INTERNATIONAL ST. CROIX RIVER WATERSHED BOARD

ANNUAL REPORT

2010

ST. CROIX RIVER
MAINE AND NEW BRUNSWICK

2010 ANNUAL REPORT

OF THE

INTERNATIONAL ST. CROIX RIVER WATERSHED BOARD

Covering

The Orders of Approval with respect to the control of the discharge of the St. Croix River at Forest City, Vanceboro, and the water levels of East Grand Lake, Spednic Lake, Grand Falls Flowage and Milltown Dam Forebay

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The Water Quality and Aquatic Ecosystem Health of the St. Croix River Boundary Waters

SUBMITTED TO

THE INTERNATIONAL JOINT COMMISSION

BY

THE INTERNATIONAL ST. CROIX RIVER WATERSHED BOARD

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1.0 GENERAL

1.1 Synopsis for 2010

2010 was an above average water year for the St. Croix River system. During most of the year, lake levels operated within normal levels and flows in the river provided satisfactory conditions for activities such as power generation, canoeing and kayaking, and for support of aquatic life.

In December 2010, a significant precipitation event occurred in the watershed (~Dec 13 to 16, 2010). During this event, water levels above Grand Falls Dam briefly rose above the maximum pool level normally maintained at the dam. During the rest of the year, flows and levels at the St. Croix boundary dams under international Joint Commission Orders of Approval were maintained in accordance with IJC requirements.

In 2010, the International St. Croix River Watershed Board (the Board) continued to work in cooperation with the IJC, stakeholders and users to facilitate a resolution of the alewife passage issue in the St. Croix River Watershed.

From June 15 to September 17, 2010, the Board accepted public comments on a draft plan to restore the native sea-run (anadromous) alewife (*Alosa pseudoharengus*) to the St. Croix River watershed.

The plan was drafted at the request of the Board and IJC by fisheries experts from the bi-national St. Croix Fisheries Steering Committee, an informal group with membership of State, Provincial and Federal fisheries management agencies from both sides of the border. The plan proposed to reopen the river to the alewife while maintaining the basin's economically important smallmouth bass fishery at current and/or higher levels.

Because the alewife must swim upstream to spawn, they are vital to the food webs and nutrient cycles of marine, freshwater and land habitats within the basin. As bait, they help support the lobster fishery. Fossil evidence has indicated that alewives were present in the basin from prehistoric times.

In addition to accepting written comments, the Board convened its annual public meeting on August 4, 2010 in Princeton, Maine. Due to the high-level of interest, the draft alewife adaptive management plan was the primary topic of the meeting. Over 100 people attended the meeting and there was an opportunity for the public to engage

in discussion and express their thoughts and concerns for the proposed adaptive management plan.

In lieu of responding individually to the more than 100 written comments received and the additional comments made at the public meeting, the Board/IJC updated its Frequently Asked Questions webpage on the plan to reflect responses to questions and comments on the draft plan. The draft plan and supporting materials, remain available on the Board/IJC website (http://www.ijc.org/rel/st-croix-alewife/).

Public Meeting - August 4, 2010 in Princeton, Maine

1.2 Board Membership

Board membership as of December 2010 is provided below. In November 2010, Darryl Pupek and Jean-François Bibeault were appointed to the Board for a period of two years. Bill Ayer (Canadian member) retired from the Board in August 2010.

Canadian Membership	**U.S. Membership**
Bill Appleby *(Canadian Co-Chair)* Director-Atlantic Meteorological Services of Canada Environment Canada Dartmouth, NS	**Colonel Philip T. "Tom" Feir** *(U.S. Co-Chair)* U.S. Army Corps of Engineers New England District Concord, MA
Darryl Pupek Director, Environmental Evaluation & Reporting New Brunswick Department of the Environment Fredericton, NB	**Matt Schweisberg** Office of Ecosystem Protection U.S. Environmental Protection Agency New England Region Boston, MA
Jessie Davies Resident St. Andrews, NB	**Edward Logue** Regional Director, Eastern Maine Maine Dept. of Environmental Protection Bangor, ME
Robert Stephenson, Ph.D. Fredericton, NB	**Joan Garner Trial**, Ph.D. Senior Atlantic Salmon Biologist Bureau of Sea Run Fisheries and Habitat Department of Marine Resources Bangor, ME
Jean-François Bibeault Acting Manager - Atlantic Fresh Water Quality Monitoring, Manager of the National Water Quality Indicators Program Environment Canada Montréal, QC	**Robert Lent, Ph.D.** Maine District Chief United States Geology Survey Augusta, ME
Nadine MacKay *(Canadian Secretary)* Strategic Integration and Partnerships Branch Environment Canada-Atlantic Dartmouth, NS	**Barbara Blumeris** *(U.S. Secretary)* U.S. Army Corps of Engineers New England District Concord, MA

1.3 Annual Public / Stakeholder Meeting in Basin

The annual public meeting was held in Princeton, Maine on the evening of August 4th, 2010 at the Princeton Elementary School. The meeting began with opening remarks from Colonel Feir, the Board Co-Chair and then opening remarks from IJC Commissioners Sam Speck and Pierre Trepanier.

The Co-Chair and the Commissioners indicated that although this was the Board's annual public meeting, one issue was uppermost in everyone's mind – alewife restoration in the St. Croix River Watershed.

Board member (and St. Croix Fisheries Steering Committee member) Joan Trial provided a presentation on the draft plan entitled "An Adaptive Plan for Managing Alewife in the St. Croix River Watershed, Maine and New Brunswick".

Once the presentation was completed, Colonel Feir thanked the St. Croix Fisheries Steering Committee for putting the plan together for public comment and then opened the floor to the public for questions and discussion. Over 100 people were in attendance and everyone was given the opportunity to ask questions and provide comments on the draft management plan. Attendees were encouraged to provide their comments in writing at the IJC/Board's web site by September 17th.

1.4 Annual Site Visit of Facilities in the Basin

Board members met with New Brunswick Power Corporation officials on the afternoon of August 3rd to tour the Milltown Dam operations. Board members met with Domtar Industries Inc, officials in the Woodland Mill at Baileyville, Maine on the morning of August 5th and then toured the Grand Falls, Vanceboro and Forest City dam sites. (Visit notes and information describing the dams is provided in Appendix 2.)

The Board visits dam sites with IJC Orders of Approval annually to ensure the dams are operated in compliance with the IJC requirements for flows and levels (see Section 2 of this report). It is the responsibility of the dam owners, operators and appropriate jurisdictional agencies to conduct the necessary dam inspections and maintenance to ensure the safety and security of the dams.

1.5 Policy of the Board Regarding Dam Regulation

In accordance with its mandate from the IJC, the Board leaves the control of operation of the dams at Forest City, Vanceboro, and Grand Falls (owned and operated by Woodland Pulp, LLC as of October 2010 and formerly owned by Domtar Industries Inc.), and Milltown (owned and operated by New Brunswick Power) in the owners' hands.

During the 2010 reporting period, the Board reviewed conditions prevailing in the river by the following means: a continuous record of water elevations of East Grand Lake and a continuous record of discharge below Forest City Dam; a continuous record of water elevations of Spednic Lake and a continuous record of discharge at Vanceboro; a continuous record of water levels above the dam at Grand Falls; a continuous record of discharge at Baring, Maine; and monthly reports received from New Brunswick Power indicating daily forebay elevations obtained during regular work days at the Milltown Dam and water level data from a continuous monitoring station in the head pond at Milltown Dam operated by Environment Canada. Data are discussed in Section 2 of this report and summarized in Tables and Figures in the Appendices.

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2.0 MANAGEMENT OF THE WATER LEVELS AND FLOWS

2.1 Summary

In 2010, the annual mean water level at East Grand Lake was 132.040 metres (433.20 feet), which is higher than the long term mean value of 131.809 metres (432.44 feet).

The annual mean flow from the lake at Forest City Stream was 7.54 m^3/s (266 cfs), 17% higher than the long term mean value of 6.43 m^3/s (227 cfs).

The annual mean water level for the year at Spednic Lake was 116.614 metres (382.59 feet), which is higher than the long term mean value of 116.312 metres (381.60 feet).

The annual mean flow as recorded at Vanceboro was 27.4 m^3/s (968 cfs), 33% higher than the long term mean of 20.6 m^3/s (727 cfs).

The annual mean water level for the year at Grand Falls Flowage was 61.819 metres (202.82 feet), which is higher than the long term mean value of 61.759 metres (202.62 feet)

The annual mean flow at Baring was 87.8 m^3/s (3100 cfs), which is 19.1% higher than the long term mean at Baring of 73.7 m^3/s (2600 cfs).

2.2 East Grand Lake Reservoir and Discharges below Forest City Dam

During the period from January 1 to December 31, the reservoir was operated between a maximum daily mean water level of 132.432 metres (434.49 feet) on December 18th and a minimum daily mean of 131.408 metres (431.13 feet) on October 15th. The maximum lake level as prescribed by the Commission's Order is 132.570 metres (434.94 feet): the minimum is 130.496 metres (428.14 feet). The Order was maintained throughout the year. The daily mean elevations are presented in Table I and depicted in Figure I of the Appendix.

Table II and Figure II of the Appendix presents the daily mean discharges below the Forest City Dam at the outlet of East Grand Lake for 2010. The maximum daily mean for the reporting period was 29.2 m^3/s (1030 cfs) on April 2nd and the minimum daily mean was 2.39 m^3/s (84.4 cfs) on November 11th. The mean discharge for the year was 7.54 m^3/s (266 cfs). The Commission's Order of 2.12 m^3/s (75 cfs) as a minimum flow was maintained throughout the year.

Incident at Forest City Stream Gauge on December 15, 2010

On December 15th at approximately 07:15 EST, the gauge at Forest City Stream was destroyed by fire. It is suspected, but not confirmed, that the fire was related to high water levels experienced at the station. Water level and discharge monitoring were restored to the site at Forest City, thanks to the efforts of the USGS in support of the Gauge operator, Water Survey of Canada.

On December 17th a survey crew from the Augusta, Maine office of the USGS were dispatched to the site to construct a shelter and re-establish flow monitoring instrumentation for Woodland Pulp to continue basin management.

Flows are estimated at the Forest City Gauge from December 15th to 17th due to the loss of the gauge. Information from observed water levels collected by the USGS and photos taken during the fire were used to estimate flows during this period. It was concluded that the annual maximum daily water level did not occur during this period due to the draw down during gauge construction. The daily maximum is considered to have occurred on April 2, 2010.

Photograph above shows fire as observed by Woodland Pulp staff on December 15, 2010.

Photograph above shows construction of new gauge at Forest City by USGS staff.

Photograph above shows completion of new gauge by USGS on December 17th at Forest City.

2.3 Spednic Lake Reservoir and Discharges below Vanceboro Dam

During the year, levels in the Spednic Lake reservoir, ranged from a maximum daily mean of 117.599 metres (385.82 feet) on December 16th, to a minimum daily mean of 115.277 metres (378.21 feet) on October 15th. The maximum limit specified in the Commission's Order is 117.610 metres (385.86 feet). The allowable minimum level is 113.233 metres (371.50 feet) for the period January 1 to April 30 and October 1 to December 31 inclusive, and 114.757 meters (376.50 feet) for the period May 1 to 30 September inclusive. These orders were maintained throughout the year.

The daily mean elevations for the Spednic Lake Reservoir during the year are presented in Table III and depicted in Figure III of the Appendix.

The maximum daily mean discharge recorded from the outflow at the reservoir at Vanceboro was 146 m^3/s (5160 cfs) on December 18th and the minimum daily mean discharge recorded was 6.06 m^3/s (214), on November 11th. The Commission's Order of a minimum flow of 5.66 m^3/s (200 cfs) was maintained throughout the year.

Daily mean discharges are presented in Table IV and depicted in Figure IV of the Appendix.

2.4 Water Levels above Grand Falls Dam

Table V of the Appendix and Figure V include a list of the water level elevations of the head pond above the Grand Falls Dam. The recorded maximum daily mean elevation was 62.218 metres (204.13 feet) on December 15th and the minimum recorded elevation was 61.634 metres (202.21 feet) on December 2nd.

The maximum prescribed elevation of 62.106 metres (203.76 feet), as set by the Commission, was exceeded during the period of December 14th at 06:45 EST to December 16th at 19:15 EST. Water levels during this period reached a maximum instantaneous value of 62.270 metres (204.30 feet) at 04:15 EST on December 15th. All daily mean water levels for this period (December 14th to December 16th) exceeded the prescribed maximum elevation.

A graph of the daily unit values during the incident are depicted in Figure VIII of the Appendix. Woodland Pulp alerted the Board to the high rainfall/runoff event in the watershed by voicemail on December 14, 2010, e-mail dated December 17, 2010 and follow-up letter on December 31, 2010 that described the event.

2.5 Discharges at Baring, Maine

Table VI of the Appendix and Figure VI present and depict the daily mean discharges of the St. Croix River at Baring, Maine. The mean discharge for the report period was 87.8 m^3/s (3100 cfs). The maximum daily mean was 586 m^3/s (20,700 cfs) on December 15th. The minimum daily mean was 24.9 m^3/s (879 cfs) on August 22nd.

Woodland Pulp met the minimum flow requirements of 21.2 m^3/s (750 cfs). (This is the normal minimum flow requirement as considered by the Maine Department of Environmental Protection.)

2.6 Headwater Elevations above Milltown Dam

Table VII and Figure VII of the Appendix present and depict daily water elevations in the forebay of the New Brunswick Power Corporation (NB Power) plant at Milltown, New Brunswick. These elevations refer to mean sea level datum. In 2009, Environment Canada established a continuous water-level and water quality monitoring station. The supplied data for 2010 was extracted from this gauging station located in the head pond supplemented with contributed data from NB Power where periods of data from the gauge were missing or suspect. Some missing periods occur on weekends or holidays.

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3.0 WATER QUALITY

3.1 USGS Milltown Monitor

Water-quality values for the St. Croix River at the Milltown monitor were within the extreme values for the period of daily record during the summer of 2010 based on record since September 1969. Values were above the water-quality objectives for the river. The USGS Milltown monitoring station is located at the international bridge crossing at Mill City, Maine about 3000 feet (914metres) above the Milltown Dam. The record for water temperature, dissolved oxygen, pH and specific conductance are all 100% complete and are rated good. The maximum dissolved oxygen value recorded was 9.3 mg/L on September 21, 22, 27 & 28; the minimum dissolved oxygen value recorded was 6.3 mg/L on July 11th.

Table 1
St. Croix River at Milltown USGS Station # 01021050
Water-Quality Monitor, June – September 2010

	June	July	August	September
Dissolved Oxygen (mg/L), IJC objective = 5.0 mg/L minimum				
Maximum	9.0	8.2	8.3	9.3
Minimum	7.1	6.3	6.7	6.6
Mean	7.9	7.2	7.6	8.2
Water Temperature (degrees Celsius)				
Maximum	24.4	27.2	25.2	26.9
Minimum	16.6	20.8	21.6	15.5
Mean	20.2	24.7	23.4	19.5
pH (standard units)				
Maximum	7.1	7.0	7.2	7.1
Minimum	6.7	6.8	6.8	6.8
Median	6.9	6.9	7.0	6.9
Specific conductance (microsiemens per centimeter at 25 C)				
Maximum	96	94	119	114
Minimum	43	53	68	36
Mean	68	73	91	78

3.2 Environment Canada Monitoring Stations – Forest City and Milltown

Environment Canada, in partnership with the New Brunswick Department of the Environment, currently maintains two real-time water quality monitoring stations on the St. Croix River system. The first location is at the outlet of the East Grand Lake dam in Forest City, Maine, and the second is at the Milltown Dam in Milltown (St. Stephen) New Brunswick. These real-time stations are visited at regular intervals (every 4-5 weeks) to re-calibrate the measuring devices and to collect a grab sample for surface water quality analysis. The real-time water quality parameters measured are: temperature, dissolved oxygen, pH, specific conductance, and turbidity. Turbidity values have not been reported for 2010 as there were issues with sensor fouling at both sites.

Real time monitoring allows an observer to assess several river water quality parameters quickly at any particular instant in time. This can alert managers to sudden changes in the characteristics of the river and relate them to particular events such as rapid spilling of water, accidental discharges from industry, severe weather events or remote introduction of atmospheric or other pollutants which might threaten the health of aquatic organisms or humans using the river. It could also allow responsible agencies to take rapid intervention to correct the problem.

3.2.1 Interpretation of Real-Time Monitoring Data

Monthly summaries of the real-time data and annual charts showing daily means from these two stations for each parameter are presented in Appendix 5. The Environment Canada (EC) station is located just above the Milltown Dam at a depth of 1.8 to 3.0 metres depending on head pond elevation. This EC station and the USGS station reported in Section 3.1 above monitor water quality in the “urban” area below Baileyville but generally above St. Stephen/Calais.

During 2010, the real-time water quality parameters measured in the headwaters of the St. Croix River (Forest City, ME) were similar to those measured just above the estuarine portion of the St. Croix River (Milltown, NB) for temperature and dissolved oxygen. The values for pH at Forest City continued to be slightly lower than at the Milltown station. The range of specific conductance values (13.0 to 99.6 microSiemens per centimetre - µS/cm) at Milltown is greater than at Forest City (30.9 to 36.8 µS/cm).

The reasons for these differences likely reflect the impact of tributaries draining into the St. Croix between the two stations, changes in the geology in the lower part of the St. Croix River Watershed, groundwater influences, industrial inputs, and an increase in

urbanization in the lower part of the St. Croix River Watershed. More than likely, the changes in water quality are the result of a combination of the above sources.

3.2.2 St. Croix River at Forest City, ME

The real-time water quality station was installed for most of the year except for December when the station was destroyed by fire on December 15, 2010 during heavy flooding. Therefore data for the second half of December 2010 was not available. There was an issue with the pH sensor in October and November and therefore the pH data is not reported for this period. There is also a gap in the specific conductance data from February 25 to April 21, 2010 due to a data logger error. Turbidity has not been reported this year due to excessive sensor fouling during most of the deployment periods.

The highest dissolved oxygen value (13.5 mg/L) recorded was on February 23, 2010 and the lowest value (8.0 mg/L) recorded was on July 25, 2010. Dissolved oxygen values for the entire year remained above the minimum Canadian Council of Ministers of the Environment (CCME) Water Quality Guideline for the Protection of Aquatic Life of 6.5 mg/L (CCME, 2005). A maximum temperature of 26.1 degrees Celsius (˚C) was recorded on August 25, 2010. A significant drop in pH occurred just prior to the station being destroyed. This drop is likely the result of localized flooding combined with the impact of acidic precipitation. The pH dropped below the minimum CCME guideline of 6.5 for the final readings before the sonde stopped recording values.

3.2.3 St. Croix River at Milltown, NB

The real-time water quality station operated without major problems for the entire year. Slight gaps in the data exist when the water level was dropped at the dam and the sensors were no longer in the water. Turbidity has not been reported this year due to excessive sensor fouling during most of the deployment periods.

The highest dissolved oxygen value (14.6 mg/L) recorded was on December 19, 2010 and the lowest value (7.6 mg/L) recorded was on July 19, 2010. Dissolved oxygen values measured in 2010 were above the minimum CCME Guideline for the Protection of Aquatic Life of 6.5 mg/L. A maximum temperature of 27.1 ˚C was recorded on July 16, 2010 and is slightly warmer than the maximum temperature recorded at the Forest City station in 2010. A significant drop in pH also occurred at the Milltown station similar to the Forest City station during the December 15, 2010 flooding. Measurements of pH dropped below the minimum CCME guideline of 6.5 but quickly recovered to normal

levels within a week.

3.2.4 Interpretation of Monthly Grab Samples

Staff from Environment Canada's Water Quality Monitoring and Surveillance group along with staff from the New Brunswick Department of Environment visited each real-time monitoring location on a four to five week basis (less frequently in winter months as bio-fouling is not as prevalent in colder water). During each of these visits, the multi-parameter sonde was removed from the water and taken off-site for cleaning and calibration. The following day, the newly calibrated sonde was re-deployed at the site and grab samples were collected for analysis at Environment Canada's Atlantic Laboratory for Environmental Testing located in Moncton, New Brunswick. This laboratory is accredited by the Canadian Association for Laboratory Accreditation (CALA) for all the parameters reported here.

A total of nine samples were collected for each site during 2010. Sample counts below nine in the analytical summaries indicate problems with individual parameter analysis (e.g. data outlier) or some results were still pending at the time of this report.

St. Croix River at Forest City, ME

The range of results (i.e. minimum and maximum) for each parameter measured is shown in Appendix 5 along with the applicable guideline for the protection of aquatic life. There were no parameters analyzed that exceeded the applicable guidelines during the year 2010 at this monitoring location.

Historical data for this station are available at:
http://map.ns.ec.gc.ca/envirodat/root/main/en/extraction_page_e.asp?stations=NB01AR0151

St. Croix River at Milltown, NB

The range of results (i.e. minimum and maximum) for each parameter measured is shown in Appendix 5 along with the applicable guideline for the protection of aquatic life. A summary of the parameters analyzed that exceeded their applicable guideline are included below.

- Extractable aluminum exceeded the CCME guideline of 100 micrograms per litre (µg/L) in eight of the nine samples collected in 2010. Elevated levels of

aluminum are fairly common in areas of Atlantic Canada although the aquatic life seems to be in good health. This is believed to be because most of the aluminum in Atlantic Canada rivers is complexed with organic compounds and therefore not bio-available to aquatic life. Preliminary work currently conducted by Environment Canada supports this theory and in fact, for several samples collected from the St. Croix River in previous years, the concentration of free aluminum was below 10 µg/L.

- One of the nine samples taken had a total phosphorous concentration of 0.032 mg/L which is slightly above the Ontario Ministry of the Environment (OMOE, 1994) phosphorous guideline of 0.03 mg/L indicating possible eutrophic conditions in the river. Eutrophic conditions indicate increased potential for excess plant and algal growth.

Historical data for this station are available at: http://map.ns.ec.gc.ca/envirodat/root/main/en/extraction_page_e.asp?stations=NB01AR0021

Water Quality Index

As a quick tool to assess water quality at the two monitoring sites, the CCME water quality index (WQI) has been calculated for the two sites. The water quality index measures the frequency and extent to which selected parameters exceed water quality guidelines and reports the results as a single score.

This allows for a quick assessment of the status of the water body and can be used as an indicator of overall aquatic health. Further analysis should always be completed on individual parameters in addition to other assessments (e.g. biological) for a full evaluation of aquatic health. More information on the CCME WQI is available at: http://www.ccme.ca/ourwork/water.html?category_id=102.

For the two sites on the St. Croix River, the parameters and guidelines used in the WQI are included in Table 2. These are consistent with parameters used by New Brunswick Department of Environment in the Canadian Environmental Sustainability Indicators project, with the exception of ammonia as this is not part of the laboratory analysis at these two sites. Guidelines used are for the protection of aquatic life so the WQI scores will reflect this intended water use only.

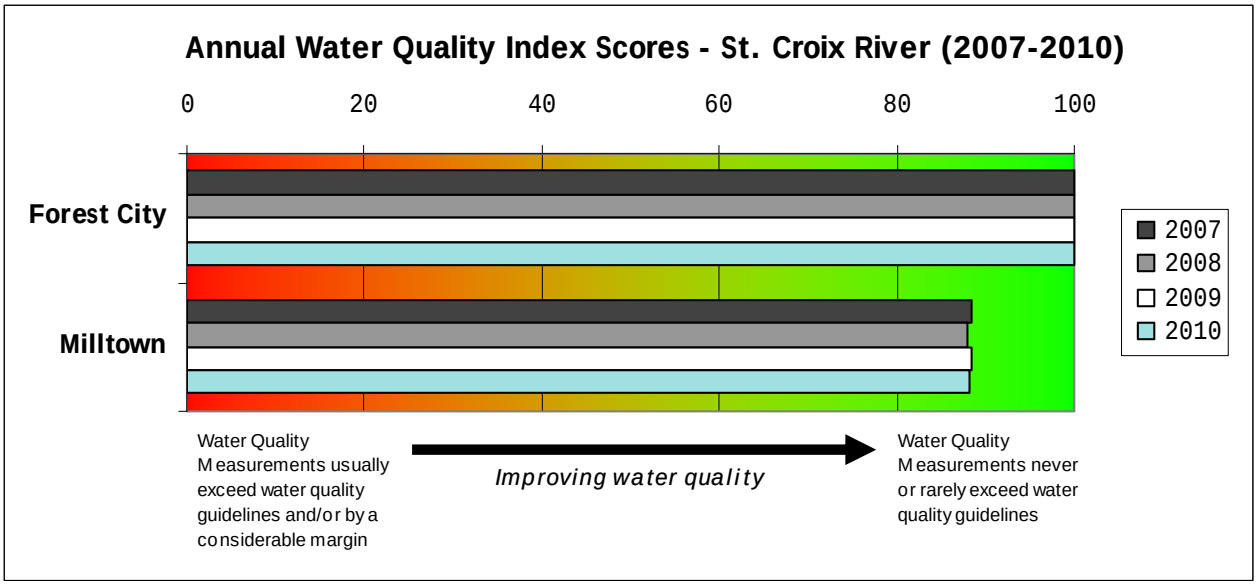
Table 2. Parameters and Guidelines used in WQI

Parameter	Units	Lower Guideline	Upper Guideline	Guideline Source
Arsenic	µg/L		5	CCME, 2005
Chloride	mg/L		150	BC MOE, 2001
Copper	µg/L		2	CCME, 2005
Iron	mg/L		0.3	CCME, 2005
Nitrate	mg/L as Nitrogen		2.9	CCME, 2005
Dissolved Oxygen	mg/L	6.5		CCME, 2005
Phosphorous	mg/L		0.03	OMOE, 1994
pH	pH units	6.5	9.0	CCME, 2005
Turbidity	NTU		10	CCME, 2005
Zinc	µg/L		calculated	BC MOE, 2001

Notes: µg/L – micrograms per Litre; mg/L – milligrams per Litre; NTU – nephelometric turbidity units

Annual WQIs have been calculated for the last four years at the two sites and are presented in the next chart. Forest City WQI scores are consistently at the 100 mark on a scale of 0-100 indicating that water quality is excellent and never exceeds the water quality guidelines for the protection of aquatic life for the parameters included in the index calculation.

WQI scores for Milltown are lower and range from 88 to 88.4 indicating that water quality is good and occasionally exceeds water quality guidelines for some parameters included in the calculations. WQI scores are fairly consistent at Milltown on an annual basis although it is not always the same parameters that have exceedances from year to year. Exceedances occasionally occur for total phosphorous, zinc and/or iron at the Milltown station.



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4.0 STATUS OF POLLUTION ABATEMENT

4.1 Maine

Baileyville: Effective July 1, 2010 the Town of Baileyville assumed responsibility for the operation of the municipal wastewater treatment facility from the Baileyville Utility District. The facility had one Sanitary Sewer Overflow (SSO) in December 2010 associated with heavy rains and snow melt. The facility is currently in good compliance.

Calais: The City of Calais is continuing to implement its approved combined sewer overflow (CSO) Removal Plan. The City has received grant and loan money to set up a Repair and Replacement Reserve Account. The City has also agreed to conduct a Comprehensive Energy Audit of the wastewater facility. Overall compliance was good during 2010.

Domtar to Woodland Pulp: In October 2010 Domtar Industries Inc. sold the Baileyville facility to International Grand Investment Company and the facility was renamed Woodland Pulp, LLC. The new owner plans to increase pulp production and use some softwood with their current hardwood production. There are no current plans to make paper. The mill does plan to construct a gas pipeline from the Maritimes Northeast pipeline and convert one of their boilers from oil to gas. Repairs have been made to their chip line and most of the chips have been recovered from their spill in 2009. Improvements are being made to their wastewater treatment system to reduce high BOD liquor losses to the sewer. There were three BOD violations after a difficult startup from their annual shutdown in the fall of 2010.

4.2 New Brunswick

McAdam: The McAdam wastewater treatment facility continues to meet the effluent requirements of the Province of New Brunswick. The McAdam wastewater treatment facility is an oxidation ditch system that uses an activated sludge process. In 2010 accumulated solids were removed and dried in the facility drying beds.

The town’s collection system has an infiltration problem and as a result may need to bypass the system which threatens water quality in the receiving waters of Waklehegan Lake. In 2010, the town received provincial funding to begin the Wastewater Characterization and determine the mixing zone as part of the Environmental Risk Assessment required under the CCME Canada-wide Strategy for the Management of

Municipal Wastewater Effluent. This assessment will identify the areas of concern and if additional treatment will be required as part of a proposed upgrade.

St. Stephen: The new municipal aerated lagoon system along Dennis Stream operates within annual effluent limits of 20 mg/l L for BOD (biological oxygen demand) and SS (suspended solids) and is equipped with disinfection; effective in treating the municipal and industrial wastewater.

Champlain Industrial Park: The extended aeration facility treats the domestic wastewater of approximately 85 employees as well as the industrial wastewater from the industrial park. At its current capacity, it continues to meet provincial requirements.

East Coast Village Mobile Home Park: The facultative lagoon treats the domestic wastewater of the 58 mobile homes in the park. The facility discharges treated effluent to the marshy headwaters of Meadow Brook. This current situation will eventually be resolved by extending sewer service from the Town of St. Stephen.

Oak Bay Park: The Oak Bay Campground uses a trickling filter system to treat the domestic wastewater from 110 campsites prior to discharging the treated disinfected effluent to Oak Bay. The lessee has submitted a plan with a time-line to replace the current system with an in-ground system. The lessee plans to complete the engineering in 2011 with the intention of replacing the system in 2012.

5.0 FISHERIES

5.1 Anadromous Fisheries

Adult alewives (*Alosa pseudoharengus*) and Atlantic salmon (*Salmo salar*) returning to the St. Croix River have been counted at the Milltown Dam fishway since 1981. This head-of-tide dam is owned and operated by New Brunswick Power Corporation (NB Power). The Milltown fishway and research trap are on the Canadian side of the river and are under the jurisdiction of Canada's Department of Fisheries & Oceans (DFO).

Due to funding constraints, since 2007 the Milltown research trap has been operated solely for a May-July period that focuses primarily on the alewife run. The St. Croix International Waterway Commission conducts these assessments under agreements and/or partnerships with the U.S. Fish & Wildlife Service, DFO, NB Power and the Maine Department of Marine Resources.

In 2010, the research trap was operated from May 10, when alewives were first sighted below the dam, until July 19, when the alewife run had clearly ended. Fish of all species were counted individually and all, except for a sample of alewives taken for biological sampling, were released upstream. No Atlantic salmon were recorded during this period in 2010.

A total of 58,776 alewives were counted through the Milltown trap in 2010, this being the largest return in 11 years and exceeding the *combined* return of the species over the last eight years. The run was highly concentrated: 43% of the fish passed through the trap on just two of the 69 days of monitoring and six days accounted for 87% of the run.

Age data collected from 151 fish suggest that the higher 2010 return may be due in part to the effect of multiple year classes – these assumed to be originating from spawning habitat in Woodland Flowage since 2001 – returning to spawn simultaneously.

In 1995, the State of Maine blocked alewife passage at the second St. Croix dam (to Woodland Flowage), leaving less than 0.2% of the St. Croix's believed historic alewife spawning habitat available to the species.

A DFO trap-and-truck operation to Woodland Flowage in 2001-2007 and the State's reopening of the Woodland fishway to alewives in 2008 has restored alewife access to an additional 475 hectares (1174 acres) of spawning habitat above this dam for the last decade. [Note: In 2005-2006, DFO transported over 13,700 alewives to Woodland Flowage at the height of its trap-and-truck operation, with the progeny of these fish returning as typical 4-5 year old spawners in 2010.]

Aging data suggests that more of the 2010 returning fish were the result of this restored

access to Woodland Flowage. For the first time in over a decade, eight-year-old fish were documented and a greater number of fish returned to re-spawn for the second to fifth time.

The State of Maine maintains a fishway barrier at the next dam above Woodland Dam, Grand Falls Dam, which blocks alewife access to further spawning habitat.

5.2 Shellfish Harvesting

The New Brunswick area was last surveyed by Environment Canada (EC) for bacterial contamination in 2008 (four runs) and 2009 (one run). From 2011 forward, it is planned that the St Croix River and Oak Bay be surveyed five times per year.

Shellfish harvesting in Oak Bay includes areas designated as conditional, restricted-depuration area, and closed area.

A three-year conditional area management plan (CMP) [November 1, 2008 to May 1, 2011] gives access to shellfish resources along Oak Bay's eastern coastline during dry weather conditions. A similar CMP for 2006 - 2008 was only exploited during a short period in March of 2006.

No depuration harvesting permit was issued for Oak Bay in 2009 - 2010 but an application has been received for one in 2010 – 2011.

The shoreline along Calais and Robbinston, Maine has limited habitat for commercial shellfish. The area is classified as prohibited to shellfishing by the Maine Department of Marine Resources, Division of Shellfish Management. There is no change expected to this classification in 2011.

6.0 WATERSHED INITIATIVES

6.1 St. Croix Adaptive Management Plan

One of the priorities of the Board is the issue of alewife passage on the St. Croix. As a follow-on to the public meeting in June 2009 and at the suggestion of the Governor of Maine (August 10th letter), the Board sponsored a joint meeting on October 15th 2009 in Calais, Maine with Aboriginal/Tribal stakeholders and fisheries agencies represented on the St. Croix Fisheries Steering Committee (FSC).

At this meeting, it was determined that there was a need for a St. Croix Adaptive Management Plan for the reintroduction of alewives above Grand Falls Dam. The Board asked the FSC to develop the draft plan. The FSC started work on the plan in late 2009 and a draft was provided to the Board and IJC in spring 2010.

The draft plan's goal is to restore a self-sustaining alewife population, while maintaining the smallmouth bass fishery at current and/or higher levels. One-third of the alewife's estimated natural spawning habitat would be reopened under the plan. Spednic Lake, West Grand Lake, and all points upstream of them, are excluded from the area to be reopened to the alewives.

Adaptive management under this plan means that bass reproductive success will be monitored to determine the pace of rebuilding the alewife population. It has been proposed that an interagency group would implement the plan and review proposed changes over the years to come.

The FSC drafters drew on their accumulated decades of expertise and experience in the watershed, along with the body of relevant scientific literature.

From June 15 to September 17, 2010, the International St. Croix River Watershed Board (Board) accepted public comments on the draft plan. As described in Section 1.0 of this report, the Board's annual public meeting (held on August 4, 2010 in Princeton, Maine) was focused solely on the draft alewife restoration plan.

The draft plan and supporting materials (including frequently asked questions) and the written comments on the draft plan are available on the Board/IJC website:

http://www.ijc.org/rel/st-croix-alewife/plan

6.2 Impervious Surface Map

As part of its International Watersheds Initiative, the IJC has supported work by the St. Croix International Waterway Commission, USGS, the New Brunswick Community College - Moncton Campus (NBCC – Moncton), the N.B. Department of the Environment and the Gulf of Maine Council on the Marine Environment (a 3-state, 2-province intergovernmental body) to develop a seamless protocol for mapping water-impervious land surfaces in watersheds on both sides of the US/Canada border. The maps and metadata generated will be used to expand regional capabilities to better evaluate, plan and manage the impact of land development on flooding and stormwater management, water quality and infrastructure sustainability.

Training of NBCC – Moncton personnel in the USGS impervious surface mapping protocols in 2009 was followed in 2010 by research and development to adapt this methodology for application using Canadian data sets. The prototype for the St. Croix will be provided to the IJC in early 2011. Expansion of this new technology to other areas, and future updating of the St. Croix map, is expected to continue under other sponsors.

6.3 Spednic Lake Study

The Spednic Lake Study is a cooperative project between the USGS, Maine Water Science Center, Maine Department of Marine Resources, Maine Inland Fisheries and Wildlife, and NOAA Fisheries. The project includes developing the bathymetric model of Spednic Lake and using this information to develop a better understanding of smallmouth bass habitat available in the lake. The report was completed in 2010. The report can be downloaded at: http://pubs.usgs.gov/sir/2010/5255/

7.0 ADDITIONAL ITEMS TO REPORT

7.1 Maine FERC Dam Re-licensing

The Forest City Dam (Forest City Project) and the West Grand Lake and Sysladobsis and Farm Cove Dams (West Branch Project) on the St. Croix River system owned by Woodland Pulp LLC as of October 2010 are currently undergoing U.S. Federal Energy Regulatory Commission (FERC) re-licensing. The Forest City Dam crosses the international boundary. The West Grand, Sysladobsis Dams and Farm Cove Dams are located entirely in Maine.

These projects are non-generating water storage dams that have been proceeding through a FERC re-licensing process since 2006. In March 2006, the owner filed with FERC to renew. In May 2006, FERC approved the use of the traditional licensing process for both these projects. In 2007, the owner worked on studies related to the re-licensing efforts. In 2008, the owner filed the draft licenses and met with stakeholders to discuss the draft license applications. Final license applications were filed in March 2009. FERC is currently preparing a draft Environmental Impact Statement (EIS) for the re-licensing of these dams. The FERC process would include public comments on the draft EIS.

It is the opinion of Woodland Pulp that certain State and Federal agencies have demanded payments, infrastructure, further restriction and burden that if granted, exceed any benefit to private business ownership of these dams. Woodland Pulp is prepared to move to a surrender application process if necessary. Woodland Pulp has publicly reiterated the economics of these storage dams are marginal at best and has predicated all re-licensing activities to a willingness to maintain the status quo but not to incur additional costs, restrictions and burden. (Information provided by Jay Beaudoin, Woodland Pulp, LLC by e-mail March 7, 2011.)

On a parallel track, Woodland Pulp has also submitted a petition with FERC (March 2010) for a Declaratory Order, stating that all of its FERC licensed Projects are "not required to be licensed because new data show that [they] contribute[s] only a de minimis amount to power generated at the downstream generating projects." The FERC public information site does not include a timeline for decision on this petition and no further information is available on the status of this petition.

[Note: On March 1, 2011, Woodland Pulp LLC filed a notice of intent to start the re-licensing process for Vanceboro Dam which expires in 2016.]

The above FERC re-licensing information is provided in the Board's Annual Report for general information purposes only.

7.2 LNG Facilities Proposals

There are currently no LNG applications under review by the Maine DEP or Maine Board of Environmental Protection. There are two projects still active in the FERC licensing process as listed below.

DOWNEAST LNG: The proposed project would consist of an onshore LNG import and storage terminal (located on Mill Cove in the Town of Robbinston, Maine) and about a 30-mile natural gas send out pipeline to an interconnect point with the existing pipeline near the Town of Baileyville, Maine. The FERC Draft Environmental Impact Statement (EIS) on the project was issued on May 15, 2009. The draft is still in the FERC review process and no date has been set for the final EIS.

CALAIS LNG: The proposed project would consist of a LNG import and storage terminal, located about six miles south of downtown Calais along the St. Croix River and a 20-mile send out pipeline to interconnect with the existing pipeline near the town of Baileyville, Maine. The Calais LNG filed a formal application with FERC on December 18, 2009 and its application proceeded through initial licensing review steps in 2010. In September 2010, the owners of the property proposed for the Calais LNG terminal advised FERC that Calais LNG had not renewed its option for this site and no longer had legal right, title or interest in the property, this being a FERC licensing requirement. FERC has yet to rule on this matter; at present this remains an active docket awaiting the release of FERC's draft EIS, with no announced time line.

The proposed projects would include the transit of LNG vessels through both U.S. and Canadian waters to the terminals. Correspondence from the Canadian government (letter dated April 7, 2006, from the Canadian Ambassador to the U.S.) conveyed Canada's strong concerns with the passage of LNG vessels through Head Harbor Passage to access the Maine LNG sites.

The above LNG project proposal information is provided in the Board's Annual Report for general information purposes only.

7.3 Ice Jam Study

A reconnaissance level draft report was completed in 2010 by the Ice Engineering Group, Remote Sensing/ GIS Branch, US Army Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory on ice jam flooding along portions of the St. Croix River. The report provides a review of information on ice jams in 2004 and 2009. The completed report will be provided to the Board in 2011.

ACKNOWLEDGEMENTS

The International St. Croix River Watershed Board gratefully acknowledges the valuable input and efforts in support of this report provided by the following groups/ individuals and without which the preparation of this report would not be possible.

- Lee Sochasky - St. Croix International Waterway Commission
- Paul Noseworthy - Environment Canada
- Denis Parent - Environment Canada
- Bernard Richard - Environment Canada
- Stephen Drost - New Brunswick Department of the Environment
- Ed Logue - Maine Department of Environmental Protection
- Gregory J Stewart - U.S. Geological Survey
- Jay Beaudoin - Woodland Pulp LLC
- Barbara Blumeris - U.S. Army Corps of Engineers
- Nadine MacKay - Environment Canada
- Adam Fancy - Environment Canada

APPENDIX 1

SUMMARY - ORDERS OF APPROVAL & BASIN MAP

SUMMARY - ST. CROIX RIVER ORDERS OF APPROVAL

INTERNATIONAL JOINT COMMISSION

9 November, 1915- For approval of a dam and power canal and the obstruction, diversion and use of the waters of the St. Croix River at Grand Falls in the State of Maine and the Province of New Brunswick: Maximum elevation 202.0 feet m.s.l.

3 October, 1923- Erection and repairs of fishways in the St. Croix River.

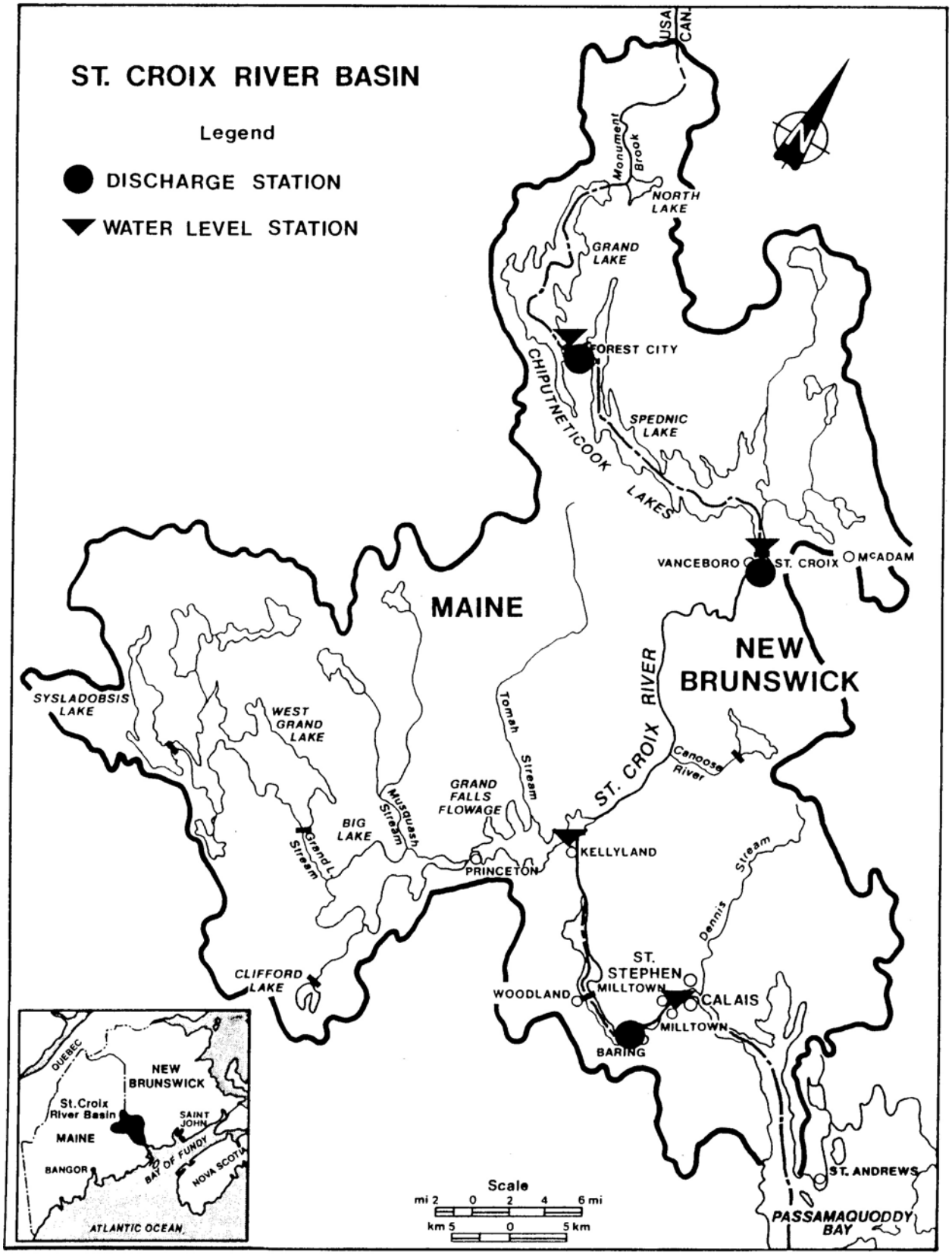
6 October, 1931- For the obstructions of the waters of t he St. Croix River at Grand Falls in the State of Maine and the Province of New Brunswick. Increase in elevation to 203.5 feet m.s.l.

2 October, 1934- For the reconstruction of a dam across the St. Croix River from Milltown in the Province of New Brunswick to Milltown in the State of Maine.

15 October, 1965- For the construction of a storage dam in the St. Croix River at Vanceboro, Maine and St. Croix, New Brunswick:

Discharge from Spednic Lake-	200 cfs (5.66 m3\s) minimum
Elevation of Spednic Lake-	385.86 feet (117.611 metres) maximum
Between 1 October and 30 April-	371.50 feet (113.233 metres) minimum
Between 1 May and 30 September-	376.50 feet (114.759 metres) minimum
Discharge from East Grand Lake-	75 cfs (2.12 m3\s) minimum
Elevation of East Grand Lake-	434.94 feet (132.571 metres) maximum 427.94 feet (130.438 metres) minimum

16 November, 1982- For the reconstruction of the diversion dike in the St. Croix River near Baileyville, Maine.


ST. CROIX RIVER BASIN
Legend
DISCHARGE STATION
WATER LEVEL STATION
USA
CAN.
Monument Brook
NORTH LAKE
GRAND LAKE
FOREST CITY
CHIPUTNETICOOK LAKES
SPEDNIC LAKE
VANCEBORO
ST. CROIX
McADAM
MAINE
NEW BRUNSWICK
ST. CROIX RIVER
SYSLADOBSIS LAKE
WEST GRAND LAKE
Tomah Stream
Canoose River
GRAND FALLS FLOWAGE
Musquash Stream
BIG LAKE
Grand L. Stream
PRINCETON
KELLYLAND
Dennis Stream
CLIFFORD LAKE
ST. STEPHEN
MILLTOWN
WOODLAND
CALAIS
MILLTOWN
BARING
ST. ANDREWS
PASSAMAQUODDY BAY
Scale
mi 2 0 2 4 6 mi
km 5 0 5 km
QUEBEC
NEW BRUNSWICK
St.Croix River Basin
SAINT JOHN
MAINE
BAY OF FUNDY
BANGOR
NOVA SCOTIA
ATLANTIC OCEAN

APPENDIX 2

MILLTOWN, GRAND FALLS, VANCEBORO AND FOREST CITY DAMS

GENERAL DESCRIPTION OF MILLTOWN,
GRAND FALLS, VANCEBORO & FOREST CITY DAMS

Milltown Dam & Fish Passage Facilities

The Milltown facility is located in Milltown, New Brunswick across the river from Calais, Maine and approximately one mile upstream from the international bridge between Calais and St. Stephen, New Brunswick. It consists of a powerhouse with 7 hydroelectric generating units (installed capacity is 3.96 MW), an upstream fish passage facility that goes from the lower pool around the side of the powerhouse to the upper pool. The spillway is located adjacent to the powerhouse and has 6 openings with large wooden stop logs that can be removed or installed via a railed vertical lifting mechanism. Other sections of the spillway have been equipped with wooden flashboards that are meant to fail and increase the spillway's capacity during high flows. At the far end of the spillway, running perpendicular from the spillway to the river bank, is a gatehouse with 5 vertical lift gates used to control the forebay elevation. A wooden-chute downstream fish passage facility is located in the area between the spillway and the gatehouse.

Grand Falls Dam & Fish Passage Facilities

Grand Falls Flowage Dam is approximately 8 miles upstream of the town of Baileyville, Maine and can store approximately 88,000 acre-feet of water. This dam has 9 steel tainter gates on the right (facing downstream) of the spillway, and a concrete emergency spillway approximately 800 to 850 feet in length running from the concrete gatehouse and ending at the left shoreline. The gatehouse is located between the gates and the emergency spillway. A floating walkway allows access to the entire upstream length of the spillway. Lake levels are recorded by a gauging station on the right bank of the dam.

The downstream side of the emergency spillway/dam has a concrete face sloping at an angle of approximately 45 degrees, and supported by concrete buttresses along its length. The space between these buttresses has been enclosed with a pressure-treated timber log system. This log system was installed to minimize the temperature differential in the downstream face area during freezing conditions to reduce possible degradation of the concrete face.

Water is impounded behind Grand Falls Dam and delivered to the hydroelectric plant and fish passage facilities via a channel on the right side of the impoundment, approximately 1000 feet upstream of the dam.

Water flows to the turbines via three steel penstocks. A Denil fishway is located on the side of the hydroelectric plant. It is a concrete structure with a series of bays equipped with guide slots that allow for the installation of wooden V notched weirs to modify flows to levels acceptable for fish migration.

Vanceboro Dam & Fish Passage Facilities

Vanceboro Dam consists of an earth embankment with a concrete gate structure and with rock filled gabions on the upstream face. The concrete structure is 69 feet (21 m) long, and contains a fishway and two tainter gates, each 22'-6" (6.9 m) wide by 14'-6" (4.4 m) high. These gates are operated by electrical cable lifts. The gate structure is located on the International Boundary line between the United States and Canada. Gate sill elevation is at 371.5 feet (113.23 m) NGVD. Normal full pond elevation is at 385.86 feet (117.61 m), with an impounded surface of 20,870 acres (84.5 km2). There are approximately 221,200 acre-feet (0.27 km3) of useable storage at normal full pond. The fishway is a vertical slot fish ladder and is on the left side of the dam and consists of 10 bays or pools. There are 5 vertical lift wooden gates to regulate flow through the ladder. The trash rack on the upstream face of the fish passage consists of steel bars spaced approximately 1 foot in the horizontal direction and 3 feet in the vertical.

Forest City Dam & Fish Passage Facilities

Forest City Dam is a small timber crib rock filled structure with three wooden sluice gates operated with a wooden ratchet lever system that lifts the gates using a steel cable or steel chain. These gates have openings of 8'-4" (2.54 m) and a sill elevation of 427.94 feet (130.44 m) NGVD. Full pond elevation is at elevation 434.94 feet (132.57 m) NGVD, and impounds 105,300 acre-feet (0.130 km3) of water. The fishway is located on the left side (facing downstream) of the dam and consists of timber baffle system with an upstream timber trash rack.

FACITILY SITE VISITS IN 2010

Board members met with New Brunswick Power Corporation officials (NB Power) on the afternoon of August 3rd at the Milltown Dam in New Brunswick and participated in a site visit of the facility.

Board members met with Domtar Industries Inc. (Domtar) officials on morning of August 5th at the Woodland Mill at Baileyville, Maine and then Board members participated in site visits at Grand Falls, Forest City, and Vanceboro Dams. (Note: In October 2010 the facilities owned and operated by Domtar were purchased by Woodland Pulp LLC.)

Participants included in the NB Power and Domtar meetings and site visits are shown below:

Name	Affiliation
Sam Speck	IJC Commissioner/ U.S. Section
Pierre Trepanier	IJC Commissioner/ Canadian Section
Nick Heisler	IJC staff
Robert Reynolds	IJC staff
Emily Williams	IJC staff intern
Bill Appleby	St. Croix Board, Co-Chair, Canadian Section
Nadine MacKay	Acting Secretary, St Croix Board, Canadian Section
Kasey Thomas	Environment Canada
Colonel Philip “Tom” Feir	USACOE, St. Croix Board, Co-Chair, U.S. Section
Matt Schweisberg	EPA, St. Croix Board, U.S. Section
Barbara Blumeris	USACOE, Secretary, St. Croix Board, U.S. Section

Abbreviations:
USACOE, U.S. Army Corps of Engineers
EPA, Environmental Protection Agency

Facility Representatives

Glen Hanscom	Hydro Technical Services, NB Power
Rick Polinski	General Manager, Domtar
Paul Jack	Utilities Manager, Domtar
Kevin Dean	Hydro-Superintendent, Domtar
Jay Beaudoin	Environmental Manager, Domtar

General Comments and Photographs of Facilities, August 2010

Forest City Dam. Domtar reported a new security fence was installed and the log boom was repaired.

Forest City Dam, upstream

Forest City Dam, downstream

Forest City Dam, fishway 	Forest City Dam, view downstream 

.

Vanceboro Dam. Domtar had no new information to report on the dam or fishway. The FERC license at the dam expires in 2016 and Domtar is planning to re-license.

Vanceboro Dam

Grand Falls Dam. Domtar had no new information to report on the dam or fishway.

Grand Falls Dam

View downstream at Powerhouse

Grand Falls Dam fishway

Milltown Dam. During the Board's annual site visits, it has been observed that there is a crack in the floor of the powerhouse near units 5/6/7. This is not a new issue as the crack has been apparent since the 1980s. However, about five years ago NB Power reported to the Board that there was increased movement in the crack. At that time (2003) NB Power took actions to assess the situation and established initial procedures to prevent further movement of the wall. NB Power set up temporary heated hoarding on the outside face of the wall to prevent freezing and thawing action and has continued to use this method in 2009. NB Power will continue to monitor movement of the downstream wall. NB Power reported that no movement of the wall occurred during 09-10. NB power engages an independent engineering consultant to periodically review conditions at the facilities. NB Power continues to maintain the fishway in good condition.

Milltown Dam and Powerhouse

Milltown Dam and Powerhouse

Milltown Dam, fishway

APPENDIX 3

HYDROGRAPHS

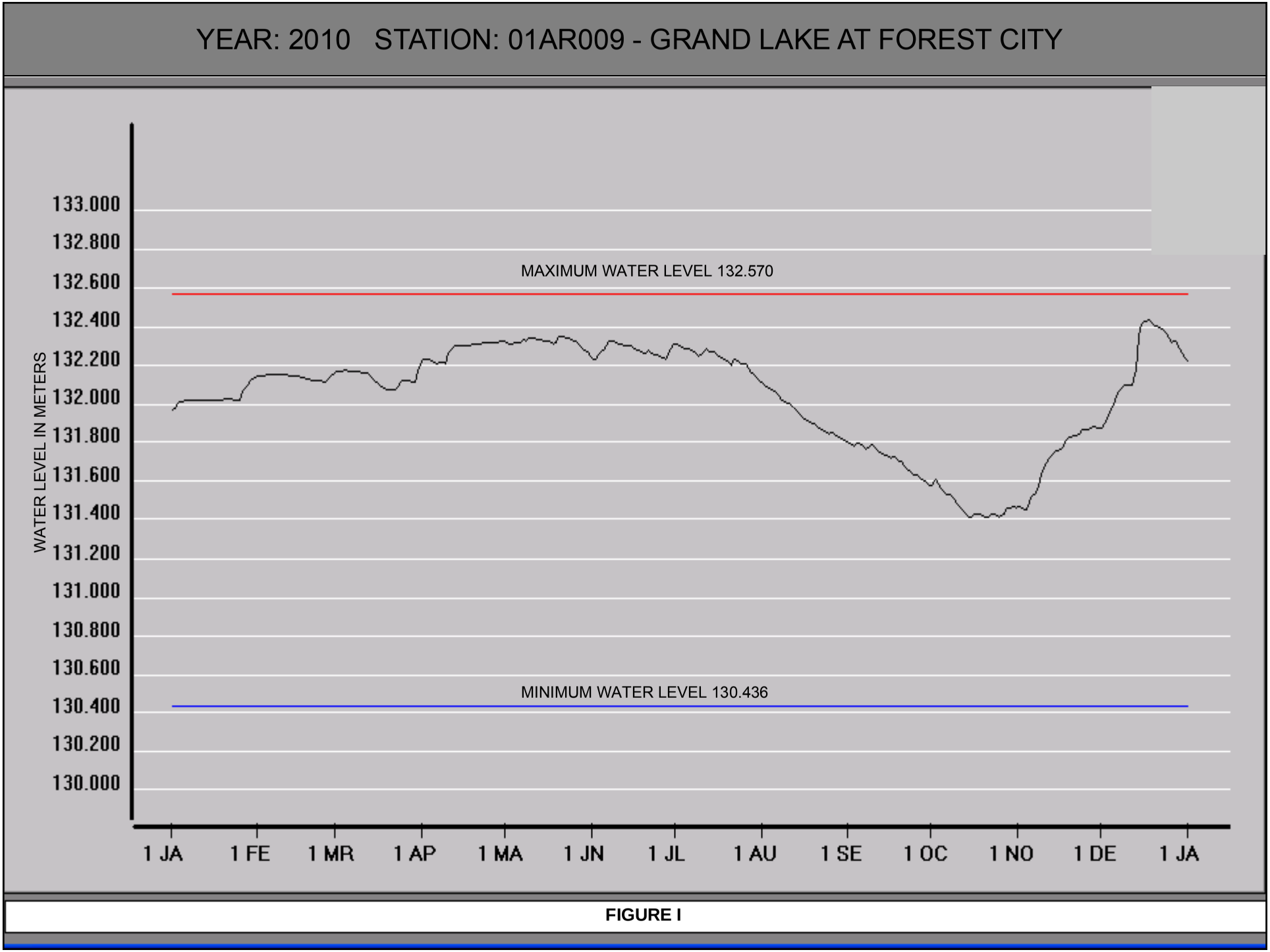

YEAR: 2010 STATION: 01AR009 - GRAND LAKE AT FOREST CITY
WATER LEVEL IN METERS
133.000
132.800
132.600
132.400
132.200
132.000
131.800
131.600
131.400
131.200
131.000
130.800
130.600
130.400
130.200
130.000
MAXIMUM WATER LEVEL 132.570
MINIMUM WATER LEVEL 130.436
1 JA
1 FE
1 MR
1 AP
1 MA
1 JN
1 JL
1 AU
1 SE
1 OC
1 NO
1 DE
1 JA

FIGURE I

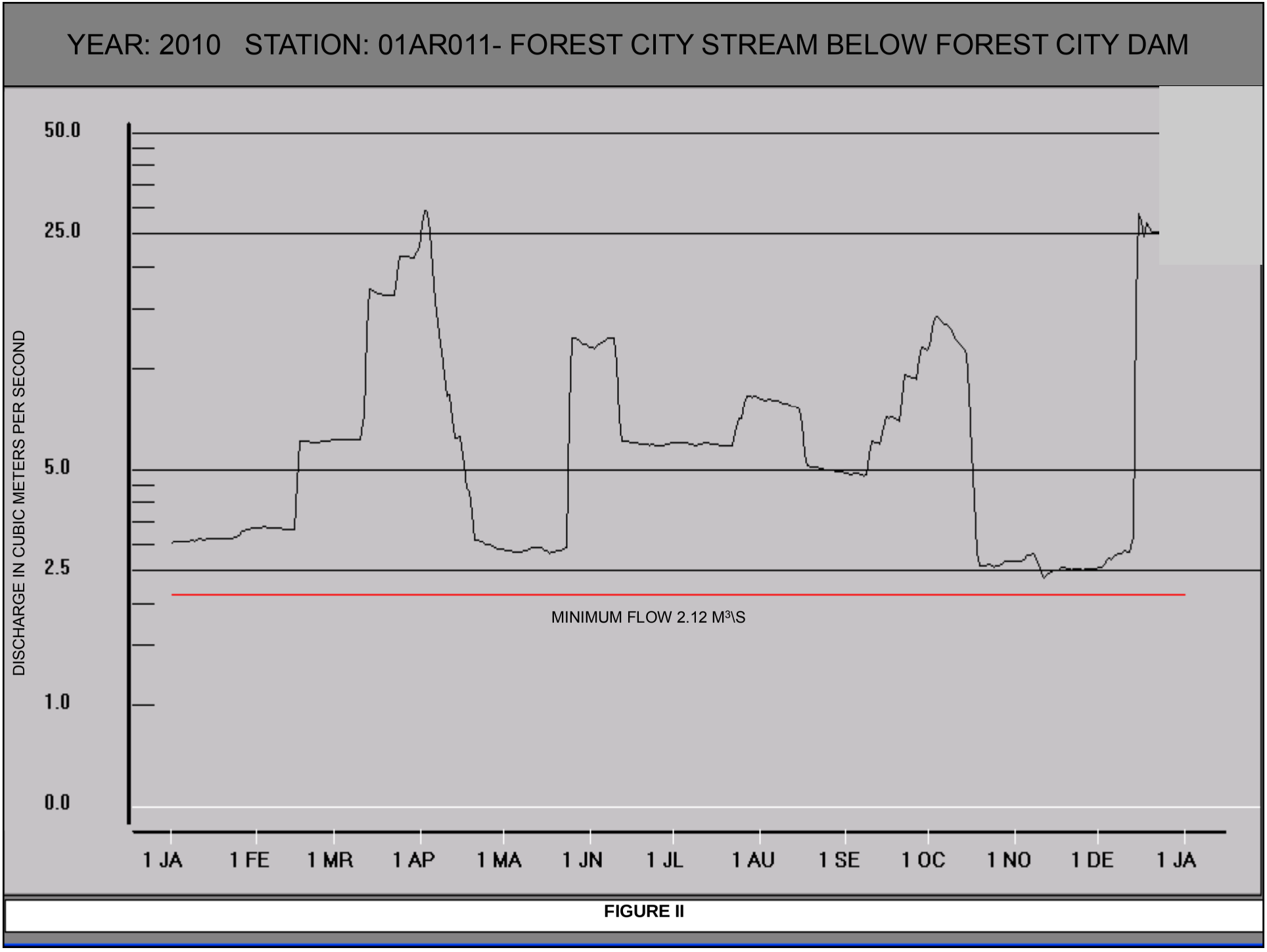

YEAR: 2010 STATION: 01AR011- FOREST CITY STREAM BELOW FOREST CITY DAM
DISCHARGE IN CUBIC METERS PER SECOND
50.0
25.0
5.0
2.5
1.0
0.0
MINIMUM FLOW 2.12 M3\S
1 JA
1 FE
1 MR
1 AP
1 MA
1 JN
1 JL
1 AU
1 SE
1 OC
1 NO
1 DE
1 JA

FIGURE II

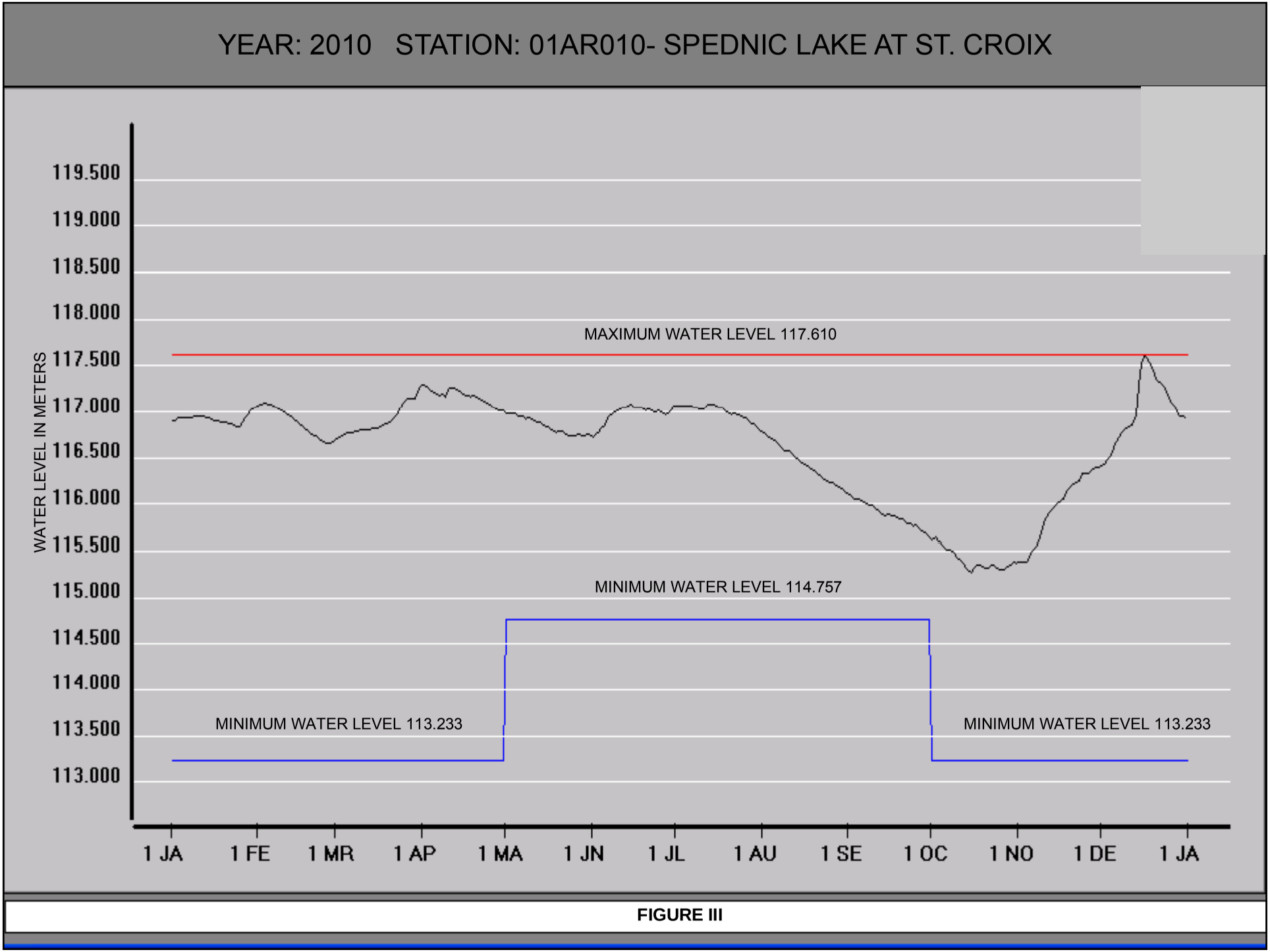

YEAR: 2010 STATION: 01AR010- SPEDNIC LAKE AT ST. CROIX
WATER LEVEL IN METERS
119.500
119.000
118.500
118.000
117.500
117.000
116.500
116.000
115.500
115.000
114.500
114.000
113.500
113.000
MAXIMUM WATER LEVEL 117.610
MINIMUM WATER LEVEL 114.757
MINIMUM WATER LEVEL 113.233
MINIMUM WATER LEVEL 113.233
1 JA
1 FE
1 MR
1 AP
1 MA
1 JN
1 JL
1 AU
1 SE
1 OC
1 NO
1 DE
1 JA

FIGURE III

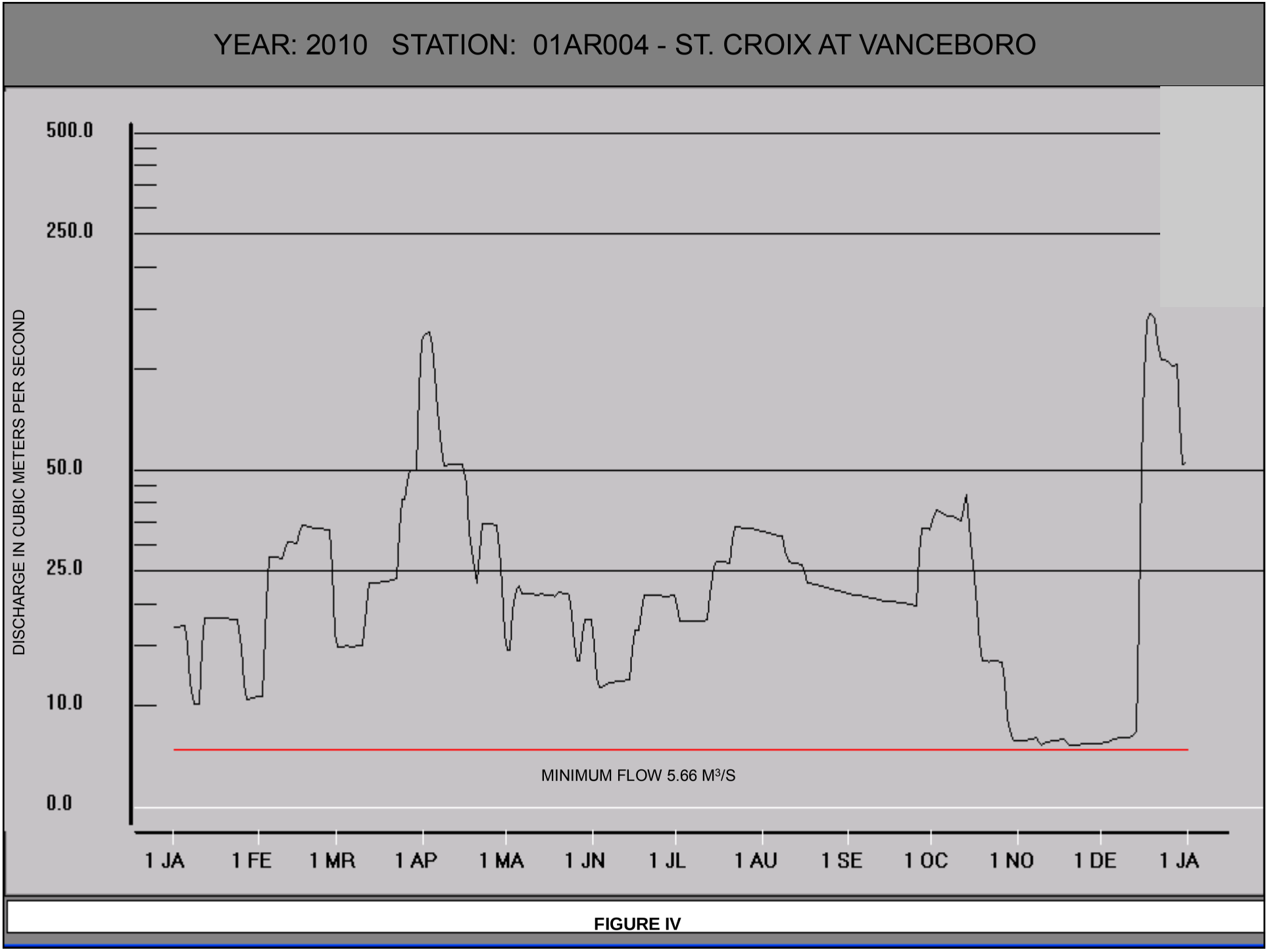

YEAR: 2010 STATION: 01AR004 - ST. CROIX AT VANCEBORO
DISCHARGE IN CUBIC METERS PER SECOND
500.0
250.0
50.0
25.0
10.0
0.0
MINIMUM FLOW 5.66 M³/S
1 JA
1 FE
1 MR
1 AP
1 MA
1 JN
1 JL
1 AU
1 SE
1 OC
1 NO
1 DE
1 JA

FIGURE IV

YEAR: 2010 STATION: 01AR013 - GRAND FALLS FLOWAGE AT GRAND FALLS

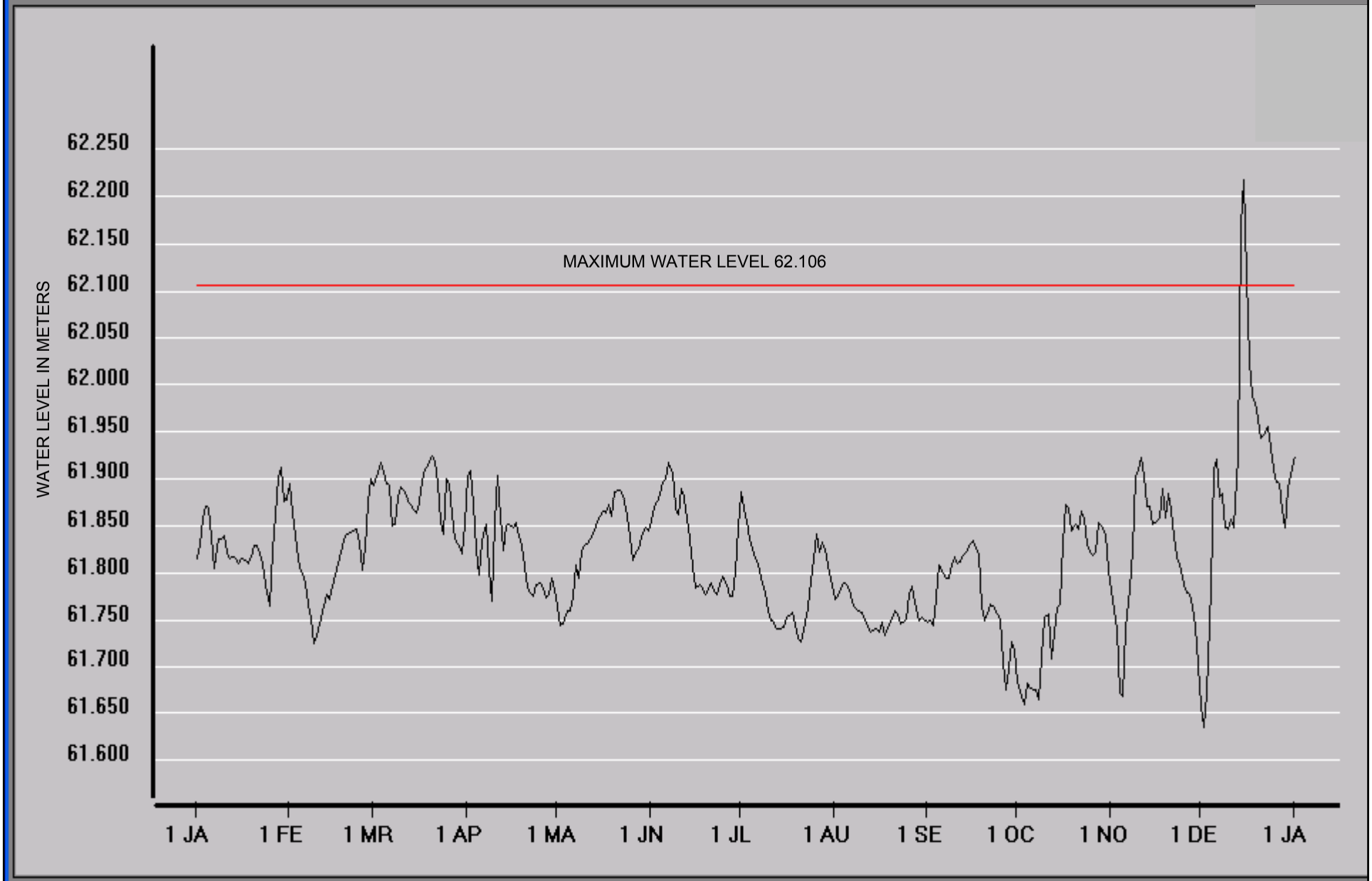


FIGURE V

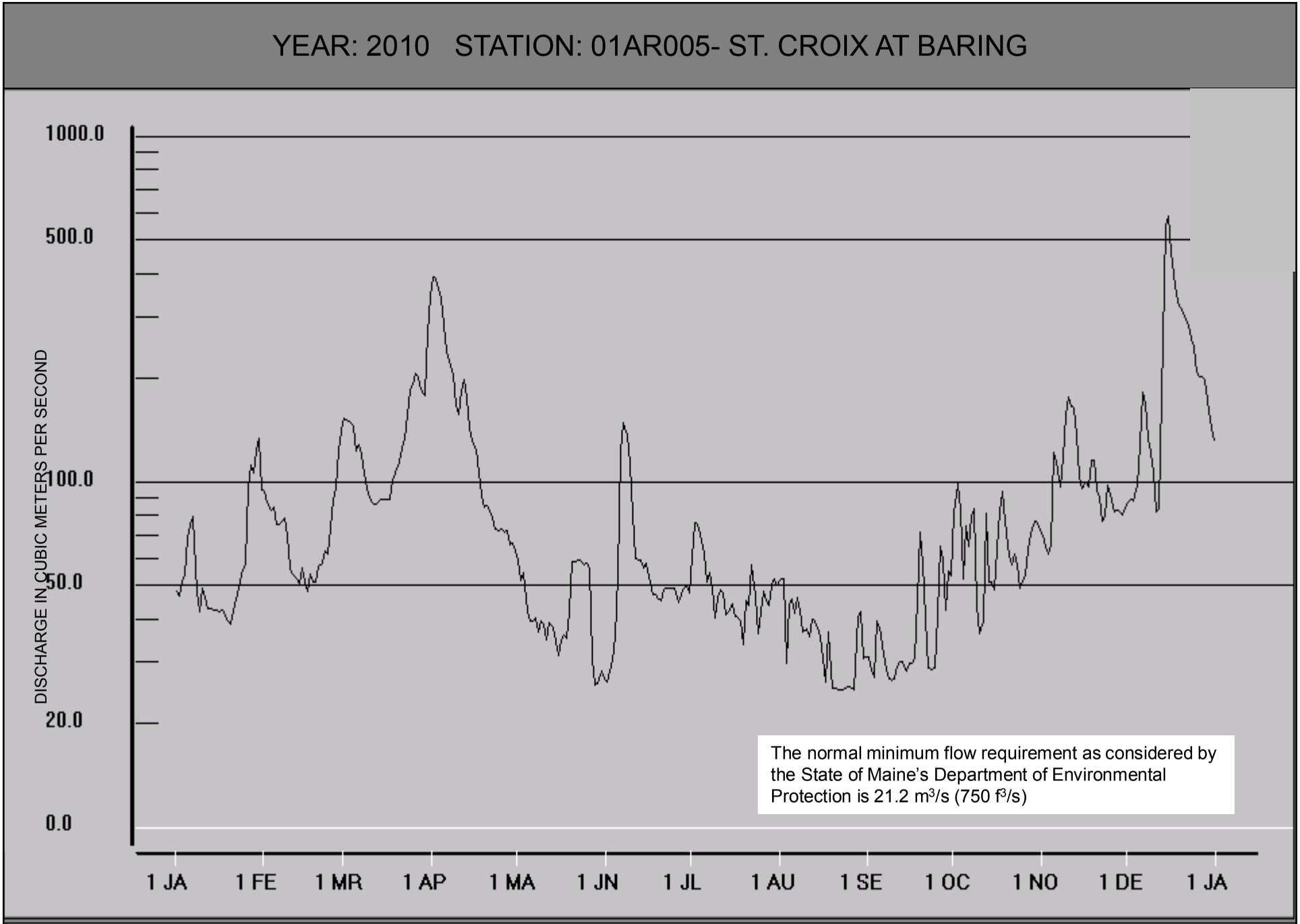

YEAR: 2010 STATION: 01AR005- ST. CROIX AT BARING
1000.0
500.0
100.0
50.0
20.0
0.0
DISCHARGE IN CUBIC METERS PER SECOND
1 JA
1 FE
1 MR
1 AP
1 MA
1 JN
1 JL
1 AU
1 SE
1 OC
1 NO
1 DE
1 JA
The normal minimum flow requirement as considered by the State of Maine's Department of Environmental Protection is 21.2 m3/s (750 f3/s)

FIGURE VI

YEAR: 2010 STATION: 01AR014 – ST. CROIX RIVER AT MILLTOWN DAM

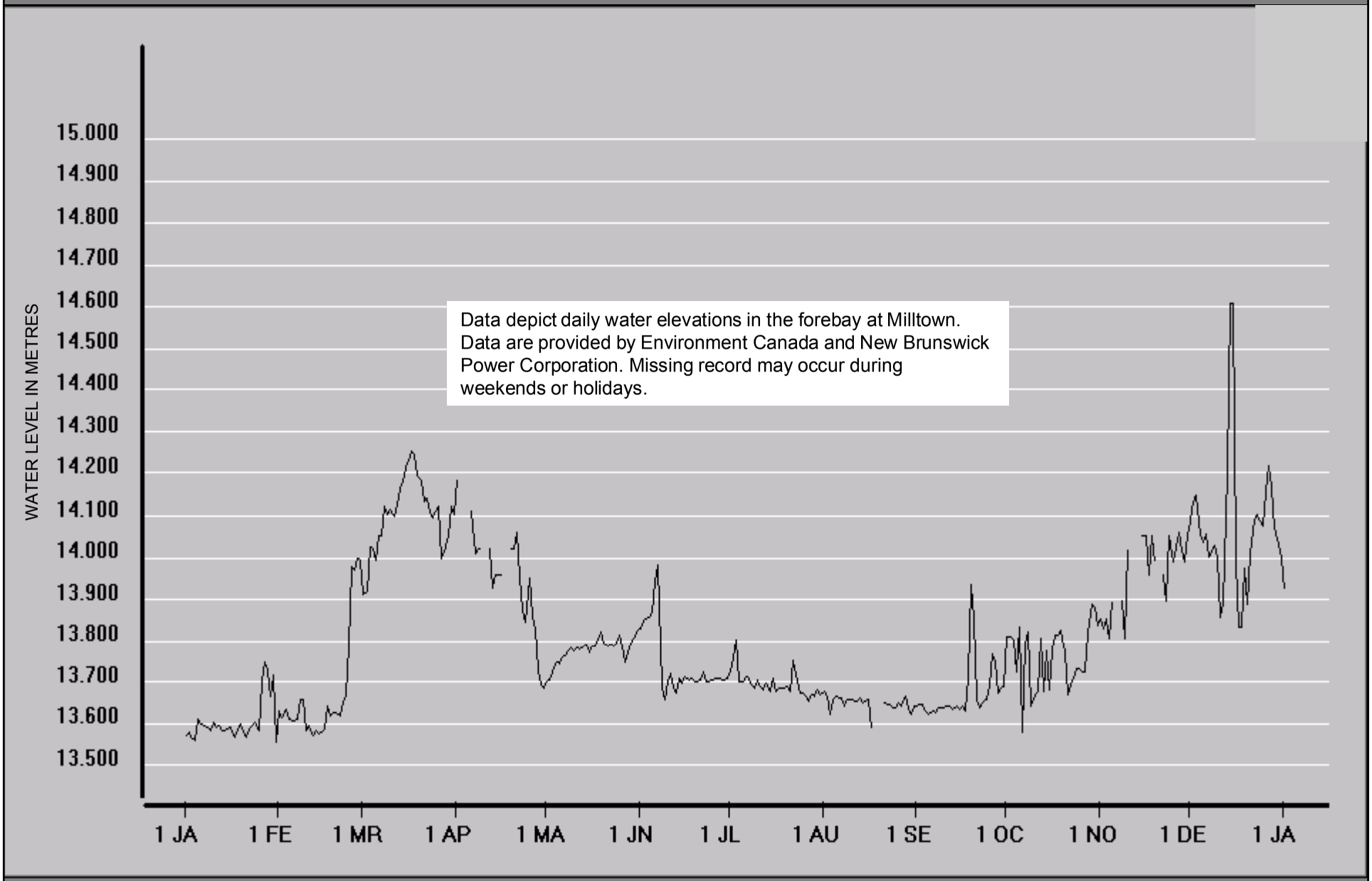


FIGURE VII

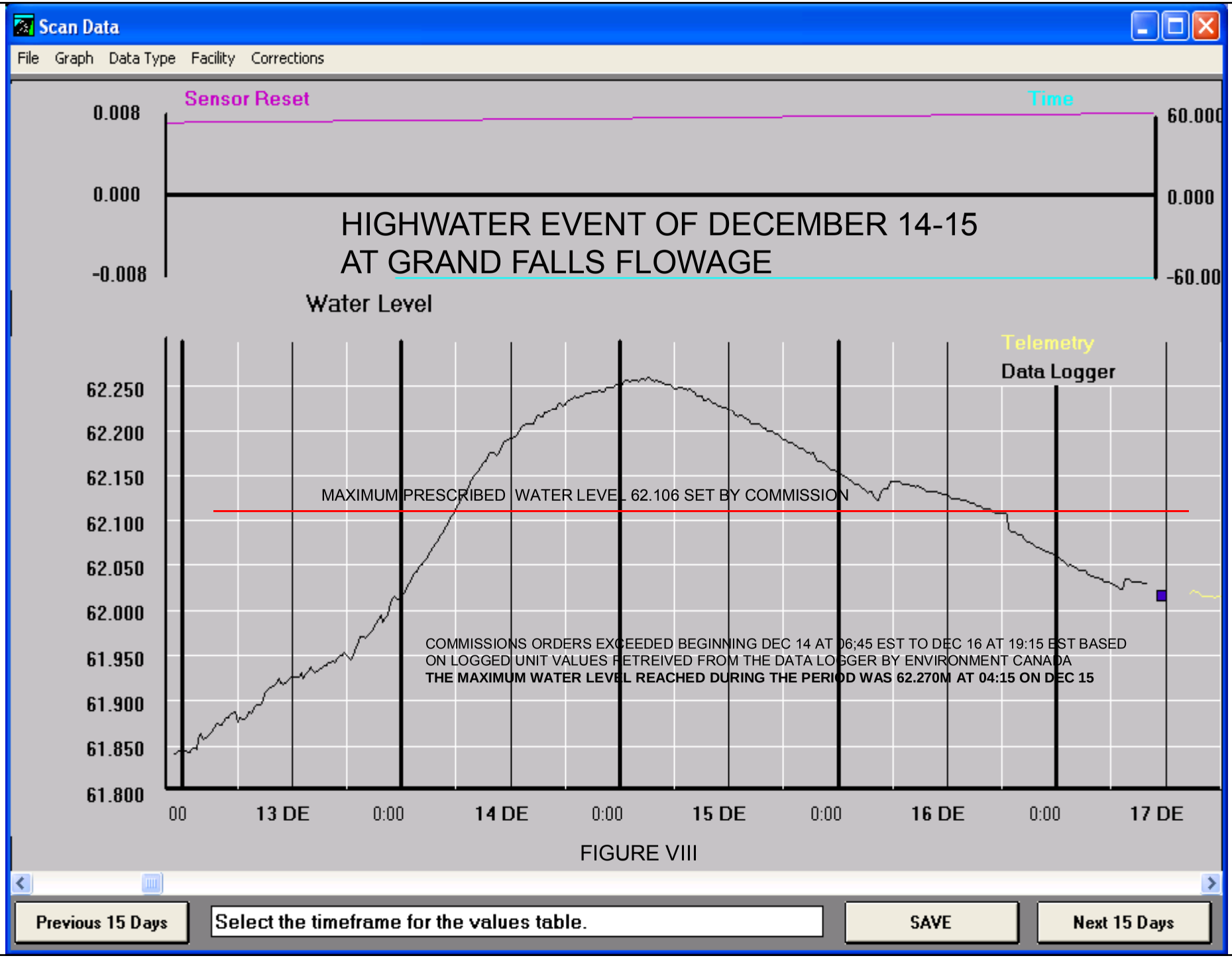

Scan Data
File Graph Data Type Facility Corrections
Sensor Reset
Time
0.008
0.000
-0.008
60.000
0.000
-60.00
HIGHWATER EVENT OF DECEMBER 14-15
AT GRAND FALLS FLOWAGE
Water Level
Telemetry
Data Logger
62.250
62.200
62.150
62.100
62.050
62.000
61.950
61.900
61.850
61.800
MAXIMUM PRESCRIBED WATER LEVEL 62.106 SET BY COMMISSION
COMMISSIONS ORDERS EXCEEDED BEGINNING DEC 14 AT 06;45 EST TO DEC 16 AT 19:15 EST BASED
ON LOGGED UNIT VALUES RETREIVED FROM THE DATA LOGGER BY ENVIRONMENT CANADA
THE MAXIMUM WATER LEVEL REACHED DURING THE PERIOD WAS 62.270M AT 04:15 ON DEC 15
00 13 DE 0:00 14 DE 0:00 15 DE 0:00 16 DE 0:00 17 DE
Previous 15 Days
Select the timeframe for the values table.
SAVE
Next 15 Days

FIGURE VIII

APPENDIX 4

WATER LEVELS AND FLOWS

TABLE 1
GRAND LAKE AT FOREST CITY
DAILY MEAN WATER LEVELS IN METRES FOR 2010

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	DAY
1	131.968	132.144	132.169	132.229	132.316	132.235	132.308	132.109	131.794	131.573	131.462	131.876	1
2	131.978	132.149	132.171	132.232	132.31	132.236	132.306	132.095	131.786	131.608	131.458	131.892	2
3	132.006	132.15	132.174	132.23	132.313	132.253	132.297	132.082	131.777	131.58	131.45	131.917	3
4	132.012	132.152	132.176	132.224	132.318	132.272	132.292	132.075	131.793	131.561	131.45	131.964	4
5	132.017	132.152	132.173	132.217	132.319	132.282	132.286	132.065	131.791	131.546	131.489	131.996	5
6	132.019	132.151	132.17	132.211	132.322	132.304	132.278	132.059	131.776	131.531	131.517	132.042	6
7	132.021	132.152	132.168	132.213	132.333	132.325	132.271	132.043	131.766	131.529	131.534	132.066	7
8	132.023	132.153	132.167	132.214	132.326	132.327	132.262	132.024	131.77	131.518	131.569	132.084	8
9	132.025	132.152	132.167	132.212	132.34	132.32	132.251	132.014	131.787	131.502	131.629	132.096	9
10	132.025	132.152	132.166	132.266	132.345	132.313	132.252	132.007	131.779	131.478	131.672	132.101	10
11	132.024	132.151	132.166	132.282	132.339	132.308	132.268	131.996	131.764	131.46	131.695	132.101	11
12	132.024	132.149	132.161	132.292	132.336	132.305	132.285	131.98	131.748	131.443	131.715	132.101	12
13	132.024	132.146	132.147	132.301	132.334	132.305	132.271	131.967	131.736	131.428	131.734	132.176	13
14	132.022	132.145	132.131	132.304	132.326	132.307	132.271	131.952	131.729	131.41	131.747	132.348	14
15	132.021	132.144	132.118	132.306	132.328	132.305	132.267	131.935	131.728	131.408	131.752	132.413	15
16	132.02	132.14	132.104	132.305	132.329	132.286	132.25	131.917	131.718	131.423	131.766	132.427	16
17	132.02	132.136	132.092	132.305	132.319	132.279	132.243	131.914	131.727	131.426	131.779	132.43	17
18	132.021	132.133	132.083	132.307	132.313	132.274	132.236	131.905	131.716	131.425	131.813	132.432	18
19	132.021	132.129	132.079	132.315	132.317	132.265	132.224	131.896	131.704	131.417	131.823	132.423	19
20	132.028	132.124	132.076	132.31	132.347	132.267	132.216	131.886	131.697	131.413	131.826	132.409	20
21	132.029	132.122	132.075	132.309	132.348	132.276	132.205	131.875	131.679	131.413	131.833	132.402	21
22	132.026	132.122	132.076	132.311	132.341	132.267	132.23	131.866	131.66	131.431	131.83	132.393	22
23	132.022	132.119	132.095	132.315	132.34	132.257	132.224	131.856	131.646	131.43	131.842	132.383	23
24	132.02	132.118	132.119	132.315	132.338	132.254	132.209	131.846	131.632	131.419	131.868	132.363	24
25	132.022	132.116	132.125	132.318	132.331	132.251	132.212	131.839	131.632	131.413	131.867	132.341	25
26	132.066	132.132	132.127	132.318	132.324	132.24	132.209	131.846	131.624	131.418	131.866	132.317	26
27	132.086	132.147	132.122	132.318	132.315	132.229	132.187	131.839	131.607	131.427	131.872	132.327	27
28	132.103	132.155	132.112	132.319	132.294	132.257	132.161	131.825	131.597	131.455	131.877	132.32	28
29	132.12		132.117	132.326	132.276	132.29	132.154	131.816	131.591	131.46	131.877	132.288	29
30	132.132		132.168	132.325	132.268	132.308	132.138	131.809	131.577	131.465	131.875	132.263	30
31	132.138		132.208		132.244		132.122	131.801		131.46		132.237	31
TOTAL	4093.083	3699.935	4096.202	3968.449	4101.949	3968.397	4099.385	4090.139	3951.331	4075.47	3951.487	4098.928	TOTAL
MEAN	132.035	132.141	132.136	132.282	132.321	132.28	132.238	131.94	131.711	131.467	131.716	132.223	MEAN
MAX	132.138	132.155	132.208	132.326	132.348	132.327	132.308	132.109	131.794	131.608	131.877	132.432	MAX
MIN	131.968	132.116	132.075	132.211	132.244	132.229	132.122	131.801	131.577	131.408	131.45	131.876	MIN

SUMMARY FOR THE YEAR 2010
Mean water level, 132.040 Metres
Maximum daily water level, 132.432 Metres On 2010-12-18
Minimum daily water level, 131.408 Metres On 2010-10-15

NOTES: THE DATA ARE PROVISIONAL AND ARE SUPPLIED BY ENVIRONMENT CANADA IN COOPERATION WITH WOODLAND PULP LLC.

TABLE II
FOREST CITY STREAM BELOW FOREST CITY DAM
DAILY MEAN DISCHARGE IN CUBIC METRES PER SECOND FOR 2010

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	DAY
1	3.03	3.35	6.14	26.9	2.88	11.6	6.01	8.15	4.86	11.7	2.66	2.55	1
2	3.07	3.36	6.15	29.2	2.86	11.6	6	8.1	4.86	13.9	2.66	2.57 E	2
3	3.07	3.39	6.15	29.1	2.86	11.7	6	8.05	4.81	14.3	2.66	2.62	3
4	3.07	3.36	6.15	25.6	2.84	11.9	6	8.15	4.9	14.1	2.69	2.72	4
5	3.07	3.36	6.15	19.9	2.85	11.9	6	8.1	4.87	13.8	2.78	2.71	5
6	3.07	3.36	6.15	15.8	2.83	12.1	5.98	8.08	4.82	13.6	2.79	2.76	6
7	3.07	3.34	6.15	12.8	2.83	12.3	5.98	8.03	4.8	13.5	2.82	2.78	7
8	3.08	3.34	6.15	11.2	2.86	12.4	5.93	7.96	4.83	13.3	2.73	2.8	8
9	3.07	3.34	6.15	9.63	2.88	12.3	5.92	7.92	5.54	13	2.61	2.82	9
10	3.09	3.34	6.15	8.36	2.9	10.4	5.93	7.87	6.08	12.4	2.47	2.86	10
11	3.12	3.34	7.27	8.38	2.93	7.21	5.99	7.84	6.05	12	2.39	2.84	11
12	3.09	3.34	12.9	7.12	2.93	6.06	6.04	7.77	6	11.7	2.43	2.86	12
13	3.1	3.34	17.3	6.22	2.93	6.07	5.99	7.72	5.94	11.5	2.47	3.15	13
14	3.12	3.34	17.1	6.23	2.93	6.06	5.98	7.68	6.65	11.1	2.49	15.8	14
15	3.12	4.58	16.9	6.27	2.86	6.05	5.95	7.59	7.19	8.48	2.51	28.8 E	15
16	3.12	6.1	16.8	5.17	2.86	6.02	5.93	6.81	7.13	5.64	2.52	27.3 E	16
17	3.12	6.1	16.7	4.42	2.81	6	5.92	5.58	7.18	4.1	2.56	24.7 E	17
18	3.12	6.1	16.6	4.32	2.83	5.98	5.89	5.16	7.11	2.85	2.55 E	26.9	18
19	3.12	6.07	16.5	3.71	2.83	5.96	5.89	5.13	7.05	2.58	2.54	26.2	19
20	3.12	6.03	16.5	3.1	2.86	5.93	5.87	5.09	6.99	2.58	2.54	25.5	20
21	3.12	6.03	16.5	3.08	2.88	5.93	5.87	5.09	8.17	2.59	2.52	25.4	21
22	3.12	6.03	16.5	3.06	2.9	5.93	5.89	5.06	9.64	2.62	2.54	25.3	22
23	3.12	6.04	18.9	3.05	2.93	5.93	6.66	5.03	9.5	2.59	2.55	25.1	23
24	3.16	6.06	21.4	3.01	7.54	5.9	7.13	5.01	9.46	2.56	2.54	24.8	24
25	3.2	6.06	21.4	3	12.4	5.88	7.12	4.99	9.43	2.58	2.51	24.4	25
26	3.31	6.1	21.5	2.95	12.3	5.88	7.87	4.98	9.34	2.58	2.53	24.2	26
27	3.3	6.11	21.4	2.94	12.3	5.87	8.32	4.97	10.8	2.62	2.54	24.3	27
28	3.31	6.13	21.3	2.91	12.1	5.96	8.28	4.95	11.6	2.66	2.54	24.1	28
29	3.33		21.3	2.91	11.9	5.99	8.28	4.92	11.5	2.66	2.54	23.4	29
30	3.34		22.1	2.9	11.8	6.01	8.32	4.92	11.4	2.66	2.54	23.2	30
31	3.34		22.8		11.6		8.24	4.89		2.66		22.9	31
TOTAL	97.49	130.44	441.16	273.24	158.01	238.82	201.18	201.59	218.5	234.91	77.22	478.34	TOTAL
MEAN	3.14	4.66	14.2	9.11	5.1	7.96	6.49	6.5	7.28	7.58	2.57	15.4	MEAN
DAM3	8420	11300	38100	23600	13700	20600	17400	174000	18900	20300	6670	41300	DAM3
MAX	3.34	6.13	22.8	29.2	12.4	12.4	8.32	8.15	11.6	14.3	2.82	28.8	MAX
MIN	3.03	3.34	6.14	2.9	2.81	5.87	5.87	4.89	4.8	2.56	2.39	2.55	MIN

SUMMARY FOR THE YEAR 2010
Total discharge, 238000 DAM3
Mean discharge, 7.54 M3/S
Maximum daily discharge, 29.2 M3/S On 2010-04-02
Minimum daily discharge, 2.39 M3/S On 2010-11-11

NOTES: THE DISCHARGE ARE PROVISIONAL AND ARE SUPPLIED BY ENVIRONMENT CANADA IN COOPERATION WITH WOODLAND PULP LLC.
E - ESTIMATED

TABLE III
SPEDNIC LAKE AT ST. CROIX
DAILY MEAN WATER LEVELS IN METRES FOR 2010

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	DAY
1	116.896	117.069	116.705	117.286	116.989	116.723	117.066	116.776	116.101	115.619	115.388	116.411	1
2	116.905	117.085	116.722	117.278	116.974	116.745	117.071	116.748	116.078	115.639	115.39	116.43	2
3	116.925	117.092	116.738	117.253	116.977	116.765	117.064	116.724	116.047	115.599	115.385	116.471	3
4	116.929	117.084	116.759	117.229	116.973	116.813	117.065	116.706	116.058	115.571	115.382	116.532	4
5	116.931	117.072	116.765	117.205	116.949	116.841	117.061	116.681	116.049	115.548	115.432	116.6	5
6	116.931	117.059	116.77	117.19	116.944	116.891	117.057	116.67	116.022	115.515	115.499	116.679	6
7	116.935	117.047	116.776	117.185	116.956	116.949	117.049	116.635	115.997	115.513	115.55	116.723	7
8	116.94	117.031	116.785	117.186	116.914	116.982	117.043	116.599	115.98	115.506	115.596	116.768	8
9	116.947	117.014	116.794	117.165	116.928	117	117.033	116.581	115.979	115.483	115.686	116.799	9
10	116.95	116.998	116.8	117.237	116.919	117.018	117.028	116.569	115.968	115.439	115.783	116.818	10
11	116.949	116.978	116.803	117.26	116.9	117.035	117.036	116.551	115.941	115.407	115.851	116.834	11
12	116.943	116.953	116.803	117.256	116.879	117.045	117.071	116.522	115.915	115.361	115.902	116.852	12
13	116.936	116.93	116.804	117.247	116.876	117.047	117.072	116.5	115.895	115.322	115.942	116.946	13
14	116.926	116.906	116.812	117.231	116.847	117.062	117.079	116.475	115.879	115.291	115.975	117.286	14
15	116.915	116.882	116.822	117.206	116.835	117.077	117.071	116.446	115.884	115.277	116	117.52	15
16	116.907	116.853	116.827	117.183	116.836	117.054	117.049	116.42	115.87	115.322	116.031	117.599	16
17	116.898	116.83	116.837	117.17	116.804	117.047	117.044	116.411	115.867	115.35	116.058	117.593	17
18	116.888	116.805	116.85	117.165	116.782	117.045	117.03	116.39	115.855	115.354	116.136	117.544	18
19	116.88	116.782	116.867	117.172	116.767	117.027	117.003	116.366	115.839	115.333	116.171	117.479	19
20	116.878	116.759	116.891	117.161	116.79	117.021	116.987	116.347	115.837	115.322	116.197	117.408	20
21	116.869	116.735	116.918	117.147	116.779	117.036	116.962	116.321	115.821	115.313	116.223	117.348	21
22	116.859	116.715	116.944	117.126	116.757	117.021	116.985	116.295	115.794	115.344	116.228	117.311	22
23	116.85	116.69	116.987	117.117	116.744	117.001	116.97	116.269	115.785	115.348	116.254	117.272	23
24	116.837	116.666	117.044	117.099	116.732	117.003	116.944	116.249	115.765	115.316	116.327	117.222	24
25	116.829	116.648	117.088	117.079	116.732	117.008	116.938	116.227	115.766	115.298	116.337	117.162	25
26	116.889	116.652	117.127	117.054	116.738	116.988	116.939	116.227	115.745	115.302	116.335	117.099	26
27	116.933	116.657	117.138	117.03	116.749	116.971	116.908	116.213	115.711	115.303	116.356	117.065	27
28	116.97	116.672	117.137	117.012	116.742	116.979	116.875	116.184	115.687	115.33	116.378	117.019	28
29	117.006		117.149	117.018	116.737	117.012	116.863	116.161	115.672	115.352	116.389	116.955	29
30	117.032		117.23	117.017	116.745	117.057	116.833	116.142	115.642	115.378	116.399	116.942	30
31	117.052		117.271		116.729		116.804	116.12		115.371		116.926	31
TOTAL	3624.535	3272.664	3623.963	3514.964	3622.023	3509.263	3627.000	3609.525	3476.449	3577.426	3478.58	3627.613	TOTAL
MEAN	116.920	116.881	116.902	117.165	116.839	116.975	117.000	116.436	115.882	115.401	115.953	117.02	MEAN
MAX	117.052	117.092	117.271	117.286	116.989	117.077	117.079	116.776	116.101	115.639	116.399	117.599	MAX
MIN	116.829	116.648	116.705	117.012	116.729	116.723	116.804	116.12	115.642	115.277	115.382	116.411	MIN

SUMMARY FOR THE YEAR 2010
Mean water level, 116.614 Metres
Maximum daily water level, 117.599 Metres On 2010-12-16
Minimum daily water level, 115.277 Metres On 2010-10-15

NOTES: WATER LEVELS ARE IN METRES AND ARE REFERENCED TO GEODETIC SURVEY OF CANADA DATUM
THE DATA ARE PROVISIONAL AND ARE SUPPLIED BY ENVIRONMENT CANADA IN COOPERATION WITH WOODLAND PULP LLC.

TABLE IV
ST. CROIX RIVER AT VANCEBORO
DAILY MEAN DISCHARGE IN CUBIC METRES PER SECOND FOR 2010

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	DAY
1	17	10.6	14.8	126	14.7	15.2	19.9	32.8	21.4	35.4	6.54	6.34	1
2	17	10.7	14.9	127	14.6	12.1	17.8	32.6	21.3	38.2	6.57	6.37	2
3	17.1	20.2	14.9	129	19.2	11.3	17.8	32.6	21.2	37.7	6.54	6.46	3
4	17.2	27.7	15	118	22.1	11.4	17.8	32.3	21.3	37.4	6.54	6.57	4
5	17.2	27.6	14.9	96.6	22.5	11.5	17.8	32.3	21.2	37.1	6.66	6.66	5
6	15	27.6	14.9	75.6	21.5	11.6	17.8	32	21.1	36.5	6.74	6.77	6
7	11.7	27.5	14.9	57.8	21.5	11.7	17.8	32	20.9	36.5	6.8	6.83	7
8	10.1	27.4	15	51.5	21.4	11.8	17.8	31.7	20.8	36.5	6.43	6.88	8
9	10.1	27.3	15	51.5	21.4	11.8	17.8	28.6	20.8	36.3	6.2	6.94	9
10	10.1	29.2	15	52.1	21.4	11.9	17.7	26.6	20.8	35.7	6.32	6.94	10
11	14.7	30.6	19.5	52.1	21.3	11.9	17.8	26.6	20.6	35.4	6.43	6.94	11
12	18.2	30.6	23.1	52.1	21.3	11.9	17.9	26.4	20.5	39.1	6.49	7	12
13	18.2	30.3	23.1	52.1	21.5	11.9	21.2	26.3	20.5	42.2	6.54	7.42	13
14	18.2	30.3	23.1	51.8	21.4	11.9	25.5	26.2	20.4	34.3	6.6	18.4	14
15	18.1	32.6	23.2	51.8	21.3	14.7	26.8	26	20.4	28.1	6.6	51.5	15
16	18.1	34.3	23.2	45.3	21.3	16.7	26.7	24.7	20.3	24.2	6.66	96	16
17	18.1	34.3	23.3	32.8	21.2	16.6	26.7	23.1	20.3	19.3	6.71	138	17
18	18.1	34	23.3	28.6	21.1	19.2	26.6	23	20.2	15.2	6.4	146	18
19	18.1	34	23.4	25.5	21.5	21.2	26.5	22.9	20.2	13.6	6.06	144	19
20	18.1	33.7	23.5	23.2	21.6	21.2	26.5	22.8	20.1	13.5	6.12	142	20
21	18.1	33.7	23.6	28.3	21.5	21.2	30.9	22.7	20.1	13.5	6.15	121	21
22	18	33.4	23.8	34.8	21.4	21.2	34	22.5	19.9	13.6	6.15	107	22
23	18	33.4	32.8	34.5	21.4	21.1	34	22.4	19.9	13.6	6.17	106	23
24	18	33.1	40.8	34.5	18.7	21.1	33.7	22.3	19.8	13.5	6.26	105	24
25	14.8	33.1	41.1	34.5	15.1	21.1	33.7	22.2	19.8	13.4	6.26	104	25
26	11.6	33.1	45.9	34.3	13.5	21	33.7	22.1	28.1	13.4	6.26	103	26
27	10.4	25.3	49.8	34.3	13.5	21	33.4	22	33.7	11.8	6.29	102	27
28	10.5	16.4	49.8	29.2	16.2	21	33.4	21.9	33.4	8.69	6.34	103	28
29	10.6		50.1	22.9	18	21.2	33.1	21.8	33.4	7.11	6.34	69.9	29
30	10.6		86.9	16.1	18	21.4	33.1	21.7	33.1	6.54	6.34	52.1	30
31	10.6		121		17.9		32.8	21.5		6.54		52.4	31
TOTAL	471.6	802	943.6	1603.8	609	488.8	788	804.6	675.5	753.88	192.51	1849.42	TOTAL
MEAN	15.2	28.6	30.4	53.5	19.6	16.3	25.4	26	22.5	24.3	6.42	59.7	MEAN
DAM3	40700	69300	81500	139000	52600	42200	68100	69500	58400	65100	16600	160000	DAM3
MAX	18.2	34.3	121	129	22.5	21.4	34	32.8	33.7	42.2	6.8	146	MAX
MIN	10.1	10.6	14.8	16.1	13.5	11.3	17.7	21.5	19.8	6.54	6.06	6.34	MIN

SUMMARY FOR THE YEAR 2010
Total discharge, 863000 DAM3
Mean discharge, 27.4 M3/S
Maximum daily discharge, 146 M3/S On 2010-12-18
Minimum daily discharge, 6.06 M3/S On 2010-11-19

NOTES: THE DISCHARGE ARE PROVISIONAL AND ARE SUPPLIED BY ENVIRONMENT CANADA IN COOPERATION WITH WOODLAND PULP LLC.

TABLE V
GRAND FALLS FLOWAGE AT GRANDFALLS
DAILY MEAN WATER LEVELS IN METRES FOR 2010

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	DAY
1	61.816	61.894	61.893	61.902	61.765	61.856	61.886	61.772	61.749	61.683	61.783	61.657	1
2	61.83	61.864	61.906	61.908	61.745	61.871	61.869	61.776	61.75	61.667	61.761	61.634	2
3	61.86	61.828	61.917	61.874	61.746	61.876	61.855	61.784	61.744	61.66	61.74	61.67	3
4	61.872	61.806	61.906	61.827	61.759	61.882	61.836	61.79	61.774	61.682	61.672	61.784	4
5	61.87	61.801	61.895	61.799	61.76	61.896	61.821	61.788	61.809	61.676	61.668	61.91	5
6	61.839	61.789	61.892	61.835	61.777	61.899	61.814	61.782	61.8	61.676	61.74	61.92	6
7	61.806	61.768	61.85	61.852	61.809	61.917	61.804	61.771	61.795	61.675	61.782	61.881	7
8	61.837	61.753	61.853	61.805	61.796	61.906	61.79	61.763	61.795	61.665	61.824	61.883	8
9	61.837	61.726	61.881	61.771	61.825	61.869	61.78	61.76	61.809	61.71	61.901	61.85	9
10	61.84	61.734	61.89	61.854	61.829	61.863	61.76	61.758	61.818	61.754	61.909	61.846	10
11	61.822	61.747	61.886	61.902	61.832	61.889	61.75	61.751	61.811	61.757	61.922	61.857	11
12	61.816	61.765	61.876	61.862	61.837	61.88	61.749	61.744	61.813	61.709	61.902	61.849	12
13	61.817	61.778	61.873	61.825	61.846	61.859	61.741	61.738	61.82	61.738	61.872	61.922	13
14	61.815	61.772	61.869	61.85	61.855	61.837	61.741	61.74	61.825	61.763	61.871	62.169	14
15	61.81	61.786	61.864	61.852	61.86	61.806	61.742	61.74	61.831	61.767	61.852	62.218	15
16	61.816	61.798	61.874	61.85	61.866	61.785	61.754	61.738	61.836	61.833	61.857	62.117	16
17	61.815	61.81	61.895	61.854	61.865	61.788	61.755	61.748	61.827	61.874	61.859	62.025	17
18	61.811	61.823	61.91	61.84	61.873	61.784	61.758	61.735	61.821	61.869	61.889	61.987	18
19	61.817	61.835	61.913	61.831	61.862	61.777	61.747	61.744	61.766	61.845	61.859	61.981	19
20	61.829	61.842	61.924	61.807	61.885	61.783	61.731	61.752	61.749	61.852	61.883	61.964	20
21	61.831	61.844	61.918	61.786	61.887	61.79	61.727	61.759	61.757	61.847	61.867	61.944	21
22	61.822	61.846	61.893	61.78	61.886	61.782	61.739	61.756	61.766	61.866	61.84	61.949	22
23	61.81	61.847	61.855	61.775	61.876	61.777	61.764	61.746	61.763	61.859	61.818	61.955	23
24	61.789	61.833	61.843	61.788	61.862	61.788	61.791	61.748	61.757	61.831	61.81	61.932	24
25	61.764	61.804	61.899	61.79	61.838	61.797	61.817	61.752	61.752	61.823	61.788	61.91	25
26	61.825	61.828	61.895	61.785	61.815	61.788	61.841	61.777	61.704	61.819	61.78	61.896	26
27	61.862	61.875	61.863	61.773	61.823	61.776	61.823	61.787	61.676	61.822	61.777	61.895	27
28	61.902	61.899	61.836	61.777	61.827	61.777	61.834	61.762	61.698	61.855	61.766	61.868	28
29	61.912		61.83	61.795	61.838	61.802	61.826	61.749	61.728	61.85	61.744	61.849	29
30	61.877		61.822	61.783	61.849	61.849	61.809	61.754	61.717	61.842	61.701	61.889	30
31	61.879		61.852		61.845		61.794	61.749		61.804		61.912	31
TOTAL	1916.848	1730.695	1918.273	1854.732	1916.738	1854.949	1915.448	1914.513	1853.260	1915.073	1854.437	1919.123	TOTAL
MEAN	61.834	61.811	61.88	61.824	61.83	61.832	61.789	61.758	61.775	61.777	61.815	61.907	MEAN
MAX	61.912	61.899	61.924	61.908	61.887	61.917	61.886	61.79	61.836	61.874	61.922	62.218	MAX
MIN	61.764	61.726	61.822	61.771	61.745	61.776	61.727	61.735	61.676	61.66	61.668	61.634	MIN

SUMMARY FOR THE YEAR 2010
Mean water level, 61.819 Metres
Maximum daily water level, 62.218 Metres On 2010-12-15
Minimum daily water level, 61.634 Metres On 2010-12-02

NOTES: WATER LEVELS ARE IN METRES AND ARE REFERENCED TO GEODETIC SURVEY OF CANADA DATUM
THE DATA ARE PROVISIONAL AND ARE SUPPLIED BY ENVIRONMENT CANADA IN COOPERATION WITH WOODLAND PULP LLC.

TABLE VI
ST. CROIX RIVER AT BARING
DAILY MEAN DISCHARGE IN CUBIC METRES PER SECOND FOR 2010

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	DAY
1	47.9	94	154	391	59.2	26.4	60.6	52.4	31.2	80.7	70	87.5	1
2	46.7	86.9	150	388	51.8	28.3	76.2	52.1	28.6	98.6	64.9	89.2	2
3	51	82.7	149	363	54.7	30.3	75.6	29.7 E	27.2	83.3	61.5	88.4	3
4	53.2	84.7	145	340	42.2	35.4	70.8	44.5	39.4	52.4	66	97.7	4
5	68.8	75.6 B	123	286	39.6	53.2	62	45.9	37.7	74.5	122	129	5
6	75.6	75.6 B	128	239	39.4	124	51.3	41.6	31.7	65.1	115	183	6
7	79	76.7 B	120	218	40.2	148	54.4	46.4	28.6	79.6	96.9	169	7
8	48.1	78.7	107	206	36.8	137	49	42.5	26.8	83.5	118	133	8
9	42.2	70	95.7	168	39.6	113	40.2	36.8	26.5	43.6	156	122	9
10	49 B	56.1	90.3	158	38.8	80.7	46.2	37.4	26.8	36.2	176	108	10
11	46.2 B	54.1	86.7	184	34.8	59.8	48.7	35.4	29.2	39.4	167	81.8	11
12	43 B	52.1	86.7	199	39.1	59.2	47.6	39.9	30	80.7	165	83.3	12
13	42.8 B	50.7	88.4	178	37.9	59.2	41.3	39.6	30	51.3	136	259	13
14	42.5 B	56.4	88.6	142	34.6	56.4	42.5	37.9	28.2	51.5	104	549	14
15	42.5	51	88.9	132	31.4	57.8	44.2	35.7	29.7	48.7	96	586	15
16	42.2	48.1	88.9	124	34.8	52.7	40.8	30.6	29.7	63.7	99.4	462	16
17	42.5	54.1	89.2	107	36	47.3	40.2	26.3	30.6	81.6	97.1	399	17
18	41.3	51.3	101	91.5	35.1	47	39.6	36.8	45.6	93.5	116	354	18
19	39.6	51	107	84.7	42.2	45.9	33.7	25.1	71.4	77	115	326	19
20	38.8	56.9	114	85.5	58.6	45	45	25.1	58.3	60.9	94.6	317	20
21	41.9	57.8	126	83	58.9	48.7	43.6	25	40.2	57.5	90.9	303	21
22	45.9	63.2	133	79	59.2	49	57.5	24.9	28.9	61.7	77.3	286	22
23	49	62	156	72.8	58.6	49.3	46.7	25	28.6	57.5	79.3	262	23
24	54.1	73.9	187	72.5	57.5	49.3	36.5	25.1	28.9	49.3	98.3	248	24
25	58.1	88.6	193	72.8	58.1	49.3	41.9	25.4	41.3	51.5	89.2	209	25
26	96.3	95.4	208	71.6	56.1	44.7	48.1	25.1	65.4	53.2	81.6	203	26
27	112	123	202	72.5	30.9	47.3	45	25	59.5	64	82.4	204	27
28	107	141	187	65.7	25.8	49.3	43.9	40.8	42.5	71.1	81.6	198	28
29	123		179	66.6	25.9	50.1	50.4	42.2	54.9	76.7	80.4	173	29
30	133		272	63.4	28.2	47.6	52.1	30.9	53.5	76.2	83.8	151	30
31	95.2		346		26.8		50.4	31.2		73.1		131	31
TOTAL	18980	2011.6	4390.4	4804.6	1312.8	1791 2	1526.	1082.3	1131	2037.6	3081.2	6991.9	TOTAL
MEAN	61.2	71.8	142	160	42.3	59.7	49.2	34.9	37.7	65.7	103	226	MEAN
DAM3	16400	174000	379000	415000	113000	155000	132000	93500	97700	176000	266000	604000	DAM3
MAX	133	141	346	391	59.2	148	76.2	52.4	71.4	98.6	176	586	MAX
MIN	38.8	48.1	86.7	63.4	25.8	26.4	33.7	24.9	26.5	36.2	61.5	81.8	MIN

SUMMARY FOR THE YEAR 2010
Total discharge, 2770000 DAM3
Mean discharge, 87.8 M3/S
Maximum daily discharge, 586 M3/S On 2010-12-15
Minimum daily discharge, 24.9 M3/S On 2010-08-22

NOTES: THE DISCHARGE ARE PROVISIONAL AND ARE SUPPLIED BY ENVIRONMENT CANADA IN COOPERATION WITH WOODLAND PULP LLC.
E - ESTIMATED
B - ICE CONDITIONS

TABLE VII
ST. CROIX RIVER AT MILLTOWN DAM
DAILY MEAN WATER LEVELS IN METRES FOR 2010

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	DAY
1	13.571	13.628	13.913	14.185	13.702	13.828	13.724	13.678	13.643	13.809	13.853	14.087	1
2	13.580	13.615	13.920	---	13.706	13.851	13.755	13.665	13.646	13.812	13.831	14.133	2
3	13.562	13.634	14.027	---	13.725	13.852	13.801	13.624	13.647	13.804	13.855	14.148	3
4	13.560	13.611	14.023	---	13.746	13.858	13.700	13.658	13.631	13.725	13.807 E	14.058	4
5	13.610	13.608	13.994	---	13.743	13.869	13.701	13.664	13.624	13.834	13.898 E	14.039	5
6	13.599	13.605	14.052	14.112 E	13.758	13.945	13.714	13.661	13.629	13.58	---	14.056	6
7	13.595	13.609	14.052	14.008 E	13.765	13.981	13.710	13.660	13.624	13.795	---	14.001	7
8	13.590	13.656	14.125	14.02 E	13.776	13.690	13.692	13.643	13.64	13.823	13.898 E	14.013	8
9	13.584	13.657	14.104	14.02 E	13.781	13.656	13.686	13.658	13.64	13.643	13.807 E	14.031 A	9
10	13.603	13.584	14.114	---	13.773	13.700	13.703	13.658	13.638	13.663	14.020 E	14.001	10
11	13.590	13.595	14.102	---	13.784	13.719	13.687	13.654	13.641	13.677	---	13.858	11
12	13.594	13.572	14.126	14.020 E	13.777	13.688	13.682	13.655	13.641	13.805	13.959 E	13.889	12
13	13.583	13.585	14.161	13.929 E	13.785	13.674	13.696	13.663	13.634	13.679	---	14.201	13
14	13.585	13.575	14.178	13.959 E	13.791	13.707	13.677	13.650	13.643	13.776	---	14.607	14
15	13.587	13.581	14.212	13.959 E	13.770	13.698	13.708	13.652	13.635	13.680	14.051 E	14.607	15
16	13.590	13.585	14.228	13.959 E	13.788	13.712	13.676	13.658	13.641	13.778	14.051 E	13.988	16
17	13.566	13.643	14.253	---	13.788	13.704	13.686	13.586	13.631	13.815	13.959 E	13.833	17
18	13.586	13.620	14.246	---	13.804	13.708	13.684	---	13.714	13.813	14.051 E	13.835	18
19	13.599	13.628	14.192	14.02 E	13.823	13.701	13.687	---	13.935	13.825	13.990 E	13.974	19
20	13.578	13.625	14.182	14.02 E	13.794	13.702	13.69	---	13.854	13.769 ---		13.888	20
21	13.569	13.619	14.135	14.059	13.788	13.706	13.677	13.651	13.657	13.671 ---		14.009	21
22	13.586	13.648	14.140	13.957	13.791	13.725	13.753	13.647	13.64	13.694	13.959 E	14.09	22
23	13.595	13.669	14.113	13.877	13.787	13.699	13.702	13.645	13.654	13.707	13.898 E	14.106	23
24	13.601	13.787	14.098	13.847	13.794	13.701	13.674	13.637	13.657	13.731	14.051 E	14.087	24
25	13.585	13.979	14.113	13.952	13.813	13.704	13.674	13.637	13.692	13.730	13.990 E	14.076	25
26	13.702	13.973	14.121	13.861	13.787	13.707	13.665	13.651	13.768	13.725	14.027	14.158	26
27	13.747	13.998	14.000	13.830	13.747	13.709	13.655	13.642	13.752	13.726	14.061	14.219	27
28	13.730	13.994	14.013	13.726	13.773	13.705	13.671	13.667	13.671	13.821	14.019 A	14.164	28
29	13.664		14.053	13.693	13.796	13.703	13.666	13.640	13.685	13.888	13.989	14.073	29
30	13.717		14.122	13.685	13.812	13.710	13.682	13.624	13.688	13.881	14.052	14.045	30
31	13.557		14.103		13.828		13.671	13.642		13.837		14.000 A	31

SUMMARY FOR THE YEAR 2010
NOTES: WATER LEVELS ARE IN METRES AND ARE REFERENCED TO GEODETIC SURVEY OF CANADA
THE WATER LEVEL DATA ARE PROVISONAL AND ARE SUPPLIED BY ENVIRONMENT CANADA AND NB POWER CORPORATION
A - PARTIAL DAY
E - ESTIMATED

APPENDIX 5

WATER QUALITY DATA

Grab Sample Results - 2010								
PARAMETER	UNIT	GUIDELINES[1]	FOREST CITY			MILTOWN		
			COUNT	MINIMUM	MAXIMUM	COUNT	MINIMUM	MAXIMUM
ALUMINUM	µg/L	100	9	5	22	9	67	**143**
ANTIMONY	µg/L		7	<0.1	<0.1	7	<0.1	<0.1
ARSENIC	µg/L	5	7	<0.1	0.5	7	<0.1	0.83
BARIUM	µg/L		9	<1	2	9	4	10
BERYLLIUM	µg/L		7	<0.1	<0.1	7	<0.1	<0.1
CADMIUM	µg/L	calculated	7	<0.1	<0.1	7	<0.1	<0.1
CALCIUM	mg/L		9	3.15	4.5	9	2.68	4.87
CHLORIDE	mg/L	150[2]	9	1.4	1.75	9	2.37	7.37
CHROMIUM	µg/L	8.9	7	<0.4	<0.4	7	<0.4	<0.4
COBALT	µg/L		7	<0.1	<0.1	7	<0.1	<0.1
COLOUR	Hazen Units		9	10	13	9	43	72
COPPER	µg/L	2	7	0.2	0.3	7	<0.2	0.6
GRAN ALKALINITY	mg/L ($CaCO_3$)		9	10.63	11.7	9	7.26	18.11
IRON	mg/L	0.3	9	<0.02	0.03	9	0.12	0.25
LEAD	µg/L	1	7	<0.1	<0.1	7	<0.1	0.2
MAGNESIUM	mg/L		9	0.46	0.65	9	0.55	0.81
MANGANESE	µg/L		9	<2	6	9	19	63
MOLYBDENUM	µg/L	73	7	<0.1	0.1	7	<0.1	<0.1
NICKEL	µg/L	25	7	<0.1	0.2	7	<0.1	1
NITRATE	mg/L as Nitrogen	2.9	9	<0.02	<0.02	9	<0.02	0.12
pH - LAB	pH Units	6.5-9.0	9	7.35	7.48	9	7.02	7.49
PHOSPHOROUS	mg/L	0.03[3]	9	0.004	0.009	9	0.015	**0.032**
POTASSIUM	mg/L		9	0.2	0.41	9	0.32	1.2
SELENIUM	µg/L		7	<0.1	<0.1	7	<0.1	<0.1
SILVER	µg/L	0.05	7	<0.1	<0.1	7	<0.1	<0.1
SODIUM	mg/L		9	1.14	1.56	9	3.13	10.63
SPECIFIC CONDUCTANCE - LAB	µS/cm		9	33	35.6	9	34.9	93.9
STRONTIUM	µg/L		9	16	23	9	13	23
SULPHATE	mg/L		9	1.76	2.19	9	3.48	12.36
THALLIUM	µg/L		7	<0.1	<0.1	7	<0.1	<0.1
TIN	µg/L		7	<0.1	<0.1	7	<0.1	<0.1
TITANIUM	µg/L		7	0.1	0.7	7	<0.1	1.5
TOTAL ALKALINITY	mg/L ($CaCO_3$)		9	<20	<20	9	<20	<20
TOTAL NITROGEN	mg/L		9	0.14	0.2	9	0.28	0.38
TOTAL ORGANIC CARBON	mg/L		9	3.8	4.2	9	7.5	10.3
TURBIDITY	NTU		9	0.1	0.4	9	0.2	2.1
URANIUM	µg/L		7	<0.1	<0.1	7	<0.1	<0.1
VANADIUM	µg/L		7	<0.1	0.1	7	<0.1	0.69
ZINC	µg/L	calculated[2]	7	<0.3	<0.3	7	<0.3	**15.7**

Notes:

"-" - not tested; µg/L - microgram per litre; mg/L - milligrams per litre; $CaCO_3$ - calcium carbonate; µS/cm - microSiemens per centimetre; NTU - nephelometric turbidity units

1 - Guidelines refer to the Canadian Council of Ministers of the Environment (CCME) guidelines (2010 update) unless otherwise indicated. Bold and shading indicates exceedance.

2 - British Columbia Ministry of the Environment (BC MOE),. 2001. BC Approved Water Quality Guidelines (criteria) 1998 edition. Environmental Protection Division, British Columbia Ministry of Environment, Victoria, British Columbia. Updated August 24, 2001 (www.env.gov.bc.ca/wat/wq/BCguidelines/approv_wq_guide/approved.html).

3 - Ontario Ministry of the Environment. 1994. Water Management Policies, Guidelines, Provincial Water Quality Objectives of the Ministry of Environment and Energy [reprinted February 1999]. Ontario Ministry of the Environment. 67 pp.

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St. Croix River at Forest City, ME - 2010

Temperature (°C)

	January	February	March	April	May	June	July	August	September	October	November	December[1]
Min	0.0	0.5	0.9	2.5	8.3	15.4	18.8	20.8	15.4	7.1	1.4	0.0
Max	0.5	1.0	2.7	13.0	20.3	23.2	26.1	25.5	26.1	18.5	9.1	3.7
Mean	0.3	0.8	1.8	6.4	13.3	18.5	23.2	22.8	18.5	11.9	5.6	2.0
% of monthly data used	85	100	93	96	97	95	97	99	93	100	97	43

Dissolved Oxygen (mg/L)

	January	February	March	April	May	June	July	August	September	October	November	December[1]
Min	13.2	13.2	12.8	10.8	9.3	8.6	8.0	8.1	8.1	8.9	10.5	11.3
Max	13.4	13.5	13.4	12.8	11.1	9.7	9.1	8.8	9.5	11.1	12.3	12.7
Mean	13.3	13.4	13.1	11.9	10.2	9.2	8.5	8.4	8.9	10.0	11.2	11.8
% of monthly data used	83	100	93	96	97	95	97	99	93	100	97	43

pH (pH units)

	January[2]	February	March	April	May	June	July	August	September[3]	October[3]	November	December[1]
Min	6.7	6.7	6.6	6.9	7.2	6.6	6.6	6.9	6.7	-	6.1	5.8
Max	7.0	7.0	7.0	7.3	7.4	7.4	7.1	7.3	7.2	-	6.7	7.2
Mean	6.9	6.9	6.9	7.1	7.3	7.1	6.9	7.0	6.9	-	6.4	6.7
% of monthly data used	71	88	92	95	97	95	97	99	16	-	86	41

Specific Conductance (µS/cm)

	January	February[4]	March[4]	April[4]	May	June	July	August	September	October	November	December[1]
Min	25.3	29.9	-	29.7	30.8	31.1	31.2	30.9	29.8	32.6	32.0	31.7
Max	31.8	31.3	-	31.7	32.8	34.1	34.7	33.4	35.8	37.8	36.3	35.5
Mean	30.8	30.7	-	30.5	31.6	31.9	32.8	32.3	32.1	34.6	35.2	34.1
% of monthly data used	77	44	-	32	95	93	97	80	83	93	96	43

Notes:

1. Sonde stopped measuring on December 15, 2010 when the monitoring station was destroyed by fire.
2. pH sensor was experiencing technical issues for the first deployment period of the year.
3. A power loss on September 8, 2010 affected pH sensor readings for the remainder of the deployment period (until November 4, 2010) and therefore have been excluded.
4. No log of specific conductance data available between February 25, 2010 and April 21, 2010.

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St. Croix River at Milltown, NB - 2010

Temperature (°C)

	January	February	March	April	May	June	July	August	September[1]	October	November	December
Min	-0.1	-0.1	0.2	4.1	11.1	16.6	20.8	21.6	15.5	7.9	0.7	-0.1
Max	1.1	1.9	6.1	13.6	21.4	24.3	27.1	25.2	25.4	18.4	8.9	3.3
Mean	0.0	0.6	3.0	9.5	15.8	20.1	24.7	23.3	18.0	12.0	5.4	1.0
% of monthly data used	96	100	97	99	99	98	95	91	73	99	98	94

Dissolved Oxygen (mg/L)

	January	February	March	April	May	June	July	August	September[1]	October	November	December
Min	13.4	13.5	12.6	9.9	8.8	8.2	7.6	7.7	8.1	9.3	11.4	12.8
Max	14.4	14.4	14.8	13.0	10.7	9.7	8.8	8.6	9.9	11.5	14.3	14.6
Mean	13.9	13.9	13.5	11.0	9.7	8.8	8.1	8.3	9.4	10.6	12.5	14.0
% of monthly data used	96	100	96	99	99	98	95	91	73	99	98	94

pH (pH units)

	January	February	March	April	May	June	July	August	September[1]	October	November	December
Min	6.4	6.3	6.3	6.2	6.7	6.4	6.8	6.8	6.6	6.3	6.4	5.8
Max	6.8	6.7	6.6	6.9	7.1	7.1	7.3	7.2	7.2	7.0	6.8	6.8
Mean	6.6	6.6	6.5	6.6	6.9	6.8	7.0	7.1	6.9	6.7	6.6	6.4
% of monthly data used	96	100	97	99	99	93	87	86	73	98	98	95

Specific Conductance (µS/cm)

	January	February	March	April	May	June	July	August	September[1]	October	November	December
Min	35.0	37.9	24.4	22.5	50.9	36.2	43.8	57.6	31.4	42.5	38.3	13.0
Max	93.3	70.4	41.1	60.2	93.1	89.0	83.6	101.1	90.7	74.7	60.7	49.0
Mean	69.3	53.7	34.5	38.4	70.1	61.3	64.3	79.3	60.2	59.0	46.5	32.0
% of monthly data used	96	100	97	99	99	95	88	86	73	99	98	94

Notes:

1. Sonde was not deployed from September 1-9, 2010

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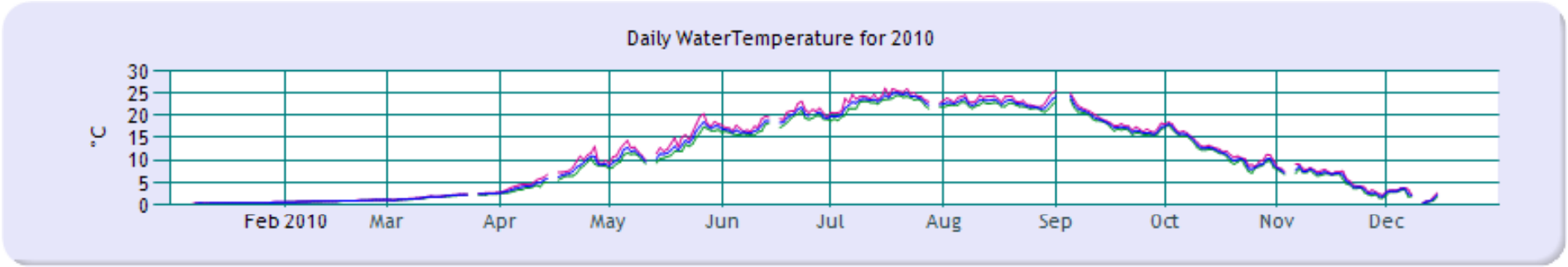
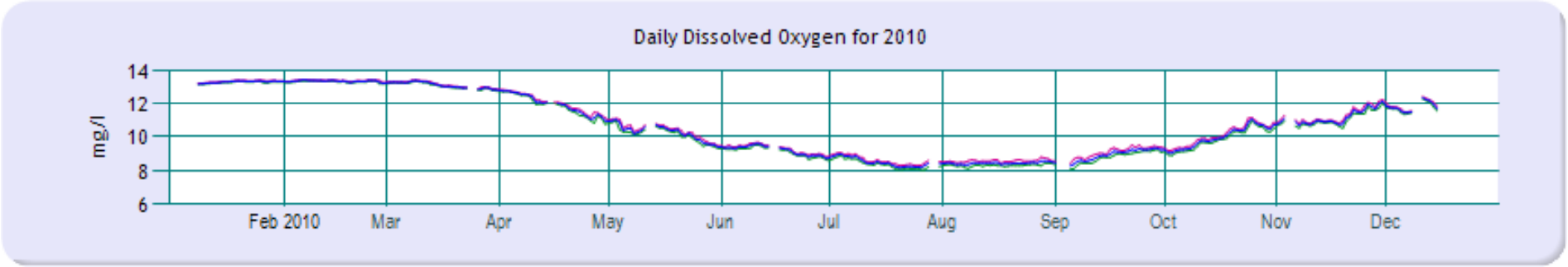
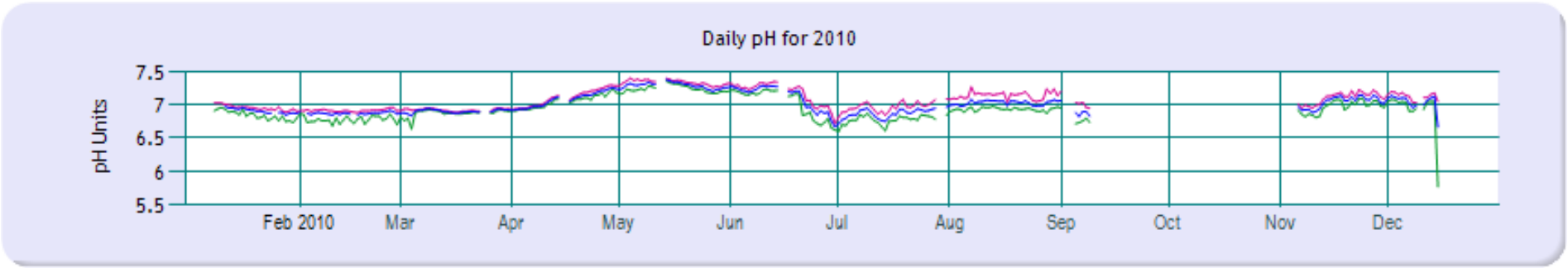
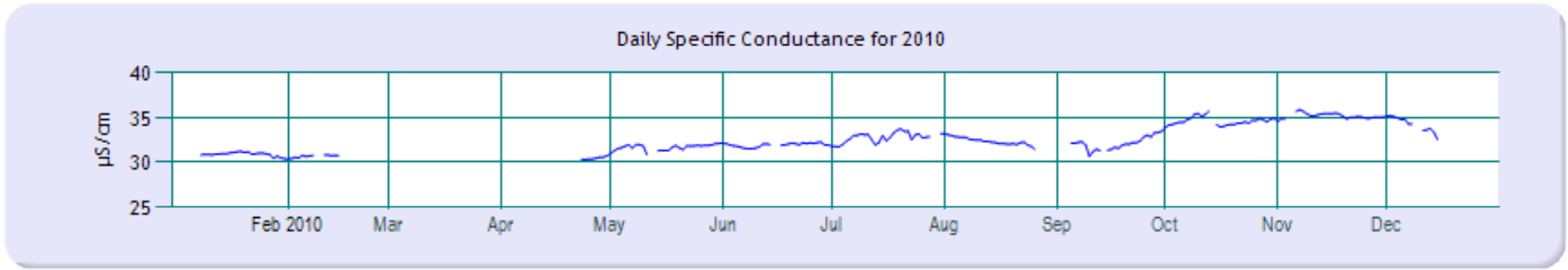
St. Croix River at Forest City Dam, ME









Minimum Maximum Mean

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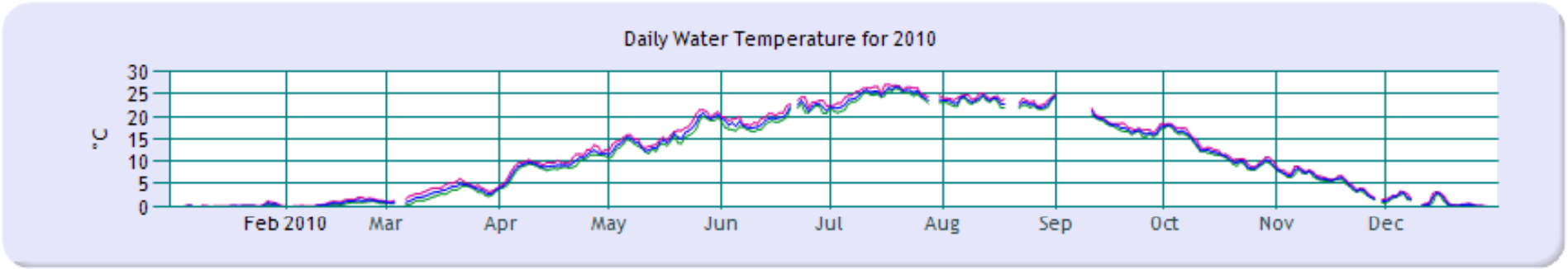
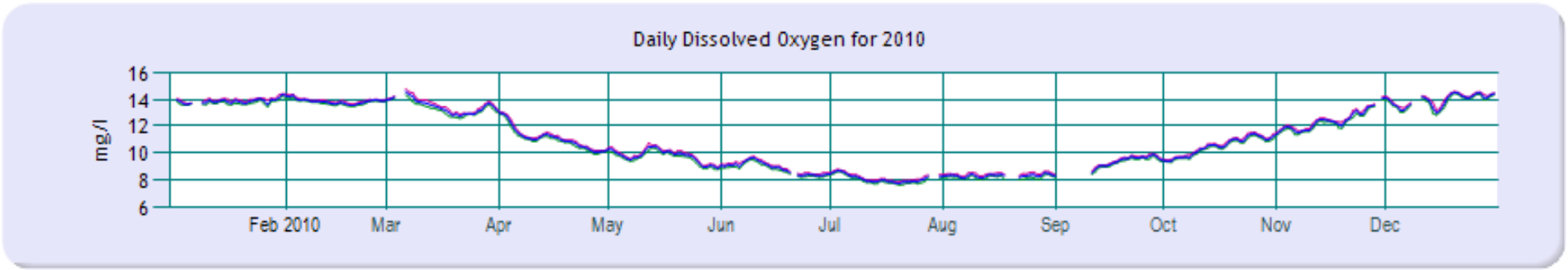
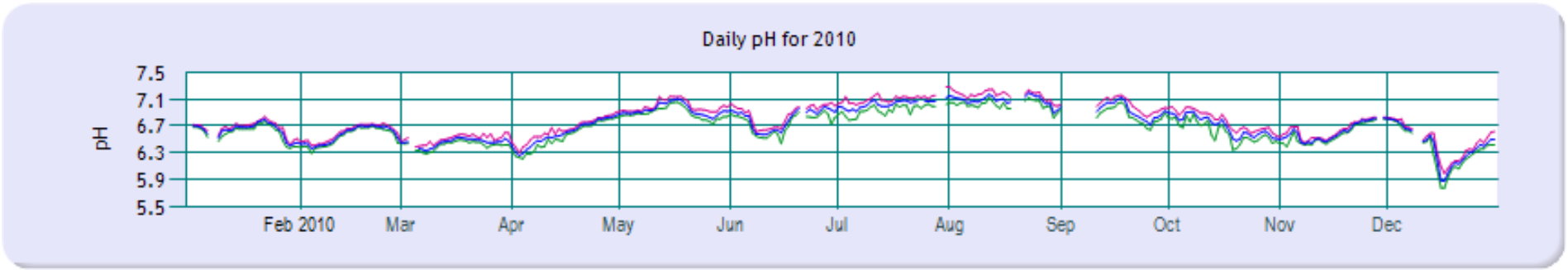
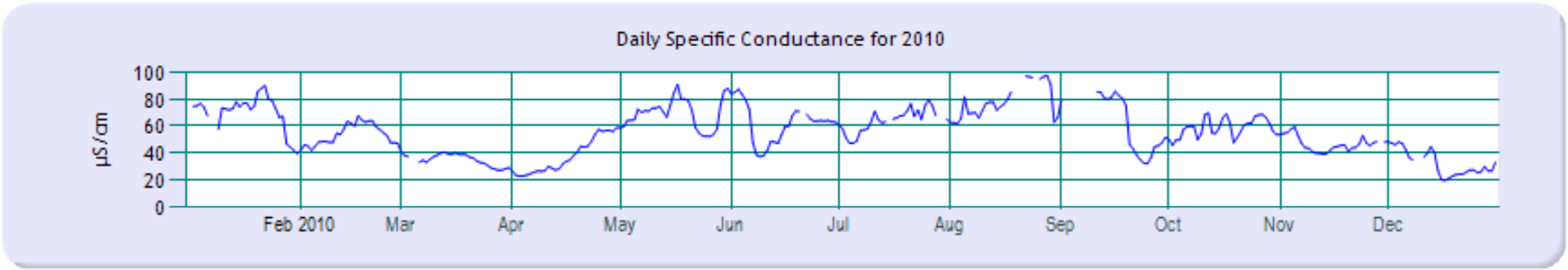
St. Croix River at Milltown, NB









Minimum Maximum Mean