Current River / Boulevard Lake Dam
Water Management Report 2011

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City of Thunder Bay
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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 2011 operating season.

2.0 Stop Log Configuration

2.1. Background

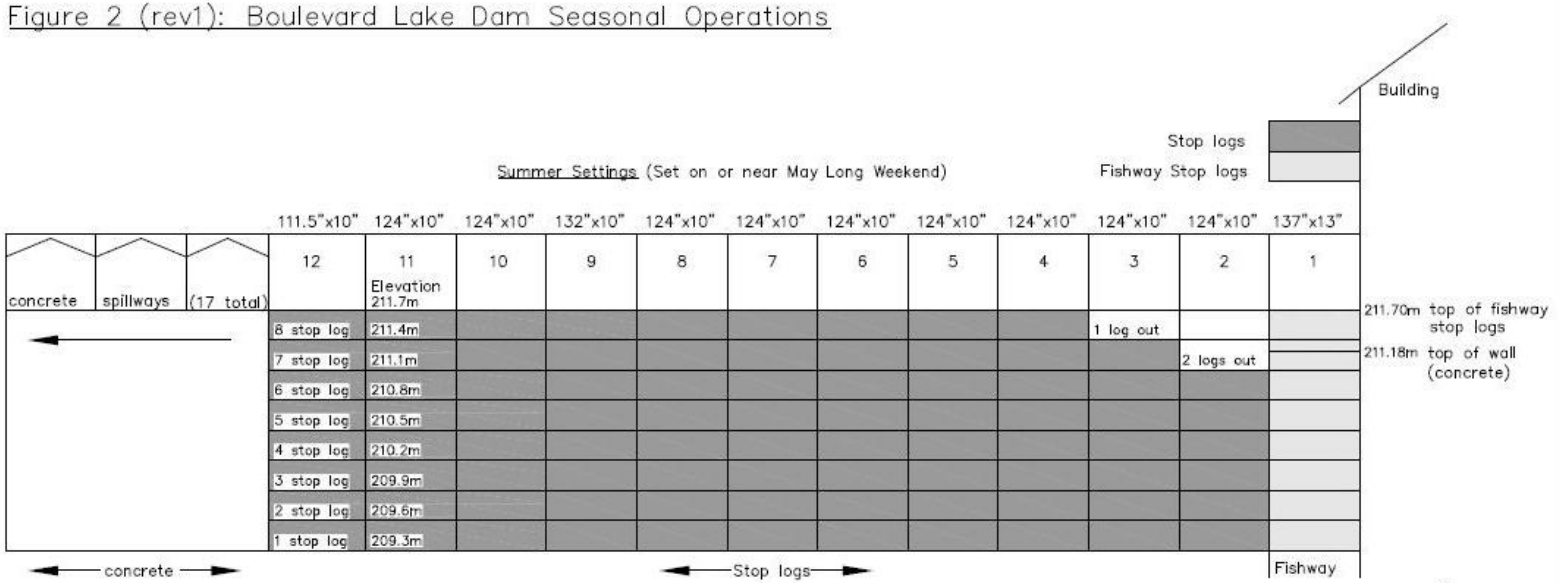
The Boulevard Lake water elevation levels are controlled by the insertion and removal of the spillway logs. Figure 2.0 (rev 1) illustrates the standard configuration of the logs for both the summer and winter settings. The log settings are monitored and adjusted to achieve the optimal lake level for the various functions, including maintaining a clean lake surface, recreational use, power generation, and fish ladder flows.

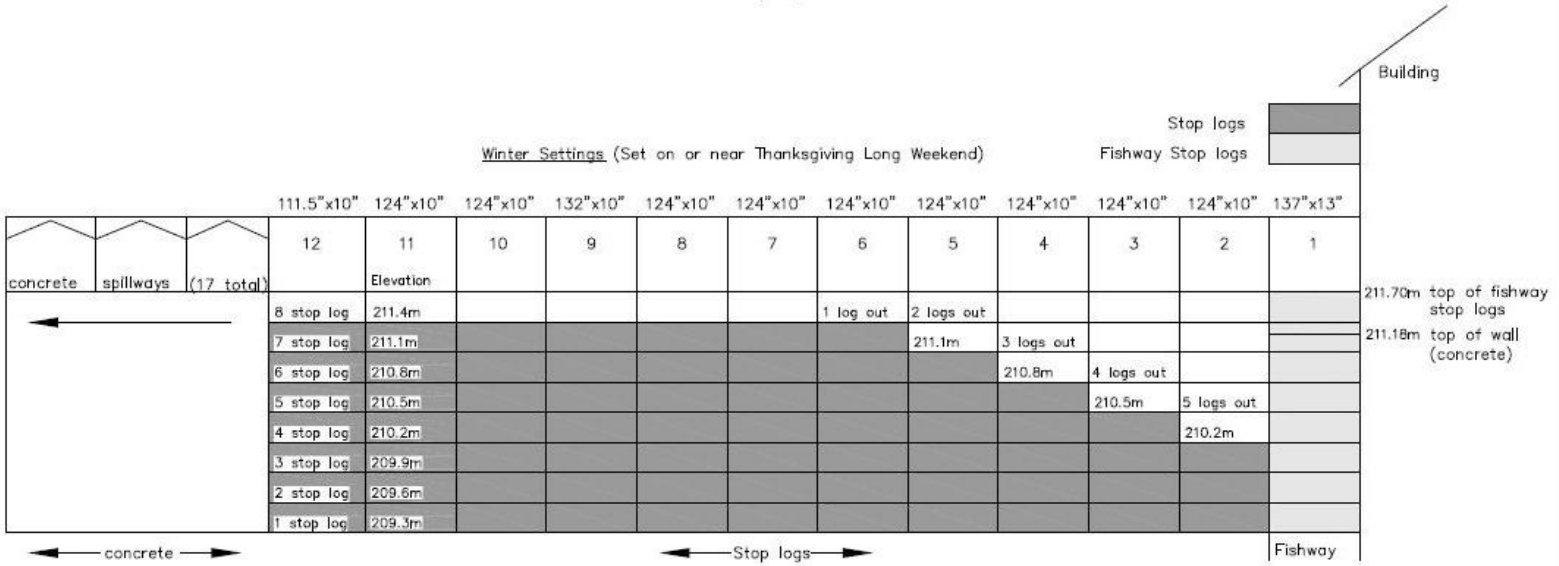
The summer set is typically applied on or near May long weekend. This setting is based on the water level being higher than 211.7m. If the water level drops below 211.7m then logs may be added to chutes 2 and 3 to reduce spillage over the dam and may be removed from the fish ladder chute to maintain 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 (rev1): 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, 2011 to October 15, 2011.

Due to ice build-up on the lake and in the fish ladder cells the level logger could not be installed until April 14th.

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 May 19.

The winter set log settings were applied on October 24.

During the summer and fall months there were two attempts made to coordinate a flow study of the lower Current River. Representatives from the MOE, MNR, DFO, City of Thunder Bay, and Whiteside Power and Light attended the meetings. The intent of the study was to release specific flow volumes past the dam/generating station so they could be observed downstream at the mouth of the river and help identify minimum flow values required for fish spawning. Both attempts were unsuccessful due to the complexity of the coordination between all parties and the existing water use priorities that are in effect. It is expected that efforts to coordinate the flow study will resume in the new year.

2.3. Routine Maintenance

A new level transmitter was installed on June 13/14, 2011. This sensor continuously measures the water level of the lake. The measurement data is recorded and is used to prepare this report.

The design phase for the rehabilitation of the Boulevard Lake Dam is still ongoing. The construction schedule has yet to be determined. The project will primarily consist of concrete restoration work required due to deterioration of the existing structure.

3.0 Boulevard Lake Water Levels

A 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 for the time periods of April 14, 2011 to June 15, 2011 and September 15, 2011 to October 15, 2011. These average daily lake levels 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.

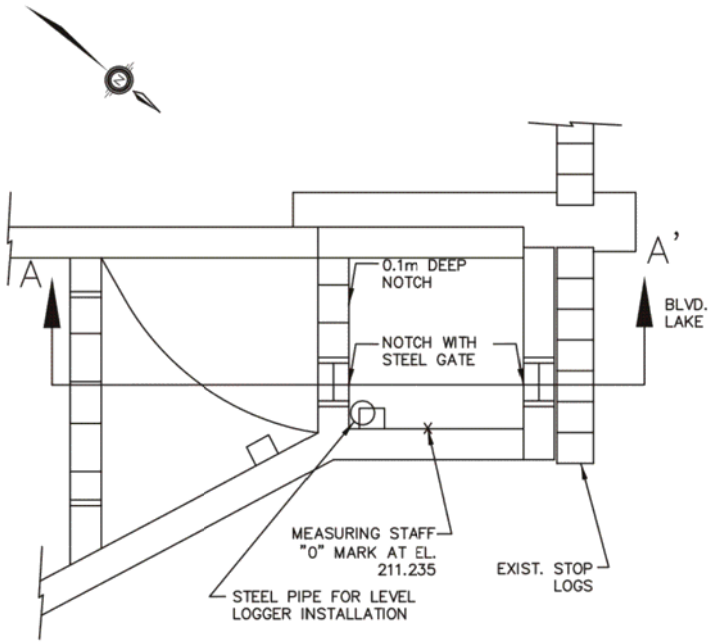
The tabulated average daily lake level data is also included in Appendix "A" of this report.

4.0 Fish Ladder

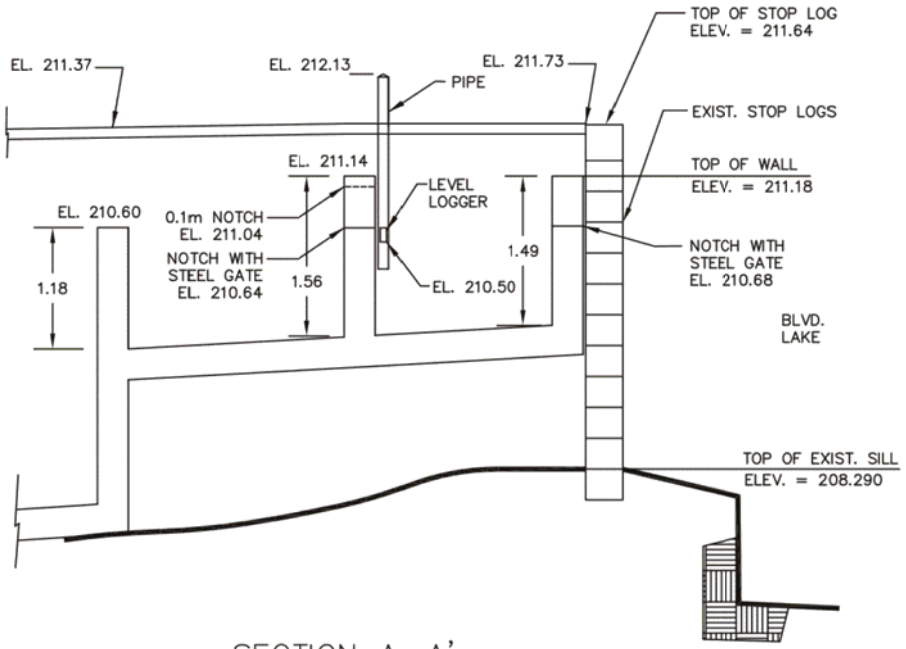
4.1. Configuration Overview

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).



PLAN



SECTION A–A'

FISH LADDER – PLAN & SECTION

FIGURE 4.1

N.T.S.

4.2. Recorded Water Levels

Spring 2011

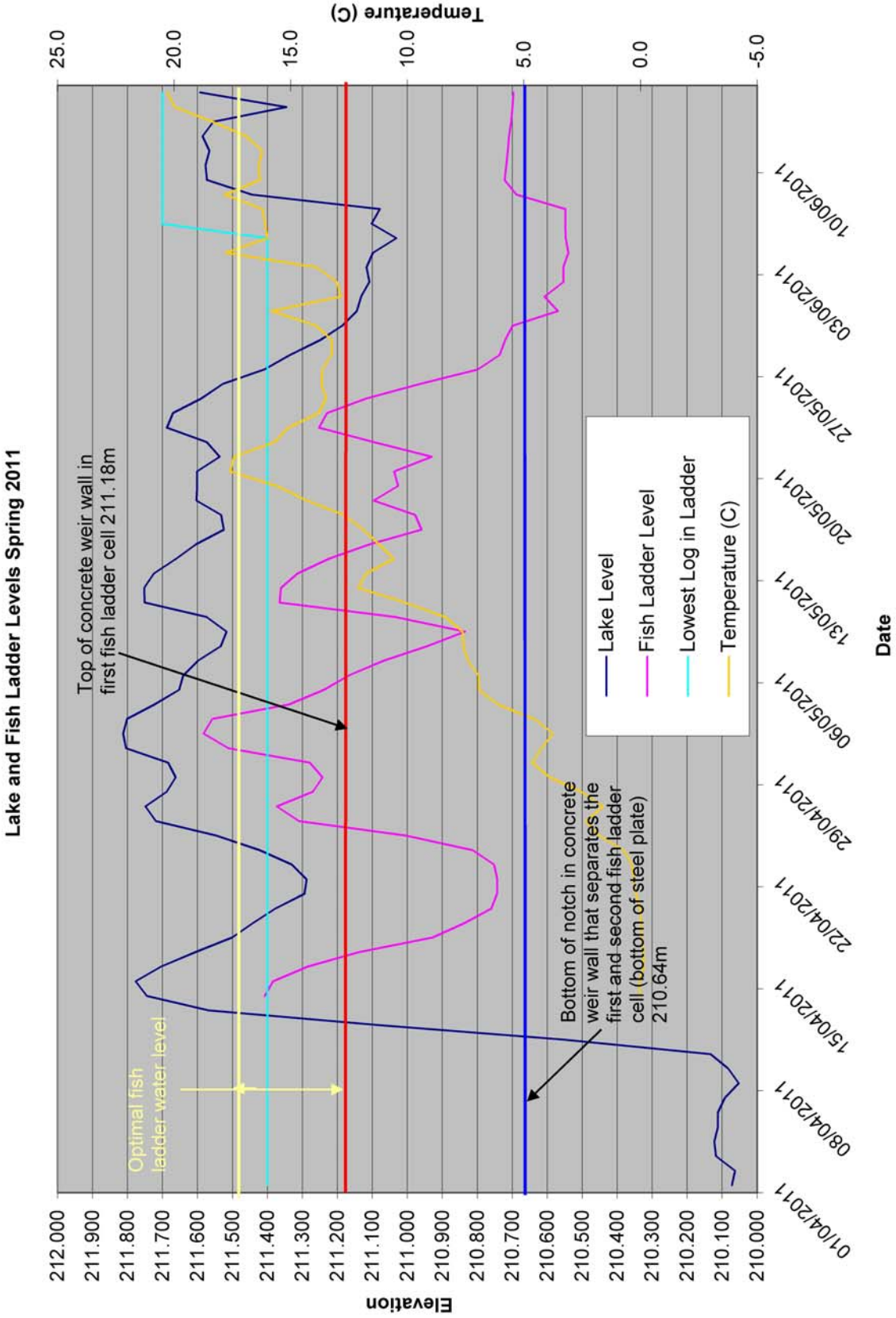
The level logger was installed on April 14, 2011. Monitoring continued through to June 15, 2011.

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 2011.

Figure 4.2-A Spring 2011



Fall 2011

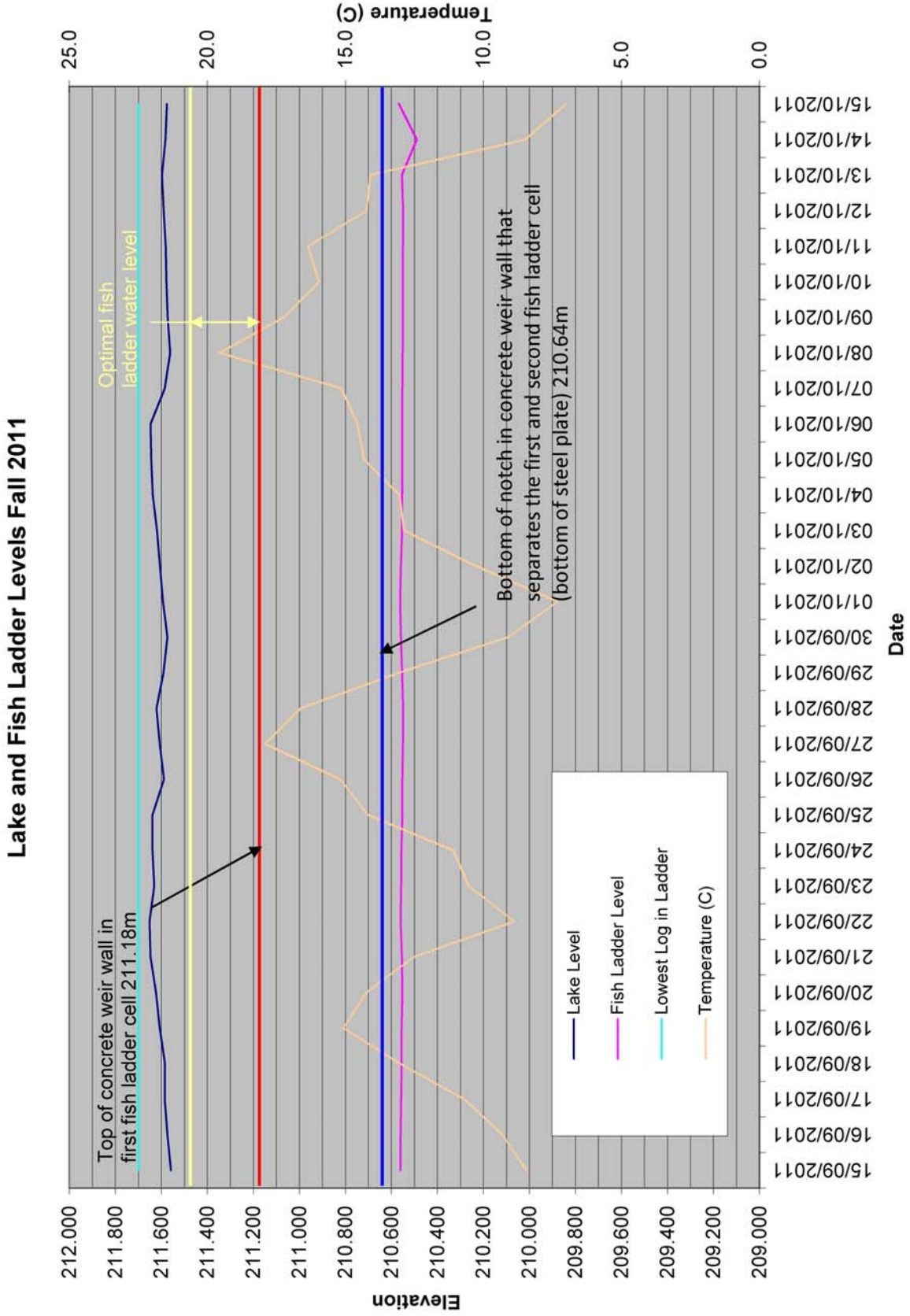
The level logger was installed on September 15, 2011. Monitoring continued through to October 15, 2011.

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 2011.

Figure 4.2-B Fall 2011



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.

2011 DAILY FLOW VOLUMES IN LITRES											
	Jan	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sep**	**Oct**	**Nov**
Day of Month											
1st	238,680,000	154,440,000	336,960,000	126,360,000	336,960,000	266,760,000			14,040,000	0	42,120,000
2nd	238,680,000	154,440,000	210,600,000	140,400,000	336,960,000	336,960,000			0	0	42,120,000
3rd	238,680,000	154,440,000	56,160,000	140,400,000	336,960,000	210,600,000			0	0	42,120,000
4th	238,680,000	154,440,000	56,160,000	168,480,000	336,960,000	336,960,000			0	0	42,120,000
5th	196,560,000	140,400,000	56,160,000	168,480,000	336,960,000	266,760,000			0	0	42,120,000
6th	196,560,000	140,400,000	56,160,000	168,480,000	336,960,000	308,880,000			0	0	42,120,000
7th	196,560,000	140,400,000	56,160,000	196,560,000	336,960,000	126,360,000			0	56,160,000	42,120,000
8th	196,560,000	112,320,000	56,160,000	196,560,000	336,960,000	168,480,000			0	0	42,120,000
9th	196,560,000	112,320,000	56,160,000	196,560,000	336,960,000	280,800,000			0	0	42,120,000
10th	182,520,000	112,320,000	84,240,000	252,720,000	336,960,000	280,800,000			0	0	42,120,000
11th	182,520,000	112,320,000	84,240,000	252,720,000	336,960,000	196,560,000			0	0	42,120,000
12th	182,520,000	112,320,000	84,240,000	336,960,000	336,960,000	224,640,000			0	0	42,120,000
13th	168,480,000	112,320,000	84,240,000	336,960,000	336,960,000	196,560,000			0	0	42,120,000
14th	168,480,000	112,320,000	84,240,000	336,960,000	336,960,000	140,400,000			0	70,200,000	42,120,000
15th	168,480,000	98,280,000	84,240,000	336,960,000	336,960,000	126,360,000			0	70,200,000	42,120,000
16th	168,480,000	98,280,000	84,240,000	336,960,000	336,960,000	98,280,000			0	182,520,000	42,120,000
17th	168,480,000	98,280,000	84,240,000	336,960,000	336,960,000	140,400,000			0	168,480,000	42,120,000
18th	168,480,000	98,280,000	84,240,000	336,960,000	336,960,000	70,200,000			0	84,240,000	42,120,000
19th	168,480,000	98,280,000	84,240,000	336,960,000	336,960,000	112,320,000			0	56,160,000	42,120,000
20th	168,480,000	98,280,000	84,240,000	336,960,000	336,960,000	84,240,000			0	98,280,000	42,120,000
21th	168,480,000	98,280,000	84,240,000	336,960,000	336,960,000	112,320,000			0	56,160,000	42,120,000
22nd	168,480,000	98,280,000	84,240,000	336,960,000	336,960,000	84,240,000			0	98,280,000	42,120,000
23rd	154,440,000	98,280,000	84,240,000	336,960,000	336,960,000	154,440,000			0	126,360,000	42,120,000
24th	154,440,000	98,280,000	84,240,000	336,960,000	336,960,000	154,440,000			56,160,000	336,960,000	42,120,000
25th	154,440,000	98,280,000	84,240,000	336,960,000	336,960,000	98,280,000			0	98,280,000	42,120,000
26th	154,440,000	84,240,000	84,240,000	336,960,000	336,960,000	154,440,000			56,160,000	42,120,000	42,120,000
27th	154,440,000	84,240,000	84,240,000	336,960,000	336,960,000	168,480,000			0	56,160,000	42,120,000
28th	154,440,000	84,240,000	84,240,000	336,960,000	336,960,000	224,640,000			28,080,000	56,160,000	42,120,000
29th	154,440,000		84,240,000	336,960,000	336,960,000	266,760,000			42,120,000	56,160,000	42,120,000
30th	154,440,000		84,240,000	336,960,000	336,960,000	280,800,000				56,160,000	42,120,000
31st	154,440,000		84,240,000		336,960,000					56,160,000	
TOTAL MONTHLY FLOW	**5,559,840,000**	**3,159,000,000**	**2,793,960,000**	**8,409,960,000**	**10,445,760,000**	**5,672,160,000**			**196,560,000**	**1,825,200,000**	**1,263,600,000**

The month of December was not included as the data was required by the end of November, therefore an assumed production amount of 42,120,000 l/day will be assumed where a value was required to calculate the total flow past the dam 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 the stop logs) was calculated by comparing the recorded lake elevations against the recorded height of log settings, in order to calculate the depth of water flowing over the stop logs throughout the year. 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 2011 is equal to 89,564,591 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 the estimated flow of water past the generating station for 2011 is equal to 40,631,760 cu-m.

Therefore the estimated total flow of water past the dam and generating station is equal to 130,196,351 cu-m.

Appendix “A” - 2011 Fish Ladder and Lake Level Data

2011 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)
01/04/2011	210.073		211.4	
02/04/2011	210.063		211.4	
03/04/2011	210.118		211.4	
04/04/2011	210.123		211.4	
05/04/2011	210.112		211.4	
06/04/2011	210.112		211.4	
07/04/2011	210.093		211.4	
08/04/2011	210.053		211.4	
09/04/2011	210.083		211.4	
10/04/2011	210.133		211.4	
11/04/2011	210.558		211.4	
12/04/2011	211.084		211.4	
13/04/2011	211.568		211.4	
14/04/2011	211.745	211.408	211.4	0.0
15/04/2011	211.777	211.384	211.4	0.0
16/04/2011	211.705	211.285	211.4	-0.1
17/04/2011	211.607	211.139	211.4	-0.1
18/04/2011	211.501	210.928	211.4	-0.1
19/04/2011	211.442	210.837	211.4	0.0
20/04/2011	211.377	210.760	211.4	0.0
21/04/2011	211.295	210.744	211.4	0.2
22/04/2011	211.288	210.743	211.4	0.3
23/04/2011	211.330	210.752	211.4	0.4
24/04/2011	211.423	210.813	211.4	0.7
25/04/2011	211.547	211.005	211.4	1.8
26/04/2011	211.719	211.310	211.4	2.3
27/04/2011	211.749	211.373	211.4	1.6
28/04/2011	211.689	211.270	211.4	2.5
29/04/2011	211.663	211.243	211.4	3.9
30/04/2011	211.684	211.279	211.4	4.7
01/05/2011	211.804	211.511	211.4	4.2
02/05/2011	211.813	211.583	211.4	3.8
03/05/2011	211.802	211.558	211.4	4.6
04/05/2011	211.723	211.339	211.4	6.1
05/05/2011	211.653	211.238	211.4	6.9
06/05/2011	211.641	211.167	211.4	6.9

07/05/2011	211.599	211.068	211.4	7.4
08/05/2011	211.534	210.944	211.4	7.6
09/05/2011	211.517	210.835	211.4	7.6
10/05/2011	211.574	211.036	211.4	8.4
11/05/2011	211.751	211.365	211.4	10.1
12/05/2011	211.753	211.362	211.4	12.1
13/05/2011	211.725	211.314	211.4	11.8
14/05/2011	211.661	211.225	211.4	10.6
15/05/2011	211.605	211.108	211.4	11.2
16/05/2011	211.525	210.960	211.4	11.9
17/05/2011	211.532	210.978	211.4	12.7
18/05/2011	211.603	211.097	211.4	14.3
19/05/2011	211.601	211.026	211.4	15.6
20/05/2011	211.602	211.038	211.4	17.6
21/05/2011	211.537	210.930	211.4	17.4
22/05/2011	211.574	211.096	211.4	15.7
23/05/2011	211.688	211.252	211.4	15.1
24/05/2011	211.670	211.229	211.4	13.8
25/05/2011	211.590	211.118	211.4	13.5
26/05/2011	211.528	210.964	211.4	13.7
27/05/2011	211.409	210.799	211.4	13.7
28/05/2011	211.336	210.736	211.4	13.3
29/05/2011	211.249	210.721	211.4	13.2
30/05/2011	211.187	210.699	211.4	13.9
31/05/2011	211.145	210.570	211.4	15.8
01/06/2011	211.132	210.608	211.4	12.9
02/06/2011	211.109	210.554	211.4	13.0
03/06/2011	211.117	210.554	211.4	13.9
04/06/2011	211.099	210.540	211.4	17.8
05/06/2011	211.032	210.548	211.4	16.0
06/06/2011	211.102	210.549	211.7	16.1
07/06/2011	211.078	210.548	211.7	16.2
08/06/2011	211.444	210.688	211.7	17.8
09/06/2011	211.573	210.722	211.7	16.3
10/06/2011	211.578	210.717	211.7	16.4
11/06/2011	211.566	210.713	211.7	16.2
12/06/2011	211.586	210.709	211.7	16.9
13/06/2011	211.555	210.703	211.7	18.4
14/06/2011	211.346	210.700	211.7	20.0
15/06/2011	211.593	210.697	211.7	20.3
15/09/2011	211.559	210.561	211.7	8.4
16/09/2011	211.574	210.561	211.7	9.3
17/09/2011	211.586	210.558	211.7	10.7

18/09/2011	211.585	210.556	211.7	13.0
19/09/2011	211.608	210.556	211.7	15.1
20/09/2011	211.623	210.553	211.7	14.2
21/09/2011	211.648	210.555	211.7	12.5
22/09/2011	211.652	210.561	211.7	8.9
23/09/2011	211.632	210.558	211.7	10.5
24/09/2011	211.639	210.557	211.7	11.1
25/09/2011	211.639	210.553	211.7	14.2
26/09/2011	211.589	210.552	211.7	15.2
27/09/2011	211.607	210.551	211.7	17.9
28/09/2011	211.622	210.550	211.7	16.6
29/09/2011	211.591	210.554	211.7	13.1
30/09/2011	211.574	210.559	211.7	9.1
01/10/2011	211.593	210.562	211.7	7.3
02/10/2011	211.607	210.560	211.7	10.3
03/10/2011	211.620	210.554	211.7	12.9
04/10/2011	211.638	210.554	211.7	13.0
05/10/2011	211.645	210.553	211.7	14.3
06/10/2011	211.648	210.553	211.7	14.6
07/10/2011	211.586	210.553	211.7	15.1
08/10/2011	211.563	210.552	211.7	19.6
09/10/2011	211.574	210.550	211.7	17.2
10/10/2011	211.579	210.551	211.7	16.0
11/10/2011	211.582	210.551	211.7	16.4
12/10/2011	211.590	210.550	211.7	14.2
13/10/2011	211.598	210.555	211.7	14.1
14/10/2011	211.583	210.490	211.7	8.5
15/10/2011	211.576	210.568	211.7	7.0