillance activities, such as extreme rainfall/flooding, earthquake, or reported changes in site conditions.

A locally based contractor should be identified, who will be available to carry out required maintenance promptly when needed.

5.5 Routine Maintenance Requirements

All maintenance activities will be implemented based on recommendations following from observations recorded during site visits or review of site data. Routine maintenance activity that is considered likely to be required from time to time are described below for key site components.

5.5.1 Dam 1

Routine maintenance of Dam 1 is expected to include the following:

- Removing woody vegetation (i.e., trees and shrubs greater than 25 mm butt diameter) from the crest and the top three metres of sideslopes, ensuring that the roots are pulled out. Some earthfill and compaction may be required if large root bulbs are removed;
- Removing woody vegetation (i.e., trees and shrubs greater than 25 mm butt diameter) from the crest and the top three metres of sideslopes, ensuring that the trunks are cut off close to the ground surface and all cut material is removed from the dam. The surfaces should be recompacted, if necessary, after vegetation removal to restore a flat surface;
- Repairing, re-grading and/or backfilling gullies, depressions, rilling, cracking, or similar features where the dam has been distressed, eroded or otherwise damaged. Additional fill should be placed as required to maintain design grades.

5.5.2 Dam 2

Routine maintenance of Dam 2 is expected to include the following:

- Removing woody vegetation (i.e., trees and shrubs smaller than 25 mm butt diameter) from the crest, the top three metres of sideslopes, and the spillway, ensuring that the roots are pulled out. Some earthfill and compaction may be required if large root bulbs are removed;
- Removing woody vegetation (i.e., trees and shrubs greater than 25 mm butt diameter) from the crest, the top three metres of sideslopes, and the spillway, ensuring that the trunks are cut off close to the ground surface and all cut material is removed from the dam. The surfaces should be recompacted, if necessary, after vegetation removal to restore a flat surface; and
- Repairing, re-grading and/or backfilling gullies, depressions, rilling, cracking, or similar features where the dam has been distressed, eroded or otherwise damaged. Additional fill should be placed as required to maintain design grades.

5.5.3 Dam 3

Routine maintenance of Dam 3 is expected to include the following:

- Removing woody vegetation (i.e., trees and shrubs smaller than 25 mm butt diameter) from the crest, the top three metres of sideslopes, and the spillway, ensuring that the roots are pulled out. Some earthfill and compaction may be required if large root bulbs are removed;
- Removing woody vegetation (i.e., trees and shrubs greater than 25 mm butt diameter) from the crest, the top three metres of sideslopes, and the spillway, ensuring that the trunks are cut off close to the ground surface and all cut material is removed from the dam. The surfaces should be recompacted, if necessary, after vegetation removal to restore a flat surface; and
- Repairing, re-grading and/or backfilling gullies, depressions, rilling, cracking, or similar features where the dam has been distressed, eroded or otherwise damaged. Additional fill should be placed as required to maintain design grades.

5.5.4 Site Access Road

Routine maintenance of the site access road should be conducted to maintain site access for off-road, 4x4 vehicles during snow-free months. This is expected to include trimming back vegetation that encroaches on the road. Tetra Tech understands that CGC prefers to allow approximately the first 50 m of the trail to remain overgrown to discourage public access to the TSFs.

5.6 Documentation

All maintenance activity undertaken at the site should be documented.

For routine maintenance tasks (e.g., maintenance requirements identified during regular scheduled site inspections), as-built records, logs, and/or inspection reports should be produced and stored for future reference.

For event-driven maintenance (e.g., in response to extreme weather events), an associated incident report should also be prepared if appropriate.

6.0 SURVEILLANCE

6.1 Objective

The objective of the surveillance program within the overall OMS Program is to carry out routine monitoring to identify changes in site conditions or performance that will trigger maintenance or some other response.

These surveillance activities are also useful in developing programs for routine or preventative maintenance, as opposed to solely reactive, or event-based, maintenance.

The key components of the surveillance program include the following:

- Complete regular performance monitoring of the TSFs;
- Review and interpret water quality data;
- Record and report observations from surveillance activities; and
- Review the surveillance program on an annual basis, and update as/when required.

6.2 Responsibility

The Site Manager is responsible for implementing the Surveillance Program, including coordinating all site visits and inspections.

6.3 Surveillance Program

6.3.1 Previous Monitoring Programs

DSIs for the Taurus Mine Site have been conducted in 2002 by KP, and in 2015, 2017, and 2019 by Tetra Tech.

A regularly scheduled water quality monitoring program was developed by Palmer Environmental Consulting Group (PEGC) to meet regulatory requirements. Program details are included in the Updated Reclamation and Closure Plan for Taurus mine permit M-149, dated March 12, 2020. Water quality sampling has been performed by the Site Manager or delegate.

6.3.2 Geotechnical Surveillance Program

6.3.2.1 Visual Geotechnical Inspections (Bimonthly during snow free months)

Site visits and visual inspection of the site components should be completed by a qualified Geotechnical Inspector or the Site Manager (see qualifications on Table 2.3-1) once every two months during snow-free months (typically May to October).

As a minimum, the following observations should be recorded during geotechnical inspections:

- Cracks, slumping, sinkholes, rutting, erosion, or ponded water on the tailings surfaces or the dam crests of the TSFs;
- Erosion, gullyng or other slope movement in the natural slopes adjacent to the TSFs;
- Measurements of the freeboard in the TSFs;
- Seepage (especially with entrained sediment), erosion, gullyng or other slope movement on the downstream side of any of the dams, or adjacent natural slopes;
- Erosion, rutting, or similar that affect the trafficability of the site access road to light vehicle traffic;
- Vegetation growing on the dams; and
- Animal burrows or tunnels that may affect stability of any earthen structure.

Inspection reports should be provided to the Site Manager and Engineer-of-Record promptly following each inspection, so that any maintenance requirements can be identified and implemented.

6.3.2.2 Dam Safety Inspections (Annually)

Annual DSIs should be completed by the Engineer-of-Record (see qualifications on Tables 2.2-1 and 2.3-1) or a similarly qualified consultant retained on behalf of the Engineer-of-Record.

The scope of DSIs should include all the required observations described above for monthly visual inspections, as well as the following:

- Review and assessment of any future instrumentation and monitoring data;

- Evaluation of the adequacy and performance of the TSFs with respect to the current design and condition of the site components; and
- Review and update of this OMS Manual.

6.3.2.3 Dam Safety Reviews

DSRs should be completed every five years by a suitably qualified, independent third party, as required by the Health, Safety, and Reclamation Code for Mines in BC (HSRC) (2017) and in accordance with scope described by the CDA (2013) and the APEGBC Professional Practice Guidelines for Legislated Dam Safety Reviews in BC (2016).

A DSR must be completed for Taurus TSFs by 2021 and submitted by March 31, 2022.

6.3.3 Environmental Surveillance Program

The regularly scheduled water quality monitoring program is currently being developed by CGC. This manual should be updated with the details of the monitoring program, including, but not limited to; monitoring frequency, sampling locations, and monitoring procedures (including Quality Assurance and Quality Control practices).

6.3.4 Event Driven Surveillance

In addition to the regularly scheduled surveillance activities described above, additional surveillance should be undertaken by appropriate personnel in the event of unusual or extreme events. Events that should trigger Surveillance activity include the following:

- Earthquake of magnitude M4 or greater occurring within 100 km of the site, or any seismic event causing shaking that is felt in Jade City, for example a larger magnitude earthquake occurring more than 100 km from the site;
- Rainfall equal to or greater than the 1 in 50 year precipitation event, or flooding caused by any other source (e.g., rapid snow melt);
- Mass movement event from the slopes surrounding the site (e.g. landslide, rockslide, snow avalanche), that impacts the site; and
- Unusual construction activities or other events occurring at or near the site, that could potentially impact or change the configuration of any of the site components.

7.0 REPORTING AND COMMUNICATIONS

7.1 Communication Procedures

Site management and monitoring policy should be communicated to all interested parties involved in the Maintenance and Surveillance of the site.

The Site Manager should ensure that all issues, concerns and incidents are promptly addressed and reported to interested parties. The Site Manager should ensure clear, concise and consistent communication so that the

Emergency Preparedness and Response Plan (EPRP) is effective and the public can be made aware of hazards associated with the site.

7.2 Documentation

All inspection reports should be prepared and/or reviewed by a qualified person (see qualifications on Table 2-2), and securely stored for future reference.

7.3 Operations, Maintenance and Surveillance Reporting

Any personnel visiting the site should promptly report any observed issues that may require maintenance to the Site Manager in writing.

The Inspector should prepare an inspection memorandum describing the observations from each site visit, as well as recommended maintenance activities, which is to be submitted to the Site Manager. Similarly, DSI and DSR reports should be submitted to the Site Manager. As a minimum, these memoranda and reports should include:

- Summaries of all data generated or recorded;
- Description of any maintenance, remedial, or reclamation work completed since the previous inspection, DSI, or DSR;
- Description of the current condition and performance of the site components;
- Recommended maintenance to ensure ongoing acceptable performance of the site components; and
- Other details requested by the Site Manager.

The Environmental Field Technician should prepare an environmental inspection memorandum following each site visit including, at a minimum, the following:

- Summary of all relevant site observations;
- Record of any future field instrument calibration;
- Summary of all physicochemical parameters measured in the field;
- Record of all samples collected;
- Description of the current condition and performance of the monitoring stations and equipment;
- Recommended maintenance to ensure ongoing acceptable performance of the site monitoring stations and equipment;
- Tabulated water quality data including field parameters and laboratory analytical results;
- Discussion of QA/QC results;
- Completed site inspection forms; and
- Laboratory report.

Upon completion of each year of monitoring, an annual environmental monitoring report should be completed by CGC, including but not necessarily limited to the following:

Description of the current condition and performance of the site components and any potential maintenance activities carried out over the past year;

Summary of the environmental monitoring program over the past year including a description of all sampling methods applied;

A list of all monitoring stations with relevant information, such as location UTM coordinates, well completion details etc.;

An up-to-date site plan showing all monitoring stations;

Compilation and discussion of all monitoring results over the past year;

Identification of any exceedances of applicable water quality standards and guidelines;

Long-term trend analysis for identified parameters of concern, including all historical data available; and

Conclusions and recommendations, including recommendations for changes to the monitoring program as appropriate.

Paper and electronic copies of all documents should be securely stored for future reference.

Observations made during site inspections should be recorded in field books and/or site inspection sheets. Photocopies of field notes and inspection sheets should be retained along with the associated memoranda or reports.

8.0 EMERGENCY PREPAREDNESS AND RESPONSE PLAN

8.1 General

The Taurus mine site has been in a state of long-term care and maintenance since 1988. There has been no documented remediation work at the TSFs beyond the removal of buildings, structures, equipment, and garbage from the site.

Currently, field work at the site includes periodic inspections and maintenance of the site components on an as-needed basis. In general, the TSFs are understood to be operating as designed, with no critical signs of instability.

The Emergency Preparedness and Response Plan (EPRP) is intended to provide a framework for preparing for, responding to, and investigating incidents that may occur at the site, with respect to both the performance and condition of the TSFs as well as potential health and safety hazards that may affect personnel visiting the site or members of the public that may be present in the surrounding area. CGC has reported that there are no permanent residents downstream of the TSFs.

This EPRP has been prepared with the intent of meeting the requirements of the Regulation. CGC and local, regional and provincial response agencies all play a role in responding to an emergency under the Emergency Program Act.

Notifications regarding an unusual or emergency event at the dam are based on three emergency levels which described in Section 8.1.1. A list of key contacts, regulatory agencies, and local authorities is provided at the front of this OMS Manual.

Section 9 (1) (a) (ii) of the Regulation requires the EPRP to include a record containing specific information on the site to be used by local emergency authorities for their own local emergency plan; a plan mandated under the Emergency Program Act. This information includes a general dam description, directions to the dams, emergency contacts, and a map of the access route, and is provided in Appendix B. Therefore, to fulfill this requirement, following approval by the Dam Safety Officer (DSO), CGC must provide Appendix B to relevant local emergency authorities. Subsequently, these sections are reviewed annually by CGC and, if required, updated and copies sent to the DSO and all local emergency authorities for that area. Tetra Tech does not have the data required to complete an inundation map for the Taurus TSFs. However, due to the lack of downstream infrastructure and residents, and the small impoundment volume of the TSFs, the inundation hazard is considered to be low.

8.1.1 Emergency Levels

8.1.1.1 Level 1

Level 1 is the first or lowest level of severity for an emergency. Typical situations that may constitute a Level 1 emergency include the following:

- Minor erosion or other distress (e.g., seepage, cracking, toe bulging) visible on the surface of the tailings surface, dams, or surrounding natural slopes;
- Elevated flow and/or minor erosion in or surrounding the spillways; and
- Anomalous environmental test results, potentially indicating an increasing trend and or unacceptable environmental impact.

8.1.1.2 Level 2

A Level 2 emergency represents potential for imminent danger to human health and safety, the environment, or the physical stability of one or more site components. Typical situations that may constitute Level 2 emergency include the following:

- Overtopping of any of the dams by retained water, causing rapid visible erosion of the dams or other site components;
- Major erosion or other distress (e.g., seepage, cracking, toe bulging) on the surface of the dams; and
- Sediment in Snowy Creek immediately downstream of TA-TSF 2, that indicates seepage from the TSF.

8.1.1.3 Level 3

A Level 3 emergency represents a situation where one or more site components has failed or is in a condition where imminent failure is almost certain.

8.2 General Roles and Responsibilities

The following are the basic emergency planning and response roles and responsibilities for the five key agencies involved when an emergency occurs. For more detailed information regarding emergency planning, preparedness, response and recovery refer to the document, BC Emergency Management System 2016.

8.2.1 Dam Owner (CGC)

CGC's responsibilities in the event of an emergency are as follows:

- As soon as an emergency event is observed or reported, immediately determine the emergency level;
 - Level 1: unusual event, slowly developing;
 - Level 2: potential dam failure situation, rapidly developing; and
 - Level 3: dam failure appears imminent or is in progress.
- Immediately notify the personnel listed in Section 8.3.3 for the appropriate emergency level;
- Undertake appropriate remedial actions during Level 1 or 2. Remedial actions may be recommended by the Engineer-of-Record or required by the DSO;
- Provide updates of the situation to the local emergency authority to assist them in making timely and accurate decisions regarding warnings and evacuations; and
- Provide leadership to assure the EPRP is reviewed and updated annually and copies of the revised EPRP are distributed to all who received copies of the original EPRP including the records for the local emergency authorities. Undertake EPRP exercises as appropriate.

8.2.2 Local Emergency Authorities

Local emergency authorities support and coordinate the overall emergency response activities within its geographical or functional jurisdiction. The contact information for emergency authorities is included in the Key Contacts table at the beginning of this document. Their responsibilities in the event of an emergency are as follows:

- Serve as the primary contact responsible for coordination of all emergency actions for potentially affected communities;
- When a Level 2 situation occurs;
 - Prepare emergency response personnel for possible evacuations that may be needed if a Level 3 situation occurs;
 - Consider drafting a State of Local Emergency in preparation for Level 3; and
 - Provide resources as necessary to the dam owners.
- When a Level 3 situation occurs;
 - Initiate warnings and order evacuation of any people at risk downstream of the dam;
 - Declare a State of Local Emergency if required;

- Direct local emergency response services (may include local law enforcement) to carry out the evacuation of any people and close roads within the evacuation area; and
- Provide resources as necessary to the dam owners.
- Decide when to terminate the emergency; and
- Participate in review, updates and exercises of the EPRP.

8.2.3 Emergency Management BC (EMBC)

Emergency Management BC (EMBC) is the lead agency in the provincial government for all emergency management activities. EMBC works with local governments, First Nations, federal departments, industry, non-government organizations and volunteers to support the emergency management phases of mitigation/ prevention, preparedness, response and recovery. EMBC has its headquarters, the Provincial Emergency Co-ordination Centre and the 24/7 Emergency Call Centre, in Victoria. Six Provincial Regional Emergency Operations Centres are located in Terrace, Prince George, Kamloops, Nelson, Surrey and Victoria (co-located with the Provincial Emergency Co-ordination Centre). In the event of an emergency EMBC's responsibilities are as follows:

- Assist local emergency authority when notified of the activation of local emergency plans with issuance of an emergency task number;
- Propagate the emergency information to other relevant stakeholders;
- Support the communication needs of local emergency authority;
- Declare a Provincial State of Emergency if required; and
- Participate in exercises of the EPRP.

8.2.4 Engineer of Record

The Engineer-of-Record's responsibilities in the event of an emergency are as follows:

- Undertake an engineering assessment of the safety hazard at the dam;
- Assist the dam owner to determine the emergency level, if time permits; and
- Advise the dam owner of remedial actions to take if a Level 1 or 2 event occurs, as required.

8.2.5 Ministry of Forests, Lands and Natural Resource Operations

The Ministry of Forests, Lands and Natural Resource Operations (MFLNRO) is the ministry responsible for the provincial government "Dam Emergency Response Plan (DERP)" under the Emergency Program Act. The BC Dam Safety Program administers the DERP and has an active role in all levels.

The DSO is the first point of contact in MFLNRO for Level 1 and is required to inform EMBC if a dam is considered to be at Level 1. EMBC may contact the local emergency authority at their discretion.

The DSO may have an active role in Levels 2 and 3. The DSO may advise the dam owner of the emergency level determination. The DSO may advise the dam owner of remedial actions to take if Level 2 event occurs.

The DSO will support EMBC, local emergency authorities, and other agencies, and may be called on to be the Subject Matter Expert at an emergency response center. The DSO is responsible for reviewing and accepting the EPRP.

8.3 Emergency Action Plan

The Emergency Action Plan is a five-step process that begins with the detection of an unusual or emergency event. The five steps are outlined below.

8.3.1 Step 1 – Event Detection

This step describes the detection of an unusual or emergency event and provides information to assist the dam owner in determining the appropriate emergency level for the event.

Unusual or emergency events may be detected by:

- Observations at or near the dam by dam owner, government personnel (local, Provincial, or Federal), landowners, visitors to the dam, or the public;
- Dam safety review, formal inspection or site surveillance;
- Evaluation of any future instrumentation data;
- Earthquakes felt or reported in the vicinity of the dam; and
- Forewarning of conditions that may cause an unusual event or emergency event at the dam (for example, a severe weather or flash flood forecast).

8.3.2 Step 2 Emergency Level Determination

After an unusual or emergency event is detected or reported, CGC is responsible for classifying the event into one of the following three emergency levels.

8.3.2.1 Level 1

This situation is not normal and has not yet threatened the operation or structural integrity of the dam, but possibly could if it continues to develop (corresponds to Section 15 - Potential Safety Hazard of the Regulation). A dam safety engineer or technical expert should be contacted to investigate the situation and recommend actions to take. The condition of the dam should be closely monitored, especially during storm events, to detect any development of a potential or imminent dam failure situation. The Local Emergency Authority should be informed if it is determined that the issue may possibly develop into a worse condition that may require emergency actions.

8.3.2.2 Level 2

This situation may eventually lead to dam failure and flash flooding downstream, but there is not an immediate threat of dam failure (corresponds to Section 14 – Hazardous Conditions of the Regulation). A dam safety engineer or technical expert should be contacted to investigate the situation, if time permits, and recommend actions to take. CGC should closely monitor the condition of the dam and undertake other appropriate hazard response activities. CGC should periodically update the status of the situation to appropriate emergency response authorities. If the dam condition worsens and failure becomes imminent, evacuation procedures must be implemented under Level 3.

Level 2 is also applicable when flow through the spillway has caused or is expected to cause flooding of downstream areas and people near the stream channel could be endangered.

Persons in the immediate vicinity of the dam, local emergency authorities, EMBC and the dam safety officer should be on alert to initiate evacuations or road closures if the flooding increases or the level 2 emergency escalates.

8.3.2.3 Level 3

This is an extremely urgent situation where a dam failure is occurring or obviously is about to occur and cannot be prevented. This situation is also applicable when flow through the spillway is causing downstream flooding and creates a hazardous condition that places persons in danger. The following persons must be contacted immediately so any persons in imminent danger can be evacuated from the endangered area, roads can be closed as needed and other emergency response activities can be undertaken; any persons in the immediate vicinity of the dam, Emergency Management BC, Local Emergency Authority and the Dam Safety Officer (Regulation, Section 14 – Hazardous Conditions).

8.3.3 Step 3 – Notification and Communication

After the emergency level has been determined, the appropriate people for the emergency level shall be notified immediately.

The Dam Emergency Situation Report (Appendix D) may be used as a guide for the information that should be communicated with the various emergency personnel.

8.3.3.1 Level 1

CGC should contact the Engineer-of-Record and must notify the DSO to describe the situation and request technical assistance on next steps to take.

8.3.3.2 Level 2

CGC should contact the Engineer-of-Record if time permits, but must notify the following of this emergency situation (see Regulation, Section 14 – Hazardous Conditions); Emergency Management BC, Local Emergency Authority, any persons in the immediate vicinity of the dam, and the DSO.

8.3.3.3

In the event of a Level 3 Emergency CGC should take the following actions:

- Contact any persons in the immediate vicinity of the dam to advise them to vacate the endangered area and call the Local Emergency Authorities. Be sure to say, “This is an emergency.” The Local Emergency Authority will implement their mandated emergency plan and begin the evacuation;
- Notify Emergency Management BC and the DSO of this emergency situation (see Regulation, Section 14 – Hazardous Conditions);
- Do whatever is necessary to bring any people in imminent danger to safety;
- Keep in frequent contact with the Local Emergency Authorities and to keep them up-to-date on the condition of the dam; and

- If all means of communication are lost: (1) try to find out why, (2) try to get to another radio or telephone that works, or (3) get someone else to try to re-establish communications. If these means fail, handle the immediate problems as best as you can, and periodically try to re-establish contact with Local Emergency Authorities.

8.3.4 Step 4 Expected Action

If CGC becomes aware of an unusual or emergency event at their dam, they should immediately determine the emergency level and the following actions should be taken. If time permits, the Engineer-of-Record should be contacted for technical consultation.

8.3.4.1 Emergency Level 1

If the emergency event is determined to be a Level 1, the following actions should be taken:

- CGC should inspect the dam for signs of changing conditions. If increased seepage, erosion, cracking, or settlement is observed, immediately report the observed conditions to the Engineer-of-Record;
- The dam owner must notify the DSO and prepare a plan, through the Engineer-of-Record, that sets out any actions required to rectify this potential safety hazard (see Regulation, Section 15 – Potential Safety Hazard); and
- Record all contacts that were made, and all information, observations, and actions taken. Note the time of changing conditions. Document the situation with photographs and video, if possible.

8.3.4.2 Emergency Level 2

If the emergency event is determined to be a Level 2, the following actions should be taken:

- CGC should contact the Engineer-of-Record, if time permits, to report the situation and request technical staff to investigate the situation and recommend corrective actions;
- CGC must contact EMBC and the Local Emergency Authorities to inform them that the EPRP has been activated and if current conditions get worse an emergency situation may require issuing warnings;
- Provide updates to Local Emergency Authorities to assist them in making timely decisions concerning the need for warnings;
- If time permits, CGC should inspect the dam for signs of changing conditions. If piping, increased seepage, erosion, cracking, or settlement are observed, CGC should immediately report the observed conditions to the Engineer-of-Record and determine if the new conditions change the established Emergency Level;
- Record all contacts that were made, and all information, observations, and actions taken. Note the time of changing conditions. Document the situation with photographs and video, if possible; and
- If time permits, follow the Emergency Remedial Actions for Level 2 Conditions (Appendix C) as appropriate.

8.3.4.3 Emergency Level 3

If the emergency event is determined to be a Level 3, the following actions should be taken:

- CGC shall immediately advise the Local Emergency Authorities of the urgent condition of the dam and request that they lead the efforts to carry out warnings to safeguard any persons in the area;
- CGC shall immediately contact EMBC, the Engineer-of-Record, and the DSO;

- CGC shall maintain continuous communication and provide the Local Emergency Authorities with updates of the situation to assist them in making timely decisions concerning warnings;
- CGC should record all contacts that were made and all information, observations, and actions and note the time of changing conditions. Document the situation with photographs and video, if possible; and
- Advise people monitoring the dam to follow safe procedures. Everyone should stay away from any failing structures or slopes and out of the potential breach inundation areas.

8.3.5 Step 5 Termination

Whenever the EPRP has been activated, an emergency level has been declared, all EPRP actions have been completed, and the emergency is over, the EPRP operations must eventually be terminated and follow-up procedures completed.

Following the end of the emergency, the Local Emergency Authority is responsible for terminating EPRP operations and relaying this decision to CGC. It is then the responsibility of each person to notify the same group of contacts that were notified during the original event notification process to inform those people that the event has been terminated.

Prior to termination of an Level 3 event that has not resulted in an actual dam failure, the dam owner's Engineer-of-Record or the DSO will inspect the dam or require the inspection of the dam to determine whether any damage has occurred that could potentially result in loss of life, injury, or property damage. If it is determined those conditions do not pose a threat to people or property, the Local Emergency Authority will be advised to terminate EPRP operations as described above.

CGC shall ensure that a final Dam Emergency Situation Report (Appendix D) is completed and document the emergency event and all actions that were taken. The dam owner shall distribute copies of the completed report to the DSO.

8.4 EPRP Maintenance

8.4.1 Annual Review of EPRP

The emergency contact information in the EPRP should be updated at least once a year as per the Regulation, Schedule 2. The EPRP should be revised if any of the contacts have changed. The EPRP annual review should include the following:

- Verifying that all of the information in Appendix B is current; and
- Verifying that all contact information at the front of this OMS Manual is current.

8.4.2 Revisions

The EPRP document held by CGC is the master document. If revisions occur, CGC will provide the revised pages and an updated revision summary page to all the EPRP document holders. The document holders are responsible for revising any outdated copy of the respective document(s) whenever revisions are received. The document holders are listed in Section 1.3.

8.4.3 Training and Exercises

BC, along with the CDA recommends EPRP training for all dam personnel and testing the EPRP through internal exercises and periodic review and/or exercise of the EPRP. Periodic exercise may consist of a simple review CGC and key CGC personnel or a more thorough exercise that could include external organizations such as the local emergency authorities (who may want to include emergency responders), persons in the immediate vicinity of the dam, the DSO, EMBC, and others with responsibilities listed in the EPRP. Other organizations that may be involved with an unusual or emergency event at the dam may also be encouraged to participate. It is recommended that before the tabletop exercise begins, meeting participants visit the Taurus Mine Site to familiarize themselves with the TSFs.

A tabletop exercise usually involves a facilitator presenting a scenario of an unusual or emergency event at a dam. The scenario should be developed prior to the exercise. Once the scenario has been presented, the participants will discuss the responses and actions that they would take to address and resolve the scenario. The facilitator controls the discussion, ensuring realistic responses and developing the scenario throughout the exercise.

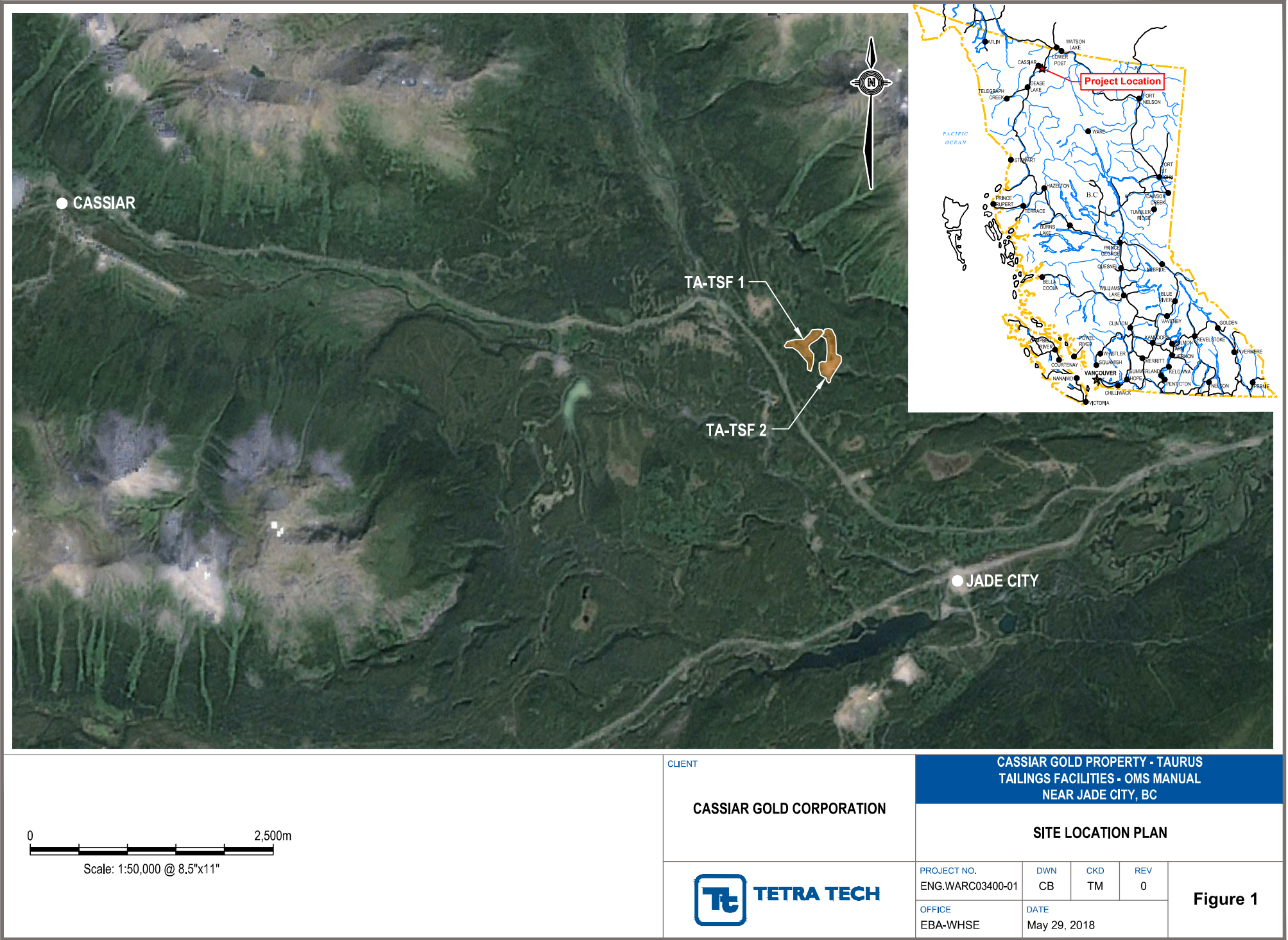
After the tabletop exercise, the five-step EPRP response process should be reviewed and discussed. Any recommendations for improvements should be documented.

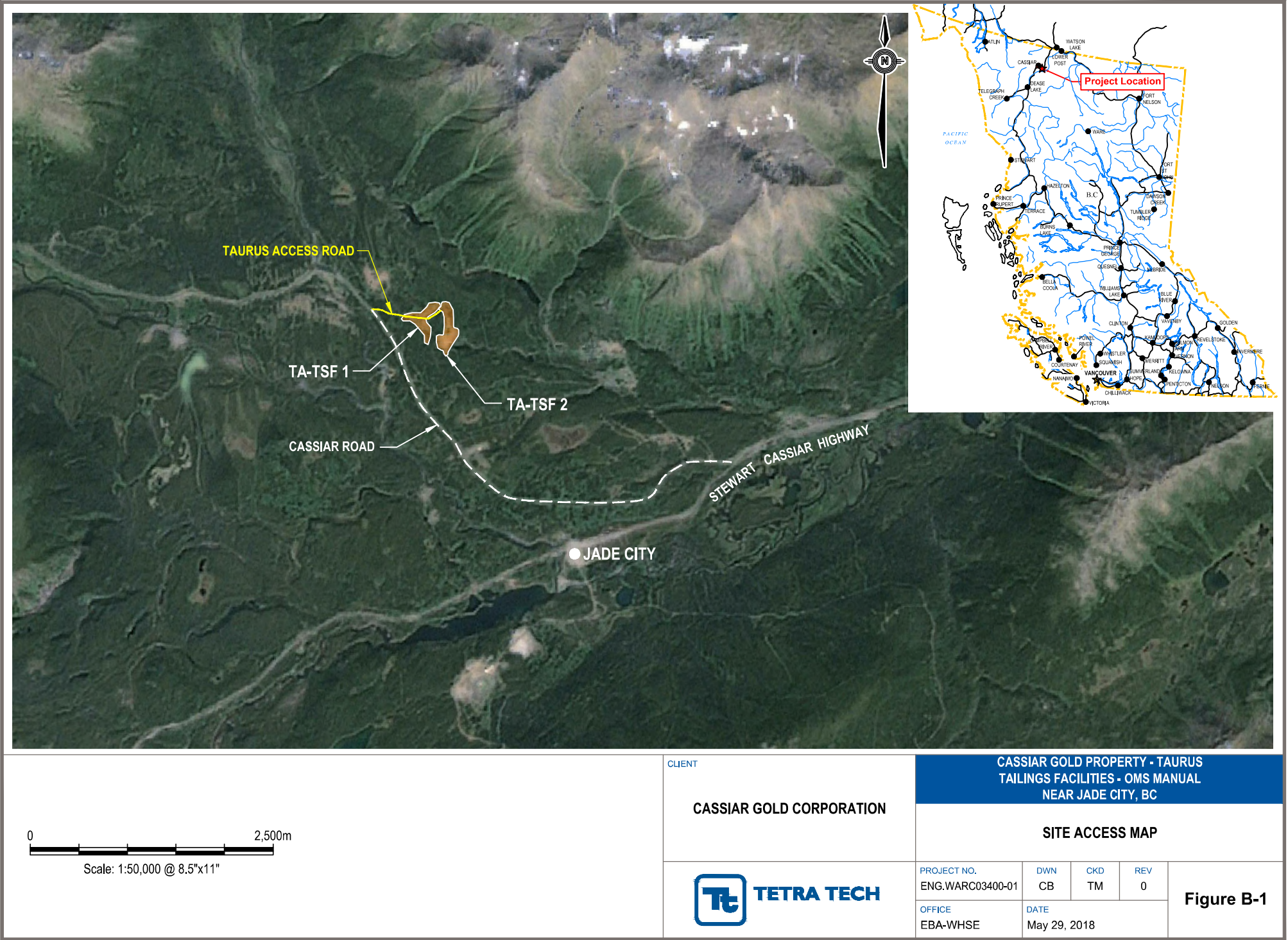
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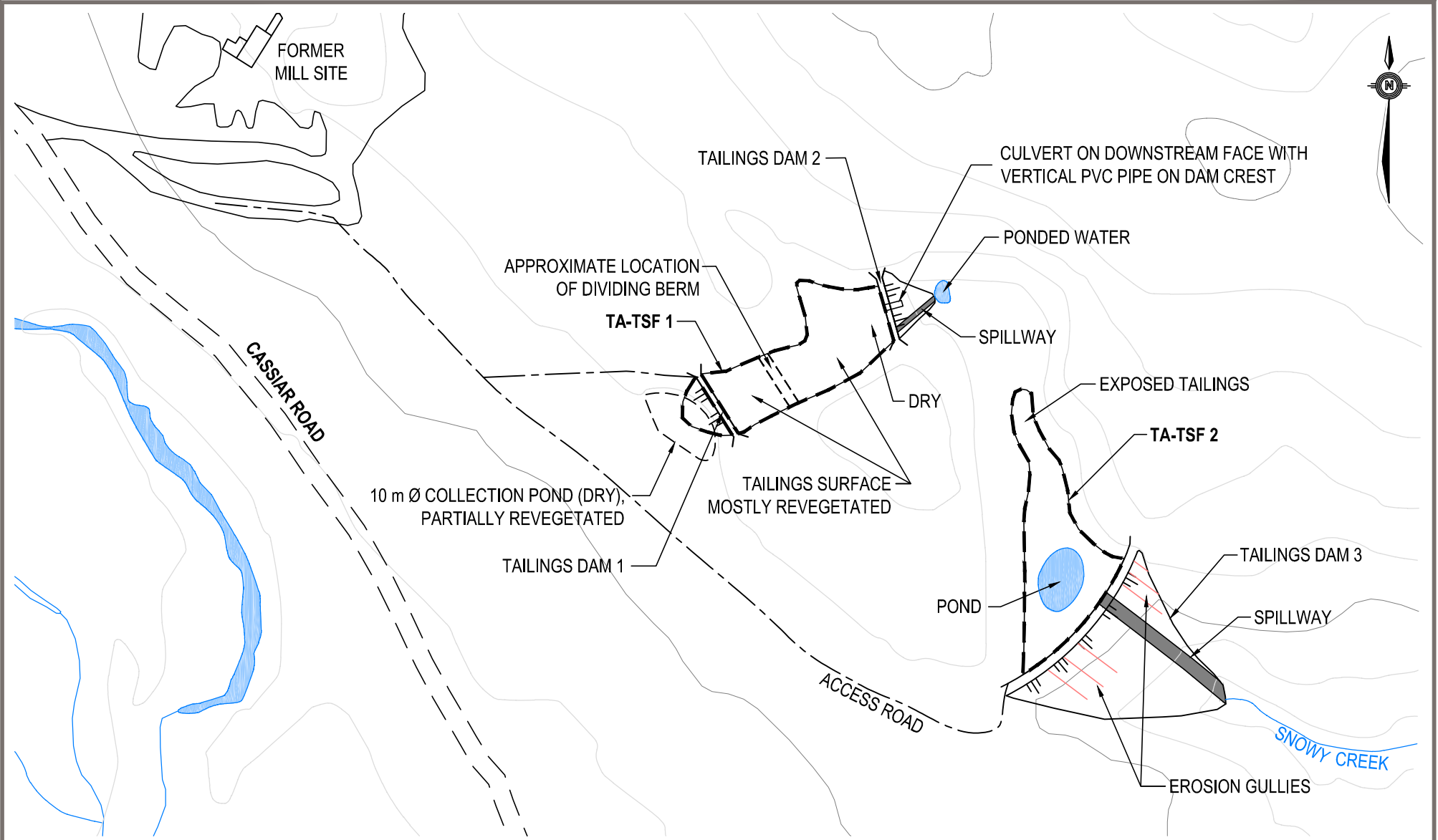
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FIGURES

- Figure 1 Site Location Plan
Figure 2 Site Plan







NOTE : THE INFORMATION SHOWN IS FROM OBSERVATIONS MADE ON JUNE 9, 2015 AND AUGUST 16, 2017

CLIENT

CASSIAR GOLD CORPORATION

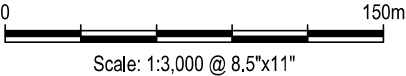


CASSIAR GOLD PROPERTY - TAURUS
TAILINGS FACILITIES - OMS MANUAL
NEAR JADE CITY, BC

SITE PLAN

PROJECT NO. ENG.WARC03400-01	DWN CB	CKD TM	REV 0
OFFICE EBA-WHSE	DATE May 29, 2018		

Figure 2



APPENDIX A

TETRA TECH'S LIMITATIONS ON THE USE OF THIS DOCUMENT

LIMITATIONS ON USE OF THIS DOCUMENT

GEOTECHNICAL

1.1 USE OF DOCUMENT AND OWNERSHIP

This document pertains to a specific site, a specific development, and a specific scope of work. The document may include plans, drawings, profiles and other supporting documents that collectively constitute the document (the "Professional Document").

The Professional Document is intended for the sole use of TETRA TECH's Client (the "Client") as specifically identified in the TETRA TECH Services Agreement or other Contractual Agreement entered into with the Client (either of which is termed the "Contract" herein). TETRA TECH does not accept any responsibility for the accuracy of any of the data, analyses, recommendations or other contents of the Professional Document when it is used or relied upon by any party other than the Client, unless authorized in writing by TETRA TECH.

Any unauthorized use of the Professional Document is at the sole risk of the user. TETRA TECH accepts no responsibility whatsoever for any loss or damage where such loss or damage is alleged to be or, in fact, caused by the unauthorized use of the Professional Document.

Where TETRA TECH has expressly authorized the use of the Professional Document by a third party (an "Authorized Party"), consideration for such authorization is the Authorized Party's acceptance of these Limitations on Use of this Document as well as any limitations on liability contained in the Contract with the Client (all of which is collectively termed the "Limitations on Liability"). The Authorized Party should carefully review both these Limitations on Use of this Document and the Contract prior to making any use of the Professional Document. Any use made of the Professional Document by an Authorized Party constitutes the Authorized Party's express acceptance of, and agreement to, the Limitations on Liability.

The Professional Document and any other form or type of data or documents generated by TETRA TECH during the performance of the work are TETRA TECH's professional work product and shall remain the copyright property of TETRA TECH.

The Professional Document is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of TETRA TECH. Additional copies of the Document, if required, may be obtained upon request.

1.2 ALTERNATIVE DOCUMENT FORMAT

Where TETRA TECH submits electronic file and/or hard copy versions of the Professional Document or any drawings or other project-related documents and deliverables (collectively termed TETRA TECH's "Instruments of Professional Service"), only the signed and/or sealed versions shall be considered final. The original signed and/or sealed electronic file and/or hard copy version archived by TETRA TECH shall be deemed to be the original. TETRA TECH will archive a protected digital copy of the original signed and/or sealed version for a period of 10 years.

Both electronic file and/or hard copy versions of TETRA TECH's Instruments of Professional Service shall not, under any circumstances, be altered by any party except TETRA TECH. TETRA TECH's Instruments of Professional Service will be used only and exactly as submitted by TETRA TECH.

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

1.3 STANDARD OF CARE

Services performed by TETRA TECH for the Professional Document have been conducted in accordance with the Contract, in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Professional judgment has been applied in developing the conclusions and/or recommendations provided in this Professional Document. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of the Professional Document.

If any error or omission is detected by the Client or an Authorized Party, the error or omission must be immediately brought to the attention of TETRA TECH.

1.4 DISCLOSURE OF INFORMATION BY CLIENT

The Client acknowledges that it has fully cooperated with TETRA TECH with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The Client further acknowledges that in order for TETRA TECH to properly provide the services contracted for in the Contract, TETRA TECH has relied upon the Client with respect to both the full disclosure and accuracy of any such information.

1.5 INFORMATION PROVIDED TO TETRA TECH BY OTHERS

During the performance of the work and the preparation of this Professional Document, TETRA TECH may have relied on information provided by third parties other than the Client.

While TETRA TECH endeavours to verify the accuracy of such information, TETRA TECH accepts no responsibility for the accuracy or the reliability of such information even where inaccurate or unreliable information impacts any recommendations, design or other deliverables and causes the Client or an Authorized Party loss or damage.

1.6 GENERAL LIMITATIONS OF DOCUMENT

This Professional Document is based solely on the conditions presented and the data available to TETRA TECH at the time the data were collected in the field or gathered from available databases.

The Client, and any Authorized Party, acknowledges that the Professional Document is based on limited data and that the conclusions, opinions, and recommendations contained in the Professional Document are the result of the application of professional judgment to such limited data.

The Professional Document is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site conditions present, or variation in assumed conditions which might form the basis of design or recommendations as outlined in this document, at or on the development proposed as of the date of the Professional Document requires a supplementary exploration, investigation, and assessment.

TETRA TECH is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the Client.

1.7 ENVIRONMENTAL AND REGULATORY ISSUES

Unless stipulated in the report, TETRA TECH has not been retained to explore, address or consider and has not explored, addressed or considered any environmental or regulatory issues associated with development on the subject site.

1.8 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

Classification and identification of soils and rocks are based upon commonly accepted systems, methods and standards 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 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.

1.9 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.

1.10 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 historical environment. TETRA TECH 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 exploration and review may be necessary.

1.11 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.

1.12 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.

1.13 INFLUENCE OF CONSTRUCTION ACTIVITY

Construction activity can impact 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, and construction sequence are known.

1.14 OBSERVATIONS DURING CONSTRUCTION

Because of the nature of geological deposits, the judgmental nature of geotechnical engineering, and 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.

1.15 DRAINAGE SYSTEMS

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. Where temporary or permanent drainage systems are installed within or around a structure, these systems must protect the structure from loss of ground due to mechanisms such as internal erosion and must be designed so as to assure continued satisfactory performance of the drains. Specific design details regarding the geotechnical aspects of such systems (e.g. bedding material, surrounding soil, soil cover, geotextile type) should be reviewed by the geotechnical engineer to confirm the performance of the system is consistent with the conditions used in the geotechnical design.

1.16 DESIGN PARAMETERS

Bearing capacities for Limit States or Allowable Stress Design, strength/stiffness properties and similar geotechnical design parameters 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 used in this report. Sufficient observations should be made by qualified geotechnical personnel during construction to assure that the soil and/or rock conditions considered in this report in fact exist at the site.

1.17 SAMPLES

TETRA TECH 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.

1.18 APPLICABLE CODES, STANDARDS, GUIDELINES & BEST PRACTICE

This document has been prepared based on the applicable codes, standards, guidelines or best practice as identified in the report. Some mandated codes, standards and guidelines (such as ASTM, AASHTO Bridge Design/Construction Codes, Canadian Highway Bridge Design Code, National/Provincial Building Codes) are routinely updated and corrections made. TETRA TECH cannot predict nor be held liable for any such future changes, amendments, errors or omissions in these documents that may have a bearing on the assessment, design or analyses included in this report.

APPENDIX B

TAURUS MINE SITE INFORMATION FOR LOCAL EMERGENCY AUTHORITIES

TAURUS MINE SITE INFORMATION FOR LOCAL EMERGENCY AUTHORITIES

Table 1: Dam Description

Dam Name	Taurus Mine Tailings Storage Facilities
Stream Name	Snowy Creek
Consequence Classification	Low
Dam Type	Earthfilled
Spillway Type	Open Channel
Coordinates	TA-TSF 1: 9N V 461106E 6570383N TA-TSF 2: 9N V 461284E 6570050N

Directions to Taurus Tailings Storage Facilities

The Taurus Access Road can be reached from Cassiar Road, approximately 5.4 km northwest of the junction between Cassiar Road and the Stewart-Cassiar Highway. The Cassiar Road junction is approximately 119 km south of the junction between the Stewart-Cassiar Highway and the Alaska Highway. The Tailings Storage Facilities area approximately 0.7 km southeast of the Taurus Access Road trailhead. The Taurus Access Road requires a 4x4 vehicle. The access route is shown on Figure B-1.

Table 2: Emergency Contacts

Owner: Cassiar Gold Corporation		
General	Cassiar Gold Corp. Office	1-604-694-6535
Site Manager	Kaesy Gladwin	1-250-239-3301 (Office) 1-705-351-2601 (Mobile)
Engineer-of-Record: Tetra Tech Canada Inc.		
Engineer-of-Record	J. Richard Trimble, P.Eng.	1-867-668-9216 (Office) 1-867-334-1640 (Mobile)

APPENDIX C

EMERGENCY REMEDIAL ACTIONS FOR LEVEL 2 CONDITIONS

EMERGENCY REMEDIAL ACTIONS FOR LEVEL 2 CONDITIONS

If time permits, the following emergency remedial actions should be considered for Level 2 conditions. Immediate implementation of these remedial actions may delay, moderate, or prevent the failure of the dam. Several of the listed adverse or unusual conditions may be apparent at the dam at the same time, requiring implementation of several modes of remedial actions. Close monitoring of the dam must be maintained to confirm the success of any remedial action taken at the dam. Time permitting, any remedial action should be developed through consultation with the Dam Owner's Technical Expert. See Emergency Response Resources (Appendix B-3) for sources of equipment and materials to assist with remedial actions.

Embankment Overtopping

- If the water level in the reservoir is no longer rising, place sandbags along the low areas of the top of the dam to control wave action, reduce the likelihood of flow concentration during minor overtopping, and to safely direct more water through the spillway; and
- Cover the weak areas of the top of the dam and downstream slope with riprap, sandbags, plastic sheets, or other materials to provide erosion-resistant protection.

Seepage and sinkholes

- Pump or siphon water to lower the reservoir level as rapidly as possible to a level that stops or decreases the seepage to a non-erosive velocity. Continue lowering the water level until the seepage stops;
- If the entrance to the seepage origination point is observed in the reservoir (possible whirlpool) and is accessible, attempt to reduce the flow by plugging the entrance with readily available materials such as hay bales, bentonite, soil or rockfill, or plastic sheeting;
- Cover the seepage exit area(s) with several feet of sand/gravel to hold fine-grained embankment or foundation materials in place. Alternatively, construct sandbag or other types of ring dikes around seepage exit areas to retain a pool of water, providing backpressure and reducing the erosive nature of the seepage; and
- Prevent vehicles and equipment from driving between the seepage exit points and the embankment to avoid potential loss from the collapse of an underground void.

Embankment movement

- Lower the reservoir to a safe level at a rate commensurate with the urgency and severity of the condition of the slide or slump. If the spillway is damaged or blocked, pumping or siphoning may be required;
- Repair settlement of the crest by placing sandbags or earth and rockfill materials in the damaged area to restore freeboard; and
- Stabilize slides by placing a soil or rockfill buttress against the toe of the slide.

Earthquake

- Immediately conduct a general overall visual inspection of the dam;
- Perform a field survey to determine if there has been any settlement and movement of the dam embankment and spillway; and
- Drain the reservoir, if required.

APPENDIX D

DAM EMERGENCY SITUATION REPORT

DAM EMERGENCY SITUATION REPORT

Dam Name:		
Provincial Dam Number:		
Dam Location:		
Date:	Time:	Situation Report #:
Weather Conditions:		
General Description of Emergency Situation		
Area(s) of Dam Affected:		
Extent of Dam Damage:		
Possible Cause(s):		
Effect on Dam's Operation:		
Initial Reservoir Elevation:	Time:	
Maximum Reservoir Elevation:	Time:	
Final Reservoir Elevation:	Time:	
Description of Area Flooded Downstream/Damages/Injuries/Loss of Life:		
Other Data and Comments:		
Observers Name and Telephone Number:		
Report Prepared By:	Date:	