

Historic Harrisville
Cheshire Mills Hydroelectric Project
Linda Willett, Executive Director
Harrisville, New Hampshire 03450

WATER QUALITY CERTIFICATION

In Fulfillment of

NH RSA 485-A:12

WQC # 2010-485A12IV-001

Activity Name	Cheshire Mills Hydroelectric Project
Activity Location	Harrisville, New Hampshire 03450
Affected Surface waters	Nubanusit Brook
Owner/Applicant	Linda Willett, Executive Director Historic Harrisville Harrisville, New Hampshire 03450

Appurtenant permit(s):

DATE OF APPROVAL (subject to Conditions below)	May 18, 2012
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A. INTRODUCTION

Historic Harrisville (Applicant) proposes to redevelop the existing Cheshire Mills hydroelectric facility located in Harrisville, NH (the Activity). The proposed project will use the existing dam, intake, penstock, and turbine. Mechanical controls will be refurbished and the existing penstock will be inspected, repaired, and painted as needed. The purpose of the project is to generate electricity from hydropower for the Historic Harrisville property. A detailed description of the proposed Activity is provided in item D-1 below.

This Water Quality Certification (WQC) documents laws, regulations, determinations and conditions related to the Activity for the attainment and maintenance of NH surface water quality standards, including the provisions of NH RSA 485-A:8 and NH Code of Administrative Rules Env-Wq 1700, for the support of designated uses identified in the standards.

B. WATER QUALITY CERTIFICATION APPROVAL

Based on the findings and conditions noted below, the New Hampshire Department of Environmental Services (DES) has determined that construction and operation of the Activity will not violate surface water quality standards, or cause additional degradation in surface waters not presently meeting water quality standards. DES hereby issues this WQC subject to the conditions defined in RSA 485-A:12,IV.

C. STATEMENT OF FACTS AND LAW

- C-1 RSA 485-A:12, III. No activity, including construction and operation of facilities, that requires certification under section 401 of the Clean Water Act and that may result in a discharge, as that term is applied under section 401 of the Clean Water Act, to surface waters of the state may commence unless the department certifies that any such discharge complies with the state surface water quality standards applicable to the classification for the receiving surface water body. The department shall provide its response to a request for certification to the federal agency or authority responsible for issuing the license, permit, or registration that requires the certification under section 401 of the Clean Water Act. Certification shall include any conditions on, modifications to, or monitoring of the proposed activity necessary to provide assurance that the proposed discharge complies with applicable surface water quality standards. The department may enforce compliance with any such conditions, modifications, or monitoring requirements as provided in RSA 485-A:22.
- C-2 RSA 485-A:12,IV. No activity that involves surface water withdrawal or diversion of surface water that requires registration under RSA 488:3, that does not otherwise require the certification required under paragraph III, and which was not in active operation as of the effective date of this paragraph, may commence unless the department certifies that the surface water withdrawal or diversion of surface water complies with state surface water quality standards applicable to the classification for the surface water body. The certification shall include any conditions on, modifications to, or monitoring of the proposed activity necessary to provide reasonable assurance that the proposed activity complies with applicable surface water quality standards. The department may enforce compliance with any such conditions, modifications, or monitoring requirements as provided in RSA 485-A:22.
- C-3 RSA 488:3 Registration Required. –
I. No person shall withdraw or discharge a cumulative amount of

more than 20,000 gallons of water per day, averaged over any 7-day period, or more than 600,000 gallons of water over any 30-day period, at a single real property or place of business without registering the withdrawal or discharge with the department. Transfers of such volume of water shall also be registered. Registration shall be in addition to any required permits.

II. No registration shall be transferred to another person without written notification to the commissioner.

- C-4 Env-Wq 1702.07 "Biological integrity" means the ability of an aquatic ecosystem to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of similar natural habitats of a region.
- C-5 Env-Wq 1702.17 "Designated uses" means those uses specified in water quality standards for each water body or segment whether or not such uses are presently occurring.
- C-6 Env-Wq 1702.23 "Existing uses" means those uses, other than assimilation or waste transport, which actually occurred in the water body on or after November 28, 1975, whether or not they are included in the water quality standards.
- C-7 Env-Wq 1703.01 Water Use Classifications.
 - (a) State surface waters shall be divided into class A and class B, pursuant to RSA 485-A:8, I, II and III. Each class shall identify the most sensitive use which it is intended to protect.
 - (b) All surface waters shall be restored to meet the water quality criteria for their designated classification including existing and designated uses, and to maintain the chemical, physical, and biological integrity of surface waters.
 - (c) All surface waters shall provide, wherever attainable, for the protection and propagation of fish, shellfish and wildlife, and for recreation in and on the surface waters.
 - (d) Unless the flows are caused by naturally occurring conditions, surface water quantity shall be maintained at levels adequate to protect existing and designated uses.
- C-8 Env-Wq 1703.19 Biological and Aquatic Community Integrity.
 - (a) The surface waters shall support and maintain a balanced, integrated, and adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of similar natural habitats of a region.

(b) Differences from naturally occurring conditions shall be limited to non-detrimental differences in community structure and function.

- C-9 Env-Wq 1708.02 Applicability. Antidegradation shall apply to:
- (a) Any proposed new or increased activity, including point source and nonpoint source discharges of pollutants, that would lower water quality or affect the existing or designated uses;
 - (b) Any proposed increase in loadings to a water body when the proposal is associated with existing activities;
 - (c) Any increase in flow alteration over an existing alteration; and
 - (d) Any hydrologic modifications, such as dam construction and water withdrawals.
- C-10 Env-Wq 1708.07 Protection of Water Quality in High Quality Waters.
- (a) Subject to (b), below, high quality waters shall be maintained and protected, except that insignificant changes in water quality, as determined by the department in accordance with Env-Wq 1708.09, shall be allowed.
 - (b) Degradation of significant increments of water quality, as determined in accordance with Env-Wq 1708.09, in high quality waters shall be allowed only if it can be demonstrated to the department, in accordance with Env-Wq 1708.10, that allowing the water quality degradation is necessary to accommodate important economic or social development in the area in which the receiving waters are located.
 - (c) Economic/social benefits demonstration and alternatives analysis shall not be required for authorization of an insignificant lowering of water quality. However, in allowing a lowering of water quality, significant or insignificant, all reasonable measures to minimize degradation shall be used.
 - (d) If the water body is Class A Water, the requirements of Env-Wq 1708.06 shall also apply.
- C-11 Env-Wq 1708.09 Significant or Insignificant Determination.
- (a) Any discharge or activity that is projected to use 20% or more of the remaining assimilative capacity for a water quality parameter, in terms of either concentration or mass of pollutants, or volume or flow rate for water quantity, shall be considered a significant lowering of water quality. The department shall not approve such a discharge or activity unless the applicant demonstrates that the proposed lowering of water quality is necessary to achieve important economic or social development, in accordance with Env-Wq 1708.10, in the area where the water body is located.

(b) Subject to (d), below, those activities that cause an insignificant lowering of water quality shall not be required to demonstrate that they are necessary to provide important economic or social development.

(c) Activities under (b), above shall include, but not be limited to:

- (1) Short term or intermittent discharges such as hydrostatic testing of pipelines, fire pump test water, and uncontaminated stormwater discharges or site clean-up activities;
- (2) Permanent discharges such as uncontaminated noncontact or uncontaminated geothermal cooling water, uncontaminated groundwater seepage, or unchlorinated or dechlorinated swimming pool water;
- (3) Facilities whose nonpoint source runoff is controlled through the use of best management practices; and
- (4) Any discharge or activity that is projected to use less than 20% of the remaining assimilative capacity for a water quality parameter, in terms of either concentration or mass for pollutants.

C-12 18 CFR § 4 Subpart K, provides procedures for exemption on a case-specific basis from all or part of Part I of the Federal Power Act, including licensing, for small hydroelectric power projects as defined in § 4.30(b)(29).

C-13 18 CFR § 4.30(b)(29). Small hydroelectric power project means any project in which capacity will be installed or increased after the date of notice of exemption or application under subpart K of this chapter, which will have a total installed capacity of not more than 5 MW, and which:

- (i) Would utilize for electric power generation the water power potential of an existing dam that is not owned or operated by the United States or by an instrumentality of the Federal Government, including the Tennessee Valley Authority; or
- (ii) (A) Would utilize for the generation of electricity a natural water feature, such as a natural lake, waterfall, or the gradient of a natural stream, without the need for a dam or man-made impoundment; and
(B) Would not retain water behind any structure for the purpose of a storage and release operation.

C-14 18 CFR § 4.106. Any case-specific exemption from licensing granted for a small hydroelectric power project is subject to the following standard terms and conditions:

- (b) The construction, operation, and maintenance of the exempt project must comply with any terms and conditions that the United

States Fish and Wildlife Service, the National Marine Fisheries Service, and any state fish and wildlife agencies have determined are appropriate to prevent loss of, or damage to, fish or wildlife resources or otherwise to carry out the purposes of the Fish and Wildlife Coordination Act, as specified in exhibit E of the application for exemption from licensing or in the comments submitted in response to the notice of exemption application.

- C-15 In 2010, DES published guidance (hereinafter called the 2010 instream flow guidance or 2010 ISF guidance) for estimating instream flow requirements for the protection of aquatic life for situations. The guidance is available at:
<http://des.nh.gov/organization/commissioner/pip/publications/wd/documents/wd-11-3.pdf>.
- C-16 The Applicant is responsible for the Activity, including construction and operation.
- C-17 On October 17, 2011, the Applicant submitted an application and associated supplemental information for Water Quality Certification to DES which included a completed DES Water Quality Certification Application Form and a draft application to the Federal Energy Regulatory Commission for a case-specific exemption from licensing for a small hydroelectric power project under 18 CFR § 4 Subpart K.
- C-18 DES issued a draft certification for public comment from April 12, 2012 to May 14, 2012. No comments were received.

D. FINDINGS

- D-1 The Activity reviewed for this Water Quality Certification includes the plans and information submitted with the Water Quality Certification application and, in general, includes the construction and operation of the following:
- a. Reactivation of the existing Cheshire Mills hydroelectric power facility located on the Nubanusit Brook in Harrisville, NH. The existing facility includes a dam, walkway, trashracks, headgate, penstock, turbine, generator, and governor. The dam and equipment will be inspected, repaired or replaced and returned to service. Anticipated installation of new equipment includes the generator, switchgear controls, and possibly the transformer to meet current standards. Anticipated repairs to the existing equipment include painting the penstock and turbine

refurbishment. The proposed activity does not involve construction or repair of the dam.

- b. Operation of a turbine within a minimum hydraulic capacity of 15 cfs and a maximum hydraulic capacity of 36 cfs in instantaneous, run-of- river mode with a proposed minimum bypass flow of 2.1 cfs (see condition E-7 for the minimum bypass flow required for this Activity).

D-2 The Activity would affect river flow in the bypass reach of Nubanusit Brook. Nubanusit Brook flows out of Harrisville Pond at Harrisville Pond Dam (NH Dam Code 109.8). The brook flows for approximately 470 feet before it reaches the impoundment (forebay) behind the Cheshire Mills Forebay Dam (NH Dam Code 109.14). The Cheshire Mills Forebay Dam is a quarried-stone gravel dam with a length of 94 feet, structural height of 29 feet, a hydraulic height of 27 feet, and a drainage area of 10.5 square miles. The proposed Activity would operate the Cheshire Mills Forebay Dam in run-of-river mode but would divert flow through a penstock and turbine for power generation. During turbine operation, the flow to operate the turbine would be removed from a bypass reach of Nubanusit Brook. The bypass reach is approximately 1440 feet in length and consists of an upper and lower bypass reach. The upper bypass reach is 140 feet in length with approximately half of its length running beneath the mill building through a 6 foot radius semi-circular block stone archway culvert. Near the end of the upper bypass reach, the water flows through another small, breached dam. The outlet of the breached dam is the beginning of the lower bypass reach. Just downstream of the breached dam the brook in the lower bypass reach splits into several braided channels. Flow from the tailrace discharges to a tailrace channel on the river right side of the brook which partially rejoins the lower bypass reach after approximately 200 feet. The braided channel reach and tailrace continues for approximately 1300 feet (0.25 miles) where it forms a single channel of Nubanusit Brook and discharges to Skaututakee Lake 0.6 miles downstream of the Cheshire Mills Forebay Dam.

D-3 Named and unnamed, streams, rivers, lakes, ponds and wetlands, potentially affected by any Activity, are surface waters under Env-Wq 1702.46. DES has assigned Assessment Unit (AU) identification numbers to surface waters that appear on 1:24,000 scale hydrography. Consequently, not all surface waters currently have an AU number. Surface waters that do not have an AU number are still considered surface waters of the State in accordance with Env-

Wq 1702.46. Surface waters that could be potentially affected by this Activity and their associated AU numbers (where available) include the following:

Surface Water Name and AU Numbers	Class	Description
Harrisville Pond NHLAK700030103-05-01	B	138 acre pond located upstream of the Harrisville Pond Dam.
Unnamed Brook NHRIV700030103-23	B	River reach between Harrisville Pond Dam and forebay
Unnamed Brook NHIMP700030103-08	B	Forebay upstream of Cheshire Mills Forebay Dam
Unnamed Brook NHRIV700030103-24	B	Nubanusit Brook downstream of the Cheshire Mills Forebay Dam including the bypass reach

D-4 According to the 2010 list of impaired waters, the following surface waters in the vicinity of the proposed Activity which have assigned AU numbers are listed as impaired. All impairments, with the exception of those highlighted in bold (which have approved TMDLs), are on the Section 303(d) List:

Assessment Unit (AU)	Water body Name	Cause of Impairment (Designated Use Impaired)
Harrisville Pond NHLAK700030103-05-01	Harrisville Pond	pH (AL) Dissolved Oxygen Saturation (AL) Mercury (FC)
Unnamed Brook NHIMP700030103-08	Unnamed Brook	Mercury (FC)
Unnamed Brook NHRIV700030103-23	Unnamed Brook	Mercury (FC)
Unnamed Brook NHRIV700030103-24	Unnamed Brook	Mercury (FC)

Notes: AL = Aquatic Life, PCR = Primary Recreation, SCR = Secondary Recreation, FC = Fish Consumption, SFC = Shellfish Consumption

Impairments highlighted in bold have approved TMDLs. All other impairments are on the Section 303(d) List.

- D-5 The Applicant is seeking a case-specific exemption from licensing by the Federal Energy Regulatory Commission (FERC) for a small hydroelectric power project under 18 CFR § 4 Subpart K.
- a) On May 5, 2010, the Applicant submitted a draft Application for Exemption of Licensing of a Small Hydropower Project for initial consultation with the natural resource agencies: the U.S. Fish and Wildlife Service (USFWS), the N.H. Department of Fish and Game (NHFG), and DES.
 - b) On July 6, 2010, USFWS provided comments to the applicant. Based on a June 9, 2010 site visit, USFWS determined that bypass flows would need to be established. It was recommended that the Applicant conduct a study to determine the flow needs for aquatic habitat. Absent a flow study, the USFWS recommended bypass flows be 5.5 cfs based on the New England Aquatic Baseflow Policy. USFWS also stated that there is evidence of downstream fish migration through the project. Trashrack spacing of 1 inch and a calculation of intake velocities would be needed to protect fish from entrainment in the turbine.
 - c) On February 4, 2011, the Applicant submitted a draft application to FERC for a case-specific exemption from licensing for a small hydroelectric power project (the "draft FERC Exemption Application").
 - d) On May 4, 2011, DES provided comments to the Applicant on the draft FERC Exemption Application. DES provided information on the requirements for a Water Quality Certification of the project under RSA 485-A: 12, III, or IV. A copy of these statutes was enclosed with the comments. The comments provided information on how to apply for a Water Quality Certification from DES. Further information on the project specifications was requested along with a request for a flow study to be performed. It was recommended that before any flow study being conducted that DES review the plans for the proposed flow study.
 - e) On May 6, 2011, USFWS provided comments on the draft FERC Exemption Application. The comments included a request to confirm the minimum capacity of the turbine, a request for information on the presence of any federally endangered or threatened species, and a recommendation that an Incremental Demonstration Flow Study should be performed to determine

flow needs for aquatic life in the braided reach downstream from the remnant dam.

- f) On December 2, 2011, the Applicant filed an Application for Exemption of a Small Hydroelectric Power Project of less than 5 MW with FERC. The Applicant also requested a waiver from additional pre-filing consultation.
- D-6 The Activity requires water quality certification under NH RSA 485-A:12, IV. Diversion of up to 36 cfs is equivalent to 23 million gallons per day which is more than the minimum requirement for registration under RSA 488:3 (20,000 gallons of water per day, averaged over any 7-day period). The Activity will also be required to register with the Water Use Registration and Reporting Program per RSA 488:3.
- D-7 The proposed Activity includes diversion of water from Nubanusit Brook through a penstock, turbine, and tailrace. This diversion of water will alter stream flow in the bypass reach and tailrace channel. Stream flow is an important characteristic of habitat for the aquatic community. Therefore, the proposed diversion of water may cause the water quality criteria for biological and aquatic community integrity (Env-Wq 1703.19, item C-8) to be violated in the bypass reach and tailrace channel.
- D-8 The water quality criteria for biological and aquatic community integrity (Env-Wq 1703.19) can be met for the bypass reach if sufficient flow is maintained in the bypass reach and tailrace channel. Ideally, the stream flow in the bypass reach and tailrace channel should mimic natural flows as much as possible as outlined in the 2010 ISF Guidance (see item C-15).
- D-9 To determine minimum flows in bypass channels associated with small hydropower projects (5 MW or less) on existing dams that are applying for an exemption from FERC licensing, DES currently uses the following process. This process for determining instream flow requirements does not necessarily apply to other types of water withdrawal or water diversion projects.
- a. Step 1: DES will consult with the resource agencies (USFWS and NHFG) and other reliable sources to determine whether the bypass reach: (1) provides important habitat for cold water fish species including Eastern brook trout, freshwater mussels or other high value aquatic species that are highly dependent on

seasonal flow variation; or (2) either supports important fish passage or is a priority for fish passage restoration.

- b. Step 2a: If the resource agencies determine that important habitat does not exist in Step 1, the project may operate with a single minimum flow which applies throughout the year. The minimum flow will be set based on a weight of evidence from the following sources.
 - i. For rivers where inadequate flow records exist or are regulated by dams or upstream diversions, the recommended minimum flow is 0.5 cubic feet per second per square mile of drainage (cfsm).
 - ii. Alternatively, where a minimum of 25 years of streamgaging records exist at or near a project site on a river that is effectively free-flowing, the recommended minimum flow for all times of the year can be the median August flow for the period of record.
 - iii. Finally, the Applicant can also choose to complete a site-specific flow study to determine the minimum flow. The study is not necessarily required to follow the Instream Flow Incremental Method discussed in the 2010 ISF guidance (see item C-15), but the objectives and design of the study should be pre-approved by the resource agencies.
- c. Step 2b: If the resource agencies determine that important habitat exists in Step 1, the project may operate with seasonal minimum flows for at least three different periods of the year. The minimum flows will be set based on a weight of evidence from the following sources.
 - i. For rivers where inadequate flow records exist or for rivers regulated by dams or upstream diversions, the recommended minimum flow is 0.5 cubic feet per second per square mile of drainage (cfsm). This 0.5 cfsm recommendation shall apply to all times of the year, except when superseded by spawning and incubation flow recommendations. If certain species are present, including, but not limited to, Eastern Brook Trout, the recommended flow releases are 1.0 cfsm in the fall/winter (October 1 through March 14) and 4.0 cfsm in the spring (March 15 –

May 31) for the applicable spawning and incubation periods.

- ii. Alternatively, where a minimum of 25 years of streamgaging records exist at or near a project site on a river that is essentially free-flowing, the recommended flow for all times of the year can be the median August flow for the period of record unless superseded by spawning and incubation flow recommendations. The recommended flow releases are the historical median stream flow (based on the median of monthly means) throughout the applicable spawning and incubation periods.
 - iii. Finally, the Applicant can also choose to complete a site-specific flow study to determine the minimum flow. The study is not necessarily required to follow the Instream Flow Incremental Method outlined in the 2010 ISF guidance (see item C-15), but the objectives and design of the study should be pre-approved by the resource agencies..
- d. Step 3: If a site-specific flow study has not already been performed for Steps 2a or 2b, the resource agencies will determine whether a site-specific flow study is needed to ensure adequate flow and connectivity to prevent stranding of aquatic species in the bypass reach or downstream of the tailrace discharge.
- e. Step 4: Since the Activity includes an increase in flow alteration, the antidegradation provisions of Env-Wq 1708 et seq. may apply. If the resource agencies determine that important habitat exists in Step 1 and the bypass reach for the Activity is greater than 500 feet long, then the Activity must either demonstrate an insignificant impact per Env-wq 1708.09 in Step 5 or compliance with the antidegradation provisions in Env-Wq 1708 et seq. in Step 6.
- f. Step 5: Per Env-wq 1708.09(b), if the Activity causes an insignificant impact, it is not necessary to demonstrate compliance with the antidegradation provisions. The Activity will be considered to have an insignificant impact if less than 20% of the remaining assimilative capacity is used, unless otherwise determined by DES pursuant to Env-Wq 1708.09(d). For the purposes of this analysis, the remaining assimilative capacity will

be calculated from the following approaches and any other relevant information.

- i. Compare the total volume of flow through the bypass reach over a 25+ year period of record both with and without the Activity operating. The impact will be considered "insignificant" if the annual average volume of flow through the bypass would change by less than 20% from the natural condition.
 - ii. Calculate the percent of days in a 25+ year period for which the Activity would change the flow rate by 20% or more. The impact will be considered "insignificant" if less than 20% of the days in a 25+ period of record would have flows altered by 20% or more.
 - iii. Calculate the percent of time over a 25+ year period that flows would be less than or equal to the minimum bypass flows with the Activity operating. The impact will be considered "insignificant" if the percent of time with flows less than or equal to the minimum flows changes by less than 20% from the natural condition.
 - iv. DES will consider the weight-of-evidence of these three analyses and any other analyses deemed relevant and make a determination as to whether the proposed Activity insignificantly alters flows in the bypass reach per Env-Wq 1708.09. If DES determines that the flow alteration to be insignificant, then an alternatives analysis per Env -Wq 1708.10 would not be required. If DES determines that the flow alteration is significant then an alternatives analysis in Step 6 would be required.
- g. Step 6. If so required, the Applicant must prepare an Alternatives Analysis per Env-Wq 1708.10 to demonstrate that; (1) lowering the water quality is necessary to accommodate the Activity, (2) the Activity will provide net economic or social benefits in the area in which the water body is located, and (3) the net social and economic benefits of constructing and operating or otherwise engaging in the Activity outweigh the environmental impact that could be caused by the lower water quality.
- i. Given that the Activity involves an existing dam and hydropower infrastructure, the alternatives considered for

the analysis under Env-Wq 1708.10(d) may be limited to alternative methods for production and operation of the turbine (Option 1 under Env-Wq 1708.10(d)). The alternative methods of operation considered should include not operating the turbine, operating the turbine in such a manner that the impacts are insignificant per Env-Wq 1708.09, and operating the turbine as proposed.

- ii. Given that the benefits of the Activity are primarily the production of electricity, the analysis of net social and economic benefits of the alternatives under Env-Wq 1708.10(e)(2) may be limited to expected annual electricity production in units of kilowatt-hours per year and the equivalent number of households assuming that each household uses 3000 kilowatt-hours per year.
- iii. To determine the environmental impacts of the alternatives, the Applicant shall submit information on each of the elements in Env-Wq 1708.10(f). Given that the Activity involves an existing dam and hydropower infrastructure, the information submitted may be qualitative or based on observations under existing conditions.
- iv. Pursuant to Env-Wq 1708.10(c), the Applicant shall submit the analysis and a request for approval of the preferred alternative to DES with technically and scientifically valid supporting information.
- v. Pursuant to Env-Wq 1708.10(g), DES will review the information submitted by the Applicant and either approve or deny the request.

D-10 For the proposed Activity, the natural resource agencies determined that the bypass reach and tailrace channel do not contain important habitat for cold water fish species including, Eastern brook trout or other species that are highly dependent on seasonal flow variation and is not a priority for fish passage restoration. Therefore, the Activity may operate with a single minimum flow for the whole year and antidegradation review is not necessary. Following the process from item D-9(b), there are several different ways that minimum bypass flows can be determined.

- a. In the absence of site-specific studies and adequate streamgage data, the U.S. Fish and Wildlife Service recommends a minimum

- flow of 5.5 cfs based on the USFWS Aquatic Baseflow method (see item D-5(b)).
- b. Stream gages near the proposed Activity can be used to estimate the August median flow if the basin characteristics are similar. There are six stream gages within 15 miles of the Activity that have at least 25 years of daily stream flow measurements: USGS site numbers 0116000, 01158500, 01084000, 01084500, 01082000, and 01157000. The US Geological Survey has developed models to predict low flow statistics for basins. The most important basin characteristics for predicting low flow statistics throughout the year are drainage area, average mean annual basin temperature, and average summer precipitation (USGS, 2003)¹. These basin characteristics were calculated for the Activity drainage area and the drainage areas for the six nearby stream gages using the USGS Low Flow Regression tool for ArcView. The summer precipitation values for all of the stream gages were similar and were -5% to -9% lower than for the Activity. The mean annual temperature was within +/-2% for all the stream gages and the Activity. The drainage areas for the stream gages (36-71 square miles) were all larger than the drainage area of the Activity (10.5 square miles). Given that the other factors were similar for all the stream gages, the stream gages with the drainage area closest to the drainage area for the Activity should be the best predictors of stream flow at the Activity. Therefore, the two most appropriate USGS gages for estimating the flow for this project are South Branch Ashuelot River (USGS#01660000, Drainage Area 36 square miles) and Otter Brook (USGS#01158500, Drainage Area 42.3 square miles). The median of the mean August flow pro-rated for a 10.5 square mile drainage area was 2.55 cfs for South Branch Ashuelot River (Period of Record: 1921-2010) and 2.61 cfs for Otter Brook (Period of Record: 1924-1957). The average of these two estimates is 2.58 cfs.
- c. On September 21, 2011, the Applicant completed a flow study at the site. DES and USFWS participated in the study. The flows for the study were regulated at the dam gate. DES staff measured flows at the archway of the bypass reach. The target flows in the bypass reach for the study were 1 cfs, 2 cfs, and 6 cfs. The actual flows measured by DES at the remnant dam were 0.65 cfs, 2.07 cfs, and 5.31 cfs. A representative from USFWS and

1. Development of Regression Equations to Estimate Flow Durations and Low-Flow- Frequency Statistics in New Hampshire Streams. United States Geological Survey, 2003.

DES observed the flows in the braided downstream reach to determine whether suitable aquatic habitat existed at each of the tested flows. The middle flow appeared satisfactory although it was recommended that a small amount (approximately 0.1 to 0.2 cfs) be allowed to flow into tailrace channel to keep it wet. It appears this could be accomplished by shifting a few rocks near the stone dam between the bypass and tailrace to create a small path for flow.

- d. Based on the weight of evidence from the August median calculations and site-specific flow study, a minimum flow of 2.58 cfs applied throughout the year will be sufficient to maintain water quality standards in the bypass reach and tailrace channel. The minimum flow was calculated from the August median flow at two USGS gages near the site. Although a site-specific flow study was done, the study was not rigorous enough to calculate an exact minimum flow. However, the results of the flow study provided evidence that supports the choice of 2.58 cfs as a minimum bypass flow to protect designated uses in the bypass reach.

D-11 Neither the existing condition nor the proposed Activity allows for upstream migration of fish over the Cheshire Mills Forebay Dam. Downstream migration of fish is possible under current conditions and should be maintained according to USFWS. In their letter of June 6, 2010, USFWS recommended that the Applicant modify the existing trashrack to a spacing of 1 inch and calculate intake velocities to protect fish from entrainment.

E. WATER QUALITY CERTIFICATION CONDITIONS

Unless otherwise authorized by DES, the following conditions shall apply.

- E-1. The Activity shall not cause or contribute to a violation of surface water quality standards. DES may modify this Water Quality Certification to include additional conditions to ensure the Activity complies with surface water quality standards, when authorized by law, and after notice and opportunity for hearing, should DES determine that surface water quality standards are being violated as a result of the Activity.
- E-2. The Applicant shall allow DES to inspect the Activity and its effects on affected surface waters at any time to monitor compliance with the conditions of this Water Quality Certification.

- E-3. The Applicant shall consult with DES regarding any proposed modifications to the Activity, including construction or operation, to determine whether this Water Quality Certification requires modification in the future.
- E-4. The Applicant shall comply with all other permits required for this Activity, including, but not limited to, any DES Wetlands permits and amendments.
- E-5. Transfer of this Certification to a new owner shall require notification to and approval by the DES.
- E-6. The Activity shall be operated in a run-of-river mode with inflow equal to outflow at all times and with no drawing down of water levels above the dam for the purpose of generating power. Run-of-river operation may be temporarily modified if due to emergencies beyond the control of the Applicant, or for short periods upon mutual agreement of the Applicant, DES, NHFG and the USFWS.
- E-7. The minimum bypass channel flow shall be as shown in the following table:

Season	Minimum Bypass Channel Flow
June 1 through September 30	2.58 cfs
October 1 through March 14	2.58 cfs
March 15 through May 31	2.58 cfs

Flow in the bypass channel shall not fall below the minimum flows shown in the table above unless the excursions are due to 1) inflow to the facility being less than the minimum bypass channel flow, 2) emergencies beyond the control of the Applicant, or 3) short periods upon mutual agreement of the Applicant, DES, NHFG and the USFWS.

- E-8. Prior to construction, the Applicant shall submit to, and obtain DES approval of, a report that describes the steps that will be taken to prevent stranding of aquatic organisms in the bypass reach, the tailrace, and tailrace channel when the facility is not generating power. This plan must address the need to maintain 0.1-0.2 cfs in the tailrace channel (see D-10c) which should be achievable by

shifting a few relatively small rocks near the stone dam between the bypass and tailrace to create a flow path. A permit from the DES Wetlands Bureau may be necessary for work in the stream channel. The Applicant shall then implement the DES approved plan.

- E-9. The Applicant shall be responsible for constructing, operating, maintaining and evaluating upstream and/or downstream fish passage facilities when notified by the DES, NHFG or USFWS. All plans and schedules associated with the design, construction, maintenance and evaluation of any prescribed fishways shall be developed by the Applicant in consultation with DES, NHFG and the USFWS. The Applicant shall then implement the approved plan.
- E-10. Prior to construction, and to prevent entrainment of fish on the trash rack covering the penstock opening, the Applicant shall obtain approval of the trash rack design from DES, NHFG and USFWS. This plan must address the USFWS recommendation for 1-inch spacing for the trashracks and intake velocity calculations. The Applicant shall then install the approved trash rack.
- E-11. The Applicant shall register the water use with DES per RSA 488:3.
- E-12. The turbine shall be a refurbished Morgan Smith Francis turbine with the use of one runner and with an operating range of 15 cfs to 36 cfs, unless otherwise approved by DES.
- E-13. Prior to operation the Applicant shall submit to, and obtain DES approval of, an Operation, Maintenance and Monitoring Plan (OMMP). The Applicant shall then implement the DES approved plan. The OMMP shall include, but not be limited to, the following:
- i. A description of the mechanisms, equipment and structures that will be used
 - ii. The level of manual and automatic operation
 - iii. The methods and equipment (including its accuracy) that will be used for recording data on run-of-river operation and minimum flow releases.
 - iv. Routine maintenance procedures (including schedules and notification procedures) for trash rack cleaning, flash board maintenance, any activity requiring impoundment drawdown/refilling etc.

- v. Emergency drawdown procedures (including notification procedures)
- vi. A plan for maintaining data for inspection by DES.

E-14. The Applicant shall notify DES within 36 hours anytime minimum flow in the bypass channel is not met with the exception of any previously approved routine maintenance or when inflow is less than the bypass channel flow. The notification shall include an explanation as to why the deviations occurred, a description of corrective actions taken and how long it will take until minimum bypass flows are met.

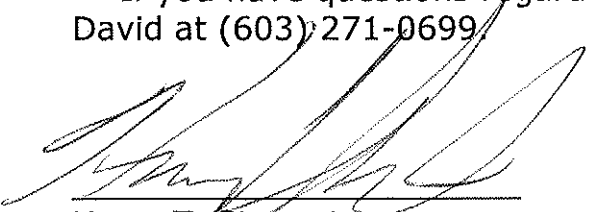
E-15. If directed by DES, and prior to operation of the Activity, the Applicant shall submit to, and obtain DES approval of, a water quality monitoring plan. The Applicant shall then implement the approved plan. Such plans typically include monitoring for dissolved oxygen (mg/L and percent saturation) and temperature in the bypass channel and tailrace during periods of low flow and high temperature. In addition, such plans may also include monitoring for other parameters, including but not limited to, chlorophyll-a (algae) and nutrients. Water quality monitoring plans also include sampling and laboratory protocols, including quality assurance/quality control provisions. If sampling indicates a violation of water quality standards (Env-Wq 1700) and it is apparent that operation of the dam contributes to the violation, the Applicant shall, after consultation with DES, submit to and obtain DES approval of a remediation plan to eliminate the violations. The Applicant shall then implement the DES approved remediation plan.

E-16. The Applicant shall maintain daily records demonstrating that the facility has been operated in accordance with the DES approved Operations, Maintenance and Monitoring Plan (OMMP), including but not limited to, passage of minimum bypass channel flows. The records shall be maintained by the Applicant and submitted to DES within 72 hours of receiving a request from DES.

APPEAL

If you are aggrieved by this decision, you may appeal the decision to the Water Council. Any appeal must be filed within 30 days of the date of this decision, and must conform to the requirements of Env-Wq 200. Inquiries regarding appeal procedures should be directed to NHDES Council Appeals Clerk, 29 Hazen Drive, PO Box 95, Concord, NH 03302-0095; telephone (603) 271-6072.

If you have questions regarding this Certification, please contact Owen David at (603) 271-0699.



Harry T. Stewart
Director, DES Water Division

- cc: John Warner, US Fish and Wildlife Service
- Carol Henderson, NH Fish and Game
- Donna Stone, Town Clerk Harrisville NH
- Derek Bennett, DES Drinking Water and Ground Water Bureau
- Bob Easton, Federal Energy Regulatory Commission New England Branch