Current River / Boulevard Lake Dam
Water Management Report 2012

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City of Thunder Bay
November, 2012

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1.0 Introduction

A water management plan was completed in March 2006 for Boulevard Lake (Current River) Dam. The water management plan identified that there were information gaps with respect to the fish management aspect of the operation. This report provides data and analysis related to these gaps, including information related to the fish ladder, dam and generating station.

The main information gaps surrounding the operation of the dam and generating station relate to water flows and levels through the fish ladder. This information is necessary to promote Rainbow Trout movement upstream and up through the fish ladder. A monitoring and reporting program for stop log configuration, reservoir water level and flow through the fish ladder during times of expected Rainbow Trout runs is provided in this report to evaluate these operations.

The following report is for the 2012 operating season.

2.0 Stop Log Configuration

2.1. Background

The Boulevard Lake water elevation levels are controlled by the insertion and removal of the spillway logs. Figure 2.0 (rev 2) illustrates the standard configuration of the logs for both the summer and winter settings. Revision 2 of the drawing illustrates changes applied in 2012 which included the addition of submerged openings introduced to provide minimum flows during times when the surface of the lake was drawn down below the top log elevation of the dam. Also the log settings in chutes 2 and 3 were reversed to improve the operation of the log settings.

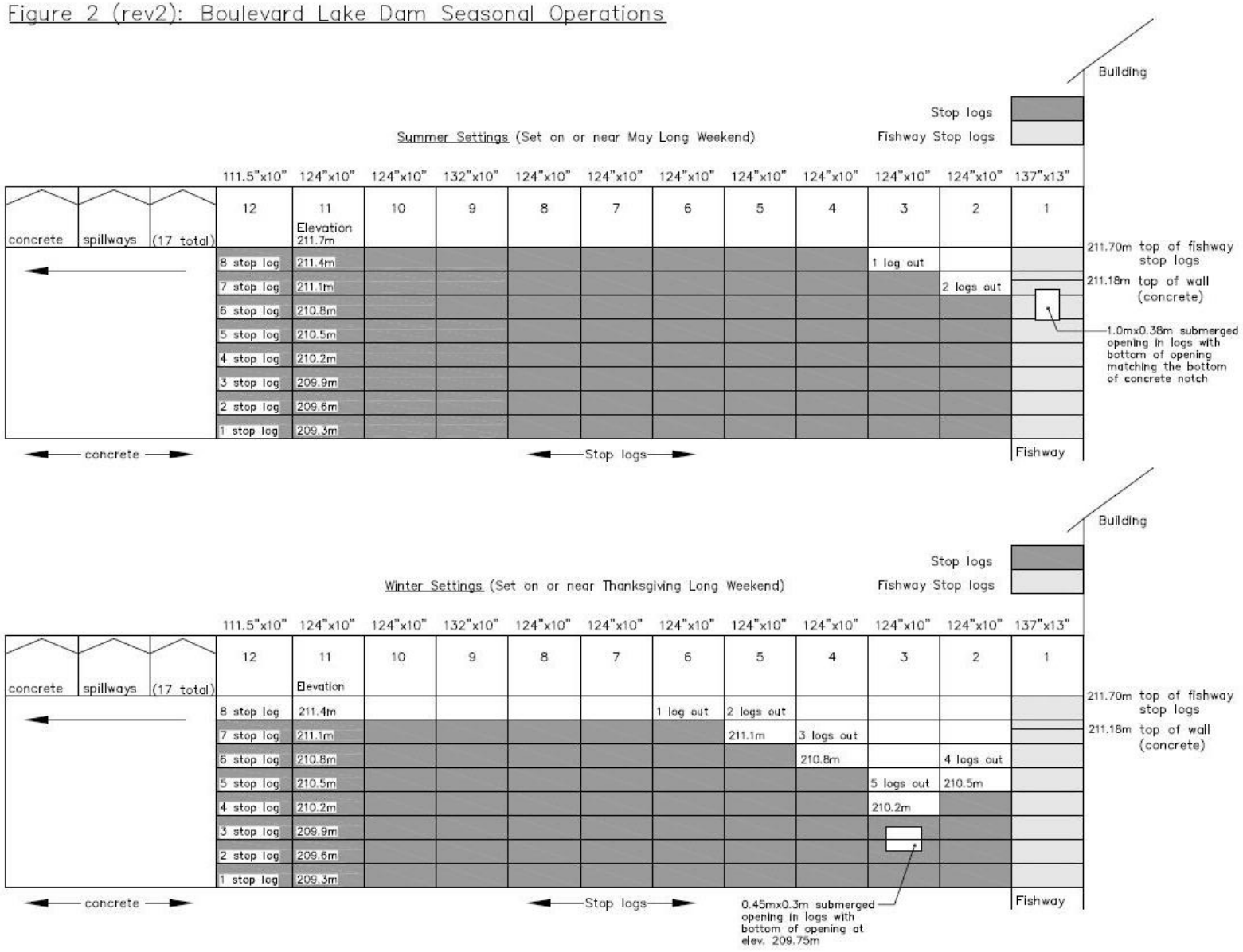
The log settings are monitored and adjusted to achieve the optimal lake level for the various functions, including maintaining a clean lake surface, recreational use, power generation, and fish ladder flows.

The summer set is typically applied on or near May long weekend. This setting is based on the water level being higher than 211.7m. If the water level drops below 211.7m then logs may be added to chutes 2 and 3 to reduce spillage over the dam and may be removed from the fish ladder chute to maintain ladder flows.

The winter set is typically applied on or near Thanksgiving long weekend. Starting in April the winter set is transitioned into the summer set as ice conditions will allow. Logs are added once the ice subsides so that the lake level can be maintained above the top of the concrete wall in the fish ladder cell (211.18m).

A permanent diary is located in the gatehouse for maintenance staff to accurately record the configuration of the stop logs, the level of water passing over the stop logs, and if any fish are spotted using the ladder.

Figure 2 (rev2): Boulevard Lake Dam Seasonal Operations



2.2. General Activity

Operation of the stop logs within the dam structure and the fish ladder occurred during the recording period of April 1, 2012 to October 15, 2012.

Due to ice build-up on the lake and in the fish ladder cells the level logger could not be installed until April 4th.

The aluminum gates in the walls of the first fish ladder cell remained out during the entire year.

The summer set log settings were applied on April 11.

A submerged opening was installed in chute #3 on April 11th to allow 0.4 cu-m/s of flow to pass through the dam at all times. The size of the opening was 0.45m wide by 0.3m high and was installed at 211.0m. This stayed in place until September 11th when the opening was moved to the fish ladder chute.

All logs were removed from the dam November 5th to perform maintenance on all the logs.

The winter set log settings were applied on November 27th.

On August 15-17 a flow study of the lower Current River was conducted by the MNR. The intent of the study was to release specific flow volumes past the dam so they could be observed downstream at the mouth of the river and help identify minimum flow values required for fish spawning.

2.3. Routine Maintenance

The design phase for the rehabilitation of the Boulevard Lake Dam is still ongoing. The construction is planned for summer of 2013. The project will primarily consist of concrete restoration work required due to deterioration of the existing structure.

All the stop logs were planed in November in order to reduce the amount of leakage going between the logs.

3.0 Boulevard Lake Water Levels

A permanently installed level recorder is in operation at the Boulevard Lake Dam and the signal is transmitted to the Bare Point Water Treatment Plant via a SCADA System. Lake level elevation measurements are taken and logged every 12 seconds, along with all the other data points, then put in the archive files, so not to fill the hard drive of the computer.

Using this data the average daily lake levels were calculated. The average daily lake levels for the time periods of April 1, 2012 to June 15, 2012 and September 15, 2012 to October 15, 2012 have been graphed alongside the fish ladder elevation data in figures 4.2-A and 4.2-B located in section 4.0 Fish Ladder.

The tabulated average daily lake level data is also included in Appendix "A" of this report.

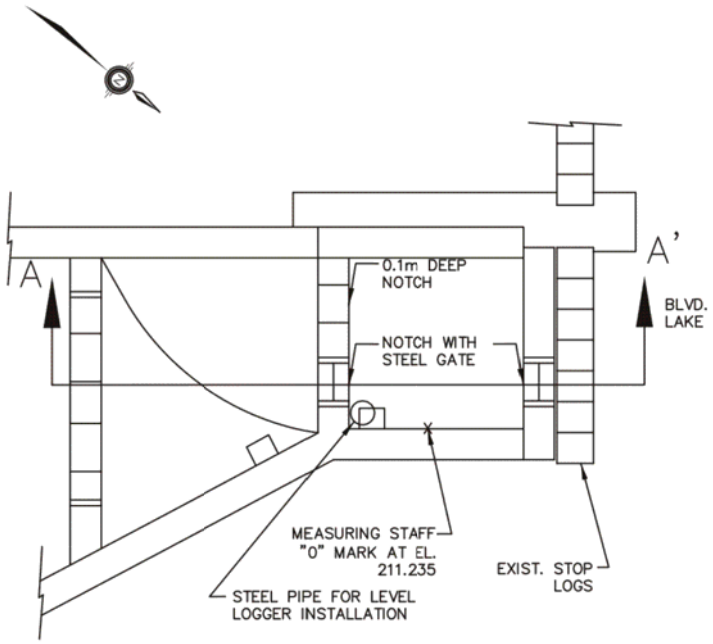
4.0 Fish Ladder

4.1. Configuration Overview

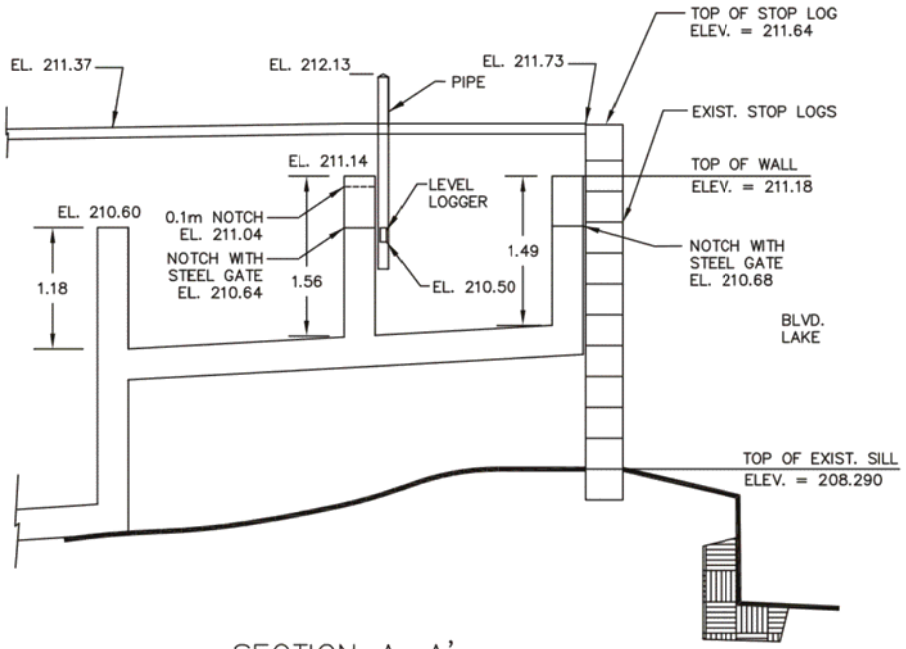
The fish ladder structure consists of a concrete spillway segmented into cells by concrete weirs. A level logger has been installed in the top cell of the fish ladder so that water level measurements can be recorded during the operation of the fish ladder. Figure 4.1 illustrates the configuration of the top fish ladder cell and the installation of the water level recording device.

The bottom of the optimal 30cm water depth in the fish ladder is defined by the top of the concrete wall in the fish ladder (elevation 211.18m). Therefore the optimal range is 211.18m to 211.48m. When the lake level drops below 211.18m flow is maintained though the open gates by removing additional logs down to 210.68m (bottom of concrete notch).

A submerged opening was installed in the fish ladder chute on September 11th, 2012 to allow 0.4 cu-m/s of flow to pass at all times. The opening was 1.0m wide by 0.38m high and the bottom of the opening was set to match the bottom of the concrete notch elevation (210.68m).



PLAN



SECTION A–A'

FISH LADDER – PLAN & SECTION

FIGURE 4.1

N.T.S.

4.2. Recorded Water Levels

Spring 2012

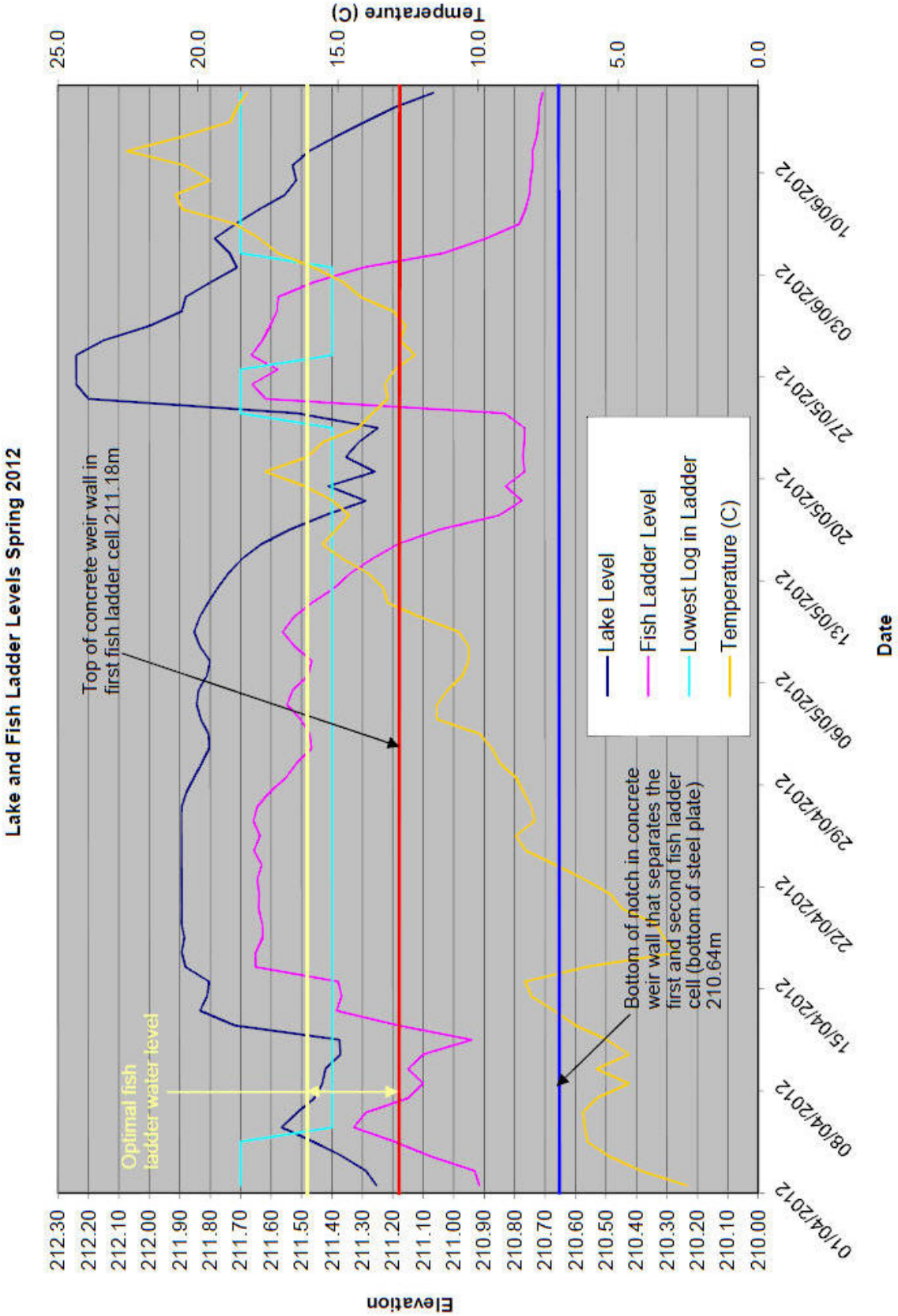
The level logger was installed on March 30, 2012. Monitoring continued through to June 15, 2012.

The two aluminum gates in the fish ladder were not in place during the recording period.

The fish ladder water levels and the lake water levels recorded in the time period are shown in Figure 4.2-A.

Refer to Appendix “A” for tabulated fish ladder data for Spring 2012.

Figure 4.2-A Spring 2012



Fall 2012

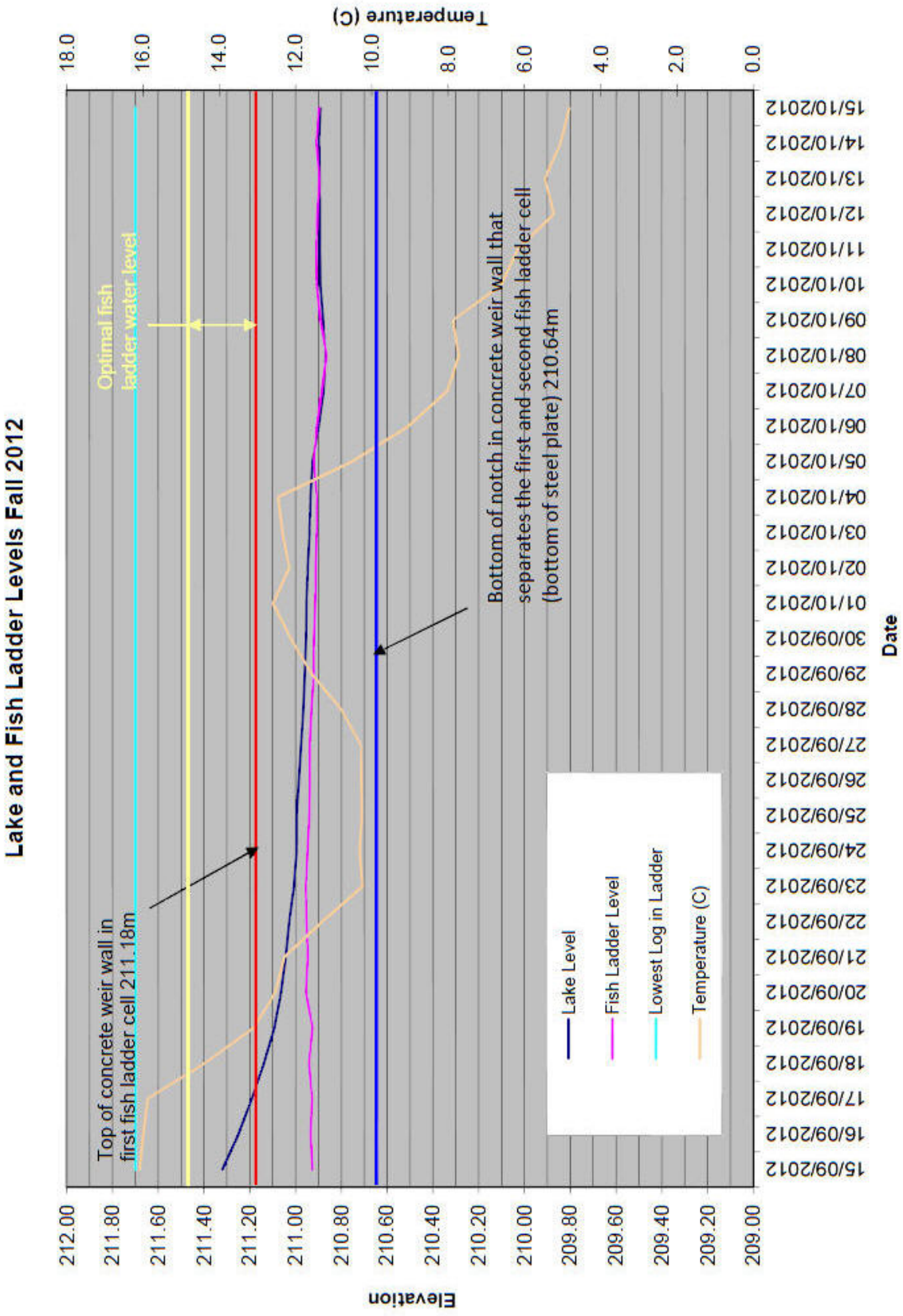
The level logger was installed on September 13, 2012. Monitoring continued through to October 15, 2012.

The two aluminum gates in the fish ladder were not in place during the recording period.

The fish ladder water levels and the lake water levels recorded in the time period are shown in Figure 4.2-B.

Refer to Appendix “A” for tabulated fish ladder data for Fall 2012.

Figure 4.2-B Fall 2012



5.0 Generating Station Records

The power generating station flow volume records have been provided to the City by the owner/operator in the form of litres per day. These records are shown below.

2012 DAILY FLOW VOLUMES IN LITRES											
	Jan	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sep**	**Oct**	**Nov**
Day of Month											
1st	42,120,000	42,120,000	42,120,000	126,360,000	336,960,000	336,960,000	336,960,000	0	0	0	42,120,000
2nd	42,120,000	42,120,000	42,120,000	140,400,000	336,960,000	336,960,000	336,960,000	0	0	0	42,120,000
3rd	42,120,000	42,120,000	42,120,000	140,400,000	336,960,000	336,960,000	336,960,000	0	0	0	42,120,000
4th	42,120,000	42,120,000	42,120,000	168,480,000	336,960,000	336,960,000	336,960,000	0	0	0	42,120,000
5th	42,120,000	42,120,000	42,120,000	168,480,000	336,960,000	336,960,000	336,960,000	0	0	0	42,120,000
6th	42,120,000	42,120,000	42,120,000	168,480,000	336,960,000	336,960,000	336,960,000	0	0	0	42,120,000
7th	42,120,000	42,120,000	42,120,000	336,960,000	336,960,000	336,960,000	336,960,000	0	0	0	42,120,000
8th	42,120,000	42,120,000	42,120,000	336,960,000	336,960,000	336,960,000	336,960,000	0	0	0	42,120,000
9th	42,120,000	42,120,000	42,120,000	336,960,000	336,960,000	336,960,000	266,760,000	0	0	0	42,120,000
10th	42,120,000	42,120,000	42,120,000	336,960,000	336,960,000	336,960,000	266,760,000	0	0	0	42,120,000
11th	42,120,000	42,120,000	42,120,000	336,960,000	336,960,000	336,960,000	266,760,000	0	0	0	42,120,000
12th	42,120,000	42,120,000	84,240,000	336,960,000	336,960,000	336,960,000	266,760,000	0	0	0	42,120,000
13th	42,120,000	42,120,000	84,240,000	336,960,000	336,960,000	336,960,000	266,760,000	0	0	0	42,120,000
14th	42,120,000	42,120,000	84,240,000	336,960,000	336,960,000	336,960,000	266,760,000	0	0	0	42,120,000
15th	42,120,000	42,120,000	140,400,000	336,960,000	336,960,000	336,960,000	182,520,000	0	0	0	42,120,000
16th	42,120,000	42,120,000	140,400,000	336,960,000	336,960,000	336,960,000	182,520,000	0	0	0	42,120,000
17th	42,120,000	42,120,000	140,400,000	336,960,000	336,960,000	336,960,000	182,520,000	0	0	0	42,120,000
18th	42,120,000	42,120,000	336,960,000	336,960,000	336,960,000	336,960,000	182,520,000	0	0	0	42,120,000
19th	42,120,000	42,120,000	336,960,000	336,960,000	336,960,000	336,960,000	182,520,000	0	0	0	42,120,000
20th	42,120,000	42,120,000	336,960,000	336,960,000	336,960,000	336,960,000	0	0	0	0	42,120,000
21th	42,120,000	42,120,000	336,960,000	336,960,000	336,960,000	336,960,000	0	0	0	0	42,120,000
22nd	42,120,000	42,120,000	336,960,000	336,960,000	336,960,000	336,960,000	0	0	0	0	42,120,000
23rd	42,120,000	42,120,000	336,960,000	336,960,000	336,960,000	336,960,000	0	0	0	0	42,120,000
24th	42,120,000	42,120,000	336,960,000	336,960,000	336,960,000	336,960,000	0	0	0	0	42,120,000
25th	42,120,000	42,120,000	336,960,000	336,960,000	336,960,000	336,960,000	0	0	0	0	42,120,000
26th	42,120,000	42,120,000	336,960,000	336,960,000	336,960,000	336,960,000	0	0	0	0	42,120,000
27th	42,120,000	42,120,000	336,960,000	336,960,000	336,960,000	336,960,000	0	0	0	0	42,120,000
28th	42,120,000	42,120,000	336,960,000	336,960,000	336,960,000	336,960,000	0	0	0	0	42,120,000
29th	42,120,000	42,120,000	336,960,000	336,960,000	336,960,000	336,960,000	0	0	0	0	42,120,000
30th	42,120,000		336,960,000	336,960,000	336,960,000	336,960,000	0	0	0	0	42,120,000
31st	42,120,000		336,960,000		336,960,000		0	0		0	
TOTAL MONTHLY FLOW	**1,305,720**	**1,221,480**	**5,854,680**	**8,999,640**	**10,445,760**	**10,108,800**	**5,208,840**	**0**	**0**	**0**	**1,263,600**

The month of December shall assume a production amount of 42,120,000 l/day in order to calculate the total flow past the generating for the entire year.

6.0 Total Flow Past the Dam and the Generating Station

The current facility is not equipped with flow meters to calculate the volume of water flowing over each of the dam chutes, or through the hydro generating facility. Therefore an estimated volume of water had to be calculated using the information available.

The total flow past the dam (over and/or through the stop logs) was calculated using the recorded lake elevations in conjunction with the recorded height of stop log settings. Using this information the depth of water flowing over the stop logs was calculated. This depth was then used to calculate the weir flow passing stop logs. Using this method the estimated flow of water past the dam for 2012 is equal to 126,800,000 cu-m.

The total flow past the generating station was provided by the owner/operator in the format of litres per day (refer to Section 5.0). Based on this information and using an assumed flow value of 42,120,000 l/day for the month of December the estimated flow of water past the generating station for 2012 is equal to 45,700,000 cu-m.

Therefore the estimated total flow of water past the dam and generating station is equal to 172,500,000 cu-m.

Appendix “A” - 2012 Fish Ladder and Lake Level Data

2012 Lake Level and Fish Ladder Elevations
Boulevard Lake

Date	Ave. Lake Level (m)	Ave. Fish Ladder Level (m)	Lowest Log Elev in Fish Ladder (m)	Temp (C)
01/04/2012	211.25	210.915	211.7	2.5
02/04/2012	211.29	210.931	211.7	4.2
03/04/2012	211.36	211.075	211.7	5.3
04/04/2012	211.46	211.193	211.7	6.1
05/04/2012	211.56	211.328	211.4	6.2
06/04/2012	211.51	211.290	211.4	6.3
07/04/2012	211.46	211.150	211.4	5.8
08/04/2012	211.43	211.100	211.4	4.6
09/04/2012	211.42	211.150	211.4	5.8
10/04/2012	211.37	211.100	211.4	4.6
11/04/2012	211.38	210.941	211.4	5.4
12/04/2012	211.72	211.183	211.4	6.5
13/04/2012	211.83	211.385	211.4	7.3
14/04/2012	211.81	211.368	211.4	8.1
15/04/2012	211.80	211.380	211.4	8.3
16/04/2012	211.88	211.650	211.4	6.1
17/04/2012	211.89	211.650	211.4	2.9
18/04/2012	211.88	211.628	211.4	3.4
19/04/2012	211.89	211.629	211.4	3.7
20/04/2012	211.89	211.640	211.4	4.9
21/04/2012	211.89	211.639	211.4	5.3
22/04/2012	211.89	211.646	211.4	6.2
23/04/2012	211.89	211.630	211.4	7.2
24/04/2012	211.89	211.656	211.4	8.3
25/04/2012	211.89	211.637	211.4	8.7
26/04/2012	211.89	211.658	211.4	8.0
27/04/2012	211.89	211.646	211.4	8.1
28/04/2012	211.88	211.605	211.4	8.4
29/04/2012	211.85	211.551	211.4	8.6
30/04/2012	211.83	211.516	211.4	9.2
01/05/2012	211.80	211.467	211.4	9.5
02/05/2012	211.81	211.473	211.4	9.9
03/05/2012	211.83	211.504	211.4	11.5
04/05/2012	211.84	211.548	211.4	11.5
05/05/2012	211.84	211.529	211.4	11.1
06/05/2012	211.81	211.478	211.4	10.6

07/05/2012	211.80	211.466	211.4	10.3
08/05/2012	211.83	211.521	211.4	10.3
09/05/2012	211.85	211.561	211.4	10.7
10/05/2012	211.83	211.526	211.4	12.0
11/05/2012	211.81	211.465	211.4	13.2
12/05/2012	211.78	211.393	211.4	13.4
13/05/2012	211.74	211.342	211.4	13.9
14/05/2012	211.70	211.268	211.4	14.8
15/05/2012	211.63	211.185	211.4	15.6
16/05/2012	211.54	211.051	211.4	15.1
17/05/2012	211.42	210.851	211.4	14.6
18/05/2012	211.29	210.777	211.4	15.2
19/05/2012	211.41	210.829	211.4	16.2
20/05/2012	211.26	210.768	211.4	17.6
21/05/2012	211.35	210.773	211.4	16.1
22/05/2012	211.31	210.769	211.4	15.6
23/05/2012	211.25	210.768	211.4	14.3
24/05/2012	211.51	210.833	211.7	13.8
25/05/2012	212.20	211.618	211.7	13.2
26/05/2012	212.24	211.662	211.7	13.3
27/05/2012	212.24	211.578	211.7	13.0
28/05/2012	212.24	211.664	211.4	12.3
29/05/2012	212.15	211.629	211.4	12.8
30/05/2012	212.00	211.603	211.4	12.6
31/05/2012	211.89	211.581	211.4	13.0
01/06/2012	211.88	211.576	211.4	14.2
02/06/2012	211.80	211.459	211.4	14.8
03/06/2012	211.71	211.298	211.4	15.9
04/06/2012	211.74	211.033	211.7	17.1
05/06/2012	211.79	210.894	211.7	17.8
06/06/2012	211.72	210.784	211.7	18.7
07/06/2012	211.64	210.765	211.7	20.6
08/06/2012	211.55	210.752	211.7	20.8
09/06/2012	211.52	210.748	211.7	19.6
10/06/2012	211.53	210.741	211.7	20.4
11/06/2012	211.47	210.741	211.7	22.5
12/06/2012	211.39	210.727	211.7	20.5
13/06/2012	211.29	210.721	211.7	18.9
14/06/2012	211.19	210.719	211.7	18.6
15/06/2012	211.07	210.708	211.7	18.3
15/09/2012	211.32	210.927	211.7	16.1
16/09/2012	211.25	210.934	211.7	16.0
17/09/2012	211.19	210.928	211.7	15.9

18/09/2012	211.14	210.941	211.7	14.4
19/09/2012	211.09	210.926	211.7	13.1
20/09/2012	211.06	210.955	211.7	12.5
21/09/2012	211.04	210.947	211.7	12.3
22/09/2012	211.03	210.952	211.7	11.3
23/09/2012	211.01	210.955	211.7	10.2
24/09/2012	211.00	210.948	211.7	10.3
25/09/2012	211.00	210.940	211.7	10.3
26/09/2012	210.99	210.938	211.7	10.3
27/09/2012	210.98	210.938	211.7	10.3
28/09/2012	210.97	210.930	211.7	10.8
29/09/2012	210.96	210.921	211.7	11.6
30/09/2012	210.95	210.919	211.7	12.1
01/10/2012	210.95	210.914	211.7	12.6
02/10/2012	210.95	210.912	211.7	12.2
03/10/2012	210.94	210.907	211.7	12.3
04/10/2012	210.94	210.908	211.7	12.5
05/10/2012	210.93	210.919	211.7	10.5
06/10/2012	210.90	210.908	211.7	9.0
07/10/2012	210.88	210.886	211.7	8.0
08/10/2012	210.87	210.865	211.7	7.7
09/10/2012	210.88	210.891	211.7	7.9
10/10/2012	210.89	210.908	211.7	6.6
11/10/2012	210.89	210.909	211.7	6.2
12/10/2012	210.89	210.906	211.7	5.2
13/10/2012	210.89	210.897	211.7	5.5
14/10/2012	210.90	210.908	211.7	5.1
15/10/2012	210.89	210.899	211.7	4.8