

6-M: 2015 Baseline Bathymetry

It should be noted that this historical baseline report (Appendix 6-M) was reviewed and received conformity approval as part of the Approved Project FEIS submission (Agnico Eagle 2016c), and then final approval under Project Certificate No. 008. This baseline report remain unchanged.



6.M-1 BACKGROUND

Bathymetric data at the Whale Tail Pit and Haul Road Project (the Project) were collected in 2015; however, elevation-area-volume relationships were not reported in 2015. This appendix presents the results of the bathymetry analysis of 19 lakes (Lake A16, A17, A18, A19, A20, A22, A43, A44, A45, A47, A49, A53, A55, A56, A60, A62, A63, A65 and C38) at the Project.

6.M-2 METHODS

The following data sets were used to calculate the surface area-volume and elevation-volume curves at each lake:

- Project digital elevation surface satellite imagery from PhotoSat (PhotoSat 2015) in raster format;
- Project lake boundaries from PhotoSat (PhotoSat 2015) in vector format, captured under low water level conditions in August 2015;
- Project lake bathymetric contour lines (Agnico Eagle 2015) in vector format; and
- Project contour elevation lines from PhotoSat (PhotoSat 2015) in vector format.

At each lake with available bathymetric data, a database was built with the following layers: Project contour elevation lines, bathymetric contour lines, and lake boundaries. A shoreline layer was created by estimating the lake water surface elevation representative for high water levels for the bathymetry calculation using the satellite imagery and the contour line layer. This approach was selected to compensate for the fact that the bathymetry data were collected in August during the typical low water levels for the open water season.

Using the data sets created for each lake, a bathymetric surface was interpolated using the 3-D Surface-Volume analysis tool in ESRI's ArcGIS software. This tool calculates the lake surface area and volume at a specified elevation. At each lake, a 0.2 m interval was selected, that extended from the minimum lake elevation (maximum lake depth) to the lake water surface elevation (lake shoreline), for which lake surfaces and volumes were reported.

6.M-3 RESULTS

The results of the elevation-area-volume curve calculations are summarized in Table 6-M-1. The elevation-area and elevation-volume curves are presented in Figure 6-M-1 to Figure 6-M-38.

The bathymetric maps and the elevation-stage-volume curves are presented in Attachment A.



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2015 Baseline Bathymetry

Table 6-M-1: Project Lake Bathymetry, 2015

Lake Name	Volume (m ³)	Representative Lake Water Surface Elevation (masl, geodetic)	Surface Area at Representative Lake Water Surface Elevation (km ²)	Mean Lake Depth (m)	Maximum Lake Depth (m)
Lake A16 (Mammoth Lake)	6,290,000	152.8	1.597	3.9	17.2
Lake A17 (Whale Tail Lake)	8,510,000	153.0	1.669	5.1	18.3
Lake A18	179,000	154.2	0.190	0.9	2.2
Lake A19	61,700	154.9	0.065	1.0	2.9
Lake A20	2,890,000	154.9	0.562	5.1	25.0
Lake A22	225,000	155.0	0.052	4.3	9.0
Lake A43	260,000	155.5	0.170	1.5	6.6
Lake A44	884,000	156.2	0.223	4.0	12.3
Lake A45	49,100	156.5	0.030	1.6	4.0
Lake A47	50,200	155.2	0.047	1.1	3.4
Lake A49	87,800	159.1	0.030	2.9	7.3
Lake A53	140,000	161.7	0.100	1.3	3.8
Lake A55	82,700	155.3	0.080	1.0	1.8
Lake A56	726,000	159.7	0.242	3.0	8.0
Lake A60	1,110,000	170.0	0.334	3.3	12.2
Lake A62	72,000	155.6	0.058	1.3	5.1
Lake A63	191,000	154.7	0.084	2.3	5.7
Lake A65	1,400,000	154.9	0.630	2.2	11.2
Lake C38 (Nemo Lake)	8,360,000	156.1	1.255	6.7	23.2

m³ = cubic metres; masl = metres above sea level; km² = square kilometers; m = metre.



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2015 Baseline Bathymetry

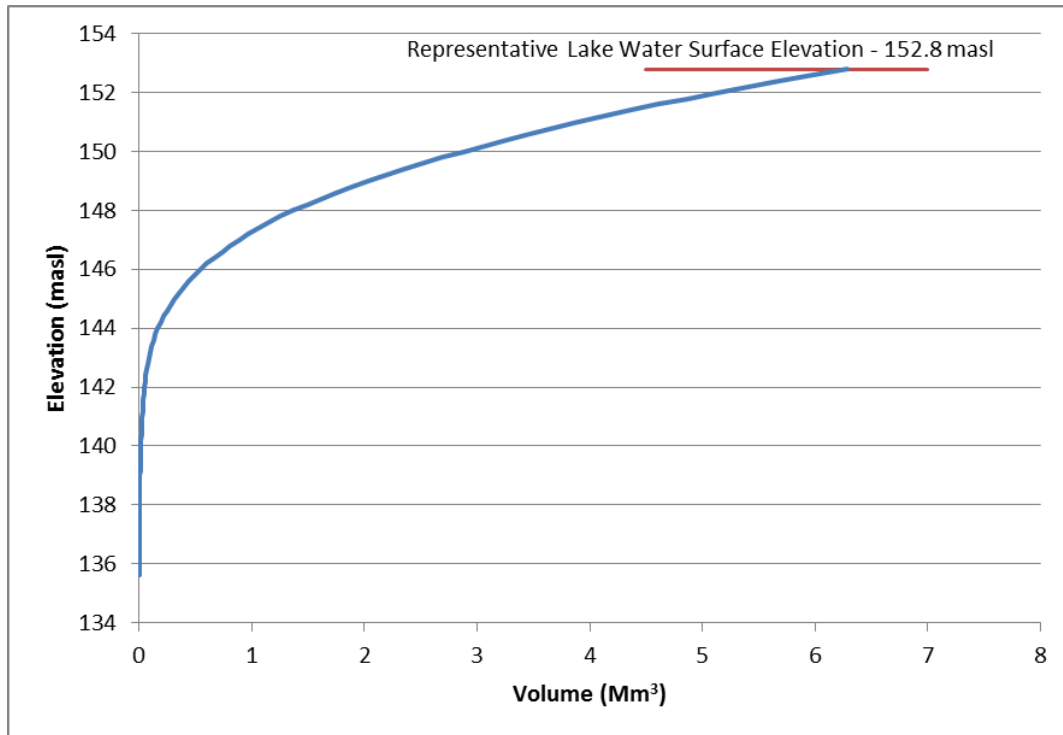


Figure 6-M-1: Lake A16 (Mammoth Lake), Elevation-Volume Curve

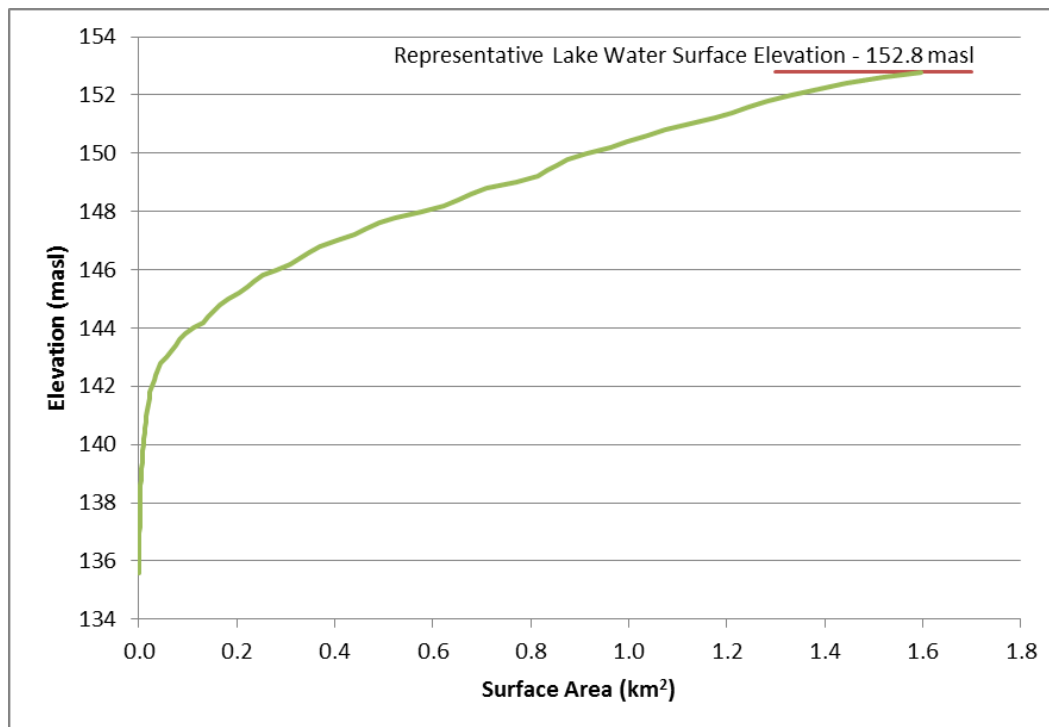


Figure 6-M-2: Lake A16 (Mammoth Lake), Elevation-Area Curve



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2015 Baseline Bathymetry

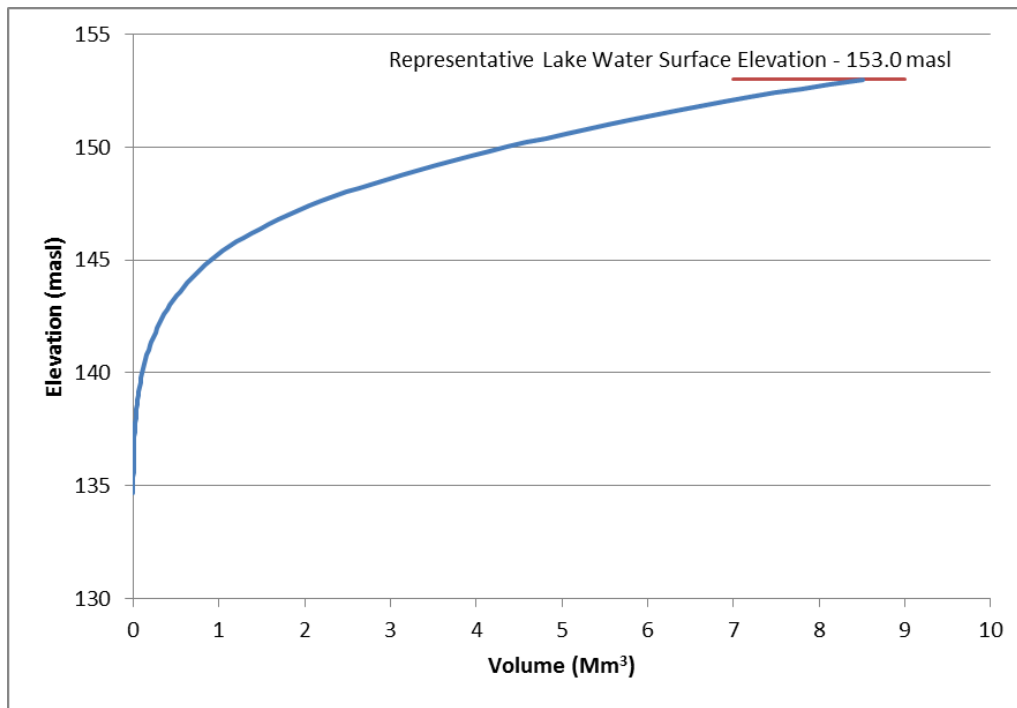


Figure 6-M-3: Lake A17 (Whale Tail Lake), Elevation-Volume Curve

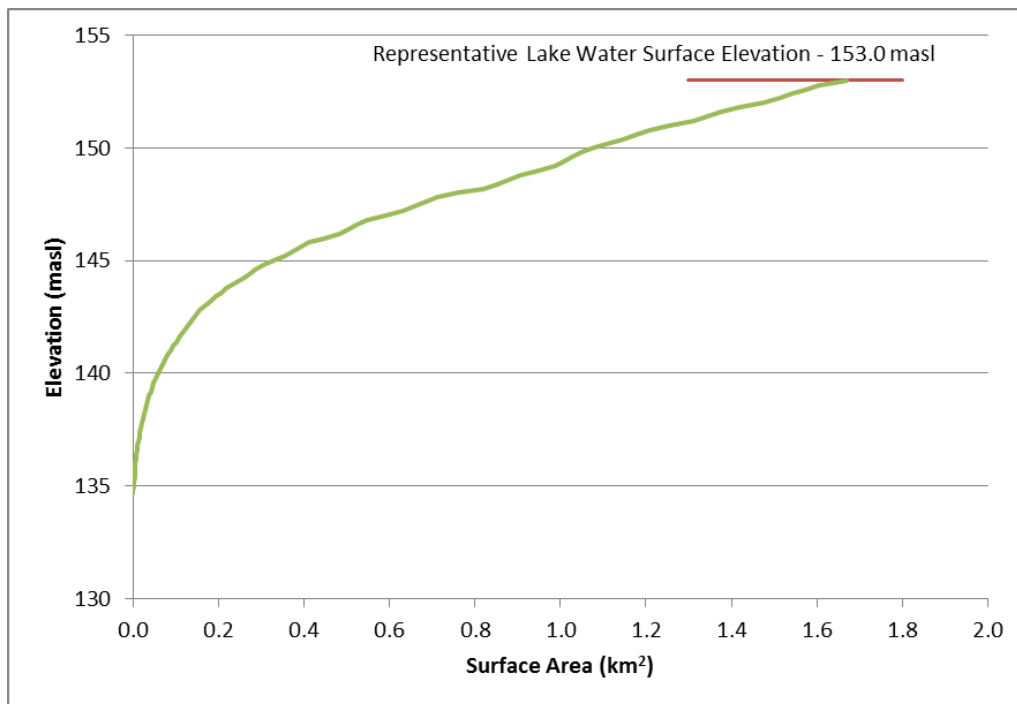


Figure 6-M-4: Lake A17 (Whale Tail Lake), Elevation-Area Curve



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2015 Baseline Bathymetry

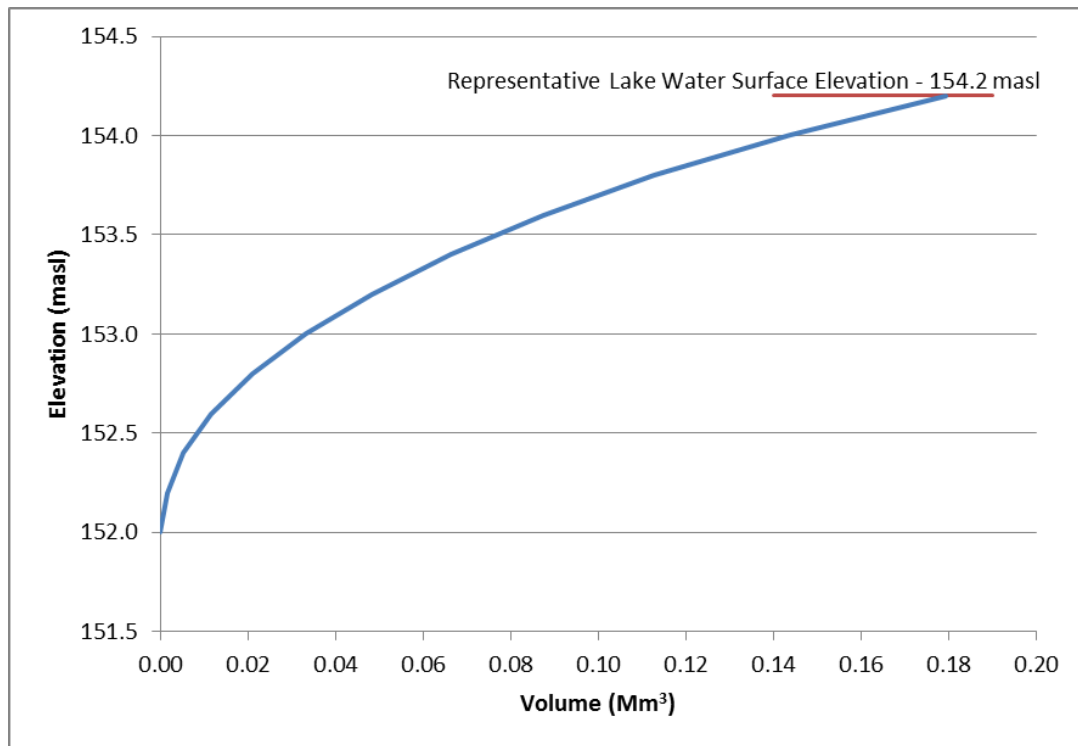


Figure 6-M-5: Lake A18, Elevation-Volume Curve

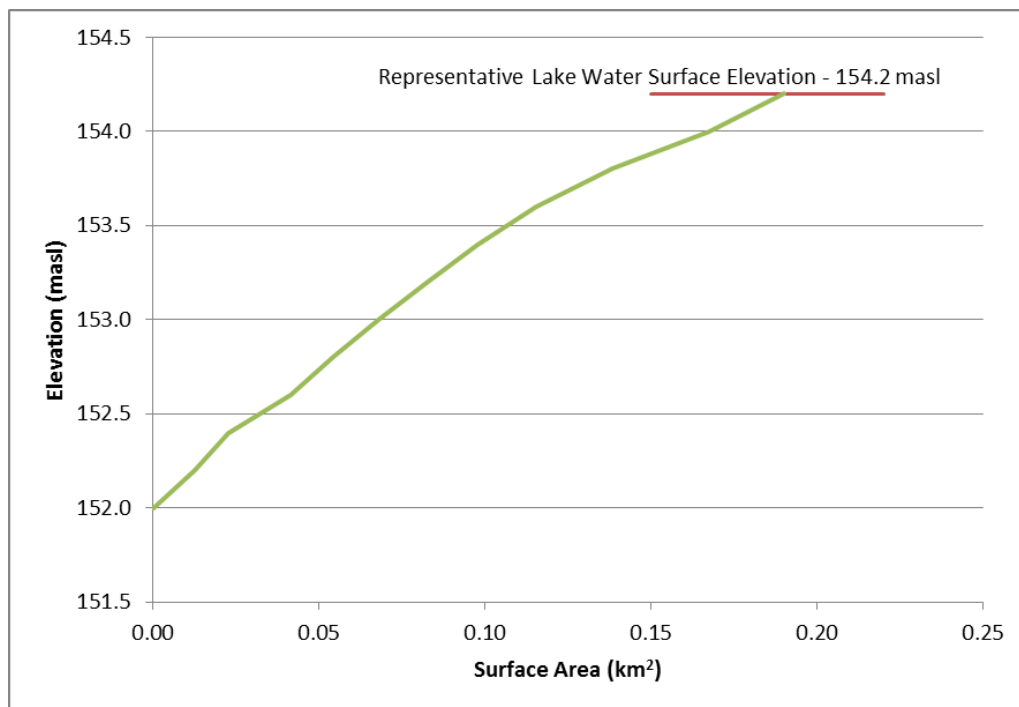


Figure 6-M-6: Lake A18, Elevation-Area Curve



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2015 Baseline Bathymetry

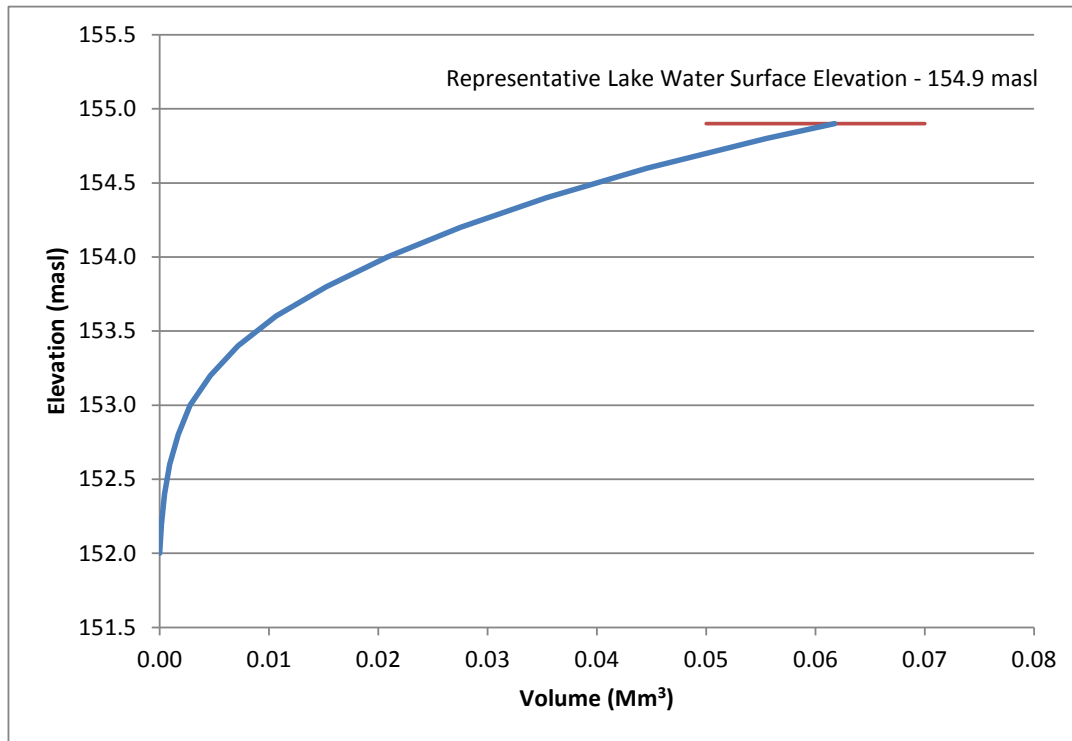


Figure 6-M-7: Lake A19, Elevation-Volume Curve

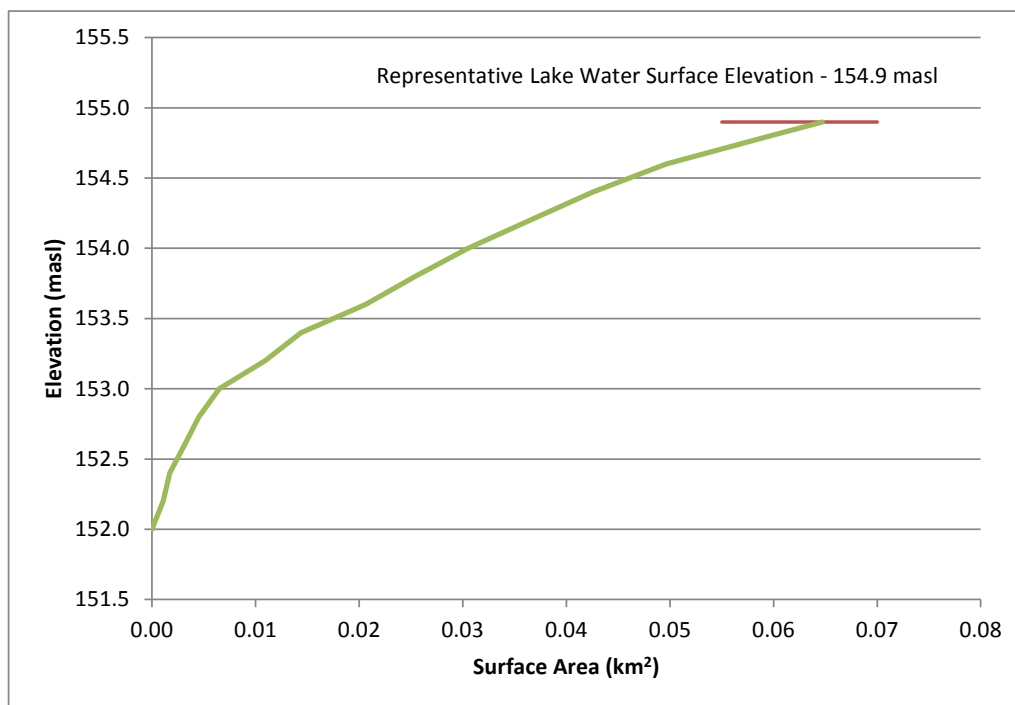


Figure 6-M-8: Lake A19, Elevation-Area Curve



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2015 Baseline Bathymetry

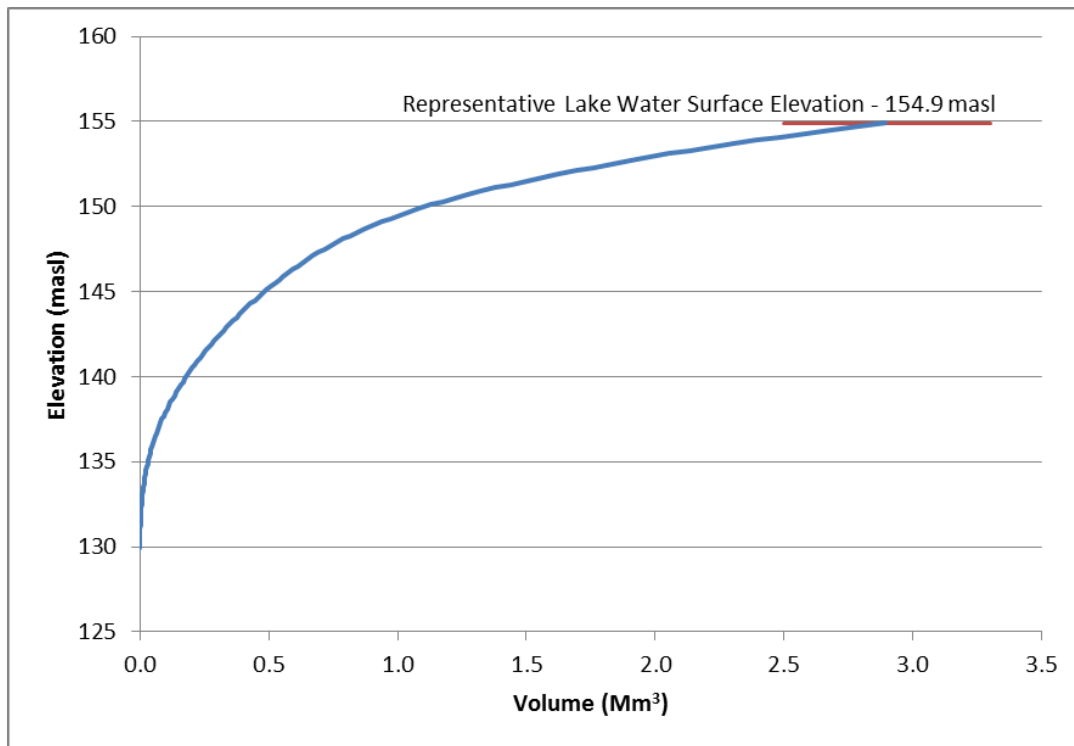


Figure 6-M-9: Lake A20, Elevation-Volume Curve

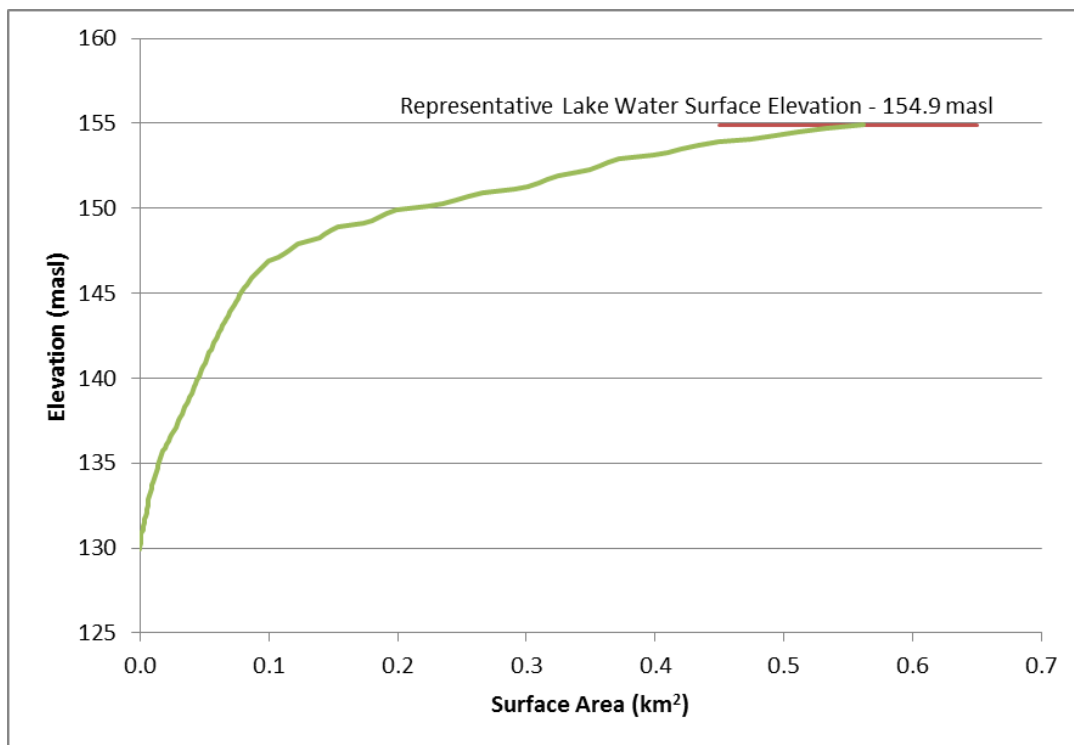


Figure 6-M-10: Lake A20, Elevation-Area Curve



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2015 Baseline Bathymetry

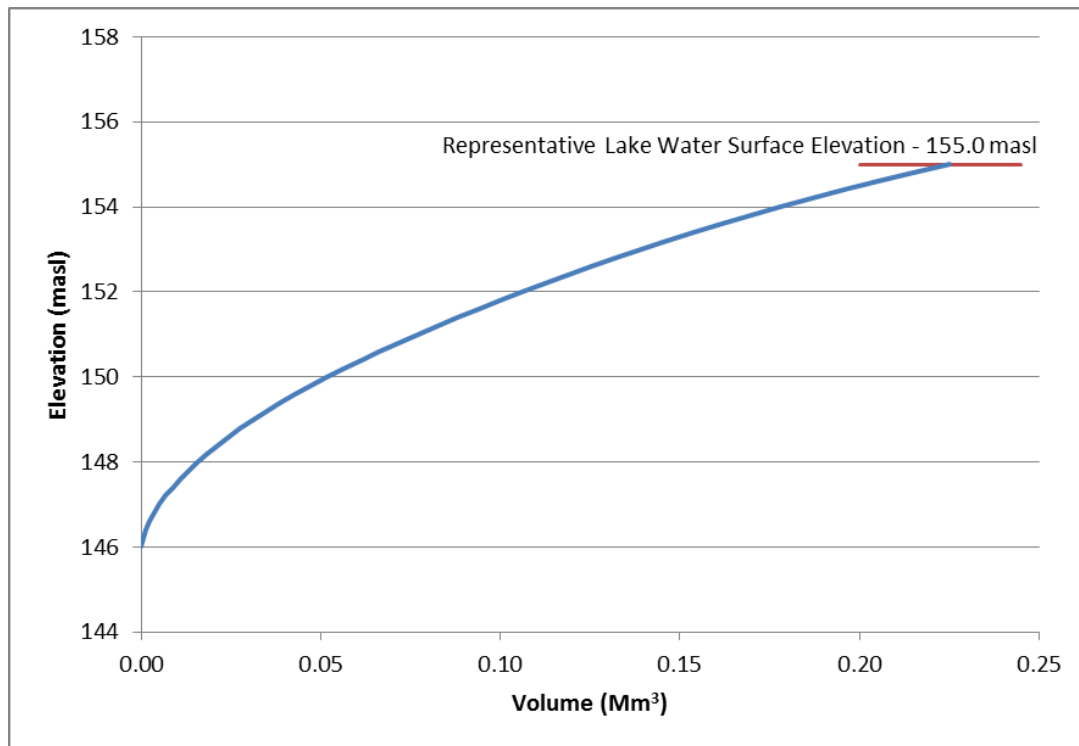


Figure 6-M-11: Lake A22, Elevation-Volume Curve

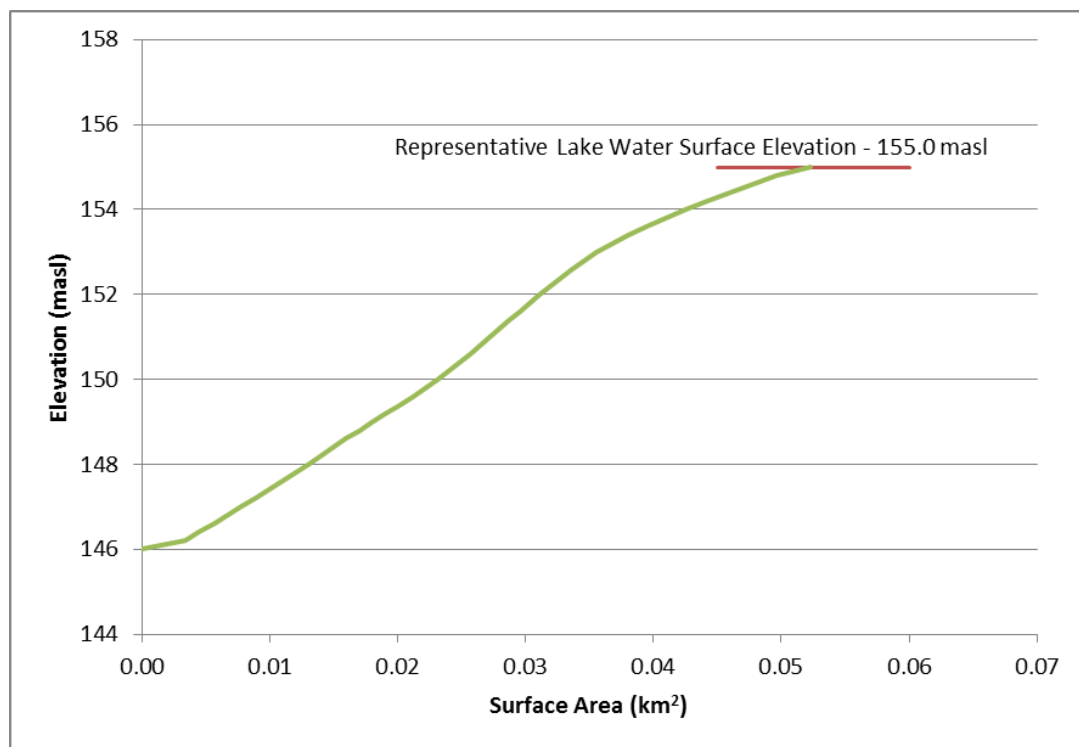


Figure 6-M-12: Lake A22, Elevation-Area Curve



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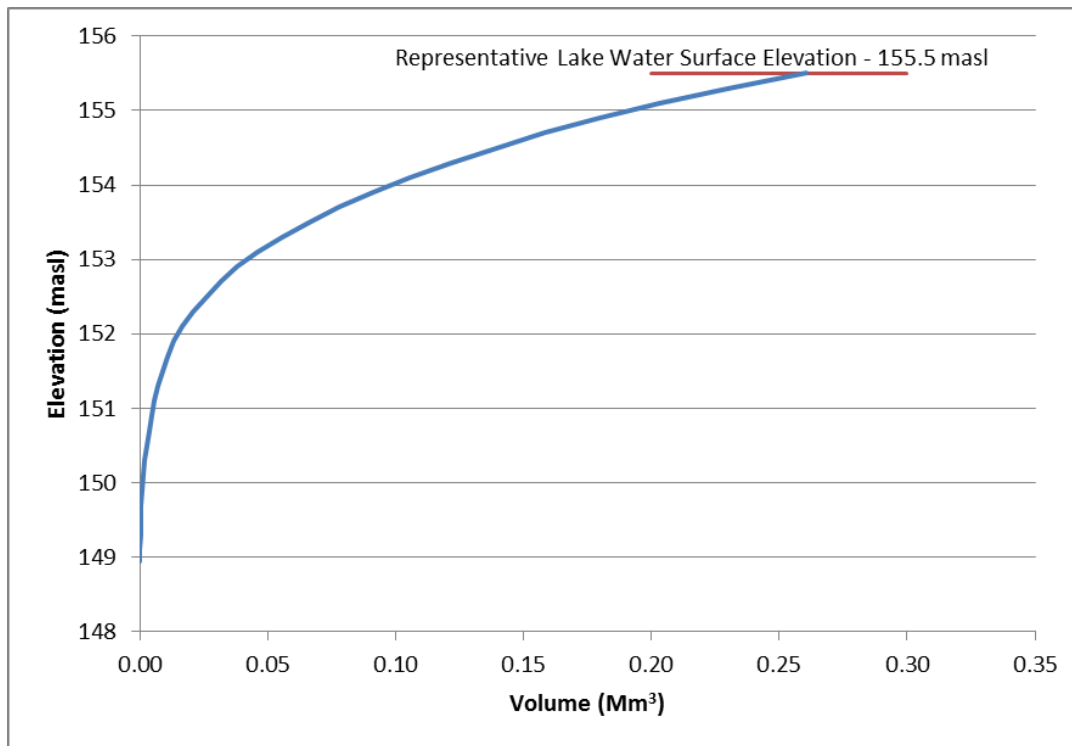


Figure 6-M-13: Lake A43, Elevation-Volume Curve

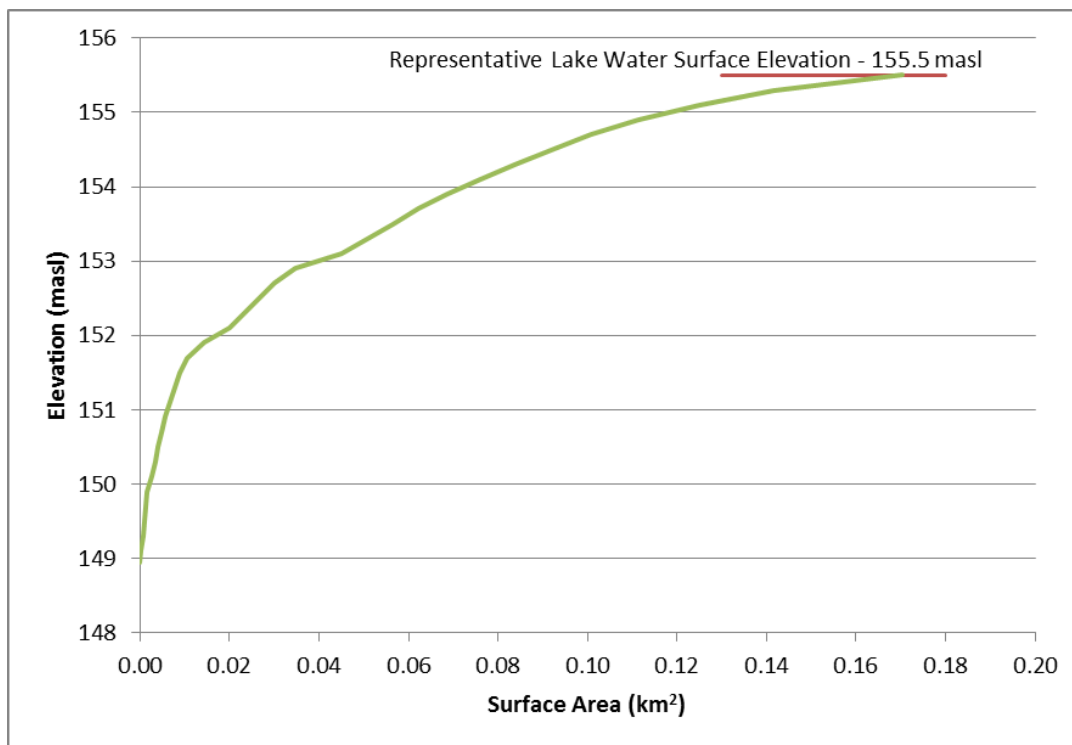


Figure 6-M-14: Lake A43, Elevation-Area Curve



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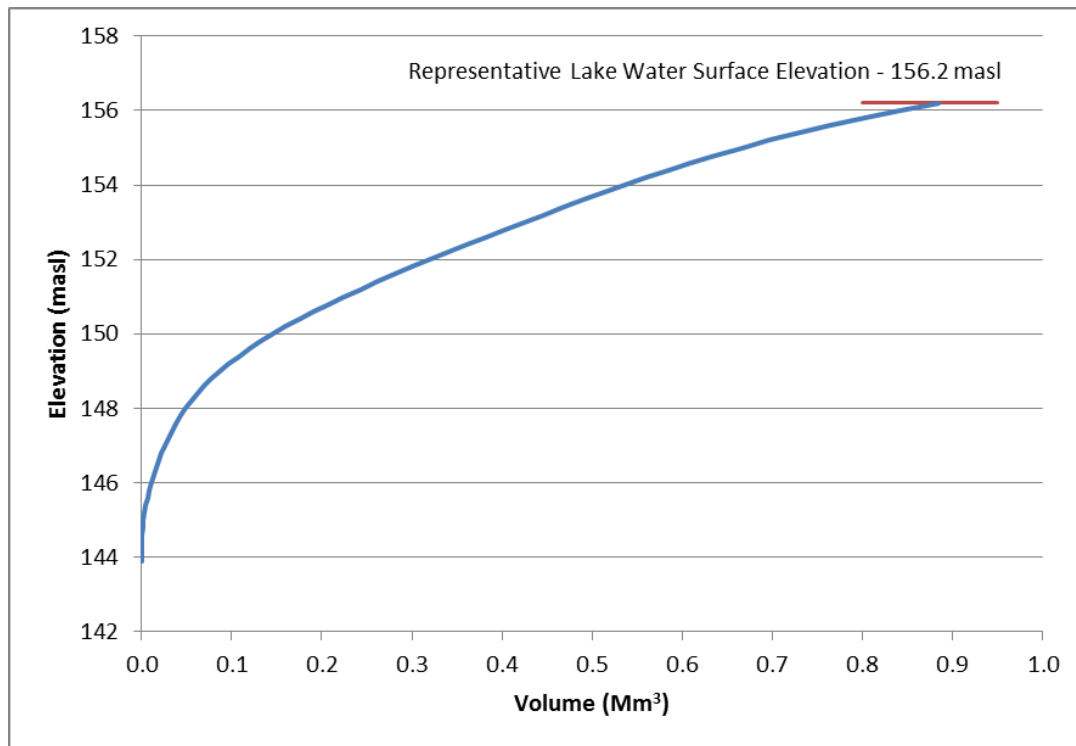


Figure 6-M-15: Lake A44, Elevation-Volume Curve

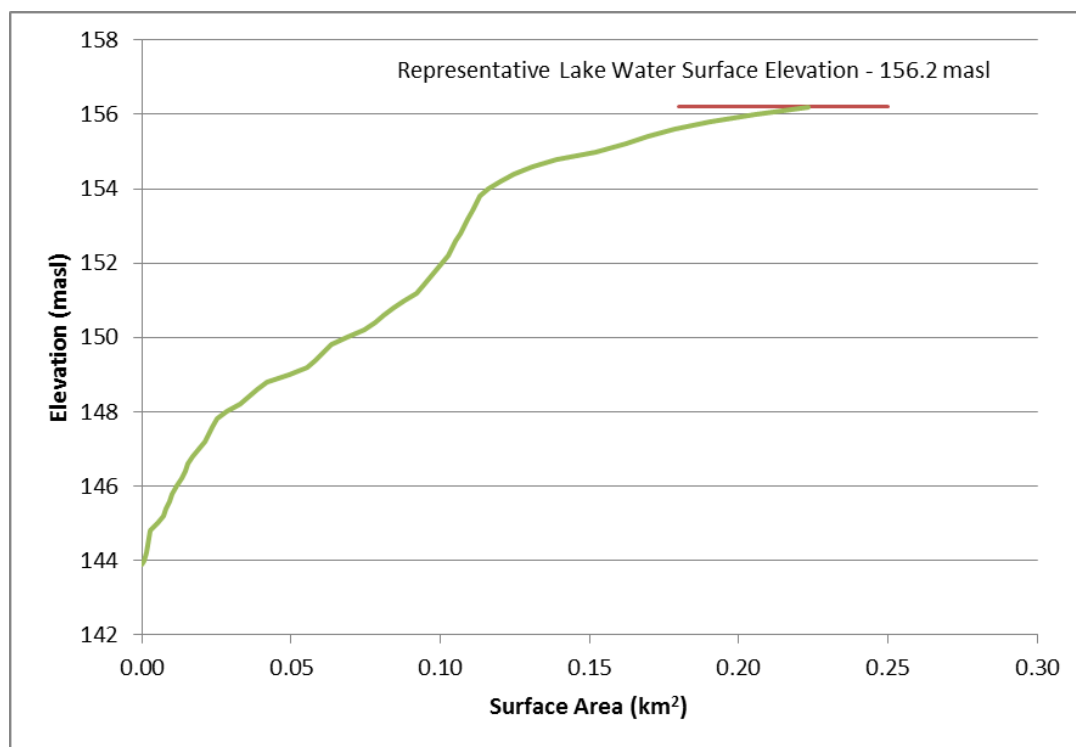


Figure 6-M-16: Lake A44, Elevation-Area Curve



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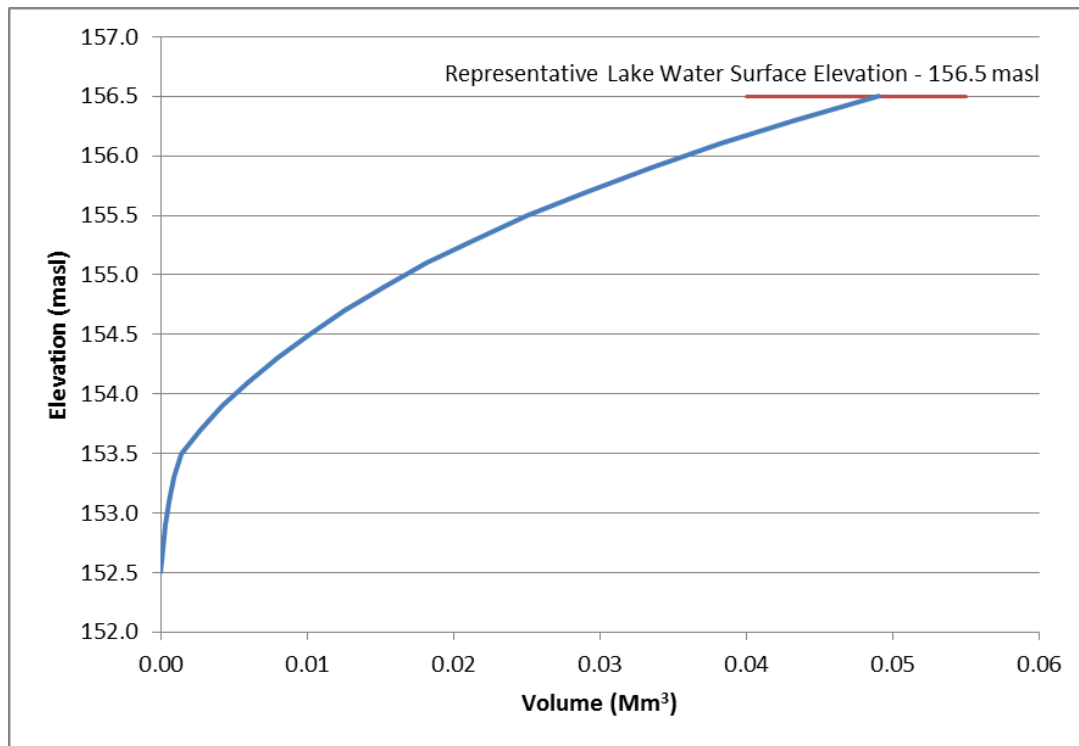


Figure 6-M-17: Lake A45, Elevation-Volume Curve

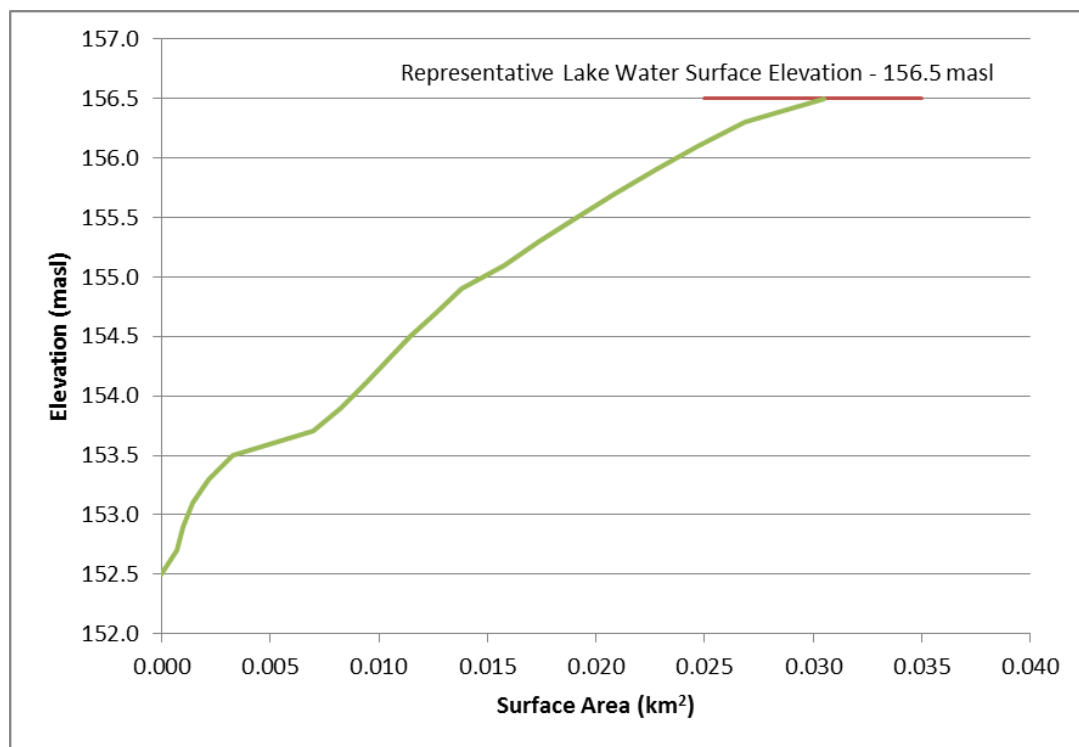


Figure 6-M-18: Lake A45, Elevation-Area Curve



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2015 Baseline Bathymetry

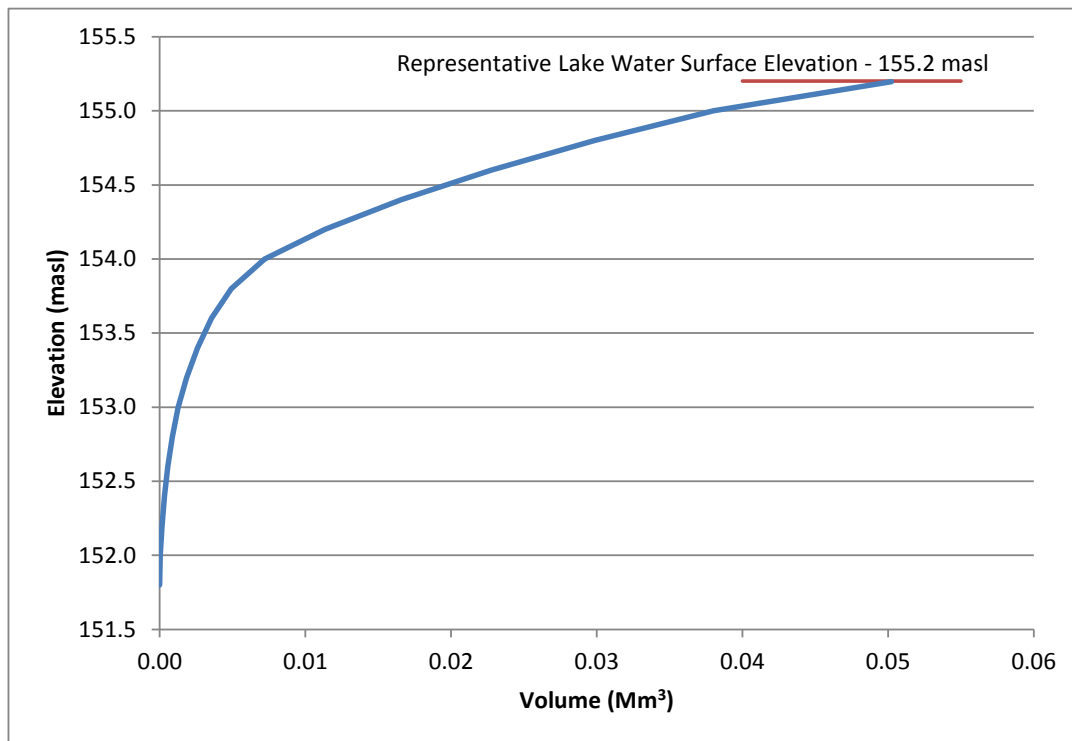


Figure 6-M-19: Lake A47, Elevation-Volume Curve

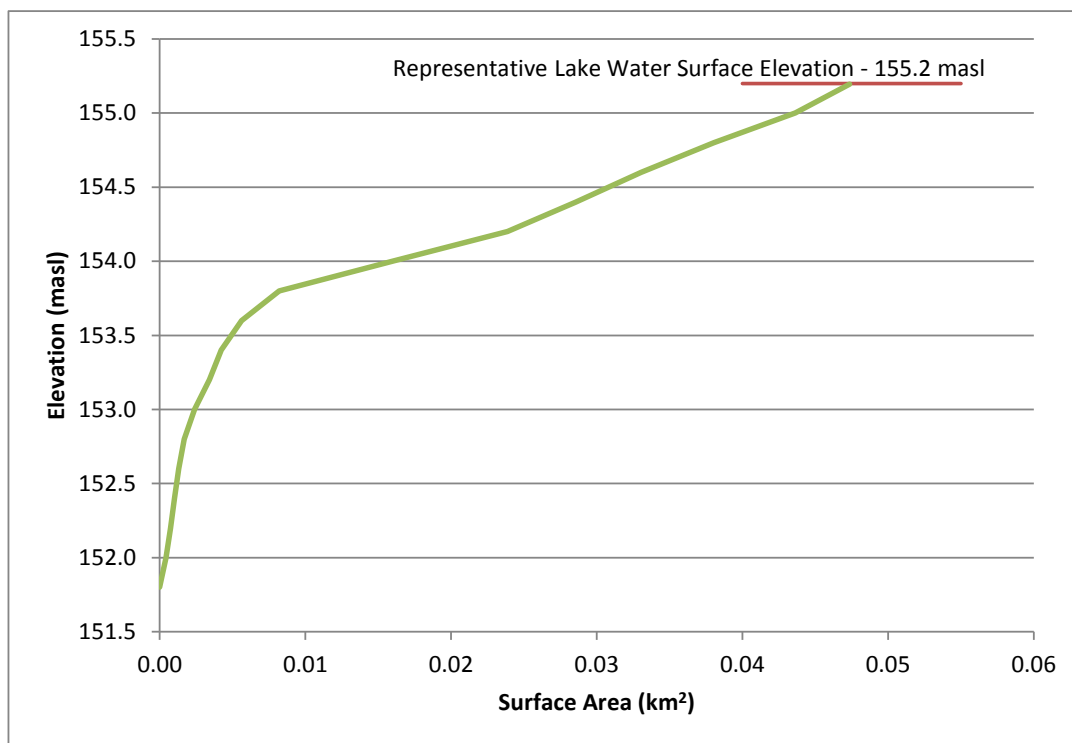


Figure 6-M-20: Lake A47, Elevation-Area Curve



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2015 Baseline Bathymetry

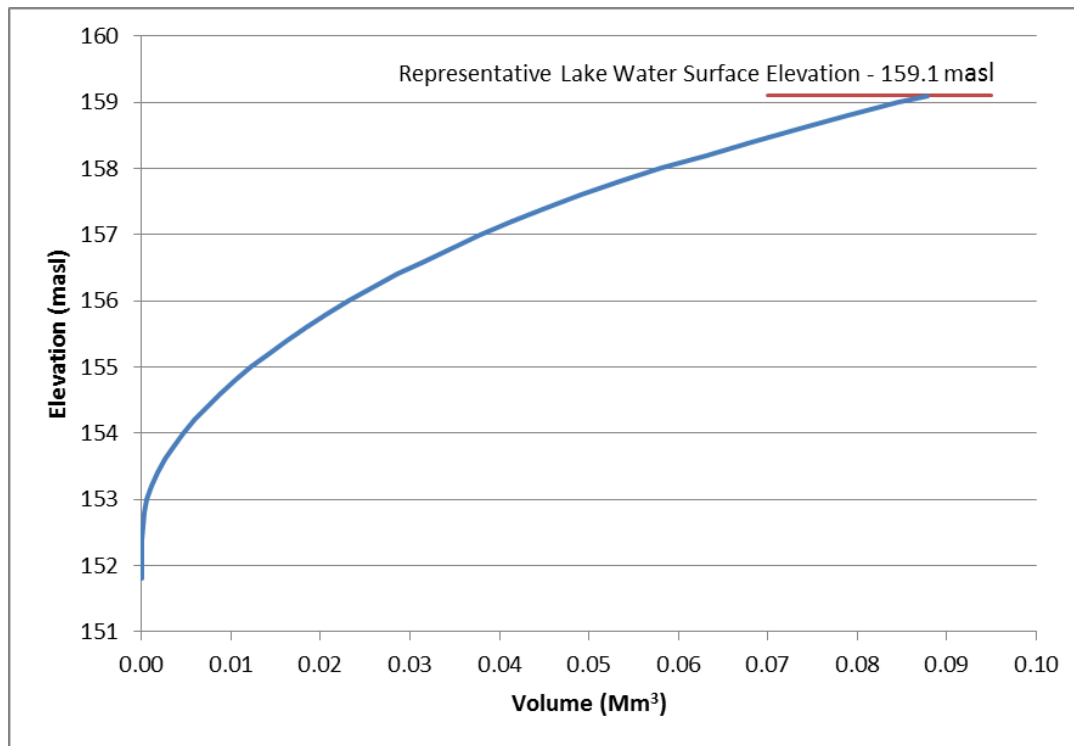


Figure 6-M-21: Lake A49, Elevation-Volume Curve

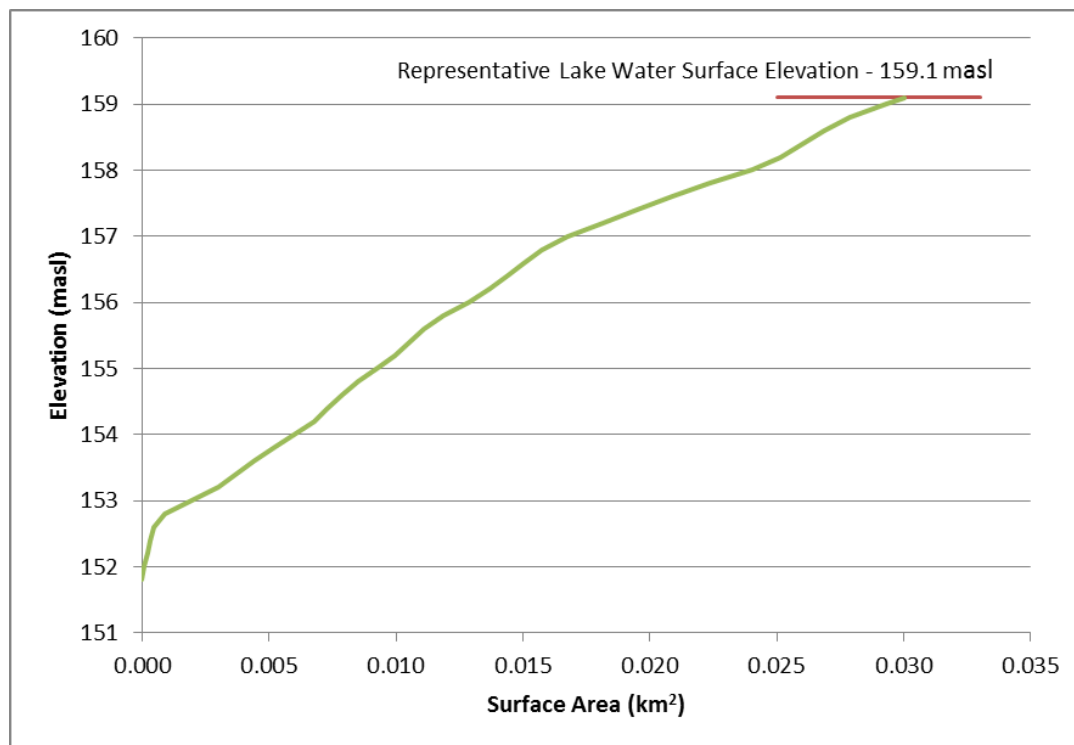


Figure 6-M-22: Lake A49, Elevation-Area Curve



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2015 Baseline Bathymetry

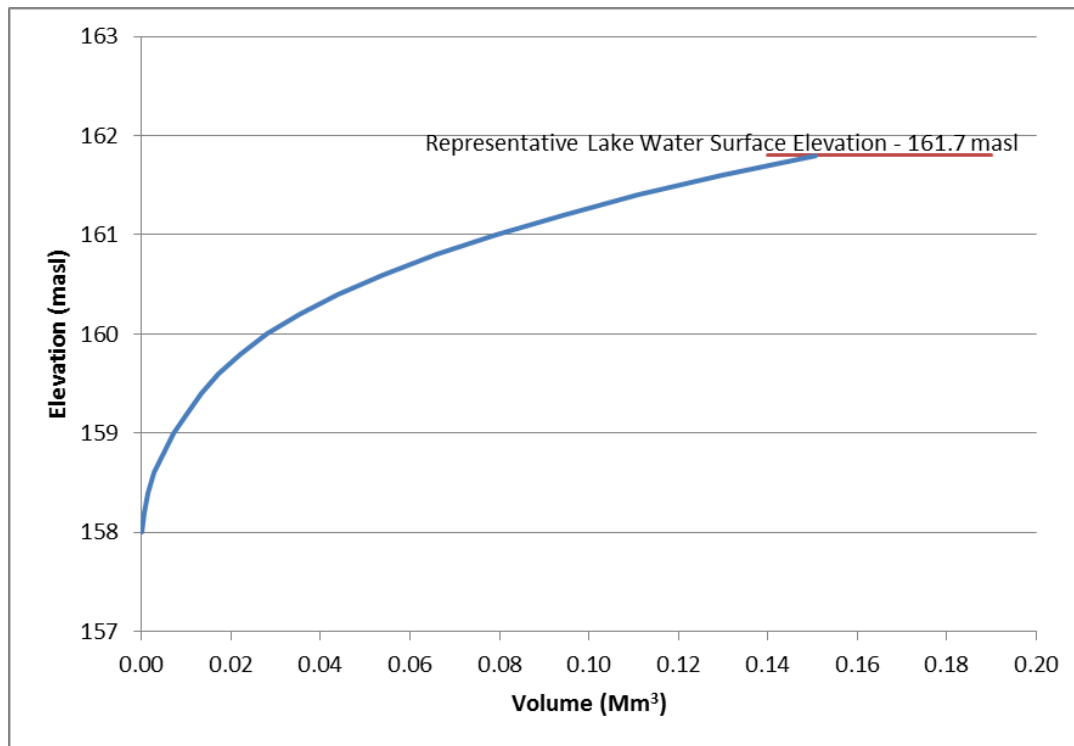


Figure 6-M-23: Lake A53, Elevation-Volume Curve

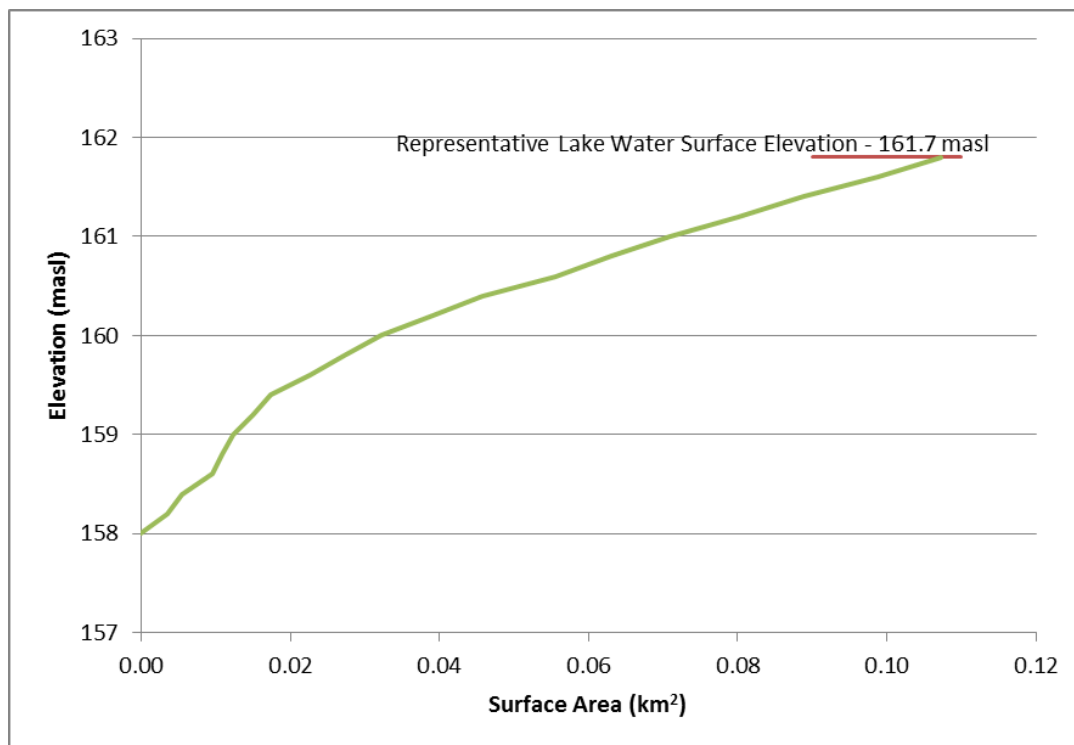


Figure 6-M-24: Lake A53, Elevation-Area Curve



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2015 Baseline Bathymetry

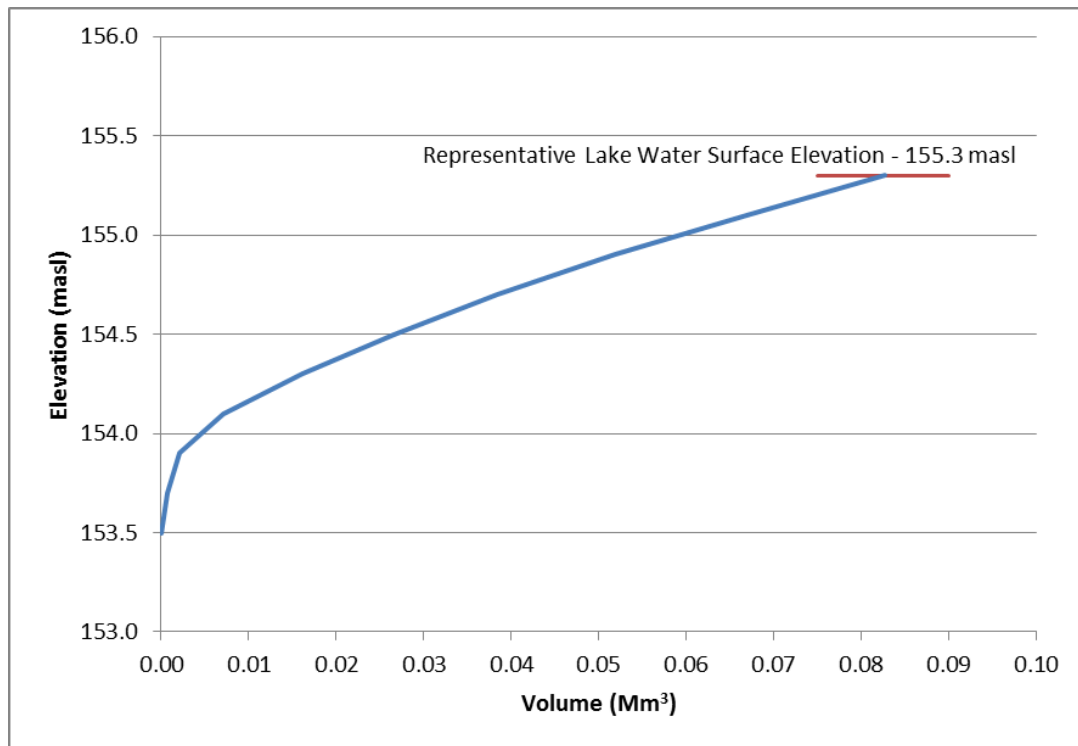


Figure 6-M-25: Lake A55, Elevation-Volume Curve

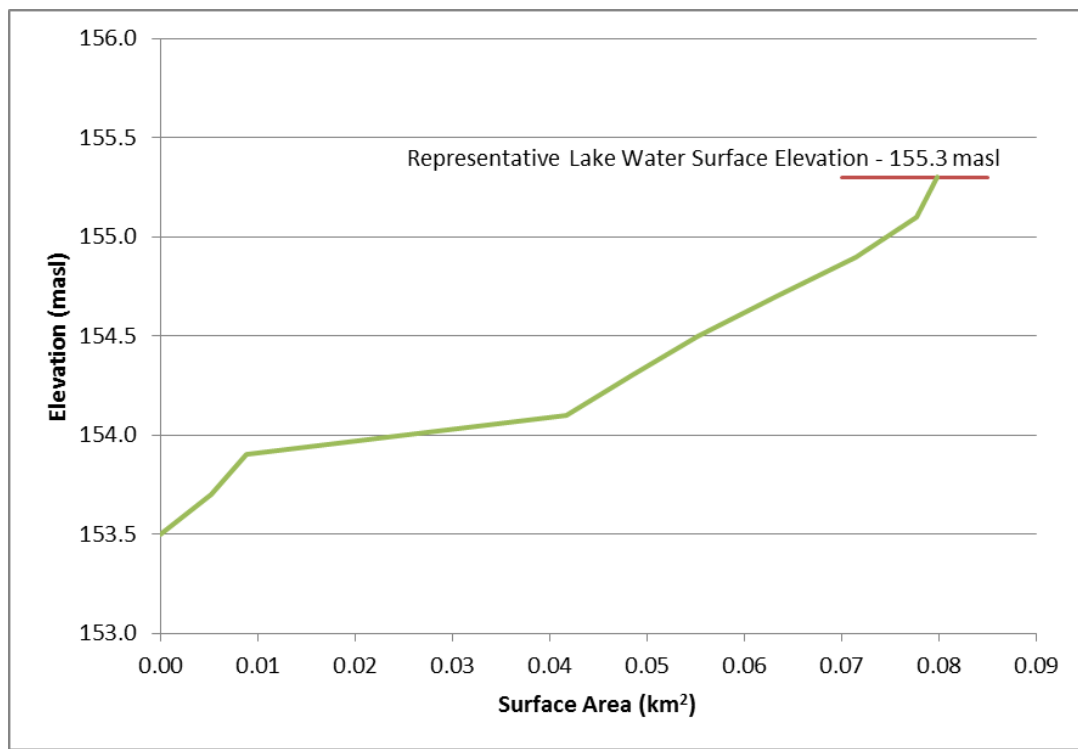


Figure 6-M-26: Lake A55, Elevation-Area Curve



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2015 Baseline Bathymetry

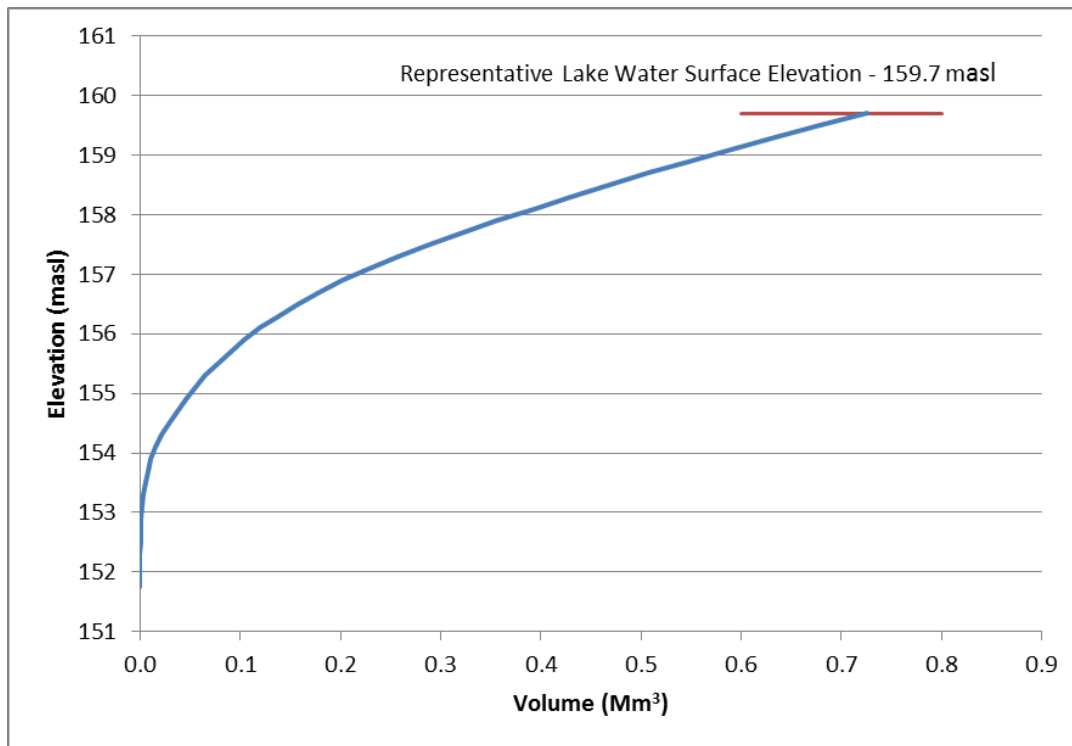


Figure 6-M-27: Lake A56, Elevation-Volume Curve

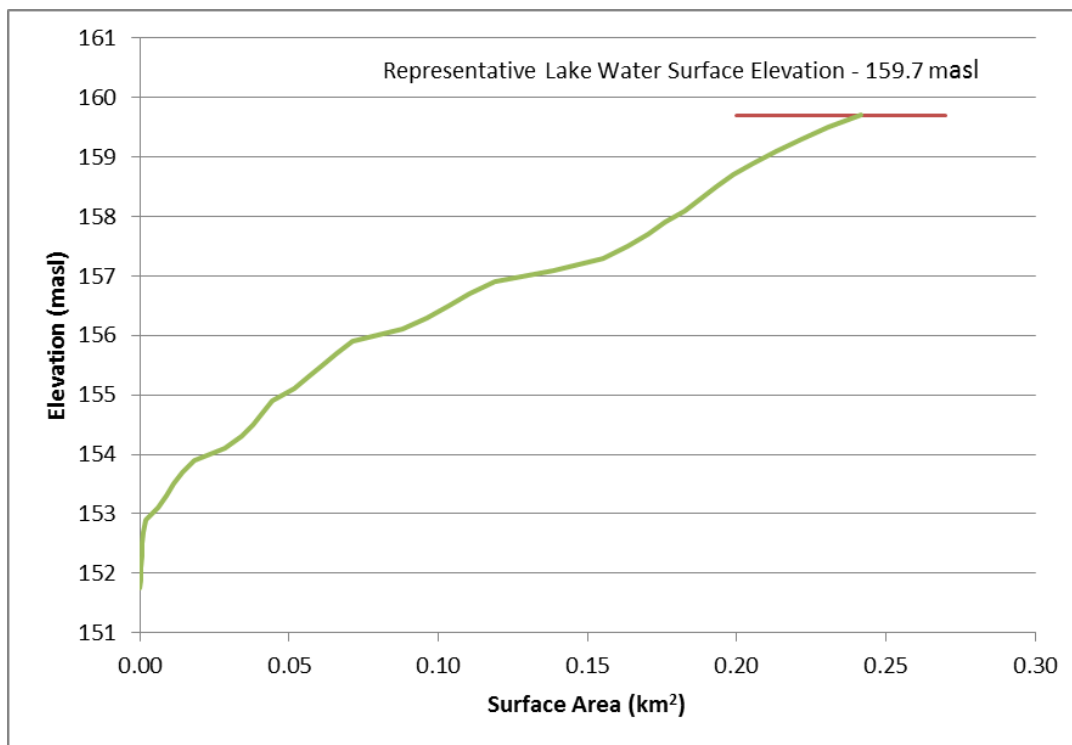


Figure 6-M-28: Lake A56, Elevation-Area Curve



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2015 Baseline Bathymetry

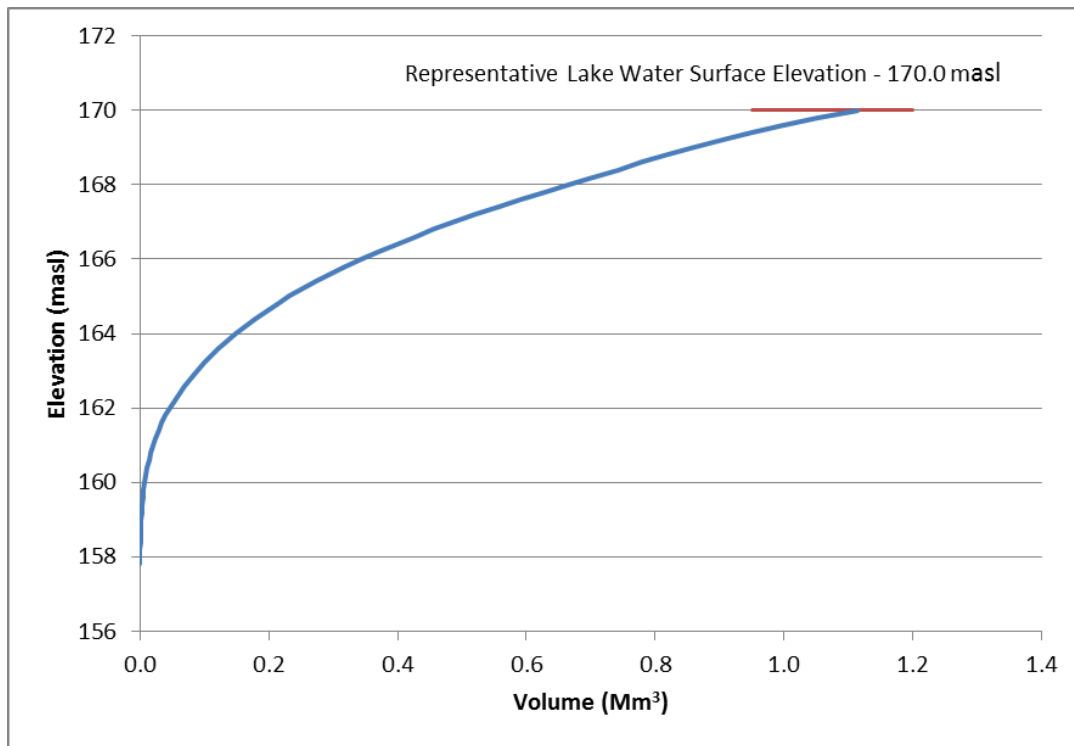


Figure 6-M-29: Lake A60, Elevation-Volume Curve

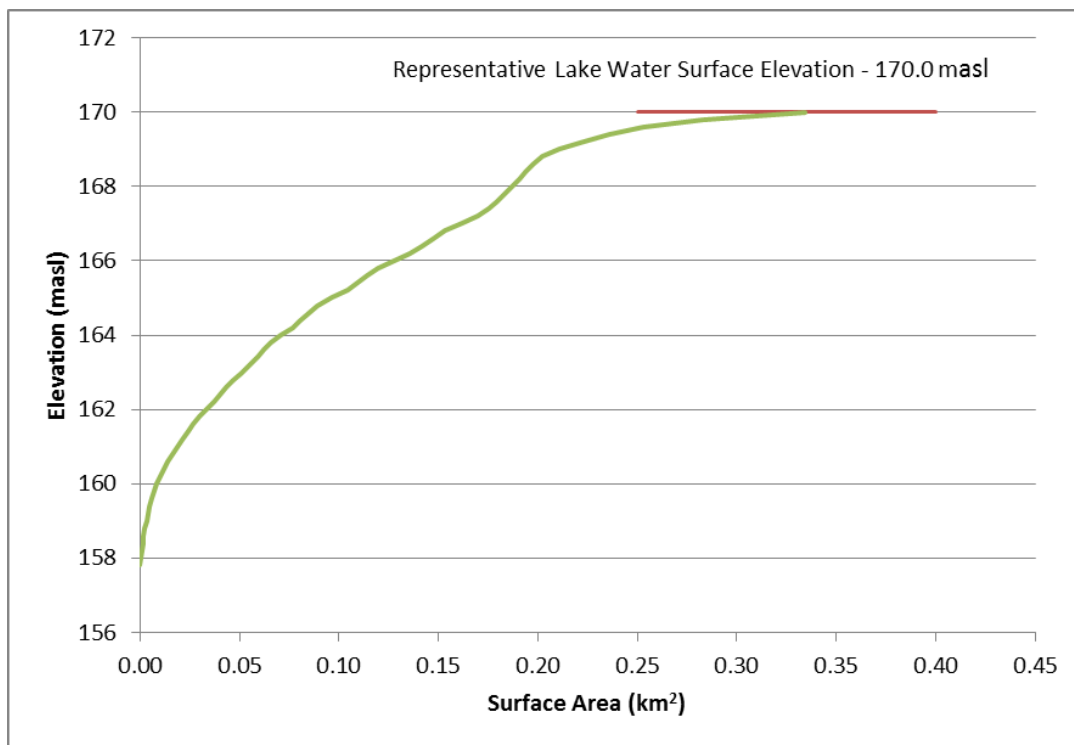


Figure 6-M-30: Lake A60, Elevation-Area Curve



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2015 Baseline Bathymetry

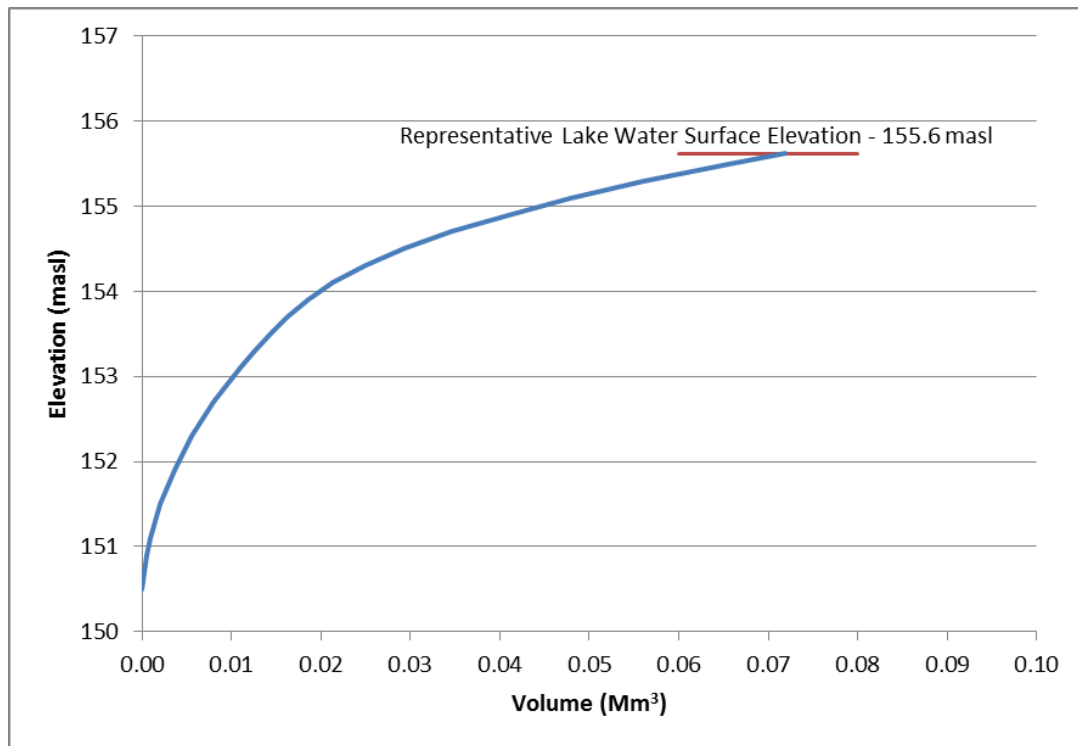


Figure 6-M-31: Lake A62, Elevation-Volume Curve

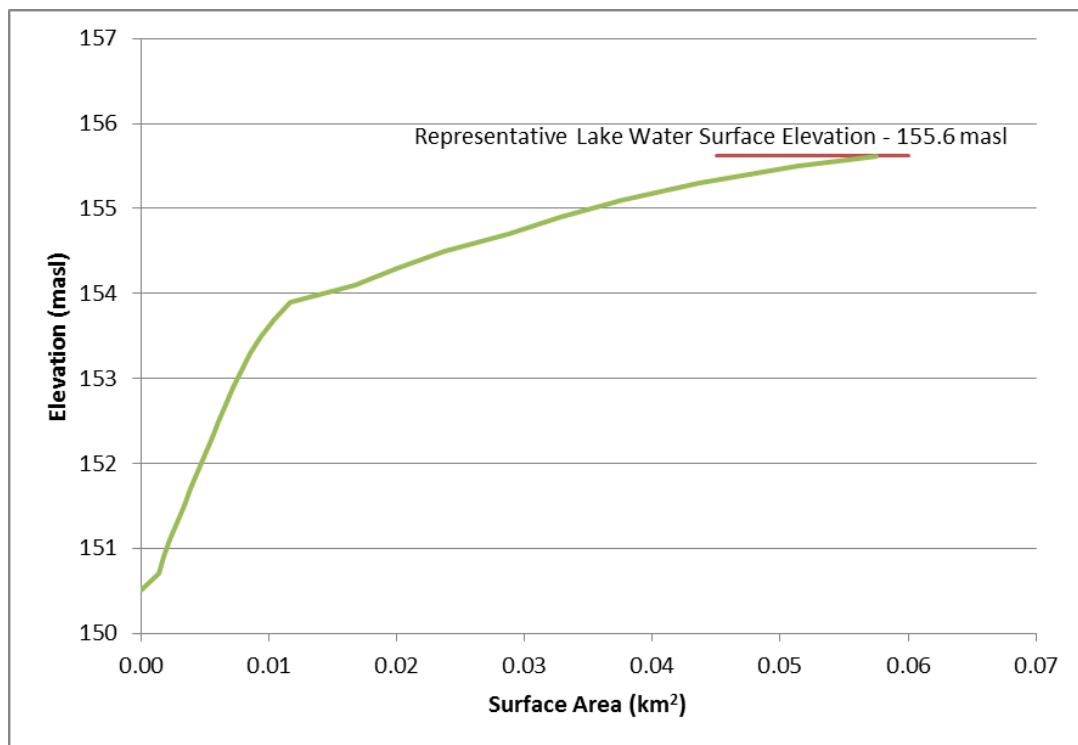


Figure 6-M-32: Lake A62, Elevation-Area Curve



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2015 Baseline Bathymetry

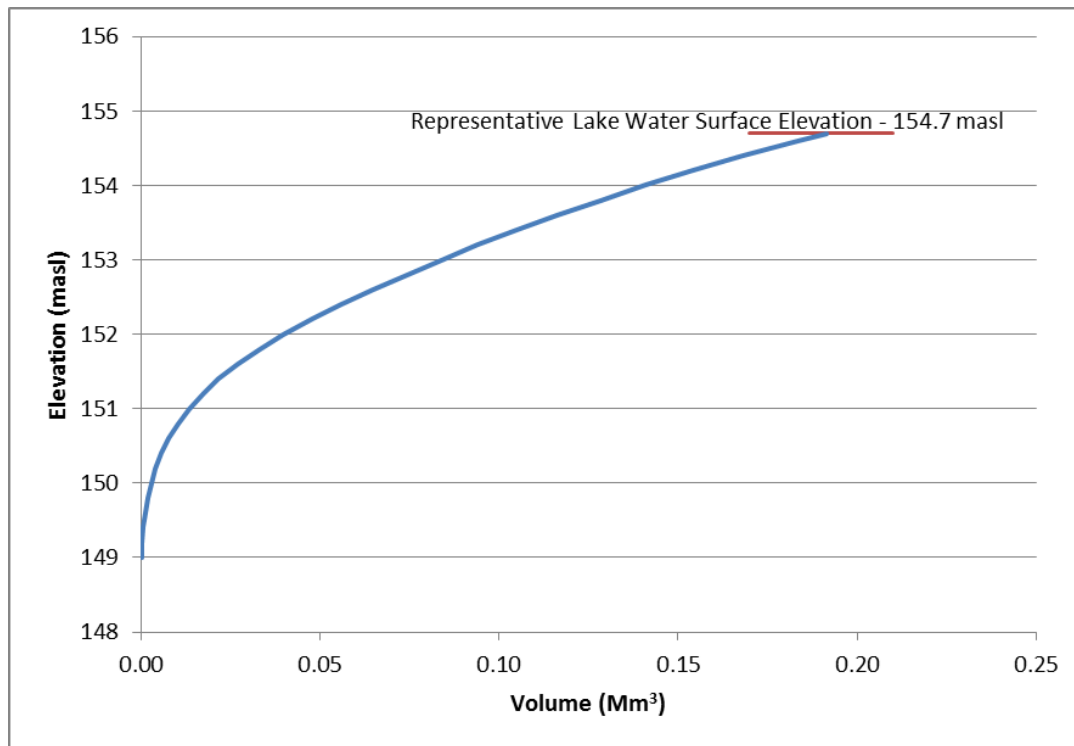


Figure 6-M-33: Lake A63, Elevation-Volume Curve

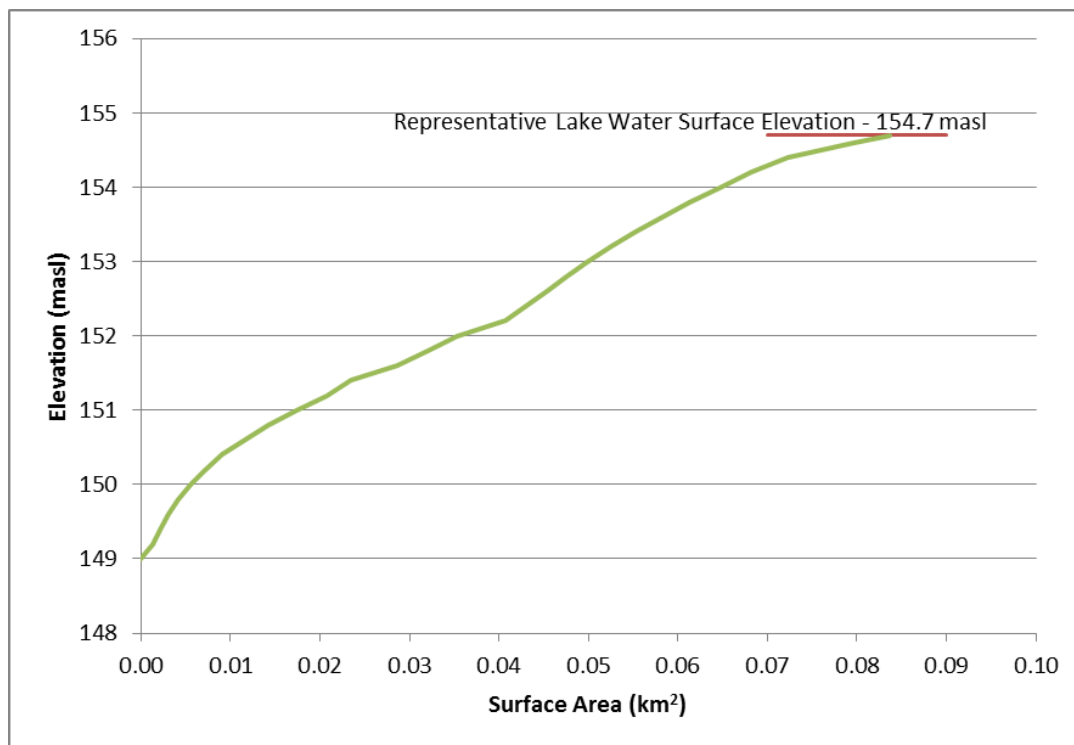


Figure 6-M-34: Lake A63, Elevation-Area Curve



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2015 Baseline Bathymetry

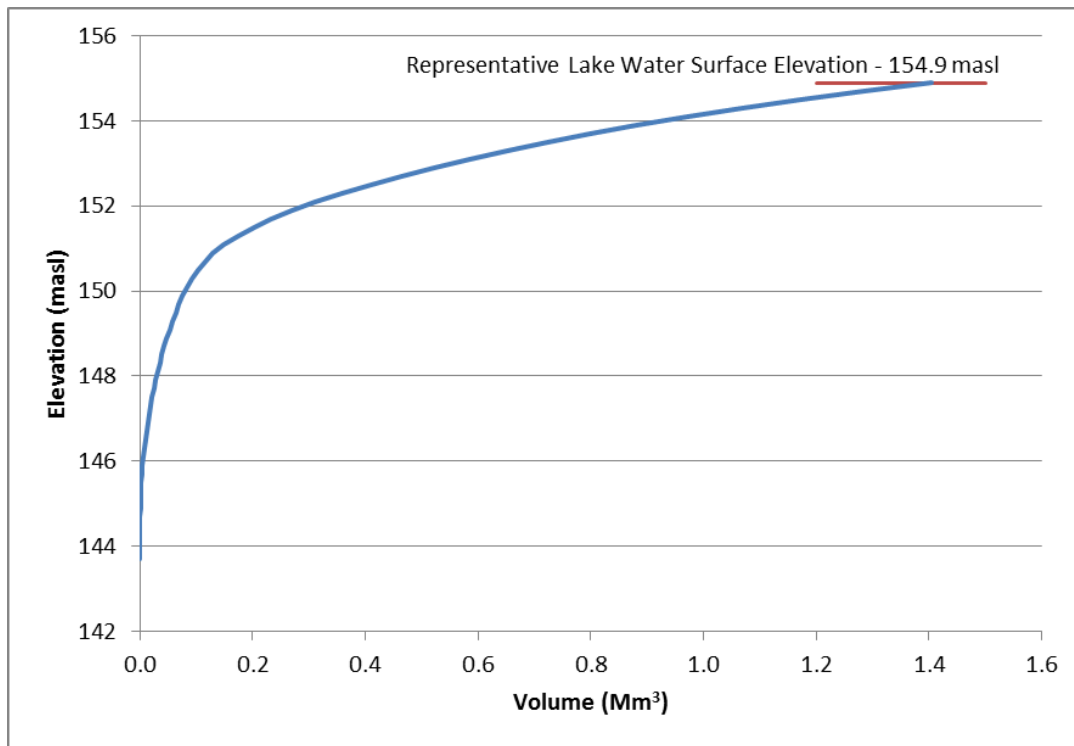


Figure 6-M-35: Lake A65, Elevation-Volume Curve

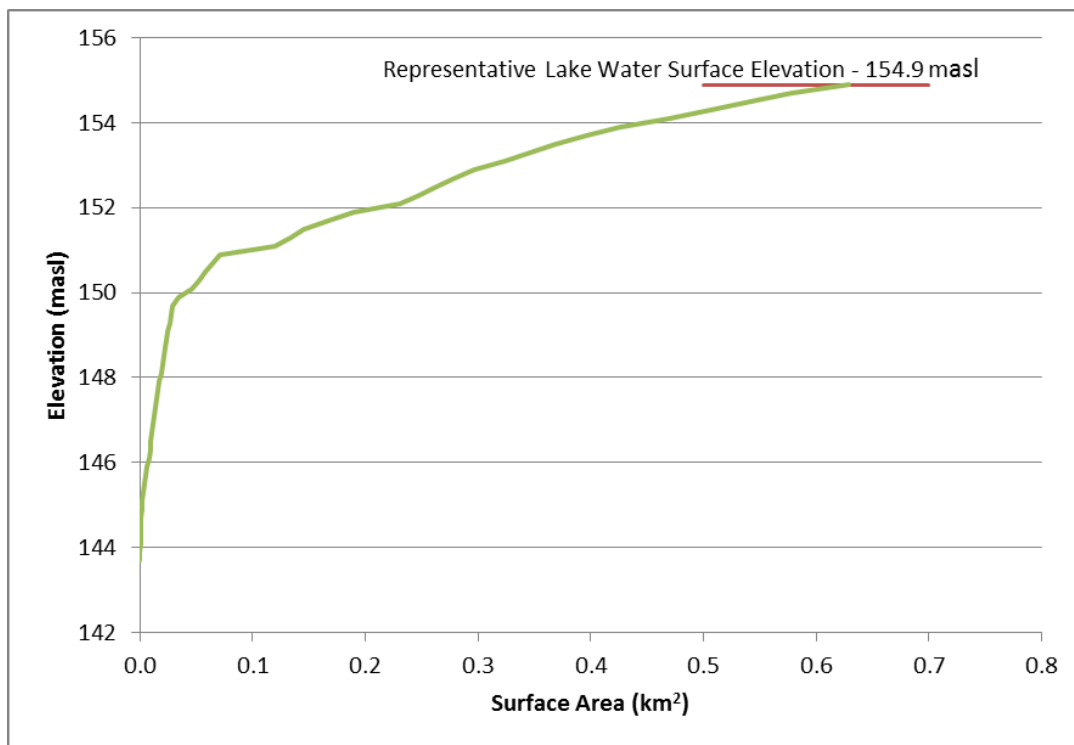


Figure 6-M-36: Lake A65, Elevation-Area Curve



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2015 Baseline Bathymetry

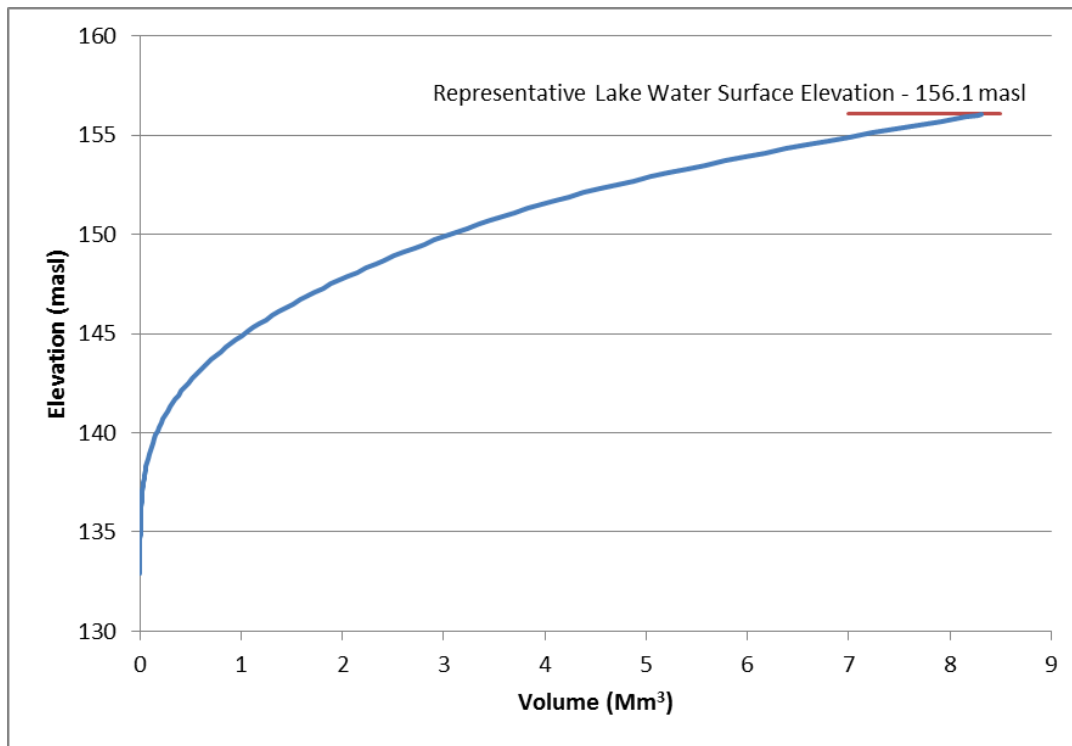


Figure 6-M-37: Lake C38, Elevation-Volume Curve

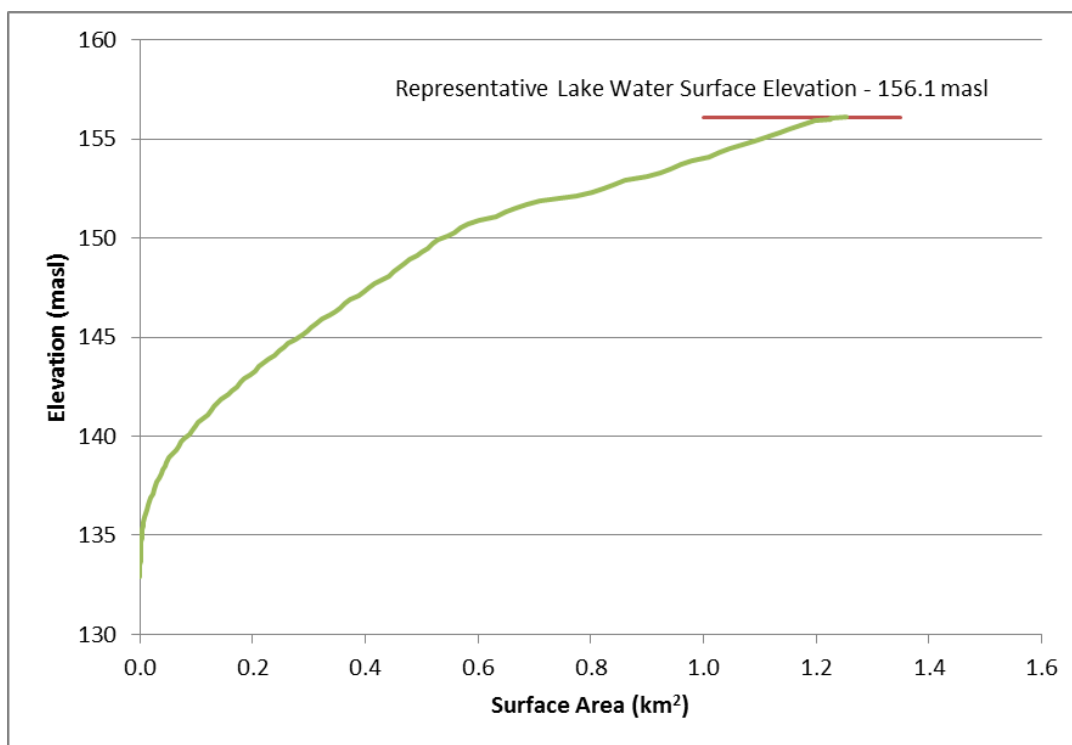


Figure 6-M-38: Lake C38 (Nemo Lake), Elevation-Area Curve



6.M-4 CLOSURE

Bathymetric relationships were derived for 19 lakes at the Project, including Lake A16 (Mammoth Lake), Lake A17 (Whale Tail Lake), Lake A18, Lake A19, Lake A20, Lake A22, Lake A43, Lake A44, Lake A45, Lake A47, Lake A49, Lake A53, Lake A55, Lake A56, Lake A60, Lake A62, Lake A63, Lake A65, and Lake C38 (Nemo Lake). Elevation-area-volume curves were calculated for each lake.

6.M-5 REFERENCES

Agnico Eagle Mines (Agnico Eagle). 2015. Email communications from Serge Ouellet on September 4 and 8, 2015.

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



ATTACHMENT A

Bathymetry

This attachment presents the bathymetric maps (Figure A-1 to Figure A-19), and the tables for the elevation-area-volume curves (Table A-1 to Table A-19) for the Project.

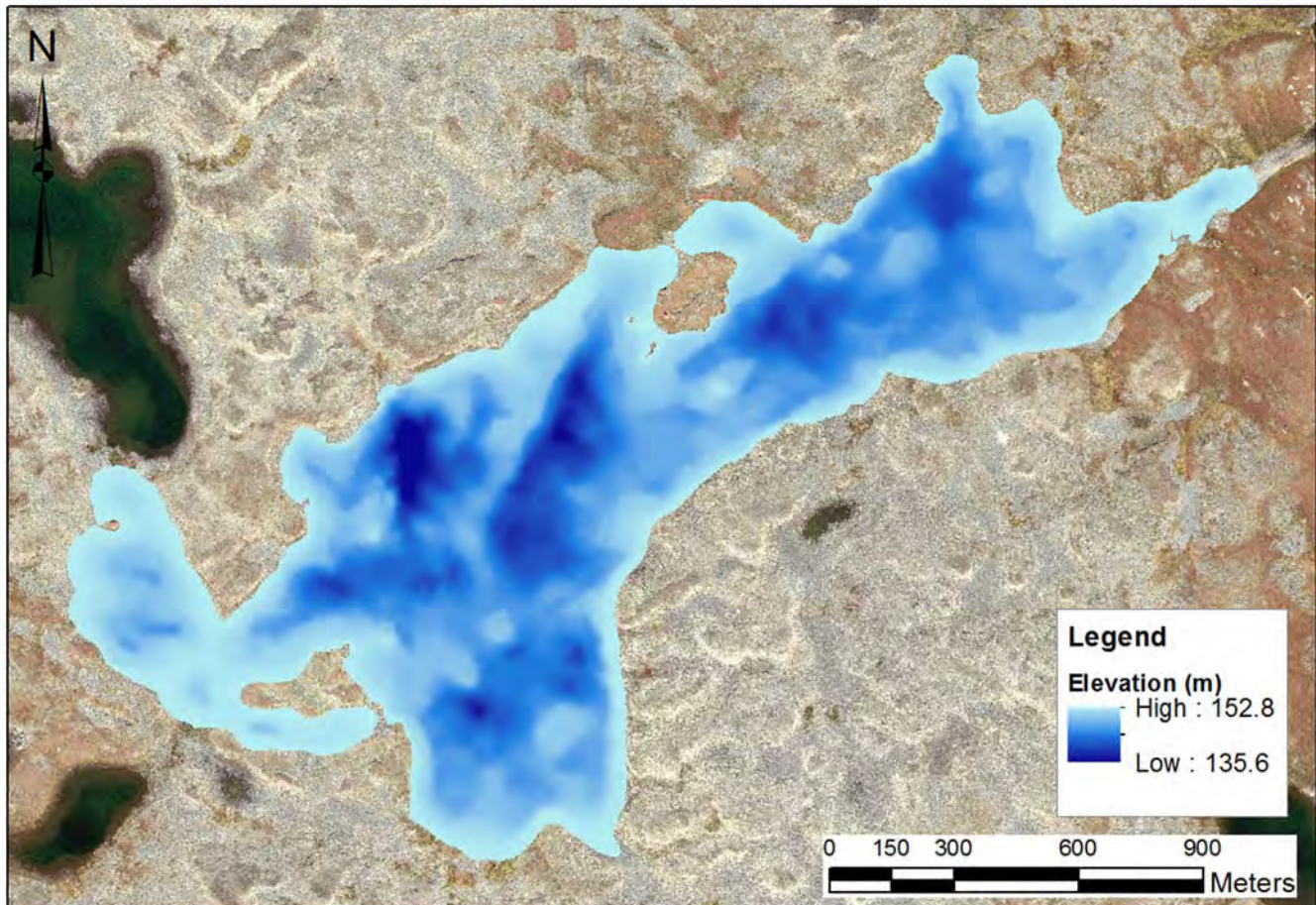


Figure A-1: Bathymetric Map Lake A16



ATTACHMENT A

Bathymetry

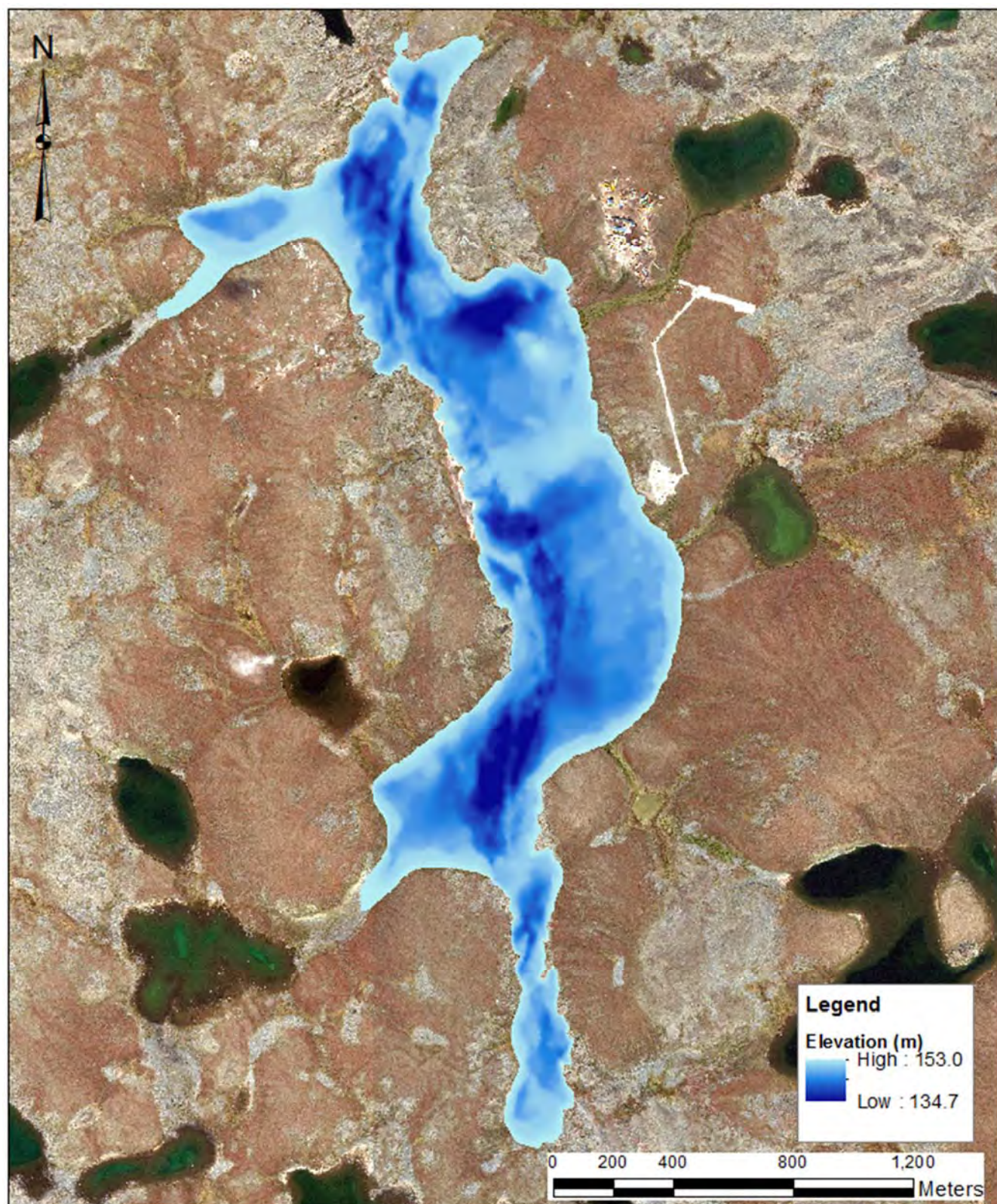


Figure A-2: Bathymetric Map Lake A17



ATTACHMENT A

Bathymetry

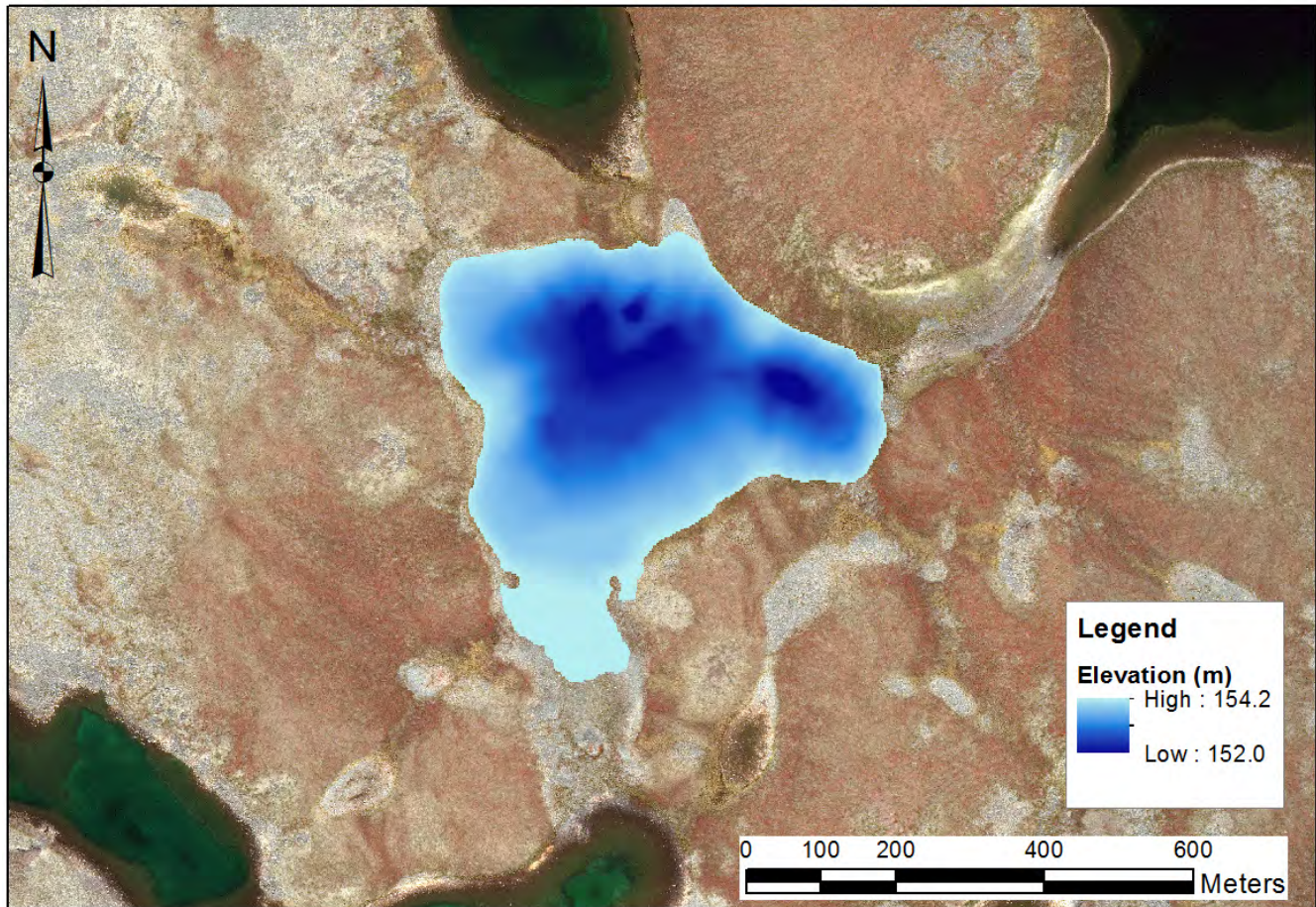


Figure A-3: Bathymetric Map Lake A18



ATTACHMENT A

Bathymetry

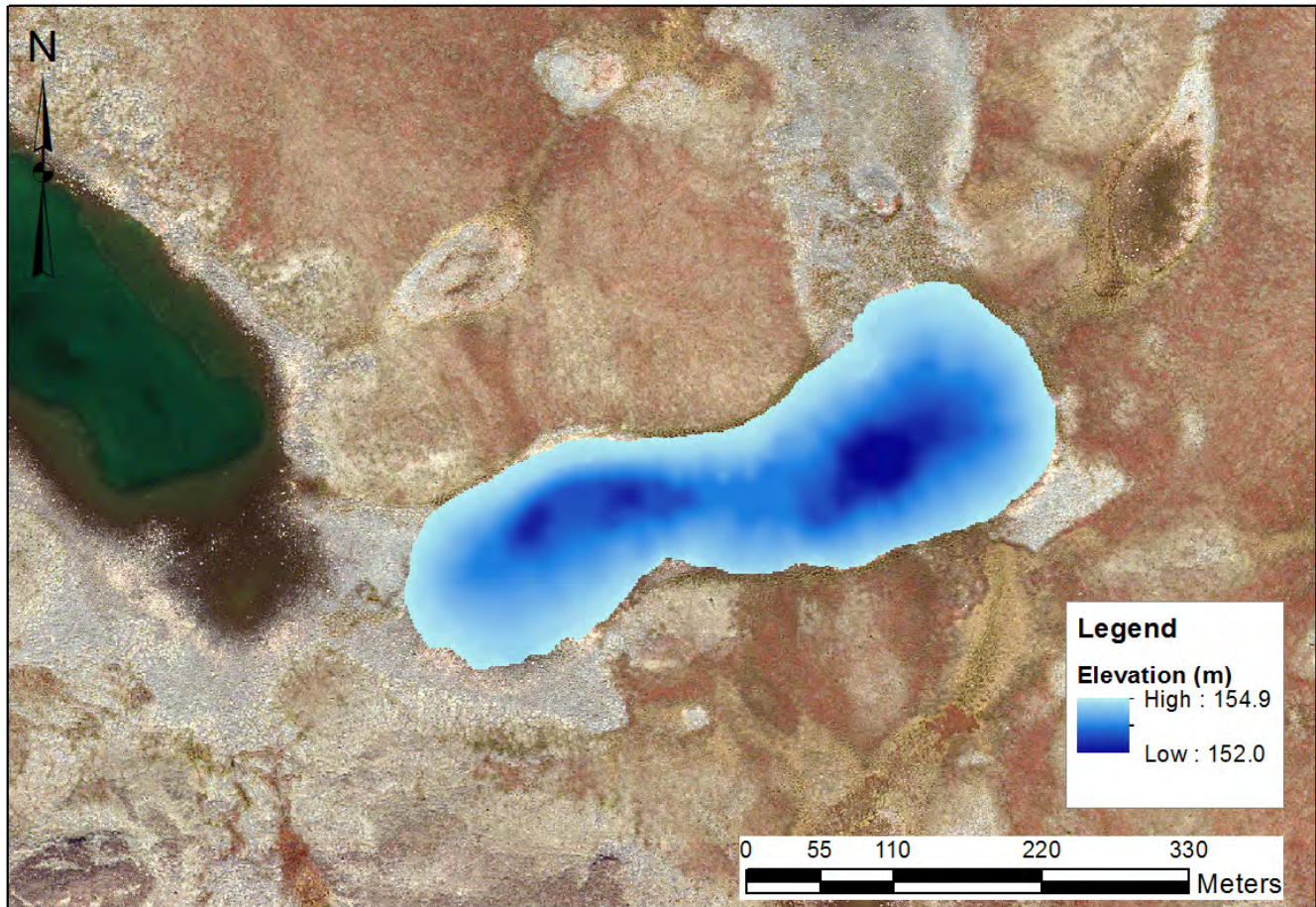


Figure A-4: Bathymetric Map Lake A19



ATTACHMENT A

Bathymetry

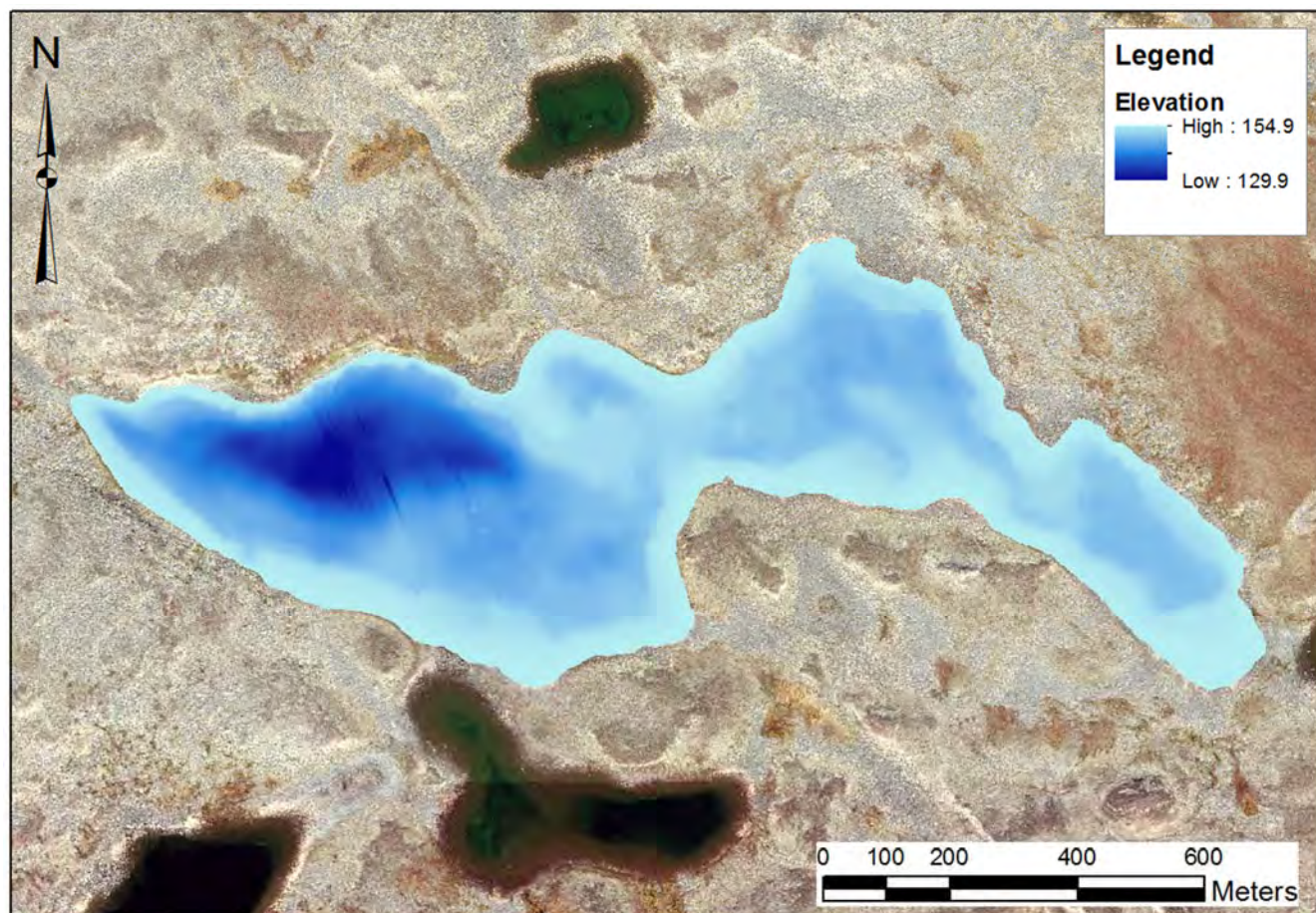


Figure A-5: Bathymetric Map Lake A20



ATTACHMENT A

Bathymetry

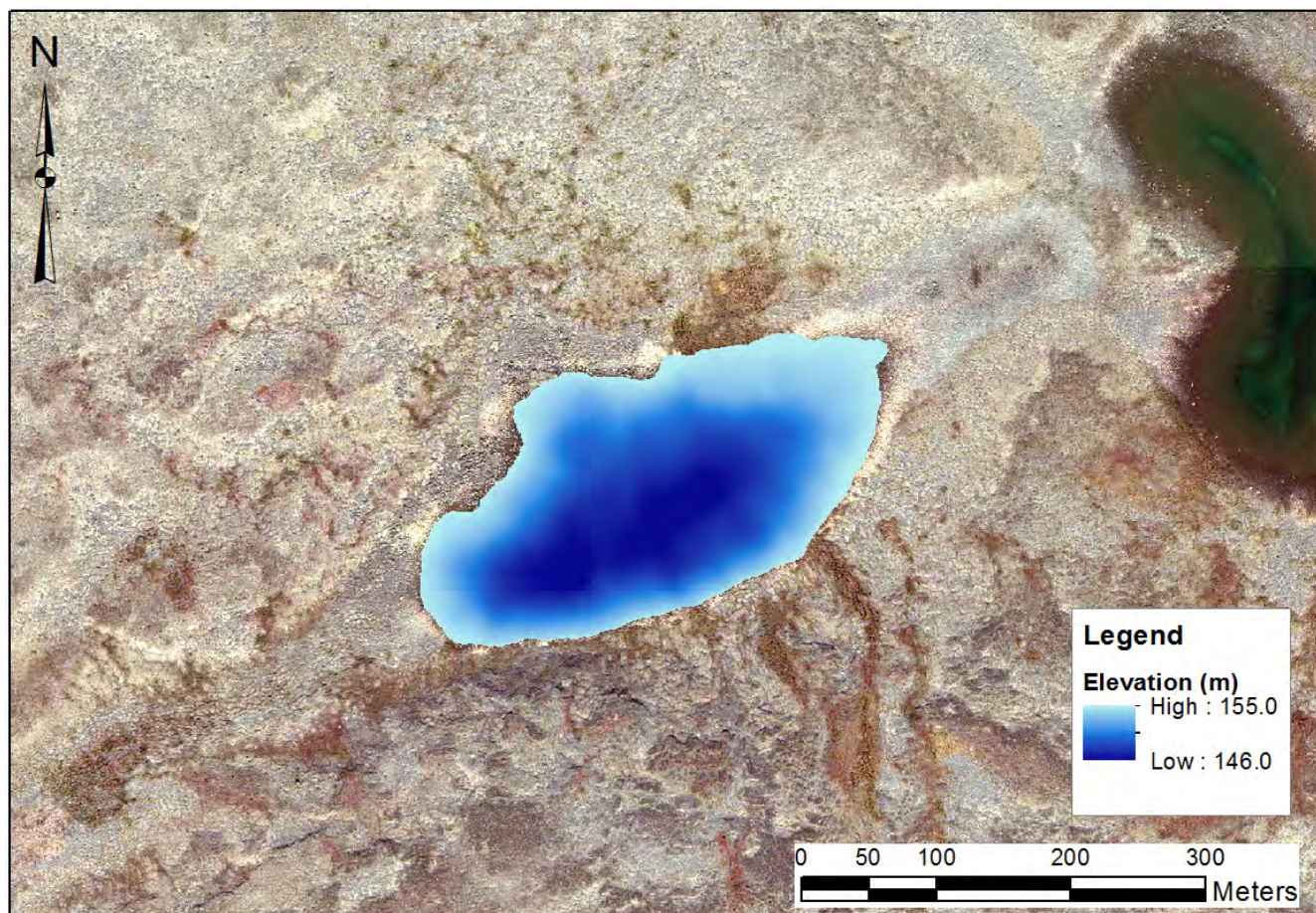


Figure A-6: Bathymetric Map Lake A22



ATTACHMENT A

Bathymetry

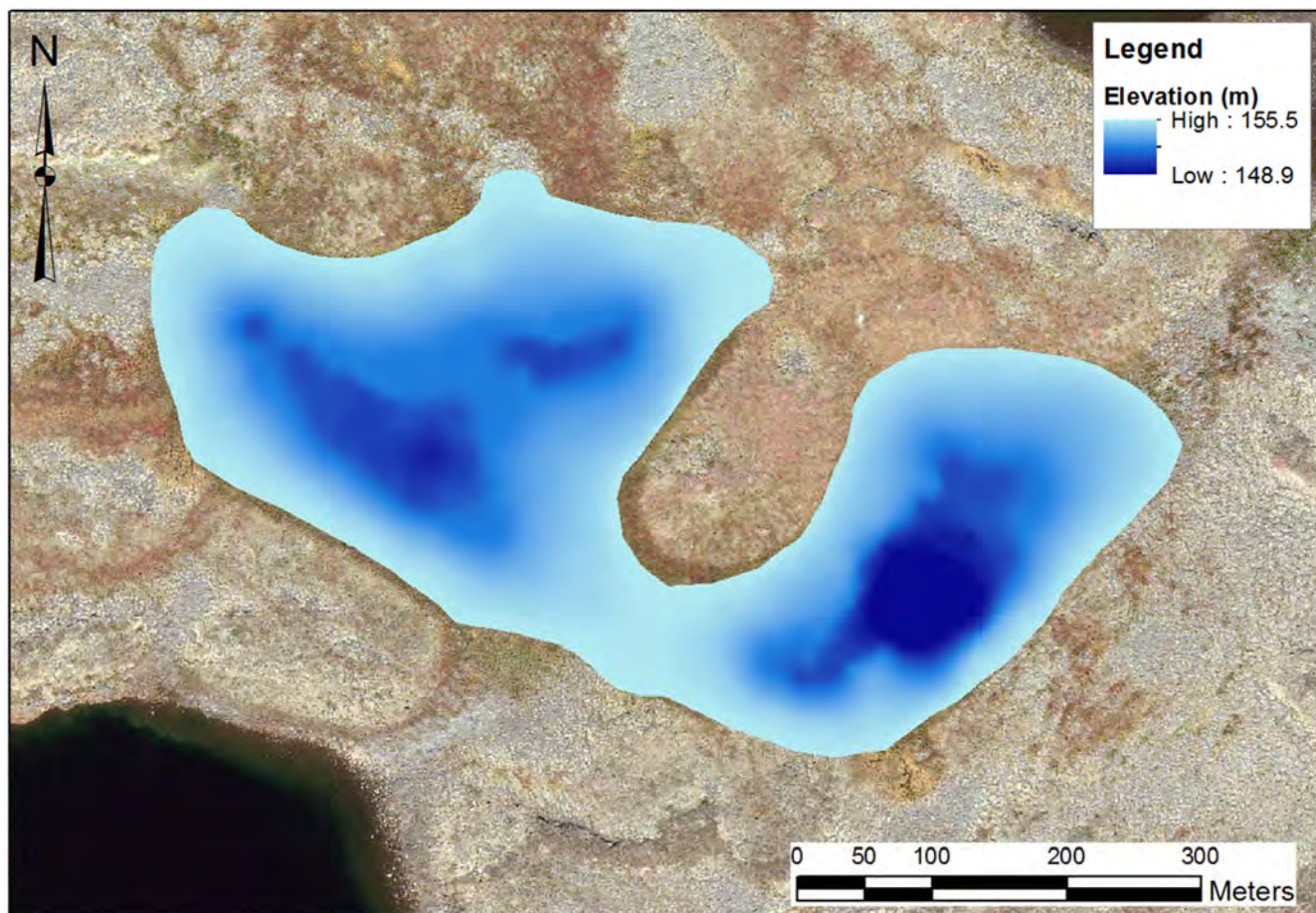


Figure A-7: Bathymetric Map Lake A43



ATTACHMENT A

Bathymetry

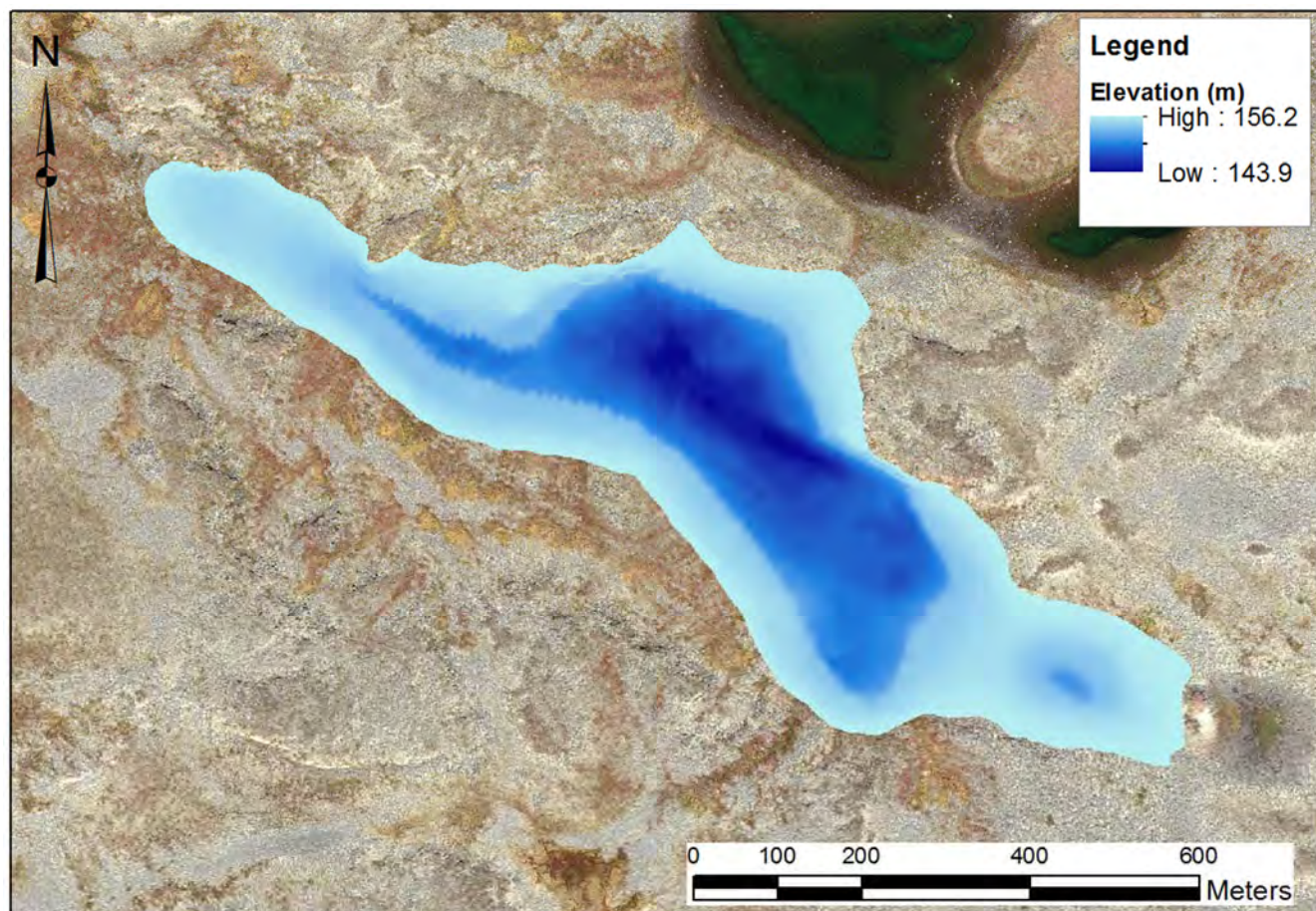


Figure A-8: Bathymetric Map Lake A44



ATTACHMENT A

Bathymetry

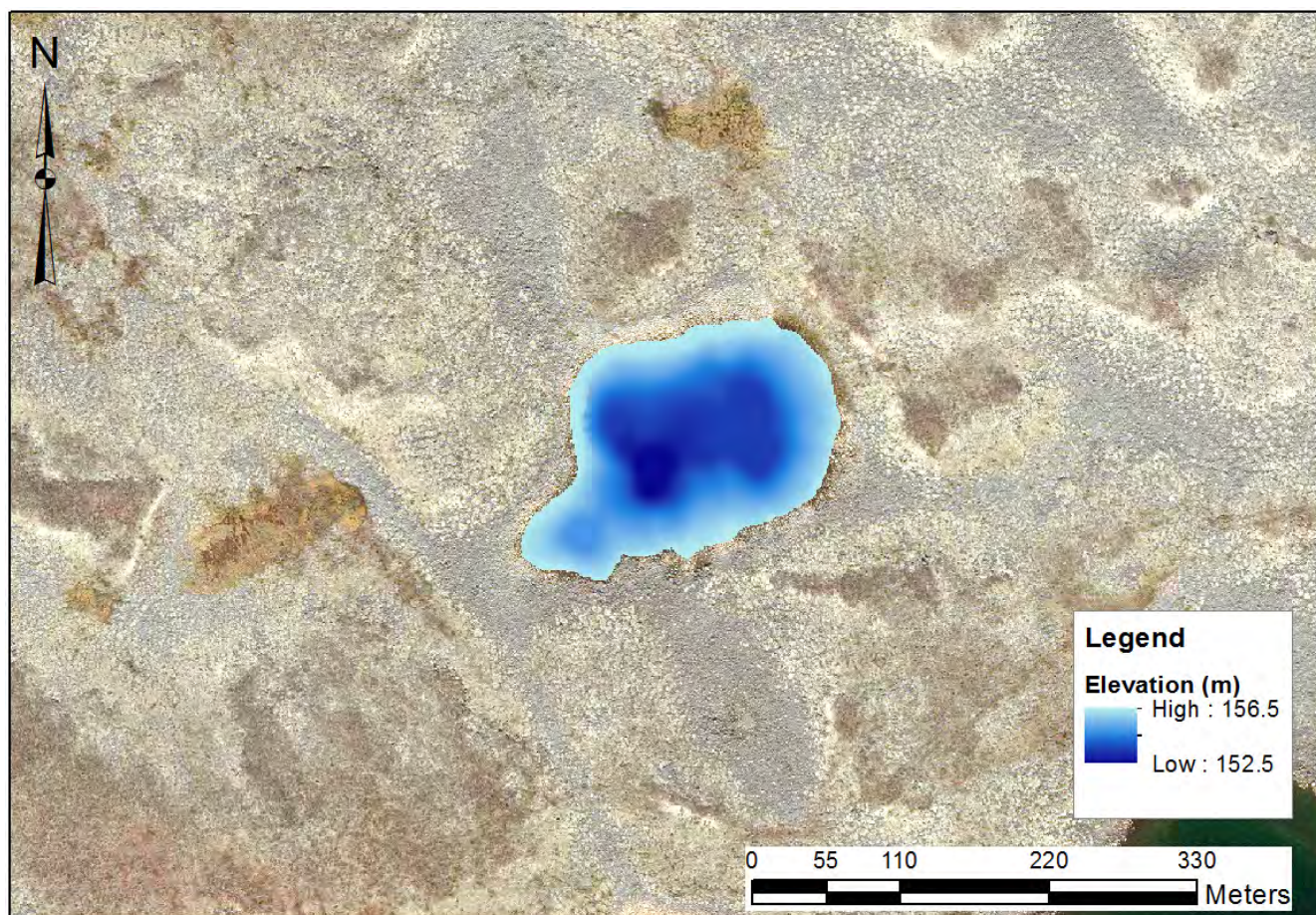


Figure A-9: Bathymetric Map Lake A45



ATTACHMENT A

Bathymetry

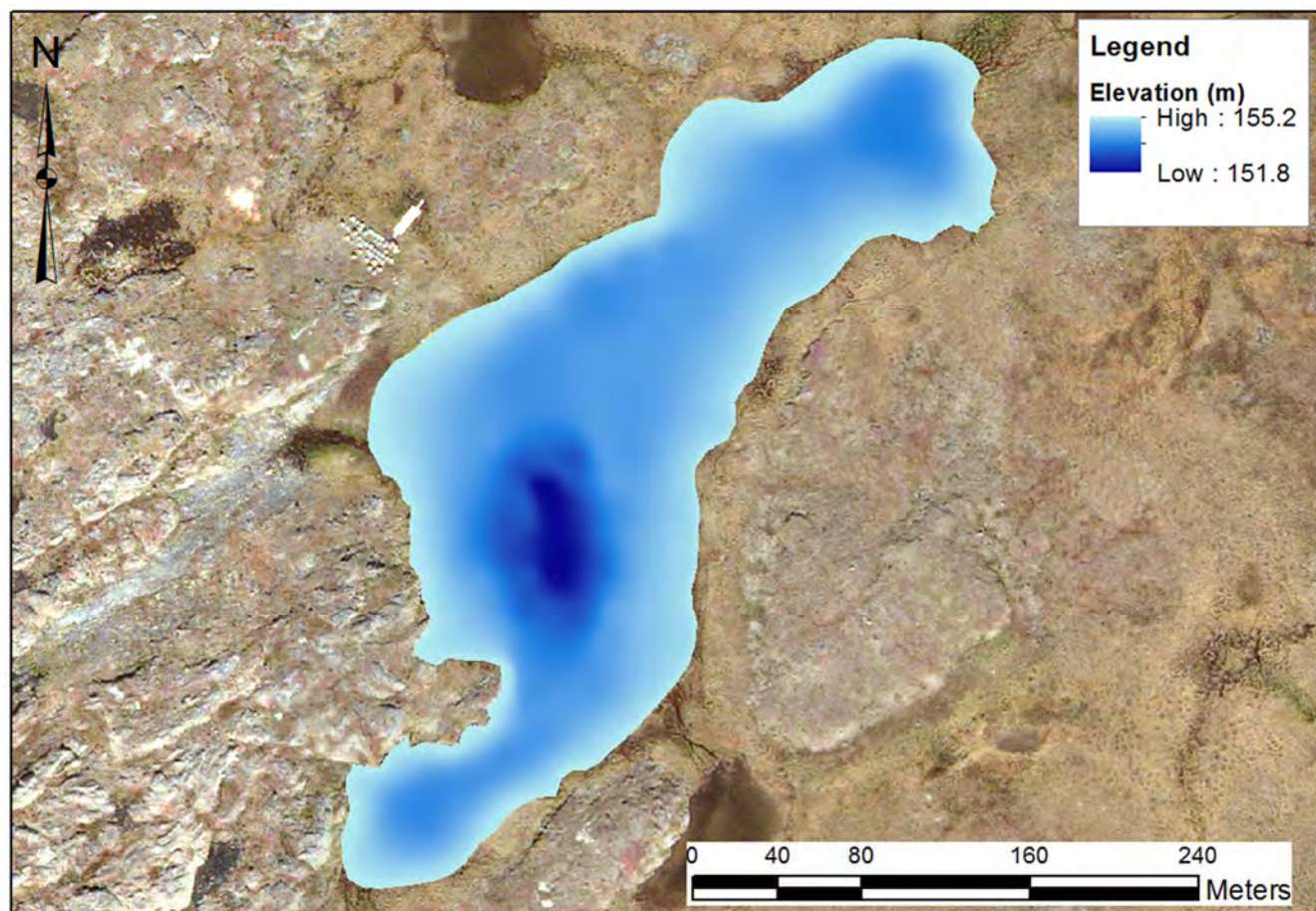


Figure A-10: Bathymetric Map Lake A47



ATTACHMENT A

Bathymetry

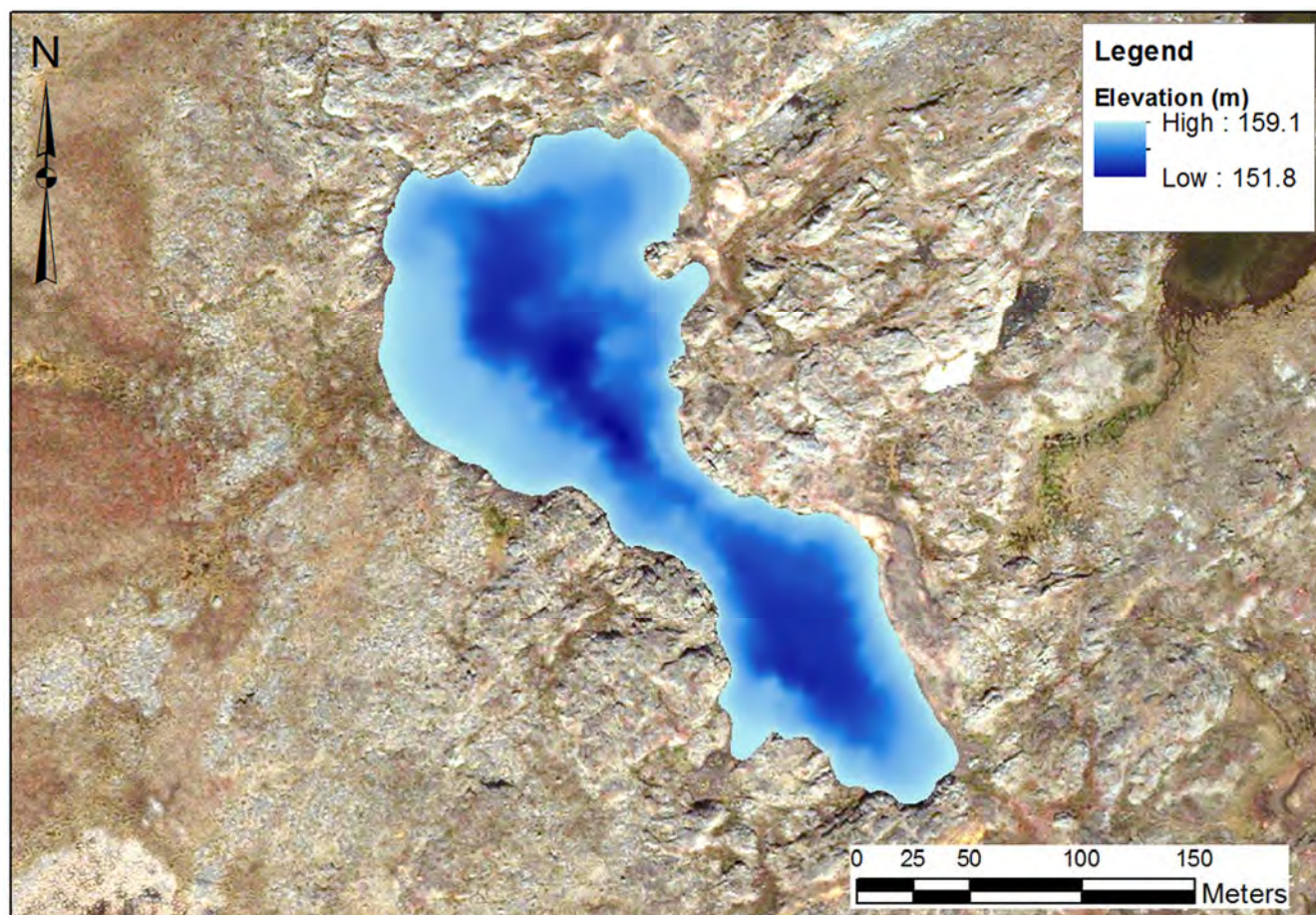


Figure A-11: Bathymetric Map Lake A49



ATTACHMENT A

Bathymetry

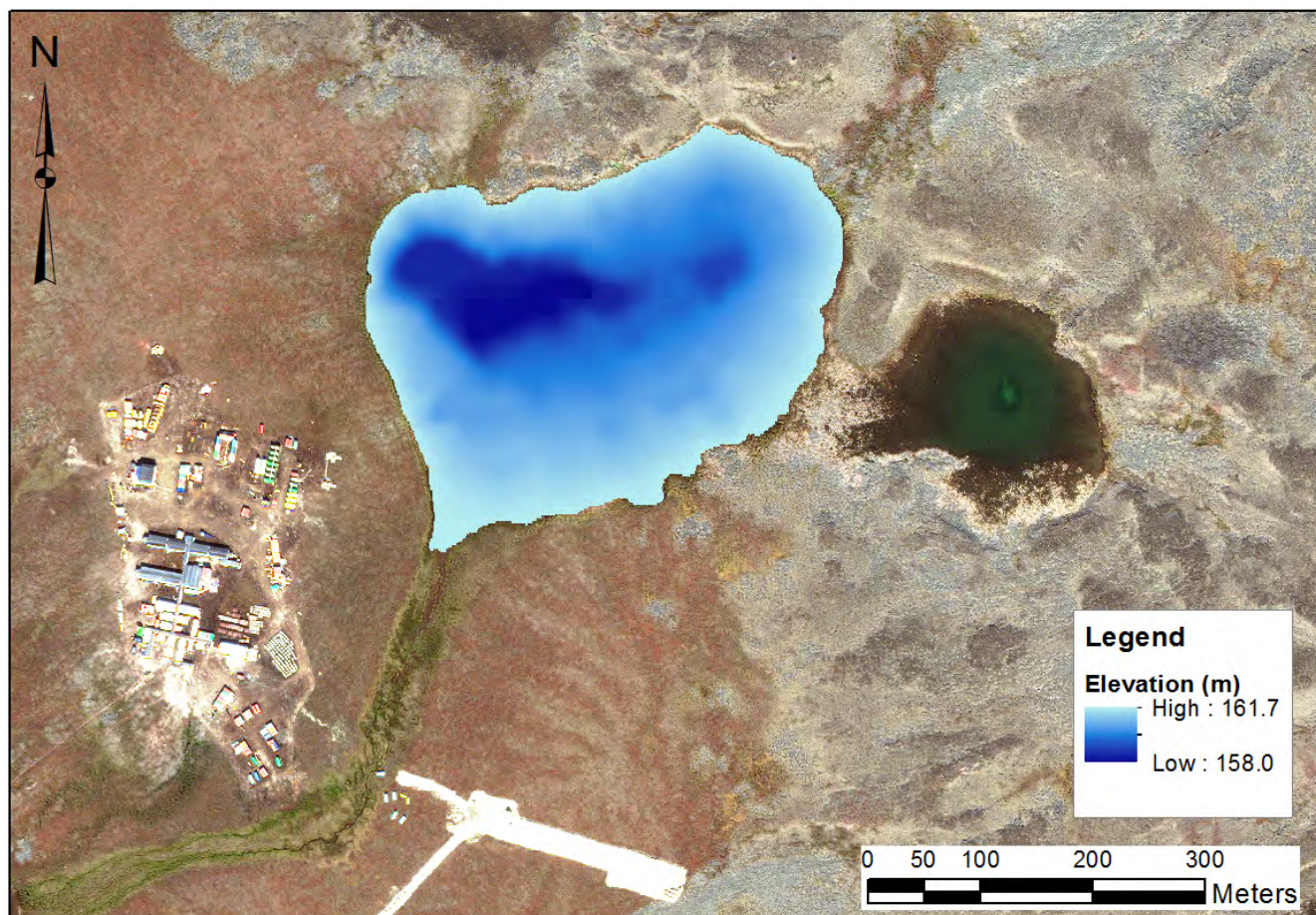


Figure A-12: Bathymetric Map Lake A53



ATTACHMENT A

Bathymetry

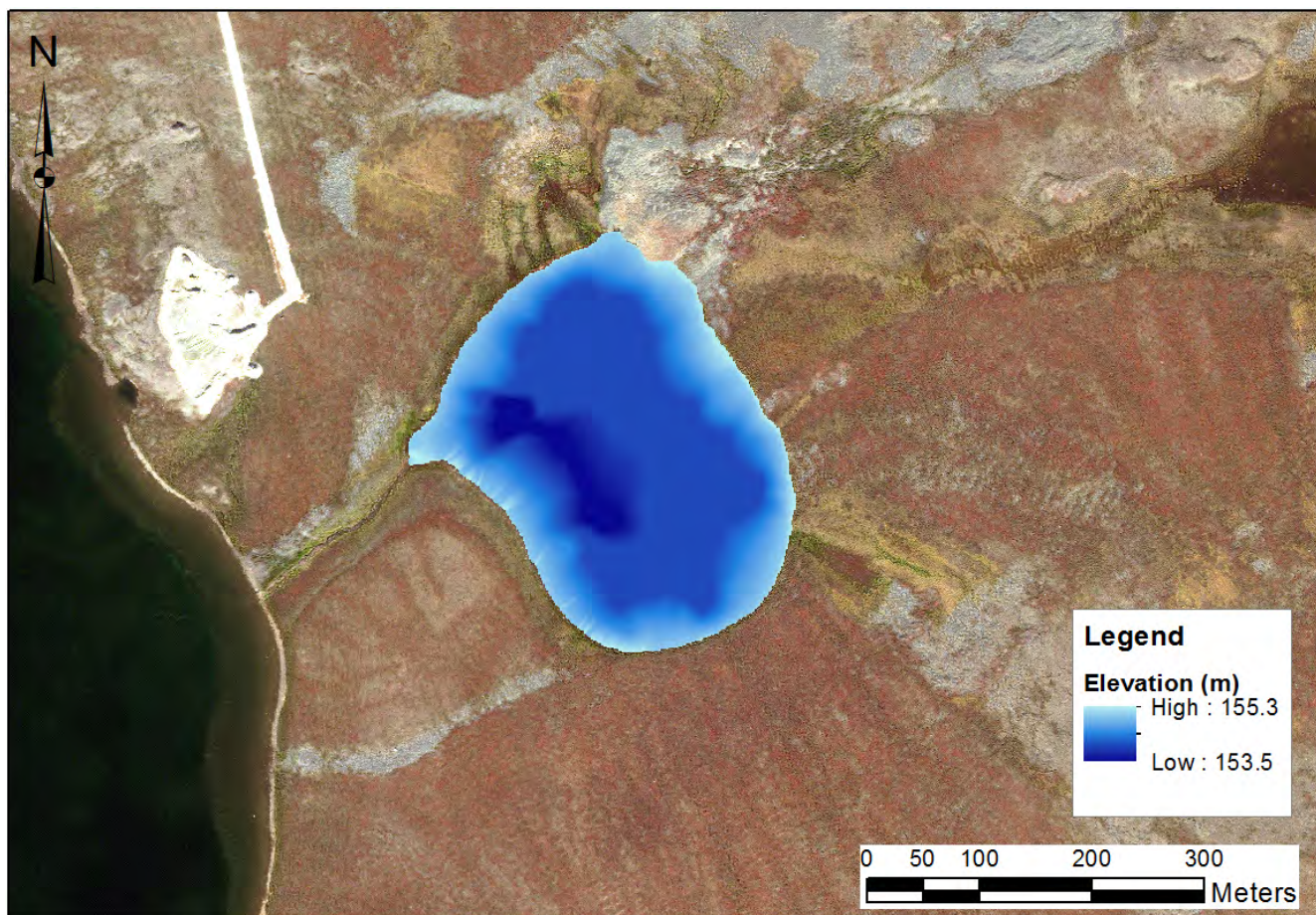


Figure A-13: Bathymetric Map Lake A55



ATTACHMENT A

Bathymetry

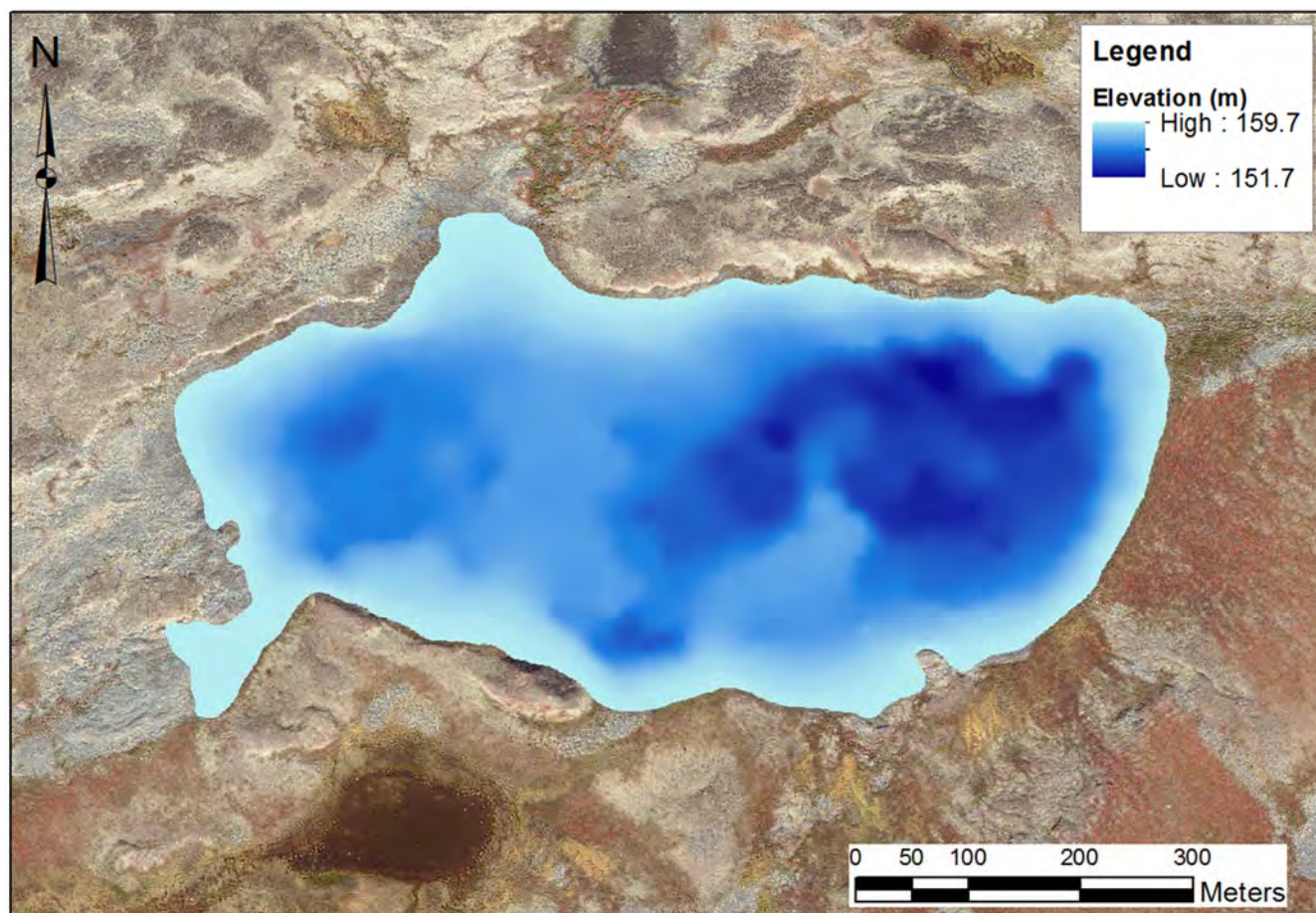


Figure A-14: Bathymetric Map Lake A56



ATTACHMENT A

Bathymetry

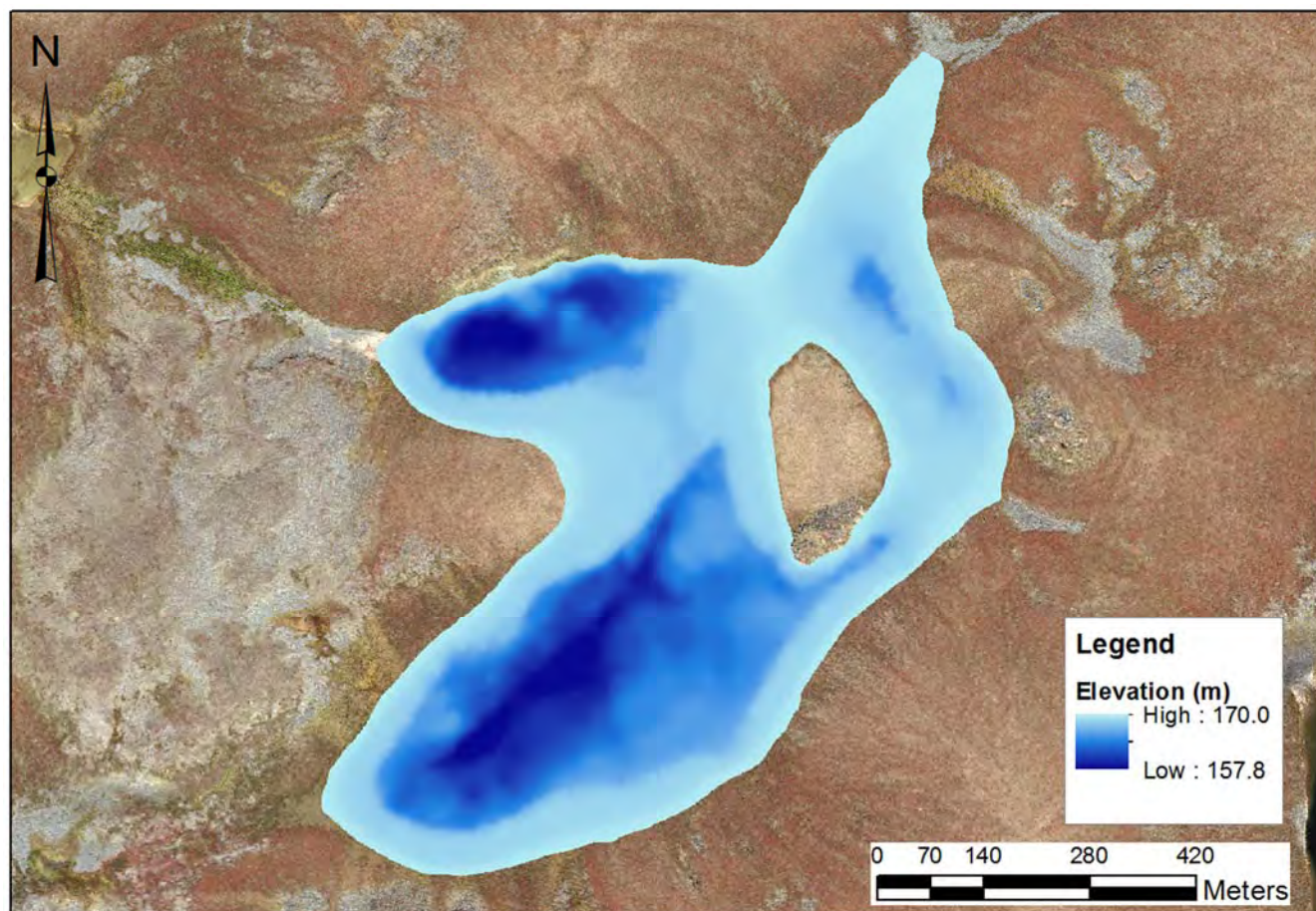


Figure A-15: Bathymetric Map Lake A60



ATTACHMENT A

Bathymetry

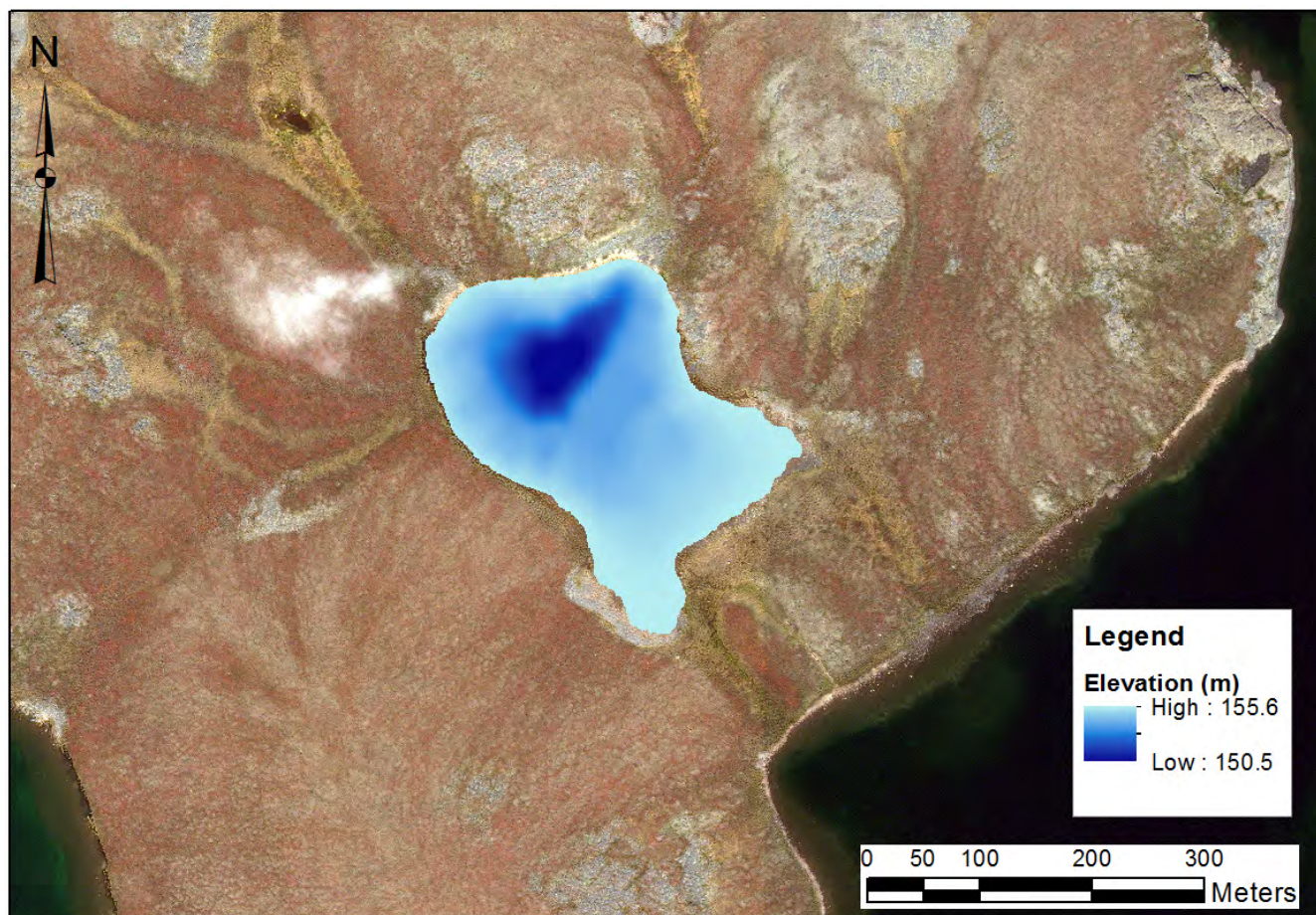


Figure A-16: Bathymetric Map Lake A62



ATTACHMENT A

Bathymetry

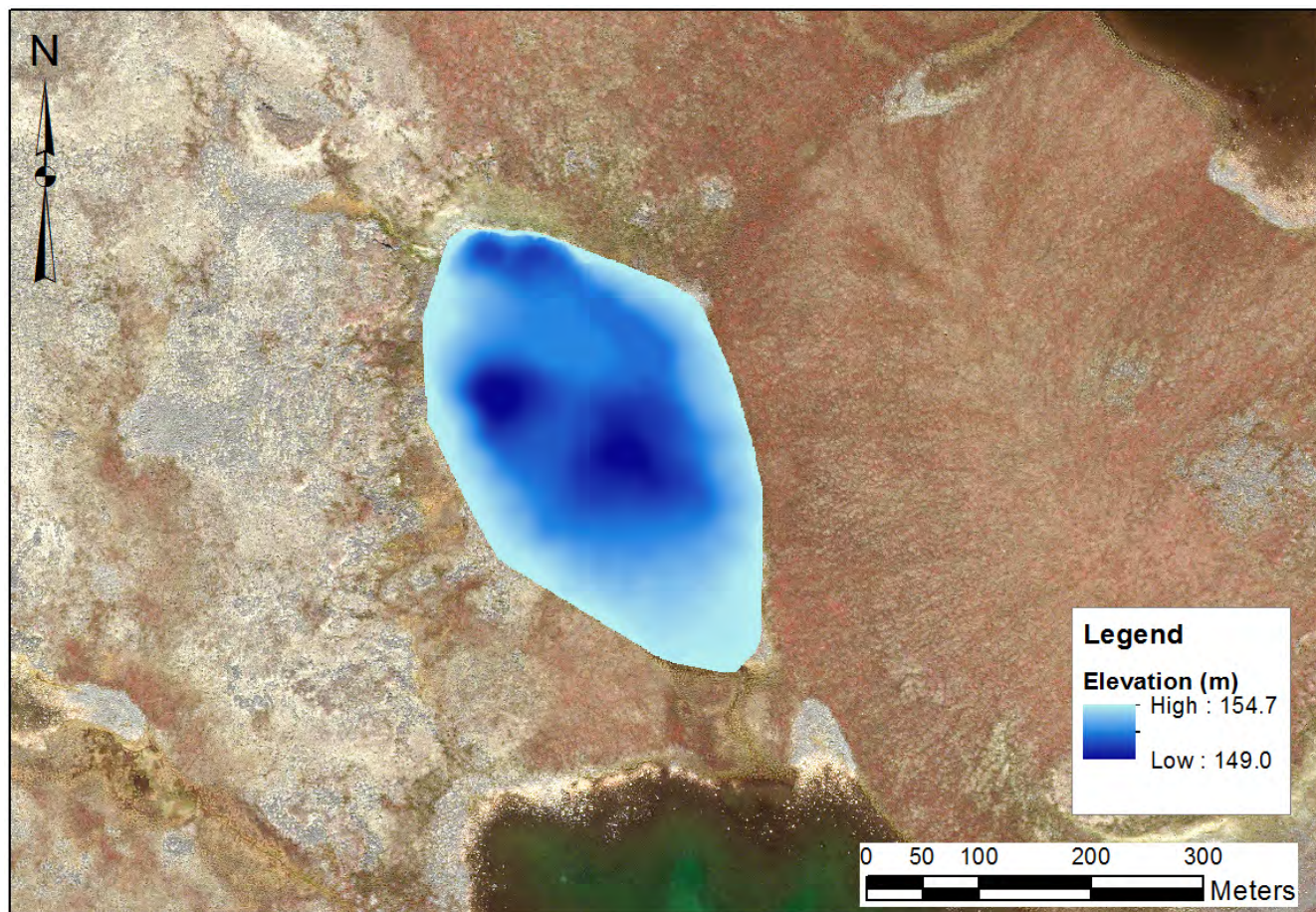


Figure A-17: Bathymetric Map Lake A63



ATTACHMENT A

Bathymetry

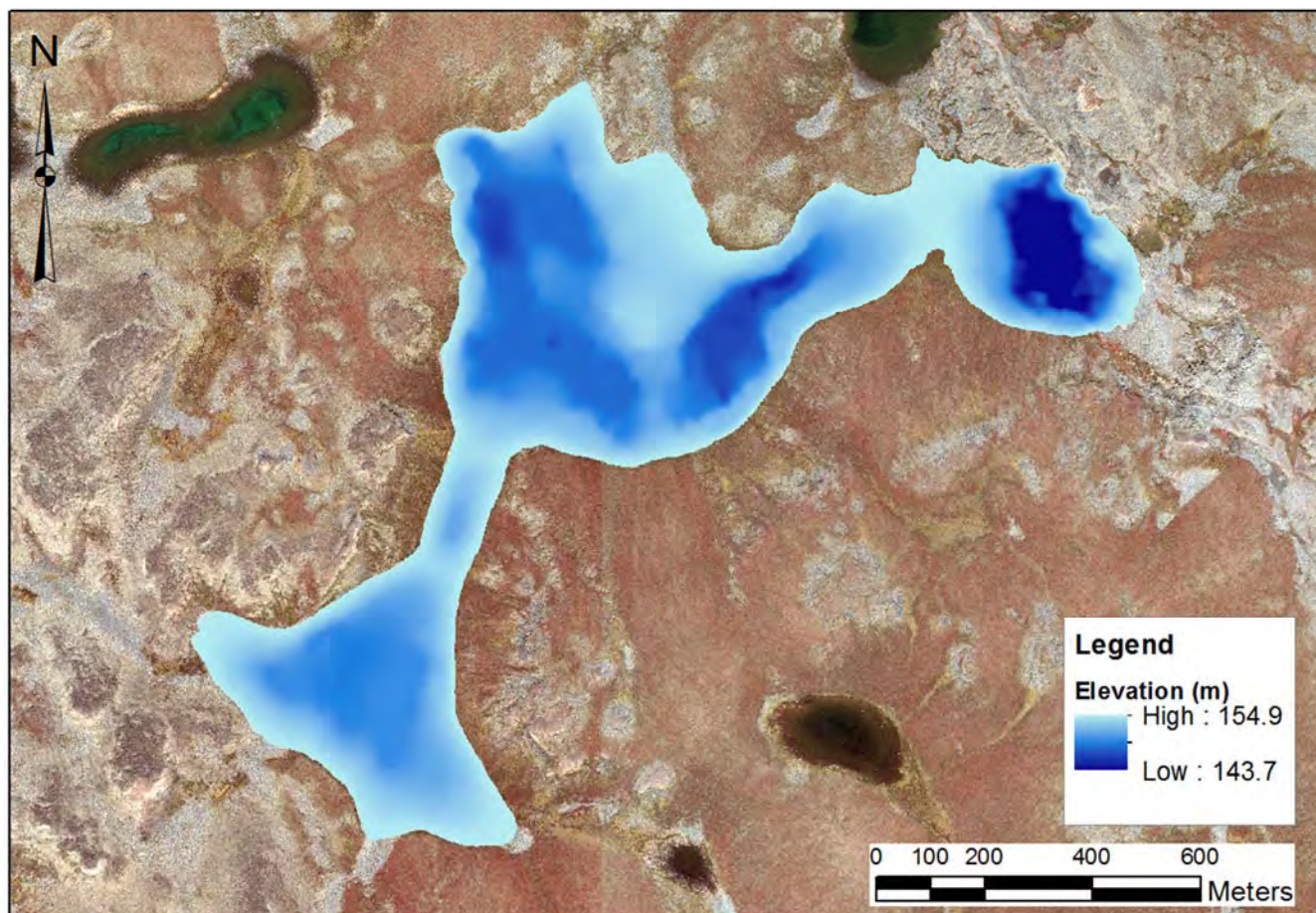


Figure A-18: Bathymetric Map Lake A65



ATTACHMENT A

Bathymetry

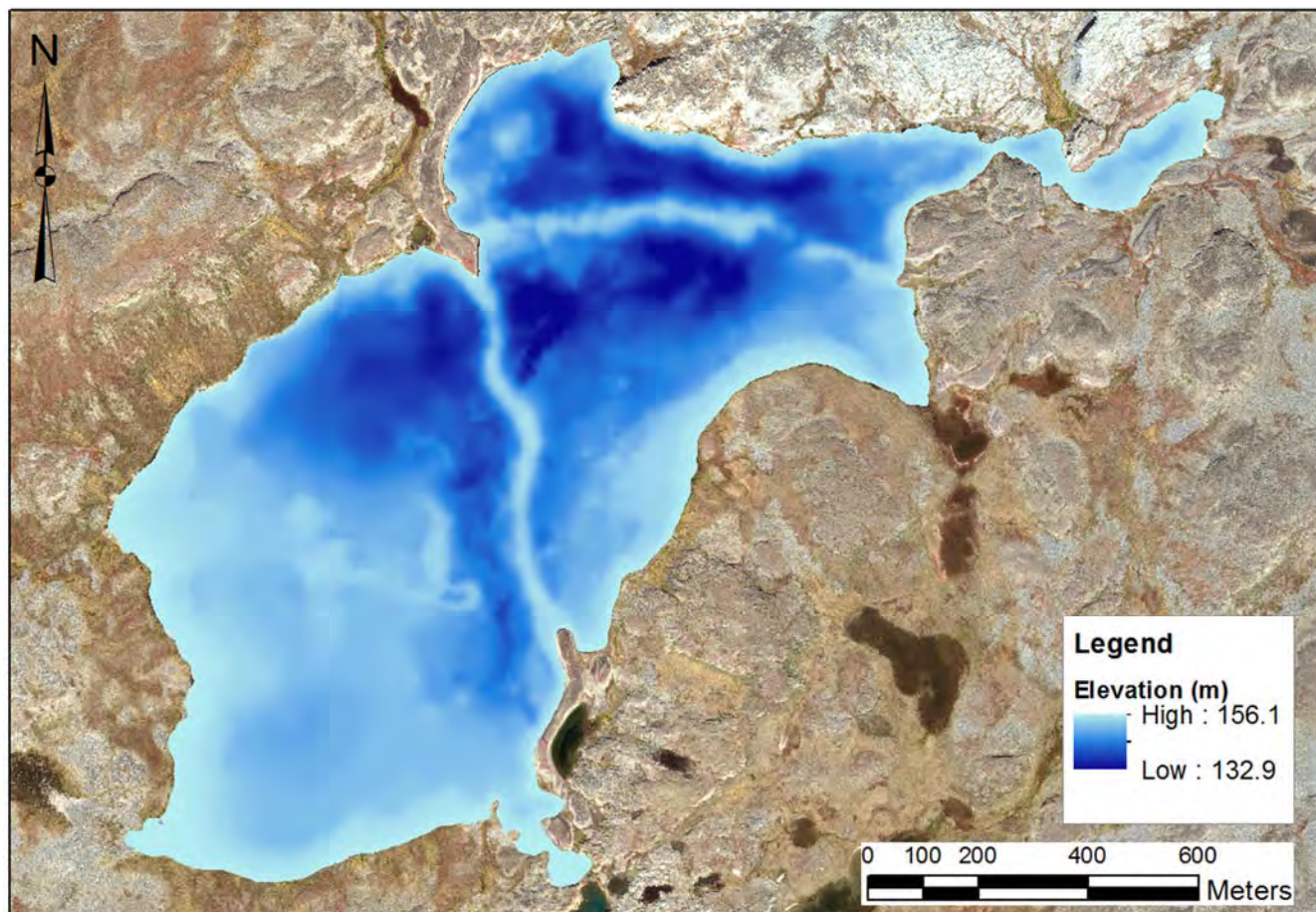


Figure A-19: Bathymetric Map Lake C38



ATTACHMENT A

Bathymetry

Table A-1: Lake A16 (Mammoth Lake) Elevation-Volume-Surface Area Curve

Elevation (masl)	Volume (m³)	Surface Area (m²)	Elevation (masl)	Volume (m³)	Surface Area (m²)	Elevation (masl)	Volume (m³)	Surface Area (m²)
135.6	0	0	142.2	54801	31038	148.8	1885551	710977
135.8	14	223	142.4	61407	35110	149.0	2032071	769542
136.0	96	603	142.6	68891	39761	149.2	2191988	814749
136.2	248	900	142.8	77328	44958	149.4	2356977	834872
136.4	452	1136	143.0	87274	55677	149.6	2525817	853618
136.6	702	1366	143.2	99545	66186	149.8	2698598	874939
136.8	999	1606	143.4	113657	74990	150.0	2876630	913482
137.0	1346	1866	143.6	129578	84336	150.2	3065024	961868
137.2	1745	2127	143.8	147447	94585	150.4	3260924	997061
137.4	2196	2380	144.0	167805	113382	150.6	3464456	1038025
137.6	2698	2639	144.2	192629	131427	150.8	3675550	1073406
137.8	3253	2921	144.4	220065	142739	151.0	3894452	1126308
138.0	3868	3237	144.6	249708	153753	151.2	4125948	1176813
138.2	4548	3563	144.8	281630	165751	151.4	4364596	1209734
138.4	5294	3893	145.0	316294	183688	151.6	4609941	1244162
138.6	6106	4235	145.2	355397	205338	151.8	4862562	1283193
138.8	7000	4741	145.4	398132	221610	152.0	5123924	1332918
139.0	8014	5471	145.6	443970	236903	152.2	5395954	1387395
139.2	9212	6424	145.8	492940	253107	152.4	5679093	1444517
139.4	10573	7179	146.0	545646	280748	152.6	5975305	1518314
139.6	12084	7936	146.2	605206	309413	152.8	6286468	1596996
139.8	13750	8739	146.4	669037	328605			
140.0	15586	9648	146.6	736658	348072			
140.2	17619	10663	146.8	808468	370440			
140.4	19847	11622	147.0	885366	404134			
140.6	22276	12761	147.2	970120	439133			
140.8	24977	14313	147.4	1060536	464683			
141.0	28022	16235	147.6	1156072	491271			
141.2	31470	18169	147.8	1257325	522228			
141.4	35278	19910	148.0	1365895	575163			
141.6	39437	21699	148.2	1486455	622360			
141.8	43970	23675	148.4	1613797	650581			
142.0	48986	26943	148.6	1746700	678767			



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Table A-2: Lake A17 (Whale Tail Lake) Elevation-Volume-Surface Area Curve

Elevation (masl)	Volume (m³)	Surface Area (m²)	Elevation (masl)	Volume (m³)	Surface Area (m²)	Elevation (masl)	Volume (m³)	Surface Area (m²)
134.7	0	0	141.2	196555	94545	147.8	2331006	710625
134.8	9	180	141.4	216079	100658	148.0	2476887	761323
135.0	147	1609	141.6	236800	106694	148.2	2636548	819954
135.2	613	2709	141.8	258825	113787	148.4	2803755	851027
135.4	1216	3310	142.0	282441	123106	148.6	2976742	878444
135.6	1938	3918	142.2	308025	132316	148.8	3155187	906629
135.8	2796	4730	142.4	335301	140195	149.0	3340078	950390
136.0	3837	5712	142.6	364099	147890	149.2	3534711	987788
136.2	5084	6760	142.8	394534	156789	149.4	3734448	1008876
136.4	6541	7814	143.0	427003	169311	149.6	3938133	1028078
136.6	8222	9095	143.2	462297	182792	149.8	4145788	1049136
136.8	10185	10567	143.4	500045	194506	150.0	4358343	1079474
137.0	12465	12305	143.6	540092	205957	150.2	4578091	1115451
137.2	15119	14182	143.8	582471	218065	150.4	4804365	1147179
137.4	18131	15920	144.0	627606	235357	150.6	5036804	1177002
137.6	21490	17699	144.2	676916	255593	150.8	5275280	1208113
137.8	25222	19666	144.4	729608	271182	151.0	5520632	1253121
138.0	29427	22643	144.6	785348	286295	151.2	5778178	1309604
138.2	34253	25560	144.8	844285	303970	151.4	6043386	1342396
138.4	39639	28309	145.0	907405	329543	151.6	6315249	1376728
138.6	45590	31223	145.2	976216	355582	151.8	6594543	1418248
138.8	52145	34375	145.4	1049289	374724	152.0	6883551	1475905
139.0	59377	38061	145.6	1126020	392515	152.2	7182987	1513969
139.2	67382	41886	145.8	1206442	412631	152.4	7488691	1542760
139.4	76099	45249	146.0	1291678	446361	152.6	7800092	1571543
139.6	85478	48560	146.2	1384886	480847	152.8	8117574	1604388
139.8	95545	52197	146.4	1483363	502808	153.0	8509682	1669380
140.0	106448	57470	146.6	1585930	523016			
140.2	118614	63635	146.8	1692801	547030			
140.4	131887	69108	147.0	1805643	590359			
140.6	146224	74157	147.2	1928415	631281			
140.8	161588	79884	147.4	2057439	658389			
141.0	178309	87533	147.6	2191652	683681			



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Table A-3: Lake A18 Elevation-Volume-Surface Area Curve

Elevation (masl)	Volume (m ³)	Surface Area (m ²)
152.0	0	0
152.2	1639	12450
152.4	5112	22630
152.6	11483	41340
152.8	21036	54200
153.0	33189	67700
153.2	48311	82800
153.4	66336	97500
153.6	87475	115200
153.8	112775	138400
154.0	143731	167600
154.2	179470	190100



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Table A-4: Lake A19 Elevation-Volume-Surface Area Curve

Elevation (masl)	Volume (m ³)	Surface Area (m ²)
152.0	0	0
152.2	168	1087
152.4	446	1720
152.6	921	3127
152.8	1678	4523
153.0	2761	6490
153.2	4636	10950
153.4	7162	14380
153.6	10637	20620
153.8	15238	25410
154.0	20817	30520
154.2	27526	36480
154.4	35423	42530
154.6	44592	49650
154.8	55516	59700
154.9	61742	64700



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Table A-5: Lake A20 Elevation-Volume-Surface Area Curve

Elevation (masl)	Volume (m³)	Surface Area (m²)	Elevation (masl)	Volume (m³)	Surface Area (m²)	Elevation (masl)	Volume (m³)	Surface Area (m²)
129.9	0	0	136.7	63422	24521	143.5	374217	66933
130.1	4	50	136.9	68472	26079	143.7	387734	68256
130.3	23	157	137.1	73886	27923	143.9	401536	69806
130.5	66	268	137.3	79592	29099	144.1	415673	71556
130.7	132	406	137.5	85518	30160	144.3	430135	73038
130.9	243	843	137.7	91657	31236	144.5	444883	74435
131.1	554	2272	137.9	98020	32431	144.7	459910	75848
131.3	1063	2768	138.1	104647	33838	144.9	475231	77402
131.5	1655	3153	138.3	111540	35050	145.1	490891	79210
131.7	2326	3575	138.5	118660	36142	145.3	506903	80898
131.9	3095	4134	138.7	125996	37230	145.5	523250	82626
132.1	4007	4996	138.9	133558	38415	145.7	539991	84754
132.3	5058	5487	139.1	141385	39860	145.9	557164	87033
132.5	6197	5891	139.3	149481	41067	146.1	574838	89718
132.7	7413	6271	139.5	157805	42163	146.3	593021	92083
132.9	8708	6705	139.7	166345	43249	146.5	611672	94431
133.1	10124	7486	139.9	175110	44426	146.7	630793	96806
133.3	11690	8146	140.1	184133	45797	146.9	650422	99661
133.5	13375	8696	140.3	193413	46977	147.1	671129	107738
133.7	15170	9272	140.5	202917	48061	147.3	693104	111720
133.9	17103	10120	140.7	212637	49144	147.5	715779	115009
134.1	19246	11301	140.9	222580	50309	147.7	739111	118360
134.3	21600	12168	141.1	232774	51629	147.9	763178	122768
134.5	24098	12801	141.3	243219	52801	148.1	788682	132882
134.7	26717	13388	141.5	253890	53901	148.3	815926	139007
134.9	29459	14062	141.7	264780	55004	148.5	844198	143598
135.1	32369	15033	141.9	275897	56195	148.7	873350	147970
135.3	35456	15814	142.1	287270	57537	148.9	903443	153289
135.5	38699	16679	142.3	298903	58774	149.1	936084	173259
135.7	42149	17880	142.5	310778	59982	149.3	971447	180008
135.9	45852	19175	142.7	322899	61243	149.5	1008013	185567
136.1	49851	20769	142.9	335283	62623	149.7	1045669	191181
136.3	54129	21994	143.1	347968	64249	149.9	1084632	199007
136.5	58648	23221	143.3	360959	65636	150.1	1126753	223274



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Table A-5: Lake A20 Elevation-Volume-Surface Area Curve (continued)

Elevation (masl)	Volume (m ³)	Surface Area (m ²)
150.3	1172683	235342
150.5	1220762	245387
150.7	1270778	254801
150.9	1322813	266158
151.1	1378463	291035
151.3	1437769	301146
151.5	1498818	309126
151.7	1561380	316475
151.9	1625447	324458
152.1	1691792	339803
152.3	1760745	349075
152.5	1831291	356294
152.7	1903259	363459
152.9	1976755	371943
153.1	2053669	398166
153.3	2134470	409523
153.5	2217461	420501
153.7	2302762	432869
153.9	2390848	449023
154.1	2483111	473594
154.3	2579798	492810
154.5	2680187	511138
154.7	2784425	532027
154.9	2893567	562011



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Table A-6: Lake A22 Elevation-Volume-Surface Area Curve

Elevation (masl)	Volume (m ³)	Surface Area (m ²)	Elevation (masl)	Volume (m ³)	Surface Area (m ²)
146.0	0	0	152.8	132165	34580
146.2	575	3349	153.0	139179	35580
146.4	1350	4435	153.2	146412	36770
146.6	2365	5660	153.4	153890	38010
146.8	3600	6700	153.6	161627	39410
147.0	5046	7780	153.8	169660	40930
147.2	6719	8890	154.0	178003	42510
147.4	8604	9980	154.2	186676	44230
147.6	10708	11030	154.4	195699	46020
147.8	13014	12030	154.6	205089	47860
148.0	15522	13050	154.8	214838	49660
148.2	18229	14020	155.0	225033	52300
148.4	21131	15000			
148.6	24230	15980			
148.8	27523	16960			
149.0	31015	17970			
149.2	34716	19030			
149.4	38632	20140			
149.6	42773	21210			
149.8	47109	22150			
150.0	51634	23100			
150.2	56338	23940			
150.4	61211	24790			
150.6	66254	25620			
150.8	71457	26410			
151.0	76818	27210			
151.2	82336	27970			
151.4	88007	28740			
151.6	93833	29510			
151.8	99813	30290			
152.0	105949	31070			
152.2	112245	31900			
152.4	118708	32740			
152.6	125343	33630			



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Table A-7: Lake A43 Elevation-Volume-Surface Area Curve

Elevation (masl)	Volume (m ³)	Surface Area (m ²)
148.9	0	0
149.1	20	276
149.3	108	584
149.5	253	868
149.7	458	1197
149.9	740	1654
150.1	1161	2627
150.3	1768	3418
150.5	2522	4117
150.7	3413	4792
150.9	4441	5497
151.1	5645	6600
151.3	7071	7675
151.5	8726	8911
151.7	10664	10577
151.9	13112	14178
152.1	16518	19944
152.3	20869	23381
152.5	25852	26473
152.7	31492	30024
152.9	37927	34599
153.1	45874	44901
153.3	55458	50833
153.5	66191	56489
153.7	78063	62290
153.9	91145	68674
154.1	105601	76014
154.3	121567	83679
154.5	139100	91754
154.7	158326	100705
154.9	179491	111330
155.1	203063	124870
155.3	229630	141590
155.5	260491	170235



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Table A-8: Lake A44 Elevation-Volume-Surface Area Curve

Elevation (masl)	Volume (m³)	Surface Area (m²)	Elevation (masl)	Volume (m³)	Surface Area (m²)
143.9	0	0	150.4	175324	78016
144.0	10	550	150.6	191230	81023
144.2	215	1310	150.8	207738	84101
144.4	523	1774	151.0	224893	87947
144.6	925	2260	151.2	242951	91957
144.8	1439	2910	151.4	261599	94432
145.0	2153	5058	151.6	280694	96476
145.2	3433	7198	151.8	300189	98515
145.4	4978	8186	152.0	320099	100612
145.6	6701	9042	152.2	340415	102439
145.8	8601	9991	152.4	361050	103879
146.0	10727	11498	152.6	381960	105214
146.2	13211	13153	152.8	403134	106532
146.4	15964	14352	153.0	424576	107910
146.6	18950	15517	153.2	446297	109272
146.8	22177	16795	153.4	468281	110567
147.0	25706	18960	153.6	490527	111904
147.2	29744	21053	153.8	513054	113417
147.4	34092	22399	154.0	535941	116250
147.6	38702	23708	154.2	559621	120250
147.8	43584	25162	154.4	584076	124478
148.0	48820	28255	154.6	609532	130576
148.2	55031	32799	154.8	636436	138870
148.4	61878	35624	155.0	665304	152157
148.6	69279	38444	155.2	696874	162197
148.8	77295	41858	155.4	730062	169627
149.0	86182	49087	155.6	764799	178263
149.2	96807	55309	155.8	801594	190183
149.4	108175	58265	156.0	841019	205318
149.6	120091	60868	156.2	884016	223183
149.8	132526	63535			
150.0	145614	68912			
150.2	160049	74581			



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Table A-9: Lake A45 Elevation-Volume-Surface Area Curve

Elevation (masl)	Volume (m ³)	Surface Area (m ²)
152.5	0	0
152.7	119	716
152.9	289	986
153.1	526	1430
153.3	880	2168
153.5	1416	3310
153.7	2685	6980
153.9	4208	8240
154.1	5977	9390
154.3	7957	10410
154.5	10143	11460
154.7	12550	12620
154.9	15194	13830
155.1	18144	15760
155.3	21460	17400
155.5	25100	19040
155.7	29091	20880
155.9	33455	22770
156.1	38201	24680
156.3	43333	26840
156.5	49068	30470



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Table A-10: Lake A47 Elevation-Volume-Surface Area Curve

Elevation (masl)	Volume (m ³)	Surface Area (m ²)
151.8	0	0
152.0	34	427
152.2	154	746
152.4	330	1017
152.6	562	1307
152.8	859	1688
153.0	1254	2386
153.2	1839	3409
153.4	2603	4224
153.6	3559	5609
153.8	4907	8206
154.0	7193	15965
154.2	11340	23862
154.4	16592	28555
154.6	22749	33047
154.8	29844	38042
155.0	38008	43625
155.2	50238	47362



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Table A-11: Lake A49 Elevation-Volume-Surface Area Curve

Elevation (masl)	Volume (m ³)	Surface Area (m ²)	Elevation (masl)	Volume (m ³)	Surface Area (m ²)
151.8	0	0	158.4	68165	26013
152.0	6	86	158.6	73454	26888
152.2	36	213	158.8	78928	27880
152.4	90	330	159.0	85693	29322
152.6	169	474	159.1	87804	30042
152.8	301	894			
153.0	568	1932			
153.2	1077	3019			
153.4	1752	3734			
153.6	2571	4451			
153.8	3531	5151			
154.0	4637	5960			
154.2	5919	6769			
154.4	7331	7333			
154.6	8852	7882			
154.8	10488	8506			
155.0	12264	9285			
155.2	14194	9972			
155.4	16245	10532			
155.6	18406	11085			
155.8	20690	11844			
156.0	23156	12864			
156.2	25814	13698			
156.4	28626	14388			
156.6	31567	15031			
156.8	34642	15737			
157.0	37879	16760			
157.2	41368	18121			
157.4	45128	19486			
157.6	49163	20862			
157.8	53479	22365			
158.0	58124	24053			
158.2	63050	25133			



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Table A-12: Lake A53 Elevation-Volume-Surface Area Curve

Elevation (masl)	Volume (m ³)	Surface Area (m ²)
158.0	0	0
158.2	494	3445
158.4	1389	5530
158.6	2908	9490
158.8	4943	10860
159.0	7255	12270
159.2	10021	14930
159.4	13249	17400
159.6	17199	22540
159.8	22167	27180
160.0	28084	32190
160.2	35262	39080
160.4	43742	45770
160.6	53863	55500
160.8	65711	63000
161.0	79064	70800
161.2	94204	80000
161.4	111077	88800
161.6	129774	98700
161.7	140190	103000



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Table A-13: Lake A55 Elevation-Volume-Surface Area Curve

Elevation (masl)	Volume (m ³)	Surface Area (m ²)
153.5	0	0
153.7	706	5200
153.9	2108	8880
154.1	7104	41770
154.3	16126	48440
154.5	26475	55200
154.7	38348	63300
154.9	51830	71500
155.1	66880	77700
155.3	82654	79900



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Table A-14: Lake A56 Elevation-Volume-Surface Area Curve

Elevation (masl)	Volume (m³)	Surface Area (m²)	Elevation (masl)	Volume (m³)	Surface Area (m²)
151.7	0	0	158.3	430084	187927
151.9	13	173	158.5	468205	193315
152.1	69	375	158.7	507431	199031
152.3	161	539	158.9	547871	205544
152.5	286	717	159.1	589728	213177
152.7	451	1007	159.3	633188	221551
152.9	749	2089	159.5	678407	230820
153.1	1533	6058	159.7	725630	241836
153.3	3050	8925			
153.5	5081	11394			
153.7	7631	14244			
153.9	10843	18189			
154.1	15427	28508			
154.3	21747	33996			
154.5	28921	37635			
154.7	36775	40881			
154.9	45282	44405			
155.1	54872	51439			
155.3	65670	56459			
155.5	77417	61006			
155.7	90088	65779			
155.9	103777	71375			
156.1	119582	87757			
156.3	137998	95960			
156.5	157909	103252			
156.7	179258	110249			
156.9	202123	119046			
157.1	227631	138461			
157.3	257244	155172			
157.5	289138	163521			
157.7	322557	170339			
157.9	357188	176024			
158.1	393040	182441			



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Table A-15: Lake A60 Elevation-Volume-Surface Area Curve

Elevation (masl)	Volume (m ³)	Surface Area (m ²)	Elevation (masl)	Volume (m ³)	Surface Area (m ²)	Elevation (masl)	Volume (m ³)	Surface Area (m ²)
157.8	0	0	162.0	46129	33593	166.2	370121	135782
158.0	18	286	162.2	53244	37306	166.4	397879	141716
158.2	140	897	162.4	61016	40413	166.6	426793	147412
158.4	365	1344	162.6	69403	43437	166.8	456853	153245
158.6	679	1805	162.8	78403	46659	167.0	488180	161668
158.8	1092	2360	163.0	88130	50863	167.2	521485	170074
159.0	1658	3279	163.2	98812	55630	167.4	556065	175619
159.2	2397	4105	163.4	110298	59109	167.6	591621	179629
159.4	3299	4925	163.6	122439	62300	167.8	627896	183154
159.6	4374	5848	163.8	135233	65703	168.0	664908	186973
159.8	5656	7033	164.0	148795	71018	168.2	702655	190468
160.0	7213	8619	164.2	163648	76752	168.4	741097	193968
160.2	9119	10412	164.4	179408	80780	168.6	780258	197703
160.4	11385	12262	164.6	195952	84671	168.8	820214	202004
160.6	14015	14081	164.8	213310	89221	169.0	861204	210527
160.8	17033	16127	165.0	231815	96707	169.2	904530	223017
161.0	20488	18623	165.2	251984	104193	169.4	950434	236067
161.2	24511	21405	165.4	273351	109360	169.6	999194	252709
161.4	29051	24077	165.6	295712	114330	169.8	1052300	282938
161.6	34141	26828	165.8	319112	119717	170.0	1114114	334342
161.8	39800	29853	166.0	343699	127344			



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Table A-16: Lake A62 Elevation-Volume-Surface Area Curve

Elevation (masl)	Volume (m ³)	Surface Area (m ²)
150.5	0	0
150.7	227	1340
150.9	540	1796
151.1	948	2271
151.3	1450	2770
151.5	2060	3347
151.7	2784	3874
151.9	3613	4426
152.1	4561	5030
152.3	5618	5550
152.5	6781	6090
152.7	8054	6640
152.9	9438	7210
153.1	10943	7860
153.3	12584	8560
153.5	14371	9340
153.7	16345	10440
153.9	18551	11630
154.1	21335	16660
154.3	24994	19990
154.5	29355	23780
154.7	34692	28660
154.9	40837	32830
155.1	47863	37680
155.3	55981	43670
155.5	65434	51300
155.6	71951	57500



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Table A-17: Lake A63 Elevation-Volume-Surface Area Curve

Elevation (masl)	Volume (m ³)	Surface Area (m ²)
149.0	0	0
149.2	208	1336
149.4	545	2068
149.6	1054	3063
149.8	1778	4207
150.0	2752	5580
150.2	4027	7200
150.4	5650	9070
150.6	7713	11650
150.8	10296	14240
151.0	13437	17320
151.2	17310	20730
151.4	21730	23470
151.6	26925	28650
151.8	32989	31980
152.0	39711	35330
152.2	47628	40750
152.4	56006	43030
152.6	64838	45290
152.8	74123	47560
153.0	83863	49880
153.2	94100	52500
153.4	104869	55200
153.6	116198	58200
153.8	128145	61300
154.0	140731	64600
154.2	154007	68200
154.4	168047	72200
154.6	183198	79600
154.7	191366	83700



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Table A-18: Lake A65 Elevation-Volume-Surface Area Curve

Elevation (masl)	Volume (m ³)	Surface Area (m ²)	Elevation (masl)	Volume (m ³)	Surface Area (m ²)
143.7	0	0	150.3	92672	52519
143.9	3	56	150.5	103752	58241
144.1	29	200	150.7	115968	63933
144.3	83	351	150.9	129375	70513
144.5	173	558	151.1	148222	119767
144.7	310	825	151.3	173640	133506
144.9	515	1324	151.5	201548	145468
145.1	870	2216	151.7	232824	167072
145.3	1405	3184	151.9	268392	189448
145.5	2141	4152	152.1	310623	230145
145.7	3067	5156	152.3	358535	248226
145.9	4211	6332	152.5	409733	263476
146.1	5621	7726	152.7	463978	279203
146.3	7282	8825	152.9	521543	297056
146.5	9129	9646	153.1	583628	323805
146.7	11141	10478	153.3	650607	345884
146.9	13328	11430	153.5	722055	369038
147.1	15734	12675	153.7	798434	395388
147.3	18390	13792	153.9	880504	426278
147.5	21241	14714	154.1	969843	469119
147.7	24276	15661	154.3	1067485	506429
147.9	27515	16824	154.5	1172351	541497
148.1	31062	18660	154.7	1284284	578780
148.3	34912	19809	154.9	1404626	629529
148.5	38979	20848			
148.7	43252	21890			
148.9	47739	23039			
149.1	52526	24790			
149.3	57616	26098			
149.5	62967	27446			
149.7	68610	29198			
149.9	74844	33781			
150.1	82801	45904			



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Table A-19: Lake C38 Elevation-Volume-Surface Area Curve

Elevation (masl)	Volume (m³)	Surface Area (m²)	Elevation (masl)	Volume (m³)	Surface Area (m²)	Elevation (masl)	Volume (m³)	Surface Area (m²)
132.9	0	0	139.5	124727	67758	146.1	1369129	335554
133.1	7	85	139.7	138755	72622	146.3	1437316	345935
133.3	32	165	139.9	153820	78309	146.5	1507385	354637
133.5	74	259	140.1	170329	86864	146.7	1579194	363660
133.7	141	427	140.3	188331	92947	146.9	1652912	373798
133.9	251	713	140.5	207457	98213	147.1	1728984	387078
134.1	464	1411	140.7	227632	103838	147.3	1807488	397611
134.3	781	1749	140.9	249062	110990	147.5	1887935	406905
134.5	1161	2048	141.1	272233	120065	147.7	1970286	416834
134.7	1601	2360	141.3	296881	126257	147.9	2054762	428237
134.9	2109	2739	141.5	322701	131909	148.1	2141730	441366
135.1	2735	3531	141.7	349650	137652	148.3	2231011	451124
135.3	3512	4246	141.9	377850	144660	148.5	2322113	459823
135.5	4441	5075	142.1	407939	156046	148.7	2414933	468494
135.7	5548	6022	142.3	439937	163884	148.9	2509604	478612
135.9	6879	7575	142.5	473428	170898	149.1	2606559	490999
136.1	8740	11031	142.7	508269	177562	149.3	2705787	500955
136.3	11135	12838	142.9	544522	185322	149.5	2806886	510004
136.5	13858	14360	143.1	582684	196453	149.7	2909782	518995
136.7	16893	16116	143.3	622848	204843	149.9	3014539	528988
136.9	20341	18608	143.5	664526	211834	150.1	3122078	546421
137.1	24415	22056	143.7	707590	218937	150.3	3232619	558681
137.3	29086	24593	143.9	752199	227496	150.5	3345492	570072
137.5	34245	27033	144.1	798825	238947	150.7	3460743	583021
137.7	39920	29804	144.3	847489	247490	150.9	3579043	601152
137.9	46219	33438	144.5	897757	255171	151.1	3702247	631214
138.1	53313	37412	144.7	949607	263601	151.3	3830384	649416
138.3	61140	40798	144.9	1003374	274752	151.5	3961986	666569
138.5	69611	43920	145.1	1059663	287595	151.7	4097097	685049
138.7	78715	47168	145.3	1118064	296250	151.9	4236381	709790
138.9	88536	51323	145.5	1178132	304384	152.1	4384933	774749
139.1	99462	58020	145.7	1239838	312801	152.3	4542745	801420
139.3	111607	63326	145.9	1303334	322629	152.5	4705112	821258



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Table A-19: Lake C38 (Nemo Lake) Elevation-Volume-Surface Area Curve (continued)

Elevation (masl)	Volume (m ³)	Surface Area (m ²)
152.7	4871116	838950
152.9	5040950	860512
153.1	5217035	900351
153.3	5399508	922896
153.5	5585972	941699
153.7	5776140	960020
153.9	5970133	980502
154.1	6169226	1009900
154.3	6373125	1028767
154.5	6580723	1047329
154.7	6792149	1067275
154.9	7007790	1089678
155.1	7228254	1114598
155.3	7453178	1134167
155.5	7681833	1152388
155.7	7914208	1171772
155.9	8150891	1196613
156.1	8359828	1254532