

GREENVILLE DAM PROJECT

LIHI APPLICATION

ATTACHMENT B

WATER QUALITY

## **B. Water Quality**

Questions:

- 1) Is the Facility either:
  - a) In Compliance with all conditions issued pursuant to a Clean Water Act Section 401 water quality certification issued for the Facility after December 31, 1986? Or
  - b) In Compliance with the quantitative water quality standards established by the state that support designated uses pursuant to the federal Clean Water Act in the Facility area and in the downstream reach?
- 2) Is the Facility area or the downstream reach currently identified by the state as not meeting water quality standards (including narrative and numeric criteria and designated uses) pursuant to Section 303(d) of the Clean Water Act?

Water quality in the Shetucket River in the vicinity of the project is identified as Class B by the CTDEEP Water Management Bureau. According to Connecticut Water Quality Standards, Class B waters have a minimum dissolved oxygen concentration of 5 mg/l and temperature can deviate above ambient conditions by 4 degrees F. Water quality should be suitable for recreational use, fish and wildlife habitat, agricultural, industrial supply and other legitimate uses including navigation.

Water quality below the dam was classified as Class C/B prior to licensing. The reduced water quality was a result of no minimum flows formerly released into the bypass. Upon licensing, a minimum flow into the bypass reach was instituted to maintain Class B water quality. The 2012 Integrated Water Quality Report (excerpt below) indicated that the river segment containing the project (CT3800-00\_01) has not been re-assessed for use support for Aquatic Life and for Recreation.

NPU has confirmed that the original water quality certifications remain current per communications with the CTDEEP. NPU has requested CTDEEP provide a formal letter to LIHI from to provide written confirmation that these provision remain valid. NPU has provided a copy of the CTDEEP email indicating a letter will be provided and that the CTDEEP will support the application. NPU has also provided a copy of the most recent FERC environmental review confirming current compliance. FERC has not issued the 2012 report but has verbally communicated that the project is in compliance.

## Al Nash

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**From:** Gephard, Steve [Steve.Gephard@ct.gov]  
**Sent:** Friday, December 21, 2012 3:01 PM  
**To:** 'Al Nash'  
**Cc:** Mark Greene  
**Subject:** RE: Counter information and LIHI letter

I'm sorry to tell you that I just can't get to this until January. Too many last minute things and I'm am off next week. I will try to get to it promptly after the new year.

I will reassure Mark that I have decided to write the letter of support for LIHI. In most cases, I send that directly to LIHI. Should I do that (and copy you) or should I send it to one of you?

Merry Christmas.

Steve

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**From:** Al Nash [<mailto:al.nash@renewablepowerconsulting.com>]  
**Sent:** Wednesday, December 19, 2012 11:42 AM  
**To:** Gephard, Steve  
**Subject:** Counter information and LIHI letter

Good morning Steve - when you get a chance would you please send me the Denil counter information we discussed and the LIHI letter for Norwich's Occum and Greenville stations?

Alfred Nash, P.E.  
Renewable Power Consulting, PA  
43 Spaulding Road  
P.O. Box 195  
Palmyra, ME 04965  
(207) 992-3926  
email: [AL.Nash@renewablepowerconsulting.com](mailto:AL.Nash@renewablepowerconsulting.com)



STATE OF CONNECTICUT  
DEPARTMENT OF ENVIRONMENTAL PROTECTION

OFFICE OF THE SECRETARY



92 DEC 21 PM 4:13

Mr. Richard DesRoches  
City of Norwich, Department of Public Utilities  
34 Court House Square  
Norwich, CT 06360

REGULATORY  
COMMISSION

RE: WATER QUALITY CERTIFICATION  
GREENVILLE DAM PROJECT  
FERC No. 2441 009

Dear Mr. DesRoches:

The Department of Environmental Protection (Department) has reviewed the City of Norwich Department of Public Utility's request, received on December 22, 1991, for Water Quality Certification for the proposed Greenville Dam Project on the Shetucket River, in accordance with the December 1991 application to the Federal Energy Regulatory Commission (FERC Project No. 2441).

Pursuant to Section 401 of the Federal Water Pollution Control Act, the Department hereby certifies that the proposed project will not violate Connecticut's Water Quality Standards provided that the following conditions are complied with:

- (1) The licensee shall, in a manner and on a schedule as approved by the Department, construct and maintain a denil fish ladder. This facility should conform with Figure E-2, the description in Appendix D of the Greenville Dam Project application and with any final design modifications recommended and approved by U.S. Fish & Wildlife Service (Service) and the Department.
- (2) The licensee shall, in a manner and on a schedule as approved by the Department, construct and maintain downstream fish passage facilities. These facilities should conform with Figure E-3, the description in Appendix D of the Greenville Dam Project application and with any final design modifications recommended and approved by the Service and the Department.
- (3) The licensee shall construct and have operational a fish lift/elevator by April 1st of the second year after experiencing the passage of 20,000 American shad or 200,000 river herring or an equivalent combination of the two species (one shad = ten herring). The fish lift/elevator should conform with Figure E-4 (Sheets 1 of 2 and 2 of 2), the description in Appendix D of the Greenville Dam Project application and with any final design modifications recommended and approved by the Service and the Department.
- (4) The licensee shall operate the project during the upstream fish passage season (April through November) in such a manner to prevent the congregation of fish at the project tailrace and, thus, insure the efficient movement of fish, as determined by the Department, to the above cited passage facilities at the Greenville Dam.

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DEC 21 1992

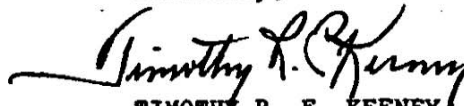
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- (5) The licensee shall maintain a minimum stream flow of 250 cfs or inflow, whichever is less, from the base of the Greenville Dam to the bypassed reach.
- (6) The licensee shall operate the project in conformance with a run-of river mode, so that the inflow to the project shall equal the outflow on an instantaneous basis .
- (7) If the licensee applies to the FERC to modify any of the foregoing conditions, the applicant shall simultaneously submit to the Department a copy of said application for modification.

This is not the permit or authorization which may be required under Section 22a-32; 22a-36 to 45, inclusive; 22a-384; or 22a-365 to 377, inclusive; of the Connecticut General Statutes as amended.

Sincerely,

  
TIMOTHY R. E. KEENEY  
COMMISSIONER

DATED: December 16, 1992

Waterbody Segment ID	Waterbody Name	Location	Miles	Aquatic Life	Recreation
CT3800-00_01	Shetucket River-01	From end of estuary, at Route 2 crossing, US to Greenville dam, Norwich.	1.56	Not Assessed	Not Supporting
CT3800-00_03	Shetucket River-03	From Sprague WPCF (near head of Occum Pond), US to confluence with Merrick Brook at Sprague/ Scotland town line (DS of Scotland Dam).	4.7	Fully Supporting	Fully Supporting
CT3800-00_05	Shetucket River-05	From confluence with Cold Brook (DS of Franklin Mushroom Farm STP from unnamed tributary), US to headwaters at confluence of Natchaug River and Willimantic River.	4.99	Not Supporting	Not Supporting
CT3800-02_01	Obwebetuck Brook (Windham)-01	Mouth at confluence with Shetucket River just DS of Route 32 and RailRoad crossing, US to confluence with Jordan Brook, US of Windham Road crossing and parallel to Bush Hill Road, Windham.	0.55	Not Assessed	Not Supporting
CT3801-01_01	Ballymahack Brook (Windham)-01	mouth at INLET to Marie Lake on Joshuas Trust property (near dirt road off Back Rd just south of Sundale Drive intersection), US to HW just US of Beaver Hill Road crossing (near Nutmeg Lane intersection), Windham.	1.92	Fully Supporting	Not Assessed
CT3802-00_01	Beaver Brook (Scotland)-01	From mouth at confluence with Merrick Brook (just DS of Bass Road), US to Route 14 (Huntington Road) crossing, Scotland.	1.38	Fully Supporting	Not Assessed
CT3802-01_01	Unnamed Tributary to Beaver Brook (Scotland)-01	Mouth on Beaver Brook, just US of Route 14, US to WH parallel to Ziegler Road, Scotland.	3.93	Fully Supporting	Not Assessed
CT3803-00_01	Merrick Brook-01	From mouth at confluence with Shetucket River (just DS of Station Road), Scotland, US to headwaters (just US of Goshen Road crossing), Chaplin.	12	Fully Supporting	Not Assessed
CT3805-00_02	Little River (Sprague)-02	From inlet to Versailles Pond (northwest corner of pond), US to Papermill Pond outlet dam, Sprague.	0.89	Not Supporting	Fully Supporting
CT3805-00_03	Little River (Sprague)-03	From inlet to Paper Mill Pond, Sprague, US to headwaters at Hampton Reservoir outlet dam (just US of Kenyon Road crossing), Hampton.	1.79	Fully Supporting	Not Assessed
CT3805-00_04	Little River (Canterbury/ Scotland/ Hampton)-04	From Hanover Reservoir inlet, Canterbury, US to headwaters at Hampton Reservoir outlet dam (just US of Kenyon Road crossing), Hampton.	16.02	Fully Supporting	Not Assessed

**ENVIRONMENTAL INSPECTION REPORT  
(ELECTRONICALLY SUBMITTED)  
FEDERAL ENERGY REGULATORY COMMISSION**

**New York Region**

**Date of Inspection - May 11, 2005**

**Name** Greenville **Project No.** 2441-CT

**Licensee** City of Norwich **License Type** Major

**License Issued** March 31, 1993 **License Expires** January 1, 2044

**Location** Shetucket River None  
(Waterway) (Reservation)  
New London Connecticut  
(County) (State)

**Inspector** Joseph Enrico

**Licensee Representatives** Messrs. Roy Borque, Maintenance Engineer &  
Christopher La Rose, Operations Integrity Manager.

**Other Participants** None

**Summary of Findings**

The project was found in good condition with all safety and environmental requirements being met. A sign in compliance with Part 8.2(a) of the regulations was not posted at the Greenville recreation area. A follow up letter was sent to request a schedule for sign installation.

**Submitted** July 29, 2005

Joseph G. Enrico  
**Environmental Protection Specialist**

**A. INSPECTION FINDINGS**

Requirements*	Date of Requirement	Follow-up Needed	Photo Nos.
<b>CULTURAL RESOURCES</b>			
Article 412 requires the licensee to implement a Memorandum of Agreement with the State executed on February 11, 1993. The CMP was filed on 3-31-95 and 7-28-97. <b>C-184</b>	<b>O: 3-31-93 Ap: 8-21-97</b>	N	
Article 413 requires the Licensee to consult with the SHPO and conduct a cultural resource survey prior to any ground disturbance at the project other than authorized in the license. <b>C-184</b>	<b>O: 3-31-93</b>	N	
<b>FISH AND WILDLIFE RESOURCES</b>			
Article 401 requires the licensee to file a Soil Erosion Control Plan prior to the installation of fish passage facilities. Filed 7-20-94. <b>C-120</b>	<b>O: 3-31-93 Ap:10-19-94</b>	N	
Article 402 requires the licensee to operate the project in a run of river mode. <b>C-204</b>	<b>O: 3-31-93</b>	N	
Article 403 requires the licensee to release a minimum flow of 250cfs from the Greenville dam, or inflow. <b>C-089</b>	<b>O: 3-31-93</b>	N	3
Article 404 requires the licensee to install stream flow gages to monitor compliance with the ROR operation and minimum flow release. Plan filed on 4-3-95 and 6-5-95. <b>C-017</b>	<b>O: 3-31-93 Ap:9-19-95</b>	N	1,2
Article 405 requires the licensee to file design drawings and begin construction and complete the installation of an upstream Denil fish ladder by 4-1-96. Filed 7-20-94. Amendment filed 3-14-94 to install lift instead of ladder. Filed revised drawing for V-trap gate design on 12-2-94. <b>C-071</b>	<b>O: 3-31-93 Ap:4-12-94 Ap:10-19-94 Ap:3-20-95</b>	N	4-6
Article 406 requires the licensee to file design drawings and begin construction and complete the installation of downstream fish passage facilities by 4-1-96. Filed 7-20-94. <b>C-018</b>	<b>O: 3-31-93 Ap:10-19-94</b>	N	7,8
Article 407 requires the licensee to file a plan to assess upstream fish passage. The plan is to include post construction evaluation of the facilities as well as attraction flow needed for the fishway. Filed 4-3-95. <b>C-027</b>	<b>O: 3-31-93 Ap:5-7-96</b>	N	
Article 408 requires the licensee to file a plan for post construction evaluation plan to assess the efficiency of the downstream fish passage facilities. Filed 4-3-95. <b>C-027</b>	<b>O: 3-31-93 Ap:5-7-96</b>	N	
Article 409 requires the licensee to file a fishway maintenance plan for operation of the fish passage facilities. Filed 4-3-95 & 6-5-95. <b>C-026</b>	<b>O: 3-31-93 Ap:10-17-95</b>	N	

Requirements*	Date of Requirement	Follow-up Needed	Photo Nos.
<b>PUBLIC SAFETY</b>			
Facilities and measures to assure public safety (18 CFR, Part 12). Filed 5-8-2000. <b>C-218</b>	<b>O: 3-31-93</b> <b>Ap:6-14-00</b>	N	3,9-10
<b>RECREATION RESOURCES</b>			
Article 410 requires the licensee to implement the recreation plan filed with the license application on 8-7-92 and 11-4-92. <b>C-113</b>	<b>O: 3-31-93</b>	N	12-14
Article 411 requires the licensee to monitor recreation use to determine if the facilities are adequate, within five years of license issuance and report in conjunction with the Form 80. Report filed 6-16-00. <b>C-112</b>	<b>O: 3-31-93</b> <b>Ap:6-29-00</b>	N	
Recreation signing and posting (18 CFR, Part 8) <b>C-186</b>	<b>O: 3-31-93</b>	Y	
Standard Article 13 requires the Licensee to allow public free access to project waters and adjacent lands <b>C-110</b>	<b>O: 3-31-93</b>	N	
Submission of the Commission's Form 80 monitoring report. Filed 3-31-03. <b>C-112.</b>	<b>18CFR4-1-03</b>	N	
<b>OTHER ENVIRONMENTAL RESOURCES</b>			
Standard Article 15 requires the Licensee to install fish passage and other wildlife facilities when requested by state and federal resource agencies. <b>C-071</b>	<b>O: 3-31-93</b>	N	
Standard Article 19 requires the Licensee to take reasonable measures to control sedimentation and other pollution at the project. <b>C-120</b>	<b>O: 3-31-93</b>	N	
Article 202 gives the Licensee authority to grant conveyances for non-project use of project lands and waters, for certain types of use without prior Commission approval. <b>C-202</b>	<b>O: 3-31-93</b>	N	

O:=Order C=OEP-IT Code 18CFR=Title 18 Code of Federal Regulations , Ap=Approved

### **COMMENTS AND FOLLOW-UP ACTION**

This project consists of an overflow spillway, gatehouse, power canal and two powerhouses. Upstream and downstream fish passage facilities are also in place and functional. The project's fish lift was in operation and is controlled remotely from the licensee's control center in Norwich (**Photo Nos. 4-6**). The lift began operation in April and lifting is started at 8:30am each day. The licensee's control center, which is manned full time, 24 hours per day and seven days per week, remotely monitors and operates this project as well as the licensee's other project, P-11574, Occum. Equipment at the control center

allows the operator to monitor all project information including generation, flows, headpond and tailwater levels. This information is recorded hourly on manual logs which are available at the licensee's office. Cameras in the control center allow the operator to monitor the fish lift as well as certain areas around the intake canal/headgates. The downstream fish passage facility consists of an angled bar rack with one-inch spacing and discharge chute located in power canal (**Photo Nos. 7 & 8**).

The project provides a fairly good size parking/access area along the left side of the river, downstream of the dam. The powerhouse and intake canal areas are fenced and off limits to the public. The access area is used by hikers, fishermen and canoeists portaging down from upstream areas. The area was in fair condition and is consistently used, according to the licensee. It was noted that there was no sign posted in compliance with Part 8, Section 8.2(a) of the regulations at the recreation area. Signs are posted indicating that the area is open for public use, however. The licensee was advised that the applicable Part 8 information should be included either on the main sign at the entrance or at the kiosk, within the area itself.

## **B. EXHIBITS AND PHOTOGRAPHS**

The following are provided to show the location of the project and to illustrate project features: 14 photographs and photograph location map.

**Cc: FERC-DHCA  
FERC-NYRO  
Enrico, J./di**

## **ENVIRONMENTAL ASSESSMENT**

### **FEDERAL ENERGY REGULATORY COMMISSION OFFICE OF HYDROPOWER LICENSING DIVISION OF PROJECT REVIEW**

**Greenville Dam Project  
FERC No. 2441-009-Connecticut  
and  
Tenth Street Hydro Station Project  
FERC No. 2508-002-Connecticut**

#### **I. APPLICATIONS**

On December 23, 1991, the City of Norwich, Department of Public Utilities, Connecticut (Norwich), filed (1) an application for subsequent minor license for the Greenville Dam Project (Greenville) and (2) an application for subsequent minor license for the Tenth Street Hydro Station Project (Tenth Street). The projects are located on the Shetucket River in the City of Norwich, New London County, Connecticut (figure 1).

Tenth Street is located in the bypass reach of Greenville and receives water diverted from the Greenville dam. The operations of these two projects is currently coordinated and proposed to continue to be coordinated. Based on these factors, we consider these two projects to comprise a unit of development as defined in Section 3(11) of the Federal Power Act. Hence, in this document, Greenville and Tenth Street will be referred to as "developments" and the combination of the two as "project." Furthermore, although Norwich has proposed to continue operating as two separate licenses, we propose to combine any license issued for these two developments for the reasons stated above.

#### **II. PURPOSE AND NEED FOR ACTION**

##### **A. Purpose of Action**

Greenville and Tenth Street are existing, operating, licensed developments with total installed capacities of 800 kilowatts (kW) and 1,400 kW, respectively. Historically, Greenville has produced annually about 3.85 gigawatthours (GWh) and Tenth Street has produced about 5.35 GWh, for a total of 9.2 GWh. With Norwich's recommended 250 cubic feet per second (cfs) minimum flow release to the bypass reach, Greenville would generate annually 3.06 GWh and Tenth Street would generate 4.56 GWh, for a total of 7.61 GWh. Norwich would continue to use the renewable energy from the project to meet its system load requirements.

In this Environmental Assessment (EA) we analyze the impacts associated with the issuance of one new license for the two developments, make recommendations to the Commission on whether to issue a new license and on the term of the license, and

Environmental Impacts and Recommendations: Norwich is working with the FWS and CDEP to develop a plan for construction of the fish passage facilities at Greenville dam. Fishway construction activity has the potential to cause erosion and sedimentation. We recommend that an Erosion and Sediment Control Plan be filed for approval when the fish passage plans are finalized.

Unavoidable Adverse Impacts: There would be minor soil erosion and stream sedimentation during construction of fish passage and recreation facilities.

## 2. Water Resources

Affected Environment: The Shetucket River is typical of low gradient rivers of the eastern United States coastal plain. Large population centers and industrial developments influence the Shetucket River with point and non-point sources of pollution. Because of these influences, water quality in the vicinity of the project is eutrophic.

The average annual flow at the project is 2,216 cfs, with December through May being the peak precipitation months (Table 1). The maximum gauged flow at the USGS Shetucket River gauge (No. 01122500) was 52,200 cfs on Sept. 21, 1938; the minimum gauged flow was 19 cfs on August 22 and October 24, 1949.

Table 1. Monthly median streamflow estimates in cubic feet per second (cfs) at the Greenville dam site (Source: Norwich 1992).

Month	Median Flow	Month	Median Flow
January	2118	July	571
February	2429	August	450
March	3716	September	500
April	3659	October	786
May	2270	November	1507
June	1114	December	2128

CDEP designates the reach above Greenville dam as class B, which means that the water quality meets the requirements for: recreational use; fish and wildlife habitat; agricultural and industrial supply; and other uses including navigation. Class B waters exhibit good to excellent aesthetics, maintain dissolved oxygen (DO) concentrations of at least 5 milligrams per liter

(mg/l), have turbidity values less than 5 Nephelometric turbidity units (NTU's), and display fecal coliform counts less than 200 organisms per liter. CDEP's goal is to maintain these standards within the project's vicinity.

As a result of municipal sewer outflows below the dam and no minimum flow, the classification is lowered to C/B below the Greenville dam. The consequences of these effluences is that fecal coliform counts are significantly elevated in the bypass reach. Secondary effects of this nutrient loading is high chlorophyll-a concentrations, particularly during the low-flow summer and fall months (June to November). During this period no water is released (except leakage) into the 3,200-foot-long bypass reach. The combination of eutrophic conditions, increasing temperatures, and no flushing flow degrades the water quality, whereby DO concentrations may fall below 5 mg/l, turbidities may exceed 5 NTU's, and fecal coliform counts exceed the maximum Class B criterion.

#### Water Rights

Water diverted into the canal is used exclusively for hydropower generation and then returned into the Shetucket River. There are no known consumptive uses of project water. Therefore, the project would not affect any existing water rights.

Environmental Impacts and Recommendations: To protect aquatic resources, Norwich, CDEP, and FWS, agree the project should operate run-of-river, where inflow to the Greenville project reservoir is equal to the combined outflow from Greenville and Tenth Street on an instantaneous basis. In addition, Norwich and the resource agencies agree that an instream bypass flow of 250 cfs be released from the Greenville dam to improve water quality, protect resident fish habitat, and provide a zone-of-passage for anadromous fish species.

Fluctuating water surface levels can reduce fish spawning success and strand fish and invertebrates, subjecting them to desiccation and predation. Operating the project in an instantaneous run-of-river mode would minimize water level fluctuations upstream and downstream of the project and would protect aquatic resources. We therefore agree that the project should be operated instantaneous run-of-river.

Norwich's proposed and the agencies' recommended minimum bypass flow of 250 cfs is based on a watershed runoff value of 0.2 cubic feet per second per square mile (cfs/m) of drainage area. This method, which bases flow recommendations on the hydrologic and geologic characteristics of the drainage area, has been effective in establishing adequate base flows to protect water quality and fish in similar river basins in Connecticut.

A minimum flow analysis in the bypass reach found 250 cfs to be sufficient to maintain fish habitat for American shad, alewife, blueback herring, smallmouth bass, brown trout, striped bass and white perch. Additionally, the same study concludes that all standard stream depth and width criteria needed for passage is met or exceeded at 250 cfs at all transects.

We, therefore, agree that providing a minimum flow of 250 cfs to the bypassed portion of the Shetucket River should improve water quality and enhance the aquatic resources found in the reach.

The FWS recommends Norwich prepare a plan for maintaining run-of-river operation and the 250-cfs minimum flow release. FWS recommends the plan include: (1) a description of mechanisms that will be used; (2) the level of automatic or manned facility operation; (3) the methods to be used for recording data; and (4) a plan for providing this data to the agencies.

We agree that Norwich should consult with the FWS and CDEP to develop a plan to monitor compliance with the instantaneous run-of-river operation and with the provision of continuous minimum flows.

The plan should be filed with the Commission for approval and should include, but not be limited to, the following:

A description of the location and operation of stream flow gaging measures to monitor compliance with the run-of-river operation and a 250-cfs minimum flow release, and the methods for recording data and providing data to agencies.

Unavoidable Adverse Impacts: None

### 3. Fisheries Resources

Affected Environment: Impoundments in the basin above the Greenville dam provide a significant warmwater fishery. Game fish species include both smallmouth and largemouth bass, pickerel and bluegills. The free-flowing reaches of the mainstem Shetucket and Quinebaug Rivers are included among the five more important large trout streams in Connecticut (Connecticut Department of Environmental 1985).

Historically, anadromous fish ascended the Thames River Basin in significant numbers. American shad, Atlantic salmon, striped bass, and Atlantic sturgeon were abundant in the system. With the construction of the Greenville dam, only those anadromous fishes whose spawning habitat requirements were met in the areas below the Greenville dam were able to sustain some