Attachment II: Weekly Discharge Summary for Qinguq Creek (1970-1978, 1981-1994)

Figure II-1: Box Plot of Average 7-Day Discharge for Qinguq Creek, Annual Weeks 20-23

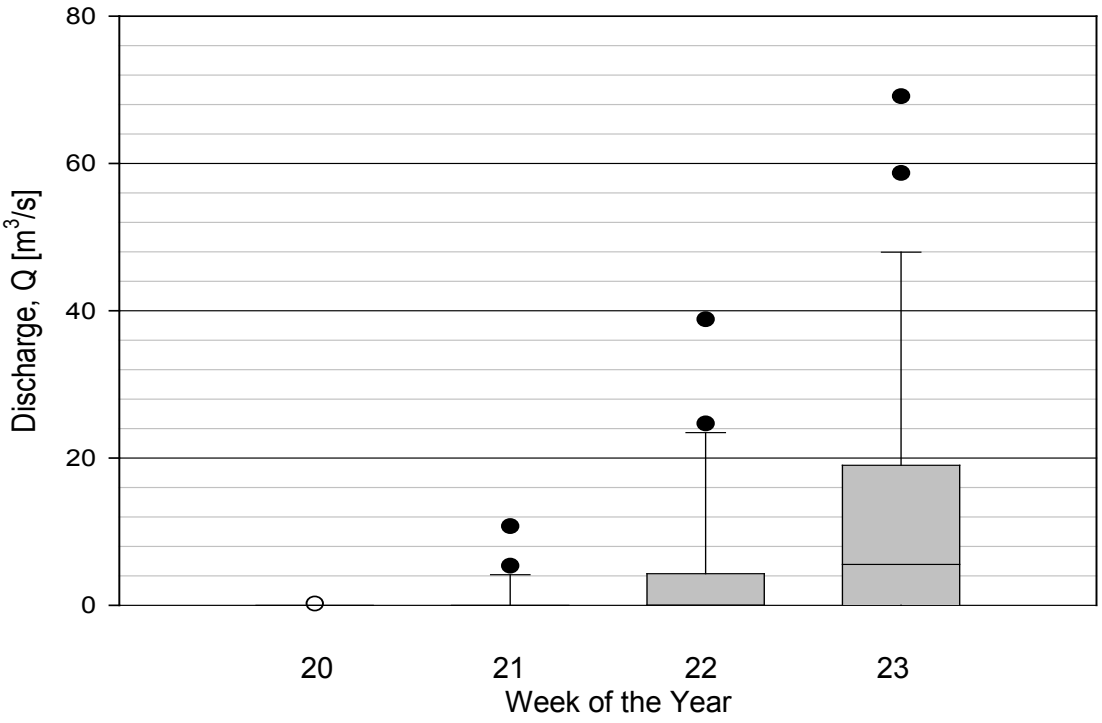


Figure II-2: Box Plot of Average 7-Day Discharge for Qinguq Creek, Annual Weeks 24-27

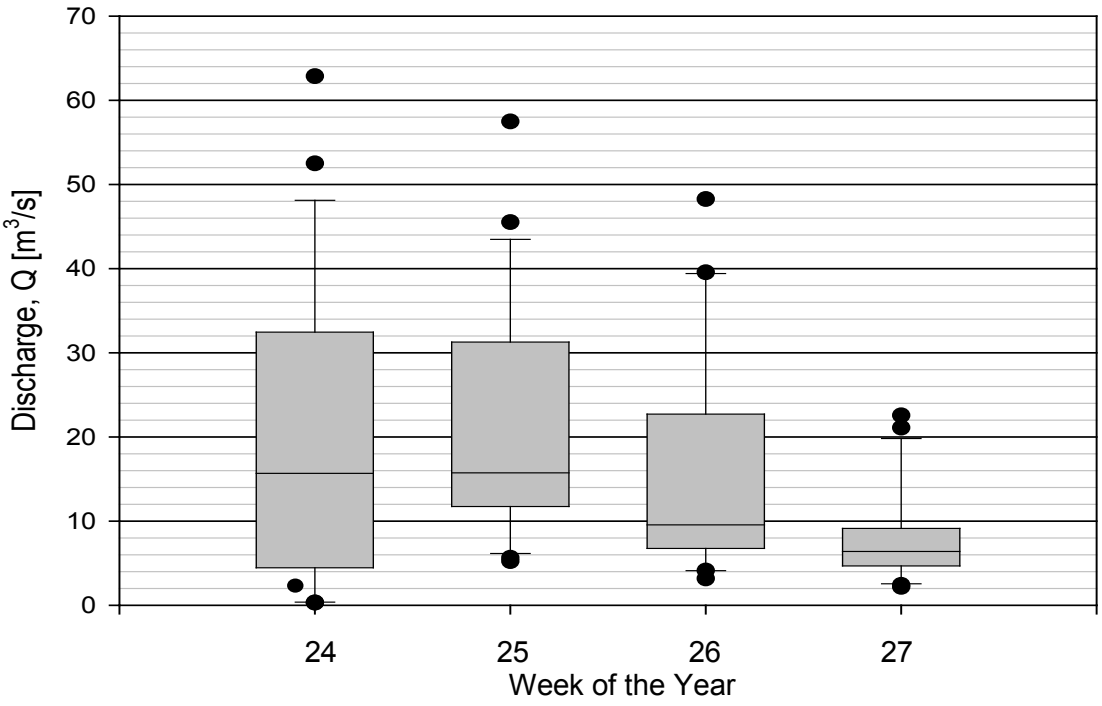


Figure II-3: Box Plot of Average 7-Day Discharge for Qinguq Creek, Annual Weeks 28-31

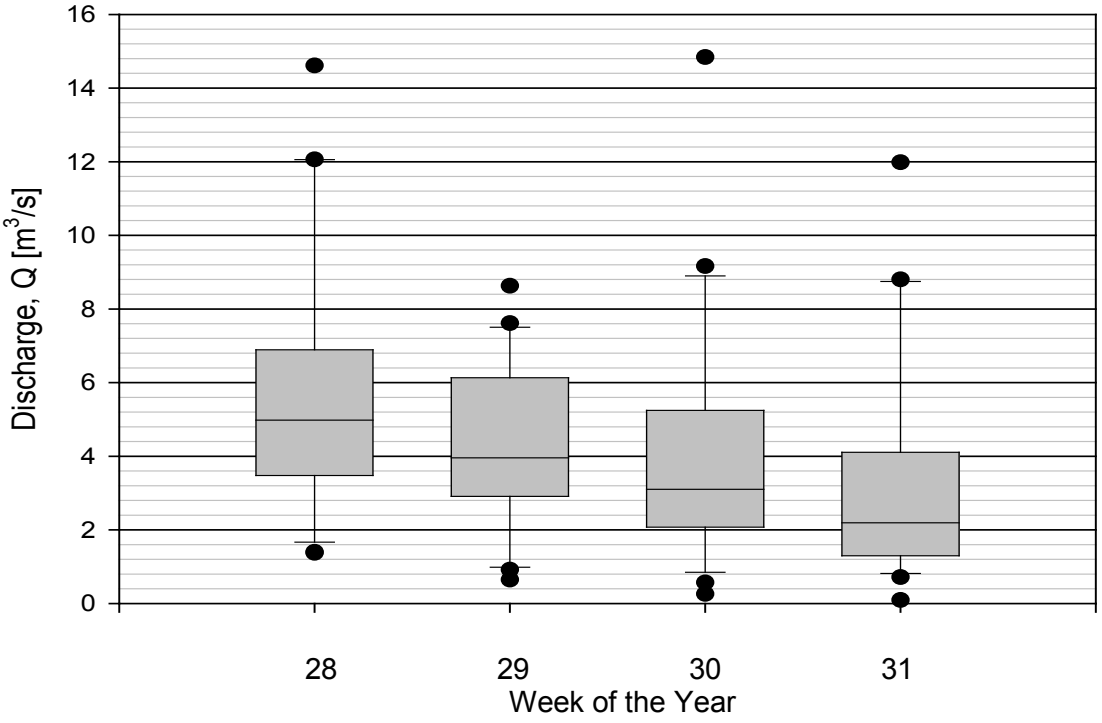


Figure II-4: Box Plot of Average 7-Day Discharge for Qinguq Creek, Annual Weeks 32-35

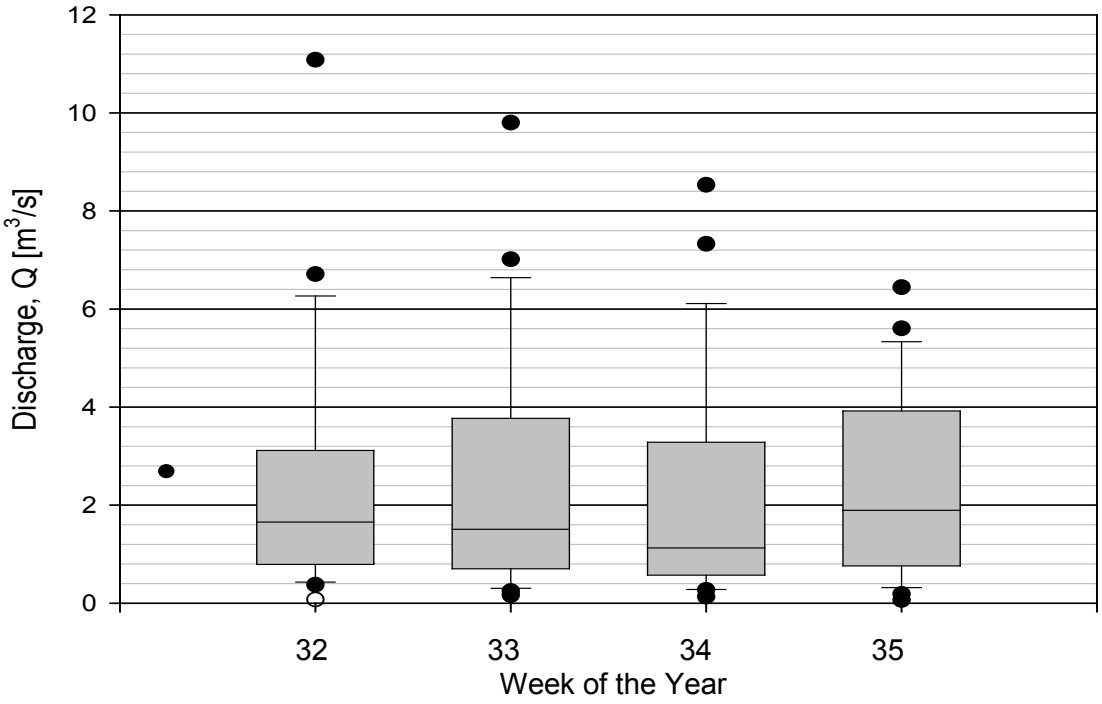


Figure II-5: Box Plot of Average 7-Day Discharge for Qinguq Creek, Annual Weeks 36-39

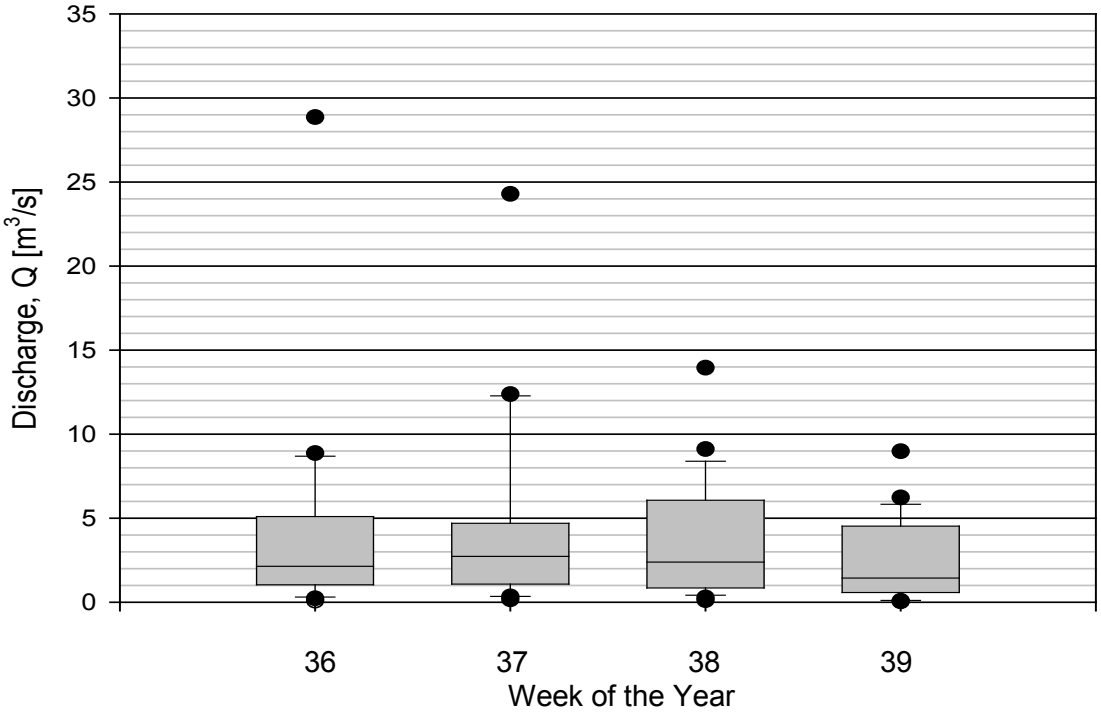


Figure II-6: Box Plot of Average 7-Day Discharge for Qinguq Creek, Annual Weeks 40-43

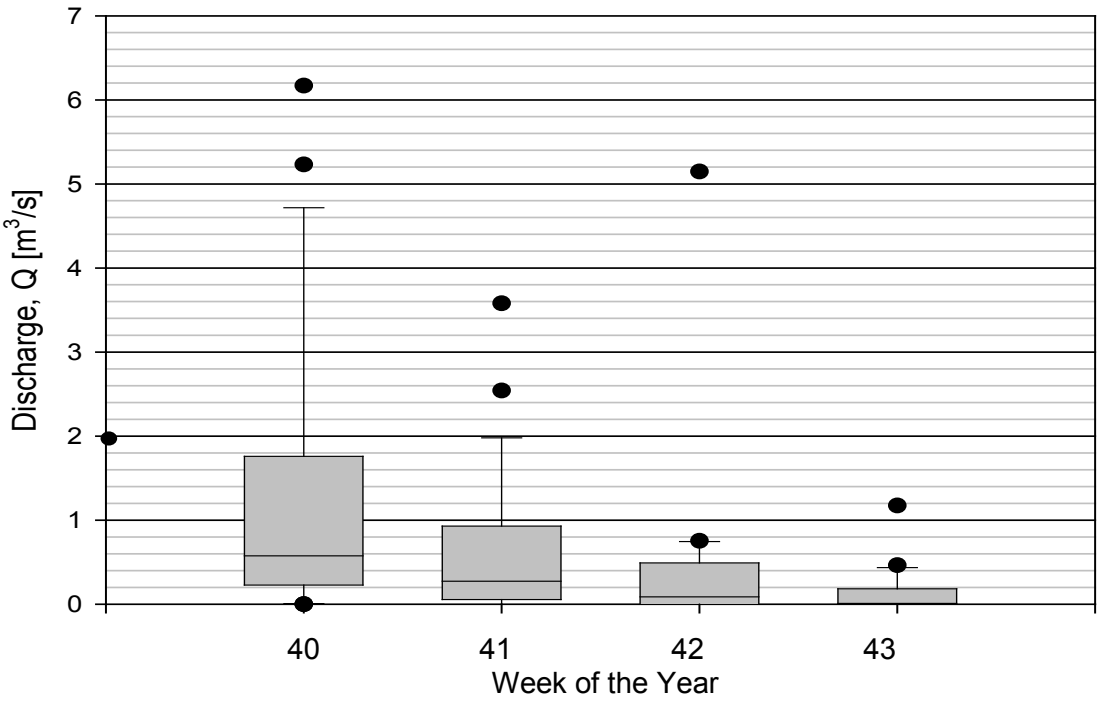
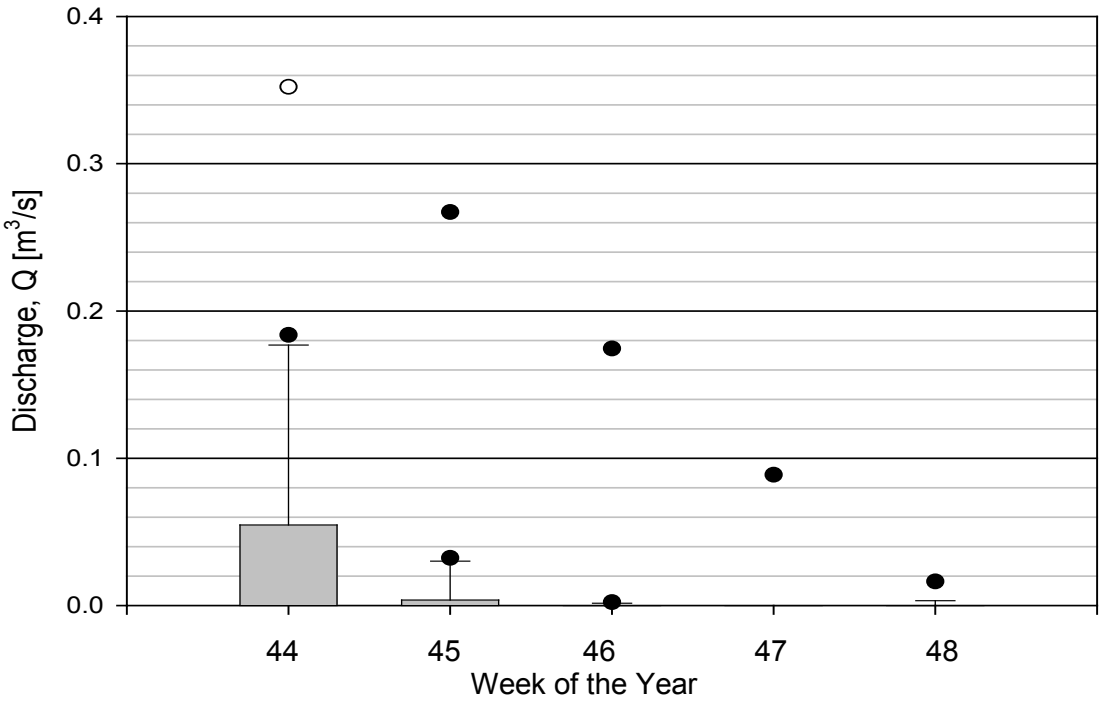


Figure II-7: Box Plot of Average 7-Day Discharge for Qinguq Creek, Annual Weeks 44-48



Attachment III: Local Lake Volumes, Mean Annual Discharge, and Retention Times

Table III-1
Local Lake Volumes, Mean Annual Discharge, and Retention Times

Lake	Estimated Drainage Area (km^2)[a]	Estimated Surface Area (ha)[b]	Total Volume (10^6 m^3)[c]	Volume of water below 2 m contour (m^3)[c]	5% of Under Ice Volume (m^3)[c]	Estimated Mean Annual Discharge (m^3/s)[d]	Retention Time (year)[c], [d]
Andrew Lake	33.6	54.3	0.0958	n/a	n/a	0.21	0.01
Audra Lake	2,740	9,520	381	no bathymetry	-	15.84	0.76
Baker Lake	--	189,000	28,400	no bathymetry	-	-	-
Bear Island Lake	9.22	36.5	0.183	n/a	n/a	0.06	0.10
Boulder Lake	68.6	478	-	no bathymetry	-	0.42	-
Calf Lake	88.2	35.8	0.214	n/a	n/a	0.54	0.01
Caribou Lake	80.9	341	4.77	n/a	n/a	0.49	0.31
Cigar Lake	11.8	113	1.70	n/a	n/a	0.07	0.73
Cirque Lake	0.742	5.60	0.146	45,000	2,250	0.00	0.95
Crash Lake	10.6	8.10	0.0891	n/a	n/a	0.07	0.04
Drum Lake	5.56	25.0	0.325	n/a	n/a	0.04	0.29
End Grid Lake	7.09	13.2	0.103	n/a	n/a	0.04	0.07
Escarpment Lake	2.69	12.7	0.279	120,000	6,000	0.02	0.51
Felsenmeer Lake	1.32	20.8	0.416	139,000	6,950	0.01	1.55
Fox Lake	28.9	128	2.18	n/a	n/a	0.18	0.39
Jaegar Lake	50.4	281	4.50	n/a	n/a	0.31	0.46
Judge Sissons Lake	705	9,550	439	264,000,000	13,200,000	4.16	3.35
Kavisilik Lake	148	564	23.7	14,500,000	725,000	0.90	0.84
Knee Lake	11.6	34.9	0.0698	n/a	n/a	0.07	0.03
L2	66.9	792	-	no bathymetry	-	0.41	-
Lin Lake	7.20	48.0	0.624	n/a	n/a	0.05	0.44
Long Lake	356	614	-	no bathymetry	-	2.12	-
Lower Lake	69.0	49.0	0.196	n/a	n/a	0.42	0.01
Lunch Lake	29.6	77.8	0.467	n/a	n/a	0.18	0.08
Meadow Lake	1.16	14.0	0.112	n/a	n/a	0.01	0.47
Mushroom Lake	4.41	32.0	0.590	284,000	14,200	0.03	0.67
Pointer Lake	79.0	393	5.47	118,000	5,920	0.48	0.36
Qinguq Bay	466	998	-	no bathymetry	-	2.77	-
Rhyolite Lake	0.570	7	-	no bathymetry	-	0.00	-
Ridge Lake	2.10	16.7	0.384	173,000	8,650	0.01	0.90
Rock Lake	99.2	32.4	0.210	n/a	n/a	0.60	0.01
Scotch Lake	11.7	195	7.02	3,700,000	185,000	0.07	3.03
Shack Lake	47.2	60.0	0.360	n/a	n/a	0.29	0.04
Siamese Lake	85.2	2,790	115	65,800,000	3,290,000	0.52	7.01
Siamese Lake East Basin	-	1,500	64.2	38,000,000	1,900,000	-	-
Siamese Lake West Basin	-	1,290	50.4	27,800,000	1,390,000	-	-
Sik Sik Lake	1.81	17.5	0.135	n/a	n/a	0.01	0.37
Skinny Lake	112	197	6.11	2,700,000	135,000	0.68	0.29
Sleek Lake	31.8	376	-	no bathymetry	-	0.20	-
Smoke Lake	5.56	63.5	0.826	n/a	n/a	0.04	0.74
Squiggly Lake	41.8	638	38.3	25,600,000	1,280,000	0.26	4.73
Willow Lake	102	54.9	0.769	n/a	n/a	0.62	0.04

(a) estimated from digital NTS coverage
(b) based on bathymetric data as presented in BEAK (1990 and 1992), unless recent bathymetric information was available. If no bathymetry was available at all, value was estimated from digital NTS coverage.
(c) based on bathymetric data as presented in BEAK (1990 and 1992), unless recent bathymetric information was available.
(d) calculated based on regional curve (mean annual discharge versus drainage area).

Attachment IV: Lake Elevation Data and Lake Stage-Outflow Curves

Table IV-1
Kiggavik Lake Elevation Data (2007-2010)

Station	Lake	Date	Elevation (m)
LE1	Pointer Lake	18-Jun-07	98.906
		31-Jul-07	98.197
		18-Sep-07	98.223
		12-Jun-08	98.595
		23-Jul-08	98.241
		1-Sep-08	98.236
		17-Jun-09	98.906
		25-Jul-09	98.285
		25-Aug-09	98.316
		19-Jun-10	99.048
LE2	Unnamed Lake Downstream of Cirque Lake	14-Jun-07	99.068
		2-Aug-07	98.738
		18-Sep-07	98.754
		2-Jun-08	98.905
		6-Jun-08	98.812
		8-Jun-08	98.941
		12-Jun-08	99.033
		22-Jul-08	98.769
		1-Sep-08	98.858
		17-Jun-09	99.142
		20-Jun-09	99.035
		27-Jul-09	98.774
		24-Aug-09	98.900
		17-Jun-10	99.111
LE3	Judge Sissons Lake	17-Jun-07	99.797
		31-Jul-07	99.670
		17-Sep-07	99.548
		5-Jun-08	99.623
		8-Jun-08	99.645
		10-Jun-08	99.690
		23-Jul-08	99.679
		2-Sep-08	99.616
		17-Jun-09	99.816
		25-Jul-09	99.680
		25-Aug-09	99.578
		18-Jun-10	100.055
LE4	Squiggly Lake	18-Jun-07	96.653
		1-Aug-07	96.428
		19-Sep-07	96.435
		22-Jul-08	96.486
		31-Aug-08	96.416

Table IV-1
Kiggavik Lake Elevation Data (2007-2010) (continued)

Station	Lake	Date	Elevation (m)
LE5	Skinny Lake	3-Aug-07	99.211
		19-Sep-07	99.308
		22-Jul-08	99.264
		31-Aug-08	99.312
		18-Jun-09	99.601
		27-Jul-09	99.232
		26-Aug-09	99.334
LE6	Kavisilik Lake	3-Aug-07	98.170
		20-Sep-07	98.255
		22-Jul-08	98.229
		31-Aug-08	98.196
		18-Jun-09	98.540
		27-Jul-09	98.187
		26-Aug-09	98.263
LE7	Siamese Lake	3-Aug-07	97.050
		19-Sep-07	96.980
		22-Jul-08	97.135
		1-Sep-08	97.012
		18-Jun-09	97.241
		26-Jul-09	97.084
		26-Aug-09	97.043
		19-Jun-10	97.421
LE8	Andrew Lake	18-Jun-09	99.460
		6-Jul-09	99.028
		25-Jul-09	98.871
		25-Aug-09	98.882
		17-Jun-10	99.529
		19-Jun-10	99.411
LE9	Mushroom Lake	18-Jun-09	99.579
		25-Jul-09	99.419
		25-Aug-09	99.410
		16-Jun-10	99.642
		19-Jun-10	99.612

Figure IV-1: Skinny Lake (LE5) Stage-Discharge Curve

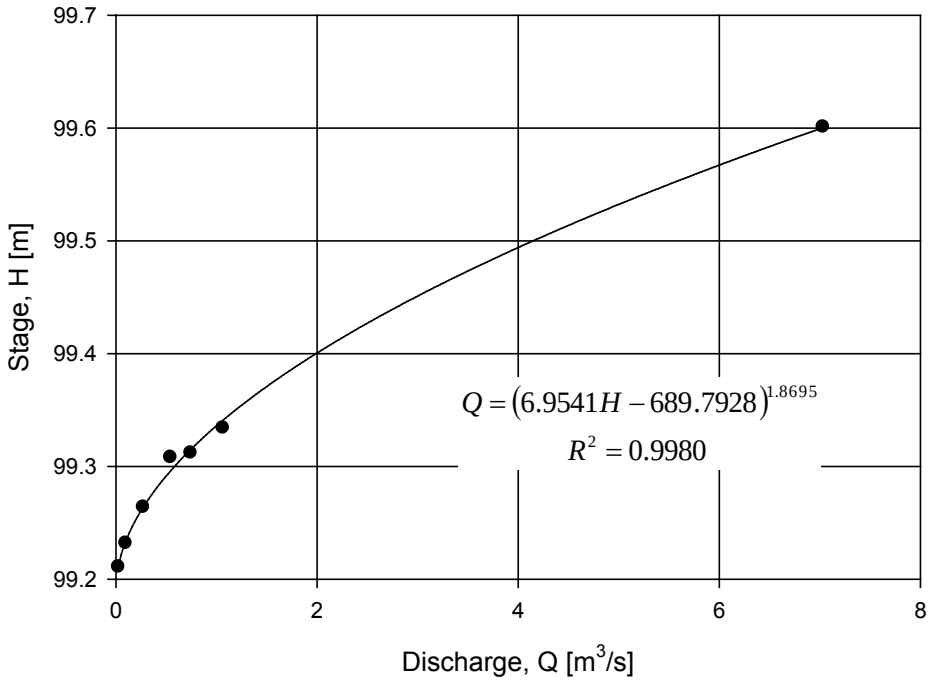


Figure IV-2: Unnamed Lake Downstream of Cirque Lake (LE2) Stage-Discharge Curve

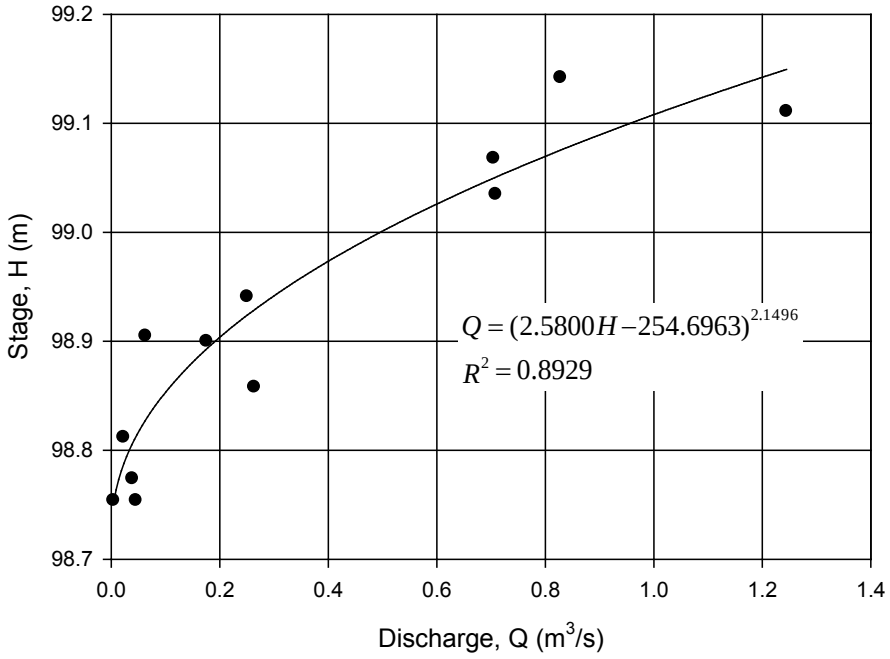


Figure IV-3: Pointer Lake (LE1) Stage-Discharge Curve

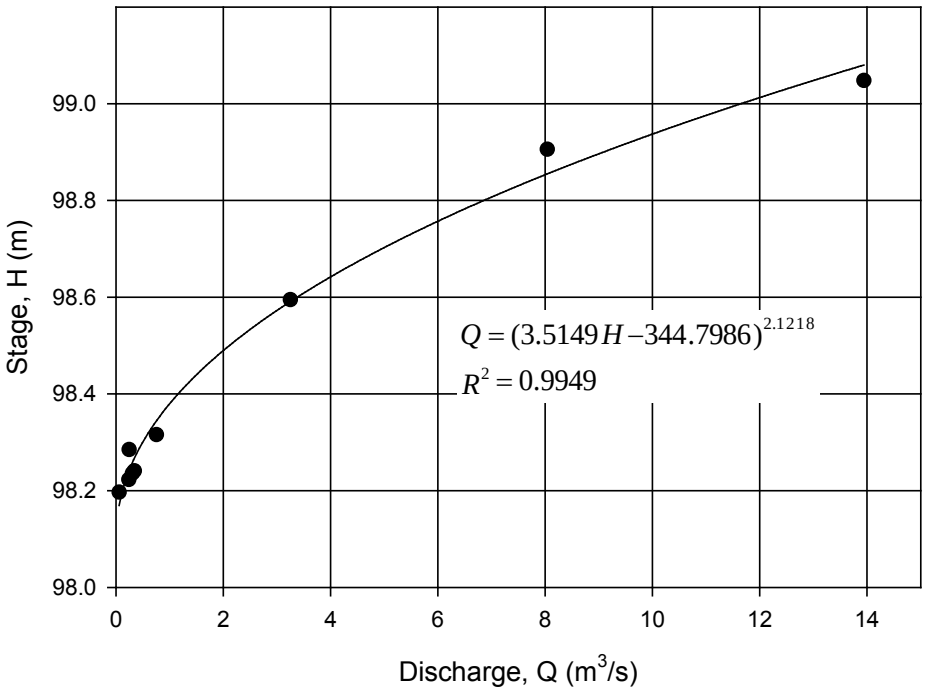


Figure IV-4: Judge Sissons (LE3) Lake Stage-Discharge Curve

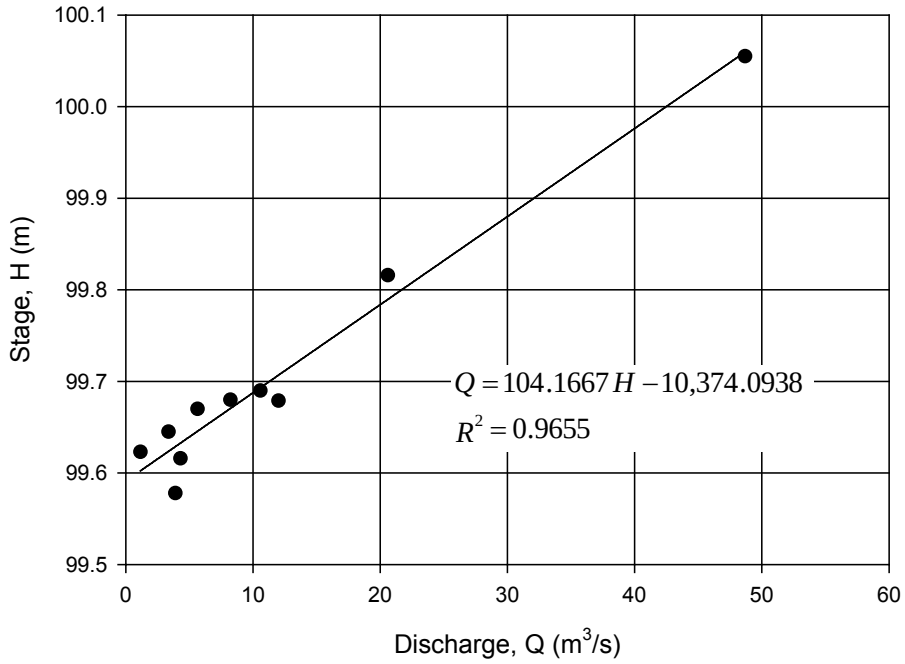


Figure IV-5: Siamese Lake (LE7) Stage-Discharge Curve

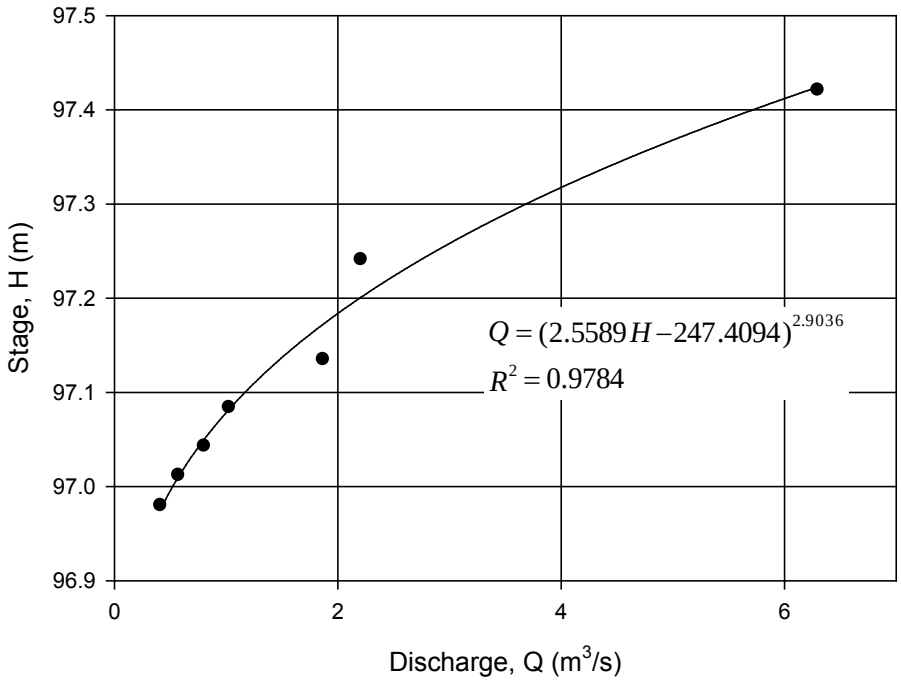


Figure IV-6: Squiggly Lake (LE4)Stage-Discharge Curve

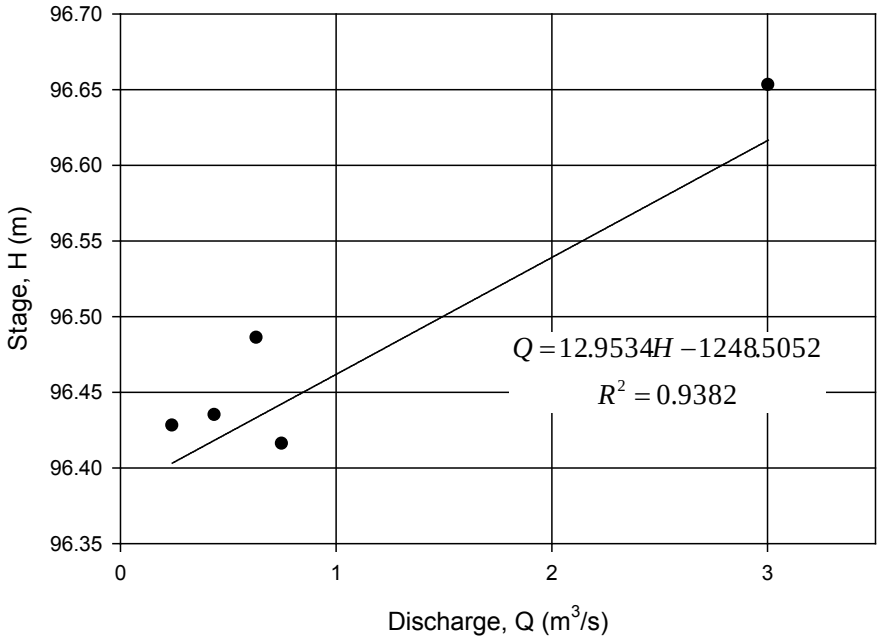


Figure IV-7: Andrew Lake (LE8) Stage-Discharge Curve

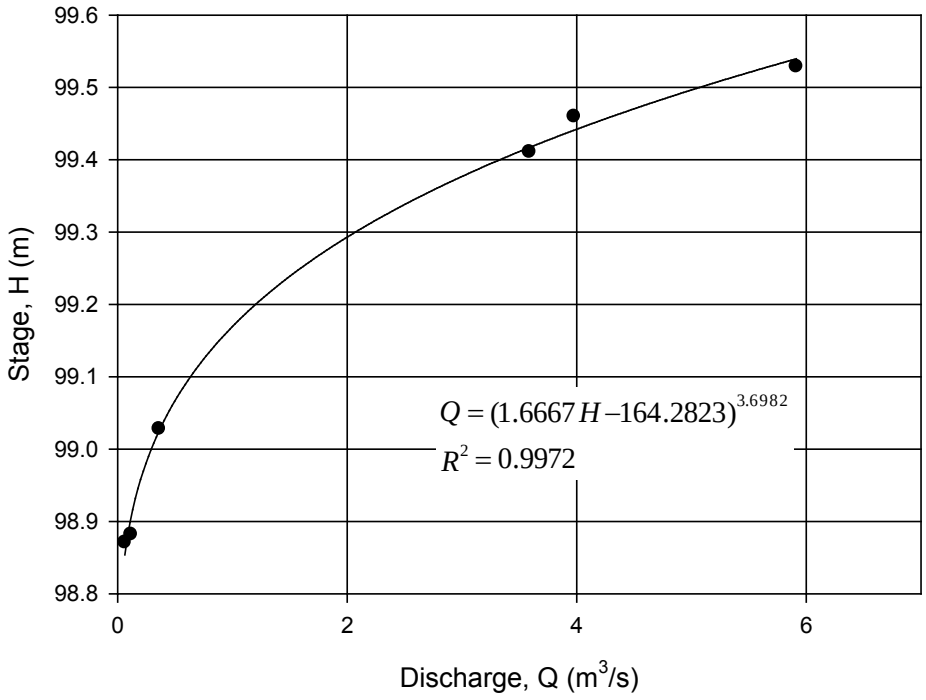
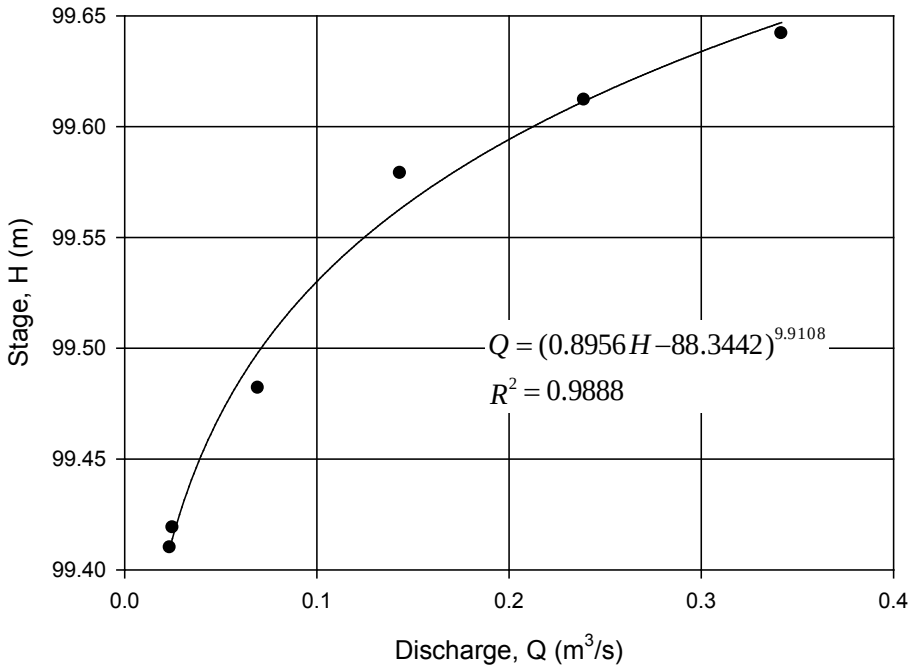


Figure IV-8: Mushroom Lake (LE9) Stage-Discharge Curve



Attachment IX: Daily Stream Temperature Data for Select Streams near Kiggavik, 2007-2010

Table IX-1
SF2 Stream Temperature Data (°C), 2007, 2008, and 2009

Day	2007				2008				2009		
	Jun	Jul	Aug	Sep	Jun	Jul	Aug	Sep	Jun	Jul	Aug
1	-	13.8	12.5	6.9	-	11.9	14.5	6.0	-	15.3	10.5
2	-	14.7	12.5	8.3	1.5	11.2	14.8	-	-	16.0	12.4
3	-	14.6	13.5	7.7	0.5	11.8	14.5	-	-	17.0	13.2
4	-	11.5	12.7	5.9	1.3	13.1	12.0	-	-	16.2	11.5
5	-	10.3	12.1	5.9	2.1	12.1	13.9	-	-	16.2	11.9
6	-	10.6	11.6	5.3	3.4	11.6	13.4	-	-	14.6	13.8
7	-	11.5	12.5	5.6	2.2	13.3	13.4	-	-	13.2	10.9
8	-	11.7	11.5	4.4	1.7	13.5	14.6	-	-	14.0	10.5
9	-	13.3	10.2	3.2	2.9	14.4	15.3	-	-	10.6	10.6
10	-	14.1	10.2	1.6	2.7	15.4	15.1	-	-	10.9	11.0
11	-	15.6	10.7	1.7	2.4	16.6	16.8	-	-	11.3	10.4
12	-	15.8	10.6	2.9	1.6	16.7	13.6	-	-	11.2	9.4
13	-	15.2	10.5	2.3	2.0	16.0	11.7	-	-	9.7	8.6
14	0.3	14.8	10.7	0.8	1.5	13.5	11.0	-	-	10.3	9.7
15	0.5	14.4	10.3	0.5	2.1	13.1	11.8	-	-	12.6	11.3
16	0.4	14.5	11.0	1.3	3.0	13.9	11.4	-	-	12.9	12.3
17	0.5	14.6	9.2	0.1	3.1	15.4	12.5	-	4.0	12.2	13.3
18	0.8	14.6	11.6	0.2	3.7	17.1	12.8	-	4.1	14.6	11.3
19	1.0	16.7	13.3	-	4.3	18.0	12.3	-	4.3	14.2	10.9
20	1.3	17.2	12.6	-	4.9	18.5	6.8	-	3.2	12.5	10.5
21	1.8	19.6	12.2	-	6.2	18.1	8.1	-	3.7	13.4	10.2
22	2.8	16.0	7.9	-	5.8	17.3	10.6	-	4.2	13.1	9.0
23	3.5	14.7	6.0	-	6.5	16.9	10.8	-	5.4	14.2	8.7
24	4.3	13.4	5.3	-	8.0	18.6	9.8	-	5.9	16.0	9.0
25	5.3	13.2	6.8	-	5.6	16.7	6.9	-	7.6	16.1	-
26	6.4	11.9	7.3	-	5.3	15.6	6.7	-	7.1	16.0	-
27	6.3	12.4	7.4	-	4.8	12.4	6.6	-	6.1	15.6	-
28	8.0	11.9	6.9	-	7.8	13.1	7.5	-	9.7	14.9	-
29	10.7	13.7	7.2	-	10.1	13.6	7.2	-	12.4	12.7	-
30	12.6	15.2	6.5	-	10.8	14.5	7.1	-	14.3	11.9	-
31	-	15.3	6.4	-		15.1	7.9	-	-	11.3	-

Table IX-2
SF3 Stream Temperature Data (°C), 2008 and 2009

Day	2008		2009		
	Jun	Jul	Jun	Jul	Aug
1	-	9.5	-	10.6	8.9
2	0.2	8.9	-	11.1	12.7
3	0.0	9.9	-	12.1	14.2
4	0.0	10.7	-	11.4	11.3
5	0.0	10.4	-	12.4	12.1
6	0.0	9.6	-	11.4	13.8
7	0.3	10.3	-	9.6	9.1
8	0.4	11.2	-	11.3	8.4
9	0.6	11.5	-	8.6	8.0
10	0.8	12.0	-	8.0	8.4
11	0.9	12.9	-	8.7	8.4
12	1.2	12.9	-	8.7	7.9
13	1.8	12.0	-	7.8	7.2
14	1.7	10.6	-	7.4	7.9
15	2.3	9.9	-	8.4	9.1
16	3.8	10.3	4.8	9.0	10.3
17	2.5	10.8	3.3	9.2	11.9
18	5.1	13.0	4.8	10.0	10.5
19	4.5	14.5	4.9	10.8	8.6
20	5.8	14.9	2.7	9.5	8.3
21	6.6	15.3	3.4	9.9	7.7
22	5.6	14.8	5.8	10.4	6.1
23	6.2	12.6	6.8	11.3	6.1
24	8.0	-	6.0	13.8	6.3
25	7.0	-	7.4	14.6	-
26	5.6	-	7.3	14.6	-
27	4.6	-	7.0	12.2	-
28	7.9	-	8.8	11.7	-
29	9.8	-	10.2	10.2	-
30	8.2	-	10.4	9.6	-
31	-	-	-	9.5	-

Table IX-3
SF4 Stream Temperature Data (°C), 2007 , 2008 and 2009

Day	2007				2008				2009		
	Jun	Jul	Aug	Sep	Jun	Jul	Aug	Sep	Jun	Jul	Aug
1	-	15.1	14.2	6.9	-	-	14.6	7.3	-	15.1	9.9
2	-	15.1	12.4	8.2	-	-	14.6	-	-	15.7	11.3
3	-	16.2	13.5	8.3	-	-	15.0	-	-	16.6	13.0
4	-	12.4	13.2	6.4	0.3	-	13.3	-	-	16.5	12.0
5	-	10.5	12.8	5.5	0.4	-	12.8	-	-	16.2	11.5
6	-	10.9	12.6	4.4	0.6	-	13.3	-	-	15.3	13.1
7	-	12.6	12.9	5.4	0.4	-	12.8	-	-	13.3	11.5
8	-	13.2	11.7	4.7	0.3	-	13.8	-	-	13.4	9.8
9	-	13.4	11.0	3.0	1.1	-	14.9	-	-	10.8	9.8
10	-	15.4	10.6	1.5	1.2	-	15.2	-	-	10.1	10.4
11	-	17.3	10.4	1.1	1.5	-	15.5	-	-	11.3	10.4
12	-	17.3	10.8	2.4	2.4	-	15.4	-	-	11.5	8.8
13	-	16.6	11.0	2.7	3.7	-	11.5	-	-	9.8	8.0
14	-	15.4	11.2	0.7	2.8	-	11.3	-	-	10.2	8.2
15	-	15.1	10.9	0.7	3.3	-	11.2	-	-	11.9	10.0
16	0.6	15.1	10.6	1.3	4.9	-	10.7	-	1.5	12.5	11.3
17	0.7	15.5	9.5	0.7	5.0	-	12.1	-	1.6	12.1	12.8
18	1.2	15.2	10.8	0.4	5.6	-	12.3	-	2.0	13.3	11.5
19	1.3	17.2	13.0	-	-	-	12.6	-	3.5	15.2	9.8
20	1.1	17.7	13.0	-	-	-	7.0	-	3.2	13.1	9.8
21	2.2	19.8	12.7	-	-	-	6.8	-	4.1	12.9	9.5
22	3.2	17.1	8.5	-	-	-	8.6	-	6.7	13.1	8.0
23	5.5	15.2	5.7	-	-	-	9.7	-	9.3	14.0	8.0
24	5.8	13.3	4.7	-	-	17.8	9.9	-	8.9	15.3	8.8
25	6.7	13.1	6.8	-	-	17.5	8.2	-	10.0	16.3	8.7
26	9.5	11.9	8.1	-	-	15.9	6.4	-	10.6	16.0	-
27	10.0	12.1	7.9	-	-	12.6	6.0	-	10.2	15.8	-
28	11.8	12.0	6.9	-	-	12.6	6.6	-	12.2	14.6	-
29	11.3	13.0	7.7	-	-	13.3	7.1	-	13.7	12.6	-
30	12.7	14.7	7.0	-	-	13.3	6.8	-	15.0	11.3	-
31	-	16.2	6.2	-	-	14.8	7.7	-	-	10.4	-

Table IX-4
SF5 Stream Temperature Data (°C), 2007, 2008, 2009, and 2010

Day	2007			2008				2009			2010		
	Jul	Aug	Sep	Jun	Jul	Aug	Sep	Jun	Jul	Aug	Jun	Jul	Aug
1	-	13.3	7.2	-	4.9	14.8	7.4	-	5.2	10.6	-	4.6	17.2
2	-	12.5	7.8	-	4.7	15.3	-	-	5.2	12.6	-	5.0	15.8
3	-	14.0	7.7	-	4.6	15.1	-	-	5.8	13.4	-	4.8	14.8
4	-	13.6	7.0	-	5.1	12.7	-	-	6.1	12.3	-	3.6	11.0
5	-	13.0	5.8	-	4.6	13.5	-	-	5.6	12.2	-	1.6	9.1
6	-	13.0	5.2	-	3.8	13.8	-	-	4.8	13.8	-	2.1	11.2
7	-	13.2	5.8	-	4.8	13.7	-	-	4.6	11.2	-	3.1	12.8
8	-	12.1	5.3	-	5.5	15.4	-	-	5.8	10.8	-	3.6	13.5
9	-	11.6	4.3	-	6.3	15.6	-	-	2.7	10.5	-	6.2	14.0
10	-	11.0	2.8	0.9	8.8	15.2	-	-	3.1	11.3	-	10.7	15.3
11	-	10.9	2.3	0.9	11.2	17.0	-	-	4.7	10.5	-	10.6	15.3
12	-	11.2	3.1	1.0	13.0	14.5	-	-	8.9	9.7	-	10.6	16.2
13	-	11.2	2.9	1.0	13.8	12.1	-	-	8.7	8.7	-	12.1	12.9
14	-	11.5	1.4	0.7	13.1	11.8	-	-	9.7	9.3	-	14.2	9.7
15	-	10.7	0.8	0.6	12.7	11.9	-	-	11.4	10.6	-	15.0	9.8
16	-	10.9	1.4	0.8	13.1	11.6	-	1.3	11.3	11.5	-	16.3	8.2
17	-	9.7	0.5	0.9	14.0	12.9	-	1.1	11.5	12.6	-	16.8	7.3
18	-	11.6	0.3	1.2	14.9	13.4	-	1.2	13.2	11.4	-	16.9	7.3
19	-	13.1	-	1.4	16.1	12.5	-	1.4	13.4	11.0	1.1	17.9	7.5
20	-	12.3	-	1.5	17.2	7.3	-	1.4	12.4	11.0	1.3	18.0	10.1
21	-	12.5	-	2.0	17.6	8.4	-	1.1	13.3	10.7	1.7	18.4	10.2
22	-	8.5	-	2.4	17.6	10.6	-	1.8	13.3	9.1	1.6	17.6	10.8
23	-	6.6	-	2.9	17.5	10.7	-	2.2	14.0	9.6	1.4	17.4	11.8
24	-	5.6	-	3.5	18.2	10.1	-	2.5	15.8	9.9	1.6	17.6	10.2
25	-	7.8	-	4.2	16.7	7.5	-	2.9	15.5	9.1	2.7	17.8	-
26	-	8.2	-	4.1	16.6	6.1	-	3.3	16.0	-	3.4	17.2	-
27	-	7.7	-	3.0	13.9	6.2	-	3.9	15.4	-	4.1	17.5	-
28	-	7.1	-	2.9	14.1	7.9	-	4.9	14.9	-	4.2	16.4	-
29	-	7.9	-	3.8	13.8	7.4	-	4.9	13.6	-	4.2	16.6	-
30	-	7.0	-	5.1	14.7	7.5	-	5.1	12.4	-	3.9	16.7	-
31	15.8	6.7	-		15.2	8.1	-		11.5	-		16.7	-

Table IX-5
SF6 Stream Temperature Data (°C), 2007, 2008, and 2009

Day	2007				2008				2009		
	Jun	Jul	Aug	Sep	Jun	Jul	Aug	Sep	Jun	Jul	Aug
1	-	15.9	13.6	7.7	-	13.5	14.6	7.2	-	16.1	10.7
2	-	16.2	12.3	8.8	-	12.5	15.3	-	-	16.4	12.7
3	-	16.2	13.8	8.3	-	12.8	15.1	-	-	17.0	13.8
4	-	12.8	13.9	6.7	-	13.7	12.9	-	-	16.7	11.8
5	-	10.7	13.7	5.7	-	13.1	13.3	-	-	16.6	11.7
6	-	10.6	12.9	4.8	0.5	11.9	13.9	-	-	15.6	14.2
7	-	12.1	12.8	5.5	0.2	13.1	13.7	-	-	13.5	11.4
8	-	12.6	11.4	5.0	0.3	14.3	14.5	-	-	14.1	10.5
9	-	12.8	10.7	3.4	0.5	14.6	15.5	-	-	10.9	10.6
10	-	15.1	10.4	1.7	0.7	15.9	15.6	-	-	10.5	11.7
11	-	16.7	10.8	1.1	0.7	17.0	16.6	-	-	11.9	10.7
12	-	16.9	10.9	2.4	1.2	17.0	15.5	-	-	12.1	9.2
13	-	16.6	11.4	2.3	2.5	16.3	11.9	-	-	10.5	8.1
14	-	15.4	11.4	0.6	2.1	13.7	11.9	-	-	11.0	9.6
15	-	15.1	10.4	0.4	2.6	12.7	11.8	-	-	12.6	12.0
16	0.3	15.1	10.3	0.8	4.0	14.2	10.6	-	-	13.3	13.3
17	0.2	15.1	9.0	0.2	3.4	15.3	13.0	-	6.0	12.2	14.1
18	0.6	14.8	11.0	0.0	4.8	16.9	13.3	-	4.7	14.4	11.3
19	1.6	16.8	13.4	-	4.5	18.3	13.1	-	4.4	15.7	10.2
20	2.4	18.1	13.0	-	6.5	18.7	6.2	-	2.4	12.5	10.8
21	3.5	20.1	13.1	-	7.5	18.0	8.1	-	3.6	13.3	10.0
22	4.5	16.8	8.0	-	8.0	17.9	10.3	-	5.8	13.4	8.1
23	5.7	15.0	5.5	-	9.4	16.8	11.0	-	7.3	14.8	8.6
24	5.6	13.2	4.6	-	11.7	19.1	10.4	-	7.2	16.8	9.7
25	6.7	13.1	7.4	-	11.3	17.8	7.1	-	8.8	17.3	9.4
26	8.9	11.9	8.3	-	9.1	16.4	6.1	-	10.0	17.3	-
27	9.2	12.6	7.7	-	7.4	12.8	6.2	-	10.6	16.3	-
28	10.4	12.7	7.0	-	10.0	13.1	7.7	-	12.8	15.1	-
29	12.2	13.5	7.9	-	13.9	13.6	7.3	-	15.1	12.6	-
30	14.2	15.7	7.1	-	13.1	14.1	7.0	-	16.1	11.6	-
31	-	16.4	7.0	-	-	15.6	8.1	-	-	10.9	-

Table IX-6
SF7 Stream Temperature Data (°C), 2007, 2008, 2009 and 2010

Day	2007				2008				2009			2010		
	Jun	Jul	Aug	Sep	Jun	Jul	Aug	Sep	Jun	Jul	Aug	Jun	Jul	Aug
1	-	3.9	11.7	8.9	-	3.9	11.9	9.3	-	4.0	9.1	-	4.8	15.4
2	-	4.0	11.7	9.2	-	4.1	12.2	-	-	4.1	9.4	-	4.7	15.0
3	-	4.1	11.9	9.0	-	4.2	12.4	-	-	4.2	9.8	-	4.7	14.5
4	-	4.1	12.3	8.2	-	4.3	12.0	-	-	4.3	10.0	-	4.1	12.3
5	-	4.1	12.6	8.1	1.7	4.4	12.2	-	-	4.5	10.3	-	4.1	11.9
6	-	4.1	12.7	8.0	1.9	4.4	12.7	-	-	4.4	11.1	-	4.3	13.1
7	-	4.3	12.9	8.1	1.9	4.4	12.9	-	-	4.4	10.9	-	4.2	13.8
8	-	4.3	12.4	7.5	2.0	4.6	13.6	-	-	4.4	10.6	-	4.4	14.4
9	-	4.2	12.1	6.5	2.3	4.7	13.7	-	-	4.2	10.6	-	5.3	15.3
10	-	4.4	12.0	5.4	2.4	5.6	13.3	-	-	4.2	11.5	-	4.9	14.9
11	-	4.6	12.2	5.5	2.5	5.9	14.1	-	-	4.4	11.1	-	4.5	14.3
12	-	4.4	12.1	5.1	2.6	5.2	13.5	-	-	4.6	10.6	-	4.6	14.8
13	-	5.1	12.2	5.4	2.7	4.6	13.4	-	-	4.3	10.2	-	5.5	11.8
14	-	5.2	12.3	3.9	2.6	4.8	13.0	-	-	4.4	10.4	-	5.8	10.1
15	-	5.7	12.0	3.2	2.6	4.6	13.1	-	-	4.6	11.1	-	7.0	11.2
16	-	5.9	12.0	4.1	2.8	5.0	13.1	-	-	4.3	11.4	-	7.6	11.1
17	1.9	6.1	11.5	3.0	2.8	6.6	13.3	-	2.5	5.1	11.8	-	8.3	10.4
18	2.2	6.6	12.0	-	2.9	7.5	13.7	-	2.6	4.9	11.2	2.4	9.3	9.6
19	2.4	7.7	12.6	-	2.9	6.7	13.4	-	2.7	6.0	10.9	2.3	10.2	10.3
20	2.5	9.3	12.6	-	3.0	8.4	12.0	-	2.6	5.5	11.0	2.7	7.6	11.4
21	2.7	10.3	12.5	-	3.1	8.9	12.0	-	2.8	5.3	10.9	2.9	11.3	11.1
22	2.8	11.2	11.4	-	3.1	9.1	12.4	-	2.9	5.7	10.5	2.9	9.1	11.3
23	2.9	11.4	10.0	-	3.2	10.5	12.2	-	3.0	5.7	10.3	3.1	9.9	12.2
24	3.1	11.3	9.2	-	3.3	11.4	12.0	-	3.1	6.6	10.8	3.3	12.5	12.5
25	3.2	11.1	9.9	-	3.3	9.2	11.1	-	3.2	7.3	10.9	3.8	13.4	-
26	3.2	11.0	9.9	-	3.4	9.5	10.2	-	3.3	7.8	-	4.2	10.8	-
27	3.3	11.2	9.5	-	3.4	10.3	9.8	-	3.4	7.0	-	4.6	11.1	-
28	3.5	11.2	8.9	-	3.6	11.4	10.2	-	3.5	7.6	-	4.9	12.3	-
29	3.6	12.1	9.2	-	3.8	11.4	9.4	-	3.7	8.4	-	5.3	12.7	-
30	3.7	12.9	8.7	-	3.8	11.9	9.0	-	3.8	8.8	-	4.4	14.0	-
31	-	12.2	8.9	-	-	12.3	9.4	-	-	9.0	-	-	14.2	-

Table IX-7
SF8 Stream Temperature Data (°C), 2007, 2008, 2009, and 2010

Day	2007		2008			2009			2010		
	Aug	Sep	Jul	Aug	Sep	Jun	Jul	Aug	Jun	Jul	Aug
1		7.5	-	13.8	6.5	-	7.1	10.1	-	5.0	16.5
2	13.4	8.6	-	14.5	-	-	7.3	11.9	-	4.6	15.1
3	13.4	7.8	-	14.5	-	-	7.8	13.0	-	4.5	14.0
4	13.3	6.6	-	13.0	-	-	7.3	11.9	-	4.0	10.4
5	12.6	6.2	-	13.8	-	-	7.5	11.9	-	3.9	9.0
6	12.2	5.2	-	13.8	-	-	7.2	13.2	-	4.0	11.7
7	12.9	6.1	-	13.2	-	-	5.9	11.0	-	4.2	13.5
8	11.9	5.2	-	14.4	-	-	6.6	10.8	-	5.0	14.5
9	11.2	3.6	-	15.2	-	-	6.2	10.4	-	5.8	14.6
10	11.2	1.9	-	14.8	-	-	6.0	11.3	-	5.9	15.0
11	11.5	1.9	-	15.8	-	-	6.8	10.7	-	4.9	14.3
12	11.5	3.3	-	14.2	-	-	6.8	9.4	-	5.1	15.0
13	11.4	3.1	-	12.2	-	-	6.5	8.7	-	7.0	11.9
14	11.7	1.3	-	11.8	-	-	7.0	9.1	-	8.5	9.3
15	11.1	1.0	-	12.0	-	-	7.5	10.9	-	8.5	9.9
16	11.1	1.5	-	11.8	-	-	7.7	12.0	-	8.6	7.9
17	9.8	0.4	-	12.7	-	-	8.2	12.8	-	9.5	7.0
18	11.7	1.0	-	13.4	-	2.5	10.0	10.9	-	10.3	6.9
19	13.0	0.7	-	12.8	-	2.6	10.2	10.0	-	12.7	8.0
20	12.5	0.0	-	7.4	-	2.4	8.1	10.6	3.2	13.2	10.7
21	12.5	-	-	8.5	-	2.8	8.7	10.2	3.4	14.4	10.5
22	8.5	-	-	10.9	-	4.4	9.3	8.7	3.3	14.2	10.9
23	6.6	-	-	10.9	-	4.7	9.4	8.9	3.6	13.7	12.1
24	6.3	-	16.7	10.2	-	4.6	11.4	10.4	4.0	14.8	11.9
25	8.0	-	13.5	7.5	-	5.2	11.9	10.3	4.9	15.1	-
26	8.8	-	13.8	6.3	-	5.5	11.6	-	5.4	14.5	-
27	8.1	-	12.5	6.5	-	5.8	12.6	-	5.6	15.0	-
28	7.4	-	12.8	8.7	-	6.7	13.0	-	5.6	14.5	-
29	8.0	-	13.3	7.9	-	7.5	11.7	-	5.8	15.1	-
30	6.9	-	14.0	7.8	-	7.1	11.3	-	4.8	15.8	-
31	6.7	-	14.3	8.8	-		10.7	-	-	16.0	-

Table IX-8
SF9 Stream Temperature Data (°C), 2007 and 2008

Day	2007				2008	
	Jun	Jul	Aug	Sep	Jul	Aug
1	-	10.3	12.2	5.9	-	12.8
2	-	10.9	11.3	7.0	-	13.2
3	-	11.0	11.6	6.6	-	13.0
4	-	8.8	11.5	5.2	-	11.5
5	-	7.8	11.0	4.8	-	12.3
6	-	8.5	10.7	3.8	-	12.4
7	-	9.8	11.5	4.5	-	11.8
8	-	10.4	10.6	3.8	-	12.3
9	-	10.7	10.0	2.4	-	13.4
10	-	12.3	9.9	1.0	-	13.5
11	-	13.6	9.8	1.0	-	14.5
12	-	14.3	10.0	2.0	-	13.9
13	-	14.2	9.5	1.9	-	11.6
14	-	13.6	9.2	0.3	-	10.7
15	-	13.4	9.5	0.0	-	10.9
16	-	13.5	9.1	0.6	-	9.9
17	-	13.5	8.3	0.0	-	10.6
18	0.0	13.4	9.8	0.2	-	11.2
19	0.0	14.7	11.6	0.0	-	11.2
20	0.1	15.3	11.6	-	-	6.5
21	0.2	17.7	10.9	-	-	7.2
22	0.3	15.4	7.7	-	17.1	8.9
23	0.3	13.8	5.5	-	15.4	9.0
24	1.1	12.5	4.1	-	16.0	8.6
25	2.1	12.1	5.9	-	15.2	6.5
26	4.0	11.0	6.3	-	14.0	6.0
27	4.7	11.2	6.0	-	12.0	5.9
28	6.2	11.0	5.5	-	11.5	6.9
29	7.6	11.8	6.4	-	12.0	6.8
30	9.1	13.2	5.5	-	12.4	6.6
31	-	13.9	5.6	-	13.2	6.6

Table IX-9
SF13 Stream Temperature Data (°C), 2008, 2009 and 2010

Day	2008				2009			2010
	Jun	Jul	Aug	Sep	Jun	Jul	Aug	Jun
1	-	4.6	15.2	8.4	-	6.9	12.0	-
2	-	3.1	15.6	9.3	-	7.2	12.6	-
3	-	3.2	16.1	9.6	-	7.7	14.2	-
4	-	4.7	14.4	-	-	7.8	13.4	-
5	-	4.9	14.6	-	-	7.8	13.0	-
6	-	4.8	14.7	-	-	8.0	13.9	-
7	-	7.9	13.9	-	-	7.6	12.3	-
8	-	9.7	15.3	-	-	7.8	11.4	-
9	-	10.1	15.5	-	-	6.9	11.4	-
10	-	10.9	15.4	-	-	6.9	12.0	-
11	0.3	12.4	16.6	-	-	8.7	11.9	-
12	0.4	13.5	15.6	-	-	9.9	10.2	-
13	0.6	14.2	13.2	-	-	9.7	9.6	-
14	0.3	13.9	12.4	-	-	9.9	9.3	-
15	0.3	13.3	12.3	-	-	11.3	11.0	-
16	0.5	13.6	11.9	-	-	12.5	12.7	-
17	0.6	14.6	13.1	-	-	12.5	13.2	-
18	0.9	15.7	13.7	-	-	14.4	11.5	-
19	0.6	16.9	13.7	-	1.6	14.8	10.3	-
20	1.0	17.3	8.4	-	0.8	12.1	10.9	1.2
21	1.2	17.2	9.0	-	1.5	13.7	10.8	1.3
22	1.2	17.3	10.7	-	2.6	12.6	9.6	1.4
23	1.4	17.1	11.1	-	3.1	12.3	9.1	2.2
24	1.9	18.1	10.9	-	3.6	16.7	10.1	2.6
25	2.0	17.1	8.4	-	3.8	15.6	11.0	4.2
26	2.1	16.5	6.5	-	3.2	14.8	10.6	6.0
27	1.9	14.7	6.5	-	4.3	16.5	-	6.8
28	3.0	14.6	8.3	-	4.8	15.8	-	7.3
29	4.5	14.8	7.9	-	6.0	14.4	-	-
30	4.3	15.3	7.9	-	6.5	13.2	-	-
31	-	15.7	8.7	-	-	11.8	-	-

Table IX-10
SF14 Stream Temperature Data (°C), 2008, 2009, and 2010

Day	2008				2009			2010		
	Jun	Jul	Aug	Sep	Jun	Jul	Aug	Jun	Jul	Aug
1	-	8.9	15.2	9.2	-	9.9	11.6	-	6.3	16.9
2	-	8.3	15.3	9.7	-	10.5	12.4	-	5.5	15.8
3	-	7.7	16.3	9.7	-	10.9	14.7	-	5.4	14.7
4	-	8.7	14.3	-	-	10.4	14.0	-	4.5	11.2
5	-	8.8	14.0	-	-	10.7	12.7	-	4.6	7.9
6	-	8.6	14.8	-	-	11.5	14.1	-	4.8	10.4
7	0.2	9.2	13.8	-	-	9.6	12.2	-	5.5	13.5
8	0.2	11.0	14.5	-	-	10.8	11.7	-	7.3	14.6
9	0.4	11.3	15.1	-	-	8.3	11.4	-	6.4	15.7
10	2.3	11.8	15.4	-	-	7.3	12.0	-	7.1	16.8
11	2.9	13.0	15.8	-	-	9.2	11.4	-	7.7	16.0
12	3.7	13.3	16.1	-	-	9.2	9.5	-	9.2	16.1
13	4.4	12.4	12.9	-	-	8.7	9.3	-	9.7	12.7
14	3.5	11.2	12.6	-	-	8.5	9.3	-	10.7	10.0
15	3.7	11.6	12.0	-	-	10.8	11.2	-	12.3	9.2
16	4.4	12.6	11.3	-	-	11.0	13.3	-	10.9	7.7
17	4.1	13.2	12.4	-	-	12.9	13.9	-	11.0	7.1
18	5.1	14.5	13.5	-	-	14.4	12.1	-	11.8	7.0
19	3.9	15.6	14.1	-	5.7	13.6	9.8	-	12.9	8.5
20	5.6	16.4	8.6	-	3.1	12.3	10.4	4.0	14.3	10.9
21	6.1	16.4	7.6	-	4.0	12.2	10.1	3.8	16.4	11.1
22	5.1	16.1	9.8	-	5.3	12.3	8.8	3.3	15.6	11.2
23	5.6	15.6	11.0	-	5.4	12.3	8.2	3.8	15.5	12.6
24	6.7	16.6	11.5	-	5.7	13.6	9.4	4.1	16.6	12.6
25	6.1	15.5	9.4	-	6.9	15.1	10.6	5.2	16.2	-
26	5.7	14.3	7.5	-	6.1	15.1	9.7	6.1	15.1	-
27	5.1	13.2	6.8	-	6.4	15.7	-	6.5	15.6	-
28	7.2	13.4	8.2	-	7.9	15.0	-	7.0	15.2	-
29	9.5	13.8	8.4	-	9.2	13.7	-	7.7	15.7	-
30	8.2	14.1	8.5	-	9.7	12.5	-	6.2	16.2	-
31	-	15.6	9.7	-	-	11.3	-	-	17.0	-

Table IX-11
SF15 Stream Temperature Data (°C), 2009 and 2010

Day	2009			2010		
	Jun	Jul	Aug	Jun	Jul	Aug
1	-	15.7	10.6	-	9.7	17.3
2	-	15.9	12.7	-	9.2	15.0
3	-	17.0	14.1	-	7.9	12.6
4	-	16.6	12.0	-	5.6	9.0
5	-	16.1	11.8	-	5.0	7.9
6	-	15.3	14.1	-	5.5	10.9
7	-	13.4	11.2	-	6.4	13.6
8	-	13.9	10.3	-	8.7	14.7
9	-	10.8	10.4	-	11.6	15.5
10	-	10.8	11.3	-	14.5	16.1
11	-	11.7	10.3	-	13.6	15.4
12	-	11.9	9.0	-	13.0	16.1
13	-	10.2	7.9	-	14.6	12.5
14	-	10.8	9.5	-	17.0	9.1
15	-	12.1	11.4	-	18.3	9.6
16	-	12.7	12.5	1.9	18.2	7.6
17	-	12.1	13.6	1.3	16.9	6.8
18	2.8	13.9	11.5	1.2	17.1	7.3
19	2.3	14.7	10.3	2.6	18.5	7.3
20	1.9	12.3	10.5	4.0	18.2	9.9
21	3.3	13.1	9.9	4.7	18.6	10.6
22	5.9	13.2	8.1	4.9	17.7	11.3
23	8.8	14.5	8.8	5.3	16.6	12.0
24	8.4	16.2	10.0	7.1	17.1	10.5
25	10.0	16.7	9.3	9.6	16.8	-
26	11.0	16.7	-	10.7	16.6	-
27	10.9	15.7	-	11.9	16.8	-
28	12.7	14.7	-	12.5	15.5	-
29	14.8	12.5	-	12.8	16.0	-
30	15.4	11.4	-	11.1	16.0	-
31	-	10.8	-	-	16.2	-

Attachment V: Lake Stage-Storage Volume Area Curves

Figure V-1: Pointer Lake Stage-Storage Volume-Area Curve

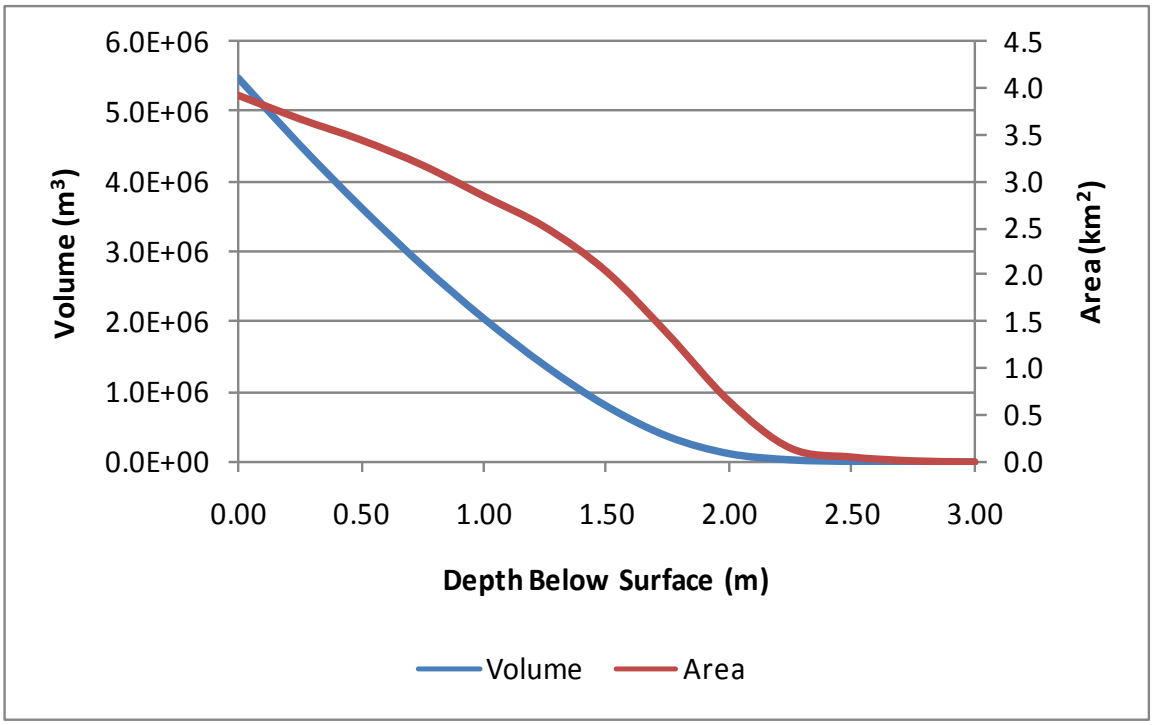


Figure V-2: Rock Lake Stage-Storage Volume-Area Curve

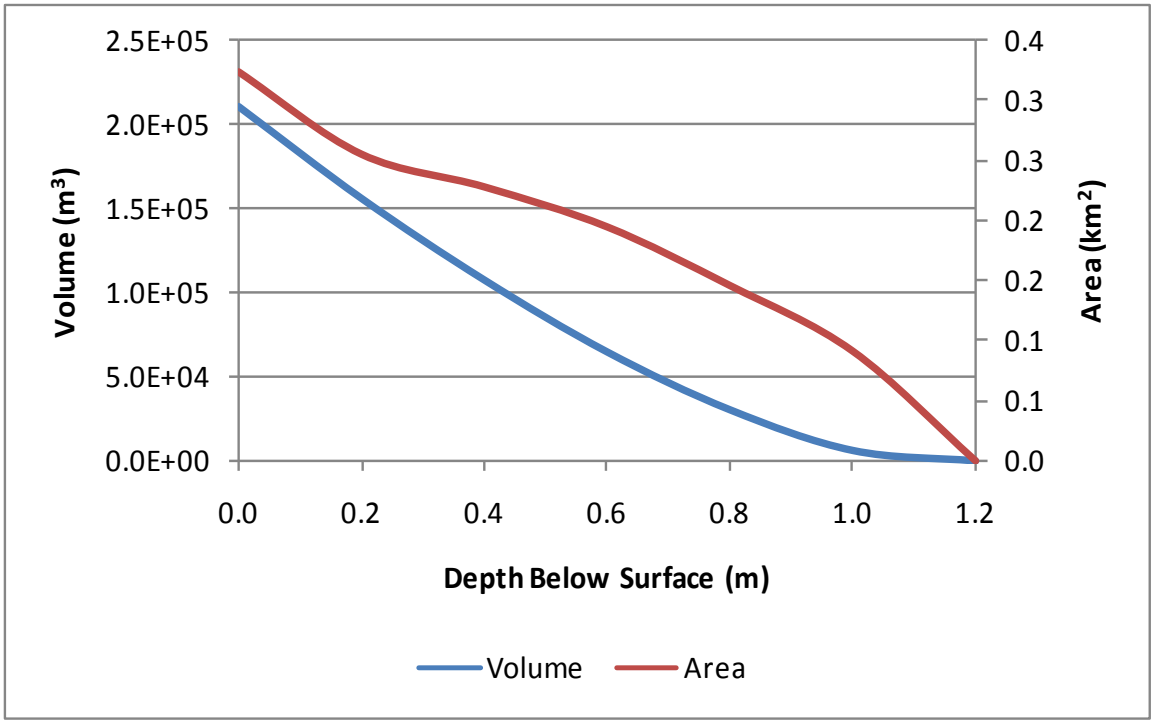


Figure V-3: End Grid Lake Stage-Storage Volume-Area Curve

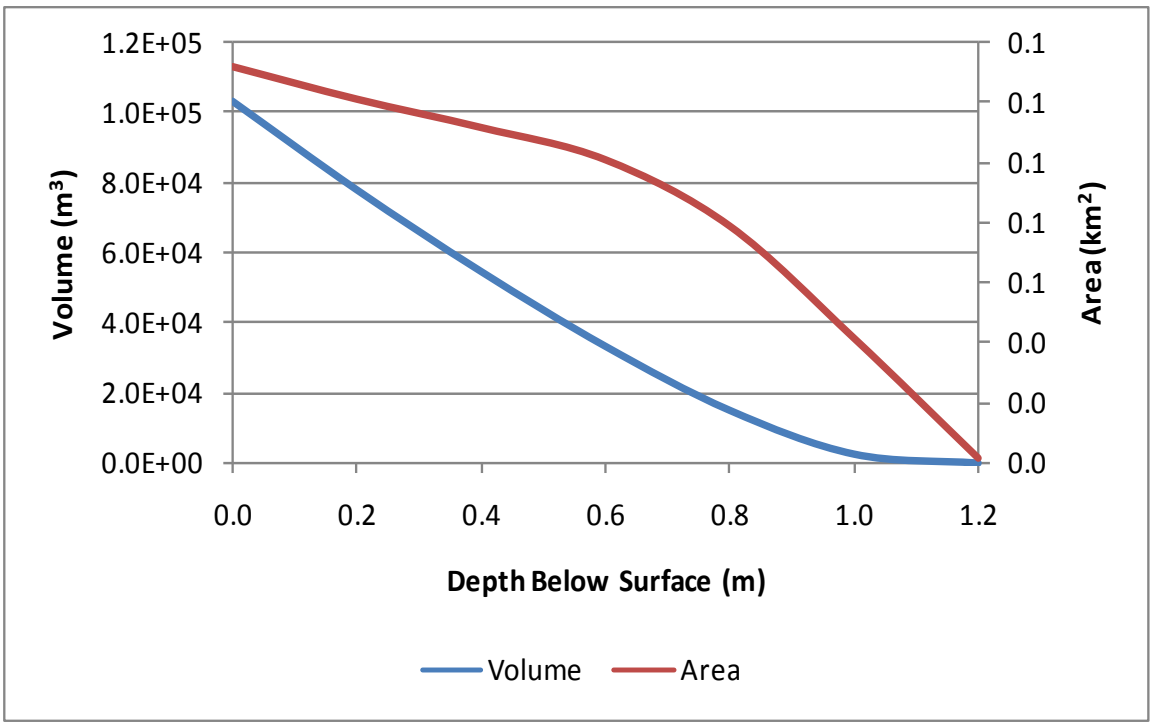


Figure V-4: Calf Lake Stage-Storage Volume-Area Curve

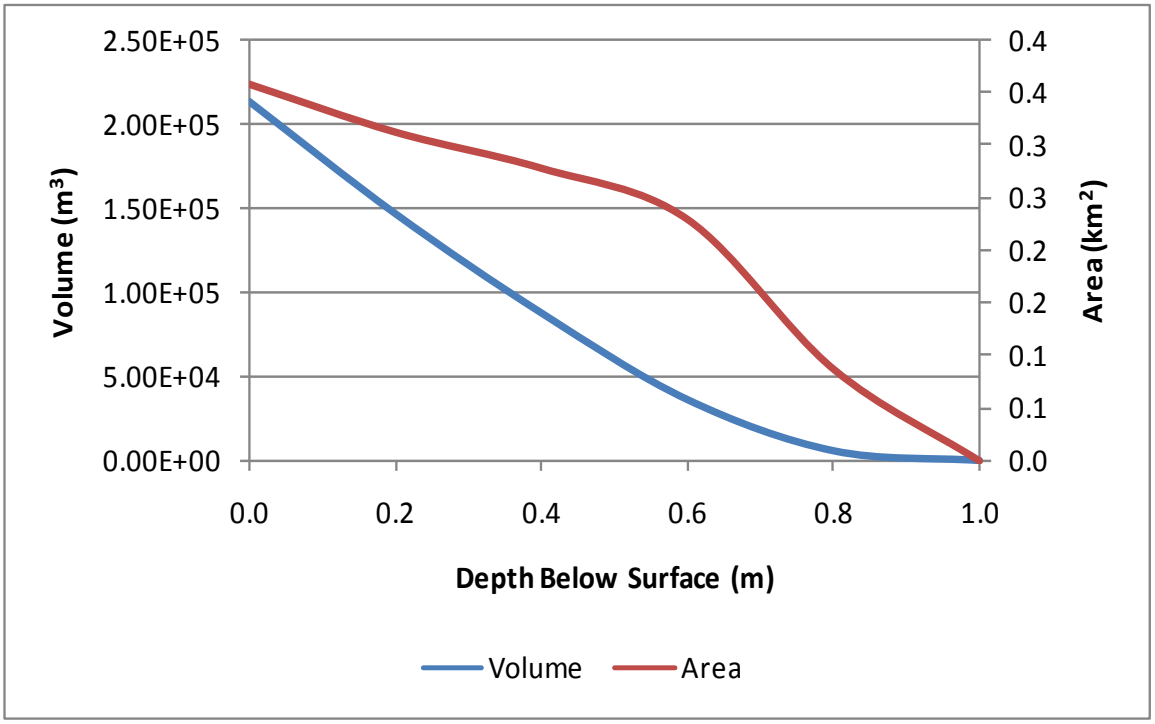


Figure V-5: Siamese Lake Stage-Storage Volume-Area Curve

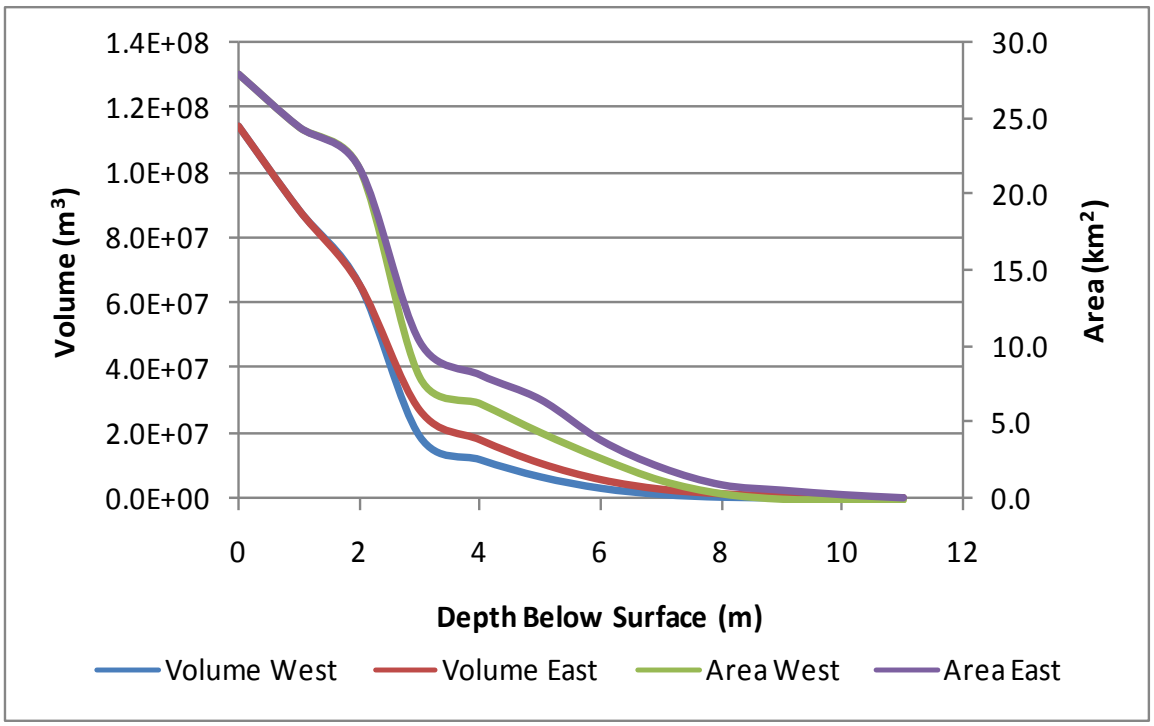


Figure V-6: Mushroom Lake Stage-Storage Volume-Area Curve

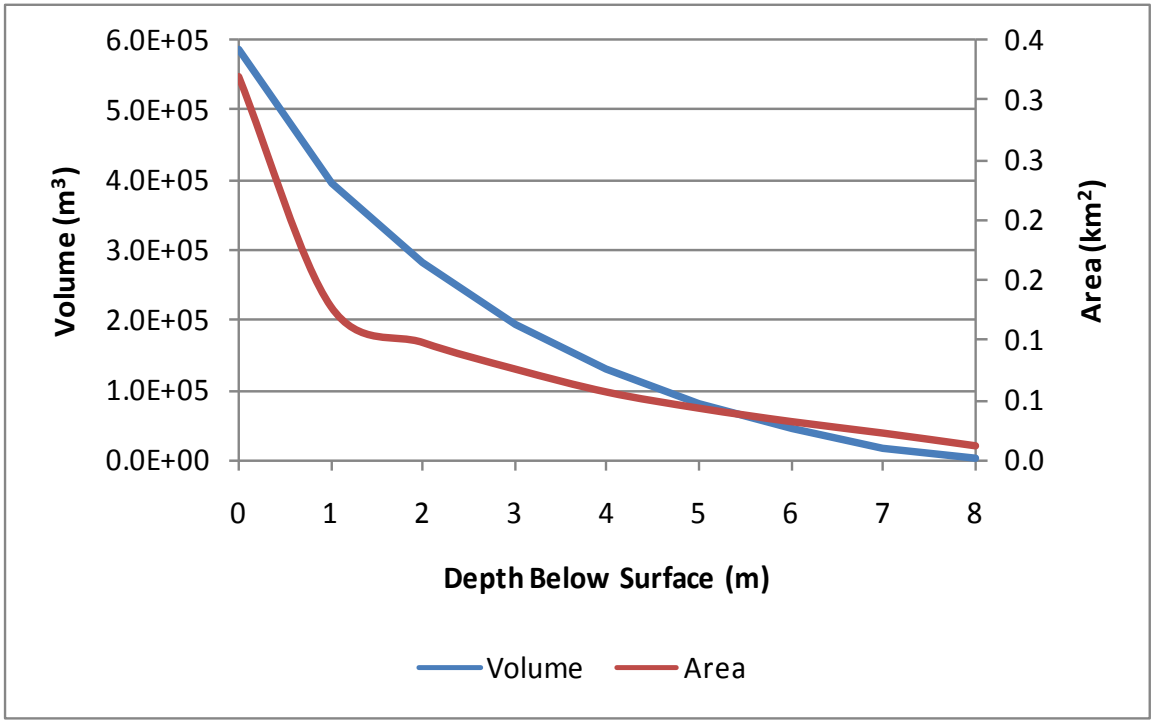


Figure V-7: Andrew Lake Stage-Storage Volume-Area Curve

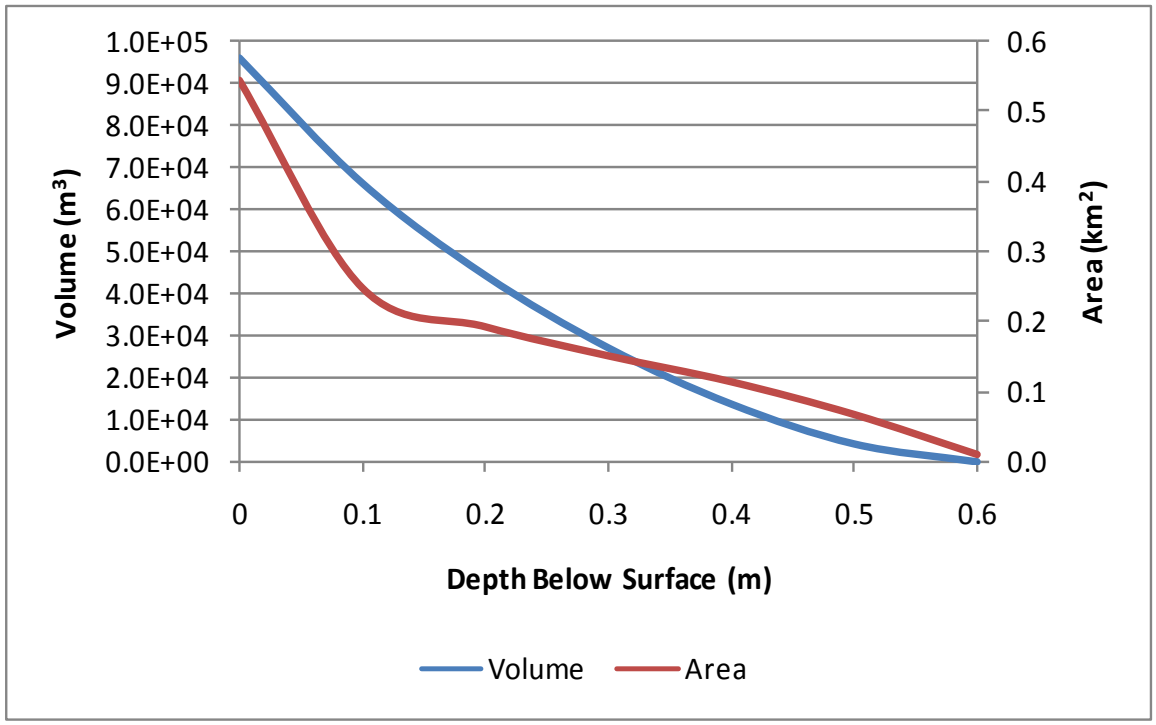
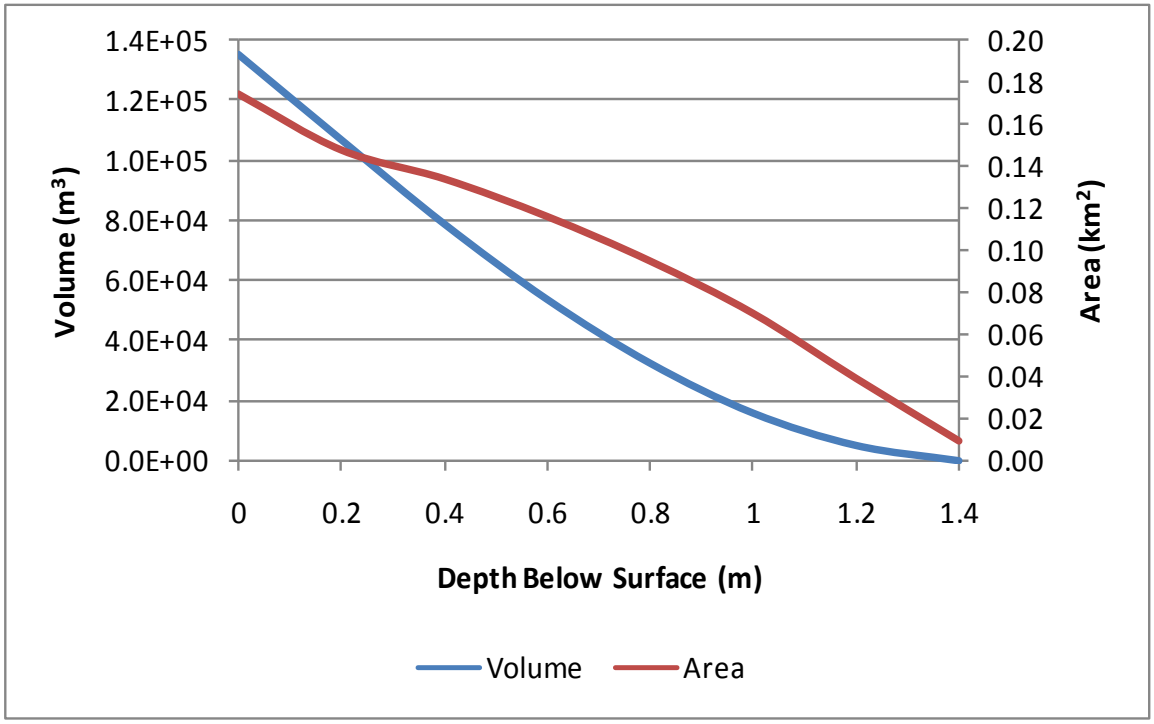


Figure V-8: Sik Sik Lake Stage-Storage Volume-Area Curve



Attachment VI: Stream Stage-Discharge Curves

Figure VI-1: SF1, Outflow of Skinny Lake Stage-Discharge Curve

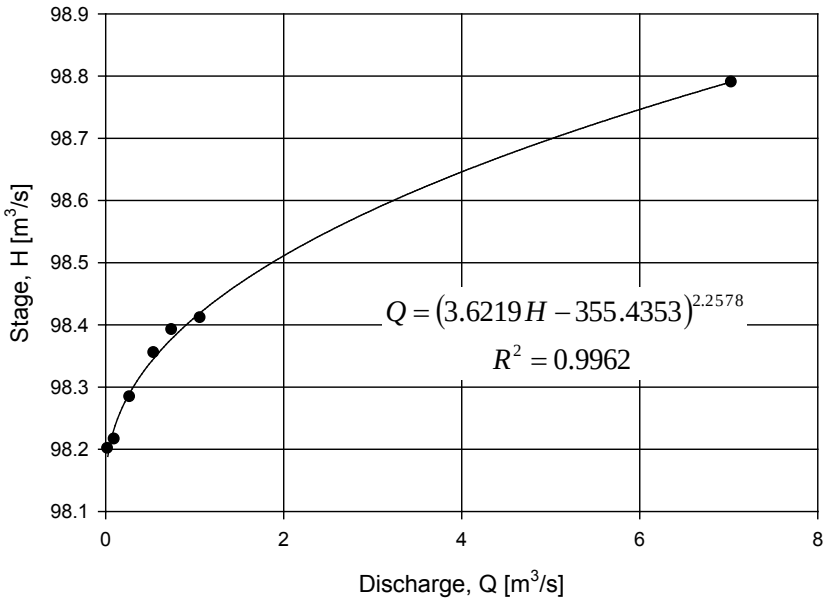


Figure VI-2: SF2, Outflow of Unnamed Lake Downstream of Cirque Lake Stage-Discharge Curve

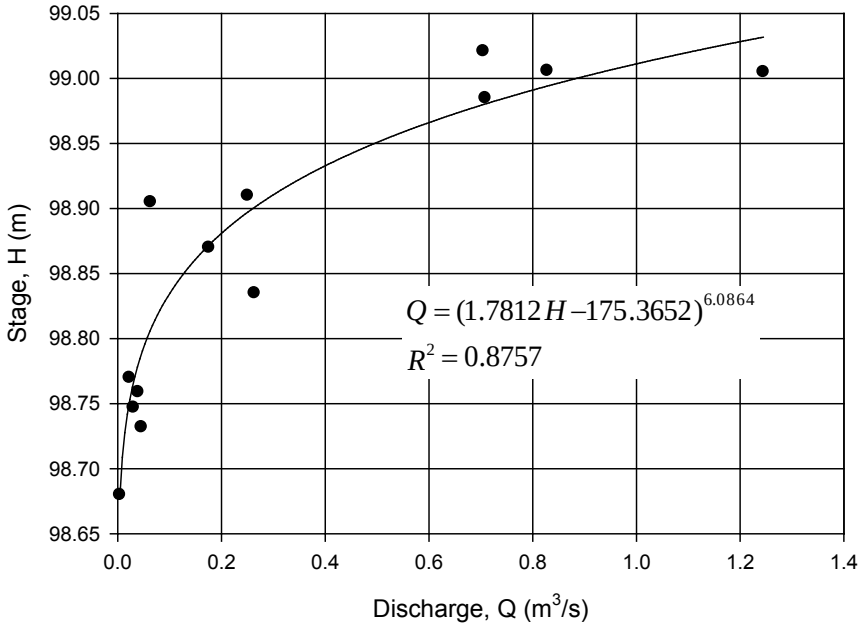


Figure VI-3: SF3, Northeast Inflow of Pointer Lake Stage-Discharge Curve

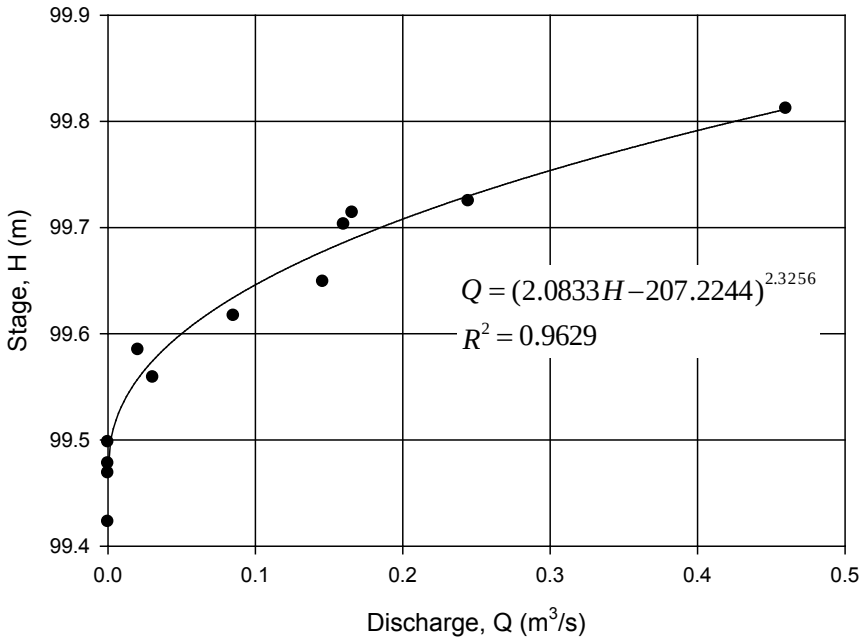


Figure VI-4: SF4, Outflow of Sik Sik Lake Stage-Discharge Curve

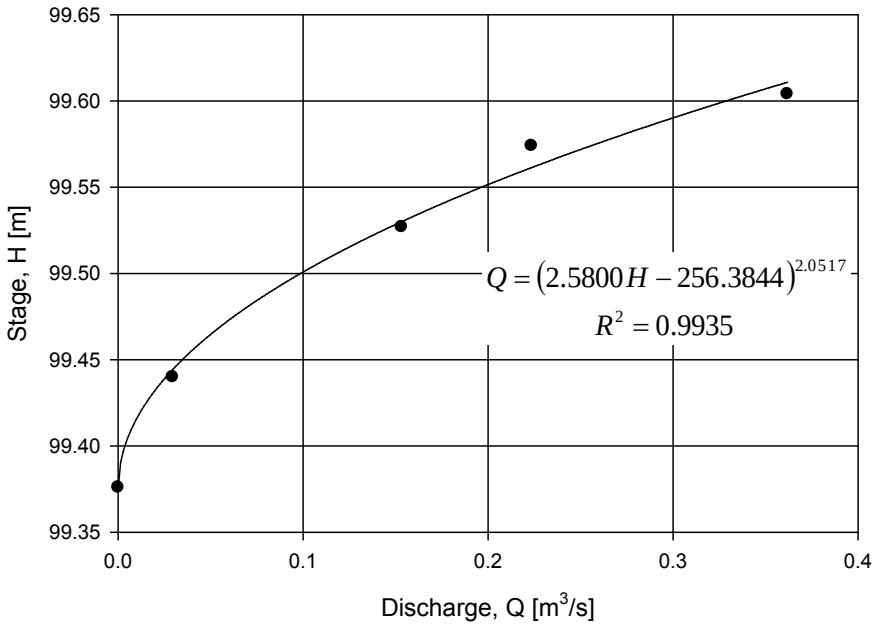


Figure VI-5: SF5, Outflow of Pointer Lake Stage-Discharge Curve

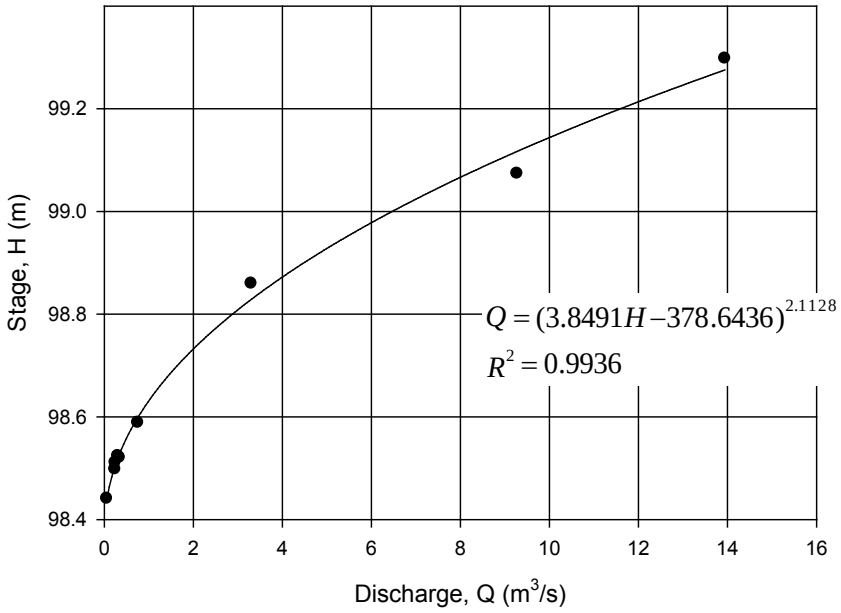


Figure VI-6: SF6, Outflow of Shack Lake Stage-Discharge Curve

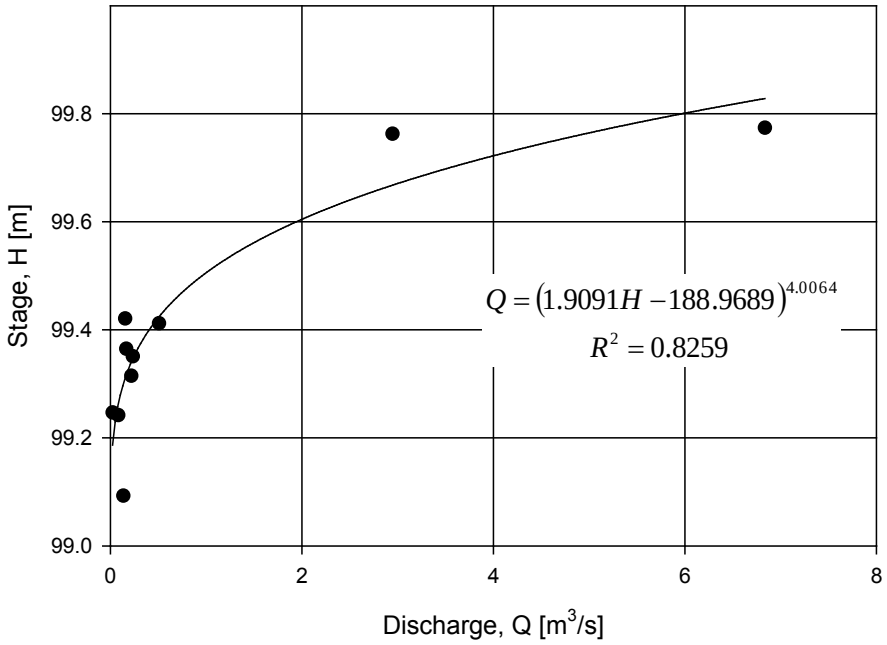


Figure VI-7: SF7, Outflow of Judge Sissons Lake Stage-Discharge Curve

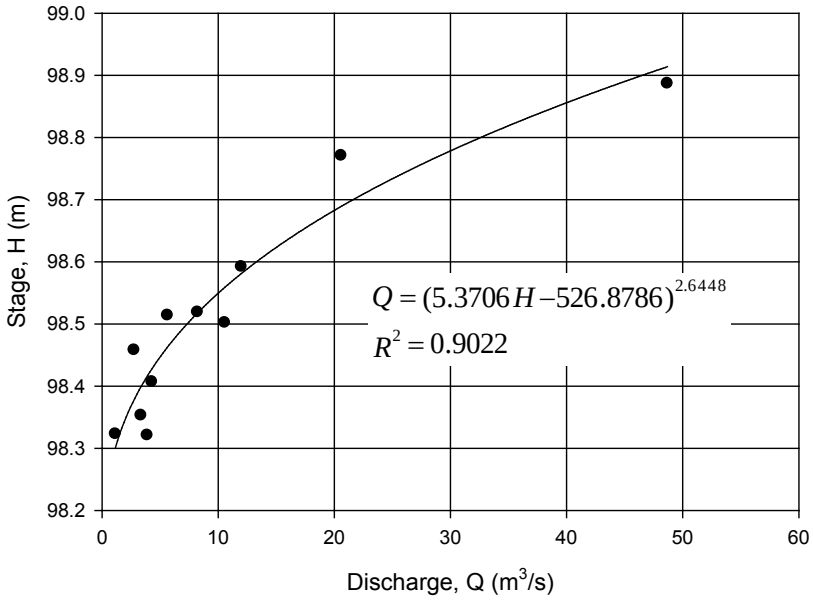


Figure VI-8: SF8, Outflow of Siamese Lake Stage-Discharge Curve

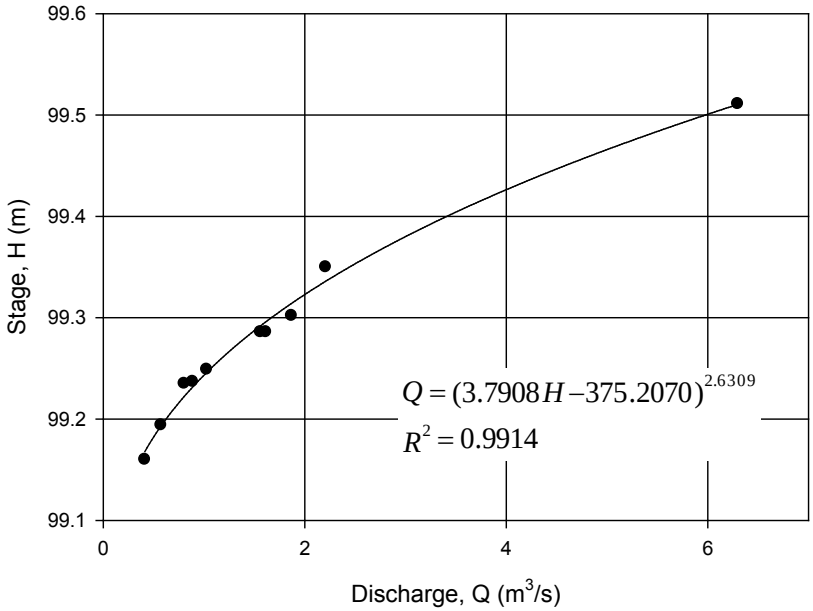


Figure VI-9: SF9, Outflow of Squiggly Lake Stage-Discharge Curve

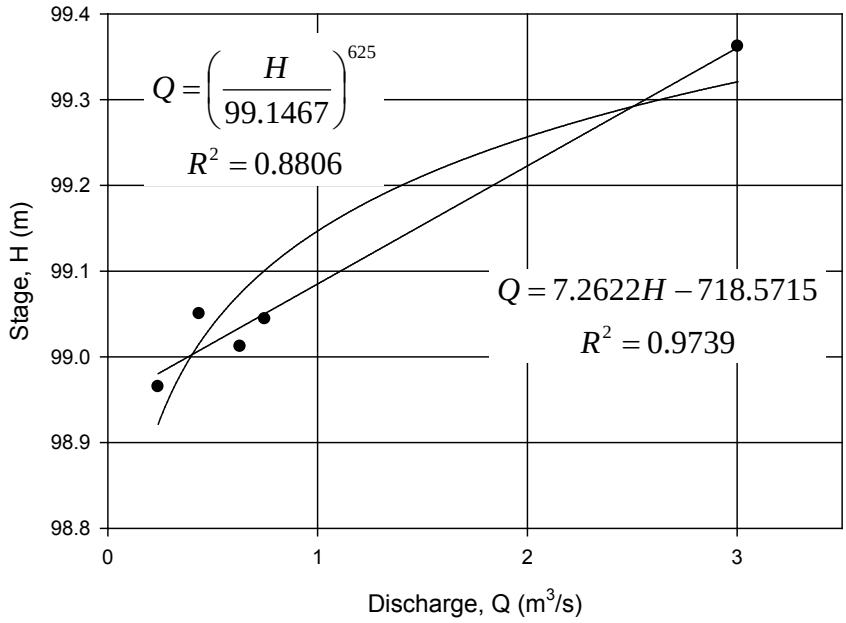


Figure VI-10: SF10 Tributary to the Northeast Inflow of Pointer Lake Stage-Discharge Curve

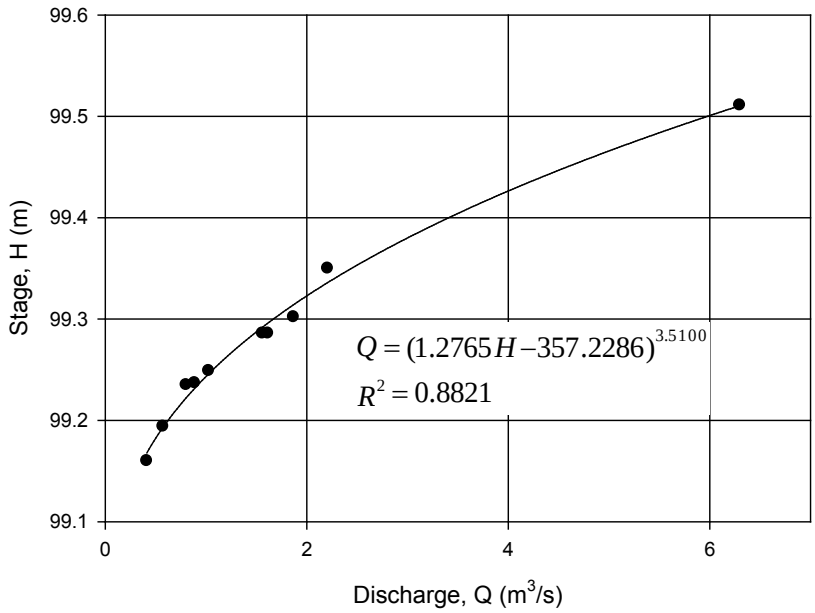


Figure VI-11: SF11 Northwest Inflow of Pointer Lake Stage-Discharge Curve

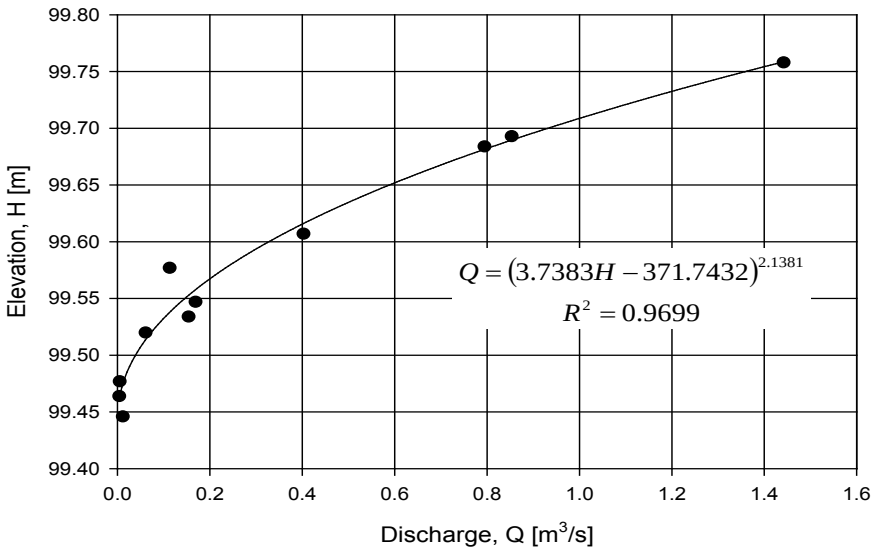


Figure VI-12: SF12 Outflow of Jaeger Lake Stage-Discharge Curve

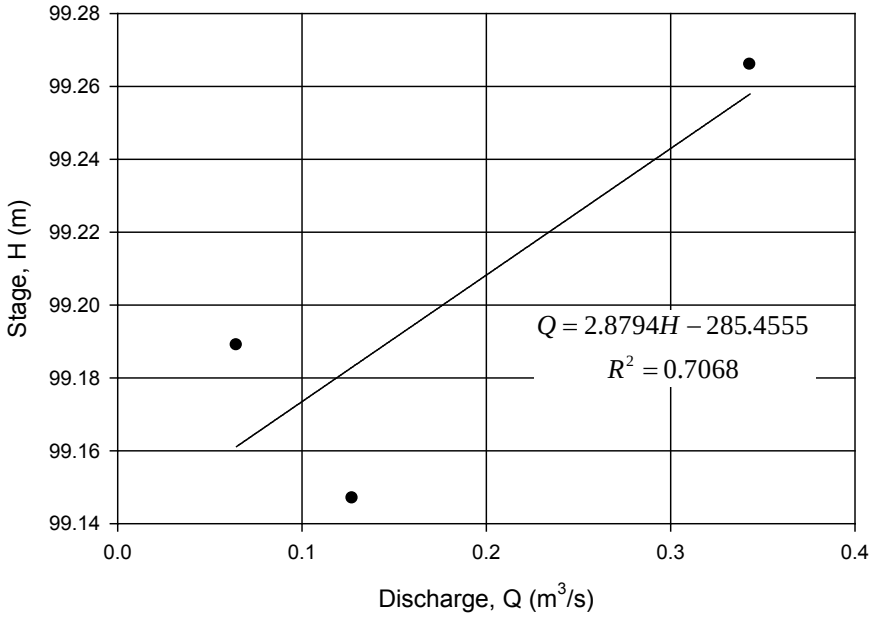


Figure VI-13: SF15 Outflow of Andrew Lake Stage-Discharge Curve

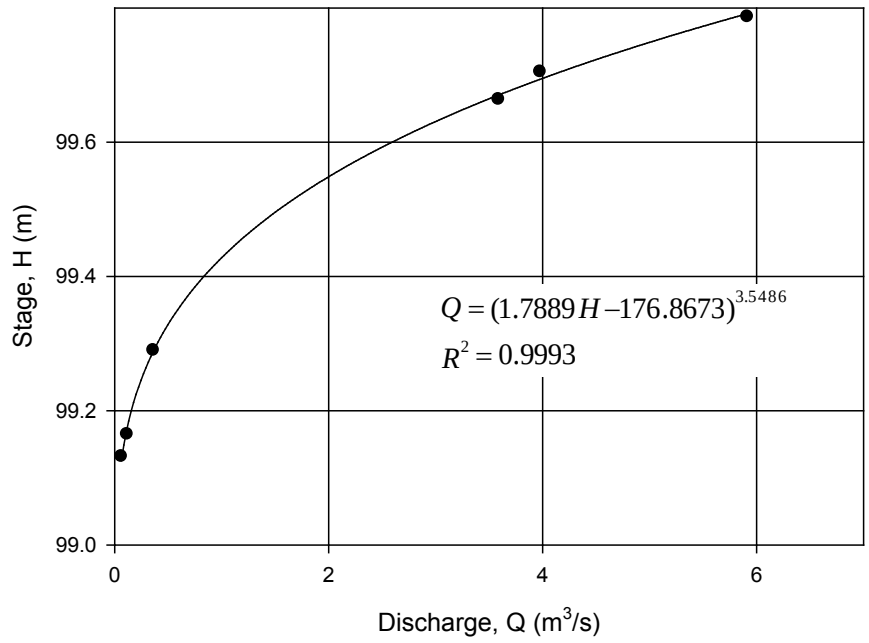
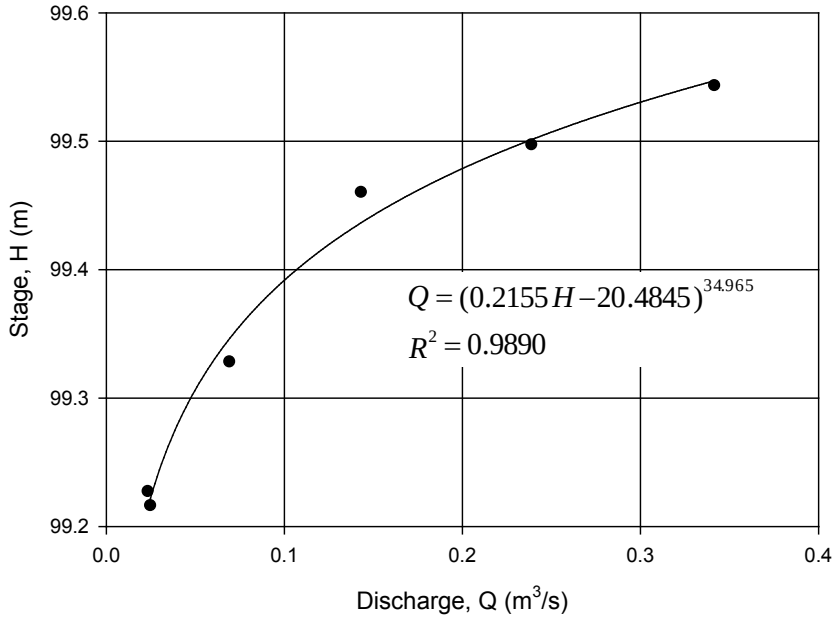


Figure VI-14: SF16 Outflow of Mushroom Lake Stage-Discharge Curve



Attachment VII: Daily Discharge Record for Select Streams near Kiggavik, 2007-2010

The daily data presented in Tables VII-1 to VII-11 are calculated using the water elevation data collected by the continuous water level sensors and Equations (11) through (23) as presented in Section 5. The data collected at the two monitoring stations that were previous Environment Canada hydrometric stations (SF13 and SF14) were placed into their historical rating curves, provided by Environment Canada.

In some cases, the daily discharge data between two streams were highly correlated, and were used to infill missing data. For example, the hydrographs for 2007 and 2008 at SF15 were generated based upon the relationship between the 2009 data set at SF6 and SF15. In addition, for the years in which the peak water level (and corresponding peak discharge) was measured, the rising limb of the hydrograph was extrapolated back in time in order to provide estimates for the data prior to field measurement. The data that have been infilled through correlation or extrapolation are denoted with asterisks (*).

Table VII-1
Calculated Daily Discharge Data for SF2, Outflow of Unnamed Lake Downstream of Cirque Lake; 2007, 2008, and 2009 (m^3/s)

Day	2007				2008				2009		
	Jun	Jul	Aug	Sep	Jun	Jul	Aug	Sep	Jun	Jul	Aug
1	-	0.39	0.00	0.20		0.51	0.00	0.20	-	0.25	0.00
2	-	0.34	0.01	0.17	0.10	0.37	0.00	-	-	0.21	0.00
3	-	0.29	0.01	0.15	0.04	0.26	0.00	-	-	0.17	0.00
4	-	0.25	0.01	0.15	0.02	0.19	0.00	-	-	0.13	0.00
5	-	0.19	0.01	0.15	0.02	0.14	0.00	-	-	0.12	0.00
6	-	0.17	0.01	0.13	0.03	0.12	0.00	-	-	0.11	0.00
7	-	0.15	0.01	0.11	0.11	0.11	0.00	-	-	0.10	0.05
8	-	0.14	0.02	0.11	0.22	0.09	0.00	-	-	0.09	0.32
9	-	0.12	0.02	0.09	0.23	0.07	0.00	-	-	0.08	0.30
10	-	0.09	0.02	0.08	0.30	0.07	0.00	-	-	0.07	0.19
11	0.00*	0.08	0.02	0.05	0.29	0.06	0.00	-	-	0.05	0.13
12	0.18*	0.06	0.02	0.06	0.54	0.06	0.00	-	-	0.04	0.09
13	0.42*	0.06	0.01	0.07	0.81	0.06	0.00	-	-	0.03	0.07
14	0.66	0.05	0.01	0.07	1.26	0.06	0.00	-	-	0.03	0.05
15	0.57	0.04	0.02	0.07	1.31	0.05	0.01	-	-	0.02	0.04
16	0.89	0.03	0.02	0.06	0.97	0.04	0.01	-	-	0.02	0.03
17	0.89	0.03	0.02	0.07	1.39	0.04	0.01	-	0.54	0.02	0.03
18	0.85	0.02	0.01	0.03	1.77	0.04	0.01	-	0.51	0.02	0.03
19	1.00	0.02	0.01	-	1.19	0.03	0.01	-	0.50	0.02	0.11
20	0.86	0.01	0.01	-	1.21	0.03	0.01	-	0.56	0.02	0.36
21	0.82	0.02	0.01	-	0.94	0.02	0.01	-	0.51	0.02	0.40
22	0.96	0.02	0.02	-	0.63	0.02	0.01	-	0.63	0.02	0.53
23	1.11	0.01	0.03	-	0.46	0.01	0.00	-	0.62	0.02	0.43
24	0.91	0.01	0.12	-	0.40	0.01	0.01	-	0.53	0.02	0.30
25	0.85	0.01	0.38	-	0.41	0.01	0.00	-	0.40	0.01	-
26	0.89	0.01	0.56	-	0.41	0.01	0.01	-	0.42	0.01	-
27	0.91	0.01	0.50	-	0.39	0.01	0.05	-	0.41	0.02	-
28	0.66	0.00	0.42	-	0.38	0.00	0.21	-	0.38	0.02	-
29	0.54	0.00	0.35	-	0.38	0.00	0.40	-	0.34	0.02	-
30	0.43	0.00	0.29	-	0.56	0.00	0.35	-	0.30	0.01	-
31		0.00	0.23	-		0.00	0.26	-	-	0.01	-
Average	0.72	0.08	0.10	-	0.58	0.08	0.04	-	-	0.06	-
Max	1.11	0.39	0.56	-	1.77	0.51	0.40	-	-	0.25	-
Min	0.00	0.00	0.00	-	0.02	0.00	0.00	-	-	0.01	-
Volume (10^6 m^3)	1.24	0.23	0.27	-	1.45	0.22	0.12	-	-	0.15	-
Basin Yield (mm)	90	16	20	-	104	15	9	-	-	11	-

Table VII-2
Calculated Daily Discharge Data for SF3, Northeast Inflow of Pointer Lake; 2008 and 2009 (m^3/s)

Day	2008		2009		
	Jun	Jul	Jun	Jul	Aug
1	-	0.06	-	0.06	0.00
2	0.04	0.03	-	0.05	0.00
3	0.03	0.02	-	0.03	0.00
4	0.03	0.00	-	0.02	0.00
5	0.28	0.00	-	0.03	0.00
6	0.23	0.00	-	0.02	0.00
7	0.09	0.00	-	0.01	0.00
8	0.11	0.00	-	0.01	0.13
9	0.13	0.00	-	0.01	0.11
10	0.18	0.00	-	0.00	0.07
11	0.21	0.00	-	0.00	0.04
12	0.23	0.00	-	0.00	0.03
13	0.34	0.00	-	0.00	0.02
14	0.33	0.00	-	0.00	0.01
15	0.27	0.00	-	0.00	0.01
16	0.23	0.00	0.29	0.00	0.00
17	0.24	0.00	0.27	0.00	0.00
18	0.31	0.00	0.24	0.00	0.00
19	0.21	0.00	0.23	0.00	0.10
20	0.25	0.00	0.24	0.00	0.21
21	0.18	0.00	0.20	0.00	0.14
22	0.11	0.00	0.20	0.00	0.18
23	0.08	0.00	0.17	0.00	0.12
24	0.07	-	0.14	0.00	0.09
25	0.07	-	0.12	0.00	-
26	0.06	-	0.12	0.00	-
27	0.05	-	0.11	0.00	-
28	0.04	-	0.09	0.00	-
29	0.04	-	0.08	0.00	-
30	0.07	-	0.07	0.00	-
31	-	-	-	0.00	-
Average	0.15	0.01	-	0.01	-
Max	0.34	0.06	-	0.06	-
Min	0.03	0.00	-	0.00	-
Volume (10^5 m^3)	3.87	0.10	-	0.19	-
Basin Yield (mm)	107	3	-	5	-

Table VII-3
Calculated Daily Discharge Data for SF4, Outflow of Sik Sik Lake; 2007, 2008 and 2009 (m^3/s)

Day	2007				2008				2009		
	Jun	Jul	Aug	Sep	Jun	Jul	Aug	Sep	Jun	Jul	Aug
1	-	0.06	0.00	0.00	-	0.00*	0.00	0.00	-	0.00	0.00
2	-	0.04	0.00	0.00	-	0.00*	0.00	-	-	0.00	0.00
3	-	0.03	0.00	0.00	0.00*	0.00*	0.00	-	-	0.00	0.00
4	-	0.02	0.00	0.00	0.05	0.00*	0.00	-	-	0.00	0.00
5	-	0.01	0.00	0.00	0.07	0.00*	0.00	-	-	0.00	0.00
6	-	0.00	0.00	0.00	0.07	0.00*	0.00	-	-	0.00	0.00
7	-	0.00	0.00	0.00	0.11	0.00*	0.00	-	-	0.00	0.00
8	-	0.00	0.00	0.00	0.13	0.00*	0.00	-	-	0.00	0.00
9	-	0.00	0.00	0.00	0.19	0.00*	0.00	-	-	0.00	0.00
10	-	0.00	0.00	0.00	0.32	0.00*	0.00	-	-	0.00	0.00
11	-	0.00	0.00	0.00	0.28	0.00*	0.00	-		0.00	0.00
12	0.00*	0.00	0.00	0.00	0.25	0.00*	0.00	-		0.00	0.00
13	0.04*	0.00	0.00	0.00	0.31	0.00*	0.00	-		0.00	0.00
14	0.14*	0.00	0.00	0.00	0.34	0.00*	0.00	-		0.00	0.00
15	0.23*	0.00	0.00	0.00	0.25	0.00*	0.00	-		0.00	0.00
16	0.33	0.00	0.00	0.00	0.20	0.00*	0.00	-	0.16	0.00	0.00
17	0.31	0.00	0.00	0.00	0.19	0.00*	0.00	-	0.12	0.00	0.00
18	0.31	0.00	0.00	0.00	0.29	0.00*	0.00	-	0.08	0.00	0.00
19	0.31	0.00	0.00	-	0.23	0.00*	0.00	-	0.06	0.00	0.00
20	0.31	0.00	0.00	-	0.20*	0.00*	0.00	-	0.07	0.00	0.00
21	0.34	0.00	0.00	-	0.17*	0.00*	0.00	-	0.08	0.00	0.00
22	0.30	0.00	0.00	-	0.14*	0.00*	0.00	-	0.06	0.00	0.00
23	0.26	0.00	0.00	-	0.11*	0.00	0.00	-	0.04	0.00	0.00
24	0.22	0.00	0.00	-	0.08*	0.00	0.00	-	0.03	0.00	0.00
25	0.19	0.00	0.00	-	0.05*	0.00	0.00	-	0.02	0.00	0.00
26	0.18	0.00	0.00	-	0.02*	0.00	0.00	-	0.02	0.00	-
27	0.17	0.00	0.00	-	0.00*	0.00	0.00	-	0.01	0.00	-
28	0.13	0.00	0.00	-	0.00*	0.00	0.00	-	0.01	0.00	-
29	0.10	0.00	0.00	-	0.00*	0.00	0.00	-	0.01	0.00	-
30	0.07	0.00	0.00	-	0.00*	0.00	0.00	-	0.00	0.00	-
31	-	0.00	0.00	-	-	0.00	0.00	-	-	0.00	-
Average	0.21	0.01	0.00	-	0.14	0.00	0.00	-	-	0.00	-
Max	0.34	0.06	0.00	-	0.34	0.00	0.00	-	-	0.00	-
Min	0.00	0.00	0.00	-	0.00	0.00	0.00	-	-	0.00	-
Volume (m^3)	341,244	14,139	0	-	348,246	0	159	-	-	165	-
Basin Yield (mm)	148	6	0	-	151	0	0	-	-	0	-

Table VII-4
Calculated Daily Discharge Data for SF5, Outflow of Pointer Lake; 2007, 2008, 2009 and 2010 (m^3/s)

Day	2007				2008				2009			2010		
	Jun	Jul	Aug	Sep	Jun	Jul	Aug	Sep	Jun	Jul	Aug	Jun	Jul	Aug
1	-	3.03*	0.10	0.24	-	2.55	0.08	0.26	-	1.92	0.16	-	3.49	0.74
2	-	3.37*	0.14	0.25	-	2.36	0.08	-	-	1.77	0.15	-	3.31	0.72
3	-	3.45*	0.10	0.28	-	2.09	0.07	-	-	1.63	0.18	-	3.14	0.67
4	-	3.14*	0.09	0.32	-	1.90	0.08	-	-	1.51	0.14	-	3.25	0.95
5	-	2.88*	0.08	0.35	-	1.72	0.08	-	-	1.40	0.10	-	3.45	0.58
6	-	2.68*	0.05	0.35	-	1.57	0.08	-	-	1.29	0.09	-	3.88	0.43
7	0.75*	2.39*	0.03	0.30	-	1.39	0.06	-	-	1.20	0.26	-	4.53	0.42
8	0.47*	2.14*	0.08	0.35	0.00*	1.23	0.05	-	-	1.15	0.22	-	5.69	0.41
9	0.79*	1.98*	0.06	0.31	1.70*	1.07	0.04	-	-	1.09	0.18	0.00*	6.31	0.39
10	3.14*	1.75*	0.05	0.37	3.68	1.01	0.05	-	-	0.99	0.17	1.82*	6.31	0.37
11	5.28*	1.55*	0.05	0.28	3.41	0.93	0.03	-	0.00*	0.90	0.23	3.65*	5.95	0.35
12	5.56*	1.39*	0.05	0.24	3.21	0.84	0.07	-	0.46*	0.89	0.24	5.47*	5.19	0.36
13	10.36*	1.29*	0.04	0.28	6.20	0.79	0.05	-	2.44*	0.84	0.23	7.29*	4.74	0.47
14	11.23*	1.22*	0.05	0.40	9.34	0.80	0.02	-	4.42*	0.75	0.18	9.11*	4.23	0.38
15	12.53*	1.22*	0.07	0.26	10.26	0.74	0.14	-	6.40*	0.64	0.15	10.94*	3.73	0.33
16	10.57*	1.17*	0.07	0.27	9.69	0.61	0.04	-	8.37	0.52	0.15	12.76*	3.31	0.34
17	8.66*	1.02*	0.05	0.22	8.82	0.55	0.05	-	8.77	0.50	0.12	14.58*	2.91	0.35
18	7.62*	0.93*	0.03	0.20	8.90	0.48	0.03	-	7.97	0.49	0.12	16.41	2.59	0.36
19	8.77*	0.85*	0.03	-	8.43	0.43	0.10	-	6.95	0.43	0.23	14.25	2.38	0.27
20	8.73*	0.77*	0.03	-	8.30	0.37	0.04	-	6.25	0.43	0.32	12.62	2.14	0.25
21	8.95*	0.69*	0.05	-	7.86	0.32	0.02	-	5.44	0.41	0.41	10.77	1.89	0.27
22	8.14*	0.61*	0.11	-	6.89	0.31	0.02	-	4.66	0.39	0.57	9.33	1.71	0.28
23	6.79*	0.62*	0.12	-	5.84	0.31	0.00	-	4.10	0.37	0.63	8.04	1.51	0.28
24	5.58*	0.59*	0.12	-	4.88	0.28	0.03	-	3.74	0.34	0.68	6.92	1.33	0.27
25	4.64*	0.51*	0.09	-	4.33	0.24	0.00	-	3.27	0.33	0.73	6.09	1.22	-
26	3.94*	0.47*	0.08	-	3.88	0.26	0.02	-	2.95	0.34	-	5.42	1.23	-
27	3.49*	0.48*	0.15	-	3.39	0.22	0.05	-	2.73	0.36	-	4.85	1.12	-
28	3.02*	0.52*	0.16	-	2.95	0.16	0.08	-	2.48	0.31	-	4.34	1.01	-
29	2.86*	0.37*	0.18	-	2.53	0.15	0.11	-	2.26	0.27	-	3.91	0.94	-
30	2.65*	0.21*	0.23	-	2.67	0.12	0.15	-	2.07	0.25	-	3.64	0.84	-
31		0.09*	0.22	-		0.09	0.22	-		0.23	-		0.81	-
Average	6.02	1.40	0.09	-	5.53	0.83	0.06		4.29	0.77	-	7.83	3.04	-
Max	12.53	3.45	0.23	-	10.26	2.55	0.22		8.77	1.92	-	16.41	6.31	-
Min	0.47	0.09	0.03	-	0.00	0.09	0.00		0.00	0.23	-	0.00	0.81	-
Volume (10^6 m^3)	12.5	3.75	0.24		11.0	2.23	0.17		7.41	2.07	-	14.9	8.13	-
Basin Yield (mm)	158	47	3	-	139	28	2	-	94	26	-	188	103	-

Table VII-5
Calculated Daily Discharge Data for SF6, Outflow of Shack Lake; 2007, 2008 and 2009 (m^3/s)

Day	2007				2008				2009		
	Jun	Jul	Aug	Sep	Jun	Jul	Aug	Sep	Jun	Jul	Aug
1	-	1.82	0.00	0.64	-	1.99	0.00	0.54	-	0.95	0.06
2	-	1.65	0.00	0.64	-	2.04	0.00	-	-	0.85	0.05
3	-	1.59	0.00	0.65	-	1.85	0.00	-	-	0.76	0.05
4	-	1.49	0.00	0.70	-	1.69	0.00	-	-	0.68	0.05
5	-	1.34	0.00	0.64	-	1.56	0.00	-	-	0.60	0.04
6	-	1.17	0.00	0.62	0.34	1.38	0.00	-	-	0.53	0.04
7	-	1.05	0.00	0.59	0.17	1.22	0.00	-	-	0.47	0.07
8	-	0.97	0.00	0.59	0.37	1.12	0.00	-	-	0.44	0.09
9	-	0.89	0.00	0.57	1.85	0.97	0.00	-	-	0.43	0.07
10	-	0.83	0.00	0.58	3.20	0.85	0.00	-	0.00	0.36	0.06
11	-	0.76	0.00	0.52	3.37	0.75	0.00	-	0.16	0.32	0.07
12	-	0.67	0.00	0.46	6.39	0.68	0.00	-	1.41	0.30	0.08
13	0.00	0.60	0.00	0.45	6.94	0.64	0.00	-	2.65	0.26	0.07
14	0.02	0.54	0.00	0.53	7.76	0.64	0.00	-	3.90	0.22	0.07
15	3.04	0.48	0.00	0.48	6.53	0.61	0.00	-	5.15	0.19	0.06
16	6.06	0.41	0.00	0.40	5.32	0.51	0.00	-	5.40	0.14	0.05
17	7.03	0.35	0.00	0.38	4.67	0.46	0.00	-	4.83	0.12	0.05
18	8.51	0.32	0.00	0.33	5.39	0.41	0.00	-	4.26	0.12	0.04
19	7.16	0.28	0.00	-	5.37	0.36	0.00	-	3.64	0.10	0.06
20	6.52	0.23	0.00	-	5.51	0.30	0.00	-	3.29	0.09	0.08
21	6.03	0.20	0.00	-	5.00	0.26	0.00	-	3.22	0.09	0.09
22	5.61	0.23	0.00	-	4.15	0.26	0.00	-	2.61	0.08	0.10
23	5.06	0.20	0.00	-	3.38	0.24	0.00	-	2.26	0.08	0.10
24	4.34	0.18	0.16	-	2.79	0.19	0.00	-	2.02	0.08	0.10
25	3.79	0.03	0.26	-	2.36	0.17	0.00	-	1.77	0.08	0.10
26	3.31	0.00	0.28	-	2.07	0.17	0.00	-	1.59	0.08	-
27	2.79	0.01	0.42	-	1.77	0.20	0.00	-	1.46	0.09	-
28	2.50	0.00	0.57	-	1.67	0.10	0.17	-	1.31	0.09	-
29	2.22	0.00	0.62	-	1.54	0.00	0.28	-	1.18	0.09	-
30	2.01	0.00	0.69	-	1.78	0.00	0.36	-	1.06	0.08	-
31	-	0.00	0.66	-	-	0.00	0.46	-	-	0.08	-
Average	4.22	0.59	0.12	-	3.59	0.70	0.04	-	2.53	0.29	-
Max	8.51	1.82	0.69	-	7.76	2.04	0.46	-	5.40	0.95	-
Min	0.00	0.00	0.00	-	0.17	0.00	0.00	-	0.00	0.08	-
Volume (10^5 m^3)	65.7	15.8	3.16	-	77.5	18.7	1.10	-	45.9	7.64	-
Basin Yield (mm)	120	29	6	-	142	34	2	-	84	14	-

Table VII-6
Calculated Daily Discharge Data for SF7, Outflow of Judge Sissons Lake; 2007, 2008, 2009 and 2010 (m^3/s)

Day	2007				2008				2009			2010		
	Jun	Jul	Aug	Sep	Jun	Jul	Aug	Sep	Jun	Jul	Aug	Jun	Jul	Aug
1	-	16.09	3.06	1.36	-	16.34	4.08	3.17	-	18.87	7.96	-	20.71	5.92
2	-	14.44	2.99	1.37	-	16.00	3.84	-	-	18.20	7.72	-	19.50	5.71
3	-	13.40	2.97	1.42	-	15.15	3.72	-	-	17.45	7.27	-	18.41	5.04
4	-	12.61	2.87	1.52	-	14.42	3.60	-	-	16.87	7.38	-	18.42	3.69
5	-	11.69	2.70	1.17	1.88	13.78	3.61	-	0.00*	16.44	7.41	-	18.71	3.74
6	-	10.93	2.81	1.19	1.87	13.19	3.67	-	1.48*	15.81	7.23	-	18.91	3.69
7	-	10.37	2.86	1.30	2.23	12.56	3.40	-	3.36*	15.43	7.22	-	19.77	3.47
8	-	10.00	2.69	1.20	3.48	11.85	3.23	-	5.25*	15.04	8.27	-	21.63	3.31
9	-	9.58	2.88	1.18	4.45	11.18	3.08	-	7.13*	14.87	8.12	0.00*	22.46	3.26
10	-	8.92	2.59	1.04	6.48	10.47	2.96	-	9.02*	14.40	8.14	4.73*	22.35	3.12
11	0.00*	8.16	2.38	1.01	9.20	9.95	2.99	-	10.90*	13.82	7.51	9.45*	22.26	2.90
12	0.19*	7.22	2.20	1.17	11.35	9.39	2.83	-	12.79*	13.50	7.28	14.18*	21.11	2.60
13	2.08*	6.93	2.00	1.01	12.83	8.49	2.74	-	14.67*	13.02	7.41	18.91*	20.66	1.82
14	3.96*	6.33	1.85	0.88	14.81	9.11	3.10	-	16.56*	12.56	7.10	23.63*	19.45	1.65
15	5.85*	5.96	1.66	0.89	16.69	8.94	3.03	-	18.44*	12.02	7.01	28.36*	18.53	1.80
16	7.73*	5.72	1.72	0.76	17.79	8.47	3.11	-	20.33*	11.63	6.71	33.09*	17.86	1.68
17	9.62	5.48	1.77	0.87	18.54	8.12	2.92	-	22.21	11.53	6.98	37.82*	16.84	1.42
18	10.76	5.47	1.73	-	20.30	7.70	2.84	-	23.39	10.92	6.83	42.54	15.81	1.27
19	13.66	5.35	1.72	-	21.43	6.79	2.74	-	24.39	10.69	6.99	42.24	15.02	1.52
20	17.59	5.18	1.47	-	22.94	6.89	2.36	-	25.44	10.56	7.04	42.25	13.84	1.53
21	21.17	5.21	1.27	-	23.25	6.86	2.34	-	26.10	10.31	6.66	40.97	13.40	1.44
22	22.97	5.43	0.76	-	22.98	6.92	2.24	-	25.41	9.82	6.84	39.55	11.79	1.55
23	24.09	5.13	0.88	-	22.39	6.05	2.28	-	24.71	9.48	6.74	37.36	10.93	1.49

Table VII-6
Calculated Daily Discharge Data for SF7, Outflow of Judge Sissons Lake; 2007, 2008, 2009 and 2010 (m^3/s) (continued)

Day	2007				2008				2009			2010		
	Jun	Jul	Aug	Sep	Jun	Jul	Aug	Sep	Jun	Jul	Aug	Jun	Jul	Aug
24	24.22	4.86	1.32	-	21.49	5.46	1.89	-	24.35	9.28	6.55	34.75	10.68	1.59
25	23.71	4.42	1.48	-	20.33	5.12	1.88	-	23.66	9.12	6.49	31.96	9.95	-
26	22.45	4.38	1.60	-	19.31	5.29	1.94	-	23.03	8.94	-	29.57	8.60	-
27	21.09	4.26	1.57	-	18.38	5.18	1.73	-	22.21	8.72	-	27.37	8.14	-
28	19.60	4.03	1.62	-	17.46	4.78	2.51	-	21.38	8.58	-	25.31	7.63	-
29	18.62	3.97	1.55	-	16.41	4.49	3.63	-	20.38	8.69	-	23.35	6.88	-
30	17.35	3.79	1.42	-	16.77	4.38	3.50	-	19.52	8.36	-	21.60	6.66	-
31	-	3.37	1.44	-	-	4.26	3.13	-	-	8.09	-	-	6.35	-
Average	14.34	7.38	1.99	-	14.81	8.95	2.93	-	17.16	12.36	-	27.7	15.6	-
Max	24.22	16.09	3.06	-	23.25	16.34	4.08	-	26.10	18.87	-	42.5	22.5	-
Min	0.00	3.37	0.76	-	1.87	4.26	1.73	-	0.00	8.09	-	0.0	6.3	-
Volume (10^6 m^3)	24.8	19.8	5.34	-	33.3	24.0	7.86	-	38.5	33.1	-	52.6	41.8	-
Basin Yield (mm)	38	30	8	-	51	36	12	-	59	50	-	80	63	-

Table VII-7
Calculated Daily Discharge Data for SF8, Outflow of Siamese Lake; 2007, 2008, 2009 and 2010 (m^3/s)

Day	2007		2008			2009			2010		
	Aug	Sep	Jul	Aug	Sep	Jun	Jul	Aug	Jun	Jul	Aug
1	-	0.60	-	0.80	0.57	-	1.99	0.66	-	3.90	1.55
2	0.87	0.61	-	0.83	-	-	1.94	0.62	-	3.79	1.58
3	0.82	0.62	-	0.80	-	-	1.89	0.65	-	3.72	1.42
4	0.79	0.74	-	0.79	-	-	1.84	0.62	-	3.65	1.89
5	0.72	0.61	-	0.80	-	-	1.85	0.53	-	4.09	1.29
6	0.66	0.62	-	0.89	-	-	1.79	0.47	-	4.20	0.92
7	0.56	0.57	-	0.71	-	0.00*	1.71	0.81	-	4.63	0.86
8	0.79	0.66	-	0.63	-	0.10*	1.71	0.94	-	5.15	0.83
9	0.64	0.59	-	0.58	-	0.32*	1.73	0.75	0.00*	5.09	0.80
10	0.58	0.79	-	0.57	-	0.54*	1.66	0.68	0.63*	4.86	0.77
11	0.54	0.52	-	0.53	-	0.76*	1.56	0.72	1.25*	4.70	0.73
12	0.51	0.48	-	0.59	-	0.97*	1.49	0.70	1.88*	4.42	0.70
13	0.47	0.50	-	0.49	-	1.19*	1.49	0.72	2.50*	4.30	0.77
14	0.46	0.84	-	0.46	-	1.41*	1.42	0.58	3.13*	4.12	0.66
15	0.49	0.79	-	0.69	-	1.63*	1.30	0.51	3.75*	3.89	0.60
16	0.50	0.51	-	0.51	-	1.84*	1.18	0.49	4.38*	3.70	0.57
17	0.48	0.57	-	0.51	-	2.06*	1.20	0.45	5.00*	3.54	0.57
18	0.43	0.49	-	0.46	-	2.28	1.22	0.43	5.63*	3.39	0.67
19	0.42	0.38	-	0.69	-	2.47	1.12	0.51	6.25	3.27	0.49
20	0.39	0.60	-	0.48	-	2.71	1.13	0.70	6.25	3.13	0.43
21	0.41	-	-	0.38	-	2.80	1.10	0.66	6.11	3.02	0.44
22	0.48	-	-	0.35	-	2.66	1.04	0.74	5.89	2.82	0.50
23	0.76	-	-	0.34	-	2.56	1.08	0.69	5.69	2.65	0.44
24	0.76	-	1.41	0.35	-	2.52	1.03	0.65	5.33	2.50	0.52
25	0.65	-	1.34	0.29	-	2.38	0.99	0.65	5.00	2.33	-
26	0.62	-	1.50	0.27	-	2.34	0.97	-	4.76	2.26	-
27	0.78	-	1.61	0.34	-	2.31	0.97	-	4.53	2.14	-
28	0.78	-	1.21	0.47	-	2.18	0.93	-	4.27	2.00	-
29	0.71	-	1.08	0.59	-	2.12	0.95	-	4.05	1.86	-
30	0.74	-	1.01	0.58	-	2.02	0.87	-	3.95	1.72	-
31	0.62	-	0.89	0.57	-	-	0.85	-	-	1.68	-
Average	-	-	-	0.56	-	1.76	1.35	-	4.10	3.44	-
Max	-	-	-	0.89	-	2.80	1.99	-	6.25	5.15	-
Min	-	-	-	0.27	-	0.00	0.85	-	0.00	1.68	-
Volume (10^6 m^3)	-	-	-	1.50	-	3.64	3.63	-	7.79	9.20	-
Basin Yield (mm)	-	-	-	17	-	42	42	-	91	107	-

Table VII-8
Calculated Daily Discharge Data for SF9, Outflow of Squiggly Lake, 2007 and 2008 (m^3/s)

Day	2007				2008	
	Jun	Jul	Aug	Sep	Jul	Aug
1	-	2.24	0.29	1.03	-	0.34
2	-	1.94	0.29	0.92	-	0.33
3	-	1.81	0.28	0.88	-	0.32
4	-	1.62	0.27	0.85	-	0.33
5	-	1.48	0.26	0.82	-	0.33
6	-	1.37	0.25	0.73	-	0.32
7	-	1.26	0.26	0.66	-	0.30
8	-	1.16	0.33	0.65	-	0.30
9	-	1.06	0.28	0.60	-	0.29
10	-	0.98	0.27	0.53	-	0.30
11	-	0.90	0.27	0.51	-	0.29
12	-	0.82	0.27	0.43	-	0.30
13	-	0.76	0.26	0.44	-	0.29
14	-	0.69	0.27	0.42	-	0.29
15	-	0.62	0.29	0.66	-	0.36
16	-	0.56	0.30	0.42	-	0.34
17	-	0.51	0.28	0.44	-	0.32
18	2.74	0.45	0.27	0.47	-	0.31
19	2.68	0.41	0.26	0.38	-	0.33
20	2.70	0.38	0.26	-	-	0.29
21	2.72	0.38	0.28	-	-	0.30
22	3.48	0.36	0.30	-	0.53	0.30
23	5.25	0.36	0.37	-	0.45	0.29
24	4.70	0.35	2.44	-	0.45	0.30
25	4.08	0.34	2.99	-	0.43	0.29
26	3.82	0.33	2.07	-	0.43	0.34
27	3.43	0.32	1.78	-	0.38	0.38
28	3.05	0.30	1.55	-	0.38	0.56
29	2.69	0.30	1.37	-	0.37	0.61
30	2.40	0.29	1.25	-	0.36	0.62
31	-	0.28	1.12	-	0.35	0.62
Average	-	0.79	0.68	-	-	0.35
Max	-	2.24	2.99	-	-	0.62
Min	-	0.28	0.25	-	-	0.29
Volume (10^6 m^3)	-	2.13	1.82	-	-	0.94
Basin Yield (mm)	-	31	26	-	-	14

Table VII-9
Calculated Daily Discharge Data for SF13, Aniguq River, 2008, 2009 and 2010 (m^3/s)

Day	2008				2009			2010
	Jun	Jul	Aug	Sep	Jun	Jul	Aug	Jun
1	-	107.53	13.48	21.16	-	75.27	14.60	-
2	-	103.37	14.43	21.04	-	70.96	13.86	-
3	-	97.66	13.79	21.51	-	67.27	14.56	-
4	-	93.63	13.30	-	-	63.10	15.11	-
5	-	89.62	15.14	-	-	59.22	13.49	-
6	-	81.82	18.11	-	-	56.79	11.84	-
7	-	78.98	13.43	-	-	51.61	12.56	-
8	0.00*	75.23	11.39	-	-	51.12	20.60	-
9	8.66*	69.39	9.12	-	-	49.78	15.69	-
10	26.60*	63.29	9.46	-	-	44.09	14.54	-
11	44.55	59.33	8.49	-	-	45.69	15.44	-
12	51.56	55.57	10.33	-	0.00*	42.23	14.87	-
13	65.04	53.61	8.95	-	6.76*	40.83	16.05	-
14	77.65	55.38	8.22	-	24.70*	37.96	12.70	-
15	92.93	52.80	13.74	-	42.65*	35.64	11.50	-
16	102.66	46.63	11.54	-	60.59*	28.82	10.75	-
17	150.07	43.25	11.56	-	78.54*	28.73	9.89	-
18	170.15	41.84	10.41	-	96.48*	29.36	7.73	-
19	168.60	38.98	14.64	-	114.42	26.16	7.48	-
20	167.74	35.62	11.70	-	115.98	25.31	15.52	283.31
21	168.31	31.99	9.33	-	117.07	25.06	14.70	254.13
22	161.03	35.84	8.81	-	128.01	24.11*	15.92	220.80
23	154.49	33.00	8.40	-	123.07	23.16*	15.84	200.07
24	145.52	28.47	8.12	-	116.41	22.21*	15.23	176.84
25	137.38	26.36	6.14	-	107.90	21.26*	15.63	154.93
26	130.42	30.26	4.72	-	101.05	20.31	15.78	137.75
27	117.18	32.01	5.19	-	97.68	23.69	-	126.21
28	116.88	24.52	9.22	-	89.18	23.35	-	115.59
29	109.25	21.06	17.55	-	84.52	22.68	-	-
30	104.21	18.77	17.50	-	79.74	20.34	-	-
31	-	15.78	18.95	-	-	20.66	-	-
Average	107.43	52.96	11.46	-	83.41	37.96	-	-
Max	170.15	107.53	18.95	-	128.01	75.27	-	-
Min	0.00	15.78	4.72	-	0.00	20.31	-	-
Volume (10^8 m^3)	2.13	1.41	0.31	-	1.37	1.02	-	-
Basin Yield (mm)	78	52	11	-	50	37	-	-

Table VII-10
Calculated Daily Discharge Data for SF14, Qinguq Creek, 2008, 2009 and 2010 (m^3/s)

Day	2008				2009			2010		
	Jun	Jul	Aug	Sep	Jun	Jul	Aug	Jun	Jul	Aug
1	-	12.18	1.72	10.73	-	7.26	1.64	-	11.69	2.65
2	-	11.14	1.67	10.71	-	6.64	1.48	-	11.05	2.57
3	-	10.23	1.61	10.40	-	6.08	1.56	-	10.53	2.44
4	-	9.36	1.55	-	-	5.58	1.56	-	11.59	4.01
5	0.00*	8.65	1.56	-	-	5.16	1.33	-	17.14	2.89
6	7.63*	7.95	1.68	-	-	4.85	1.18	-	19.25	-
7	15.26	7.17	1.53	-	-	4.48	1.97	-	27.52	-
8	34.75*	6.58	1.26	-	-	4.43	3.54	-	30.79	-
9	32.45	5.95	1.13	-	-	4.38	2.59	-	28.18	-
10	29.69	5.42	1.07	-	-	4.00	2.09	-	26.83	-
11	27.35	5.00	1.03	-	-	3.74	1.89	-	24.88	-
12	25.99	4.57	1.08	-	-	3.55	2.03	-	21.68	-
13	26.43	4.36	1.24	-	-	3.29	1.85	-	20.57	-
14	26.08	4.42	1.11	-	-	3.13	1.65	-	18.48	-
15	26.64	4.94	3.17	-	-	2.96	1.32	-	15.98	-
16	25.28	4.41	2.66	-	-	2.59	1.24	-	14.08	-
17	23.07	4.35	2.27	-	-	2.38	1.18	-	12.41	-
18	23.02	4.37	2.09	-	-	2.57	1.15	-	11.17	-
19	22.66	4.39	2.06	-	20.61	2.39	2.93	-	10.07	10.44
20	22.40	4.24	2.89	-	19.51	2.30	9.61	38.69	9.55	8.68
21	21.27	3.96	1.65	-	18.83	2.29	6.42	34.88	8.35	8.66
22	19.33	4.13	1.58	-	17.26	2.13	6.39	31.38	7.44	9.86
23	17.54	4.02	1.48	-	15.71	2.17	5.40	28.33	6.45	10.09
24	15.71	3.71	1.54	-	14.36	2.12	4.78	25.09	5.51	9.72
25	15.17	3.50	1.46	-	12.80	2.16	4.61	21.91	4.86	-
26	16.80	3.72	1.45	-	11.56	2.21	4.46	19.43	4.55	-
27	14.87	4.11	4.06	-	10.76	2.30	-	17.23	4.18	-
28	13.61	2.95	11.12	-	9.75	2.47	-	15.35	3.87	-
29	12.42	2.58	9.81	-	8.82	2.30	-	13.70	3.43	-
30	12.39	2.30	10.31	-	7.96	2.13	-	12.41	3.06	-
31	-	2.01	10.66	-	-	2.40	-	-	2.76	-
Average	19.84	5.38	2.89	-	-	3.43	-	-	13.16	-
Max	32.45	12.18	11.12	-	-	7.26	-	-	30.79	-
Min	0.00	2.01	1.03	-	-	2.12	-	-	2.76	-
Volume (10^6 m^3)	44.6	14.4	7.73	-	14.5	9.20	-	-	35.2	
Basin Yield (mm)	103	33	18	-	34	21	-	-	82	-

Table VII-11
Calculated Daily Discharge Data for SF15, Outflow of Andrew Lake, 2009 and 2010 (m^3/s)

Day	2007				2008				2009			2010		
	Jun	Jul	Aug	Sep	Jun	Jul	Aug	Sep	Jun	Jul	Aug	Jun	Jul	Aug
1	-	1.34*	0.00*	0.47*	-	1.46*	0.00*	0.39*	-	0.65	0.03	-	0.77	0.15
2	-	1.21*	0.00*	0.47*	-	1.50*	0.00*	-	-	0.59	0.03	-	0.74	0.14
3	-	1.16*	0.00*	0.47*	-	1.35*	0.00*	-	-	0.55	0.02	-	0.68	0.14
4	-	1.09*	0.00*	0.51*	-	1.23*	0.00*	-	-	0.50	0.02	-	0.64	0.15
5	-	0.98*	0.00*	0.47*	-	1.14*	0.00*	-	-	0.45	0.02	-	0.80	0.12
6	-	0.86*	0.00*	0.45*	0.25*	1.01*	0.00*	-	-	0.40	0.02	-	1.03	0.10
7	-	0.76*	0.00*	0.43*	0.12*	0.89*	0.00*	-	-	0.36	0.04	-	1.58	0.08
8	-	0.71*	0.00*	0.43*	0.27*	0.82*	0.00*	-	-	0.35	0.05	-	2.76	0.07
9	-	0.65*	0.00*	0.42*	1.35*	0.71*	0.00*	-	-	0.32	0.05	0.00*	3.08	0.06
10	-	0.60*	0.00*	0.42*	2.35*	0.62*	0.00*	-	0.00*	0.28	0.04	0.99*	2.83	0.06
11	-	0.55*	0.00*	0.38*	2.47*	0.55*	0.00*	-	0.11*	0.26	0.04	1.99*	2.40	0.05
12	-	0.49*	0.00*	0.34*	4.70*	0.50*	0.00*	-	1.03*	0.23	0.05	2.98*	1.89	0.05
13	0.00*	0.44*	0.00*	0.32*	5.10*	0.47*	0.00*	-	1.95*	0.20	0.05	3.98*	1.67	0.05
14	0.01*	0.40*	0.00*	0.39*	5.70*	0.47*	0.00*	-	2.86*	0.18	0.04	4.97*	1.46	0.04
15	2.23*	0.35*	0.00*	0.35*	4.80*	0.44*	0.00*	-	3.78*	0.16	0.04	5.96*	1.24	0.04
16	4.46*	0.30*	0.00*	0.29*	3.91*	0.37*	0.00*	-	3.97*	0.12	0.04	6.96	1.04	0.04
17	5.16*	0.25*	0.00*	0.27*	3.43*	0.33*	0.00*	-	3.55*	0.11	0.04	5.83	0.89	0.04
18	6.25*	0.23*	0.00*	0.23*	3.96*	0.29*	0.00*	-	3.29	0.11	0.03	4.98	0.79	0.04
19	5.26*	0.20*	0.00*	-	3.95*	0.26*	0.00*	-	2.70	0.09	0.04	3.92	0.72	0.04
20	4.79*	0.16*	0.00*	-	4.04*	0.22*	0.00*	-	2.36	0.08	0.06	3.22	0.65	0.04
21	4.43*	0.14*	0.00*	-	3.67*	0.18*	0.00*	-	2.31	0.08	0.06	2.63	0.57	0.04
22	4.12*	0.17*	0.00*	-	3.05*	0.19*	0.00*	-	1.89	0.07	0.08	2.28	0.50	0.04
23	3.72*	0.15*	0.00*	-	2.48*	0.17*	0.00*	-	1.63	0.08	0.08	1.98	0.44	0.04
24	3.19*	0.13*	0.11*	-	2.05*	0.14*	0.00*	-	1.46	0.07	0.08	1.71	0.38	0.03
25	2.78*	0.02*	0.19*	-	1.73*	0.12*	0.00*	-	1.26	0.06	0.08	1.48	0.32	-

Table VII-11
Calculated Daily Discharge Data for SF15, Outflow of Andrew Lake, 2009 and 2010 (m^3/s) (continued)

Day	2007				2008				2009			2010		
	Jun	Jul	Aug	Sep	Jun	Jul	Aug	Sep	Jun	Jul	Aug	Jun	Jul	Aug
26	2.43*	0.00*	0.20*	-	1.52*	0.12*	0.00*	-	1.12	0.05	-	1.30	0.30	-
27	2.05*	0.00*	0.31*	-	1.30*	0.14*	0.00*	-	1.02	0.05	-	1.18	0.27	-
28	1.83*	0.00*	0.41*	-	1.23*	0.07*	0.12*	-	0.91	0.05	-	1.05	0.24	-
29	1.63*	0.00*	0.45*	-	1.13*	0.00*	0.20*	-	0.81	0.05	-	0.92	0.20	-
30	1.47*	0.00*	0.50*	-	1.30*	0.00*	0.26*	-	0.72	0.04	-	0.83	0.18	-
31		0.00*	0.48*	-		0.00*	0.34*	-		0.04	-		0.17	-
Average	3.10	0.43	0.08	-	2.63	0.51	0.03	-	1.84	0.21	-	2.8	1.0	-
Max	6.25	1.34	0.50	-	5.70	1.50	0.34	-	3.97	0.65	-	7.0	3.1	-
Min	0.00	0.00	0.00	-	0.12	0.00	0.00	-	0.00	0.04	-	0.0	0.2	-
Volume 10^6 m^3)	4.82	1.15	0.22	-	5.70	1.36	0.07	-	3.35	0.57	-	5.28	2.70	-
Basin Yield (mm)	143	34	7	-	169	40	2	-	99	17	-	157	80	-

Attachment VIII: Daily Discharge Hydrographs for Select Streams near Kiggavik, 2007-2010

Figure VIII-1: SF2, Outflow of Unnamed Lake Downstream of Cirque Lake Hydrograph 2007, 2008, and 2009

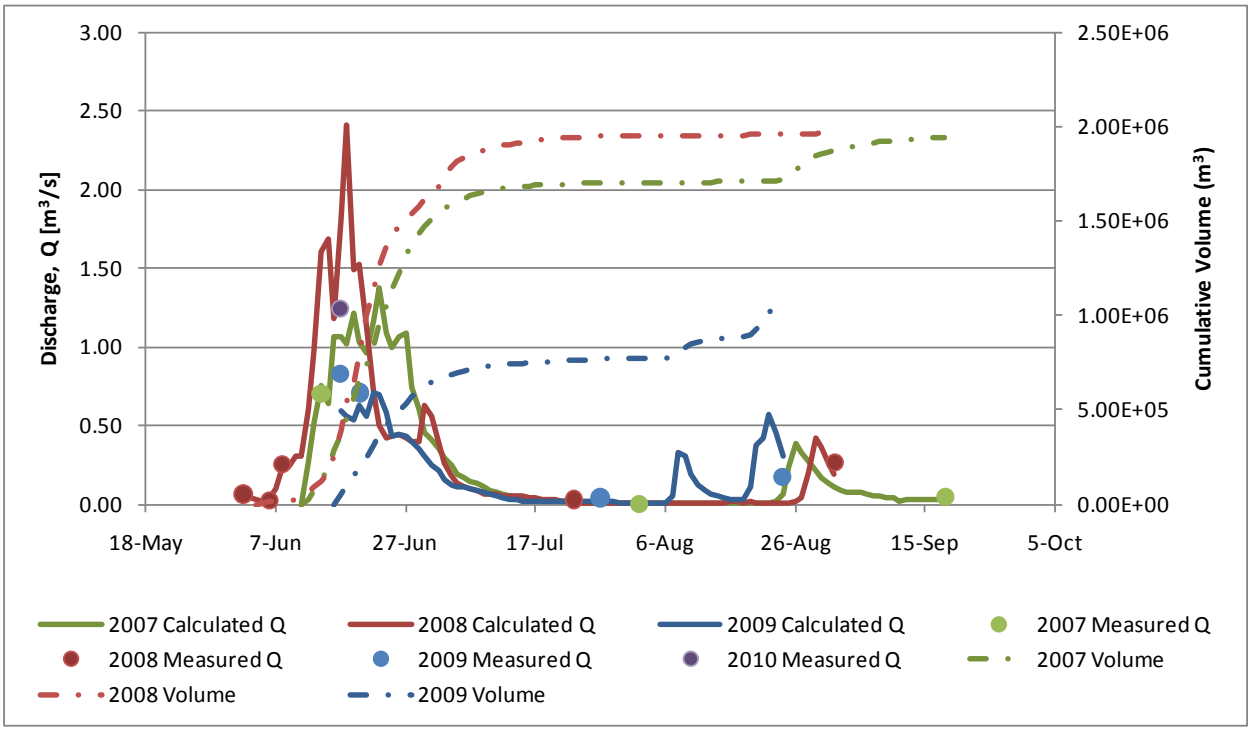


Figure VIII-2: SF3, Northeast Inflow of Pointer Lake Hydrograph 2008, and 2009

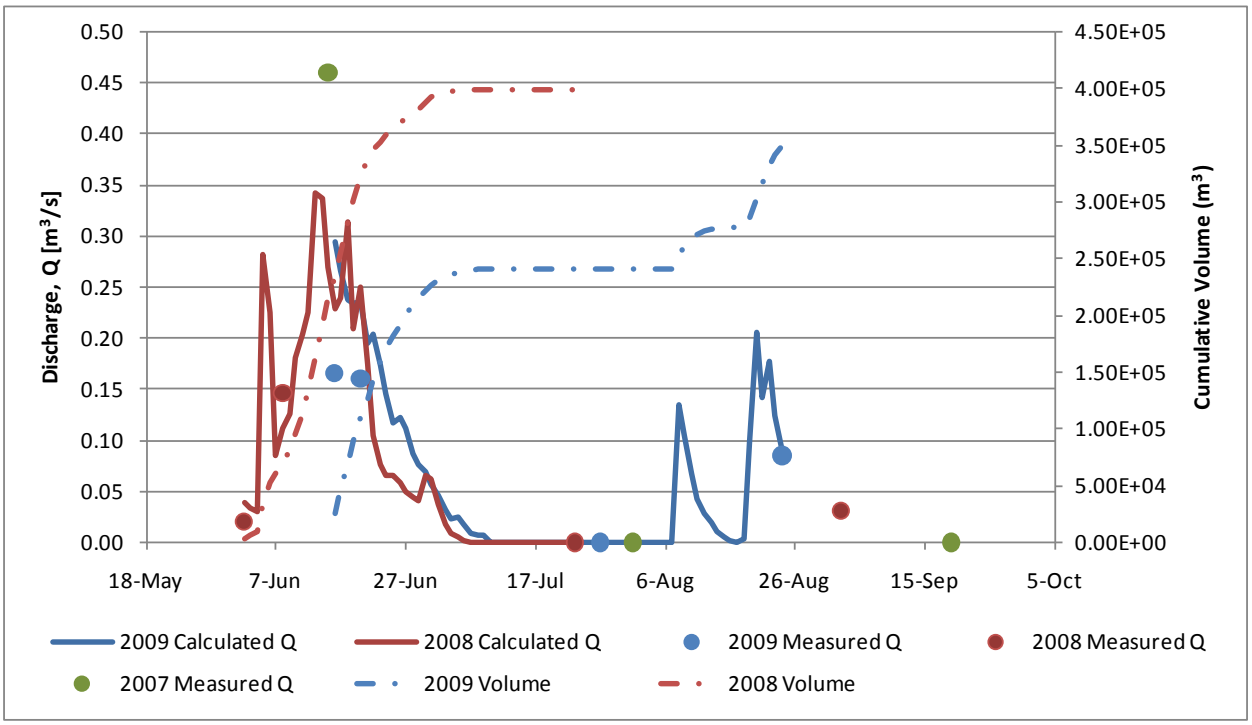


Figure VIII-3: SF4, Outflow of Sik Sik Lake Hydrograph 2007, 2008, and 2009

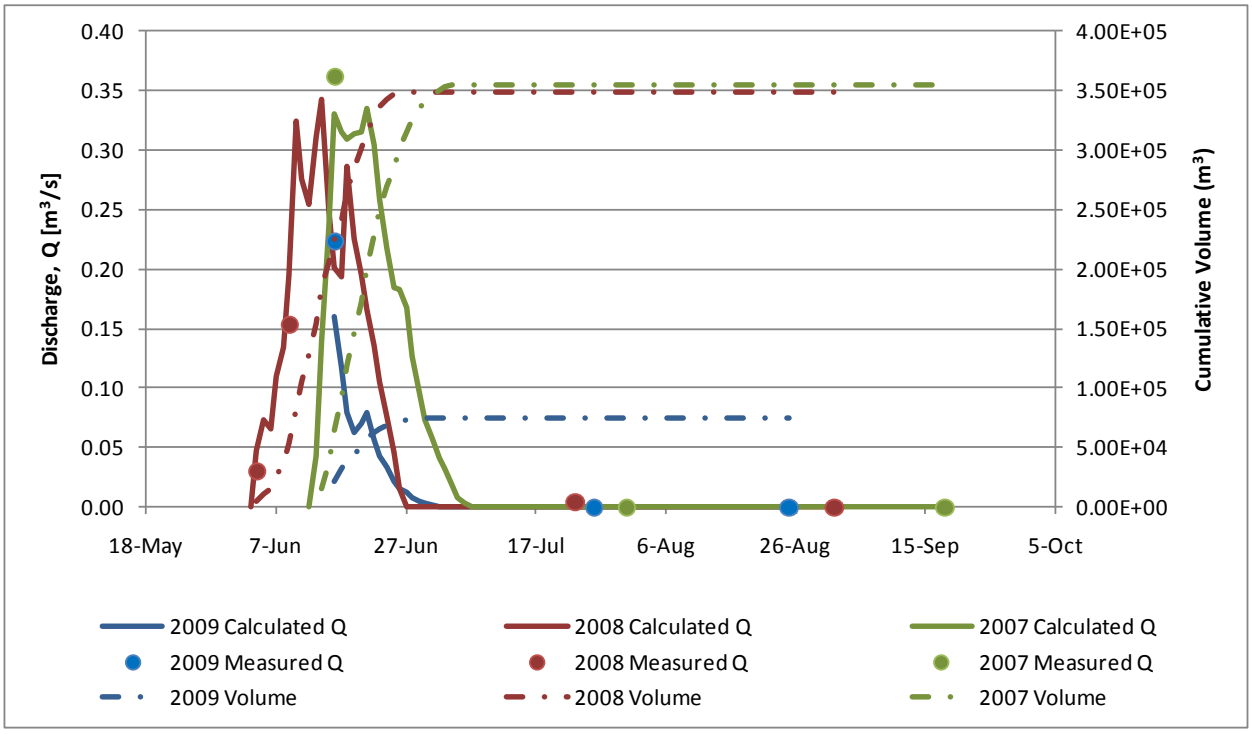


Figure VIII-4: SF5, Outlfow of Pointer Lake Hydrograph 2007, 2008, 2009, and 2010

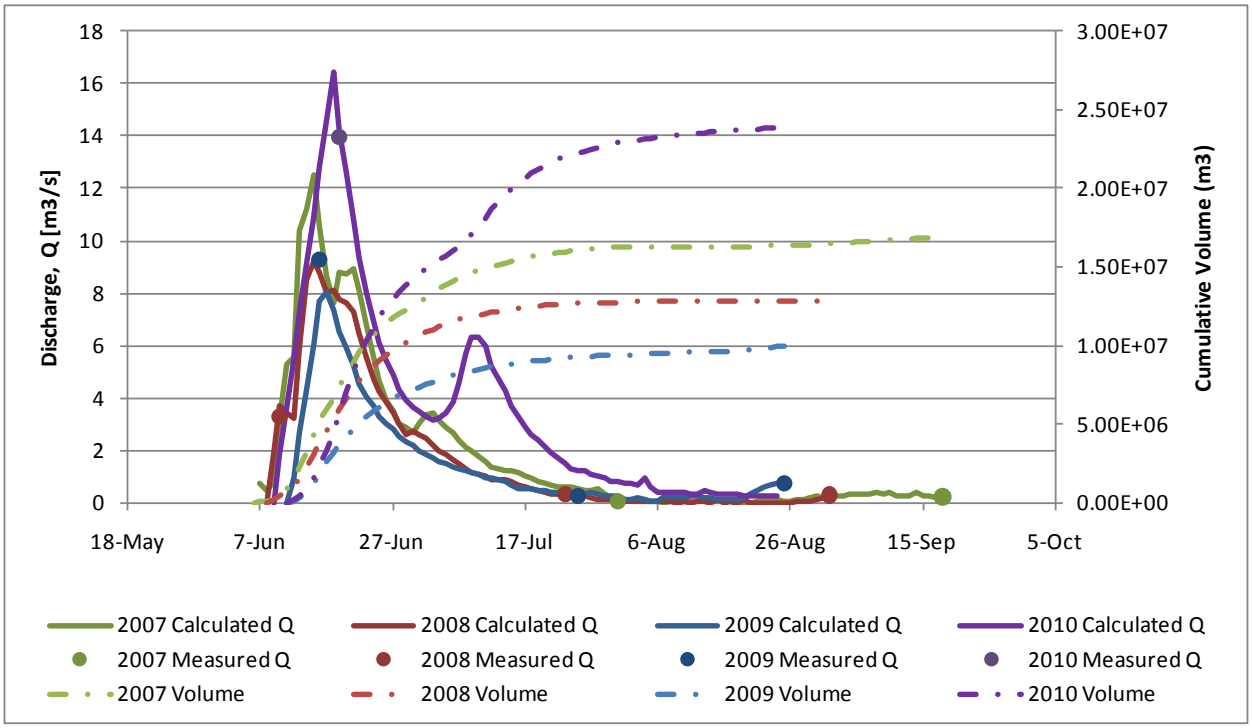


Figure VIII-5: SF6, Outflow of Shack Lake Hydrograph 2007, 2008, and 2009

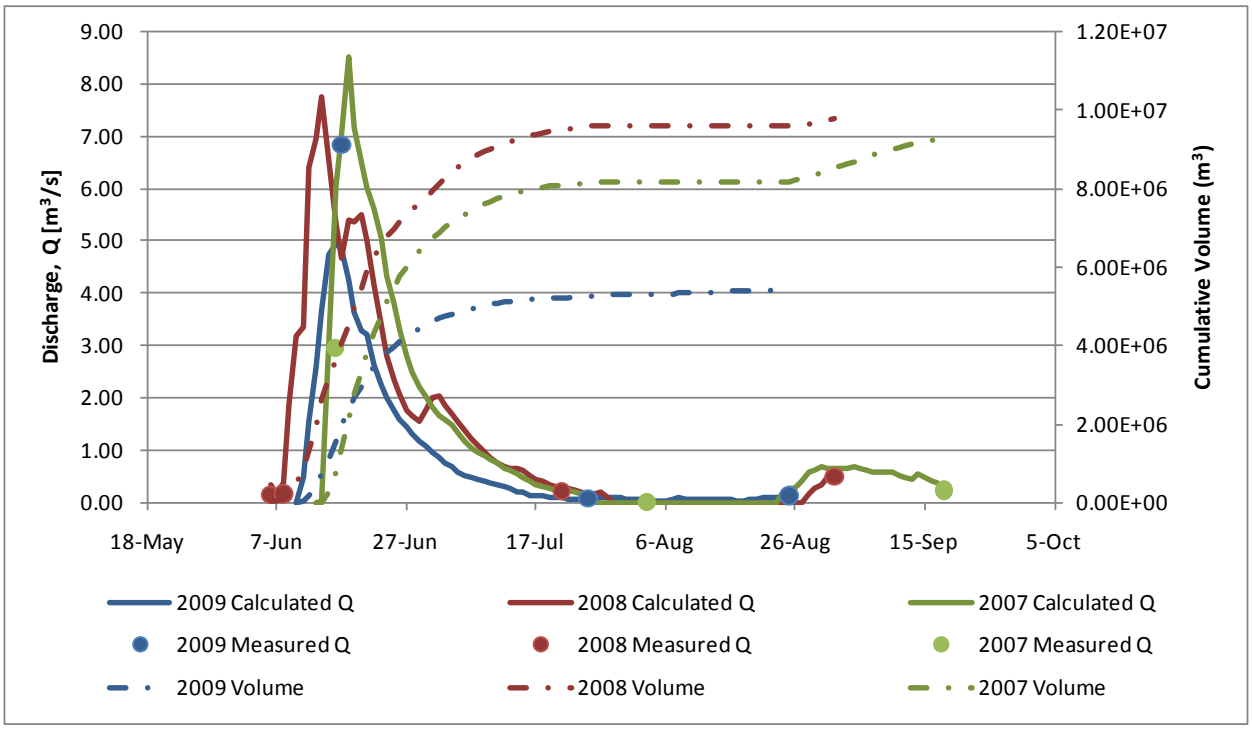


Figure VIII-6: SF7, Outflow of Judge Sissons Lake Hydrograph 2007, 2008, 2009, and 2010

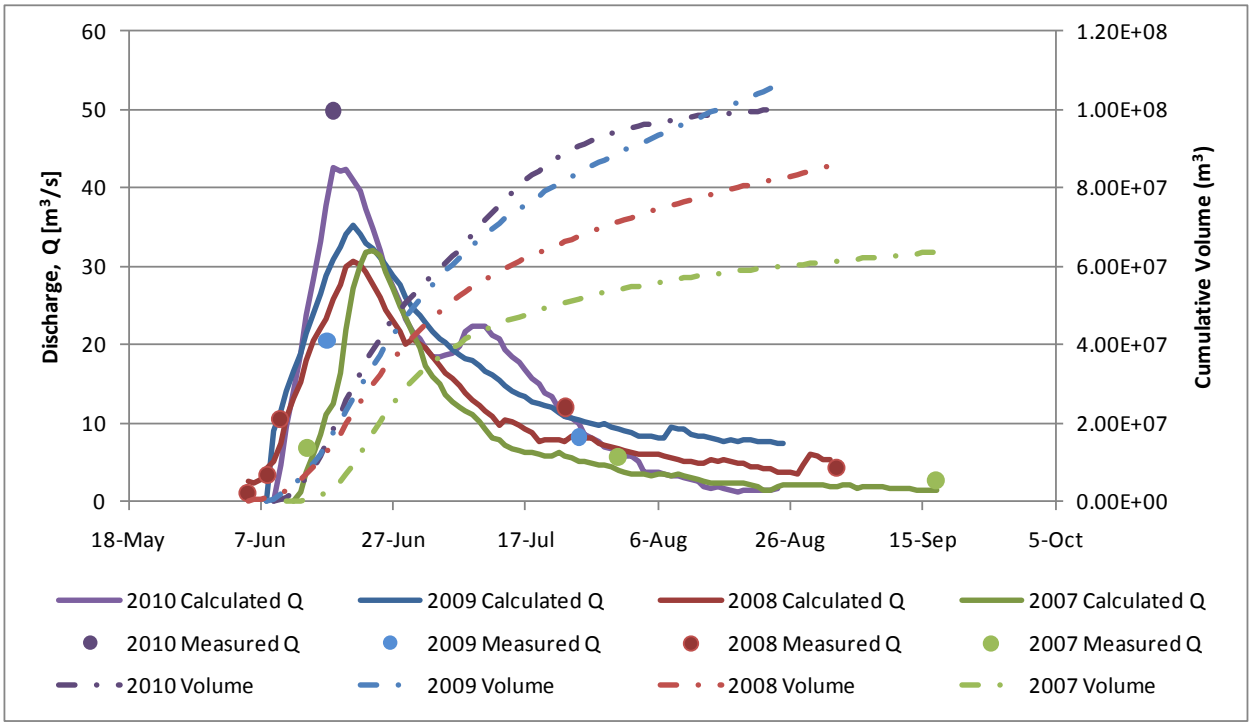


Figure VIII-7: SF8, Outflow of Siamese Lake Hydrograph 2007, 2008, 2009, and 2010

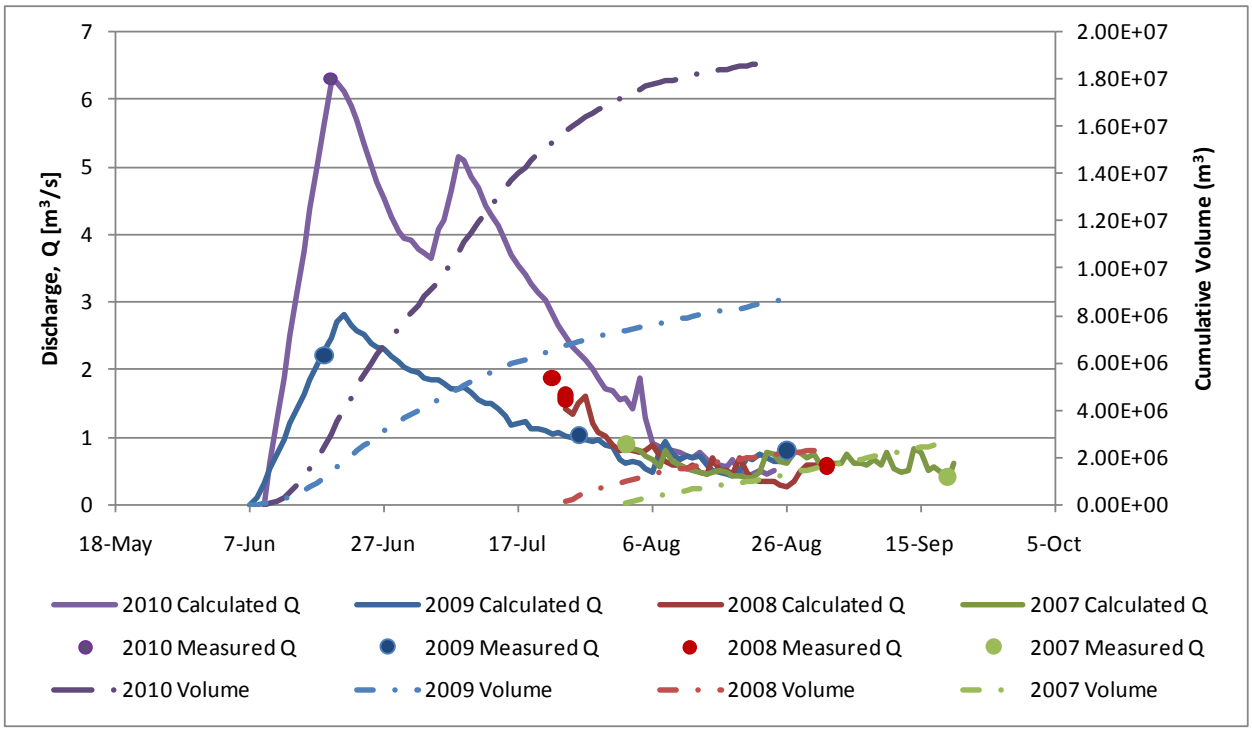


Figure VIII-8: SF9, Outflow of Squiggly Lake Hydrograph 2007 and 2008

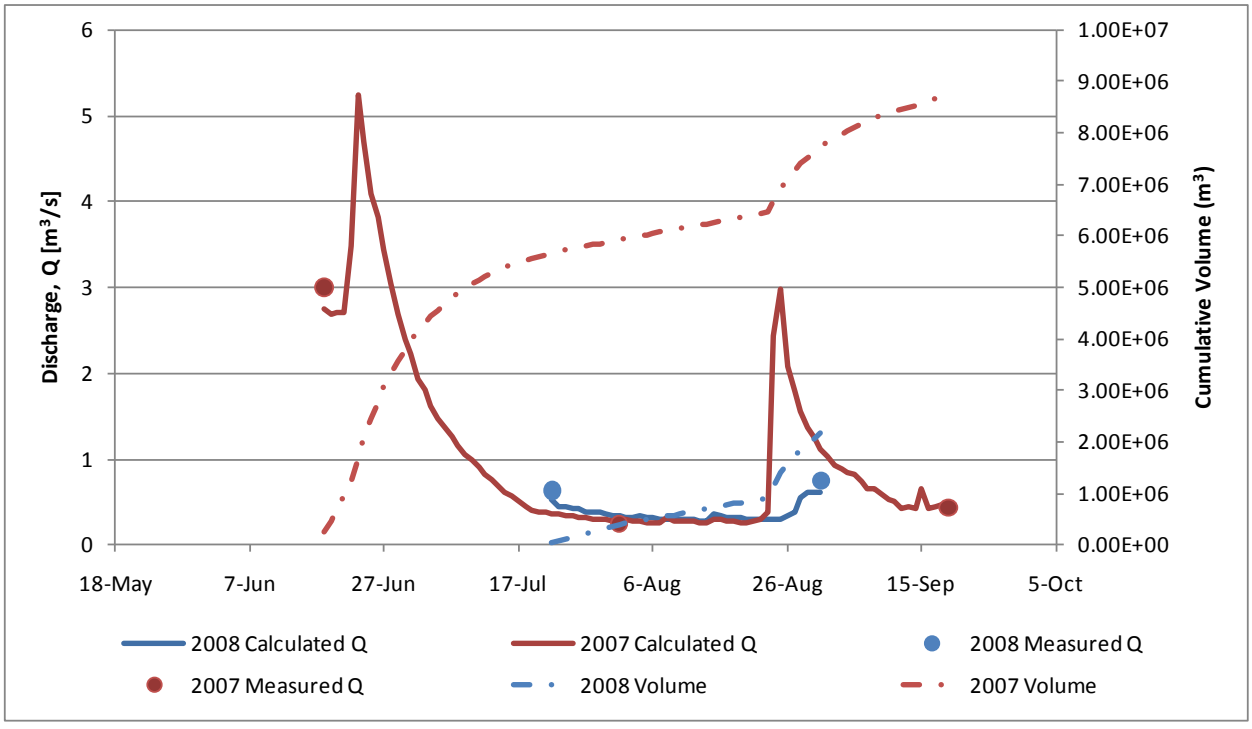


Figure VIII-9: SF13, Aniguq River Hydrograph 2008, 2009, and 2010

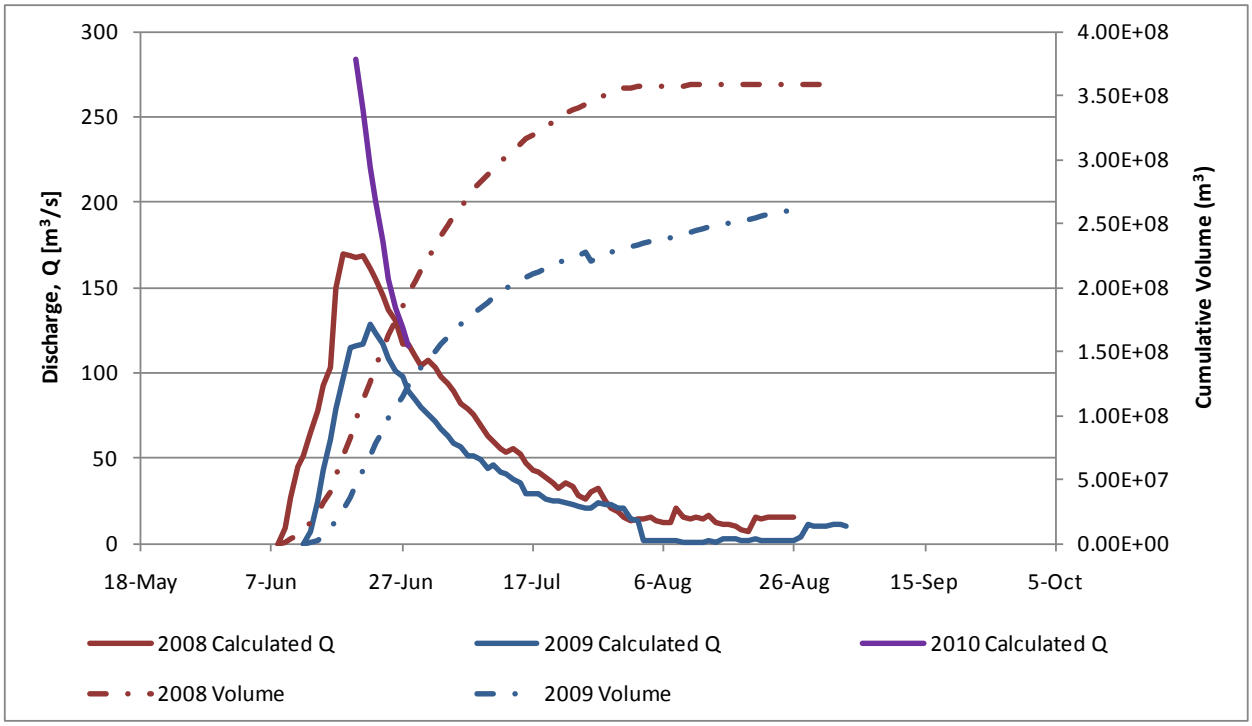


Figure VIII-10: SF14, Qinguq Creek Hydrograph 2008, 2009 and 2010

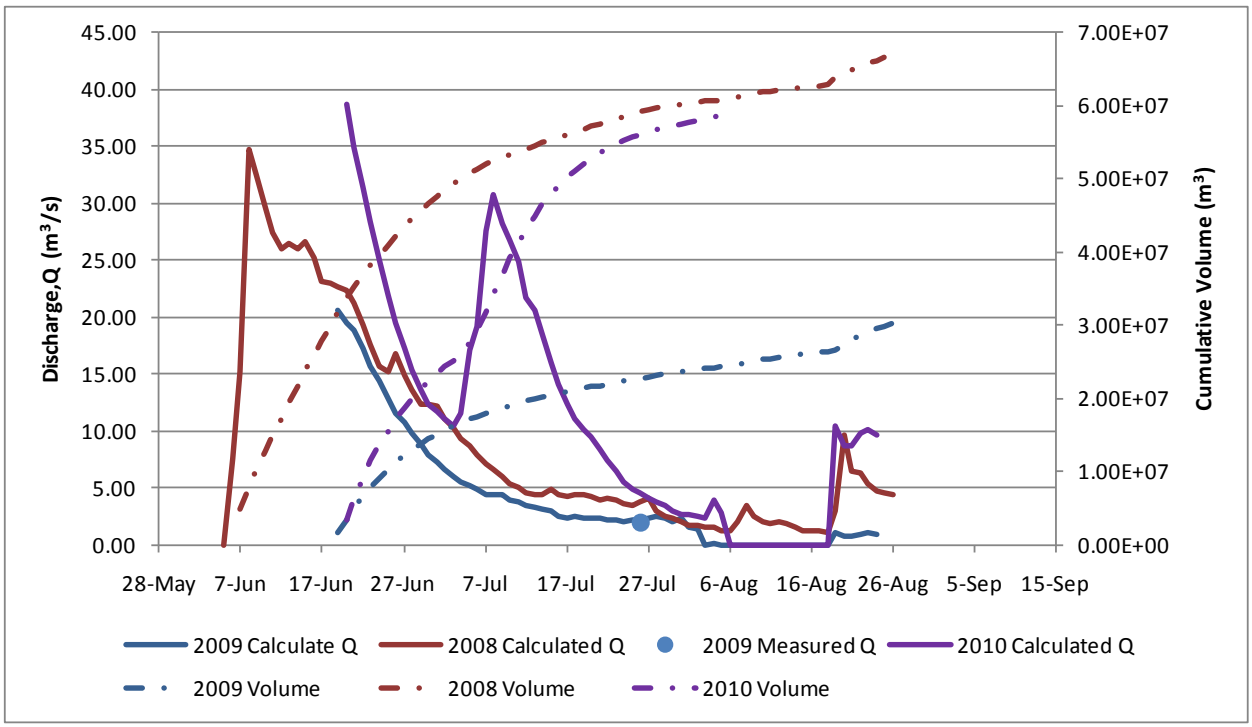
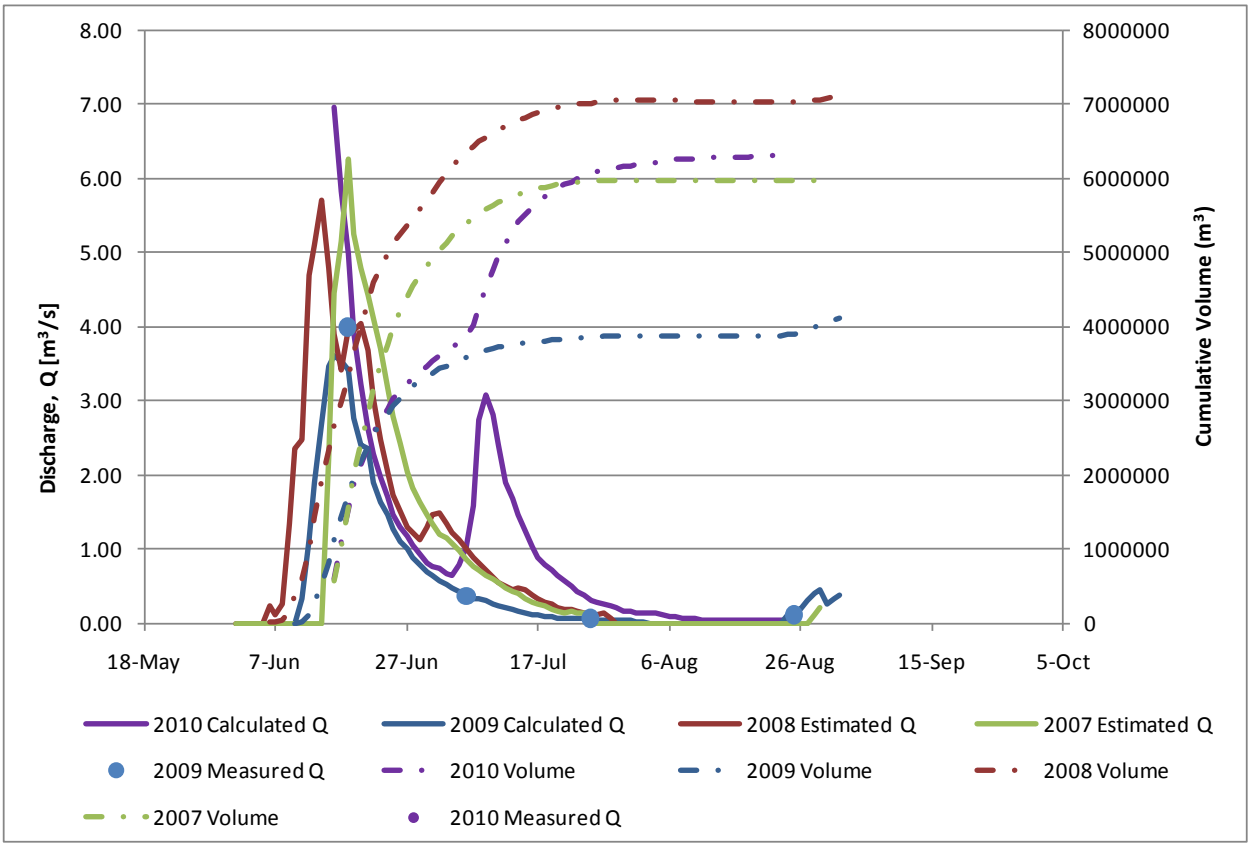


Figure VIII-11: SF15, Outflow of Andrew Lake Hydrograph 2007, 2008, 2009, and 2010



Attachment X: Ice Thickness Model Formulation

Ice thickness formation

In the Arctic region, there is little solar radiation in the winter, and the growth of ice cover can be predicted by heat conduction alone. The total heat flux upward through the ice and snow is a summation of the heat flux from the warm water below and the latent heat loss as a result of ice formation. Using the degree-day method, which assumes a daily steady-state condition and linear temperature gradients in the ice and snow covers, the total heat flux can be expressed by the heat conduction relation below.

$$\rho L \frac{dh}{dt} + q_w = (T_m - T_a)\left(\frac{h}{k_i} + \frac{\alpha_1 h_s}{k_s} + \frac{1}{H_a}\right)^{-1} \quad (29)$$

where:
- ρ - the density of ice (kg/m^3), defined by equation (30)
- L - the latent heat of fusion of ice (333.4 J/g or 2.49x10^{15} m^2/day^2)
- h - the average ice cover thickness (m)
- t - time (day)
- q_w - the heat flux from the warm water below (w/m^2), defined by Equation (31)
- T_m - the temperature at the ice/water interface (assumed to be 0^{o}C)
- T_a - the average daily air temperature (^{o}C)
- k_i - the thermal conductivity of ice (w/m/^{o}C), defined by Equation (32)
- h_s - the average thickness of snow cover (m)
- α_1 - the correction factor for the thickness of snow cover because of wind effects
- k_s - the thermal conductivity of snow (w/m/^{o}C), defined by Equation (33), and
- H_a - accounting for the thermal resistance between the uppermost surface and air, and assumed to be 20 W/m^2 ^{o}C or 1.29E16 kg/(^{o}C day^3))

The density of ice, ρ, as defined by Bader (1964), can be calculated by:

$$\rho = 916.5 - 0.142 T_i \quad (30)$$

where T_i is the ice temperature which is assumed to be $0.5T_a$.

The heat flux, q_w, from the warm water below was calculated using equation (31) as suggested by Ashton (1986). It was assumed that q_w is equal to zero when the mean water temperature, T_w, is equal or less than 2 ^{o}C.

$$q_w = \alpha_2 1622 \frac{U^{0.8}(T_w - T_m)}{Y^{0.2}} \quad (31)$$

where: α_2 - a calibration factor
U - the mean lake current (estimated to be 0.07 m/s for open-water condition)
Y - the mean lake depth

The thermal conductivity of ice, k_i, as suggested by Ashton (1986), is calculated by:

$$k_i = \left(2.21 - 0.11T_i\right) \quad (32)$$

The thermal conductivity of snow, k_s, as suggested Woo and Heron (1989), is calculated by:

$$k_s = 2.84E(-6)\,\rho_s^2 \quad (33)$$

where ρ_s is the density of snow which is assumed to be equal to 300 kg/m^3.

Break-up Process

The are two methods of predicting the ice cover thickness during the break-up processes based on air temperature records. They are the regression equation method and the degree-day method. The former estimates the date of break-up based on break-up records, which are unavailable for this lake, and the latter uses a modified form of Equation (29).

Equation (29) was modified to obtain Equation (34),

(34)

where α_3 is a calibration factor, and
Δh_s is the daily snow thickness change, defined by equation (34), according to $\Delta h_s = 0.00183\left(T_a + 2.8\right)$

Attachment XI: Flood Frequency Predictions for the Kiggavik Haul Road

Table XI-1
Flood Frequency Predictions for Stream Crossings on the Haul Road East of the Thelon River (m^3/s)

Crossing ID	Area (km^2)	3Q10 (m^3/s)	1 in 20 (m^3/s)	1 in 50 (m^3/s)	1 in 100 (m^3/s)
Alternate EC 1	0.44	0.26	0.35	0.39	0.41
Km 213.1	4.70	1.77	2.37	2.63	2.80
Km 212.2	1.43	0.68	0.90	1.01	1.07
Km 209.4	2.74	1.14	1.53	1.70	1.81
Km 207.6	0.82	0.43	0.57	0.64	0.68
Alternate EC6	1.66	0.76	1.02	1.14	1.21
Alternate EC7	0.09	0.07	0.10	0.11	0.11
Alternate EC 8	7.21	2.50	3.35	3.73	3.97
Alternate EC 9	0.13	0.09	0.13	0.14	0.15
Km 203.0	4.59	1.74	2.32	2.59	2.75
Alternate EC 11	1.22	0.59	0.79	0.88	0.94
Alternate EC 12	2.12	0.93	1.24	1.38	1.47
Alternate EC 13	2.15	0.94	1.25	1.40	1.49
Alternate EC 14	19.82	5.68	7.59	8.46	9.00
Alternate EC 15	0.52	0.30	0.40	0.44	0.47
Alternate EC 16	0.77	0.41	0.55	0.61	0.65
Alternate EC 17	6.82	2.39	3.20	3.56	3.79
Alternate EC 18	3.10	1.26	1.69	1.88	2.00
Km 197.5	5.44	1.99	2.66	2.96	3.16
Km 195.1	2.60	1.10	1.46	1.63	1.74
Km 193.3	8.16	2.77	3.70	4.12	4.39
Alternate EC 22	1.11	0.55	0.73	0.82	0.87
Alternate EC 23	14.60	4.44	5.92	6.60	7.02
Alternate EC 24	3.05	1.25	1.67	1.86	1.98
Alternate EC 25	1.39	0.66	0.88	0.98	1.05
Alternate EC 26	0.22	0.15	0.20	0.22	0.24
Alternate EC 27	0.28	0.18	0.24	0.27	0.29
Alternate EC 30	5.66	2.06	2.75	3.06	3.26

Table XI-2
Flood Frequency Predictions for Stream Crossings on the Haul Road West of the Thelon River (m^3/s)

Crossing ID	Area (km^2)	3Q10 (m^3/s)	1 in 20 (m^3/s)	1 in 50 (m^3/s)	1 in 100 (m^3/s)
Km 174.3	1.14	0.56	0.75	0.84	0.89
Km 172.2	3.78	1.48	1.98	2.21	2.35
Km 171.2	0.53	0.30	0.40	0.45	0.48
Km 168.0	3.00	1.23	1.64	1.83	1.95
Km 163.2	1.07	0.53	0.71	0.79	0.84
Km 161.5	2.79	1.16	1.55	1.73	1.84
Km 159.5	0.96	0.49	0.65	0.73	0.78
Km 157.7	3.90	1.52	2.03	2.26	2.41
Km 157.3	56.67	13.31	17.77	19.80	21.07
Km 154.8	10.40	3.37	4.50	5.01	5.34
Km 147.1	5.29	1.95	2.60	2.90	3.09
Km 145.3	43.17	10.67	14.26	15.88	16.90
Km 140.0	2.84	1.18	1.57	1.75	1.86
Km 131.3	4.34	1.66	2.22	2.47	2.63
Km 129.2	305.01	52.02	69.47	77.39	82.37
Km 127.5	16.53	4.91	6.55	7.30	7.77
Alternate NC 17	2.69	1.13	1.50	1.67	1.78
Alternate NC 18	8.70	2.92	3.89	4.34	4.62
Km 112.9	0.15	0.11	0.15	0.16	0.17
Alternate NC 20	0.72	0.39	0.52	0.58	0.61
Alternate NC 21	1.24	0.60	0.80	0.89	0.95
Alternate NC 22	0.24	0.16	0.21	0.24	0.25
Km 109.8	2.40	1.03	1.37	1.53	1.63
Km 108.8	0.89	0.46	0.62	0.69	0.73
Km 107.8	1.09	0.54	0.73	0.81	0.86
Km 103.4	0.16	0.11	0.15	0.17	0.18
Km 100.2	2.57	1.09	1.45	1.62	1.72
Km 19.6	0.35	0.22	0.29	0.33	0.35
Km 17.2	12.26	3.85	5.14	5.73	6.10
Km 15.6	4.66	1.76	2.35	2.62	2.79
Km 14.1	1.04	0.52	0.69	0.77	0.82
Km 11.3	32.76	8.54	11.40	12.70	13.52
Km 6.7	17.87	5.23	6.98	7.77	8.27
Km 2.0	4.23	1.63	2.17	2.42	2.57

Attachment XIII: Input and Output Table Summaries for Culvert Design

Table XIII-1
Culvert Design Input/Output Summary for Crossing Alternate EC 1 (Non Fish Bearing)

		Option	
		1	**2[(a)]**
Inputs			
Culvert Properties	Assumed Tailwater Depth (m)	0.10	0.10
	Number of Culverts	1	1
	Shape	circular	circular
	Diameter (mm)	800	600
	Material	helical 68 x 13 mm	helical 68 x 13 mm
	Entrance Type	projecting	projecting
	Embedded (% of diameter)	0	0
	Culvert Roughness (n)	0.017	0.016
	Culvert Length (m)	30	30
	Assumed Culvert Slope (%)	2.00	2.00
	1:100 year discharge (m^3/s)	0.41	0.41
Outputs			
	Culvert flowing	part full	part full
	Headwater depth (m)	0.58	0.70
	Hydraulic Control	inlet	inlet
	Velocity at Outlet (m/s)	2.46	2.59

(a) preferred configuration based on all-weather road crossing analysis

Table XIII-2
Culvert Design Input/Output Summary for Crossing Km 213.1 (Fish Bearing)

		Option				
		1	**2**	**3**	**4**	**5**[(a)]
Inputs						
Channel	Manning's n	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030
	Slope (%)	3.9	3.9	3.9	3.9	3.9
	Geometry	shown in Figure XII-37,38	shown in Figure XII-37,38	shown in Figure XII-37,38	shown in Figure XII-37,38	shown in Figure XII-37,38
Culvert Properties	Number of Culverts	3	3	3	2	2
	Shape	circular	circular	circular	horizontal ellipse	circular
	Diameter (mm)	2700	3000	3050	4420 x 2790 mm	3000
	Material	helical 76 x 25 mm	helical 76 x 25 mm	structural plate 152 x 51 mm	structural plate 152 x 51 mm	helical 76 x 25 mm
	Entrance Type	projecting	projecting	projecting	projecting	projecting
	Embedded (% of diameter)	20	20	20	20	50
	Culvert Roughness (n)	0.027	0.027	0.030	0.030	0.027
	Bottom Roughness (n)	0.040	0.040	0.040	0.040	0.040
	Culvert Length (m)	30	30	30	30	30
	Culvert Slope (%)	0.00	0.00	0.00	0.00	0.00
	1:100 year discharge (m^3/s)	2.80	2.80	2.80	2.80	2.80
Fish Info	3Q10 (m^3/s)	1.77	1.77	1.77	1.77	1.77
	Target species	arctic grayling	arctic grayling	arctic grayling	arctic grayling	arctic grayling
	Fish Length (cm)	30	30	30	30	30
	Max Velocity (m/s)	0.80	0.80	0.80	0.80	0.80
	Min Depth (m)	0.20	0.20	0.20	0.20	0.20
Outputs						
For 3Q10 Discharge	Velocity at Inlet (m/s)	0.85	0.81	0.80	0.82	0.93
	Velocity in Barrel (m/s)	0.85	0.80	0.80	0.80	0.80
	Velocity at Outlet (m/s)	1.35	1.14	1.13	1.03	1.25
	Depth at Inlet (m)	0.44	0.42	0.42	0.43	0.49
	Depth within Barrel (m)	0.30	0.29	0.28	0.30	0.38
	Depth at Outlet (m)	0.20	0.20	0.20	0.24	0.24
	Hydraulic Control	outlet	outlet	outlet	outlet	outlet
	Surface Profile Type	H2	H2	H2	H2	H2

(a) preferred configuration based on all-weather road crossing analysis

Table XIII-3
Culvert Design Input/Output Summary for Crossing Km 212.2 (Non Fish Bearing)

		Option		
		1	2[(a)]	3
Inputs				
Culvert Properties	Assumed Tailwater Depth (m)	0.10	0.10	0.10
	Number of Culverts	1	1	1
	Shape	circular	circular	circular
	Diameter (mm)	800	900	1000
	Material	helical 68 x 13 mm	helical 68 x 13 mm	helical 68 x 13 mm
	Entrance Type	projecting	projecting	projecting
	Embedded (% of diameter)	0	0	0
	Culvert Roughness (n)	0.017	0.018	0.019
	Culvert Length (m)	30	30	30
	Culvert Slope (%)	2.00	2.00	2.00
	1:100 year discharge (m^3/s)	1.07	1.07	1.07
Outputs				
	Culvert flowing	part full	part full	part full
	Headwater depth (m)	1.25	1.00	0.93
	Hydraulic Control	inlet	inlet	inlet
	Velocity at Outlet (m/s)	3.12	3.01	2.89

[(a)] preferred configuration based on all-weather road crossing analysis

Table XIII-4
Culvert Design Input/Output Summary for Crossing Km 209.4 (Fish Bearing)

		Option				
		1	**2**	**3**	**4**	**5** [(a)]
Inputs						
Channel	Manning's n	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030
	Slope (%)	1.3	1.3	1.3	1.3	1.3
	Geometry	shown in Figure XII-41,42	shown in Figure XII-41,42	shown in Figure XII-41,42	shown in Figure XII-41,42	shown in Figure XII-41,42
Culvert Properties	Number of Culverts	2	2	2	1	2
	Shape	circular	circular	Circular	horizontal ellipse	circular
	Diameter (mm)	2700	3000	3050	5283 x 3531	2200
	Material	helical 76 x 25 mm	helical 76 x 25 mm	structural plate 152 x 51 mm	structural plate 152 x 51 mm	helical 76 x 25 mm
	Entrance Type	projecting	projecting	projecting	projecting	projecting
	Embedded (% of diameter)	20	20	20	20	30
	Culvert Roughness (n)	0.027	0.027	0.030	0.030	0.027
	Bottom Roughness (n)	0.040	0.040	0.040	0.040	0.040
	Culvert Length (m)	30	30	30	30	30
	Culvert Slope (%)	0.00	0.00	0.00	0.00	0.00
	1:100 year discharge (m^3/s)	1.81	1.81	1.81	1.81	1.81
Fish Info	3Q10 (m^3/s)	1.14	1.14	1.14	1.14	1.14
	Target species	arctic grayling	arctic grayling	arctic grayling	arctic grayling	arctic grayling
	Fish Length (cm)	30	30	30	30	30
	Max Velocity (m/s)	0.80	0.80	0.80	0.80	0.80
	Min Depth (m)	0.20	0.20	0.20	0.20	0.20
Outputs						
For 3Q10 Discharge	Velocity at Inlet (m/s)	0.84	0.80	0.79	0.85	0.87
	Velocity in Barrel (m/s)	0.83	0.79	0.78	0.84	0.76
	Velocity at Outlet (m/s)	1.33	1.14	1.12	1.14	1.37
	Depth at Inlet (m)	0.43	0.41	0.41	0.44	0.46
	Depth within Barrel (m)	0.30	0.28	0.28	0.30	0.36
	Depth at Outlet (m)	0.19	0.20	0.20	0.22	0.2
	Hydraulic Control	outlet	outlet	Outlet	outlet	outlet
	Surface Profile Type	H2	H2	H2	H2	H2

[(a)] preferred configuration based on all-weather road crossing analysis

Table XIII-5
Culvert Design Input/Output Summary for Crossing Km 207.6 (Non Fish Bearing)

		Option	
		1[(a)]	2
Inputs			
Culvert Properties	Assumed Tailwater Depth (m)	0.10	0.10
	Number of Culverts	1	1
	Shape	circular	circular
	Diameter (mm)	800	600
	Material	helical 68 x 13 mm	helical 68 x 13 mm
	Entrance Type	projecting	projecting
	Embedded (% of diameter)	0	0
	Culvert Roughness (n)	0.017	0.016
	Culvert Length (m)	30	30
	Assumed Culvert Slope (%)	0.50	0.50
	1:100 year discharge (m^3/s)	0.68	0.68
Outputs			
	Culvert flowing	part full	full
	Headwater depth (m)	0.81	1.53
	Hydraulic Control	outlet	outlet
	Velocity at Outlet (m/s)	2.08	2.58

(a) preferred configuration based on all-weather road crossing analysis

Table XIII-6
Culvert Design Input/Output Summary for Crossing Alternate EC 06(Non Fish Bearing)

		Option			
		1	**2**	**3[(a)]**	**4**
Inputs					
Culvert Properties	Assumed Tailwater Depth (m)	0.10	0.10	0.10	0.10
	Number of Culverts	1	1	1	1
	Shape	circular	circular	circular	circular
	Diameter (mm)	800	900	1000	1200
	Material	helical 68 x 13 mm	helical 68 x 13 mm	helical 68 x 13 mm	helical 68 x 13 mm
	Entrance Type	projecting	projecting	projecting	projecting
	Embedded (% of diameter)	0	0	0	0
	Culvert Roughness (n)	0.017	0.018	0.019	0.020
	Culvert Length (m)	30	30	30	30
	Assumed Culvert Slope (%)	0.50	0.50	0.50	0.50
	1:100 year discharge (m^3/s)	1.21	1.21	1.21	1.21
Outputs					
	Culvert flowing	full	full	full	part full
	Headwater depth (m)	1.58	1.25	1.23	0.93
	Hydraulic Control	outlet	outlet	outlet	outlet
	Velocity at Outlet (m/s)	2.68	2.47	2.28	2.14

[(a)] preferred configuration based on all-weather road crossing analysis

Table XIII-7
Culvert Design Input/Output Summary for Crossing Alternate EC 7 (Non Fish Bearing)

		Option	
		1	2[(a)]
Inputs			
Culvert Properties	Assumed Tailwater Depth (m)	0.10	0.10
	Number of Culverts	1	1
	Shape	circular	circular
	Diameter (mm)	800	600
	Material	helical 68 x 13 mm	helical 68 x 13 mm
	Entrance Type	projecting	projecting
	Embedded (% of diameter)	0	0
	Culvert Roughness (n)	0.017	0.016
	Culvert Length (m)	30	30
	Assumed Culvert Slope (%)	0.50	0.50
	1:100 year discharge (m^3/s)	0.11	0.11
Outputs			
	Culvert flowing	part full	part full
	Headwater depth (m)	0.35	0.31
	Hydraulic Control	outlet	inlet
	Velocity at Outlet (m/s)	1.19	1.20

(a) preferred configuration based on all-weather road crossing analysis

Table XIII-8
Culvert Design Input/Output Summary for Crossing Km 203.0 (Fish Bearing)

		Option				
		1	2	3	4	5[(a)]
Inputs						
Channel	Manning's n	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030
	Slope (%)	0.13	0.13	0.13	0.13	0.13
	Geometry	shown in Figure XII-43,44	shown in Figure XII-43,44	shown in Figure XII-43,44	shown in Figure XII-43,44	shown in Figure XII-43,44
Culvert Properties	Number of Culverts	3	3	2	2	2
	Shape	circular	circular	circular	circular	circular
	Diameter (mm)	2400	2200	3300	3000	2200
	Material	helical 76 x 25 mm	helical 76 x 25 mm	helical 76 x 25 mm	helical 76 x 25 mm	helical 76 x 25 mm
	Entrance Type	projecting	projecting	projecting	projecting	projecting
	Embedded (% of diameter)	20	20	20	20	50
	Culvert Roughness (n)	0.027	0.027	0.027	0.027	0.027
	Bottom Roughness (n)	0.040	0.040	0.040	0.040	0.040
	Culvert Length (m)	30	30	30	30	30
	Culvert Slope (%)	0.00	0.00	0.00	0.00	0.00
	1:100 year discharge (m^3/s)	2.75	2.75	2.75	2.75	2.75
Fish Info	3Q10 (m^3/s)	1.74	1.74	1.74	1.74	1.74
	Target species	arctic grayling	arctic grayling	arctic grayling	arctic grayling	arctic grayling
	Fish Length (cm)	30	30	30	30	30
	Max Velocity (m/s)	0.80	0.80	0.80	0.80	0.80
	Min Depth (m)	0.20	0.20	0.20	0.20	0.20
Outputs						
For 3Q10 Discharge	Velocity at Inlet (m/s)	0.76	0.82	0.79	0.85	1.00
	Velocity in Barrel (m/s)	0.62	0.68	0.63	0.69	0.80
	Velocity at Outlet (m/s)	0.64	0.70	0.64	0.71	0.89
	Depth at Inlet (m)	0.51	0.53	0.54	0.56	0.63
	Depth within Barrel (m)	0.43	0.43	0.47	0.47	0.53
	Depth at Outlet (m)	0.42	0.42	0.46	0.46	0.46
	Hydraulic Control	outlet	outlet	outlet	outlet	outlet
	Surface Profile Type	H2	H2	H2	H2	H2

[(a)] preferred configuration based on all-weather road crossing analysis

Table XIII-9
Culvert Design Input/Output Summary for Crossing Alternate EC 11 (Non Fish Bearing)

		Option		
		1	**2[(a)]**	**3**
Inputs				
Culvert Properties	Assumed Tailwater Depth (m)	0.10	0.10	0.10
	Number of Culverts	1	1	1
	Shape	circular	circular	circular
	Diameter (mm)	800	900	1000
	Material	helical 68 x 13 mm	helical 68 x 13 mm	helical 68 x 13 mm
	Entrance Type	projecting	projecting	projecting
	Embedded (% of diameter)	0	0	0
	Culvert Roughness (n)	0.017	0.018	0.019
	Culvert Length (m)	30	30	30
	Assumed Culvert Slope (%)	0.50	0.50	0.50
	1:100 year discharge (m^3/s)	0.94	0.94	0.94
Outputs				
	Culvert flowing	full	full	part full
	Headwater depth (m)	1.14	1.11	0.87
	Hydraulic Control	outlet	outlet	inlet
	Velocity at Outlet (m/s)	2.36	2.19	2.08

(a) preferred configuration based on all-weather road crossing analysis

Table XIII-10
Culvert Design Input/Output Summary for Crossing Alternate EC 12 (Fish Bearing)

		Option		
		1[(a)]	2	3
Inputs				
Culvert Properties	Assumed Tailwater depth (m)	0.2	0.2	0.2
	Number of Culverts	2	2	1
	Shape	circular	circular	horizontal ellipse
	Diameter (mm)	2400	2700	6230 x 3840
	Material	helical 76 x 25 mm	helical 76 x 25 mm	structural plate 152 x 51 mm
	Entrance Type	projecting	projecting	projecting
	Embedded (% of diameter)	20	20	20
	Culvert Roughness (n)	0.027	0.027	0.030
	Bottom Roughness (n)	0.040	0.040	0.040
	Culvert Length (m)	30	30	30
	Culvert Slope (%)	0.00	0.00	0.00
	1:100 year discharge (m^3/s)	1.47	1.47	1.47
Fish Info	3Q10 (m^3/s)	0.93	0.93	0.93
	Target species	arctic grayling	arctic grayling	arctic grayling
	Fish Length (cm)	30	30	30
	Max Velocity (m/s)	0.80	0.80	0.80
	Min Depth (m)	0.20	0.20	0.20
Outputs				
For 3Q10 Discharge	Velocity at Inlet (m/s)	0.79	0.76	0.79
	Velocity in Barrel (m/s)	0.79	0.75	0.74
	Velocity at Outlet (m/s)	1.12	1.04	0.88
	Depth at Inlet (m)	0.41	0.39	0.33
	Depth within Barrel (m)	0.28	0.27	0.24
	Depth at Outlet (m)	0.20	0.20	0.20
	Hydraulic Control	Outlet	Outlet	Outlet
	Surface Profile Type	H2	H2	H2

(a) preferred configuration based on all-weather road crossing analysis

Table XIII-11
Culvert Design Input/Output Summary for Crossing Alternate EC 13 (Fish Bearing)

		Option			
		1	**2**	**3**	**4[a]**
Inputs					
Culvert Properties	Assumed Tailwater depth (m)	0.2	0.2	0.2	0.2
	Number of Culverts	2	2	1	2
	Shape	circular	circular	horizontal ellipse	circular
	Diameter (mm)	2400	2700	6230 x 3840	1800
	Material	helical 76 x 25 mm	helical 76 x 25 mm	structural plate 152 x 51 mm	helical 76 x 25 mm
	Entrance Type	projecting	projecting	projecting	projecting
	Embedded (% of diameter)	20	20	20	50
	Culvert Roughness (n)	0.027	0.027	0.030	0.027
	Bottom Roughness (n)	0.040	0.040	0.040	0.040
	Culvert Length (m)	30	30	30	30
	Culvert Slope (%)	0.00	0.00	0.00	0.00
	1:100 year discharge (m^3/s)	1.49	1.49	1.49	1.49
Fish Info	3Q10 (m^3/s)	0.94	0.94	0.94	0.94
	Target species	arctic grayling	arctic grayling	arctic grayling	arctic grayling
	Fish Length (cm)	30	30	30	30
	Max Velocity (m/s)	0.80	0.80	0.80	0.80
	Min Depth (m)	0.20	0.20	0.20	0.20
Outputs					
For 3Q10 Discharge	Velocity at Inlet (m/s)	0.79	0.76	0.79	0.93
	Velocity in Barrel (m/s)	0.79	0.76	0.75	0.75
	Velocity at Outlet (m/s)	1.13	1.05	0.89	1.48
	Depth at Inlet (m)	0.41	0.39	0.34	0.51
	Depth within Barrel (m)	0.28	0.27	0.24	0.37
	Depth at Outlet (m)	0.20	0.20	0.20	0.20
	Hydraulic Control	Outlet	Outlet	Outlet	Outlet
	Surface Profile Type	H2	H2	H2	H2

[a] preferred configuration based on all-weather road crossing analysis

Table XIII-12
Culvert Design Input/Output Summary for Crossing Km 197.5 (Fish Bearing)

		Option				
		1	**2**	**3**	**4**	**5[(a)]**
Inputs						
Channel	Manning's n	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030
	Slope (%)	0.16	0.16	0.16	0.16	0.16
	Geometry	shown in Figure XII-45,46	shown in Figure XII-45,46	shown in Figure XII-45,46	shown in Figure XII-45,46	shown in Figure XII-45,46
Culvert Properties	Number of Culverts	2	2	1	2	2
	Shape	circular	circular	horizontal ellipse	horizontal ellipse	circular
	Diameter (mm)	3300	3050	5283 x 3531	3200 x 2260	2800
	Material	helical 76 x 25 mm	structural plate 152 x 51 mm	structural plate 152 x 51 mm	structural plate 152 x 51 mm	helical 76 x 25 mm
	Entrance Type	projecting	projecting	projecting	projecting	projecting
	Embedded (% of diameter)	20	20	20	20	50
	Culvert Roughness (n)	0.027	0.030	0.030	0.030	0.027
	Bottom Roughness (n)	0.040	0.040	0.040	0.040	0.040
	Culvert Length (m)	30	30	30	30	30
	Culvert Slope (%)	0.00	0.00	0.00	0.00	0.00
	1:100 year discharge (m^3/s)	3.16	3.16	3.16	3.16	3.16
Fish Info	3Q10 (m^3/s)	1.99	1.99	1.99	1.99	1.99
	Target species	arctic grayling	arctic grayling	arctic grayling	arctic grayling	arctic grayling
	Fish Length (cm)	30	30	30	30	30
	Max Velocity (m/s)	0.80	0.80	0.80	0.80	0.80
	Min Depth (m)	0.20	0.20	0.20	0.20	0.20
Outputs						
For 3Q10 Discharge	Velocity at Inlet (m/s)	0.93	0.98	1.06	0.90	0.97
	Velocity in Barrel (m/s)	0.81	0.88	0.92	0.77	0.79
	Velocity at Outlet (m/s)	0.88	0.96	0.98	0.82	0.93
	Depth at Inlet (m)	0.54	0.56	0.61	0.53	0.57
	Depth within Barrel (m)	0.42	0.42	0.47	0.41	0.47
	Depth at Outlet (m)	0.39	0.39	0.44	0.39	0.39
	Hydraulic Control	Outlet	Outlet	Outlet	Outlet	Outlet
	Surface Profile Type	H2	H2	H2	H2	H2

[(a)] preferred configuration based on all-weather road crossing analysis

Table XIII-13
Culvert Design Input/Output Summary for Crossing Km 195.1 (Fish Bearing)

		Option				
		1	2	3	4	5[(a)]
Inputs						
Channel	Manning's n	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030
	Slope (%)	0.36	0.36	0.36	0.36	0.36
	Geometry	shown in Figure XII-47,48	shown in Figure XII-47,48	shown in Figure XII-47,48	shown in Figure XII-47,48	shown in Figure XII-47,48
Culvert Properties	Number of Culverts	2	2	2	1	2
	Shape	circular	circular	circular	horizontal ellipse	circular
	Diameter (mm)	2700	2400	2430	4826 x 3426	1800
	Material	helical 76 x 25 mm	helical 76 x 25 mm	structural plate 152 x 51 mm	structural plate 152 x 51 mm	helical 76 x 25 mm
	Entrance Type	projecting	projecting	projecting	projecting	projecting
	Embedded (% of diameter)	20	20	20	20	50
	Culvert Roughness (n)	0.027	0.027	0.032	0.032	0.027
	Bottom Roughness (n)	0.040	0.040	0.040	0.040	0.040
	Culvert Length (m)	30	30	30	30	30
	Culvert Slope (%)	0.00	0.00	0.00	0.00	0.00
	1:100 year discharge (m^3/s)	1.74	1.74	1.74	1.74	1.74
Fish Info	3Q10 (m^3/s)	1.1	1.1	1.1	1.1	1.1
	Target species	arctic grayling	arctic grayling	arctic grayling	arctic grayling	arctic grayling
	Fish Length (cm)	30	30	30	30	30
	Max Velocity (m/s)	0.80	0.80	0.80	0.80	0.80
	Min Depth (m)	0.20	0.20	0.20	0.20	0.20
Outputs						
For 3Q10 Discharge	Velocity at Inlet (m/s)	0.80	0.83	0.82	0.83	0.93
	Velocity in Barrel (m/s)	0.72	0.77	0.76	0.73	0.78
	Velocity at Outlet (m/s)	0.81	0.87	0.86	0.80	1.05
	Depth at Inlet (m)	0.44	0.46	0.46	0.46	0.52
	Depth within Barrel (m)	0.33	0.33	0.34	0.35	0.42
	Depth at Outlet (m)	0.30	0.30	0.30	0.33	0.3
	Hydraulic Control	Outlet	Outlet	Outlet	Outlet	Outlet
	Surface Profile Type	H2	H2	H2	H2	H2

[(a)] preferred configuration based on all-weather road crossing analysis

Table XIII-14
Culvert Design Input/Output Summary for Crossing Km 193.3 (Fish Bearing)

		Option				
		1	2	3	4	5[(a)]
Inputs						
Channel	Manning's n	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030
	Slope (%)	0.87	0.87	0.87	0.36	0.36
	Geometry	shown in Figure XII-49,50	shown in Figure XII-49,50	shown in Figure XII-49,50	shown in Figure XII-49,50	shown in Figure XII-49,50
Culvert Properties	Number of Culverts	3	3	4	2	3
	Shape	circular	circular	circular	horizontal ellipse	circular
	Diameter (mm)	3670	3990	3000	6230 x 3840	3200
	Material	structural plate 152 x 51 mm	structural plate 1 52 x 51 mm	helical 76 x 25 mm	structural plate 152 x 51 mm	helical 76 x 25 mm
	Entrance Type	projecting	projecting	projecting	projecting	projecting
	Embedded (% of diameter)	20	20	20	20	50
	Culvert Roughness (n)	0.030	0.030	0.027	0.027	0.027
	Bottom Roughness (n)	0.040	0.040	0.040	0.040	0.040
	Culvert Length (m)	30	30	30	30	30
	Culvert Slope (%)	0.00	0.00	0.00	0.00	0.00
	1:100 year discharge (m^3/s)	4.39	4.39	4.39	4.39	4.39
Fish Info	3Q10 (m^3/s)	2.77	2.77	2.77	2.77	2.77
	Target species	arctic grayling	arctic grayling	arctic grayling	arctic grayling	arctic grayling
	Fish Length (cm)	30	30	30	30	30
	Max Velocity (m/s)	0.80	0.80	0.80	0.80	0.80
	Min Depth (m)	0.20	0.20	0.20	0.20	0.20
Outputs						
For 3Q10 Discharge	Velocity at Inlet (m/s)	0.92	0.89	0.88	0.88	0.93
	Velocity in Barrel (m/s)	0.93	0.90	0.89	0.87	0.81
	Velocity at Outlet (m/s)	1.61	1.47	1.50	1.36	1.53
	Depth at Inlet (m)	0.48	0.45	0.45	0.44	0.48
	Depth within Barrel (m)	0.32	0.30	0.30	0.30	0.37
	Depth at Outlet (m)	0.19	0.19	0.18	0.20	0.19
	Hydraulic Control	Outlet	Outlet	outlet	outlet	outlet
	Surface Profile Type	H2	H2	H2	H2	H2

[(a)] preferred configuration based on all-weather road crossing analysis

Table XIII-15
Culvert Design Input/Output Summary for Crossing Alternate EC 22 (Fish Bearing)

		Option		
		1	2	3[(a)]
Inputs				
Channel	Manning's n	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030
	Slope (%)	1.33	1.33	1.33
	Geometry	shown in Figure XII-51,52	shown in Figure XII-51,52	shown in Figure XII-51,52
Culvert Properties	Number of Culverts	1	1	1
	Shape	circular	circular	circular
	Diameter (mm)	2000	2200	1800
	Material	helical 76 x 25 mm	helical 76 x 25 mm	helical 76 x 25 mm
	Entrance Type	projecting	projecting	projecting
	Embedded (% of diameter)	20	20	20
	Culvert Roughness (n)	0.026	0.027	0.027
	Bottom Roughness (n)	0.040	0.040	0.040
	Culvert Length (m)	30	30	30
	Culvert Slope (%)	0.00	0.00	0.00
	1:100 year discharge (m^3/s)	0.87	0.87	0.87
Fish Info	3Q10 (m^3/s)	0.55	0.55	0.55
	Target species	arctic grayling	arctic grayling	arctic grayling
	Fish Length (cm)	30	30	30
	Max Velocity (m/s)	0.80	0.80	0.80
	Min Depth (m)	0.20	0.20	0.20
Outputs				
For 3Q10 Discharge	Velocity at Inlet (m/s)	0.84	0.80	0.88
	Velocity in Barrel (m/s)	0.70	0.66	0.76
	Velocity at Outlet (m/s)	0.74	0.69	0.80
	Depth at Inlet (m)	0.53	0.51	0.54
	Depth within Barrel (m)	0.43	0.43	0.43
	Depth at Outlet (m)	0.41	0.41	0.41
	Hydraulic Control	Outlet	Outlet	Outlet
	Surface Profile Type	H2	H2	H2

(a) preferred configuration based on all-weather road crossing analysis

Table XIII-16
Culvert Design Input/Output Summary for Crossing Alternate EC 30 (Fish Bearing)

		Option			
		1	2	3	4[(a)]
Inputs					
Channel	Manning's n	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030
	Slope (%)	1.07	1.07	1.07	1.07
	Geometry	shown in Figure XII-53,54	shown in Figure XII-53,54	shown in Figure XII-53,54	shown in Figure XII-53,54
Culvert Properties	Number of Culverts	2	2	2	2
	Shape	circular	circular	circular	circular
	Diameter (mm)	3300	3600	3670	3000
	Material	helical 76 x 25 mm	helical 76 x 25 mm	structural plate 152 x 51 mm	helical 76 x 25 mm
	Entrance Type	projecting	projecting	projecting	projecting
	Embedded (% of diameter)	20	20	20	50
	Culvert Roughness (n)	0.026	0.026	0.030	0.026
	Bottom Roughness (n)	0.040	0.040	0.040	0.040
	Culvert Length (m)	30	30	30	30
	Culvert Slope (%)	0.00	0.00	0.00	0.00
	1:100 year discharge (m^3/s)	3.26	3.26	3.26	3.26
Fish Info	3Q10 (m^3/s)	2.06	2.06	2.06	2.06
	Target species	arctic grayling	arctic grayling	arctic grayling	arctic grayling
	Fish Length (cm)	30	30	30	30
	Max Velocity (m/s)	0.80	0.80	0.80	0.80
	Min Depth (m)	0.20	0.20	0.20	0.20
Outputs					
For 3Q10 Discharge	Velocity at Inlet (m/s)	0.95	0.92	0.91	0.95
	Velocity in Barrel (m/s)	0.83	0.79	0.78	0.77
	Velocity at Outlet (m/s)	0.90	0.85	0.84	0.89
	Depth at Inlet (m)	0.55	0.53	0.53	0.56
	Depth within Barrel (m)	0.42	0.42	0.42	0.46
	Depth at Outlet (m)	0.39	0.39	0.39	0.39
	Hydraulic Control	Outlet	Outlet	Outlet	Outlet
	Surface Profile Type	H2	H2	H2	H2

[(a)] preferred configuration based on all-weather road crossing analysis

Table XIII-17
Culvert Design Input/Output Summary for Crossing Km 174.3 (Non Fish Bearing)

		Option			
		1	**2**	**3[(a)]**	**4**
Inputs					
Culvert Properties	Assumed Tailwater Depth (m)	0.1	0.1	0.1	0.1
	Number of Culverts	1	1	1	1
	Shape	circular	circular	circular	circular
	Diameter (mm)	1000	900	800	600
	Material	helical 68 x 13 mm	helical 68 x 13 mm	helical 68 x 13 mm	helical 68 x 13 mm
	Entrance Type	projecting	projecting	projecting	projecting
	Embedded (% of diameter)	0	0	0	0
	Culvert Roughness (n)	0.018	0.018	0.018	0.018
	Culvert Length (m)	30	30	30	30
	Culvert Slope (%)	0.50	0.50	0.50	0.50
	1:100 year discharge (m^3/s)	0.89	0.89	0.89	0.89
Outputs					
	Culvert flowing	part full	part full	full	full
	Headwater depth (m)	0.84	0.91	1.10	2.60
	Hydraulic Control	inlet	outlet	outlet	outlet
	Velocity at Outlet (m/s)	2.06	2.15	2.30	3.23

(a) preferred configuration based on all-weather road crossing analysis

Table XIII-18
Culvert Design Input/Output Summary for Crossing Km 172.2 (Non Fish Bearing)

		Option			
		1	**2**	**3**	**4[(a)]**
Inputs					
Channel	Manning's n	0.040	0.040	0.040	0.040
	Slope (%)	1.2	1.2	1.2	1.2
	Tailwater Depth (m)	0.16	0.16	0.16	0.16
Culvert Properties	Number of Culverts	1	1	1	1
	Shape	circular	circular	circular	circular
	Diameter (mm)	1800	1600	1400	1200
	Material	helical 76 x 25 mm	helical 76 x 25 mm	helical 76 x 25 mm	helical 76 x 25 mm
	Entrance Type	projecting	projecting	projecting	projecting
	Embedded (% of diameter)	0	0	0	0
	Culvert Roughness (n)	0.024	0.024	0.024	0.024
	Culvert Length (m)	30	30	30	30
	Culvert Slope (%)	1.2	1.2	1.2	1.2
	1:100 year discharge (m^3/s)	2.35	2.35	2.35	2.35
Outputs					
	Culvert flowing	part full	part full	part full	full
	Headwater depth (m)	1.10	1.19	1.27	1.62
	Hydraulic Control	inlet	inlet	inlet	outlet
	Velocity at Outlet (m/s)	2.43	2.46	2.54	2.78

[(a)] preferred configuration based on all-weather road crossing analysis

Table XIII-19
Culvert Design Input/Output Summary for Crossing Km 171.2 (Non Fish Bearing)

		Option			
		1	2	3	4[(a)]
Inputs					
Culvert Properties	Assumed Tailwater Depth (m)	0.10	0.10	0.10	0.10
	Number of Culverts	1	1	1	1
	Shape	circular	circular	circular	circular
	Diameter (mm)	1000	900	800	600
	Material	helical 68 x 13 mm	helical 68 x 13 mm	helical 68 x 13 mm	helical 68 x 13 mm
	Entrance Type	projecting	projecting	projecting	projecting
	Embedded (% of diameter)	0	0	0	0
	Culvert Roughness (n)	0.018	0.018	0.017	0.016
	Culvert Length (m)	30	30	30	30
	Culvert Slope (%)	0.50	0.50	0.50	0.50
	1:100 year discharge (m^3/s)	0.48	0.48	0.48	0.48
Outputs					
	Culvert flowing	part full	part full	part full	full
	Headwater depth (m)	0.61	0.61	0.65	0.93
	Hydraulic Control	outlet	inlet	inlet	outlet
	Velocity at Outlet (m/s)	1.64	1.78	1.82	2.08

(a) preferred configuration based on all-weather road crossing analysis

Table XIII-20
Culvert Design Input/Output Summary for Crossing Km 168.0 (Non Fish Bearing)

		Option			
		1	**2**	**3**[(a)]	**4**
Inputs					
Culvert Properties	Assumed Tailwater Depth (m)	0.20	0.20	0.20	0.20
	Number of Culverts	1	1	1	1
	Shape	circular	circular	circular	circular
	Diameter (mm)	900	1000	1200	1400
	Material	helical 68 x 13 mm	helical 68 x 13 mm	helical 68 x 13 mm	helical 68 x 13 mm
	Entrance Type	projecting	projecting	projecting	projecting
	Embedded (% of diameter)	0	0	0	0
	Culvert Roughness (n)	0.018	0.019	0.020	0.021
	Culvert Length (m)	30	30	30	30
	Culvert Slope (%)	0.50	0.50	0.50	0.50
	1:100 year discharge (m^3/s)	1.95	1.95	1.95	1.95
Outputs					
	Culvert flowing	full	full	full	part full
	Headwater depth (m)	2.28	1.77	1.49	1.16
	Hydraulic Control	outlet	outlet	outlet	outlet
	Velocity at Outlet (m/s)	3.23	2.90	2.55	2.41

(a) preferred configuration based on all-weather road crossing analysis

Table XIII-21
Culvert Design Input/Output Summary for Crossing Km 163.2 (Non Fish Bearing)

		Option			
		1	**2**	**3[(a)]**	**4**
Inputs					
Culvert Properties	Assumed Tailwater Depth (m)	0.10	0.10	0.10	0.10
	Number of Culverts	1	1	1	1
	Shape	circular	circular	circular	circular
	Diameter (mm)	1000	900	800	700
	Material	helical 68 x 13 mm	helical 68 x 13 mm	helical 68 x 13 mm	helical 68 x 13 mm
	Entrance Type	projecting	projecting	projecting	projecting
	Embedded (% of diameter)	0	0	0	0
	Culvert Roughness (n)	0.018	0.018	0.017	0.016
	Culvert Length (m)	30	30	30	30
	Culvert Slope (%)	0.50	0.50	0.50	0.50
	1:100 year discharge (m^3/s)	0.84	0.84	0.84	0.84
Outputs					
	Culvert flowing	part full	part full	full	full
	Headwater depth (m)	0.82	0.86	1.07	1.32
	Hydraulic Control	inlet	outlet	outlet	outlet
	Velocity at Outlet (m/s)	2.04	2.11	2.24	2.49

(a) preferred configuration based on all-weather road crossing analysis

Table XIII-22
Culvert Design Input/Output Summary for Crossing Km 161.5 (Non Fish Bearing)

		Option			
		1	2[(a)]	3	4
Inputs					
Channel	Manning's n	0.04 / 0.03	0.04 / 0.03	0.04 / 0.03	0.04 / 0.03
	Slope (%)	0.72	0.72	0.72	0.72
	Tailwater Depth (m)	0.39	0.39	0.39	0.39
Culvert Properties	Number of Culverts	1	1	1	1
	Shape	circular	circular	circular	circular
	Diameter (mm)	900	1000	1200	1400
	Material	helical 68 x 13 mm	helical 68 x 13 mm	helical 68 x 13 mm	helical 68 x 13 mm
	Entrance Type	projecting	projecting	projecting	projecting
	Embedded (% of diameter)	0	0	0	0
	Culvert Roughness (n)	0.018	0.019	0.020	0.021
	Culvert Length (m)	30	30	30	30
	Culvert Slope (%)	0.72	0.72	0.72	0.72
	1:100 year discharge (m^3/s)	1.84	1.84	1.84	1.84
Outputs					
	Culvert flowing	full	full	part full	part full
	Headwater depth (m)	2.03	1.58	1.18	1.10
	Hydraulic Control	outlet	outlet	inlet	inlet
	Velocity at Outlet (m/s)	3.10	2.80	2.50	2.39

(a) preferred configuration based on all-weather road crossing analysis

Table XIII-23
Culvert Design Input/Output Summary for Crossing Km 159.5 (Non Fish Bearing)

		Option			
		1	2	3[(a)]	4
Inputs					
Culvert Properties	Assumed Tailwater Depth (m)	0.10	0.10	0.10	0.10
	Number of Culverts	1	1	1	1
	Shape	circular	circular	circular	circular
	Diameter (mm)	1000	900	800	600
	Material	helical 68 x 13 mm	helical 68 x 13 mm	helical 68 x 13 mm	helical 68 x 13 mm
	Entrance Type	projecting	projecting	projecting	projecting
	Embedded (% of diameter)	0	0	0	0
	Culvert Roughness (n)	0.019	0.018	0.017	0.016
	Culvert Length (m)	30	30	30	30
	Culvert Slope (%)	0.50	0.50	0.50	0.50
	1:100 year discharge (m^3/s)	0.78	0.78	0.78	0.78
Outputs					
	Culvert flowing	part full	part full	full	full
	Headwater depth (m)	0.78	0.82	1.03	1.90
	Hydraulic Control	inlet	inlet	outlet	outlet
	Velocity at Outlet (m/s)	1.99	2.04	2.14	2.87

(a) preferred configuration based on all-weather road crossing analysis

Table XIII-24
Culvert Design Input/Output Summary for Crossing Km 157.7 (Fish Bearing)

		Option				
		1[(a)]	2	3	4	5
Inputs						
Channel	Manning's n	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030
	Slope (%)	1.0	1.0	1.0	1.0	1.0
	Geometry	shown in Figure XII-59,60	shown in Figure XII-59,60	shown in Figure XII-59,60	shown in Figure XII-59,60	shown in Figure XII-59,60
Culvert Properties	Number of Culverts	3	3	1	1	3
	Shape	circular	circular	horizontal ellipse	pipe-arch	circular
	Diameter (mm)	3000	3050	6120 x 3960	7040 x 4060	2200
	Material	helical 76 x 25 mm	structural plate 152 x 51 mm	structural plate 152 x 51 mm	structural plate 152 x 51 mm	helical 76 x 25 mm
	Entrance Type	projecting	projecting	projecting	projecting	projecting
	Embedded (% of diameter)	20	20	20	20	50
	Culvert Roughness (n)	0.027	0.030	0.027	0.027	0.030
	Bottom Roughness (n)	0.040	0.040	0.040	0.040	0.040
	Culvert Length (m)	30	30	30	30	30
	Culvert Slope (%)	0.00	0.00	0.00	0.00	0.00
	1:100 year discharge (m^3/s)	2.41	2.41	2.41	2.41	2.41
Fish Info	3Q10 (m^3/s)	1.52	1.52	1.52	1.52	1.52
	Target species	arctic grayling	arctic grayling	arctic grayling	arctic grayling	arctic grayling
	Fish Length (cm)	30	30	30	30	30
	Max Velocity (m/s)	0.80	0.80	0.80	0.80	0.80
	Min Depth (m)	0.20	0.20	0.20	0.20	0.20
Outputs						
For 3Q10 Discharge	Velocity at Inlet (m/s)	0.76	0.75	0.93	0.82	0.87
	Velocity in Barrel (m/s)	0.77	0.76	0.93	0.80	0.77
	Velocity at Outlet (m/s)	1.30	1.28	1.44	1.10	1.79
	Depth at Inlet (m)	0.38	0.38	0.47	0.41	0.45
	Depth within Barrel (m)	0.26	0.26	0.31	0.28	0.35
	Depth at Outlet (m)	0.16	0.16	0.21	0.21	0.16
	Hydraulic Control	outlet	outlet	outlet	outlet	outlet
	Surface Profile Type	H2	H2	H2	H2	H2

[(a)] preferred configuration based on all-weather road crossing analysis

Table XIII-25
Culvert Design Input/Output Summary for Crossing Km 154.8 (Non Fish Bearing)

		Option				
		1	**2[(a)]**	**3**	**4**	**5**
Inputs						
Culvert Properties	Assumed Tailwater Depth (m)	0.20	0.20	0.20	0.20	0.20
	Number of Culverts	1	1	1	1	1
	Shape	circular	circular	circular	circular	circular
	Diameter (mm)	1600	1800	2000	1970	1600
	Material	helical 68 x 13 mm	helical 68 x 13 mm	helical 68 x 13 mm	structural plate 152 x 51 mm	helical 68 x 13 mm
	Entrance Type	projecting	projecting	projecting	projecting	projecting
	Embedded (% of diameter)	0	0	0	0	20
	Culvert Roughness (n)	0.021	0.021	0.021	0.033	0.021
	Culvert Length (m)	30	30	30	30	30
	Culvert Slope (%)	0.50	0.50	0.50	0.50	0.50
	1:100 year discharge (m^3/s)	5.34	5.34	5.34	5.34	5.34
Outputs						
	Culvert flowing	full	full	part full	full	full
	Headwater depth (m)	2.28	2.23	1.79	2.27	2.63
	Hydraulic Control	outlet	outlet	outlet	outlet	outlet
	Velocity at Outlet (m/s)	3.35	3.10	2.95	3.04	4.95

(a) preferred configuration based on all-weather road crossing analysis

Table XIII-26
Culvert Design Input/Output Summary for Crossing Km 147.1 (Fish Bearing)

		Option				
		1	2	3	4	5[(a)]
Inputs						
Channel	Manning's n	0.035	0.035	0.035	0.035	0.035
	Slope (%)	1.8	1.8	1.8	1.8	1.8
	Geometry	shown in Figure XII-63,64	shown in Figure XII-63,64	shown in Figure XII-63,64	shown in Figure XII-63,64	shown in Figure XII-63,64
Culvert Properties	Number of Culverts	3	3	1	1	3
	Shape	circular	circular	horizontal ellipse	pipe-arch	circular
	Diameter (mm)	3300	3360	7010 x 4290 mm	7040 x 4060	2400
	Material	helical 76 x 25 mm	structural plate 152 x 51 mm	structural plate 152 x 51 mm	structural plate 152 x 51 mm	helical 76 x 25 mm
	Entrance Type	projecting	projecting	projecting	projecting	projecting
	Embedded (% of diameter)	20	20	20	20	50
	Culvert Roughness (n)	0.027	0.030	0.032	0.032	0.030
	Bottom Roughness (n)	0.040	0.040	0.040	0.040	0.040
	Culvert Length (m)	30	30	30	30	30
	Culvert Slope (%)	0.00	0.00	0.00	0.00	0.00
	1:100 year discharge (m^3/s)	3.09	3.09	3.09	3.09	3.09
Fish Info	3Q10 (m^3/s)	1.95	1.95	1.95	1.95	1.95
	Target species	arctic grayling	arctic grayling	arctic grayling	arctic grayling	arctic grayling
	Fish Length (cm)	30	30	30	30	30
	Max Velocity (m/s)	0.80	0.80	0.80	0.80	0.80
	Min Depth (m)	0.20	0.20	0.20	0.20	0.20
Outputs						
For 3Q10 Discharge	Velocity at Inlet (m/s)	0.81	0.80	0.98	0.93	0.89
	Velocity in Barrel (m/s)	0.80	0.79	0.96	0.90	0.77
	Velocity at Outlet (m/s)	1.13	1.12	1.37	1.19	1.39
	Depth at Inlet (m)	0.41	0.41	0.50	0.47	0.47
	Depth within Barrel (m)	0.28	0.28	0.34	0.32	0.37
	Depth at Outlet (m)	0.20	0.20	0.24	0.24	0.20
	Hydraulic Control	outlet	outlet	outlet	outlet	outlet
	Surface Profile Type	H2	H2	H2	H2	H2

[(a)] preferred configuration based on all-weather road crossing analysis

Table XIII-27
Culvert Design Input/Output Summary for Crossing Km 140.0 (Non Fish Bearing)

		Option		
		1	**2**	**3[(a)]**
Inputs				
Channel	Manning's n	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030
	Slope (%)	3.2	3.2	3.2
	Tailwater Depth (m)	0.29	0.29	0.29
Culvert Properties	Number of Culverts	1	1	1
	Shape	circular	circular	circular
	Diameter (mm)	1000	1200	1200
	Material	helical 68 x 18 mm	helical 68 x 18 mm	helical 68 x 18 mm
	Entrance Type	projecting	projecting	projecting
	Embedded (% of diameter)	0	0	0
	Culvert Roughness (n)	0.019	0.020	0.020
	Culvert Length (m)	30	30	30
	Culvert Slope (%)	3.20	3.20	2.00
	1:100 year discharge (m^3/s)	1.86	1.86	1.86
Outputs				
	Culvert flowing	part full	part full	part full
	Headwater depth (m)	1.54	1.17	1.18
	Hydraulic Control	inlet	inlet	inlet
	Velocity at Outlet (m/s)	3.96	3.81	3.20

[(a)] preferred configuration based on all-weather road crossing analysis

Table XIII-28
Culvert Design Input/Output Summary for Crossing Km 131.3 (Non Fish Bearing)

		Option			
		1	2[(a)]	3	4
Inputs					
Culvert Properties	Assumed Tailwater Depth (m)	0.20	0.20	0.20	0.20
	Number of Culverts	1	1	1	3
	Shape	circular	circular	circular	circular
	Diameter (mm)	1200	1400	1600	1400
	Material	helical 68 x 13 mm	helical 68 x 13 mm	helical 68 x 13 mm	helical 68 x 13 mm
	Entrance Type	projecting	projecting	projecting	projecting
	Embedded (% of diameter)	0	0	0	20
	Culvert Roughness (n)	0.020	0.021	0.021	0.021
	Culvert Length (m)	30	30	30	30
	Culvert Slope (%)	0.50	0.50	0.50	0.50
	1:100 year discharge (m^3/s)	2.63	2.63	2.63	2.63
Outputs					
	Culvert flowing	full	full	part full	full
	Headwater depth (m)	1.74	1.68	1.31	1.57
	Hydraulic Control	outlet	outlet	outlet	outlet
	Velocity at Outlet (m/s)	2.93	2.62	2.49	3.87

(a) preferred configuration based on all-weather road crossing analysis

Table XIII-29
Culvert Design Input/Output Summary for Crossing Km 127.5 (Fish Bearing)

		Option				
		1	2	3	4	5[(a)]
Inputs						
Channel	Manning's n	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030
	Slope (%)	0.27	0.27	0.27	0.27	0.27
	Geometry	shown in Figure XII-71,72	shown in Figure XII-71,72	shown in Figure XII-71,72	shown in Figure XII-71,72	shown in Figure XII-71,72
Culvert Properties	Number of Culverts	4	4	3	1	4
	Shape	circular	circular	horizontal ellipse	horizontal ellipse	circular
	Diameter (mm)	3600	3990	5283 x 3531 mm	9220 x 5460 mm	3000
	Material	helical 76 x 25 mm	structural plate 152 x 51 mm	structural plate 152 x 51 mm	structural plate 152 x 51 mm	helical 76 x 25 mm
	Entrance Type	projecting	projecting	projecting	projecting	projecting
	Embedded (% of diameter)	20	20	20	20	50
	Culvert Roughness (n)	0.027	0.030	0.030	0.030	0.027
	Bottom Roughness (n)	0.040	0.040	0.040	0.040	0.040
	Culvert Length (m)	30	30	30	30	30
	Culvert Slope (%)	0.00	0.00	0.00	0.00	0.00
	1:100 year discharge (m^3/s)	7.77	7.77	7.77	7.77	7.77
Fish Info	3Q10 (m^3/s)	4.91	4.91	4.91	4.91	4.91
	Target species	arctic grayling	arctic grayling	arctic grayling	arctic grayling	arctic grayling
	Fish Length (cm)	30	30	30	30	30
	Max Velocity (m/s)	0.80	0.80	0.80	0.80	0.80
	Min Depth (m)	0.20	0.20	0.20	0.20	0.20
Outputs						
For 3Q10 Discharge	Velocity at Inlet (m/s)	1.04	0.98	0.96	1.24	0.97
	Velocity in Barrel (m/s)	0.96	0.88	0.84	1.04	0.79
	Velocity at Outlet (m/s)	1.09	0.98	0.90	1.09	0.94
	Depth at Inlet (m)	0.57	0.57	0.55	0.75	0.54
	Depth within Barrel (m)	0.41	0.41	0.42	0.59	0.44
	Depth at Outlet (m)	0.37	0.37	0.40	0.56	0.37
	Hydraulic Control	Outlet	Outlet	Outlet	Outlet	Outlet
	Surface Profile Type	H2	H2	H2	H2	H2

[(a)] preferred configuration based on all-weather road crossing analysis

Table XIII-30
Culvert Design Input/Output Summary for Crossing Alternate NC 17 (Non Fish Bearing)

		Option		
		1	2[(a)]	3
Inputs				
Channel	Manning's n	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030
	Slope (%)	3.3	3.3	3.3
	Tailwater Depth (m)	0.38	0.38	0.38
Culvert Properties	Number of Culverts	1	1	1
	Shape	circular	circular	circular
	Diameter (mm)	1200	1000	1000
	Material	helical 68 x 13 mm	helical 68 x 13 mm	helical 68 x 13 mm
	Entrance Type	projecting	projecting	projecting
	Embedded (% of diameter)	0	0	0
	Culvert Roughness (n)	0.020	0.019	0.019
	Culvert Length (m)	30	30	30
	Culvert Slope (%)	3.3	3.3	2.0
	1:100 year discharge (m^3/s)	1.78	1.78	1.78
Outputs				
	Culvert flowing	part full	part full	full
	Headwater depth (m)	1.14	1.46	1.50
	Hydraulic Control	inlet	inlet	outlet
	Velocity at Outlet (m/s)	3.81	3.96	2.78

[(a)] preferred configuration based on all-weather road crossing analysis

Table XIII-31
Culvert Design Input/Output Summary for Crossing Alternate NC 18 (Non Fish Bearing)

		Option				
		1	**2**	**3**	**4[(a)]**	**5**
Inputs						
Channel	Manning's n	0.035	0.035	0.035	0.035	0.035
	Slope (%)	3.2	3.2	3.2	3.2	3.2
	Tailwater Depth (m)	0.18	0.18	0.18	0.18	xsection
Culvert Properties	Number of Culverts	1	1	1	1	1
	Shape	circular	circular	circular	circular	circular
	Diameter (mm)	2000	1800	1800	1600	1600
	Material	helical 76 x 25 mm	helical 76 x 25 mm	helical 76 x 25 mm	helical 76 x 25 mm	helical 76 x 25 mm
	Entrance Type	projecting	projecting	projecting	projecting	projecting
	Embedded (% of diameter)	0	0	0	0	20
	Culvert Roughness (n)	0.026	0.025	0.025	0.024	0.024
	Culvert Length (m)	30	30	30	30	30
	Culvert Slope (%)	3.20	2.00	1.50	1.50	1.50
	1:100 year discharge (m^3/s)	4.62	4.62	4.62	4.62	4.62
Outputs						
	Culvert flowing	part full	part full	part full	part full	part full
	Headwater depth (m)	1.58	1.66	1.67	1.82	1.99
	Hydraulic Control	inlet	inlet	inlet	inlet	outlet
	Velocity at Outlet (m/s)	3.92	3.40	3.04	3.17	4.57

[(a)] preferred configuration based on all-weather road crossing analysis

Table XIII-32
Culvert Design Input/Output Summary for Crossing Km 112.9 (Non Fish Bearing)

		Option		
		1	**2**	**3[(a)]**
Inputs				
Culvert Properties	Assumed Tailwater Depth (m)	0.10	0.10	0.10
	Number of Culverts	1	1	1
	Shape	circular	circular	circular
	Diameter (mm)	800	700	600
	Material	helical 68 x 13 mm	helical 68 x 13 mm	helical 68 x 13 mm
	Entrance Type	projecting	projecting	projecting
	Embedded (% of diameter)	0	0	0
	Culvert Roughness (n)	0.017	0.016	0.016
	Culvert Length (m)	30	30	30
	Culvert Slope (%)	0.50	0.50	0.50
	1:100 year discharge (m^3/s)	0.17	0.17	0.17
Outputs				
	Culvert flowing	part full	part full	part full
	Headwater depth (m)	0.39	0.37	0.40
	Hydraulic Control	outlet	inlet	inlet
	Velocity at Outlet (m/s)	1.34	1.36	1.42

(a) preferred configuration based on all-weather road crossing analysis

Table XIII-33
Culvert Design Input/Output Summary for Crossing Alternate NC 20 (Non Fish Bearing)

		Option		
		1	2[(a)]	3
Inputs				
Channel	Manning's n	0.035	0.035	0.035
	Slope (%)	0.7	0.7	0.7
	Tailwater Depth (m)	0.12	0.12	0.12
Culvert Properties	Number of Culverts	1	1	1
	Shape	circular	circular	circular
	Diameter (mm)	600	800	900
	Material	helical 68 x 13 mm	helical 68 x 13 mm	helical 68 x 13 mm
	Entrance Type	projecting	projecting	projecting
	Embedded (% of diameter)	0	0	0
	Culvert Roughness (n)	0.016	0.017	0.018
	Culvert Length (m)	30	30	30
	Culvert Slope (%)	0.70	0.70	0.70
	1:100 year discharge (m^3/s)	0.61	0.61	0.61
Outputs				
	Culvert flowing	full	part full	part full
	Headwater depth (m)	1.24	0.75	0.74
	Hydraulic Control	outlet	inlet	inlet
	Velocity at Outlet (m/s)	2.41	1.94	1.92

(a) preferred configuration based on all-weather road crossing analysis

Table XIII-34
Culvert Design Input/Output Summary for Crossing Alternate NC 21 (Non Fish Bearing)

		Option		
		1[(a)]	2	3
Inputs				
Channel	Manning's n	0.035	0.035	0.035
	Slope (%)	7.0	7.0	7.0
	Assumed Tailwater Depth (m)	0.10	0.10	0.10
Culvert Properties	Number of Culverts	1	1	1
	Shape	circular	circular	circular
	Diameter (mm)	900	800	600
	Material	helical 68 x 13 mm	helical 68 x 13 mm	helical 68 x 13 mm
	Entrance Type	projecting	projecting	projecting
	Embedded (% of diameter)	0	0	0
	Culvert Roughness (n)	0.018	0.017	0.016
	Culvert Length (m)	30	30	30
	Culvert Slope (%)	2.00	2.00	2.00
	1:100 year discharge (m^3/s)	0.95	0.95	0.95
Outputs				
	Culvert flowing	part full	part full	full
	Headwater depth (m)	0.91	1.07	2.37
	Hydraulic Control	inlet	inlet	inlet
	Velocity at Outlet (m/s)	2.93	3.04	3.41

(a) preferred configuration based on all-weather road crossing analysis

Table XIII-35
Culvert Design Input/Output Summary for Crossing Alternate NC 22 (Non Fish Bearing)

		Option	
		1	2[(a)]
Inputs			
Channel	Manning's n	0.035	0.035
	Slope (%)	4.3	4.3
	Assumed Tailwater Depth (m)	0.10	0.10
Culvert Properties	Number of Culverts	1	1
	Shape	circular	circular
	Diameter (mm)	800	600
	Material	helical 68 x 13 mm	helical 68 x 13 mm
	Entrance Type	projecting	projecting
	Embedded (% of diameter)	0	0
	Culvert Roughness (n)	0.017	0.016
	Culvert Length (m)	30	30
	Culvert Slope (%)		
	1:100 year discharge (m^3/s)	0.25	0.25
Outputs			
	Culvert flowing	part full	part full
	Headwater depth (m)	0.43	0.50
	Hydraulic Control	inlet	inlet
	Velocity at Outlet (m/s)	2.14	2.28

(a) preferred configuration based on all-weather road crossing analysis

Table XIII-36
Culvert Design Input/Output Summary for Crossing Km 109.8 (Fish Bearing)

		Option				
		1	2	3	4	5[(a)]
Inputs						
Channel	Manning's n	0.035	0.035	0.035	0.035	0.035
	Slope (%)	2.40	2.40	2.40	2.40	2.40
	Geometry	shown in Figure XII-83	shown in Figure XII-83	shown in Figure XII-83	shown in Figure XII-83	shown in Figure XII-83
Culvert Properties	Number of Culverts	2	2	2	1	2
	Shape	circular	circular	circular	horizontal ellipse	circular
	Diameter (mm)	3000	2700	2740	4826 x 3429	2000
	Material	helical 76 x 25 mm	helical 76 x 25 mm	structural plate 152 x 51 mm	structural plate 152 x 51 mm	helical 76 x 25 mm
	Entrance Type	projecting	projecting	projecting	projecting	projecting
	Embedded (% of diameter)	20	20	20	20	50
	Culvert Roughness (n)	0.027	0.027	0.032	0.032	0.027
	Bottom Roughness (n)	0.040	0.040	0.040	0.040	0.040
	Culvert Length (m)	30	30	30	30	30
	Culvert Slope (%)	0.00	0.00	0.00	0.00	0.00
	1:100 year discharge (m^3/s)	1.63	1.63	1.63	1.63	1.63
Fish Info	3Q10 (m^3/s)	1.03	1.03	1.03	1.03	1.03
	Target species	arctic grayling	arctic grayling	arctic grayling	arctic grayling	arctic grayling
	Fish Length (cm)	30	30	30	30	30
	Max Velocity (m/s)	0.80	0.80	0.80	0.80	0.80
	Min Depth (m)	0.20	0.20	0.20	0.20	0.20
Outputs						
For 3Q10 Discharge	Velocity at Inlet (m/s)	0.76	0.80	0.79	0.83	0.88
	Velocity in Barrel (m/s)	0.76	0.80	0.79	0.81	0.79
	Velocity at Outlet (m/s)	1.13	1.30	1.29	1.07	1.43
	Depth at Inlet (m)	0.39	0.41	0.42	0.43	0.46
	Depth within Barrel (m)	0.27	0.28	0.28	0.29	0.35
	Depth at Outlet (m)	0.18	0.18	0.18	0.23	0.00
	Hydraulic Control	outlet	outlet	outlet	outlet	outlet
	Surface Profile Type	H2	H2	H2	H2	H2

(a) preferred configuration based on all-weather road crossing analysis

Table XIII-37
Culvert Design Input/Output Summary for Crossing Km 108.8 (Non Fish Bearing)

		Option		
		1	2[(a)]	3
Inputs				
Channel	Manning's n	0.035	0.035	0.035
	Slope (%)	1.9	1.9	1.9
	Tailwater Depth (m)	0.17	0.17	0.17
Culvert Properties	Number of Culverts	1	1	1
	Shape	circular	circular	circular
	Diameter (mm)	900	800	600
	Material	helical 68 x 13 mm	helical 68 x 13 mm	helical 68 x 13 mm
	Entrance Type	projecting	projecting	projecting
	Embedded (% of diameter)	0	0	0
	Culvert Roughness (n)	0.018	0.017	0.016
	Culvert Length (m)	30	30	30
	Culvert Slope (%)	1.90	1.90	1.90
	1:100 year discharge (m^3/s)	0.73	0.73	0.73
Outputs				
	Culvert flowing	part full	part full	full
	Headwater depth (m)	0.78	0.83	1.53
	Hydraulic Control	inlet	inlet	inlet
	Velocity at Outlet (m/s)	2.68	2.81	2.72

(a) preferred configuration based on all-weather road crossing analysis

Table XIII-38
Culvert Design Input/Output Summary for Crossing Km 107.8 (Non Fish Bearing)

		Option			
		1	2	3[(a)]	4
Inputs					
Channel	Manning's n	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030
	Slope (%)	0.88	0.88	0.88	0.88
	Tailwater Depth (m)	0.66	0.66	0.66	0.66
Culvert Properties	Number of Culverts	1	1	1	1
	Shape	circular	circular	circular	circular
	Diameter (mm)	1000	900	800	600
	Material	helical 68 x 13 mm	helical 68 x 13 mm	helical 68 x 13 mm	helical 68 x 13 mm
	Entrance Type	projecting	projecting	projecting	projecting
	Embedded (% of diameter)	0	0	0	0
	Culvert Roughness (n)	0.019	0.018	0.017	0.016
	Culvert Length (m)	30	30	30	30
	Culvert Slope (%)	0.88	0.88	0.88	0.88
	1:100 year discharge (m^3/s)	0.86	0.86	0.86	0.86
Outputs					
	Culvert flowing	part full	part full	part full	full
	Headwater depth (m)	0.83	0.86	0.86	2.18
	Hydraulic Control	inlet	inlet	inlet	outlet
	Velocity at Outlet (m/s)	1.56	1.72	1.94	3.04

(a) preferred configuration based on all-weather road crossing analysis

Table XIII-39
Culvert Design Input/Output Summary for Crossing Km 103.4 (Non Fish Bearing)

		Option	
		1	2[(a)]
Inputs			
Channel	Manning's n	0.035	0.035
	Slope (%)	0.19	0.19
	Tailwater Depth (m)	0.13	0.13
Culvert Properties	Number of Culverts	1	
	Shape	circular	circular
	Diameter (mm)	800	600
	Material	helical 68 x 13 mm	helical 68 x 13 mm
	Entrance Type	projecting	projecting
	Embedded (% of diameter)	0	0
	Culvert Roughness (n)	0.017	0.016
	Culvert Length (m)	30	30
	Culvert Slope (%)	0.20	0.20
	1:100 year discharge (m^3/s)	0.18	0.18
Outputs			
	Culvert flowing	part full	part full
	Headwater depth (m)	0.49	0.46
	Hydraulic Control	outlet	outlet
	Velocity at Outlet (m/s)	1.30	1.42

(a) preferred configuration based on all-weather road crossing analysis

Table XIII-40
Culvert Design Input/Output Summary for Crossing Km 100.2 (Non Fish Bearing)

		Option			
		1	**2**	**3**[(a)]	**4**
Inputs					
Channel	Manning's n	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030
	Slope (%)	2.2	2.2	2.2	2.2
	Tailwater Depth (m)	0.44	0.44	0.44	0.44
Culvert Properties	Number of Culverts	1	1	1	1
	Shape	circular	circular	circular	circular
	Diameter (mm)	1000	1200	1000	1200
	Material	helical 68 x 13 mm	helical 68 x 13 mm	helical 68 x 13 mm	helical 68 x 13 mm
	Entrance Type	projecting	projecting	projecting	projecting
	Embedded (% of diameter)	0	0	0	0
	Culvert Roughness (n)	0.019	0.020	0.019	0.020
	Culvert Length (m)	30	30	30	30
	Culvert Slope (%)	2.2	2.2	1.5	1.5
	1:100 year discharge (m^3/s)	1.72	1.72	1.72	1.72
Outputs					
	Culvert flowing	part full	part full	part full	part full
	Headwater depth (m)	1.40	1.12	1.40	1.13
	Hydraulic Control	inlet	inlet	inlet	inlet
	Velocity at Outlet (m/s)	3.36	3.25	2.87	2.81

(a) preferred configuration based on all-weather road crossing analysis

Table XIII-41
Culvert Design Input/Output Summary for Crossing Km 19.6 (Non Fish Bearing)

		Option		
		1	**2**	**3**[(a)]
Inputs				
Culvert Properties	Assumed Tailwater Depth (m)	0.10	0.10	0.10
	Number of Culverts	1	1	1
	Shape	circular	circular	circular
	Diameter (mm)	800	700	600
	Material	helical 68 x 13 mm	helical 68 x 13 mm	helical 68 x 13 mm
	Entrance Type	projecting	projecting	projecting
	Embedded (% of diameter)	0	0	0
	Culvert Roughness (n)	0.017	0.016	0.016
	Culvert Length (m)	30	30	30
	Culvert Slope (%)	0.50	0.50	0.50
	1:100 year discharge (m^3/s)	0.35	0.35	0.35
Outputs				
	Culvert flowing	part full	part full	part full
	Headwater depth (m)	0.53	0.58	0.64
	Hydraulic Control	inlet	inlet	outlet
	Velocity at Outlet (m/s)	1.64	1.73	1.83

(a) preferred configuration based on all-weather road crossing analysis

Table XIII-42
Culvert Design Input/Output Summary for Crossing Km 17.2 (Fish Bearing)

		Option				
		1	2	3	4	5[(a)]
Inputs						
Channel	Manning's n	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030	0.035 / 0.031	0.035 / 0.031
	Slope (%)	2.50	2.50	2.50	3.50	3.50
	Geometry	shown in Figure XII-92,93	measured cross section	shown in Figure XII-92,93	shown in Figure XII-92,93	shown in Figure XII-92,93
Culvert Properties	Number of Culverts	4	4	4	2	3
	Shape	circular	circular	circular	horizontal ellipse	circular
	Diameter (mm)	3600	3670	3990	5715 x 3988 mm	3000
	Material	helical 76 x 25 mm	structural plate 152 x 51 mm	structural plate 152 x 51 mm	structural plate 152 x 51 mm	helical 76 x 25 mm
	Entrance Type	projecting	projecting	projecting	projecting	projecting
	Embedded (% of diameter)	20	20	20	20	50
	Culvert Roughness (n)	0.027	0.030	0.030	0.030	0.027
	Bottom Roughness (n)	0.040	0.040	0.040	0.040	0.040
	Culvert Length (m)	30	30	30	30	30
	Culvert Slope (%)	0.00	0.00	0.00	0.00	0.00
	1:100 year discharge (m^3/s)	6.10	6.10	6.10	6.10	6.10
Fish Info	3Q10 (m^3/s)	3.85	3.85	3.85	3.85	3.85
	Target species	arctic grayling	arctic grayling	arctic grayling	arctic grayling	arctic grayling
	Fish Length (cm)	30	30	30	30	30
	Max Velocity (m/s)	0.80	0.80	0.80	0.80	0.80
	Min Depth (m)	0.20	0.20	0.20	0.20	0.20
Outputs						
For 3Q10 Discharge	Velocity at Inlet (m/s)	0.93	0.92	0.88	0.94	0.96
	Velocity in Barrel (m/s)	0.88	0.87	0.81	0.83	0.81
	Velocity at Outlet (m/s)	1.03	1.02	0.93	0.91	1.06
	Depth at Inlet (m)	0.50	0.50	0.47	0.52	0.52
	Depth within Barrel (m)	0.35	0.35	0.35	0.39	0.41
	Depth at Outlet (m)	0.30	0.30	0.30	0.36	0.30
	Hydraulic Control	outlet	outlet	outlet	outlet	outlet
	Surface Profile Type	H2	H2	H2	H2	H2

[(a)] preferred configuration based on all-weather road crossing analysis

Table XIII-43
Culvert Design Input/Output Summary for Crossing Km 15.6 (Fish Bearing)

		Option				
		1	2	3	4	5[(a)]
Inputs						
Channel	Manning's n	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030
	Slope (%)	2.00	2.00	2.00	2.00	2.00
	Geometry	shown in Figure XII-94,95	shown in Figure XII-94,95	shown in Figure XII-94,95	shown in Figure XII-94,95	shown in Figure XII-94,95
Culvert Properties	Number of Culverts	3	3	1	2	2
	Shape	circular	circular	horizontal ellipse	horizontal ellipse	circular
	Diameter (mm)	3000	3050	7950 x 5540	3680 x 2440	3000
	Material	helical 76 x 25 mm	structural plate 152 x 51 mm	structural plate 152 x 51 mm	structural plate 152 x 51 mm	helical 76 x 25 mm
	Entrance Type	projecting	projecting	projecting	projecting	projecting
	Embedded (% of diameter)	20	20	20	20	50
	Culvert Roughness (n)	0.027	0.030	0.030	0.030	0.027
	Bottom Roughness (n)	0.040	0.040	0.040	0.040	0.040
	Culvert Length (m)	30	30	30	30	30
	Culvert Slope (%)	0.00	0.00	0.00	0.00	0.00
	1:100 year discharge (m^3/s)	2.79	2.79	2.79	2.79	2.79
Fish Info	3Q10 (m^3/s)	1.76	1.76	1.76	1.76	1.76
	Target species	arctic grayling	arctic grayling	arctic grayling	arctic grayling	arctic grayling
	Fish Length (cm)	30	30	30	30	30
	Max Velocity (m/s)	0.80	0.80	0.80	0.80	0.80
	Min Depth (m)	0.20	0.20	0.20	0.20	0.20
Outputs						
For 3Q10 Discharge	Velocity at Inlet (m/s)	0.80	0..79	0.85	0.86	0.93
	Velocity in Barrel (m/s)	0.77	0.77	0.76	0.82	0.79
	Velocity at Outlet (m/s)	0.96	0.95	0.83	0.99	1.11
	Depth at Inlet (m)	0.42	0.42	0.46	0.45	0.49
	Depth within Barrel (m)	0.29	0.29	0.35	0.32	0.39
	Depth at Outlet (m)	0.24	0.24	0.32	0.27	0.27
	Hydraulic Control	outlet	outlet	outlet	outlet	outlet
	Surface Profile Type	H2	H2	H2	H2	H2

[(a)] preferred configuration based on all-weather road crossing analysis

Table XIII-44
Culvert Design Input/Output Summary for Crossing Km 14.1 (Non Fish Bearing)

		Option			
		1	2[(a)]	3	4
Inputs					
Culvert Properties	Assumed Tailwater Depth (m)	0.10	0.10	0.10	0.10
	Number of Culverts	1	1	1	1
	Shape	circular	circular	circular	circular
	Diameter (mm)	1000	900	800	600
	Material	helical 68 x 13 mm	helical 68 x 13 mm	helical 68 x 13 mm	helical 68 x 13 mm
	Entrance Type	projecting	projecting	projecting	projecting
	Embedded (% of diameter)	0	0	0	0
	Culvert Roughness (n)	0.019	0.018	0.017	0.016
	Culvert Length (m)	30	30	30	30
	Culvert Slope (%)	0.50	0.50	0.50	0.50
	1:100 year discharge (m^3/s)	0.82	0.82	0.82	0.82
Outputs					
	Culvert flowing	part full	part full	full	full
	Headwater depth (m)	0.81	0.85	1.06	2.06
	Hydraulic Control	inlet	outlet	outlet	outlet
	Velocity at Outlet (m/s)	1.99	2.06	2.18	2.97

(a) preferred configuration based on all-weather road crossing analysis

Table XIII-45
Culvert Design Input/Output Summary for Crossing Km 2.0 (Fish Bearing)

		Option			
		1	2	3	4[(a)]
Inputs					
Channel	Manning's n	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030	0.035 / 0.030
	Slope (%)	0.12	0.12	0.12	0.12
	Geometry	shown in Figure XII-100-101	shown in Figure XII-100-101	shown in Figure XII-100-101	shown in Figure XII-100-101
Culvert Properties	Number of Culverts	1	1	1	1
	Shape	circular	circular	circular	circular
	Diameter (mm)	2700	3000	2740	2600
	Material	helical 76 x 25 mm	helical 76 x 25 mm	structural plate 152 x 51 mm	helical 76 x 25 mm
	Entrance Type	projecting	projecting	projecting	projecting
	Embedded (% of diameter)	20	20	20	50
	Culvert Roughness (n)	0.027	0.027	0.032	0.032
	Bottom Roughness (n)	0.040	0.040	0.040	0.040
	Culvert Length (m)	30	30	30	30
	Culvert Slope (%)	0.00	0.00	0.00	0.00
	1:100 year discharge (m^3/s)				
Fish Info	3Q10 (m^3/s)	1.63	1.63	1.63	1.63
	Target species	arctic grayling	arctic grayling	arctic grayling	arctic grayling
	Fish Length (cm)	30	30	30	30
	Max Velocity (m/s)	0.80	0.80	0.80	0.80
	Min Depth (m)	0.20	0.20	0.20	0.20
Outputs					
For 3Q10 Discharge	Velocity at Inlet (m/s)	0.99	0.90	0.97	1.03
	Velocity in Barrel (m/s)	0.75	0.67	0.74	0.78
	Velocity at Outlet (m/s)	0.75	0.68	0.74	0.79
	Depth at Inlet (m)	0.95	0.94	0.96	0.98
	Depth within Barrel (m)	0.87	0.87	0.87	0.9
	Depth at Outlet (m)	0.86	0.86	0.86	0.86
	Hydraulic Control	outlet	outlet	outlet	outlet
	Surface Profile Type	H2	H3	H2	H2

(a) preferred configuration based on all-weather road crossing analysis