Appendix C

Anderson TIA Operations, Monitoring, and Surveillance (OMS) Manual

Anderson Tailings Impoundment Area

Operation, Maintenance and Surveillance (OMS) Manual

Module 10: Emergency Action Plan

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Table of Acronyms and Abbreviations

ATIA	Anderson Tailings Impoundment Area
BGC	BGC Engineering Inc.
CDA	Canadian Dam Association
CQP	Casual Quarry Permit
EAP	Emergency Action Plan
ENV or Environment	Environment Department
EOR	Engineer of Record
EPP	Emergency Preparedness Plan
Hudbay	Hudbay Minerals Inc.
MB	Manitoba
MBU	Manitoba Business Unit
OMS	Operation, Maintenance and Surveillance
PR	Provincial Road
QL	Quarry Lease
RACI	Responsible, Accountable, Consulted, Informed
RP	Responsible Person

Relevant Hudbay Document Nomenclature

Area Prefix	EN = environmental control.
(see PWC-075 MBU Plant & Mine Location for full list)	HW = Hudbay-wide systems.
	LM = Lalor Mine.
	NB = New Britannia Mill.
	PW = plant-wide systems, i.e., MBU-wide systems.
	SL = Snow Lake Mill, a.k.a. Stall Mill.
Document Type	T = training manuals.
(see PWI-075 MBU Document Numbering for complete details)	O = originals, i.e., forms.
	P = policies or procedures.
	I = instructions, i.e., work instructions.
	C = charts, e.g., flow or organization charts, tables, diagrams.

10 EMERGENCY ACTION PLAN

10.1 Introduction

This module of the Operation, Maintenance, and Surveillance (OMS) Manual is the Emergency Action Plan (EAP) for the Anderson Tailings Impoundment Area (ATIA), and covers:

- Quick reference flowcharts, responsibility matrix, and contact list (Section 10.2).
- What could lead to an emergency (Section 10.3).
- What to do during an emergency (Section 10.4).
- How to maintain this Plan (Section 10.5).
- Supporting documents, maps, and event log template (Section 10.6 and appendices).

Note that this is an internal document for Hudbay personnel use, while the accompanying Emergency Preparedness Plan (EPP) is the external version targeted for and distributed to 3rd parties. The EPP is the next module of the OMS Manual.

10.2 At-a-Glance

This section is intended as quick reference for users of this plan, summarized on Figure 10-1, during tailings dam emergencies at the Anderson Tailings Impoundment Area (ATIA).

Notification flowcharts with checklists for key roles in tailings dam emergency scenarios are given in:

- Figure 10-2 for Level 1 emergencies, characterized by abnormal conditions that do not affect routine operations. The intent of the response is to monitor and understand the conditions.
- Figure 10-3 for Level 2 emergencies, characterized by a potential dam failure which can still be prevented. The intent of the response is to save the dam and warn people.
- Figure 10-4 for Level 3 emergencies, characterized by imminent or in-progress dam failure which cannot be prevented. The intent of the response is to save people.

Responsibility assignment for key roles is shown in Table 10-1. Current contact details are given in ENO-689 MBU Dams & Tailings Facilities Contact List, which should be used in conjunction with this plan.

Figure 10-1. Emergency Action Plan (EAP) flowchart.

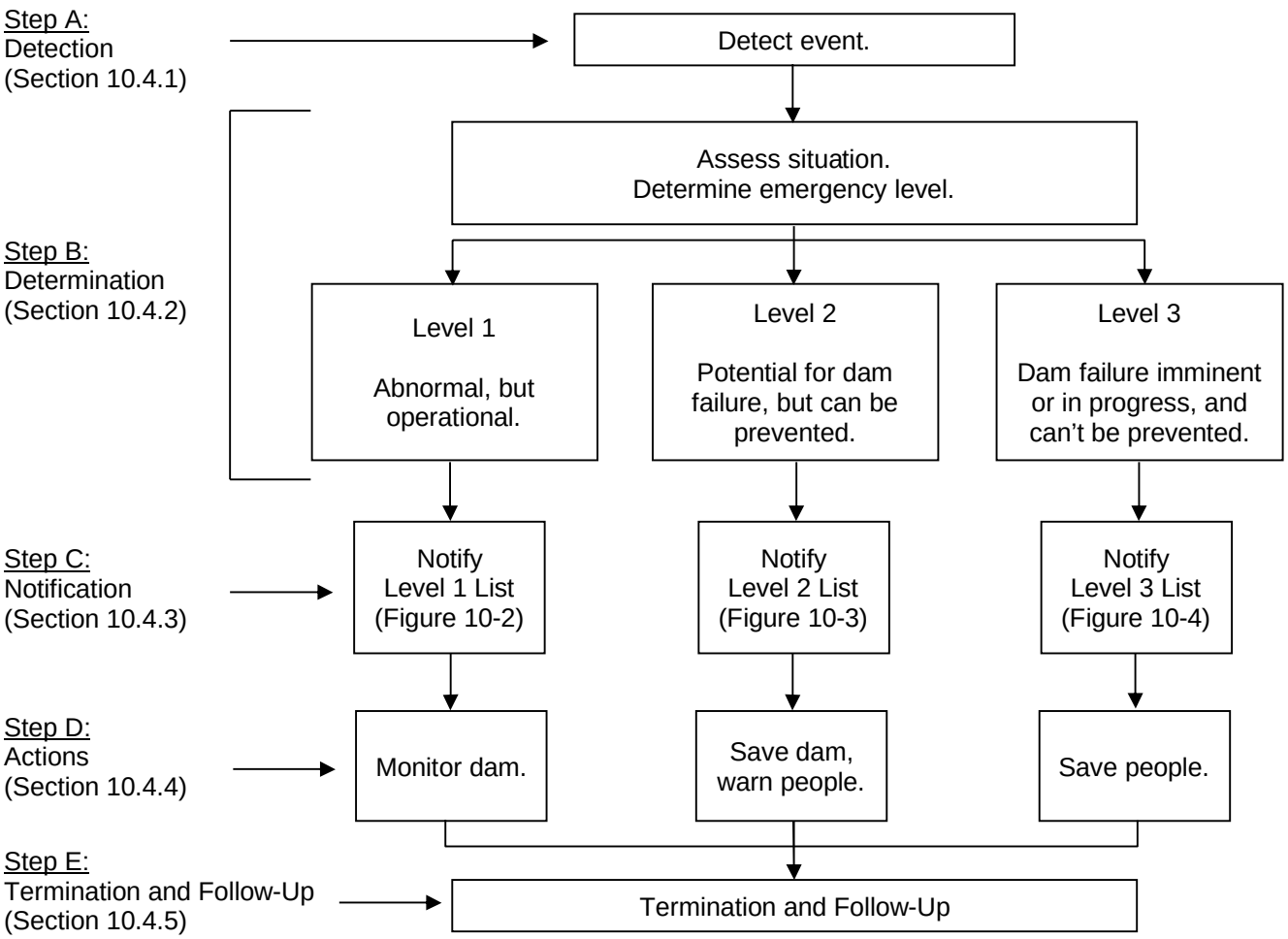


Figure 10-2. Emergency notification flowchart and checklists – Level 1.

Notes:
1. Items not related to Level 1 are shown in **grey**.
2. Black lines denote lines of two-way communication.

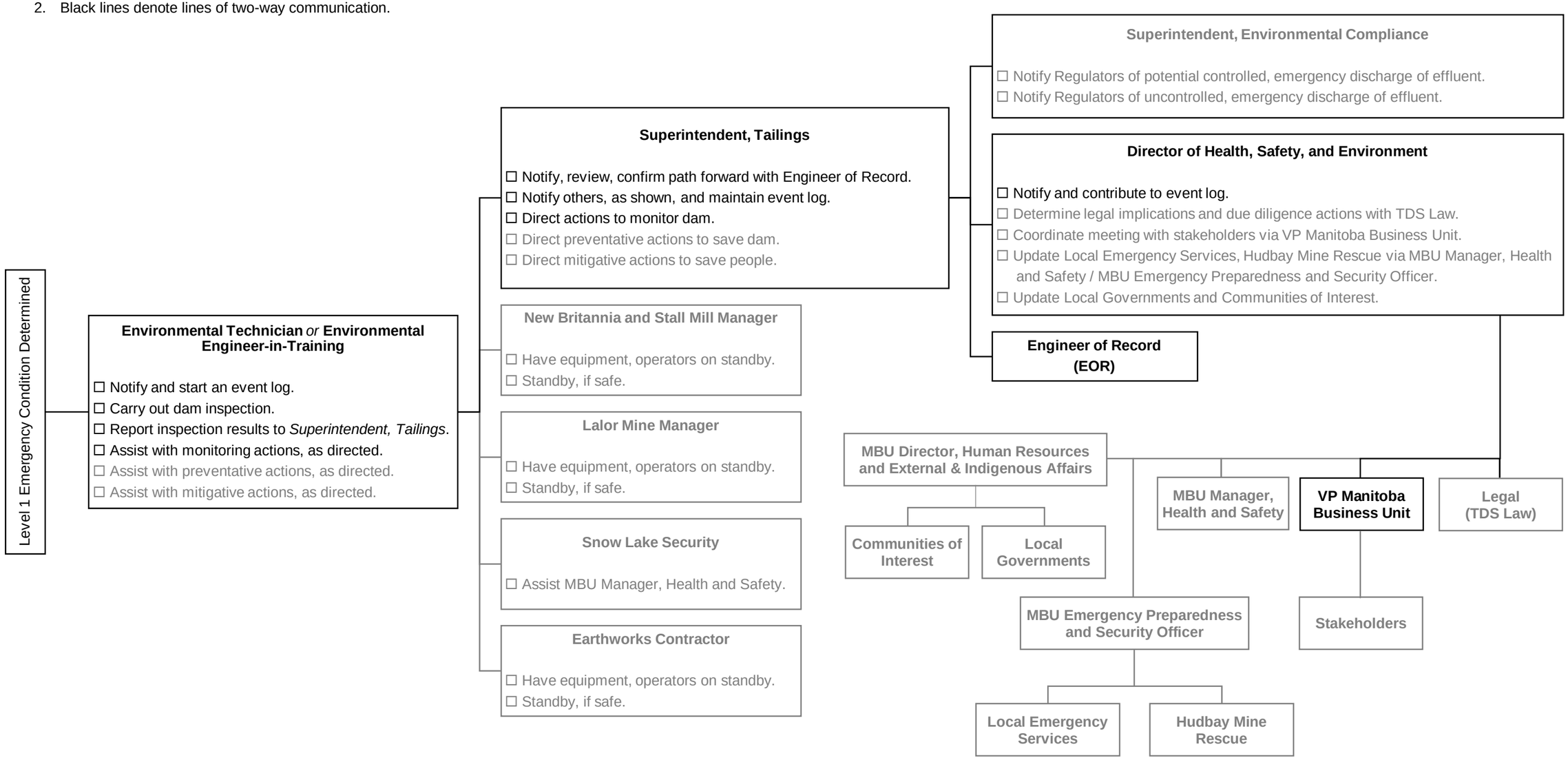


Figure 10-3. Emergency notification flowchart and checklists – Level 2.

Notes:
1. Items not related to Level 2 are shown in **grey**.
2. Black lines denote lines of two-way communication.

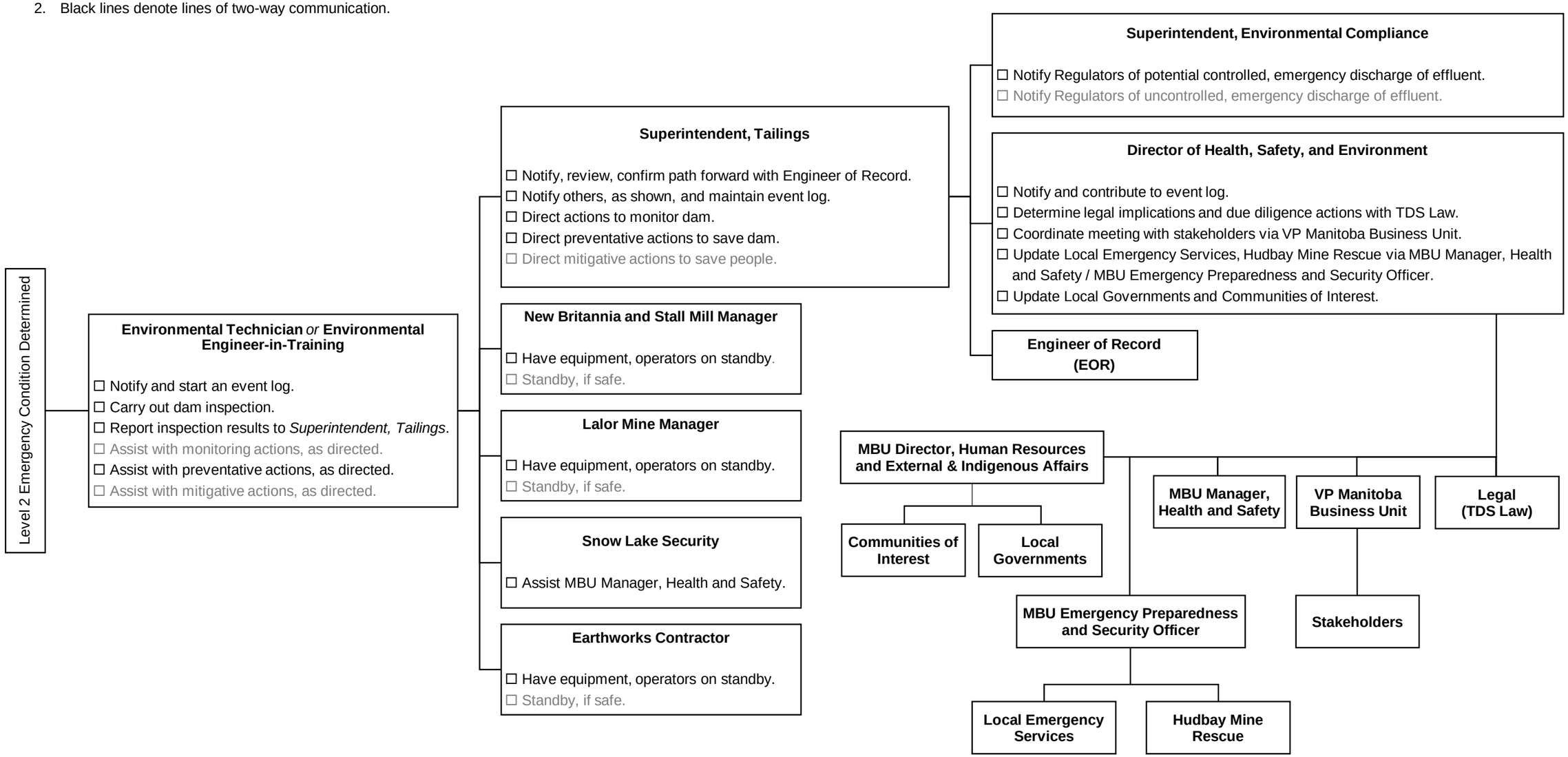


Figure 10-4. Emergency notification flowchart and checklists – Level 3.

Notes:
1. Items not related to Level 3 are shown in **grey**.
2. Black lines denote lines of two-way communication.

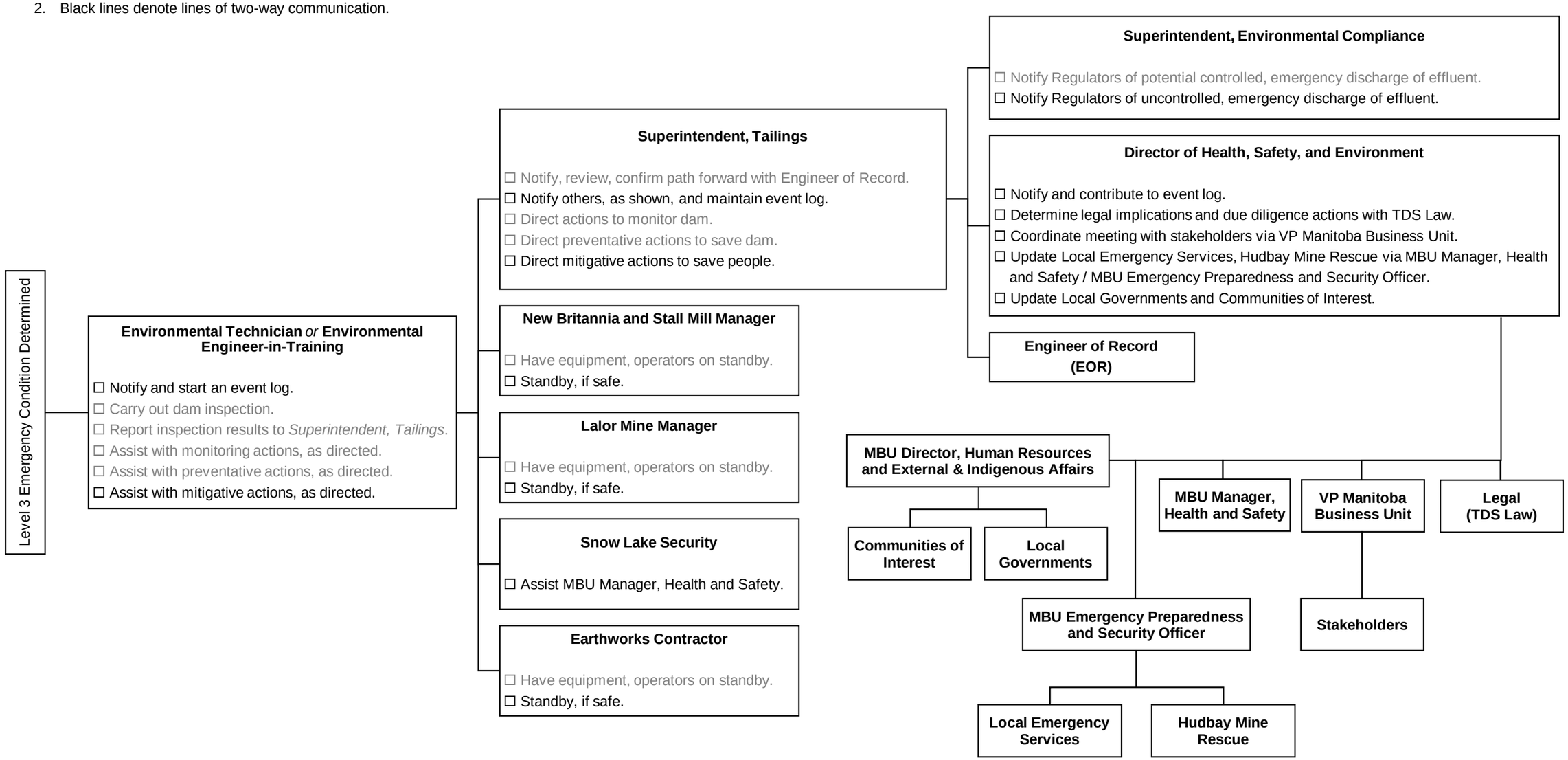


Table 10-1. Contact list and responsibility assignment / RACI matrix.

Role (see ENO-689 for current contact details)	Responsibility Assignment / RACI[(1)] Matrix sorted by Sections of this Plan					
	Section 10.4.1 Detection	Section 10.4.2 Determination	Section 10.4.3 Notification	Section 10.4.4 Action	Section 10.4.5 Termination and Follow-Up	Section 10.5.1 Testing and Training
Internal Parties (Hudbay)						
Director of Health, Safety, and Environment	A	A	A	A	A	A
ENV Superintendent, Tailings	R	R	R	R	R	R
ENV Superintendent, Environmental Compliance	R	C	R	R	C	I
ENV Environmental EIT – Snow Lake	R	C	R	R	C	I
ENV Environmental Technician – Snow Lake	R	C	R	R	C	I
New Britannia and Stall Mill Manager			I	R	C	I
Lalor Mine Manager			I	R	C	I
Snow Lake Security			I	R	C	I
Hudbay Mine Rescue			I	R	C	I
MBU Director, Human Resources and External & Indigenous Affairs			R	R	C	I
MBU Manager, Health and Safety			R	R	C	R
MBU Emergency Preparedness and Security Officer			I	R	C	R
VP Manitoba Business Unit			R	R	C	I
External Parties (non-Hudbay)						
Engineer of Record for: • ATIA Stage A • ATIA Stage B/C	R	R	I	R	C	R
Regulatory Agencies: • MB Mines Branch • MB Conservation and Climate (Regional Office)	Covered in the external Emergency Preparedness Plan (ENP-111).					

Role (see ENO-689 for current contact details)	Responsibility Assignment / RACI[1] Matrix sorted by Sections of this Plan					
	Section 10.4.1 Detection	Section 10.4.2 Determination	Section 10.4.3 Notification	Section 10.4.4 Action	Section 10.4.5 Termination and Follow-Up	Section 10.5.1 Testing and Training
• MB Conservation and Climate (District Office) • MB Conservation and Climate (Environmental Accident Reporting)	Covered in the external Emergency Preparedness Plan (ENP-111).					
Local Government: Town of Snow Lake						
Local Emergency Services: • Snow Lake RCMP • Volunteer Fire Department						
Communities of Interest: Wekusko Lake Cottage Owners						
Legal: TDS Law						
Earthworks Contractor: • Strilkiwski Contracting Ltd. • Sigfusson Northern Ltd. (SNL) • Bob's Contracting • McKeen's Trucking Service Ltd. • RJ's Construction Ltd.	Contacted on an as-needed basis to provide support, as directed by Hudbay.					
Other Service Providers: • Multicrete • M.A. Ironworks • Uni-Jet • United Rentals • VA Plumbing and Heating						

1. RACI components are summarized as follows:
    a. R=Responsible; one or more persons.
    b. A=Accountable; only one person.
    c. C=Consulted; one or more persons.
    d. I=Informed; one or more persons.

10.3 Background

10.3.1 Purpose, Roles and Responsibilities

The purpose of this Emergency Action Plan (EAP, a.k.a. the Plan) is to minimize harm to people, the environment, and/or property during potential or in-progress failure of the tailings dams at the Anderson Tailings Impoundment Area (ATIA).

Note that this Plan is part of the ATIA OMS Manual and as such, is purposely lean on details which can be readily found in other modules. Details critical to emergency response have been repeated herein.

The key roles in tailings dam emergency response are identified on the notification flowcharts in Section 10.2, along with a responsibility matrix and contact list. A discussion of dam failure modes, risks, and indicators which could constitute an emergency follows.

10.3.2 Failure Modes, Risks, and Indicators

The purpose of this section[1] is to identify conditions which could lead to an emergency, based on known credible failure modes for the ATIA dams. In general, there are three failure modes for dams, as described in [Ref 1]:

- *Overtopping*—Water flows over the crest of the dam, contrary to design intent.
- *Collapse*—Internal resistance to the applied forces is inadequate.
- *Contaminated seepage*—Contaminated fluid escapes to the natural environment.

All three were evaluated as part of the dam consequence classification exercise, and found to be credible for the ATIA dams [Ref 2]. The risk posed by each failure mode is given in Table 10-2, along with typical indicators to guide determination of the appropriate emergency level.

A general arrangement of the ATIA dams and surrounding, at-risk infrastructure is provided in Appendix 10-A.

[1] Content adapted from the writeup in OMS Manual Module 7: Dam Safety Program.

Table 10-2. Failure modes, risks, and indicators for the ATIA dams.

Failure Mode	Associated Risk	Typical Indicator	Controls Discussed in
Overtopping	Insufficient flood management capacity	Difficulty keeping ATIA Pond levels below maximum operating due to depleted capacity.	Module 5: Dam Raise Plan
		Blockage of or damage to the sluice gate and/or spillway.	Module 6: Water Management Plan
	Unexpected pond rise		
	Loss of containment	Insufficient freeboard between the minimum dam crest and the ATIA Pond level.	Module 6: Water Management Plan
		Settlement of the dam crest.	Module 7: Dam Safety Program
Collapse	Surface erosion	Rilling and scour on the dam crests, slopes.	
	Piping / internal erosion	Changes in seepage regime including new or increased flows, clear water becoming cloudy, or areas of saturation above the dam toe.	
		Physical deformations on dam crests and slopes including sinkholes, cracks.	
	Slope instability	Physical deformations of dam crests and slopes including sloughing, slumping, bulging.	
		Instrumentation readings trending toward or exceeding acceptable limits.	Module 8: Instrumentation Monitoring Plan
Contaminated seepage	Piping / internal erosion	See above under “Collapse”.	-
	Non-compliant discharge to environment	Sample water quality begins trending toward or exceeding acceptable limits.	Module 9: Environmental Monitoring Plan

1. Table is repeated from OMS Manual Module 7: Dam Safety Program.

10.4 The Plan

10.4.1 Detection

Emergencies are detected through surveillance carried out with the use of:

- Automated level logger with assigned alarms and automatic notifications for the ATIA Pond. (see OMS Manual Module 6: Water Management Plan)
- Site observations during routine dam inspections and day-to-day operations. (see OMS Manual Module 7: Dam Safety Program)
- Geotechnical instrumentation installed in the ATIA dams with routine review of readings. (see OMS Manual Module 8: Instrumentation Monitoring Plan)

The pond level logger also functions as an internal warning system. An alarm is automatically triggered should the pond drop more or quicker than expected, which could indicate a significant release/discharge. In addition, the following forecast systems are utilised:

- *Manual* through Hudbay personnel checking public resources for severe weather or flash floods.
- *Automated* with emergency notices pushed by the Government of Canada to cell phones in the area, using the Alert Ready system.

Once an emergency is detected, the next step is to determine the appropriate level.

10.4.2 Determination

As the *Responsible Person* (*RP*) for the ATIA dams, the *ENV Superintendent, Tailings* or designated alternate is responsible for determining the emergency level. For tailings dam emergencies, the designated alternate is the *Director of Health, Safety, and Environment*.

The *RP* may solicit input from the *Engineer of Record* (*EOR*) or other parties to determine the appropriate emergency level, which are defined as follows:

- Level 1: characterized by abnormal conditions that do not affect routine operations. The intent of the response is to monitor and understand the conditions.
- Level 2: characterized by a potential dam failure which can still be prevented. The intent of the response is to save the dam and warn people.
- Level 3: characterized by imminent or in-progress dam failure which cannot be prevented. The intent of the response is to save people.

A direct correlation of indicators[2] to emergency levels has been deliberately omitted as the impact on dam safety is dependent on many factors including severity or magnitude, location, and even time of year. Instead, once an indicator is detected, the emergency level is determined case-by-case based on the above definitions. Exceptions include pre-defined orange or red alarm levels for geotechnical instrumentation; see Table 10-3.

Once the emergency level has been determined, the next step is to notify key parties.

[2] Of credible dam failure modes; see Table 10-2.

Table 10-3. Linkage between emergency levels and instrumentation alarm levels.

Status of dam / facility	No Emergency		Emergency		
			Level 1	Level 2	Level 3
Condition of dam / facility	Normal, and operational.		Abnormal, but operational.	Potential for dam failure, but can be prevented.	Dam failure imminent or in progress, and can't be prevented.
Intent of response	n/a		Monitor dam.	Save dam, warn people.	Save people.
Corresponding instrumentation alarm level: Reading is indicative of…	Green: Typical conditions.	Yellow: Expected high or low deviation from typical, no stability concerns.	Orange: Unexpected high deviation from typical, no stability concerns.	Red: Unexpected high deviation from typical, with stability concerns.	n/a – not quantifiable through instrumentation measurements.

1. Table is repeated from OMS Manual Module 8: Instrumentation Monitoring Plan.

10.4.3 Notification

Parties responsible for notifying others are identified on flowcharts and checklists in Section 10.2:

- Figure 10-2 for Level 1 emergencies.
- Figure 10-3 for Level 2 emergencies.
- Figure 10-4 for Level 3 emergencies.

Which have been developed to align with ENC-528 Internal Notification Protocol for Environmental Operations. Presently, there are no external warning systems, e.g., sirens or broadcasts, to notify the downstream population or highway users should a dam failure be in progress. Internal warning systems are discussed as part of Detection in Section 10.4.1.

Message templates are provided below for consideration. Once key parties have been notified of an emergency, actions may be carried out as described in the next section.

Figure 10-5. Message template for Level 1 and Level 2 emergencies.

This is *(name, position)*.

We have an emergency condition at the Anderson Tailings Impoundment Area, located 7 km southeast of Snow Lake, Manitoba.

We have activated the Emergency Action Plan for this tailings facility and are currently under Emergency Level *(1 or 2)*.

We are implementing measures to mitigate a tailings dam failure.

Hudbay will advise you when the situation is resolved or escalated to Emergency Level *(2 or 3)*.

In case of Emergency Level 2, please be prepared to evacuate the areas downstream of the tailings facility.

I can be contacted at *(phone number)*. If you cannot reach me, please call *(alternate phone number)*.

Figure 10-6. Message template for Level 3 emergencies.

This is an emergency. This is *(name, position)*.

Tailings dams at the Anderson Tailings Impoundment Area, located 7 km southeast of Snow Lake, Manitoba, is failing.

The downstream area must be evacuated immediately. This includes Anderson Creek and Wekusko Lake.

We have activated the emergency action plan for this dam and are under Emergency Level 3.

I can be contacted at *(phone number)*. If you cannot reach me, please call *(alternate phone number)*.

10.4.4 Action

As the *Responsible Person* (*RP*) for the ATIA dams, the *ENV Superintendent, Tailings* or designated alternate is responsible for directing/coordinating actions during tailings dam emergencies. In these situations, the designated alternate is the *Director of Health, Safety, and Environment*.

Note that these designations do not apply for any other plans activated during an emergency, such as:

- The corporate Crisis Management Plan (HWP-003).
- The MBU crisis management plan documented in PWC-607 Control Flow Chart and PWI-006 Incident Assessment and Response.

The *Director of Health, Safety, and Environment*, who is notified for all tailings dam emergency levels, may assist the *RP* in when these secondary plans are activated or triggered. Note that at a corporate level, there is a standby option to keep the crisis management team apprised of potential crises (i.e., dam failure) before actions are taken / the plan is activated in full.

Similarly, other emergency response plans may be activated if deemed necessary by other notified parties, including:

- For Stall Mill: SLC-001 Mill Emergency Procedures Manual Index, SLP-012 Mill & Crusher Emergency Evacuation.
- For New Britannia Mill: NBP-002 New Britannia Emergency Evacuation Procedure.
- For Lalor Mine: LMP-001 Surface Emergency Procedures for Lalor Mine & Chisel Site.
- For external parties: emergency response plans, as appropriate.

A list of actions that may be taken during tailings dam emergencies is given in Table 10-4, sorted by failure modes and indicators. A location plan of commonly utilised resources, including material stockpiles, equipment, and contractor services, is provided on Figure 10-7. Note that presently, there are no service level agreements, i.e., contracts, in place with external parties for emergency response.

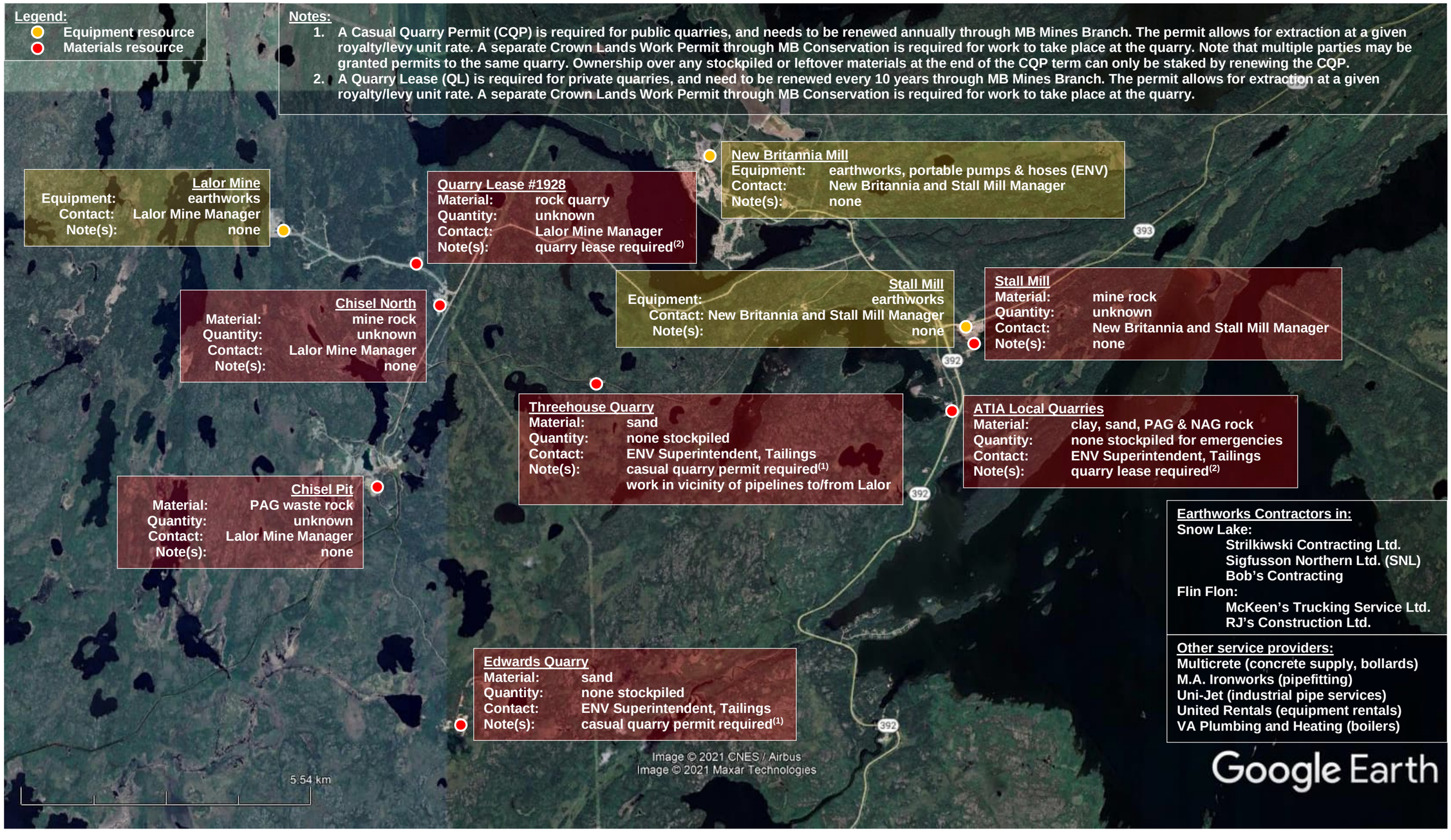
Once all necessary actions have been taken, the emergency may be terminated as described in the next section.

Table 10-4. Potential actions during a tailings dam emergency.

Failure Mode[1]	Associated Risk[1]	Typical Indicator[1]	Type of Action (objective)		
			Monitoring (understand conditions)	Preventative (save dam[2])	Mitigative (save people/downstream receivers)
Overtopping	Insufficient flood management capacity	Difficulty keeping ATIA Pond levels below maximum operating due to depleted capacity.	Verify pond logger reading through manual ground survey.	Increase discharge by opening sluice gate. Supplement discharge with syphons or other temporary means, e.g., tractor pump. Increase reclaim, lower freshwater drawdown. Shut down Mills to stop tailings slurry inflow. Place fill to raise dam crest/containment elevation. Breach the dam in a controlled manner.	Evacuate areas downstream in accordance with inundation maps provided in Appendix 10-B. Two sets of maps have been included to cover: • Normal/dry or “sunny-day” conditions, when sudden collapse could occur. • Wet or “rainy-day” conditions, when the dam may be overtopped while the region experiences flooding. Note that PR 392 is inside the inundation zone and post-dam breach access to Snow Lake may need to be via a combination of airlift or land/water.
	Unexpected pond rise	Blockage of or damage to the sluice gate and/or spillway.	Verify source of blockage / extent of damage.	Remove blockage, repair damage. Engage trappers to address beavers.	
	Loss of containment	Insufficient freeboard between the minimum dam crest and the ATIA Pond level.	Verify pond logger reading through manual ground survey.	Increase discharge by opening sluice gate. Supplement discharge with syphons or other temporary means, e.g., tractor pump. Increase reclaim, lower freshwater drawdown. Shut down Mills to stop tailings slurry inflow. Place fill to raise dam crest/containment elevation. Breach the dam in a controlled manner.	
		Settlement of the dam crest.	Verify and track progression through manual ground survey.	Place fill to restore containment.	
Collapse	Surface erosion	Rilling and scour on the dam crests, slopes.	Mark extents of erosion gullies and increase inspection frequency to track progression.	Place fill to repair erosion gullies. Place fill to divert surface water.	
	Piping / internal erosion	Changes in seepage regime including new or increased flows, clear water becoming cloudy, or areas of saturation above the dam toe.	Measure seepage flowrate. Increase inspection frequency to track clarity.	Place fill to slow loss of material.	
		Physical deformations on dam crests and slopes including sinkholes, cracks.	Mark extents of deformation and increase inspection frequency to track progression.	Place fill to repair deformations. Place fill to buttress dam.	
	Slope instability	Physical deformations of dam crests and slopes including sloughing, slumping, bulging.			
		Instrumentation readings trending toward or exceeding acceptable limits.	Verify reading through manual measurement. Increase reading frequencies and expand to include surrounding instruments.	Lower the ATIA Pond by increasing discharge, if related to indicator. Pause construction activities, if related.	
Contaminated seepage	Piping / internal erosion	See above under “Collapse”.	-	-	-
	Non-compliant discharge to environment	Sample water quality begins trending toward or exceeding acceptable limits.	Modify the sampling and testing plan to confirm the source/cause.	Shut off discharge by closing the sluice gate. Build deflection berms across discharge flowpath(s).	None; environmental remedial tasks are part of emergency follow-up.

1. Repeated from OMS Manual Module 7: Dam Safety Program.
2. Second objective of “warn people” is covered by the previous step: notification.

Figure 10-7. Location plan for commonly utilised resources during a tailings dam emergency.



10.4.5 Termination and Follow-Up

As the *RP* for the ATIA dams, the *ENV Superintendent, Tailings* or designated alternate is responsible for terminating the EAP. For tailings dam emergencies, the designated alternate is the *Director of Health, Safety, and Environment*.

Criteria for termination will vary depending on the level and nature of emergency, but should include, at minimum:

1. Assessing the dam(s) in its current state to determine whether emergency conditions are still present. This typically includes an inspection by the *RP* (for Levels 1, 2) and/or *EOR* (Level 3).
2. Confirming sufficient capacity to respond should another emergency occur after termination. This typically includes taking inventory and estimating time to replenish depleted resources, e.g., materials, equipment, manpower.

Once the *RP* deems the criteria for termination have been met, all parties who were notified of the emergency shall be similarly notified of termination by following the same flowcharts. Entries in the event log may be used in the event parties not identified on the notification flowcharts were also engaged during the emergency.

Following termination:

- The *Director of Health, Safety, and Environment* must complete a post-event report to document the event including actions taken, root cause, and lessons learned. This may be done using Intelex and include input from other parties, e.g., a letter summarizing findings from the *EOR*.
- The *RP* should develop a plan to restore dam integrity with input from the *EOR*.
- The *RP*, *New Britannia and Stall Mill Manager*, and the *Lalor Mine Manager* may wish to collectively develop a plan for return to normal tailings operation.

10.5 Administrative and Maintenance

10.5.1 Testing and Training

The following are carried out annually, as prescribed in PWP-006 Emergency Preparedness:

- Tabletop exercise / audit lead by the *MBU Emergency Preparedness and Security Officer* and documented in PWO-017 Emergency Procedure Test Report.
- Live drill lead by the *MBU Emergency Preparedness and Security Officer*, also documented in PWO-017.

Upon Plan revision, tabletop training lead by the *ENV Superintendent, Tailings* may be required to familiarise affected parties with the changes. Proof of any such training sessions is documented using PWO-019 MBU Training Record.

In all cases, the *ENV Superintendent, Tailings* is encouraged to engage external parties to participate, such that all parties may align on expected actions during a tailings dam emergency.

10.5.2 Documentation and Reporting

Should the EAP be activated, there are only two reporting requirements:

- A post-event report by the *Director of Health, Safety, and Environment*; see previous section.
- An event log maintained by the *ENV Superintendent, Tailings*; attached in Appendix 10-C.

The notification flowcharts provided in Section 10.2 are meant to serve as guides, and are not required to be used or filled out for compliance with this Plan.

As the *RP*, the *ENV Superintendent, Tailings* is responsible for keeping this Plan up to date. This may be achieved through:

- Annual review of this Plan, as prescribed in PWP-006 Emergency Preparedness.
- Change-driven revision of this Plan, such as change of personnel or updated inundation maps.

Upon revision, the *RP* is also responsible for distributing to all responsible/affected parties which have been identified as part of the contact list provided in Section 10.2.

10.6 References

Table 10-5. Hudbay documents.

No.	Title
Hudbay-Wide	
HWP-003	Crisis Management Plan
Plant-Wide, i.e., MBU-Wide	
PWC-607	Control Flow Chart
PWI-006	Incident Assessment and Response
PWP-006	Emergency Preparedness
PWO-017	Emergency Procedure Test Report
PWO-019	MBU Training Record
Environment Control	
ENC-528	Internal Notification Protocol for Environmental Operations
ENO-689	MBU Dams & Tailings Facilities Contact List
ENP-111	ATIA OMS Manual – Module 11: Emergency Preparedness Plan
Other(s)	
LMP-001	Surface Emergency Procedures for Lalor Mine & Chisel Site
NBP-002	New Britannia Emergency Evacuation Procedure
SLC-001	Mill Emergency Procedures Manual Index
SLP-012	Mill & Crusher Emergency Evacuation

1. All Hudbay controlled documents are filed on the M-Drive.

Table 10-6. Non-Hudbay documents.

[Order]	Document Title	Author	Issue Date(s)
[Ref 1]	Dam Safety Guidelines 2007 (2013 Edition)	Canadian Dam Association (CDA)	2013
[Ref 2]	Consequence Classification and FMEA Exercises	BGC Engineering Inc.	in progress
[Ref 3]	ATIA Stage C Desktop Inundation Study – FINAL	BGC Engineering Inc.	2020, November 6

1. All non-Hudbay documents are either publicly available online, or saved on the ENV Google Drive.

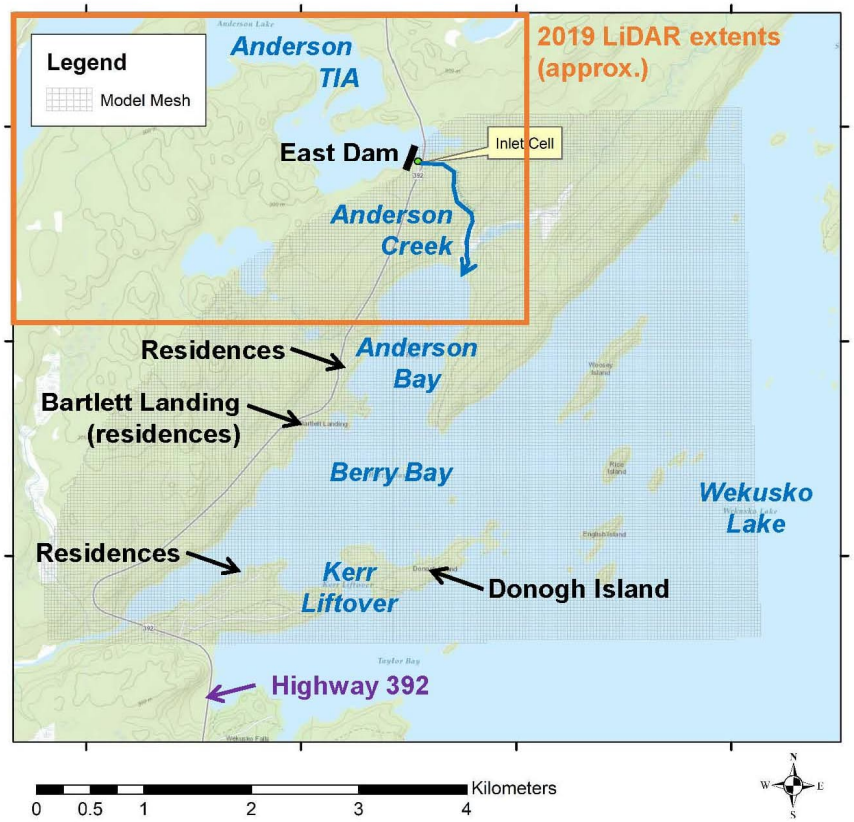
Appendix 10-A Site Access Plan

Repeated from OMS Manual Module 2: Facility Description.

Appendix 10-B Inundation Maps

From [Ref 3].

10-2020



NOTES:
1. This Figure should be read in conjunction with BGC's memo titled ATIA Stage C Desktop Inundation Study, and dated November, 2020.
2. Residences shown are not inclusive of all within the figure extents.

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PG	GENERAL ARRANGEMENT		
CHECKED BY:	CLIENT:		
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APPROVED BY:	SCALE:	PROJECT NO:	FIGURE NO:
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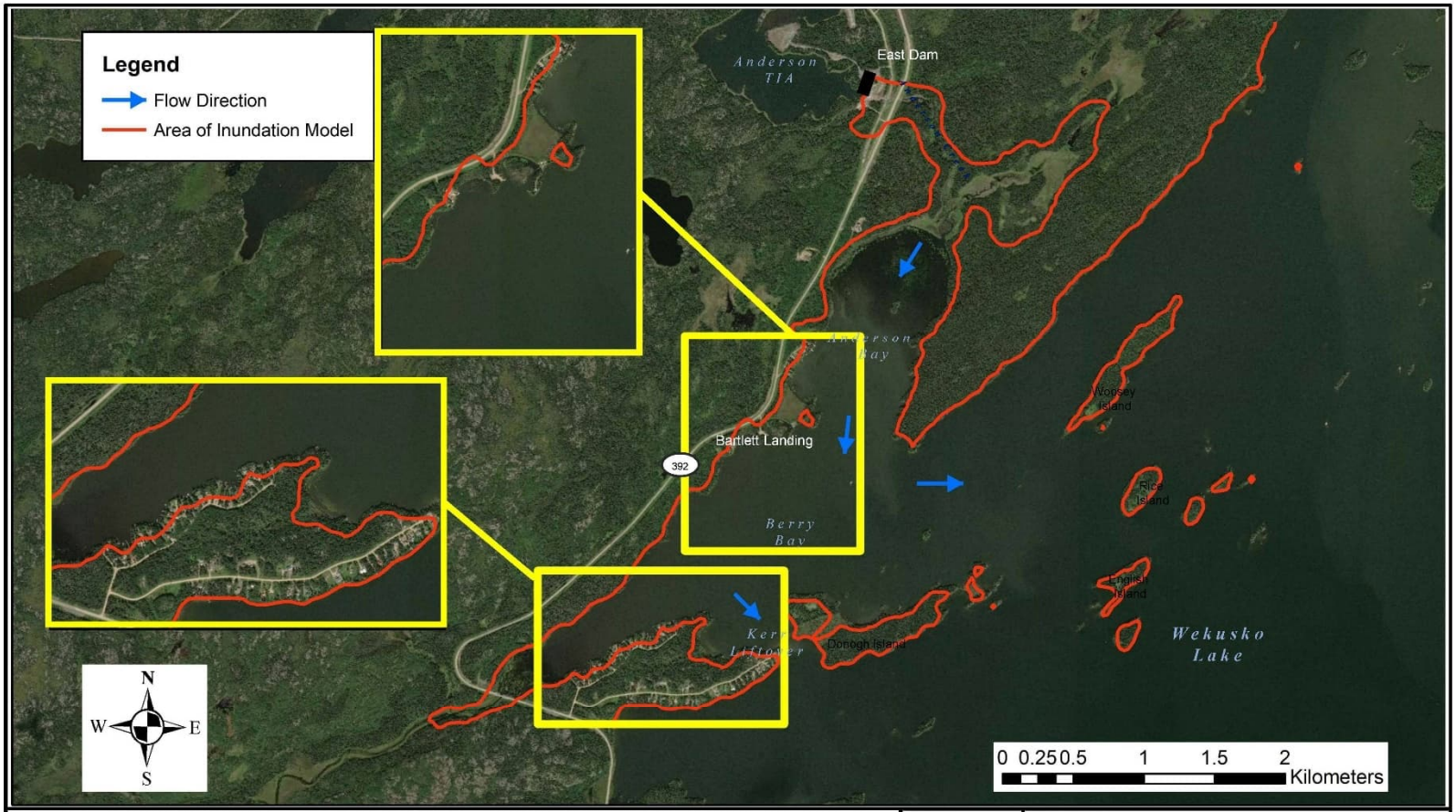
BGC ENGINEERING INC.

10-2020



NOTES:
1. This Figure should be read in conjunction with BGC's memo titled ATIA Stage C Desktop Inundation Study, and dated November, 2020.
2. Coordinate System: NAD 83 UTM Zone 14N.
3. Base topographic data based on the Canadian Digital Elevation Model (CDEM) produced by Natural Resources Canada.
4. This dam breach inundation map depicts the result of an overtopping failure of the Stage C (El. 283.75 m) East Dam under sunny-day conditions.

PREPARED BY:	FIGURE TITLE		
PG	STAGE C SUNNY-DAY OVERTOPPING FAILURE – INUNDATION EXTENTS		
CHECKED BY:	CLIENT:		
CW	HUDBAY MINERALS INC.		
APPROVED BY:	SCALE:	PROJECT NO:	FIGURE NO:
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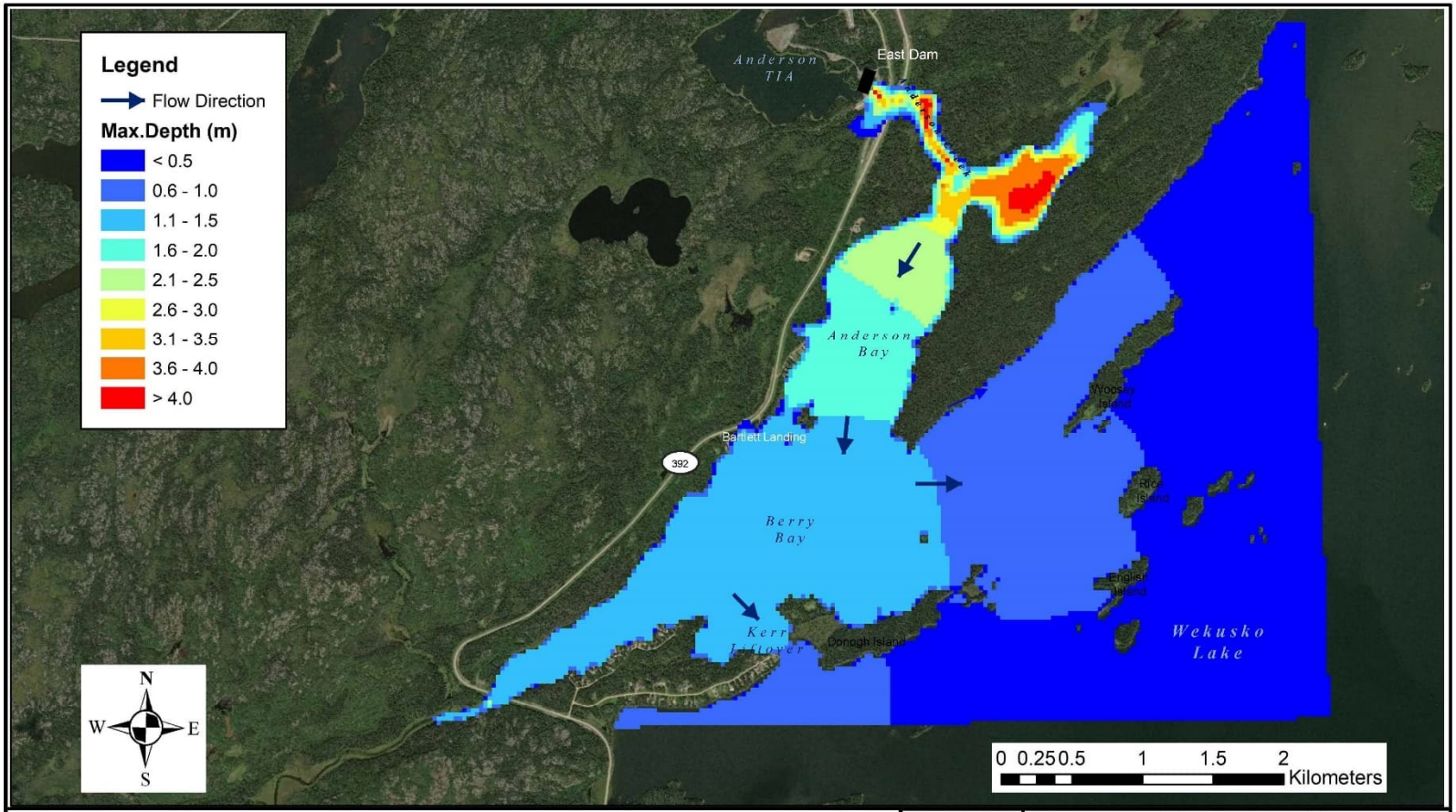
BGC ENGINEERING INC.

10-2020



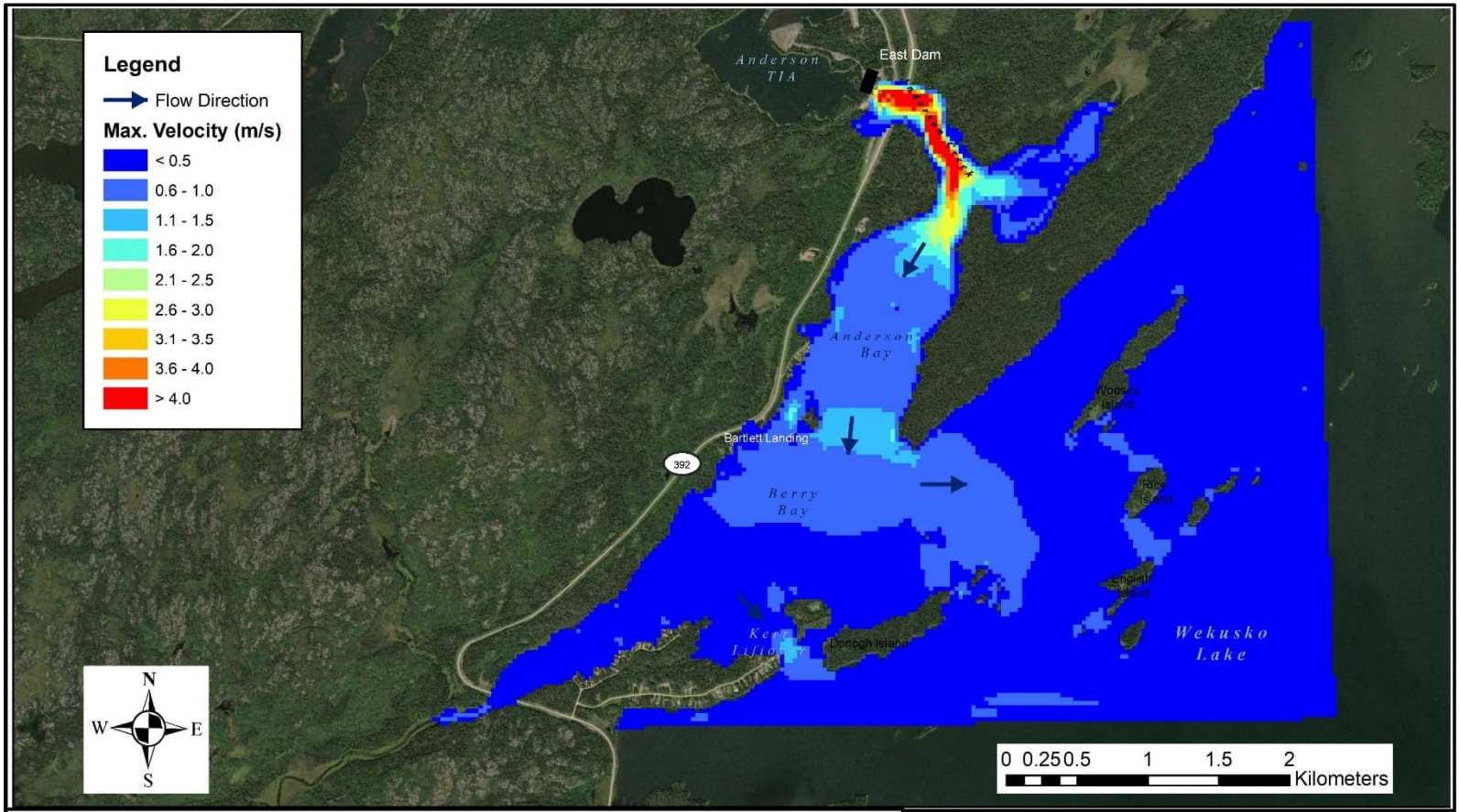
NOTES:
1. This Figure should be read in conjunction with BGC's memo titled ATIA Stage C Desktop Inundation Study, and dated November, 2020.
2. Coordinate System: NAD83 UTM Zone 14N.
3. Base topographic data based on the Canadian Digital Elevation Model (CDEM) produced by Natural Resources Canada.
4. This dam breach inundation map depicts the result of an overtopping failure of the Stage C (El. 283.75 m) East Dam under sunny-day conditions.

PREPARED BY:	FIGURE TITLE		
PG	STAGE C SUNNY-DAY OVERTOPPING FAILURE – MAXIMUM FLOOD DEPTH		
CHECKED BY:	CLIENT:		
CW	HUDBAY MINERALS INC.		
APPROVED BY:	SCALE:	PROJECT NO:	FIGURE NO:
RGM	1:40,000	0077086	6

0 5 10 mm in ANSI A sized paper

BGC ENGINEERING INC.

10-2020



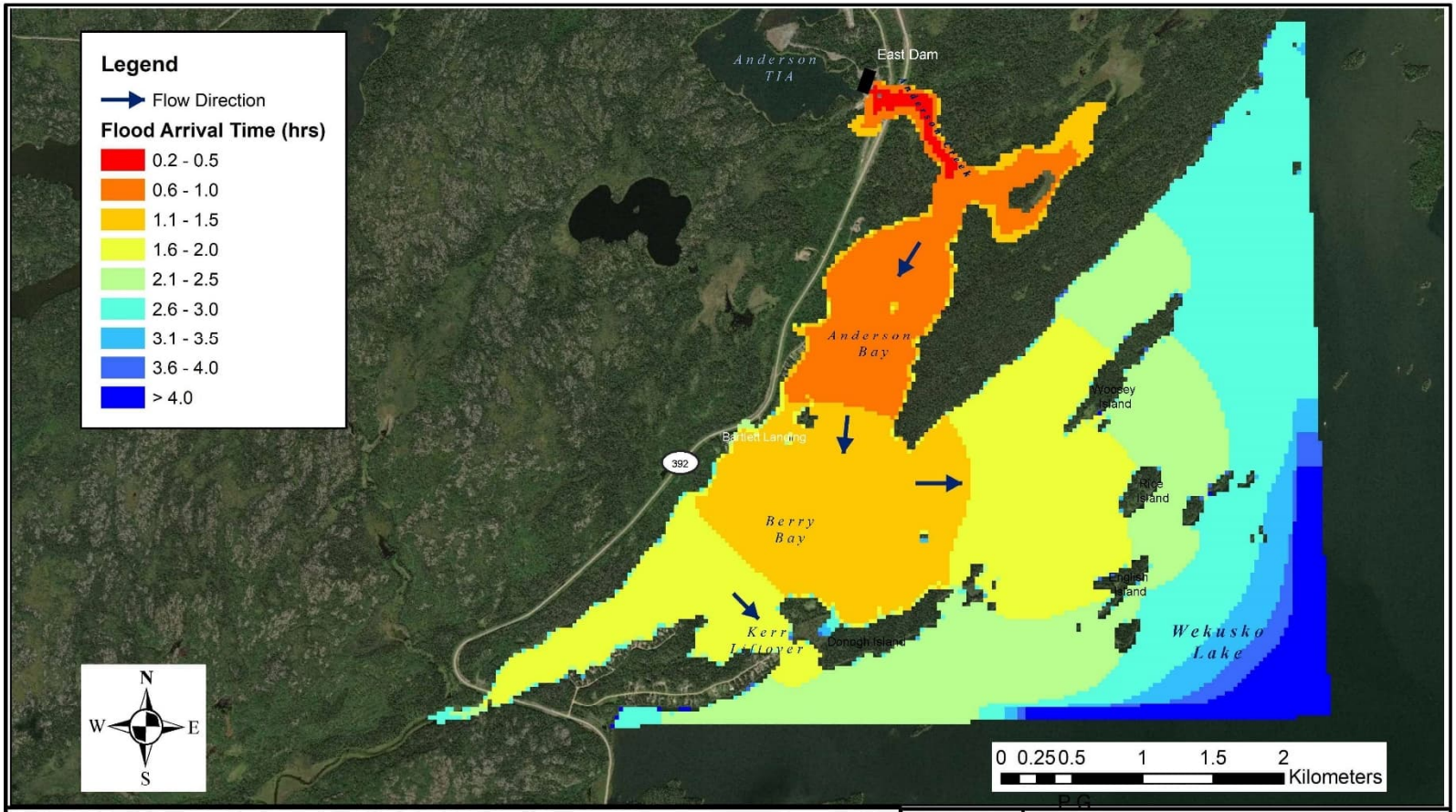
NOTES:
1. This Figure should be read in conjunction with BGC's memo titled ATIA Stage C Desktop Inundation Study, and dated November, 2020.
2. Coordinate System: NAD83 UTM Zone 14N.
3. Base topographic data based on the Canadian Digital Elevation Model (CDEM) produced by Natural Resources Canada.
4. This dam breach inundation map depicts the result of an overtopping failure of the Stage C (El. 283.75 m) East Dam under sunny-day conditions.

PREPARED BY:	FIGURE TITLE		
PG	STAGE C SUNNY-DAY OVERTOPPING FAILURE – MAXIMUM VELOCITY		
CHECKED BY:	CLIENT:		
CW	HUDBAY MINERALS INC.		
APPROVED BY:	SCALE:	PROJECT NO:	FIGURE NO:
RGM	1:40,000	0077086	7

0 5 10 mm in ANSI A sized paper

BGC ENGINEERING INC.

10-2020



NOTES:
1. This Figure should be read in conjunction with BGC's report titled ATIA Stage C Desktop Inundation Study, and dated November, 2020.
2. Coordinate System: NAD83 UTM Zone 14N.
3. Base topographic data based on the Canadian Digital Elevation Model (CDEM) produced by Natural Resources Canada.
4. This dam breach inundation map depicts the result of an overtopping failure of the Stage C (El. 283.75 m) East Dam under sunny-day conditions.

PREPARED BY:	FIGURE TITLE		
PG	STAGE C SUNNY-DAY OVERTOPPING FAILURE – FLOOD ARRIVAL TIME		
CHECKED BY:	CLIENT:		
CW	HUDBAY MINERALS INC.		
APPROVED BY:	SCALE:	PROJECT NO:	FIGURE NO:
RGM	1:40,000	0077086	8

P.G.

0 5 10 mm in ANSI A sized paper

BGC ENGINEERING INC.

Appendix 10-C Event Log

DAM EMERGENCY EVENT LOG (one per emergency event)
Name & Job Title:
Incident Start Date & Time:
Incident Description:
Initial Incident Level:
INCIDENT DETECTION
When did you detect or learn about the incident?
How did you detect or learn about the incident?
LOG ALL NOTIFICATIONS AND ACTIVITY IN THE TABLE BELOW

Date	Time	Contact Notified (Name & Title)	Action / Incident Progression	Action Taken By