UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Green Mountain Power Corporation Project No. 2558-029

NOTICE OF AVAILABILITY OF FINAL ENVIRONMENTAL ASSESSMENT

(July 26, 2013)

In accordance with the National Environmental Policy Act of 1969 and the Federal Energy Regulatory Commission (Commission) regulations, 18 CFR Part 380 (Order No. 486, 52 Fed. Reg. 47897), the Office of Energy Projects has reviewed the application for a new license for the 21.814-megawatt (MW) Otter Creek Hydroelectric Project (Commission Project No. 2558-029) and has prepared a final environmental assessment (final EA). The project consists of three developments (Proctor, Beldens, and Huntington Falls) located on Otter Creek in Addison and Rutland counties, Vermont.

In the final EA, Commission staff analyzes the potential environmental effects of relicensing the project and concludes that issuing a new license for the project, with appropriate environmental measures, would not constitute a major federal action significantly affecting the quality of the human environment.

A copy of the final EA is available for review at the Commission in the Public Reference Room or may be viewed on the Commission's website at www.ferc.gov using the "eLibrary" link. Enter the docket number, excluding the last three digits, in the docket number field to access the document. For assistance, contact Commission Online Support at CommissionOnlineSupport@ferc.gov; toll-free at 1-866-208-3676; or for TTY, (202) 502-8659.

You may also register online at www.ferc.gov/docs-filing/esubscription.asp to be notified via email of new filings and issuances related to this or other pending projects. For assistance, contact Commission Online Support.

For further information, contact Aaron Liberty at (202) 502-6862 or by email at aaron.liberty@ferc.gov.

Kimberly D. Bose,
Secretary.

FINAL ENVIRONMENTAL ASSESSMENT

FOR NEW HYDROPOWER LICENSE

Otter Creek Hydroelectric Project
FERC Project No. 2558-029

Vermont

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
888 First Street, NE
Washington, D.C. 20426

July 2013

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ACRONYMS AND ABBREVIATIONS

ACRWC	Addison County River Water Collaborative
APE	area of potential effect
ABF	aquatic base flow
BMI	benthic macroinvertebrates
°C	degrees Celsius
Central Vermont	Central Vermont Public Service Corporation
cfs	cubic feet per second
Commerce	U.S. Department of Commerce
Corps	United States Army Corps of Engineers
Commission	Federal Energy Regulatory Commission
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DO	dissolved oxygen
EA	environmental assessment
EPRI	Electric Power Research Institute
EPT	Ephemeroptera, Plecoptera, and Tricoptera
ESA	Endangered Species Act
°F	degrees Fahrenheit
feet msl	feet above mean sea level
FERC	Federal Energy Regulatory Commission
FPA	Federal Power Act
fps	feet per second
FWS	U.S. Fish and Wildlife Service
Green Mountain	Green Mountain Power Corporation
HPMP	Historic Properties Management Plan
IFIM	Instream Flow Incremental Methodology
Interior	U.S. Department of Interior
ISO-New England	Independent System Operator- New England
kV	kilovolts
kW	kilowatt
kWh	kilowatt-hours
Middlebury Trust	Middlebury Area Land Trust
MGD	million gallons per day
mg/L	milligrams per liter
mm	millimeters
MWh	megawatt-hour
National Register	National Register of Historic Places
NERC	North American Electric Reliability Council
NHPA	National Historic Preservation Act
NWI	National Wetland Inventory

PA	programmatic agreement
PEM	palustrine freshwater emergent
PFO	palustrine forested
PHABSIM	Physical Habitat Simulation Model
PSS	palustrine scrub-shrub
R2UBH	riverine floodplain
ROR	run-of-river
RM	river mile
USGS	United States Geological Survey
Vermont ANR	Vermont Agency of Natural Resources
Vermont SHPO	Vermont State Historic Preservation Officer
Vermont FWD	Vermont Fish and Wildlife Department
Vermont Marble	Vermont Marble Power Division of Omya, Inc.
Vermont WRP	Vermont Water Resources Panel of the Natural Resource Board
VGS	Vermont Geologic Society
WQC	water quality certification
WUW	weighted usable width

EXECUTIVE SUMMARY

Proposed Action

On March 31, 2010, Vermont Marble Power Division of Omya, Inc. (Vermont Marble) filed an application for a new license with the Federal Energy Regulatory Commission (Commission) to continue to operate and maintain the Otter Creek Hydroelectric Project No. 2558 (Otter Creek Project). On November 23, 2010, the Commission issued an order approving the transfer of the license from Vermont Marble to Central Vermont Public Service Corporation (Central Vermont).[1] On August 1, 2011, Central Vermont amended the license application for the project, proposing to increase the project's installed capacity from 18.279 megawatts (MW) to 21.814 MW.[2] On September 13, 2012, the Commission issued an order approving the transfer of the license from Central Vermont to Green Mountain Power Corporation (Green Mountain).[3] As such, the current applicant for the new license for the project is Green Mountain.

The project is located on Otter Creek in Addison and Rutland counties, Vermont and includes three developments. The Proctor, Beldens, and Huntington Falls developments are located in the towns of Proctor, New Haven, and Weybridge, Vermont, respectively. The existing project produces an average annual generation of 67,258 megawatt-hours. The project does not occupy federal lands.

Project Description

The Proctor development is located at river mile (RM) 64.2 and consists of the following existing facilities: (1) a 13-foot-high, 128-foot-long masonry, concrete-capped dam with a 3-foot-high, inflatable flashboard system; (2) a 95-acre reservoir with a usable storage capacity of 275 acre-feet at a maximum water surface elevation of 469.5 feet above mean sea level (msl); (3) a 22-foot-high by 23-foot-wide gated-forebay intake structure; (4) 17-foot-high by 57-foot-wide trashracks with 1-inch clear bar spacing; (5) a 57-foot-wide by 22-foot-high intake; (6) two penstocks: a 9-foot-diameter, 460-foot-long, riveted steel penstock that decreases to 8 feet in diameter beyond a surge tank, and a 7-foot-diameter, 500-foot-long, spiral welded steel penstock; (7) a 100-foot by 33-foot concrete and brick masonry powerhouse containing four vertical shaft turbines, including

[1] 133 FERC ¶ 62,171 (2011).

[2] Central Vermont's amended license application was made effective on September 2, 2011.

[3] 140 FERC ¶ 62,191 (2012).

three 750-kilowatt (kW) units and one 1,680-kW unit with a combined maximum hydraulic capacity of 565 cubic feet per second (cfs), and an attached 28-foot by 48-foot steel structure containing one 3,000-kW vertical shaft unit with a maximum hydraulic capacity of 325 cfs; (8) generator leads; (9) two banks of 0.48/4.16-kilovolt (kV) single-phase transformers; (10) a 0.48/43.8-kV three-winding transformer; (11) a 265-foot long bridge located 760 feet downstream of the Proctor dam that is used to access the Proctor powerhouse; (12) a 1,500-foot-long access road; and (13) appurtenant facilities. The bypassed reach at the Proctor development, which contains an area known as Sutherland Falls, is 680 feet in length and drops approximately 100 feet in elevation from the base of Proctor dam to the tailwater.

The Beldens development is located at RM 23 and consists of the following existing facilities: (1) a concrete dam composed of two sections on either side of a ledge/bedrock island with 2.5-foot-high wooden flashboards: a 15-foot-high, 56-foot-long section (west) and a 24-foot-high, 57-foot-long section (east); (2) a 22-acre reservoir with a usable storage capacity of 253 acre-feet at a maximum water surface elevation of 283 feet msl; (3) two intakes equipped with trashracks: a 20-foot-high by 40-foot-wide intake and a 38-foot-high by 40-foot-wide intake; (4) one 12-foot-diameter steel penstock that bifurcates into two 10-foot-diameter, 30-foot-long sections, each leading to an original 40-foot by 44-foot concrete and masonry powerhouse containing two horizontal turbine units, a 800-kW unit and a 949-kW unit, with a combined maximum hydraulic capacity of 650 cfs; (5) a second, 12-foot-diameter, 45-foot-long concrete penstock that leads to a newer 40-foot by 75-foot concrete powerhouse containing a 4,100-kW horizontal shaft unit with a maximum hydraulic capacity of 1,350 cfs; (6) generator leads; (7) a 2.4/46-kV step-up transformer bank; and (8) appurtenant facilities. Recreation facilities at the Beldens development include a: (1) canoe/kayak put-in and take-out; (2) canoe portage; (3) viewing platform; and (4) picnic area. The Beldens bypassed reach consists of two primary channels, one (approximately 150 feet in length from the base of the dam to the tailwater) below the east dam composed primarily of an area known as Beldens Falls, and one (approximately 450 feet in length from the base of the dam to the tailwater) below the west dam.

The Huntington Falls development is located at RM 21 and consists of the following existing facilities: (1) a 31-foot-high, 187-foot-long concrete dam with a 2.5-foot-high inflatable flashboard system; (2) a 23-acre reservoir with a storage capacity of 234 acre-feet at a maximum water surface elevation of 217.8 feet msl; (3) two intakes equipped with trashracks: a 20-foot-high by 40-foot-wide intake and a 38-foot-high by 40-foot-wide intake; (4) two 10-foot-diameter, 30-foot-long steel penstocks leading to 42-foot by 60-foot an original 42-foot by 60-foot brick masonry powerhouse containing two horizontal shaft turbine-generator units, a 600-kW unit and a 800-kW unit, with a combined maximum hydraulic capacity of 660 cfs; (5) a 12-foot-diameter, 75-foot-long concrete penstock leading to a newer 40-foot by 75-foot powerhouse containing a 4,100-kW horizontal shaft turbine-generator unit with a maximum hydraulic capacity of 1,350

cfs; (6) generator leads; (7) a 2.4/46-kV step-up transformer bank; and (8) appurtenant facilities. Recreation facilities at the Huntington Falls development include a: (1) canoe/kayak put-in and take-out; (2) canoe portage; and (3) picnic/overlook area. The Huntington Falls development contains a 215-foot-long bypassed reach.

The current project license requires Green Mountain to operate the Proctor development in a modified run-of-river (ROR) mode to maintain a stable reservoir elevation so outflows from the development's dam and powerhouse approximate inflows to the development's reservoir; however, Green Mountain may periodically draw down the reservoir up to 4 feet. The draw downs are used to either dewater areas needed to perform maintenance activities or repairs, to create additional reservoir storage in anticipation of high flows, or to supply additional water to the powerhouse to meet Independent System Operator (ISO)-New England or local power demands.

The current project license requires Green Mountain to operate the Beldens and Huntington Falls developments ROR , whereby impoundment fluctuations are minimized and outflow, as measured immediately downstream from the tailrace of each development, approximates the instantaneous sum of inflow into each of the respective project reservoirs. The current project license also requires that Green Mountain provide: (1) a continuous bypassed reach minimum flow of 5 cfs, or inflow to the reservoir, whichever is less, at the Beldens development; (2) a continuous bypassed reach minimum flow of 15 cfs, or inflow to the reservoir, whichever is less, at the Huntington Falls development; and (3) 50 percent of project inflow downstream of the Proctor powerhouse during the months of April and May, and the first two weeks of June, and 100 cfs, or inflow, whichever is less, at all other times.

Proposed Facilities

At the Proctor development, Green Mountain received authorization on June 20, 2013, under the current license to remove the existing powerhouse unit 1 runner and the existing turbine-generator units 2 through 4, realign the development's intake and replace and reorient the intake trashracks, and cut back the bedrock face near the intake to create a more hydraulically efficient flow path to the Proctor powerhouse.[4] The new trashracks will have 1-inch clear bar spacing, maximum approach velocities of 1.9 feet-per-second (fps), and be oriented parallel to river flow to minimize fish entrainment and impingement. Upon receiving a new license for the project, Green Mountain proposes to: (1) install a new runner at unit 1 and three new turbine-generator units 2 through 4 that together would increase the development's combined installed capacity from 6,930 to

[4] Green Mountain requested the amendment to expedite the replacement of the Proctor development's generating equipment. *See* 143 FERC ¶ 62,207 (2013).

9,240 kW and increase the hydraulic capacity from 890 to 1,150 cfs; and (2) install new electrical switchgear, breakers, controls, and relays.[5]

Green Mountain also proposes physical improvements at the Huntington Falls development, some of which would result in an increased generating capacity. At Huntington Falls, Green Mountain proposes to: (1) upgrade turbine-generator units 1 and 2, resulting in an increase in nameplate capacity from 5,500 to 6,725 kW, and an increase in the existing hydraulic capacity from 2,010 to 2,250 cfs; (2) install new switchgear, breakers, control, and relays; and (3) construct a new minimum flow gate at the southern end of the Huntington Falls dam (near the power canal).

Green Mountain is not proposing any changes to existing project facilities at the Beldens development other than making improvements to the existing canoe/kayak take-out area and portage around Beldens dam as noted below.

Proposed Operation

Green Mountain proposes to change operation of the Proctor development to eliminate the existing 4-foot drawdown (except during infrequent emergency operations and maintenance activities) and operate the development in an instantaneous ROR mode (i.e., maintain a stable reservoir elevation) from July 1 through April 30, when inflow is less than 200 cfs, and from May 1 through June 30, when inflow is less than 400 cfs. At all other times, Green Mountain proposes to operate the Proctor development with up to a daily 1.5-foot drawdown/refill cycle (i.e., peaking mode). During peaking operations at the Proctor development, Green Mountain proposes the following maximum ratios over a 24-hour period between the maximum and minimum daily powerhouse flow releases:

- from May 1 to June 30, 1.5:1 when inflow is equal to or greater than 400 cfs;[6]

[5] In the draft EA, Commission staff described and analyzed Green Mountain's proposal to realign the Proctor intake, reorient the trashrack, and cut back the bedrock face to create a more hydraulically efficient flow path to the Proctor powerhouse. However, on March 29, 2013, Green Mountain filed an application to amend its license for the Otter Creek Project, proposing to realign the intake at the Proctor development and begin removal of inoperable generating equipment from the Proctor powerhouse. Because redevelopment of the Proctor intake was authorized in an order issued June 20, 2013, Green Mountain's proposals to realign the Proctor intake, reorient the trashrack, and cut back the bedrock face have been removed from the description of Green Mountain's proposed project facilities in this final EA. Those facilities which are authorized by the amendment order are described as authorized project facilities in this final EA.

- from July 1 to July 15, 1.5:1 when inflow is between 200 and 400 cfs, and 2:1 when inflow is equal to or greater than 400 cfs;
- from July 16 to December 15, 2.5:1 when inflow is between 200 and 400 cfs, and 3:1 when inflow is equal to or greater than 400 cfs;
- from December 16 to March 15, 3:1 when inflow is equal to or greater than 200 cfs; and
- from March 16 to April 30, 2.5:1 when inflow is between 200 and 400 cfs, and 3:1 when inflow is greater than or equal to 400 cfs.

No changes to existing ROR operation are proposed for the Beldens or Huntington Falls developments.

Proposed Environmental Measures

Green Mountain proposes the following measures to protect or enhance environmental resources at the project:

- implement erosion and sediment control measures during construction of the recreational enhancements at the Proctor and Beldens developments;

- provide a continuous minimum flow of 60 cfs to the Proctor bypassed reach to improve aesthetics and habitat conditions for resident aquatic species;

- provide a continuous minimum flow of 25 cfs over the Beldens west dam to improve aesthetics and habitat conditions for resident aquatic species in the Beldens western bypassed reach;

- provide a continuous minimum flow of 10 cfs over the Beldens east dam to improve aesthetics and habitat conditions for resident aquatic species in the Beldens eastern bypassed reach and crossover channel;[7]

[6] To illustrate, if the minimum powerhouse flow during a 24-hour peaking cycle is 500 cfs, the maximum (i.e., "peak") powerhouse flow released at any time during the same 24-hour peaking cycle will be no greater than 750 cfs (i.e., 1.5 times 500 cfs).

[7] Given the existing stream morphology downstream of the Beldens east dam, as further discussed in section 3.3.2.1, *Aquatic Resources*, Green Mountain's proposal to spill 10 cfs over the Beldens east dam would result in 5 cfs being provided to both the eastern bypassed reach itself, which primarily consists of Beldens Falls, and a crossover channel that flows from the eastern to the western bypassed channel.

- provide a continuous minimum flow of 66 cfs to the Huntington Falls bypassed reach to improve habitat conditions for resident aquatic species;

- replace the existing turbine-generator unit 3 trashracks at the Huntington Falls development with trashracks that have 2-inch clear bar spacing with maximum approach velocities of less than 2 fps, and are oriented parallel to river flow to minimize fish entrainment and impingement;

- consult with the resource agencies to determine appropriate modifications to the project's trashracks if the Vermont Fish and Wildlife Department (Vermont FWD) provides notification that its fisheries management program will resume Atlantic salmon restoration or stocking efforts in Otter Creek;[8]

- review and update, as necessary, the existing Spill Prevention Control and Countermeasures Plan and file it for Commission approval;

- in consultation with the Vermont Agency of Natural Resources (Vermont ANR) and the Middlebury Area Land Trust (Middlebury Trust), add signage and conduct brush clearing to clearly define the location of the existing canoe/kayak take-out and portage around the Beldens dam;

- continue to operate and maintain the existing recreation facilities at Beldens and Huntington Falls developments;

- modify the location of the boat barrier at the Huntington Falls development to enable the use of the existing canoe/kayak take-out;

- enhance the tailwater access site at the Proctor development by: (1) constructing a gravel parking area for two to three vehicles; and (2) installing directional signage; and

- implement the *Otter Creek Hydroelectric Project FERC No. 2558 Historic Properties Management Plan* (HPMP), filed on March 8, 2013.

Alternatives Considered

This final environmental assessment considers the following alternatives: (1) Green Mountain's proposal, as outlined above; (2) Green Mountain's proposal with staff

[8] Anadromous fish stocking efforts have currently been discontinued in Otter Creek and management for anadromous fish is not expected to continue in the immediate future (FERC, 2000).

modifications (staff alternative); and (3) no action, meaning that Green Mountain would continue to operate the project with no changes.

Staff Alternative

Under the staff alternative, the Huntington Falls development would be redeveloped as proposed and the new runner and three additional turbine-generator units would be installed at the Proctor development, thereby increasing the project's generating and hydraulic capacities.

Under the staff alternative, the project would include the following measures proposed by Green Mountain: (1) operate the Beldens and Huntington Falls developments in an instantaneous ROR mode, whereby outflow from each project reservoir approximates inflow; (2) operate the Proctor development: (a) in an instantaneous ROR mode from July 1 through April 30 and May 1 through June 30 when inflows into the impoundment are less than 200 and 400 cfs, respectively; and (b) in a 1.5-foot peaking mode at all other times; (3) when operating the Proctor development in a peaking mode, implement the proposed 24-hour maximum ratios between maximum and minimum daily powerhouse flow releases as previously described in the *Proposed Operation* section; (4) provide a continuous minimum flow of 60 cfs to the Proctor bypassed reach; (5) provide continuous minimum flows of 10 and 25 cfs over the Beldens east and west dams, respectively; (6) provide a continuous minimum flow of 66 cfs to the Huntington Falls bypassed reach; (7) replace the existing turbine-generator unit 3 trashracks at the Huntington Falls development with trashracks that have 2-inch clear bar spacing and maximum approach velocities of less than 2 fps, and are oriented parallel to river flow; and (8) review and update, as necessary, the existing Spill Prevention Control and Countermeasures Plan and file it for Commission approval.

Under the staff alternative, the project would include the following measures proposed by Green Mountain, as modified by staff: (1) develop and implement a soil erosion and sediment control plan that contains specific measures to minimize erosion and sediment mobilization during proposed ground-disturbing activities; (2) develop and implement a recreation management plan that includes measures to: (a) improve the existing canoe/kayak take-out and portage trail around the Beldens dam; (b) modify the location of the boat barrier at the Huntington Falls development to enable the use of the existing canoe/kayak take-out; (c) operate and maintain all project recreation facilities; (d) enhance the existing tailwater access site at the Proctor development; (e) ensure recreationists' safety during construction; and (f) develop interpretive signage at the Proctor development; and (3) revise the proposed HPMP to include procedures to implement if an emergency occurs (i.e., an immediate threat to life or property) that may affect properties eligible for or listed on the National Register of Historic Places.

Under the staff alternative, the project would include the following additional measures: (1) an operation compliance monitoring plan to document compliance with the operational requirements of any license issued for the project; (2) after a drawdown of the Proctor, Beldens, and Huntington Falls reservoirs for maintenance or emergency purposes, release 90 percent of the inflow to the developments while refilling the reservoirs using the remaining 10 percent of inflow; and (3) a terrestrial monitoring and management plan with provisions to: (a) survey construction areas for any new evidence of bald eagle and Indiana bat use and potential habitat prior to the commencement of ground-disturbing or future tree removal activities and file a report with the Commission documenting the results with any proposed protection/avoidance measures developed in consultation with FWS and Vermont ANR;[9] (b) prevent the spread of invasive plants during construction of proposed project facilities; and (c) restore disturbed areas once construction of proposed project facilities is completed; and (4) revise the project's exhibit G drawings to include the existing portage trail from the take-out to the Morgan Horse Farm Road at the Huntington Falls development.

Public Involvement and Areas of Concern

Before filing its license application for the Otter Creek Project, the previous licensee and applicant, Vermont Marble Power, conducted pre-filing consultation under the integrated licensing process. The intent of the Commission's pre-filing process is to initiate public involvement early in the project planning process and to encourage citizens, governmental entities, Indian tribes, and other interested parties to identify and resolve issues prior to a license application being formally filed with the Commission. During pre-filing, we conducted scoping to determine what issues and alternatives should be addressed. A scoping document was distributed to interested parties on May 21, 2007, which solicited comments, recommendations, and information on the project. We conducted a site visit on June 5, 2007, and held two scoping meetings on June 6, 2007, in Middlebury and Pittsford, Vermont.

On May 14, 2012, staff requested comments, recommendations, and terms and conditions, in response to a notice that the amended license application for the Otter Creek Project was ready for environmental analysis.

The primary issues associated with relicensing the Otter Creek Project are minimum flows in the bypassed reaches, recreation access, and the effects of the proposed project operation on historic properties.

[9] Surveys for Indiana bats would be conducted only during the roosting season, or from April 1 through October 31.

Environmental Effects of the Staff Alternative

Geologic and Soil Resources

A soil erosion and sediment control plan would be implemented during all proposed ground-disturbing activities at the project, including enhancement of the recreation facilities at the Proctor and Beldens developments. Although construction of these proposed project facilities would likely result in minimal, short-term increases in erosion and sedimentation to Otter Creek, implementing a soil erosion and sediment control plan that specifies measures to be used during construction activities to control erosion and sedimentation would ensure that terrestrial and aquatic habitats are protected.

Aquatic Resources

The Beldens and Huntington Falls developments, as well as the Proctor development, under certain inflow conditions,[10] would be operated in instantaneous ROR modes with minimal reservoir fluctuations. Operating in an instantaneous ROR mode would help to maintain stable conditions for aquatic resources in each of the three project reservoirs and in the respective reaches of Otter Creek downstream of these developments. Specifically, operating the Proctor development in a ROR mode from May 1 through June 30 when inflows are less than 400 cfs would coincide with the critical spawning months of many warmwater fish species present within Otter Creek, thereby ensuring stable reservoir levels and downstream flows would be provided during spawning activities.

Green Mountain would eliminate the existing 4-foot drawdowns of the Proctor reservoir, except during emergency operations and maintenance activities, and implement a 1.5-foot peaking mode from July 1 through April 30 and May 1 through June 30, if inflows to the development exceed 200 or 400 cfs, respectively. Green Mountain would also implement its proposed 24-hour maximum ratios between maximum and minimum daily powerhouse flow releases during peaking operations, as previously described in the *Proposed Operation* section. Overall, operating the Proctor development in a 1.5-foot peaking mode under the inflow conditions described and implementing Green Mountain's proposed ratios between maximum and minimum daily powerhouse flow releases would ensure any potential negative effects associated with peaking operations are minimized. Also, because the 1.5-foot drawdown of the Proctor reservoir is within the range of existing drawdowns and the majority of the Proctor shoreline is forested and well-armored, no shoreline erosion is expected as a result of Green Mountain's proposed peaking operations.

[10] The conditions are inflow less than 200 cfs from July 1 through April 30 and less than 400 cfs from May 1 through June 30.

Minimum instream flows to each of the project bypassed reaches would be increased as compared to current conditions, thereby improving the quantity and quality of existing aquatic habitat within these reaches. Existing habitat conditions would also be improved downstream of the Proctor tailrace during low-flow conditions, as run-of-river operations would be implemented once inflows to the Proctor impoundment are less than 200 or 400 cfs, depending upon the time of year. Also, Green Mountain would release 90 percent of the inflow to the Proctor, Beldens, and Huntington Falls developments while refilling the reservoirs with the remaining 10 percent of inflow after a drawdown of the reservoirs for maintenance or emergency purposes. This would ensure adequate flows for aquatic resources would be maintained in the reaches of Otter Creek downstream of these developments during reservoir refill.

The number of fish entrained at the project would likely increase as the hydraulic capacities of the Proctor and Huntington Falls developments would be increased. However, the numbers of fish entrained and killed at the Otter Creek Project would likely be small relative to the high fecundities (i.e., high reproductive rates) of the fish species present at the project, and thus the effects of the individual losses on the health of the fish population as a whole would be minimal.

The staff-recommended operation compliance monitoring plan would specify how compliance with the operational requirements of any license issued would be measured, and would avoid disagreements about whether the project was operating within these requirements.

Terrestrial Resources

Construction of the proposed project improvements may cause the temporary disturbance or displacement of wildlife species due to construction-related noise. Species of particular concern include the bald eagle and Indiana bat, both of which have potential nesting/roosting habitat available at the Otter Creek Project. The movement of heavy equipment and personnel during construction has the potential to create ground-disturbance and soil compaction, increasing the potential to contribute toward the spread of invasive plant species. Under the staff alternative, a terrestrial monitoring and management plan would ensure disturbances to federally-protected species are minimized, the spread of invasive species are minimized, and disturbed areas are properly revegetated post-construction.

Recreation, Land Use, and Aesthetics

Recreational use of the tailwater access area at the Proctor development would be temporarily restricted during the installation of new turbines/generators at the powerhouse. Implementing a recreation management would help ensure public safety during installation of the turbines would help minimize user conflicts in the popular tailrace area. Parking at the Proctor development and enhance recreationist' experience by providing interpretive signage about the project and its influence on the marble industry. Finally, the recreation management plan would include provisions to enhance the existing canoe/kayak portage and take-out area at the Beldens development, and modify the location of the boat barrier at the Huntington Falls development, which would improve boater safety.

At Sutherland Falls, which is located within the Proctor development's bypassed reach and visible from the tailrace access area, the minimum flow that would be released at the Proctor development would result in a year-round audible waterfall where currently none exists during non-spill conditions. Also, the minimum flows released at the Beldens development would result in a veil of water flowing over the east and west dams. Both of these measures would enhance aesthetics.

Cultural Resources

The Otter Creek Project is eligible for listing on the National Register of Historic Places (National Register). In addition, 14 archaeological and historical sites within the project's area of potential effect are eligible for the National Register. Of these 14 sites, four are actively being eroded, and the ground disturbance associated with the proposed project facility upgrades and the 1.5-foot peaking mode operation of the Proctor development could contribute to this erosion. The effects on the National Register-eligible properties could be taken into account through the implementation of an executed Programmatic Agreement that requires the implementation of the proposed HPMP. The proposed HPMP contains provisions to conduct data recovery at two of the sites and to monitor and develop mitigation plans at the other two sites to mitigate for project-related erosion. The proposed HPMP also contains measures to monitor the remaining 10 sites for 3 years to mitigate for any project-related erosion. Finally, the proposed HPMP contains measures to implement if the proposed operation and maintenance of the Proctor, Beldens, and Huntington Falls developments results in an adverse effect (e.g., rehabilitation of a powerhouse). The measures within the proposed HPMP would lessen, avoid, or mitigate for the adverse effects that could occur during project operation and maintenance.

No-Action Alternative

Under the no-action alternative, the Otter Creek Project would continue to be operated by Green Mountain under the terms and conditions of the existing license, and no additional generation capacity or new environmental protection, mitigation, or enhancement measures would be implemented.

Conclusions

Based on our analysis, we recommend licensing the project as proposed by Green Mountain, with some staff modifications and additional measures.

In section 4.2, *Comparison of Alternatives*, we estimate the likely cost of alternative power under the no-action alternative, Green Mountain's proposal, and the staff alternative. Our analysis shows that during the first year of operation under the no-action alternative, project power would cost $1,382,824 or $20.56 per megawatt-hour (MWh) more than the likely alternative cost of power. Under Green Mountain's proposal, project power would cost $3,211,260 or $46.54/MWh more than the likely alternative cost of power. Under the staff alternative, project power would cost $3,214,710 or $46.59/MWh more than the likely alternative cost of power.

We chose the staff alternative as the preferred alternative because: (1) the project would provide a dependable source of electrical energy for the region (69,000 MWh annually); (2) the 21.814-MW of electric capacity would come from a renewable resource that does not contribute to atmospheric pollution, including greenhouse gases; and (3) the recommended environmental measures proposed by Green Mountain, as modified by staff, would adequately protect and enhance environmental resources affected by the project. The overall benefits of the staff alternative would be worth the cost of the proposed and recommended environmental measures.

We conclude that issuing a new license for the project, with the environmental measures we recommend, would not be a major federal action significantly affecting the quality of the human environment.

FINAL ENVIRONMENTAL ASSESSMENT

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
Washington, D.C.

Otter Creek Hydroelectric Project
FERC Project No. 2558-029-VT

1.0 INTRODUCTION

1.1 APPLICATION

On March 31, 2010, Vermont Marble Power Division of Omya Inc. (Vermont Marble) filed a license application with the Federal Energy Regulatory Commission (Commission) for a new license to continue to operate and maintain the existing Otter Creek Hydroelectric Project No. 2558 (Otter Creek Project).

On August 31, 2010, Vermont Marble and Central Vermont Public Service Corporation (Central Vermont) filed an application for the transfer of the existing license for the Otter Creek Project. On October 8, 2010, Vermont Marble and Central Vermont also filed a request for the substitution of Central Vermont for Vermont Marble as the applicant in the pending application for new license. On November 23, 2010, the Commission issued an order approving the transfer of the license and substitution of applicant from Vermont Marble to Central Vermont.[11]

On August 1, 2011, Central Vermont filed with the Commission an amendment to the new license application for the Otter Creek Project, proposing to increase the installed capacity of the project from 18.279 megawatts (MW) to 21.814 MW, and the average annual generation from 67,258 megawatt-hours (MWh) to 69,000 MWh.[12]

On June 28, 2012, Central Vermont and Green Mountain Power Corporation (Green Mountain) filed an application to transfer the license and substitute the applicant for the Otter Creek Project. On September 13, 2012, the Commission issued an order approving the transfer of the license and substitution of applicant from Central Vermont

[11] 133 FERC ¶ 62,171 (2010).

[12] Central Vermont's amended license application was made effective on September 2, 2011.

to Green Mountain.[13] As such, the current applicant for a new license for the project is Green Mountain.

The project is located on Otter Creek in Addison and Rutland counties, Vermont and includes three developments (figure 1). The Proctor development (figure 2) is located at river mile (RM) 64.2 in the community of Proctor, the Beldens development (figure 3) is located at RM 23.0 in the town of New Haven, and the Huntington Falls development (figure 4) is located at RM 21.0 in the community of Weybridge. The project does not occupy any federal lands.

At the Proctor development, Green Mountain proposes to: (1) install a new runner at unit 1, and three additional turbine-generator units (units 2 through 4), resulting in an increase in the development's combined installed capacity from 6,930 to 9,240 kilowatts (kW) and an increase in the existing hydraulic capacity from 890 to 1,150 cubic feet per second (cfs); and (2) install new electrical switchgear, breakers, controls, and relays.

At the Huntington Falls development, Green Mountain proposes to: (1) upgrade turbine-generator units 1 and 2, resulting in an increase in nameplate capacity from 5,500 to 6,725 kW and an increase in the existing hydraulic capacity from 2,010 cfs to 2,250 cfs; (2) install new switchgear, breakers, control, and relays; and (3) construct a new minimum flow gate at the southern end of the Huntington Falls dam (near the power canal).

No changes to existing project facilities are proposed for the Beldens development, other than improvements to the existing canoe/kayak take-out and portage around the Beldens dam as noted below.

[13] 140 FERC ¶ 62,191 (2012).

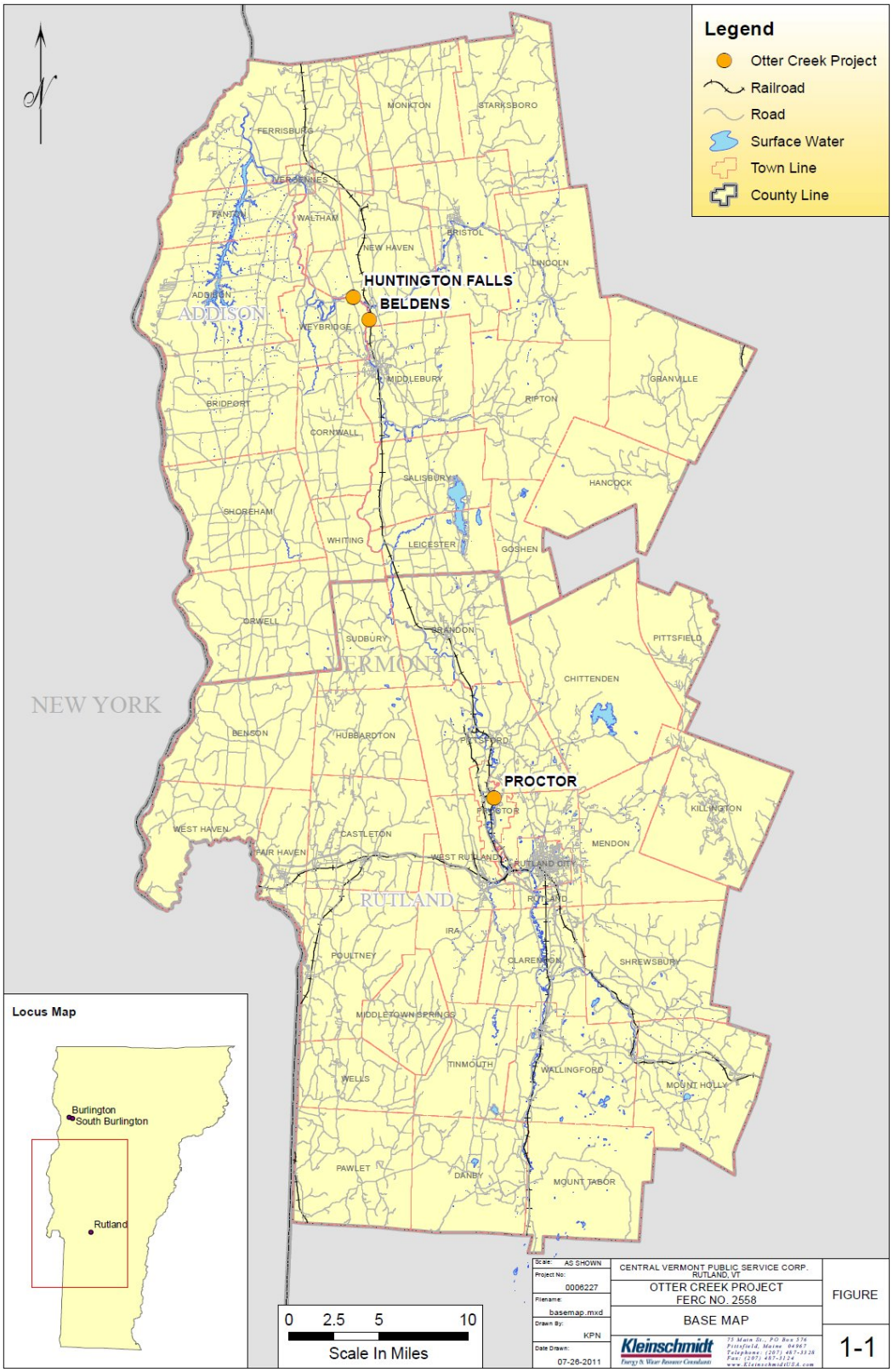

Figure 1. General location of the three developments (Proctor, Beldens, and Huntington Falls) for the Otter Creek Project. (Source: Green Mountain, 2011)

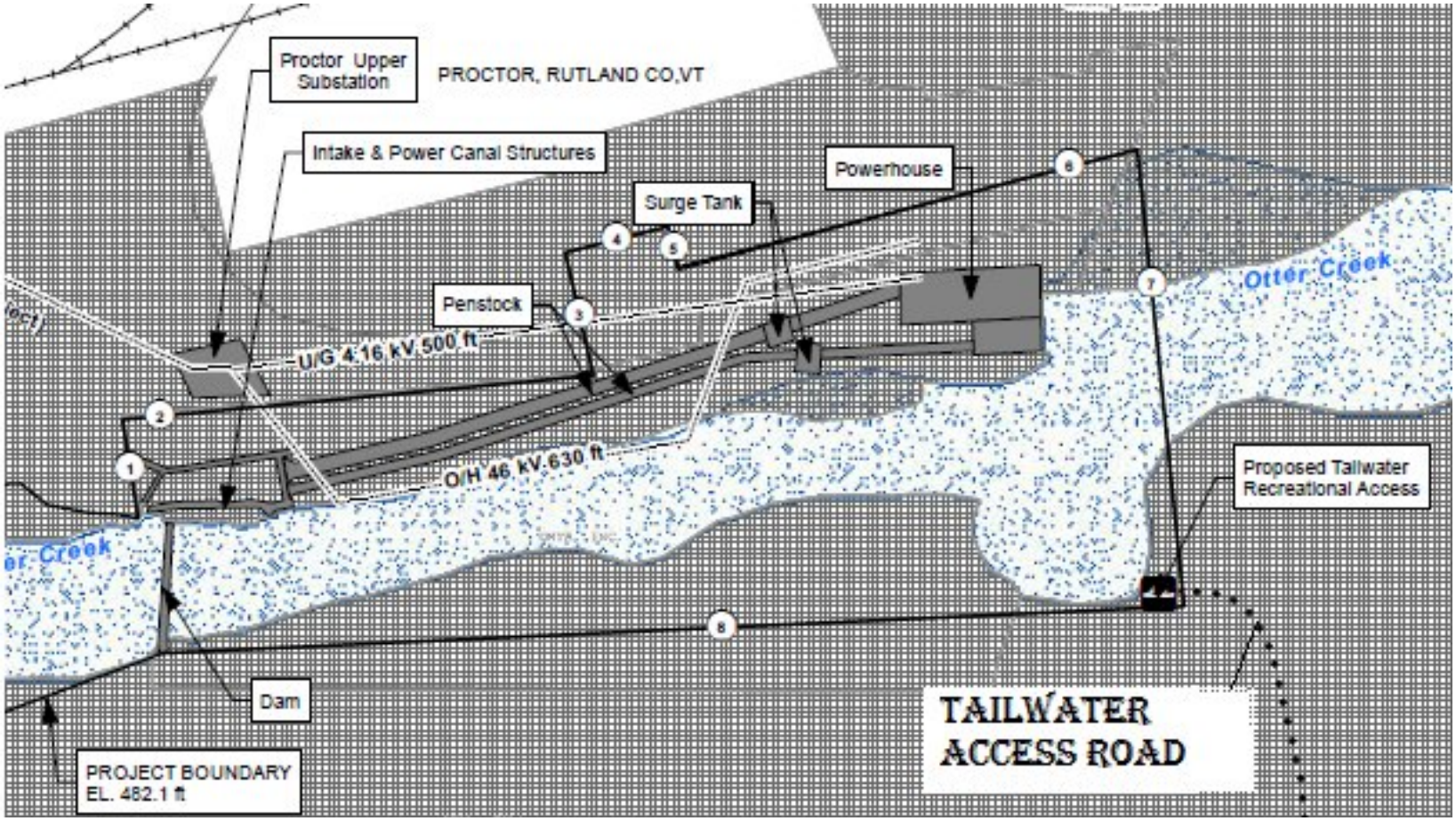

Figure 2. Proctor development site plan. (Source: Central Vermont, 2011, as modified by Staff)

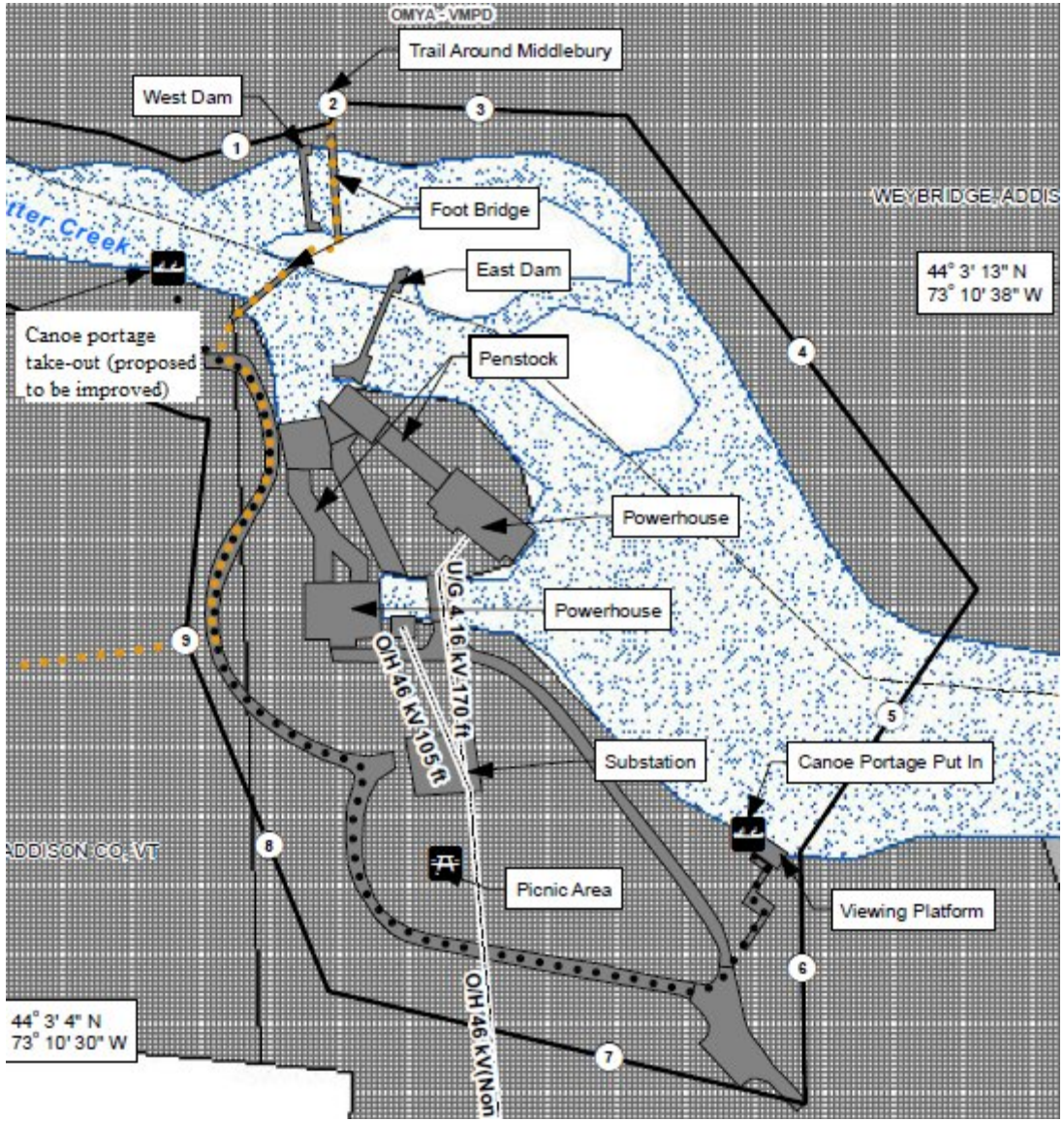

Figure 3. Beldens development site plan. (Source: Central Vermont, 2011, as modified by Staff)

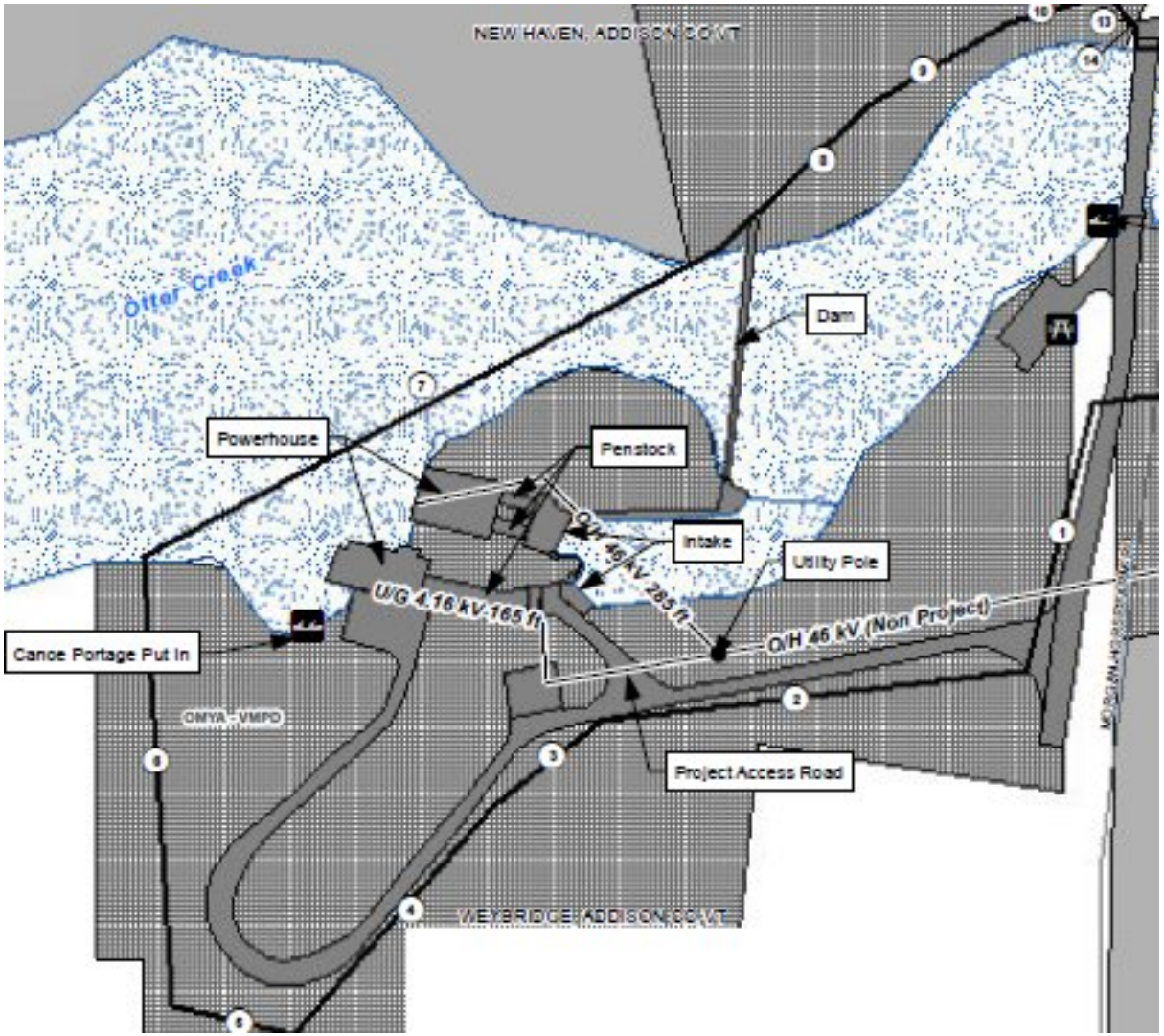

Figure 4. Huntington Falls development site plan. (Source: Central Vermont, 2011, as modified by Staff)

1.2 PURPOSE OF ACTION AND NEED FOR POWER

1.2.1 Purpose of Action

The purpose of the Otter Creek Project is to continue to provide a source of hydroelectric power. Therefore, under the provisions of the Federal Power Act (FPA), the Commission must decide whether to issue a license to Green Mountain for the Otter Creek Project and what conditions should be placed on any license issued. In deciding whether to issue a license for a hydroelectric project, the Commission must determine that the project will be best adapted to a comprehensive plan for improving or developing a waterway. In addition to the power and developmental purposes for which licenses are issued (such as flood control, irrigation, or water supply), the Commission must give equal consideration to the purposes of: (1) energy conservation; (2) the protection of, mitigation of damage to, and enhancement of fish and wildlife resources; (3) the protection of recreational opportunities; and (4) the preservation of other aspects of environmental quality.

Issuing a new license for the Otter Creek Project would allow Green Mountain to generate electricity at the project for the term of a new license, making electric power from a renewable resource available to its customers.

This final environmental assessment (final EA) assesses the effects associated with operation of the project, alternatives to the proposed project, and makes recommendations to the Commission on whether to issue a new license, and if so, recommends terms and conditions to become part of any license issued.

In this final EA, we assess the environmental and economic effects of continuing to operate the project: (1) as proposed by Green Mountain; and (2) with our recommended measures. We also consider the effects of the no-action alternative, meaning that Green Mountain would continue to operate the project with no changes. Important issues that are addressed include minimum flows in the bypassed reaches, recreation access, and the effects of the proposed project operation on historic properties.

1.2.2 Need for Power

The Otter Creek Project would continue to provide hydroelectric generation to meet part of Vermont's power requirements, resource diversity, and capacity needs. The project currently produces about 67,258,000 (kilowatt hours) kWh per year. Green Mountain is proposing to increase the generating capacity of the existing project by 3.535 MW and generate about 69,000,000 kWh per year.

The North American Electric Reliability Council (NERC) annually forecasts electricity supply and demand nationally and regionally for a 10-year period. The Otter Creek Project is located within the jurisdiction of the New England Independent System Operator (ISO-New England), which is a subregion of the Northeast Power Coordinating Council Inc., a region of the NERC. The ISO-New England is responsible for the reliable operation of the bulk power system, wholesale electricity markets, and planning processes for the six-state New England region. The ISO-New England is a summer-peaking region, and the winter peaks are normally less than those experienced in the summer. According to NERC's 2011 forecast, summer peak demand requirements for the ISO-New England region are projected to grow at a compound annual growth rate of 1.4 percent from 2011 through 2020. The capacity margins are forecasted to decrease from about 18.9 percent in 2011 to about 14.2 percent in 2020 (NERC, 2011).

We conclude that power from the Otter Creek Project would help meet a need for power in the ISO-New England region in both the short and long-term. The project provides low-cost power that displaces generation from non-renewable sources. Displacing the operation of non-renewable facilities may avoid some power plant emissions, thus creating an environmental benefit.

1.3 STATUTORY AND REGULATORY REQUIREMENTS

A license for the Otter Creek Project is subject to numerous requirements under the FPA and other applicable statutes. The major regulatory and statutory requirements are summarized in table 1 and described below.

Table 1. Major statutory and regulatory requirements for the Otter Creek Project. (Source: Staff)

Requirement	Agency	Status
Section 18 of the FPA - fishway prescriptions	U.S. Department of the Interior (Interior)	No fishway prescriptions or reservation of authority to prescribe fishways were filed.
Section 10(j) of the FPA	Vermont Agency of Natural Resources (Vermont ANR) U.S. Fish and Wildlife Service (FWS)	No 10(j) recommendations were filed.
Clean Water Act (CWA) – section	Vermont Agency of Natural	Vermont Marble applied to Vermont ANR for WQC on August 26, 2011. Central Vermont

401 water quality certification (WQC)	Resources (Vermont ANR)	submitted an amended WQC application to Vermont ANR on September 7, 2011. Central Vermont withdrew and resubmitted its request for WQC on June 6, 2012, which was received by Vermont ANR on June 7, 2012. Similarly, Green Mountain withdrew and resubmitted its request for WQC on March 22, 2013, which was received by Vermont ANR on March 26, 2013. Vermont ANR's decision on the application is due by March 26, 2014.
Endangered Species Act (ESA) Consultation	U.S. Fish and Wildlife Service (FWS)	FWS, by letter filed February 14, 2013, concurred that relicensing the project is not likely to adversely affect the federally endangered Indiana bat.
Section 106 of the National Historic Preservation Act (NHPA)	Vermont State Historic Preservation Officer (Vermont SHPO)	We intend to execute a Programmatic Agreement (PA) with the Vermont SHPO.

1.3.1 Federal Power Act

1.3.1.1 Section 18 Fishway Prescriptions

Section 18 of the FPA states that the Commission is to require construction, operation, and maintenance by a licensee of such fishways as may be prescribed by the Secretaries of Commerce or the Interior. The FWS, through Interior, did not file a fishway prescription, or a reservation of authority to prescribe fishways, pursuant to section 18 of the FPA.

1.3.1.2 Section 10(j) Recommendations

Under the provisions of section 10(j) of the FPA, each hydroelectric license issued by the Commission shall include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, and enhancement of fish and wildlife resources affected by the project. The Commission is required to include these conditions unless it determines that they are inconsistent with the purposes and requirements of the FPA or other applicable law. Before rejecting or modifying an agency recommendation, the Commission is required to attempt to resolve any such inconsistency with the agency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency. No section 10(j)

recommendations were filed in response to the ready for environmental analysis notice issued on May 14, 2012.

1.3.2 Clean Water Act

Under section 401 of the CWA, a license applicant must obtain certification from the appropriate state pollution control agency verifying compliance with the CWA. On August 26, 2011, Vermont Marble applied to Vermont ANR for 401 WQC for the Otter Creek Project. Upon filing an amended license application for the project on August 1, 2011, Central Vermont filed an amended WQC application with Vermont ANR on September 7, 2011, which was subsequently withdrawn and refilled by Central Vermont on June 6, 2012. Vermont ANR received this request on June 7, 2012. Similarly, Green Mountain withdrew and resubmitted its request for WQC on March 22, 2013, which was received by Vermont ANR on March 26, 2013. Vermont ANR's decision is due by March 26, 2014.

1.3.3 Endangered Species Act

Section 7 of the ESA requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of the critical habitat of such species. Review of the FWS' website in August 2012 indicated that only one federally listed species, the endangered Indiana bat (*Myotis sodalis*), is known to occur in the vicinity of the Otter Creek Project. Although Indiana bat habitat (e.g., roosting trees) is not likely to be removed or disturbed, the noise associated with the proposed construction-related activities could temporarily displace roosting individuals, as could the future removal of trees within the project area for safety or project access reasons. Under the staff alternative, the applicant would develop and implement a terrestrial monitoring and management plan, which would contain provisions for surveying proposed construction areas (or trees slated for future removal) for bat use prior to the construction and installation of new project facilities (or tree removal activities), if such activities were to occur during the Indiana bat roosting season (i.e., April through October). The plan would also contain provisions for implementing any necessary Indiana bat protection or avoidance measures (e.g., measures stipulated in FWS' Indiana Bat Draft Recovery Plan) in consultation with FWS and Vermont ANR.

We conclude that relicensing the Otter Creek Project, as proposed with staff-recommended measures, is not likely to adversely affect the federally endangered Indiana bat. We requested FWS concurrence with our conclusion by letter dated January 8, 2013. FWS concurred with our determination on February 14, 2013 (letter from Thomas R. Chapman, New England Field Office Supervisor, FWS, Concord, NH, to K.D. Bose, Secretary, FERC, Washington, D.C.).

In its February 14, 2013 letter, FWS states adverse effects to Indiana bats may be avoided if time-of-year restrictions (from October 30 through April 1) for construction in Indiana bat habitat within the project area is applied. FWS further states that implementing these time-of-year restrictions would eliminate the need for pre-construction surveys and a monitoring plan for Indiana bats because potential roosting habitat would not be eliminated. As part staff alternative in the final EA, staff has adopted FWS' suggestions for when Indiana bat surveys need to be conducted.

By letters dated August 29, 2011, May 1, 2012, and July 11, 2012, Interior stated it had no comments on the Otter Creek Project.

1.3.4 Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) of 1972, as amended, requires review of the project's consistency with a state's Coastal Management Program for projects within or that would affect the coastal zone. Under section 307(c)(3)(A) of the CZMA, 16 U.S.C. §1456(3)(A), the Commission cannot issue a license for a project within or affecting a state's coastal zone unless the state's coastal zone management agency concurs with the license applicant's certification of consistency with the state's Coastal Management Program, or the agency's concurrence is conclusively presumed by its failure to act within 180 days of its receipt of the applicant's certification.

The state of Vermont does not have a coastal zone program. The Otter Creek Project, therefore, does not require a coastal zone consistency determination.

1.3.5 National Historic Preservation Act

Section 106 of the NHPA requires that every federal agency "take into account" how each of its undertakings could affect historic properties. Historic properties are districts, sites, buildings, structures, traditional cultural properties, and objects significant in American history, architecture, engineering, and culture that are eligible for inclusion in the National Register of Historic Places (National Register).

Vermont Marble, Central Vermont, and Green Mountain consulted with the Vermont SHPO to identify historic properties, determine the National Register-eligibility of the Proctor development,[14] and assess potential adverse effects on historic properties within the project's area of potential effects (APE). These consultations and surveys conducted in 2008, 2010, 2011, and 2012 concluded that the project, including the Proctor, Beldens, and Huntington Falls developments, and 14 archaeological and

[14] The Huntington Falls and Beldens developments were previously determined to be eligible for the National Register.

historical sites within the APE, are eligible for listing on the National Register and may be adversely affected by the project.

To meet the requirements of section 106 of the NHPA, Commission staff intends to execute a Programmatic Agreement (PA) with the Vermont SHPO for the protection of historic properties from the effects of the continued operation and maintenance of the Otter Creek Project. The terms of a PA would ensure that Green Mountain addresses and treats all historic properties identified within the project's APE through the finalization and implementation of the proposed Historic Properties Management Plan (HPMP).[15] The Vermont SHPO concurred with the proposed HPMP on March 15, 2013.

1.4 PUBLIC REVIEW AND COMMENT

The Commission's regulations (18 CFR, section 5.1-5.16) require that applicants consult with appropriate resource agencies, tribes, and other entities before filing an application for a license. This consultation is the first step in complying with the Fish and Wildlife Coordination Act, ESA, NHPA, and other federal statutes. Pre-filing consultation must be completed and documented according to the Commission's regulations.

1.4.1 Scoping

Before preparing this EA, we conducted scoping to determine what issues and alternatives should be addressed. A scoping document was distributed to interested agencies and others on May 21, 2007. It was noticed in the Federal Register on May 29, 2007. Two scoping meetings, both advertised in the Rutland Herald, were held on June 6, 2007, in Middlebury and Pittsford, Vermont, to request oral comments on the project. A court reporter recorded all comments and statements made at the scoping meetings, and these are part of the Commission's public record for the project. In addition to comments provided at the scoping meetings, Vermont ANR filed comments on July 27, 2007.

1.4.2 Interventions

On May 2, 2011, the Commission issued a notice accepting Vermont Marble's application for a new license for the Otter Creek Project. This notice set August 30, 2011, as the deadline for filing protests and motions to intervene. On August 30, 2011, Vermont ANR filed a timely motion to intervene. On May 14, 2012, the Commission issued a notice accepting Central Vermont's amended application for a new license for the Otter Creek Project filed on August 1, 2011. This notice set July 13, 2012, as the

[15] The draft HPMP was filed on February 2, 2011, and revised on June 19, 2012, and March 18, 2013.

deadline for filing protests and motions to intervene. No additional protests or motions to intervene were filed.

1.4.3 Comments on the Application

A notice requesting conditions and recommendations was issued on May 2, 2011 for the Otter Creek Project. A second notice requesting conditions and recommendations was issued on May 14, 2012 for the amended license application filed by Central Vermont on August 1, 2011. In letters filed on August 29, 2011 and July 11, 2012, Interior stated it had no comments on the project.

1.4.4 Comments on the Draft Environmental Assessment

The draft EA for the Otter Creek Project was issued on December 21, 2012. Comments on the draft EA were due by January 20, 2013. Written comments on the draft EA were filed by the following entities:

Commenting Entities	Date Filed
Vermont State Historic Preservation Officer	January 18, 2013
Vermont Agency of Natural Resources	January 22, 2013
Green Mountain Power Corporation	January 22, 2013

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 NO-ACTION ALTERNATIVE

The no-action alternative is the baseline from which to compare the proposed action and all action alternatives that are assessed in the environmental document. Under the no-action alternative, the project would continue to be operated by Green Mountain under the terms and conditions of the current license.

2.1.1 Existing Project Facilities

The Otter Creek Project consists of the Proctor development, located at RM 64.2; the Beldens development, located at RM 23; and the Huntington Falls development, located at RM 21. Below are descriptions of the facilities at the three developments, as currently licensed.

The Proctor development consists of the following existing facilities: (1) a 13-foot-high, 128-foot-long masonry, concrete-capped dam with a 3-foot-high, inflatable flashboard system; (2) a 95-acre reservoir with a usable storage capacity of 275 acre-feet at a normal maximum water surface elevation of 469.5 feet above mean sea level (msl);

(3) a 22-foot-high by 23-foot-wide gated-forebay intake structure; (4) 17-foot-high by 57-foot-wide trashracks with 1-inch clear bar spacing; (5) a 57-foot-wide by 22-foot-high intake; (6) two penstocks: a 9-foot-diameter, 460-foot-long, riveted steel penstock that decreases to 8 feet in diameter beyond a surge tank, and a 7-foot-diameter, 500-foot-long, spiral welded steel penstock; (7) a 100-foot by 33-foot concrete and brick masonry powerhouse containing four vertical shaft turbines, including three 750-kw units and one 1,680-kW unit with a combined maximum hydraulic capacity of 565 cfs, and an attached 28-foot by 48-foot steel structure containing one 3,000-kW vertical shaft unit with a maximum hydraulic capacity of 325 cfs; (8) generator leads; (9) two banks of 0.48/4.16-kilovolt (kV) single-phase transformers; (10) a 0.48/43.8-kV three-winding transformer; (11) a 265-foot long bridge located 760 feet downstream of the Proctor dam that is used to access the Proctor powerhouse; (12) a 1,500-foot-long access road; and (13) appurtenant facilities. The bypassed reach at the Proctor development, which contains an area known as Sutherland Falls, is 680 feet in length and drops approximately 100 feet in elevation from the base of Proctor dam to the tailwater.

The Beldens development consists of the following existing facilities: (1) a concrete dam composed of two sections on either side of a ledge/bedrock island with 2.5-foot-high wooden flashboards: a 15-foot-high, 56-foot-long dam section (west) and a 24-foot-high, 57-foot-long dam section (east); (2) a 22-acre reservoir with a usable storage capacity of 253 acre-feet at a normal maximum water surface elevation of 283 feet msl; (3) two intakes equipped with trashracks: a 20-foot-high by 35-foot-wide intake, and a 34.5-foot-high by 40-foot-wide intake; (4) one 12-foot-diameter steel penstock that bifurcates into two 10-foot-diameter, 30-foot-long sections, each leading to an original 40-foot by 44-foot concrete and masonry powerhouse containing two horizontal turbine units, a 800-kW unit and a 949-kW unit, with a combined maximum hydraulic capacity of 650 cfs; (5) a second, 12-foot-diameter, 45-foot-long concrete penstock that leads to a newer 40-foot by 75-foot concrete powerhouse containing a 4,100-kW horizontal shaft unit with a maximum hydraulic capacity of 1,350 cfs; (6) generator leads; (7) a 2.4/46-kV step-up transformer bank; and (8) appurtenant facilities. Recreation facilities at the Beldens development include a: (1) canoe/kayak put-in and take-out; (2) canoe portage; (3) a viewing platform; and (4) a picnic area.

The Huntington Falls development consists of the following existing facilities: (1) a 31-foot-high, 187-foot-long concrete dam with a 2.5-foot-high inflatable flashboard system; (2) a 23-acre reservoir with a storage capacity of 234 acre-feet at a maximum water surface elevation of 217.8 feet msl; (3) two intakes equipped with trashracks: a 20-foot-high by 40-foot-wide intake and a 38-foot-high by 40-foot-wide intake; (4) two 10-foot-diameter, 30-foot-long steel penstocks leading to 42-foot by 60-foot an original 42-foot by 60-foot brick masonry powerhouse containing two horizontal shaft turbine-generator units, a 600-kW unit and a 800-kW unit, with a combined maximum hydraulic capacity of 660 cfs; (5) a 12-foot-diameter, 75-foot-long concrete penstock leading to a newer 40-foot by 75-foot powerhouse containing a 4,100-kW horizontal shaft turbine-

generator unit with a maximum hydraulic capacity of 1,350 cfs; (6) generator leads; (7) a 2.4/46-kV step-up transformer bank; and (8) appurtenant facilities. Recreation facilities at the Huntington Falls development include a: (1) canoe/kayak put-in and take-out; (2) canoe portage; and (3) picnic/overlook area.

2.1.2 Existing Project Boundary

The existing project boundary generally follows the shoreline of the impoundments and the tailwaters for each development, and includes lands sufficient to include all project works and structures, except for the Huntington Falls development's portage trail from the canoe/kayak take-out to the Morgan Horse Farm Road.

The Proctor development's existing project boundary encompasses the Proctor impoundment, following a contour elevation of 482.1 feet msl, extending approximately 6 miles upstream of the dam. The project boundary also extends downstream from the Proctor dam to include the bypassed reach (i.e., Sutherland Falls), the outlet of the powerhouse, approximately 150 feet of Otter Creek downstream of the powerhouse, a 265-foot-long bridge located 760 feet downstream of the Proctor dam that is used to access the Proctor powerhouse, and a 1,500-foot-long access road. A total of approximately 605 acres of lands and waters, including those lands surrounding project structures and the impoundment shoreline, are currently included within the project boundary.

The Beldens development's existing project boundary encompasses the Beldens impoundment, following a contour elevation of 286.5 feet msl, extending approximately 1.77 miles upstream of the dam. The project boundary also extends approximately 550 feet downstream of the dam, surrounding project structures and recreation facilities, and encompassing a total of approximately 82 acres: 48 acres of land and 34 acres of water.

The Huntington Falls development's existing project boundary encompasses the Huntington Falls impoundment, following a contour elevation of 230 feet msl, extending approximately 1.32 miles upstream of the dam. The project boundary also continues for approximately 500 feet downstream of the powerhouse. The project boundary, containing project facilities and recreation sites, encompasses a total of approximately 74 acres: 34 acres of land and 40 acres of water.

2.1.3 Project Safety

The project has been operating for over 35 years under the existing license, and during this time, Commission staff has conducted operational inspections focusing on the continued safety of the structures, identification of unauthorized modifications, efficiency and safety of operations, compliance with the terms of the license, and proper maintenance. In addition, the project has been inspected and evaluated every 5 years by

an independent consultant, and a consultant's safety report has been submitted for Commission review. As part of the relicensing process, Commission staff will evaluate the continued adequacy of the proposed project facilities under a new license. Special articles would be included in any license issued, as appropriate. Commission staff will continue to inspect the project during the new license term to assure continued adherence to Commission-approved plans and specifications, special license articles relating to construction (if any), operation and maintenance, and accepted engineering practices and procedures.

2.1.4 Existing Project Operation

Green Mountain currently operates the Proctor development in a modified run-of-river (ROR) mode to maintain a stable reservoir elevation so that outflows from the development's dam and powerhouse approximate inflows to the development's reservoir; however, Green Mountain may draw down the reservoir up to 4 feet. The draw downs are used to either dewater areas needed to perform maintenance activities or repairs, to create additional reservoir storage in anticipation of high flows, or to supply additional water to the powerhouse to meet Independent System Operator (ISO)-New England or local power demands. The Beldens and Huntington Falls developments, however, are operated in instantaneous ROR modes, whereby impoundment fluctuations are minimized and outflow, as measured immediately downstream from the tailrace of each development, approximates the instantaneous sum of inflow into each of the respective project reservoirs. The existing project license also requires that Green Mountain provide: (1) a continuous bypassed reach minimum flow of 5 cfs, or inflow to the reservoir, whichever is less, at the Beldens development; (2) a continuous bypassed reach minimum flow of 15 cfs, or inflow to the reservoir, whichever is less, at the Huntington Falls development; and (3) 50 percent of project inflow downstream of the Proctor powerhouse during the months of April and May, and the first two weeks of June, and 100 cfs, or inflow, whichever is less, at all other times.

Green Mountain maintains headpond transducers at each of the three developments to monitor the elevation of the reservoirs. Pond levels at the Proctor development are manually controlled by operations staff. Units 1 and 2 at the Beldens and Huntington Falls developments have pond control functionality installed, but are not currently utilized. Unit 3 at the Beldens and Huntington Falls developments can be operated in pond level control, but due to limited control once in that mode of operation, pond levels are more typically operated manually by operations staff. Under most conditions, the headpond levels are maintained to plus or minus 1 to 1.5 inches when operated automatically. Under certain conditions, such as high flow periods, Green Mountain operates the facilities manually, during which time the reservoir elevations are maintained within plus or minus 3 inches. With the exception of the infrequent generation drawdowns that may be utilized at the Proctor development, or periodic

inspection and maintenance drawdowns at all three developments, the impoundments are maintained at or near the top of flashboards.

2.2 APPLICANT'S PROPOSAL

2.2.1 Proposed Project Facilities

At the Proctor development, Green Mountain received authorization on June 20, 2013, under the current license to remove the existing powerhouse unit 1 runner and the existing turbine-generator units 2 through 4, realign the development's intake and replace and reorient the intake trashracks, and cut back the bedrock face near the intake to create a more hydraulically efficient flow path to the Proctor powerhouse.[16] The new trashracks will have 1-inch clear bar spacing, maximum approach velocities of 1.9 feet-per-second (fps), and be oriented parallel to river flow to minimize fish entrainment and impingement. Upon receiving a new license for the project, Green Mountain proposes to: (1) install a new runner at unit 1and three new turbine-generator units 2 through 4 that together would increase the development's combined installed capacity from 6,930 to 9,240 kW and increase the hydraulic capacity from 890 to 1,150 cfs; and (2) install new electrical switchgear, breakers, controls, and relays. [17]

At the Huntington Falls development, Green Mountain proposes to: (1) upgrade turbine-generator units 1 and 2, resulting in an increase in nameplate capacity from 5,500 to 6,725 kW and an increase in the existing hydraulic capacity from 2,010 to 2,250 cfs; (2) install new switchgear, breakers, control, and relays; and (3) construct a new minimum flow gate at the southern end of the Huntington Falls dam (near the power canal).

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[16] Green Mountain requested the amendment to expedite the replacement of the Proctor development's generating equipment. *See* 143 FERC ¶ 62,207 (2013).

[17] In the draft EA, Commission staff described and analyzed Green Mountain's proposal to realign the Proctor intake, reorient the trashrack, and cut back the bedrock face to create a more hydraulically efficient flow path to the Proctor powerhouse. However, on March 29, 2013, Green Mountain filed an application to amend its license for the Otter Creek Project, proposing to realign the intake at the Proctor development and begin removal of inoperable generating equipment from the Proctor powerhouse. Because redevelopment of the Proctor intake was authorized in an order issued June 20, 2013, Green Mountain's proposals to realign the Proctor intake, reorient the trashrack, and cut back the bedrock face have been removed from the description of Green Mountain's proposed project facilities in this final EA. Those facilities which are authorized by the amendment order are described as authorized project facilities in this final EA.

No changes to existing project facilities are proposed for the Beldens development, other than making improvements to the existing canoe/kayak take-out area and portage around Beldens dam.

In the draft EA, Commission staff analyzed the effects of Green Mountain's proposal to modify the existing intake headworks at the Proctor development, which would include widening and deepening the entrance of the Proctor intake to better align components such as the sluice gate, trashracks, and/or headgates, thereby improving the hydraulic efficiency through the structure. Because Commission staff's June 20, 2013, order amending license authorizes the redevelopment of the Proctor development's intake under the existing license, and the removal of the existing trashracks and installation of new trashracks with 1-inch clear spacing, as further discussed in section 2.2.3, *Proposed Environmental Measures*, Green Mountain's proposals for intake realignment and installing new trashracks have been removed from the description of Green Mountain's proposed project facilities in the final EA.[18] Additionally, staff-recommended measures pertaining to mitigating negative effects associated with fish entrainment and realignment of the Proctor intake have been removed from section 5.2, *Comprehensive Development and Staff Recommended Alternativ*e, in the final EA.[19] However, because the June 20, 2013, order amending license references the analyses contained in the draft EA, the final EA continues to contain our analysis of the environmental effects associated with proposed project operation on fish entrainment and realigning the Proctor intake.

2.2.2 Proposed Project Operation

Green Mountain proposes to change operation of the Proctor development to eliminate the existing 4-foot drawdown of the Proctor reservoir (except during infrequent emergency operations and maintenance activities) and operate the development in an instantaneous ROR mode (i.e., maintain a stable reservoir elevation) from July 1 through April 30, when inflow is less than 200 cfs, and from May 1 through June 30, when inflow is less than 400 cfs. At all other times, Green Mountain proposes to operate the Proctor development in a 1.5-foot drawdown/refill cycle (i.e., peaking mode). During peaking operations, Green Mountain proposes to implement the following maximum ratios over a 24-hour period between the maximum and minimum daily powerhouse flow:

[18] Those facilities which are authorized by the amendment order are described as authorized project facilities in this final EA.

[19] 143 FERC ¶ 62,207 (2013).

- from May 1 to June 30, 1.5:1 when inflow is equal to or greater than 400 cfs;[20]
- from July 1 to July 15, 1.5:1 when inflow is between 200 and 400 cfs, and 2:1 when inflow is equal to or greater than 400 cfs;
- from July 16 to December 15, 2.5:1 when inflow is between 200 and 400 cfs, and 3:1 when inflow is equal to or greater than 400 cfs;
- from December 16 to March 15, 3:1 when inflow is equal to or greater than 200 cfs; and
- from March 16 to April 30, 2.5:1 when inflow is between 200 and 400 cfs, and 3:1 when inflow is greater than or equal to 400 cfs.

No changes to existing ROR operation are proposed for the Beldens or Huntington Falls developments.

2.2.3 Proposed Environmental Measures

Green Mountain proposes the following measures to protect or enhance environmental resources at the project:

- implement erosion and sediment control measures during construction of the recreational enhancements at the Proctor and Beldens developments;

- provide a continuous minimum flow of 60 cfs to the Proctor bypassed reach to improve aesthetics and habitat conditions for resident aquatic species;

- provide a continuous minimum flow of 10 and 25 cfs over the east and west Beldens dams, respectively, to improve aesthetics and downstream habitat conditions for resident aquatic species;[21]

- provide a continuous minimum flow of 66 cfs to the Huntington Falls bypassed reach to improve habitat conditions for resident aquatic species;

[20] To illustrate, if the minimum powerhouse flow during a 24-hour peaking cycle is 500 cfs, the maximum (i.e., "peak") powerhouse flow released at any time during the same 24-hour peaking cycle will be no greater than 750 cfs (i.e., 1.5 times 500 cfs).

[21] Given the existing stream morphology downstream of the Beldens east dam, as further discussed in section 3.3.2.1, *Aquatic Resources*, Green Mountain's proposal to spill 10 cfs over the Beldens east dam would result in 5 cfs being provided to both the eastern bypassed reach itself, which primarily consists of Beldens Falls, and a crossover channel that flows from the eastern to the western bypassed channel.

- replace the existing turbine-generator unit 3 trashracks at the Huntington Falls development with trashracks that have 2-inch clear bar spacing and maximum approach velocities of less than 2 fps, and are oriented parallel to river flow to minimize fish entrainment and impingement;

- consult with the resource agencies to determine appropriate modifications to the project's trashracks if the Vermont Fish and Wildlife Department (Vermont FWD) provides notification that its fisheries management program will resume Atlantic salmon restoration or stocking efforts in Otter Creek;[22]

- review and update, as necessary, the existing Spill Prevention Control and Countermeasures Plan and file it for Commission approval;

- in consultation with the Vermont ANR and the Middlebury Area Land Trust (Middlebury Trust), add signage and conduct brush clearing to clearly define the location of the existing canoe/kayak take-out and portage around the Beldens dam;

- continue to operate and maintain the existing recreation facilities at the Beldens and Huntington Falls developments;

- modify the location of the boat barrier at the Huntington Falls development to enable the use of the existing canoe/kayak take-out;

- enhance the tailwater access site at the Proctor development by: (1) constructing a gravel parking area for two to three vehicles; and (2) installing directional signage; and

- implement the HPMP filed on March 18, 2013.

2.3 STAFF ALTERNATIVE

Under the staff alternative, the Proctor and Huntington Falls developments would be redeveloped as proposed, thereby increasing the project's generating and hydraulic capacities.

[22] Anadromous fish stocking efforts have currently been discontinued in Otter Creek, and management for anadromous fish is not expected to continue in the immediate future (FERC, 2000).

Under the staff alternative, the project would include the following measures proposed by Green Mountain: (1) operate the Beldens and Huntington Falls developments in an instantaneous ROR mode, whereby outflow from each project reservoir approximates inflow; (2) operate the Proctor development: (a) in an instantaneous ROR mode from July 1 through April 30 and May 1 through June 30 when inflows into the impoundment are less than 200 and 400 cfs, respectively; and (b) in a 1.5-foot peaking mode at all other times; (3) when operating the Proctor development in a peaking mode, implement the proposed 24-hour maximum ratios between maximum and minimum daily powerhouse flow releases as previously described in the *Proposed Operation* section; (4) provide a continuous minimum flow of 60 cfs to the Proctor bypassed reach; (5) provide a continuous minimum flow of 10 and 25 cfs over the east and west Beldens dams, respectively; (6) provide a continuous minimum flow of 66 cfs to the Huntington Falls bypassed reach; (7) replace the existing turbine-generator unit 3 trashracks at the Huntington Falls development with trashracks that have 2-inch clear bar spacing and maximum approach velocities of less than 2 fps, and are oriented parallel to river flow; and (8) review and update, as necessary, the existing Spill Prevention Control and Countermeasures Plan and file it for Commission approval.

Under the staff alternative, the project would include the following measures proposed by Green Mountain, as modified by staff: (1) develop and implement a soil erosion and sediment control plan that contains specific measures to minimize erosion and sediment mobilization during proposed ground-disturbing activities; (2) develop and implement a recreation management plan that includes measures to: (a) improve the canoe/kayak take-out and portage trail around the Beldens dam; (b) modify the location of the boat barrier at the Huntington Falls development to enable the use of the existing canoe/kayak take-out; (c) operate and maintain all project recreation facilities; (d) enhance the tailwater access site at the Proctor development; (e) ensure recreationists' safety during construction; and (f) develop interpretive signage at the Proctor development; and (3) revise the proposed HPMP to include procedures to implement if an emergency occurs (i.e., an immediate threat to life or property) that may affect properties eligible for or listed on the National Register.

Under the staff alternative, the project would include the following additional measures: (1) an operation compliance monitoring plan to document compliance with the operational requirements of any license issued for the project; (2) after a drawdown of the Proctor, Beldens, and Huntington Falls reservoirs for maintenance or emergency purposes, release 90 percent of the inflow to the developments while refilling the reservoirs with the remaining 10 percent of inflow; (3) a terrestrial monitoring and management plan with provisions to: (a) survey construction areas for any new evidence of bald eagle and Indiana bat use and potential habitat prior to the commencement of ground-disturbing or future tree removal activities and file a report with the Commission documenting the results with any proposed protection/avoidance measures developed in

consultation with FWS and Vermont ANR;[23] (b) prevent the spread of invasive plants during construction of proposed project facilities; and (c) restore disturbed areas once construction of proposed project facilities is completed; and (4) revise the project's exhibit G drawings to include the existing portage trail from the take-out to the Morgan Horse Farm Road at the Huntington Falls development.

2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

We considered several alternatives to Green Mountain's proposals, but eliminated them from further analysis because they are not reasonable in the circumstances of this case. They are: (1) issuing a non-power license; (2) Federal Government takeover of the Otter Creek Project; and (3) retiring the Otter Creek Project.

2.4.1 Issuing a Non-power License

A non-power license is a temporary license that the Commission will terminate when it determines that another governmental agency will assume regulatory authority and supervision over the lands and facilities covered by the non-power license. At this point, no agency has suggested a willingness or ability to do so. No party has sought a non-power license, and we have no basis for concluding that the project should no longer be used to produce power. Thus, we do not consider issuing a non-power license a realistic alternative to relicensing in this circumstance.

2.4.2 Federal Government Takeover of the Project

We don't consider federal takeover to be a reasonable alternative. Federal takeover and operation of the Otter Creek Project would require Congressional approval. While that fact alone wouldn't preclude further consideration of this alternative, there is no evidence to indicate that federal takeover should be recommended to Congress. No party has suggested federal takeover would be appropriate, and no federal agency has expressed an interest in operating the project.

2.4.3 Retiring the Project

Project retirement could be accomplished with or without dam removal. Either alterative would involve denial of the license applications and surrender or termination of the existing license with appropriate conditions. No participant has suggested that dam removal would be appropriate in this case, and we have no basis for recommending it.

[23] Surveys for Indiana bats would be conducted only during the roosting season, or from April 1 through October 31.

Therefore, dam removal is not a reasonable alternative to relicensing the project with appropriate protection, mitigation, and enhancement measures.

The second project retirement alternative would involve retaining the dam and disabling or removing equipment used to generate power. Project works would remain in place and could be used for historic or other purposes. This alternative would require us to identify another government agency with authority to assume regulatory control and supervision of the remaining facilities. No agency has stepped forward, and no participant has advocated this alternative. Nor have we any basis for recommending it. Because the power supplied by the project is needed, a source of replacement power would have to be identified. In these circumstances, we don't consider removal of the electric generating equipment to be a reasonable alternative.

3.0 ENVIRONMENTAL ANALYSIS

In this section, we present: (1) a general description of the project vicinity; (2) an explanation of the scope of our cumulative effects analysis; and (3) our analysis of the proposed action and other recommended environmental measures. Sections are organized by resource area (aquatic, recreation, etc.). Under each resource area, historic and current conditions are first described. The existing condition is the baseline against which the environmental effects of the proposed action and alternatives are compared, including an assessment of the effects of proposed protection, mitigation, and enhancement measures, and any potential cumulative effects of the proposed action and alternatives. Staff conclusions and recommended measures are discussed in section 5.2, *Comprehensive Development and Recommended Alternative*.[24]

3.1 GENERAL DESCRIPTION OF THE RIVER BASIN

The Otter Creek watershed is the third largest of Vermont's 17 river basins, having a drainage area of 1,106 square miles (FERC, 2000). The watershed is located in western central Vermont, known as the Champlain Valley, and is contained within the Lake Champlain Basin, which encompasses the northeastern corner of upstate New York and the northwestern section of the state of Vermont.

Otter Creek, the longest river situated entirely within the state of Vermont, flows approximately 100 miles in a northeasterly direction from the headwaters of Emerald Lake to its mouth on Lake Champlain. Major tributaries to Otter Creek include: Mill, Cold, Clarendon, Leicester, Middlebury, New Haven, and Lemon Fair rivers; East and Dead creeks; and Tinmouth Channel (FERC, 2000).

Otter Creek is delineated by three reaches. The upper reach runs from the headwaters of Emerald Lake (RM 100) to the Proctor development (RM 64.2) and is characterized by steep gradient, swift flows, and rapids. The middle section of Otter Creek extends from the Proctor development to the Vergennes Project (FERC Project No. 2674) (RM 7.6), with the Beldens and Huntington Falls developments located at RM 23.0 and RM 21.0, respectively (FERC, 1998). Otter Creek, between the Proctor development and just upstream of the Beldens development (RM 64.2 to 25), is characterized by moderate topography with slow, flat water and meandering stream sections. The 9-mile stretch of Otter Creek from Frog Hollow (RM 25) to the upstream extent of the Vergennes Project (RM 16) has an average gradient of 22 feet per river mile (Central Vermont, 1998a) and is home to Otter Creek Falls and the Otter Creek Gorge. The lower

[24] Unless noted otherwise, the sources of our information are the amended license application (Central Vermont, 2011), additional information filed by Central Vermont (2012), and the summary of water quality certification negotiations between Green Mountain and Vermont ANR (Green Mountain, 2012b).

section of Otter Creek from the Vergennes dam (RM 7.6) to Lake Champlain is generally flat with water levels influenced by a backwatering effects from seasonal variations in lake levels in Lake Champlain (FERC, 1998).

The Otter Creek basin is located in a rural area with little local residential or commercial development; developed land including residential, commercial, industrial, transportation, and utility uses accounts for approximately 6 percent of the land cover type. Approximately 60 percent of the basin is forest, 23 percent is agricultural lands, and 11 percent of the basin is lakes, ponds, and wetlands (FERC, 2000).

From its headwaters at Emerald Lake, Otter Creek elevations range from over 700 feet to under 100 feet at Lake Champlain. The landscape in the basin is moderately rugged, mostly forested terrain with a generally moderate topography, varying from steep to rolling hills. The highest elevation in the watershed is 4,230 feet msl (Killington Mountain), and the mean elevation is approximately 1,100 feet msl.

The project vicinity experiences warm, relatively humid summers and cold winters with moderate to heavy snowfall in elevations above 5,000 feet and moderate snowfall in the lower elevations. The National Weather Service monitoring station (No. 436995) located in Rutland, Vermont shows the overall average temperatures in July are 69°F and the overall average temperatures in January are 20°F. The average annual total precipitation is 39.12 inches. The average total snowfall is 65.4 inches.

3.2 SCOPE OF CUMULATIVE EFFECTS ANALYSIS

According to the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act (40 C.F.R., §1508.7), a cumulative effect is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time, including hydropower and other land and water development activities.

Based on our review of the license application and agency and public comments, we have identified water quality and fishery resources as having the potential to be cumulatively affected by project expansion and the continued operation and maintenance of the Otter Creek project in combination with other past, present, and future activities on Otter Creek such as hydropower development, agriculture, and wastewater effluent discharge.

3.2.1 Geographic Scope

The geographic scope of the cumulative analysis defines the physical limits or boundaries of the proposed action's effect on the resources. Because the proposed action can affect resources differently, the geographic scope for each resource may vary. We have identified the scope for water quality to include Otter Creek from: (1) the upstream extent of the Proctor reservoir downstream to the upstream extent of the Middlebury Lower Hydroelectric Project reservoir (FERC Project No. 2737); and (2) the upstream extent of the Beldens reservoir downstream to the upstream extent of the Weybridge Hydroelectric Project reservoir (FERC Project No. 2731). The scope for fishery resources includes the reach of Otter Creek from the base of Ripley Mills dam (RM 70.8) to its confluence with Lake Champlain.

We chose this geographic scope for water quality because construction and operation of nine dams on Otter Creek (table 2), seven of which are hydropower projects, have affected water quality and altered the natural flow regime, in combination with agricultural runoff and the numerous waste water discharges along its length. Therefore, Green Mountain's proposals to: (1) increase the generating capacities of the Proctor and Huntington Fall developments; (2) enhance recreation facilities at the Proctor and Huntington Falls developments; and (3) continue operating all three project developments, in combination with realigning the Proctor intake, and these existing effects on Otter Creek water quality, may contribute to cumulative effects on water temperature and dissolved oxygen (DO) concentrations.[25]

For fishery resources, proposed project operation, in combination with the operation of the other hydropower projects on Otter Creek, has the potential to cumulatively affect resident fish populations through the impingement and entrainment of fish. The presence and operation of the other dams on Otter Creek, as discussed above, limits the extent of any project-related cumulative effects on water quality and fishery resources to the geographic scope described above.

In section 3.3.2.1, we discuss the cumulative effects of licensing the project on fishery and water quality resources.

3.2.2 Temporal Scope

The temporal scope of analysis includes a discussion of the past, present, and reasonably foreseeable future actions and their effects on water quality and fishery

[25] As discussed in section 2.2.1, *Proposed Project Facilities*, in an order issued June 20, 2013, Green Mountain is authorized to realign the Proctor intake under the existing license.

resources. Based on the potential new license term, the temporal scope looks 30 to 50 years into the future, concentrating on the effects on the resources from reasonably foreseeable future actions. The historical discussion is limited, by necessity, to the amount of available information for each resource. We identified the present resource conditions based on the license application, agency comments, and comprehensive plans.

3.3 PROPOSED ACTION AND ACTION ALTERNATIVES

In this section, we discuss the effects of the project alternatives on environmental resources. For each resource, we first describe the affected environment, which is the existing condition and baseline against which we measure effects. We then discuss and analyze the specific cumulative and site-specific environmental issues.

Only the resources that would be affected, or about which comments have been received, are addressed in detail in this EA. We have determined that geology and soils, water quality and quantity, aquatic, terrestrial, threatened and endangered species, recreation, land use, cultural, and aesthetic resources may be affected by the proposed action and action alternatives.[26] We have not identified any substantive issues related to socioeconomics associated with the proposed action; therefore, these resources are not assessed in the EA. We present our recommendations in section 5.2, *Comprehensive Development and Recommended Alternative*.

3.3.1 Geologic and Soil Resources

3.3.1.1 Affected Environment

Physiography

The project area is located within the Vermont and Champlain Valley physiographic provinces. The Vermont and Champlain Valleys were formed by glacial retreat from Vermont about 13,500 years ago. The Proctor development is situated south in the narrow, steep-sided Vermont Valley, which is between the Taconic Mountains to the west and the southern Green Mountains to the east. The Beldens and Huntington Falls developments occur in the wide and flat Champlain Valley, at the foot of the Northern Green Mountains located to the east (Thompson and Sorenson, 2005).

Two fault lines are located in the project area, the Taconic Klippe and the Champlain Thrust Fault. The Taconic Klippe borders Otter Creek to the west in the vicinity of the Proctor development and is composed of a hard, erosion-resistant rock

[26] Threatened and endangered species are discussed within the terrestrial resources section.

layer that, with additional rock layers, form the Taconic Mountain Range. The mountain range also contains marble, which was quarried throughout the Vermont Valley (Thompson and Sorenson, 2005; VGS, 2006).[27] The Champlain Thrust Fault originates near the Beldens and Huntington Falls developments. The thrust fault runs north from Middlebury, Vermont to Canada and borders the eastern edge of Lake Champlain. The thrust fault is Middle Ordovician in age, and it is an east-dipping fault along which older Cambrian rocks have been moved on top of younger Ordovician rocks (VGS, 2006).

Soils

Soils in Vermont and the Champlain Valley, and in the vicinity of the project area, are composed of upland till, lake and sea sands, and valley floor clays that were left behind following the glacial retreat (Thompson and Sorenson, 2005). Erosion is not extensive within the project area. Soil types and characteristics for each development are discussed in greater detail below.

Proctor Development

The predominate soils in the area of the Proctor development are the Farmington-Galway-Galoo complex and the Galway-Nellis-Farmington complex. The Farmington soil series is a rocky silt loam that is shallow, well-drained to somewhat excessively-drained and is formed in till. The Galway soil series is also a rocky loam and consists of moderately deep, well-drained and moderately well-drained soils formed in till. The Galway soil series consist of nearly level to very steep soils that are 20 to 40 inches deep over calcareous sedimentary bedrock. The Galoo soil series consists of very shallow, somewhat excessively to excessively-drained soils formed in a thin layer of till overlying limestone or calcareous sandstone bedrock. The Nellis soil series consists of rocky, very deep, well-drained sandy loam soils formed in calcareous till. The Nellis soil series consists of nearly level to very steep soils on upland ridges, knolls, and hillsides, with depth to bedrock greater than 60 inches (USDA, 2007).

Beldens Development

The predominant soil type in the area of the Beldens development is the Farmington series, which borders Otter Creek on the east and northwest. The Farmington soil series consist of nearly level to very steep silt loam soils on glaciated uplands. Depth to bedrock is between 10 to 20 inches, and slope ranges from 2 to 50 percent in the project area (USDA, 2007).

[27] The Vermont Valley is famous for its marble, which is mined for building stone, gravestones, road-building material, and for use in the paper-making industry.

Vergennes clay soil is located in smaller proportions on the southwest section of Otter Creek. Vergennes clay is a series consisting of very deep, moderately well-drained soils on glacial lake plains.[28] Vergennes clay formed in calcareous estuarine and glaciolacustrine clays, [29] and has slow or moderately slow permeability in the surface layer, slow or very slow permeability in the subsoil, and very slow permeability in the substratum. Slopes range from 0 to 50 percent, and the depth to the bedrock is greater than 60 inches (USDA, 2007).

Huntington Falls Development

Soils in the area of the Huntington Falls development are composed of the same two series types as in the Beldens development area; however, their proportions are reversed. Most of the Huntington Falls development consists of Vergennes clay soil, which borders Otter Creek to the south in the project area. Farmington series is located in smaller proportions on the north section of Otter Creek (USDA, 2007).

Riverbank Conditions

Otter Creek, between the Proctor development and just upstream of the Beldens development (RM 64.2 to 25), is characterized by moderate topography with slow, flat water and meandering stream sections. From the Beldens development to downstream of the Huntington Falls development, Otter Creek increases in grade, with an average drop in elevation of 22 feet per mile (Central Vermont, 1998b).

In general, all three impoundments have moderately to steeply sloped banks and are densely forested up to the waters' edge. The Proctor impoundment has locations of steep, bedrock shoreline; however, the tailwater and downstream sections appear to have more cobble bars and moderate to low gradient shoreline. The banks of both the Huntington Falls and Beldens impoundments have many areas composed largely of bedrock substrate and vertical ledge. Other steeply-sloped shoreline areas are composed of clay substrate. Near the downstream end of the Beldens and Huntington Falls impoundments, the shoreline gradient decreases somewhat in sections, and there are small patches of vegetated point bar or emergent shoreline.

[28] Glacial lake plains are flat plains that were once flooded by lakes of glacial meltwater. Sediment that was deposited from the lake water form the soils of the lake plains.

[29] Glaciolacustrine deposits are deposits pertaining to, or derived from, glacial lakes.

3.3.1.2 Environmental Effects

Green Mountain's authorized and proposed ground-disturbing activities would be limited to: (1) realignment of the Proctor development intake, which would consist of removing a portion of the rock outcropping at the existing intake through the use of blasting and heavy equipment; (2) enhancing the existing canoe/kayak take-out and portage trail around Beldens dam, which would consist of limited shoreline disturbance and vegetation removal; and (3) enhancing the existing tailwater access site at the Proctor development, which would consist of constructing a gravel parking area for approximately 2 to 3 vehicles. Ground disturbance associated with these project facility upgrades could expose soils to accelerate erosion and result in increased sedimentation to Otter Creek. Any such increases in sedimentation may lead to negative effects on water quality, resident aquatic species, and their associated instream habitat, as further discussed in section 3.3.2.2, *Water Quality*.

Green Mountain's proposal to implement a 1.5-foot peaking mode at the Proctor impoundment under certain inflow conditions[30] could also result in increased levels of shoreline erosion. Under these proposed project operations, shoreline areas would be exposed to alternating wet and dry conditions, which has the potential to reduce the stability of the Proctor impoundment shoreline.

Green Mountain proposes to minimize adverse effects associated with these ground-disturbing activities by implementing erosion and sediment control measures during the proposed redevelopment of the intake at the Proctor development and construction of the recreational enhancements at the Proctor and Beldens developments.

Our Analysis

Generally, Otter Creek in the vicinity of the project area has forested banks and shorelines that are composed of bedrock. This includes the Proctor impoundment shoreline, which Vermont ANR (2006) identified as being forested with vegetated buffers that averaged 25 feet, and only minor areas of erosion. Green Mountain's proposal to implement a 1.5-foot peaking mode at the Proctor development would result in reservoir fluctuations that are within the range of existing 4-foot reservoir drawdowns (table 4). Because existing erosion within the Proctor impoundment has been identified as minimal and proposed project operations would result in reservoir fluctuations that are within the range of current reservoir fluctuations, it is unlikely proposed project operations at this development would lead to any substantial increases in erosion. Furthermore, the

[30] The conditions are inflows equal to or greater than 400 cfs from May 1 through June 30, and inflows greater than 200 cfs during all other times of the year.

bedrock-dominated geology within the area of the Proctor impoundment would also help to minimize any future occurrences of project-related erosion.

Although Central Vermont (2011) stated that significant areas of erosion have been identified in the reach of Otter Creek from upstream of Beldens to downstream of Huntington Falls, these areas were generally within the vicinity of the Weybridge and Middlebury Lower projects. Green Mountain's proposal to continue operating the Beldens and Huntington Falls developments in instantaneous ROR modes would maintain existing conditions within these respective impoundments and in downstream areas of Otter Creek. Operating in an instantaneous ROR mode would also minimize fluctuations of reservoir levels and flows downstream of these respective developments, which otherwise may contribute to erosion within the project area.

Realignment of the Proctor intake would involve cutting and removing a section of bedrock that is approximately 100 feet long by a maximum of 23 feet wide. The vertical extent of the removal will be to the bottom of the existing intake channel, resulting in a maximum cut of approximately 24 feet (approximately 6.9 feet below ordinary high water mark). Given the low erosive qualities of this material proposed for removal, it is likely that any erosion would be minimal and limited in duration. Similarly, although Green Mountain's proposed upgrades to the recreation facilities at the Proctor and Beldens developments would require some vegetation removal and soil-disturbing activities, these disturbances would have a small footprint, and any effects to soils would be limited to these areas. Nonetheless, Green Mountain's construction activities may result in minor, short-term increases in erosion and sedimentation to Otter Creek.

Although Green Mountain proposes to implement erosion and sediment control measures during the redevelopment of the intake at the Proctor development and the construction of the recreational enhancements at the Proctor and Beldens developments, incorporating these measures into a soil erosion and sediment control plan would provide for a document that addresses erosion control throughout the entire project area. A properly implemented soil erosion and sediment control plan would minimize any sedimentation and erosion associated with construction activities both within the riverbed (i.e., Proctor intake realignment) and in riparian or upland areas (i.e., recreation facility upgrades). Overall, an effective soil erosion and sediment control plan for the project should include: (1) a description of the actual site conditions; (2) a description of measures that would be used to control erosion, stabilize streambanks, prevent slope instability, and minimize the quantity of sediment entering project waters during ground-disturbing activities; (3) detailed descriptions, design drawings, and specific locations of all control measures; (4) a description of the measures for storing and disposing spoil materials and the locations of any spoil disposal areas; (5) a description of methods for revegetating disturbed areas, including a description of the native plant species used, planting densities, temporary soil stabilization techniques, and fertilization procedures or other requirements; (6) requirements for inspection and maintenance of erosion and

sediment control measures to ensure proper operation; (7) a description of the measures to monitor for and suppress dust during construction of proposed project facilities; and (8) an implementation schedule.

We discuss the potential for proposed project operation to contribute to erosion and sedimentation to Otter Creek in section, 3.3.2.2, *Operational Effects*.

3.3.2 Aquatic Resources

3.3.2.1 Affected Environment

Otter Creek, located primarily in Addison and Rutland counties in Central Vermont, is approximately 100 miles long and flows north from the headwaters of Emerald Lake to its confluence with Lake Champlain. The Otter Creek watershed drains an area of 1,106 square miles and is located in the Champlain Valley, which is a sub-unit of the larger Lake Champlain Basin. The area is primarily rural with agricultural-based land use practices comprising up to 14 and 38 percent of the watersheds in Rutland and Addison counties, respectively (NOAA CSC, 2006). Major tributaries to Otter Creek include Mill, Cold, Clarendon, Leicester, Middlebury, Lemon Fair and New Haven rivers; East and Dead creeks; and Tinmouth Channel (FERC, 2000).

The project includes the following three developments located on Otter Creek: (1) the Proctor development at RM 64.2; (2) the Beldens development at RM 23; and (3) the Huntington Falls development at RM 21. The 6-mile-long Proctor impoundment has a surface area of 92 acres at a normal maximum pool elevation of 469.5 feet msl and a usable storage capacity of 275 acre-feet. The 1.8-mile-long Beldens impoundment has a surface area of 22 acres at a normal maximum pool elevation of 283 feet msl and a usable storage capacity of 252.5 acre-feet. The 1.3-mile-long Huntington Falls impoundment has a surface area of 23 acres at a normal maximum pool elevation of 217.8 feet msl and a usable storage capacity of 234 acre-feet. The drainage areas for the Proctor, Beldens, and Huntington Falls developments are 395, 633, and 752 square miles, respectively.

Currently, Green Mountain uses the waters of Otter Creek for power generation at the three project developments (i.e., Proctor, Beldens, and Huntington Falls) and four other hydroelectric facilities (table 2). There are also two additional dams located on Otter Creek, which are not owned by Green Mountain and do not produce power (table 2).

Table 2. Existing dams located on Otter Creek. (Source: Vermont Marble, 2007)

Dam Name	Owner	Location	River Mile	Height of Dam (feet)	Usable Storage Capacity (acre-feet)	Generating Capacity (kW)
Emerald Lake	Vermont Agency of Natural Resources (Vermont ANR), Dept. of Forests and Parks	Dorset, VT	100	2	23.0	None
Center Rutland (FERC No. 2445)	Green Mountain	Rutland, VT	72	10	34.4	275
Ripley Mills	Rutland Plywood Corporation	Rutland, VT	70.8	4	11.5	None
Proctor (FERC No. 2558)	Green Mountain	Proctor, VT	64.2	7	2,275.5	7,040
Middlebury Lower (FERC No. 2737)	Green Mountain	Middlebury, VT	27.2	10	45.9	2,400
Beldens (FERC No. 2558)	Green Mountain	New Haven, VT	23	24	252.5	5,700
Huntington Falls (FERC No. 2558)	Green Mountain	New Haven, VT	21	31	234.2	5,500
Weybridge (FERC No. 2731)	Green Mountain	Weybridge, VT	19.5	36	608.4	3,000
Vergennes (FERC No. 2674)	Green Mountain	Vergennes, VT	7.6	12	200.0	2,400

Water Quantity

The following U.S. Geological Survey (USGS) gages were used to calculate streamflows in the project area: (1) USGS Gage No. 04282000 (Otter Creek at Center Rutland), located approximately 6.8 miles upstream of the Proctor development at RM 71, was used to calculate streamflows at the Proctor development;[31] (2) USGS Gage No. 04282500 (Otter Creek at Middlebury), located approximately 4.2 miles upstream of the Beldens development at RM 27.2, was used to calculate streamflows at the Beldens development;[32] and (3) USGS Gage No. 04282525 (New Haven River at Brooksville, Near Middlebury, VT), located on the New Haven River, which flows into Otter Creek approximately 1.5 miles upstream of the Huntington Falls dam, was used to calculate the streamflows at the Huntington Falls development.[33]

Table 3 lists the mean, maximum, and minimum annual and monthly flows for Otter Creek at each of the three project developments during the respective periods of record. Overall, the highest flows in Otter Creek typically occur during the spring months (i.e., March through May) with the lowest flows occurring during the late summer and early fall months (i.e., July through September). Average annual flows in Otter Creek at the Proctor, Beldens, and Huntington Falls developments are approximately 751, 1,096, and 1,369 cfs, respectively.

[31] Daily discharge data (January 1964 to December 2009) for USGS Gage No. 04282000 were adjusted by a factor of 1.29 to account for the 88 square miles of additional drainage area between this streamgage and Proctor dam.

[32] Daily discharge data (January 1964 to December 2009) for USGS Gage No. 04282500 were used to directly estimate flows at Beldens dam, because the difference in drainage area between the Beldens dam and this streamgage was approximately 1 percent.

[33] Daily discharge data (January 1991 to December 2009) for USGS Gage No. 04282525 were added to the data from USGS Gage No. 04282500 to estimate flows at Huntington Falls dam. Flows for the USGS Gage No. 04282525 were not pro-rated, because the difference in drainage area between the Huntington Falls dam and this streamgage was approximately 1 percent.

Table 3. Annual and monthly mean, minimum, and maximum flows recorded at the Proctor (January 1964 to December 2009), Beldens (January 1964 to December 2010), and Huntington Falls (January 1991 to December 2010) developments (calculated using USGS gage nos. 04282000, 04282525, and 04282500). (Source: Green Mountain, 2011)

Month	Mean Flow (cfs)	Minimum Flow (cfs)	Maximum Flow (cfs)	Mean Flow (cfs)	Minimum Flow (cfs)	Maximum Flow (cfs)	Mean Flow (cfs)	Minimum Flow (cfs)	Maximum Flow (cfs)
	Proctor Development			**Beldens Development**			**Huntington Falls Development**		
January	654	80	7,979	987	207	5,281	1,437	278	6,430
February	638	113	8,018	945	211	5,041	1,054	421	5,550
March	1,113	121	8,867	1,587	211	6,991	1,854	381	6,190
April	1,809	201	10,039	2,473	207	7,211	3,012	770	7,630
May	1,029	153	9,073	1,572	207	6,431	1,788	394	6,500
June	565	84	7,233	863	106	5,381	1,081	189	10,150
July	417	60	8,958	640	96	3,191	877	155	4,870
August	371	49	10,206	593	93	3,931	808	119	4,510
September	315	50	3,308	463	87	2,791	513	99	3,330
October	586	75	5,727	802	121	3,211	1,076	163	8,830
November	734	103	4,183	1,080	139	3,651	1,439	241	4,580
December	775	108	7,825	1,145	201	4,391	1,490	330	6,350
Annual	**751**	**49**	**10,206**	**1,096**	**87**	**7,211**	**1,369**	**99**	**10,150**

Existing Project Operations

As further discussed in section 2.1.4, *Existing Project Operation*, under the existing license, the Proctor development is operated in a modified ROR mode. Under this existing modified ROR operation, Green Mountain normally operates the Proctor development in such a way as to maintain a stable reservoir elevation, but can utilize up to 4 feet of storage within the Proctor reservoir during Independent System Operator-New England (ISO-New England) power emergency conditions, local energy demands, maintenance repairs, or in anticipation of high inflows. A full 4-foot drawdown of the Proctor reservoir results in headpond elevations being reduced from 469.5 to 465.5 feet msl. The existing license requires that the Huntington and Beldens developments both be operated in ROR modes, such that outflow from the projects are equivalent to inflow on an instantaneous basis.

The existing maximum hydraulic capacities for the Proctor, Beldens, and Huntington Falls developments are 890, 2,000, and 2,010 cfs, respectively. During high-flow periods, typically associated with spring run-off, flows in excess of these maximum hydraulic capacities are spilled into the bypassed reaches at each respective development. At the Proctor, Beldens, and Huntington Falls developments, spill into the bypassed reaches occurs approximately 24, 14, and 22 percent of the calendar year, respectively.

Under the existing license, both the Huntington Falls and Beldens developments have minimum instream flow requirements for their respective bypassed reaches. The minimum instream flow requirement for the Huntington Falls bypassed reach is 15 cfs. The existing minimum flow requirement of 5 cfs for the Beldens development is released from the western dam; however, leakage of approximately 5 cfs from beneath the flashboards of the eastern dam keeps this separate reach wetted during non-spill, low flow conditions.[34] There is no minimum flow requirement for the Proctor bypassed reach; however, leakage from two gates at the Proctor dam continuously provides approximately 2 to 3 cfs to this reach. The existing license does require that Green Mountain release 50 percent of project inflow downstream of the Proctor powerhouse during the months of April and May, and the first two weeks of June, and 100 cfs, or inflow, whichever is less, at all other times.[35]

[34] The Beldens development has two dams, a 57-foot-long eastern dam, and a 56-foot-long western dam, each with a separate bypassed reach.

[35] These flows were agreed upon by a former licensee, Vermont Marble Division of Omya, Inc., and the resource agencies during a 1987 license amendment process, and were required to protect and enhance downstream water quality and aquatic habitat.

Table 4 shows the frequency, timing, and duration of Proctor reservoir drawdowns during the period of record (September 2000 through March 2008). On average, 4-foot drawdowns have generally occurred once or twice annually and last less than 24 hours. On two occasions (September 2001 and September 2006), prolonged 4-foot drawdowns of 5.5 and 7.9 days occurred as a result of maintenance activities. Two and 3-foot drawdowns typically occur less than once per year on average. The most common reservoir drawdown operation at the Proctor development is to bring the reservoir down by 1-foot to an elevation of 468.5 feet msl. One-foot drawdowns occur approximately 10 times per year on average, typically in January, March, and May for maintenance activities, and have been limited to less than 24 hours in duration, although more prolonged (2 to 6 days) drawdowns have occurred on several occasions. As a result of these impoundment drawdowns, downstream river flows are temporarily modified to refill the impoundment.

Table 4. Frequency, timing, and duration of Proctor impoundment drawdowns during the period of record (September 2000 through March 2008). (Source: Central Vermont, 2011)

	Frequency of Proctor Reservoir Drawdowns			
Month	**1-Foot**	**2-Foot**	**3-Foot**	**4-Foot**
January	10	1	0	0
February	5	0	0	0
March	6	1	0	1
April	4	0	0	0
May	12	1	0	0
June	14	0	0	1
July	1	0	0	5
August	0	0	0	0
September	8	1	1	7
October	5	0	0	0
November	3	0	0	2
December	17	0	0	0
Total	85	4	1	16
Per Year Avg. Frequency	10.6	0.5	0.1	2.0

Avg. Duration (hrs)	26	34	41	22
Min. Duration (hrs)	1	2	41	1
Max. Duration (hrs)	160	168	41	190

Water Use

Industrial use of Otter Creek occurs throughout its length, primarily for purposes of hydroelectric generation and wastewater assimilation. There are seven hydroelectric facilities on Otter Creek, including the three project developments (table 2). In addition, municipal use for wastewater assimilation occurs along Otter Creek from the town of Wallingford (RM 84.8) to the town of Ferrisburg at its confluence with Lake Champlain (Central Vermont, 1998a). There are a total of 10 wastewater treatment facilities in the Otter Creek basin, 5 of which are located on the mainstem itself. These facilities are designed and permitted to collectively discharge no more than 12.79 million gallons per day (MGD); however, typically these facilities collectively release much less than the quantity permitted (Vermont DEC, 2012a). In 2010, a total of 7.3 MGD was released into Otter Creek from these wastewater treatment facilities (Vermont DEC, 2012a). There are also a total of 112 industrial, commercial, and stormwater discharge permits in the Otter Creek basin. No other uses for the waters of Otter Creek in the project area have been identified. There are also no current or proposed water withdrawals located in the project area.

Water Quality

Water Quality Standards

Vermont's existing water quality standards were adopted by the Vermont Water Resources Panel of the Natural Resources Board (Vermont WRP).[36] Numeric and qualitative water-quality standards have been established which are consistent with 10 V.S.A. Chapter 47, of the Vermont Water Quality Policy and Section 303(c) of the Federal Clean Water Act (CWA). Project waters are classified as Class B waters. Class B waters are managed to achieve and maintain a level of quality that fully supports the following designated uses (Vermont WRP, 2011): (1) aquatic biota, wildlife, and aquatic habitat; (2) aesthetics; (3) public water supply; (4) irrigation of crops and other agricultural uses; (5) swimming and other primary contact recreation; and (6) boating, fishing, and other recreational uses.

[36] Effective May 14, 2012, the rulemaking authority of the Vermont WRP, including that for water quality standards, was transferred to the Vermont DEC.

State of Vermont water quality standards for project area waters are provided below in table 5. Turbidity, DO, and water temperature standards vary according to whether the water is classified as warm or cold water fish habitat. Otter Creek, from the Proctor wastewater treatment facility, which is located directly downstream of the Proctor bypassed reach, to Beldens dam is classified as warm water fish habitat, as is the reach of Otter Creek downstream of Huntington Falls dam (Vermont WRP, 2011). Vermont WRP (2011) states that by default, all other waters of the project area must meet water quality standards associated with cold water fishery habitat. Therefore, the Proctor impoundment and bypassed reach, the Beldens bypassed reach and tailrace, and the Huntington Falls impoundment fall within the geographic area covered by the coldwater fish habitat water quality standards.

Table 5. Vermont water quality standards for Class B waters applicable to Otter Creek waters. (Source: Vermont WRP, 2011)

<table>
<tr><th>Parameter</th><th colspan="2">Standard</th></tr>
<tr><td rowspan="7">Temperature</td><td colspan="2">Cold Water Fish Habitat - The total increase from the ambient temperature due to all discharges and activities shall not exceed 1.0ºF.
Warm Water Fish Habitat – The total increase from the ambient temperature due to all discharges and activities shall not exceed the following temperature criteria:</td></tr>
<tr><td>Ambient temperature:</td><td>Total allowable increase above ambient temperature</td></tr>
<tr><td>Above 66ºF</td><td>1 ºF</td></tr>
<tr><td>63º to 66 ºF</td><td>2 ºF</td></tr>
<tr><td>59 ºF to 62 ºF</td><td>3 ºF</td></tr>
<tr><td>55 ºF to 58 ºF</td><td>4 ºF</td></tr>
<tr><td>Below 55 ºF</td><td>5 ºF</td></tr>
<tr><td>Dissolved oxygen (mg/L)</td><td colspan="2">Cold Water Fish Habitat - Not less than 7 mg/L and 75 percent saturation at all times, nor less than 95 percent saturation during late egg maturation and larval development of salmonids in areas that the Secretary of Vermont ANR determines are salmonid spawning or nursery areas important to the establishment or maintenance of the fishery resource. Not less than 6 mg/L and 70 percent saturation at all times in all other waters designated as a cold water fish habitat.

Warm Water Fish Habitat - Not less than 5 mg/L and 60 percent saturation at all times.</td></tr>
<tr><td>pH</td><td colspan="2">Values shall be maintained within the range of 6.5 and 8.5.</td></tr>
<tr><td>Total Nitrogen (mg/L)</td><td colspan="2">Not to exceed 5.0 mg/L as NO3-N at flows exceeding low median monthly flows, in Class B waters.</td></tr>
<tr><td>Total Phosphorus</td><td colspan="2">In all waters, total phosphorous loadings shall be limited so that they will not contribute to the acceleration of eutrophication or the stimulation of the growth of aquatic biota in a manner that prevents the full support of uses.</td></tr>
</table>

Turbidity	-Cold Water Fish Habitat waters - Not to exceed 10 NTU. -Warm Water Fish Habitat waters - Not to exceed 25 NTU.
E. coli	Not to exceed 77 organisms/100 ml.[a]
Mercury	-Human Consumption of Water and Organisms: 0.14 -Maximum Allowable Concentration - Acute Criteria: 2.4 -Average Allowable Concentration - Chronic Criteria: 0.012

[a] This limit can be waived by the Secretary of Vermont ANR between October 31 and April 1 provided that no health hazard is created.

Water Quality Study Results

Water quality in the Otter Creek watershed generally meets or exceeds state standards for Class B waters (Vermont DEC 2012a and 2012b). The primary issue with respect to violations of state water quality standards in the project area is related to concentrations of *Escherichia coli*, which are likely caused by agricultural runoff and effluent from wastewater treatment facilities in the watershed. The presence of *E. coli* was the sole cause of impairments identified in the State of Vermont's 2010 Section 303(d) list (Vermont DEC, 2012b). Although none of these affected reaches are within project waters, Vermont ANR has identified several additional reaches of Otter Creek which are in need of further assessment. One of these reaches from the mouth of Middlebury River to Pulp Mill Bridge includes the Proctor development and is suspected to potentially have *E. coli* concentrations that are inconsistent with the bodily contact/recreation designated use criteria.

Vermont Marble conducted water quality sampling in the project area from August 3 to 5, 2010. The goals of this water quality sampling were to collect baseline information which could be used to assess potential project-related effects. Specifically, Vermont Marble monitored DO concentrations and water temperature in all of the project impoundments, bypassed reaches, and tailwater areas during "worst-case" conditions (i.e., low summer flows with high air temperatures).[37] The mean air temperature during the morning and afternoon sampling events was 21.8ºC (71.2 ºF) and 26.5ºC (79.7 ºF), respectively, with a maximum recorded air temperature of 28.4 ºC (83.1 ºF). Otter Creek flows ranged from approximately 301 to 437 cfs during the water quality sampling.

Table 6 shows the mean results of the water quality monitoring conducted at each of the three project developments. The minimum and maximum DO concentrations observed were 7.2 mg/L (83 percent saturation) and 10.1 mg/L (118 percent saturation), respectively. The minimum DO concentration was recorded in the large plunge pool below Sutherland Falls at the Proctor development and the maximum recorded water temperature was 23.2 ºC (73.8 ºF) at the Huntington Falls tailwater site. Overall, water quality monitoring indicates that DO concentrations and water temperature are consistent throughout the project area and meet the State of Vermont's water quality standards for Class B waters.

[37] During water quality sampling, Otter Creek flows were high enough to enable operation of at least one turbine-generator unit at each project development during the two daily water quality sampling periods (i.e., pre-sunrise and afternoon).

Table 6. Mean water quality monitoring results for the Proctor, Beldens, and Huntington Falls developments. (Source: Vermont Marble, 2010)

Location	Mean DO Concentration (mg/L)	Mean Water Temperature (ºC)
Proctor Development		
Impoundment (near project intake)	8.5	22.5
Bypass (below dam)	8.1	22.5
Bypass (below Sutherland Falls)	7.8	21.8
Tailrace	8.4	22.2
Huntington Falls Development		
Intake (near project intake)	9.2	22.1
Bypass	8.7	22.2
Tailrace	9.3	22.2
Beldens Development		
Intake (near project intake)	8.5	21.9
Bypass (site 1)	8.7	22.2
Bypass (site 2)	8.7	22.2
Bypass (site 3)	8.6	22.8
Tailrace	8.7	22.1

Note: Results shown are mean values based on the water quality monitoring results provided in Attachment A to Vermont Marble's *Water Quality Data Report*, filed on November 1, 2010.

Fishery Resources

Approximately 25 fish species are known to occur in the Otter Creek watershed (table 7). Otter Creek supports a mix of cold and warm water native and non-native fish species typical of Lake Champlain drainages.

In 1989, the Vermont Department of Environmental Conservation (Vermont DEC) conducted a backpack electrofishing survey of Otter Creek near Clarendon, Vermont, approximately 13 miles upstream of the Proctor development. The results of this survey indicate that the fish community upstream of, and likely inclusive of the Proctor

development, is composed of at least 11 fish species.[38] Fisheries survey information from a Vermont FWD study in 1977 indicates that the fish community between Vergennes and the Middlebury/Salisbury town line, which includes the Beldens and Huntington Falls developments, is composed of 14 fish species (table 7). Additionally, information derived from relicensing efforts at the Weybridge Hydroelectric Project (FERC Project No. 2731) (located 1.5 miles downstream of the Huntington Falls development) completed in the early 2000's indicates that the fish assemblage in the Weybridge impoundment, up to Huntington Falls dam, is composed of northern pike (*Esox lucius*), largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieu)*, rock bass (*Ambloplites rupestris)*, brown trout (*Salmo trutta*), rainbow trout (*Oncorhynchus mykiss)*, yellow perch *(Perca flavescens)*, bluegill (*Lepomis macrochirus*), pumpkinseed (*Lepomis gibbosus*), brown bullhead (*Ameiurus spp.*), and fallfish (*Semotilus corporalis*) (FERC, 2000).

Table 7. Fish species known to occur in the Otter Creek watershed. (Source: Central Vermont, 2011)

Common Name	Scientific Name	Native Species (Y/N)
Banded killifish [a]	*Fundulus diaphanus*	Y
Bluegill [a, c]	*Lepomis macrochirus*	Y
Bluntnosed minnow [b]	*Pimephales notatus*	Y
Brook trout	*Salvelinus fontinalis*	Y
Brown trout [a, c]	*Salmo trutta*	N
Brown bullhead [a, c]	*Ameiurus nebulosus*	Y
Burbot [c]	*Lota lota*	Y
Common shiner [a, b, c]	*Luxilus cornutus*	Y
Creek chub [b]	*Semotilus atromaculatus*	Y
Cutlips minnow [b]	*Exoglossum maxillingua*	Y
Fallfish [a, b, c]	*Semotilus corporalis*	Y
Golden shiner [a]	*Notemigonus crysoleucas*	Y
Largemouth bass [c]	*Micropterus salmoides*	Y

[38] We note that Vermont Marble, in its Proctor Impoundment Drawdown Evaluation Draft Study Report, states that based on existing literature, all species in table 7, except for largemouth bass, likely occur in the Proctor reservoir (Vermont Marble, 2009).

Longnosed dace [b]	*Rhinichthys cataractae*	Y
Carp [a]	*Cyprinus carpio*	N
Northern pike [a, c]	*Exos lucius*	Y
Pumpkinseed [a, c]	*Lepomis gibbosus*	Y
Rainbow trout [a, c]	*Oncorhynchus mykiss*	N
Rock bass [b, c]	*Ambloplites rupestris*	Y
Slimy sculpin	*Cottus asper*	Y
Smallmouth bass [a, c]	*Micrpterus dolomieu*	Y
Spottail shiner [a]	*Notropis hudsonius*	Y
Tesselated darter [b]	*Etheostoma olmstedi*	Y
Yellow perch [a, b, c]	*Perca flavescens*	Y
White sucker [a, b]	*Catostomus commersoni*	Y

[a] 1977 Vermont FWD survey results, provided by Rod Wentworth, Vermont FWD, December 13, 2006.

[b] 1989 Vermont Department of Environmental Conservation (Vermont DEC) survey results, provided by Rich Langdon, Vermont DEC, December 21, 2006.

[c] Final environmental assessment for the Weybridge Hydropower Project (FERC, 2000).

The Proctor impoundment and bypassed reach are classified as a coldwater fishery. However, Otter Creek downstream of the Proctor tailwater is classified as a warmwater fishery (Vermont WRP, 2011). An active fishery for brown and rainbow trout exists downstream of Proctor dam; however, flows required in the exiting license for this reach were developed to protect the smallmouth bass fishery and associated spawning habitat. Vermont FWD manages Otter Creek downstream of Beldens dam as a coolwater and warmwater fishery with a special management interest in smallmouth bass and northern pike (Central Vermont, 1998b). Between the Beldens and Huntington Falls dams, Otter Creek is managed as a coldwater/coolwater fishery with emphasis on brown trout and rainbow trout (Central Vermont, 1998b).

Three cold water tributaries in the project area (Furnace Brook, New Haven River, and Neshobe River), all of which support an active fishery for rainbow and brown trout, converge with Otter Creek between the Proctor and the Huntington Falls developments. Vermont FWD annually stocks approximately 8,000 brown, brook, and rainbow trout in eight locations on the mainstem of Otter Creek. Additional stocking of these trout species also occurs in several tributaries to Otter Creek,

including the New Haven, Middlebury, Clarendon, and Neshobe rivers, and Furnace Brook.

Aquatic Habitat

Proctor Development

The Proctor impoundment consists of various types of shallow and deeper-water habitat. The impoundment is generally narrow, ranging from approximately 90 to 150 feet in width, and is generally shallow, with maximum depths of approximately 10 feet. Substrates in the impoundment are generally fine-grained (*i.e.*, silt, sand, and gravel). In its upper reaches, the impoundment becomes riverine, and as such, water velocity becomes measurable, although it is generally less than 1 foot per second (fps) during moderate inflow conditions (*i.e.*, approximately 600 cfs). The majority of the aquatic vegetation in the impoundment is found in water less than four feet deep.

The Proctor bypassed reach is 680 feet in length and drops approximately 100 feet in elevation from the base of Proctor dam to the tailwater, consisting of a mix of bedrock-controlled falls, a solitary deep pool, and areas of fast water and cascades. The upper section, directly below the dam, includes a set of falls (approximately 120 feet in length) that empties into a large, moderately-sloped pool, approximately 125 feet in length. The pool transitions into a higher-gradient section of pocket water and cascades that extends another 300 feet before Otter Creek drops sharply over Sutherland Falls. At the base of Sutherland Falls, there is a large plunge pool (approximately 135 feet in length) which mixes with flows discharged from the Proctor powerhouse. Tailrace discharge coupled with minor existing leakage (2 to 3 cfs) from the Proctor dam and gates maintains deep pool habitat in the plunge pool at the base of Sutherland Falls.

The morphology of Otter Creek from the Proctor tailrace downstream to Middlebury, a distance of approximately 30 miles, is uniform in shape with steep banks and flat sandy bottoms (Vermont ANR, 1981). As such, the water surface profile has only a very slight slope. The reach is characterized by low stream velocities and high water depth (Vermont ANR, 1981).

Beldens Development

The Beldens impoundment is generally narrow, approximately 100 feet wide, and largely occupies the historical river channel. Portions of the channel banks, especially near the east and west dam, consist of steep sections of bedrock, which provide limited shoreline habitat for aquatic species. Substrate within the impoundment is generally silt with little to no vegetation. Several small tributaries drain into the impoundment.

Downstream of the Beldens dam, there are two primary bypassed channels, one (approximately 150 feet in length from the base of the dam to the tailwater) below the east dam composed primarily of Beldens Falls, and one (approximately 450 feet in length from the base of the dam to the tailwater) below the west dam, which includes a small gorge and two large step-pools. The two bypassed reaches are linked by a third crossover channel that originates in the eastern bypassed reach, but flows into the lowermost pool in the western bypassed channel. Overall, the bypassed reaches at this development are high-gradient and dominated by bedrock.

The Beldens tailrace and the reach of Otter Creek immediately downstream of the development are generally shallow (approximately 2 to 3 feet deep), consisting of riffle and run habitat. At Beldens Falls, the river transitions from high-gradient falls and bedrock to lower gradient run/riffle habitat. Substrates in the tailrace area generally consist of cobble, gravel, and small boulders. The upper end of the reach contains some small plunge pools and deeper areas that were likely excavated during construction of the project. The river channel is widest (approximately 200 feet) immediately downstream of the powerhouse and bypassed reaches before narrowing to approximately 90 feet.

Huntington Falls Development

The Huntington Falls impoundment has an average width of approximately 200 feet. At the upper end of the impoundment, the river shallows dramatically and transitions into a low-gradient riverine reach. The New Haven River enters Otter Creek in the impoundment, providing sediment for the formation of gravel bars. Small isolated pockets of emergent wetlands occur along the margins of the reservoir.

The Huntington Falls bypassed reach consists of a short set of falls (approximately 40 feet in length from the base of the dam to a plunge pool), a steep-sided bedrock and boulder-dominated plunge pool (approximately 50 feet in length), and a lower pool (approximately 125 feet in length from the pool area to the tailwater). During all flow conditions, including normal (non-spill) operating conditions, the Huntington Falls bypassed reach pool, up to the base of the falls, is entirely backwatered by the tailwater. Maximum pool depth during non-spill conditions is approximately 17 feet (at the base of the falls). The pool shallows and transitions into run habitat approximately 400 feet downstream of the dam after mixing with water discharged from the development into the tailrace. Overall, the bypassed reach at this development is similar to those at the other two developments, consisting of a high-gradient reach that is dominated by bedrock.

The Huntington Falls tailrace is hydraulically complex as discharge from the generating units backwaters into the bypassed reach. However, the tailrace creates a small section of riffle/run habitat immediately downstream of the powerhouse. Water depth downstream of the powerhouse discharge on the river left bank (looking

downstream) ranges from approximately 3 to 5 feet. Along the river right bank, Otter Creek shallows considerably as the bypassed reach joins the main river channel and a depositional area/bypassed reach pool tail-out occurs. Substrates in the tailrace area primarily consist of cobbles, gravel, and sand. At a distance of approximately 200 feet downstream of the powerhouse, Otter Creek becomes lacustrine (i.e., reservoir-like) due to the presence of the Weybridge Project impoundment.

Fish Passage

Fish species requiring extensive migratory corridors do not occur in Otter Creek. Historically, Vermont FWD stocked steelhead (*Oncorhynchus mykiss*) and Atlantic salmon (*Salmo salar*) in the middle reaches of Otter Creek near the Huntington Falls and Beldens developments (FERC, 2000). However, these stocking efforts have been discontinued, and management for anadromous fish is not expected to continue in the immediate future in Otter Creek (FERC, 2000).[39] Furthermore, dams (table 2) and natural stream morphology in Otter Creek limit fish migration in the vicinity of the three project developments. A natural set of falls below the Huntington Falls development prevents upstream fish migration from Lake Champlain; thus, adfluvial fish were not likely an historical component of the freshwater fish assemblage in the project area (FPC, 1976).[40] Due to its high gradient (*i.e.*, Sutherland Falls), the Proctor bypassed reach also prevents upstream fish migration.

Each of the three project developments is equipped with trashrack facilities. The intake at the Proctor development has a trashrack with 1-inch clear bar spacing, which is situated at a 45 degree angle to river flow.[41] The Beldens development has two sets of trashracks, each serving a separate intake. The trashrack serving turbine-generator units 1 and 2 has 1.125-inch clear bar spacing, while the trashrack serving turbine-generator unit 3 has 3-inch clear bar spacing and is situated at a 90 degree angle to river flow. Similarly, the Huntington Falls development also has two sets of trashracks. The trashrack serving turbine-generator units 1 and 2 has 1.125-inch clear bar spacing, while

[39] Anadromous fish species are born in freshwater, spend the majority of their lives at sea, and return to freshwater to spawn.

[40] Adfluvial species live in lakes and migrate into rivers or streams to spawn.

[41] As part of the construction associated with Green Mountain's authorized Proctor intake realignment, as approved in an order issued by the Commission on June 20, 2013, Green Mountain would replace the existing trashracks at the Proctor development. The new trashracks would have 1-inch clear bar spacing, maximum approach velocities of 1.9 feet-per-second (fps), and be oriented parallel to river flow to minimize fish entrainment and impingement.

the trashrack serving turbine-generator unit 3 has 2-inch clear bar spacing and is positioned 45 degrees to river flow.

Macroinvertebrates

Vermont DEC has collected baseline macroinvertebrate data from over 100 sites in the Otter Creek watershed since 1985. Data collected by Vermont DEC from below Weybridge dam, just downstream of the Huntington Falls development, is likely reflective of the existing macroinvertebrate community found within the river reaches of the Beldens and Huntington Falls developments. In general, the macroinvertebrate community metrics from Vermont DEC's 2001 Weybridge sample indicate that water quality is good. Species from the Orders Ephemeroptera (mayflies), Plecoptera (stoneflies), and Tricoptera (caddisflies) (EPT) comprised approximately 72 percent of the sample, which is reflective of a healthy aquatic system due to the sensitivity of EPT species to pollution, DO levels, and high water temperatures (NCSU, 2006).

Vermont DEC also has long-term macroinvertebrate data sets from within portions of the upper watershed near Rutland and in several major tributaries. Long-term data sets from these sites indicate that water quality conditions (based on the use of benthic macroinvertebrate data) in and around the City of Rutland, upstream of the Proctor development, are generally good to excellent or have improved over time. Data from the most recent sampling events (2001 through 2006) indicate that the existing benthic macroinvertebrate community in the Otter Creek watershed is robust and diverse, and therefore, is indicative of good water quality. The majority of Vermont DEC's more recent invertebrate community assessments are reflective of high-quality conditions, ranging from good to excellent.

Freshwater Mussels

There are 17 native freshwater mussel species known to inhabit Vermont waters, 9 of which may occur within the project area (table 8) (Fichtel and Smith, 1995). Of these, four freshwater mussel species within the project area are state-listed species (table 8). A freshwater mussel survey was conducted by Vermont Marble in the Proctor impoundment in 2008 and 2009 to assess the potential impacts of modified ROR operation on freshwater mussels. No freshwater mussels or shells (middens) were observed in either year in the Proctor impoundment. However, several species were collected downstream of the Proctor bypassed reach during this study, including: Eastern elliptio, Eastern floater, and Eastern lampmussel.

Table 8. Freshwater mussel species likely to occur in the Otter Creek Project area. (Source: Central Vermont, 2011)

Common Name	Scientific Name

Creek heelsplitter	*Lasmigona compressa*
Eastern elliptio	*Elliptio complanata*
Eastern floater	*Pyganodon c. cataracta*
Eastern lampmussel	*Lampsilis radiata*
Triangle floater	*Alasmidonta undulata*
Fluted-shell[a]	*Lasmigona costata*
Pink heelsplitter[a]	*Potamilus alatus*
Black sandshell[a]	*Ligumia recta*
Giant floater[a]	*Pyganodon grandis*

[a] Denotes a state-listed species.

3.3.2.2 Environmental Effects

Water Quality

Construction Effects

Construction activities at the Proctor and Beldens developments have the potential to negatively affect water quality within Otter Creek. Construction effects, such as increased turbidity and stream sedimentation, would be associated with realignment of the intake headworks at the Proctor development, as authorized in Commission staff's June 20, 2013 order. Intake realignment would require the removal of rock outcropping at the existing intake through the use of blasting and heavy equipment. Also, Green Mountain's proposed recreational improvements, constructing a gravel parking area for 2 to 3 vehicles at the Proctor development, and improving the canoe/kayak take-out and portage trail at the Beldens development, would require vegetation removal and earth-disturbing activities, which may further contribute to soil erosion in the project area and subsequent sedimentation of Otter Creek.

To minimize the effects of constructing project facilities on water quality, Green Mountain proposes to implement erosion and sediment control measures during the authorized redevelopment of the intake at the Proctor development and the construction of the recreational enhancements at the Proctor and Beldens developments.

Our Analysis

Construction activities associated with Green Mountain's authorized redevelopment at the Proctor development and recreation facility upgrades at the Proctor and Beldens developments could potentially cause short-term increases in erosion and

sedimentation, especially during runoff events associated with large precipitation events. Erosion of disturbed land areas adjacent to Otter Creek and disturbance of the riverbed during realignment of the Proctor intake headworks could potentially increase the sediment levels in Otter Creek with fine silt and clay-sized particles settling in the Proctor reservoir and in river channel downstream of the Proctor and Beldens developments. These construction activities could also cause short-term increases in turbidity that would reduce water quality in Otter Creek. However, because Green Mountain is proposing a minimal amount of ground-disturbance for its proposed recreation facility enhancements and the material (i.e., bedrock) authorized for excavation at the Proctor intake would not be susceptible to erosive forces, the overall extent of construction-related erosion in the project area is expected to be minimal.

To control run-off during construction activities, Green Mountain proposes to implement erosion and sediment control measures during redevelopment of the intake at the Proctor development and the construction of the recreational enhancements at the Proctor and Beldens developments. Including appropriate erosion control measures (e.g., stream bank armoring, silt barrier fences, and revegetation) as part of a comprehensive soil erosion and sediment control plan would ensure that effective erosion control measures and best management practices are used during construction activities at the project to control runoff and prevent negative effects (i.e., turbidity increases) to water quality within Otter Creek. Overall, implementing a soil erosion and sediment control plan would minimize the potential for erosion in the project area during construction of project facilities and ensure that any negative effects associated with ground-disturbing activities are temporary.

Operational Effects

The existing Proctor, Beldens, and Huntington Falls developments currently have maximum hydraulic capacities of 890, 2,000, and 2,010 cfs, respectively. However, under Green Mountain's proposed project operations, as further discussed in section 2.2.2, *Proposed Project Operation*, there would be an increase in the percentage of river flow passing through the generating units at the Proctor and Huntington Falls developments as compared to existing conditions. Under Green Mountain's proposal, the Proctor and Huntington Falls developments would have maximum hydraulic capacities of 1,150 and 2,250 cfs, respectively, while the Beldens development would maintain its existing maximum hydraulic capacity of 2,000 cfs.[42] Therefore, Green Mountain's proposal would reduce the frequency of spill into the Proctor and Huntington Falls bypassed reaches when flows are between 890 and 1,150 cfs, and 2,010 and 2,250 cfs, respectively. This reduction of flow into the bypassed reaches could reduce the aeration

[42] Green Mountain is not proposing any generating facility upgrades at the Beldens development.

effect caused by existing spill, thereby potentially reducing the existing DO concentrations of water within the bypassed reaches of the Proctor and Huntington Falls developments, and in the reaches of Otter Creek downstream of these developments. By reducing flow in the bypassed reaches, the turn-over rate of water within pools located in the bypassed reaches would also be reduced, potentially leading to increased water temperatures as a result of thermal heating.

Green Mountain's proposal to implement a 1.5-foot peaking mode at the Proctor development under certain inflow conditions, as further discussed in section 2.2.2, *Proposed Project Operation*, could also increase erosion of the impoundment shoreline.[43] Exposing these areas to alternative dry and wet conditions could reduce the stability of the shoreline, resulting in erosion and increased levels of sedimentation.

Green Mountain does not propose any specific mitigation measures for water quality, as it anticipates that the potential impacts to water quality from proposed project operations would be minimal. However, as discussed below in the *Minimum Flows* section, Green Mountain is proposing to increase the minimum instream flows to the bypassed reaches at all three project developments.

Our Analysis

Under existing conditions, water quality in the project vicinity is relatively good and consistently meets Vermont state standards under worst-case conditions (i.e., low flows and high water temperatures), with the exception of high levels of *E. coli*, which are likely the result of agricultural runoff, effluent from wastewater treatment facilities, and failed septic systems located in the Otter Creek watershed. As shown in table 6, water quality monitoring conducted by Vermont Marble during low flow and high water temperature conditions indicated that: (1) the minimum DO concentration of 7.2 mg/L, which was recorded in the Proctor bypass pool (below Sutherland Falls), meets the cold water fishery state standards that apply to this reach (table 5); (2) the maximum recorded water temperature of 23.2 ºC (73.8 ºF), which was recorded in the Huntington Falls tailwater site, also meets the warm water fishery state standards that apply to this reach (table 5); and (3) DO concentrations and water temperatures were generally consistent throughout the project area. This water quality monitoring indicates that existing project operations and current bypassed reach minimum flows (5 cfs at Beldens and 15 cfs at Huntington Falls)[44] maintain DO concentrations and water temperatures that meet or

[43] As part of this proposal, peaking constraints at the Proctor development would be utilized under normal project operations of no greater than a 3:1 ratio between maximum and minimum flow in a 24-hour period.

[44] Although the existing license does not require a minimum bypassed reach flow at the Proctor development, approximately 2 to 3 cfs was present in the bypassed reach during water quality sampling as a result of leakage from the Proctor dam. Leakage at

exceed applicable state water quality standards for both warm and cold water fish habitat in project affected reaches. Also, due to the consistency of the water quality monitoring results throughout the project area, this suggests that existing project operations have little overall affect on water quality in the Otter Creek watershed.

Green Mountain proposes to increase all bypassed reach minimum instream flows at the project. Specifically, Green Mountain proposes to: (1) increase the existing 5-cfs minimum bypassed reach flow for the Beldens development by releasing 10 and 25 cfs over the east and west Beldens dams, respectively;[45] (2) provide a 60-cfs minimum flow to the Proctor bypassed reach, where under the existing license no minimum bypassed reach flow is required;[46] and (3) increase the Huntington Falls bypassed reach minimum flow from 15 to 66 cfs. Although the hydraulic capacities of the Proctor and Huntington Falls developments would be increased under Green Mountain's proposal, resulting in reduced spill frequencies into these respective bypassed reaches, Green Mountain's proposal to increase the minimum bypassed reach flows at both the Proctor and Huntington Falls developments would likely maintain or improve existing water quality conditions within these reaches of Otter Creek.[47] Green Mountain's proposal to increase the minimum bypassed reach flows for the Proctor, Beldens, and Huntington Falls developments may also provide some enhancement of DO levels over existing conditions via aeration within these respective channels; however, this enhancement is expected to be limited as DO saturation values were already high throughout the project area, ranging from 83 to 118 percent.

Under the proposed action, Green Mountain would implement a 1.5-foot peaking mode of operation at the Proctor development when inflows are equal to or greater than 400 cfs from May 1 through June 30, and when inflows are greater than 200 cfs during all other times of the year. Under existing project operations, the development is operated in a modified ROR mode, with reservoir drawdowns of up to 4 feet occurring approximately twice a year on average; however, 1-foot drawdowns occur more frequently under

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the Beldens development also provides an additional 5 cfs to the bypassed reach, which also was present during water quality sampling.

[45] Under the existing license, Green Mountain is required to release a 5-cfs minimum bypassed reach flow to the western channel and leakage in the eastern channel provides approximately 5 cfs to this reach.

[46] Existing leakage from the Proctor dam currently provides approximately 2 to 3 cfs into the bypassed reach.

[47] Under Green Mountain's proposed project operations, average annual spill into the Proctor and Huntington Falls bypassed reaches would be reduced by approximately 5 and 4 percent of the time, respectively, as compared to existing conditions.

existing operations, approximately 11 times per year on average (table 4). Although Green Mountain's proposed 1.5-foot drawdown would be within the range of existing reservoir fluctuations, its proposed peaking operation would subject littoral areas of the impoundment to more frequent water-level fluctuations.

Green Mountain's proposal to implement peaking operations at the Proctor development would result in the alternating of wetting and drying of littoral areas within the Proctor impoundment. This has the potential to increase erosion rates along the impoundment shoreline as these areas would continually saturate and dry, potentially causing unstable areas of shoreline which would become more susceptible to sloughing. However, under existing conditions erosion is not extensive within the project area, and large portions of the Proctor impoundment shoreline are armored with bedrock and vegetated to the shoreline. It is likely that the existing geology of the impoundment and the vegetated shorelines would provide natural protection against potential erosive forces caused by proposed project operations, thereby limiting any erosion and subsequent sedimentation within the impoundment that would be related to proposed project operations.

Green Mountain's proposal to continue operating the Beldens and Huntington Falls developments in instantaneous ROR modes would likely maintain existing water quality conditions within the reaches of Otter Creek located upstream and downstream from these respective developments. Therefore, other than the potential for minor increases in DO levels within the project bypassed reaches, existing water quality conditions at each of three developments would likely be maintained under Green Mountain's proposed project operations.

Hazardous Materials

Construction related to redevelopment of the Proctor intake and enhancement of recreational resources in the project area, as well as continued operation and maintenance of the project, has the potential to contaminate waterways from the introduction of hazardous materials such as petroleum products resulting from accidental spills and equipment leakage.

Green Mountain states that the former licensee, Vermont Marble, maintained a Spill Prevention Control and Countermeasures Plan for the project. Green Mountain proposes to review the plan, update it as necessary, and file it with the Commission for approval. Green Mountain also proposes that any new measures identified in the revised plan will be analyzed and provided at that time.

Our Analysis

Updating the existing Spill Prevention Control and Countermeasures Plan and filing it for Commission approval, as proposed by Green Mountain, would minimize the potential for hazardous material spills and ensure that procedures are in place to minimize the extent and adverse effects of any hazardous materials spills that do occur. Specifically, this plan should address the prevention of hazardous substance spills, ensure protocols and equipment are in place to contain and cleanup any spills, and ensure appropriate notification procedures are followed. Overall, implementing this plan would minimize any negative effects to water quality and aquatic resources within the project area that may result from accidental hazardous substance spills.

Fisheries

Mode of Operation

As further discussed in section 2.1.4, *Existing Project Operation*, Green Mountain currently operates the Proctor development in a modified ROR mode. As such, the Proctor reservoir is infrequently drawn down a maximum of 4 feet from its normal headpond elevation of 469.5 to 465.5 feet msl for Independent System Operator-New England (ISO-NE) power emergency conditions, local energy demands, maintenance repairs, or in anticipation of high inflows. The Beldens and Huntington Falls developments are currently operated in instantaneous ROR modes.

Green Mountain proposes to eliminate the existing 4-foot drawdown of the Proctor impoundment, with the exception of infrequent emergency or maintenance repair needs. In lieu of this drawdown, Green Mountain proposes to implement a 1.5-foot peaking mode of operation at the Proctor development when inflows are equal to or greater than 400 cfs from May 1 through June 30, and when inflows are greater than 200 cfs during all other times of the year. When inflow conditions are less than 200 and 400 cfs, respectively, Green Mountain proposes to operate the Proctor development in an instantaneous ROR mode. During peaking operations, Green Mountain also proposes to implement seasonal peaking constraints, which are discussed below in the *Minimum Flows* section.

Green Mountain proposes to continue to operate the Beldens and Huntington Falls developments in instantaneous ROR modes with minimal impoundment drawdowns, except during brief periods, as needed for emergency conditions, local energy demands, or maintenance repairs.

Our Analysis

Reservoir and instream flow fluctuations have been shown to adversely affect the quantity and quality of littoral habitat present within reservoirs and in river reaches downstream of hydropower projects. Rapid changes in reservoir levels and instream

flows can reduce the production of macroinvertebrates, lead to fish stranding, and desiccate fish spawning habitat, as well as any eggs, larval fish, or freshwater mussels that may be present within the substrates. Any such changes in reservoir levels or instream flows can also have negative effects on aquatic vegetation, which provides important forage, rearing, and shelter habitat for juvenile fish species. However, the extent of such effects depends to a large extent on the timing, magnitude, and frequency of the fluctuations.

To assess the effects of proposed project operation on the availability of aquatic habitat within the Proctor reservoir, Vermont Marble conducted a reservoir drawdown study. Due to the hydraulic gradient of Otter Creek upstream of the Proctor dam, the effects of a Proctor impoundment drawdown on aquatic habitat depend largely upon the quantity of inflow into the impoundment. Therefore, Green Mountain analyzed the effects of Proctor reservoir drawdowns on aquatic habitat during worst-case conditions. Specifically, this study assessed the effects of reservoir drawdowns on aquatic habitat during a 7Q10 flow (87 cfs) and a typical September low flow period (326 cfs).[48] During this study, Vermont Marble identified the presence of 6 different types of aquatic habitat within the impoundment at the normal full pond elevation of 469.7 feet msl (table 9).[49] Study results indicated that the two most abundant types of aquatic habitat present in the Proctor impoundment were habitat types 5 and 6, which each represented approximately 30 and 50 percent, respectively, of the total available aquatic habitat. Habitat types 1 through 4 each comprised less than 10 percent of the total available habitat.

Table 9. Types of aquatic habitat present within the Proctor impoundment. (Source: Central Vermont, 2011)

Habitat Type	Description
Habitat 1	Littoral, lentic, predominantly sand/gravel substrate, no vegetation[a,b]
Habitat 2	Habitat 2: Littoral, lentic, predominantly silt substrate, SAV or EAV
Habitat 3	Habitat 3: Littoral, lentic, predominantly silt substrate, no vegetation

[48] A 7Q10 flow is the 7-consecutive-day average low flow expected to occur once every 10 years. Both the 7Q10 and typical September low flow used for this study were calculated using estimated flows at the Proctor dam.

[49] The normal full pond elevation in the Proctor impoundment is 469.5 feet msl; however, to create base mapping for dropdowns evaluations, aerial photography was digitized, which resulted in an elevation of 469.7 feet msl. For consistency purposes, this elevation was used in Green Mountain's subsequent calculations of drawdown/refill times.

Habitat 4	Littoral, lotic, predominantly sand/gravel substrate, no vegetation[c]
Habitat 5	Littoral, lotic, predominantly silt substrate, no vegetation
Habitat 6	Deep, lentic or lotic, silt or sand/gravel substrate

a The littoral zone refers to aquatic habitat near the shoreline.
b Lentic systems are characterized by still waters (e.g., reservoirs).
c Lotic systems are characterized by flowing water (e.g., streams).

Study results indicated that with a 7Q10 inflow of 87 cfs into the Proctor reservoir, a 1-foot drawdown results in the loss of approximately 7 acres of wetted habitat, with each additional foot of drawdown resulting in a loss of 14, 22, and 26 acres of aquatic habitat, respectively. With a full 4-foot drawdown of the reservoir, the total available aquatic habitat is reduced by 30 percent, with the greatest loss of habitat occurring within habitat type 6 (deep water habitat) and approximately 26 acres of habitat transitioning to littoral habitat (figure 5). Figure 5 also indicates that during a Proctor reservoir drawdown, habitat types 2 and 5 are reduced, while habitat types 3 and 4 increase, and habitat type 1 remains relatively unaffected.

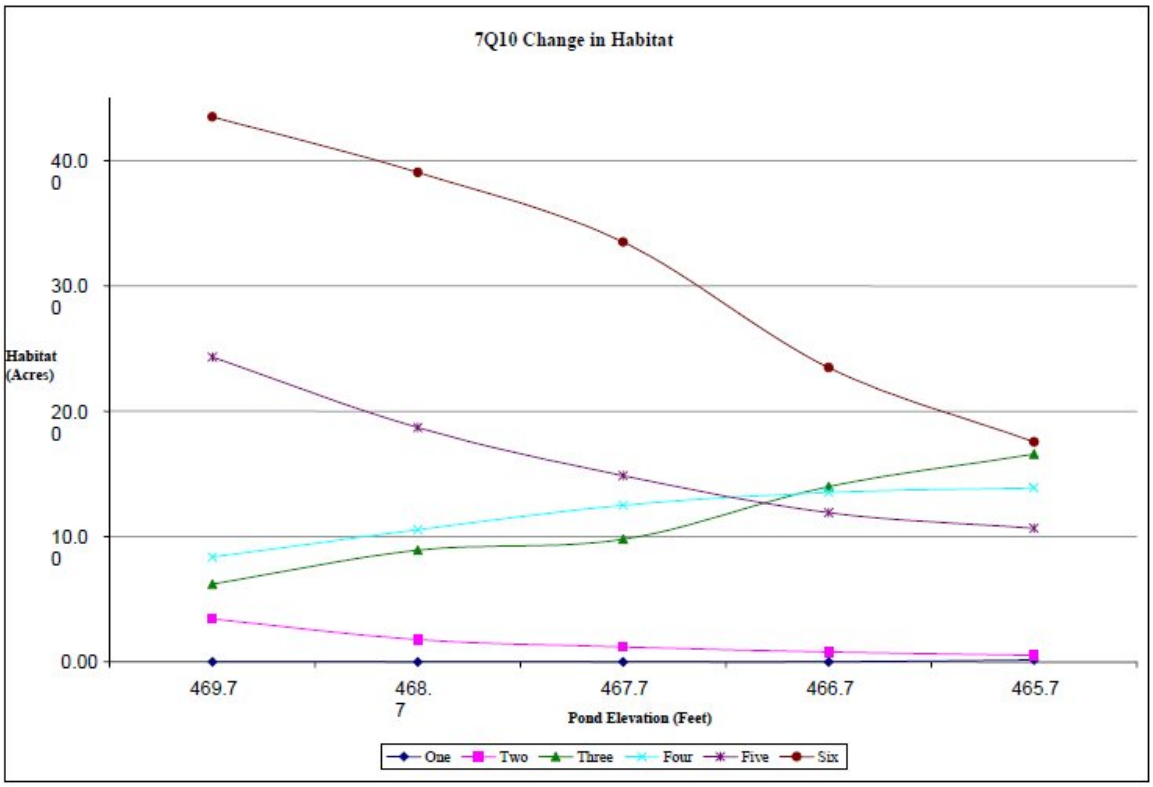

Figure 5. Change in habitat (acres) within the Proctor reservoir with a 4-foot drawdown and an inflow of 87 cfs (7Q10). (Source: Vermont Marble, 2009)

With an inflow of 326 cfs into the Proctor reservoir, a 1-foot drawdown results in the loss of approximately 6 acres of wetted habitat. With each additional foot of drawdown, the loss of wetted habitat is reduced by 12, 18 and 23 acres, respectively. Under these inflow conditions, a full 4-foot drawdown of the Proctor reservoir results in the loss of approximately 24 percent of the total wetted area in the impoundment. However, similar to conditions observed during a 7Q10 inflow, drawing down the impoundment with an inflow of 326 cfs results in: (1) an increase of littoral habitat while the amount of deep water habitat decreases; (2) a reduction of habitat types 2, 5, and 6; (3) an increase in habitat types 3 and 4; and (4) habitat type 1 remaining relatively unaffected (figure 6).

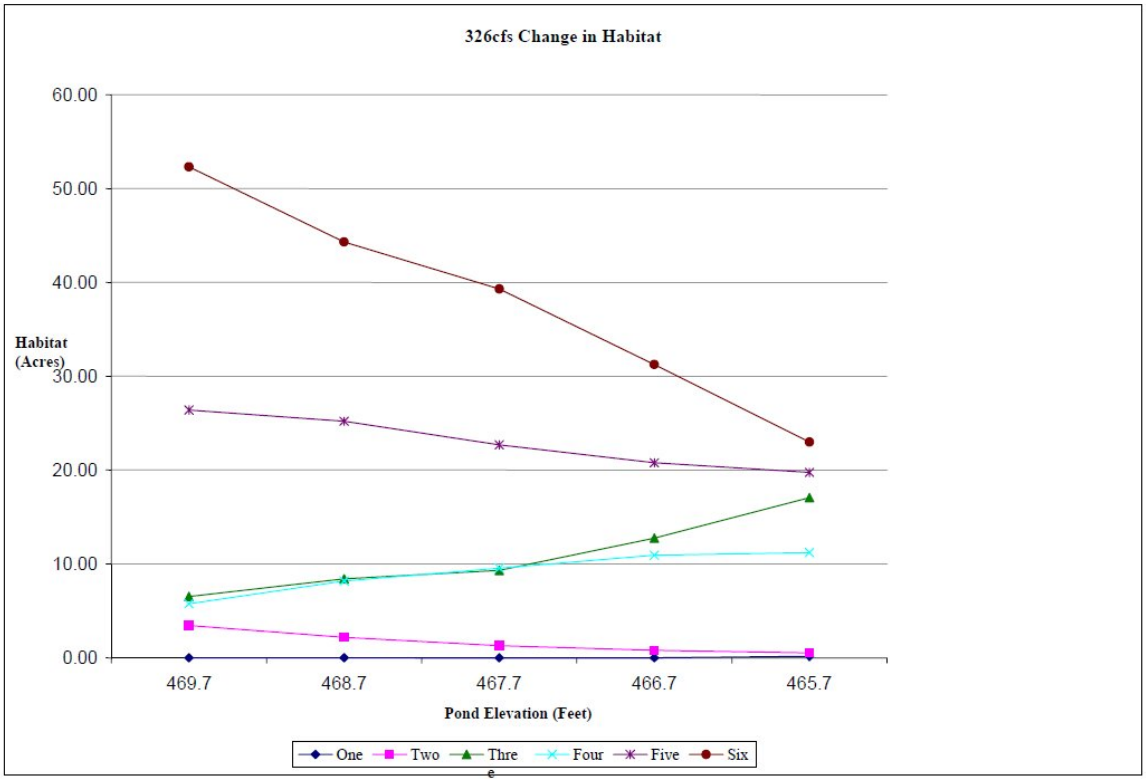

Figure 6. Change in habitat (acres) within the Proctor reservoir with a 4-foot drawdown and an inflow of 326 cfs (i.e., a typical September low flow period). (Source: Vermont Marble, 2009)

Under existing project operations, the maximum 4-foot drawdown of the Proctor impoundment occurs infrequently, approximately once or twice annually, while 1-foot drawdowns occur more often, approximately 10 times per year on average (table 4). As shown in table 4, the majority of these drawdowns for the period of record (2000-2008) occurred during the spring and early summer months (i.e., April through May). Furthermore, table 7 indicates that the Proctor impoundment contains several fish species (e.g., smallmouth bass, yellow perch, bluegill) that are known to spawn in near-shore littoral areas during the spring and early summer months when Proctor reservoir

drawdowns typically occur (FWS, 1983a; FWS, 1983b; Pierce et al, 1986). The Proctor impoundment also contains several other fish species (e.g., longnose dace and northern pike) which are known to predominantly utilize littoral habitat for cover and foraging (FWS, 1982 and 1983c). Under existing conditions, any of these fish species utilizing the 4-foot drawdown zone for spawning, cover, or foraging habitat, are likely disturbed and forced to move from nests or preferred habitats. Furthermore, any eggs located within this dewatered area are likely exposed and subjected to desiccation.

Green Mountain's proposal to operate the Proctor development in an instantaneous ROR mode from May 1 through June 30 when inflows are less than 400 cfs would provide the greatest benefit to fish species that spawn during these months within the littoral areas of the project impoundment and in the reach of Otter Creek immediately downstream from the Proctor development. This includes the majority of the Centrachidae (e.g., bluegill and smallmouth bass) and Cyprinid species (e.g., creek chub and spottail shiner) which are present in the Proctor impoundment and known to spawn in littoral areas during this timeframe (FWS, 1983a; Pierce et al., 1986; Ohio DNR, 2012a and 2012b). Based on the monthly flow duration curves for the Proctor development, ROR operations would be implemented approximately 11 and 44 percent of the time during the months of May and June, respectively, in an average water year. Operating the Proctor development in an instantaneous ROR mode under these conditions from May 1 through June 30 when inflows are less than 400 cfs, would maintain stable water levels during low flow conditions, which would protect fish from stranding in shallow water areas and prevent reductions in near-shore habitat during the critical spawning and egg incubation periods for many of the species identified as being present within the Proctor impoundment and downstream of the Proctor development.

Green Mountain's proposal to operate the Proctor development in a ROR mode throughout the remaining months of the year when inflows are less than 200 cfs would provide similar benefits to juvenile and adult fish species that utilize littoral areas of Otter Creek and would otherwise potentially be further stressed by any peaking operations that would coincide with low flow conditions. Because Green Mountain proposes to continue to operate both the Beldens and Huntington Falls developments in year-round instantaneous ROR modes, existing habitat conditions within these respective impoundments and in downstream reaches of Otter Creek would also be maintained.

Currently, the Proctor development is managed by Vermont ANR as a coldwater fishery, with the coldwater species of interest including: brown, brook, and rainbow trout.[50] Of these fish species managed by Vermont ANR, only two are spring-spawners: smallmouth bass, which spawn from late May through early June, and rainbow trout,

[50] Smallmouth bass were also included as a species of interest in Green Mountain's aquatic habitat study because existing instream flow requirements downstream of the Proctor development were developed for the protection of this fishery.

which spawn from mid-April through late June (Central Vermont, 2011). Green Mountain's proposal to operate the Proctor development in an instantaneous ROR mode from May 1 through June 30 when inflows are less than 400 cfs would likely provide an overall benefit to smallmouth bass populations upstream and downstream of the development, as previously discussed.

Adult trout generally prefer habitat type 4 (littoral, lotic, predominantly sand/gravel substrate, no vegetation) and spawning trout typically prefer habitat type 1 (littoral, lentic areas of streams with gravel substrates) (table 9). At a full pond elevation of 469.7 feet msl there is little (approximately 8.4 acres) habitat type 1 within the Proctor impoundment. Although there is limited trout spawning habitat within the Proctor impoundment, Green Mountain's proposed ROR operations during low flow conditions from May 1 through June 30 would maintain this limited spawning habitat for rainbow trout; however, the overall benefits of proposed project operations on rainbow trout spawning habitat are expected to be limited since most spawning occurs upstream of the impoundment, outside the reach of Otter Creek affected by project operations. Furthermore, by holding the Proctor reservoir elevation steady during this period, figures 5 and 6 indicate that less habitat type 4 is available for adult rainbow than there would otherwise be if the impoundment were drawn down below this elevation.

Green Mountain is proposing to implement its proposed 1.5-foot peaking mode of operation at the Proctor development when inflows are greater than 200 cfs during the months of July 1 through April 30 and when inflows are greater than 400 cfs during the months of May 1 through June 30. It is expected that because these reservoir fluctuations would occur outside low flow conditions and the peak spawning times for the majority of warmwater fish species present within the impoundment, the spawning success and overall health of resident fish communities within the Proctor impoundment would not be negatively affected. And as previously discussed, because little adequate spawning habitat exists for trout within the Proctor impoundment, brook and brown trout populations, both of which are fall-spawners and Vermont ANR-managed species, would also be unlikely to be affected by proposed peaking operations in the fall, which under Green Mountain's proposal would be implemented once inflows exceed 200 cfs. Additionally, most juvenile and adult fish species utilizing littoral areas for cover, rearing, or foraging, would be able to seek refuge from these drawdowns by migrating to other locations within the impoundment.

Proposed peaking operations, in combination with the existing hydraulic gradient upstream of Proctor dam and inflow to the Proctor reservoir, would however influence the overall habitat characteristics and types of habitat available to fish species present in the impoundment. For example, as shown in figures 5 and 6, Green Mountain's 1.5-foot drawdown of the Proctor impoundment would have the largest affect on habitat types 5 and 6, resulting in the loss of approximately 5 to 6 acres of both habitat types with a 7Q10 inflow. Similarly, with an inflow into the reservoir of 326 cfs, habitat types 5 and 6

are also reduced by 2 and 9 acres, respectively. Generally, for fish species present within the impoundment, habitat type 5 is utilized by the majority of fish during the fry, adult, and spawning lifestages, while habitat type 6 provides habitat for most adult fish species. Also, under both inflow conditions, habitat types 3 and 4 would increase by approximately 2 to 3 acres, while habitat type 2 would decrease by approximately 1 to 2 acres. Habitat type 3 is similar to habitat type 5 in that it is utilized by the majority of species present with the Proctor impoundment during all lifestages. Habitat type 4 provides habitat for adult trout and Centrarchids, and spawning habitat for smallmouth bass and Cyprinids. Overall, this indicates that a complex relationship exists between the types and quantity of aquatic habitat available at different Proctor reservoir elevations. Although preferred habitat types for some species and lifestages will be reduced under Green Mountain's proposed 1.5-foot drawdown, other types of preferred or suitable habitat for other species/lifestages would likely increase.

Overall, the timing and magnitude of Green Mountain's proposed peaking operations would minimize negative effects to fish communities within the Proctor impoundment and in downstream reaches of Otter Creek. Green Mountain's proposal to operate the Proctor development in a ROR mode during low flow conditions to minimize the effects of peaking operations on aquatic resources would maintain the existing health of the fishery and aquatic resources within the Proctor impoundment. Lastly, continuing to operate the Beldens and Huntington Falls developments in instantaneous ROR modes would maintain the health of the existing aquatic resources in these project-affected reaches of Otter Creek.

Minimum Flows

Proctor Development

Flow releases from operating hydroelectric projects affect aquatic habitat by regulating the volume and timing of flows downstream of the project, both in bypassed reaches and in river reaches downstream of project powerhouses. Under the existing license, there is no minimum flow requirement for the Proctor bypassed reach. However, the existing license does require that 50 percent of the inflow into the Proctor impoundment be released downstream of the Proctor powerhouse during April, May, and the first two weeks of June. During the remainder of the year, Green Mountain is required to release 100 cfs, or inflow, whichever is less, downstream of the Proctor powerhouse.

Green Mountain proposes to operate the Proctor development in an instantaneous ROR mode (i.e., maintain a stable reservoir elevation) from July 1 through April 30, when inflow is less than 200 cfs, and from May 1 through June 30, when inflow is less than 400 cfs. At all other times, Green Mountain proposes to operate the Proctor development with up to a 1.5-foot drawdown/refill cycle (i.e., peaking mode). During

peaking operations at the Proctor development, Green Mountain proposes the following maximum ratios over a 24-hour period between the maximum and minimum daily powerhouse flow releases:

- from May 1 to June 30, 1.5:1 when inflow is equal to or greater than 400 cfs;
- from July 1 to July 15, 1.5:1 when inflow is between 200 and 400 cfs, and 2:1 when inflow is equal to or greater than 400 cfs;
- from July 16 to December 15, 2.5:1 when inflow is between 200 and 400 cfs, and 3:1 when inflow is equal to or greater than 400 cfs;
- from December 16 to March 15, 3:1 when inflow is equal to or greater than 200 cfs; and
- from March 16 to April 30, 2.5:1 when inflow is between 200 and 400 cfs, and 3:1 when inflow is greater than or equal to 400 cfs.

Green Mountain proposes to maintain a minimum flow of 60 cfs in the Proctor bypassed reach.

Our Analysis (Proctor Tailrace)

As previously discussed, Green Mountain proposes to eliminate its 4-foot drawdowns of the Proctor impoundment as currently licensed, with the exception of infrequent emergency or maintenance repair needs. However, if the Proctor impoundment were to be drawn down as a result of maintenance or emergency purposes, project generation may need to be reduced in order to refill the impoundment, potentially resulting in a reduction of downstream flows. Because reducing downstream flows to refill the impoundment has the potential to affect the quantity and quality of aquatic habitat downstream of the Proctor development, Vermont Marble: (1) evaluated the effects of reducing flow through the generating units in the event that the Proctor impoundment needed to be refilled as a result of a drawdown during low-flow conditions; and (2) assessed the adequacy of the current minimum downstream flow requirements at protecting and providing suitable aquatic habitat for the existing aquatic community.

In 2008, Vermont Marble, in consultation with Vermont ANR, conducted a modified incremental instream flow study. The study methodology was based upon an instream flow study conducted for the Canaan Hydroelectric Project (FERC Project No. 7528). In summary, the instream flow study for the Proctor bypassed reach utilized a modified Instream Incremental Flow Methodology (IFIM) that relied on empirical measurements of depth and velocity gathered during the release of a range of pre-

determined flows.[51] Habitat suitability was determined on the basis of weighted wetted width.[52]

Vermont Marble modeled habitat suitability for the target species and lifestages (i.e., adult brown trout, adult and juvenile smallmouth bass, fallfish, and macroinvertebrates) at flows that were selected based on percentages of the aquatic base flow (ABF) of 198 cfs. The following flows were modeled: 47 cfs (23 % of ABF), 75 cfs (38 % of ABF), 100 cfs (50 % of ABF), 150 cfs (75 % of ABF), and 198 cfs (100 % of ABF).[53, 54] The results of this study indicated that the inflection points on habitat-flow curves for all of the target species occur between 75 and 100 cfs (figure 7).[55] As shown in figure 7, the only target species in which weighted usable width (WUW) increases significantly with flows greater than 100 cfs is adult fallfish, as depth and velocity continue to increase and approach optimal conditions for this species across the study area. Study results also indicated that with minimum flows of at least 75 cfs downstream of the Proctor development, the Otter Creek river channel remains fully wetted and provides suitable depths and velocities for all target species. For flows below 47 cfs, the

[51] The IFIM provides a technical basis for evaluating the incremental effects on fish habitat resulting from incremental changes in stream flow. The stream flow releases and associated habitat effects are typically modeled using the Physical Habitat Simulation Model (PHABSIM); however, in this instance, the IFIM evaluation relied on empirical point-based stream flow and habitat data rather than a simulated range of stream flow and habitat data generated by PHABSIM. For this reason, the approach is here referred to as a "modified" IFIM.

[52] Additional details pertaining to the methodologies used for this study are available in Vermont Marble's instream flow study report (Vermont Marble, 2009).

[53] ABF is a flow statistic similar to August median flow, which is considered to be a default standard-setting flow recommendation for the determination of minimum instream flows in the absence of site-specific information. Because it is approximately equivalent to the naturally occurring August median flow, it is considered to be a threshold to which aquatic biota can tolerate and be subjected to on an annual basis depending on the water-year type.

[54] Vermont Marble, in consultation with Vermont ANR, chose adult brown trout, fallfish, and macroinvertebrates as target species because they were also the target species chosen for the Proctor bypass instream flow study. Juvenile and adult smallmouth bass were chosen because this reach is managed as a warmwater fishery by Vermont ANR.

wetted width of the river channel is substantially reduced, resulting in a loss of habitat, exposed shorelines, and mudflats.

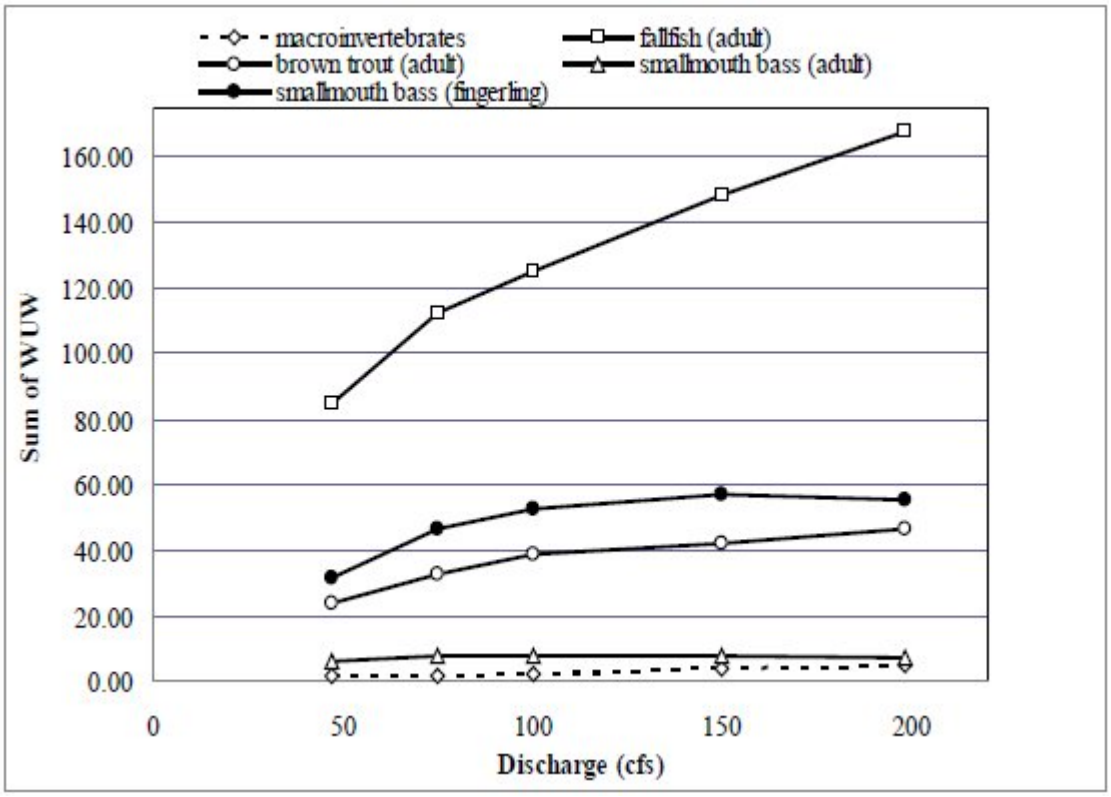

Figure 7. Summary of the total amount and expected change in suitable habitat (expressed as WUW) for all species under evaluation in the Proctor tailrace area. (Source: Vermont Marble, 2009)

As further discussed in section 2.2.2, *Proposed Project Operation*, Green Mountain proposes to operate the Proctor development in an instantaneous ROR mode from July 1 through April 30 when inflow is less than 200 cfs, and from May 1 through June 30, when inflow is less than 400 cfs. Operating the project in this manner would provide more a more stable flow regime during low-flow conditions, as compared to current operating conditions. However, as flow releases into the Proctor tailrace approach 200 cfs, the percent maximum available suitable habitat for nearly all target species does not change (*see* figure 7), as compared to conditions under the existing 100 cfs minimum flow, with the exception of adult fallfish habitat, which increases by approximately 25 percent.

Because Vermont Marble's modified incremental instream flow study in the Proctor tailrace only assessed habitat suitability for the target species up to a flow of 198 cfs, we are unable to assess the specific effects that Green Mountain's proposed ratios over a 24-hour period between the maximum and minimum daily powerhouse flow releases may have on available WUW downstream of the Proctor development because

peaking operations would only be implemented at inflows greater than 200 or 400 cfs, as previously discussed. Generally, however, Green Mountain's proposal would provide for smaller maximum ratios between maximum and minimum daily flows as inflow to the development decreases, up to the point at which ROR mode would be implemented, and greater maximum ratios between maximum and minimum daily flows as inflow to the development increases. Because the effects of project operations would become somewhat attenuated as inflows increase, Green Mountain's proposed ratios would serve to minimize the difference between maximum and minimum flow releases as inflows decrease and the potential for any negative effects associated with project operations become greater. Furthermore, because less mobile lifestages such as fish eggs and fry would likely be more susceptible to standing effects caused by proposed peaking operations, Green Mountain has generally proposed more restrictive ratios during the timeframes when these lifestages of warmwater fish species would be present within the potentially affected reaches of Otter Creek (i.e., May 1 through July 30). Alternatively, during periods in which fishery resources would not be as susceptible to the effects of ramping and are generally more mobile and able to avoid stranding, Green Mountain has proposed less restrictive ratios.

Overall, Green Mountain's proposal to operate the Proctor development in a ROR mode once inflows are below 200 or 400 cfs, depending upon the time of year, would adequately protect aquatic resources in Otter Creek downstream from the Proctor development's tailrace by maintaining or increasing the majority of the existing preferred habitat for the species of interest, including smallmouth bass, a Vermont ANR-managed species. Also, implementing Green Mountain's proposed peaking ratios would minimize the effects of peaking operations on aquatic resources downstream of the Proctor development. Because project maintenance or emergencies would necessitate the refilling of the Proctor impoundment, we further discuss the potential effects of reservoir refilling on aquatic resources in the *Reservoir Drawdown and Refill* section below.

Our Analysis (Proctor Bypassed Reach)

The Proctor bypassed reach is approximately 680 feet long and consists of a series of bedrock-controlled falls, a solitary deep pool, and alternating reaches of fast water and cascades. Vermont ANR stated that the large pool within the bypassed reach was the habitat of primary concern.[56] Although the gradient of the bypassed reach hydrologically isolates this pool from the mainstem of Otter Creek and prevents upstream fish passage, it likely serves as an important refuge area for fish that pass over the Proctor dam and hold in this pool prior to moving downstream.

[56] The pool is approximately 125 feet long by 57 feet wide and makes up approximately 18 percent of the entire Proctor bypassed reach.

We analyzed the results of Vermont Marble's instream flow study to assess an appropriate flow for the Proctor development's bypassed reach. Study results indicated that the inflection points on the habitat-flow curves for both adult brown trout and adult fallfish occur at 54 cfs, and for macroinvertebrates the inflection point was observed at 83 cfs (table 10). With Green Mountain's proposed bypassed reach flow of 60 cfs, the percent of maximum WUW for both adult brown trout and adult fallfish is approximately 86 and 93 percent, respectively. Although habitat suitability continues to increase for adult brown trout and adult fall fish as flow releases exceed 54 cfs, gains in maximum suitable habitat occur at a reduced rate. For macroinvertebrates, the inflection point occurs at 83 cfs, yielding a percent of maximum WUW of 90.

Table 10. Available WUW and percent of maximum suitable WUW for adult brown trout, adult fallfish, and macroinvertebrates at incremental target flows in the Proctor bypassed reach. (Source: Green Mountain, 2009)

	Adult Brown Trout		**Adult Fallfish**		**Macroinvertebrates**	
Discharge (cfs)	**Total WUW**	**Percent of Maximum WUW**	**Total WUW**	**Percent of Maximum WUW**	**Total WUW**	**Percent of Maximum WUW**
10	6.1	3.1 %	25.5	37.8 %	0	0 %
25	9.1	64.5 %	45.1	66.9 %	0	0 %
54	12.1	85.4 %	63.0	93.3 %	5.8	33.9 %
83	12.7	89.6 %	65.3	92.7 %	15.5	90.4 %
149	13.9	97.9 %	67.5	96.8 %	16.8	97.8 %
218	14.2	100 %	67.5	100 %	17.2	100 %

Under existing conditions, spill into the Proctor bypassed reach occurs approximately 24 percent of the year. During non-spill conditions, the only water present in this bypassed reach is approximately 2 to 3 cfs of leakage, which provides limited aquatic habitat. Under Green Mountain's proposal, the maximum hydraulic capacity of the project would be increased by 260 cfs and spill into the bypassed reach would be reduced approximately 5 percent of the time, as compared to existing conditions; however, Green Mountain's proposal to release a minimum flow of 60 cfs into the bypassed reach would ensure the reach remains wetted on a year-round basis, providing more stable habitat conditions for aquatic resources. Based on the results of Vermont Marble's flow study, releasing a flow of 60 cfs into the bypassed reach would greatly enhance aquatic habitat for the target species within this pool, providing approximately 86, 93, and 45 percent of maximum WUW, respectively, for adult brown trout, adult fallfish, and macroinvertebrates. Of the target species, only macroinvertebrates would benefit significantly from increasing bypassed flow above 60 cfs. Specifically, releasing a bypassed reach flow of 83 cfs would provide an additional 50 percent of the maximum WUW (90.4 percent WUW) for macroinvertebrates, as compared to Green Mountain's proposed 60 cfs bypassed reach flow.

Beldens Development

Green Mountain proposes to release a minimum bypassed reach flow of 10 and 25 cfs over the east and west Beldens dams, respectively, to improve downstream habitat conditions for resident aquatic species in the Beldens bypassed reaches.

Our Analysis

Because the bypassed reach at the Beldens development consists mainly of bedrock pools and gorge-type habitat, Vermont Marble, in consultation with Vermont ANR, decided the bypassed reach was not suited to a standard transect-based IFIM study. In lieu of an IFIM-based study, Vermont Marble evaluated the turn-over rate of the two largest pools in the western channel of the bypassed reach to evaluate water quality under existing conditions and a range of alternative bypassed reach flows. As part of this study, DO and water temperature were monitored over a range of flows (10 to 65 cfs) to assess the quality of aquatic habitat under these flow releases.[57] Green Mountain also implemented an evaluation of the change in physical habitat (i.e., edge-velocity and depth) at these same flow releases to collect information pertaining to habitat suitability for the three target fish species discussed below.[58]

Under the existing license, Green Mountain is required to release a minimum flow of 5 cfs to the western bypassed reach and approximately 5 cfs of leakage from beneath the eastern dam keeps this portion of the bypassed reach wetted during non-spill, low-flow conditions (e.g., July and August). However, because of the morphology of the bypassed reach, as further discussed in section 3.3.1, *Aquatic Habitat*, during non-spill conditions at the Beldens development, more than half the water resulting from leakage in the eastern channel discharges into the lowermost western bypassed channel pool via a crossover channel which serves to connect the two separate bypassed reaches. Therefore, under existing conditions with no spill at the Beldens development, the lowermost western bypassed channel pool receives approximately 8 cfs of flow. Under these existing flow conditions, study results indicated that: (1) the Beldens bypassed reach pools had edge velocities that ranged from -0.10 to 0.23 fps with an average edge velocity of 0.09 fps; and (2) turnover rates of the lower and upper pools within the western bypassed reach were 47 and 54 minutes, respectively.

[57] The range of flows selected for this study mimicked the flow releases evaluated as part of the aesthetics flow study, as further discussed in section 3.3.5, *Recreation, Land Use, and Aesthetics*.

[58] Due to the depth of the upper pool/gorge, Vermont Marble was only able to collect data near the downstream end of the upper pool.

Because the Beldens bypassed reach is primarily dominated by a bedrock substrate, and is subject to high-intensity flows during spill conditions, it likely provides limited long-term instream cover or habitat for aquatic species, including the target species Vermont Marble selected in consultation with Vermont ANR for this study (i.e., adult brown trout, adult fallfish, and benthic macroinvertebrates). However, these bypassed reaches may provide short-term habitat for aquatic organisms that pass over the Beldens dams and temporarily hold within these pools before moving into downstream reaches of Otter Creek. Because of the morphology of the Beldens bypassed reach, Green Mountain's proposal to provide a 10-cfs minimum flow to the east channel and a 25-cfs minimum flow to the west channel would result in a flow of 25 cfs to the upper pool below the western dam and approximately 30 cfs to the lower pool. Under this proposal, the turnover time of water would decrease from 47 to 12 minutes in the lower pool, and 54 to 10 minutes in the upper pool. Over the range of flows evaluated, DO concentrations remained high and stable (between 11.6 and 11.8 mg/L) throughout the bypassed reach, indicating Green Mountain's proposed minimum flows would continue to provide high DO concentrations throughout the entire bypassed reach, thereby benefiting aquatic species.

With minimum bypassed reach flows of 20, 30, 45 and 65 cfs divided between the eastern and western dams (table 11), the overall average edge velocities in both pools combined increased to 0.13, 0.17, 0.20, and 0.27 fps, respectively. Based on the habitat suitability index curves provided by Vermont ANR, velocities of 0.5, 0.10 to 0.8, and 1 to 3.5 fps are considered optimal for adult brown trout, adult fall fish, and macroinvertebrates, respectively.[59] Therefore, compared to existing conditions, Green Mountain's proposed bypassed reach flows of 10 and 25 cfs for the east and west bypassed reach channels, respectively, would increase edge velocities within the Beldens bypassed reach and provide habitat conditions more suitable for all three target species.

Table 11. Channel discharge in the Beldens bypassed reach used for habitat/turnover rate evaluation. (Vermont Marble, 2009)

Channel Flow (cfs)			
East Dam-Right Channel	**East Dam-Left Channel**	**West Dam**	**Total Flow**
2	3	5	10
5	7	8	20
7	11	12	30
12	15	18	45
18	21	26	65

[59] The habitat suitability index curves are provided in Appendix B to Vermont Marble's instream flow study report (Vermont Marble, 2009).

Huntington Falls Development

To protect aquatic resources, Green Mountain proposes to provide a 66-cfs minimum instream flow to the bypassed reach at the Huntington Falls development.

Our Analysis

The Weybridge Hydroelectric Project (FERC Project No. 2731) is located at RM 19.5, approximately 1.5 miles downstream of the Huntington Falls development, and is also owned and operated by Green Mountain. Because the Weybridge impoundment abuts the Huntington Falls tailwater pool, the effect of drawing down the Weybridge impoundment on flows and aquatic habitat availability within the Huntington Falls bypassed reach was raised as a concern by Vermont ANR.[60]

In October 2008, Vermont Marble conducted a study in consultation with Vermont ANR to assess the effects of a Weybridge reservoir drawdown on aquatic biota and associated habitat within the Huntington Falls bypassed reach. Changes in the water surface elevation and shoreline exposure were monitored by comparing conditions within the bypassed and tailrace reaches prior to, and after, a full 2-foot drawdown of the Weybridge impoundment. Results of this study indicated that a 2-foot drawdown of the Weybridge reservoir resulted in a maximum water surface elevation decrease of 2 and 2.75 inches within the Huntington Falls bypassed and tailrace reaches, respectively. Additionally, as a result of the 2-foot drawdown, no loss of shoreline habitat within the bypassed or tailrace reaches was observed.

Overall, results of Vermont Marble's drawdown study of the Weybridge reservoir indicates that the full 2-foot drawdown of the impoundment has minimal effects on water elevations within the Huntington Falls tailrace and bypassed reaches. These results further indicate that increasing minimum flow releases from the Huntington Falls development in the event of a Weybridge reservoir drawdown would not be necessary to maintain water levels or littoral habitat for aquatic resources downstream of the Huntington Falls development because water depth remains relatively unaffected under normal project operations at Weybridge Project.

[60] Article 403 of the existing license for the Weybridge Project: (1) allows for a maximum drawdown of 2 feet during normal (non-emergency) operations from June 16 through March 31; (2) eliminates reservoir drawdowns from April 1 through June 15; (3) eliminates reservoir drawdowns of 2 feet, except as needed for emergency or maintenance activities; and (4) prohibits any reservoir drawdowns from April 1 through June 15.

In 2009, Vermont Marble also conducted a modified instream flow study in consultation with Vermont ANR to assess the relationship between instream flow and habitat suitability for adult fallfish along the perimeter and surface of the pool located within the Huntington Falls bypassed reach.[61] Depth and velocity measurements were collected at four target flows (i.e., 16, 66, 155, and 276 cfs) to compare the resultant conditions to existing habitat suitability criteria for fallfish.

Results of this study indicated that edge velocity in the Huntington Falls bypassed reach pool ranged from -0.36 fps (276 cfs) to 1.88 fps (276 cfs) and the average velocity for all four flows ranged from 0.01 fps (16 cfs) to 0.36 fps (276 cfs) (table 12). Also, the majority of velocity measurements at the lowermost flow threshold (16 cfs) were less than 0.10 fps, which is considered the lowermost velocity that is suitable for adult fallfish. As flow increased to 66 cfs, approximately 45 percent of point velocity measurements were within the 0.1 to 0.8 fps range, which is considered optimal for adult fallfish. At 155 and 276 cfs, the number of point velocity measurements within the 0.1 to 0.8 fps range diminished as water velocity increased above the suitability threshold, or eddies and counter-currents developed as a result of increased discharge.

Table 12. Minimum, maximum, and average depth and velocity measurements taken along the perimeter of the Huntington Falls bypassed reach pool at four flow thresholds. (Source: Green Mountain, 2011)

	16 cfs		**66 cfs**		**155 cfs**		**276 cfs**	
	Depth (feet)	**Velocity (fps)**	**Depth (feet)**	**Velocity (fps)**	**Depth (feet)**	**Velocity (fps)**	**Depth (feet)**	**Velocity (fps)**
Minimum Value	0.05	-0.29	0.20	-0.14	0.20	-0.15	0.30	-0.36
Maximum Value	4.00	0.17	4.00	0.39	4.10	0.45	4.10	1.88
Average Value	1.66	0.01	1.65	0.10	1.65	0.11	1.66	0.36

The habitat suitability index curves provided by Vermont ANR for adult fallfish indicate that this target species prefers water depths of 3 feet or greater and water velocities between 0.10 and 0.80 fps. Information provided by Vermont ANR also indicates that adult fallfish generally prefer gravel substrates, but that all habitat types are utilized equally. As shown in table 12, mean water depths within the bypassed reach

[61] Vermont ANR stated that adult fallfish was the most applicable target fish species for this study given this species' preference for water depths greater than 3 feet and the deep water characteristics of this study reach. Vermont ANR also stated that substrate is not important for adult fallfish and that this target species can be expected to inhabit near-shore areas where ledge and rocks provide the necessary cover.

pool remain relatively constant, ranging from 0.1 to 4.1 feet as flow releases increase from 16 to 276 cfs. The greatest percentage of point velocity measurements within the optimal range (i.e., 0.10 to 0.80 fps) for adult fall fish occurred at a bypassed reach flow release of 66 cfs (45 percent). At bypassed reach flows of 16, 155, and 276 cfs, the percentage of point velocity measures within the optimal range for adult fall fish was reduced to 2, 36, and 29 percent, respectively.

Overall, study results indicate that increasing flows to 66 cfs into the Huntington Falls bypassed reach, as proposed by Green Mountain, increases suitable habitat (i.e., water velocity) for adult fallfish. Because water depths remained relatively unchanged at various flow releases from the Huntington Falls development, this also suggests that existing cover in this reach provided by water depth, large boulders, and uplifted bedrocks slabs would remain available to adult fallfish with a bypassed reach flow of 66 cfs.

Reservoir Drawdown and Refill

As previously discussed, Green Mountain proposes to release a minimum flow to each of the project's bypassed reaches. However, Green Mountain does not propose any specific measures to protect aquatic resources downstream of the project developments in the event generation at any of the three developments is curtailed to refill a project reservoir after an emergency or maintenance-related drawdown.

In its January 22, 2013, comments on the draft EA, Green Mountain commented that the existing license requirement to release 50 percent of project inflow from the Proctor development from April through mid-June is no longer relevant. Green Mountain states that it anticipates Vermont ANR will require its standard refill operations condition as part of its water quality certification. Green Mountain further states that this condition typically requires that 90 percent of the inflow to the development be released downstream while refilling the reservoir. In its January 22, 2013, comments on the draft EA, Vermont ANR confirmed that in its water quality certifications, it typically requires 90 percent of project inflow to be released during reservoir refill, which Vermont ANR further states would supersede the existing license requirement to release 50 percent of project inflow during the months of April and May, and the first two weeks of June.

Our Analysis

Scheduled project maintenance or emergency reservoir drawdowns of the project reservoirs would result in the need to refill the reservoirs, which could limit the amount of water being released downstream of the respective project developments. Under proposed project operations, maintaining flows in Otter Creek downstream of the project developments during reservoir refill operations would be necessary to protect aquatic habitat. Releasing 90 percent of inflow to the Proctor, Beldens, and Huntington Falls

developments during refill of these impoundments would ensure that downstream flows would not be interrupted and aquatic habitat is maintained while project impoundments are being refilled. Furthermore, as compared to existing conditions, releasing 90 percent of project inflow during refill operations would provide downstream flows more similar to natural conditions, thereby benefiting aquatic resources in the Proctor tailrace. Table 13 illustrates the time (in hours) that would be needed to refill the Proctor impoundment after a 4-foot emergency/maintenance drawdown with inflows ranging from 40 to 2,000 cfs.

Table 13. Time required to refill the Proctor impoundment after a 4-foot drawdown for inflows ranging from 40 to 2,000 cfs. (Source: Central Vermont, 2011)

	Impoundment Refill Rate		
River Flow (cfs)	**90 percent of Inflow Passed**	**Time (hours)**	**Total time (days)**
40	36	373.2	15.5
87	78	202.5	8.4
100	90	192.7	8.0
200	180	103.7	4.3
326	293	76.2	3.1
500	450	39.5	1.6
1000	900	15.5	0.6
2000	1800	5.3	0.2

Lastly, consulting with Vermont ANR prior to implementing any maintenance drawdowns of the project impoundments would ensure any such drawdowns are scheduled during non-biologically critical time periods (e.g., spawning periods), to the extent possible, to minimize adverse effects on aquatic resources.

Operational Compliance Monitoring

Operational compliance monitoring is a standard requirement in all Commission-issued licenses. Development and implementation of an operation compliance monitoring plan and schedule would be beneficial in that it would document the procedures Green Mountain would employ to demonstrate compliance with any license requirements for its proposed minimum flows and project operational restrictions. In

addition, development of an operation compliance monitoring plan would clarify what techniques or measures Green Mountain would employ to ensure its proposed minimum flow and operational restrictions are met.

Fish Protection

Proposed project operation could result in fish entrainment into the generating units, and some injury or mortality to these fishes. As further discussed in section 2.2.2, *Proposed Project Operation*, under Green Mountain's proposal, the hydraulic capacities at both the Proctor and Huntington Falls developments would be increased by 260 and 240 cfs, respectively. Therefore, instead of these flows being spilled into downstream reaches of Otter Creek, as occurs under existing conditions, these flows would pass through the turbine-generator units. Therefore, any fish that are entrained in these flow releases would pass through the project's turbine-generator units.

To minimize fish entrainment at the proposed project, Green Mountain proposes to replace the existing turbine-generator unit 3 trashracks at Huntington Falls with 2-inch clear bar spacing trashracks that have maximum approach velocities of less than 2 fps, and are oriented parallel to river flow. At the Proctor development, Green Mountain is authorized to replace the existing trashracks with 1-inch clear bar spacing trashracks, which are oriented parallel to river flow and have approach velocities of 1.9 fps. Green Mountain also proposes to consult with the resource agencies to determine an appropriate modification to the project's trashracks if, at some point in the future, Vermont FWD provides notification to Green Mountain that its fisheries management program is going to resume Atlantic salmon restoration or stocking efforts in Otter Creek.

In regards to the need to modify trashrack spacing the future, in its January 22, 2013 comments on the draft EA, Vermont ANR clarified that consultation between Vermont ANR and Green Mountain to address this issue would not be limited to resumption of a salmon stocking program. Vermont ANR states consultation could also be initiated if other changes in fishery management objectives are anticipated and trashrack bar rack spacing is relevant to meeting those objectives.

Our Analysis

Water intake structures at hydropower projects can injure or kill fish that are entrained through turbines. Typically, fish injury or mortality is caused by fish being struck by turbine blades, or being exposed to pressure changes, sheer forces in turbulent flows, and water velocity accelerations (Knapp et al., 1982). Ultimately, the amount of fish entrainment at a hydroelectric project is dependent upon site-specific factors, including the size, age, and seasonality of entrainment patterns of fish present within the reservoir (EPRI, 1992). Fish that are entrained and killed are removed from the river population and no longer available for recruitment to the fishery.

Under existing conditions, the three project reservoirs and associated downstream reaches of Otter Creek support a diverse community of warmwater and coldwater fish species (table 7) typical of northern New England reservoirs. Under existing conditions, fish within the project reservoirs may pass downstream of the project developments via spill over the project dams or passage through the project intakes, which can result in turbine-induced injury or mortality. Site-specific fish entrainment and turbine-survival data do not exist for existing or proposed project operations; therefore, we reviewed the Electric Power Research Institute's (EPRI) (1997) database[62] to determine a general estimate of likely mortality rates at each of the three project developments.

Nothing in the record suggests that existing levels of fish entrainment, and related mortality, are having an adverse effect on the fish communities in the vicinity of the three project developments. The project likely provides some level of protection from entrainment and entrainment-related injury and mortality via the existing trashracks of various specifications that are installed over the project intakes at each of the three developments (table 14). Currently, turbine-generator unit 3 at the Huntington Falls development[63] has trashracks with 2-inch clear bar spacing, while turbine-generator unit 3 at the Beldens development has trashracks with 3-inch clear bar spacing.[64] Based upon our review of EPRI's (1997) summary of fish entrainment studies, many of the fish species occurring in the project reservoirs are susceptible to entrainment at similar hydroelectric projects, although the extent of entrainment varies among species and from project to project. Overall, most of the fish entrained are typically less than 4 inches long and are often juvenile fish or forage species such as minnows that never exceed a length

[62] EPRI (1997) is a database of the results of 43 fish entrainment studies conducted at hydroelectric projects located primarily in the northeast, southeast, and midwest United States in the early to mid 1990s.

[63] Green Mountain states that when the Huntington Falls turbine-generator unit 3 intake and powerhouse were developed in the late 1980s, the resource agencies required provisions for downstream fish passage and protection because Atlantic salmon were being stocked in the New Haven River watershed as part of the state fisheries management plan. One provision consisted of the installation of the existing trashracks for the turbine-generator unit 3 intake. Green Mountain states that these trashracks create significant icing and debris loading issues which cause significant maintenance issues and generation losses.

[64] Green Mountain states that the unit 3 trashracks at the Beldens development were designed, in consultation with Vermont ANR and USFWS, to prevent entrainment and impingement of resident fish through the units when the site was redeveloped in the 1980s and 1990s.

of 3 or 4 inches.[65] Therefore, although it is likely that trashracks with 2 to 3-inch clear bar spacing prevent some large resident fish from becoming entrained at these developments, trashracks with 2 to 3-inch clear bar spacing are unlikely to prevent smaller fish species from becoming entrained at these locations. Also, because the approach velocities of the existing trashracks are unknown, it is possible that the existing approach velocities exceed the burst speeds of some resident fish species within the project impoundments, thereby resulting in increased levels of fish entrainment.[66]

Table 14. Existing and proposed trashrack specifications at the Proctor, Beldens, and Huntington Falls developments. (Source: Staff, 2012)

Development	Existing Trashrack Specifications	Proposed Trashrack Specifications
Proctor	1-inch clear bar spacing, oriented at 45 degrees to river flow[67]	No proposed change (see footnote 71)
Beldens (turbine-generator units 1 and 2)	1.125 inches on center	No proposed change
(Turbine-generator unit 3)	0.5-inch bars spaced 3.5 inches on center (3-inch clear bar spacing), oriented at 90 degrees to river flow	No proposed change
Huntington Falls (Turbine-generator units 1 and 2)	1.125 inches on center	No proposed change
(Turbine-generator unit 3)	0.44-inch bars spaced 2.44 inches on center (2-inch clear bar spacing), oriented 45 degrees to river flow	2-inch clear bar spacing with maximum approach velocities of less than 2 fps, and oriented parallel to river flow

[65] EPRI found that overall, 90 percent of the fish entrained in the 43 studies were less than 4 inches long.

[66] Burst speed is defined as the highest speed attainable by a fish that can be maintained for only short periods of time, usually less than 20 seconds (Weaver, 1965).

[67] As part of the construction associated with Green Mountain's authorized Proctor intake realignment, Green Mountain would replace the existing trashracks at the Proctor development with new trashracks that would have 1-inch clear bar spacing, maximum approach velocities of 1.9 feet-per-second (fps) and be oriented parallel to river flow.

The existing trashracks servicing the Proctor development and turbine-generator units 1 and 2 at both the Beldens and Huntington Falls developments are more restrictive (i.e., approximately 1-inch clear bar spacing) than those discussed above. It is likely that these trashracks provide greater protection to smaller size classes of fish within the respective project impoundments. It is estimated that most fish 9 inches in length, or longer, would be physically excluded from passing through these trashracks (Lawler et al., 1991). These trashracks with 1-inch spacing may also result in some behavioral avoidance of the trashracks by smaller fish that may be able to physically pass through the bars.

Even though Green Mountain is authorized to install new trashracks with similar specifications to what currently exists (i.e., 1-inch clear bar spacing) at the Proctor development, its proposal to increase the hydraulic capacity at this development may result in increased levels of fish entrainment as a greater quantity of water would be used for generating purposes. Similar effects would likely occur under Green Mountain's proposal to increase the hydraulic capacity of turbine-generator units 1 and 2 at the Huntington Falls development by 120 cfs each and keep the existing trashracks in place. Although the hydraulic capacity of turbine-generator unit 3 at the Huntington Falls development would not be increased and new trashracks with the same clear bar spacing (i.e., 2-inch) and maximum intake velocities of 2 fps would be installed, Green Mountain proposes that these trashracks would be installed parallel to inflow. This parallel orientation to river flow has the potential to subject a greater number of fish to entrainment through project works since the existing trashracks are angled to flow, which may help some fish avoid entering the project intakes. By replacing the existing trashracks (oriented 45 degrees to inflow) at the Proctor development with trashracks oriented parallel to inflow, similar increases in fish entrainment may also occur at this development. However, because the trashracks authorized at the Proctor development, and proposed at the Huntington Falls development, would have maximum intake velocities of approximately 2 fps, the majority of adult resident fish species approaching the intake would have burst speeds that would enable them to avoid entrainment. For smaller fish, because unit 3 at the Huntington Falls development is a Kaplan turbine, and survival estimates in the EPRI (1997) database have shown that survival for fish passing through a Kaplan turbine is generally high (>90%), this further indicates proposed project operation would have limited effects on resident fish populations. Lastly, because Green Mountain proposes to continue to operate the Beldens development in an instantaneous ROR mode, without any upgrades to this developments' existing capacity, existing levels of fish entrainment would likely continue.

As discussed above, it is likely that any increased levels of fish entrainment at the proposed project would affect fish that are 4 inches in length, or less, as indicated by EPRI (1997). However, the loss of individual fish of this size range (which may include juvenile life stages or forage species), which typically experience high natural mortality

rates in river systems unaffected by hydropower operations, would be unlikely to affect the overall fish populations in Otter Creek. Furthermore, many of the fish species (i.e., Centrarchidae) that present are within the project reservoirs and most likely to inhabit areas of the reservoirs near the project intakes, are known to have high fecundity rates. For example, a 6-inch female yellow perch can carry as many as 15,000 eggs, with larger individuals reportedly having many times that number of eggs (Forest Service, 2012). Therefore, the numbers of fish entrained and killed at the Otter Creek Project would likely be small relative to the fecundities of the fish species present at the project, and thus the effects of the individual losses on the health of the fish population as a whole would be minimal.

No evidence has been provided into the record that indicates the State of Vermont will reinstitute management for migratory species within Otter Creek. Additionally, no evidence has been provided into the record which suggests the State of Vermont plans to change its existing fishery management objectives in Otter Creek. Green Mountain's proposal to consult with the resource agencies to determine appropriate modifications to the project's trashracks if, at some point in the future, Vermont FWD does resume Atlantic salmon restoration or stocking efforts in Otter Creek would be an administrative action that would not directly contribute an environmental benefit. This also holds true for Vermont ANR's comments on the draft EA, which suggest consultation and subsequent modifications to project trashracks may be necessary if other fishery management objectives in the Otter Creek watershed change in the future. Any future proposal to replace licensed project facilities (i.e., trashracks) would need to be addressed through an amendment to any license issued for the project.

Fish Passage

Historically, the Vermont FWD stocked anadromous fish species, including steelhead and Atlantic salmon, into Otter Creek near the Huntington Falls and Beldens developments (FERC, 2000). However, these stocking efforts have currently been discontinued in Otter Creek, and management for migratory species is not expected to continue in the immediate future. Currently, there are no migratory fish species present within Otter Creek that are able to access the three project developments. Downstream of the Huntington Falls development, a natural fish barrier (i.e., a set of falls) prevents fish movement from Lake Champlain into Otter Creek and the lower reaches of the river. Furthermore, as shown in table 2, there are a total of 6 dams without fish passage facilities between the Proctor development and Lake Champlain. In addition to these barriers, the 680-foot-long Sutherland Falls prevents fish located immediately downstream of the Proctor development from moving upstream.

Even though overall upstream fish passage within the watershed is limited, existing fish populations within Otter Creek appear to be healthy upstream and downstream of each of the three project developments. Based on the current fishery

management activities within Otter Creek, upstream and downstream fish passage facilities would be unlikely to benefit existing resident fish populations within Otter Creek. Therefore, upstream and downstream fish passage facilities are not warranted at this time.

Freshwater Mussels

Freshwater mussels are considered good indicators of the health of aquatic ecosystems because of habitat requirements that include free-flowing streams and rivers with stable substrates composed of a mixture of gravel, sand, and silt deposits (Parmalee and Bogan, 1998; Williams et al., 1998). Additionally, excess sedimentation in river systems has been shown to adversely affect mussel species, which as filter feeders, require clean, well-oxygenated water (Brim-Box and Mossa, 1999).

Green Mountain's proposal to realign the intake headworks at the Proctor development would require the removal of rock outcropping at the existing intake through the use of blasting and heavy equipment. This has the potential to adversely affect resident mussel populations within the Proctor impoundment by increasing turbidity and sedimentation levels. Furthermore, Green Mountain is proposing to implement a 1.5-foot peaking mode of operation at the Proctor development when inflows are equal to or greater than 400 cfs from May 1 through June 30, and when inflows are greater than 200 cfs during all other times of the year. Any freshwater mussels residing within the 1.5-foot drawdown zone of the Proctor impoundment could be de-watered, resulting in mussel stranding, and mortality associated with desiccation, freezing, or predation within these exposed areas.

Our Analysis

In October 2008, Vermont Marble conducted a freshwater mussel survey in the Proctor impoundment and tailrace to document existing habitat conditions, species composition, and the distribution and relative abundance of mussels. Study results indicated that no live freshwater mussels, shells, or middens were present within the Proctor impoundment. Therefore, Green Mountain's proposal to implement a 1.5-foot peaking mode of operation, and any impoundment drawdowns associated with dam maintenance or emergency purposes, would be unlikely to have any negative effects on freshwater mussels within the Proctor impoundment.

During the Proctor tailrace drawdown study, three species of freshwater mussels were observed to be present in the Proctor development tailrace, including: Eastern elliptio, Eastern floater, and Eastern lampmussel. Additionally, in May of 2012, an additional mussel survey associated with the construction of a new powerhouse access bridge was conducted in the Proctor development tailrace (Green Mountain, 2012b). Results of this study found Eastern elliptio, Eastern lampmussel, and triangle floater

mussels were present in this reach, with overall mussel densities of one live mussel every 2 to 20 square meters.

Green Mountain states that because of the channel form and dominant substrate type (sand and silt), habitat for existing mussel species is maintained until wetted-width begins to diminish at instream flows of less than 75 cfs. As discussed above, Green Mountain proposes to operate the project in a ROR mode once inflows to the Project development are less than 200 or 400 cfs, depending upon the time of year. This would ensure the project would pass all flows into the development once inflow is less than 200 cfs. Any conditions whereby flows in the Proctor tailrace are less than 75 cfs would typically be associated with extreme low-flow conditions. Furthermore, based on Green Mountain's mussel survey (2012b), most live mussels were located toward the middle-third of the channel in coarse sand and gravel substrates, or in the deep pool located within this reach. This suggests that mussels located immediately downstream of the Proctor development do not prefer edge habitat, which has the greatest potential to become dewatered during low-flow conditions. Therefore, based on the results of these studies, proposed project operations are unlikely to affect freshwater mussels inhabiting the Otter Creek reach downstream of the Proctor development.

3.3.2.4 Cumulative Effects

In section 3.2, *Scope of Cumulative Effects Analysis*, we indicate that water quality and aquatic resources may be cumulatively affected by Green Mountain's proposed construction activities and continued operation and maintenance of the Otter Creek Project in combination with other activities in the Otter Creek watershed.

Water Quality

As previously discussed, water quality in Otter Creek has been affected by numerous activities in the watershed, including the construction and operation of dams, seven of which have hydropower facilities, wastewater assimilation, and run-off. All of these uses have the potential to affect water quality, including in-stream water temperatures and DO concentrations. Under existing project operations, water quality monitoring indicates that DO concentrations and water temperatures are consistent throughout the project area and are generally consistent with the State of Vermont's water quality standards for Class B waters. Green Mountain's proposal to increase the bypassed reach minimum flows at each of the three project developments would maintain or potentially improve water quality within these stream reaches. Furthermore, Green Mountain's proposals to continue to operate the Beldens and Huntington Falls developments in instantaneous ROR modes, and eliminate the existing ability to draw down the Proctor impoundment up to 4 feet in lieu of operating in a peaking and ROR mode, as further discussed in section 2.2.2, *Proposed Project Operation*, are expected to maintain similar water quality conditions as those described in section 3.3.2.1, *Water*

Quality. Lastly, realignment of the Proctor intake, improving recreational access at the Proctor development, and improving the canoe/kayak take-out and portage at the Beldens development would result in minimal ground disturbance. However, developing and implementing a soil erosion and sediment control plan would ensure measures are in place to minimize any negative effects (e.g., erosion and instream sedimentation) on water quality associated with these construction activities. Overall, Green Mountain's proposed construction activities and project operations are not expected to contribute any cumulative effects to water temperature or DO in the Otter Creek watershed.

Aquatic Resources

Operation of the proposed project has the potential to contribute to cumulative effects on fisheries resources by causing entrainment-related injury and mortality of resident fish species. These actions could contribute to adverse effects on resident fish populations which are cumulatively affected by entrainment through other hydroelectric projects on Otter Creek (table 2). It is likely that Green Mountain's proposal to increase the hydraulic capacity of the Proctor and Huntington Falls developments would increase existing levels of project-related fish entrainment and lead to a higher rate of fish injury and mortality, as compared to existing conditions. However, the numbers of fish entrained and killed at the Otter Creek Project would likely be small relative to the fecundities of the fish species present at the project, and thus the effects of the individual losses on the health of the fish population as a whole would be minimal.

3.3.3 Terrestrial Resources

3.3.3.1 Affected Environment

Otter Creek is located primarily in the Northern Eastern Highlands ecoregion, characterized by nutrient poor soils with northern hardwood (maple-beech-birch) and spruce-fir forests. The landscapes in the region grade from low mountains in the southwest and central portions, to open high hills in the northeastern areas (EPA, 2012).

Botanical Resources

The Proctor development is located in an area composed largely of deciduous and hardwood-mixed forests, interspersed with wetlands and agricultural lands. Upland species primarily include American basswood, black walnut, red oak, and red maple. The Proctor impoundment is also bordered by corn fields, pumpkin patches, and cattle pastures, causing the fragmentation of the forested areas. The Beldens and Huntington Falls developments are located amongst mixed hardwood and coniferous stands, and deciduous scrub-shrub habitat, as well as some smaller wetlands, agricultural, and residential areas. Upland communities include maple species (red, silver, and sugar), beech, yellow birch, white pine, balsam fir, shagbark hickory, eastern hemlock, bigtooth

and quaking aspen. The associated understory also includes striped hazel, hobblebush, and witch-hazel, along with some long-lived perennials like Christmas fern. In general, all three impoundments have shorelines that are steep and heavily forested.

A variety of wetlands exist in close proximity to the project developments based on the National Wetland Inventory (NWI) classification system. These wetland types include riverine floodplain (R2UBH), palustrine freshwater emergent (PEM), palustrine forested (PFO), and palustrine scrub-shrub (PSS) wetlands. Survey maps from the 2008 study conducted by Vermont Marble (figures 8 and 9), show that the Proctor development appears to have more wetland areas than either the Beldens or Huntington Falls developments. PFO wetlands were the most common wetland types identified throughout the study. Further, the majority of the PSS wetlands were in the early stages of succession toward PFO, or were in between PFO and PEM. While several wetland areas are located within the proposed project boundary, it does not appear that any wetlands are directly adjacent to the dam or powerhouse at the Proctor, Beldens, or Huntington Falls developments.[68]

[68] However, forested wetlands are located just outside the project boundary, northeast of the Proctor dam. Forested wetlands are also located within the project boundary and just southwest of the Huntington Falls dam.

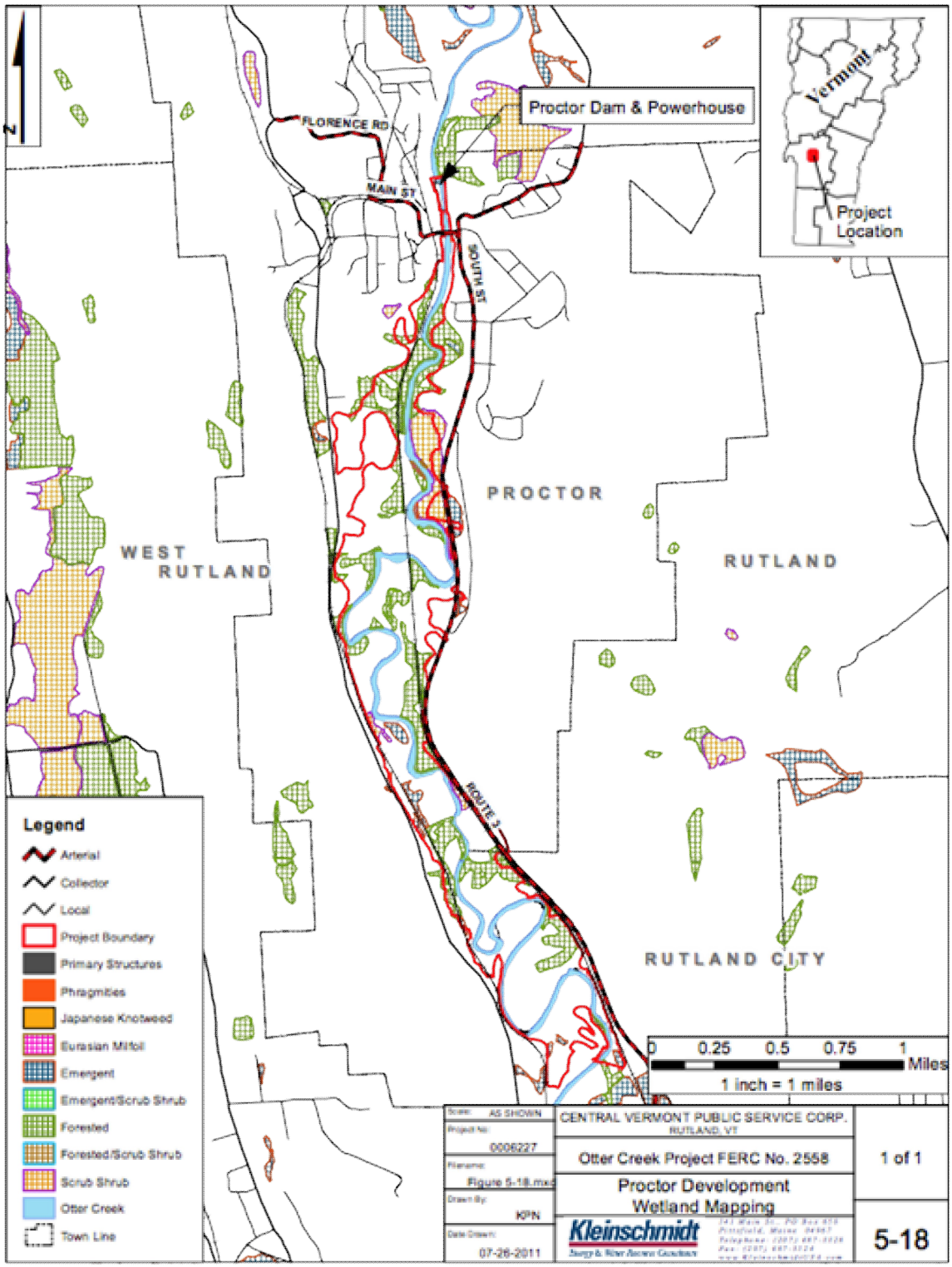

Figure 8. Wetland and invasive species mapping at the Proctor development. (Source: Central Vermont, 2011)

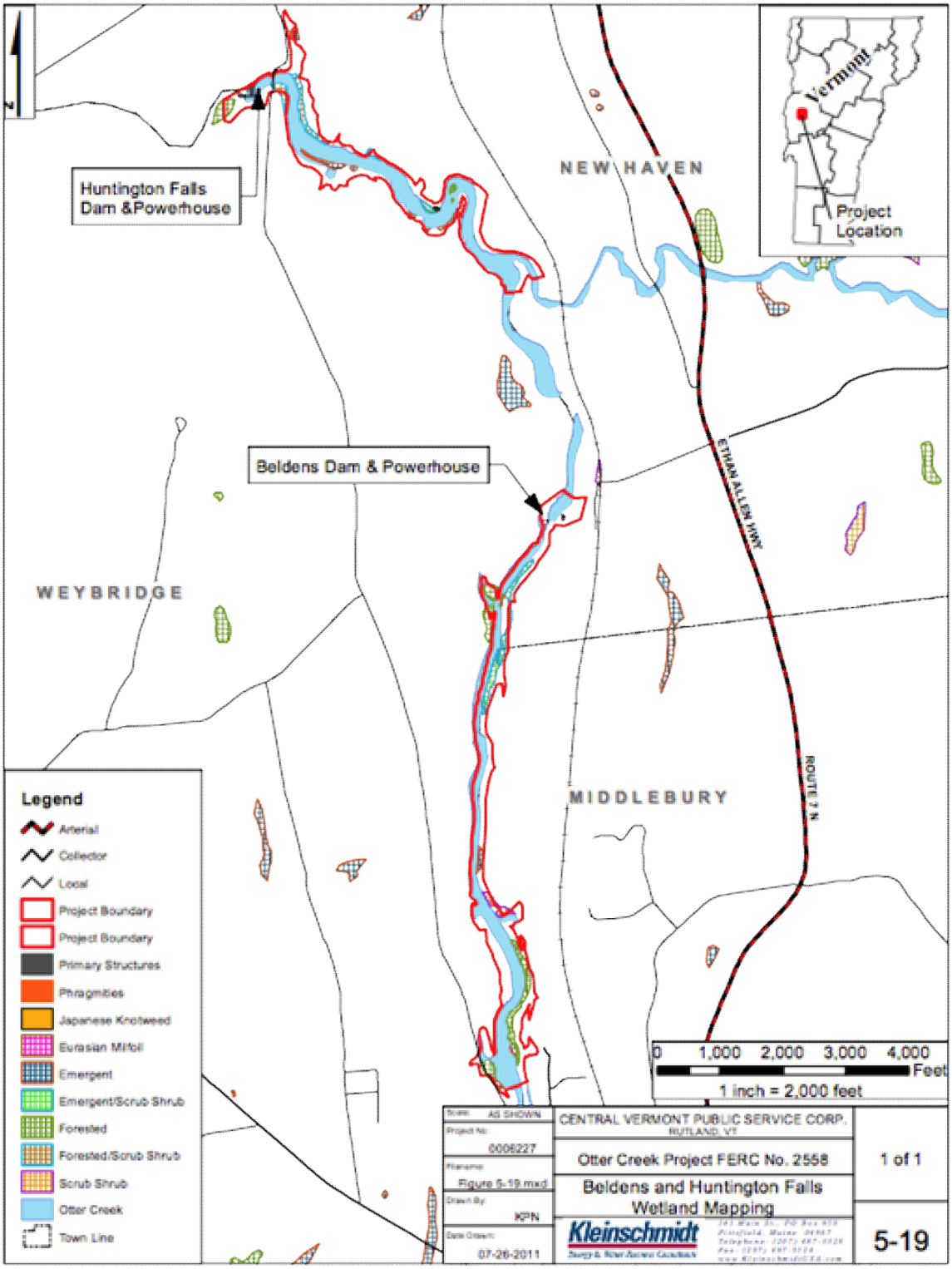

Figure 9. Wetland and invasive species mapping at the Beldens and Huntington Falls developments. (Source: Central Vermont, 2011)

Seven species of invasive plants were identified near the project reservoirs during the 2008 study, namely, Japanese knotweed, common reed, purple loosestrife, flowering rush, common buckthorn, tartarian honeysuckle, and Eurasian water milfoil (table 15).

Table 15. Location and abundance data for invasive plants found during the 2008 survey of the Otter Creek Project. (Source: Central Vermont, 2011, as modified by staff)

Species	Location and Population Description
Japanese knotweed (*Fallopia japonica*)	patches of the species were found in agricultural fields surrounding the Proctor development; in some areas it was encroaching into forested habitat
common reed (*Phragmites australis*)	found in small patches along the Proctor impoundment, mostly associated with drainage ditches adjacent to roads; one population was found in the floodplain just upstream from the Proctor dam
purple loosestrife (*Lythrum salicaria*)	found in a PEM wetland at the Huntington Falls development, though it was not the dominant feature; the wetland contained a wide variety of wetland plants
flowering rush (*Butomus umbellatus*)	only the remnant of a single plant (it had started to go dormant, so identification was difficult) was identified along the Proctor impoundment
Common buckthorn (*Rhamnus cathartica*)	found in scrub-shrub habitat near the Beldens and Huntington Falls developments
tartarian honeysuckle (*Lonicera tatarica*)	common in the scrub-shrub habitat along all three impoundments.
Eurasian water milfoil (*Myriophyllum Spicatum)*	a large mat of this species was found in the Proctor impoundment

Wildlife Resources

Migratory birds and waterfowl utilize the exposed mudflats along the impoundments when water levels are low, and also forage in nearby agricultural fields. Forest-dwelling raptors and numerous songbird species are also known to occupy the forested areas in the vicinity of the project. These species include snow geese, common mallard, black duck, Virginia rail, Cooper's hawk, Red-tailed hawk, rose-breasted

grosbeak, ovenbird, wood thrush, red-winged blackbird, and black-capped chickadee. A bald eagle was also observed in the vicinity of the Huntington Falls development during the 2008 survey. A variety of mammal species are also known to occur in the project area, including but not limited to, black bear, white-tailed deer, moose, red fox, striped skunk, river otter, porcupine, shrews, and various rodent species.

Staff review of the FWS (2012) endangered species list found that the federally endangered Indiana bat (*Myotis sodalis*) is known to occur in Rutland and Addison counties. More specifically, the FWS lists Weybridge, Vermont as one of the towns where the Indiana bat is known to occur.[69] Indiana bats live in colonies, hibernating during the winter in caves, mines, and other underground areas (hibernacula). During the non-hibernation season, Indiana bats live in suitable "roost trees," which are characterized as either dead/dying trees, or live trees with loose bark (i.e., shagbark hickory and black locust), with a diameter of at least 8 inches. Habitat loss and/or degradation, human disturbance in caves, and pesticide use have all contributed to the decline of the species (Vermont FWD, 2008).

3.3.3.2 Environmental Effects

Construction of Proposed Project Facilities

At the Proctor development, Green Mountain has been authorized to realign the intake headworks, such that the entrance would be widened and deepened to reduce significant head losses. Green Mountain also proposes to enhance the tailwater access site at the Proctor development by constructing a gravel parking area for approximately two to three vehicles. Any ground disturbance at the Huntington Falls development would be associated with the movement of heavy equipment necessary to upgrade turbine-generator units 1 and 2, and installation of the new trashrack and other necessary controls (e.g., switchgears, breakers, etc.). No ground-disturbing activities, other than improving the canoe/kayak portage and take-out area at the Beldens development, are proposed at the Beldens development.

Our Analysis

While each development is surrounded by forested habitat, ground-disturbing activities in the project area would be minimal. The majority of the construction-related activities involve the realignment and/or replacement of existing infrastructure to support the increased hydraulic capacity at the Proctor and Huntington Falls developments.

[69] Huntington Falls is located in Weybridge; however, there is no information in the project record showing that Indiana bats exist in the immediate vicinity of this project development.

Realignment of the intake headworks at the Proctor development would require removal of the rock outcropping and trimming of the bedrock face, but very little soil or vegetation would be disturbed. Further, development of a parking area at the Proctor development's tailwater access site, as discussed in section 3.3.4, *Recreation Resources*, would also be relatively small in scope. These improvements would also ultimately prevent recreationists from parking informally in vegetated areas. While some grassy areas may be temporarily disturbed, and soils slightly compacted by the movement of equipment and personnel during construction of the proposed project upgrades, no long-term adverse effects to upland habitats are anticipated.

As stated above, seven invasive plant species were identified in the vicinity of the project. In most instances, the populations identified were small and to the extent known, are located outside of the areas that would be disturbed under Green Mountain's proposed construction activities. However, these species are notoriously prolific in nature and can spread rapidly when disturbed. Even minor disturbances can allow these species to become established in new areas where they often outcompete native species for similar habitat, creating monocultures. Further, aquatic submerged plants like Eurasian water milfoil form surface mats that can interfere with aquatic recreation and lower DO concentrations. Given that a mat of Eurasian water milfoil exists in the Proctor impoundment, special care should be taken not to disturb or allow the mat to break apart during installation of the new intake facilities. When disturbed, each fragment has the ability to root and form a new colony. Therefore, it is extremely important that precautions are taken to avoid areas with invasive plant populations during proposed ground-disturbing activities to prevent further distribution of these species.

While no tree-clearing or major vegetation disturbance have been proposed, some wildlife species could be temporarily displaced due to the noise associated with proposed construction activities. This is particularly important with respect to bald eagles and the Indiana bat, both of which are species protected by federal statutes. While the bald eagle is no longer listed under the Endangered Species Act (ESA), it is still protected by the Migratory Bird Treaty Act, as well as the Bald and Golden Eagle Protection Act. No bald eagle nests were identified at the project, although an individual was observed flying in the vicinity of the Huntington Falls dam. Further, all three project developments have habitat that supports existing or future nesting of bald eagles. Similarly, no evidence of foraging or roosting activity by the federally endangered Indiana bat has been documented. However, the project developments are surrounded by potential roosting trees, including shagbark hickory, ash, elm, and sycamore that could be used by Indiana bats.

FWS states in its February 21, 2013 letter concurring with Commission staff's January 8, 2013 assessment of the project's effects on the federally listed Indiana bat, that adverse effects to Indiana bats may be avoided if a time-of-year restriction of October 30

through April 1 for construction in Indiana bat habitat within the project area is applied.[70] FWS further states that implementation of these time-of-year restrictions would eliminate the need for pre-construction surveys and a monitoring plan since potential roosting habitat would not be eliminated. We concur with FWS's assessment that Indiana bat surveys would not be necessary if construction activities were limited to the October 30 through April 1 timeframe, which is when Indiana bats would be hibernating in areas such as caves and abandoned mine shafts and would be unlikely to be present in any areas slatted for construction.

As stated above, although no tree-clearing activities are proposed by Green Mountain, situations may arise where trees within the project area need to be removed for reasons related to public safety or project access. If such tree removal activities are slated to occur from April 1 through October 31, it would coincide with the non-hibernating season for Indiana bats, which are known to utilize certain tree species as roosting habitat during these months. The removal of any trees during this time period, which serve as Indiana bat roosting habitat, could potentially negatively affect this species through habitat loss, injury, or death.

A terrestrial monitoring and management plan with measures to: (1) survey construction areas for any new evidence of Indiana bat use and potential habitat prior to the commencement of ground-disturbing activities or future tree removal activities that occur between April 1 and October 31; (2) survey construction areas for any new evidence of bald eagle use and potential habitat prior to the commencement of ground-disturbing activities or future tree removal activities; (3) consult with Vermont ANR and FWS on the survey results and any appropriate mitigation measures prior to the commencement of ground-disturbing or future tree removal activities; (4) prevent the spread of invasive plants during construction of proposed project facilities; and (5) restore disturbed areas once construction of proposed project facilities is completed would minimize any potential adverse effects to botanical and wildlife resources associated with the construction and installation of proposed project facilities, and future tree removal activities. With the implementation of this plan, construction of proposed project facilities are not likely to adversely affect botanical habitat, bald eagles or federally endangered Indiana bats, or their respective nesting habitats. ,

Project Operation

Green Mountain proposes to continue instantaneous ROR operations at the Beldens and Huntington Falls developments. At the Proctor development, Green Mountain proposes to implement an instantaneous ROR operation or a 1.5-foot peaking mode, depending upon the quantity of inflow to the development and the time of year, as

[70] *See* FWS's letter filed on February 21, 2013.

further discussed in section 2.2.2., *Proposed Project Operation*. Green Mountain also proposes to increase the existing hydraulic capacity of the Proctor and Huntington Falls developments, while also increasing the bypassed reach flows at all three project developments.

Our Analysis

Several wetland areas are located in the vicinity of the project. However, the PFO and PSS wetlands are typically located above or behind natural levees, or set farther back from the shoreline. Given that PEM wetlands were typically found directly adjacent to the project reservoirs (or along their tributaries), within the zone of inundation, they are more likely to be affected by reservoir fluctuations, depending on the frequency and duration of the change. The proposed 1.5-foot drawdown of the Proctor impoundment could temporarily stress wetland vegetation in the drawdown area, given that most wetland plants require soil saturation within 12 inches of the root zone. Though this fluctuation may cause some migration of obligate plants, the fluctuation zone proposed by Green Mountain is still smaller than the 4-foot drawdown currently licensed. Further, given the fragmentation of wetland habitat at the Proctor development by farmland and grazing activity, any adverse effects associated with this change in project operations would be minor.

Periodic changes in water levels can also facilitate the spread and proliferation of invasive plants like Eurasian water milfoil, purple loosestrife, flowering rush, and common reed. Most of these species were found in areas that have been previously disturbed by flood scour, or by plowing/mowing. Given the existing reservoir fluctuations at the Proctor development and the small invasive plant populations that were identified, Green Mountain's proposed operating regime is unlikely to significantly alter existing invasive plant populations.

Because the Beldens and Huntington Falls developments would continue to be operated in an instantaneous ROR mode, wetland areas and shoreline invasive species populations will likely remain unchanged. Overall, the minor changes to project operation would likely have little to no effect on wildlife species at the project.

3.3.4 Recreation, Land Use, and Aesthetics

3.3.4.1 Affected Environment

Regional Recreation

The Green Mountain National Forest; the Middlebury Gap Scenic Road; and the Appalachian, Long, and Robert Frost trails, all nationally designated trails, are within the

project vicinity. These places offer recreational opportunities such as boating, biking, fishing, hiking, camping, sightseeing, picnicking, skiing, and hunting.

The Green Mountain National Forest, located near the Proctor, Beldens, and Huntington Falls developments, is over 400,000 acres, and includes the Abbey Pond Trail and the Bristol Cliffs Wilderness Area. The Middlebury Gap Scenic Road, which extends 16 miles, is located to the south east of the Beldens and Huntington Falls developments and has trailheads, scenic overlooks, and picnic areas. The Appalachian Trail passes though Rutland County in the vicinity of the Proctor development, while the Robert Frost Trail, which commemorates Frost's works, is near the Beldens and Huntington Falls developments. The Long Trail follows the main ridge of the Green Mountains and coincides with the Appalachian Trail.

There are also several state-managed recreation opportunities nearby the project. West Rutland State Forest, located near the Proctor development, allows for primitive camping and hunting. The Whipple Hollow Wildlife Management Area is located near the Proctor development and provides hunting, fishing, and wildlife watching opportunities. The Weybridge Cave State Park, located near the Beldens and Huntington Falls developments, features the largest cave in Vermont and the second largest in New England. Hiking and hunting, along with spelunking, occurs at the park. The Snake Mountain Wildlife Management Area is also located near the Beldens and Huntington Falls developments, and provides opportunities for hunting, trapping, hiking, and wildlife watching.

The Trail Around Middlebury, managed by the Middlebury Trust, traverses the Beldens development and offers 18 miles of hiking and biking trails in and around the town of Middlebury, Vermont and through the Otter Creek Gorge Preserve. The Beldens development is situated at the northern end of the trail and the development's parking lot is used by recreationists who access trail. The trails provide views of the Beldens impoundment, dam, bypassed reach, and tailrace.

There are also two additional trails that originate at the Beldens development that are not part of the Trail Around Middlebury. The Otter Creek Gorge Preserve Trail starts at the Beldens dam and follows Otter Creek north along the shoreline about 0.3 mile before heading west. The White Circle trail, located south of the dam, follows Otter Creek to the Beldens dam.

Existing Recreation at the Project

Proctor Development

The Proctor development does not have formal recreation facilities; however, there are two informal recreation sites providing impoundment and tailrace access. The

impoundment can be accessed informally at the Main Street Marble Bridge, less than a mile upstream of the dam. The informal access provides opportunities for bank fishing and a hand-carry access site (i.e., no boat ramp) for canoes and kayaks. An informal pull-off area adjacent to the bridge can accommodate two vehicles.

The informal tailrace access site is accessible via the project's access road, which was upgraded in 2012. The informal tailrace access provides opportunities for bank fishing and a hand-carry access site for canoes or kayaks. The tailrace access site also provides sightseeing opportunities, as the Sutherland Falls and the powerhouse are viewable from the site. An informal pull-off area adjacent to the tailrace access site can accommodate two vehicles.

Beldens Development

The Beldens development offers opportunities for boating, angling, picnicking, sightseeing, hiking, and biking. Amenities downstream of the dam include the canoe portage, canoe/kayak put-in, viewing platform, and picnic area. The viewing platform offers views of Otter Creek, the development, and the bypassed reach. The platform is also used for angling, and bank fishing occurs near the put-in. The picnic area provides grills, picnic tables, and parking for about six vehicles. Amenities upstream of the dam include the canoe/kayak take-out and portage, which also provide upstream banking fishing access.

Huntington Falls Development

The Huntington Falls development provides opportunities for boating, angling, and picnicking. Amenities upstream of the dam include a canoe/kayak take-out and a portage trail that connects to Morgan Horse Farm Road, a county-maintained road that is used for a portion of the canoe portage. Bank fishing occurs at the take-out, and there is an informal pull-off area that can accommodate two to three vehicles. A picnic/overlook area and parking lot are also upstream of the project. The site provides picnic tables and views of Otter Creek; however, the development is not viewable from this area.

Amenities downstream of the dam include the canoe portage and the canoe/kayak put-in. Bank fishing access is available at the put-in.

Land Use and Aesthetics

Rutland and Addison counties are mostly undeveloped. About 45 percent of the land cover in Rutland County and about 34 percent of land cover in Addison County is forest. Also about 26 percent of the land cover in Addison County is pasture. Overall, about 5 percent of the land is developed in the project vicinity.

About 45 percent of the Proctor development's shoreline is agricultural lands and the area surrounding the Proctor development is predominantly forested. Developed land consists of residential neighborhoods in the community of Proctor that is adjacent to the Proctor development.

The Beldens and Huntington Falls developments also are forested. Over 70 percent of the Beldens development's shoreline and over 65 percent of the Huntington Falls development's shoreline is forested. Development is limited primarily to the Route 7 corridor.

3.3.4.2 Environmental Effects

Project Operation

Green Mountain proposes to eliminate the existing 4-foot drawdown of the Proctor reservoir (except during infrequent emergency operations and maintenance activities) and operate the development in an instantaneous ROR mode from July 1 through April 30, when inflow is less than 200 cfs, and from May 1 through June 30, when inflow is less than 400 cfs. At all other times, Green Mountain proposes to operate the Proctor development with up to a 1.5-foot drawdown/refill cycle (i.e., peaking mode). Green Mountain proposes to operate the Beldens and Huntington Falls developments in a run-of-river mode. The hydraulic capacities of the Proctor and Huntington Falls developments would also be increased.

Our Analysis

Proctor Development

Recreation at the Proctor development is primarily shoreline or land-use based. The shoreline near the informal access site at the reservoir is gently sloping and not rocky. Anglers and boaters would be able to continue to access the water even when the reservoir was drawn down 1.5 feet.

Green Mountain's proposal to increase the hydraulic capacity at the Proctor development should not affect recreationists in the tailrace. The tailrace access area is located on a broad, flat reach of Otter Creek. The shoreline is gently sloping, not rocky, enabling anglers to access the shoreline downstream of any areas affected by the discharge.

Beldens Development

Project operations are not currently affecting public access and recreational use at the Beldens development. Because Green Mountain does not propose any changes to

project operations at the Beldens development, project operations should not affect recreation access and use.

Huntington Falls Development

Green Mountain proposes to increase the hydraulic capacity at the powerhouse containing turbine-generator units 1 and 2. As discussed in the Commission's *Guidelines for Public Safety at Hydropower Projects*, boat ramps or put-ins should be located at least 300 feet from project structures to prevent unsafe boating conditions. The canoe put-in for the development is greater than 400 feet from the powerhouse. In addition, the powerhouse discharge would be closer to the middle of the river, not near the canoe put-in. Therefore, the proposed operation changes should not affect boaters' ability to safely use the canoe put-in.

Recreation Resources

Fishing and canoeing/kayaking are the most popular outdoor recreation activities in Vermont from May to October. The Vermont State Outdoor Recreation Plan estimates that 18 percent of residents fish, while 10 percent of its residents canoe or kayak (Vermont Department of Forests, Parks and Recreation, 2005).

The results from Vermont Marble's Recreation Assessment Study confirmed that bank fishing is popular at the Proctor development, as nearly 72 percent of survey respondents participated in the activity. At the Beldens development, canoeing/kayaking was the most popular activity, with 22 percent of survey respondents engaging in the activity. Other activities that visitors engaged in were sightseeing, bank fishing, and walking/hiking. At the Huntington Falls development, bicycling, bank fishing, picnicking, and sightseeing were popular activities. Overall, visitors surveyed for the Recreation Assessment Study rated the Beldens and Huntington Falls recreation sites as being in excellent condition, and the Proctor development's informal recreation sites were rated as very good.

At the Proctor development, Green Mountain proposes to enhance the tailwater access site by constructing a gravel parking area for two to three vehicles and installing directional signage. At the Beldens development, Green Mountain proposes, in consultation with the Vermont ANR and the Middlebury Trust, to add directional signage and conduct brush clearing to clearly define the location of the existing canoe/kayak take-out and portage around the Beldens dam. At the Huntington Falls development, Green Mountain proposes to modify the location of the boat barrier at the Huntington Falls development to enable the use of the existing canoe/kayak take-out. Green Mountain also proposes to operate and maintain the existing recreation facilities at Beldens and Huntington Falls developments.

Our Analysis

Future Demand

As stated in the Recreation Assessment Study, the Proctor tailrace access site is the most popular recreation site at the project, but it is used at about 5 percent capacity during the weekends and less during the week. The Beldens development recreation sites, including the parking area that is used for both the development's recreation sites and the Trails Around Middlebury, is used at about 10 percent capacity on weekends and less during the week. The Huntington Falls development's recreation sites, including the parking area, are at less than 1 percent capacity on weekends.

By 2020, the population in Addison County is estimated to increase by 2.6 percent. For Rutland County, the population is estimated to increase less than 1 percent. The recreation sites are currently under-capacity, and the expected population growth would not result in the facilities being at or near capacity, even with the proposed upgrades to the recreation facilities. The recreation facilities at the project would be adequate to meet future recreational demands.

Recreational Facilities

Proctor Development

As stated above, bank fishing is a popular activity at the Proctor development's tailrace access site and visitors are able to view Sutherland Falls from the tailrace site. Currently, recreationists must park at an informal pull-off area near the tailwaters of the development to bank fish or view the falls. Green Mountain's proposal to provide a designated gravel parking area could reduce any erosion run-off caused by parking at the unvegetated pull-off areas.

Huntington Falls Development

Although canoeing and kayaking are popular at the Beldens development, which is located less than 2 miles upstream of the Huntington Falls development, the Recreation Assessment Study states that none of the survey respondents canoed or kayaked at the Huntington Falls development. Both developments provide similar boating experiences; however, the limiting factor for boating at the Huntington Falls development is that the existing take-out is located downstream of the development's boat barrier. The shoreline upstream of the development is wooded, and there are limited places to safely take-out. Relocating the boat barrier, as proposed by Green Mountain, would improve boater safety by ensuring that the take-out is accessible. Moving the boat barrier may also increase boater usage because the portage trail and canoe/kayak put-in would be more accessible from the take-out.

Signage

Proctor Development

Currently, there is no directional signage for the tailrace access site at the Proctor development. While the Recreation Assessment Study determined that the Proctor development's informal tailrace area was the most visited of the three developments' recreation sites, the overall usage of the tailrace site is low, with 141 recreation days.[71] Without signage, non-local recreationists may not be aware of the access site. Green Mountain's proposal to install directional signage would help recreationists, especially those not local to the area, locate the tailrace site and may help increase the usage of the area.

As discussed in section 3.3.6, *Cultural Resources,* the Proctor, Beldens, and Huntington Falls developments are eligible for the National Register because they were integral in the development of the marble industry in the Otter Creek Valley. For over 20 years, the Vermont Marble Museum, located adjacent to the Proctor development, has provided visitors with information on the developments and how they influenced the marble industry; however, the museum may permanently close (Preservation Trust of Vermont, 2013).

Interpretative signage at the project would help convey the history of the project and how it affected the marble industry. Of the three developments, the Proctor development is the most visited development and the most visible from the project's recreation sites. Installing interpretative signage at the Proctor development, rather than at the Beldens or Huntington Falls developments, would ensure that the majority of visitors to the project would be exposed to the project's history.

Beldens Development

The Beldens development's kayak/canoe put-in is clearly marked. Also, most of the portage trail, which includes portions of the Trail Around Middlebury and the project's access road, is clearly defined. However, the take-out and the portion of portage trail from the take-out to the Trail Around Middlebury are not marked.

As stated above, canoeing/kayaking is a popular activity at the Beldens development. Green Mountain's proposal to install signage, along with brush clearing, would improve the safety for boaters. Take-out signage would identify a safe egress

[71] Recreation days are defined as each visit by a person to a development for recreational purposes during any portion of a 24-hour period.

prior to the boat barrier, and signage and brush clearing along the portage would ensure that boaters easily find the canoe/kayak put-in.

Huntington Falls Development

Signage is provided at the development's put-in, take-out, portage, and picnic and overlook areas. Currently the signs are maintained and there is no demonstrated need to provide additional signage.

Recreation Management Plan

A recreation management plan would provide a framework for Green Mountain to develop and maintain the proposed recreation facilities, maintain the existing facilities, and develop and maintain interpretative signage at the Proctor development. Consultation with the Vermont ANR and the Middlebury Trust during the development of the recreation management plan would ensure the appropriate location of the Beldens development's take-out and canoe portage signage, which would improve the boaters experience at the development. Similarly, the recreation management plan would ensure that tailrace enhancements and interpretative signage at the Proctor development and relocating the boat barrier at the Huntington development would be implemented, which would benefit anglers, boaters, and visitors to these developments.

The installation of Green Mountain's proposed turbines/generators at the Proctor development would result in public access being limited or closed at the tailrace access site. Although not proposed by Green Mountain, measures in the recreation management plan to address public safety during construction would help avoid user conflicts. A recreation management plan that also includes: (1) a schedule as to when public use near the Proctor tailrace would be restricted during installation of project facilities; (2) provisions to install signage to inform the public if, and when, recreation use restrictions occur; and (3) signage to notify the public of the installation activities would ensure public safety during construction at the Proctor development.

Project Boundary

Green Mountain proposes to operate and maintain the existing recreation facilities at the Huntington Fall development. However, at the Huntington Falls development, the portage trail from the take-out to where it intersects with the Morgan Horse Farm Road is not within the project boundary.

Our Analysis

Commission regulations require that all lands necessary for the operation and maintenance of the project, such as lands for project-related recreation, be included in the

project boundary.[72] The existing portage trail from the take-out to the Morgan Horse Farm Road is project-related and needed for project purposes, but Green Mountain did not include this portion of the portage trail within the project boundary, as shown by its exhibit G drawings filed on March 11, 2012. To ensure that this portion of the portage trail is maintained over the term of any license issued, it would need to be enclosed within the project boundary.

Aesthetic Resources

Currently, the minimum flows at the Proctor development are passed through the powerhouse and discharged into the tailrace. The Sutherland Falls, a portion of which is the foundation of the powerhouse, is watered during spillage events (i.e., inflow exceeds the hydraulic capacity of the Proctor development), which occur about 24 percent of the time annually. At the Beldens development, a 5-cfs minimum flow is released along the west dam through an opening along the dam. Only leakage, equivalent to 5 cfs, flows over the east dam at the Beldens development. At the Huntington Falls development, a 15-cfs minimum flow is released through a concrete abutment on the north side of the dam. During normal operations the Huntington Falls dam face remains dry.

An aesthetics flow evaluation was conducted to help determine the amount of minimum flow needed at improve the aesthetics at the developments. As a result of the evaluation, at the Proctor development, Green Mountain proposes to release a year-round minimum flow of 60 cfs to the bypassed reach and over the Sutherland Falls. At the Beldens development, Green Mountain proposes to increase the existing minimum flow and provide 25 cfs over the Beldens west dam and 10 cfs over the Beldens east dam, which would result in 5 cfs being provided to each of the east and crossover channels. At the Huntington Falls development, Green Mountain also proposes to increase the existing minimum flow and pass 66 cfs through a new minimum flow gate to be constructed at the southern end of the dam. The current minimum flow notch at the north end of the dam would be closed.

Our Analysis

Proctor Development

The Sutherland Falls, which is composed of ledge and bedrock, drops 100 feet in elevation from the Proctor dam to the tailrace of the development, and is visible from the tailrace access area. While about 2 to 3 cfs of leakage flows over the falls, the leakage is barely noticeable and the falls are essentially dry unless spillage occurs. An aesthetics study examined the visual effects flows had on the falls at leakage, 10, 25, 50, and 75 cfs.

[72] *See* 18 C.F.R. § 4.41(h)(2) (2012).

A large uplifted vertical slab of bedrock in the center of the falls prevents water from spreading out across the entire face of the falls. Therefore, all of the flow regimes were confined to the main incised channel, on the powerhouse side of the falls, and the greatest visual effect the flows had was the fullness of the water cascading down the falls. At 10 and 25 cfs, the flows spread throughout the incised channel and created a veil over the areas able to be wetted. The 50 and 75 cfs flows both increased the fullness of the falls, and at 50 cfs, the waterfall was audible at the tailrace access site.

Green Mountain's proposal to pass 60 cfs over the Sutherland Falls would improve the visual aspect of the falls compared to existing conditions because the falls would remain wetted during normal operation. Also, at 60 cfs, water flowing over the falls would be heard by visitors at the tailrace access site, thus enhancing their experience at the site. Therefore, the proposed passage of 60 cfs would improve the visual aspects of the Sutherland Falls.

Beldens Development

The Beldens dams are separated by an island and viewable from several locations. The Trail Around Middlebury pedestrian bridge offers views of the west dam. The tailrace viewing platform offers views of the east dam and powerhouses. Under the current project operation, the leakage over the east dam creates a thin veil over the entire dam. The current minimum flow, which is released over the west dam at a notch in the dam, results in the majority of the dam remaining dry during normal operations. An aesthetics study examined providing flows of 10, 20, 30, 45, and 65 cfs in the bypassed reaches, with equal amounts flowing in each bypassed reach and over the associated dam (e.g., 5 cfs in the west dam's bypassed reach and 5 cfs in the east dam's bypassed reach for a total of 10 cfs).

Providing a minimum flow of 10 cfs in the bypassed reaches for each dam (for a total of 20 cfs) resulted in a thin veil of water occurring over both the east and west dams, while providing a minimum flow of 15 cfs or greater in the bypassed reaches for each dam created a fuller veil. Providing a minimum flow of 10 cfs or greater in the east dam's bypassed reach also resulted in a waterfall, which currently does not exist. In addition, providing minimum flows of 20 cfs or greater in the bypassed reach for the west dam resulted in the reach near the pedestrian bridge being wetted, which under current operations, is normally dry. Green Mountain's proposal to provide 25 cfs over the Beldens west dam and 10 cfs over the Beldens east dam would improve the aesthetics by ensuring that the dams and bypassed reaches would remain wetted, which could also enhance the recreational experience of hikers using the Trail Around Middlebury and anglers using the tailrace platform.

Huntington Falls Development

Currently, 16 cfs (minimum flow plus leakage) is passed through a notch at the northern end of the dam. The flow results in water flowing onto a bedrock ledge, creating a waterfall, while the face of the dam remains dry. Green Mountain's proposal to pass a minimum flow of 66 cfs through a new gate at the southern end of the dam, rather than through the notch at the existing notch at the northern end of the dam, would result in the bedrock ledge remaining dry and elimination of the waterfall.

While the waterfall would cease to exist, this would result in a minimal adverse effect to the aesthetics of the area because the downstream waterfall is not visible from the established recreation sites at the development; rather it is only viewable from a portion of the canoe/kayak portage. As stated in the Recreation Assessment Study, none of the survey respondents stated they canoed or kayaked, and the portage was only sparsely used to access downstream bank fishing areas. There would be only a minor adverse effect on visual resources by removing flow from the bedrock ledge, because few recreationists currently view the waterfall.

3.3.5 Cultural Resources

3.3.5.1 Affected Environment

Area of Potential Effects

Under section 106 of the NHPA of 1966, as amended, the Commission must take into account whether any historic property within the project's APE could be affected by the project. The Advisory Council on Historic Preservation defines an APE as the geographic area or areas in which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The APE for the project includes lands enclosed by the project boundary.

Regional History

The earliest evidence of Native American occupation in Vermont occurred during the Paleoindian period (9000-7000 B.C.). The inhabitants were small groups of semi-nomadic hunters, who were adapted to tundra/woodland environments. During the Archaic period (7000-1000 B.C.), the inhabitants in Vermont were hunter-gatherer groups who settled along rivers and streams in larger family groups. Evidence of this period, especially in the Champlain Valley of Vermont, is generally more common than that of the Paleoindian period. Native American occupation continued through the Woodland period (1000-B.C.-A.D. 1600), and during this period, there is evidence of the use of ceramic vessels and limited horticulture. There is also evidence that sedentary settlements occurred in Vermont during this period.

European settlement in the area occurred in the early 17th century. The Otter Creek Valley was initially inhabited by the French and English; however, with the capture of Fort St. Frederic (Crown Point), located on the western side of Lake Champlain, the English controlled both ends of the Otter Creek Valley by 1759. After the capture of the fort, the English constructed the Crown Point Road from Fort No. 4, on the Black River in Vermont to Crown Point. The road followed the Otter Creek valley from south of Rutland, and through Proctor to north of Brandon, where it veered to the west toward Lake Champlain. Initially used as a military road, the road became an immigration route for early settlers after the American Revolution (Bartone et al., 2009).

The Proctor area was first settled in the 1770's. By the late eighteenth century, a saw mill and a grist mill was operated using hydropower generated from the Sutherland Falls, which is now the location of the Proctor development. Marble quarrying began in the region during the 1830s, and by the late nineteenth century, the region became one of the most important sources of architectural marble in the world. To facilitate the quarrying of the marble, Vermont Marble converted from hydro-mechanical power to hydroelectric generation in the early 1900's. In 1905, Vermont Marble constructed the Proctor development, which consisted of three generators. An additional generator was installed in 1926, without modifying the powerhouse. In 1984, a fifth generator unit was installed at the Proctor development. The original powerhouse did not provide the space for a fifth unit, so a metal frame addition was built adjacent the original powerhouse to house the generator. In addition, a second penstock was built, running parallel to the original penstock. The second penstock also has its own surge tank, located immediately adjacent to the original surge tank.

The Beldens area has been used for industrial purposes since the early 1790's, when a sawmill was built on the west side of Otter Creek across from the present-day Beldens powerhouse. Other industries at the site included a grist mill, iron works, and several different marble companies. Vermont Marble acquired the Beldens Falls property, and in 1913, built a hydroelectric plant. In 1988, an additional powerhouse was constructed to house an additional generator, and in 2008, a generator and control board were replaced in the original powerhouse.

Waterpower at the Huntington Falls development was first developed in 1884 to operate a pump paper mill. Vermont Marble acquired the Huntington Falls property in 1910, and built a hydroelectric plant at the falls in 1911. In 1917, the timber crib dam was replaced with the existing concrete dam. In 1986, Vermont Marble constructed an additional powerhouse adjacent to the existing powerhouse and added a penstock.

Archaeological and Historic Resources

In association with its relicensing efforts, a Phase IA cultural resources survey was conducted in 2008. The Phase 1A survey, developed in consultation with the Vermont SHPO, identified areas within the APE that would likely have archaeological resources and be affected by either current or proposed project operations. The Phase IA survey resulted in the identification of 34 archaeologically sensitive areas[73] within the APE. Fifteen archaeologically sensitive areas were identified at the Proctor development, nine areas were identified at the Beldens development, and 10 areas were identified at the Huntington Falls development. The Phase 1A survey recommended a Phase 1 survey be completed to determine if archaeological sites would be present in the archaeologically sensitive areas.

In 2010, the Phase I survey was conducted in the archaeologically sensitive areas. Phase II surveys were conducted in 2011 and 2012 to determine if any of the identified archaeological sites detected in the Phase I survey were eligible for the National Register.

At the Proctor development the Phase I survey identified site VT-RU-604, an archaeological site from the Late Archaic Period. The Phase II surveys determined that site VT-RU-604 is eligible for the National Register. The Phase II surveys also identified a previously unrecorded archaeological site, site VT-RU-627. The site, which is eligible for the National Register, is an archaeological site from the Late Woodland Period and is experiencing severe shoreline erosion.

At the Beldens development, the Phase I survey identified six archaeological sites and one historic Euroamerican site within the APE. Phase II surveys determined that sites VT-AD-1540, VT-AD-1541, VT-AD-1549, VT-AD-1556, VT-AD-1557, and VT-AD-1558 are eligible for the National Register. Five of the eligible sites are archaeological sites, ranging from the Late Archaic to Woodland periods, while the remaining eligible site is an historic site, the remains of the Beldens Falls Marble Company mill complex. The remaining archaeological site was determined not eligible for the National Register.

The Phase II surveys determined that site VT-AD-1558 is experiencing moderate shoreline erosion, which may threaten the site.

At the Huntington Falls development, the Phase I survey identified seven archaeological sites and two historic Euroamerican sites within the APE. Phase II surveys determined that archaeological sites VT-AD-350, VT-AD-1544, VT-AD-1546, VT-AD-1547, VT-AD-1550, and VT-AD-1555 are eligible for the National Register and

[73] Archaeologically sensitive areas are areas that could contain archaeological resources and would be subject to on-going erosion or adverse effects from recreational access.

are from the Late Archaic and Woodland periods. The remaining archaeological and both historical sites were determined not eligible for the National Register.

The Phase II surveys determined that site VT-AD-350 is experiencing severe shoreline erosion and that site VT-AD-1550 is experiencing moderate shoreline erosion, which may threaten the site.

Historic Hydroelectric System Facilities

The Proctor, Beldens, and Huntington Falls developments are eligible for listing in the National Register under Criterion A and Criterion C. The Proctor development is eligible under Criterion A as the first and the largest of the three developments designed and built by Vermont Marble.[74] The Beldens and Huntington Falls developments are eligible under Criterion A because of their association with Vermont Marble. The Proctor, Beldens, and Huntington Falls developments are significant under Criterion C for difficult site planning, engineering, and design. The Proctor development is also eligible under Criterion C because the powerhouse is faced in marble, which is rare among hydroelectric powerhouses.

3.3.5.2 Environmental Effects

Effects on Historic Properties

Continued operation and maintenance of the Proctor, Beldens, and Huntington Falls developments may adversely affect both identified and unidentified historic properties. To address such effects, Green Mountain proposes to implement the HPMP filed on March 18, 2013. The HPMP contains procedures and requirements for: (1) a Phase III data recovery for sites VT-AD-350 and VT-RU-627 to mitigate for the ongoing, project-induced shoreline erosion; (2) erosion monitoring in 2013 and the implementation of the treatment plans in 2014 for sites VT-AD-1550 and VT-AD-1558 to mitigate for ongoing, project-induced shoreline erosion; (3) 3 years of consecutive shoreline erosion monitoring for the 10 archaeological and historical sites that are eligible for the National Register; (4) the treatment of adverse effects (e.g., rehabilitation of a powerhouse) that may occur during the proposed operation and maintenance of the Proctor, Beldens, and Huntington Falls developments; (5) the development of treatment plans for any unknown historic properties that may be identified in the future and would be adversely affected by the project; (6) activities that are exempt from Vermont SHPO review or action; (7) future reviews and revisions of the HPMP; and (8) dispute resolution.

[74] Vermont Marble was once one of the largest producers of marble in the world, and provided marble for the construction of the Washington Monument and the Tomb of the Unknown Solider at Arlington National Cemetery.

In a letter filed on March 15, 2013, the Vermont SHPO concurred with the HPMP and recommended that mitigation proposed in the HPMP be implemented.

Staff Analysis

Project Facilities

Continued operation of the Otter Creek Project would ensure that the historic facilities at the Proctor, Beldens, and Huntington Falls developments would be used as they were originally designed and built for, and would, therefore, be beneficial. However, operating the project under the protections afforded by section 106 does not ensure that there would be no adverse effects. Adverse effects may occur to historic project features due to repairs and modifications that, while necessary for the continued safe and efficient operation, are not in keeping with the project's historic character. This type of adverse effect has already occurred at the Beldens development; recent replacement of the original marble control board adversely affected the integrity of the historic property.

While adverse effects on the historic facilities may be necessary, they should nevertheless be taken into account. As a stipulation in the HPMP, Green Mountain would notify the Vermont SHPO in advance of any action affecting historic project facilities and would consult with the Vermont SHPO to develop and implement appropriate measures to resolve any adverse effects. The stipulation in the HPMP would ensure that adverse effects on historic properties, arising from project operations or project-related activities over the term of any new license, would be mitigated, lessened, or avoided.

Archaeological and Historic Resources

Of the 14 archaeological and historical sites eligible for the National Register, four are currently being affected by project-induced shoreline erosion, and could be adversely affected by proposed project operation. The erosion at two of the sites (VT-RU-627 and VT-AD-350) has become so severe that the sites could be destroyed, thus jeopardizing their eligibility for the National Register. For these two sites, the HPMP contains provisions for a Phase III data recovery. A Phase III data survey would document the sites in situ, and then remove the historic properties to preserve them. The other two sites (VT-AD-1550 and VT-AD-1158) are being moderately eroded, and the HPMP contains provisions for monitoring for one year and then developing a mitigation plan which could include shoreline protection to mitigate for erosion or, if needed, a Phase III data recovery. Conducting a Phase III data recovery for the severely eroded sites and implementing monitoring/mitigation plans for the other two sites would ensure the adverse effects caused by project-related erosion would be reduced and lessened.

The HPMP also contains provisions for Green Mountain to conduct annual monitoring for 3 consecutive years for the remaining 10 historic properties (nine archaeological sites and one historic site). The monitoring would assess the condition of the sites to identify any project-related erosion or damage that may have occurred as a result of project operation or maintenance. Finally, the HPMP contains protocols to follow if undocumented archaeological sites would be discovered during project operation or maintenance. By implementing these protocols and provisions, Green Mountain would ensure that any adverse effects to the 10 identified historic properties, and any undocumented archaeological sites, arising from project operation or project-related activities over the term of any new license would be avoided, lessened, or mitigated.

Emergency Procedures

The proposed HPMP contains measures and procedures to implement to mitigate for any adverse effects on historic properties that may occur during normal project operation and maintenance. However, the proposed HPMP does not contain any measures to implement if an emergency would occur (i.e., an immediate threat to life or property) that may affect historic properties. The *Guidelines for the Development of Historic Properties Management Plans for FERC Hydroelectric Projects* (FERC and Advisory Council, 2002) states that an HPMP should address how the effects on historic resources will be considered in the event of an emergency.

To ensure that any adverse effects on historic properties would be mitigated for, the HPMP could be revised to include emergency procedures. The procedures could include the following: (1) consult with the Vermont SHPO and the Commission concerning the effects on historic properties as soon as possible, but no later than 10 days, after any emergency; and (2) if historic properties are damaged during emergency situations, conduct an assessment of the damage and develop site-specific treatment plans, as appropriate, after consultation with the Vermont SHPO and the Commission. These procedures and any treatment plans, if necessary, would lessen or mitigate for any adverse effects that may occur to historic properties during an emergency situation.

Programmatic Agreement

We anticipate that effects on historic properties could be taken into account through an executed PA between the Commission and the Vermont SHPO. The PA could require Green Mountain to revise the HPMP to include emergency procedures. Execution of the PA, and revisions and implementation of the HPMP, would ensure that any adverse effects of the project on historic properties would be lessened, avoided, or mitigated.

3.4 NO-ACTION ALTERNATIVE

Under the no action alternative, the Otter Creek Project would continue to operate as it has in the past and none of Green Mountain's proposed measures or Commission staff's recommendations would be implemented. There would be no enhancement of bypassed reach flows at the Proctor, Beldens, or Huntington Falls developments, or stabilization of Proctor reservoir elevations during periods of low-flow and months in which warmwater fish spawning occurs, which would improve aquatic habitat conditions for resident fish within the Proctor reservoir and in the reaches of Otter Creek downstream from each respective project development. Continuing the existing operational regime would also preclude the potential for some improvement in water quality (i.e., DO concentrations) which may occur downstream of the Proctor, Beldens, and Huntington Falls developments under the staff alternative. Green Mountain's proposed recreation facility upgrades including, enhancing the existing canoe take-out and portage around Beldens dam, and formalizing and enhancing the tailwater access site at the Proctor development would also not be completed. Lastly, at the Beldens and Huntington Falls developments, boater safety would be affected because the canoe/kayak take-outs would not be marked or would be unavailable.

4.0 DEVELOPMENTAL ANALYSIS

In this section, we look at Green Mountain's use of Otter Creek for hydropower purposes to see what effects various environmental measures would have on the project's costs and power generation. Under the Commission's approach to evaluating the economics of hydropower projects, as articulated in *Mead Corp*.,[75] the Commission compares the current project cost to an estimate of the cost of obtaining the same amount of energy and capacity using a likely alternative source of power for the region (cost of alternative power). In keeping with Commission policy as described in *Mead Corp.*, our economic analysis is based on current electric power cost conditions and does not consider future escalation of fuel prices in valuing the hydropower project's power benefits.

For each of the licensing alternatives, our analysis includes an estimate of: (1) the cost of individual measures considered in the EA for the protection, mitigation, and enhancement of environmental resources affected by the project; (2) the cost of alternative power; (3) the total project cost (i.e., for construction, operation, maintenance, and environmental measures); and (4) the difference between the cost of alternative power and total project cost. If the difference between the cost of alternative power and total project cost is positive, the project produces power for less than the cost of alternative power. If the difference between the cost of alternative power and total project cost is negative, the project produces power for more than the cost of alternative power. This estimate helps to support an informed decision concerning what is in the public interest with respect to a proposed license. However, project economics is only one of many public interest factors the Commission considers in determining whether, and under what conditions, to issue a license.

4.1 POWER AND ECONOMIC BENEFITS OF THE PROJECT

Table 16 summarizes the assumptions and economic information we use in our analysis. We find that the values provided by Central Vermont (2011 and 2012) are reasonable for the purposes of this analysis. Cost items common to all alternatives include: taxes and insurance costs; net investment (the total investment in power plant facilities remaining to be depreciated); estimated future capital investment required to maintain and extend the life of plant equipment and facilities; relicensing costs; normal

[75] *See Mead Corporation, Publishing Paper Division,* 72 FERC ¶ 61,027 (July 13, 1995). In most cases, electricity from hydropower would displace some form of fossil-fueled generation, in which fuel cost is the largest component of the cost of electricity production.

operation and maintenance cost; and Commission fees. Throughout this section, all dollars are 2012 unless otherwise specified.

Table 16. Parameters for the economic analysis for Green Mountain's Otter Creek Project. (Source: Green Mountain and Staff)

Economic Parameter	Value	Source
Proposed capacity	21.814 MW	Central Vermont
Proposed average annual generation	69,000 MWh	Central Vermont
Construction cost	$ 18,425,697[a]	Central Vermont
Annual O&M cost	$1,100,818/year [b]	Central Vermont
Cost to prepare license application	$359,901[c]	Central Vermont
Net investment	$29,595,350 [d]	Central Vermont
Period of economic analysis	30 years	Staff
Term of financing	20 years	Staff
Cost of capital (Long-term interest rate)	7.85 percent [e]	Central Vermont
Short-term interest rate (during construction)	7.85 percent [f]	Central Vermont
Federal tax rate	34 percent	Staff
Local tax rate	3 percent	Staff
Federal user charges	$0	Staff
Insurance rate	0.25 percent	Staff
Energy rate	$35.77/MWh [g]	Staff
Capacity rate	$161/kWh-yr [h]	Staff

[a] Central Vermont, April 11, 2012 response to the Commission staff's additional information requests, page 7.
[b] Central Vermont, August 1, 2011 amended license application, page D-6 reports $1,086,839/year in 2011 dollars. Staff escalated this value to 2012 dollars.
[c] Central Vermont, August 1, 2011 amended license application, page D-7 reports $750,000/year in 2011 dollars. Staff escalated this value to 2012 dollars. .
[d] Central Vermont, April 11, 2012 response to Commission's additional information requests, page 6.
[e] Central Vermont, August 1, 2011 amended license application, page D-7.
[f] Staff assumed Central Vermont's short term interest rate was the same as their long-term interest rate.
[g] Central Vermont provided an energy rate of $54/MWh. A lower energy is used based on information contained in the Energy Information Administration's 2012 Annual Energy Outlook.
[h] The capacity rate is based on the Energy Information Administration's 2012 Annual Energy Outlook.

4.2 COMPARISON OF ALTERNATIVES

Table 17 summarizes the installed capacity, annual generation, cost of alternative power, and estimated total production cost, and difference between the value of project power and cost of operating and maintaining the project for each of the alternatives considered in this EA: the no-action alternative, the applicant's proposal, and the staff alternative.

Table 17. Summary of the annual cost of alternative power and annual project costs for alternatives for the Otter Creek Project. (Source: Staff)

	No-Action Alternative	**Green Mountain's Proposal** [a]	**Staff Alternative**
Installed capacity (MW)	18.279	21.814	21.814
Annual generation (MWh)	67,258	69,000	69,000
Annual cost of alternative power ($/MWh)	$2,405,819 (35.77)	$2,468,130 (35.77)	$2,468,130 (35.77)
Annual project cost ($/MWh)	$3,788,643 (56.33)	$5,679,390 (82.31)	$5,682,840 (82.36)
Difference between cost of alternative power and project power (mills/kwh)	($1,382,824) (20.56)	($3,211,260) (46.54)	($3,214,710) (46.59)

[a] A number in brackets denotes that the difference between the power value and production cost is negative.

4.2.1 No-Action Alternative

Under the no-action alternative, the project would continue to operate as it does now. Based on an installed capacity of 18.279 MW, the Otter Creek Project generates an average of 67,258 MWh of electricity annually. The average annual cost of alternative power would be about $2,405,819 or $35.77/MWh. The average annual cost of producing this power, including depreciation, operation and maintenance costs, and taxes would be about $3,788,643 or $56.33/MWh. Overall, the project would produce power at a cost that is $1,382,824 or $20.56/MWh, more than the cost of alternative power. There are no other costs associated with this alternative, other than Green Mountain's development cost for preparing its license application ($359,901).

4.2.2 Green Mountain's Proposal

At the Proctor development, Green Mountain proposes to install a new runner at unit 1 and three additional turbine-generator units (units 2 through 4). At the Huntington

Falls development, Green Mountain proposes to replace both turbine-generator units (units 1 and 2). Upon installation of the new turbine-generator units at both the Proctor and Huntington Falls developments, the project's installed capacity would increase to 21.814 MW, an increase of 3.535 MW, from the existing installed capacity of 18.279 MW, and generate an average of 69,000 MWh of electricity annually. The average annual cost of alternative power would be $2,468,130, or about $35.77/MWh. The average annual project cost would be $5,679,390, or about $82.31/MWh. Overall, the project would produce power at a cost which is $3,211,260, or $46.54/MWh, more than the cost of alternative power.

4.2.3 Staff Alternative

The staff alternative includes the same developmental upgrades as Green Mountain's proposal, including the same proposed minimum flow releases, and therefore, it would have the same installed capacity and average annual generation. Based on a total installed capacity of 21.814 MW, an estimated average annual generation of 69,000 MWh, the parameters in table 16, and the cost of environmental measures identified in table 18, we estimate that the cost of alternative power would be $2,468,130, or about $35.77/MWh. The average annual project cost would be $5,682,840, or about $82.36/MWh. Overall, the project would produce power at a cost which is $3,214,710, or $46.59/MWh, more than the cost of alternative generation. This alternative would have an annual cost that would be $3,450 more than Green Mountain's proposal.

4.3 COST OF ENVIRONMENTAL MEASURES

Table 18 gives the cost of each of the environmental enhancement measures considered in our analysis. We convert all costs to equal annual (levelized) values over a 30-year period of analysis to give a uniform basis for comparing the benefits of a measure to its cost.

Table 18. Cost of environmental mitigation and enhancement measures considered in assessing the environmental effects of the Otter Creek Project. (Source: Central Vermont and Staff)

Enhancement/Mitigation Measure	Entity	Capital Cost ($)	Annual Cost ($)	Levelized Annual Cost ($)	Notes
Geology and Soils					
Implement erosion and sediment control measures during the redevelopment of the intake at the Proctor development and the construction of the proposed recreational enhancements at the Proctor and Beldens developments.	Green Mountain	$0	$0	$0	a, g,
Develop and implement a soil erosion and sediment control that contains specific measures to minimize erosion and sediment mobilization during all proposed ground-disturbing activities.	Staff	$5,500	$0	$464	b
Aquatic Resources					
Review and update the existing Spill Prevention Control and Countermeasures	Green Mountain, Staff	$0	$0	$0	a

Enhancement/Mitigation Measure	Entity	Capital Cost ($)	Annual Cost ($)	Levelized Annual Cost ($)	Notes
Plan for the project and file it for Commission approval.					
Replace the existing trashracks at the Proctor development with 1-inch clear bar spacing trashracks oriented parallel to river flow.	Green Mountain, Staff	$0	$0	$0	a, h
Replace the existing turbine-generator unit 3 trashracks at the Huntington Falls development with 2-inch clear bar spacing trashracks that have maximum approach velocities of less than 2 feet-per-second and are oriented parallel to river flow.	Green Mountain, Staff	$0	$0	$0	a
If Vermont FWD provides notification to Green Mountain that it is going to resume Atlantic salmon restoration or stocking efforts in Otter Creek, consult with	Green Mountain	$0	$0	$0	b, c

Enhancement/Mitigation Measure	Entity	Capital Cost ($)	Annual Cost ($)	Levelized Annual Cost ($)	Notes
the resource agencies to determine an appropriate modification to the project's trashracks.					
Between May 1 and June 30 and July 1 and April 30, operate the Proctor development in an instantaneous ROR mode when inflow is less than 400 and 200 cfs, respectively.	Green Mountain, Staff	$0	$0	$0	a
Between May 1 and June 30 and July 1 and April 30, operate the Proctor development in a 1.5-foot peaking operation when inflow is greater than 400 and 200 cfs, respectively.	Green Mountain, Staff	$0	$0	$0	a, f
At the Proctor development, release a continuous minimum flow of 60 cfs to the bypassed reach.	Green Mountain, Staff	$0	$0	$0	a
Operate the Beldens and	Green Mountain,	$0	$0	$0	a

Enhancement/Mitigation Measure	Entity	Capital Cost ($)	Annual Cost ($)	Levelized Annual Cost ($)	Notes
Huntington Falls developments in instantaneous ROR modes.	Staff				
At the Beldens development, release a continuous flow of 10 and 25 cfs over the Beldens east and west dams, respectively.	Green Mountain, Staff	$0	$0	$0	a
At the Huntington Falls development, release a continuous bypassed reach minimum flow of 66 cfs.	Green Mountain, Staff	$0	$0	$0	a
Implement a reservoir refill protocol following drawdown of the Proctor, Beldens, and Huntington Falls reservoirs whereby 90 percent of the inflow to these respective reservoirs would be released downstream during reservoir refill operations.	Staff	$0	$0	$0	b
Develop and implement an	Staff	5,000	3,000	$2,402	b,d

Enhancement/Mitigation Measure	Entity	Capital Cost ($)	Annual Cost ($)	Levelized Annual Cost ($)	Notes
operation and compliance monitoring plan.					
Terrestrial Resources					
Develop and implement a terrestrial monitoring and management plan to prevent the spread of invasive plants and ensure the protection of federally-protected wildlife species.	Staff	$3,000	$0	$253	b
Recreation Resources					
Add signage and conduct brush clearing at the existing canoe/kayak take-out and portage trail around the Beldens dam.	Green Mountain, Staff	$15,000	$500	$1,595	e
Continue to operate and maintain the existing recreation facilities at Beldens and Huntington Falls developments.	Green Mountain, Staff	$0	$0	$0	a
Modify the location of the boat barrier at the Huntington Falls development to enable	Green Mountain, Staff	$0	$0	$0	a

Enhancement/Mitigation Measure	Entity	Capital Cost ($)	Annual Cost ($)	Levelized Annual Cost ($)	Notes
use of the existing canoe/kayak take-out.					
Enhance the tailwater access site at the Proctor development by: (1) constructing a gravel parking area for two to three vehicles; and (2) installing directional signage.	Green Mountain, Staff	$25,000	$1,000	$2,768	e
Develop and implement a recreation management plan that includes measures to: (1) improve the canoe/kayak take-out and portage trail around the Beldens dam; (2) modify the location of the boat barrier at the Huntington Falls development to enable the use of the existing canoe/kayak take-out; (3) operate and maintain the existing recreation facilities; (4) enhance the tailwater access site at the Proctor	Staff	$7,000	$500	$920	b

Enhancement/Mitigation Measure	Entity	Capital Cost ($)	Annual Cost ($)	Levelized Annual Cost ($)	Notes
development; (5) ensure recreationists' safety during construction; and (6) develop interpretive signage at the Proctor development.					
Cultural Resources					
Implement the HPMP.	Green Mountain, Staff	$352,000	$0	$29,680	e
Revise the proposed HPMP to include procedures to implement if an emergency occurs (i.e., an immediate threat to life or property) that may affect properties eligible for or listed on the National Register.	Staff	$0	$0	$0	a
Aesthetic Resources					
Improve aesthetics by passing minimum flows over Sutherland Falls within the Proctor development's bypassed reach and by increasing the minimum flow	Green Mountain, Staff	$0	$0	$0	a

Enhancement/Mitigation Measure	Entity	Capital Cost ($)	Annual Cost ($)	Levelized Annual Cost ($)	Notes
for the east and west channels within the Beldens development bypassed reach.					

a This measure is considered to be included in the physical and operational design of the project and would require no additional cost beyond the construction cost provided by Central Vermont in the amended license application.

b Cost estimated by staff.

c Any proposal to replace trashracks at the project during any license term would require a license amendment and approval from the Commission, prior to implementation.

d This plan would be implemented every year for the duration of any license issued.

e Cost provided by Central Vermont.

f When operating in a peaking mode, Green Mountain also proposes to implement seasonal maximum ratios between maximum and minimum daily flows. This measure is also considered to be included in the physical and operational design of the project and would require no additional cost beyond the construction cost provided by Central Vermont in the amended license application.

g Commission staff's June 20, 2013, order amending license authorizes Green Mountain to realign the Proctor intake under the existing license.

h Commission staff's June 20, 2013, order amending license authorizes Green Mountain to install these trashracks during the realignment of the Proctor intake.

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 COMPARISON OF ALTERNATIVES

In this section, we compare the developmental and non-developmental effects of the no-action alternative, Green Mountain's proposal, and Green Mountain's proposal as modified by staff (i.e., the staff alternative).

We estimate the annual generation of the project under Green Mountain's proposal, the staff alternative, and the no-action alternative. Our analysis shows that the annual generation would be 67,258 MWh for the no-action alternative and 69,000 MWh for both the proposed action and staff alternative.

We summarize the environmental effects of the different alternatives in table 19.

Table 19. Comparison of alternatives for the Otter Creek Project. (Source: Staff)

Resource	No-Action Alternative	Proposed Action	Staff Alternative
Generation	67,258 MWh	69,000 MWh	69,000 MWh
Geology and Soils	No changes to existing conditions in that there is no documented evidence of erosion or sedimentation at the project.	Minimal, short-term increases in erosion and sedimentation during realignment of the Proctor intake and enhancement of recreation facilities.[76]	Same as proposed action.
Water Quality	No changes to existing conditions where water quality in the project vicinity meets Vermont state standards.	Increasing bypassed reach flows at the Proctor, Beldens, and Huntington Falls developments has the potential to increase DO concentrations in these bypassed reaches and in the reaches of Otter Creek downstream of these developments.	Same as proposed action.

[76] Commission staff's June 20, 2013, order amending license authorizes Green Mountain to realign the Proctor intake under the existing license.

Resource	No-Action Alternative	Proposed Action	Staff Alternative
Fisheries (project operations)	No changes to existing project operations where the Beldens and Huntington Falls developments are operated in instantaneous ROR modes, which maintain stable environments both upstream and downstream of these developments. Also, no changes would occur at the Proctor development, which is operated in a modified ROR mode with reservoir drawdowns of up to 4-feet that likely disrupt aquatic resources in littoral areas within the reservoir.	No changes to existing conditions at the Beldens or Huntington Falls developments. However, Green Mountain's proposal to eliminate the existing 4-foot drawdown of the Proctor reservoir and operate the development in an instantaneous ROR mode from May 1 to June 30 and July 1 to April 30, when inflow is less than 400 and 200 cfs, respectively, would provide a more stable environment for aquatic resources both upstream and downstream of the Proctor dam during low flow conditions. Operating the Proctor development in a 1.5-foot peaking mode of operation at all other times, as also proposed by Green Mountain, would reduce any adverse effects on aquatic resources associated with the existing 4-foot drawdowns of the reservoir.	Same as proposed action.

Resource	No-Action Alternative	Proposed Action	Staff Alternative
Fisheries (fish entrainment)	No changes to existing project operations which likely cause fish entrainment at each of the three developments.	Increasing the hydraulic capacity of the Proctor and Huntington Falls developments would likely increase existing levels of project-related fish entrainment and lead to a higher rate of fish injury and mortality. The overall effects of increased fish entrainment on fish populations within Otter Creek are expected to be minimal.	Same as proposed.
Fisheries (tailrace flows)	No changes to existing conditions downstream of the Proctor development whereby suitable water depths and velocities are maintained for target aquatic species via the release of 50 percent of project inflow during the months of April and May, and the first 2 weeks in June, and 100 cfs, or inflow, whichever is less, at all other times.	Green Mountain's proposal to operate the Proctor development in a ROR mode from July 1 through April 30 when inflow is less than 200 cfs, and from May 1 through June 30, when inflow is less than 400 cfs would provide an increase in existing minimum tailrace flows at the Proctor development during low flow conditions, thereby improving aquatic habitat.	Same as proposed action, except during any reservoir refill operations, Green Mountain would release 90 percent of project inflow into downstream reaches of Otter Creek to maintain aquatic habitat downstream of the project developments.

Resource	No-Action Alternative	Proposed Action	Staff Alternative
Fisheries (bypassed reach flows)	No changes to the existing bypassed reach flows at the Beldens (5 cfs) and Huntington Falls (15 cfs) developments. There would also continue to be no requirement for a bypassed reach flow at the Proctor development, thereby continuing to provide limited habitat for aquatic species.	Green Mountain's proposal to increase bypassed reach flows at the Beldens (10 and 25 cfs in the east and west channels, respectively), Proctor (60 cfs), and Huntington Falls (66 cfs) developments would enhance existing aquatic habitat conditions in these reaches.	Same as proposed
Terrestrial	No changes to terrestrial resources due to ground disturbance or changing the operating regime at the Proctor development, as proposed.	Minor temporary disturbance/displacement of wildlife species due to construction-related noise; temporary vegetation/ground-disturbance and soil compaction associated with the improvement of project facilities, and movement of heavy equipment, leading to the potential spread of invasive plant species; and minor shifting of emergent wetland vegetation associated with the proposed 1.5-foot	Same as under proposed action, except Green Mountain would develop a terrestrial monitoring and management plan that would contain measures to survey for and protect federally-protected species, prevent the spread of invasive species, and restore disturbed vegetated areas.

Resource	No-Action Alternative	Proposed Action	Staff Alternative
		drawdown.	
Recreation	The recreation facilities at the Beldens and Huntington Falls development would continue to be maintained. The portage and canoe/kayak take-outs at the Beldens and Huntington Falls developments would not be improved, adversely affecting boater experiences.	Green Mountain's proposed measures to enhance the Proctor development's tailrace access site would improve access for anglers and sightseers. Improvements to the Beldens and Huntington Falls development's canoe/kayak take-outs and portages would enhance boater safety.	Same as proposed action, except that a recreation management plan would be developed to ensure that the proposed enhancements are maintained and that measures are implemented for public safety during the installation of turbines at the Proctor development.

Resource	No-Action Alternative	Proposed Action	Staff Alternative
Cultural	No changes to the Otter Creek Project, a historic property. No changes to the four archaeological sites which are eligible for the National Register and are being adversely affected by project-induced erosion. No changes to the 10 archaeological and historic sites which are eligible for the National Register and have a low risk of being eroded.	Proposed operation and maintenance could adversely affect the Otter Creek Project. Proposed project operation would adversely affect the four eligible sites, and may potentially affect the 10 other sites. The proposed HPMP would contain provisions and treatment plans to mitigate for the adverse effects.	Same as proposed.

Resource	No-Action Alternative	Proposed Action	Staff Alternative
Aesthetics	No changes to the current minimum flows. The Sutherland Falls at the Proctor development would be watered during spillage, and at the Beldens development, leakage over the east dam would create a thin veil over the entire dam, while the majority of the west dam would not be wetted. The bedrock ledge downstream of the Huntington Falls dam would remain wetted.	Passing the minimum flow over the Sutherland Falls would improve the aesthetics by creating a consistent waterfall. At the Beldens development, the increase in minimum flows would create a veil over the east and west dams, which would improve the aesthetics of the area. At the Huntington Falls development, the minimum flow would be rerouted and the bedrock ledge would become dry. The ledge is not readily viewable by most visitors; therefore, there should be a minimal effect to the aesthetics of the development.	Same as proposed.

5.2 COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

Sections 4(e) and 10(a)(1) of the FPA require the Commission to give equal consideration to the power development purposes and to the purposes of energy conservation; the protection, mitigation of damage to, and enhancement of fish and wildlife; the protection of recreational opportunities; and the preservation of other aspects of environmental quality. Any license issued shall be such as in the Commission's judgment will be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses. This section contains the basis for, and a summary of, our recommendations for relicensing the Otter Creek Hydroelectric Project. We weigh the costs and benefits of our recommended alternatives against other proposed measures.

Based on our independent review of agency and public comments filed on this project and our review of the environmental and economic effects of the proposed project and its alternatives, we recommend the proposed action with additional staff-recommended measures as the preferred alternative. We recommend this option because: (1) issuing a new license would allow Green Mountain to continue operating the project as a beneficial and dependable source of electrical energy for its customers; (2) the 69,000 MWh of electric energy comes from a renewable resource which does not contribute to atmospheric pollution; (3) the public benefits of this alternative would exceed those of the no-action alternative; and (4) the recommended measures would protect and enhance aquatic, terrestrial, and cultural resources and improve public recreation opportunities at the project.

In the following section, we make recommendations as to which environmental measures proposed by Green Mountain should be included in any new license issued for the Otter Creek project. In addition to Green Mountain's proposed environmental measures, we recommend additional staff-recommended environmental measures to be included in any new license issued to for the project. In Appendix A, we describe the draft license articles that we recommend be included in any new license for the project.

5.2.1 Measures Proposed by Green Mountain

Based on our environmental analysis of Green Mountain's proposal in section 3, *Environmental Analysis*, and the costs present in section 4, *Developmental Analysis*, we conclude that the following environmental measures proposed by Green Mountain would protect and enhance environmental resources and would be worth the cost. Therefore, we recommend including these measures in any license issued for Green Mountain:[77]

[77] As part of the construction associated with the Proctor intake realignment, which was authorized in an order issued by the Commission on June 20, 2013 (143 FERC

- operate the Beldens and Huntington Falls developments in an instantaneous run-of-river mode, whereby outflow from each project reservoir approximates inflow;

- operate the Proctor development: (a) in an instantaneous ROR mode from July 1 through April 30 and May 1 through June 30 when inflows into the impoundment are less than 200 and 400 cfs, respectively; and (b) in a 1.5-foot peaking mode at all other times;

- when operating the Proctor development in a peaking mode, implement the following maximum ratios over a 24-hour period between the maximum and minimum daily powerhouse flow releases:

    - from May 1 to June 30, 1.5:1 when inflow is equal to or greater than 400 cfs;
    - from July 1 to July 15, 1.5:1 when inflow is between 200 and 400 cfs, and 2:1 when inflow is equal to or greater than 400 cfs;
    - from July 16 to December 15, 2.5:1 when inflow is between 200 and 400 cfs, and 3:1 when inflow is equal to or greater than 400 cfs;
    - from December 16 to March 15, 3:1 when inflow is equal to or greater than 200 cfs; and
    - from March 16 to April 30, 2.5:1 when flows are between 200 and 400 cfs, and 3:1 when flows are greater than or equal to 400 cfs.

- provide a continuous minimum flow of 60 cfs to the Proctor bypassed reach to improve aesthetics and habitat conditions for resident aquatic species;

- provide a continuous minimum flow of 10 and 25 cfs over the east and west Beldens dams, respectively, to improve aesthetics and downstream habitat conditions for resident aquatic species;[78]

¶ 62,207 (2013)), Green Mountain would replace the existing trashracks at the Proctor development. These new trashracks would have 1-inch clear bar spacing, maximum approach velocities of 1.9 feet-per-second (fps), and be oriented parallel to river flow to minimize fish entrainment and impingement.

[78] Given the existing stream morphology downstream of the Beldens east dam, as further discussed in section 3.3.2.1, *Aquatic Resources*, Green Mountain's proposal to spill 10 cfs spill over the Beldens east dam would result in 5 cfs being provided to both the eastern bypassed reach itself, which primarily consists of Beldens Falls, and a crossover channel that flows from the eastern to the western bypassed channel.

- provide a continuous minimum flow of 66 cfs to the Huntington Falls bypassed reach to improve habitat conditions for resident aquatic species;

- replace the existing turbine-generator unit 3 trashracks at the Huntington Falls development with trashracks that have 2-inch clear bar spacing and maximum approach velocities of less than 2 fps, and are oriented parallel to river flow to minimize fish entrainment and impingement; and

- review and update, as necessary, the existing Spill Prevention Control and Countermeasures Plan and file it for Commission approval.

5.2.2 Additional Measures for Green Mountain Recommended by Staff

In addition to Green Mountain's proposed measures noted above, we recommend including the following measures in any license issued for Green Mountain:

- develop and implement a soil erosion and sediment control plan that contains specific measures to minimize erosion and sediment mobilization during proposed ground-disturbing activities;

- develop and implement an operation compliance monitoring plan to document compliance with the operational requirements of any license issued for the project;

- after a drawdown of the Proctor, Beldens, and Huntington Falls reservoirs for maintenance or emergency purposes, release 90 percent of the inflow to the developments while refilling the reservoirs with the remaining 10 percent of inflow;

- in consultation with the FWS and Vermont ANR, develop and implement a terrestrial monitoring and management plan that includes measures to: (a) survey construction areas for any new evidence of bald eagle and Indiana bat use and potential habitat prior to the commencement of ground-disturbing or future tree removal activities and file a report with the Commission documenting the results with any proposed protection/avoidance measures, as necessary; (b) prevent the spread of invasive plants during construction of proposed project facilities; and (c) restore disturbed areas once construction of proposed project facilities is completed;[79]

[79] Surveys for Indiana bats would be conducted only during the roosting season, or from April 1 through October 31.

- develop, after consultation with the Vermont ANR and the Middlebury Trust, and implement a recreation management plan that includes measures to: (1) improve the existing canoe/kayak take-out and portage trail around the Beldens dam; (2) modify the location of the boat barrier at the Huntington Falls development to enable the use of the existing canoe/kayak take-out; (3) operate and maintain all project recreation facilities; (4) improve the tailwater access site at the Proctor development; (5) ensure recreationists' safety during construction; and (6) develop interpretive signage at the Proctor development;

- revise the project's exhibit G drawings to include the existing portage trail from the take-out to the Morgan Horse Farm Road at the Huntington Falls development; and

- revise the proposed HPMP to include procedures to implement if an emergency occurs (i.e., an immediate threat to life or property) that may affect properties eligible for or listed on the National Register.

Below, we discuss the rationale for modifying Green Mountain's proposal and the basis for our additional staff-recommended measures.

Soil Erosion and Sediment Control Plan

As discussed in section 3.3.1, *Geologic and Soil Resources*, potential sources of project-related erosion and sedimentation would be limited to construction-related activities. These activities include improvement of the existing canoe/kayak take-out and portage trail around the Beldens dam, and enhancement of the existing tailwater access site at the Proctor development. Implementation of a soil erosion and sediment control plan would help to ensure that these construction-related activities do not adversely affect water resources in the project area. In section 4, *Developmental Analysis*, we determined that the levelized annual cost of developing and implementing a soil erosion and sediment control plan would be $464.

Implementation of a soil erosion and sediment control plan would ensure that any adverse effects to water and aquatic resources from erosion and sedimentation would be minimized during Green Mountain's proposed ground-disturbing activities. We conclude that these benefits associated with protecting water quality would be worth the levelized annual cost of $464. Therefore, we recommend that Green Mountain develop a soil erosion and sediment control plan that would be implemented during all ground-disturbing activities associated with construction of recreational improvements. At a minimum, the plan should include the following provisions: (1) a description of the actual site conditions in the area of proposed ground-disturbance; (2) a description of measures that would be used to control erosion, stabilize streambanks, prevent slope

instability, and minimize the quantity of sediment entering project waters during ground-disturbing activities; (3) detailed descriptions, design drawings, and specific locations of all control measures; (4) a description of the measures for storing and disposing of spoil materials and the locations of any spoil disposal areas; (5) a description of methods for revegetating disturbed areas, including a description of the native plant species used, planting densities, temporary soil stabilization techniques, and fertilization procedures or other requirements; (6) requirements for inspection and maintenance of erosion and sediment control measures to ensure proper operation; (7) a description of the measures to monitor for and suppress dust during construction activities; and (8) an implementation schedule.

Operation Compliance Monitoring Plan

An operation compliance monitoring plan would ensure the understanding of and compliance with the operational requirements of the license. In section 4, *Developmental Analysis*, we determined that the levelized annual cost of developing and implementing an operation compliance monitoring plan for the project would be about $2,402, depending on the measures selected by Green Mountain and approved by the Commission to obtain the information needed to ensure compliance.

The benefits of the plan would be worth this cost to ensure an adequate means by which the Commission could ensure compliance with the operational terms of any license issued for the project. We, therefore, recommend that Green Mountain develop, and file for Commission approval, an operation compliance monitoring plan that would document the procedures and techniques that Green Mountain would employ to demonstrate compliance with any license requirements pertaining to: (1) operating the Proctor development in an instantaneous ROR mode from May 1 to June 30 and July 1 to April 30 when inflow is less than 400 and 200 cfs, respectively, and in a 1.5-foot peaking mode at all other times; (2) implementing 24-hour maximum ratios between maximum and minimum daily powerhouse flow releases at the Proctor development when operating in a peaking mode; (3) releasing minimum instream flows in each of the project's bypassed reaches; (4) releasing minimum instream flows downstream of the project developments during any reservoir refill operations, as further discussed below; and (5) maintaining required reservoir levels.

Impoundment Drawdown and Refilling Procedures

Although Green Mountain proposes to eliminate routine Proctor reservoir drawdowns of 4 feet and instead operate this development in either an instantaneous ROR mode or a 1.5-foot peaking mode, as further discussed in section 2.2.2, *Proposed Project Operations*, reservoir drawdowns greater than 1.5 feet could still occur during emergencies or infrequently scheduled project maintenance activities. Similarly, emergency or maintenance-related reservoir drawdowns could also occur at the Beldens

or Huntington Falls developments, where Green Mountain is proposing to continue operating both developments in instantaneous ROR modes.

As discussed in section 3.3.2.2, *Reservoir Drawdowns and Refill*, emergency or maintenance-related reservoir drawdowns would require the project reservoirs to be refilled, which could require Green Mountain to reduce the flows released downstream of these developments during refill. Any such reduction in downstream flows has the potential to adversely affect aquatic organisms, especially those that have reduced mobility capabilities (i.e., macroinvertebrates and freshwater mussels), which may become susceptible to stranding in littoral areas of Otter Creek. Therefore, during any drawdown and refill operation at the Proctor, Beldens, and Huntington Falls developments, we conclude that releasing 90 percent of project inflow to Otter Creek immediately downstream of the powerhouse tailraces while using the remaining 10 percent to refill the reservoirs would protect aquatic habitat both within the project reservoirs, and in the respective river reaches downstream of these developments, by ensuring that downstream flows are kept at near natural flow levels and impoundments are timely refilled.

In section 4, *Developmental Analysis,* we determined that the levelized annual cost of operating the three project developments such that 90 percent of reservoir inflow would be provided downstream of the project developments during the conditions described above would be minimal. We conclude that the benefits of protecting aquatic resources with the project impoundments and downstream of the project developments would be worth this minimal cost.

Terrestrial Monitoring and Management Plan

Although construction and installation of Green Mountain's proposed project upgrades would not require tree removal, it would require the use of heavy equipment, which could result in noise that temporarily disturbs wildlife in and around project lands. Furthermore, although likely to be an infrequent occurrence during the period of any license issued for the project, the removal of trees within the project area for safety or project access purposes could negatively affect Indiana bats which require roosting trees for breeding and shelter outside of the hibernation period. Therefore, as discussed in section 3.3.3, *Terrestrial Resources*, a terrestrial monitoring and management plan is needed to ensure that disturbed areas would be restored in a timely manner, areas with known invasive species would be avoided, and the presence of bald eagle nesting, as well as Indiana bat roosting habitat, would be documented through surveys conducted prior to ground-disturbing or tree removal activities to prevent harassment or harm to either species.

In section 4, *Developmental Analysis*, we determined that the levelized annual cost of developing and implementing a terrestrial monitoring and management plan would be

$253. Because implementing a terrestrial monitoring and management plan would protect the terrestrial habitat along the project reservoirs and minimize any potential disturbance to wildlife, we find that the levelized annual cost of $253 to develop and implement the plan would be warranted.

We, therefore, recommend that Green Mountain develop and implement a terrestrial monitoring and management plan that at a minimum includes: (1) a provision to survey proposed construction areas or trees slated for future removal for evidence of bald eagle use, or potential habitat, prior to the commencement and installation of new project facilities or tree removal; (2) a provision to survey proposed construction areas or trees slated for future removal for evidence of Indiana bat use, or potential habitat, prior to the commencement and installation of new project facilities or tree removal, if such activities are implemented during the Indiana bat roosting season, or from April 1 through October 31; (3) a provision to file a report with the Commission, FWS, and Vermont ANR at least 90 days prior to the commencement of ground-disturbing or tree removal activities that documents the bald eagle and Indiana bat survey results, and details any proposed protection/avoidance measures developed in consultation with FWS and Vermont ANR, as necessary; (4) a provision to avoid areas with known populations of invasive plant species during construction of project facilities and detailed descriptions of any measures that would be implemented to prevent their spread; (5) a provision to limit lay down equipment to a small footprint; (6) a provision to re-vegetate any disturbed areas with native species after ground-disturbing activities are completed; and (7) an implementation schedule. We recommend that the plan be developed in consultation with the FWS and Vermont ANR, and filed with the Commission for approval prior to the commencement of ground-disturbing activities.

Recreation Management Plan

As discussed in section 3.3.5, *Recreation, Land Use, and Aesthetic Resources*, tailrace bank fishing is a popular activity at the Proctor development, and providing parking at the tailrace area could reduce any erosion run-off caused by parking at the unvegetated pull-off areas. Also, providing directional signage to the tailrace area would enable non-local recreationists to locate the tailrace site and may help increase the usage of the area. Additionally, installing interpretative signage at the Proctor development would help ensure that visitors know the history of the project and how it affected the marble industry in the Otter Creek Valley.

The installation of the proposed turbines/generators at the Proctor development would affect recreationists at the tailrace. Recreational use would be limited, because the tailrace access road would be needed for construction activities during the installation of the turbines. A schedule and signage to inform the public when public use at the Proctor development's tailrace access area would be restricted would ensure recreationists' safety during construction.

Also, as discussed in section 3.3.5, *Recreation, Land Use, and Aesthetics*, the installation of directional signage and brush clearing at the Beldens development's canoe/kayak take-out and portage would improve safety for boaters. Take-out signage would identify a safe egress prior to the boat barrier, and signage and brush clearing along the portage would ensure that boaters would easily find the canoe/kayak put-in. Finally, as discussed section 3.3.5, *Recreation, Land Use, and Aesthetics*, relocating the boat barrier would improve boater safety by ensuring that the take-out is accessible.

A recreation management plan that incorporates the recreation measures discussed above would help mitigate the temporary adverse effects of project construction on recreational use at the Proctor development's tailrace, and would ensure the project's recreation facilities would be enhanced to meet the recreating public's needs.

In section 4, *Developmental Analysis*, we determined that the levelized annual cost to develop and implement a recreation management plan that includes the above recreation measures would be $5,283. We find that the benefits of the plan would be worth the cost.

We, therefore, recommend that Green Mountain develop and implement a recreation management plan that includes, at a minimum: (1) final design drawings for the Proctor development gravel parking area; (2) provisions to install directional signage at the Proctor and Beldens developments; (3) a provision to install interpretative signage, at the Proctor development's tailrace access area, that provides information on the Otter Creek Project and how it affected the marble industry in the Otter Creek Valley; (4) a provision to modify the location of the boat barrier at the Huntington Falls development to enable the use of the existing canoe/kayak take-out; (5) a schedule for: (a) implementing signage and brush clearing at the Beldens development; (b) installing directional and interpretive signage and constructing the parking lot at the Proctor development; and (c) modifying the location of the boat barrier at the Huntington Falls development; (6) a schedule when public use at the Proctor development's tailrace access area would be restricted during installation of the turbines/generators; (7) a provision for signage that would inform the public when recreation use restrictions near the Proctor development's tailrace would occur due to installation of the turbines/generators; (8) provisions to ensure recreationists' safety during installation of the turbines/generators at the Proctor development; (9) provisions to operate and maintain the Proctor development tailrace access road and parking area, the Beldens development canoe/kayak put-in, take-out, and portage, the Beldens development viewing platform, picnic area, and parking lot, the Huntington Falls development canoe put-in, take-out, and portage trail from the take-out to Morgan Horse Farm Road, excluding Morgan Horse Farm Road, and from Morgan Horse Farm Road to the put-in, and the Huntington Falls overlook/picnic area and parking lot over the term of the license; and (10) a discussion of how the needs of the disabled were considered in the planning and design of the facilities. We recommend that the recreation management plan be developed after consultation with the Vermont

ANR and Middlebury Trust.

Project Boundary

As discussed in section 3.3.5, *Recreation, Land Use, and Aesthetic Resources,* Green Mountain's exhibit G drawings for the project do not enclose the Huntington Falls' portage from the take-out to Morgan Horse Farm Road, a county-maintained road.

Commission regulations require that all lands necessary for the operation and maintenance of the project, such as project-related recreation, be included within the project boundary. Therefore, we recommend that the exhibit G drawings be revised to extend the project boundary to enclose the existing portage from the take-out to Morgan Horse Farm Road.

Cultural Resources

As discussed in section 3.3.6, *Cultural Resources,* implementing the proposed HPMP would ensure that any adverse effects on the National Register-eligible project, or the archaeological or historical sites that are eligible for the National Register would be resolved through the proposed mitigation measures and treatment plans identified in the HPMP.

However, the proposed HPMP does not contain measures to implement if an emergency would occur and historic properties could be adversely affected. As discussed in section 3.3.6, *Cultural Resources,* the *Guidelines for the Development of Historic Properties Management Plans for FERC Hydroelectric Projects* states that an HPMP should address how the effects on historic resources will be considered in the event of an emergency. Therefore, we recommend that the proposed HPMP be revised to include procedures to address an emergency situation. Emergency procedures should include, but not be limited to: (1) consultation with the Vermont SHPO and the Commission concerning the effects on historic properties as soon as possible, but no later than 10 days, after any emergency; and (2) conducting an assessment of the damage and developing site-specific treatment plans, as appropriate, after consultation with the Vermont SHPO and the Commission, if historic properties are damaged during emergency situations. These measures would ensure that any adverse effects to historic properties would be lessened or mitigated.

The revision to the HPMP could be a stipulation of a PA, which could be executed between the Commission and the Vermont SHPO. Revising and implementing the HPMP to include emergency procedures would ensure the protection of historic properties that may be affected by an immediate threat to life or property. Therefore, we recommend that Green Mountain revise its HPMP to include this procedure. We conclude that the benefits of the revisions are worth the levelized annual cost of $29,680.

5.2.3 Measures Not Recommended

Green Mountain's proposal to consult with the resource agencies to determine appropriate modifications to the project's trashracks if the Vermont FWD provides notification that its fisheries management program will resume Atlantic salmon restoration or stocking efforts in Otter Creek would be an administrative action that would not directly contribute to the best comprehensive use of Otter Creek water resources. For this reason, we do not recommend including this proposed measure as a condition of any license issued for the project. Should, in the future, Green Mountain wish to modify the project's trashracks, it could seek Commission approval to do so through a license amendment application.

5.3 UNAVOIDABLE ADVERSE EFFECTS

Construction of Green Mountain's proposed recreation facility upgrades at the Proctor and Beldens developments would result in minor, short-term increases in soil erosion within disturbed areas. However, most of these effects would be short-term, limited to the construction period, and reduced through implementing a soil erosion and sediment control plan.

Green Mountain's proposal to implement a 1.5-foot peaking mode of operation at the Proctor development has the potential to affect aquatic organisms inhabiting the littoral areas of the Proctor impoundment. These proposed project operations could dewater nests, desiccate fish eggs and other aquatic organisms stranded by the drawdowns, and affect the overall behavior of aquatic species residing within the proposed 1.5-foot drawdown zone.

Green Mountain's proposal to increase the hydraulic capacity of the Proctor and Huntington Falls developments would likely increase existing levels of project-related fish entrainment and lead to a higher rate of fish injury and mortality. However, the overall effect on the resident fish populations in Otter Creek would likely be minimal.

Green Mountain's proposal to route minimum flows through a gate at the southern end of the dam at the Huntington Falls development would result in the waterfall downstream of the dam becoming dry. However, the overall effect to aesthetics would be minimal, because the waterfall is not easy to access and is not viewed by many visitors to the area.

5.4 FISH AND WILDLIFE AGENCY RECOMMENDATIONS

Under the provisions of section 10(j) of the FPA, each hydroelectric license issued by the Commission shall include conditions based on recommendations provided by

federal and state fish and wildlife agencies for the protection, mitigation, and enhancement of fish and wildlife resources affected by the project.

Section 10(j) of the FPA states that whenever the Commission believes that any fish and wildlife agency recommendation is inconsistent with the purposes and the requirements of the FPA or other applicable law, the Commission and the agency shall attempt to resolve such inconsistency, giving due weight to the recommendations, expertise, and statutory responsibilities of the agency. No section 10(j) recommendations were filed in response to the ready for environmental analysis notice.

5.5 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2)(A) of the FPA, 16 U.S.C. §803(a)(2)(A), requires the Commission to consider the extent to which a project is consistent with federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project. We reviewed 11 comprehensive plans that are applicable to the project.[80] No inconsistencies were found.

6.0 FINDING OF NO SIGNIFICANT IMPACT

If the Otter Creek Project is issued a new license as proposed with the additional staff-recommended measures, the project would continue to operate while providing

[80] (1) Lake Champlain Fish and Wildlife Policy Committee and Technical Committee. 2009. A strategic plan Lake Champlain Fisheries. Essex Junction, Vermont. July 2009; (2) Vermont Agency of Natural Resources. 1990. Vermont's lake trout management plan for inland waters. Waterbury, Vermont. May 1990. St. Johnsbury, Vermont. July 1990. 50 pp; (3) U.S. Fish and Wildlife Service. Undated. Fisheries USA: the recreational fisheries policy of the U.S. Fish and Wildlife Service. Washington, D.C; (4) Vermont Agency of Natural Resources. 1988. Wetlands component of the 1988 Vermont recreation plan. Waterbury, Vermont. July 1988. 43 pp; (5) Vermont Agency of Environmental Conservation. 1986. Vermont Rivers Study. Waterbury, Vermont. 236 pp: (6) Vermont Agency of Natural Resources. 1988. Hydropower in Vermont: an assessment of environmental problems and opportunities. Waterbury, Vermont. May 1988; (7) National Park Service. 1982. The nationwide rivers inventory. Department of the Interior, Washington, D.C. January 1982; (8) Vermont Department of Forests, Parks and Recreation. 2005. Vermont’s outdoor recreation plan, 2005-2009: State Comprehensive Outdoor Recreation Plan (SCORP). Waterbury, Vermont. July 2005; (10) Forest Service. 1993. Green Mountain National Forest land and resource management plan. Department of Agriculture, Rutland, Vermont. December 1993; and (11) Vermont Agency of Natural Resources. 1986. The waterfalls, cascades, and gorges of Vermont. Waterbury, Vermont. May 1986. 320 pp.

enhancements to fish and wildlife resources, improvements to recreation facilities, and protection of cultural and historic resources in the project area.

Based on our independent analysis, issuance of a new license for the Otter Creek Project, as proposed with additional staff-recommended measures, would not constitute a major federal action significantly affecting the quality of the human environment.

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APPENDIX A
Commission Staff Recommended License Conditions for Green Mountain

We recommend including the following license articles in any new license issued for Green Mountain:

Draft Article 001. *Administrative Annual Charges*. The licensee shall pay the United States annual charges, effective the first day of the month in which the license is issued, and as determined in accordance with provisions of the Commission's regulations in effect from time to time, for the purposes of reimbursing the United States for the cost of administration of Part I of the Federal Power Act. The authorized installed capacity for that purpose is as follows:

(a) 18,279 kilowatts (kW) based on the authorized and currently existing capacity; and

(b) 21,814 kW upon commencement of construction of the additional capacity authorized in this order.

The licensee shall file a report stating the date of commencement of construction of the additional authorized capacity, within 90 days of such date. Such commencement date will be the effective date for the annual charges under Draft Article 001(b).

Draft Article 002. *Exhibit F Drawings*. Within 45 days of the effective date of this license, the licensee shall file the approved exhibit F drawings in aperture card and electronic file formats.

(a) Three sets of the approved exhibit drawings shall be reproduced on silver or gelatin 35 mm microfilm. All microfilm shall be mounted on type D (3-1/4" X 7-3/8") aperture cards. Prior to microfilming, the FERC Project-Drawing Number (e.g., P-2558-1001 through 1013) shall be shown in the margin below the title block of the approved drawing. After mounting, the FERC Drawing Number shall be typed on the upper right corner of each aperture card. Additionally, the Project Number, FERC Exhibit (i.e., F-1, etc.), Drawing Title, and date of this license shall be typed on the upper left corner of each aperture card.

Two of the sets of aperture cards shall be filed with the Secretary of the Commission, ATTN: OEP/DHAC. The third set shall be filed with the Commission's Division of Dam Safety and Inspections New York Regional Office.

(b) The licensee shall file two separate sets of exhibit drawings in electronic raster format with the Secretary of the Commission, ATTN: OEP/DHAC. A third set shall be filed with the Commission's Division of Dam Safety and Inspections New York Regional Office. Exhibit F drawings must be separated from other project exhibits and identified as Critical Energy Infrastructure Information (CEII) material under 18 C.F.R. §388.113(c) (2012). Each drawing must be a separate electronic file, and the file name shall include: FERC Project-Drawing Number, FERC Exhibit, Drawing Title, date of this license, and file extension in the following format [P-2558-1001, F-1, Drawing Title, MM-DD-YYYY.TIF]. Electronic drawings shall meet the following format specification:

IMAGERY - black & white raster file
FILE TYPE – Tagged Image File Format (TIFF), CCITT Group 4
RESOLUTION – 300 dpi desired (200 dpi min)
DRAWING SIZE FORMAT – 24" X 36" (min), 28" X 40" (max)
FILE SIZE – less than 1 MB desired

Draft Article 003. *Exhibit G Drawings*. Within 90 days of the effective date of this license, the licensee shall file, for Commission approval, revised exhibit G drawings enclosing within the project boundary all project works and facilities necessary for operation and maintenance of the project, including the Huntington Falls development's portage trail from the take-out to the Morgan Horse Farm Road. The exhibit G drawings shall comply with sections 4.39 and 4.41 of the Commission's regulations, 18 C.F.R §§ 4.39 and 4.41 (2012).

Draft Article 004. *Amortization Reserve*. Pursuant to section 10(d) of the Federal Power Act, a specified reasonable rate of return upon the net investment in the project shall be used for determining surplus earnings of the project for the establishment and maintenance of amortization reserves. The licensee shall set aside, in a project amortization reserve account at the end of each fiscal year, one-half of the project surplus earnings, if any, in excess of the specified rate of return per annum on the net investment. To the extent that there is a deficiency of project earnings below the specified rate of return per annum for any fiscal year, the licensee shall deduct the amount of that deficiency from the amount of any surplus earnings subsequently accumulated, until absorbed. The licensee shall set aside one-half of the remaining surplus earnings, if any, cumulatively computed, in the project amortization reserve account. The licensee shall maintain the amounts established in the project amortization reserve account until further order of the Commission.

The specified reasonable rate of return used in computing amortization reserves shall be calculated annually based on current capital ratios developed from an average of 13 monthly balances of amounts properly included in the licensee's long-term debt and proprietary capital accounts as listed in the Commission's Uniform System of Accounts. The cost rate for such ratios shall be the weighted average cost of long-term debt and

preferred stock for the year, and the cost of common equity shall be the interest rate on 10-year government bonds (reported as the Treasury Department's 10-year constant maturity series) computed on the monthly average for the year in question plus four percentage points (400 basis points).

Draft Article 005. *Headwater Benefits.* If the licensee's project was directly benefited by the construction work of another licensee, a permittee, or the United States on a storage reservoir or other headwater improvement during the term of the original license (including extensions of that term by annual licenses), and if those headwater benefits were not previously assessed and reimbursed to the owner of the headwater improvement, the licensee shall reimburse the owner of the headwater improvement for those benefits, at such time as they are assessed, in the same manner as for benefits received during the term of this license. The benefits will be assessed in accordance with Part 11, Subpart B, of the Commission's regulations.

Draft Article 006. *Project Land Rights Progress Report*. No later than four years after license issuance, the licensee shall file a report with the Commission describing the status of acquiring title in fee or the rights for all the lands within the project boundary. The report must provide an overview map of each parcel and summary table identifying the licensee's rights over each parcel within the project boundary. The report shall also include specific supporting documentation showing the status of the land rights on all parcels of land within the project boundary that: (1) have been acquired up to the date of filing of the report, including pertinent deeds, lease agreements, and/or bill of sale information that specifically verify the licensee's rights; and (2) the licensee's plan and schedule for acquiring all remaining project lands prior to the five-year deadline, including a history of actions taken, current owner information, the type of ownership to be acquired whether in fee or by easement, and the timeline for completing property acquisition.

Draft Article 007. *Documentation of Project Financing.* At least 90 days before starting construction, the licensee shall file with the Commission, for approval, three copies of the licensee's documentation for the project financing. The documentation must show that the licensee has acquired the funds, or commitment for funds, necessary to construct the project in accordance with this license. The documentation must include, at a minimum, financial statements, including a balance sheet, income statement, and a statement of actual or estimated cash flows over the license term which provide evidence that the licensee has sufficient assets, credit, and projected revenues to cover project construction, operation, and maintenance expenses, and any other estimated project liabilities and expenses.

The financial statements must be prepared in accordance with generally accepted accounting principles and signed by an independent certified public accountant. The

licensee shall not commence project construction associated with the project before the filing is approved.

Draft Article 008. *Start of Construction*. The licensee shall commence construction of the project works within 2 years from the issuance date of the license and shall complete construction of the project works within 4 years from the issuance date of the license.

Draft Article 009. *Cofferdam Construction Drawings and Deep Excavations.* Before starting construction, the licensee shall review and approve the design of contractor-designed cofferdams and deep excavations and shall make sure construction of cofferdams and deep excavations is consistent with the approved design. At least 30 days before starting construction of the cofferdam, the licensee shall submit one copy to the Commission's Division of Dam Safety and Inspections (D2SI) New York Regional Engineer and two copies to the Commission (one of these copies shall be a courtesy copy to the Commission's Director, D2SI), of the approved cofferdam construction drawings and specifications and the letters of approval.

Draft Article 010. *Dam Safety and Spillway Adequacy Report*. Within 60 days of the date of this license, the licensee shall submit one copy to the Division of Dam Safety and Inspections – New York Regional Engineer and two copies to the Commission (one of these shall be a courtesy copy to the Director, Division of Dam Safety and Inspections), of a report describing the effects of the target reservoir levels required by this license on upstream and downstream flooding and the project's spillway adequacy. At a minimum, the report shall: (1) include a flood routing study that evaluates the ability of the project to safely pass flows up to the Inflow Design Flood; (2) assess if there would be an increased likelihood of low-lying structures being flooded under the new operating scenario; and (3) if necessary, include a plan and schedule for performing any remedial measures necessary to ensure the continued safe operation of the developments during high flows. The licensee shall not implement the water level requirements of this license until the Division of Dam Safety and Inspections' New York Regional Engineer determines that the altered project operations have no adverse impact on dam safety and issues a letter indicating such.

Draft Article 011. *Contract Plans and Specifications*. At least 60 days prior to start of construction, the licensee shall submit one copy of its final contract plans and specifications and supporting design report to the Commission's Division of Dam Safety and Inspections (D2SI) – New York Regional Engineer, and two copies to the Commission (one of these shall be a courtesy copy to the Director, D2SI). The submittal must also include as part of preconstruction requirements: a Quality Control and Inspection Program, Temporary Construction Emergency Action Plan, and a Soil Erosion and Sediment Control Plan.

The purpose of the Soil Erosion and Sediment Control Plan shall be, at a minimum, to control erosion and to minimize the quantity of sediment resulting from construction of recreational enhancements at the Proctor and Beldens developments.

The plan shall be based on actual-site geological, soil, and sediment conditions and on project design, and shall include, at a minimum, the following items:

(1) a description of the actual site conditions;

(2) a description of measures that would be used to control erosion, stabilize streambanks, prevent slope instability, and minimize the quantity of sediment entering project waters during any ground-disturbing activities;

(3) detailed descriptions, design drawings, and specific locations of all control measures;

(4) a description of the measures for storing and disposing spoil materials and the locations of any spoil disposal areas;

(5) a description of methods for revegetating disturbed areas, including a description of the native plant species used, planting densities, temporary soil stabilization techniques, and fertilization procedures or other requirements;

(6) requirements for inspection and maintenance of erosion and sediment control measures to ensure proper operation;

(7) a description of the measures to monitor for and suppress dust during construction activities; and

(8) an implementation schedule.

The licensee may not begin construction until the D2SI – New York Regional Engineer has reviewed and commented on the plans and specifications, determined that all preconstruction requirements have been satisfied, and authorized the start of construction.

Draft Article 012. *As–Built Drawings*. Within 90 days of completion of all construction activities authorized by this license, the licensee shall file for Commission approval, revised exhibits A, F, and G, as applicable, to describe and show those project facilities as built. A courtesy copy shall be filed with the Commission's Division of Dam Safety and Inspections (D2SI) – New York Regional Engineer; the Director, D2SI; and the Director, Division of Hydropower Administration and Compliance.

Draft Article 013. *Operation of the Proctor Development*. From July 1 through April 30 when inflow is less than 200 cubic feet per second (cfs) and from May 1 through June 30 when inflow is less than 400 cfs, the licensee shall operate the Proctor development in a run-of-river (ROR) mode for the protection of aquatic resources in the Proctor reservoir and in Otter Creek downstream of the development's powerhouse. While operating in a ROR mode, the licensee shall at all times act to minimize fluctuation of the development's reservoir surface elevation by maintaining a discharge from the development so that, at any point in time, flows as measured immediately downstream from the development's powerhouse approximates the sum of inflows to the development's reservoir.

During all other times, the licensee may operate the Proctor development in either a ROR mode as specified above or in a peaking mode, provided that if the licensee operates in a peaking mode, it maintains the development's minimum flows required by Draft Article 016 and implements the following operational constraints while peaking: (1) maintain the Proctor reservoir surface elevation between 468 and 469.5 feet above mean sea level (msl) to the extent of the operational control of the licensee; and (2) maintain the following maximum ratios between the maximum and minimum flows released from the development over a 24-hour period as measured immediately downstream of the development's powerhouse:

- from May 1 to June 30, 1.5:1 when inflow is equal to or greater than 400 cfs;

- from July 1 to July 15, 1.5:1 when inflow is between 200 and 400 cfs, and 2:1 when inflow is equal to or greater than 400 cfs;

- from July 16 to December 15, 2.5:1 when inflow is between 200 and 400 cfs, and 3:1 when inflow is equal to or greater than 400 cfs;

- from December 16 to March 15, 3:1 when inflow is equal to or greater than 200 cfs; and

- from March 16 to April 30, 2.5:1 when inflow is between 200 and 400 cfs, and 3:1 when inflow is greater than or equal to 400 cfs.

The operational constraints of this article may be temporarily modified if required by operating emergencies beyond the control of the licensee, and for short periods upon mutual agreement between the licensee and the Vermont Agency of Natural Resources. If the operations are so modified, the licensee shall notify the Commission as soon as possible, but no later than 10 days after each such incident.

Draft Article 014. *Operation of the Beldens Development*. The licensee shall operate the Beldens development in a run-of-river (ROR) mode for the protection of

aquatic resources in the Beldens reservoir and Otter Creek downstream of the development's powerhouse. While operating ROR, the licensee shall at all times act to minimize the fluctuation of the development's reservoir surface elevation by maintaining a discharge from the development so that at any point in time, flows as measured immediately downstream from the development's lower powerhouse approximates the sum of inflows to the development's reservoir.

ROR operation may be temporarily modified if required by operating emergencies beyond the control of the licensee, and for short periods upon mutual agreement between the licensee and the Vermont Agency of Natural Resources. If the flow is so modified, the licensee shall notify the Commission as soon as possible, but no later than 10 days after each such incident.

Draft Article 015. *Operation of the Huntington Falls Development*. The licensee shall operate the Huntington Falls development in a run-of-river (ROR) mode for the protection of aquatic resources in the Huntington Falls reservoir and Otter Creek downstream of the development's lower powerhouse. While operating ROR, the licensee shall at all times act to minimize the fluctuation of the development's reservoir surface elevation by maintaining a discharge from the development so that at any point in time, flows as measured immediately downstream from the development's lower powerhouse approximates the sum of inflows to the development's reservoir.

ROR operation may be temporarily modified if required by operating emergencies beyond the control of the licensee, and for short periods upon mutual agreement between the licensee and the Vermont Agency of Natural Resources. If the flow is so modified, the licensee shall notify the Commission as soon as possible, but no later than 10 days after each such incident.

Draft Article 016. *Minimum Flows*. The licensee shall release the following minimum flows for the protection of aquatic resources in Otter Creek: (1) 60 cubic feet per second (cfs), or inflow if less, to the Proctor bypassed reach immediately downstream of the Proctor dam at all times; (2) 25 and 10 cfs over the west and east channels of the Beldens dams, respectively, or inflow to the development if less, such that all inflow to the development would be released to the west and east channels utilizing a 2.5:1 ratio; and (3) 66 cfs, or inflow if less, to the Huntington Falls bypassed reach immediately downstream of the Huntington Falls dam at all times.

These flows may be temporarily modified if required by operating emergencies beyond the control of the licensee, and for short periods upon mutual agreement between the licensee and the Vermont Agency of Natural Resources. If the flow is so modified, the licensee shall notify the Commission as soon as possible, but no later than 10 days after each such incident.

Draft Article 017. *Reservoir Refill Operations*. While refilling the Proctor, Beldens, or Huntington Falls reservoirs after a drawdown resulting from scheduled project maintenance activities or operating emergencies, the licensee shall release a minimum of 90 percent of reservoir inflow from the respective project developments.

The refill protocol may be temporarily modified if required by operating emergencies beyond the control of the licensee, or for short periods upon mutual agreement between the licensee and the Vermont Agency of Natural Resources. If the refill protocol is so modified, the licensee shall notify the Commission as soon as possible, but no later than 10 days after each such incident.

Draft Article 018. *Operation Compliance Monitoring Plan.* Within six months of license issuance, the licensee shall file with the Commission, for approval, an operation compliance monitoring plan that describes how the licensee will comply with the operational requirements of this license.

The plan shall include, but not necessarily be limited to, the following: (1) a provision to monitor compliance with the operational requirements contained in draft articles 013 through 017; (2) a description of the exact location of all gages and/or measuring devices, or techniques that would be used to monitor compliance; (3) the procedures for maintaining and calibrating monitoring equipment; (4) the frequency of recording for each gage and/or measuring device; (5) the protocols or methods to be used for reporting the monitoring data to the Commission; (6) a monitoring schedule; (7) a provision to maintain a log of project operations; and (8) an implementation schedule.

The licensee shall prepare the plan after consultation with the Vermont Agency of Natural Resources (Vermont ANR) and the U.S. Fish and Wildlife Service (FWS). The licensee shall include with the plan, documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the agencies' comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the agencies to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific information. The Commission reserves the right to require changes to the plan and schedule.

Implementation of the plan shall not begin until the licensee is notified by the Commission that the plan and schedule are approved. Upon Commission approval, the licensee shall implement the plan and schedule, including any changes required by the Commission.

Draft Article 019. *Spill Prevention Control and Countermeasures Plan*. At least 90 days before the start of any land-disturbing activities, the licensee shall file for

Commission approval, a Spill Prevention Control and Countermeasures Plan. The plan shall include, but not necessarily be limited to the following: (1) a description of the procedures that would be used to minimize hazardous substance spills in the project area; (2) a description of the protocols and procedures that would be used to minimize the extent and adverse effects of any hazardous materials spills that do occur; (3) a description of the protocols and procedures that would be used to cleanup any spills; and (4) a provision to notify the Vermont Agency of Natural Resources (Vermont ANR) and the Commission of any hazardous substance spills from the project as soon as possible but no later than 24 hours after becoming aware of an incident.

The licensee shall prepare the plan after consultation with the Vermont ANR. The licensee shall include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to Vermont ANR, and specific descriptions of how Vermont ANR's comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for Vermont ANR and to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. Implementation of the plan shall not begin until the licensee is notified by the Commission that the plan is approved. Upon Commission approval, the licensee shall implement the plan according to the approved schedule, including any changes required by the Commission.

Draft Article 020. *Detailed Trashrack Design Drawings and Specifications*. Within six months of license issuance, the licensee shall file, for Commission approval, detailed design drawings and specifications of the licensee's proposed trashracks at the intake for turbine-generator unit 3 at the Huntington Falls development to reduce fish entrainment.

This filing shall include, but not necessarily be limited to: (1) specifications showing a maximum clear space of 2 inches in the openings between the trashrack bars at the intake for turbine-generator unit 3 at the Huntington Falls; (2) specifications showing a maximum intake approach velocity at the Huntington Falls development's unit 3 trashrack of 2 feet per second; (3) specifications showing the orientation of the new trashracks at the Huntington Falls development as being parallel to the river's flow; and (4) a description of the methods and a schedule for installing the trashracks.

The licensee shall prepare the aforementioned drawings and schedule after consultation with the U.S. Fish and Wildlife Service and the Vermont Agency of Natural Resources. The licensee shall include with the drawings, documentation of consultation, copies of agency comments and recommendations on the drawings and schedule after they have been prepared and provided to the agencies, and specific descriptions of how

the agencies' comments are accommodated by the licensee's facilities. The licensee shall allow a minimum of 30 days for the agencies to comment and to make recommendations before filing the drawings and schedule with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the proposed facilities and schedule. Land-disturbing or land-clearing activities associated with the trashracks shall not begin until the licensee is notified by the Commission that the filing is approved. Upon Commission approval, the licensee shall implement the proposal, including any changes required by the Commission.

Draft Article 021. *Terrestrial Monitoring and Management Plan*. At least 180 days before the start of any land-disturbing or land-clearing activities, the licensee shall file for Commission approval, a terrestrial monitoring and management plan to ensure terrestrial resources are protected during construction and installation of new project facilities.

The plan shall include, but not necessarily be limited to, the following: (1) a provision to survey proposed construction areas or trees slated for future removal for evidence of bald eagle use, or potential habitat, prior to the commencement and installation of new project facilities or tree removal; (2) a provision to survey proposed construction areas or trees slated for future removal for evidence of Indiana bat use, or potential habitat, prior to the commencement and installation of new project facilities or tree removal, if such activities are implemented during the Indiana bat roosting season, or from April 1 through October 31; (3) a provision to file a report with the Commission, FWS, and Vermont ANR at least 90 days prior to the commencement of ground-disturbing or tree removal activities that documents the bald eagle and Indiana bat survey results, and details any proposed protection/avoidance measures developed in consultation with FWS and Vermont ANR, as necessary; (4) a provision to avoid areas with known populations of invasive plant species during construction of project facilities and detailed descriptions of any measures that would be implemented to prevent their spread; (5) a provision to limit lay down equipment to a small footprint; (6) a provision to re-vegetate any disturbed areas with native species after ground-disturbing activities are completed; and (7) an implementation schedule. We recommend that the plan be developed in consultation with the FWS and Vermont ANR, and filed with the Commission for approval prior to the commencement of ground-disturbing activities.

The licensee shall prepare the plan after consultation with the FWS and Vermont ANR. The licensee shall include with the plan, documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the agencies' comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the

agencies to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan and schedule. Land-disturbing and land-clearing activities shall not begin until the licensee is notified that the plan is approved. Upon Commission approval, the licensee shall implement the plan and schedule, including any changes required by the Commission.

Draft Article 022. *Recreation Management Plan*. At least 90 days before the start of any land-disturbing or land-clearing activities, the licensee shall file for Commission approval, a recreation management plan. The plan shall include, but not necessarily be limited to, the following: (1) final design drawings for the Proctor development gravel parking area; (2) provisions to install directional signage at the Proctor and Beldens developments; (3) a provision to install interpretative signage, at the Proctor development's tailrace access area, that provides information on the Otter Creek Project and how it affected the marble industry in the Otter Creek Valley; (4) a provision to modify the location of the boat barrier at the Huntington Falls development to enable the use of the existing canoe/kayak take-out; (5) a schedule for: (a) implementing signage and brush clearing at the Beldens development; (b) installing directional and interpretive signage and constructing the parking lot at the Proctor development; and (c) modifying the location of the boat barrier at the Huntington Falls development; (6) a schedule when public use at the Proctor development's tailrace access area would be restricted during installation of the turbines/generators; (7) a provision for signage that would inform the public when recreation use restrictions near the Proctor development's tailrace would occur due to installation of the turbines/generators; (8) provisions to ensure recreationists' safety during installation of the turbines/generators at the Proctor development; (9) provisions to operate and maintain the Proctor development tailrace access road and parking area, the Beldens development canoe/kayak put-in, take-out, and portage, the Beldens development viewing platform, picnic area, and parking lot, the Huntington Falls development canoe put-in, take-out, and portage trail from the take-out to Morgan Horse Farm Road, excluding Morgan Horse Farm Road, and from Morgan Horse Farm Road to the put-in, and the Huntington Falls overlook/picnic area and parking lot over the term of the license; and (10) a discussion of how the needs of the disabled were considered in the planning and design of the facilities.

The licensee shall prepare the plan after consultation with the Vermont Agency of Natural Resources (Vermont ANR) and the Middlebury Area Land Trust (Middlebury Trust). The licensee shall include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the Vermont ANR and the Middlebury Trust, and specific descriptions of how the Vermont ANR's and the Middlebury Trust's comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the Vermont ANR and the

Middlebury Trust to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. Implementation of the plan shall not begin until the licensee is notified by the Commission that the plan is approved. Upon Commission approval, the licensee shall implement the plan according to the approved schedule, including any changes required by the Commission.

The Proctor development's parking area, built in accordance with this plan, shall be shown on the as-built drawings filed pursuant to Draft Article 012.

Draft Article 023. *Programmatic Agreement and Historic Properties Management Plan.* The licensee shall implement the "Programmatic Agreement Between the Federal Energy Regulatory Commission and the Vermont Historic Preservation Officer for Managing Historic Properties that May be Affected by Issuance of a License to Green Mountain Power Corporation for the Continued Operation of the Otter Creek Hydroelectric Project in Addison and Rutland counties, Vermont (FERC No. 2558)," executed on _____, and including but not limited to the Historic Properties Management Plan (HPMP) for the project. In the event that the Programmatic Agreement is terminated, the licensee shall continue to implement the provisions of its approved HPMP. The Commission reserves the authority to require changes to the HPMP at any time during the term of the license.

Draft Article 024. *Use and Occupancy.* (a) In accordance with the provisions of this article, the licensee shall have the authority to grant permission for certain types of use and occupancy of project lands and waters and to convey certain interests in project lands and waters for certain types of use and occupancy, without prior Commission approval. The licensee may exercise the authority only if the proposed use and occupancy is consistent with the purposes of protecting and enhancing the scenic, recreational, and other environmental values of the project. For those purposes, the licensee shall also have continuing responsibility to supervise and control the use and occupancies for which it grants permission, and to monitor the use of, and ensure compliance with the covenants of the instrument of conveyance for, any interests that it has conveyed, under this article. If a permitted use and occupancy violates any condition of this article or any other condition imposed by the licensee for protection and enhancement of the project's scenic, recreational, or other environmental values, or if a covenant of a conveyance made under the authority of this article is violated, the licensee shall take any lawful action necessary to correct the violation. For a permitted use or occupancy, that action includes, if necessary, canceling the permission to use and occupy the project lands and waters and requiring the removal of any non-complying structures and facilities.

(b) The type of use and occupancy of project lands and waters for which the licensee may grant permission without prior Commission approval are: (1) landscape plantings; (2) non-commercial piers, landings, boat docks, or similar structures and facilities that can accommodate no more than 10 water craft at a time and where said facility is intended to serve single-family type dwellings; (3) embankments, bulkheads, retaining walls, or similar structures for erosion control to protect the existing shoreline; and (4) food plots and other wildlife enhancement. To the extent feasible and desirable to protect and enhance the project's scenic, recreational, and other environmental values, the licensee shall require multiple use and occupancy of facilities for access to project lands or waters. The licensee shall also ensure, to the satisfaction of the Commission's authorized representative, that the use and occupancies for which it grants permission are maintained in good repair and comply with applicable state and local health and safety requirements. Before granting permission for construction of bulkheads or retaining walls, the licensee shall: (1) inspect the site of the proposed construction, (2) consider whether the planting of vegetation or the use of riprap would be adequate to control erosion at the site, and (3) determine that the proposed construction is needed and would not change the basic contour of the impoundment shoreline. To implement this paragraph (b), the licensee may, among other things, establish a program for issuing permits for the specified types of use and occupancy of project lands and waters, which may be subject to the payment of a reasonable fee to cover the licensee's costs of administering the permit program. The Commission reserves the right to require the licensee to file a description of its standards, guidelines, and procedures for implementing this paragraph (b) and to require modification of those standards, guidelines, or procedures.

(c) The licensee may convey easements or rights-of-way across, or leases of project lands for: (1) replacement, expansion, realignment, or maintenance of bridges or roads where all necessary state and federal approvals have been obtained; (2) storm drains and water mains; (3) sewers that do not discharge into project waters; (4) minor access roads; (5) telephone, gas, and electric utility distribution lines; (6) non-project overhead electric transmission lines that do not require erection of support structures within the project boundary; (7) submarine, overhead, or underground major telephone distribution cables or major electric distribution lines (69-kV or less); and (8) water intake or pumping facilities that do not extract more than one million gallons per day from a project impoundment. No later than January 31 of each year, the licensee shall file three copies of a report briefly describing for each conveyance made under this paragraph (c) during the prior calendar year, the type of interest conveyed, the location of the lands subject to the conveyance, and the nature of the use for which the interest was conveyed.

(d) The licensee may convey fee title to, easements or rights-of-way across, or leases of project lands for: (1) construction of new bridges or roads for which all necessary state and federal approvals have been obtained; (2) sewer or effluent lines that discharge into project waters, for which all necessary federal and state water quality certification or permits have been obtained; (3) other pipelines that cross project lands or waters but do

not discharge into project waters; (4) non-project overhead electric transmission lines that require erection of support structures within the project boundary, for which all necessary federal and state approvals have been obtained; (5) private or public marinas that can accommodate no more than 10 water craft at a time and are located at least one-half mile (measured over project waters) from any other private or public marina; (6) recreational development consistent with an approved report on recreational resources of an Exhibit E; and (7) other uses, if: (i) the amount of land conveyed for a particular use is five acres or less; (ii) all of the land conveyed is located at least 75 feet, measured horizontally, from project waters at normal surface elevation; and (iii) no more than 50 total acres of project lands for each project development are conveyed under this clause (d)(7) in any calendar year. At least 60 days before conveying any interest in project lands under this paragraph (d), the licensee must file a letter with the Commission, stating its intent to convey the interest and briefly describing the type of interest and location of the lands to be conveyed (a marked Exhibit G map may be used), the nature of the proposed use, the identity of any federal or state agency official consulted, and any federal or state approvals required for the proposed use. Unless the Commission's authorized representative, within 45 days from the filing date, requires the licensee to file an application for prior approval, the licensee may convey the intended interest at the end of that period.

(e) The following additional conditions apply to any intended conveyance under paragraph (c) or (d) of this article:

(1) Before conveying the interest, the licensee shall consult with federal and state fish and wildlife or recreation agencies, as appropriate, and the State Historic Preservation Officer.

(2) Before conveying the interest, the licensee shall determine that the proposed use of the lands to be conveyed is not inconsistent with any approved report on recreational resources of an Exhibit E; or, if the project does not have an approved report on recreational resources, that the lands to be conveyed do not have recreational value.

(3) The instrument of conveyance must include the following covenants running with the land: (i) the use of the lands conveyed shall not endanger health, create a nuisance, or otherwise be incompatible with overall project recreational use; (ii) the grantee shall take all reasonable precautions to ensure that the construction, operation, and maintenance of structures or facilities on the conveyed lands will occur in a manner that will protect the scenic, recreational, and environmental values of the project; and (iii) the grantee shall not unduly restrict public access to project waters.

(4) The Commission reserves the right to require the licensee to take reasonable remedial action to correct any violation of the terms and conditions of this article, for the

protection and enhancement of the project's scenic, recreational, and other environmental values.

(f) The conveyance of an interest in project lands under this article does not in itself change the project boundaries. The project boundaries may be changed to exclude land conveyed under this article only upon approval of revised Exhibit G drawings (project boundary maps) reflecting exclusion of that land. Lands conveyed under this article will be excluded from the project only upon a determination that the lands are not necessary for project purposes, such as operation and maintenance, flowage, recreation, public access, protection of environmental resources, and shoreline control, including shoreline aesthetic values. Absent extraordinary circumstances, proposals to exclude lands conveyed under this article from the project shall be consolidated for consideration when revised Exhibit G drawings would be filed for approval for other purposes.

(g) The authority granted to the licensee under this article shall not apply to any part of the public lands and reservations of the United States included within the project boundary.

APPENDIX B

STAFF RESPONSES TO COMMENTS ON THE DRAFT ENVIRONMENTAL ASSESSMENT FOR THE OTTER CREEK HYDROELECTRIC PROJECT NO. 2558

The draft EA for the Otter Creek Project was issued on December 21, 2012. Comments on the draft EA were due by January 20, 2013.[81] Written comments on the draft EA were filed by the Vermont State Historic Preservation Officer (Vermont SHPO) on January 18, 2013, and Green Mountain Power Corporation (Green Mountain) and the Vermont Agency of Natural Resources (Vermont ANR), respectively, on January 22, 2013.[82]

We summarize below the comments received; provide responses to those comments; and indicate, where appropriate, how we modified the text of the final EA. The comments are grouped by topic for convenience.

General Comments

Comment 1: Green Mountain comments that in its amended license application, it proposed to increase the project's installed capacity to 21.814 megawatts (MW), not 21.595 MW, as stated in the draft EA (*Executive Summary*, *Proposed Action*). Green Mountain further clarifies that it proposes to increase the installed capacity at the Proctor and Huntington Falls developments to 9,240 and 6,725 kilowatts (kW), respectively, with no proposed increase in generating capacity at the Beldens development.

Response 1: Commission staff used the most updated installed capacity values available at the time of the draft EA was issued, which were provided by you in your April 11, 2012, response to the Commission's January 10, 2012, additional information request. Based on your comments on the draft EA, we understand that your latest proposal is to increase the installed capacity of the Proctor and Huntington Falls developments to 9,240 and 6,725 kilowatts (kW), respectively, and the overall installed capacity of the project to

[81] The Commission was closed on January 20, 2013; therefore, comments on the draft EA were due by January 21, 2013.

[82] Vermont ANR states that its comments on the draft EA reference statements made in the *Executive Summary* and elsewhere in the document, except as noted. Similarly, Green Mountain states that because corrections generally need to be carried throughout the document, only the first instance of the needed correction is cited in its comments on the draft EA.

21.814 MW, which is consistent with your previous proposals contained in the amended license application, filed on August 1, 2011. Because these latest changes to your proposal do not have a substantial effect on our environmental analysis contained in the final EA, we have edited the following sections of the final EA to indicate that your current proposal is to increase the overall installed capacity of the project to 21.814 MW and the installed capacities at the Proctor and Huntington Falls developments to 9,240 and 6,725 kilowatts (kW), respectively: *Executive Summary* and sections 1.1, *Application,* and 4.0, *Developmental Analysis*.

Proposed Project Facilities

Comment 2: Green Mountain comments that in its amended license application, it proposed a nameplate capacity of 9,240 kW for the Proctor development, not 9,402 kW, as stated in the draft EA (*Executive Summary*, *Proposed Facilities*).

Response 2: Commission staff used the most updated nameplate capacity values available at the time the draft EA was issued, which were provided by you in your April 11, 2012, response to the Commission's January 10, 2012, additional information request. Based on your comments on the draft EA, we understand that your latest proposal is for the Proctor development to have a nameplate capacity of 9,240 kW, which is consistent with your previous proposal contained in the amended license application, filed on August 1, 2011. Because this change to your proposal does not have a substantial effect on our environmental analysis contained in the final EA, we have edited the following sections of the final EA to indicate that your current proposal is for the Proctor development to have a nameplate capacity of 9,240 kW: *Executive Summary* and sections 1.1, *Application*, and 2.2, *Applicant's Proposal*.

Comment 3: Green Mountain comments that in its amended license application, it proposed a nameplate capacity of 6,725 kW for the Huntington Falls development, not 6,344 kW, as stated in the draft EA (*Executive Summary*, *Proposed Facilities*).

Response 3: Commission staff used the most updated nameplate capacity values available at the time the draft EA was issued, which were provided by you in your April 11, 2012, response to the Commission's January 10, 2012, additional information request. Based on your comments on the draft EA, we understand that your latest proposal is for the Huntington Falls development to have a nameplate capacity of 6,725 kW, which is consistent with your previous proposal contained in the amended license application, filed on August 1, 2011. Because this change to your proposal does not have a substantial effect on our environmental analysis contained in the final EA, we have edited the following sections of the final EA to indicate that your current proposal is for the Huntington Falls development to have a nameplate capacity of 6,725 kW: *Executive Summary* and sections 1.1, *Application,* and 2.2, *Applicant's Proposal*.

Comment 4: Green Mountain comments that in its amended license application, it proposed a hydraulic capacity of 2,250 cubic feet per second (cfs) for the Huntington Falls development, not 2,144 cfs, as stated in the draft EA (*Executive Summary*, *Proposed Facilities*).

Response 4: Commission staff used the most updated hydraulic capacity values available at the time the draft EA was issued, which were provided by you in your April 11, 2012, response to the Commission's January 10, 2012, additional information request. Based on your comments on the draft EA, we understand that your latest proposal is for the Huntington Falls development to have a maximum hydraulic capacity of 2,250 cfs, which is consistent with your previous proposal contained in the amended license application, filed on August 1, 2011. Because this change to your proposal does not have a substantial effect on our environmental analysis contained in the final EA, we have edited the following sections of the final EA to indicate that your current proposal is for the Huntington Falls development to have a maximum hydraulic capacity of 2,250 cfs: *Executive Summary* and sections 1.1, *Application*, 2.2, *Applicant's Proposal*, and 3.3.2.2, *Aquatic Resources*.

Project Boundary

Comment 5: Green Mountain comments that the draft EA (section 2.1.2, *Existing Project Boundary*) describes the Huntington Falls project boundary as being at contour elevation 218 feet mean sea level (msl). Green Mountain clarifies that Exhibit E of its amended license application states that the project boundary elevation is at 230 feet msl for the Huntington Falls development.

Response 5: We have verified that the Exhibit G drawings for the Huntington Falls development show the project boundary as being at contour elevation 230 feet msl. Accordingly, we have edited section 2.1.2, *Existing Project Boundary*, of the final EA to reflect the project boundary as being at contour elevation 230 feet msl for the Huntington Falls development.

Aquatic Resources

Comment 6: Vermont ANR comments that in section 3.3.2 (page 36) of the draft EA, there is a statement that the Vermont Water Resources Board establishes water quality standards. Vermont ANR comments that the current water quality standards were adopted by the Vermont Water Resources Panel of the Natural Resources Board, and that the rulemaking authority of the Vermont Water Resources Panel, including that for water quality standards, has since been transferred to the Vermont Department of Environmental Conservation.

Response 6: We have updated section 3.3.2.1, *Aquatic Resources*, of the final EA to reflect the information provided by Vermont ANR regarding the development of existing water quality standards within Vermont.

Comment 7: In reference to the draft EA's discussion (*Executive Summary*, *Proposed Environmental Measures*) of Green Mountain proposed minimum flow at the Beldens development east channel, Green Mountain clarifies that its proposed minimum flow of 10 cfs would be provided over the Beldens east dam, with 5 cfs to each of the east and crossover channels.

Response 7: We have edited the relevant sections of the final EA to clarify that Green Mountain's proposed minimum flow of 10 cfs for the east channel at the Beldens development would be provided over the dam, with 5 cfs to each of the east and crossover channels, including the *Executive Summary* and sections 2.2, *Applicant's Proposal*, 2.3, *Staff Alternative*, 3.3.2.2, *Aquatic Resources*, 3.3.4.2, *Recreation, Land Use, and Aesthetics*, 5.2, *Comprehensive Development and Recommended Alterative*, and Appendix A, *Draft License Articles*. We have also provided clarification in these same sections of the final EA to indicate that Green Mountain's proposal to provide 25 cfs to the Beldens western bypassed channel would also be provided over the Beldens west dam.

Comment 8: Green Mountain comments that section 1.2.1 of its license application states that Green Mountain "proposes to implement a cycling operation at Proctor that would utilize a 1.5-foot drawdown/refill cycle between June 16 and March 31, provided that the existing downstream minimum flow requirement during refill of at least 100 cfs is maintained. To enhance fish spawning opportunities, no reservoir drawdowns will occur between April 1 and June 15, when Proctor will operate in run-of-river mode." Green Mountain comments that from April through mid-June, the existing license requires that at least 50 percent of the inflow into the Proctor impoundment be released downstream of the powerhouse. Green Mountain further comments that in reviewing the draft EA (*Executive Summary*, *Proposed Environmental Measures*) and the current operations proposal being considered by Vermont ANR, Green Mountain believes the 50 percent of inflow release from April through mid-June is no longer relevant. Green Mountain also states that it anticipates Vermont ANR will require its standard refill operations condition of 90 percent of inflow released from the project.[83] In addition, Green Mountain states that with proposed run-of-river operations for inflows less than 200 or 400 cfs (depending on the season), the existing 100-cfs downstream minimum flow requirement would no longer be relevant. Similarly, Vermont ANR comments that

[83] In its January 22, 2013 comments on the draft EA, Vermont ANR confirmed that as part of its water quality certifications, it typically requires 90 percent of reservoir inflow to be released during impoundment refill.

the existing flow releases at the Proctor development would be superseded by implementing the reservoir refill procedures and proposed run-of-river operations discussed above.

Response 8: We agree with the comments provided by Green Mountain and Vermont ANR that Green Mountain's proposed project operations at the Proctor development, as updated in its November 2, 2012 filing describing water quality certification negotiations with Vermont ANR, would negate the need for the existing downstream flow requirements at the Proctor development and Green Mountain's previously proposed project operations, as contained in its amended license application. In the final EA, we have provided a discussion in section 3.3.2.2, *Aquatic Resources*, indicating that operating the Proctor development, as currently proposed by Green Mountain, would supersede the need to provide 50 percent of project inflow downstream of the Proctor powerhouse during the months of April and May, and the first two weeks of June, and 100 cfs, or inflow, whichever is less, at all other times to maintain aquatic habitat for resident fish species. We have also edited the final EA throughout to remove from Green Mountain's proposal and the staff alternative any reference to Green Mountain's previously proposed project operations at the Proctor development, as described above. Based upon the comments and clarifying information provided by Vermont ANR and Green Mountain, we have also edited section 5.2, *Comprehensive Development*, to recommend that 90 percent of the inflow to the Proctor development be provided downstream during any reservoir refill operations to protect aquatic resources in downstream reaches of Otter Creek.

Comment 9: Vermont ANR comments that Green Mountain and Vermont ANR are still discussing the appropriate peaking ratio for the December 16 through March 15 time period at the Proctor development as part of Green Mountain's section 401 WQC application. Additionally, Vermont ANR and Green Mountain clarify that Green Mountain is proposing a 3:1 peaking ratio from December 16 through March 15, while Vermont ANR is currently considering requiring a 2.5:1 peaking ratio in the WQC. Green Mountain further states that its proposal for a 3:1 peaking ratio is not included in its amended license application, but rather it was filed with the Commission on November 1, 2012, as part of the water quality certification negotiated conditions summary.[84]

Response 9: We have revised the relevant sections of the final EA to reflect Green Mountain's proposed 3:1 peaking ratio from December 16 through March 15, including the *Executive Summary*, and sections 2.2.2, *Proposed Project Operations*, 5.2, *Comprehensive Development and Recommended Alterative*, and Appendix A, *Draft License Articles*.

[84] The amended license application was filed on August 1, 2011.

Comment 10: Green Mountain comments that Exhibit E, section 5.3.3.1, of its license application indicates that existing trashracks at the Proctor development have a clear spacing of 2 inches situated at 45 degrees to river flow. Green Mountain comments that as part of design efforts associated with the Proctor development's intake realignment, Green Mountain field measured the Proctor rack spacing and determined the trashracks have a clear spacing of 1 inch. Green Mountain further comments that while it intends to orient the new intake trashracks to be parallel with flow, the 1-inch spacing will be maintained for the realigned intake. Similarly, Vermont ANR comments that the proposed trashrack bar spacing at the Proctor development is 1-inch.

Response 10: We have edited the final EA to describe: (1) the existing trashracks at the Proctor development as having 1-inch clear spacing and an orientation of 45 degrees to river flow; and (2) Green Mountain's proposal to maintain the existing clear spacing of the trashracks and orient the new trashracks such that they would be oriented parallel to river flow. We have also noted in the final EA that replacement of the existing trashracks at the Proctor development has been authorized as part of the activities associated with the intake realignment at the Proctor development.[85] Specifically, the following sections of the final EA have been updated: the *Executive Summary* and sections 2.2, *Applicant's Proposal*, 2.2.1, *Existing Project Facilities*, 2.2.3, *Proposed Environmental Measures*, 2.3, *Staff Alternative,* 3.3.2.2, *Aquatic Resources*, 5.2, *Comprehensive Development and Recommended Alterative*, and Appendix A, *Draft License Articles*.

Comment 11: Vermont ANR comments that the draft EA references Green Mountain consulting with resource agencies regarding trashrack bar spacing if the Vermont Department of Fish and Wildlife proposes to resume stocking of Atlantic salmon in Otter Creek. Vermont ANR comments that this consultation is not limited to resumption of a salmon stocking program. Vermont ANR states consultation could also be initiated if other changes in fishery management objectives are anticipated and trashrack bar rack spacing is relevant to meeting those objectives.

Response 11: We appreciate Vermont ANR providing this clarifying information regarding when consultation may be necessary between Green Mountain and Vermont ANR. We have updated section 3.3.2.2, *Aquatic Resources*, to reflect Vermont ANR's comments. However, as discussed in section 3.3.2.2, *Aquatic Resources,* any future proposal to replace licensed project facilities (i.e., trashracks) would need to be addressed through an amendment to any new license issued for the Otter Creek Project.

[85] On June 20, 2013, the Commission issued an order amending license and revising annual charges for the Otter Creek Project (143 FERC ¶ 62,207 (2013)). This order authorizes the realignment of the Proctor intake under the existing license.

Cultural Resources

Comment 12: Green Mountain comments that section 3.3.5.1 of the draft EA states that the control boards in both the Beldens and Huntington Falls original powerhouses were replaced in 2008. Green Mountain clarifies that only the Beldens development's control board has been replaced.

Response 12: We have edited the relevant sections of the final EA to reflect that only the Beldens development's control board was replaced, including sections 3.3.5.1, *Cultural Resources* and 5.2, *Comprehensive Development and Recommended Alterative*.

Comment 13: The Vermont SHPO comments that Green Mountain conducted Phase I and II surveys during 2012, and as a result, a majority of its recommended measures are completed. The Vermont SHPO also comments that the proposed historic properties management plan (HPMP) has been revised to include mitigation measures for four historic properties that are experiencing project-induced erosion. The Vermont SHPO recommends that the final EA be revised to reflect the additional surveys and revised HPMP.

Response 13: We have edited the relevant sections of the final EA to reflect the current status of archaeological work that has been completed and is being proposed, as well as the proposed mitigation measures in the revised HPMP, including the *Executive Summary* and sections 1.3.5, *National Historic Preservation Act*, 2.2, *Applicant's Proposal*, 2.3, *Staff Alternative*, 3.3.5, *Cultural Resources*, 4.3, *Cost of Environmental Measures*, and 5.2, *Comprehensive Development and Recommended Alterative*.

Comment 14: Green Mountain states that in the Vermont SHPO's January 8, 2013 comment letter on the draft EA, the Vermont SHPO describes the current status of archaeological work completed and proposed at the Otter Creek Project. Green Mountain comments that it concurs with the Vermont SHPO's comments and recommends that the final EA (*Executive Summary*, *Proposed Environmental Measures*, xii) be revised to reflect these comments.

Response 14: We have edited the relevant sections of the final EA to reflect the current status of archaeological work completed and proposed at the Otter Creek Project, including the *Executive Summary* and sections 1.3.5, *National Historic Preservation Act*, 2.2, *Applicant's Proposal*, 2.3, *Staff Alternative*, 3.3.5, *Cultural Resources*, 4.3, *Cost of Environmental Measures*, and 5.2, *Comprehensive Development and Recommended Alterative.*

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