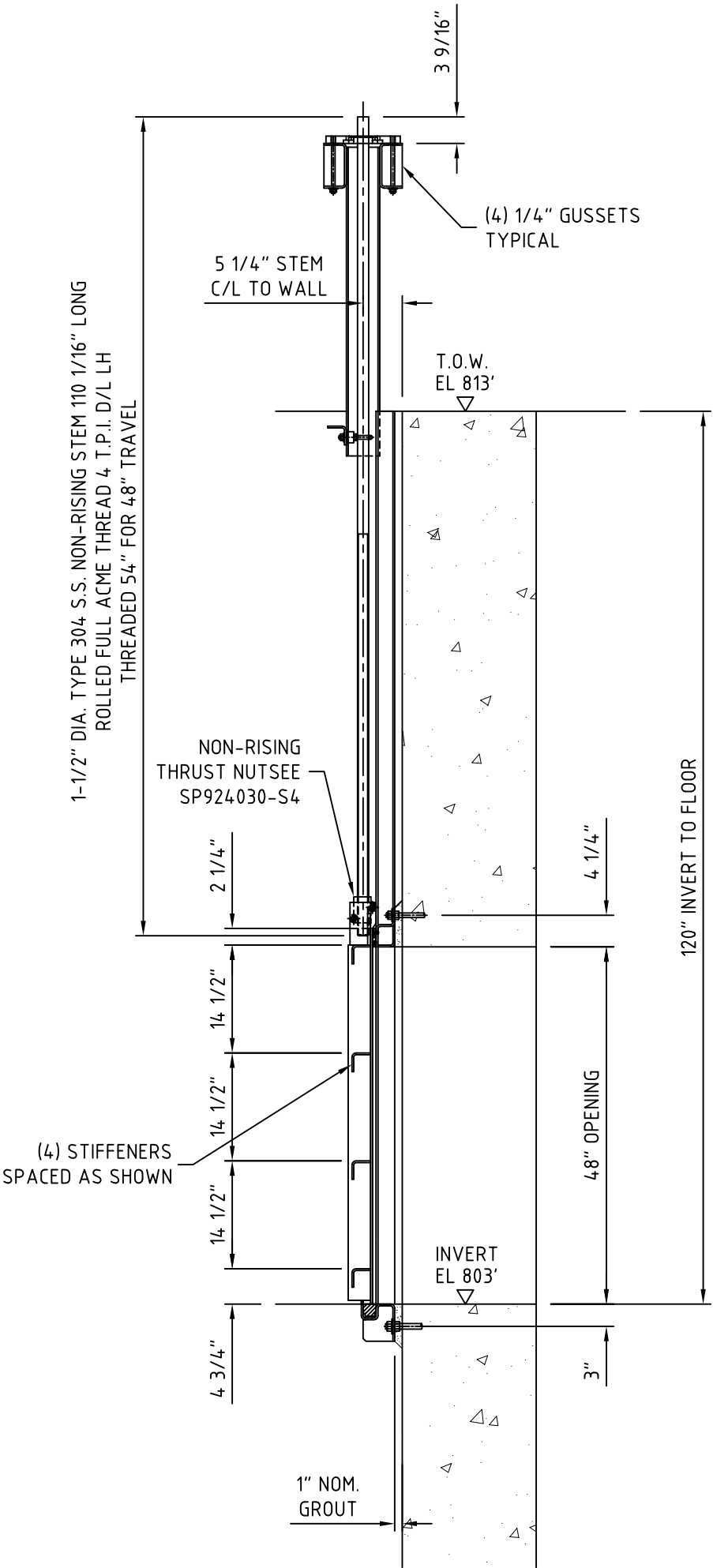
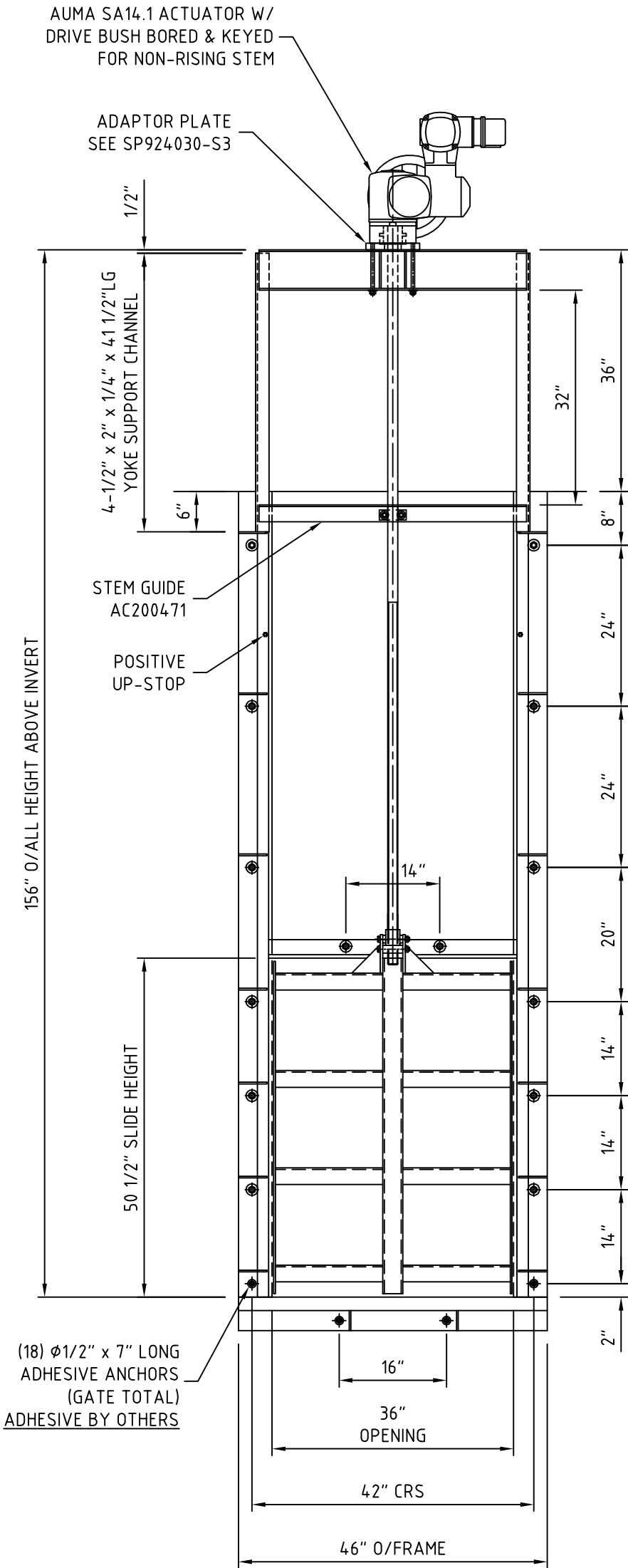


Attachment B

Bypass Gate Details

FOR GATE SECTIONS SEE: SP924030-S2
YOKE: 6" x 3" x 1/4" CHANNEL
HORIZONTAL STIFFENERS: 2-1/2" x 2-1/2 x 1/4" ANGLE
VERTICAL STIFFENERS: 2-1/2" x 1/4" FLAT BAR
STEM GUIDE: 2-1/2" x 2-1/2 x 1/4" ANGLE
SLIDE CENTER STIFFENER: 3" x 3" x 1/4" x 50" LG CHANNEL



Title SERIES 924 STAINLESS GATE INSTALL. 36" x 48"		Quantity: 1	Scale: 1:20		DO NOT SCALE THIS DRAWING Work to Dimensions Linear Dimensions are Inches							
		Tag No's: T.B.A.										
Project GLENDALE DAM, STOCKBRIDGE, MA.		Seating	Unseating	Requested Concrete Opening Tolerances Height & Width ±1/4" Squareness ±3/8 Diagonal		A	Original Issue		01/25/11	APC	APC	
	Design Head	10'	10'		Rev.	Rev. Record		Date	Eng.	Chk.		
Location T.B.A.		Leakage Rate GPM/ft of seal	0.1	0.1	THIRD ANGLE PROJECTION						370 SOUTH ATHOL ROAD ATHOL, MA 01331	
Drg. No. SP-924-030	S.O. No. T.B.A.											

PROJECT NAME GLENDALE
SUBJECT MIN. FLOW UNIT
BYPASS GATE

SHEET 1 of 1
PROJECT NO. 1476
BY MMM DATE 3/14/11
CHK'D CRK

MAX FLOW

$$Q = 0.7 A \sqrt{2gH}$$

WHERE

$$A = 3' \times 4' = 12 \text{ sq. ft.}$$

$$g = 32.2 \text{ ft/sec}^2$$

$$H = 810.9' - 803' - \frac{4'}{2} = 5.9'$$

↑ NORMAL HW ± ↑ GATE INV. ↑ GATE HEIGHT

$$Q = 0.7(12) \sqrt{2(32.2)(5.9')} = 163.7 \text{ cfs max}$$

OPENING REQUIRED TO PASS 90 CFS

FOR OPENING OF 3' WIDE $\times$ 2.04' HIGH

$$A = 6.12 \text{ sq. ft.}$$

$$H = 810.9' - 803' - \frac{2.04'}{2} = 6.88'$$

$$Q = 0.7(6.12 \text{ sq. ft.}) \sqrt{2(32.2)(6.88')} = 90.2 \text{ cfs } \textcircled{OK}$$

Gate Selection Criteria

Gate Size: In water and waste water treatment plants, gates are most often sized to fit a pre-designed structure. In this regard, Series 950-960 gates offer great flexibility to accommodate any round, square or rectangular opening.

In sizing a gate for a given flow, a discharge coefficient of 0.7 is conservatively used. The discharge for a submerged gate may be calculated as:

$$Q = 0.7 A \sqrt{2gH}$$

where for **English units:**

Q = Discharge, cubic feet per second

A = Opening area, square feet

g = 32.2 ft./sec.

H = Head on opening centerline, feet

or for **metric units:**

Q = Discharge, cubic meters per second

A = Opening area, square meters

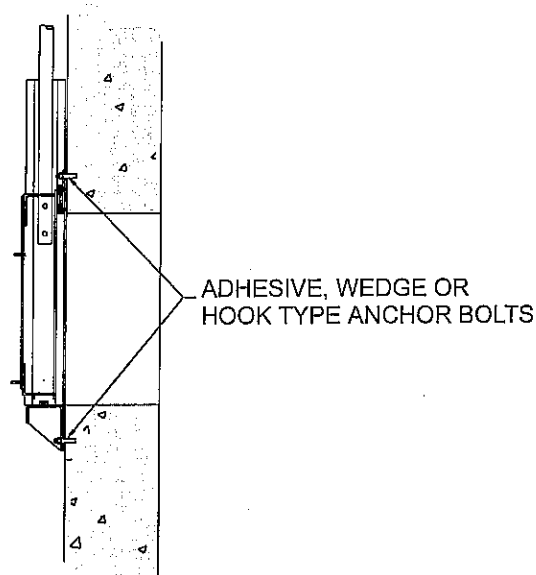
g = 9.81 m/sec.

H = Head on opening centerline, meters

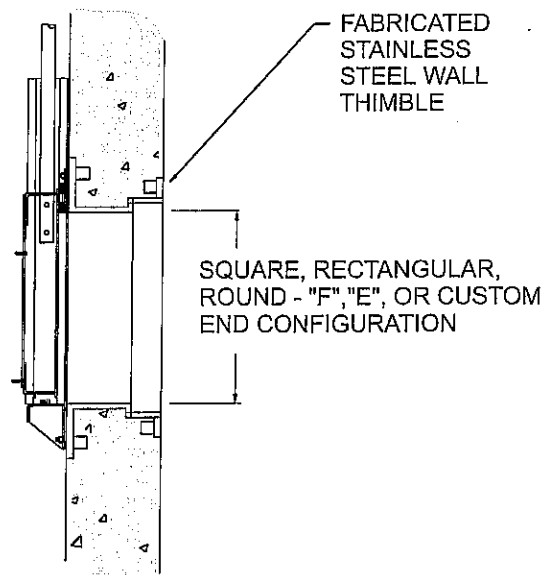
Gates used as overflow weirs approximate a sharp crest weir. Consult a text on hydraulics for flow calculations.

Gate Mounting: As shown in the model descriptions and their drawings, Series 950-960 gate frames may be embedded in the channel sides or mounted on the face of a wall or wall thimble. Pipe flange mounting is available. These variations are designed to accommodate the mounting structure. Gate operation is not affected by mounting type.

MODEL 961 SLUICE GATE
ANCHOR BOLT MOUNTED



MODEL 961 SLUICE GATE
WALL THIMBLE MOUNTED



Series 950-960 gates perform equally well in seating head or unseating head service. The direction of water loading should be specified for all gates to assure proper sizing of attachment bolting.

use 0.7 (conservative)

ENTRANCE CONDITIONS	SERIES 1	SERIES 2	SERIES 3	SERIES 4	SERIES 5	SERIES 6	SERIES 7
	 $K_e = 1.60$ $C = 0.62$	 $K_e = 1.44$ $C = 0.64$	 $K_e = 1.37$ $C = 0.65$	 $K_e = 0.93$ $C = 0.72$	 $K_e = 0.69$ $C = 0.77$	 $K_e = 0.56$ $C = 0.80$	 $K_e = 0.52$ $C = 0.81$
	 $K_e = 1.44$ $C = 0.64$	Elliptical entrance NOTES All tubes 4'-0" x 4'-0". Where elliptical entrance is not indicated corners are square, cut in wood. Values of C given are averages for the formula $V = C\sqrt{2gh}$ Loss coefficient $K_e = \frac{1}{C^2} - 1$			 $K_e = 1.04$ $C = 0.70$	 $K_e = 0.64$ $C = 0.78$	 $K_e = 0.49$ $C = 0.82$
	 $K_e = 1.16$ $C = 0.68$				 $K_e = 0.93$ $C = 0.72$	 $K_e = 0.52$ $C = 0.81$	 $K_e = 0.45$ $C = 0.83$
	 $K_e = 0.64$ $C = 0.78$				 $K_e = 0.88$ $C = 0.73$	 $K_e = 0.38$ $C = 0.85$	 $K_e = 0.38$ $C = 0.85$
	 $K_e = 0.08$ $C = 0.96$				 $K_e = 0.18$ $C = 0.92$	 $K_e = 0.16$ $C = 0.93$	 $K_e = 0.29$ $C = 0.88$
						 $K_e = 0.23$ $C = 0.90$	 $K_e = 0.29$ $C = 0.88$

CONDENSED FROM
UNIVERSITY OF WISCONSIN
BULLETIN NO. 216

Figure 10-10.—Flow through submerged tubes. 288-D-2531.

Flow in an open channel downstream from the headworks will be at either the subcritical or the supercritical stage, depending on the flow conditions through the control structure. In either case, flow depths and velocities throughout the channel can be determined from Bernoulli's equation (see sec. 9.18).

Flow in an ungated outlet conduit is similar to that in a culvert spillway (discussed in sec. 9.27). Where the inlet geometry and the conduit slope are such that the control remains at the inlet, partly full flow will prevail and flow depths and velocities will be in accordance with the Bernoulli's equation for open-channel flow. When flow from a pressure

Attachment C

Agency Comment Letters

Webb, Kevin (Enel North America)

From: Kubit, Robert (DEP) [Robert.Kubit@state.ma.us]
Sent: Friday, December 17, 2010 1:18 PM
To: Webb, Kevin (Enel North America)
Cc: Melissa_Grader@fws.gov; Caleb Slater (Caleb.Slater@state.ma.us)
Subject: RE: Request for Comments: Run-of-River and Minimum Flow Monitoring Plan for Glendale
Follow Up Flag: Follow up
Flag Status: Red

Kevin,

The proposed run-of-river and minimum flow monitoring plan as presented meets the MA water quality certificate conditions. The MA DEP offer no additional comment.

Bob

Robert Kubit, P.E.
 MassDEP
 Division of Watershed Management
 627 Main Street
 Worcester MA 01608
 Telephone: (508) 767-2854
 Email: robert.kubit@state.ma.us
 Fax: (508) 791-4131

From: Webb, Kevin (Enel North America) [mailto:Kevin.Webb@enel.com]
Sent: Tuesday, December 14, 2010 10:31 AM
To: Melissa_Grader@fws.gov; Caleb Slater (Caleb.Slater@state.ma.us); Kubit, Robert (DEP)
Subject: Request for Comments: Run-of-River and Minimum Flow Monitoring Plan for Glendale

Melissa, Caleb and Bob:

On August 19, 2009 the Federal Energy Regulatory Commission issued a Subsequent License to Littleville Power Company, Inc. for the Glendale Hydroelectric Project (FERC No. 2801) on the Housatonic River in Stockbridge, MA. LPC has prepared the attached Run-of-River and Minimum Flow Monitoring Plan in response to the requirements of license Article 401(a) of the FERC license and Condition 19 of the WQC. Pursuant to the consultation requirements under license Article 401(a) and the WQC, we respectfully request that you provide us with any comments you may have on this plan within 30 days. We will forward any comments received to the FERC, along with any necessary responses to your comments.

Thank you for your review of and comments on this proposed plan. If you have any questions concerning this plan please do not hesitate to contact me at (978) 681-1900, extension 809 or via email at kevin.webb@enel.com.

Sincerely,

Kevin M. Webb
 Regulatory Affairs Coordinator
 Littleville Power Company, Inc.
 A subsidiary of Enel North America, Inc.
 One Tech Drive, Suite 220
 Andover, MA 01810
 P: (978) 681-1900 x-809

3/10/2011

F: (978) 681-7727
Kevin.Webb@Enel.com

The information contained in this communication is confidential and may be legally privileged. It is intended solely for the use of the individual or entity to whom it is addressed and others authorized to receive it. If you are not the intended recipient please notify us immediately and be notified that any disclosure, copying, distribution or taking of any action in reliance on the contents of this information is strictly prohibited and may be unlawful.



MassWildlife

Commonwealth of Massachusetts

Division of Fisheries & Wildlife

Wayne F. MacCallum, *Director*

December 16, 2010

Kevin M. Webb
Regulatory Affairs Coordinator
Littleville Power Company, Inc.
A subsidiary of Enel North America, Inc.
One Tech Drive, Suite 220
Andover, MA 01810

Re: Glendale Hydroelectric Project (FERC No. 2801)
Run-of-River and Minimum Flow Monitoring Plan

Dear Mr. Webb,

The Massachusetts Division of Fisheries and Wildlife (Division) is the agency responsible for the protection and management of the fish and wildlife resources of the Commonwealth. As such we monitor operations at hydroelectric projects within the Commonwealth. The Division has the following comments on the "Run-of-River and Minimum Flow Monitoring Plan" received via email on December 14, 2010 for the Glendale Hydroelectric Project (FERC No. 2801) on the Housatonic River in Stockbridge, MA.

BACKGROUND

On August 19, 2009 the Federal Energy Regulatory Commission (FERC) issued a Subsequent License to Littleville Power Company, Inc. (LPC) for the Glendale Hydroelectric Project (FERC No. 2801). In addition, on July 8, 2009 the Massachusetts Department of Environmental Protection (MDEP) issued a Water Quality Certification (WQC) for the project, which established the operating conditions deemed necessary to protect the water quality of the Housatonic River pursuant to Section 401(a) of the Clean Water Act. The FERC license incorporates the WQC Conditions at Ordering Paragraph (D).

The operating conditions under which the project is required to operate under the subsequent license are set by the Conditions of the WQC. The pertinent WQC Conditions are:

- Condition 14, which requires the project to be operated in a run-of-river mode: The Project Owner shall operate the project in a run-of-river mode such that inflow to the project equals outflow from the project on an instantaneous basis and fluctuations of the head pond water level are minimized. This operating regime may be temporarily modified by approved maintenance activities, agreement between the Project Owner and appropriate state and/or federal resource agencies, or by extreme hydrologic conditions or emergency electrical system conditions, as these terms are defined below.
- Condition 15, which requires the project to release a minimum flow of 90 cfs, or inflow, if less, to the bypass reach downstream of the dam. The Project Owner shall release to the project bypass reach a continuous minimum flow of 90 cfs, or inflow, if less, for the protection and enhancement of fish and aquatic life habitat. Minimum flows may be temporarily modified by approved maintenance activities, by agreement between the Project Owner and appropriate state and federal resource agencies, or by extreme hydrologic conditions or emergency electrical system conditions.

www.masswildlife.org

Division of Fisheries and Wildlife

Field Headquarters, One Rabbit Hill Road, Westborough, MA 01581 (508) 389-6300 Fax (508)

An Agency of the Department of Fisheries, Wildlife & Environmental Law Enforcement

In order to meet the new requirement of a 90 cfs bypass reach flow LPC will install a new minimum flow hydroelectric turbine in a new powerhouse constructed downstream of the existing project gatehouse. The unit will draw water through two unused waste gate openings at the southerly end of the gatehouse and will discharge to the dam's tailwater area and bypass reach downstream of the gatehouse. As required under Article 403 and WQC Condition 21, 1-inch clear space trashracks will be installed upstream of the waste gate openings to prevent fish entrainment through the new unit. Water will initially flow into a small forebay before being drawn through the unit and passed downstream. A 4 ft wide by 6 ft high bypass slide gate will be installed on the river side of the forebay, which will automatically open to pass the minimum flow to the bypass reach in the event of minimum flow unit trip or shut-down. The bypass gate will be provided with a backup power supply so that it will open even in the event of a power outage.

The proposed minimum flow unit is a vertical Francis turbine having a rated flow of 90 cfs and a rated output of 165 kW at a net head of 24 ft. The unit will be equipped with adjustable wicket gates which will allow it to track reduced inflows down to approximately 60 cfs (projected figure based on manufacturer's specifications). It is expected that the minimum flow unit will normally operate at full load for most of the year. LPC is presently finalizing the engineering design details for installation of the new minimum flow unit. Furthermore, LPC is initiating permitting activities to obtain all necessary local, state and federal approvals for the construction activities at the dam. It is anticipated that installation will commence in Spring, 2011.

RUN-OF-RIVER AND MINIMUM FLOW MONITORING PLAN

Run of river operation: LPC proposes to comply with the Run-of-river requirement by passing all inflows either through the project's available turbines, over the spillway when all units are off-line, or via both turbines and spillway when inflow exceeds the hydraulic capacity of the available turbines in such a manner as project outflow is equal to project inflow in a instantaneous manner.

Minimum bypass flow: Compliance with the bypass reach minimum flow requirement will be accomplished by passing 90 cfs or inflow, which ever is less, either through the new minimum flow unit, through the new bypass gate or over the spillway.

Until the new minimum flow turbine is operational LPC will comply with the bypass minimum flow requirement by demonstrating one of the following conditions is true at all times:

- one or more main units are on-line and the pond level is at or above El. 811.25 ft NGVD, demonstrating that 90 cfs is being passed over the spillway; or
- all units are off-line and the pond level is above the spillway crest (El. 810.90 ft NGVD).

Once the new minimum flow turbine is operational LPC proposes to comply with the bypass minimum flow requirement by demonstrating one of the following conditions is true at all times:

- the minimum flow unit is on-line at full load; or
- the minimum flow unit is off-line and the bypass gate is open; or
- the minimum flow unit is on-line at reduced load, and the main units are off-line, and the pond level is at or above the spillway crest (i.e., under low inflow conditions between 60 and 90 cfs); or
- the minimum flow unit is off-line, the bypass gate is closed, one or more main units are on-line and the pond level is at or above El. 811.25 ft NGVD, demonstrating that 90 cfs is being passed over the spillway; or
- all units (minimum flow and main) are off-line and the pond level is above the spillway crest (El. 810.90 ft NGVD).

Following the installation and commissioning of the minimum flow unit, LPC proposes to perform streamflow gauging measurements in the bypass reach, to determine the relationship between unit kW output and operating flow and to confirm that operation of the unit meets the specified 90 cfs minimum

flow. LPC will also confirm that the flow through the bypass gate meets the 90 cfs minimum flow requirement.

As an additional quality control measure, LPC proposes that the pond level transducer reading will be periodically compared to the pond level staff gage mounted on the gatehouse, to confirm that the pond levels recorded by the control system accurately reflect actual pond level conditions.

LPC proposes that all compliance monitoring and documentation will be performed by the project's computer control system. Data electronically recorded by the control system at half-hour intervals will include the following for compliance monitoring purposes:

- Date and time
- Headpond level (feet NGVD)
- Minimum flow unit output (kW)
- Bypass gate status (open or closed)
- Total output of main units (kW)

The logged data will be stored in the powerhouse for compliance record-keeping purposes. Compliance with run-of-river operating conditions will be confirmed by demonstrating that the headpond level is at or above the spillway crest at all times when any units are operating, such that spillage of all inflow (via the spillway and/or the automated bypass gate) will occur shortly after unit trip. When the units are off-line all inflow will be passed over the spillway and/or via the automated bypass gate.

COMMENTS

After reviewing the "Run-of-River and Minimum Flow Monitoring Plan" the Division believes that operation of the Glendale Hydroelectric Project (FERC No. 2801) as proposed by LPC will result in compliance with both the Run of River and Minimum Bypass Flow conditions contained in the project's FERC license and 401 Water Quality Certificate .

Sincerely,

A handwritten signature in black ink, appearing to read "Caleb Slater", with a stylized flourish at the end.

Caleb Slater, Ph.D.
Anadromous Fish Project Leader

cc. Melissa Grader, USFWS
Bob Kubit, MADEP



United States Department of the Interior

FISH AND WILDLIFE SERVICE

New England Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5087
<http://www.fws.gov/newengland>



RECEIVED

JAN 18 2011

REF: FERC No. 2801
Littleville Power Company, Inc.
Glendale Project
Comments on Run-of-River and Minimum Flow Monitoring and Compliance Plan

January 14, 2011

Mr. Kevin Webb
Environmental Affairs Coordinator
Littleville Power Company, Inc.
One Tech Drive, Suite 220
Andover, MA 01810

Dear Mr. Webb:

This is regarding your electronic message and attached draft Run-of-River and Minimum Flow Monitoring and Compliance Plan (Plan), sent to us on December 14, 2010. The Plan was developed pursuant to the requirements of Article 401(a) of the license issued for the Glendale Project on August 19, 2009 and Condition 19 of the Water Quality Certification issued by the Massachusetts Department of Environmental Protection. We have reviewed the Plan and offer the following comments.

OVERVIEW

The new license issued for the project allows Littleville Power Company (LPC) to install a new minimum flow unit that would pass the required 90 cfs bypass flow. That turbine is scheduled to be installed this coming spring. The Plan provides operational scenarios both with and without the minimum flow unit.

Until the new minimum flow unit is installed, run-of-river operations will be maintained by keeping the headpond at elevation 811.25 feet NGVD or higher. This elevation will ensure that at least 90 cfs (or inflow, if less) flows into the bypass reach via spill over the dam. Once the new turbine is operational, it will be tied into the existing control system. The new unit, which will operate at flows from 60 cfs up to 90 cfs, will act as the first-on/last-off, with the main units being brought on-line sequentially as flows increase. The headpond sensor will be set to maintain the impoundment elevation at the dam crest (810.9 feet NGVD), with the bypass flow being provided by either the new turbine, or the new slide gate when that unit is not operational. If the new turbine is off-line and the slide gate is closed, the 90 cfs will be spilled over the dam into the bypass reach.

The project's control system will monitor and record critical operations information (e.g., headpond level, minimum flow unit output, bypass gate status, output of main units, and date/time). This data will be stored in the powerhouse for compliance record-keeping purposes.

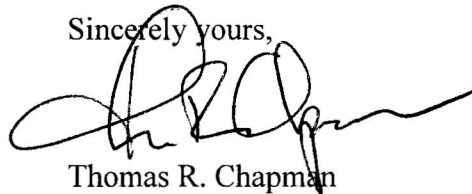
COMMENTS

The operational protocols detailed in the Plan appear sufficient to maintain and verify compliance with run-of-river and minimum flow requirements at the project. However, we recommend you make several minor adjustments to the Plan prior to submitting it for Federal Energy Regulatory Commission (FERC) approval:

- although the Plan states that electronic records will be stored in the project powerhouse, there is no provision for providing those records to FERC or resource agencies. The final Plan should specify how, and in what form, those records will be provided to the agencies (e.g., data logs, in hard copy format, will be provided to agencies within seven days of receiving a request);
- the Plan should include details on the slide gate dimensions and a calculation sheet verifying that the gate will be sized to pass 90 cfs; and
- it would be helpful to include a plan-view drawing of the project that delineates the headpond, gatehouse, new forebay and associated structures, and the location of the headpond sensor.

Thank you for the opportunity to comment on the draft Run-of-River and Minimum Flow Monitoring and Compliance Plan. If you require further assistance, please contact Melissa Grader of this office at (413) 548-8002, extension 124.

Sincerely yours,

A handwritten signature in black ink, appearing to read 'T. R. Chapman', with a long horizontal flourish extending to the right.

Thomas R. Chapman
Supervisor
New England Field Office