

# WATER POWER ACT LICENCES

## LAURIE RIVER #1 GENERATING STATION SHORT-TERM EXTENSION LICENCE APPLICATION

### SUPPORTING DOCUMENTATION

Prepared for:

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HYDRAULIC OPERATIONS DEPARTMENT  
POWER SALES & OPERATIONS DIVISION  
POWER SUPPLY

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## **1.0 INTRODUCTION**

This report is provided at the request of Manitoba Water Stewardship to provide additional information in support of a short-term extension licence application. Manitoba Hydro requested this extension licence on February 04, 2010 in accordance with Section 92 of The Water Power Regulation, Manitoba Regulation 25/88R of *The Water Power Act* (WPA).

Manitoba Hydro operates the Laurie River #1 Generating Station (GS) in accordance with the Final Licence for the Development of Water Power at the Laurie River #1 Site on the Laurie River. This licence was issued in accordance with the provisions of *The Water Power Act* on June 17, 1958. The licence was issued for a term of 40 years to be computed from January 1, 1953.

Manitoba Hydro submitted the application to renew the Final Licence on June 09, 1989. With recent staffing improvements by both Manitoba Hydro and Manitoba Water Stewardship, there is a renewed focus on issuing a renewal of the Final Licence.

## **2.0 PROJECT COMPONENTS**

The Laurie River #1 GS is located approximately 200 km (120 miles) northwest of Thompson and approximately 125 km (78 miles) upstream of Southern Indian Lake, as shown in Figure 1. Photograph 1 shows the Laurie River #1 GS powerhouse and spillway.

The Laurie River #1 GS is a part of the Laurie River Development. Other regulating structures associated with this development include the Laurie River #2 GS, Russell Lake Dam, Eager Lake Dam, Loon River Diversion and the Kamuchawie Lake Weir (a regulating structure not specifically included in the licence), as shown in Figure 1.

### **2.1 Laurie River #1 Generating Station**

The Laurie River #1 GS consists of a powerhouse, spillway and gravity structures and has a name plate capacity of 7,000 horsepower (5 MW). Construction of the station was completed by Sherritt Gordon Mines Limited to supply their mining operations in the area. The generating station originally went into operation in 1952 and was officially transferred to Manitoba Hydro on May 01, 1970.

The station components include a two unit powerhouse, a five bay stoplog controlled spillway and three gravity dams. Figure 2 shows the general arrangement of the concrete structures. Table 1 summarizes major characteristics of the station.

*Table 1: Laurie River #1 G.S. Major Characteristics*

Construction Period	1950 to 1952
Capacity	7,000 horsepower (5 MW)
Average Annual Generation	27 million kW-h
Waterfall Drop (head)	16.6 m (54.5 ft)
Maximum Licence Forebay Elevation	Not specified in WPA licence
Normal Maximum Forebay Elevation (NMFE)	46.6 m (153.0 ft)*
Available Freeboard @ NMFE - Conc. Structures	1.5 m (5.0 ft) *without wind or wave effects

\* Assumed local datum

Table 2 summarizes major characteristics of the Laurie River #1 powerhouse, spillway and gravity dams.

*Table 2: Laurie River #1 G.S. Component Characteristics*

<b>Powerhouse</b>	Number of Units	2
	Length	23.1 m (76.0 ft)
	Deck Elevation	48.16 m (158.0 ft)*
	Discharge Capability (at full gate)	34 m <sup>3</sup> /s (1,200 ft <sup>3</sup> /s)
	Power Production Unit 1 Unit 2	3,500 horsepower 3,500 horsepower
<b>Spillway</b>	Number of Bays	5 bays
	Length	30.5 m (100.0 ft)
	Deck Elevation	48.16 m (158.0 ft)*
	Discharge Capability (at normal maximum forebay elevation)	295 m <sup>3</sup> /s (10,400 ft <sup>3</sup> /s)
<b>East Gravity Structure</b>	Length	114.9 m (377.0 ft)
	Design Crest Elevation	48.16 m (158.0 ft)*
<b>Centre Gravity Structure</b>	Length	5.5 m (18.0 ft)
	Design Crest Elevation	48.16 m (158.0 ft)*
<b>West Gravity Structure</b>	Length	99.7 m (327.0 ft)
	Design Crest Elevation	48.16 m (158.0 ft)*

\* Assumed local datum

## 2.2 Russell Lake Dam

Russell Lake Dam is an earthfill structure with a reinforced concrete, three bay stoplog controlled spillway located at the outlet of Russell Lake, approximately 30 km upstream of the Laurie River #2 Generating Station as shown in Figure 1. The dam was constructed by Sherritt Gordon Mines Limited to impound water to ensure reliable winter flows at the Laurie River stations.

In 1982, because of its deteriorated condition, the dam was repaired by stabilizing the two wing walls using rockfill, thus closing the north and south bays

for operations. The normal maximum operating elevation of Russell Lake was lowered from elevation 35.05 m (115.0 ft) to 34.14 m (112.0 ft) as a result of having only the centre bay available for operations. This lowering of three feet is required for flood storage to compensate for the loss of discharge capacity and therefore does not prevent levels from exceeding 34.14 m (112.0 ft). Figure 3 shows general arrangement of the earth dam and control section. Photograph 2 shows the Russell Lake Dam.

Table 3 summarizes the major characteristics of the earth structures and spillway.

*Table 3: Russell Lake Dam Major Characteristics*

Construction Period		Early 1950's (~1952)
Maximum Licence Operating Elevation		Not specified in WPA licence
Normal Maximum Operating Elevation (NMOE)		34.14 m (112.0 ft)*
Available Freeboard @ NMOE - Conc. Structure		1.7 m (5.5 ft) *without wind or wave effects
Available Freeboard @ NMOE - Earth Structure		2.0 m (6.5 ft) *without wind or wave effects
<b>Spillway</b>	Number of Bays	3 bays (1 bay operational)
	Length	15.2 m (50.0 ft)
	Deck Elevation	35.8 m (117.5 ft)*
	Discharge Capability (at normal maximum operating elevation)	29 m <sup>3</sup> /s (1,025 ft <sup>3</sup> /s)
<b>North Earthfill Dyke</b>	Length (approx.)	175.3 m (575.0 ft)
	Design Crest Elevation	36.12 m (118.5 ft)*
<b>South Earthfill Dyke</b>	Length (approx.)	85.0 m (279.0 ft)
	Design Crest Elevation	36.12 m (118.5 ft)*

\* Assumed local datum

### 2.3 Eager Lake Dam

Eager Lake Dam is an earthfill structure with a reinforced concrete, two bay stoplog controlled spillway located at the outlet of Eager Lake, approximately 70 km upstream of the Laurie River #2 Generating Station as shown in Figure 1. The dam was constructed by Sherritt Gordon Mines Limited to impound water to ensure reliable winter flows at the Laurie River stations. Figure 4 shows general arrangement of the earth dam and control section. Photograph 3 shows the Eager Lake Dam.

Table 4 summarizes the major characteristics of the earth structures and spillway.

*Table 4: Eager Lake Dam Major Characteristics*

Construction Period		Mid 1950's (~ 1956)
Maximum Licence Operating Elevation		Not specified in WPA licence
Normal Maximum Operating Elevation (NMOE)		35.05 m (115.0 ft)*
Available Freeboard @ NMOE - Conc. Structure		1.2 m (4.0 ft) *without wind or wave effects
Available Freeboard @ NMOE - Earth Structure		1.5 m (5.0 ft) *without wind or wave effects
<b>Spillway</b>	Number of Bays	2 bays
	Length	10.7 m (35.0 ft)
	Deck Elevation	36.3 m (119.0 ft)*
	Discharge Capability (at normal maximum operating elevation)	113 m <sup>3</sup> /s (4,000 ft <sup>3</sup> /s)
<b>North Earthfill Dyke</b>	Length (approx.)	210.0 m (690.0 ft)
	Design Crest Elevation	36.58 m (120.0 ft)*
<b>South Earthfill Dyke</b>	Length (approx.)	10.0 m (33.0 ft)
	Design Crest Elevation	36.58 m (120.0 ft)*

\* Assumed local datum

## 2.4 Loon River Diversion

The diversion consists of two earthfill dams and a low weir with an uncontrolled crest (i.e. no stoplogs or gates). The Loon River Diversion, constructed by Sherritt Gordon Mines Limited, increases the flow on the Laurie River by diverting all or the majority of the Loon River's flow into Russell Lake.

The works associated with the Loon River Diversion are located approximately 18 km downstream of Kamuchawie Lake near the southwest arm of Russell Lake as shown in Figure 1. Figures 5 and 6 show the general arrangement of the earth dams and control section. Photograph 4 shows the Loon River Dams.

Table 5 summarizes the major characteristics of the diversion.

*Table 5: Loon River Diversion Major Characteristics*

Construction Period		Early 1950's (~ 1953)
Maximum Licence Elevation		Not specified in WPA licence
Normal Maximum Elevation (NME)**		36.9 m (121.0 ft)*
Available Freeboard @ NME - Earth Structure		1.2 m (4.0 ft) *without wind or wave effects
<b>East Channel Dam</b>	Length (approx.)	65.0 m (213.3 ft)
	Design Crest Elevation	38.1 m (125.0 ft)*
<b>West Channel Dam</b>	Length (approx.)	100.0 m (328.1 ft)
	Design Crest Elevation	38.1 m (125.0 ft)*

\* Assumed local datum

\*\* Based on design drawings

## 2.5 Kamuchawie Lake Weir

The structure is a man-made notched weir constructed by Sherritt Gordon Mines Limited with local trees and stones and faced with plywood. The structure acts to regulate the outflow from Kamuchawie Lake (approximately 18 km upstream of the Loon River Diversion as shown in Figure 1) by allowing for a more constant inflow to Russell Lake via the Loon River Diversion. Photograph 5 shows the Kamuchawie Weir.

Table 6 summarizes the major characteristics of the structure.

*Table 6: Kamuchawie Lake Weir Major Characteristics*

Construction Period		Unknown (~ late 1950's)
Maximum Licence Operating Elevation		Not specified in WPA licence
Normal Forebay Elevation (NOE)		Unknown
Available Freeboard		Varies
<b>Weir</b>	Total Length (approx.)	24.4 m (80.0 ft)
	Notch Opening (approx.)	3.0 m (10.0 ft)

## 3.0 WATER POWER LICENSING REQUIREMENTS

### 3.1 Licence Terms

The Final Licence stipulates that:

*“Now therefore, under authority of and subject to the provisions of the Water Power Act and the said Regulations in force thereunder, this Final Licence is issued granting to the lawful holder thereof the right:*

- a) to impound, divert and use the waters of the Laurie River at No. 1 Power Site in the Granville Lake Mining Division of The Pas Mining District of the Province of Manitoba, to develop power or energy therefrom...;*
- b) to impound and store water in Russell and Eager Lakes in the watershed of the said Laurie River for the purpose of regulating the flow thereof;*
- c) to raise and divert to the said Laurie River the entire flowage of the Loon River;*
- d) to use and occupy the lands of the Province hereinafter described.”*

Order-in-Council Number 94/68 and subsequent agreement dated 1970 05 01 between The Manitoba Hydro-Electric Board, Sherritt Gordon Mines Limited, LGD of Lynn Lake and Laurie River Power Company Limited provided for the transfer of the Laurie River Development including water power licences, facilities, dams, reservoirs, transmission lines and distribution system to

Manitoba Hydro. A renewal of the Final Licence would identify Manitoba Hydro as the Licensee.

The Kamuchawie Lake Weir is not referenced within the Final Licence for the Development of Water Power at the Laurie River #1 Site.

### **3.2 Licence Area**

The licence area of the Laurie River Development extends from approximately 2.0 km (1.2 miles) downstream of the Laurie #1 Generating Station north approximately 50 km to Story Lake, south approximately 23 km to Evans Creek and west to the Manitoba/Saskatchewan border. During the final licence renewal, Manitoba Hydro intends to significantly reduce the lands associated with this licence. The licence area is shown in Manitoba Water Stewardship file number 63-1-1017 (renumbered as 65-34-1017). New severance line drawings that reflect all approved changes to the licence area and also show the proposed reduction will be submitted as part of the Final Licence renewal process.

## **4.0 MONITORING PROGRAMS**

### **4.1 Water Levels**

#### *Laurie River #1 GS*

The forebay water level at Laurie River #1 is measured using a water level (staff) gauge mounted on the east gravity structure. The On-site Operator determines the forebay water level by reading the staff gauge directly. Water level data is sent daily to the System Control Centre and the Hydraulic Operations Department. The Hydraulic Operations Department staff enters the data into a hydrometric database that is accessible to interested parties within Manitoba Hydro. Calibration and maintenance of the water level gauge is performed by Relay and Metering Department staff.

#### *Russell Lake*

Environment Canada collects continuous water level data at the Russell Lake near Herriot (06EB006) gauging station. Real time and published data is available to the public on the Environment Canada website.

#### *Eager Lake*

Environment Canada collects continuous water level data at the Eager Lake near Tod Lake (06EB007) gauging station. Real time and published data is available to the public on the Environment Canada website.

#### *Loon River*

Manitoba Hydro collects continuous water level data at the Loon River Dam gauging station. Quality assurance and verification procedures similar to those

performed by Environment Canada are used by Manitoba Hydro to ensure data accuracy. The Hydraulic Operations Department staff enters the data into a hydrometric database that is accessible to interested parties within Manitoba Hydro.

#### *Kamuchawie Lake*

Neither Environment Canada nor Manitoba Hydro collect water level data on Kamuchawie Lake.

## **4.2 Dam Safety**

Manitoba Hydro's Dam Safety Program is based on the Canadian Dam Association Guidelines. Both concrete and earth structures continue to be inspected at regular intervals for any anomalies or deficiencies.

#### *Laurie River #1 GS*

Routine inspections by Manitoba Hydro staff are performed bi-monthly for the concrete structures, including the spillway. Additional inspections of all water retaining structures are performed by specialists from Manitoba Hydro's Engineering Services Division annually.

#### *Russell Lake Dam*

Routine inspections by Manitoba Hydro staff are performed twice per year for both the earth and concrete structures. Additional inspections are performed by specialists from Manitoba Hydro's Engineering Services Division every one to two years.

#### *Eager Lake Dam*

Routine inspections by Manitoba Hydro staff are performed twice per year for both the earth and concrete structures. Additional inspections are performed by specialists from Manitoba Hydro's Engineering Services Division every one to two years.

#### *Loon River Diversion*

Manitoba Hydro staff inspect these structures during intermediate inspections of the Laurie River Development.

#### *Kamuchawie Lake Weir*

Manitoba Hydro staff inspect this structure during intermediate inspections of the Laurie River Development.

SNC Lavalin is currently performing a Dam Safety Review (DSR) inspection of all the primary structures within the Laurie River Development. As part of the Water Power Act licence renewal process, we will be providing a condition assessment report of the generating station and its associated structures.

### **4.3 Aquatic Monitoring**

All of the fisheries on the Laurie River are excellent angling destinations. Laurie River Lodge at McGavock Lake caters to nonresident anglers seeking trophy angling and the lakes upstream are cache lakes of Laurie River Lodge and are also popular remote angling destinations for road based anglers. There are or have been commercial fisheries on Russell, Kakayak and to a lesser degree Mounteney Lakes but all are impacted by the end of scheduled rail service between Pukatawagan and Lynn Lake. Plumtree Lake has a lightly used outcamp of Northern Lites Lodge and downstream of Laurie River #2 GS, Trophy Lake offers excellent angling.

Manitoba Hydro is unaware of any aquatic monitoring in the immediate vicinity of the Laurie River Generating Stations. System wide monitoring of aquatic ecosystem health including water quality, lower trophic levels and fish sampling is taking place downstream on Southern Indian Lake under the Coordinated Aquatic Monitoring Pilot Program (CAMPP); a program of activities by which the Government of Manitoba and Manitoba Hydro are working together to provide objective information about hydrometric and environmental effects of hydro-electric development.

## **5.0 SYSTEM UPGRADES/STUDIES AND AGREEMENTS**

### **5.1 System Upgrades/Studies**

A significant amount of concrete rehabilitation on the Laurie River #1 powerhouse and spillway was completed in 1995.

Extensive rehabilitation and upgrading of electrical and mechanical components of the station were completed in 1996/97.

The access bridge downstream of the station was rehabilitated in 1997 with bridge abutments rehabilitated in 1999.

The structural stability of the spillway and north and south gravity structures was improved by installing post tensioned anchors in 2007.

Repairs to the Russell Lake Dam in 1982 included the stabilization of the two wing walls using rockfill, thereby closing the north and south bays for operations, and the installation of a stoplog hoist that could remove all stoplogs from the centre bay (the only remaining operational bay).

New stoplogs were installed at the Russell Lake Dam in 2005.

Upgrades to the Eager Lake Dam in 2004 included a new lifting mechanism on the hoist, installation of a new deck on the structures, replacement of stoplogs and additional slope protection at the downstream toe of the north wingwall.

## **5.2 Agreements**

Manitoba Hydro and the Pickerel Narrows Community Association Inc. signed an Agreement in 2006 to address issues arising from the effects of Manitoba Hydro works. Settlement proceeds are used by the Association for Community Development Projects.

From time to time, Manitoba Hydro has entered into project-specific agreements with local commercial fishermen to provide assistance with fishing infrastructure that may have been affected by the operation of the Laurie River Development.

## **6.0 CLOSURE STATEMENT**

Manitoba Hydro operates the Laurie River #1 Generating Station in accordance with the Final Licence for the Development of Water Power at the Laurie River #1 Site on the Laurie River. Manitoba Hydro operates and maintains the generating station and associated structures based on the Canadian Dam Association Guidelines.

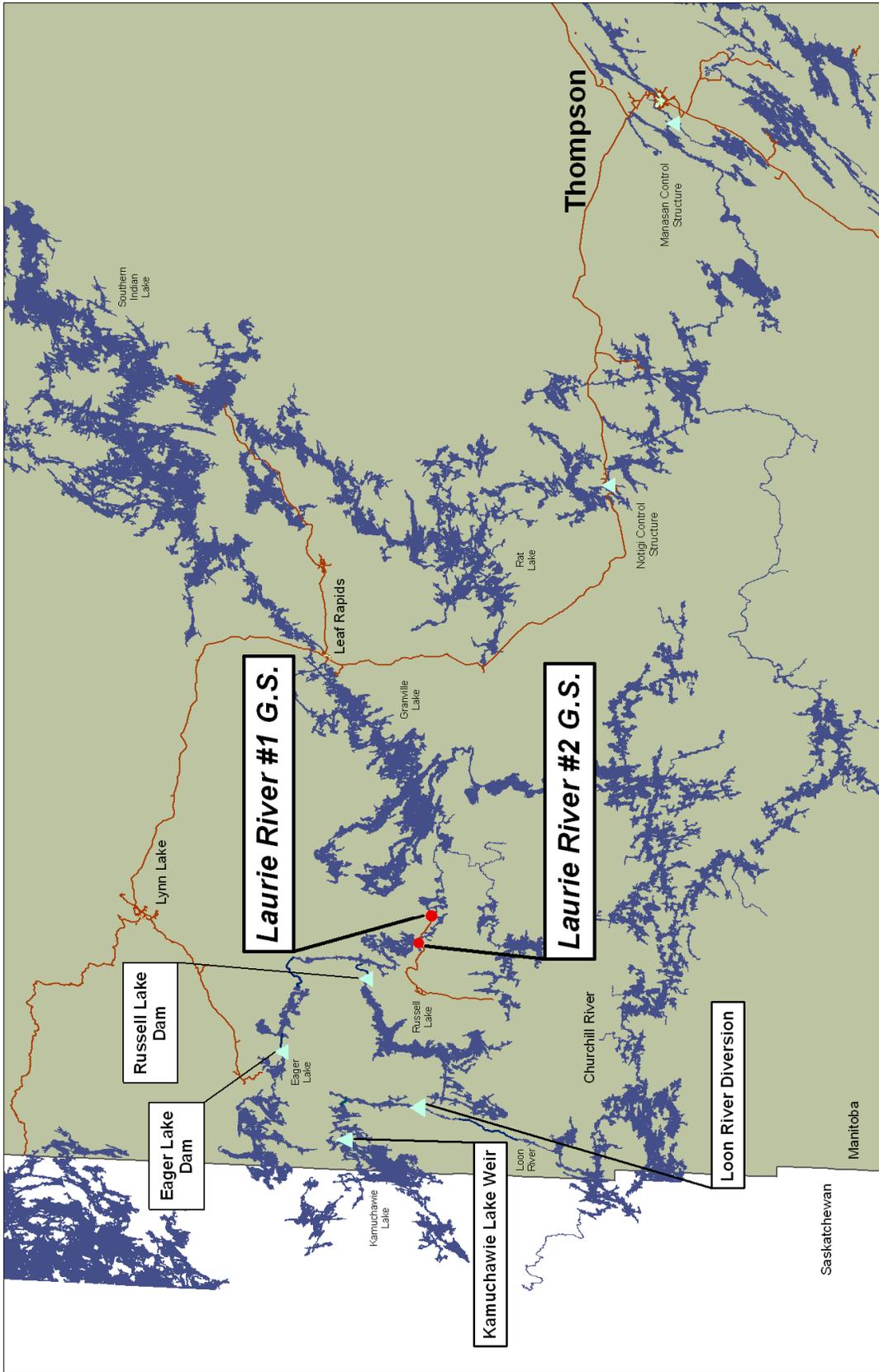


Figure 1: Laurie River Development - General Location

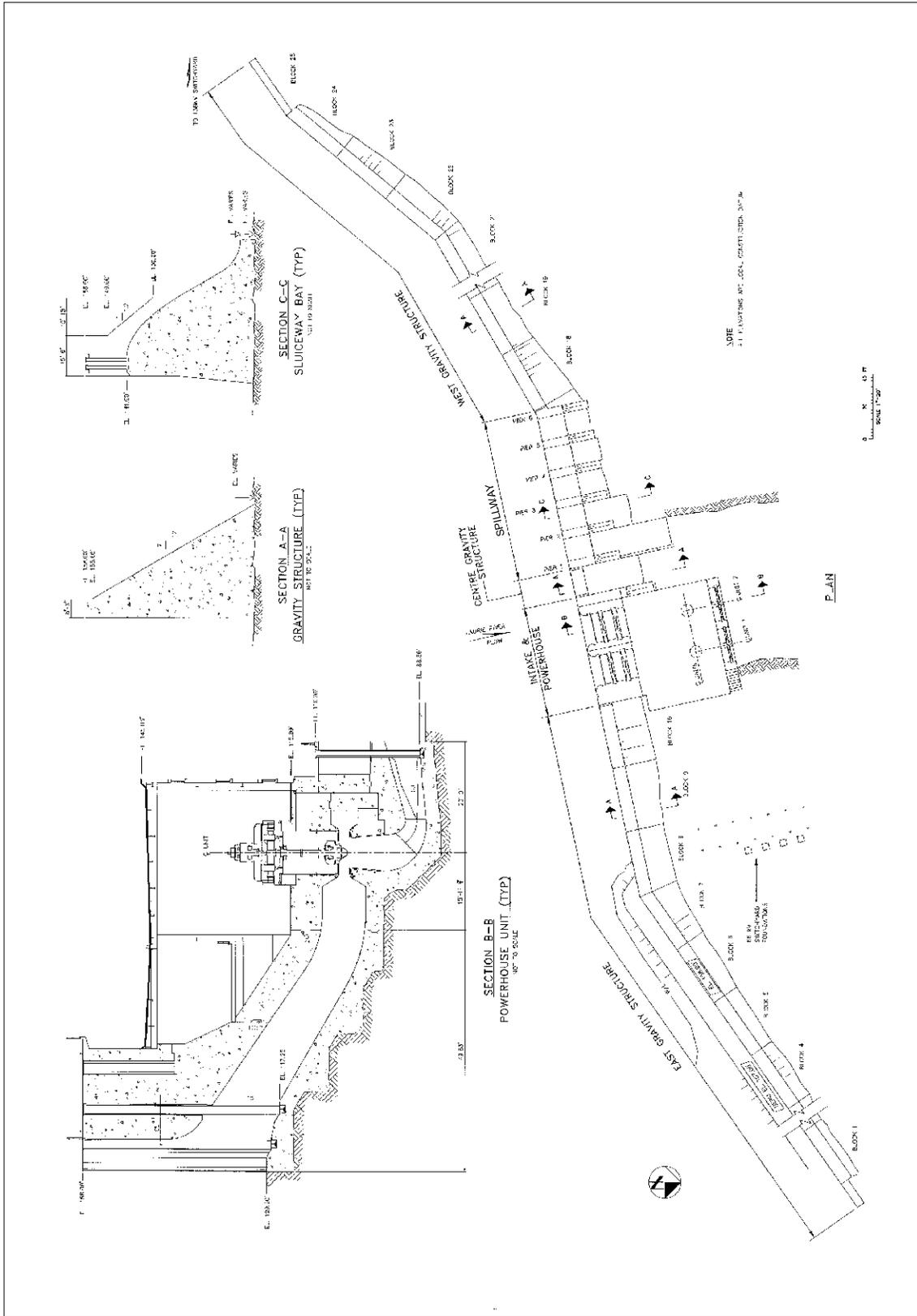


Figure 2: Laurie River #1 Concrete Structures - Plan and Elevation

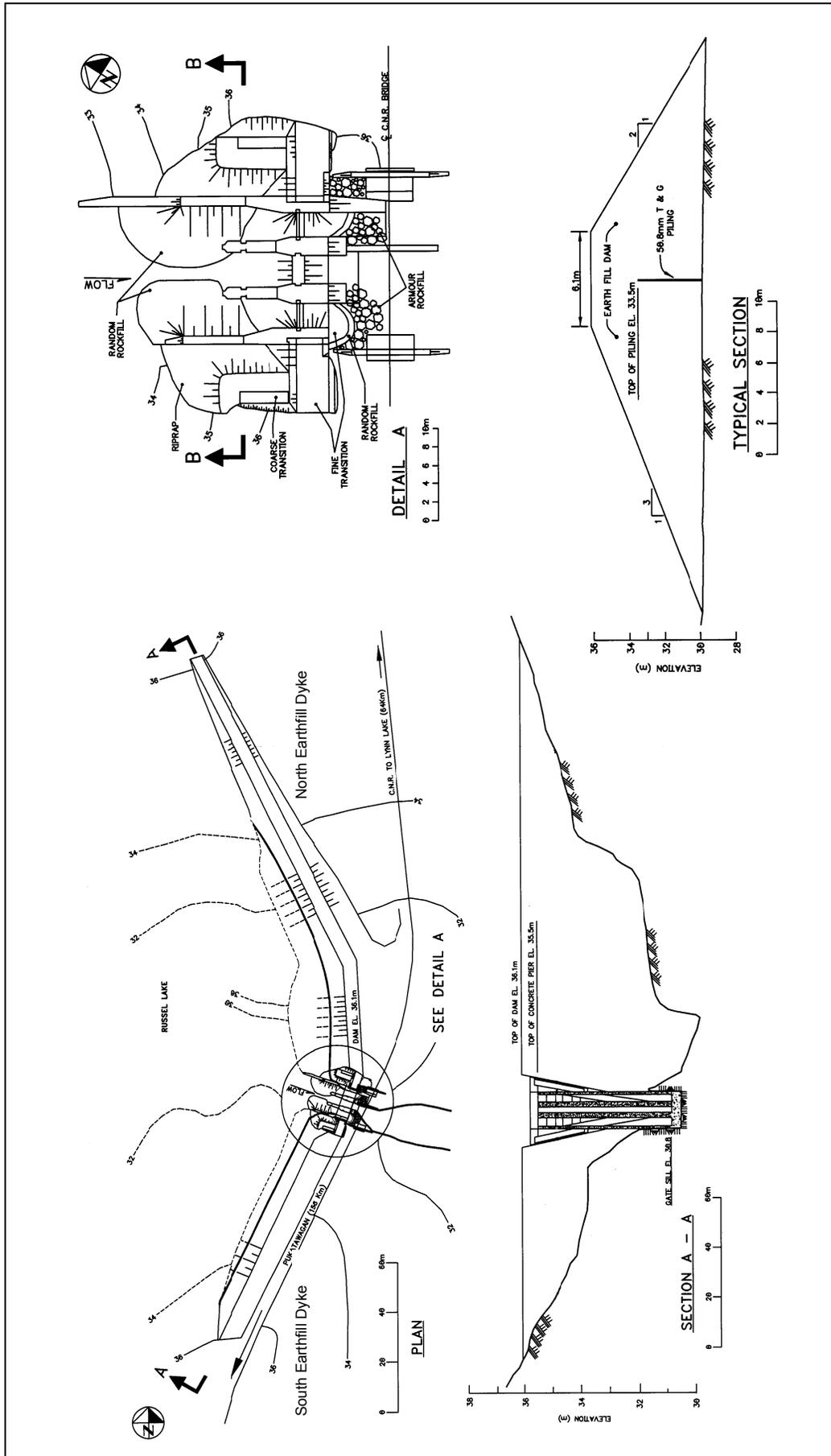


Figure 3: Russell Lake Dam - Plan and Elevation

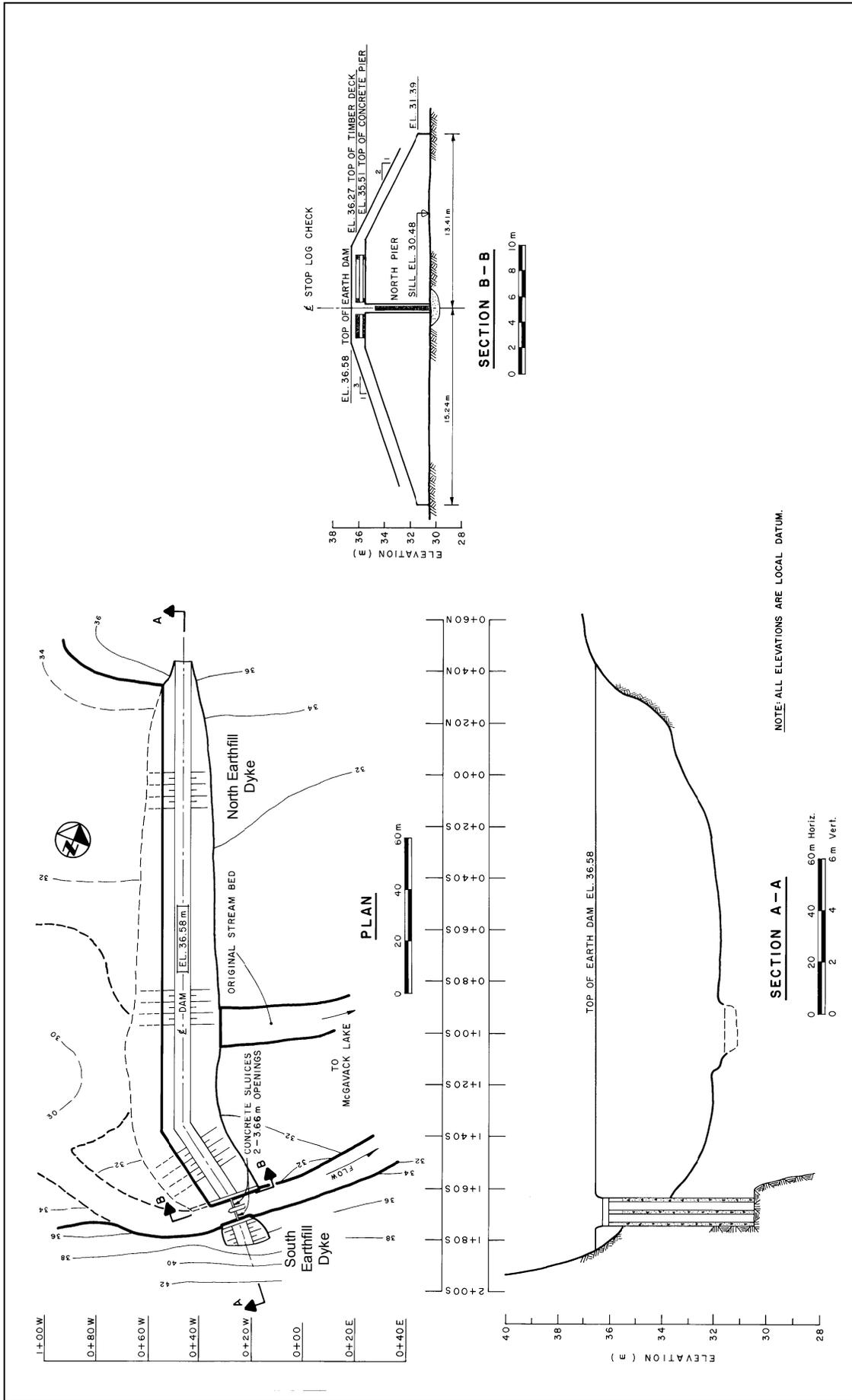


Figure 4: Eager Lake Dam - Plan and Elevation

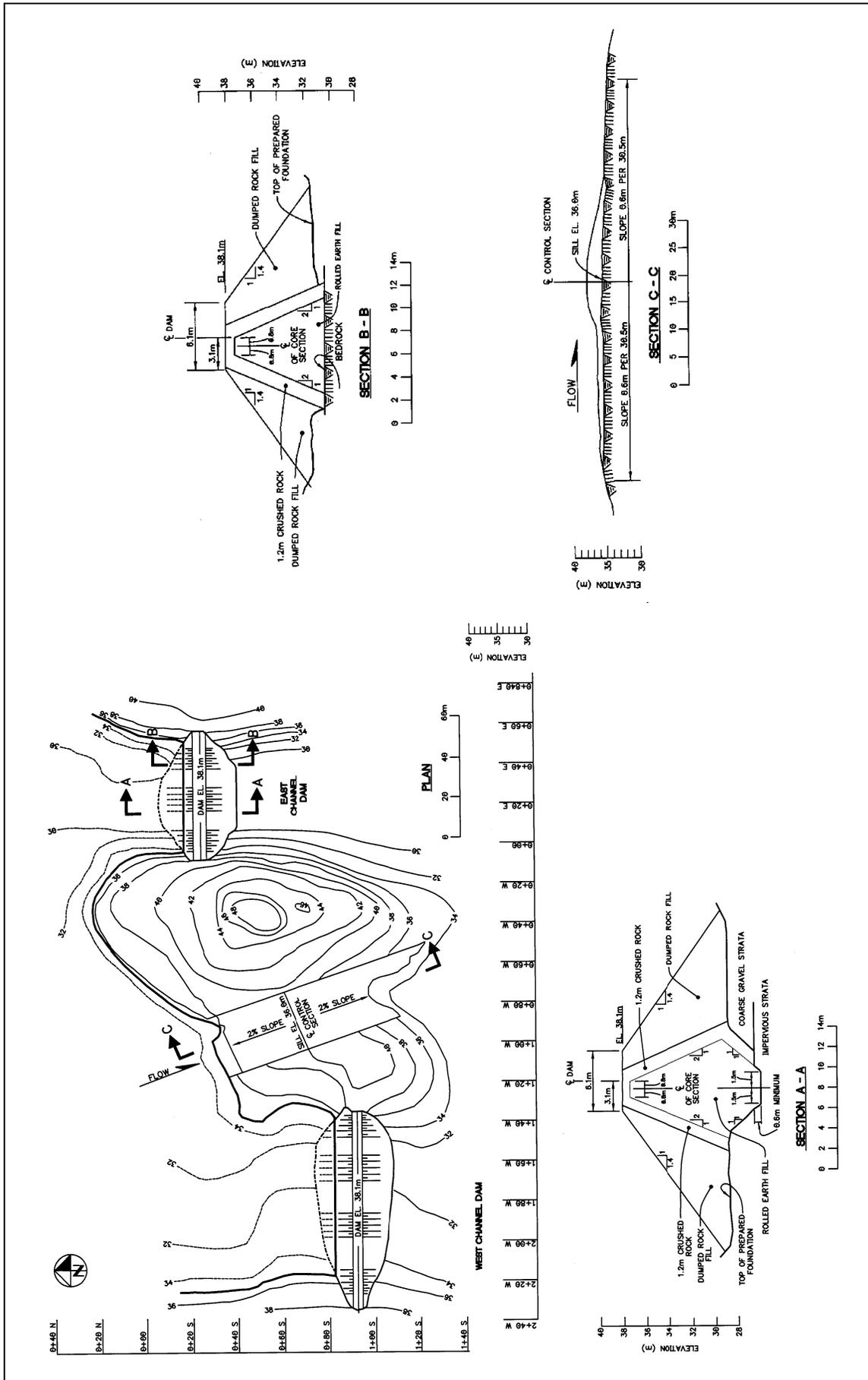


Figure 5: Loon River Diversion - East Dam & Control Section - Plan and Elevation

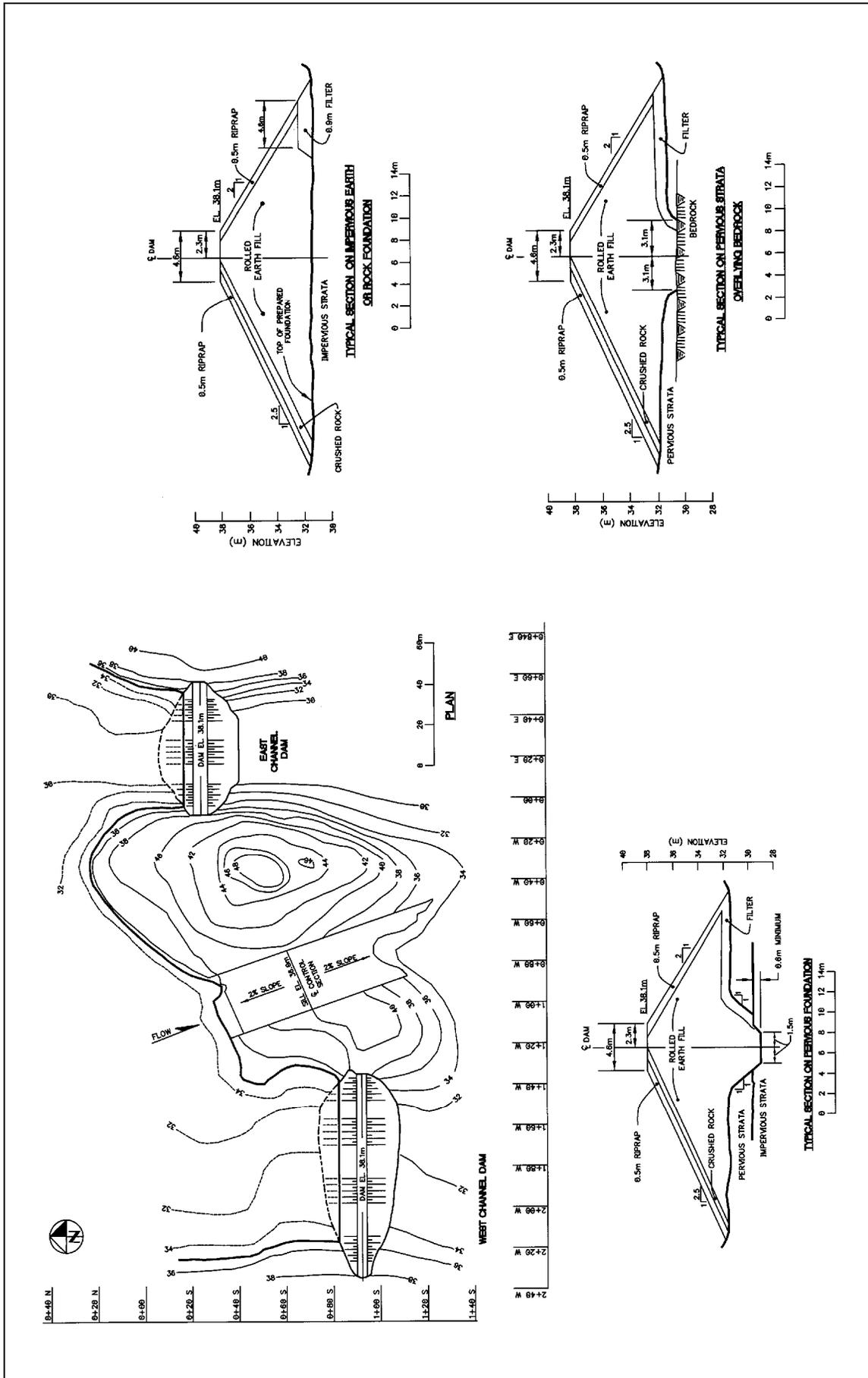


Figure 6: Loon River Diversion - West Dam - Plan and Elevation



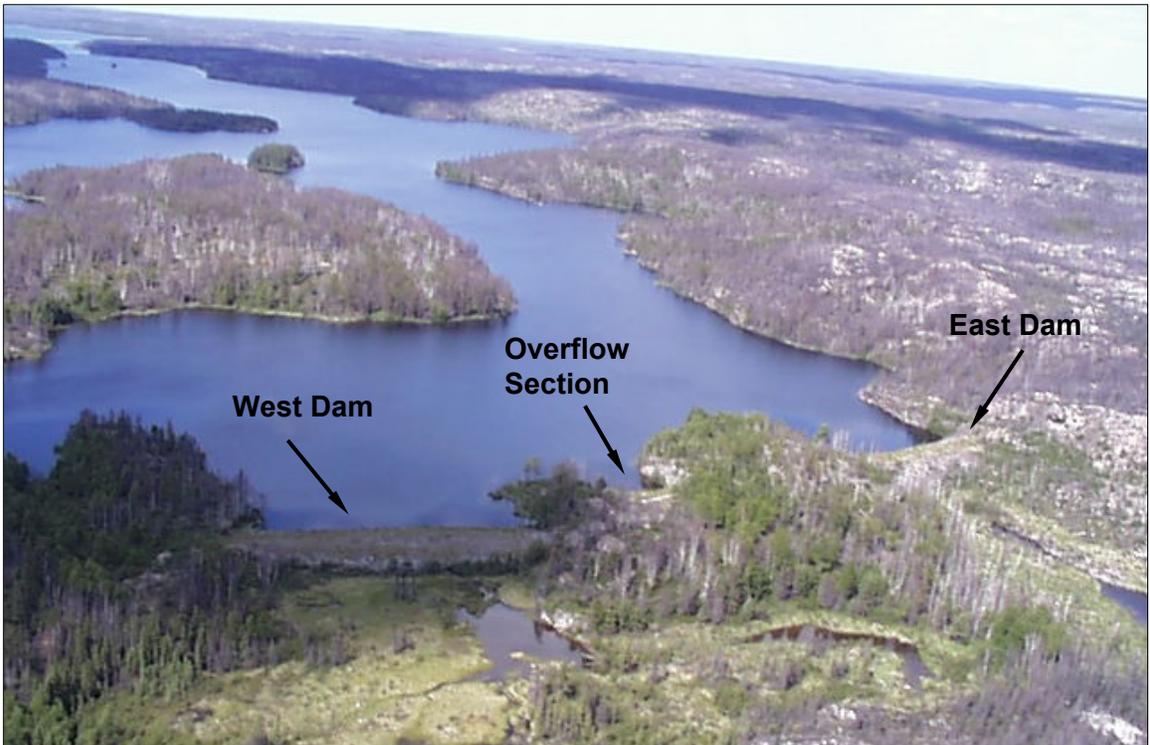
Photograph 1: Laurie River #1 Generating Station



Photograph 2: Russell Lake Control Dam



Photograph 3: Eager Lake Control Dam



Photograph 4: Loon River Dams



Photograph 5: Kamuchawie Lake Weir