6-F: Addendum Flooding During Phases

Appendix 6-F - Flooding during Construction, Operations, and Closure Phases Addendum

Whale Tail Pit - Expansion Project

Submitted to:

Nunavut Impact Review Board

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App 6-F - Flooding during Phases

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6.F-1 BACKGROUND

Two water diversions resulting in flooding, the Whale Tail Lake (South Basin) diversion, and the Northeast diversion, were planned as part of water management activities for the Approved Project. The Northeast diversion remains planned as part of the Expansion Project, but will no longer result in flooding; therefore it is not discussed further in this appendix.

The Whale Tail Lake (South Basin) diversion consists of construction of the Whale Tail Dike, from June 2018 to February 2019, to divert Whale Tail Lake (South Basin) and tributary lakes through Lake A45, just south of Lake A16 (Mammoth Lake), once a water surface elevation of 156.00 metres above sea level (masl) is reached. Flooded tributary lakes include Lake A18, Lake A19, Lake A20, Lake A21, Lake A22, Lake A55, Lake A62, Lake A63, Lake A65, Pond A-P1, and Pond A-P53. The Whale Tail Lake (South Basin) diversion is shown on Figure 6-F-1.

The purpose of this appendix is to present the anticipated flooding area and schedule during the Whale Tail Lake (South Basin) diversion. Results are also presented for the migratory bird nesting season (May 17 to August 15) to assist the wildlife environmental impact assessment.

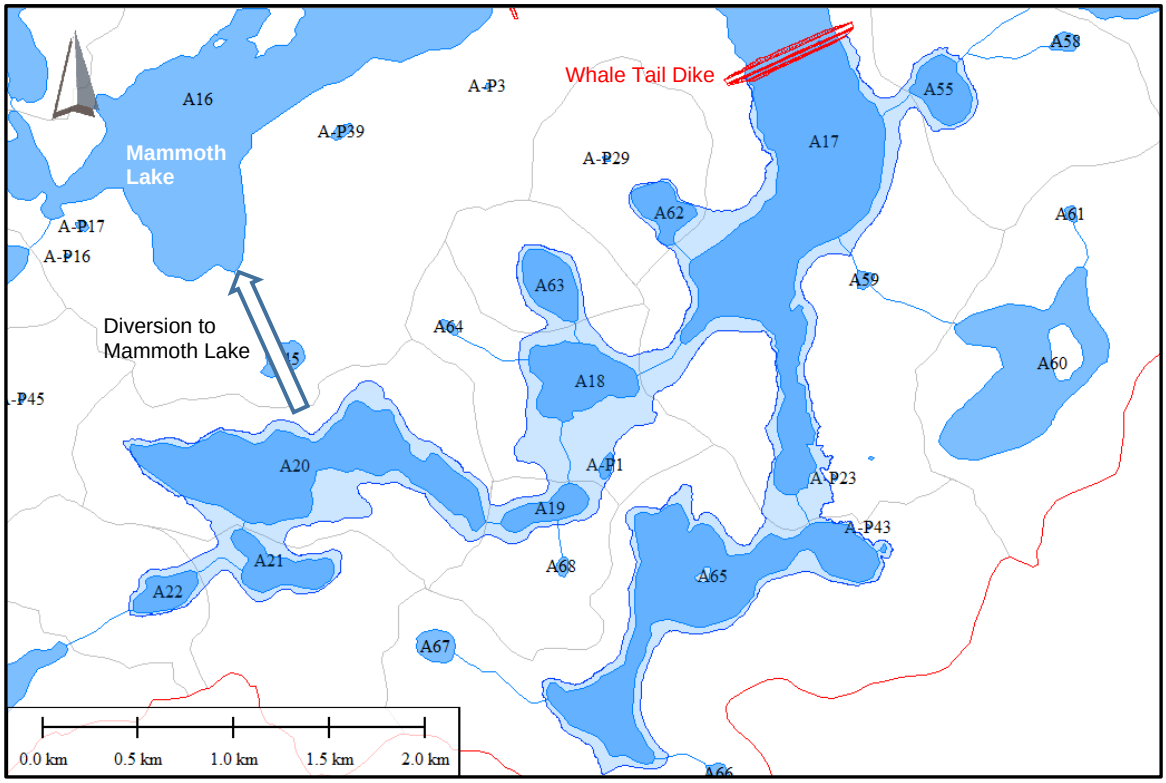

Figure 6-F-1: Whale Tail Lake (South Basin) Diversion

6.F-2 WATER MANAGEMENT ACTIVITIES

Water management activities relevant to the flooding of Whale Tail Lake (South Basin) are listed below:

- Construction of the Whale Tail dike from June 2018 to February 2019: construction of the dike will result in backwatering upstream of the dike during runoff. The water surface elevation of Whale Tail Lake (South Basin)

will increase until the spilling elevation of 156.00 masl is reached, and the flooded Whale Tail Lake (South Basin) can discharge through Lake A45, just upstream of Mammoth Lake.

- Dewatering of Whale Tail Lake, downstream of the Whale Tail dike (i.e., North Whale Tail Lake) from March to May 2019: dewatering is planned from March to May 2019 through Whale Tail Lake (South Basin) for 66% of the total volume of Whale Tail Lake (North Basin), and to Whale Tail Lake (South Basin) through Lake A16 (Mammoth Lake) for the remaining volume, and discussed further in Volume 6, Appendix 6-E.
- Active refilling of the pits and Whale Tail Lake (North Basin) from 2026 to 2041: active refilling will include pumping of the elevated Whale Tail Lake (South Basin) sector, starting in May 2026, until the water surface elevation of 153.5 masl (i.e., 1 m above the baseline elevation) is reached in Whale Tail Lake (South Basin). Filling of Whale Tail Lake (North Basin) will be on-going until the water surface elevation of 153.5 masl is reached in Whale Tail Lake (North Basin).

6.F-3 METHODS

Methods are presented in Attachment A.

6.F-4 RESULTS

Based on a mean annual water balance, the Whale Tail Lake (South Basin) diversion is expected to reach the spilling water surface water elevation of 156.00 masl by the end of June 2020, remain at 156.00 masl until the end of April 2026, and reach 153.50 masl by the end of October 2026.

Total flooded and flooded terrestrial areas are presented in Table 6-F-1 for bird nesting months of May, June, July, and August, during the diversion, at the start of each month.

The derived water surface elevation of the Whale Tail Lake (South Basin) diversion is shown in Figure 6-F-2, and the maximum water surface elevation of the Whale Tail Lake (South Basin) diversion is shown in Figure 6-F-3.

This analysis was based on mean annual climate conditions and actual filling duration may differ under wet or dry conditions.

Table 6-F-1: Total Flooded and Flooded Terrestrial Area during the Whale Tail Lake (South Basin) Diversion

Date	Water Surface Elevation (masl)	Total Flooded Area (m^2)	Flooded Terrestrial Area (m^2)	Change in Flooded Terrestrial Area (m^2)
May 2018	152.48	0	0	0
June 2018	152.50	892,967	0	0
July 2018	152.53	898,624	11,300	11,300
August 2018	152.67	915,346	22,379	11,079
May 2019	155.08	3,204,742	732,695	710,316
June 2019	155.61	3,711,875	1,127,826	395,131
July 2019	155.58	3,685,908	1,108,249	-19,577
August 2019	155.58	3,681,082	1,104,974	-3,275
May 2020	155.65	3,753,800	1,169,752	64,778
June 2020	156.00	4,069,002	1,484,953	315,201
July 2020	155.97	4,043,612	1,459,563	-25,390
August 2020	155.96	4,035,615	1,451,567	-7,996
May 2021	155.96	4,033,466	1,449,418	-2,149
June 2021	156.00	4,069,002	1,484,953	35,535
July 2021	155.99	4,062,923	1,478,874	-6,079
August 2021	156.00	4,069,002	1,484,953	6,079
May 2022	156.00	4,069,002	1,484,953	0
June 2022	156.00	4,069,002	1,484,953	0
July 2022	156.00	4,067,587	1,483,539	-1,414
August 2022	156.00	4,069,002	1,484,953	1,414
May 2023	155.96	4,037,505	1,453,457	-31,496
June 2023	156.00	4,069,002	1,484,953	31,496
July 2023	156.00	4,069,002	1,484,953	0
August 2023	156.00	4,069,002	1,484,953	0
May 2024	155.97	4,037,995	1,453,946	-31,007
June 2024	156.00	4,069,002	1,484,953	31,007
July 2024	156.00	4,069,002	1,484,953	0
August 2024	156.00	4,069,002	1,484,953	0
May 2025	155.97	4,038,117	1,454,069	-30,884
June 2025	156.00	4,069,002	1,484,953	30,884
July 2025	156.00	4,069,002	1,484,953	0
August 2025	156.00	4,069,002	1,484,953	0
May 2026	155.61	3,711,592	1,127,544	-357,409
June 2026	155.70	3,794,103	1,210,055	82,511
July 2026	155.28	3,415,600	897,779	-312,276
August 2026	154.86	2,974,046	532,671	-365,108

masl = metres above sea level; m^2 = square metres

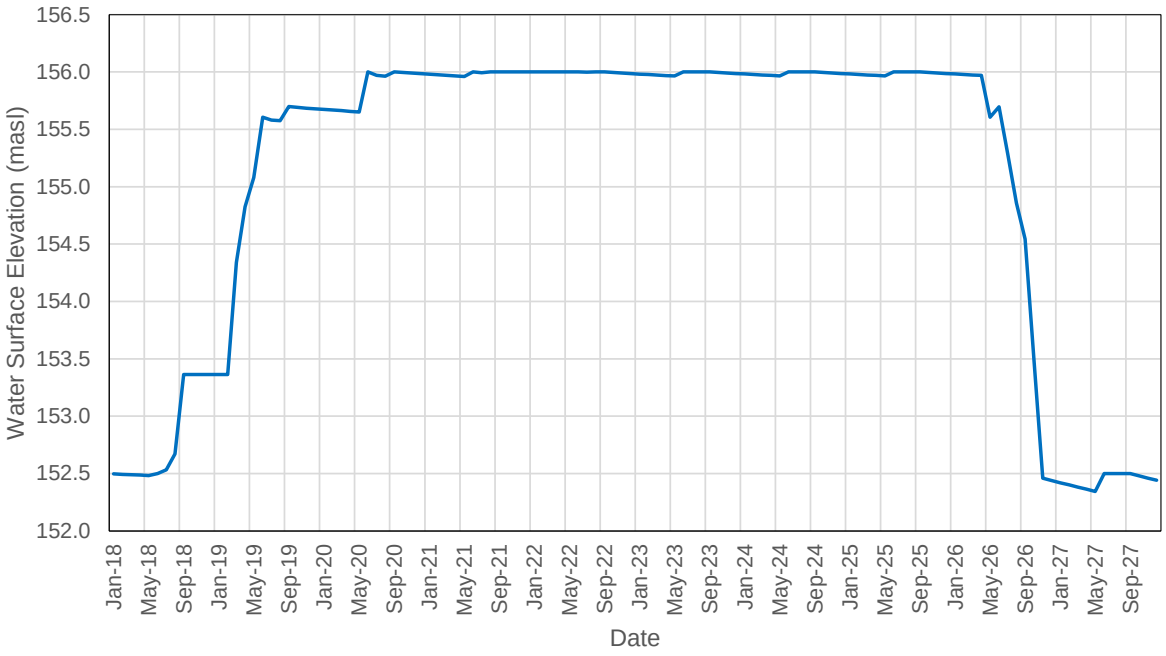

Figure 6-F-2: Derived Water Surface Elevation of the Whale Tail Lake (South Basin) Diversion

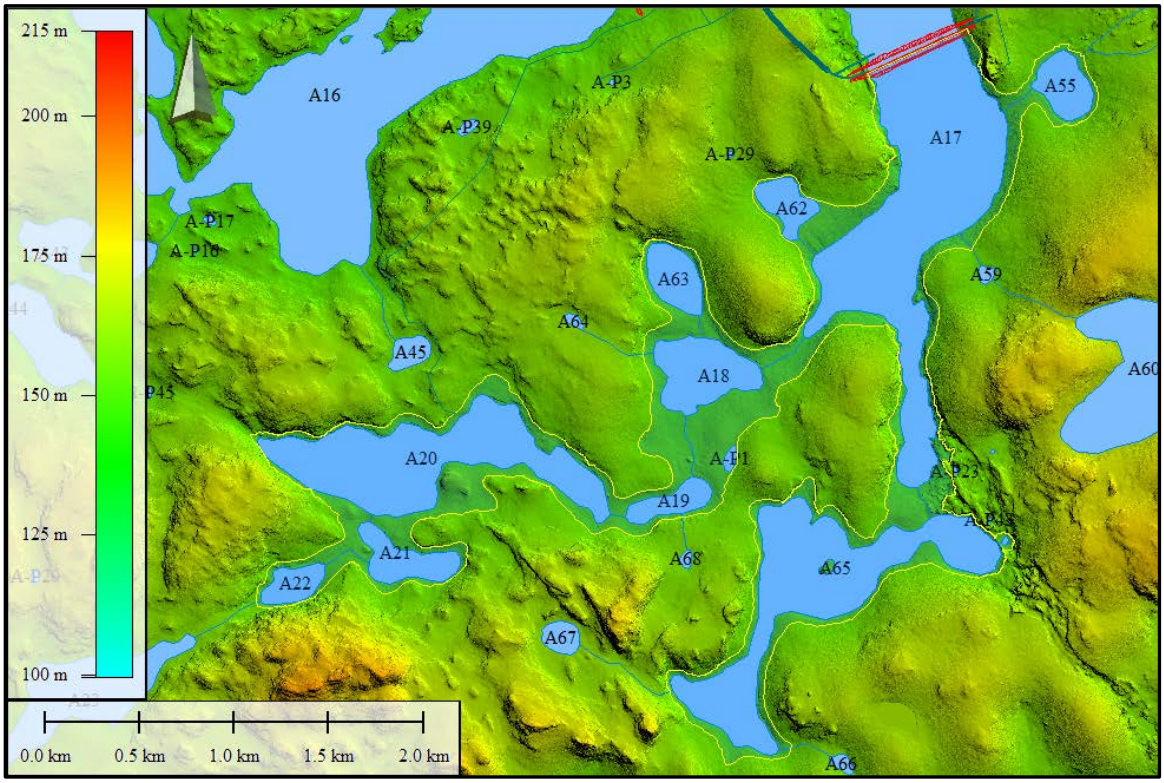

Figure 6-F-3: Maximum Water Surface Elevation of the Whale Tail Lake (South Basin) Diversion

ATTACHMENT A

This attachment presents methods to derive results presented herein.

Whale Tail Lake (South Basin) Diversion

- A mean annual water balance was developed on a monthly timestep for the Whale Tail Lake (South Basin) diversion, based on mean annual water balances, dewatering, and refilling rates presented in the water management plan (Volume 8, Appendix 8-B.2).
- Flooded area and storage were derived based on available elevation-area-storage relationships for Whale Tail Lake (South Basin) diversion (Volume 8, Appendix 8-B.2), and are presented in Figure A-1 (elevation-storage) and Figure A-2 (elevation-area).
- Flooded terrestrial areas were derived based on the updated water balance and the elevation-terrestrial area relationship (Figure A-2), derived based on Project topographic data (PhotoSat 2015[1]).

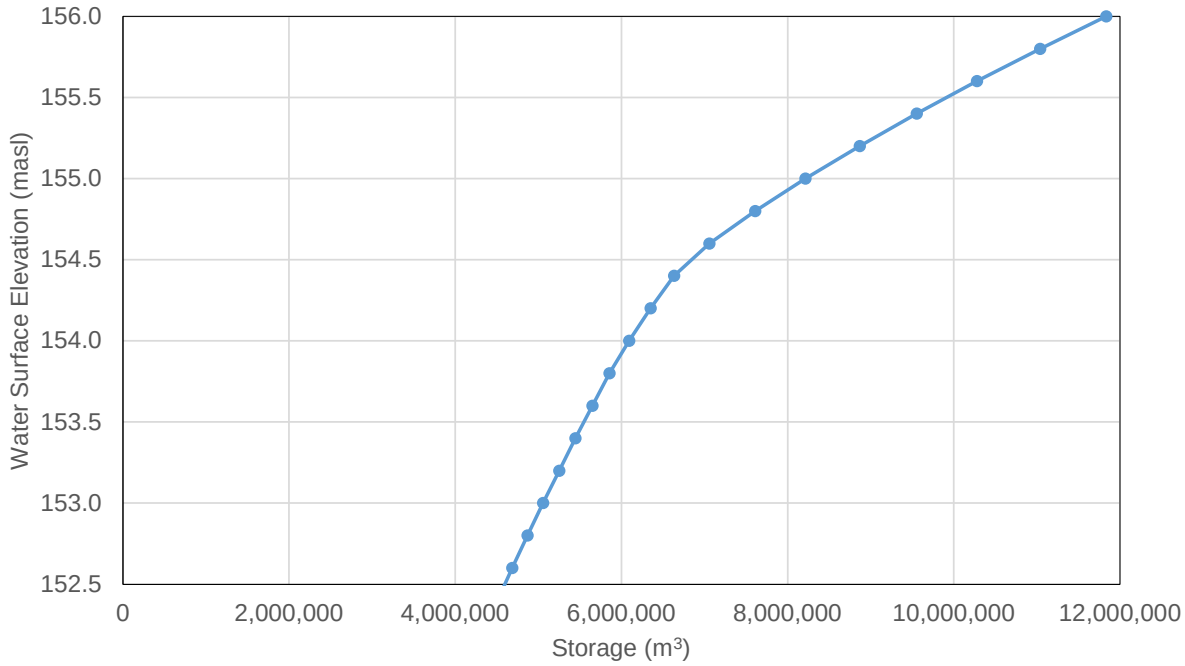

Figure A-1: Elevation-Storage Relationship for the Whale Tail Lake (South Basin) Diversion

[1] PhotoSat Information Ltd. (PhotoSat). 2015. PhotoSat Stereo Satellite Elevation Mapping Project Report. Reference No. 3631.

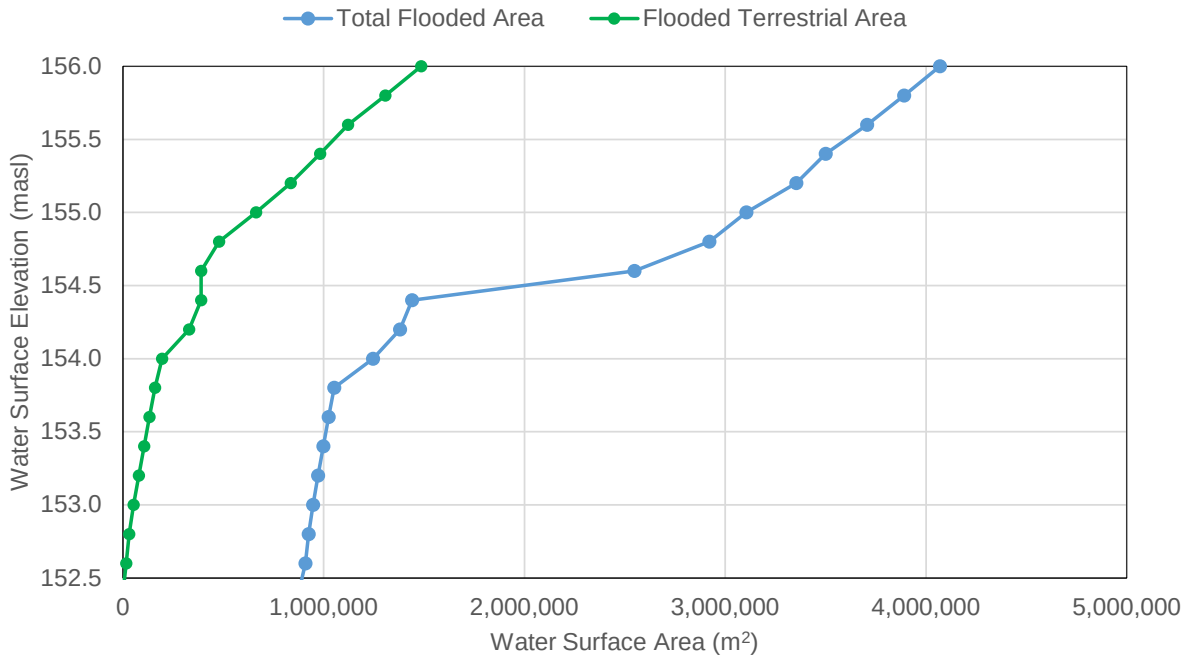

Figure A-2: Elevation-Area Relationship for the Whale Tail Lake (South Basin) Diversion