



APPENDIX 6-F

Flooding During Phases



6.F-1 BACKGROUND

Two water diversions, the Whale Tail Lake (South Basin) diversion, and the Northeast diversion, are planned as part of water management activities.

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 Northeast diversion consists of construction of the Northeast dike, from February to March 2019, to divert Lake A46 and tributary lakes through Lake C44 in the Nemo Lake watershed, once a water surface elevation of 156.66 masl is reached. Flooded tributary lakes include Lake A47, Lake A48, Lake A113, Pond A-P38, and Pond A-P68. The Northeast diversion is shown on Figure 6-F-2.

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

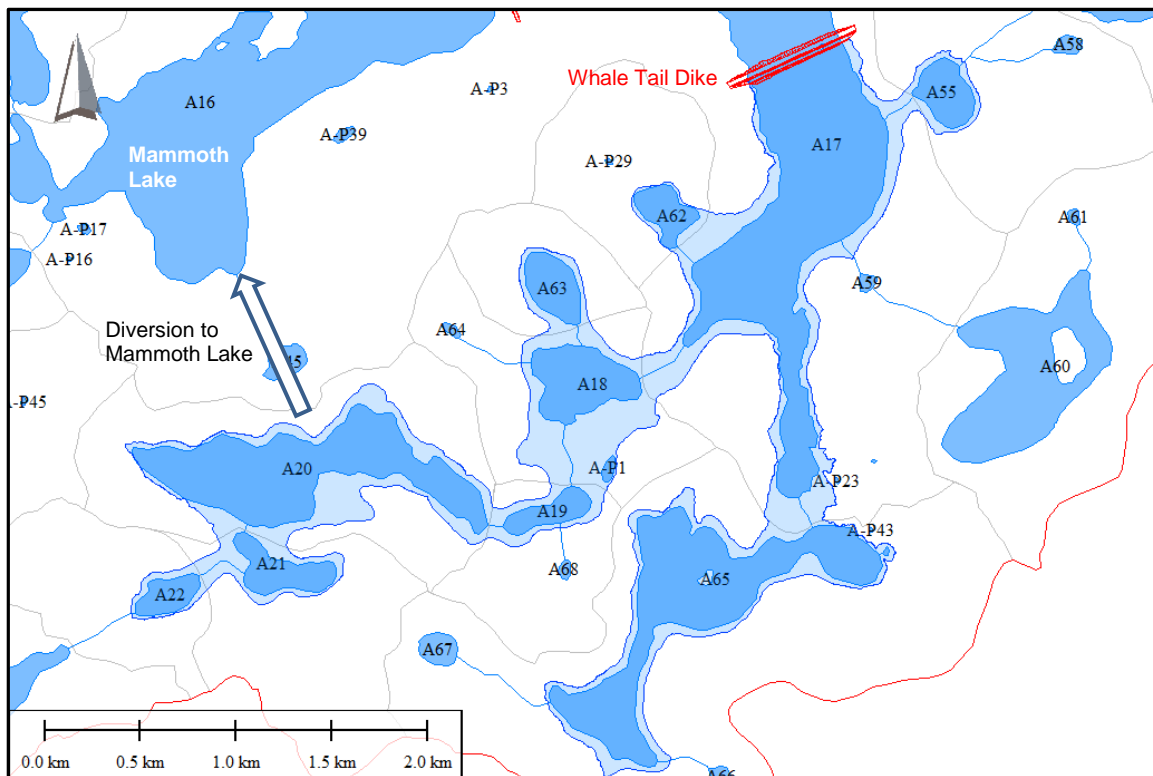


Figure 6-F-1: Whale Tail Lake (South Basin) Diversion



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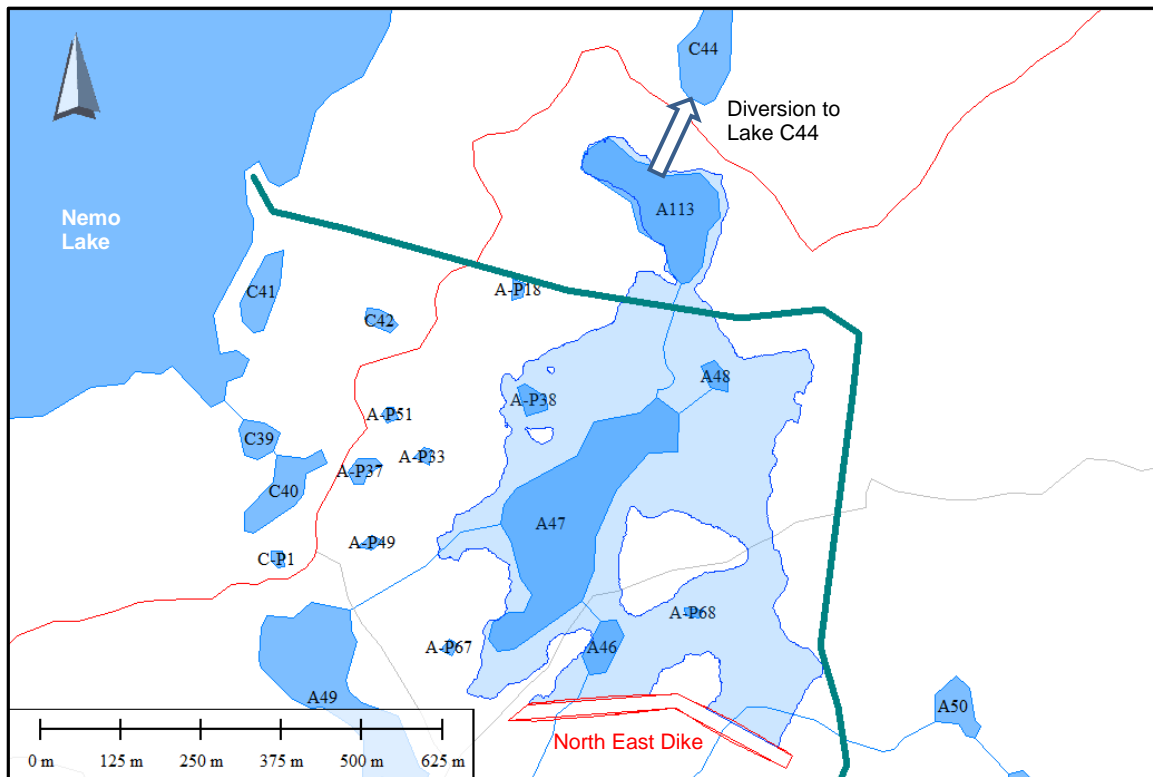


Figure 6-F-2: Northeast Diversion

6.F-2 WATER MANAGEMENT ACTIVITIES

6.F-2.1 Whale Tail Lake (South Basin) Diversion

Water management activities relevant to the Whale Tail Lake (South Basin) diversion 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 February to September 2019: dewatering is planned from February to May 2019 through Whale Tail Lake (South Basin) to expedite the filling period. Dewatering is also planned from June to September 2019 through Mammoth Lake, and discussed further in Volume 6, Appendix 6-E.
- Active refilling of the Whale Tail Pit from May to November 2022: active refilling of the Whale Tail Pit will include pumping of the elevated Whale Tail Lake (South Basin) sector, starting in May 2022, until the baseline water surface elevation of Whale Tail Lake (South Basin) (i.e., 152.50 masl) is restored. Active refilling will also include pumping of the Northeast sector, discussed in Section 6.F-2.2. Once the baseline water surface elevation of Whale Tail Lake (South Basin) is restored, the Whale Tail Pit will continue to fill passively.



6.F-2.2 Northeast Diversion

- Construction of the Northeast dike from February to March 2019: construction of the dike will result in backwatering upstream of the dike during runoff. The water surface elevation of Lake A46 will increase until the spilling elevation of 156.66 masl is reached, and the flooded Lake A46 can discharge through Lake C44.
- Active refilling of the Whale Tail Pit from May to November 2022: active refilling of the Whale Tail Pit will include pumping of the elevated Northeast sector, starting in May 2022, until the baseline water surface elevation of Lake A46 (i.e., 154.43 masl) is restored. Active refilling will also include pumping of the Whale Tail Lake (South Basin) sector, discussed in Section 6.F-2.1. Once the baseline water surface elevation of Lake A46 is restored, the Whale Tail Pit will continue to fill passively.

6.F-3 METHODS

Methods are presented in Attachment A.

6.F-4 RESULTS

6.F-4.1 Whale Tail Lake (South Basin) Diversion

Based on a mean annual water balance, the Whale Tail Lake (South Basin) diversion is expected to reach the spilling water surface elevation of 156.00 masl by the end of June 2020, remain at 156.00 masl until the end of April 2022, and return to the baseline water surface elevation of 152.50 masl by the end of November 2022.

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-3, and the maximum water surface elevation of the Whale Tail Lake (South Basin) diversion is shown in Figure 6-F-4.

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



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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	152.50	893,448	0	0
June 2018	152.50	893,448	0	0
July 2018	152.50	893,448	0	0
August 2018	152.61	903,582	2,060	2,060
May 2019	154.85	1,437,026	628,385	626,325
June 2019	155.11	1,755,701	849,873	221,488
July 2019	155.50	2,672,890	1,161,693	311,820
August 2019	155.50	2,672,890	1,161,693	0
May 2020	155.70	3,139,815	1,322,012	160,319
June 2020	155.70	3,139,815	1,322,012	0
July 2020	156.00	3,851,450	1,575,487	253,475
August 2020	156.00	3,851,450	1,575,487	0
May 2021	156.00	3,851,450	1,575,487	0
June 2021	156.00	3,851,450	1,575,487	0
July 2021	156.00	3,851,450	1,575,487	0
August 2021	156.00	3,851,450	1,575,487	0
May 2022	156.00	3,851,450	1,575,487	0
June 2022	155.60	2,912,668	1,242,689	-332,798
July 2022	155.60	2,916,686	1,244,047	1,358
August 2022	155.20	1,977,904	926,073	-317,974

masl = metres above sea level; m² = square metres



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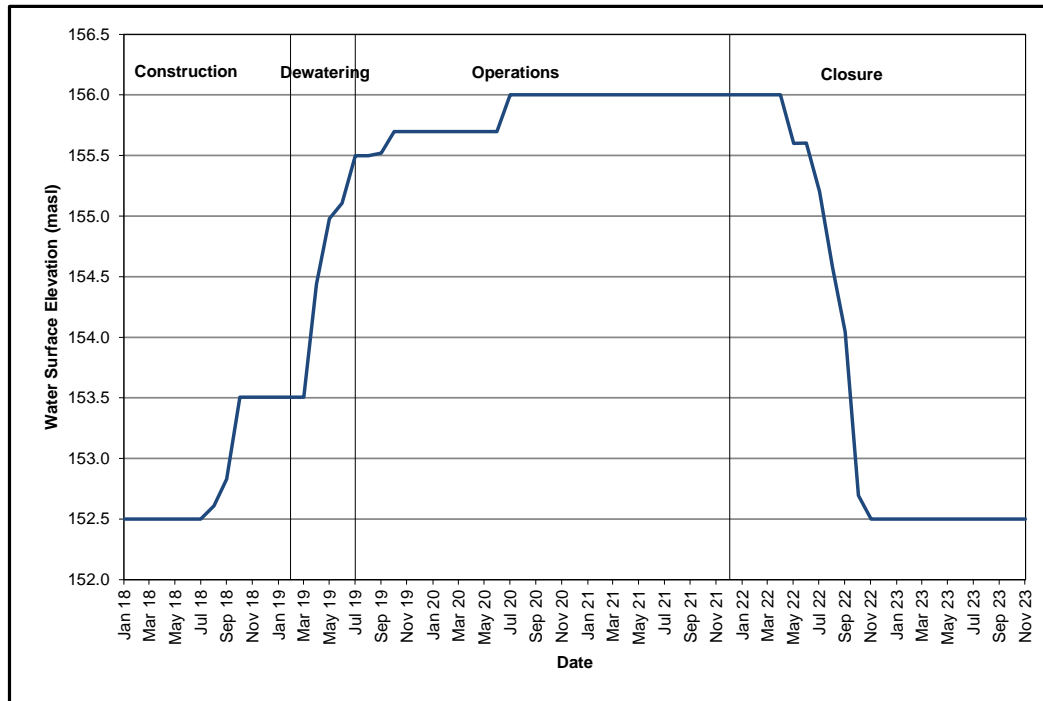


Figure 6-F-3: Derived Water Surface Elevation of the Whale Tail Lake (South Basin) Diversion

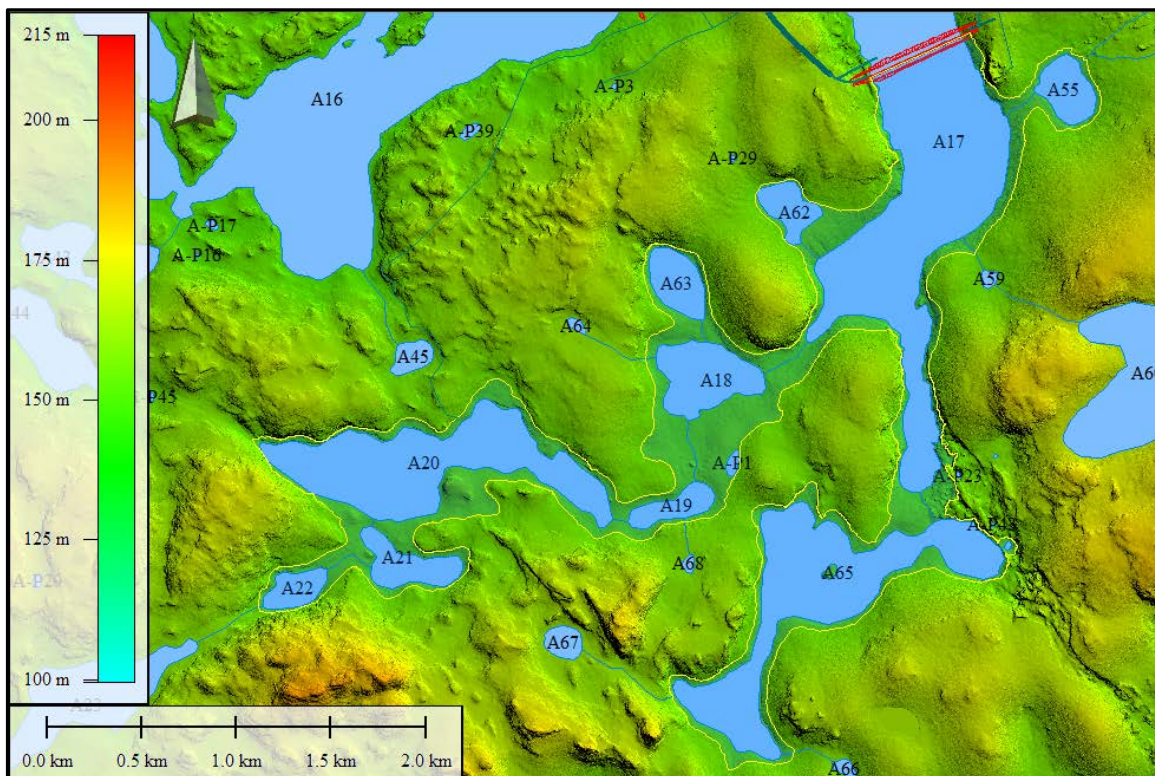


Figure 6-F-4: Maximum Water Surface Elevation of the Whale Tail Lake (South Basin) Diversion



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6.F-4.2 Northeast Diversion

Based on a mean annual water balance, the Northeast diversion is expected to reach the spilling water surface elevation of 156.66 masl by the end of June 2020, remain at 156.66 masl until the end of April 2022, and return to the baseline water surface elevation of 152.50 masl by the end of May 2022.

Total flooded and flooded terrestrial areas are presented in Table 6-F-2 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 Northeast diversion is shown in Figure 6-F-5 and the maximum water surface elevation of the Northeast diversion is shown in Figure 6-F-4.

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

Table 6-F-2: Total Flooded and Flooded Terrestrial Area during the Northeast Diversion

Date	Water Surface Elevation (masl)	Total Flooded Area (m ²)	Flooded Terrestrial Area (m ²)	Change in Flooded Terrestrial Area (m ²)
June 2019	154.43	0	0	0
July 2019	155.82	115,778	65,844	65,844
August 2019	155.82	115,778	65,844	0
May 2020	156.24	181,231	130,187	64,343
June 2020	156.24	181,231	130,187	0
July 2020	156.66	262,600	184,457	54,270
August 2020	156.66	262,600	184,457	0
May 2021	156.66	262,600	184,457	0
June 2021	156.66	262,600	184,457	0
July 2021	156.66	262,600	184,457	0
August 2021	156.66	262,600	184,457	0
May 2022	156.66	262,600	184,457	0
June 2022	154.43	0	0	-184,457

masl = metres above sea level; m² = square metres



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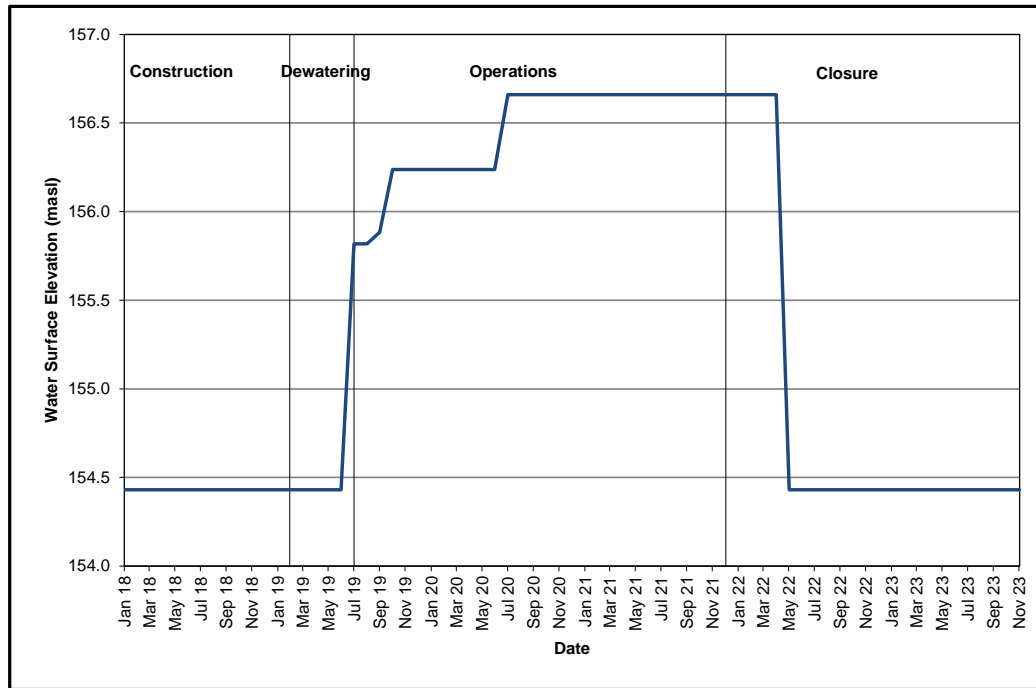


Figure 6-F-5: Derived Water Surface Elevation of the Northeast Diversion

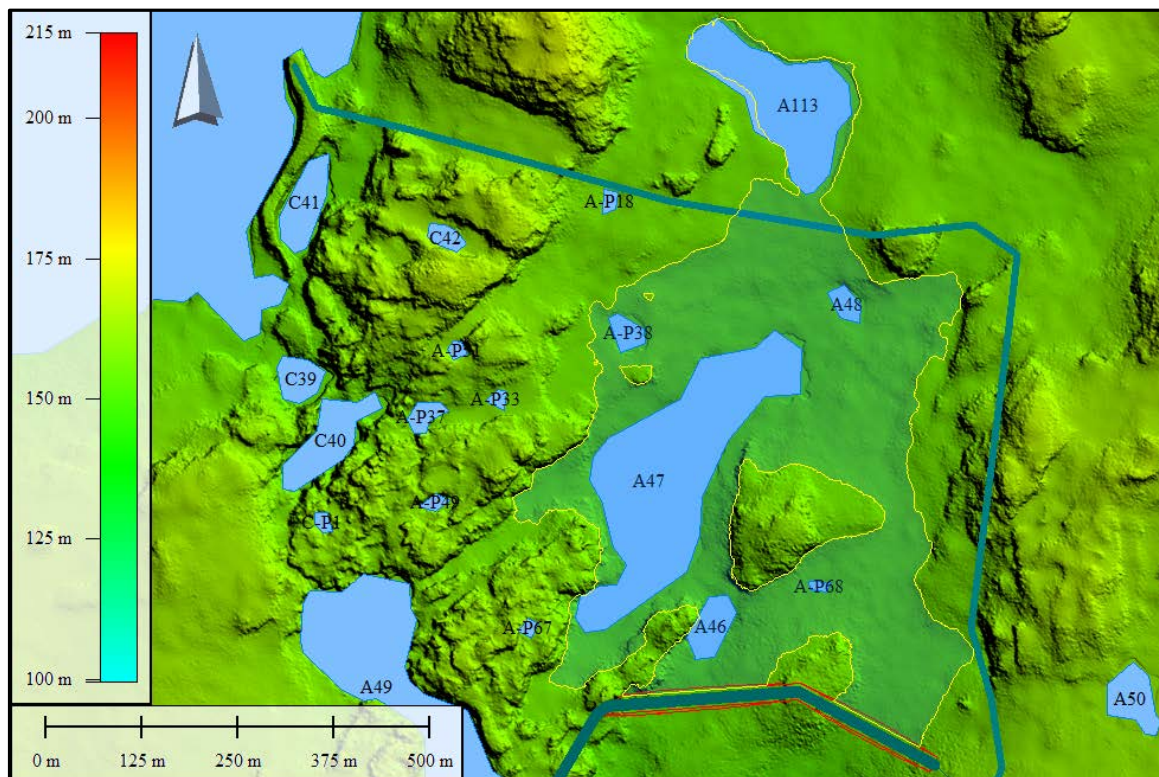


Figure 6-F-6: Maximum Water Surface Elevation of the Northeast Diversion



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6.F-5 REFERENCES

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



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).

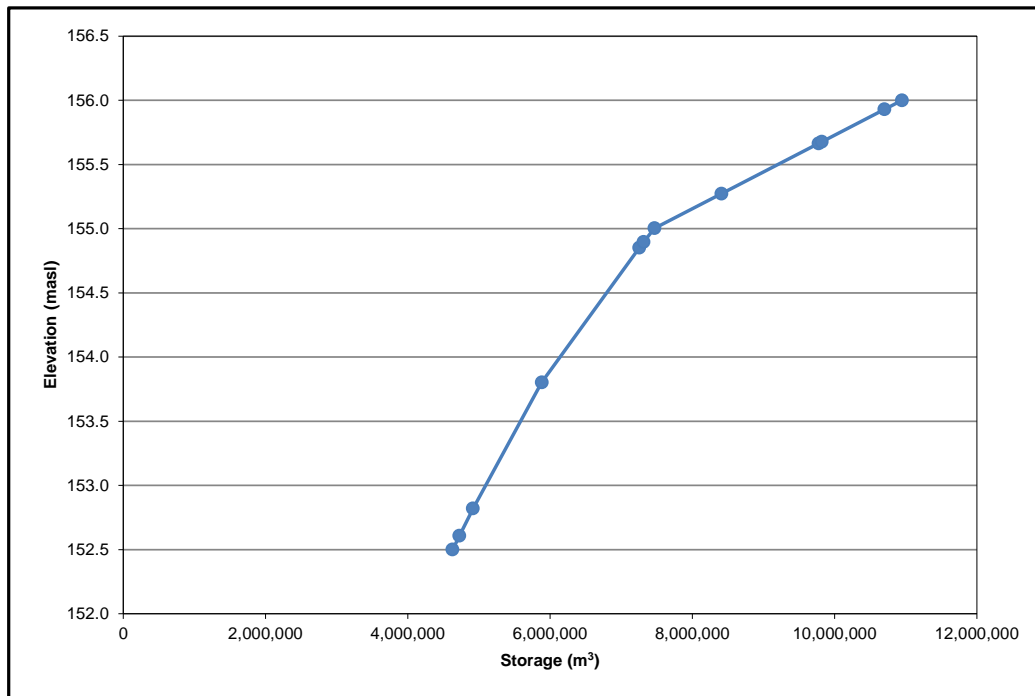


Figure A-1: Elevation-Storage Relationship for the Whale Tail Lake (South Basin) Diversion



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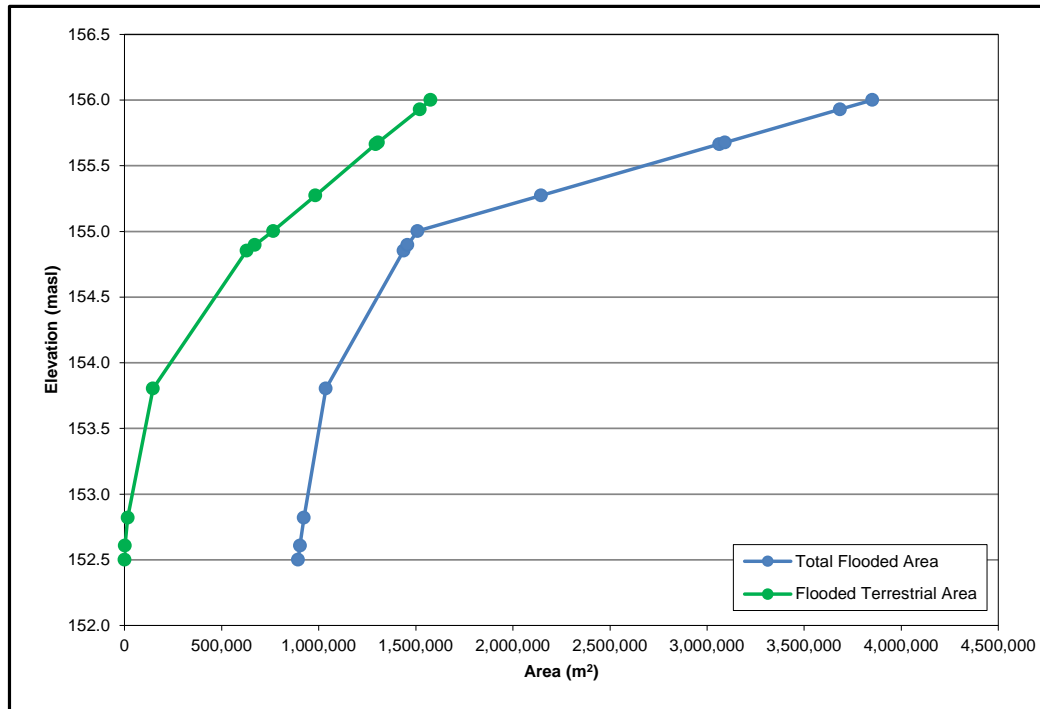


Figure A-2: Elevation-Area Relationship for the Whale Tail Lake (South Basin) Diversion

Northeast Diversion

A mean annual water balance was developed on a monthly timestep for the Northeast diversion, based on mean annual water balances and refilling rates presented in the water management plan (Volume 8, Appendix 8-B.2).

Elevation-storage-area relationships were derived based on Project topographic data (PhotoSat 2015), and are presented in Figure A-3 (elevation-storage) and Figure A-4 (elevation-area).



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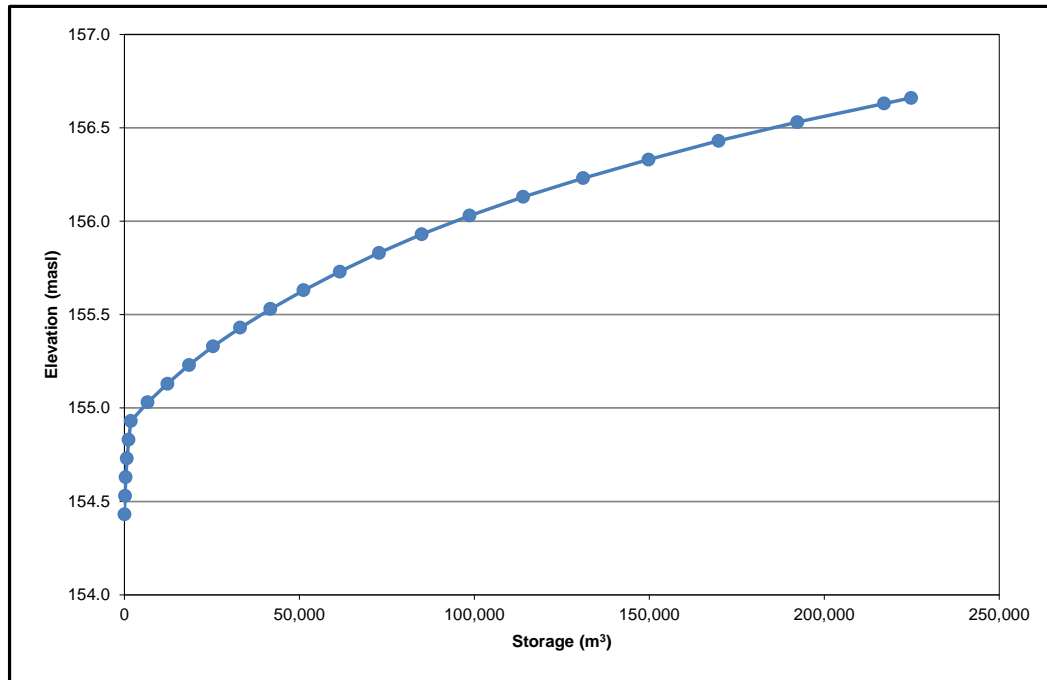


Figure A-3: Derived Elevation-Storage Relationship for the North East Diversion

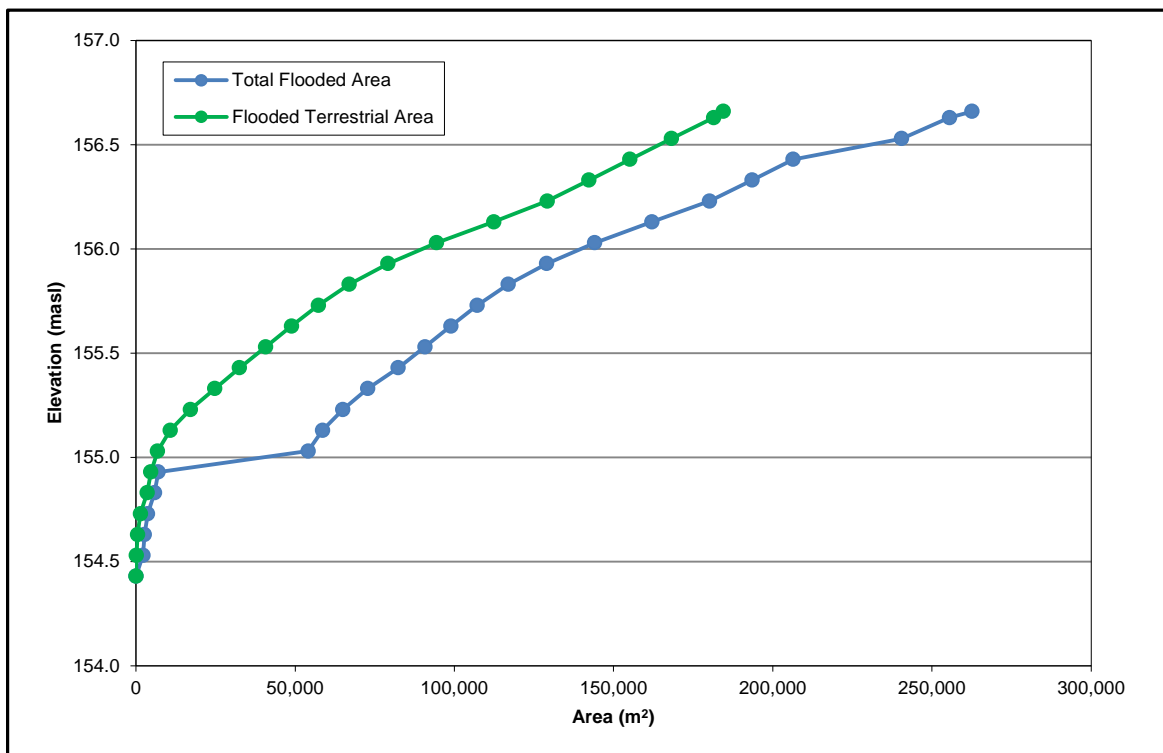


Figure A-4: Derived Elevation-Area Relationship for the Northeast Diversion