Valentine Gold Project: Federal Information Requirements

Responses to Round Two Information Requirements

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Appendix IR(2) - NRCAN04.A

RESPONSE TO IR(2)- NRCAN04

IR 2 Reference #:	**IR(2)- NRCAN04**
IR 1 Reference #:	NRCAN-04 No prior Agency number assigned
EIS Reference:	Baseline Study Appendix 3, Attachment 3D, Hydrogeology Baseline Report, Sections 3.2, 4.3. Appendix 6A, Section 3.3
Context and Rationale:	The relationship between geological units and hydraulic conductivity (the hydrostratigraphy) is key to understanding and forecasting groundwater flow quantities and direction. As stated in the response to IR-NRCAN-04, additional testing of the overburden and shallow bedrock was completed following the submission of the EIS and summarized in GEMTEC (2021b – not available) but the report was not provided for review. Tabular data that includes screen top and bottom elevation; ground surface elevation and inferred or observed bedrock top surface elevation is required. While it is understood that a calibrated groundwater model is a best fit to limited field data and informed by expert opinion, it is essential that the conceptualization of the hydrostratigraphy matches the available data to the extent possible to ensure that forecasted results have limited uncertainty which in turn can affect predicted effects on fish and fish habitat. GEMTEC Consulting Engineers and Scientists Limited. 2020. Hydrogeology Baseline Report, Marathon Valentine Gold Project, March, 2020. GEMTEC Consulting Engineers and Scientists Limited. 2021b. Feasibility-Level Site-Wide Geotechnical and Hydrogeological Investigations, Valentine Gold Project, Marathon Gold Corporation, draft report.
Information Request:	a. Provide the referenced GEMTEC (2021b) report. If not included within the cited report, provide a table summarizing the analysis results for the single well response tests, including: screen top and bottom elevation; ground surface elevation; and, inferred or observed bedrock top surface elevation. b. Confirm whether any additional testing on MW4, MW6, and MW8 has been conducted, and if not, exclude them from the results and update the assessment.
Response:	a. The referenced GEMTEC (2021b) report has been finalized since the preparation of the original IR response, and is appended as Appendix IR(2)-NRCAN04.A. b. Additional hydraulic testing has not been conducted on MW5 (referenced incorrectly in the IR as MW4), MW6 or MW8. However,

IR 2 Reference #:	IR(2)- NRCAN04
	since the hydraulic conductivity at the bedrock overburden interface are expected to be similar, the data from these locations remain valid and useful for the assessment of hydrogeological conditions at the site and have therefore not been excluded from the assessment.
Appendix:	Appendix IR(2)-NRCAN04.A (Submitted as a separate file)

RESPONSE TO IR(2)-02

IR 2 Reference #	**IR(2)-02**
IR 1 Reference #	IR-02, IR-50, IR-53
EIS Reference:	Chapter 5 – Atmospheric Emissions Section 5.5.3 – Atmospheric Emissions, Noise Section 10.2 – Existing Conditions for Avifauna Section 10.2.3.1 – Forest Breeding Bird Survey Results: Passerines, Raptors, and SAR
Context and Rationale:	The proponent has not included adequate mitigation that will reduce the effects on migratory birds and species at risk for example there are no mitigations on potential effects of blasting. The discrepancies in the 2014 and 2019 baseline surveys and standard protocols emphasizes the need for additional pre-construction surveys (which are currently underway this summer 2021). ECCC has been in discussions with the proponent regarding the survey protocols/methods for the 2021 baseline survey, in an effort to improve survey design. The 2021 survey results will assist in the determination of effects on migratory birds and species at risk, such as Olive-sided Flycatcher. This information should be used to enable appropriate mitigation measures and assist the proponent with the development of a strong, scientifically sound EEM program. Nest searches are not recommended as a mitigation measure to reduce the impacts of migratory birds and species at risk, given the fact that the ability to detect nests is very low while the risk of disturbing or damaging nests is high, which is a violation of the Migratory Bird Regulations. ECCC recommends that the proponent avoid certain activities, such as clearing and other activities that may cause disturbance, during the nesting period for most migratory birds. The breeding season for most birds within the Project Area occurs between April 15th and August 15th, however some species protected under the Migratory Birds Convention Act nest outside of this time period. It is recommended that applicable information from ECCC's "Guidelines to reduce the risk to migratory birds" (see https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/reduce-risk-migratory-birds.html.) be considered in the development of mitigations.
Information Request:	Provide an updated list of mitigation measures that incorporates the findings of the 2021 pre-construction surveys to reduce the effects of the project, including blasting, on migratory birds.

IR 2 Reference #	**IR(2)-02**
Response:	An avifauna pre-construction field program was undertaken in summer 2021. The survey data processing, analysis and interpretation is ongoing and will be provided to Environment and Climate Change Canada – Canadian Wildlife Service (ECCC-CWS) when completed. Following receipt of IR(2)-02, Marathon met with ECCC-CWS to discuss the 2021 field program and better understand the data required to determine further mitigation measures to reduce potential adverse effects to migratory birds and species at risk. The following information was requested by ECCC-CWS: • A map of the greater footprint / survey area • Locations of the surveys, habitat delineation, and Autonomous Recording Units (ARUs) (with coordinates) • Point count methodology, location, timing, point selection. • Habitat type delineation methodology (i.e., how was this done; provide more information on the habitat-specific work). • Methodology of ARU use (e.g., sample size (how many devices), recording schedule, time of year and time of day) • Methodology of ARU transcription (e.g., How is data being extracted? Is all data being analyzed or a subset? If only a subset, what is the selection process?) • Organized Excel spread sheets of data/results, linked to location • A description of analysis that will be included in the final 2021 Avifauna report The requested information is provided below, noting that the finalized avifauna survey report will be provided to ECCC-CWS once complete. **<u>2021 Pre-construction Avifauna Surveys Summary</u>** *Map of Greater Footprint / Survey Area* Figure IR(2)-02.1, below, shows the location of the 2021 avifauna survey effort, including all point count and ARU locations. *Locations of the Surveys, Habitat Delineation, and ARUs* The coordinates for each of these points and the associated Ecological Land Classification (ELC) habitat type are summarized in the tables below (Tables IR(2)-02.1 and IR(2)-02.2); an Excel spreadsheet presenting the organized data has been provided directly to ECCC-CWS and the Impact Assessment Agency of Canada. *Point Count Methods and Timing* The 2021 avifauna surveys were the final year of baseline study for the Project. The study followed the same basic point count methods as

IR 2 Reference #	IR(2)-02
	presented in EIS Baseline Study Appendix 7: Avifauna, Other Wildlife and Their Habitats (BSA.7), Attachments 7-B and 7-H. The key differences in the approach to the 2021 point counts were the addition of new point count locations to further represent the overall habitat diversity of the Project Area and Local Assessment Area (LAA), and the extension of the survey period to cover early and late nesting avifauna. The first survey occurred from June 5 to 10, 2021 and the second survey from June 26 to 28, 2021. *Habitat Type Delineation Methods* The ELC for the Project is described in detail in the EIS BSA.7, Attachment 7-D, and summarized in the following paragraph. Ecosystem mapping was produced using an iterative approach. A computer-based algorithm was developed using satellite images and remote sensing technologies (i.e., data collected from a distance, typically from satellite or aircraft, such as multispectral reflection) to delineate habitat boundaries, although not define habitat types. The output of this algorithm was then classified using field data collected from 74 sites that had been sampled in August 2014. Post-processing was conducted to correct errors. The accuracy assessment for the Project ELC was completed using 162 reference points obtained through ground truthing in September 2015. The estimated overall accuracy for the habitat classification was 83%. Full details on the methods are available in the ELC report (EIS BSA.7, Attachment 7-D). ELC habitat types were used to inform the 2021 avifauna surveys. Consideration was also given to the location of previously sampled (i.e., in 2011 and/or 2019) and unsampled areas, accessibility, and suitability for long-term monitoring. This information was used in combination to develop survey transects and point count locations prior to field visits. While in the field, site-specific habitat information for each point count and ARU location was recorded. Habitats associated with the 2021 point count and ARU locations were roughly proportional to habitat availability in the Project Area (mine site and access road) (see Tables IR(2)-02.1 and IR(2)-02.2 below). *Methods for ARU Use and Data Analysis* A significant change in the 2021 avifauna surveys from previous years was the addition of ARUs (Wildlife Acoustics Song Meter Mini Bat with the optional microphone attachment). This allowed for more efficient sampling of various habitats over longer periods of time and the collection of larger volumes of data (i.e., song recordings), to better understand how the various habitats are being used by avifauna.

IR 2 Reference #	IR(2)-02
	Ten ARUs were deployed from June 8 to 10, 2021, coinciding with the first series of point count surveys. The ARUs were programmed to record daily from 3:30 am to 9:30 am. Four recorders were reassigned to bat studies at site from June 26 to 28 (during the second round of point counts), while the other six remained in place until July 9, 2021, to gather late season avifauna data. ARUs were placed in areas proximate to point count locations and representative of the broader ecological characteristics of the Project Area and LAA landscape. This approach was selected with a view towards long-term data collection, as some of the locations will serve as control sites for future monitoring, while others will be within or proximate to areas more directly associated with Project activities (i.e., treatment sites). Initial analysis of the ARU recordings was conducted using Kaleidoscope Pro, a Wildlife Acoustics software package specifically developed for processing large datasets from long recording periods. The program detects acoustic signals and compares them to each other to identify similarities in their frequency range, then clusters similar signals together. An initial cluster analysis was performed on all recordings from two ARUs whereby vocalizations were automatically detected and grouped together based on acoustic similarity. In total, 206,556 signals were detected and grouped in 370 clusters from these two units. The first 20 vocalizations in each cluster were then visually inspected to identify the species producing the signal. Clusters with good quality recordings of bird songs (i.e., a high signal to noise ratio, assessed by visually inspecting the associated oscillogram showing the amplitude of the acoustic signal) were assigned as classifiers to automatically detect these species in the field recordings of the remaining ARUs. Clusters with poor quality and inconsistent signals were not initially classified. These initially unclassified clusters produced after clustering with the simple classifier were then manually inspected to identify any new species present. Unidentified clusters are generally the result of signals of multiple vocalizations produced at the same time from different species with similar amplitude, resulting in inaccurate calculations for proper grouping. To include more of these unclassified date points, the first 30 signals in each unnamed cluster were visually inspected to determine whether a new species was detected, and then manually identified. Preliminary species diversity results from the point counts and ARUs by habitat type are presented in Tables IR(2)-02.3 and IR(2)-02.4, below. A preliminary list of avian species observed / detected during the 2021 surveys is presented in Table IR(2)-02.5, below. Notably, all ARUs captured

IR 2 Reference #	IR(2)-02
	Olive-sided Flycatcher songs. ARUs also detected species that were not recorded during the 2021 point count surveys (e.g., Swamp Sparrow); the presence of these species will be confirmed in the final 2021 avifauna report. *Future Analyses* This preliminary analysis of the point count and ARU data will be further refined for presentation in the final 2021 avifauna survey report: • Recordings will be more deeply analyzed to confirm any species not recorded during point count surveys, in particular for the initially unidentified clusters. • Two key temporal metrics will be assessed based on ARU data collected over the approximate five-week deployment, to determine if species diversity changed during the study period. • ARU data will be analyzed to determine if there are key times during the calling periods (i.e., sunrise to 9:30 am) when avian species and/or particular species of interest are more active. The 2021 avifauna report will also present the overall species diversity / richness by habitat type based on the results of the 2021 point count surveys. *Long-term Monitoring* Overall diversity and habitat specific diversity will form the foundation for the longer-term monitoring in the area. **Mitigation Measures for Avifauna** Consistent with standard practice, Marathon is focused on avoiding and reducing potential Project-related effects on Avifauna. A complete list of mitigations specific to avifauna is presented in Section 10.4 (Table 10.18) of the EIS. These include, for example, identifying sensitive areas prior to construction and flagging and maintaining appropriate buffers around these areas, where feasible. Removal of vegetation, where required, will be scheduled outside the migratory bird breeding season to the extent practicable. If vegetation clearing is required during the migratory bird breeding season, experienced environmental monitors will inspect the areas to assess occupancy before removal; the discovery of nests by staff will be reported to the Marathon environmental manager at site and appropriate action or follow-up will be guided by the Avifauna Management Plan.

IR 2 Reference #	**IR(2)-02**
	The following additional mitigation measures will be included in the Avifauna Management Plan: • Site staff will receive training on active nest disturbance and associated avian response behaviour and will be required to check facilities, equipment and vehicles for evidence of nesting prior to use. • During bird breeding season, blasting will occur outside of the prominent bird singing / calling and activity period of sunrise to approximately 9:30 am. As committed to in the EIS, trees that provide actual or potential habitat will be retained where safe to do so and technically feasible, including retention of snags or tall isolated trees that are potential habitat for Olive-sided Flycatcher and other migratory species. Mitigation related to avifauna will be further reviewed by Marathon once final results of the 2021 survey are available, to determine if any further modifications to mitigation measures are applicable. Although not anticipated at this time, any additional mitigation measures identified would be included in the Avifauna Management Plan, which will be a component of the Environmental Protection Plan for the Project. ECCC-CWS will have an opportunity to review the Avifauna Management Plan during Project permitting. The above information and preliminary details on the 2021 Avifauna Survey provide additional context regarding migratory birds, including Olive-sided Flycatcher, in the Project Area. This information does not change the residual effects characterizations or conclusions presented for Avifauna (Chapter 10) in the EIS.
Appendix:	None

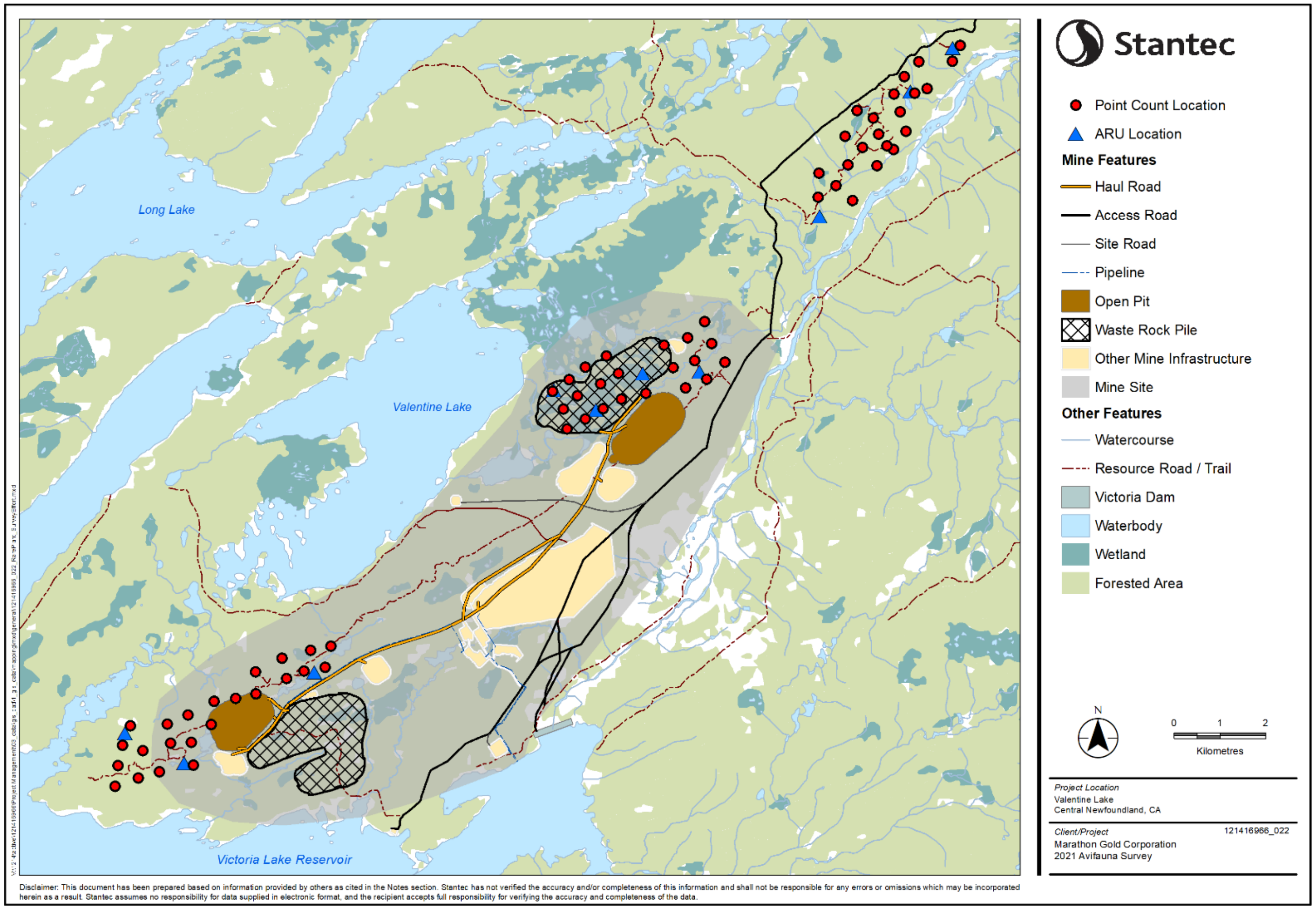

Figure IR(2)-02.1 2021 Avifauna Point Count and ARU Locations

Table IR(2)-02.1 Distribution of Point Counts by Habitat Type in the Project Area, June/July 2021

Habitat Type	% of Project Area	Distribution of Point Counts	
		# / Habitat Type	% of Total
Balsam Fir Forest	15.2	9	13.2
Mixedwood Forest	17.2	7	10.3
Black Spruce Forest	21.5	7	10.3
Shrub Fen/Shrub Bog	9.2	16	23.5
Wet Coniferous Forest	12.8	6	8.8
Anthropogenic	4.7	6	8.8
Kalmia-Black Spruce Forest	11.9	13	19.1
Regenerating Forest	3.9	4	5.9
Alder Thicket / Riparian Transition	1.6	0	0
Open Water	1.9	0	0
Total	**100**	**68**	**100**

Notes:
Project Area, as defined in EIS = Mine Site + Existing Access Road with a 20m buffer

Table IR(2)-02.2 ARU Locations and Habitat Types in the Project Area, June 2021

ADU_ID	Latitude	Longitude	Habitat Type
SMU4108	48.351935	-57.191988	Wet Coniferous Forest
SMU4026	48.355834	-57.203704	Mixedwood Forest
SMU3997	48.363774	-57.166474	Kalmia-Black Spruce Forest
SMU1234	48.398004	-57.111084	Wet Coniferous Forest
SMU1892	48.400609	-57.119347	Black Spruce Forest
SMU3803	48.402763	-57.101855	Kalmia-Black Spruce Forest
SMU1497	48.403005	-57.09068	Kalmia-Black Spruce Forest
SMU1492	48.423258	-57.067036	Wet Coniferous Forest
SMU3735	48.439513	-57.049199	Balsam Fir Forest
SMU3986	48.445218	-57.040918	Mixedwood Forest

Table IR(2)-02.3 Total Species Recorded by Point Count Location and Habitat Type, June 2021

Point Count ID	Habitat Type	Latitude	Longitude	Survey Period	Total Species
PC1	Balsam Fir Forest	48.43922	-57.05248	Late June	8
PC10	Balsam Fir Forest	48.35678	-57.20257	Early June	9
				Late June	7
PC11	Kalmia-Black Spruce Forest	48.35427	-57.20418	Early June	9
				Late June	9
PC12	Kalmia-Black Spruce Forest	48.35353	-57.20018	Early June	13
				Late June	7
PC13	Shrub Fen/ Bog	48.43397	-57.05552	Early June	8
				Late June	6
PC14	Regenerating Forest	48.432	-57.05258	Early June	11
				Late June	9
PC15	Wet Coniferous Forest	48.43247	-57.05383	Early June	8
PC16	Kalmia-Black Spruce Forest	48.40091	-57.09346	Early June	11
				Late June	6
PC17	Kalmia-Black Spruce Forest	48.34887	-57.2056	Early June	8
				Late June	6
PC18	Mixedwood Forest	48.4035	-57.09591	Early June	10
				Late June	7
PC19	Anthropogenic	48.35159	-57.20508	Early June	6
				Late June	5
PC2	Mixedwood Forest	48.43934	-57.04844	Early June	11
				Late June	11
PC20	Black Spruce Forest	48.40644	-57.09769	Early June	9
				Late June	6
PC21	Shrub Fen/ Bog	48.34998	-57.20107	Early June	6
				Late June	4
PC22	Mixedwood Forest	48.40205	-57.08928	Early June	12
				Late June	8
PC23	Shrub Fen/ Bog	48.35077	-57.19693	Early June	9
				Late June	7
PC24	Wet Coniferous Forest	48.40446	-57.09163	Early June	8
				Late June	6
PC25	Anthropogenic	48.3545	-57.19471	Early June	7
				Late June	9

Table IR(2)-02.3 Total Species Recorded by Point Count Location and Habitat Type, June 2021

Point Count ID	Habitat Type	Latitude	Longitude	Survey Period	Total Species
PC26	Kalmia-Black Spruce Forest	48.40744	-57.09304	Early June	9
				Late June	8
PC27	Shrub Fen/ Bog	48.35701	-57.19535	Early June	9
				Late June	9
PC28	Balsam Fir Forest	48.40426	-57.08576	Early June	10
				Late June	9
PC29	Shrub Fen/ Bog	48.35166	-57.19024	Early June	9
				Late June	10
PC3	Black Spruce Forest	48.43991	-57.04593	Late June	8
PC30	Mixedwood Forest	48.40666	-57.08833	Early June	8
				Late June	11
PC31	Shrub Fen/ Bog	48.35463	-57.19065	Early June	9
				Late June	5
PC32	Regenerating Forest	48.40954	-57.08972	Early June	11
				Late June	9
PC33	Shrub Fen/ Bog	48.35819	-57.19127	Early June	8
				Late June	7
PC34	Regenerating Forest	48.35697	-57.18669	Early June	6
				Late June	12
PC35	Kalmia-Black Spruce Forest	48.39685	-57.11321	Early June	7
PC36	Kalmia-Black Spruce Forest	48.35999	-57.18613	Early June	7
				Late June	10
PC37	Kalmia-Black Spruce Forest	48.3982	-57.10968	Early June	5
PC38	Anthropogenic	48.36033	-57.18199	Early June	5
				Late June	10
PC39	Kalmia-Black Spruce Forest	48.39941	-57.10606	Early June	7
PC4	Shrub Fen/ Bog	48.39553	-57.11673	Early June	10
PC40	Shrub Fen/ Bog	48.36381	-57.17804	Early June	5
				Late June	8
PC41	Regenerating Forest	48.40018	-57.10126	Early June	6
PC42	Kalmia-Black Spruce Forest	48.40144	-57.11018	Early June	10
PC43	Shrub Fen/ Bog	48.40276	-57.10668	Early June	4
PC44	Shrub Fen/ Bog	48.36298	-57.17192	Early June	8
				Late June	7

Table IR(2)-02.3 Total Species Recorded by Point Count Location and Habitat Type, June 2021

Point Count ID	Habitat Type	Latitude	Longitude	Survey Period	Total Species
PC45	Shrub Fen/ Bog	48.36562	-57.1728	Early June	7
				Late June	7
PC46	Anthropogenic	48.36396	-57.16852	Late June	6
PC47	Shrub Fen/ Bog	48.40361	-57.1132	Early June	6
PC48	Kalmia-Black Spruce Forest	48.36667	-57.16714	Early June	6
				Late June	5
PC49	Shrub Fen/ Bog	48.40507	-57.10902	Early June	7
PC5	Balsam Fir Forest	48.39811	-57.11749	Early June	8
PC50	Kalmia-Black Spruce Forest	48.36441	-57.16433	Early June	10
				Late June	3
PC51	Black Spruce Forest	48.43433	-57.05009	Late June	10
PC52	Mixedwood Forest	48.42574	-57.06739	Early June	5
				Late June	9
PC53	Shrub Fen/ Bog	48.42889	-57.06727	Early June	6
				Late June	8
PC54	Mixedwood Forest	48.42729	-57.06391	Early June	6
				Late June	5
PC55	Black Spruce Forest	48.42533	-57.06062	Early June	5
				Late June	4
PC56	Wet Coniferous Forest	48.42996	-57.06149	Early June	8
				Late June	9
PC57	Wet Coniferous Forest	48.43369	-57.06211	Early June	8
				Late June	7
PC58	Shrub Fen/ Bog	48.43227	-57.05866	Early June	6
				Late June	8
PC59	Black Spruce Forest	48.42988	-57.05584	Early June	6
				Late June	8
PC6	Wet Coniferous Forest	48.39985	-57.11468	Early June	10
PC60	Balsam Fir Forest	48.43703	-57.05974	Early June	13
				Late June	8
PC61	Anthropogenic	48.43608	-57.05652	Early June	9
				Late June	6
PC62	Balsam Fir Forest	48.43687	-57.05128	Early June	8
				Late June	7

Table IR(2)-02.3 Total Species Recorded by Point Count Location and Habitat Type, June 2021

Point Count ID	Habitat Type	Latitude	Longitude	Survey Period	Total Species
PC63	Black Spruce Forest	48.43433	-57.05009	Early June	9
PC64	Balsam Fir Forest	48.44151	-57.05045	Early June	16
				Late June	12
PC65	Balsam Fir Forest	48.44342	-57.04762	Early June	10
				Late June	12
PC66	Kalmia-Black Spruce Forest	48.44347	-57.04098	Early June	7
				Late June	8
PC67	Mixedwood Forest	48.44555	-57.03945	Early June	10
				Late June	12
PC68	Balsam Fir Forest	48.36721	-57.16322	Late June	7
PC7	Wet Coniferous Forest	48.40046	-57.11963	Early June	7
PC8	Black Spruce Forest	48.40195	-57.11638	Early June	5
PC9	Anthropogenic	48.36095	-57.17792	Late June	6
Note: The species totals are preliminary results that may change after further analysis					

Table IR(2)-02.4 Total Species Identified by ARU Location and Habitat Type, June/July 2021

ADU_ID	Habitat Type	Latitude	Longitude	Total Species Identified
SMU1234	Wet coniferous Forest	48.398004	-57.11108	20
SMU1492	Wet coniferous Forest	48.423258	-57.06704	27
SMU1497	Kalmia-Black Spruce Forest	48.403005	-57.09068	26
SMU1892	Black Spruce Forest	48.400609	-57.11935	24
SMU3735	Balsam Fir Forest	48.439513	-57.0492	28
SMU3803	Kalmia-Black Spruce Forest	48.402763	-57.10186	19
SMU3986	Mixedwood Forest	48.445218	-57.04092	23
SMU3997	Kalmia-Black Spruce Forest	48.363774	-57.16647	20
SMU4026	Mixedwood Forest	48.355834	-57.2037	21
SMU4108	Wet Coniferous Forest	48.351935	-57.19199	21
Note: The species totals are preliminary results that may change after further analysis				

Table IR(2)-02.5 Preliminary Species Identification from ARU and Point Counts, June/July 2021

Species	ARU	Point Counts
American Black Duck		X
American Redstart		X
American Robin	X	X
Black-and-white Warbler	X	X
Black-backed Woodpecker		X
Black-capped Chickadee		X
Blackpoll Warbler	X	X
Black-throated Green Warbler		X
Boreal Chickadee	X	X
Brown Creeper		X
Canada Goose	X	X
Canada Jay	X	X
Cedar Waxwing		X
Common Loon	X	X
Common Raven	X	X
Common Redpoll		X
Common Yellowthroat	X	X
Dark-eyed Junco	X	X
Downy Woodpecker		X
Fox Sparrow	X	X
Golden-crowned Kinglet	X	X
Greater Yellowlegs	X	X
Hairy Woodpecker	X	
Hermit Thrush	X	X
Herring Gull	X	
Lincoln’s Sparrow	X	X
Magnolia Warbler	X	X
Mourning Warbler	X	X
Nashville Warbler		X
Northern Flicker	X	X
Northern Goshawk	X	
Northern Waterthrush	X	X
Olive-sided Flycatcher	X	X
Orange-crowned Warbler	X	
Palm Warbler	X	X

Table IR(2)-02.5 Preliminary Species Identification from ARU and Point Counts, June/July 2021

Species	ARU	Point Counts
Pine Grosbeak	X	X
Red-breasted Nuthatch		X
Ruby-crowned Kinglet	X	X
Savannah Sparrow		X
Swainson's Thrush	X	X
Swamp Sparrow	X	
Unidentified Tern sp.		X
White-throated Sparrow	X	X
White-winged Crossbill		X
Wilson's Snipe	X	X
Wilson's Warbler	X	X
Yellow Warbler		X
Yellow-bellied Flycatcher	X	X
Yellow-rumped Warbler	X	X
Total	**34**	**44**

Note:
The species identified by the ARUs are preliminary results that may change after further analysis

RESPONSE TO IR(2)-9

IR 2 Reference#:	**IR(2)-9**
IR 1 Reference #:	IR-09
EIS Reference:	Baseline Study Appendix 3, Attachment 3D, Hydrogeology Baseline Report, Sections 4.2, 4.3, 4.4
Context and Rationale:	Faulting can enhance hydraulic conductivity relative to surrounding bedrock. These faults can act as a conduit between surface water features and the open pits. Additional information on the implementation of the fault zones within the model is required to assess the applicability of the sensitivity analysis as it relates to the assessment of groundwater-surface water interactions. Updated testing presented in GEMTEC (2021a) in the response to IR-09 expands upon the limited testing of the fault zones provided in the EIS. However, it is noted that the hydraulic properties of the fault zones have been characterized based on tests completed within the modelled fault plane. Additional tests may have been conducted within the actual fault zone but were not included in the calculation of the mean hydraulic conductivity (based on the lithology presented in Table 1 of GEMTEC (2021a)). Inclusion of these additional tests would increase the representative hydraulic conductivity for the fault zones by half an order of magnitude for the Marathon Pit. While the data may support fault zones that are of a similar range in hydraulic conductivity to the host bedrock, complete evaluation is required. GEMTEC Consulting Engineers and Scientists Limited. 2021a. Summary of Pack Testing, 2020 FS-Level Geotechnical Pit Design Program, Marathon Valentine Gold Project, Central Newfoundland, Letter Report prepared for Marathon Gold Corporation, dated May 31, 2021.
Information Request:	a. Provide a map showing the surface expression of the simulated fault zone within the model used for the sensitivity analysis as it intersects the Marathon and Leprechaun pits. b. Provide details of the thickness and depth of the simulated fault zone as modelled within the sensitivity analysis. c. Confirm that the hydraulic conductivity of the fault zone was assigned as 10 times the hydraulic conductivity of the host hydrostratigraphic unit (HSU) for the higher permeability simulations, such that it may range from on the order of $9x10^{-8}$ m/s to $1x10^{-12}$ m/s as a function of the simulated depth and HSU.

IR 2 Reference#:	**IR(2)-9**
Response:	a. A map showing the surface expression of the simulated fault zone was provided in Figure IR-14.1 (in the response to Federal Information Requirements issued on February 10, 2021), and is presented again in Figure IR(2)-9.1, below. b. The fault zone was assumed to extend the full thickness of the bedrock model layers, i.e., 370 m. The simulation of the fault zone in the groundwater model assumes the hydraulic conductivity applies to the full width of the representative model cells (i.e., 25 m). c. The hydraulic conductivity of the fault zones varies with depth in the sensitivity analyses, such that the hydraulic conductivity of the fault zone is an order of magnitude higher or lower than the assigned hydraulic conductivity of the host rock.
Appendix:	None

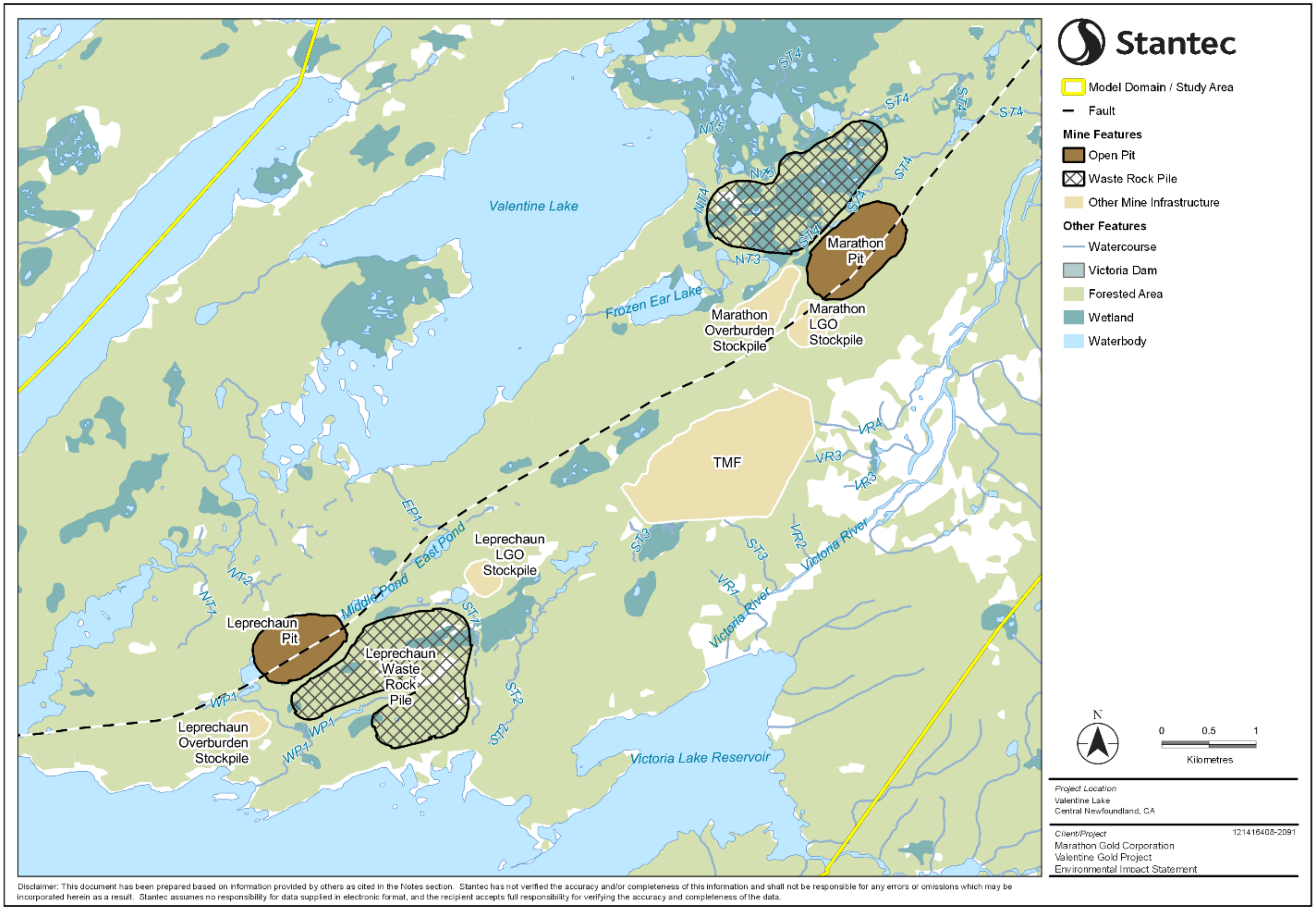

Figure IR(2)-9.1 Surface Expression of Simulated Fault Zone

RESPONSE TO IR(2)-11

IR 2 Reference #:	**IR(2)-11**
IR 1 Reference #:	IR-11
EIS Reference:	Appendix 6A, Sections 4.3.3, 4.3.4, Tables 5-1, 5-2, and 5-3, and Figures 4.1, 5.2 and 5.4
Context and Rationale:	Boundary conditions within the groundwater flow model are user specified, and control the degree to which groundwater may interact with surface water that could impact fish and fish habitat. In proximity to open pits that are actively dewatered these boundary conditions can control the extent to which drawdown is propagated. It is important that small lakes, ponds, streams, and rivers that may dry during pit dewatering are specified as boundaries that do not contribute water to the groundwater flow system. Section 5.2.1 of Appendix 6, states that boundaries in the vicinity of the open pits were switched to drains for the end of operations simulation, as is expected. However, results shown on Figure 5-2 in Appendix 6 show drawdown associated with pit dewatering being limited by the West Pond, Middle Pond, NT3, and ST4. These boundaries all appear to continue to have net flux from the groundwater flow system to the boundary during operations suggesting that they do not dry. However, in response to IR-13, Table IR-13-1 of Appendix IR-13.A shows that EP1 (Middle Pond and East Tributaries) and WP1 (West Pond and Tributaries) have a net flux from the boundaries to the groundwater flow system under the high permeability fault scenario, suggesting that these boundaries are not drains. Maps of depth to groundwater, and groundwater model water balances, are needed to assess forecasted groundwater effects.
Information Request:	a. Confirm that EP1, WP1, NT3, and ST4 were specified as drain boundaries for all of the operations simulations for which results have been presented. b. Using the zone budget functionality of MODFLOW break down the net groundwater flux into and out of the model for these boundaries under baseline, end of operations and post-closure conditions. c. Provide maps at the scale of Figure 5-2 in Appendix 6 showing the depth to the water table relative to original ground surface for baseline, end of operations, and post-closure conditions. This set of maps is also needed to satisfy IR(2)-12, IR(2)-14, and IR(2)15. d. In the event that these boundaries are not specified as drains, provide updated model results. Otherwise, provide a rationale for the effect of these boundaries on the propagation of drawdown associated with pit dewatering.

IR 2 Reference #:	**IR(2)-11**
Response:	a. The boundaries for EP1, WP1, NT3, and ST4 were specified as Modflow "RIVER" type head dependent flux boundaries in the model. This type of boundary condition allows water to enter or leave the boundary based on the calculated head in the cell relative to water elevation specified in the boundary condition representing surface water, to a maximum injection rate based on the elevation representing the bottom of the surface water feature. b. The net groundwater flux into and out of the model for the boundaries in part a) are included in the Table IR(2)-11.1, below. c. The maps showing the depth to water table below the pre-development ground surface have been prepared, and are included below as Figure IR(2)-11.1 for baseline conditions, Figure IR(2)-11.2 for operation, and Figure IR(2)-11.3 for post-closure conditions. d. The net groundwater inflows and outflows are presented in Table IR(2)-11.1, below. Isolated occurrences of groundwater inflows are observed in the boundaries, however neighbouring cells remove at least an equivalent amount of water. This balance of the inflows and outflows does not limit the lowering of the water table resulting from pit dewatering to levels below these elevations.
Appendix:	None

Table IR(2)-11.1 Groundwater Flow Rates (m^3/d) for Selected Boundary Conditions

Surface Water ID	Net Groundwater Flow into Model	Net Groundwater Flow out of Model	Net Groundwater Flow out of Model
Baseline			
EP1	1,944	2,864	920
WP1	1,784	3,951	2,167
NT3	133,712	136,587	2,875
ST4	6,110	11,311	5,201
Operations			
EP1	2,922	3,469	547
WP1	1,999	2,750	751
NT3	1,469	3,819	2,350
ST4	8,032	11,145	3,113
Post-Closure (without seepage collection)			
EP1	2,022	2,588	566
WP1	1,569	2,766	1,197
NT3	1,405	3,886	2,481
ST4	6,659	10,351	3,692

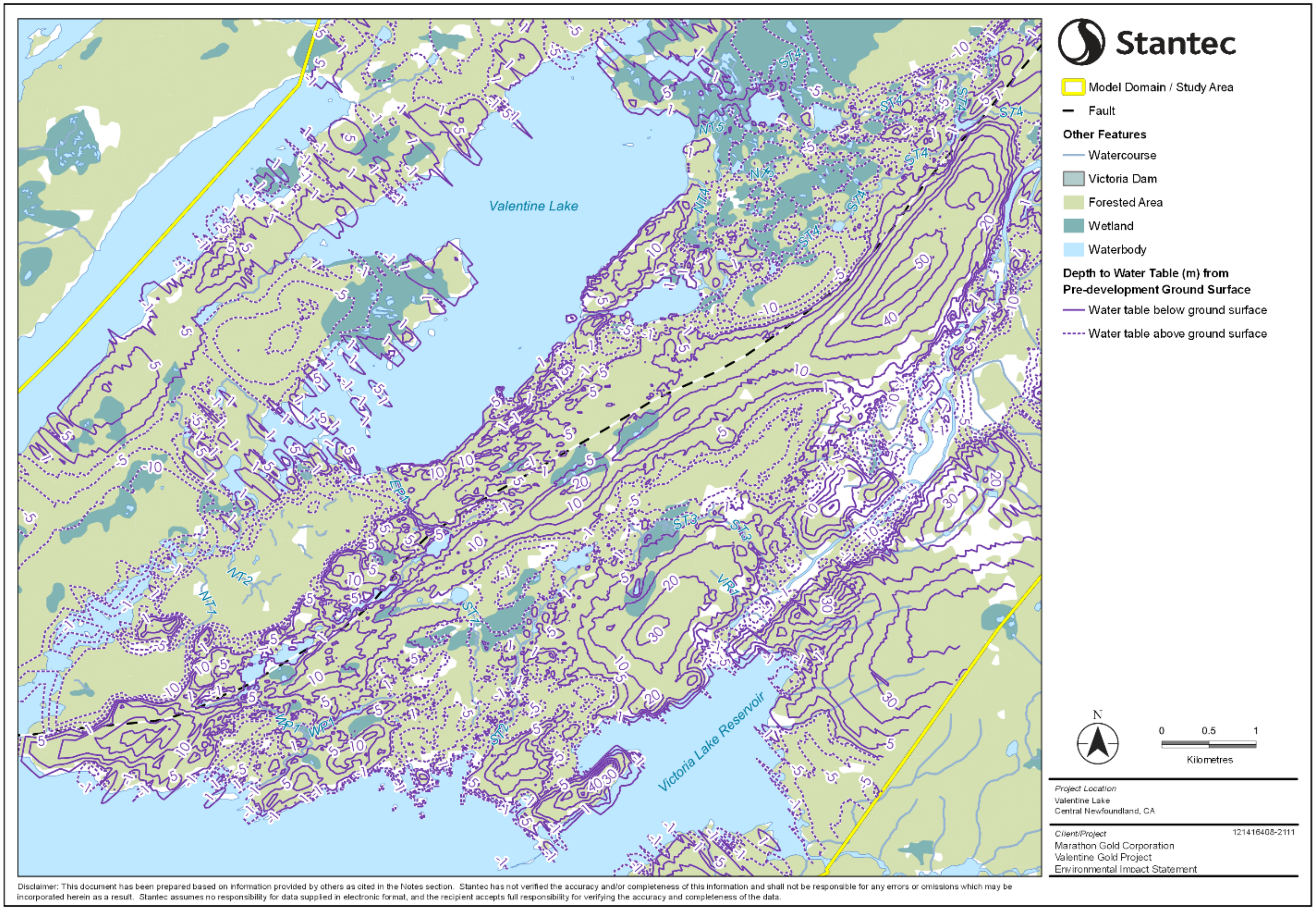

Figure IR(2)-11.1 Depth to Water Table Below Pre-development Ground Surface – Baseline

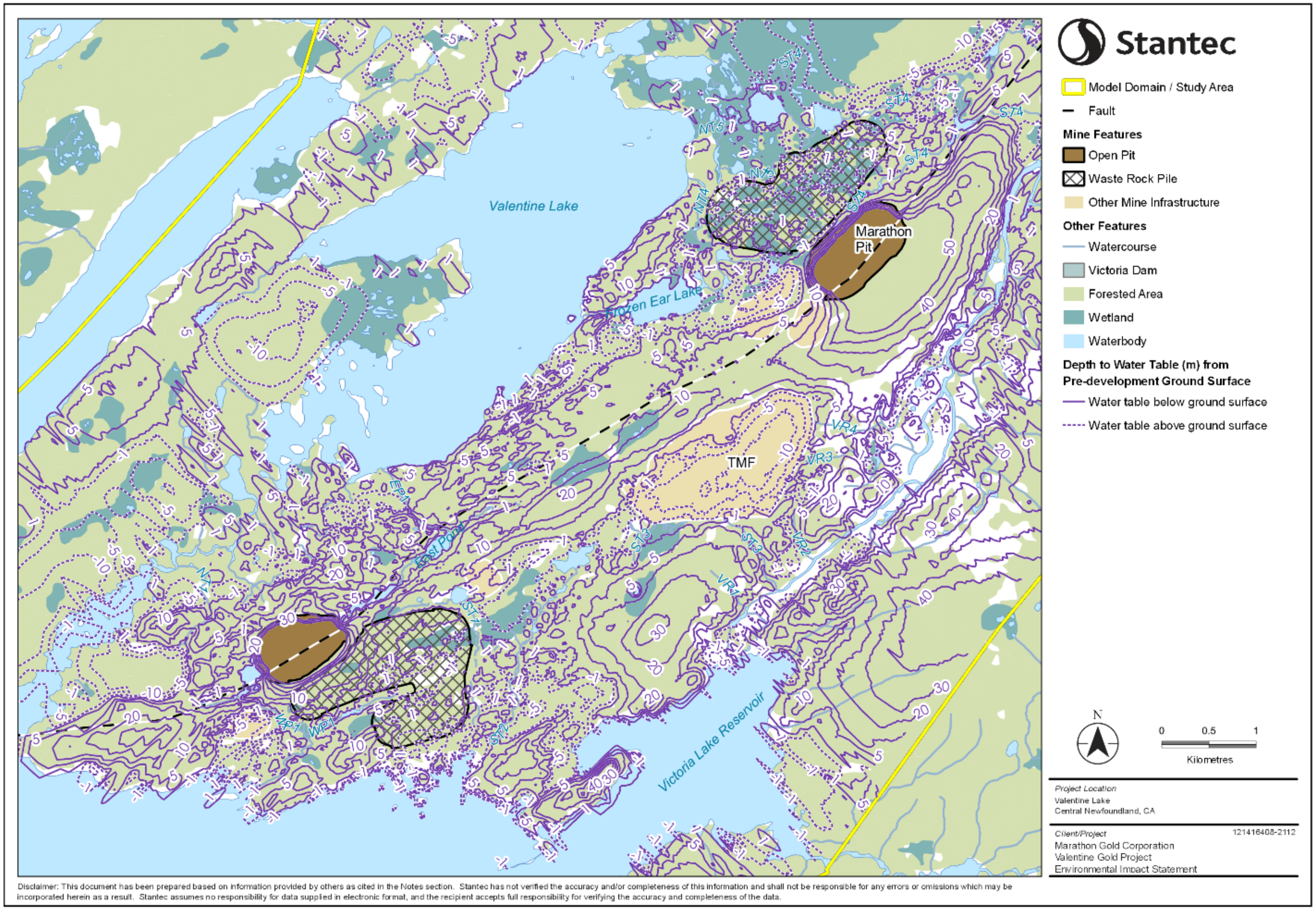

Figure IR(2)-11.2 Depth to Water Table Below Pre-development Ground Surface – End of Operation

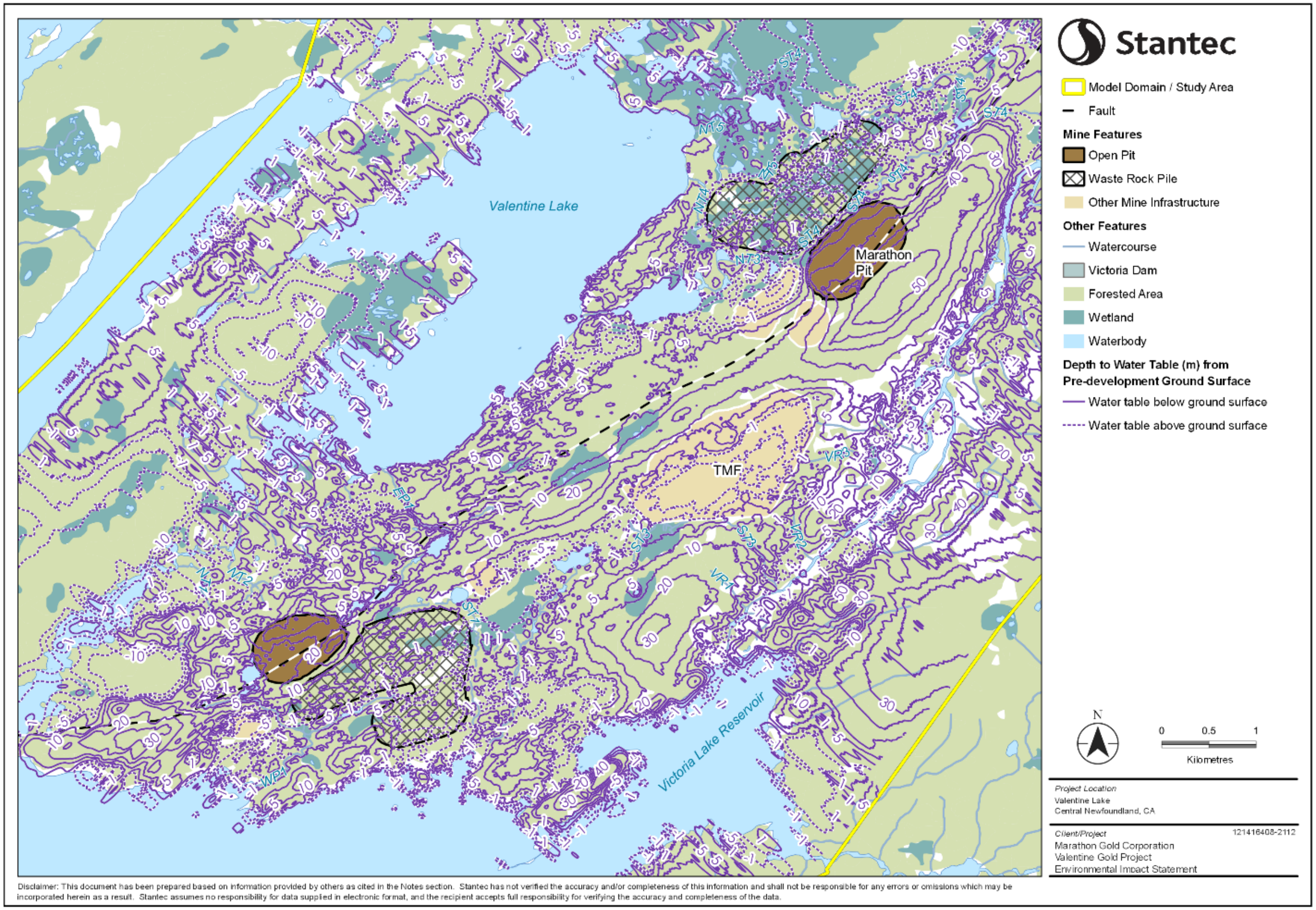

Figure IR(2)-11.3 Depth to Water Table Below Pre-development Ground Surface – Post-Closure (without ditches)

RESPONSE TO IR(2)-12

IR 2 Reference #	**IR(2)-12**
IR 1 Reference #	IR-12
EIS Reference:	Appendix 6A, Section 4.4, Tables 4-2 and 4-3, and Figures 4-3 and 4-4
Context and Rationale:	Groundwater model calibration is the measure of the ability of the groundwater model to replicate the interpreted conceptual model of groundwater flow. Without a reasonable calibration any forecasted changes to groundwater quantity, or groundwater-surface interaction are not reliable. The response to IR-12 states that the calibrated recharge value of 381 mm/year results in a model that matches observed groundwater elevations and baseflow values. To support the applied recharge value, AMEC (2013) is cited, which states that baseflow in Central Newfoundland ranges from 9.4 to 38.4% of total precipitation. With the Site's total precipitation value of 1236 mm/yr (EIS Chapter 7) baseflow should range from approximately 180 to 425 mm/year. With a baseflow index calculated for the Site of 35% (EIS Chapter 7), and the average mean annual flow calculated for the site of approximately 790 mm/year (estimated from Table 7.18 of EIS Chapter 7, Section 7.5) the site specific baseflow may be on the order of 280 mm/year, consistent with AMEC (2013). A recharge rate of 381 mm/year is more than 20% higher than the value supported by the Site-specific baseflow data. It is understood that the calibrated recharge value did produce a model that acceptably matches groundwater elevation data and baseflow data from the site. However, this calibration was achieved with an overburden hydraulic conductivity that is an order of magnitude higher than the stated range. Similar calibration statistics could feasibly be obtained with recharge and overburden hydraulic conductivity within their respective inferred ranges. Resulting in different forecast results relative to those presented. Additional information is needed (including maps, and water balances) to verify the groundwater model results and calibration.
Information Request:	a. Provide maps as per IR(2)-11c b. Provide a summary of model surface area, and the total flux into the model from recharge based on zone budgeting under baseline, end of operations, and post-closure conditions. This information is also needed to satisfy IR(2)-15. c. Based on the site specific runoff and baseflow data provided in Chapter 7 of the EIS, provide rationale for the calibrated recharge value.

IR 2 Reference #	IR(2)-12
Response:	a. The maps showing the depth to water table below the pre-development ground surface have been prepared, and are included as Figure IR(2)-11.1 for baseline conditions, Figure IR(2)-11.2 for operation, and Figure IR(2)-11.3 for post-closure conditions. b. The surface area of the model domain is 208 km^2. The total recharge applied to the model domain is 217,125 m^3/d for the baseline scenario, 218,510 m^3/d for operation, and 218,510 m^3/d for post-closure. c. Decreasing the recharge rate in the model would decrease the baseflow simulated in the watercourses. This would be further compounded by reducing the hydraulic conductivity of the overburden to match the observed heads. Because the model would no longer be calibrated to the baseflows, the recharge value assigned was required to match the baseflow conditions in the model, regardless of the estimated baseflow index presented in Chapter 7 of the EIS.
Appendix:	None

RESPONSE TO IR(2)-14

IR 2 Reference #	**IR(2)-14**
IR 1 Reference #	IR-14
EIS Reference:	Appendix 6A, Sections 5.2.2 and 5.3.2, Tables 5-3 and 5-6 and Figures 5-2 and 5-4
Context and Rationale:	Baseflow can be the main sustaining flow for surface water bodies during periods of low precipitation. Changes to baseflow, is one of the key outputs from the groundwater model for the assessment of impacts to valued components. The response provided for IR-14 does not provide an acceptable rationale for the increase in groundwater discharge to surface water during operations for NT1 and NT2. A change from a river boundary to a drain boundary does have the potential to result in increased net flux from groundwater to surface water if a portion of the boundary is contributing water to the groundwater water flow system. However, by visual comparison between the topography (EIS Chapter 7, Figure 7-46) and the baseline groundwater table elevation (EIS Appendix 6, Figure 5-1) it appears that the water table is at or above the ground surface along the majority of NT1, indicating that flux from the boundary to groundwater under baseline conditions is likely minimal.
Information Request:	a. Provide maps as per IR(2)-11c. b. Using the zone budget functionality of MODFLOW break down the net groundwater flux into and out of the model for NT1 and NT2 under baseline, end of operations and post-closure conditions.
Response:	a. The maps showing the depth to water table below the pre-development ground surface have been prepared, and are included as Figure IR(2)-11.1 for baseline conditions, Figure IR(2)-11.2 for operation, and Figure IR(2)-11.3 for post-closure conditions. b. The net groundwater flux into and out of the model for NT1 and NT2 under baseline, operations, and post-closure conditions are provided in Table IR(2)-14.1, below.
Appendix:	None

Table IR(2)-14.1 Groundwater Flow Rates (m^3/d) for Selected Boundary Conditions

Surface Water ID	Groundwater Flow into Model	Groundwater Flow out of Model	Net Groundwater Flow out of Model
Baseline			
NT1	53	385	332
NT2	0	61	61
Operations			
NT1	-	624	624
NT2	-	769	769
Post-Closure (without seepage collection)			
NT1	-	624	624
NT2	-	770	770

RESPONSE TO IR(2)-15

IR 2 Reference #	**IR(2)-15**
IR 1 Reference #	IR-15
EIS Reference:	Appendix 6A, Sections 5.2.1.3 and 5.3.1.2, Tables 5-4, 5-6, and 5-7.
Context and Rationale:	The quantity of groundwater seepage that originates from waste rock storage facilities and discharges to surface water bodies is used to assess water quality within these water bodies. Implementation of these facilities and their seepage collection infrastructure within the groundwater model has implications on these assessment results. As stated in the response to IR-15, recharge on the waste rock facilities was applied at a rate of 243 mm/year for the end of operations and post-closure simulations. This recharge rate is less than 64% of the recharge applied under the baseline simulation, yet groundwater elevation increases under the Leprechaun facility during operations and post-closure, and under the Marathon Facility during operations. These changes appear to indicate that the increased hydraulic conductivity of the waste rock added to the upper layers of the model permit more recharge to enter the system under operations and closure relative to baseline conditions. While water table mounding associated with waste rock facilities is not conceptually unexpected following wetting of the materials, the response of the model given the applied boundary conditions is not as expected, resulting in lower certainty in model results.
Information Request:	a. Provide maps as per IR(2)-11c. b. Provide information as per IR(2)-12b. c. Provide a rationale for the presence of a water table mound below the Marathon waste rock facility under operations (despite pit dewatering) that is not present during post-closure (with a flooded pit).
Response:	a. The maps showing the depth to water table below the pre-development ground surface have been prepared, and are included as Figure IR(2)-11.1 for baseline conditions, Figure IR(2)-11.2 for operation, and Figure IR(2)-11.3 for post-closure conditions. b. As requested in IR(2)-12b, the surface area of the model domain is 208 km^2. The total recharge applied to the model domain is 217,125 m^3/d for the baseline scenario, 218,510 m^3/d for operation, and 218,510 m^3/d for post-closure. c. A review of the model output files indicate that the recharge applied in the groundwater model was 543 mm/yr, and not the 243 mm/yr indicated in the original response to IR-15 (in the response to Federal Information Requirements issued on February 10, 2021). This is higher

IR 2 Reference #	**IR(2)-15**
	than the baseline recharge rate, which results in mounding of groundwater beneath the waste rock piles. The small area showing mounding beneath the Marathon waste rock pile during operation appears to have been a numerical artifact of the contouring. This is supported by the larger drawdowns surrounding this area simulated during operation, and lack of mounding in this location simulated during closure.
Appendix:	None

RESPONSE TO IR(2)-30

IR 2 Reference #:	**IR(2)-30**
IR 1 Reference #:	IR-30
EIS Reference:	EIS Chapter 8: Fish and Fish Habitat Page 8.72
Context and Rationale:	The response to the IR states that "*the Leprechaun and Marathon pit lakes were modeled as being fully mixed from top to bottom for a worst-case scenario for trace elements*". It is unclear whether the modelled scenario includes all project phases (including post-closure) and all parameters (to verify what parameters "trace elements" includes). If it does not, then a re-evaluation of the modelling may be required.
Information Request:	Confirm that the Leprechaun and Marathon pit lakes were modelled as being fully mixed (i.e. worst-case scenario) for all water quality parameters for the post closure period or provide the rationale for not including it.
Response:	Marathon confirms that the Leprechaun and Marathon pit lakes were modelled as being fully mixed for all water quality parameters for the closure and post-closure periods. For these periods, the water chemistries of the Leprechaun and Marathon pit lakes are presented in Table D-6 of Appendix 7A of the EIS (Water Quantity and Water Quality Modelling report: Leprechaun Complex, Processing Plant & TMF Complex) and Table D-4 of Appendix 7B of the EIS (Water Quantity and Water Quality Modelling Report: Marathon Complex), respectively.
Appendix:	None

RESPONSE TO IR(2)-39

IR 2 Reference #:	**IR(2)-39**
IR 1 Reference #:	IR-39
EIS Reference:	EIS Chapter 7 Response to IR-39
Context and Rationale:	Environmental flows, sometimes calculated as 30% or 50% Mean Annual Flow (MAF), are minimum flows that would maintain pre-existing habitats in a stream. As such, they should be based solely on baseline conditions. In Tables 39-1 to 39-3 in the response to IR-39, the environmental flows listed are not consistent with environmental flows that may be calculated from baseline MAF values (Table 7-18 in EIS, PDF p.37). Estimation of effects to fish habitat may not be accurate if the baseline to assess changes is not correct; there is a risk of missing important effects.
Information Request:	a. Provide a rationale on why the value of the baseline environmental flows differ from the expected project flows for the associated months (winter: October to March and summer: April to September) for all watersheds or update the tables as necessary. b. Discuss any potential effects to fish habitat, particularly in winter months.
Response:	a. Tables IR-39.1 to IR-39.3 (provided in response to Federal Information Requirements issued on February 10, 2021) have been updated to correct baseline environmental flows for the associated months (see Tables IR(2)-39.1 to IR(2)-39.3 below) and are now consistent with the baseline Mean Annual Flow (MAF) values (Table 7.18 in the EIS). The environmental flows have been updated using baseline MAFs as the calculations provided in the original response to IR-39 were incorrectly based on baseline catchment areas that did not correlate with delineated Project catchment areas. The winter environmental flow was based on 30% of baseline MAF applied to the months of October through March and the summer environmental flow was based on 50% of baseline MAF applied to the months April through September. In addition, the pre-development watershed of 0.397 km^2 for WS-1 presented in Table 7.17 Pre-development Watershed Areas and Tables IR-39.1 to IR-39.3 in the original response to IR-39 was incorrect and should have been 0.497 km^2. This correction was applied to Tables IR(2)-39.1 to IR(2)-39.3, below. Consequently, there is no change in the watershed area between pre-development and post-closure, as opposed to what was reported in the EIS for

IR 2 Reference #:	**IR(2)-39**
	closure and post-closure as an increase in flow of less than 30% from baseline conditions. As shown in Tables IR(2)-39.1 to IR(2)-39.3 and indicated in bold, some watersheds are not expected to provide sufficient summer and winter environmental flows during some Project phases, and thus will result in localized residual effects. This is a result of either reduced drainage area due to the Project or an artifact of existing, natural local conditions. This finding is consistent with the original response to IR- 39 and Chapter 7 of the EIS. The findings of the comparison of the Mean Monthly Flows (MMFs) to the seasonal environmental flows is also consistent to that presented in the original response to IR-39. The following observations were made as described in the original response to IR-39: • August is the normally driest summer month on record and the MMFs are characteristically below the summer baseline environmental flows for many of the watersheds. • Baseline summer environmental flows are repeatedly not met under pre-development conditions, and this continues throughout operation and exists in post-closure as an artifact of existing, natural local conditions. • The flow in a watercourse during January and February is typically dependent on groundwater contributions meeting winter baseline environmental flows. Approximately one-third of the watersheds' winter environmental flows will not be met in operation, closure, and post-closure drainage conditions. The watersheds that do not meet the seasonal environmental flows are summarized in Table IR(2)-39.4, below, along with the applicable Project phase. b. As assessed in the EIS, a reduction in water quantity to a watercourse may result in changes to fish habitat quality and quantity. The potential effects to fish habitat of reduced water quantity could include reduced water depth, flow and velocity, which may, in turn, change the quality and quantity of habitat available to support fish life stages, including breeding, rearing, feeding, migration and overwintering. Reduced water quantity may also decrease the wetted width and depth of a watercourse and thereby reduce the quality, quantity and connectivity of refuge areas for fish during low flow periods in summer and winter months. Shallower water depths could result in increased water temperatures during summer low flow periods and decreased water temperatures during winter low flow

IR 2 Reference #:	**IR(2)-39**
	periods. Decreased water temperatures could increase the areas where there is complete ice freeze-up to the bed of a watercourse or waterbody, thereby excluding fish. It is expected that fish will migrate to deeper water refuge areas within a watercourse during low flow periods. As discussed in Section 8.4 (specifically Table 8.14) of the EIS, after Project planning to avoid effects, mitigation is applied (e.g., managing flows) to reduce the potential for loss of fish habitat resulting from reduced water quantity. As discussed in the response to IR-27 (provided in response to Federal Information Requirements issued on February 10, 2021) and in Section 8.5 of the EIS, a Fish Habitat Offsetting Plan is being developed in consultation with DFO and will be implemented to offset the residual loss of fish habitat resulting from the Project after avoidance and mitigation have been applied.
Appendix:	None

Table IR(2)-39.1 Environmental Flows during Operation

Pre Development Watershed ID	Winter Env Flow (L/S) (Oct- Mar)	Mean Monthly Flow for Summer Months (L/S)						Summer Env Flow (L/S) (Apr - Sep)	Mean Monthly Flow for Summer Months (L/S)					
		Oct	Nov	Dec	Jan	Feb	Mar		Apr	May	Jun	Jul	Aug	Sep
WS1	3.6	10.8	10.9	6.9	4.1	4.2	8.1	6.1	29.3	30.6	12.2	**5.9**	**4.4**	7.2
WS2	9.8	51.8	55.9	38.3	23.9	24.5	42.8	16.4	138.5	130.8	53.1	27.2	21.2	34.9
WS3	2.7	15.2	15.6	10.1	6.1	6.2	11.7	4.5	41.2	42.2	16.8	8.2	6.2	10.2
WS4	4.1	14.0	14.4	9.2	5.5	5.7	10.7	6.9	38.0	39.1	15.6	7.6	**5.7**	9.4
WS5	0.8	2.0	1.9	1.1	**0.6**	**0.6**	1.3	1.4	5.4	6.3	2.5	1.1	**0.8**	**1.3**
WS6	7.4	**5.0**	**4.9**	**3.0**	**1.7**	**1.8**	**3.5**	12.4	13.5	14.9	**5.9**	**2.7**	**2.0**	**3.3**
WS7	2.4	20.2	21.0	13.8	8.3	8.5	15.8	4.0	54.6	54.9	22.0	10.9	8.2	13.6
WS8	10.6	33.3	35.3	23.7	14.5	14.9	26.8	17.6	89.4	86.9	35.0	17.7	**13.6**	22.4
WS9	4.4	24.8	26.0	17.2	10.5	10.8	19.6	7.3	66.9	66.3	26.6	13.3	10.1	16.7
WS10	14.9	55.4	60.0	41.2	25.8	26.5	46.0	24.8	148.2	139.2	56.5	29.1	22.7	37.3
WS11	2.3	14.7	15.1	9.7	5.8	6.0	11.2	3.8	39.8	40.8	16.3	7.9	6.0	9.9
WS12	17.3	26.8	28.2	18.7	**11.4**	**11.7**	21.3	28.8	72.3	71.2	28.6	**14.3**	**11.0**	**18.1**
WS13	4.9	6.3	6.3	**3.9**	**2.3**	**2.3**	**4.6**	8.2	17.3	18.8	**7.4**	**3.5**	**2.6**	**4.3**
WS14	11.2	16.7	17.2	11.2	**6.7**	**6.9**	12.9	18.7	45.2	46.0	18.4	**9.0**	**6.8**	**11.2**
WS15	10.7	42.8	45.9	31.2	19.3	19.8	35.0	17.9	114.8	109.8	44.4	22.6	**17.5**	28.8
WS16	8.7	36.1	38.4	25.9	15.9	16.4	29.2	14.5	96.9	93.7	37.8	19.1	14.8	24.3
WS17	4.6	10.1	10.2	6.5	**3.8**	**3.9**	7.6	7.7	27.5	28.9	11.5	**5.5**	**4.1**	**6.8**
WS18	16.4	58.2	63.1	43.5	27.2	28.0	48.4	27.4	155.5	145.7	59.2	30.5	**23.9**	39.2
WS19	2.0	5.8	5.8	3.5	2.1	2.1	4.2	3.3	15.9	17.3	6.8	**3.2**	**2.4**	3.9
WS20	5.3	17.2	17.7	11.5	6.9	7.1	13.3	8.9	46.5	47.2	18.9	9.2	**7.0**	11.6
WS21	13.9	50.0	53.9	36.9	23.0	23.6	41.2	23.1	133.9	126.7	51.4	26.3	**20.5**	33.7
WS22	6.1	31.3	33.0	22.1	13.6	13.9	25.0	10.2	84.0	82.0	33.0	16.6	12.8	21.0

Note: **Bold** indicates when Environmental Flows is not met for that month

Table IR(2)-39.2 Environmental Flows during Closure

Pre Development Watershed ID	Winter Env Flow (L/S) (Oct- Mar)	Mean Monthly Flow for Summer Months (L/S)						Summer Env Flow (L/S) (Apr - Sep)	Mean Monthly Flow for Summer Months (L/S)					
		Oct	Nov	Dec	Jan	Feb	Mar		Apr	May	Jun	Jul	Aug	Sep
WS1	3.6	10.8	10.9	6.9	4.1	4.2	8.1	6.1	29.3	30.6	12.2	**5.9**	**4.4**	7.2
WS2	9.8	51.8	55.9	38.3	23.9	24.5	42.8	16.4	138.5	130.8	53.1	27.2	21.2	34.9
WS3	2.7	15.2	15.6	10.1	6.1	6.2	11.7	4.5	41.2	42.2	16.8	8.2	6.2	10.2
WS4	4.1	14.0	14.4	9.2	5.5	5.7	10.7	6.9	38.0	39.1	15.6	7.6	**5.7**	9.4
WS5	0.8	2.0	1.9	1.1	**0.6**	**0.6**	1.3	1.4	5.4	6.3	2.5	**1.1**	**0.8**	**1.3**
WS6	7.4	**5.0**	**4.9**	**3.0**	**1.7**	**1.8**	**3.5**	12.4	13.5	14.9	**5.9**	**2.7**	**2.0**	**3.3**
WS7	2.4	20.2	21.0	13.8	8.3	8.5	15.8	4.0	54.6	54.9	22.0	10.9	8.2	13.6
WS8	10.6	33.3	35.3	23.7	14.5	14.9	26.8	17.6	89.4	86.9	35.0	17.7	**13.6**	22.4
WS9	4.4	24.8	26.0	17.2	10.5	10.8	19.6	7.3	66.9	66.3	26.6	13.3	10.1	16.7
WS10	14.9	55.4	60.0	41.2	25.8	26.5	46.0	24.8	148.2	139.2	56.5	29.1	**22.7**	37.3
WS11	2.3	14.7	15.1	9.7	5.8	6.0	11.2	3.8	39.8	40.8	16.3	7.9	6.0	9.9
WS12	17.3	26.8	28.2	18.7	**11.4**	**11.7**	21.3	28.8	72.3	71.2	28.6	**14.3**	**11.0**	**18.1**
WS13	4.9	6.3	6.3	**3.9**	**2.3**	**2.3**	**4.6**	8.2	17.3	18.8	**7.4**	**3.5**	**2.6**	**4.3**
WS14	11.2	16.7	17.2	**11.2**	**6.7**	**6.9**	12.9	18.7	45.2	46.0	18.4	**9.0**	**6.8**	**11.2**
WS15	10.7	37.2	39.6	26.7	16.5	16.9	30.1	17.9	99.8	96.3	38.9	19.7	**15.2**	25.0
WS16	8.7	30.2	31.9	21.3	13.0	13.4	24.1	14.5	81.1	79.4	32.0	16.1	**12.3**	20.3
WS17	4.6	10.1	10.2	6.5	**3.8**	**3.9**	7.6	7.7	27.5	28.9	11.5	**5.5**	**4.1**	**6.8**
WS18	16.4	31.4	33.2	22.2	**13.6**	**14.0**	25.1	27.4	84.4	82.3	33.2	**16.7**	**12.8**	**21.1**
WS19	2.0	5.8	5.8	3.5	2.1	2.1	4.2	3.3	15.9	17.3	6.8	3.2	**2.4**	3.9
WS20	5.3	17.2	17.7	11.5	6.9	7.1	13.3	8.9	46.5	47.2	18.9	9.2	**7.0**	11.6
WS21	13.9	50.0	53.9	36.9	23.0	23.6	41.2	23.1	133.9	126.7	51.4	26.3	**20.5**	33.7
WS22	6.1	31.3	33.0	22.1	13.6	13.9	25.0	10.2	84.0	82.0	33.0	16.6	12.8	21.0
Note: **Bold** indicates when Environmental Flows is not met for that month														

Table IR(2)-39.3 Environmental Flows during Post-Closure

Pre Development Watershed ID	Winter Env Flow (L/S) (Oct- Mar)	Mean Monthly Flow for Summer Months (L/S)						Summer Env Flow (L/S) (Apr - Sep)	Mean Monthly Flow for Summer Months (L/S)					
		Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**		**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
WS1	3.6	13.3	13.6	8.7	5.2	5.3	10.1	6.1	36.1	37.2	14.8	7.2	5.4	8.9
WS2	9.8	51.8	55.9	38.3	23.9	24.5	42.8	16.4	138.5	130.8	53.1	27.2	21.2	34.9
WS3	2.7	15.2	15.6	10.1	6.1	6.2	11.7	4.5	41.2	42.2	16.8	8.2	6.2	10.2
WS4	4.1	14.0	14.4	9.2	5.5	5.7	10.7	6.9	38.0	39.1	15.6	7.6	**5.7**	9.4
WS5	0.8	2.0	1.9	1.1	**0.6**	**0.6**	1.3	1.4	5.4	6.3	2.5	**1.1**	**0.8**	**1.3**
WS6	7.4	**5.0**	**4.9**	**3.0**	**1.7**	**1.8**	**3.5**	12.4	13.5	14.9	**5.9**	**2.7**	**2.0**	**3.3**
WS7	2.4	20.2	21.0	13.8	8.3	8.5	15.8	4.0	54.6	54.9	22.0	10.9	8.2	13.6
WS8	10.6	33.3	35.3	23.7	14.5	14.9	26.8	17.6	89.4	86.9	35.0	17.7	**13.6**	22.4
WS9	4.4	24.8	26.0	17.2	10.5	10.8	19.6	7.3	66.9	66.3	26.6	13.3	10.1	16.7
WS10	14.9	52.5	56.7	38.9	24.3	24.9	43.4	24.8	140.4	132.4	53.7	27.6	**21.5**	35.3
WS11	2.3	8.4	8.4	5.3	3.1	3.2	6.2	3.8	22.9	24.4	9.6	4.6	**3.4**	5.7
WS12	17.3	60.8	66.0	45.6	28.6	29.4	50.7	28.8	162.3	151.6	61.6	31.9	**24.9**	40.9
WS13	4.9	17.8	18.4	12.0	7.2	7.4	13.8	8.2	48.1	48.7	19.5	9.6	**7.2**	12.0
WS14	11.2	39.8	42.5	28.8	17.8	18.3	32.4	18.7	106.7	102.5	41.4	21.1	**16.3**	26.8
WS15	10.7	42.8	45.9	31.2	19.3	19.8	35.0	17.9	114.8	109.8	44.4	22.6	**17.5**	28.8
WS16	8.7	36.1	38.4	25.9	15.9	16.4	29.2	14.5	96.9	93.7	37.8	19.1	14.8	24.3
WS17	4.6	22.9	23.9	15.7	9.6	9.8	18.0	7.7	61.7	61.4	24.7	12.2	9.3	15.4
WS18	16.4	58.1	63.0	43.4	27.2	27.9	48.3	27.4	155.3	145.5	59.1	30.5	**23.8**	39.1
WS19	2.0	5.8	5.8	3.5	2.1	2.1	4.2	3.3	15.9	17.3	6.8	3.2	**2.4**	3.9
WS20	5.3	17.2	17.7	11.5	6.9	7.1	13.3	8.9	46.5	47.2	18.9	9.2	**7.0**	11.6
WS21	13.9	50.0	53.9	36.9	23.0	23.6	41.2	23.1	133.9	126.7	51.4	26.3	**20.5**	33.7
WS22	6.1	31.3	33.0	22.1	13.6	13.9	25.0	10.2	84.0	82.0	33.0	16.6	12.8	21.0

Note: **Bold** indicates when Environmental Flows is not met for that month

Table IR(2)-39.4 Summary of When Environmental Flows are Not Met

Watershed ID	Winter Env Flow (L/S) (Oct- Mar)	Summer Env Flow (L/S) (Apr - Sep)
WS1		O/C
WS2		
WS3		
WS4		O/C/PC
WS5	O/C/PC	O/C/PC
WS6	O/C/PC	O/C/PC
WS7		
WS8		O/C/PC
WS9		
WS10		C/PC
WS11		C/PC
WS12	O/C	O/C/PC
WS13	O/C	O/C/PC
WS14	O/C	O/C/PC
WS15		O/C/PC
WS16	C	
WS17	O/C	O/C
WS18	C/PC	O/C/PC
WS19	C/PC	O/C/PC
WS20		O/C/PC
WS21		O/C/PC
WS22		
WS23		

RESPONSE TO IR(2)-41

IR 2 Reference #:	**IR(2)-41**
IR 1 Reference #:	IR-41
EIS Reference:	Chapter 4: Assessment of Effects to Surface Water Appendix 7C – Assimilative Capacity Assessment Report
Context and Rationale:	The response states that "*Table IR-41.5 presents modeling results of sediment chemistry from contact water using the geochemical model. No exceedances of [Canadian Environmental Quality Guidelines Interim Sediment Quality Guidelines] CEQG ISQG and CEQG [Probable Effects Levels] PEL are predicted for sediment in contact water leaving the sedimentation ponds*." The timeframe associated with table IR-41.5 is not clear and there may be a misunderstanding of the goals of regulatory sampling compared to the goals of sampling to support an assessment of effects under environmental assessment.
Information Request:	Provide the timeframe represented by the sediment quality predictions in Table IR-41.5.
Response:	Table IR-41.5 (provided in response to Federal Information Requirements issued on February 10, 2021) shows the sediment chemistry predictions for sediment pond discharges during Operation (i.e., worst case scenario). Operation corresponds to Year 1-12 of the mine life. It is expected that Operation will start in Q3 2023 and will be completed by 2035. Predictions in Table IR-41.5 are below the Canadian Environmental Quality Guidelines (CEQG) for sediment, including the Interim Sediment Quality Guidelines (ISQG) and probable effects levels (PELs). Closure corresponds to Year 13-17 (2036-2040) and Post Closure corresponds to Year 18+ (2041+) of the mine life.
Appendix	None

RESPONSE TO IR(2)-42

IR 2 Reference #:	**IR(2)-42**
IR 1 Reference #:	IR-42
EIS Reference:	Appendix 7C – Assimilative Capacity Assessment Report (page 1.2)
Context and Rationale:	The response states that "*These parameters are not considered bioaccumulative, with the exception of arsenic which may have the potential to be bioaccumulative (EC 2012)*" but there is no further discussion of potential levels of arsenic, their effects on fish and human health, or mitigations.
Information Request:	Provide information on the potential for arsenic to bioaccumulate and the potential effects on fish and fish habitat and human health. In addition, provide mitigations to address possible effects.
Response:	The adverse effects associated with arsenic are generally related to exposures to inorganic arsenic. Organic forms of arsenic are typically much less toxic than inorganic arsenic (USEPA 2000). Although bioaccumulation of arsenic is known to occur in marine and freshwater aquatic food chains, most studies available suggest that concentrations of inorganic arsenic decrease with transfer from one trophic level to the next (i.e., biodiminution), due to the conversion of inorganic arsenic to less toxic organic forms of arsenic (Rahman et al. 2012, Foust et al. 2016). USEPA (2000) provides a discussion of metals in edible portions of fish, and specifically the chemical forms of arsenic most frequently found in fish and seafood. Seafood is a major source of trace amounts of arsenic in the human diet. In the edible parts of fish and shellfish, arsenic is predominantly present as the organic compound arsenobetaine (or arsenocholine), which has been shown to be metabolically stable and nontoxic to humans (summarized in USEPA 2000). Inorganic arsenic in fish tissue is generally a minor component of the total arsenic content compared to arsenobetaine (USEPA 2000). Regarding the potential for effects to fish and to human health for people who consume fish harvested from within the Local Assessment Area (LAA), the assessment of surface water quality determined that the concentrations of parameters of potential concern will return to baseline conditions within the 300 m mixing zone extent of the ultimate receiving waterbodies (i.e., Valentine Lake, Victoria Lake Reservoir and Victoria River) (EIS Section 7.6.2). The extent of the mixing zones in the ultimate receivers represents a very small portion of these surface waterbodies and a correspondingly small proportion of the area likely to be inhabited by fish, including species targeted for human consumption. The results of geochemical water quality modelling predict that metal concentrations

IR 2 Reference #:	**IR(2)-42**
	(including arsenic) in receiving waterbodies (i.e., Victoria Lake Reservoir, Valentine Lake and Victoria River) beyond the 300 m mixing zone, would not change from Baseline Case concentrations as a result of the Project (EIS Chapter 7, Surface Water Resources). Given that baseline concentrations of metals (including arsenic) are not predicted to change from Baseline Case concentrations, it is reasonable to conclude that arsenic in surface water will not alter the quality of fish habitat. It is also reasonable to conclude that concentrations of arsenic in fish tissue will remain unaltered from the baseline condition, and that the risks to fish health and to humans who consume fish tissue will remain unchanged from baseline conditions. As noted in the response to IR(2)-61a, a Country Foods Monitoring Program (CFMP) will be implemented to verify the EIS predictions through monitoring the quality of aquatic and terrestrial country foods harvested from within the LAA over the life of the Project, including the post-closure monitoring period. Results from the CFMP will be reviewed and shared with Qalipu and Miawpukek. Should the results from sequential monitoring events suggest contaminant concentrations in country foods may be increasing due to Project effects (i.e., even with the proactive mitigation measures that will have been implemented), potential additional (adaptive) mitigative measures such as restrictions on harvesting of country foods from specific areas, country food consumption advisories) will be identified and implemented through engagement and collaboration with both groups. For more details, see the response to IR(2)-61a. References: Foust, R.D., A. Bauer, M. Costanza-Robinson, D. W. Blinn, R. C. Prince, I.J.Pickering, and G.N.George. 2016. Arsenic transfer and biotransformation in a fully characterized freshwater food web. Coordination Chemistry Reviews, 306 pp 558 – 565, 2016 Rahman, M.A., H. Hasegawa, and R.P. Lim. 2012. Bioaccumulation, biotransformation and trophic transfer of arsenic in the aquatic food chain. Environmental Research, 116, pp 118- 135, 2012. USEPA. 2000. Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories, Volume 1. Fish Sampling and Analysis, Third Edition. Section 4.3.1.1. EPA-823-B-00-007, November 2000.
Appendix:	None

RESPONSE TO IR(2)-53

IR 2 Reference #	**IR(2)-53**
IR 1 Reference #	IR-53, IR-57
EIS Reference:	Section 10.2 – Existing Conditions for Avifauna Section 10.3 – Assessment Criteria and Methods Section 10.4 – Mitigation and Management Measures Section 10.5 – Assessment of Environmental Effects on Avifauna
Context and Rationale:	Olive-sided Flycatcher (OSFL) have relatively large territories for landbirds and beyond "forested wetland" habitat type, OSFL have other habitat requirements that may include access to snags or tall isolated trees, high insect abundance (or specific insect types) from local wetlands, good quality natural edge, proximity to burn areas, etc. As such, OSFL habitat is not easily modeled by landcover/Ecological Land Classification of forest type methods alone, and the assertion that OSFL will successfully move elsewhere is not sufficiently supported with scientific evidence. The following is a useful reference: Norris, A.R., L. Fird, C. Debyser, K.L. De Groot, J. Thomas, A. Lee, K.M. Dohms, A. Robinson, W. Easton, K. Martin, and K.L. Cockle. (2021). Forecasting the cumulative effects of multiple stressors on breeding habitat for a steeply declining aerial insectivorous songbird, the Olive- sided Flycatcher (Contopus cooperi). Frontiers in Ecology and Evolution. https://doi.org/10.3389/fevo.2021.635872 The Proponent's response to IR-57 states that "*The statement that displaced birds are likely to find habitat elsewhere is relevant for rare species and is based on the presumption that, given their status, rare species are not at their carrying capacity in Newfoundland and Labrador*" This statement assumes that the limiting factor for species in Newfoundland and Labrador is not on the breeding ground but elsewhere, which is not supported by published scientific literature. It cannot be assumed that the decline of species in NL is not linked to loss of habitat without evidence to support this statement.
Information Request:	Include additional rationale to support the assertion that OSFL and other migratory birds will successfully move to other habitat(s) in response to disturbance. In addition, provide mitigation measures if there is insufficient rationale to support your assertion. Norris et al. (2021) may provide useful guidance to support this request.
Response:	As indicted in the EIS, the assumption was that Olive-sided Flycatcher (and other migratory birds) potentially displaced by development of the Project are likely to find breeding habitat elsewhere within the Local Assessment

IR 2 Reference #	IR(2)-53
	Area (LAA) or Regional Assessment Area (RAA). This assumption is supported, in part, by the following: • Ecological land classification (ELC) data collected for the Project indicates that all habitat types that will be lost in the Project Area also occur in the surrounding area, including habitat important for migratory birds. • The loss of wintering habitat is thought to be the greatest cause of population declines for Olive-sided Flycatcher (COSEWIC 2018) and other migratory species (e.g., COSEWIC 2017). • Olive-sided Flycatcher is generally found at low densities throughout its range (COSEWIC 2018), suggesting (although not confirmed) that this species is not at carrying capacity on the island of Newfoundland. • Most migratory birds return to the same breeding areas annually and will select new locations to build their nest. Many will also re-nest (i.e., relocate) following an unsuccessful nest attempt, with Olive-sided Flycatcher frequently constructing new nests within 200 m of the first attempt (Altman and Sallabanks 2012). These behaviours indicate an inherent ability for birds to locally adapt to changing conditions and suggest that returning birds would be able to find suitable nest sites within previously established or potentially new / adjacent territories. • Olive-sided Flycatcher in Alaska have been found to nest up to 625 m from previously used nest sites (Altman and Sallabanks 2012), suggesting that they may occasionally nest outside of previously established territories [based on territory sizes of 10.5 to 26.4 ha reported in Altman and Sallabanks (2012) for this species in Alaska]. • Boreal birds in general are hypothesized to be more resilient to human disturbance, stemming from their adaptation to large-scale natural disturbances, such as insect outbreaks and fires (e.g., Norris et al. 2021 and references therein). During the breeding season, Olive-sided Flycatcher is generally associated with forested habitat that contains natural and/or disturbance-related openings (e.g., wetlands, cutovers), in addition to site-specific habitat features such as the presence of snags or tall isolated trees. Norris et al. (2021) found that Olive-sided Flycatcher occurrence was positively correlated with small clearcuts (approximately 10 ha), and areas affected by insect infestations, but found no similar relationship with either roads or distance to water. The naturally fragmented landscape in the RAA reflects some of the criteria identified by Norris et al. (2021). In the Local Assessment Area for the Project, Olive-sided Flycatcher was generally associated with Black Spruce Forest, Mixedwood Forest, Balsam Fir Forest, Wet Coniferous Forest, and Kalmia-Black Spruce Forest.

IR 2 Reference #	IR(2)-53
	To reduce the loss of potentially important habitat features for this and other migratory bird species, the following additional mitigation measures will be included in the Avifauna Management Plan: • During bird breeding season, blasting will occur outside of the prominent bird singing/calling and activity period (i.e., sunrise to approximately 9:30 am). • Site staff will receive training on active nest disturbance and associated avian response behaviour and will be required to check facilities, equipment and vehicles for evidence of nesting prior to use. As committed to in the EIS, trees that provide actual or potential habitat will be retained where safe to do so and technically feasible, including retention of snags or tall isolated trees that are potential habitat for Olive-sided Flycatcher and other migratory species. The above information provides additional context regarding potential effects of the Project on migratory birds, including Olive-sided Flycatcher, however, does not change the residual effects characterizations or conclusions presented for Avifauna (Chapter 10) in the EIS. References: Altman, B. and R. Sallabanks. 2020. Olive-sided Flycatcher (*Contopus cooperi*), version 1.0. In Birds of the World (A. F. Poole, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.olsfly.01 COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2017. Rusty blackbird (*Euphagus carolinus*): COSEWIC assessment and status report 2017. Available online at: https://www.canada.ca/en/environment-climatechange/services/species-risk-public-registry/cosewic-assessmentsstatus-reports/rusty-blackbird-2017.html#_02_1 COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2018. Olive-sided Flycatcher (*Contopus cooperi*): COSEWIC assessment and status report 2018. Available online at: https://www.canada.ca/en/environment-climatechange/services/species-risk-public-registry/cosewic-assessmentsstatus-reports/olive-sided-flycatcher-2018.html Norris, A., L. Frid, C. Debyser, K.L. De Groot, J. Thomas, A. Lee, K. Dohms, A. Robinson, W. Easton, K. Martin and K. Cockle. 2021. Forecasting the cumulative effects of multiple stressors on breeding habitat for a steeply declining aerial insectivorous songbird, the

IR 2 Reference #	**IR(2)-53**
	Olive-sided Flycatcher (Contopus cooperi). Fronteries in Ecology and Evolution, 9: 635872. DOI: 10.3389/fevo.2021.635872.
Appendix:	None

RESPONSE TO IR(2)-54

IR 2 Reference #	**IR(2)-54**
IR 1 Reference #:	IR-54, IR-70
EIS Reference:	Section 10.4 – Avifauna Mitigation and Management Measures Section 10.5 – Assessment of Environmental Effects on Avifauna
Context and Rationale:	The Proponent states that settling ponds will contain sediment, dissolved metals and other constituents like ammonia at low concentrations and that if birds were present and were to ingest water and nearby vegetation, that there would be no added mortality risk. The Proponent references the Metal and Diamond Mining Effluent Regulations (MDMER) as the basis for this assessment. However, the MDMER guidelines do not consider avian toxicity. It is also not known if the water in the settling ponds will need time to settle before it meets the guidelines or presents a lower risk. The proponent does acknowledge that the tailings in the Tailings Management Facility (TMF) could pose a threat to birds. It is understood the tailings in the TMF will have been treated for cyanide, but not for other potential contaminants of concern. The Proponent should compare water quality data/worst-case scenario predicted modelled values with constituents present in any surface water components of the project with existing toxicity reference guidelines available for birds (an avian risk assessment) to substantiate that there is no added mortality risk to avian species. The proponent has provided some mitigation measures to deter birds from the tailings ponds in Section 10.4, and it states that embankments around ponds will be maintained free of vegetation and that the ponds will be monitored. The response further states that if problematic bird use occurs, mitigation measures will be implemented and subsequently adapted if necessary. It is unclear what other proactive mitigation measures will be implemented to limit wildlife interactions with tailings. A variety of potential solutions and measures used at other sites to deter birds are identified but it is not clear if any of these measures are being considered until avifauna interactions with tailings are occurring. More detail is required on preventative (not just reactive/adaptive) means of deterring birds and ensuring that they do not come in contact with the tailings facility. This information is needed for a complete assessment of effects on migratory birds including species at risk (SAR).

<table>
<tr><th>IR 2 Reference #</th><th>IR(2)-54</th></tr>
<tr><td>Information Request:</td><td>a. Provide an avian risk assessment based on a comparison of modelled contaminant values to toxicity reference guidelines for birds for all project surface-water components.
b. Provide a comprehensive description of proactive mitigation measures that will be used to deter birds from coming into contact with project surface-water components.</td></tr>
<tr><td>Response:</td><td>a. Toxicity reference values (TRVs) for birds are expressed as doses (mg of contaminant ingested/kilogram body weight per day) and not as contaminant concentrations in water (mg contaminant per litre). Thus, while a direct comparison between TRVs for avian species and predicted contaminant concentrations in water in surface water features within the mine site is not possible, the TRVs for avian species can be used to calculate maximum acceptable concentrations (MACs) in surface water that represent a minimal health risk to avian species, and the MAC values can then be compared to predicted contaminant concentrations in surface water features within the mine site. These MACs are species-specific and are calculated using the equation shown below.

$$MAC\left({}^{mg}/_{L}\right) = \frac{TRV\left({}^{mg}/_{kg-day}\right) \times BW\ (kg)}{IR_{(water)}\left({}^{L}/_{day}\right)}$$
Where:
<table><tr><td>MAC</td><td>Maximum Acceptable Concentration of contaminant</td><td>mg/L</td></tr><tr><td>TRV</td><td>Toxicity Reference Value</td><td>mg/kg-day</td></tr><tr><td>BW</td><td>Body Weight</td><td>kg</td></tr><tr><td>$IR_{(water)}$</td><td>Fresh water intake rate</td><td>L/day</td></tr></table>
MACs were calculated for representative waterfowl and wading avian species that could reasonably be expected to have the greatest contact with surface water within the mine site including:
• Duck (American black duck or mallard)
• Common merganser
• Great blue heron
• Canada goose</td></tr>
</table>

IR 2 Reference #	IR(2)-54
	The following exposure assumptions were also used to calculate the MACs: i. Species were assumed to be present on the surface water features 100 percent of the time, that is, on a year-round basis over their lifetimes. ii. Intake from surface water was the only contributor to exposures to contaminants. iii. Surface water features within the mine site (tailings management facility (TMF), sedimentation ponds) do not provide sources of food for avian species. The tailings and sedimentation ponds will not contain fish, and the continuous deposition of tailings (in the TMF pond) will limit the likelihood that invertebrates will be present within the TMF. Similarly, routine maintenance (clearing out of sediment build-up) in the sedimentation ponds will reduce the potential presence of invertebrates. Additionally, considering the high level of human activity and sensory disturbance at the mine site, avifauna would be expected to spend limited time in the area. Therefore, incidental ingestion of water from the TMF or sedimentation (settling) ponds represents the most probable way that avifauna, resting on these waterbodies, could come into contact with metals present in the water. Sample calculations of the species-specific MACs for arsenic, according to the equation presented above, are provided in Table IR(2)-54.1, below. MACs for the other contaminants are calculated with the same equations, using contaminant-specific TRVs. MACs were calculated for the metals predicted to be present in water in the TMF and sedimentation ponds. Other constituents (e.g., chloride, fluoride, nitrogen, phosphorus, potassium, sulphate) are essential nutrients and are generally considered to be non-toxic to avifauna; therefore, the assessment of potential risk for avifauna has focused on metals and cyanide. The TRVs used for each of the metal contaminants of concern are summarized in Table IR(2)-54.2, below. Cyanide is also discussed below (Table IR(2)-54.4). The MACs for the metals are presented in Table IR(2)-54.3. The lowest calculated MAC values are shown in bold. These lowest MAC values have been compared to the predicted water quality results for metals in surface water features within the mine site. An avifauna-specific TRV for cyanide was not identified in the literature; therefore, a MAC for cyanide was not calculated. In the absence of a MAC for cyanide, the International Cyanide Code guideline for Weak Acid Dissociable (WAD)

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	cyanide of 50 mg/L for protection of birds and wildlife was used to evaluate potential health risks for avifauna exposed to cyanide in surface water within the mine site. As described in Chapter 7 (Surface Water) and the Water Management Plan (Appendix 2A) of the EIS, sedimentation ponds within the mine site are required to manage surface runoff and seepage at the Leprechaun and Marathon Complexes and the Process Plant site. These features do not receive process water. In addition, as summarized in Section 7.5.2.1 of the EIS and detailed in Section 6 of Appendix 7A of the EIS (Water Quantity and Water Quality Modelling report: Leprechaun Complex, Processing Plant & TMF Complex) and Section 6 of Appendix 7B of the EIS (Water Quantity and Water Quality Modelling Report: Marathon Complex), influent water (water collected on site and directed to the sedimentation ponds) is predicted to meet the limits for discharge before it even enters the sedimentation ponds. The TMF pond receives process water and, as noted in the original response to IR-54 (response to Federal Information Requirements issued on February 10, 2021), water in the TMF represents the worst case predicted water quality within the mine site. Therefore, the assessment of potential health risks associated with avifauna exposure to metals and cyanide in water in the mine site has been based on the worst-case (Fair Weather) water quality predictions for the TMF. Fair weather conditions represent periods of below average rainfall, resulting in less dilution in the TMF. These conditions provide conservative estimates of contaminant concentrations in water in the TMF pond. For the purposes of this assessment, the upper bound (95^{th} percentile) predicted contaminant concentrations, consistent with the water quality evaluation (Table D-5 of Appendix 7A of the EIS) have been used to evaluate potential health risks for avifauna. Comparison of the calculated MACs and predicted contaminant concentrations is provided in Table IR(2)-54.4, below. The MACs provided in Table IR(2)-54.4 are several orders of magnitude higher than the predicted worst-case contaminant concentrations in water in the TMF. The ratios between the MAC and TMF concentrations (MAC/TMF) range between 570 (cyanide) to 720,000 (lead), with the majority of the ratios being between 1000 and 100,000. These results are based on the assumption that water from the TMF represents the only exposure to the metals that avifauna would experience. It is recognized that foods would likely make a larger contribution to daily exposures for avifauna. However, if the MAC were recalculated based on the assumption that drinking water for avifauna

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	accounts for 1% of the daily intake of the metals, the resulting MAC would be reduced by 100-fold. Even under those conditions, the MAC/TMF ratios for metals would range between 10 and 10,000. It is reasonable to assume that TMF water would be the only source of exposure to cyanide for avifauna in the Project Area as cyanide would not be expected to be present in vegetation or other food sources in the Project Area. Therefore, a similar reduction in attribution of drinking water exposure would not apply to cyanide. Further, these results are based on the 95^{th} percentile concentrations predicted for worst-case conditions and it is reasonable to expect that under normal conditions metal and cyanide concentrations in TMF water would be lower than the concentrations used in this assessment. Based on the results of this comparison, it is reasonable to conclude that the worst-case predicted metal and cyanide concentrations in TMF water would represent a negligible risk to avifauna health. b. The response to IR-54 (response to Federal Information Requirements issued on February 10, 2021) identified both proactive mitigation measures to be implemented during the Project, and potential exclusionary options that could be considered as adaptive mitigation measures. Subsequently, the assessment presented above comparing modelled contaminant values to toxicity reference values (identified in the IR as toxicity reference 'guidelines') determined that avifauna exposure to Project surface-water components will present negligible risk to avifauna health. The proactive mitigation measures described in the EIS (Section 10.4) and the original response to IR-54 will nevertheless be implemented (e.g., maintaining embankments of the TMF and polishing pond free of vegetation, limiting the attraction of waterfowl and/or wildlife to these ponds for foraging or breeding); however, no additional proactive mitigation measures are deemed necessary. Should avifauna use, such as nesting occur, in the TMF and/or polishing pond despite the implementation of proactive mitigation measures, Marathon will notify CWS and consult with CWS regarding the implementation of additional adaptive mitigation measures, such as those identified in the original response to IR-54.
Appendix:	None

Table IR(2)-54.1 Species-Specific MAC for Arsenic: Sample Calculation

Species	TRV (Arsenic) (mg/kg-day) (A)	Body Weight (kg) (B)	Intake Rate (L/day) (C)	MAC (mg/L) (D = (A x B)/C
Duck	4.28	1.16	0.07	70.9
Common Merganser	4.28	1.5	0.08	80.3
Great Blue Heron	4.28	2.23	0.101	94.5
Canada Goose	4.28	3.7	0.14	113

Table IR(2)-54.2 Summary of Toxicity Reference Values for Metals

Constituent	Test Species	Effect	Reference	Toxicity Reference Value (mg/kg-day)
Aluminum	No suitable study identified			--
Antimony	No suitable study identified			--
Arsenic	Mallard duck	mortality	USFWS (1964) in Sample et al. (1996)	4.3E+00
Barium	Chicken (chicks)	mortality	Johnson et al. 1960 in Sample et al. (1996)	4.6E+01
Boron	Mallard duck	reproduction	Smith & Anders (1989) in Sample et al. (1996)	3.3E+01
Cadmium	multiple	growth, reproduction	USEPA Eco-SSL (2005)	1.5E+00
Chromium (Total)	multiple	growth, reproduction	USEPA Eco-SSL (2005)	2.7E+00
Copper	multiple	growth, reproduction	USEPA Eco-SSL (2007)	1.9E+01
Lead	multiple	growth, reproduction	USEPA Eco-SSL (2005)	1.1E+01
Manganese	multiple	growth, reproduction	USEPA Eco-SSL (2007)	1.8E+02
Mercury	Japanese quail	reproduction	Hill & Schaffner (1976) in Sample et al. (1996)	3.0E-01
Molybdenum	Chicken	reproduction	Lepore and Miller (1965) in Sample et al. (1996)	1.2E+01
Nickel	multiple	growth, reproduction	USEPA Eco-SSL (2007)	6.7E+00
Selenium	Mallard Duck	reproduction	Heinz et al. (1987) in Sample et al. (1996)	3.3E-01
Silver	Turkey	growth	Jensen et al. (1974) in USEPA Eco-SSL (2006)	2.2E+00
Thallium	Starling	mortality	Schafer (1972) in Shafer et al. (1983)	1.2E-01

Table IR(2)-54.2 Summary of Toxicity Reference Values for Metals

Constituent	Test Species	Effect	Reference	Toxicity Reference Value (mg/kg-day)
Uranium	Black Duck	various, including mortality	Haseltine and Sileo (1983) in Sample et al. (1996)	5.3E+01
Zinc	Chicken	reproduction	USEPA Eco-SSL (2007)	8.9E+01

"-" No value available

Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. Toxicological Benchmarks for Wildlife: 1996 Revision. Oak Ridge National Laboratory, Oak Ridge, TN. ES/ER/TM-86/.

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USEPA. March 2005. Ecological Soil Screening Levels for Lead: Interim Final. Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, DC. OSWER Directive 9285.7-70

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USEPA. June 2007. Ecological Soil Screening Levels for Zinc: Interim Final. Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, DC. OSWER Directive 9285.7-73

Table IR(2)-54.3 Species-Specific MACs

COC	Duck	Common Merganser	Great Blue Heron	Canada Goose
	MAC (mg/L)	MAC (mg/L)	MAC (mg/L)	MAC (mg/L)
Arsenic	**7.1E+01**	8.0E+01	9.5E+01	1.1E+02
Barium	**7.7E+02**	8.7E+02	1.0E+03	1.2E+03
Boron	**5.5E+02**	6.3E+02	7.4E+02	8.8E+02
Cadmium	**2.4E+01**	2.8E+01	3.3E+01	3.9E+01
Chromium (Total)	**4.4E+01**	5.0E+01	5.9E+01	7.0E+01
Copper	**3.1E+02**	3.5E+02	4.1E+02	4.9E+02
Lead	**1.8E+02**	2.0E+02	2.4E+02	2.9E+02
Manganese	**3.0E+03**	3.4E+03	4.0E+03	4.7E+03
Mercury	**5.0E+00**	5.6E+00	6.6E+00	7.9E+00
Molybdenum	**2.0E+02**	2.2E+02	2.6E+02	3.1E+02
Nickel	**1.1E+02**	1.3E+02	1.5E+02	1.8E+02
Selenium	**5.5E+00**	6.3E+00	7.4E+00	8.8E+00
Silver	**3.7E+01**	4.2E+01	5.0E+01	5.9E+01
Thallium	**1.9E+00**	2.2E+00	2.6E+00	3.1E+00
Uranium	**8.8E+02**	1.0E+03	1.2E+03	1.4E+03
Zinc	**1.5E+03**	1.7E+03	2.0E+03	2.4E+03

Table IR(2)-54.4 Comparison of Lowest MACs with Worst Case Predicted TMF Water Quality

COC	MAC	TMF Predicted Worst Case	MDMER
	(mg/L)	(mg/L)	(mg/L)
Arsenic	7.1E+01	1.1E-02	1.0E-01
Barium	7.7E+02	2.6E-02	---
Boron	5.5E+02	9.7E-02	---
Cadmium	2.4E+01	4.8E-05	---
Chromium (Total)	4.4E+01	1.9E-03	---
Copper	3.1E+02	1.0E-01	1.0E-01
Lead	1.8E+02	2.5E-04	8.0E-02
Manganese	3.0E+03	3.0E-01	---
Mercury	5.0E+00	2.3E-04	---
Molybdenum	2.0E+02	6.6E-02	---
Nickel	1.1E+02	2.9E-03	2.5E-01
Selenium	5.5E+00	2.6E-03	---
Silver	3.7E+01	3.1E-04	---
Thallium	1.9E+00	5.0E-05	---
Uranium	8.8E+02	2.6E-03	---
Zinc	1.5E+03	7.2E-03	4.0E-01
Cyanide	5.0E+01*	8.7E-02	
--- no value available			
* International Cyanide Code guideline for Weak Acid Dissociable (WAD) cyanide of 50 mg/L for protection of birds and wildlife			

RESPONSE TO IR(2)-61A

IR 2 Reference #:	**IR(2)-61a**
IR 1 Reference #:	IR-61
EIS Reference:	3.4.2 Indigenous Engagement: Methodology and Approach 3.4.4.4 Land and Resource Use Information Exchange 17.2.1 Existing Conditions for Indigenous Groups- Methods 17.2.3.3 MFN Current Use of Lands and Resources for Traditional Purposes 17.9 Follow up and monitoring Appendix IR-61.A
Context and Rationale:	Plans to develop mitigation measures from monitoring/follow-up programs incorporating Miawpukek First Nation (MFN) Indigenous Knowledge provided contain insufficient detail to determine their adequacy. The Proponent states that results of a traditional knowledge and land resource use study will be used in the development and implementation of mitigation measures and monitoring programs for Project impacts on air, water quality, and country foods. In addition, a grievance mechanism process will be developed to address grievances on the part of Indigenous groups and persons. However, sufficient detail was not provided for how MFN's Indigenous Knowledge relevant to the human health concerns of the Project will be incorporated into the development and implementation of mitigation measures, follow-up, and monitoring activities for all project phases (e.g., construction, operation, decommissioning, rehabilitation, and closure). For instance, the functionality of the processes and mechanisms were not described for the receipt of grievances from Indigenous community members during all project phases. This additional detail would demonstrate how the Proponent intends to collaborate with local Indigenous groups to mitigate unanticipated effects of the Project on Indigenous Peoples health and use of lands and resources, including for harvesting country foods. Furthermore, it is unclear if the need for monitoring of noise levels was considered. Health Canada encourages the monitoring of contaminants in environmental media to validate that predictions are accurate (in particular when risk estimates approach acceptable levels in the original assessment and there is concern that they may have underestimated risks) and/or determine the effectiveness of the mitigation measures. Monitoring is also advisable when there are Indigenous Peoples present.
Information Request:	Describe how the results of the monitoring program of potential effects on country foods will inform proactive mitigation measures to address potential grievances from Miapukek and Qalipu First Nations.

IR 2 Reference #:	**IR(2)-61a**
Response:	As a result of ongoing engagement with both Qalipu Mi'kmaq First Nation (Qalipu) and Miawpukek First Nation (Miawpukek), Marathon is aware of the importance of country foods to each group. Marathon has worked with Qalipu and Miawpukek to better understand their land and resource use activities in the Regional Assessment Area (RAA). These efforts have included the funding of a land and resource use study by Qalipu members and discussions (both in-person and virtual) with Miawpukek respecting its current activities in the Local Assessment Area (LAA). Based on the above and as indicated in the EIS, it appears there is a low level of current Indigenous land and resource use in the LAA. A human health risk assessment (HHRA) has also been completed by Marathon and submitted as Appendix IR-61.A (in response to Federal Information Requirements issued on February 10, 2021). The HHRA was completed using the conservative assumption that both Indigenous and non-Indigenous receptors spend 100% of their time in the LAA and that 100% of country food and fish are harvested from within the LAA. The HHRA concluded that, with the implementation of (proactive) mitigation measures, the Project is not predicted to alter surface water or soil quality in the LAA. Therefore, Project-related changes in the quality of aquatic and/or terrestrial country foods are not predicted to occur, and the health risks associated with country food consumption would not be expected to change between Baseline Case and Future Case conditions. A Country Foods Monitoring Program (CFMP) will be implemented to verify the EIS predictions through monitoring the quality of aquatic and terrestrial country foods harvested from within the LAA over the life of the Project, including the post-closure monitoring period. Results from the CFMP will be reviewed and shared with Qalipu and Miawpukek. Should the results from sequential monitoring events suggest contaminant concentrations in country foods may be increasing due to Project effects (i.e., even with the proactive mitigation measures that will have been implemented), potential additional (adaptive) mitigative measures such as restrictions on harvesting of country foods from specific areas, country food consumption advisories) will be identified and implemented through engagement and collaboration with both groups. In addition to the implementation of mitigation measures (as outlined in Section 17.4 of the EIS), Marathon has developed a formal Grievance Process which will enable Miawpukek or Qalipu (either as a collective or through individual members) or any external stakeholder to bring any concerns and complaints to the attention of Marathon, including concerns relating to adverse effects on country foods, for appropriate resolution. The Grievance Process is based on the international standards set out in the

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	"Protect, Respect and Remedy" framework articulated by the Special Representative to the Secretary General of the United Nations on Business and Human Rights, and has been informed by best practices such as those described in *Operational Level Grievance Mechanisms* (IPIECA 2012), *Addressing Grievances from Project-Affected Communities* (IFC Practice Note 2009*), Handling and Resolving Local Grievances* (ICMM 2019), and the *IRMA Standard for Responsible Mining IRMA-STD-001* (2018). It has been designed to comply with the six overarching principles for non-judicial processes recommended by the United Nations: • Legitimate • Accessible • Predictable • Equitable • Rights compatible • Transparent The Grievance Process is intended to respond to complaints and disputes by stakeholders and Indigenous groups in relation to the Project, Marathon and its operations, Project contractors and, in certain cases, the employees of both Marathon and its contractors. It will provide an accessible, timely, efficient and transparent procedure to resolve stakeholder and Indigenous concerns which will not, however, supplant or replace judicial or administrative remedies which may otherwise be available. The Grievance Process will be published on Marathon's website and a copy will be provided to external stakeholders and Qalipu and Miawpukek. In addition, Marathon will meet with Indigenous groups and external stakeholders to explain the scope and operation of the procedure. Grievances will be tracked, and Marathon will report periodically to external stakeholders and Indigenous groups on its implementation. A Grievance Report setting out the number and types of grievances, resolutions, and any associated changes in policy or procedures will be published annually. The Grievance Process is intended to address stakeholder or Indigenous concerns or complaints which have been raised and have failed to be resolved through informal means. It is Marathon's intention to act proactively to avoid the occurrence of grievances through a robust approach to engagement with Indigenous groups. Marathon will continue to engage with each group respecting their interaction with the Project, including potential adverse effects on country foods. Marathon has committed to providing opportunities for each group to be involved in the continued collection of baseline information and the implementation of mitigation and monitoring measures. Additional efforts to involve Qalipu and Miawpukek in the identification and mitigation of potential Project-related

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	adverse effects on land and resources, including country foods, include the following: • Marathon invited each group to participate in the collection of samples (i.e., big game, small game, fish and flora) to establish baseline information for the CFMP. • Marathon has committed to involve each group, consistent with each group's interest, in the implementation of monitoring measures. • Marathon has entered into a Socio-Economic Agreement with Qalipu which contains provisions on cooperative Environmental Stewardship respecting monitoring, environmental research, and the development and implementation of mitigation measures. • A Traditional Knowledge and Traditional Land Use Study funded by Marathon is being carried out by Miawpukek and the results of the study will be used to augment Marathon's understanding of Miawpukek's land and resource use in proximity to the Project Area and to inform further development of mitigation measures, if required. • Marathon and Miawpukek have concluded a Memorandum of Understanding which establishes a formal process for ongoing engagement and provides for the negotiation of a Socio-Economic Agreement which will include provisions on Environmental Stewardship. • Marathon is a regular participant in the quarterly meetings of Mi'kmaq Alsumk Mowimsikik Koqoey Association (MAMKA) and will share share relevant information related to the results of environmental monitoring with each group separately and through MAMKA. Through its ongoing engagement with Qalipu and Miawpukek in mitigation and monitoring, as illustrated by the above activities, Marathon will work with each group to avoid or mitigate adverse effects on country foods. References: IPIECA. 2012. Operational Level Grievance Mechanisms. IPIECA Good Practice Survey. Available at: https://www.securityhumanrightshub.org/sites/default/files/2020-04/grievance_mechanisms.pdf IFC (International Finance Corporation). 2009. Addressing Grievances from Project-Affected Communities. Available at: https://www.ifc.org/wps/wcm/connect/f9019c05-0651-4ff5-9496-c46b66dbeedb/IFC%2BGrievance%2BMechanisms.pdf ?MOD=AJPERES&CACHEID=ROOTWORKSPACE-f9019c05-0651-4ff5-9496-c46b66dbeedb-jkD0-.g

IR 2 Reference #:	**IR(2)-61a**
	IRMA (Initiative for Responsible Mining Assurance). 2018. IRMA Standard for Responsible Mining IRMA-STD-001. Available at: https://responsiblemining.net/wp-content/uploads/2018/07/IRMA_STANDARD_v.1.0_FINAL_2018-1.pdf
Appendix:	None

RESPONSE TO IR(2)-62

IR 2 Reference #:	**IR(2)-62**
IR 1 Reference #:	IR-62
EIS Reference:	Ch. 21 Accidental Effects. 21.5.1.2
Context and Rationale:	The response to the IR indicated that the Environmental Design Flood (EDF) value has been updated to be the larger of the 30-day, 100-year rainfall plus snowmelt event (occurring during the freshet) or the 7-day, 100-year rainfall event (during the non-winter months). Data for the Buchans station was used, and for each stage of deposition and dam raising, the 7-day, 100-year rainfall occurring over the maximum operating water level was found to be the critical EDF event (190 mm over 7 days). However, the results and methods were not provided.
Information Request:	a. Provide the updated Environmental Design Flood value and describe the sources or methods used to determine the 30-day, 100-year rainfall plus snowmelt EDF event (occurring during the freshet). b. Describe how the choice of the critical EDF event (including the relevant number of days for multi-day rain events) was determined.
Response:	a. The following Environmental Design Floods (EDFs) were assessed: • Buchans 30-day, 100-year rainfall + snowmelt event (478 mm) o *Source*: Environment and Climate Change Canada (ECCC): 8400698_NL_BUCHANS_1965-2011_RAINSNOW – Snowmelt model 1 - Eastern Canada Forested Basin (1965-2011) o *Rationale*: ECCC provides Rainfall + Snowmelt statistics from 1-day event to 30-day events. The 30-day event (478 mm) was selected as the critical event because: (a) it generates the largest storage volume requirements, and (b) if the treatment plant and discharge to the environment only occurs during the non-winter months, depending on the timing, discharge to the environment may not be possible immediately at the start of the snowmelt. The selection of the 30-day event allows for up to 30 days to bring the treatment plant online. • Buchans 7-day, 100-year rainfall event (190 mm) o *Source*: ECCC: 8400698_NL_Buchans_Precip (1965-2011) o *Rationale*: As with the snowmelt events, ECCC provides statistics for 1-day events to 30-day events. The largest incremental daily increases in the 100-year precipitation record occur in the first 7 days of the series. Given that the treatment plant is operational during the anticipated timing of a rainfall event, the conservative assumptions for the

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	snowmelt event are not required. The assumption that treatment / discharge downtime would not exceed one week was used to justify the selection of the 7-day event (instead of a longer duration event). b. For each dam stage, the tailings management facility (TMF) water balance was used to determine seasonal water volumes in the facility. The TMF deposition and water management plans were developed to provide adequate storage at the end of the winter period, in anticipation of the spring freshet. The maximum operating pond volume is typically experienced later in the fall, providing sufficient water for the mill during the winter freeze-up period. During the winter, the water volume is gradually drawn down, as reclaim water is withdrawn while much of the tailings/precipitation reporting to the pond is frozen. The minimum TMF pond volume occurs immediately prior to the spring freshet. The EDFs were then assessed as follows: • The rainfall + snowmelt volume (478 mm) was added to the pre-freshet operating pond water volume • The rainfall event (190 mm) was added to the maximum operating water volume The scenario with the highest water elevation was used to determine the EDF level requirements for each dam stage.
Appendix:	None

RESPONSE TO IR(2)-75

IR 2 Reference #:	**IR(2)-75**
IR 1 Reference #:	IR-75: ECCC-06
EIS Reference:	Chapter 22
Context and Rationale:	The Proponent did not respond fully to the request to describe the climate change information and methods used to apply climate projections to project designs. In particular, it remains unclear how (or if) the design choices identified as inclusive of climate change considerations differ (or not) from the design choices that would have been made without consideration of potential climate change.
Information Request:	Describe the methods or approach used to apply climate projections to the relevant project design considerations. This response should demonstrate how climate change information was considered or used in the proponent's designs (as indicated in the EIS) such that the approach can be evaluated.
Response:	As summarized in Section 7.2.1.1 of the EIS and Section 4.1 of the Water Management Plan (Appendix 2A of the EIS), climate change is accounted for in the design of water management infrastructure (e.g., pond, culverts, and ditches). The methodology used to consider climate change is discussed below. The Climate Atlas of Canada's online tool (Prairie Climate Center 2019) was used to generate projected climate change precipitation and temperature data for the Red Indian Lake Region. The Marathon mine site falls within the Red Indian Lake Region. The Intergovernmental Panel on Climate Change (IPCC) Representative Concentration Pathway 4.5 (RCP4.5) emission scenario was applied to the Stephenville Intensity-Duration-Frequency (IDF) climate record based on the projected change in precipitation within the Red Indian Lake Region for the next 20 years for the time horizon 2011-2040. This future 2040 IDF climate record is presented in Table 7.9 in Chapter 7 (Surface Water Resources) of the EIS. The future 2040 IDF climate record was applied in design as follows: • The 24-hour 10-year, and 100-year plus snow melt was used to calculate the peak flow, flow volumes, and velocities. • The 100-year 24-hour storm plus snowmelt was selected as the ditch conveyance peak flow and sedimentation pond volume sizing design event. • As described in the Water Management Plan (Appendix 2A of the EIS) and Chapter 7 (Surface Water Resources), the 10-year 24-hour storm was used as the sedimentation pond water quality design event.

IR 2 Reference #:	IR(2)-75
	References: ECCC (Environment and Climate Change Canada). 2019. Engineering Climate Datasets. Retrieved from Environment and Climate Change Canada - Environment and Climate Change Canada: https://climate.weather.gc.ca/prods_servs/engineering_e.html Prairie Climate Center. 2019. Climate Atlas of Canada. Available at: https://climateatlas.ca/
Appendix:	None

APPENDIX IR(2)-NRCAN04.A

(Submitted as a separate file)