

## **Appendix 16**

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### **Meadowbank and Whale Tail 2022 Geomechanical Inspection Implementation Plan**

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**Meadowbank (MBK) Annual Wall Inspection Recommendation Implementation Plan**

Recommendation Number	Priority Level <sup>(1)</sup>	Location	Year <sup>(2)</sup>	Recommendation	Action Plan/Follow-up	Status	Responsible	Due date	Completion Date
2022_MAW_01	P2	C Dump	2022	The ABF Garage has been constructed on top of the C Dump. Settlement of the dump, and potential structural damage to the garage, is likely once the water level in Pit A and Pit E reaches the base of the dump. The garage is currently being relocated away from the waste rock dump. A seacan adjacent the garage is used to provide power to the dewatering infrastructure in Pit A and should also be relocated outside of the bermed-off area along the crest of the dump.	Garage is relocated. Electrical substation will be moved for May 15th.	Open	CT	5/15/2023	
2022_MAW_02	P2	Goose and D dumps	2022	Settlement of the Goose Pit Waste Rock Dump, B Dump and D Dump is on-going. While extensometers have been installed on the D Dump, settlement of the other two dumps is not currently quantified. This limits the ability of the mine to quantify the risk to personnel accessing the open pit lakes below these dumps. A quantitative assessment of settlement should be implemented at the Goose Pit Waste Rock Dump and the B Dump. Possible options include extensometers, survey points, drone photogrammetry, etc.	A extensometer is installed at B dump and settlement monitoring points at Goose dump.	Closed	CT	-	9/1/2022
2022_MAW_03	P2	General	2022	The Ground Control Management Plan (GCMP) for the Meadowbank Site was last updated in 2018 and does not reflect the current state of operations or ground control activities. The GCMP should be reviewed and updated annually. The GCMP could be consolidated with the one for the Amaruq Site. In particular, the following should be completed: a. Specify the inspection and monitoring commitments, including who is responsible for the inspections. b. List/reference key sources of information for the Meadowbank open pits, including design reports and previous annual inspections so that the information is not lost.	Meadowbank - Open pits Surveillance program was put in place and can be found in Appendix to Whale Tail Project -GCMP.	Closed	CT	3/31/2023	3/1/2023
2022_MAW_04	P3	General	2022	Continue the monthly visual inspections of the Goose Pit, Portage Pit A, Portage Pit E, Vault Pit, Phaser Pit, B Dump, C Dump and D Dump. Specific comments include: a. The ramps used to access the pit lakes at the Goose Pit, Portage Pit A, Portage Pit E, Vault Pit and Phaser Pit should be inspected when access is required. The inspections of the ramps should be documented in the inspection report. b. The pre-access inspections for the Vault Pit should also include the in-pit waste dumps and Ring Road adjacent Vault Lake. The inspections of the Ring Road could be stopped if the potential for inrush from Vault Lake to the Vault Pit was otherwise mitigated (e.g., by breaching the Ring Road). c. The inspections for the D Dump should include the seepage flowing from the toe of the dump as well as the capacity of the rockfall berm between the dump and the Pit E Northwest Ramp.	Inspection program is including all those elements.	Closed	CT	3/21/2023	3/1/2023
2022_MAW_05	P3	D Dump	2023	Continue to monitor the wireline extensometers at the D Dump. The current frequency of reading every two weeks should be maintained until the movement of the dump stabilizes, the change in performance is better understood, or the deformation rate increases to a point where more frequent readings are required. The readings should be graphed (i.e., deformation rates and cumulative deformation vs time) to assist with the identification of trends in the data. Sudden changes in behaviour should trigger a review of the data.	Extensometer readings stable. No movement observed. Readings shown in graphs.	Closed	CT	-	9/1/2022
2022_MAW_06	P3	Pit E Ramp	2022	A rockfall in June 2022 may have resulted in material overtopping the rockfall berm below the nose in the West wall of the Pit E Northwest Ramp. The size and capacity of the rockfall berm should be reviewed before the dewatering infrastructure is moved up the ramp to below this area.	The pumping system is not at that elevation yet. It will be evaluated in summer 2023	Open	CT		6/1/2023
2022_MAW_07	P3	B Dump, D Dump and Goose Pit Dump	2022	Survey the approximate position of the tension cracks on the B Dump, D Dump and Goose Pit Dumps to better understand their position relative to the underlying open pit benches.	Tension cracks to be surveyed in summer 2023	Open	CT		8/1/2023

2022_MAW_08	P3	General	2022	The hazard assessment map captures many, but not all, of the hazards identified during the annual inspection. Comments have also been provided on several of the risk ratings. The hazard map should be reviewed and updated to reflect the outcome of the annual inspection.	Hazards have been added to the report and map.	Closed	CT	-	9/1/2022
2022_MAW_09	P3	Vault WRSF	2022	The berms restricting access to the Vault Waste Rock Dump have been removed to facilitate crushing operations. The berms should be replaced once access is no longer required.	Currently not access because of snow accumulation. To be bermed off next summer.	Open	CT	-	6/31/2023
2022_MAW_10	P3	General	2022	Rockfall events that occur within the open pits are currently not recorded unless they meet the threshold for reporting to the regulator. Events should be recorded in a register if they occur within the open pits used for tailings and water management in areas where there is the potential for worker access.	Rockfall already reported in the active working areas.	Closed	CT	-	9/1/2022
2022_MAW_11	P4	General	2022	The visual inspections are currently completed on a monthly basis, regardless of the identified hazards. A formal process should be developed where the frequency of visual inspections is increased in response to defined criteria.	This in place as part of the TARP for the wireline extensometer. For other identified hazard, it will be treated on a case-by-case basis.	Closed	CT	-	-
2022_MAW_12	P4	General	2022	The visual inspections are completed by the Geotechnical Group. While several members of the group have experience monitoring open pit slopes, the group's focus is on the management of the dykes and tailings facilities. Recommend implementing an annual visual inspection of the open pits and in-pit waste rock dumps by the Rock Mechanics Group.	Rock mechanics personnel will be present during the annual inspection.	Closed	CT	-	-
2022_MAW_13	P4	General	2022	The infiltration of surface water is likely contributing to the settlement observed at the B Dump. The upper and lower platforms of the B Dump should be graded and the sinkholes/depressions filled in to prevent water ponding and to limit further infiltration.	The area is not adequate to send equipment.	Closed	CT	-	-
2022_MAW_14	P4	General	2022	Vibrating Wire Piezometers and thermistors are installed in the east wall of the Goose Pit and are not currently monitored. While these instruments are no longer required for geotechnical monitoring, the need to periodically monitor them from an environmental perspective should be reviewed given the potential for future tailings deposition in the open pit.	Evaluate the need to perform this instrumentation review.	Open	CT	2023-06-31	

## Whale Tail (AMQ) Annual Wall Inspection

Recommendation Number	Priority Level <sup>(1)</sup>	Location	Year <sup>(2)</sup>	Recommendation	Action Plan/Follow-up	Status	Responsible	Due Date	Completion Date
2022_AAW_1	P-2	Various	2022	Several areas were identified during the visit that should be scaled or rockfall hazards mitigated: a) Whale Tail Phase 2 South Wall b) Whale Tail Phase 3 South Wall at the Ramp Fault c) Loose slabs and debris from scaling on the Whale Tail Phase 3 Southeast Wall d) Loose slabs and overhangs on the lower northwest wall of the IVR V1 open pit e) Nose between IVR V1 and IVR V2 f) Loose on the North and East walls of the IVR West 2 open pit	A)the wall is being pushed back, scaling was done to reopen the ramp, currently blasting the ridge - scaling not applicable. B) currently below the section - no coming back for scaling - ramp fault to be monitored in future bench and scaled accordingly as per our pattern approval process C) 2 benches down - D) slab was buttress - other slabs had rockfall in September - area monitor with radar after jeopardizing the ramp access E) Done - zone was scaled F) mitigated with berm - pit finished	Close	-	-	-
2022_AAW_2	P-2	IVR-2	2022	Remediate the thermal cap in the IVR V2 "Turtlehead".	Not required. Mining to be completed before next freshet and area close.	Close	-	-	-
2022_AAW_3	P-2	Various	2022	Construct, remediate or maintain rockfall or safety berms in the following locations: a) Along the inside of the Whale Tail Phase 2 ramp. The ramp needs to be extended along the upper ramp and built up to a consistent 2 m height. b) Along the inside of the ramp on the Northwest Wall of the IVR V1 open pit c) At the end of the crest road on the east side of the IVR V2 "Turtlehead" d) Along the inside of the ramp of the IVR West 2 open pit prior to the pit being used for water management.	Conditions changed. Not pertinent anymore.	Close	-	-	-
2022_AAW_4	P-2	WHL-PH1	2022	Prevent access above the potentially unstable block in the Whale Tail Phase 2 Southeast Wall. Consider leaving some muck against the block to buttress it during drilling and blasting. The area should be monitored when crews are working in the area.	Radar installed to monitor the area.	Ongoing	VD-AH	-	-
2022_AAW_5	P-2	General	2022	Review the Work Close to Pit Wall procedure, how it is communicated and whether it is being consistently used, including: a) Provide refresher training on the procedure. b) Review the use of spotters in Yellow Zones, as it is unclear if they are being reliably used. c) Review the annual training material.	a) The refresher training was done in 2022 during the geotechnical awareness campaign and will done on a yearly basis before freshet time. b) This is clearly stated in the work close to pit wall procedure. Every department is aware of this procedure and refresher training is given on annual basis. If required the rock mechanics team will be the spotters and assess the work at the same (e.g mining buttress in WHL phase and radar monitoring.) c) The training materials is updated on a yearly basis before each training refresher.	Close	VD-AH	-	-
2022_AAW_6	P-2	General	2022	Review the use of the Hazard Maps: a) Refine the legend on the Hazard Map to clearly note the restrictions associated with the risk ratings (e.g., Yellow – Spotter Required). b) Provide more detailed guidance, including examples, on how to determine the risk ratings. c) Consider the use of physical markers (e.g., pylons) in the open pit to remind personnel of hazards that are not bermed off (e.g., Yellow Zones). d) Consider a separate method for communicating the corrective actions to Operations so that it is clear that the Hazard Map is focussed on existing hazards rather than whether or not work has been completed. This could be captured within the Bench Approval process. e) Two of the hazards noted as requiring ongoing monitoring in the Hazard Tracking Database have been removed from the hazard map. All current hazards requiring mitigation should be shown on the Hazard Map.	a) "Use Spotter" will be added to hazard legend on the wall inspection map. b) Hazard are evaluated on a case by case basis. A list for refence will be produced for new employee as a guideline only. c) Hazard Map is provided to supervisors and employees. No need for marker. d) Current method is working properly. No change planned. e) No action required.	Open	VD-AH	2022-09-01	-
2022_AAW_7	P-2	General	2022	Implement a mechanism within the Hazard Tracking Database to flag overdue corrective actions. If an action has been superseded or the hazard mitigated through other means the action should be closed out.	The hazard tracking database will be modified to flag the overdue correction actions.	Open	VD-AH	2022-04-01	-
2022_AAW_8	P-2	General	2022	Review the Pit Wall Approval process: a) Review the communication of bench approvals with Engineering and Operations to ensure that the process is reliably followed. b) Incorporate a checklist to improve consistency between staff and avoid hazards being missed. c) Limit approvals in key sectors (e.g. WHL F6) to experienced staff.	Patterns approved are now reviewed at every daily production meeting to avoid any confusion.	Close	-	-	2023-01-01
2022_AAW_9	P-2	General	2022	Formally identify sectors of the open pit where SSR is a critical control for achieving an acceptable level of residual risk. Develop a process to stop or modify mining activities in these areas when SSR coverage is not available. This could be captured within the SSR TARP.	Critical sector requiring radar monitoring for mining have been identified in the new revision of the AMQ-ENG-PRO Ground Control Monitoring Using Radar System_Rev03	Close	AH	-	2023-03-01

2022_AAW_10	P-2	General	2022	Inspect the crest of the open pit for evidence of instability (e.g., above D4K) periodically. As a starting point, this could be completed in the spring and fall.	Drone inspection, including crest, has been added to the surveillance program as part of the GCMP. The frequency is monthly from May to September (free of snow period).	Close	CT	-	2023-02-01
2022_AAW_11	P-2	General	2022	Conduct periodic drone inspections of the open pit slopes. Review the inspection frequency in the GCMP and align it with current needs/capabilities.	Drone inspection has been clarified in the surveillance program as part of the GCMP. The frequency is monthly from May to September (free of snow period).	Close	CT	-	2023-02-01
2022_AAW_12	P-2	General	2022	Implement an additional surface monitoring system, such as prisms or GPS beacons, to complement the SSR, provide a long-term deformation baseline, and to allow the true displacement vector to be measured.	Corner cubes installation to enhance radar monitoring is currently ongoing. TDR has been installed in the south wall and inclinometers will be installed in WHL NE wall in September 2023.	Open	VD	-	2023-10-01
2022_AAW_13	P-2	General	2022	Update the GCMP and subsequently review and update it annually. The GCMP has not been updated since July 2020 and annual updates are a regulatory requirement under the Nunavut Mine Health and Safety Regulations.	GCMP has been updated.	Close	CT	2023-03-01	2023-03-01
2022_AAW_14	P-2	WHL NE	2022	Complete the on-going review and re-design of the Northeast Wall of the Whale Tail open pit. Possible measures under consideration include managing surface water, seasonal mining and double-benching in the lower wall.	Currently ongoing	Ongoing	CT	2023-12-01	-
2022_AAW_15	P-3	General	2022	Several areas were identified during the visit that should be a focus of on-going monitoring and inspections: a) The failure in the Phase 1 North Wall of the Whale Tail open pit b) The failed slab in the northwest corner of the Phase 1 North Wall of the Whale Tail open pit c) The potentially unstable blocks in the Whale Tail East Wall d) The accumulation of rockfall on the catch benches of the Whale Tail Phase 2 Southeast wall e) The potentially unstable wedge below the Whale Tail Phase 2 ramp, particularly during blasting below the wedge f) The Brittle Structure with seepage in the southwest corner of the IVR V1 open pit g) The nose on the north wall of the IVR V2 open pit h) The potentially unstable block in the IVR V2 open pit North wall "Turtlehead" i) The nose between the IVR V1 and IVR V2 open pits	No action required. Areas where monitoring still applicable are being monitored	Close	CT	-	-
2022_AAW_16	P-3	WHL PH1	2022	Review the risks associated with future access below the failure in the Phase 1 North Wall of the Whale Tail open pit for water management purposes. Implement mitigation measures as appropriate.	Mining is still ongoing. Prior mining completion, the dewatering plan will be reviewed with the different stakeholders and risk evaluation and appropriate mitigation measures will be taken if required.	Open	VD	2023-05-01	
2022_AAW_17	P-3	IVR1 - IVR2	2022	Review the rockfall risk associated with spillover from blasting and the potential creation of noses at the breakthrough between the IVR West 2 and IVR V2 Extension pits.	Ridge was blasted. No particular adverse conditions observed.	Close	-	-	2023-02-01
2022_AAW_18	P-3	WHL PH1	2022	Install instrumentation (e.g., wireline extensometer) in the potentially unstable wedge below the Whale Tail Phase 1 ramp to supplement radar monitoring.	No additional movement was observed since hazard was identified. No need for additional monitoring measure for this area except radar.	Close	-	-	-
2022_AAW_19	P-3	WHL PH1	2022	Review failure in the Phase 1 North Wall of the Whale Tail open pit in greater detail to better understand the failure mechanism, likely contributing factors, and the potential for the failure to continue below the ramp. A Maptek scan is recommended to better define the failure geometry.	To be analysed before next freshet.	Open	VD	2023-05-15	-
2022_AAW_20	P-3	WHL PH3	2022	Monitor the implementation and performance of the double-benching trial in the Diorite at the Whale Tail pit. In particular, there will need to be an emphasis on scaling and the Bench Approval process to ensure that hazards are managed.	This was evaluated and no issue was encountered.	Close	-	-	-
2022_AAW_21	P-3	WHL PH3	2022	Monitor the implementation and performance of the benches in the Whale Tail Phase 3 Southeast Wall (Design Sector F6). Once the next bench is complete, a review should be completed to assess if the current bench design is achievable or if it needs to be adjusted (i.e., to a BFA of 50°).	Performance was evaluated and it is better than expected. No action required.	Close	VD	-	2023-02-15
2022_AAW_22	P-3	IVR-1	2022	Revert to a 55° pre-shear angle for the IVR V1 Northwest Wall (Design Sector V0A).	Preshear was changed to 55	Close	CT	-	2022-10-01
2022_AAW_23	P-3	General	2022	Review the effectiveness of the SSR alarm parameters in 2022 and establish a commitment to review the parameters annually.	Alarms were reviewed in 2021. It will be reviewed annually.	Close	CT	-	-
2022_AAW_24	P-3	General	2022	Define a red trigger for the SSR TARP to provide a backstop for unprecedented or unexpected conditions.	Red alarms are used to monitor work taking place at very high-risk tasks that requires constant monitoring for the safety of work personnel, i.e. (Remediation of a wall failure). A JHA will also be completed for those specific tasks. The red alarm when used will be a case-by-case basis.	Close	CT	-	-
2022_AAW_25	P-3	General	2022	Adjust the SSR TARP so that the response to Grey and Orange SSR alarms does not explicitly state that mining operations are not to be stopped.	The change was performed in the last version of the procedure AMQ-ENG-PRO Ground Control Monitoring Using Radar System_Rev03	Close	CT	-	2023-03-01

2022_AAW_26	P-3	General	2022	Complete the recommended blasting trials. In particular, the development of a blasting pattern for the Komatiite is likely to be beneficial to bench performance.	This is ongoing with the DB department.	Ongoing	-	-	NA
2022_AAW_27	P-3	General	2022	Implement a year-round blasting quality control program, at a minimum measuring blasthole depth.	NA	Close	-	-	-
2022_AAW_28	P-3	General	2022	Undertake structural mapping to: a) Define the northwest dipping joint set in the lower Phase 2 Southeast Wall of the Whale Tail open pit b) Better define the extents of Structural Domain 5 in the Whale Tail open pit c) Validate the Brittle Structure model.	Those sectors will be included as part of mapping program.	Close	-	-	-
2022_AAW_29	P-3	IVR1 - IVR2	2022	Document the lithology, rock mass structure, and bench performance at regular intervals along the Northeast Wall of the IVR V1 pit in order to better understand the controls on the wall performance. While few benches remain in the pit, the results are relevant to the footwall of the IVR V2 pit.	Already done as part of the ground control quarterly report.	Ongoing	VD/AH	-	-
2022_AAW_30	P-3	IVR2	2022	Document the bench performance and key rock mass characteristics in the IVR V2 open pit and compare them to the design. In particular, it is important to verify that the north wall is being established in the Mafic Volcanics and below the Brittle Structure expected along the contact between the Mafic Volcanics and the Komatiite as the slope geometry recommendations for the V2A and V2E design sectors are based on this premise.	Only one bench exposed at IVR 2 footwall. Performance will be evaluated as part of the ground control quarterly report as mining progress.	Ongoing	VD/AH	-	-
2022_AAW_31	P-3	General	2022	Complete geomechanical mapping on a regular basis, consistent with the commitments in the GCMP. Mapping is particularly important in Q2 and Q3 when the bench faces are clear of snow. The mapping should focus on critical areas of the open pit, including Design Sectors D4K and F6 of the Whale Tail pit and V0A, V2A and V2E of the IVR pits.	Not action required. Already implemented and ongoing	Close	-	-	-
2022_AAW_32	P-4	General	2022	Take a series of overview photos (e.g., of each major wall) as part of the visual inspections to generate a record of wall performance over time.	Already done.	Close	-	-	-
2022_AAW_33	P-4	General	2022	Implement a formal mechanism (e.g., TARP) to increase the frequency of inspections in the event that an instability is observed or, for example, particular deformation limits are exceeded.	To be developed by the end of the year.	Open	VD/AH	-	2023-12-01
2022_AAW_34	P-4	General	2022	Explain in the GCMP or radar monitoring procedure why the SSR alarms have been set at their current values and provide guidance on how they can be adjusted based on different circumstances.	The change was performed in the last version of the procedure AMQ-ENG-PRO Ground Control Monitoring Using Radar System_Rev03	Close	-	-	2023-03-01
2022_AAW_35	P-4	General	2022	Evaluate methods for communicating updates to the hazard map outside of the regular two-week period if there are notable changes to the identified hazards. As an alternative to issuing an updated map, a brief addendum describing the change could be issued.	This gets cover as part of the bench approval process. No action required.	Close	-	-	-
2022_AAW_36	P-4	General	2022	Document the review of the Budget Mine Plan in greater detail, even if the document remains internal to the team, in order to better capture risks and opportunities.	Document has already made for each review. No action required.	Close	-	-	-
2022_AAW_36	P-4	General	2022	Add the following to the Quarterly Summary Reports to improve the communication of the completed rock mechanics activities and their effectiveness: a) The reports include a dashboard summary of the activities complete, but there is no reference to the commitments in the GCMP. Recommend including a column in the dashboard indicating the target frequency for the tracked items. b) Consider including a slide commenting on the effectiveness of the mine's controls (e.g. radar alarms, prior identification of rockfalls, etc.).	This will be incorporated in the next version of the GCMP	Open	VD/AH	2023-04-01	
2022_AAW_37	P-4	General	2022	Develop a skills matrix to help identify training needs.	This will be implemented in 2023	Open	AH	2023-12-01	

2022_AAW_38	P-4	General	<p>2022</p> <p>The following comments are provided for the GCMP:</p> <p>a) Consider adding a one-page overview of the deposit geology and mine plan, including key information such as the ultimate pit dimensions, approximate mine life, major lithologies, etc.</p> <p>b) (5.2.1.3) - Review and revise the commitments for drone monitoring so that they are focussed and achievable.</p> <p>c) (5.3.2) Clarify that the collected data should be compared to the design basis for the open pit in addition to looking for trends.</p> <p>d) (5.4.1) Note that crack meters and extensometers have not been installed and clarify that vibrating wire piezometers and thermistors are not currently being monitored. A plan with the location of the instrumentation should be included or referenced.</p> <p>e) (5.5) Reference a register that tracks who has received what geomechanical training.</p> <p>f) (8) Provide greater clarity and detail on the input the team provides to the mine planning and approval process. For example, the input to the Bench Master and 3MR.</p> <p>g) Describe and include a commitment to the bench approval process.</p>	<p>a) GCMP is focus on the surveillance program. Reference to design report containing this information is provided.</p> <p>b) It was added to the new GCMP revision.</p> <p>c) OK</p> <p>d) It was clarifid in the new GCMP revision.</p> <p>e) To be implemented in 2023</p> <p>f) It was added in the GCMP</p> <p>g) It was added to the new GCMP revision.</p>	Open	CT	2023-12-01	
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