



January 28th, 2021

Assol Kubeisinova
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Nunavut Water Board
P.O. Box 119
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Re: Whale Tail Dike Construction Summary Report - Appendix L Addendum

Dear Assol,

Please consider this letter as an addendum to Appendix L of the Whale Tail Dike Construction Summary Report. The purpose of this addendum is to provide additional information on the RFIs as requested by the NWB.

The objective of an RFI log is to document all proposed deviations from the design and to have them approved by the designer of the structure to ensure they will respect the design intent and not be detrimental to the structure performance. As a result, it can be said that all approved RFI will have no negative impact on the performance of the structure. The table provided in this letter clarify the RFI and their potential impacts to the structure performance.

RFI 27 to 33, 39, 41 and 42 are related to the initial grouting campaign (a grout curtain in the downstream area). A secondary grouting campaign was performed in 2019-2020 to reduce the seepage through the upper fractured bedrock. The second campaign focused on doing an upstream blanket. Following both campaigns, the grouting reduced the seepage through the dike to an acceptable level. The main reason why the first campaign was not sufficient to achieve adequate performance was the presence of permafrost in the upper bedrock that degraded during the operation of the structure.

Should you have any questions regarding this submission, do not hesitate to contact me.

Regards,

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RFI No.	Clarification
RFI-001	The sequence of the piling was modified to ease constructability. This work method was approved by the designers and met design intent.
RFI-002	There was minor deviation in the coarse filter in a localized zone. As the thickness of the fine filter material was met this was approved and is not expected to impact the dike performance.
RFI-003	At station 0+350 the work area was narrow. As a result, the rockfill material was placed in a 2 m lift instead of 1.5 m. Material placement was supervised by QA-QC and was deemed satisfactory.
RFI-004	Additional thickness of coarse filter was added in a localized area (15 m long) to compensate over excavation to respect the design intent.
RFI-005	It was realized that the thickness of the coarse filter in the western section of the dike was less than required from 0+753 to 0+767. This was accepted as the area is very localized.
RFI-006	As the bedrock was over excavated from 0+355 to 0+385 that section was modified to take into account the local field condition while respecting the design intent.
RFI-007	Area from 0+700 to 0+830 was excavated instead of being blasted. This choice of construction technique will not impact the performance of the dike as the same excavation limit was reached.
RFI-008	This RFI clarifies the numbering of the secant pile casing. This is an administrative change and has no impacts on the dike performance.
RFI-009	This RFI documents the western limit of the dike which is where the bedrock above El. 157 m was reached. There was a difference between theoretical and encountered bedrock (as expected). This will have no impact on the dike performance.
RFI-010	The secant pile spacing was increased from 0.75 m to 0.8 m. It was calculated that this spacing was acceptable and would not result in a gap in the pile. Therefore, the design intent is respected.
RFI-011	The slurry trench was sloped instead of being vertical as per the drawings. This was done for constructability purposes and will not impact the trench performance, or overall dike performance.
RFI-012	Deeper piles were requested from Sta 0+500 to 0+600 by AEM. This was done to improve the dike performance in areas where bedrock was fractured.
RFI-013	Deeper piles were requested from Sta.0+717 to Sta. 0+727 due to uncertainty of bedrock depth. This was done to improve the dike performance.
RFI-014	At the beginning of the construction the batching system was being commissioned and it was not possible to add the additive that would reduce the onset time of the grout. Therefore, at the beginning of the work there was a risk that the slurry would have been too thick which would have resulted in difficulty in pouring the pile. However, this would not have impacted the property of the grout and was an operational constraint only. This was resolved quickly.
RFI-015	This is linked to RFI-14. As it was not possible to measure the marsh viscosity at the beginning, this added an operational constraint that the slurry might be too thick for placement. This only impacted the construction and wont impact the structure performance.
RFI-016	This RFI is explained in technical memo 2 in the as-built report.
RFI-017	See RFI-10.



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RFI-018	An equivalent standard for testing of the grout was used for the bleeding test. Both standards are equivalent and this had no impact on the quality program.
RFI-019	While this RFI was not accepted by the designer all the UCS testing done showed that the minimum strength of the backfill was attained very quickly as presented in the QA-QC results. This RFI would have produced acceptable grout quality as per the specifications.
RFI-020	This RFI is linked to RFI-1. Due to the change in the sequence of the work it was impossible for a secondary pile to be bored in a primary pile. It is the tertiary pile that are interlocked and the specification was clarified with this RFI.
RFI-021	The grout recipe was modified to reduce the amount of cement required. It was verified by the QA-QC program that this new mix was still compliant to the specification.
RFI-022	The depth of the tertiary pile was taken as the average depth of the pile adjacent to it. This was accepted as a method to ensure that bedrock had been reached. This change was done to respect the design intent of the structure.
RFI-023	The tolerance on the socket installation depth was increased. This is not expected to impact the performance of the dike due to the presence of a grout curtain below the socket.
RFI-024	This is a modification to RF1-12. In some areas permafrost was encountered and as a result the socket length was reverted to the original design.
RFI-025	Similar to RFI-9 but for the Eastern abutment. This RFI documents the Eastern limit of the dike as per the encountered bedrock elevation. It was expected that the actual bedrock extent would differ slightly from the theoretical extent.
RFI-026	The depth of the rock socket was increased from 1 m to 2 m in the East abutment to improve the performance of the structure. This was a recommendation of the MDRB due to the presence of fractured bedrock in the area.
RFI-027	To preserve the integrity of the cutoff wall it was decided to drill the grout curtain with an offset to the secant wall instead of directly into it as per the original spec. This decision was confirmed by the grout committee and was continued during the second grouting campaign and will preserve the integrity of the cutoff wall. This had a positive impact on the dike performance
RFI-028	Similar to RFI-27. To preserve the integrity of the cutoff wall the grouting holes were made vertical instead of inclined. This decision will preserve the integrity of the cutoff wall and therefore has a positive impact on the dike performance.
RFI-029	This RFI document that the grout curtain length is started from the bedrock and not the socket of the wall. This has limited impact on the performance of the structure as the main seepage paths are located within the top 10 m of the bedrock as found in the remedial grouting campaign.
RFI-030	The initial grouting campaign was stopped at the limit of the permafrost (0+516) as grouting should not be performed where the bedrock temperature is less than 0°C as per the specification. However, the permafrost that was present from 0+516 to 0+730 quickly degraded when the structure was commissioned which created higher seepage than anticipated and required a grouting remediation campaign.
RFI-031	During the grouting program several discussions were held on the extent of the quaternary hole. It was agreed with the designer to perform 8 quaternary holes in the area where the highest grout take was observed in the tertiary hole. This has no impact on the dike performance.



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RFI-032	The RFI was not approved and a mix of downstage and upstage grouting technique was used.
RFI-033	The Specification was modified to change the refusal criteria after discussion with the designer. This decision respected the design intent of the structure.
RFI-034	In the western abutment the material of the top platform was modified from coarse filters to rockfill as a smaller lift of material was required. Coarse filter will have a similar performance to rockfill so this change respect the design intent.
RFI-035	The foundation on the Eastern abutment was dug deeper than the design to remove all ice rich material. This was done to minimize for the settlement of the dike due to melting of that material and is expected to improve the dike stability.
RFI-036	Same as RFI 6. As the bedrock was deeper, the extent of the filter zone had to be modified to ensure the proper thickness of material would be placed. This was done to respect the design intent.
RFI-037	The work method of the secant pile contractor was modified to minimize slurry loss. This will not impact the performance of the structure as the piles were still installed as per the specifications.
RFI-038	Piles from 0+826 to 0+832 were installed in frozen till instead of bedrock. As a result, no rock socket was required for these piles. This will have no impact on the performance of the pile as they were installed at the proper depth.
RFI-039	Water testing was cancelled after discussion with grout expert. The objective of a water test is to know how fractured the rock is before grouting. However, in the program performed it was decided that whatever the results of the test, the hole will be grouted. Removing these tests had no impact on the performance of the grouting program.
RFI-040	The placement of the thermal cover lift was delayed to summer to ensure snow and ice would not be entrapped in the structure. This had no observed impact on the performance of the dike.
RFI-041	A requirement of the specification was waived (i.e to throw out grout after 2 hours). This decision was made as there were several other properties of the grout that were controlled by the QA-QC program. Therefore, this RFI has no impact on the QA-QC program and the quality of the grout and has no impact on the dike performance.
RFI-042	Refer to RFI 30. Where the ground temperature was less than 0°C no grouting was performed.