Ferry Lane

Bypassed Reach

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Chicopee Falls Dam

Impoundment

Impoundment

Dwight Dam

Headgate



Bypassed Reach

Bypassed Reach 🚽

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Impoundment

Impoundment



Headgate

Bemis Pond

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© 2018 Google



Impoundment

Dwight Dam

Headgate

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1995





Bypassed Reach

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Confluence with Chicopee River

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Confluence with Chicopee River 🥂

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#### UNITED STATES OF AMERICA UNITED STATES OF AMERICA FEDERAL ENERGY REGULATORY COMMISSION

Western Massachusetts Electric Project No. 10675-001 Company Massachusetts

#### ORDER GRANTING EXEMPTION FROM LICENSING (5 MW OR LESS) (Issued September 11, 1992)

On December 6, 1989, Western Massachusetts Electric Company (WMEC) filed an application to exempt the existing and operating 1,440-kilowatt (kW) Dwight Project from the licensing requirements set forth in Part I of the Federal Power Act (Act). WMEC would install a 210-kW minimum flow turbine-generator unit bringing the project's installed generation capacity to 1,650 kW. The proposed small hydropower project is described in the attached public notice. No protests or motions to intervene were filed pursuant to the public notice. The comments of interested agencies and individuals, including the Department of the Interior (Interior) and the state fish and wildlife agency (State Fish and Wildlife), have been fully considered in determining whether to issue this exemption from licensing.

Article 2 of this exemption requires compliance with the terms and conditions prepared by federal or state fish and wildlife agencies to protect fish and wildlife resources. These mandatory terms and conditions are contained in the attached letters commenting on the exemption application. If contested, the Commission will determine whether any mandatory term or condition is outside the scope of article 2.

Commission staff determined that exempting the proposed project would have no effect on National Register or eligible properties based on the exemptee proposal to use the existing project works for its historic purpose. No properties of historic significance would be adversely affected by continued use of the project for hydropower as proposed. The possibility exists that properties could be adversely affected by unforseen ground-disturbing activities or by project operation not already considered in the Environmental Assessment. For these reasons, Articles 12 and 13 are included to ensure that the exemptee, before engaging in any ground disturbance not already considered in the Environmental Assessment, takes protective measures.

Commission staff also determined that excavation for the construction of the minimum flow powerhouse could increase the potential for erosion and sedimentation and result in short-term turbidity for the duration of the construction. For these reasons, Article 14 is included to ensure that the exemptee,

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before engaging in any ground disturbance take protective measures to minimize erosion and sedimentation associated with the construction of the minimum flow unit powerhouse.

After considering the mandatory terms and conditions designed to protect fish and wildlife resources, the environmental information in the exemption application, the staff's independent assessment 1/, and other public comments, the Director finds that issuance of this order is not a major federal action significantly affecting the quality of the human environment.

The Director orders:

(A) The Dwight Project is exempted from the licensing requirements of Part I of the Act, subject to the attached standard articles (See section 4.106 of the Commission's regulations) and the following additional articles:

Article 10. The exempted small hydroelectric power project is subject to the provisions of 18 CFR Part 12, as it may be amended. For the purposes of applying the provisions of 18 CFR Part 12, the exempted project is deemed to be a licensed project development, and the owner of the exempted project is deemed to be a Licensee.

Article 11. In addition to the notification of the Commission required by standard article 9, and within 30 days of transferring any property interests, the exemption holder must inform the Commission's New York Regional Director of the identity and address of the transferee.

Article 12. The Exemptee shall, before undertaking any construction activities at the project that would result in any modification of the existing historic facilities: (1) consult with the State Historic Preservation Officer (SHPO) concerning

preliminary design of the new facilities to be constructed at the project to establish specific design criteria consistent with the Secretary of the Interior's "Standards for Rehabilitation"; (2) afford the SHPO the opportunity to review preliminary and final design drawings of the new facilities; and (3) file the final design drawings, along with the SHPO's comments on the final design drawings, for Commission approval. The Exemptee shall undertake no construction activities at the project that would result in any modification of the existing historic facilities until informed by the Commission that the final design

 Environmental Assessment, Dwight Project, FERC No. 10675-001, Federal Energy Regulatory Commission, August 31, 1992. This document is available in the Commission's public file associated with this proceeding.

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drawings have been approved.

Article 13. The Exemptee, before starting any land-clearing or land-disturbing activities within the project boundaries, including recreation developments at the project and any construction activities or alterations at or within the historic Dwight Generating Station -- other than those land-clearing and land-disturbing activities, and construction activities and alterations at and within the historic Dwight Generating Station that are specifically authorized in this license -- shall consult with the State Historic Preservation Officer (SHPO).

If the Exemptee discovers previously unidentified archeological or historic properties during the course of constructing or developing project works or other facilities at the project, the Exemptee shall stop all land-clearing and landdisturbing activities in the vicinity of the properties and consult with the SHPO.

In either instance, the Exemptee shall file for Commission approval a cultural resource management plan (plan) prepared by a qualified cultural resource specialist after having consulted with the SHPO. The plan shall include the following items: (1) a description of each discovered property indicating whether it is listed on or eligible to be listed on the National Register of Historic Places; (2) a description of the potential effect on each discovered property; (3) proposed measures for avoiding or mitigating effects; (4) documentation of the nature, extent, and results of consultation; and (5) a schedule for mitigating effects and conducting additional studies. The Commission may require changes to the plan.

The Exemptee shall not begin land-clearing or landdisturbing activities within the project boundaries, including recreation developments at the project and any construction activities or alterations at or within the historic Dwight Generating Station complex -- other than those land-clearing and land-disturbing activities, and construction activities and alterations at and within the historic Dwight Generating Station complex that are specifically authorized in this license -- or resume such activities in the vicinity of a property, discovered during construction, until informed by the Commission that the requirements of this article have been fulfilled.

Article 14. At least 90 days before the start of any landdisturbing, land-clearing, or spoil-producing activities, the Exemptee shall file with the Commission for approval, and with the New York Regional Office, a plan to control erosion, to control slope instability, and to minimize the quantity of sediment resulting from project construction and operation.

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The plan shall be based on actual site geological, soil, slope, drainage, and groundwater conditions and on project design, and shall include, at a minimum, the following four items:

- (1) a description of the actual site conditions;
- (2) measures to control erosion, to prevent slope instability, and to minimize the quantity of sediment resulting from project construction and operation;
- (3) detailed descriptions, functional design drawings, and topographic map locations of all control measures; and
- (4) a specific implementation schedule and details of monitoring and maintenance programs for the project construction period and for project operation.

The Exemptee, shall prepare the plan after consultation with the Soil Conservation Service and the Massachusetts Division of Fisheries and Wildlife. The Exemptee shall include with the plan documentation of consultation with the agencies and copies of agency comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the plan accommodates all of the agency comments and recommendations. The Exemptee shall allow a minimum of 30 days for the agencies to comment and make recommendations prior to filing the plan with the Commission. If the Exemptee does not adopt a recommendation, the filing shall include the Exemptee's reasons, based on geological, soil, and groundwater conditions at the site.

The Commission reserves the right to require changes to the plan. No land-disturbing or land-clearing activities shall begin until the Exemptee is notified by the Commission that the plan is approved. Upon Commission approval, the Exemptee shall implement the plan, including any changes required by the Commission.

(B) Article 2 of this exemption is amended to include the National Marine Fisheries Service as a fish and wildlife agency that can provide terms and conditions.

(C) The Exemptee shall serve copies of any Commission filing required by this order on any entity specified in this order to be consulted on matters related to that filing. Proof of service on these entities must accompany the filing with the Commission.

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(D) This order constitutes final agency action. Requests for rehearing by the Commission may be filed within 30 days of the date of issuance of this order, pursuant to 18 C.F.R. 385.713.

Dean L. Shumway Director, Division of Project Review

- a. Type of Application: Exemption from Licensing
- b. Project No.: 10675-001

- c. Date Filed: December 6, 1989
- d. Applicant: Western Massachusetts Electric Company
- e. Name of Project: Dwight Project
- f. Location: On the Chicopee River, Hampden County, Massachusetts
- g. Filed Pursuant to: Federal Power Act 16 U.S.C. 791 (a) -825(r)
- h. Applicant Contact: Mr. Richard W. Thomas Northeast Utilities Service Company P.O. Box 270 Hartford, CT 06141-0270 (203) 665-3719
- i. FERC Contact: Mary Golato (202) 219-2804
- j. Deadline Date:
- k. Status of Environmental Analysis: This application is ready for environmental analysis at this time - see attached paragraph D4.
- 1. Description of Project: The proposed project would consist of the following facilities: (1) an existing 306-foot-long and 15-foot-high stone masonry overflow spillway dam; (2) an existing reservoir with a surface area of 32 acres, a storage capacity of approximately 70-acre-feet, and a normal surface elevation of 78.8 feet mean sea level; (3) an existing 3,000foot-long by 80-foot power canal; (4) three existing 7-footdiameter and 168-foot-long penstocks; (5) an existing powerhouse containing three existing turbine-generating units at a total installed capacity of 1,440 kilowatts (kW); (6) an existing 3.2-mile-long transmission line; and (7) appurtenant facilities. In addition to the existing works, the applicant proposes to install a minimum flow unit with a rated capacity of 210 kW, bringing the total station capacity to 1,650 kW. The applicant estimates that the average annual generation is approximately 8.5 gigawatthours. The project was found jurisdictional under UL 88-29-000.
- m. Purpose of Project: All project energy generated would be utilized by the applicant for sale to its customers.

- n. This notice also consists of the following standard paragraphs: A2, A9, B1, and D4.
- o. Available Locations of Application: A copy of the application, as amended and supplemented, is available for inspection and reproduction at the Commission's Public Reference and Files Maintenance Branch, located at 941 North Capitol Street, N.E., Room 3104, Washington, D.C. 20426, or by calling (202) 219-1371. A copy is also available for inspection and reproduction at Mr. Richard W. Thomas, Northeast Service Company, P.O. Box 270, Hartford, CT 06141-0270 (203) 665-3719.



# United States Department of the Interior

FISH AND WILDLIFE SERVICE 400 RALPH PILL MARKETPLACE 22 BRIDGE STREET



CONCORD, NEW HAMPSHIRE 03301-4901989 JUL 20 PH 4: 43

REF: Chicopee River Projects

FEDERAL ENERGY REGULATORY COMMISSION 1989

FERC

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Mr. Brandon H. Kulik Kleinschmidt Associates 75 Main Street, P.O. Box 576 Pittsfield, Maine 04967

Dear Mr. Kulik:

This is in reference to your June 14 and June 30, 1988 hydrologic analysis for the Chicopee River, in regard to the Red Bridge (#10676), Putts Bridge (#10677), Indian Orchard (#10678), and Dwight (#10675) Hydro Projects, located in Hampshire and Hampden Counties, Massachusetts.

The objective of your analysis was to determine a hydrologically based approximation of the historic, unregulated August median flow for the Chicopee River. This was accomplished by examining gage data from tributaries to the Chicopee River, i.e., the Swift, Ware, and Quaboag Rivers. The entire period of record for these gages was then examined to find those periods that met the Fish and Wildlife Service's (Service) Aquatic Base Flow (ABF) criteria, viz., at least 25 years of essentially unregulated flow, data rated "good" by USGS, and a drainage area at the gage of at least 50 square miles.

Using this approach, a 27 year period of data from the Quaboag River and the entire period of record for the Ware River yielded an unregulated August median flow value of 0.36 cfsm. Extrapolation to the four hydro projects yields minimum instantaneous flow releases at the dam of 237 cfs for Red Bridge, 247 cfs for Putts Bridge, 247 cfs for Indian Orchard, and 258 cfs for Dwight. These flow releases will apply at the base of the dam, unlocc sampling indicates a need to spill water for water quality purposes. We would also like to view these flow releases at the time you are conducting water quality sampling.

Please contact Mr. Bob Scheirer of this office at (603) 225-1411 to arrange a flow demonstration, and for further coordination as your pre-licensing studies proceed.

Sincerely yours,

Jordon E. Beckett

Gordon E. Beckett Supervisor New England Area

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# United States Department of the Interior

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OFFICE OF THE SECRETARY OFFICE OF ENVIRONMENTAL AFFAIRS O'NEILL FEDERAL OFFICE BUILDING - ROOM 1022 10 CAUSEWAY STREET BOSTON, MASSACHUSETTS 02222-1035

ER 92/595

REF: FERC No. 10675 Western Massachusetts Electric Company COMMENTS, RECOMMENDATIONS AND TERMS AND CONDITIONS

Lois D. Cashell, Secretary Federal Energy Regulatory Commission 825 North Capitol Street, N.E. Washington, DC 20426

Dear Ms. Cashell:

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This is in response to the Notice of Application Filed with the Commission for the Dwight Project located on the Chicopee River in Hampden County, Massachusetts.

The following comments, recommendations and terms and conditions reflect the best information available to us. We reserve the right to supplement our terms and conditions as needed following review of any additional information or modifications to the proposed project submitted by the applicant.

#### FISH AND WILDLIFE RESOURCES

The Chicopee River is a tributary to the Connecticut River Basin. Resident fish species currently inhabit the river in the project area. In addition, anadromous fish currently have access to the lower Chicopee River to the base of the Dwight Project Dam. Restoration of American shad, river herring and Atlantic salmon are ongoing in the Connecticut basin. No management activities are currently focussed on the Chicopee River, however, the Chicopee offers habitat for anadromous species. Future expansion of the restoration program to the Chicopee is likely.

#### IMPACTS AND MITIGATION

#### <u>Fish</u> <u>Passage</u>

Anadromous fish restoration activities in the Chicopee River would necessitate the installation of upstream and/or downstream fish passage facilities in the future. These facilities should be constructed in the future upon the request of the Fish and Wildlife Service, Massachusetts Division of Fisheries and Wildlife, and Connecticut River Atlantic Salmon Commission (CRASC).

Design of these facilities should be coordinated with these agencies and the final plans for the facilities approved by them. Plans and schedules for the construction, operation and monitoring of passage facilities will be needed and must also be developed in consultation with the agencies DOCKETED

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## Minimum Bypass Flows

The project tailrace discharges 3,000 feet downstream from the dam, thereby currently reducing flows to this reach of the Chicopee River. To determine appropriate minimum flow release needed to protect fish and other aquatic resources in the bypass reach, the applicant conducted a hydrological analysis of the river. From this analysis, the median August flow of 258 cfs was calculated. This flow is necessary to conserve and protect fish and other aquatic resources in the bypass reach. This flow should be released at the project dam, and can be provided through spill over the dam, through gates, or through minimum flow turbine as proposed in the application for exemption.

A plan to monitor minimum flow releases is needed to allow verification of compliance with the required minimum flow release.

#### Recreational Access

The applicant proposes cooperation with the City of Chicopee in procuring a conservation easement along a proposed riverside nature trail above and below the project. This activity is needed to ensure the public access to the river and to utilize its fish and wildlife resources.

# MANDATORY TERMS AND CONDITIONS

Section 30(c) of the Federal Power Act and Section 408 of the Energy Security Act require the inclusion in the exemption from licensing, all terms and conditions that are prescribed by the state and Federal fish and Wildlife agencies to prevent loss of, or damage to fish and wildlife resources. The following conditions of the Fish and Wildlife Service are provided in accordance with these provisions.

1. The Exemptee shall construct, operate, maintain and monitor upstream and downstream fish passage facilities when prescribed by the Fish and Wildlife Service (FWS) and/or the Massachusetts Division of Fisheries and Wildlife (MDFW).

The Exemptee shall be responsible for the designs of the fish passage facilities which shall be developed in consultation with, and be approved by, the FWS, MDFW and Connecticut River Atlantic Salmon Commission (CRASC).

Upstream and/or downstream passage facilities shall be constructed and operational within 2 years after being notified of their need by the FWS and/or MDFW.

- 2. The Exemptee shall develop plans for monitoring, maintaining and operating the upstream and downstream fish passage facilities in consultation with the FWS, MDFW, and CRASC. These plans shall be finalized and approved within two years after being notified of the need for passage facilities.
- 3. A minimum flow of 258 cubic feet per second, or inflow to the project, whichever is less shall be continuously released at the project dam to the bypassed reach.

ER 92/595 FERC No. 10675

- 4. The exemptee shall operate the project to limit drawdown of the project impoundment to no more than one foot below the dam crest, except for system operating emergencies or annual energy audits.
- 5. The licensee shall, within six months form the date of issuance of the exemption from licensing for this project, present to the Fish and Wildlife Service for approval, a plan for monitoring project impoundment level and instantaneous bypass flow releases. Following approval of the plan, the Exemptee shall measure and record impoundment level and flows according to the plan and provide records of these data to the Fish and Wildlife Service within 30 days from a request for the records.
- 6. The Exemptee shall cooperate with the City of Chicopee in obtaining conservation easements for a riverside nature trail, as described in the draft application, and allow public access to the project area for utilization of fish and wildlife resources, subject to reasonable safety and liability limitations. Such access should be prominently posted so that its availability is made known to the public.
- 7. The Exemptee shall allow the Fish and Wildlife Service to inspect the project area at any time while the project operates under an exemption from licensing, in order to monitor compliance with the terms and conditions.
- 8. The Fish and Wildlife Service reserves the right to add and/or alter these terms and conditions as appropriate to carry out its responsibilities with respect to fish and wildlife resources. The Exemptee shall, within 30 days of receipt, file with the Federal Energy regulatory Commission any additional or modified mandatory terms and conditions.
- 9. The Exemptee shall incorporate the aforementioned fish and wildlife conditions in any conveyance; by lease, sale or otherwise; of its interests so as to legally assure compliance with said conditions for as long as the project operates under an exemption from licensing.

We appreciate this opportunity to comment on this application.

Sincerely yours,

William Patterson Regional Environmental Officer

-26 ma



March 7, 2013

VIA E-FILING

Mr. Gerald L. Cross, P.E. Regional Engineer Federal Energy Regulatory Commission Division of Dam Safety and Inspections New York Regional Office 19<sup>th</sup> West 34<sup>th</sup> Street – Suite 400 New York, NY 10001

FERC Project No. 10675, 10676, 10677, 10678, and 2334 Release of Minimum Flows

Dear Mr. Cross:

EP Energy Massachusetts LLC owns and operates the Dwight Project (FERC No. 10675), the Red Bridge Project (FERC No. 10676), the Putts Bridge Project (FERC No. 10677) and the Indian Orchard Project (FERC No. 10678) located on the Chicopee River in Western Massachusetts. EP Energy Massachusetts LLC also owns and operates the Gardeners Falls Project (FERC No. 2334) located on the Deerfield River in Western Massachusetts. Passage of minimum flows in the river bypass reach is required at each project. On behalf of our client, we are providing the annual report on minimum flow releases at the projects during 2012.

For the twelve months of the year 2012, EP Energy Massachusetts LLC met or exceeded the required flows at each project. Documentation of the releases is available for review during the next operation and safety inspection. If you have any questions or require additional information regarding the release of minimum flows, please contact Kim Marsili of EP Energy Massachusetts LLC at (413) 730-4721 (email: kim.marsili@essentialpowerllc.com).

Sincerely,

#### **KLEINSCHMIDT ASSOCIATES**

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Chris Tomichek Project Manager

CAT:SDM cc: K. Marsili J. Bahrs C. Lane D. Schmidt

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Document Content(s)
Min Flow 2012 Annual Report.PDF1-1



October 25, 2018

VIA E-FILING

John Spain, P.E. Regional Engineer Federal Energy Regulatory Commission Division of Dam Safety and Inspections New York Regional Safety 19 West 34<sup>th</sup> Street, Suite 400 New York, New York 10001

RE: FERC Project No. 10675, 10676, 10677, 10678, and 2334 Release of Minimum Flows

Dear Mr. Spain:

Central Rivers Power MA, LLC (Central Rivers) owns and operates the Dwight Project (FERC No, 10675), the Red Bridge Project (FERC No. 10676), the Putts Bridge Project (FERC No. 10677) and the Indian Orchard Project (FERC No. 10678) located on the Chicopee River in western Massachusetts. Central Rivers also owns and operates the Gardner Falls Project (FERC No. 2334) located on the Deerfield River in western Massachusetts. Passage of minimum flows in the river bypass reach is required at each project. On behalf of Central Rivers, I am providing the annual report on minimum flow releases at the projects during 2013.

For the twelve months of the year 2013, after a review of the data from the previous years provided by the past owners, to the best of my knowledge, the minimum stream flows were met or exceeded for each project. Documentation of the release is available for review during the next operation and safety inspection. If you have any questions or require additional information regarding the release of minimum flows, please contact Luke Wright at wright@wareriverpower.com or (978) 355-4575.

Sincerely,

WARE RIVER POWER, INC.

Lucas W. Wright President

cc: Matt Willis (Hull Street Energy) Randall Osteen (Hull Street Energy)



October 25, 2018

VIA E-FILING

John Spain, P.E. Regional Engineer Federal Energy Regulatory Commission Division of Dam Safety and Inspections New York Regional Safety 19 West 34<sup>th</sup> Street, Suite 400 New York, New York 10001

RE: FERC Project No. 10675, 10676, 10677, 10678, and 2334 Release of Minimum Flows

Dear Mr. Spain:

Central Rivers Power MA, LLC (Central Rivers) owns and operates the Dwight Project (FERC No, 10675), the Red Bridge Project (FERC No. 10676), the Putts Bridge Project (FERC No. 10677) and the Indian Orchard Project (FERC No. 10678) located on the Chicopee River in western Massachusetts. Central Rivers also owns and operates the Gardner Falls Project (FERC No. 2334) located on the Deerfield River in western Massachusetts. Passage of minimum flows in the river bypass reach is required at each project. On behalf of Central Rivers, I am providing the annual report on minimum flow releases at the projects during 2014.

For the twelve months of the year 2014, after a review of the data from the previous years provided by the past owners, to the best of my knowledge, the minimum stream flows were met or exceeded for each project. Documentation of the release is available for review during the next operation and safety inspection. If you have any questions or require additional information regarding the release of minimum flows, please contact Luke Wright at wright@wareriverpower.com or (978) 355-4575.

Sincerely,

WARE RIVER POWER, INC.

Lucas W. Wright President

cc: Matt Willis (Hull Street Energy) Randall Osteen (Hull Street Energy)



October 25, 2018

VIA E-FILING

John Spain, P.E. Regional Engineer Federal Energy Regulatory Commission Division of Dam Safety and Inspections New York Regional Safety 19 West 34<sup>th</sup> Street, Suite 400 New York, New York 10001

RE: FERC Project No. 10675, 10676, 10677, 10678, and 2334 Release of Minimum Flows

Dear Mr. Spain:

Central Rivers Power MA, LLC (Central Rivers) owns and operates the Dwight Project (FERC No, 10675), the Red Bridge Project (FERC No. 10676), the Putts Bridge Project (FERC No. 10677) and the Indian Orchard Project (FERC No. 10678) located on the Chicopee River in western Massachusetts. Central Rivers also owns and operates the Gardner Falls Project (FERC No. 2334) located on the Deerfield River in western Massachusetts. Passage of minimum flows in the river bypass reach is required at each project. On behalf of Central Rivers, I am providing the annual report on minimum flow releases at the projects during 2015.

For the twelve months of the year 2015, after a review of the data from the previous years provided by the past owners, to the best of my knowledge, the minimum stream flows were met or exceeded for each project. Documentation of the release is available for review during the next operation and safety inspection. If you have any questions or require additional information regarding the release of minimum flows, please contact Luke Wright at wright@wareriverpower.com or (978) 355-4575.

Sincerely,

WARE RIVER POWER, INC.

Lúcas W. Wright President

cc: Matt Willis (Hull Street Energy) Randall Osteen (Hull Street Energy)



Essential Power Massachusetts, LLC

13 Agawam Ave West Springlichd, MA 0 \$089 413-730-4724

January 11, 2017

VIA E-File

John Spain, P.E. Regional Engineer Federal Energy Regulatory Commission Division of Dam Safety and Inspections New York Regional Office 19th West 34th Street – Suite 400 New York, NY 10001

FERC Project No. 10675, 10676, 10677, 10678, and 2334 <u>Release of Minimum Flows</u>

Dear Mr. Spain:

Essential Power Massachusetts, LLC (EPMA) owns and operates the Dwight Project (FERC No. 10675), the Red Bridge Project (FERC No. 10676), the Putts Bridge Project (FERC No. 10677) and the Indian Orchard Project (FERC No. 10678) located on the Chicopee River in western Massachusetts. EPMA also owns and operates the Gardners Falls Project (FERC No. 2334) located on the Deerfield River in western Massachusetts. Passage of minimum flows in the river bypass reach is required at each project. On behalf of EPMA I am providing the annual report on minimum flow releases at the projects during 2016.

For the twelve months of the year 2016, EPMA met or exceeded the required flows at each project. Documentation of the release is available for review during the next operation and safety inspection. If you have any questions or require additional information regarding the release of minimum flows, please contact Kim Marsili at (413) 730-4721, email: kim.marsili@cogentrix.com

Sincerely,

Ki c Maril

Kim Marsili General Manager, Dwight Project Red Bridge Project Putts Bridge Project Indian Orchard Project Gardner Falls Project

cc: Tony Halcomb (Cogentrix) John Collins (Cogentrix)



March 29, 2018

#### **VIA E-FILING**

Mr. John Spain, P.E. Regional Engineer Federal Energy Regulatory Commission Division of Dam Safety and Inspections New York Regional Office 19<sup>th</sup> West 34<sup>th</sup> Street – Suite 400 New York, NY 10001

FERC Project No. 10675, 10676, 10677, 10678, and 2334 Release of Minimum Flows

Dear Mr. Spain:

Nautilus Hydro, LLC owns and operates the Dwight Project (FERC No. 10675), the Red Bridge Project (FERC No. 10676), the Putts Bridge Project (FERC No. 10677) and the Indian Orchard Project (FERC No. 10678) located on the Chicopee River in Western Massachusetts. Nautilus Hydro, LLC also owns and operates the Gardeners Falls Project (FERC No. 2334) located on the Deerfield River in Western Massachusetts. Passage of minimum flows in the river bypass reach is required at each project. On behalf of our client, we are providing the annual report on minimum flow releases at the projects during 2017.

For the twelve months of the year 2017, Nautilus Hydro, LLC met or exceeded the required flows at each project. Documentation of the releases is available for review during the next operation and safety inspection. If you have any questions or require additional information regarding the release of minimum flows, please contact Matthew Willis of Nautilus Hydro, LLC at (240) 800-3218 (email: <a href="mailto:mwillis@hullstreetenergy.com">mwillis@hullstreetenergy.com</a>).

Sincerely,

#### KLEINSCHMIDT ASSOCIATES

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Nicholas M. Ciomei, P.E. Project Manager

NMC:TMJ cc: Matt Willis, Nautilus Hydro, LLC Luke Wright, Ware River Power

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March 13, 2019

Federal Energy Regulatory Commission Office of Energy Projects Division of Dam Safety and Inspections New York Regional Office 19 West 34<sup>th</sup> St. Suite 400 New York, New York 10001

RE: P-10678, Indian Orchard Hydro

Attn: Ryan E. Pickett, P.E.:

For calendar year 2018 Ware River Power, Inc. (WRP) has managed the Indian Orchard Hydro Power Project. The project has adhered to all recognized minimum stream flow requirements as determined in its FERC License.

Furthermore, there have been no known down-stream changes that would affect our FERC hazard classification.

Sincerely,

Lucas Wright

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Document Content(s)	
IO MSF Compliance Letter	20190313.PDF1-1



December 06, 1999 REGULATION / CUMMASSION

Attn: OHL, HL-11.1 Secretary Federal Energy Regulatory Commission 888 First Street, N.E. Washington, D.C. 20426

Chicopee River Projects 01 01 014 FERC No. 10675, 10676, 10677 and 10678 Response to Additional Information Request of October 27, 1999

Dear Secretary:

By letter dated October 27, 1999, FERC requested Consolidated Edison Energy Massachusetts, Inc. (CEEMI) to provide additional information regarding the Development Plan (Plan) submitted on July 30, 1999. This letter is to provide you with the requested information.

Consolidated Edison Energy Massachusetts, Inc. respectively requests an expedited review of this clarifying letter to expedite the issuance of an order approving the Development Plan by December 31, 1999. CEEMI is committed to completing the work involved in bringing all the projects into compliance with the FERC exemption orders and we are anxious to expedite the schedule. CEEMI is willing to have a meeting in Washington, if need be, prior to December 31, 1999 to resolve or clarify any outstanding issues or concerns. We will make available all personnel and/or consultants required for the meeting. We are looking forward to working with FERC and wish to commence construction as soon as possible in order to avoid any delays in the overall schedule. If you have any questions or if there is any we can do help FERC expedite these orders, please call John Labiak at (212) 267-5280.

Specifically, the October letter requested clarification of the seven items listed below:

1. The exemptions for the four Chicopee River Projects currently authorize an increase in the total installed capacity of 14.28 percent (1,705 kW) with minimum flow units added at each project. In our review of the Plan, we found the proposed capacity increase for the four projects is 3.67 percent (438.4 kW) without the addition of minimum flow units, as described in the table below:

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DEC

West Springfield Generating Station • 15 Agawam Avenue • West Springfield, MA 01089

FERC PROJECT No.	EXISTING CAPACITY (KW)	PROPOSED PERCENT INCREASE	ESTIMATED CAPACITY INCREASE (KW)
10675	1.440	6	86.4
10676	3,600	3	108.0
10677	3,200	3	96.0
10678	3,700	4	148.0
TOTAL	11,940	3.67%	438.4

The proposed percent increases for each project are based on estimated values. Therefore, we are unable to determine the actual installed capacity from the information provided in the Plan. So that we can verify the actual installed capacity for each of the four projects, please provide generator nameplate capacities, or KVA (after rewinding process), turbines' horsepower ratings, and power factor for each unit.

The following table provides the requested information regarding the *existing* units for each project.

FERC	UNIT	GENERATOR	GENERATOR	POWER	TURBINE
PROJECT	No.	KW (each)	KVA (each)	FACTOR	RATING
No.			, ,		(HP)
10675	2.3&4	480	600	0.8	650
10676	3 & 4	1800	2250	0.8	3000
10677	2&3	1600	2000	0.8	2600
10678	3	1500	1875	0.8	2000
10678	4	2200	2750	0.8	3000

It should be clarified that the proposed capacity increase percentage presented in the Plan are based on adjusted nameplate ratings using a power factor of 1.0.

The following table provides the requested information regarding the *upgraded* units for each project.

FERC	UNIT	GENERATOR	GENERATOR	POWER	TURBINE
PROJECT	No.	KW (each)	KVA (each)	FACTOR	RATING
No.					(HP)
10675	2,3&4	633	633	1.0	650
10676	3&4	2315	2315	1.0	3000
10677	2&3	2050	2050	1.0	2600
10678	3	1500	1875	0.8	2080
10678	4	2200	2750	0.8	3000

**Correction:** The submitted Plan for P-10678 (Indian Orchard Project) indicated an anticipated 1500 KVA rating. The actual anticipated rating is 1550 KVA (2080 horsepower)

with a power factor of 1.0. It should also be noted that the turbine rating for Unit #3 will be increased with no changes proposed to the generator nameplate.

2. The exemption for P-10675 (Dwight Project) requires a continuous minimum flow of 258 cubic feet per second (cfs), or inflow, into the bypass reach. The exemption also limits pond drawdown to one foot below the crest. You plan to install automated headgates at the canal gatehouse to better regulate pond levels and to restore the hydraulic capacity of the project. You plan no changes to the existing release flow mechanism and no additional devices. Please explain the method you intend to use to release the required minimum flow.

By agreement with the resource agencies, an interim method to release the minimum flow was established though notches in the dam flashboard system and maintenance of the pond level above the dam crest. The existing release mechanism consists of a series of notches in the existing dam flashboards that discharge directly into the bypass reach. CEEMI is proposing to maintain this system while the boards are installed and limit pond drawdown to three inches below the top of the boards.

During periods in which the flashboards system is damaged or lost, CEEMI will maintain the pond level a minimum 5-inches above the crest to maintain the minimum flow release during generation. Lower pond levels may be experienced during low inflow periods in which generation would not be possible. CEEMI would not resume generation until the pond level has reached the required levels for the 258 cfs release amount. As indicated in the Plan, short interruptions to the minimum flow release would occur during flashboard maintenance. In discussions with the resource agencies, this short duration (one to two day events) was acceptable.

CEEMI does not intend to implement the permitted pond drawdowns at this time. CEEMI does request that this permitted fluctuation be maintained in the event that future economics warrant the change in operation. CEEMI acknowledges that should the pond drawdowns be implemented, the existing minimum flow release measures would be inadequate. Therefore, CEEMI will agree not to implement the permitted pond fluctuations without modifications to the minimum flow release mechanism for the lower pond (below crest) conditions. Any modifications and operational changes would be not be implemented without appropriate agency approvals.

3. The exemption for P-10676 (Red Bridge Project) requires a continuous minimum flow of 237 cfs, or inflow at the base of the spillway, into the bypass reach. In the Plan, Appendix B (Meeting Summary), Consolidated Edison Energy, Inc (CEEI) proposes alternative minimum flow release points, such as releasing 50% of the minimum flow at the dam and the remaining flow though the canal drain gate. You indicated that both CEEI and the U.S. Fish and Wildlife Service (USFWS) are still considering alternatives, and have yet to agree on an acceptable method. Please provide us with the method of release that CEEI and the USFWS have finally agreed on.

As indicated in Section 4 of the Plan, CEEMI proposes to release all minimum flows through a single gate at the dam. The alternative to split the flow was abandoned after a review by CEEMI determined that the cost savings from this alternative was not substantial and in deference to the USFWS' concerns. The use of a single minimum flow gate at the dam is acceptable to both the USFWS and the Massachusetts Division of Fish and Wildlife (MADFW).

4. In Section 4 (Compliance Requirements) of the Plan, you state that CEEI proposes to install an automated slide gate at the Red Bridge Dam masonry spillway to discharge the required minimum flow in the bypass reach. Please provide in detail a description of the automated slide gate and how it will function.

The proposed slide gate will be located on the South side of the masonry overflow spillway directly adjacent to the abutment. An approximately 10 ft. wide by 9.5ft deep notch will be removed from the dam crest and capped with concrete. Concrete piers (approximately 1.5 ft wide) will be cast in place to provide a clear opening of 7.0 ft wide by 7.5 ft deep (below crest) and extend approximately 2 ft above the crest to protect the new gate equipment during high flow events. A 7.0ft wide by 8.5ft high painted steel slide gate will be installed and operated by an electric screw stem operator system with manual override capability. A Programmable Logic Controller (PLC), to adjust the gate level during pond fluctuations, will control the gate operator. Gate level adjustments will occur for every four inches of pond fluctuation. The gate will open vertically upwards with discharge occurring under the gate. A maintenance walkway will be installed integral with the gate guides and be located above the high water level.

5. The exemption for P-10677 (Putts Bridge Project) requires a minimum flow release of 25 cfs into the bypass reach. You state that CEEI does not plan to modify the present system and amount of minimum flow release, nor does it intend to modify project operation. In Appendix B of the Plan, the USFWS requested evidence that operation of the Putts Bridge Project does not impact the minimum flow release at Indian Orchard. CEEI should review the effects of the flow releases at the project due to additional capacity and provide us with comments on its findings.

Appendix A of this filing contains the review results on the effect of operation at the Putts Bridge Project (P-10677) on the ability of the Indian Orchard Project (P-10678) to maintain the minimum flow release at the project.

Based on the information in Appendix A attached, CEEMI plans to operate the upgraded units (turbine discharge and cycling on/off) within the headpond restrictions such that the total outflow from Putts Bridge (turbine discharge plus the 25 cfs. bypass flow) is adequate to maintain the 247 cfs minimum flow requirement at Indian Orchard. As indicated in Appendix A, this results in a reduced pond level fluctuation at the Indian Orchard Project between 4/1 and 6/30. CEEMI will follow up with USFWS and MADFW.

6. The exemption for P-10678 (Indian Orchard Project) requires a continuous minimum flow release of 247 cfs, or inflow, at the base of the dam. The minimum flow is released from canal drain gates at the base of the dam. In Appendix B of the Plan, the USFWS requested that CEEI consider installing some kind of bar rack or similar device to avoid large debris plugging the minimum flow drain gates. CEEI should review alternatives to protect the inlet gate and provide us with the alternative decided upon.

CEEMI has contacted the USFWS (John Warner on 11/12/99) to determine the actual need for any modifications of the present system. Historically the reduction of flow through the gate area has only been reduced (not stopped) on few occasions due to debris. However, to remove the debris the former project owners drained the canal causing interruptions to the minimum flow release. After discussion it was agreed that a protection device is not required at this time. Instead, CEEMI will modify its operational procedures to increase observations for debris buildup in the area and study the debris patterns over the next two years to confirm that modifications are not required. CEEMI will maintain the same level of reporting as has been historically supplied. In addition, CEEMI will review, with the USFWS, methods to remove any debris build without canal draining or interruptions to the minimum flow. If modifications are determined to be required before the end of the two year review period, CEEMI will consult with the USFWS and other resource agencies on the most appropriate method to correct the situation.

7. Included in Appendix B of the Plan is a letter dated June 24, 1999, from the Commonwealth of Massachusetts, Executive Office of Environmental Affairs in which they state their concerns with fish passage facilities and land protection issues. The Commonwealth of Massachusetts requested that you provide specific options to protect the lands and other environmental issues mentioned in the Plan. Please provide us with your comments in response to the Commonwealth of Massachusetts.

The referenced letter discusses five main topics regarding the Chicopee River Projects. Each of the main topics is briefly discussed below:

- A) Fish Passage: As indicated in the meeting minutes with the USFWS and MADFW (Appendix B of the Plan), there is no restoration plan requiring fish passage started for the Chicopee River. CEEMI acknowledges that future restoration efforts may require fish passage at some of the sites. However, as discussed during the June 22<sup>nd</sup> meetings, fish passage at any of the sites is not being proposed and is not required. CEEMI has agreed to discuss appropriate measures for fish passage at the projects after a restoration plan has been implemented.
- B) <u>Open Space Protection</u>: During the June 22<sup>nd</sup> meeting the request to protect shore land properties from development was discussed. The meeting concluded that additional information (property lines and limits) would be needed before formal arrangements could be finalized. CEEMI intends to continue discussions with the Commonwealth of Massachusetts after Plan approval.
- C) <u>Dwight Nature Trail:</u> The nature trail near the Dwight station is being considered by the local community and beyond CEEMI's ability to expedite. CEEMI has agreed to resume discussions regarding the nature trail once the local community and other organizations have developed a plan for the trail. During the June 22<sup>nd</sup> meeting the organizations involved with the project indicated that they are still determining the trail details.
- D) Access to Middle Bypass Reach: As indicated in Section 4 of the Plan access to the middle bypass section below the Dwight dam will not be pursued. Local community leaders oppose access to this area and the MADFW, the originator of

the issue, has indicated a deference to the local community. As also indicated in the Plan, there are several safety issues associated with access to this area.

E) <u>Water Quality Study:</u> CEEMI has begun preparation of a water quality study plan that will be submitted for agency review within two months after Plan approval.

We trust this information is complete and adequate for your use.

If you require additional information please do not hesitate to contact me at 212-267-5281 (email: noyesm@conedenergy.com) or John Labiak of CEEMI at 212-267-5280 (email: labiakj@conedenergy.com).

Sincerely,

Consolidated Edison Energy Massachusetts, Inc

Jack attoge

Mark Noyes Vice President

AJN

cc: John Labiak (CEEMI) Alfred Nash (KA) Fred Szufnarowski (KA)

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Appendix A

## MEMORANDUM

TO:	John Labiak, Kim Marsili
FROM:	Alfred Nash
CC:	Fred Szufnarowski (KA), John Warner (USFWS), Caleb Slater (MADFW)
DATE:	November 23, 1999
RE:	Putts Bridge Operations effect at Indian Orchard

The US Fish and Wildlife Service (USFWS) has requested information regarding the effect of operations at Putts Bridge on the minimum flow release at Indian Orchard. This request was made several years ago when the minimum flow discharge at Putts Bridge was reduced to 25 cfs. The USFWS' concern is based on the store and release operation at Putts Bridge. Since the outflow at Putts Bridge during motoring is less than the required minimum flow release at Indian Orchard, there is a concern that the ability of the Indian Orchard Project to release its minimum flow is be adversely effected by the Putts Bridge operation. The attached calculation tables were developed on the assumption that the current practice of motoring is maintained.

#### METHODOLOGY

The following table indicates the pond level fluctuations permitted by the exemption orders.

ALL ADD DOND DI LICTULATIONS

Project	4/1 to 6/30 (ft.)	7/1 to 3/31 (ft.)
Red Bridge	1	2
Putts Bridge	1	2
Indian Orchard	1	1

To determine the effects of the Putts Bridge operation of the Indian Orchard minimum flow release, three wicket gate settings were considered (60%, 80% and 100%). To identify the worse case conditions, the inflow to the Putts Bridge Project was limited to the minimum flow and motoring flow release at the Red Bridge Project. This limitation of inflow was used to reflect the current minimum flow conditions at Red Bridge in which the pond fluctuation is limited to 3 inches.

The Red Bridge, Putts Bridge and Indian Orchard Projects are each controlled by float switches that cause the units to "motor" when the minimum pond level is achieved. The units at each project are not taken off motoring until normal pond level conditions are restored. The 1989 turbine inspection at each of the projects indicated that the gate setting during motoring was approximately 20% gate. During periods of low flow, a single unit at the Putts Bridge Project is operated between the 60% and 80% gate opening. KA understands that the 60% gate opening may be more commonly used to reduce motor time of the unit. KA also reviewed the condition of using 100% gate opening.

To achieve the capacity increase required by the exemption order, CEEMI is proposing a new runner assembly at the Indian Orchard Project. Although the details of the new assembly will not be known for many months, KA assumed that a 10% increase in hydraulic capacity over the existing unit (#3) would be realized. Therefore the analysis assumed this increased discharge from the project.

To determine the gross generation for each gate opening, the 1999 index test results conducted by Voith was used. Unit flows were based on nameplate ratings and a straight ratio of percent gate to rated flow was used to determine flows at the various gate openings. Information regarding the storage area was obtained from the exemption order or the exemption application.

#### RESULTS

The following table summarizes the results shown on the attached calculation tables. The table below is based on a 12-inch pond fluctuation at Putts Bridge. The analysis indicates that the pond level fluctuation at Indian Orchard must be reduced during the summer low flow periods to provide adequate storage to maintain the minimum release at the dam. For time periods when the pond fluctuation at Putts Bridge is greater than 12 inches (*i.e.*, July through March), the full 12-inch pond fluctuation at Indian Orchard can be implemented.

Gate Opening	Indian Orchard Pond Fluctuation	Putts Bridge Motoring Time	Indian Orchard Motoring Time (hrs / day)	Gross Generation (MWH)
60%	(inches) 8	8.5	21	23.6
80%	9.5	12.5	20	22.8
100%	10	16.5	19.8	23.2

#### **CONCLUSION**

Based on the results of our review, it appears that the pond level control at the Indian Orchard Project should be set at 6 inches during the spring (4/1 to 6/30) period. This will provide sufficient storage to permit the continuous discharge of the minimum flow at the Indian Orchard Project.

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# CONSOLIDATED EDISON ENERGY MASSACHUSETTS, INC

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#### OPERATIONAL EFFECTS OF PUTTS BRIDGE ON MINIMUM FLOW RELEASE AT INDIAN ORCHARD

			PUTTS	INDIAN	
	RED BRID	DGE	BRIDGE	ORCHARD	
MINIMUM FLOW (CFS)	238		25	247	
UNIT FLOW (CFS) **	615		725	690	Ð
PERCENT GATE AT MOTORING *	20%		20%	20%	
PERCENT GATE DURING GENERATION	80%		80%	80%	
STORAGE (ACRE)	185		65.4	14	
DRAWDOWN (FEET) - SUMMER	1		1	1	
STORAGE VOLUME (CF)	8058877	7.5	2848922.1	3223551	
CONVERSION FOR STORAGE	435	61.5 \$	SF/ACRE		
* FROM 1989 INSPECTION REPORT OR ASSUMED ** ASSUMES A 10% INCREASE IN CAPACITY AT INDIA	N ORCHA	ARD C	VER THE EX	KISTING 625 CA	¥Ρ
Let Red Bridge operate in its current mode without the pro However, assume an average of the required minimum fic and that, for the worse case, a unit is motoring.	oposed mi ow is relea	inimun ised fr	n flow gate om the site		
Discharge from Red Bridge = minimum flow + motoring of Discharge <sub>R8</sub> =	unlt.	361 (	cfs	Note: exceede	d 85% of time annually
<u>PUTTS BRIDGE PROJE</u>	<u>CT FLOW</u>	<u>vs</u>			
Hours that Putts Bridge can Generate with Storage and in Time <sub>PB</sub> = storage / (min flow + Gen flow - Discharge <sub>P</sub>	nflow from RB)	Red I	3rldge		
Generation Time PB =		3.24	hours		
Generation Discharge PB =		605	cfs		
Hours Required to Recharge Putts B Pond					
Project Discharge During Motoring (unit and min flow) Time <sub>recharge</sub> = storage / (Discharge <sub>RB</sub> - Discharge during r	motoring)	170	cfs		
Time recharge =		4,14	hours	Note: general	Ion at Red Bridge decreases time
INDIAN ORCHARD PRO.	ECT FLO	<u>ws</u>			
Since flows entering IO during PB motoring are less than storage must be used to supplement flows until Putts Brid Thus determine the number of hours that storage can reliable the storage can re	the disch dge resum ease min i	narge a nes ge flow w	at IQ, the IQ   eneration. vith projects r	project notoring	
Storage discharge time = storage / (min flow + motoring i	llow -inflov	w (fror	n PB))		
Time Storage Discharge	9	4.16	hours		
By comparison with the time required to recharge the PB be full when Putts Bridge begins motoring in order to allo Putts Bridge resumes generation discharges.	l storage, i w sufficier	the po nt lime	and at IO mus a before.	st	
Time to Recharge IO with IO unit motoring and PB generative = storage / (PB discharge - IO motoring and min Flo	rating w)	4.07	hours		
Since recharge time is longer than generation time at Pu limit = (PB discharge - IO motoring - min flow (IO))*hou	itts Bridge irs gen / s	- dete urface 9.56	ermine availa e storage inches	ble drawdown lli	mit:

**Si** Development

# ORIGINAL

OFFICE OF THE SECRETARY

March 21, 2000

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Mr. David Boergers, Secretary Federal Energy Regulatory Commission 888 First Street, N.E. Washington, D.C. 20426

Chicopee River Projects, FERC Nos. 10675, 10676, 10677, 10678 Modified Terms and Conditions from Department of Interior-Fish and Wildlife Service

Dear Secretary:

Consolidated Edison Energy Massachusetts, Inc. (CEEMI) owns and operates the Red Bridge Project (FERC No. 10676), the Putts Bridge Project (FERC No. 10677), the Indian Orchard Project (FERC No. 10678) and the Dwight Project (FERC No. 10675), known collectively as the "Chicopee River Projects", which are located on the Chicopee River in western Massachusetts. We are writing to apprise you that we have received modified terms and conditions from the U.S. Department of Interior-Fish and Wildlife Service (FWS) and the Commonwealth of Massachusetts, Division of Fisheries and Wildlife (MADFW) for the Chicopee River Projects (see Attachment A). Their letters were in response to a December 29, 1999 order amending exemptions issued by the Federal Energy Regulatory Commission (FERC).

We are aware that in order to modify terms and conditions, the FWS and MADFW must have included specific language to address future modifications in their original terms and conditions letter, dated July 31, 1992. We have reviewed the July 31, 1992 letter and it does contain language that allows FWS to modify the original terms and conditions.

We intend to contact FWS and the MADFW to discuss the new terms and conditions. We will keep you apprised of the status of our discussions and any changes that occur to the terms and conditions.

If you require additional information please do not hesitate to contact me at (212) 267-5280 (email: <u>labiakj@conedenergy.com</u>).

Sincerely,

(KA)



John Labiak Project Manager Con Edison Development Inc.

HAR 2 7 200

Encl. - Attachment A

000331-0280-3

cc: Al Nash (KA), Fred Szufnarowski (KA), NYRO, Michael Bartlett – FWS Pete McGovern – FERC, Mark Robinson – FERC

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111 Broadway, 16th Floor, New York, New York 10006 Tel: (212) 393-9242 Fax: (212) 393-9282



United States Department of the Interior

FISH AND WILDLIFE SERVICE

New England Field Office 22 Bridge Street, Unit #1 Concord, New Hampshire 03301-4986



January 27, 2000

REF: FERC Nos. 11675 - Dwight 11676 - Red Bridge 11677 - Putts Bridge 11678 - Indian Orchard Consolidated Edison Energy Massachusetts, Inc.

Mark Noyes CEEMI 111 Broadway, 16<sup>th</sup> Floor New York, NY 10006

Dear Mr. Noyes:

This is in response to the Federal Energy Regulatory Commission's December 29, 1999 Order Amending Exemptions for the Red Bridge, Putts Bridge, Indian Orchard and Dwight Projects, located on the Chicopee River in Massachusetts. We originally were going to respond to the November 23, 1999 memorandum prepared by Kleinschmidt Associates which provides the results of an assessment of the effect operations at Putts Bridge has on the ability of Indian Orchard to meet its minimum flow requirement. As the FERC order addresses and accepts the findings of the assessment, we instead will comment on modifications to the original terms and conditions we prescribed for the exemptions that we believe are necessary, given that minimum flows and headpond fluctuations have changed at some sites.

As originally exempted, each project had specific minimum flows and allowable impoundment drawdowns.

Originally Exempted

- Red Bridge
  - 237 cfs min. flow (or inflow, if less), 1-ft. drawdown April I- June 30 and 2-ft. from July 1 -March 30
- Putts Bridge
  - 247 cfs min. flow (or inflow, if less), 1-ft. drawdown April 1- June 30 and 2-ft. from July 1 -March 30
- Indian Orchard
  247 cfs min. flow (or inflow, if less), 1-ft. drawdown year-round
- -2-
- Dwight
   258 cfs min. flow (or inflow, if less), 1-ft. drawdown year-round

#### Proposed

- Red Bridge
  - 237 cfs min. flow (or inflow, if less), 1-ft. drawdown April 1- June 30 and 2-ft. from July 1 -March 30.
- Putts Bridge
   25 cfs min, flow (or inflow, if less), 1-ft. drawdown April 1- June 30 and 2-ft. from July 1 -March 30.
- Indian Orchard
  - 247 cfs min. flow (or inflow, if less), 0.5-ft. drawdown April 1- June 30 and 1-ft. drawdown from July 1 March 30.
- Dwight

258 cfs min. flow (or inflow, if less), 0.25-ft. drawdown when boards are up and no fluctuation when boards are down.

As originally exempted, the mandated flows were to be released via special minimum flow turbines. This idea was subsequently found to be uneconomical, and alternative release mechanisms were investigated. Also, in order to meet the requirements for being exempted, project capacity upgrades are necessary. CEEMI submitted a development plan in June, 1999 that outlined how upgrading the existing facilities would result in meeting that criterion.

To date; we believe the following issues have been resolved to our satisfaction:

- Bypass flow rates and release mechanisms at each project, with the exception of Putts Bridge.
- Impoundment fluctuation levels. The proposed changes to limit drawdowns at Indian Orchard to 0.5-ft from April 1 - June 30, and at Dwight to within 0.25-ft. when boards are up, should ensure that continuous and stable minimum flows are maintained below those projects.
- Proposed capacity upgrades. None of the upgrades should influence the minimum flows or drawdown limits for each project.

Two issues that remain outstanding include:

- The Putts Bridge bypass flow. We never approved the reduced flow as a permanent measure. Before approving this change as a permanent condition of the exemption, a water quality study must be performed to verify that the lower flow will protect water quality in the bypass reach. It is our understanding that the study will occur this summer. Once we receive the study results we will make a final decision on the minimum bypass flow needed at Putts Bridge.
- A revised Monitoring Plan. A condition of each exemption was the development of a plan to monitor headpond elevations and bypass flows. On March 11, 1993 the previous owner of the projects submitted a Monitoring Plan for our review. Since the original plans were filed and approved, major changes in the methods of releasing the bypass flows have been made

at the projects, requiring the development of a revised Monitoring Plan. You should provide us with a plan that (1) details the flow release structures and locations, (2) describes the mechanisms used to monitor headpond elevation and minimum flows, (3) specifies how often maintenance and calibration of the monitoring and recording equipment takes place, (4) states how bypass flows will be maintained during any periodic maintenance activities that require the impoundment to be drawn down below the level of the flow release structures, and (5) states how frequently and in what form the data are recorded. A calculation sheet that verifies the discharge of each release structure (i.e., slide/canal gate, board notches and dam spill) under all operating ranges should be included.

Per Condition 8 of the Exemptions from Licensing, we hereby modify our original terms and conditions for the subject exemptions as follows:

#### Red Bridge

Modify the following conditions to read:

5. The Exemptee shall, within six months from the date of issuance of the Order Amending Exemptions, present to the Fish and Wildlife Service for approval, a plan for monitoring project impoundment level and instantaneous bypass flow releases. Following approval of the plan, the Exemptee shall measure and record impoundment level and flows according to the plan and provide records of these data to the Fish and Wildlife Service within 30 days from a request for the records.

The following new condition is to be added to the original nine.

10. In the event that any dam maintenance or emergency drawdown is required, the Exemptee shall continue to operate the project such that the minimum flows are maintained downstream of the project at all times. If during reservoir refilling, inflow to the project is less than the required minimum flow, the Exemptee shall withhold not more than 10% of project inflow.

All other conditions are to be retained in their antirety.

#### Putta Bridge

Modify the following conditions to read:

- 3. An interim minimum flow of 25 cubic feet per second, or inflow to the project, whichever is less, shall be continuously released at the project dam to the bypassed reach. This release may be modified if results of a water quality study indicate that 25 cfs is insufficient to protect water quality in the bypass reach.
- 5. The Exemptee shall, within six months from the date of issuance of the Order Amending Exemptions, present to the Fish and Wildlife Service for approval, a plan for monitoring project impoundment level and instantaneous bypass flow releases. Following approval of the plan, the Exemptee shall measure and record impoundment level and flows according

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to the plan and provide records of these data to the Fish and Wildlife Service within 30 days from a request for the records.

The following new condition is to be added to the original nine.

10. In the event that any dam maintenance or emergency drawdown is required, the Exemptee shall continue to operate the project such that the minimum flows are maintained downstream of the project at all times. If during reservoir refilling, inflow to the project is less than the required minimum flow, the Exemptee shall withhold not more than 10% of project inflow.

All other conditions are to be retained in their entirety.

#### Indian Orchard

Modify the following conditions to read:

- 4. The exemptee shall operate the project to limit drawdown of the project impoundment to no more than 0.5-feet below the top of the flashboards (or dam crest if boards are out) from April 1 through June 30. From July 1 through March 30, the Exemptee shall limit drawdown to no more than one foot below the top of the flashboards (or dam crest if boards are out).
- 5. The Exemptee shall, within six months from the date of issuance of the Order Amending Exemptions, present to the Fish and Wildlife Service for approval, a plan for monitoring project impoundment level and instantaneous bypass flow releases. Following approval of the plan, the Exemptee shall measure and record impoundment level and flows according to the plan and provide records of these data to the Fish and Wildlife Service within 30 days from a request for the records.

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All other conditions are to be retained in their entirety.

#### Dwight

Modify the following conditions to read:

4. The Exemptes shall operate the project to limit drawdown of the project impoundment to no more than 0.25 feet below the top of the flashboards. When boards are out, the Exemptee shall maintain a minimum of five inches of spill over the dam crest to maintain the minimum bypass flow specified in Condition #3.

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5. The Exemptee shall, within six months from the date of issuance of the Order Amending Exemptions, present to the Fish and Wildlife Service for approval, a plan for monitoring project impoundment level and instantaneous bypass flow releases. Following approval of the plan, the Exemptee shall measure and record impoundment level and flows according to the plan and provide records of these data to the Fish and Wildlife Service within 30 days from a request for the records.

The following new condition is to be added to the original nine.

10. In the event that any dam maintenance or emergency drawdown is required, the Examptee shall continue to operate the project such that the minimum flows are maintained downstream of the project at all times. If during reservoir refilling, inflow to the project is less than the required minimum flow, the Examptee shall withhold not more than 10% of project inflow.

All other conditions are to be retained in their entirety.

Thank you for this opportunity to comment. If you have any questions, please contact Mellasa Grader of this office at (603) 225-1411.

Sincerely,

Michael J. Bartlett Supervisor New England Field Office .

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cc: John Labiak, CEEMI Caleb Slater, MA DFW FERC/DLC FERC/OHL Reading File

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Commonwealth of Massachusetts

# MASTER FILE

February 15, 2000 OMMISSION

GULATERY



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Wayne F. MacCalkum, Director RE: Chicopee River Projects: Dwight - 11675 Red Bridge - 11676 Putts Bridge - 11677 Indian Orchard - 11678

Mark Noyes CEEMI 111 Broadway, 16th Floor New York, NY 10006

Dear Mr. Noyes,

The Massachusetts Division of Fisherles and Wildlife (Division) is the state agency responsible for the protection and management of the fish and wildlife resources of the Commonwealth. As such, we have prepared the following comments in response to the Federal Energy Regulatory Commission's December 29, 1999 Order Amending Exemptions for the Red Bridge, Putts Bridge, Indian Orchard, and Dwight Projects, located on the Chicopes River in Massachusetts.

As originally exempted, each project had specific minimum flows and allowable impoundment drawdowns.

**Original** Conditions

#### Red Bridge

237 cfs min, flow (or inflow, if Jess), 1-ft. drawdown April 1- June 30 and 2-ft. from July 1 - March 30

**Putts Bridge** 

247 cfs min. flow (or inflow, if less), 1-fL drawdown April 1- June 30 and 2-fL from July 1 - March 30

Indian Orchard

247 cfs min. flow (or inflow, if less), 1-ft. drawdown year-round

Dwight

258 cfs min, flow (or inflow, if less), 1-ft. drawdown year-round

#### **Proposed Conditions**

#### **Red Bridge**

237 cfs min. flow (or inflow, if less), 1-ft. drawdown April 1- June 30 and 2-ft. from July 1 - March 30.

#### **Patts Bridge**

25 cfs min, flow (or inflow, if less), 1-ft. drawdown April 1- June 30 and 2-ft. from July 1 - March 30.

#### Indian Orchard

247 cfs min. flow (or inflow, if less), 0.5-ft. drawdown April 1- June 30 and 1-ft. drawdown from July 1 -March 30.

Division of Fisheries & Wildlife

Field Headquarters, One Rabbit Hill Road, Westboro, MA 01581 (508) 366-4470 An Agency of the Department of Fisheries, Wildlife & Environmental Lew Enforcement

#### Dwight

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258 cfs min. flow (or inflow, if less), 0.25-fl. drawdown when boards are up and no fluctuation when boards are down.

The original exemptions required that the minimum flows were to be released via new minimum flow nurbines. This idea was subsequently found to be uneconomical, and alternative release mechanisms were investigated. The original exemptions also required project capacity upgrades. CEEMI submitted a development plan in June 1999 that outlined how upgrading the existing facilities would result in meeting that criterion.

We believe the following issues have been adequately addressed:

Minimum bypass flows and release mechanisms at each project, with the exception of Putts Bridge.

Impoundment fluctuation levels, specifically the proposed changes to limit drawdowns at Indian Orchard to 0.5-ft from April 1 - June 30, and at Dwight to within 0.25-ft, when boards are up, should ensure that continuous and stable minimum flows are maintained below those projects.

The proposed capacity upgrades should influence the minimum flows or drawdown limits for each project.

Unresolved issues:

The Putts Bridge bypass flow. We have not agreed to the reduced flow as a permanent condition of the exemption. Before we do so, a water quality study must be performed to verify that the lower flow will protect water quality in the bypass reach. It is our understanding that the study will occur this summer. Once we receive the study results we will make a final decision on the minimum bypass flow needed at Putts Bridge.

Revised Monitoring Plan. A condition of each exemption was the development of a plan to monitor headpond elevations and bypass flows. On March 11, 1993 the previous owner of the projects submitted a Monitoring Plan for our review. Since that time, major changes in the methods of releasing the bypass flows have been made at the projects. We believe that these changes require the development of a new Monitoring Plan. You should provide us with a plan that (1) details the flow release structures and locations, (2) describes the mechanisms used to monitor headpond elevation and minimum flows, (3) specifies how often maintenance and calibration of the monitoring and recording equipment takes place, (4) states how bypass flows will be maintained during any periodic maintenance activities that require the impoundment to be drawn down below the level of the flow release structures, and (5) states how frequently and in what form the data are recorded. A calculation sheet that varifies the discharge of each release structure (i.e., slide/canal gate, board notches and daru spill) under all operating ranges should be included.

Per Condition 8 of the Exemptions from Licensing, we hereby modify our original terms and conditions for the subject exemptions as follows:

#### **Red Bridge**

Modify the following conditions to read:

6. The Exemptee shall, within six months from the date of issuance of the Order Amending Exemptions, present to the Division for approval, a plan for monitoring project impoundment level and instantaneous bypass flow releases. Following approval of the plan, the Examptee shall measure and record impoundment level and flows according to the plan and provide records of these data to the Division within 30 days from a request for the records.

The following new condition is to be added to the original nine.

10. In the event that any dam maintenance or emergency drawdown is required, the Examples shall continue to operate the project such that the minimum flows are maintained downstream of the project at all times. If during reservoir refilling, inflow to the project is less than the required minimum flow, the Exemptee shall withhold not more than 10% of project inflow.

All other conditions are to be retained in their entirety.

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#### **Putts Bridge**

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Modify the following conditions to read:

- 2. An interim minimum flow of 25 cubic feet per second, or inflow to the project, whichever is less, shall be continuously released at the project dam to the bypassed reach. This release may be modified if results of a water quality study indicate that 25 cfs is insufficient to protect water quality in the bypass reach.
- 6. The Examples shall, within six months from the date of issuance of the Order Amending Examplions, present to the Division for approval, a plan for monitoring project impoundment level and instantaneous bypass flow releases. Following approval of the plan, the Examples shall measure and record impoundment level and flows according to the plan and provide records of these data to the Division within 30 days from a request for the records.

The following new condition is to be added to the original nine.

10. In the event that any dam maintenance or emergency drawdown is required, the Exemptee shall continue to operate the project such that the minimum flows are maintained downstream of the project at all times. If during reservoir refilling, inflow to the project is less than the required minimum flow, the Exemptee shall withhold not more than 10% of project inflow.

All other conditions are to be retained in their entirety.

#### Indian Orchard

Modify the following conditions to read:

- 3. The exemptee shall operate the project to limit drawdown of the project impoundment to no more than 0.5-feet below the top of the flashboards (or dam creat if boards are out) from April 1 through June 30. From July 1 through March 30, the Exemptee shall limit drawdown to no more than one foot below the top of the flashboards (or dam creat if boards are out).
- 6. The Exemptee shall, within six months from the date of issuance of the Order Amending Exemptions, present to the Division for approval, a plan for monitoring project impoundment level and instantaneous bypass flow releases. Following approval of the plan, the Exemptee shall measure and record impoundment level and flows according to the plan and provide records of these data to the Division within 30 days from a request for the records.

The following new condition is to be added to the original nine.

10. In the event that any dam maintenance or emergency drawdown is required, the Exemptee shall continue to operate the project such that the minimum flows are maintained downstream of the project at all times. If during reservoir refilling, inflow to the project is less than the required minimum flow, the Exemptee shall withhold not more than 10% of project inflow.

All other conditions are to be retained in their entirety.

#### Dwight

Modify the following conditions to read:

- 3. The Exemptee shall operate the project to limit drawdown of the project impoundment to no more than 0.25 feet below the top of the flashboards. When boards are out, the Exemptee shall maintain a minimum of five inches of spill over the dam crest to maintain the minimum bypass flow specified in Condition #3.
- 6. The Exemptee shall, within six months from the date of issuance of the Order Amending Exemptions, present to the Division for approval, a plan for monitoring project impoundment level and instantaneous bypass flow releases. Following approval of the plan, the Exemptee shall measure and record impoundment level and flows according to the plan and provide records of these data to the Division within 30 days from a request for the records.

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The following new condition is to be added to the original nine.

10. In the event that any dam maintenance or emergency drawdown is required, the Exemptee shall continue to operate the project such that the minimum flows are maintained downstream of the project at all times. If during reservoir refilling, inflow to the project is less than the required minimum flow, the Exemptee shall withhold not more than 10% of project inflow.

All other conditions are to be retained in their entirety.

Sincerely,

Caleb Slater, Ph.D.

Anadromous Fish Project Londer

cc: John Labiak, CEEMI Mellasa Grader, USFWS FERC

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February 20, 2012

## VIA FEDERAL EXPRESS

Kimberly Bose, Secretary Federal Energy Regulatory Commission 888 1<sup>st</sup> Street, NE, Room 1A Washington, DC 20426

Chicopee River Projects: No. 10675, 10676, 10677, and 10678 Minimum Flow and Impoundment Fluctuation Monitoring Plan

Dear Secretary:

EP Energy Massachusetts, LLC<sup>™</sup> (formally NAEA Energy Massachusetts, LLC) owns and operates four hydroelectric stations on the Chicopee River. Specifically Dwight Station (FERC Project No. 10675), Red Bridge (FERC Project No. 10676), Putts Bridge (FERC Project No. 10677), and Indian Orchard (FERC Project No. 10678). The attached plan is being filed to outline EP Energy Massachusetts, LLC. measures to ensure compliance with USFWS Terms and Conditions dated January 15, 2000, and MDFW Terms and Conditions dated February 15, 2000.

The plan has been reviewed by the US Fish and Wildlife Service, Massachusetts Department of Environmental Protection, and the Massachusetts Division of Fisheries and Wildlife. As of a February 8, 2012 conference call, all parties agreed the plan meets the minimum flow and impoundment fluctuation requirements of the license exemption order.

Sincerely,

David Schmidt Senior Station Engineer EP Energy Massachusetts, LLC.

## EP ENERGY MASSACHUSETTS, LLC<sup>TM</sup>

## **CHICOPEE RIVER PROJECTS**

# MINIMUM FLOW AND IMPOUNDMENT FLUCTUATION MONITORING PLAN

#### FOR

# FERC PROJECT NO. 10675 - DWIGHT FERC PROJECT NO. 10676 - RED BRIDGE FERC PROJECT NO. 10677 - PUTTS BRIDGE FERC PROJECT NO. 10678 - INDIAN ORCHARD

## **FEBRUARY 2012**

## **INTRODUCTION**

EP Energy Massachusetts, LLC<sup>TM</sup> (Essential Power<sup>TM</sup>) owns and operates the Dwight Project (FERC No. 10675), the Red Bridge Project (FERC No. 10676), the Putts Bridge Project (FERC No. 10677), and the Indian Orchard Project (FERC No. 10678), known collectively as the Chicopee River Projects, located on the Chicopee River in Massachusetts. The projects are required to operate under the Terms and Conditions established by the US Fish and Wildlife Service (USFWS) and the Massachusetts Division of Fisheries and Wildlife (MDFW). Each project's Terms and Conditions limit the impoundment fluctuation and require the release of minimum flows into the bypass river reaches. The projects currently operate under an interim agreement outlined in the April 3, 1997 MDFW letter.

The USFWS and MDFW modified the Terms and Conditions for the projects by letters dated January 27, 2000 and February 15, 2000 respectively (copies in Appendix A). MDFW Condition 6 (Condition 5 for USFWS) required the submission of a plan for monitoring project impoundment level and instantaneous bypass flow releases. By letter dated October 5, 2001 a draft of this plan was distributed to the MDFW and USFWS for review and comment. Comments received from the agencies are provided in Appendix B and have been addressed in this final plan.

As requested by the MDFW and USFWS Terms and Conditions, this plan includes the following information:

- (1) Details of the flow release structures and locations;
- (2) Descriptions of the mechanisms used to monitor head pond elevations and minimum flows;
- (3) Specifications of how often maintenance and calibration of the monitoring and recording equipment will take place;
- (4) Description of how bypass flows will be maintained during any periodic maintenance activities that require the impoundment to be drawn down below the level of the flow release structures, and;
- (5) How frequently and in what form the data are recorded.

Appendix C contains sample calculations used to determine the settings for the release mechanisms at the four projects.

#### **DWIGHT (FERC NO. 10675)**

Dwight Station is located at river mile 1.2 on the Chicopee River in the City of Chicopee. The station was constructed in 1920 and was most recently purchased in 2008 by Essential Power from Consolidated Edison Energy of Massachusetts, LLC. The station has 3 units, each rated for 480 KW, with hydraulic capacities of 254 cfs.

MDFW Condition 2 (Condition 3 of USFWS) for the Dwight Project requires the release of a minimum flow of 258 cubic-feet-per-second (cfs) (or inflow, if less) at the Dwight Dam. The flashboards have permanently been removed from the facility, so minimum flows are passed over the dam crest. Revised MDFW Condition 3 (Condition 4 of USFWS) limits impoundment draw down to a minimum of five inches above the dam crest, except for system emergencies or annual energy audits.

#### Impoundment Fluctuation

Impoundment levels are continuously monitored through the use of an electronic pressure transducer located on the south shoreline, slightly upstream of the canal gatehouse. Documentation of compliance with the impoundment limits is supplied by electronic recording of the impoundment level in addition to instantaneous visual displays in the canal gatehouse. The canal headgates are controlled by a Programmable Logic Controlling (PLC) device located within the canal gate house that adjust the headgate opening based upon pond level, canal level and unit operational status. The pond level control is proportional-integral-derivative (PID) based and is programmed to maintain a pond level of El. 77.0'; 5 inches above the permanent spillway crest level. As the pond level increases, the system increases unit load and/or brings additional units online. As the pond level falls, load is decreased and units are taken offline. The PLC continually monitors pond level and records the pond level using a strip chart as the primary recording mechanism. The sensitivity of the measurement is +/-0.01 ft. As a secondary monitoring system, a data logger records the pond elevations every 15 minutes. The flashboards on the dam at Dwight have been removed, the minimum flow release is provided by overtopping the dam. The project's turbines operate in an automatic mode using impoundment level controls which curtail operation when the lower impoundment level limits are reached and do not resume operation until impoundments levels are reestablished within the operable limits.

- 3 -

# **Release Mechanism**

Minimum flows are released over the dam's spillway. The appropriate flow release is controlled by maintaining a headpond 5 inches above the crest of the spillway. All flows pass directly into the bypass reach.

During infrequent impoundment draw down for major dam repairs minimum flows will be maintained. The minimum flow release mechanism will be outlined in a letter sent prior to the impoundment draw down.

# Instrumentation Maintenance and Calibration

Maintenance to the monitoring system is performed on an as-needed basis with calibration of the instruments being performed approximately every two years. At a minimum, operators visit the project approximately twice per week to confirm proper station operation. The station is also equipped with unit alarms to notify operational personnel of equipment malfunctions.

#### **RED BRIDGE (FERC NO. 10676)**

Red Bridge Hydro Station is located at river mile 15.2 on the Chicopee River in the towns of Wilbraham, Ludlow, and Palmer. The station was constructed in 1901 and was most recently purchased in 2008 by Essential Power from Consolidated Edison Energy of Massachusetts, LLC. The station has 2 units, each rated for 1,800 KW, with hydraulic capacities of 615 cfs.

MDFW Condition 2 (Condition 3 of USFWS) for the Red Bridge Project requires the release of a minimum flow of 237 cubic-feet-per-second (cfs) (or inflow, if less) at the project's spillway. MDFW Condition 3 (Condition 4 of USFWS) limits impoundment drawdown to 1-ft below the crest of the dam (El. 272.24) from April 1 to June 30, and a 2-ft impoundment draw down below the crest of the dam from July 1 to March 30, except for system emergencies or annual energy audits.

#### Impoundment Fluctuation

Impoundment fluctuations will be measured through the use of an electronic pressure transducer located upstream of the canal headgates. Documentation of compliance with the impoundment limits will be by electronic recording of the impoundment level in addition to instantaneous visual displays in the powerhouse. Essential Power limits impoundment draw down through the use of the project's turbines. The project's turbines operate in an automatic mode using pond level controls which curtail operation when the minimum impoundment level limits are reached and do not resume operation until acceptable operating impoundment levels are reestablished.

## **Release Mechanism**

Essential Power has installed a bottom discharge gate at the southern end of the spillway to permit minimum flow release within the permitted impoundment fluctuations. The gate is 7 ft. wide and 8.5 ft. high with a sill elevation of 264.74 (7.5 feet below crest). The gate is equipped with an electric screw stem actuator capable of manual operation in the event of power

loss. The gate is electronically controlled by a PLC device. The PLC continuously monitors impoundment level elevations and gate positions will be adjusted automatically over the range of impoundment fluctuations to consistently release the minimum flow of 237 cfs. The impoundment level indicator is located in the impoundment adjacent to the canal headgate house. The pond level and minimum flow gate position are continuously recorded using strip chart mechanism. The sensitivity of the measurement is +/- 0.01 ft. A secondary data logger is used to record the pond level every 15 minutes, if required.

During periods of gate maintenance or malfunction, minimum flows will be maintained by spilling flows over the dam spillway maintaining a pond level 5 inches above the crest level when the units are generating. During infrequent impoundment draw down for major dam repairs minimum flows will be maintained. The minimum flow release mechanism will be outlined in a letter sent prior to the impoundment draw down.

# Instrumentation Maintenance and Calibration

Maintenance to the system is performed on an as-needed basis with calibration of the instruments being performed approximately every two years. As a minimum, operators visit the project approximately twice per week to confirm proper station operation. The station is also equipped with various alarms to notify operations personnel of equipment malfunctions.

## PUTTS BRIDGE (FERC NO. 10677)

Putts Bridge Hydro Station is located at river mile 9.2 on the Chicopee River in the town of Ludlow and the City of Springfield. The station was constructed in 1918 and was most recently purchased in 2008 by Essential Power from Consolidated Edison Energy of Massachusetts, LLC. The station has 2 units, each rated for 1,600 KW, with hydraulic capacities of 725 cfs.

Revised MDFW Condition 2 (Condition 3 of USFWS) for the Putts Bridge Project requires the release of a minimum flow of 25 cubic-feet-per-second (cfs) (or inflow, if less) at the project's bypass reach. MDFW Condition 3 (Condition 4 of USFWS) limits drawdown to 1-ft below the top of flashboards (El. 205.25) from April 1 to June 30, and a 2-ft draw down below the top of flashboards from July 1 to March 30, except for system emergencies or annual energy audits.

The revised condition regarding the 25-cfs minimum flow amount was noted as being subject to change based on the results of a water quality study conducted in the bypass. The study results were issued to the MDFW and USFWS on November 6, 2000. The water quality study concluded that the 25-cfs flow maintained water quality standards within the bypass and an increase was not warranted.

## Impoundment Fluctuations

Impoundment fluctuations are measured through the use of electronic pressure transducers. Documentation of compliance with the impoundment limits is supplied by hourly strip charts recording pond levels in addition to instantaneous visual displays in the powerhouse. Essential Power limits impoundment draw down through the use of the project's turbines. The project's turbines operate in an automatic mode using impoundment level float controls which curtail operation when the lower impoundment level limits are reached and do not resume operation until operating impoundment levels are reestablished.

# **Release Mechanism**

Minimum flows are released through a single, top discharge gate located on the dam's north abutment. The steel gate is 6 ft. wide and 8 ft. high and is capable of opening approximately 4- feet below the dam crest. The gate is electronically operated, and controlled by a PLC (located in the powerhouse) which automatically adjust the gate opening with fluctuating impoundment elevations to maintain a constant discharge over the top of the gate (approximately 15 inches or 25 cfs). The PLC continuously monitors and records impoundment level elevations and gate position through the use of strip charts. The sensitivity of the measurement is +/- 0.01 ft. In addition, an impoundment level indicator is located at the head gate structure adjacent to the gate.

During periodic maintenance activities to the minimum flow gate flows are discharged over the dam crest. During infrequent impoundment draw down for major dam repairs minimum flows will be maintained. The minimum flow release mechanism will be outlined in a letter sent prior to the impoundment draw down.

If a situation occurs where the headpond elevation is low, and the inflow into the site is less than the minimum flow then, the station is taken offline and the PLC regulates the min flow gate to inflow by maintaining pond level. Units are left offline until river flows return and the pond is allowed to refill.

# Instrumentation Maintenance and Calibration

Maintenance to the monitoring and control systems is performed on an as-needed basis with calibration of the instruments being performed approximately every two years. As a minimum, operators visit the project approximately twice per week to confirm proper station operation. The station is also equipped with alarms to notify operations personnel of equipment malfunctions. These alarms include malfunction of the minimum flow gate and an alarm to designate that the gate control is in manual versus automatic mode.

#### INDIAN ORCHARD (FERC NO. 10678)

Indian Orchard Station is located at river mile 7.8 on the Chicopee River in the City of Springfield and the Town of Ludlow. The station was constructed in 1896 and was most recently purchased in 2008 by Essential Power from Consolidated Edison Energy of Massachusetts, LLC. The station has 2 units, Unit 3 rated for 1,500 KW, with a hydraulic capacity of 625 cfs; and Unit 4 rated for 2,200 KW, with a hydraulic capacity of 900 cfs.

MDFW Condition 2 (Condition 3 of USFWS) for the Indian Orchard Project requires the release of a minimum flow of 247 cubic-feet-per-second (cfs) (or inflow, if less) at the Indian Orchard Dam. Revised MDFW Condition 3 (Condition 4 of USFWS) limits drawdown to 0.5-ft below the top of the flashboards (or dam crest if boards are out) from April 1 to June 30. Drawdowns are limited to 1-ft below the top of the flashboards (or dam crest if boards are out) from July 1 to March 30, except for system emergencies or annual energy audits.

# Impoundment Fluctuations

Impoundment fluctuations are measured through the use of electronic pressure transducers. The transducer is located upstream of the gatehouse and continually monitors and records impoundment elevation on strip charts. Documentation of compliance with the minimum flow requirement is supplied by strip charts that continuously monitor the pond level in addition to instantaneous visual displays in the powerhouse. The sensitivity of the measurement is +/- 0.01 ft. A data logger also records the head pond level every 15 minutes.

Essential Power currently controls impoundment levels through the use of the project's turbines. The project's turbines operate in an automatic mode using impoundment level controls that curtail operation when the impoundment limits are reached. Unit operation does not resume until acceptable impoundment levels are reestablished.

# **Release Mechanism**

Minimums flows are released through the use of two canal drainpipes, located immediately downstream of the canal headgates, on the north side of the canal. Each drainpipe is

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36-inch in diameter, corrugated metal, and has an invert of El.151.7' (approximately 10' below the top of flashboards). Each pipe is equipped with a 2-ft-6-inch square entrance control gate that is automatically operated based on pond level. The control gates are fully opened for pond levels at or above elevation 160.8' (while the units are generating). If impoundment levels begin or continue to drop below elevation 160.5' (unit motoring setting), the gates close in approximately 5% increments to restrict pond levels from dropping further. This control feature allows the passage of inflows to the project until inflows exceed the 247 cfs.

During any periodic maintenance activities that require the canal to be dewatered, project generation is discontinued and river flows are passed over the dam spillway. Periodic maintenance to Flashboards requires the pond level be lowered to approximately 1 foot below the crest of the dam. During these activities, flows will be released via the canal drain gates. Flows will be subsidized with a pump to ensure minimum flows are maintained. During infrequent impoundment draw down for major dam repairs minimum flows will be maintained. The minimum flow release mechanism will be outlined in a letter sent prior to the impoundment draw down.

# Instrumentation Maintenance and Calibration

Maintenance to the impoundment level and drainpipe control gate systems is performed on an as-needed basis with calibration of the instruments being performed approximately every two years. As a minimum, operators visit the project approximately twice per week to confirm proper station operation. The station is also equipped with alarms to notify operations personnel of equipment malfunctions.

# **OTHER PROVISIONS**

As indicated in the new Condition 10, Essential Power will attempt to maintain minimum flow releases under all operating conditions. Unless impossible (i.e. emergency circumstances or equipment malfunction), Essential Power will obtain written authorization from the MDFW and USFWS prior to any interruption of the minimum flow and impoundment fluctuation limits greater than 24 hours. If minimum flows or impoundment levels can not be maintained at any time for a duration greater than 24 hours (aside from board maintenance or replacement), Essential Power will notify the MDFW and USFWS within ten days of the violation. The notification will include a discussion of the reasons for the violation and the corrective actions taken by Essential Power.

Data on impoundment elevation, station output, and min flow gate settings will be made available to the MDFW and USFWS within 30 days of the agency's request. Essential Power will retain data on impoundment elevation, unit output, and gate settings for a 3 year period.

	Dwight	Red Bridge	Putts Bridge	Indian Orchard
Req'd Flow	258 (or inflow)	237 (or inflow)	25 (or inflow)	247 (or inflow)
(cfs)				
Top of Boards	None	None	205.25	161.0
Dam Crest	76.5'	272.24	203.58	159.35
Gate Sill El	Not Applicable	264.74	199.74	151.7
Drawdown	5" overtopping	1-ft (4/1-6/30)	1-ft (4/1-6/30)	0.5-ft (4/1-
limits	required	2-ft (7/1 – 3/30)	2-ft (7/1 – 3/30)	6/30)
				1-ft (7/1 – 3/30)
Release	Spillway	Bottom	Spillway and/or	Spillway and/or
Mechanism(s)	Overtopping	discharge gate	Top discharge	2 Canal drain
		and/or Spillway	gate	pipes

# Summary of Operating Conditions and Pertinent Data:

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# APPENDIX A

# REVISED TERMS AND CONDITIONS

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# United States Department of the Interior

FISH AND WILDLIFE SERVICE

New England Fleid Office 22 Bridge Street, Unit #1 Concord, New Hampshire 03301-4986



January 27, 2000

REF: FERC Nos. 11675 - Dwight

11676 - Red Bridge
11677 - Putts Bridge
11678 - Indian Orchard
Consolidated Edison Energy Massachusetts, Inc.

Mark Noyes CEEMI 111 Broadway, 16<sup>th</sup> Floor New York, NY 10006

Dear Mr. Noyes:

This is in response to the Federal Energy Regulatory Commission's December 29, 1999 Order Amending Exemptions for the Red Bridge, Putts Bridge, Indian Orchard and Dwight Projects, located on the Chicopee River in Massachusetts. We originally were going to respond to the November 23, 1999 memorandum prepared by Kleinschmidt Associates which provides the results of an assessment of the effect operations at Putts Bridge has on the ability of Indian Orchard to meet its minimum flow requirement. As the FERC order addresses and accepts the findings of the assessment, we instead will comment on modifications to the original terms and conditions we prescribed for the exemptions that we believe are necessary, given that minimum flows and headpond fluctuations have changed at some sites.

As originally exempted, each project had specific minimum flows and allowable impoundment drawdowns.

Originally Exempted

Red Bridge

237 cfs min. flow (or inflow, if less), 1-ft. drawdown April 1- June 30 and 2-ft. from July 1 -March 30

Putts Bridge

247 cfs min. flow (or inflow, if less), 1-ft. drawdown April 1- June 30 and 2-ft. from July 1 -March 30

Indian Orchard

247 cfs min. flow (or inflow, if less), 1-ft. drawdown year-round

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#### Dwight

258 cfs min. flow (or inflow, if less), 1-ft. drawdown year-round

#### Proposed

Red Bridge

237 cfs min. flow (or inflow, if less), 1-ft. drawdown April 1- June 30 and 2-ft. from July 1 - March 30,

Putts Bridge

25 cfs min. flow (or inflow, if less), 1-ft. drawdown April 1- June 30 and 2-ft. from July 1 - March 30.

Indian Orchard

247 cfs min. flow (or inflow, if less), 0.5-ft. drawdown April 1- June 30 and 1-ft. drawdown from July 1 - March 30.

Dwight

258 cfs min. flow (or inflow, if less), 0.25-ft. drawdown when boards are up and no fluctuation when boards are down.

As originally exempted, the mandated flows were to be released via special minimum flow turbines. This idea was subsequently found to be uneconomical, and alternative release mechanisms were investigated. Also, in order to meet the requirements for being exempted, project capacity upgrades are necessary. CEEMI submitted a development plan in June, 1999 that outlined how upgrading the existing facilities would result in meeting that criterion.

To date; we believe the following issues have been resolved to our satisfaction:

Bypass flow rates and release mechanisms at each project, with the exception of Putts Bridge.

Impoundment fluctuation levels. The proposed changes to limit drawdowns at Indian Orchard to 0.5-ft from April 1 - June 30, and at Dwight to within 0.25-ft. when boards are up, should ensure that continuous and stable minimum flows are maintained below those projects. Proposed capacity upgrades. None of the upgrades should influence the minimum flows or

Two issues that remain outstanding include:

drawdown limits for each project.

The Putts Bridge bypass flow. We never approved the reduced flow as a permanent measure. Before approving this change as a permanent condition of the exemption, a water quality study must be performed to verify that the lower flow will protect water quality in the bypass reach. It is our understanding that the study will occur this summer. Once we receive the study results we will make a final decision on the minimum bypass flow needed at Putts Bridge.

A revised Monitoring Plan. A condition of each exemption was the development of a plan to monitor headpond elevations and bypass flows. On March 11, 1993 the previous owner of the projects submitted a Monitoring Plan for our review. Since the original plans were filed and approved, major changes in the methods of releasing the bypass flows have been made

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at the projects, requiring the development of a revised Monitoring Plan. You should provide us with a plan that (1) details the flow release structures and locations, (2) describes the mechanisms used to monitor headpond elevation and minimum flows, (3) specifies how often maintenance and calibration of the monitoring and recording equipment takes place, (4) states how bypass flows will be maintained during any periodic maintenance activities that require the impoundment to be drawn down below the level of the flow release structures, and (5) states how frequently and in what form the data are recorded. A calculation sheet that verifies the discharge of each release structure (i.e., slide/canal gate, board notches and dam spill) under all operating ranges should be included.

Per Condition 8 of the Exemptions from Licensing, we hereby modify our original terms and conditions for the subject exemptions as follows:

#### Red Bridge

5,

Modify the following conditions to read:

The Exemptee shall, within six months from the date of issuance of the Order Amending Exemptions, present to the Fish and Wildlife Service for approval, a plan for monitoring project impoundment level and instantaneous bypass flow releases. Following approval of the plan, the Exemptee shall measure and record impoundment level and flows according to the plan and provide records of these data to the Fish and Wildlife Service within 30 days from a request for the records.

The following new condition is to be added to the original nine.

10. In the event that any dam maintenance or emergency drawdown is required, the Exemptee shall continue to operate the project such that the minimum flows are maintained downstream of the project at all times. If during reservoir refilling, inflow to the project is less than the required minimum flow, the Exemptee shall withhold not more than 10% of project inflow.

All other conditions are to be retained in their entirety.

#### Putts Bridge

Modify the following conditions to read:

- 3. An interim minimum flow of 25 cubic feet per second, or inflow to the project, whichever is less, shall be continuously released at the project dam to the bypassed reach. This release may be modified if results of a water quality study indicate that 25 cfs is insufficient to protect water quality in the bypass reach.
- 5. The Exemptee shall, within six months from the date of issuance of the Order Amending Exemptions, present to the Fish and Wildlife Service for approval, a plan for monitoring project impoundment level and instantaneous bypass flow releases. Following approval of the plan, the Exemptee shall measure and record impoundment level and flows according

to the plan and provide records of these data to the Fish and Wildlife Service within 30 days from a request for the records.

The following new condition is to be added to the original nine.

10. In the event that any dam maintenance or emergency drawdown is required, the Exemptee shall continue to operate the project such that the minimum flows are maintained downstream of the project at all times. If during reservoir refilling, inflow to the project is less than the required minimum flow, the Exemptee shall withhold not more than 10% of project inflow.

All other conditions are to be retained in their entirety.

## Indian Orchard

Modify the following conditions to read:

- 4. The exemptee shall operate the project to limit drawdown of the project impoundment to no more than 0.5-feet below the top of the flashboards (or dam crest if boards are out) from April 1 through June 30. From July 1 through March 30, the Exemptee shall limit drawdown to no more than one foot below the top of the flashboards (or dam crest if boards are out).
- 5. The Exemptee shall, within six months from the date of issuance of the Order Amending Exemptions, present to the Fish and Wildlife Service for approval, a plan for monitoring project impoundment level and instantaneous bypass flow releases. Following approval of the plan, the Exemptee shall measure and record impoundment level and flows according to the plan and provide records of these data to the Fish and Wildlife Service within 30 days from a request for the records.

The following new condition is to be added to the original nine.

10. In the event that any dam maintenance or emergency drawdown is required, the Exemptee shall continue to operate the project such that the minimum flows are maintained downstream of the project at all times. If during reservoir refilling, inflow to the project is less than the required minimum flow, the Exemptee shall withhold not more than 10% of project inflow.

All other conditions are to be retained in their entirety.

#### Dwight

Modify the following conditions to read:

4. The Exemptee shall operate the project to limit drawdown of the project impoundment to no more than 0.25 feet below the top of the flashboards. When boards are out, the Exemptee shall maintain a minimum of five inches of spill over the dam crest to maintain the minimum bypass flow specified in Condition #3.

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5. The Exemptee shall, within six months from the date of issuance of the Order Amending Exemptions, present to the Fish and Wildlife Service for approval, a plan for monitoring project impoundment level and instantaneous bypass flow releases. Following approval of the plan, the Exemptee shall measure and record impoundment level and flows according to the plan and provide records of these data to the Fish and Wildlife Service within 30 days from a request for the records.

The following new condition is to be added to the original nine.

10. In the event that any dam maintenance or emergency drawdown is required, the Exemptee shall continue to operate the project such that the minimum flows are maintained downstream of the project at all times. If during reservoir refilling, inflow to the project is less than the required minimum flow, the Exemptee shall withhold not more than 10% of project inflow.

All other conditions are to be retained in their entirety.

Thank you for this opportunity to comment. If you have any questions, please contact Mellissa. Grader of this office at (603) 225-1411.

Sincerely,

Michael J. Bartlett Supervisor New England Field Office

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cc: John Labiak, CEEMI Caleb Slater, MA DFW FERC/DLC FERC/OHL Reading File es: MGrader:1-27-00:(603)225-1411

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Commonwealth of Massachusetts



# isionof heries&Wild

Wayne F. MacCallum, Director

February 15, 2000

MASTER FILE

RE: Chicopee River Projects: Dwight - 11675 Red Bridge - 11676 Putts Bridge ~ 11677 Indian Orchard - 11678

Mark Noyes CEEMI 111 Broadway, 16th Floor New York, NY 10006

#### Dear Mr. Noyes,

The Massachusetts Division of Fisheries and Wildlife (Division) is the state agency responsible for the protection and management of the fish and wildlife resources of the Commonwealth. As such, we have prepared the following comments in response to the Federal Energy Regulatory Commission's December 29, 1999 Order Amending Exemptions for the Red Bridge, Putts Bridge, Indian Orchard, and Dwight Projects, located on the Chicopes River in Massachusetts.

As originally exempted, each project had specific minimum flows and allowable impoundment drawdowns.

**Original Conditions** 

Red Bridge

237 cfs min. flow (or inflow, if less), 1-ft. drawdown April 1- June 30 and 2-ft. from July 1 - March 30

**Putts Bridge** 

247 cfs min. flow (or inflow, if less), 1-ft. drawdown April 1- June 30 and 2-ft. from July 1 - March 30

## Indian Orchard

247 cfs min. flow (or inflow, if less), 1-ft. drawdown year-round

Dwight

258 cfs min. flow (or inflow, if less), 1-ft. drawdowo year-round

## Proposed Conditions

**Red Bridge** 

237 cfs min. flow (or inflow, if less), 1-ft. drawdown April 1- June 30 and 2-ft. from July 1 - March 30.

**Putts Bridge** 

25 cfs min. flow (or inflow, if less), 1-ft. drawdown April 1- June 30 and 2-ft. from July 1 - March 30.

#### Indian Orchard

247 cfs min. flow (or inflow, if less), 0.5-ft. drawdown April 1- June 30 and 1-ft. drawdown from July 1-March 30.

# Division of Fisheries & Wildlife

Field Headquarters, One Rabbit Hill Road, Westboro, MA 01581 (508) 366-4470 An Agency of the Department of Fisheries, Wildlife & Environmental Law Enforcement

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#### Dwight

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258 cfs min. flow (or inflow, if less), 0.25-ft. drawdown when boards are up and no fluctuation when boards are down.

The original exemptions required that the minimum flows were to be released via new minimum flow turbines. This idea was subsequently found to be uneconomical, and alternative release mechanisms were investigated. The original exemptions also required project capacity upgrades. CEEMI submitted a development plan in June 1999 that outlined how upgrading the existing facilities would result in meeting that criterion.

We believe the following issues have been adequately addressed:

Minimum bypass flows and release mechanisms at each project, with the exception of Putts Bridge.

Impoundment fluctuation levels, specifically the proposed changes to limit drawdowns at Indian Orchard to 0.5-ft from April 1 - June 30, and at Dwight to within 0.25-ft, when boards are up, should ensure that continuous and stable minimum flows are maintained below those projects.

The proposed capacity upgrades should influence the minimum flows or drawdown limits for each project.

#### Unresolved issues:

The Putts Bridge bypass flow. We have not agreed to the reduced flow as a permanent condition of the exemption. Before we do so, a water quality study must be performed to verify that the lower flow will protect water quality in the bypass reach. It is our understanding that the study will occur this summer. Once we receive the study results we will make a final decision on the minimum bypass flow needed at Putts Bridge:

Revised Monitoring Plan. A condition of each exemption was the development of a plan to monitor headpond elevations and bypass flows. On March 11, 1993 the previous owner of the projects submitted a Monitoring Plan for our review. Since that time, major changes in the methods of releasing the bypass flows have been made at the projects. We believe that these changes require the development of a new Monitoring Plan. You should provide us with a plan that (1) details the flow release structures and locations, (2) describes the mechanisms used to monitor headpond elevation and minimum flows, (3) specifies how often maintenance and calibration of the monitoring and recording equipment takes place, (4) states how bypass flows will be maintained during any periodic maintenance activities that require the impoundment to be drawn down below the level of the flow release structures, and (5) states how frequently and in what form the data are recorded. A calculation sheet that verifies the discharge of each release structure (i.e., slide/canal gate, board notches and dato spill) under all operating ranges should be included.

Per Condition 8 of the Exemptions from Licensing, we hereby modify our original terms and conditions for the subject exemptions as follows:

#### **Red Bridge**

Modify the following conditions to read:

6. The Exemptee shall, within six months from the date of issuance of the Order Amending Exemptions, present to the Division for approval, a plan for monitoring project impoundment level and instantaneous bypass flow releases. Following approval of the plan, the Exemptee shall measure and record impoundment level and flows according to the plan and provide records of these data to the Division within 30 days from a request for the records.

The following new condition is to be added to the original nine.

10. In the event that any dam maintenance or emergency drawdown is required, the Exemptee shall continue to operate the project such that the minimum flows are maintained downstream of the project at all times. If during reservoir refilling, inflow to the project is less than the required minimum flow, the Exemptee shall withhold not more than 10% of project inflow.

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All other conditions are to be retained in their entirety.

#### Putts Bridge

Modify the following conditions to read:

- 2. An interim minimum flow of 25 cubic feet per second, or inflow to the project, whichever is less, shall be continuously released at the project dam to the bypassed reach. This release may be modified if results of a water quality study indicate that 25 cfs is insufficient to protect water quality in the bypass reach.
- 6. The Exemptee shall, within six months from the date of issuance of the Order Amending Exemptions, present to the Division for approval, a plan for monitoring project impoundment level and instantaneous bypass flow releases. Following approval of the plan, the Exemptee shall measure and record impoundment level and flows according to the plan and provide records of these data to the Division within 30 days from a request for the records.

The following new condition is to be added to the original nine.

10. In the event that any dam maintenance or emergency drawdown is required, the Exemptee shall continue to operate the project such that the minimum flows are maintained downstream of the project at all times. If during reservoir refilling, inflow to the project is less than the required minimum flow, the Exemptee shall withhold not more than 10% of project inflow.

All other conditions are to be retained in their entirety.

#### Indian Orchard

Modify the following conditions to read:

- 3. The exemptee shall operate the project to limit drawdown of the project impoundment to no more than 0.5-feet below the top of the flashboards (or dam crest if boards are out) from April 1 through June 30. From July 1 through March 30, the Exemptee shall limit drawdown to no more than one foot below the top of the flashboards (or dam crest if boards are out).
- 6. The Exemptee shall, within six months from the date of issuance of the Order Amending Exemptions, present to the Division for approval, a plan for monitoring project impoundment level and instantaneous bypass flow releases. Following approval of the plan, the Exemptee shall measure and record impoundment level and flows according to the plan and provide records of these data to the Division within 30 days from a request for the records.

The following new condition is to be added to the original nine.

10. In the event that my dam maintenance or emergency drawdown is required, the Exemptee shall continue to operate the project such that the minimum flows are maintained downstream of the project at all times. If during reservoir refilling, inflow to the project is less than the required minimum flow, the Exemptee shall withhold not more than 10% of project inflow.

All other conditions are to be retained in their entirety.

Dwight

Modify the following conditions to read:

- 3. The Exemptee shall operate the project to limit drawdown of the project impoundment to no more than 0.25 feet below the top of the flashboards. When boards are out, the Exemptee shall maintain a minimum of five inches of spill over the dam crest to maintain the minimum bypass flow specified in Condition #3.
- 6. The Exemptee shall, within six months from the date of issuance of the Order Amending Exemptions, present to the Division for approval, a plan for monitoring project impoundment level and instantaneous bypass flow releases. Following approval of the plan, the Exemptee shall measure and record impoundment level and flows according to the plan and provide records of these data to the Division within 30 days from a request for the records.

The following new condition is to be added to the original nine.

10. In the event that any dam maintenance or emergency drawdown is required, the Exemptee shall continue to operate the project such that the minimum flows are maintained downstream of the project at all times. If during reservoir refilling, inflow to the project is less than the required minimum flow, the Exemptee shall withhold not more than 10% of project inflow.

All other conditions are to be retained in their entirety.

Sincerely, Caleb Slater, Ph.D.

Anadromous Fish Project Leader

cc: John Labiak, CEEMI Melissa Grader, USFWS FERC

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# APPENDIX B

# AGENCY CORRESPONCES

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# United States Department of the Interior

## FISH AND WILDLIFE SERVICE

New England Field Office 70 Commercial Street, Suite 300 Concord, New Hampshire 03301-5087

November 6, 2001

REF: FERC Nos. 10675, 10676, 10677, 10678 Consolidated Edison Energy Massachusetts, Inc.

Alfred Nash, P.E. Kleinschmidt Associates 75 Main Street, P.O. Box 576 Pittsfield, ME 04967

Dear Mr. Nash:

This responds to your October 5, 2001 cover letter and accompanying Minimum Flow and Impoundment Fluctuation Monitoring Plan for the Dwight, Red Bridge, Putts Bridge and Indian Orchard Projects, located on the Chicopee River in Massachusetts. The Plan was developed pursuant to revised terms and conditions submitted by this office and the Massachusetts Division of Fisheries and Wildlife (MADFW) for the project exemptions. We have reviewed the plans and have the following comments.

#### Dwight

#### Impoundment Fluctuation

Please include the impoundment level set points (stop, start and run) that will be programmed into the PLC system for both the boards-in and boards-out condition. Given the fine level of control that will be needed (within 3 inches with boards up and 5 inches with boards out), it is necessary to specify the equipment's sensitivity (e.g., +/-0.1 ft.). Final set-points should take this margin of error into account. Also, please specify how frequently pond level is recorded, and how long the recorded readings are kept on file.

#### Release Mechanism

Please provide calculations that quantify how much flow the two canal sluice gates can discharge in the event of an impoundment drawdown for dam maintenance/repair. This section of the Plan should also describe how downstream flows will be maintained while the pond is being refilled.

#### General 🔅

Field calibration should occur as soon as possible to verify that the release structures are passing the required minimum flows. This information should be provided to both this office and the MADFW.
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#### **Red Bridge**

#### Impoundment Fluctuation

Please include the impoundment level set-points (stop, start and run) that will be programmed into the PLC system for the April 1 to June 30, and July 1 to March 30 time periods. The equipment's sensitivity (e.g., +/-0.1 ft.) should also be stated. Final set-points should take this margin of error into account. Also, please specify how frequently pond level is recorded, and how long the recorded readings are kept on file.

#### **Release Mechanism**

The Plan states that the PLC will continuously monitor pond levels. Please indicate how frequently the system takes readings and adjusts the gate (e.g., every 15 minutes).

We request that you provide calculations for the following:

- The depth of flow necessary to pass 237 cfs over the spillway.
- The amount of flow the canal drain gate and/or the drain gates at the units can pass in the event the pond is drawn down for major repairs or emergencies.

This section of the Plan should also describe how downstream flows will be maintained while the pond is being refilled.

#### General

Field calibration should occur as soon as possible to verify that the release structures are passing the required minimum flows. This information should be provided to both this office and the MADFW.

#### Putts Bridge

In the first paragraph, the second sentence should read, "...limits drawdown to 1-ft below the top of the flashboards from April 1 to June 30, and a 2-ft draw down below the top of the flashboards from July 1 to March 30..."

In the summary table on page 11, the dam crest elevation is listed as 203.54, but on the minimum flow gate calculation sheet it is listed as 203.58. Please clarify which elevation is correct.

#### Impoundment Fluctuation

Please include the impoundment level set-points (stop, start and run) that will be programmed into the PLC system for the April 1 to June 30, and July 1 to March 30 time periods. The equipment's sensitivity (e.g., +/-0.1 ft.) should also be stated. Final set-points should take this margin of error into account. Also, please specify how frequently pond level is recorded, and how long the recorded readings are kept on file.

#### Release Mechanism

The Plan states that the PLC will continuously monitor pond levels. Please indicate how frequently the system takes readings and adjusts the gate (e.g., every 15 minutes).

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Please provide calculations for the following:

- The depth of spill required to pass 25 cfs over the spillway.
- The amount of flow the low level sluice gate can pass.

This section of the Plan should also describe how downstream flows will be maintained while the pond is being refilled.

#### General

Field calibration should occur as soon as possible to verify that the release structures are passing the required minimum flows. This information should be provided to both this office and the MADFW.

#### Indian Orchard

#### Impoundment Fluctuation

This section needs to be updated to reflect the new fluctuation restrictions. As written, the sensor equipment is only programmed for a 1-ft drawdown. It must accommodate both a 0.5-ft and 1.0-ft drawdown for both board conditions. Please revise this section, and include the impoundment level set-points (stop, start and run) that will be programmed into the PLC system. The equipment's sensitivity (e.g., +/-0.1 ft.) should also be stated. Final set-points should take this margin of error into account.

We are unclear what is meant by hourly strip charts; does this mean once per hour an impoundment elevation is recorded on a strip chart? Please specify how frequently pond level is recorded, and how long the recorded readings are kept on file.

#### Release Mechanism

The minimum flow release structures proposed are adequate for periods when the pond level is at or above the dam crest. The Plan needs to describe how bypass flows will be maintained during periods of normal operation when boards are out, or when the pond is drawn down below dam crest for repairs/maintenance activity.

Please include calculations indicating that the canal drain gates and/or the drain gates at the units can pass at least 247 cfs, in the event the pond is drawn down for major repairs or emergencies.

This section of the Plan should also describe how downstream flows will be maintained while the pond is being refilled.

#### General

Field calibration should occur as soon as possible to verify that the release structures are passing the required minimum flows. This information should be provided to both this office and the MADFW.

Thank you for this opportunity to comment. If you have any questions, please contact Melissa Grader of this office at (207) 781-8364, or e-mail at <u>melissa\_grader@fws.gov.</u>

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Sincerely,

Within S. Maslernger

William J. Neidermyer Assistant Supervisor Federal Activities New England Field Office Commonwealth of Massachusetts



# ivision of eries & Wildlife

Wayne F. MacCallum, Director

November 15, 2001

RE: FERC Nos. 10675, 10676, 10677, 10678

Alfred Nash, P.E. Kleinschmidt Associates 75 Main Street, PO Box 576 Pittsfield, ME 04967

Dear Mr. Nash,

This letter is in response to your report, Chicopee River Projects: Minimum Flow and Impoundment Fluctuation Monitoring Plan, dated October 2001. We have reviewed the plan and have the following comments. How long kept for

For each project:

Please specify the set points (stop, start and run) that will be programmed into the PLC systems.

Please specify how frequently the PLC systems monitor the pond elevation and/or how con to frequently changes to gate adjustments/unit operations are made in response to this data.

Please specify how frequently the pond level will be recorded and how this data is kept.

Please provide calculations that quantify the flow to be released from the alternative flow devices to be used during maintenance drawdowns (i.e. how much flow will be provided via spillway or drain gates [and their settings] at the range of anticipated pond elevations).

Field calibration of minimum flows should occur as soon as possible to verify that the devices are functioning as required.

Sincerely,

Caleb Slater, Ph.D. Anadromous Fish Project Leader

cc

FERC John Warner, USFWS Melissa Grader, USFWS John Labiak, CEEMI

## Division of Fisheries & Wildlife

Field Headquarters, One Rabbit Hill Road, Westborough, MA 01581 (508) 792-7270 • Fax 792-7275 An Agency of the Department of Fisheries, Wildlife & Environmental Law Enforcement

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APPENDIX C

CALCULATIONS



141 Main St P.O. Box 650 Page: Pittsfield, Maine 04967 Project No: 803-004 Tel: 207.487.3328 Fax: 207.487.3174 Checked: MCS

Date: 12-9-2011 Date: 12-12-2011

Project:	Chicopee River Projects - Minimum Flow
Subject:	Dwight Minimum Flow

#### **Analysis Description:**

Calculating the gate settings required to release the minimum flow.

#### Assumptions:

Minimum flow of 258 cfs required Flow is released through 2 canal sluice gates Sluice gates only used when WSEL is below crest Bottoms of fully opened sluice gates are estimated to be El. 66.5' (approximately 10-ft below crest). Weir or Orifice flow possible Orifice flow occurs when depth at crest (critical depth, 2/3 of head on crest) rises above bottom of fully opened sluice gate. Formula for orifice flow: (2/3)\*Cd\*((2g)^0.5)\*L\*(((H1)^1.5)-((H2)^1.5)): H1=Head over the invert and H2=Head over the top of the gate Formula for weir flow: C\*L\*H^3/2

By: JSJ

#### Analysis:

#### Flow through canal sluice gates at a range of headpond elevations

Bare Crest/Invert Elevation (ft) =		66.5
	Top Elevation (ft) =	71.5
	Height (ft) =	5
	Width (ft) =	5
	Weir Coefficient (C) =	3
	Orifice Coefficient (Cd) =	0.64
	Gravity g (ft/s <sup>2</sup> ) =	32.2

Headpond	Flow	Total Flow
Elev (ft)	Condition	(cfs)
66.5	Weir	0
67	Weir	5
67.5	Weir	14
68	Weir	26
68.5	Weir	39
69	Weir	53
69.5	Weir	69
70	Weir	84
70.5	Weir	101
71	Weir	117
71.5	Weir	134
72	Weir	151
72.5	Weir	168
73	Weir	184
73.5	Weir	200
74	Weir	216
74.5	Weir	231
75	Weir	245
75.5	Weir	259
76	Weir	272
76.5	Weir	285
77	Weir	296
77.5	Weir	306
78	Weir	316
78.5	Weir	324



 141 Main St P.O. Box 650
 Page:

 Pittsfield, Maine 04967
 Project No: 803-004

 Tel: 207.487.3328
 By: JSJ

 Fax: 207.487.3174
 Checked: MCS

Date: 12-9-2011 Date: 12-12-2011

Project:	Chicopee River Projects - Minimum Flow
Subject:	Putts Bridge Minimum Flow

#### **Analysis Description:**

Calculating the gate settings required to release the minimum flow.

#### Assumptions:

25 cfs Minimum flow requirement Minimum flow passed through a top discharge gate Gate is 6-ft wide and 8-ft high Gate controlled by PLC C from Bureau of Reclaimation <u>Design of Small Dams</u> p. 373 Spillway crest elevation is 203.58' Gate Invert Elevation is 199.74' Flashboard Elevation is 205.25' Low Level Sluice no longer in use

#### Analysis:

#### Minimum Flow Top Discharge Gate

Effective Width L=L'-2(N\*kp+kq)He Kp 0.02 Ka 0.2 N 2 He 1.2 ft L' 6 ft L 5.424 ft

Required Gate Setting  $Q=CLH^{(3/2)}$ Q 25 cfs C 3.3 L 5.4 ft H 1.25 ft

Must maintain an opening of 1'-3" to release minimum flow of 25 cfs



**Project:** Chicopee River Projects - Minimum Flow Subject: Red Bridge Minimum Flow

#### **Analysis Description:**

Calculating the minimum flow.

#### Assumptions:

237 cfs minimum flow is required Minimum flow is passed through a minimum flow gate Minimum flow can be passed over the spillway as an alternative C from Bureau of Reclaimation Design of Small Dams p. 373 Spillway Crest elevation is 272.24' Gate elevation is 264.7' Gate is 7' wide x 8.5' high

#### Analysis:

1 Anter y Day	<u>, , , , , , , , , , , , , , , , , , , </u>			
Depth required to maintain minimum		Flow throu	gh minimu	m flo
flow ove	er the spillway - Backup	<u>of headpon</u>	d elevations	s - Pr
Effective	e Spillway Width	Bare C	rest/Invert E	levati
L=L'-2(1	N*kp+kq)He		Тор Е	levati
Кр	0.02			Heig
Kq	0.2			Wid
Ν	2		Weir Coe	fficie
He	2 ft		Orifice Coef	ficien
L'	300 ft		Grav	vity g
L	299.04 ft			
Required	d Gate Setting	Heednerd	Гюш	<b>T</b> -4
Q=CLH	(3/2)	Headpond Elev (ft)	FIOW Condition	1 ota
0	237 cfs	264.7	Wair	

Q	237 CTS
С	2.9
L	299.04 ft
Н	0.42 ft

Must maintain 5" of overtopping to release minimum flow

Headpond Elev (ft)	Flow Condition	Total Flow (cfs)
264.7	Weir	0
264.75	Weir	0
264.8	Weir	1
265	Weir	3
265.5	Weir	15
266	Weir	30
266.5	Weir	48
267	Weir	68
267.5	Weir	91
268	Weir	114
268.5	Weir	139
269	Weir	164
269.5	Weir	191
270	Weir	217
270.5	Weir	245
271	Weir	272
271.5	Weir	300
272	Weir	328
272.5	Weir	356
273	Weir	383
273.5	Weir	410
274	Weir	437
274.5	Weir	464
275	Weir	490

#### w gates at a range imary Min Flow

of neaupoin	i elevations - r rimary i	
Bare C	rest/Invert Elevation (ft) =	264.7
	Top Elevation (ft) =	273.2
	Height (ft) =	8.5
	Width (ft) =	7
	Weir Coefficient (C) =	3
	Orifice Coefficient (Cd) =	0.64
	Gravity g (ft/s <sup>2</sup> ) =	32.2



 141 Main St P.O. Box 650
 Page:

 Pittsfield, Maine 04967
 Project No: 803-004

 Tel: 207.487.3328
 By: JSJ

 Fax: 207.487.3174
 Checked: MCS

Date: 12-9-2011 Date: 12-12-2011

Project:	Chicopee River Projects - Minimum Flow
Subject:	Indian Orchard Minimum Flow

#### Analysis Description:

Calculating the gate settings required to release the minimum flow.

#### **Assumptions:**

247 cfs minimum flow requirement Minimum flow passed through 2-36" diameter CM pipes Gate for minimum flow pipes is a 30" sqaure opening. Invert of pipes is El 151.7' Impoundment Fluctionation = 0.5-ft drawdown (4/1-6/30), 1-ft drawdown (7/1-3/30) C based on a short pipe, from 6th edition of Elementary Fluid Mechanics p. 535

<u>Analysis:</u>			
<b>Checking H</b>	Pipe Flow	at a range	of elevations
0 0 + + 10	1)		

$Q=CA*\sqrt{2g}$	h)	
$A = (pi*d^2)/4$		
Min Flow	247	cfs
С	0.8	
А	7.07	sq-ft
d	3	ft
g	32.2	
Invert El	151.7	ft
Pipe CL El	153.2	ft
Headpond	h (ft)	Q (cfs)
161	7.8	253
160.9	7.7	252
160.8	7.6	250
160.7	7.5	249
160.6	7.4	247
160.5	7.3	245
159.6	6.4	230
158.35	5.15	206

Min Flow Calculations at Dwight Station Provided by US Fish and Wildlife

#### Dwight Dam Sluice Gate Discharge

Q <sub>min</sub>	258.0 (ft <sup>3</sup> /s)	Minimum flow release requirement
$EL_1$	66.5 (ft MSL)	Elevation of sluice gate sill
EL <sub>2</sub>	71.5 (ft MSL)	Elevation of top of sluice gate opening
WS	77.0 (ft MSL)	Normal pond elevation
EL <sub>crest</sub>	76.58 (ft MSL)	Dam crest elevation
$H_g$	5.0 (ft)	Gate opening height
W <sub>g</sub>	5.0 (ft)	Gate opening width; also serves as L', weir length; L' modified below by Ka in tables
C <sub>w</sub>	3.087 (ft <sup>0.5</sup> /s)	Weir coefficient (through gate); broad-crested chute flow; also appropriate for partially submerged discharge
Co	0.65 (-)	Orifice coefficient; p. 454 Design of Small Dams, w/development >1.25' and less than 2.5'
K <sub>a</sub>	0.1 (-)	Abutment coefficient; p. 373 Design of Small Dams, assumes headwall at 90d to flow
Kp	0.02 (-)	Pier coefficient; p. 373 Design of Small Dams





	Gate Elevation and Opening (ft)											
WS	66.5	67.0	67.5	68.0	68.5	69.0	69.5	70.0	70.5	71.0	71.5	
	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	
(ft)				<u>Flov</u>	v Condition	(Weir flow	or Orifice f	low)				
66.5	orifice	weir	weir	weir	weir	weir	weir	weir	weir	weir	weir	
67.0	orifice	orifice	weir	weir	weir	weir	weir	weir	weir	weir	weir	
67.5	orifice	orifice	orifice	weir	weir	weir	weir	weir	weir	weir	weir	
68.0	orifice	orifice	orifice	orifice	weir	weir	weir	weir	weir	weir	weir	
68.5	orifice	orifice	orifice	orifice	orifice	weir	weir	weir	weir	weir	weir	
69.0	orifice	orifice	orifice	orifice	orifice	orifice	weir	weir	weir	weir	weir	
69.5	orifice	orifice	orifice	orifice	orifice	orifice	orifice	weir	weir	weir	weir	
70.0	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	weir	weir	weir	
70.5	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	weir	weir	
71.0	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	weir	
71.5	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	
72.0	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	
72.5	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	
73.0	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	
73.5	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	
74.0	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	
74.5	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	
75.0	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	
75.5	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	
76.0	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	
76.5	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	
76.58	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	
77.0	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	
77.5	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	
78.0	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	
78.5	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	

					Gate Elevat	ion and Ope	ening (ft)				
WS	66.5	67.0	67.5	68.0	68.5	69.0	69.5	70.0	70.5	71.0	71.5
	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
(ft)						Head (ft)					
66.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
67.0	0.50	0.25	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
67.5	1.00	0.75	0.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
68.0	1.50	1.25	1.00	0.75	1.50	1.50	1.50	1.50	1.50	1.50	1.50
68.5	2.00	1.75	1.50	1.25	1.00	2.00	2.00	2.00	2.00	2.00	2.00
69.0	2.50	2.25	2.00	1.75	1.50	1.25	2.50	2.50	2.50	2.50	2.50
69.5	3.00	2.75	2.50	2.25	2.00	1.75	1.50	3.00	3.00	3.00	3.00
70.0	3.50	3.25	3.00	2.75	2.50	2.25	2.00	1.75	3.50	3.50	3.50
70.5	4.00	3.75	3.50	3.25	3.00	2.75	2.50	2.25	2.00	4.00	4.00
71.0	4.50	4.25	4.00	3.75	3.50	3.25	3.00	2.75	2.50	2.25	4.50
71.5	5.00	4.75	4.50	4.25	4.00	3.75	3.50	3.25	3.00	2.75	2.50
72.0	5.50	5.25	5.00	4.75	4.50	4.25	4.00	3.75	3.50	3.25	3.00
72.5	6.00	5.75	5.50	5.25	5.00	4.75	4.50	4.25	4.00	3.75	3.50
73.0	6.50	6.25	6.00	5.75	5.50	5.25	5.00	4.75	4.50	4.25	4.00
73.5	7.00	6.75	6.50	6.25	6.00	5.75	5.50	5.25	5.00	4.75	4.50
74.0	7.50	7.25	7.00	6.75	6.50	6.25	6.00	5.75	5.50	5.25	5.00
74.5	8.00	7.75	7.50	7.25	7.00	6.75	6.50	6.25	6.00	5.75	5.50
75.0	8.50	8.25	8.00	7.75	7.50	7.25	7.00	6.75	6.50	6.25	6.00
75.5	9.00	8.75	8.50	8.25	8.00	7.75	7.50	7.25	7.00	6.75	6.50
76.0	9.50	9.25	9.00	8.75	8.50	8.25	8.00	7.75	7.50	7.25	7.00
76.5	10.00	9.75	9.50	9.25	9.00	8.75	8.50	8.25	8.00	7.75	7.50
76.6	10.08	9.83	9.58	9.33	9.08	8.83	8.58	8.33	8.08	7.83	7.58
77.0	10.50	10.25	10.00	9.75	9.50	9.25	9.00	8.75	8.50	8.25	8.00
77.5	11.00	10.75	10.50	10.25	10.00	9.75	9.50	9.25	9.00	8.75	8.50
78.0	11.50	11.25	11.00	10.75	10.50	10.25	10.00	9.75	9.50	9.25	9.00
78.5	12.00	11.75	11.50	11.25	11.00	10.75	10.50	10.25	10.00	9.75	9.50

	Gate Elevation and Opening (ft)												
WS	66.5	67.0	67.5	68.0	68.5	69.0	69.5	70.0	70.5	71.0	71.5		
	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0		
(ft)				<u>Ori</u>	fice Flow Cr	oss-Sectior	al Area (ft <sup>2</sup> )	<u> </u>					
66.5	0												
67.0	0	2.5											
67.5	0	2.5	5										
68.0	0	2.5	5	7.5									
68.5	0	2.5	5	7.5	10								
69.0	0	2.5	5	7.5	10	12.5							
69.5	0	2.5	5	7.5	10	12.5	15						
70.0	0	2.5	5	7.5	10	12.5	15	17.5					
70.5	0	2.5	5	7.5	10	12.5	15	17.5	20				
71.0	0	2.5	5	7.5	10	12.5	15	17.5	20	22.5			
71.5	0	2.5	5	7.5	10	12.5	15	17.5	20	22.5	25		
72.0	0	2.5	5	7.5	10	12.5	15	17.5	20	22.5	25		
72.5	0	2.5	5	7.5	10	12.5	15	17.5	20	22.5	25		
73.0	0	2.5	5	7.5	10	12.5	15	17.5	20	22.5	25		
73.5	0	2.5	5	7.5	10	12.5	15	17.5	20	22.5	25		
74.0	0	2.5	5	7.5	10	12.5	15	17.5	20	22.5	25		
74.5	0	2.5	5	7.5	10	12.5	15	17.5	20	22.5	25		
75.0	0	2.5	5	7.5	10	12.5	15	17.5	20	22.5	25		
75.5	0	2.5	5	7.5	10	12.5	15	17.5	20	22.5	25		
76.0	0	2.5	5	7.5	10	12.5	15	17.5	20	22.5	25		
76.5	0	2.5	5	7.5	10	12.5	15	17.5	20	22.5	25		
76.58	0	2.5	5	7.5	10	12.5	15	17.5	20	22.5	25		
77.0	0	2.5	5	7.5	10	12.5	15	17.5	20	22.5	25		
77.5	0	2.5	5	7.5	10	12.5	15	17.5	20	22.5	25		
78.0	0	2.5	5	7.5	10	12.5	15	17.5	20	22.5	25		
78.5	0	2.5	5	7.5	10	12.5	15	17.5	20	22.5	25		

					Gate Elevat	ion and Op	ening (ft)				
WS	66.5	67.0	67.5	68.0	68.5	69.0	69.5	70.0	70.5	71.0	71.5
	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
(ft)					Weir Flow	Effective Le	ngth (ft)				
66.5		5	5	5	5	5	5	5	5	5	5
67.0			4.88	4.88	4.88	4.88	4.88	4.88	4.88	4.88	4.88
67.5				4.76	4.76	4.76	4.76	4.76	4.76	4.76	4.76
68.0					4.64	4.64	4.64	4.64	4.64	4.64	4.64
68.5						4.52	4.52	4.52	4.52	4.52	4.52
69.0							4.4	4.4	4.4	4.4	4.4
69.5								4.28	4.28	4.28	4.28
70.0									4.16	4.16	4.16
70.5										4.04	4.04
71.0											3.92
71.5											
72.0											
72.5											
73.0											
73.5											
74.0											
74.5											
75.0											
75.5											
76.0											
76.5											
76.58											
77.0											
77.5											
78.0											
78.5											

					Gate Elevat	tion and Op	ening (ft)				
WS	66.5	67.0	67.5	68.0	68.5	69.0	69.5	70.0	70.5	71.0	71.5
L	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
(ft)					Discharge r	per Sluice G	iate (cfs)				
66.5	0	0	0	0	0	0	0	0	0	0	0
67.0	0	7	5	5	5	5	5	5	5	5	5
67.5	0	11	18	15	15	15	15	15	15	15	15
68.0	0	15	26	34	26	26	26	26	26	26	26
68.5	0	17	32	44	52	39	39	39	39	39	39
69.0	0	20	37	52	64	73	54	54	54	54	54
69.5	0	22	41	59	74	86	96	69	69	69	69
70.0	0	23	45	65	82	98	111	121	84	84	84
70.5	0	25	49	70	90	108	124	137	147	100	100
71.0	0	27	52	76	98	117	135	151	165	176	116
71.5	0	28	55	81	104	126	146	164	181	195	206
72.0	0	30	58	85	111	134	156	177	195	211	226
72.5	0	31	61	90	117	142	166	188	209	227	244
73.0	0	33	64	94	122	149	175	199	221	242	261
73.5	0	34	66	98	128	156	183	209	233	256	277
74.0	0	35	69	102	133	163	192	219	245	269	291
74.5	0	36	71	105	138	169	199	228	255	281	306
75.0	0	37	74	109	143	175	207	237	266	293	319
75.5	0	39	76	112	147	181	214	246	276	305	332
76.0	0	40	78	116	152	187	221	254	286	316	345
76.5	0	41	80	119	156	193	228	262	295	327	357
76.6	0	41	81	119	157	194	229	263	296	328	359
77.0	0	42	82	122	161	198	235	270	304	337	369
77.5	0	43	84	125	165	204	241	277	313	347	380
78.0	0	44	86	128	169	209	247	285	321	357	391
78.5	0	45	88	131	173	214	253	292	330	366	402

257	Flow is below minimum required
258	Flow meets requirement

				(	Gate Elevat	ion and Opr	ening (ft)				
WS	66.5	67.0	67.5	68.0	68.5	69.0	69.5	70.0	70.5	71.0	71.5
	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
(ft)				Dis	scharge for	both Sluice	Gates (cfs)	-			
66.5	0	0	0	0	0	0	0	0	0	0	0
67.0	0	13	11	11	11	11	11	11	11	11	11
67.5	0	23	37	29	29	29	29	29	29	29	29
68.0	0	29	52	68	53	53	53	53	53	53	53
68.5	0	34	64	87	104	79	79	79	79	79	79
69.0	0	39	74	103	128	146	107	107	107	107	107
69.5	0	43	82	117	147	172	192	137	137	137	137
70.0	0	47	90	130	165	196	221	241	168	168	168
70.5	0	50	98	141	181	216	247	274	295	200	200
71.0	0	54	104	151	195	235	271	303	330	352	231
71.5	0	57	111	161	209	252	293	329	361	389	412
72.0	0	60	117	170	221	269	313	353	390	423	452
72.5	0	63	122	179	233	284	332	376	417	454	488
73.0	0	65	128	188	245	299	350	398	442	484	521
73.5	0	68	133	196	255	313	367	418	466	511	553
74.0	0	70	138	203	266	326	383	438	489	538	583
74.5	0	73	143	211	276	339	399	456	511	563	611
75.0	0	75	147	218	286	351	414	474	532	587	639
75.5	0	77	152	225	295	363	428	491	552	610	665
76.0	0	79	156	231	304	374	442	508	571	632	690
76.5	0	81	161	238	313	386	456	524	590	653	714
76.6	0	82	161	239	314	387	458	527	593	657	718
77.0	0	83	165	244	321	396	469	540	608	674	737
77.5	0	85	169	250	330	407	482	555	626	694	760
78.0	0	87	173	256	338	417	495	570	643	714	782
78.5	0	89	177	262	346	427	507	584	659	733	803

257	Flow is below minimum required
258	Flow meets requirement

Min Flow Calculations at Red Bridge Provided by US Fish and Wildlife

#### Red Bridge Dam Min. Flow Gate Discharge

$Q_{min}$	237.0 (ft <sup>3</sup> /s)	Minimum flow release requirement
EL <sub>1</sub>	264.7 (ft MSL)	Elevation of min flow discharge gate sill
EL <sub>2</sub>	273.2 (ft MSL)	Elevation of top of min flow discharge gate opening
EL <sub>crest</sub>	272.24 (ft MSL)	Spillway crest elevation
$H_g$	8.5 (ft)	Gate opening height
$W_{g}$	7.0 (ft)	Gate opening width; also serves as L', weir length; L' modified below by Ka in tables
C <sub>w</sub>	3.087	Weir coefficient; assumed for broad-crested chute flow; also appropriate for partially submerged discharge
Co	0.65 (-)	Orifice coefficient; p. 454 Design of Small Dams, w/development >1.25' and less than 2.5'
K <sub>a</sub>	0.1 (-)	Abutment coefficient; p. 373 Design of Small Dams, assumes headwall at 90d to flow



These tables do not include the spillway discharge. Spillway is used only during maintenance or outages.

	Gate Elevation and Opening (ft)										
WS	264.7	265.7	266.7	267.7	268.7	269.7	270.7	271.7	272.2	272.7	273.2
	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	7.5	8.0	8.5
(ft)						Head (ft)					
264.7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
265.2	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
265.7	1.00	0.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
266.2	1.50	1.00	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
266.7	2.00	1.50	1.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
267.2	2.50	2.00	1.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
267.7	3.00	2.50	2.00	1.50	3.00	3.00	3.00	3.00	3.00	3.00	3.00
268.2	3.50	3.00	2.50	2.00	3.50	3.50	3.50	3.50	3.50	3.50	3.50
268.7	4.00	3.50	3.00	2.50	2.00	4.00	4.00	4.00	4.00	4.00	4.00
269.2	4.50	4.00	3.50	3.00	2.50	4.50	4.50	4.50	4.50	4.50	4.50
269.7	5.00	4.50	4.00	3.50	3.00	2.50	5.00	5.00	5.00	5.00	5.00
270.2	5.50	5.00	4.50	4.00	3.50	3.00	5.50	5.50	5.50	5.50	5.50
270.7	6.00	5.50	5.00	4.50	4.00	3.50	3.00	6.00	6.00	6.00	6.00
271.2	6.50	6.00	5.50	5.00	4.50	4.00	3.50	6.50	6.50	6.50	6.50
271.7	7.00	6.50	6.00	5.50	5.00	4.50	4.00	3.50	7.00	7.00	7.00
272.2	7.50	7.00	6.50	6.00	5.50	5.00	4.50	4.00	3.75	7.50	7.50
272.7	8.00	7.50	7.00	6.50	6.00	5.50	5.00	4.50	4.25	4.00	8.00
273.2	8.50	8.00	7.50	7.00	6.50	6.00	5.50	5.00	4.75	4.50	4.25
273.7	9.00	8.50	8.00	7.50	7.00	6.50	6.00	5.50	5.25	5.00	4.75
274.2	9.50	9.00	8.50	8.00	7.50	7.00	6.50	6.00	5.75	5.50	5.25
274.7	10.00	9.50	9.00	8.50	8.00	7.50	7.00	6.50	6.25	6.00	5.75
275.2	10.50	10.00	9.50	9.00	8.50	8.00	7.50	7.00	6.75	6.50	6.25
275.7	11.00	10.50	10.00	9.50	9.00	8.50	8.00	7.50	7.25	7.00	6.75
276.2	11.50	11.00	10.50	10.00	9.50	9.00	8.50	8.00	7.75	7.50	7.25
276.7	12.00	11.50	11.00	10.50	10.00	9.50	9.00	8.50	8.25	8.00	7.75

					Gate Eleva	ation and O	pening (ft)				
WS	264.7	265.7	266.7	267.7	268.7	269.7	270.7	271.7	272.2	272.7	273.2
	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	7.5	8.0	8.5
(ft)				Flov	v Condition	(Weir flow	or Orifice f	low)			
264.7	orifice	weir	weir	weir	weir	weir	weir	weir	weir	weir	weir
265.2	orifice	weir	weir	weir	weir	weir	weir	weir	weir	weir	weir
265.7	orifice	orifice	weir	weir	weir	weir	weir	weir	weir	weir	weir
266.2	orifice	orifice	weir	weir	weir	weir	weir	weir	weir	weir	weir
266.7	orifice	orifice	orifice	weir	weir	weir	weir	weir	weir	weir	weir
267.2	orifice	orifice	orifice	weir	weir	weir	weir	weir	weir	weir	weir
267.7	orifice	orifice	orifice	orifice	weir	weir	weir	weir	weir	weir	weir
268.2	orifice	orifice	orifice	orifice	weir	weir	weir	weir	weir	weir	weir
268.7	orifice	orifice	orifice	orifice	orifice	weir	weir	weir	weir	weir	weir
269.2	orifice	orifice	orifice	orifice	orifice	weir	weir	weir	weir	weir	weir
269.7	orifice	orifice	orifice	orifice	orifice	orifice	weir	weir	weir	weir	weir
270.2	orifice	orifice	orifice	orifice	orifice	orifice	weir	weir	weir	weir	weir
270.7	orifice	orifice	orifice	orifice	orifice	orifice	orifice	weir	weir	weir	weir
271.2	orifice	orifice	orifice	orifice	orifice	orifice	orifice	weir	weir	weir	weir
271.7	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	weir	weir	weir
272.2	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	weir	weir
272.7	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	weir
273.2	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice
273.7	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice
274.2	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice
274.7	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice
275.2	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice
275.7	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice
276.2	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice
276.7	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice	orifice

	Gate Elevation and Opening (ft)											
WS	264.7	265.7	266.7	267.7	268.7	269.7	270.7	271.7	272.2	272.7	273.2	
	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	7.5	8.0	8.5	
(ft)					Weir Flow	Effective Le	ength (ft)					
264.7		7	7	7	7	7	7	7	7	7	7	
265.2		6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	
265.7			6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	
266.2			6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	
266.7				6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	
267.2				6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	
267.7					6.4	6.4	6.4	6.4	6.4	6.4	6.4	
268.2					6.3	6.3	6.3	6.3	6.3	6.3	6.3	
268.7						6.2	6.2	6.2	6.2	6.2	6.2	
269.2						6.1	6.1	6.1	6.1	6.1	6.1	
269.7							6	6	6	6	6	
270.2							5.9	5.9	5.9	5.9	5.9	
270.7								5.8	5.8	5.8	5.8	
271.2								5.7	5.7	5.7	5.7	
271.7									5.6	5.6	5.6	
272.2										5.5	5.5	
272.7											5.4	
273.2												
273.7												
274.2												
274.7												
275.2												
275.7												
276.2												
276.7												

					Gate Eleva	tion and Op	ening (ft)				
WS	264.7	265.7	266.7	267.7	268.7	269.7	270.7	271.7	272.2	272.7	273.2
	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	7.5	8.0	8.5
(ft)				<u>Or</u>	ifice Flow C	ross-Sectio	nal Area (ft <sup>2</sup>	<u>)</u>			
264.7	0										
265.2	0										
265.7	0	7									
266.2	0	7									
266.7	0	7	14								
267.2	0	7	14								
267.7	0	7	14	21							
268.2	0	7	14	21							
268.7	0	7	14	21	28						
269.2	0	7	14	21	28						
269.7	0	7	14	21	28	35					
270.2	0	7	14	21	28	35					
270.7	0	7	14	21	28	35	42				
271.2	0	7	14	21	28	35	42				
271.7	0	7	14	21	28	35	42	49			
272.2	0	7	14	21	28	35	42	49	52.5		
272.7	0	7	14	21	28	35	42	49	52.5	56	
273.2	0	7	14	21	28	35	42	49	52.5	56	59.5
273.7	0	7	14	21	28	35	42	49	52.5	56	59.5
274.2	0	7	14	21	28	35	42	49	52.5	56	59.5
274.7	0	7	14	21	28	35	42	49	52.5	56	59.5
275.2	0	7	14	21	28	35	42	49	52.5	56	59.5
275.7	0	7	14	21	28	35	42	49	52.5	56	59.5
276.2	0	7	14	21	28	35	42	49	52.5	56	59.5
276.7	0	7	14	21	28	35	42	49	52.5	56	59.5

					Gate Eleva	tion and Op	ening (ft)				
WS	264.7	265.7	266.7	267.7	268.7	269.7	270.7	271.7	272.2	272.7	273.2
	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	7.5	8.0	8.5
(ft)				D	vischarge fo	<u>r Min. Flow</u>	Gate (cfs)				
264.7	0	0	0	0	0	0	0	0	0	0	0
265.2	0	8	8	8	8	8	8	8	8	8	8
265.7	0	26	21	21	21	21	21	21	21	21	21
266.2	0	36	38	38	38	38	38	38	38	38	38
266.7	0	45	73	58	58	58	58	58	58	58	58
267.2	0	52	89	79	79	79	79	79	79	79	79
267.7	0	58	103	134	103	103	103	103	103	103	103
268.2	0	63	115	155	127	127	127	127	127	127	127
268.7	0	68	126	173	206	153	153	153	153	153	153
269.2	0	73	137	190	231	180	180	180	180	180	180
269.7	0	77	146	205	253	289	207	207	207	207	207
270.2	0	82	155	219	273	316	235	235	235	235	235
270.7	0	86	163	232	292	341	379	263	263	263	263
271.2	0	89	171	245	310	365	410	292	292	292	292
271.7	0	93	179	257	326	387	438	478	320	320	320
272.2	0	97	186	268	342	408	465	511	530	349	349
272.7	0	100	193	279	358	428	490	542	564	584	377
273.2	0	103	200	290	372	447	514	571	597	619	640
273.7	0	106	206	300	386	465	536	599	627	653	676
274.2	0	109	213	310	400	483	558	626	656	685	711
274.7	0	112	219	319	413	500	579	651	684	715	744
275.2	0	115	225	328	426	516	600	676	711	744	776
275.7	0	118	231	337	438	532	619	700	737	772	806
276.2	0	121	237	346	450	547	638	723	762	800	835
276.7	0	124	242	355	462	562	657	745	786	826	864

236	Flow is below minimum required
237	Flow meets requirement

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KLEINSCHMIDT & DUTTING CONSULTING ENGINEERS

#### UNITED STATES DEPARTMENT OF THE INTERIOR

BUREAU OF RECLAMATION

# DESIGN OF SMALL DAMS

## A Water Resources Technical Publication

Second Edition 1973 Revised Reprint 1977

#### Spillways

196. Discharge Over An Uncontrolled Overflow Ogee Crest.—(a) General.—The discharge over an ogee crest is given by the formula:

 $Q = CLH_{c^{3/2}}$ 

(3)

(4)

Q=discharge,

C = a variable coefficient of discharge,

L = effective length of crest, and

 $H_e$ =total head on the crest, including velocity of approach head,  $h_a$ .

The discharge coefficient, C, is influenced by a number of factors, such as (1) the depth of approach, (2) relation of the actual crest shape to the ideal nappe shape, (3) upstream face slope, (4) downstream apron interference, and (5) downstream submergence. The effect of these various factors is discussed in section 197.

The total head on the crest,  $H_e$ , does not include allowances for approach channel friction losses or other losses due to curvature of the upstream channel, entrance loss into the inlet section, and inlet or transition losses. Where the design of the approach channel results in appreciable losses, they must be added to  $H_e$  to determine reservoir elevations corresponding to the discharges given by the above equation.

(b) Pier and Abutment Effects.—Where crest piers and abutments are shaped to cause side contractions of the overflow, the effective length, L, will be less than the net length of the crest. The effect of the end contractions may be taken into account by reducing the net crest length as follows:

 $L = L' - 2(NK_{o} + K_{a})H_{e}$ 

where:

L = effective length of crest,

L'=net length of crest.

N=number of piers,

 $K_{p}$ =pier contraction coefficient,

 $K_{\epsilon}$ =abutment contraction coefficient, and  $H_{\epsilon}$ =total head on crest.

The pier contraction coefficient,  $K_{p}$ , is affected by the shape and location of the pier nose, the thickness of the pier, the head in relation to the design head, and the approach velocity. For conditions of design head,  $H_{o}$ , average pier contraction coefficients may be assumed as follows:  $K_{a}$ 

For square-nosed piers with corners	
rounded on a radius equal to about	
0.1 of the pier thickness	0.02
For round-nosed piers	0.01
For pointed-nose piers	-0

The abutment contraction coefficient is affected by the shape of the abutment, the angle between the upstream approach wall and the axis of flow, the head in relation to the design head, and the approach velocity. For conditions of design head,  $H_o$ , average coefficients may be assumed as follows:

For square abutments with headwall	
at 90° to direction of flow	0.20
For rounded abutment with headwall	
at 90° to direction of flow, when	
$0.5H_{o} \equiv r \equiv 0.15H_{o}$	0.10
For rounded abutments where	
$r > 0.5 H_o$ and headwall is placed	
not more than 45° to direction of	
flow	0.0

where r=radius of abutment rounding.

197. Coefficient of Discharge for Uncontrolled Ogee Crests.--(a) Effect of Depth of Approach. --For a high sharp-crested weir placed in a channel, the velocity of approach is small and the under side of the nappe flowing over the weir attains maximum vertical contraction. As the approached depth is decreased, the velocity of approach increases and the vertical contraction diminishes. For sharp-crested weirs whose heights are not less than about one-fifth the heads producing flow over them, the coefficient of discharge remains fairly constant with a value of about 3.3 although the contraction diminishes. For weir heights less than about one-fifth the head, the contraction of the flow becomes increasingly suppressed and the crest coefficient decreases. When the weir height becomes zero, the contraction is entirely suppressed and the overflow weir becomes in effect a channel or a broad-crested weir, for which the theoretical coefficient of discharge is 3.087. If the sharp-crested weir coefficients are related to the head measured from the point of maximum contraction instead of to the head above the sharp crest, coefficients applicable

K

#### HYDRAULIC DESIGN CRITERIA

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#### SHEET 320-1

#### CONTROL GATES

#### DISCHARGE COEFFICIENTS

1. General. The accompanying Hydraulic Design Chart 320-1 represents test data on the discharge coefficients applicable to partial openings of both slide and tractor gates. The basic orifice equation is expressed as follows:  $H' = b H' - CG_o$  $G_{o} = CATE OPENING HY. (MER.)$ 

# $Q = C G_0 B \sqrt{2gH^{\dagger}}$

B = GATE NIDTH (FEET)

320-1

3= 32.2 Fr/Sec

The coefficient C is actually a contraction coefficient if the gate is located near the tunnel entrance and the entrance energy loss is neglected. When the gate is located near the conduit entrance the head (H') is measured from the reservoir water surface to the top of the vena contracta. However, when the gate is located a considerable distance downstream of the conduit entrance, H' should be measured from the energy gradient just upstream of the gate to the top of the vena contracta because of appreciable losses upstream of the gate. The evaluation of H' requires successive approximation in the analysis of test data. However, the determination of H' in preparation of a rating curve can be easily accomplished by referring to the chart for C.

2. <u>Discharge Coefficients.</u> Discharge coefficients for tractor . and slide gates are sensitive to the shape of the gate lip. Also, coefficients for small gate openings are materially affected by leakage over and around the gate. Chart 320-1 presents discharge coefficients determined from tests on model and prototype structures having various gate clearances and lip shapes. The points plotted on the 100 per cent opening are not affected by the gate but rather by friction and other loss factors in the conduit. For this reason the curves are shown by dashed lines above 85 per cent gate opening.

3. <u>Suggested Criteria.</u> Model and prototype tests prove that the 45° gate lip is hydraulically superior to other gate lip shapes. Therefore, the 45° gate lip has been recommended for high head structures. In the 1949 model tests leakage over the gate was reduced to a minimum. Correction of the Dorena Dam data for leakage results in a discharge coefficient curve that is in close agreement with the 1949 curve. The average of these two curves shown on Chart 320-1 is the suggested design curve. For small gate openings special allowances should be made by the designer for any expected excessive intake friction losses and gate leakage. 4. Values from the suggested design curve are tabulated below for the convenience of the designer.

Gate Opening, Per Cent	Discharge Coefficient
10	0.73
20	0.73
30	0.74
40	0.74
50	0.75
60 · · · ·	0.77
70	0.78
80	0.80

٤



Orifices 535

t contracta remains at a her decrease of Reynolds u resistance.

au\_ratios, equation 5.23 pressure connection is at all be used only as a first t pressure taps will be ferences at the end of the

si merged orifice of Fig. r into another. Here with ssuming a perfect fluid and  $\nabla$  r and section 2,

 $(-h_2)$ 

h rostatic<sup>30</sup> in the downevent the attainment of this

replaced by  $C_cA$ :

 $f_{...,(h_1 - h_2)}$  (11.18)

the orifice. When the orifice



Fig. 11.28 Orifice discharging freely.

$$Q = C_c C_v A \sqrt{2g_n h} = C A \sqrt{2g_n h}$$

The dependence of the various orifice coefficients on shape of orifice is illustrated by Fig. 11.29. The coefficients given are nominal values for large orifices (d > 1 in.or 25 mm) operating under comparatively large heads of water (h > 4 ft or 1.2 m). Above these limits of head and size, various experiments have shown that the coefficients are practically constant. Coefficients for sharp-edged orifices over a wide range of Reynolds numbers are given in Fig. 11.30, which shows the same trend of values (for the same reasons) as that of Fig. 11.26. The plot of Fig. 11.30, although convenient and applicable to the flow of all fluids, has a certain limitation in orifice size caused by the action of surface tension. Surface-tension effects (although impossible to predict except in idealized situations) will increase with decreasing orifice size; the plotted values are valid only where such effects are negligible and, thus, cannot be applied to very small orifices.





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#### APPENDIX D

#### SATELITE PHOTOS

#### (PHOTOS CURTISEY OF GOOGLE MAPS)





Indian Orchard Dam







Red Bridge



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Document Content(s)	
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# 140 FERC ¶ 62,098 UNITED STATES OF AMERICA FEDERAL ENERGY REGULATORY COMMISSION

EP Energy Massachusetts, LLC

Project Nos. 10675-016, 10676-020, 10677-017, 10678-020

# ORDER APPROVING MINIMUM FLOW AND IMPOUNDMENT FLUCTUATION MONITORING PLAN

(August 3, 2012)

1. On February 28, 2012, and supplemented on July 18, 2012, EP Energy Massachusetts, LLC (exemptee) filed a Minimum Flow and Impoundment Fluctuation Monitoring Plan (Plan) pursuant to the terms and conditions of the U.S. Fish and Wildlife Service (FWS), and the Massachusetts Division of Fisheries and Wildlife (MDFW) for the exemptions of the Dwight Station Project No. 10675, Red Bridge Project No. 10676, Putts Bridge Project No. 10677, and Indian Orchard Project No. 10678, collectively known as the Chicopee River projects.<sup>1</sup> The projects are located on the Chicopee River in Hampden and Hampshire counties, Massachusetts.

## **Background**

2. Article 2 of the exemptions for the Chicopee River projects requires compliance with the terms and conditions prepared by federal and state fish and wildlife agencies. The FWS and MDFW modified the terms and conditions for the projects by letters dated January 27, 2000, and February 15, 2000, respectively as a result of the December 29, 1999 Order Amending Exemptions.<sup>2</sup> Condition 5 of the FWS terms and conditions, and Condition 6 of the MDFW, require the exemptee to submit within six months of the December 29, 1999 Order Amending Exemptions for the Chicopee River projects, a plan for monitoring project impoundment levels and instantaneous bypass flow releases. Following approval of the Plan, the exemptee shall measure and record impoundment

<sup>&</sup>lt;sup>1</sup> Western Massachusetts Electric Company, 60 FERC ¶ 62,199 (1992), 60 FERC ¶ 62,198 (1992), 60 FERC ¶ 62,197 (1992), 60 FERC ¶ 62,196 (1992), respectively. <sup>2</sup> Consolidated Edison Energy Inc., 89 FERC ¶ 61,256 (1999).

3. In addition, the January 27, 2000, and February 15, 2000 letters require the Plan to: 1) detail the flow release structures and locations; 2) describe the mechanisms used to monitor head pond elevation and minimum flows; 3) specify how often maintenance and calibration of the monitoring and recording equipment will take place; 4) state how bypass flows will be maintained during any periodic maintenance activities that require the impoundment to be drawn down below the level of the flow release structures; and 5) state how frequently and in what form the data are recorded. A calculation sheet that verifies the discharge of each release structure (i.e., slide/canal gate, board notches and dam spill) under all operating ranges should be included.

4. On October 5, 2001, Consolidated Edison Energy Massachusetts, Inc., the exemptee of the Chicopee projects at the time, sent the FWS and MDFW a draft Plan for review and comment. By letter dated November 6, 2001, FWS commented on the draft Plan. FWS requested that the exemptee include additional information with respect to the impoundment fluctuations and release mechanisms in the Plan, as well as requested field calibration to occur as soon as possible to verify that the release structures were passing the required minimum flows. By letter dated November 15, 2001, MDFW commented that the Plan should specify the set points programmed into the Programmable Logic Controlling (PLC) device, specify the frequency of monitoring the pond elevation and changes to gate adjustments, based on the response to the data, and how frequently the pond level will be recorded. MDFW also sought clarification as to how long the data for the pond elevation will be kept, and requested calculations to quantify the flow to be released from the alternative flow devices used during periods of maintenance.

5. On April 18, 2001, Consolidated Edison Energy Massachusetts, Inc, in its letter to the FWS, agreed that the agencies had the authority to modify the terms and conditions of the exemptions, and indicated it would file the revised Plan by May 31, 2001. However, the exemptee never responded to FWS and MDFW's comments, nor did it file the Plan with the Commission.

6. By the February 28, 2012 filing, EP Energy Massachusetts, LLC attempts to correct the previous exemptee's noncompliance (EP Energy Massachusetts, LLC purchased the project from Consolidated Edison Energy of Massachusetts, LLC in 2008) with the federal and state terms and conditions of the exemptions for the Chicopee River projects.

# **Exemptee's Plan**

## **Dwight Station Project**

7. The Plan details the flow release structures and locations by describing that the exemptee is required to release a minimum flow of 258 cubic feet per second (cfs) (or inflow, if less) at the Dwight Dam. The flashboards have permanently been removed from the facility, thus the minimum flows will be passed over the dam crest. In addition, Condition 3 of the MDFW, and Condition 4 of the FWS, limit impoundment drawdown to a minimum of five inches above the dam crest, except for system emergencies or annual energy audits. During infrequent impoundment drawdown for major dam repairs, minimum flows will be maintained, and the mechanism for releasing the minimum flow will be outlined in a letter sent to the agencies prior to the impoundment drawdown.

8. The Plan also outlines that the impoundment levels would be continuously monitored through the use of an electronic pressure transducer located on the south shoreline, slightly upstream of the canal gatehouse. An electronic recording of the impoundment level, in addition to instantaneous visual displays in the gate house, will ensure compliance with the required impoundment limits. The canal headgates will be controlled by a PLC device located within the canal gate house that adjust the headgate opening based upon impoundment level, canal level, and unit operational status. The impoundment level control is proportional-integral-derivative based, and will be programmed to maintain an impoundment elevation of 77 feet, five inches above the permanent spillway crest level. The PLC will continually monitor impoundment level, and will record the level using a strip chart as the primary recording mechanism. A data logger will record the impoundment elevations every 15 minutes as a secondary recording mechanism.

9. The exemptee states in the Plan that maintenance to the monitoring systems would be performed on an as-needed basis with calibration of the instruments occurring every two years. At a minimum, operators would visit the project approximately twice per week to confirm proper station operation. The station is also equipped with unit alarms to notify operational personnel of equipment malfunctions.

# Red Bridge Project

10. The Plan states that the required minimum flow of 237 cfs (or inflow, if less) would be released from a 7-foot-wide, 8.5-foot-high bottom discharge gate at the southern end of the spillway. The gate is equipped with an electric screw stem actuator capable of manual operation in the event of a power outage. Absent a power loss, the gate will be electronically controlled by a PLC device, which will continuously monitor impoundment elevations. Therefore, the gate positions will adjust automatically over the range of the impoundment fluctuations to consistently release the minimum flow of 237 cfs.

11. The exemptee is required to limit the impoundment drawdown to one foot below the crest of the dam, or an elevation of 272.24 feet from April 1 to June 30, and 2 feet

below the crest of the dam from July 1 to March 30, except for system emergencies or annual energy audits. The impoundment fluctuations will be measured through the use of an electronic pressure transducer located upstream of the canal headgates. Documentation of compliance with the impoundment limits will be by electronic recording of the level, and instantaneous visual displays in the powerhouse. The impoundment level and minimum flow gate will be continuously recorded using strip chats, and a secondary data logger will record the impoundment level every fifteen minutes as a backup.

12. During periods of gate maintenance or malfunctions, minimum flows will be maintained by spilling flows over the dam spillway and maintaining an impoundment level five inches above the crest level when the units are generating. During times of infrequent drawdown for major repairs, minimum flows will also be maintained, and the mechanism will be outlined in a letter sent to the resource agencies prior to the impoundment drawdown.

13. The Plan states that maintenance to the monitoring system will occur on an asneeded basis, with calibration of the instruments occurring approximately every two years. At a minimum, operators will visit the project twice per week to confirm proper station operation. The station is also equipped with alarms to notify operations personnel of equipment malfunctions.

# Putts Bridge Project

14. The exemptee is required to release a minimum flow of 25 cfs (or inflow, if less) into the Putts Bridge bypassed reach. The Plan states that the minimum flow will be released through a single, six-foot-wide, eight-foot-high top discharge gate located on the dam's north abutment. The gate is electronically operated, and controlled by a PLC, which automatically adjusts the gate opening with fluctuating impoundment elevations to maintain a constant discharge over the top of the gate. The PLC will continuously monitor and record the gate position in addition to the impoundment elevation using strip charts.

15. Additionally, the exemptee is required to limit drawdown to one foot below the top of the flashboards, elevation 205.25 feet, from April to June 30, and 2 feet below the top of the flashboards for the remainder of the year, except for system emergencies or annual energy audits.

16. The Plan states that impoundment fluctuations will be measured through the use of electronic pressure transducers. Documentation of compliance with the impoundment limits will be supplied by hourly strip charts recording impoundment levels, in addition to instantaneous visual displays in the powerhouse.

17. During periodic maintenance activities to the minimum flow gate, flows will be discharged over the dam crest. In addition, during infrequent drawdown for major dam repairs, minimum flows will be maintained, and the mechanism for the flow releases will be outlined in a letter to the agencies prior to the impoundment drawdown. The Plan also states that maintenance to the monitoring and control systems will be performed on an asneeded basis, with calibration occurring approximately every two years. At a minimum, the operators will visit the project approximately twice per week to confirm proper station operation. The station is also equipped with alarms to notify operations personnel of equipment malfunctions.

## Indian Orchard Project

18. The exemptee is required to release a minimum flow of 247 cfs (or inflow, if less) at the Indian Orchard Dam. The Plan indicates that the minimum flows will be released through the use of two canal drainpipes, located immediately downstream of the canal headgates, on the north side of the canal. Each drainpipe is 36-inch in diameter, corrugated metal, and has an invert of elevation 151.7 feet. Each pipe is equipped with a 2.5 foot square entrance control gate that is automatically operated based on impoundment level. The control gates are fully opened for impoundment levels at or above elevation 160.8 feet, while the units are generating. If the impoundment levels begin or continue to drop below an elevation of 160.5 feet, the gate closes in approximately five percent increments to restrict impoundment levels from dropping further. This control feature allows the passage of inflows to the project until inflows exceed the 247 cfs. Documentation of compliance with the minimum flow requirement is supplied by strip charts that continuously monitor the impoundment level in addition to instantaneous visual displays in the powerhouse.

19. The exemptee must also limit drawdown of the impoundment to 0.5 foot below the top of the flashboards, or dam crest if the boards are out, from April 1 to June 30, and 1 foot below the top of the flashboards, or dam crest if boards are out, for the remainder of the year, except for system emergencies or annual energy audits. The impoundment levels are controlled through the use of the project's turbines, which operate in automatic mode using impoundment level controls. The Plan states that the impoundment fluctuations will be measured through the use of electronic pressure transducers located upstream of the gatehouse. The levels will be continuously monitored and recorded on strip charts. As a secondary method, a data logger will also record the impoundment level every fifteen minutes.

20. During any periodic maintenance activities that require the canal to be dewatered, project generation is discontinued, and river flows are passed over the dam spillway. Any periodic maintenance to the flashboards requires the impoundment level to be lowered to approximately one foot below the crest of the dam, during which flows will be released via the canal drain gates. The Plan further states that the flows will be

subsidized with a pump to ensure minimum flows are maintained. During infrequent impoundment drawdown for major dam repairs, the minimum flow will be maintained, and the release mechanism will be outlined in a letter to the agencies prior to the drawdown. Maintenance to the impoundment level and drainpipe control gate systems will be performed on an as-needed basis, with calibration of the instruments being performed approximately every two years. At a minimum, operators will visit the project approximately twice a week to confirm proper station operation. The station is also equipped with alarms to notify operations personnel of equipment malfunctions.

## Agency Consultation

21. On June 8, 2012, the exemptee re-submitted the Plan to the FWS, MDFW, and the Massachusetts Department of Environmental Protection (MDEP), requesting that the agencies confirm that the outstanding comments from 2000 were adequately addressed in the Plan, and requesting concurrence with the Plan. The MDFW and MDEP provided concurrence on the Plan on June 12, 2012 via email. No other comments were received.

### **Discussion and Conclusion**

22. We reviewed the exemptees's Plan filed on February 28, 2012, and supplemented July 18, 2012, and it satisfies the requirements of Condition 5 of the FWS, and Condition 6 of the MDFW of the exemptions for the Chicopee River projects. The Plan adequately provides the details of the flow release structures and locations for the Dwight Station, Red Bridge, Putts Bridge, and Indian Orchard projects. The Plan also describes the mechanisms used to monitor head pond elevations and minimum flows, specifications of how often maintenance and calibration of the monitoring and recording equipment will occur, how bypass flows will be maintained during any periodic maintenance activities that require the impoundment to be drawn down below the level of the release structures, and how frequently and in what form the data will be recorded. The Minimum Flow and Impoundment Fluctuation Monitoring Plan should therefore be approved.

23. However, this Plan was required by the FWS and MDFW, and Article 2 of the exemption order over a decade ago. While the current exemptee is trying to fulfill the outstanding requirement, the fact that the Plan was required so long ago cannot be ignored. Nonetheless, we recognize that the current exemptee only recently realized that the requirement was outstanding. We note that in the future, the exemptee should comply with the requirements and timeframes set forth in the exemptions for the Chicopee River projects.

### The Director orders:

(A) EP Energy Massachusetts, LLC's Minimum Flow and Impoundment Fluctuation Monitoring Plan, filed February 28, 2012, and supplemented July 18, 2012, pursuant to Article 2, and the terms and conditions of the U.S. Fish and Wildlife Service

and the Massachusetts Department of Fisheries and Wildlife for the exemptions for the Dwight Station, Red Bridge, Putts Bridge, and Indian Orchard projects, is approved.

(B) This order constitutes final agency action. Any party may file a request for rehearing of this order within 30 days from the date of its issuance, as provided in section 313(a) of the Federal Power Act, 16 U.S.C. § 8251 (2006), and the Commission's regulations at 18 C.F.R. § 385.713 (2012). The filing of a request for rehearing does not operate as a stay of the effective date of this order, or of any other date specified in this order. The exemptee's failure to file a request for rehearing shall constitute acceptance of this order.

William Guey-Lee Chief, Engineering Resources Branch Division of Hydropower Administration and Compliance

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Date: 12-9-2011 Date: 12-12-2011

Project:	Chicopee River Projects - Minimum Flow	
Subject:	Dwight Minimum Flow	

#### Analysis Description:

Calculating the gate settings required to release the minimum flow.

#### Assumptions:

Minimum flow of 258 cfs required

Flow is released through 2 canal sluice gates

Sluice gates only used when WSEL is below crest

Bottoms of fully opened sluice gates are estimated to be El. 66.5' (approximately 10-ft below crest).

Weir or Orifice flow possible

Orifice flow occurs when depth at crest (critical depth, 2/3 of head on crest) rises above bottom of fully opened sluice gate.

Formula for orifice flow:  $(2/3)^{Cd}((2g)^{0.5})^{L}(((H1)^{1.5})-((H2)^{1.5}))$ : H1=Head over the invert and H2=Head over the top of the gate Formula for weir flow:  $C^{L}H^{3/2}$ 

#### Analysis:

#### Flow over the spillway - using weir flow formula

Overtopping Height (in) =

4.9	Must maintain 5 inches of	overtopping to m	aintain the 258 cfs	s minimum flow requirement
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Weir Coefficient (C) =3.2Minimum Flow (cfs) =258	Spillway Length (ft) =	306
Minimum Flow (cfs) = 258	Weir Coefficient (C) =	3.2
	Minimum Flow (cfs) =	258

Assumed sharp crested going over the edge o	of the granite blocks atop the dam.
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Bare Crest Elevation (ft) =	76.5
Headpond Elevation to Maintain (ft) =	76.9

#### Flow through canal sluice gates at a range of headpond elevations

Bare Crest/Invert Elevation (ft) =		66.5
	Top Elevation (ft) =	71.5
	Height (ft) =	5
	Width (ft) =	5
	Weir Coefficient (C) =	3
	Orifice Coefficient (Cd) =	0.64
	Gravity g $(ft/s^2) =$	32.2

Headpond	Flow	Total Flow
Elev (ft)	Condition	(cfs)
66.5	Weir	0
67	Weir	5
67.5	Weir	14
68	Weir	26
68.5	Weir	39
69	Weir	53
69.5	Weir	69
70	Weir	84
70.5	Weir	101
71	Weir	117
71.5	Weir	134
72	Weir	151
72.5	Weir	168
73	Weir	184
73.5	Weir	200
74	Weir	216
74.5	Weir	231
75	Weir	245
75.5	Weir	259
76	Weir	272
76.5	Weir	285
77	Weir	296
77.5	Weir	306
78	Weir	316
78.5	Weir	324