Current River / Boulevard Lake Dam
Water Management Report 2010

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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 2010 operating season.

2.0 Stop Log Configuration

2.1. Background

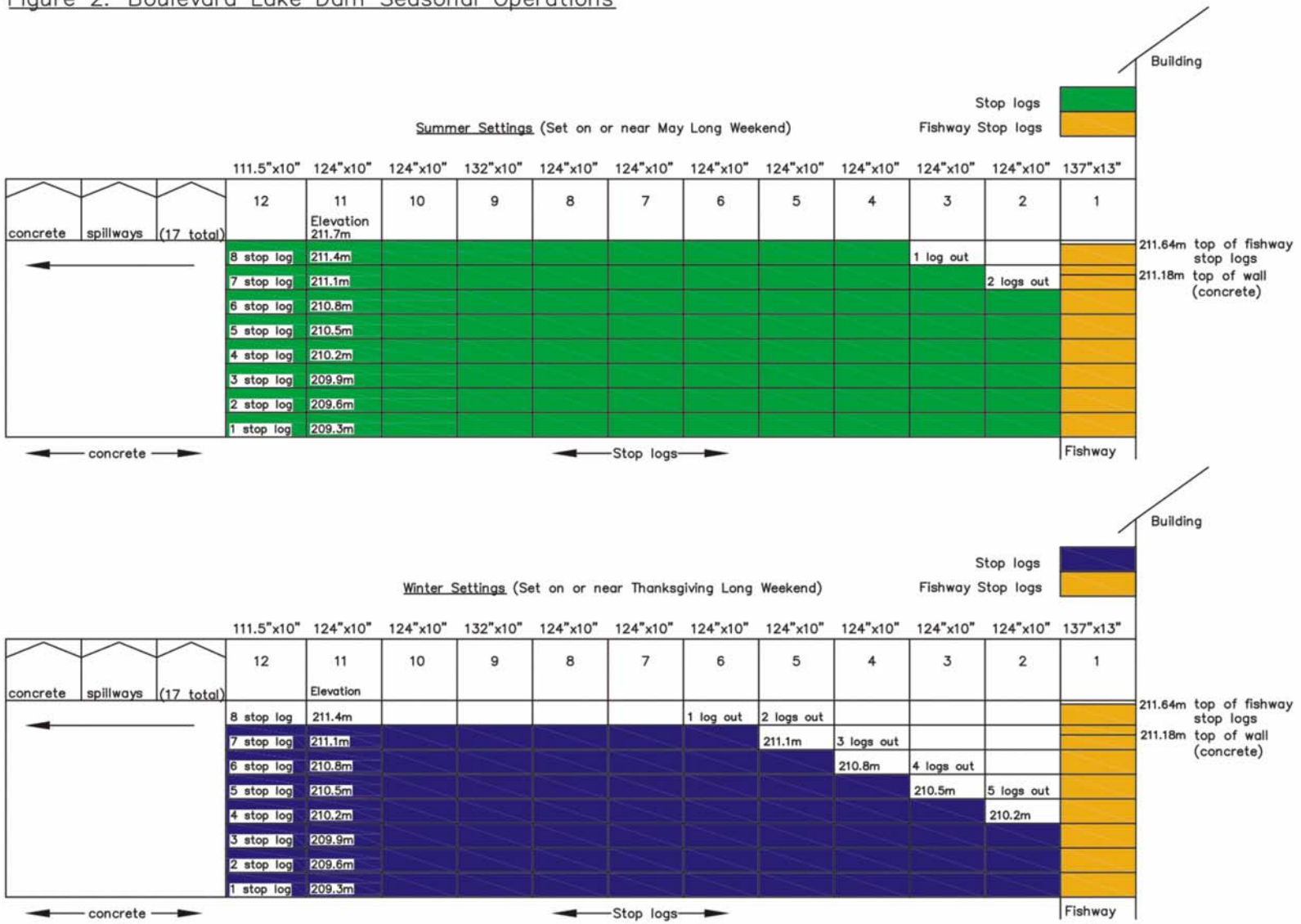
The Boulevard Lake water elevation levels are controlled by the insertion and removal of the spillway logs. Figure 2.0 illustrates the standard configuration of the logs for both the summer and winter settings. The log settings are monitored and adjusted to achieve the optimal lake level for the various 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 are removed from the fish ladder cell to maintain flow.

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: 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, 2010 to October 15, 2010.

At the start of monitoring on April 1st the ice had all melted from the lake surface, allowing the stop logs to be adjusted as required. However the lake level was relatively low due to a lack of snow during the winter, which resulted in much less spring run off flows. Therefore the logs in the dam and the fish ladder were set slightly higher than the lake level to build up the lake elevation.

Water leakage around and through the stop logs in the fish ladder resulted in water entering the fish ladder before the lake elevation was high enough to spill over the logs. This leakage continued throughout the spring and was managed as best as possible via adjustment of the logs.

On April 15th the MOE notified the City of a reported incident that occurred downstream of the dam on April 14th that involved fluctuating water levels and disturbance of fish downstream. A meeting was held on April 16th that included representatives from the DFO, MOE, MNR, and the City. A review of the reported incident was completed to determine if dam and generating station operations had to be modified. During the meeting it was decided that the incident was related to fluctuating discharge flows from the hydro generating station combined with low water flow conditions. As a precautionary measure the City immediately closed off the intake vales to the generating station on the evening of the 16th, and lowered the logs in the dam to provide a constant flow of water that would be maintained over the weekend.

On April 20th all logs were added to the fish ladder in an attempt to stop all fish ladder flow including leakage while the generating station was not operating. The water continued to leak through the logs so the fish ladder appeared to be functional except that the last set of logs was above the water level.

On April 21st two City officials on site at the dam witnessed fish swimming up to the top cell of the fish ladder, however they could not get past the last set of logs before the lake.

An interim operating procedure was prepared the week of April 19-23 with input from all parties, which involved re-starting the generating station at a reduced and constant flow rate. On April 26th the valves to the generating station were re-opened and the fish ladder remained blocked off.

On April 29th a revised interim operating procedure was implemented which involved an arrangement between the owner of the generating station, the North Shore Steelhead Association and the MNR which allowed the fish ladder to receive flows even though the generating station was not running at full capacity. This arrangement stayed in effect until May 28th, at which time all the logs were re-installed into the fish ladder, resulting in it

being blocked off for the remainder of the spring season due to low water flow. The generating station continued to run at partial capacity for the remainder of the spring.

The Winter Setting of the logs (210.2m) was applied on October 19, 2010.

2.3. Routine Maintenance

No routine maintenance took place in 2010.

In 2010 the design phase began for the rehabilitation of the Boulevard Lake Dam. 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 01, 2010 to June 15, 2010 and September 15, 2010 to October 15, 2010. 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.

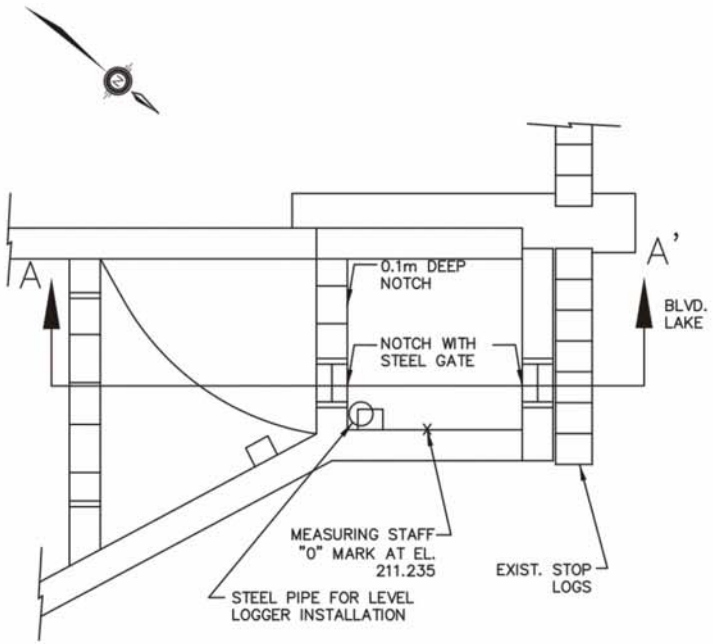
The tabulated average daily lake level data is also included in Appendix A of this report.

4.0 Fish Ladder

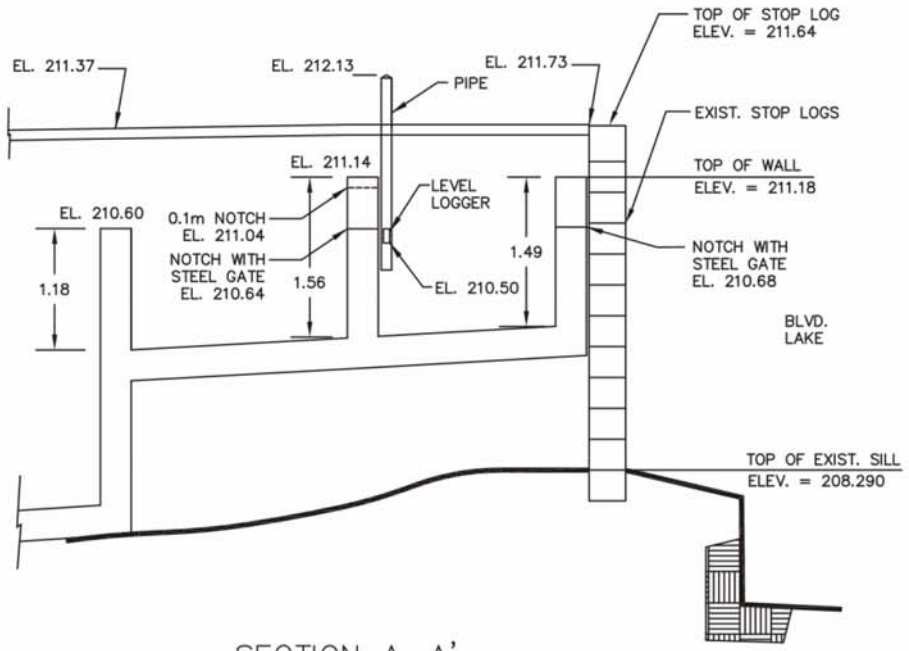
4.1. Configuration Overview

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 2010

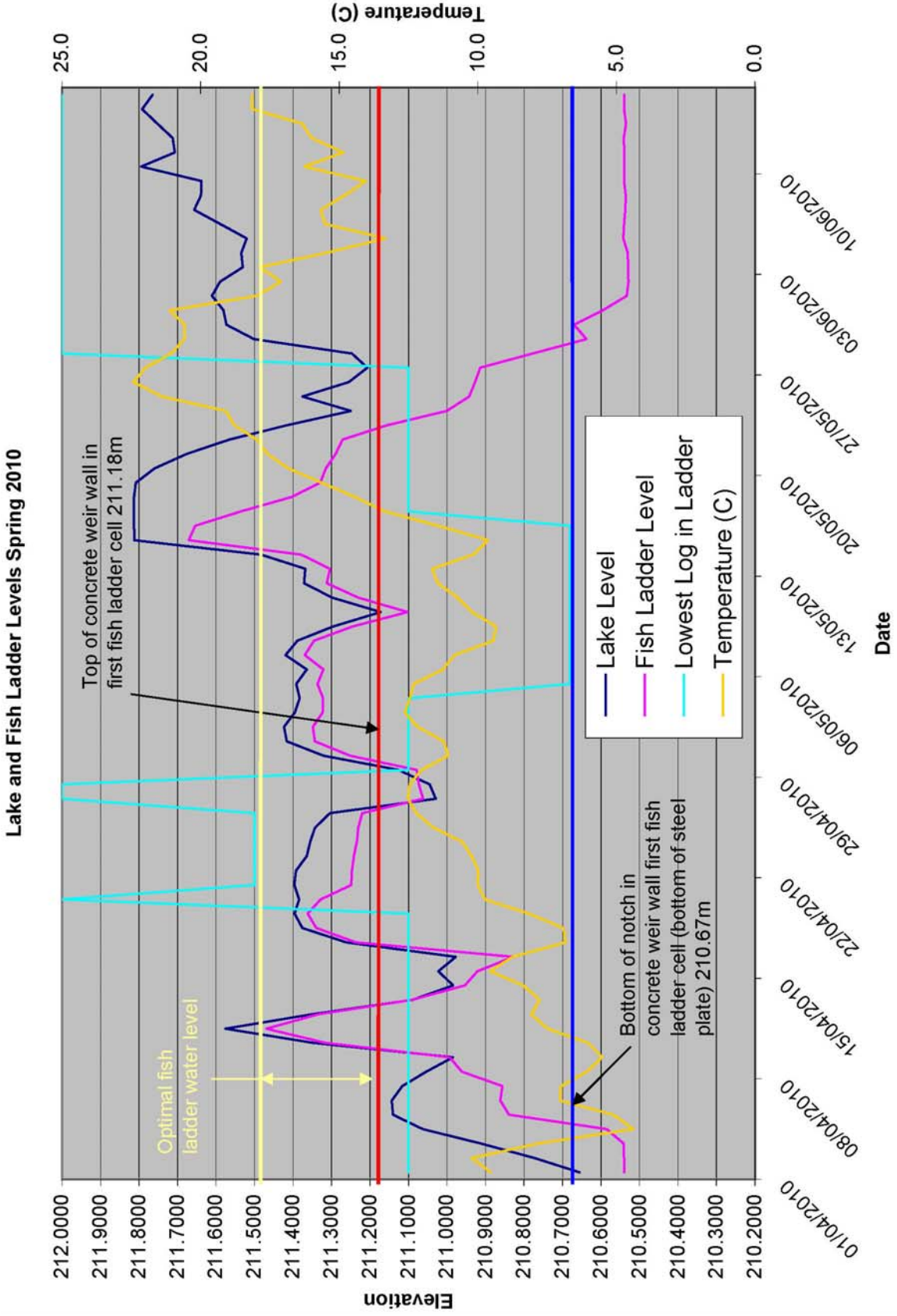
The level logger was installed on March 31st and began recording on April 01, 2010. Monitoring continued through to June 15, 2010 when the level logger was removed.

The two aluminium gates in the fish ladder were not in place as of April 1st. On April 8th the aluminium gates were both installed. On May 5th both gates were removed. On May 26th both gates were installed and were left for the rest of the spring.

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 2010.

Figure 4.2-A Spring 2010



Fall 2010

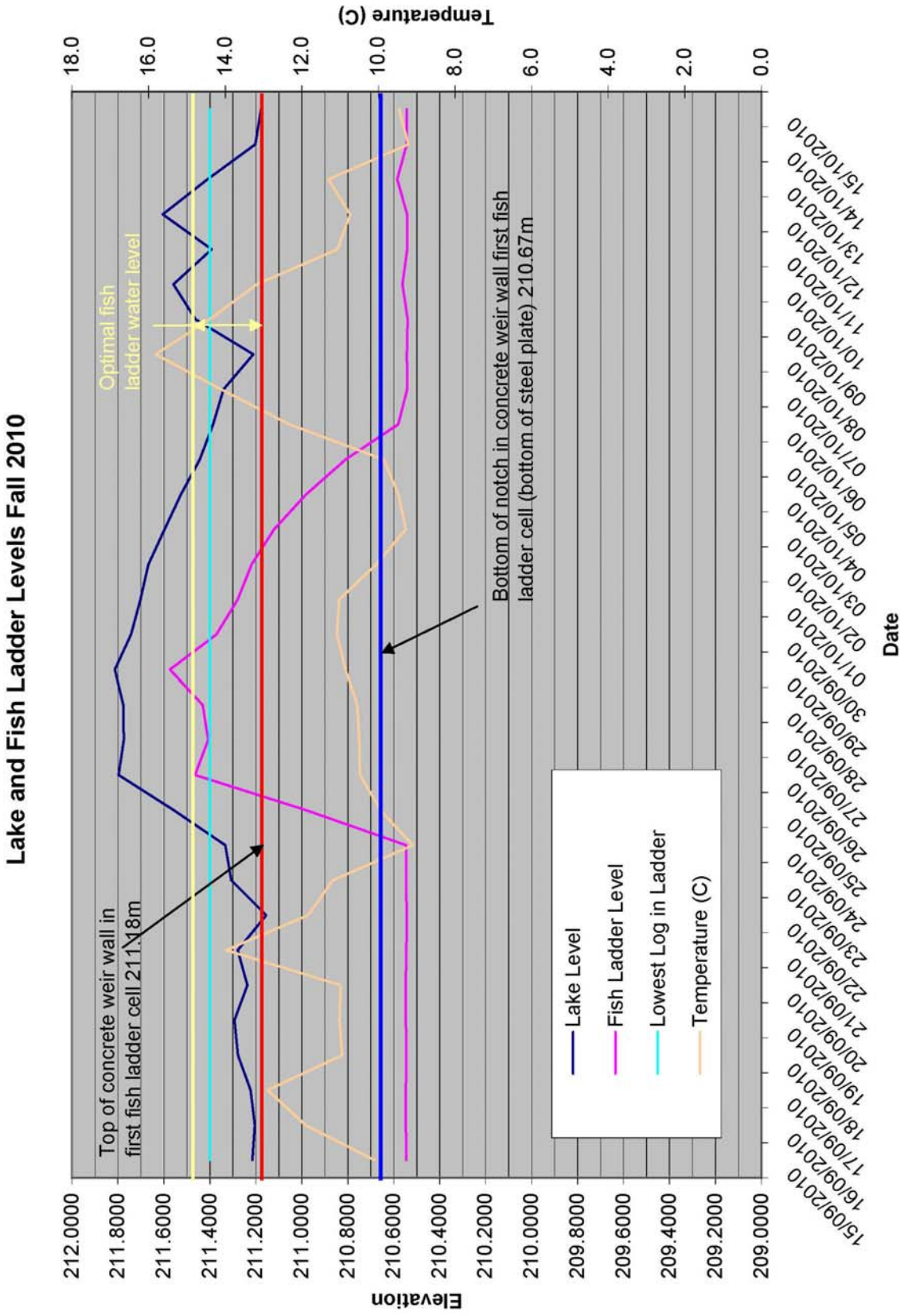
The level logger was installed on September 13, 2010 and began recording data on September 15, 2010 through to October 15, 2010 when the level logger was once again removed.

The two aluminium gates in the fish ladder remained installed during this 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 2010.

Figure 4.2-B Fall 2010



5.0 Generating Station Records

The power generating station run time records have been provided to the City by the owner/operator in the form of kWh hour production per day. These records are shown below.

Power production in 2010											
	Jan	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sep**	**Oct**	**Nov**
Monthly Production in KWH	124,000	100,800	96,100	190,500	319,300	260,100	0	0	96,100	146,940	232,440
1st	4,000	3,600	3,100	6,350	10,300	8,670			3,100	4,740	7,750
2nd	4,000	3,600	3,100	6,350	10,300	8,670			3,100	4,740	7,750
3rd	4,000	3,600	3,100	6,350	10,300	8,670			3,100	4,740	7,750
4th	4,000	3,600	3,100	6,350	10,300	8,670			3,100	4,740	7,750
5th	4,000	3,600	3,100	6,350	10,300	8,670			3,100	4,740	7,750
6th	4000	3,600	3,100	6,350	10,300	8,670			3,100	4,740	7,750
7th	4,000	3,600	3,100	6,350	10,300	8,670			3,100	4,740	7,750
8th	4,000	3,600	3,100	6,350	10,300	8,670			3,100	4,740	7,750
9th	4,000	3,600	3,100	6,350	10,300	8,670			3,100	4,740	7,750
10th	4,000	3,600	3,100	6,350	10,300	8,670			3,100	4,740	7,750
11th	4,000	3,600	3,100	6,350	10,300	8,670			3,100	4,740	7,750
12th	4,000	3,600	3,100	6,350	10,300	8,670			3,100	4,740	7,750
13th	4,000	3,600	3,100	6,350	10,300	8,670			3,100	4,740	7,750
14th	4,000	3,600	3,100	6,350	10,300	8,670			3,100	4,740	7,750
15th	4,000	3,600	3,100	6,350	10,300	8,670			3,100	4,740	7,750
16th	4,000	3,600	3,100	6,350	10,300	8,670			3,100	4,740	7,750
17th	4,000	3,600	3,100	6,350	10,300	8,670			3,100	4,740	7,750
18th	4,000	3,600	3,100	6,350	10,300	8,670			3,100	4,740	7,750
19th	4,000	3,600	3,100	6,350	10,300	8,670			3,100	4,740	7,750
20th	4,000	3,600	3,100	6,350	10,300	8,670			3,100	4,740	7,750
21th	4,000	3,600	3,100	6,350	10,300	8,670			3,100	4,740	7,750
22nd	4,000	3,600	3,100	6,350	10,300	8,670			3,100	4,740	7,750
23rd	4,000	3,600	3,100	6,350	10,300	8,670			3,100	4,740	7,750
24th	4,000	3,600	3,100	6,350	10,300	8,670			3,100	4,740	7,750
25th	4,000	3,600	3,100	6,350	10,300	8,670			3,100	4,740	7,750
26th	4,000	3,600	3,100	6,350	10,300	8,670			3,100	4,740	7,750
27th	4,000	3,600	3,100	6,350	10,300	8,670			3,100	4,740	7,750
28th	4,000	3,600	3,100	6,350	10,300	8,670			3,100	4,740	7,750
29th	4,000		3,100	6,350	10,300	8,670			3,100	4,740	7,750
30th	4,000		3,100	6,350	10,300	8,670			3,100	4,740	7,750
31st	4,000		3,100		10,300					4,740	

The month of December was not included as the data was required by the end of November, therefore an assumed production amount of 150,000 has been applied for this month where a value was required.

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 2010 is equal to 27,000,000 cu-m.

The total flow past the generating station was calculated based on the run time records provided by the owner/operator of the facility. The kWh records were converted into flows using a conversion of 0.031 cu-m per kWh (this was calculated using historical percentage run time records and power generating records provided by the owner/operator). Using this method the estimated flow of water past the generating station for 2010 is equal to 55,000,000 cu-m.

Therefore the estimated total flow of water past the dam and generating station is equal to 82,000,000 cu-m.

Appendix “A” - 2010 Fish Ladder and Lake Level Data

2010 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)
01/04/2010	210.656	210.540	211.1	9.5
02/04/2010	210.774	210.540	211.1	10.2
03/04/2010	210.912	210.542	211.1	7.8
04/04/2010	211.063	210.585	211.1	4.4
05/04/2010	211.140	210.839	211.1	5.1
06/04/2010	211.143	210.862	211.1	7.0
07/04/2010	211.116	210.856	211.1	7.0
08/04/2010	211.054	210.962	211.1	6.1
09/04/2010	210.984	210.993	211.1	5.5
10/04/2010	211.348	211.316	211.1	6.0
11/04/2010	211.576	211.469	211.1	7.5
12/04/2010	211.351	211.335	211.1	8.1
13/04/2010	211.089	211.092	211.1	7.8
14/04/2010	210.984	210.954	211.1	8.4
15/04/2010	211.022	210.921	211.1	9.5
16/04/2010	210.977	210.828	211.1	8.8
17/04/2010	211.261	211.236	211.1	6.8
18/04/2010	211.376	211.339	211.1	6.9
19/04/2010	211.396	211.362	211.1	8.2
20/04/2010	211.384	211.328	212.0	9.7
21/04/2010	211.397	211.249	211.5	10.0
22/04/2010	211.392	211.247	211.5	10.0
23/04/2010	211.364	211.242	211.5	10.2
24/04/2010	211.355	211.234	211.5	10.6
25/04/2010	211.343	211.231	211.5	11.6
26/04/2010	211.304	211.220	211.5	12.2
27/04/2010	211.029	211.062	212.0	12.5
28/04/2010	211.045	211.073	212.0	12.5
29/04/2010	211.126	211.079	211.1	12.0
30/04/2010	211.321	211.251	211.1	11.1
01/05/2010	211.417	211.343	211.1	11.2
02/05/2010	211.423	211.348	211.1	12.2
03/05/2010	211.395	211.323	211.1	12.6
04/05/2010	211.383	211.322	211.1	12.5
05/05/2010	211.392	211.337	210.7	12.3
06/05/2010	211.364	211.321	210.7	11.3

07/05/2010	211.420	211.370	210.7	10.9
08/05/2010	211.388	211.346	210.7	9.4
09/05/2010	211.296	211.245	210.7	9.3
10/05/2010	211.172	211.102	210.7	10.2
11/05/2010	211.299	211.230	210.7	10.7
12/05/2010	211.371	211.312	210.7	11.4
13/05/2010	211.368	211.304	210.7	11.7
14/05/2010	211.483	211.379	210.7	10.2
15/05/2010	211.812	211.670	210.7	9.6
16/05/2010	211.813	211.654	210.7	11.4
17/05/2010	211.813	211.535	211.1	13.3
18/05/2010	211.813	211.404	211.1	14.4
19/05/2010	211.809	211.329	211.1	15.6
20/05/2010	211.760	211.315	211.1	16.8
21/05/2010	211.677	211.290	211.1	17.6
22/05/2010	211.565	211.271	211.1	18.0
23/05/2010	211.417	211.157	211.1	18.8
24/05/2010	211.249	211.001	211.1	19.1
25/05/2010	211.376	210.942	211.1	21.4
26/05/2010	211.255	210.927	211.1	22.4
27/05/2010	211.207	210.914	211.1	22.0
28/05/2010	211.247	210.778	212.0	21.1
29/05/2010	211.501	210.638	212.0	20.6
30/05/2010	211.573	210.670	212.0	20.6
31/05/2010	211.580	210.595	212.0	21.1
01/06/2010	211.611	210.533	212.0	18.0
02/06/2010	211.589	210.529	212.0	17.1
03/06/2010	211.531	210.529	212.0	17.9
04/06/2010	211.534	210.531	212.0	15.5
05/06/2010	211.521	210.542	212.0	13.3
06/06/2010	211.589	210.540	212.0	15.5
07/06/2010	211.657	210.537	212.0	15.7
08/06/2010	211.639	210.536	212.0	14.8
09/06/2010	211.638	210.540	212.0	14.0
10/06/2010	211.795	210.540	212.0	16.3
11/06/2010	211.707	210.540	212.0	14.8
12/06/2010	211.712	210.541	212.0	16.0
13/06/2010	211.753	210.535	212.0	16.3
14/06/2010	211.792	210.540	212.0	18.1
15/06/2010	211.765	210.540	212.0	18.1
15/09/2010	211.216	210.546	211.4	10.1
16/09/2010	211.205	210.547	211.4	11.9
17/09/2010	211.223	210.547	211.4	12.9

18/09/2010	211.278	210.546	211.4	10.9
19/09/2010	211.293	210.547	211.4	11.0
20/09/2010	211.237	210.548	211.4	11.0
21/09/2010	211.279	210.545	211.4	14.0
22/09/2010	211.155	210.544	211.4	11.8
23/09/2010	211.307	210.546	211.4	11.2
24/09/2010	211.333	210.546	211.4	9.1
25/09/2010	211.558	210.985	211.4	9.9
26/09/2010	211.797	211.464	211.4	10.5
27/09/2010	211.774	211.407	211.4	10.5
28/09/2010	211.776	211.431	211.4	10.6
29/09/2010	211.813	211.574	211.4	10.9
30/09/2010	211.743	211.372	211.4	11.1
01/10/2010	211.702	211.279	211.4	11.0
02/10/2010	211.667	211.219	211.4	10.1
03/10/2010	211.597	211.122	211.4	9.3
04/10/2010	211.526	210.982	211.4	9.5
05/10/2010	211.445	210.809	211.4	9.9
06/10/2010	211.386	210.581	211.4	12.3
07/10/2010	211.340	210.542	211.4	14.1
08/10/2010	211.211	210.542	211.4	15.8
09/10/2010	211.462	210.539	211.4	14.4
10/10/2010	211.558	210.563	211.4	13.2
11/10/2010	211.392	210.541	211.4	11.1
12/10/2010	211.605	210.541	211.4	10.7
13/10/2010	211.411	210.585	211.4	11.3
14/10/2010	211.202	210.543	211.4	9.2
15/10/2010	211.177	210.544	211.4	9.5