LOW-IMPACT HYDROPOWER POWER INSTITUTE CERTIFICATION APPLICATION

WATERBURY HYDROELECTRIC PROJECT
(FERC NO. 2090)

Prepared for:

Green Mountain Power Corporation
Rutland, Vermont

Prepared by:

Kleinschmidt

Pittsfield, Maine
www.KleinschmidtGroup.com

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1.0 FACILITY DESCRIPTION

The Waterbury Hydroelectric Project (FERC No. 2090) (Project) is located at river mile (RM) 2.5 on the Little River in the town of Waterbury, Washington County, Vermont and is the only hydroelectric plant located on the Little River. The Project's hydroelectric facilities are owned and operated by Green Mountain Power Corporation (GMP or Licensee).

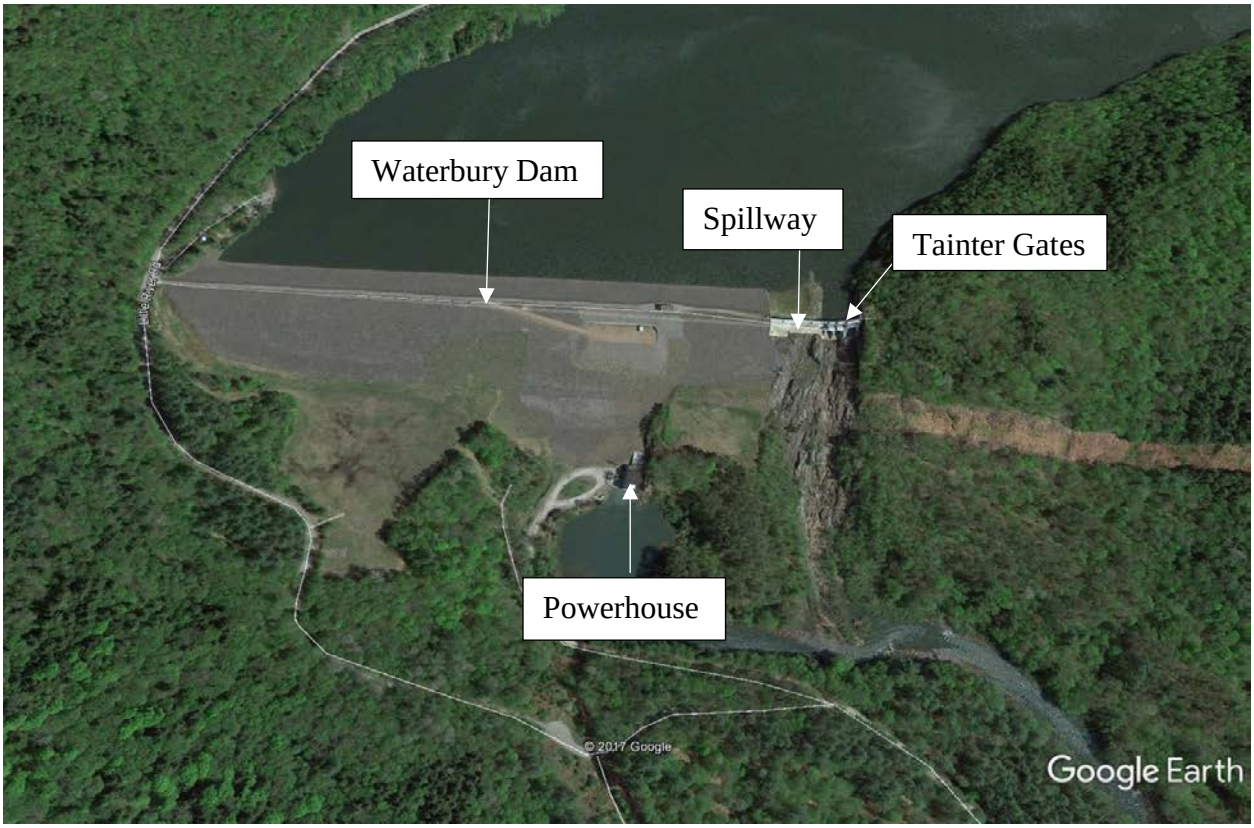

FIGURE 1 PHOTO OF PROJECT/IDENTIFICATION OF PROJECT PARTS

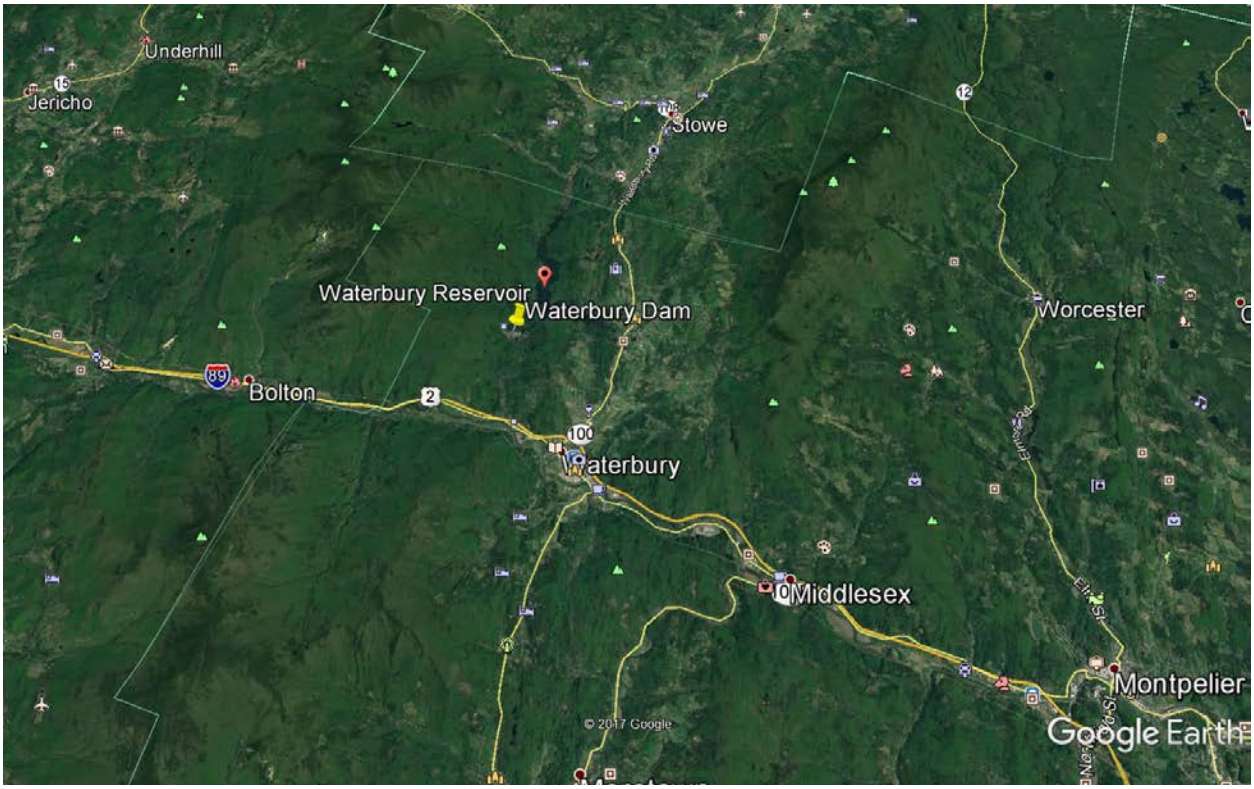

FIGURE 2 GEOGRAPHIC OVERVIEW OF PROJECT LOCATION

1.1 PROJECT DESCRIPTION

The Waterbury reservoir was built by the U.S. Army Corps of Engineers (USACE) for the purpose of flood control in the Winooski River Valley following the flood of 1927. Although the Waterbury Dam and reservoir were built by the USACE in 1938, they are owned by the State of Vermont and operated by GMP for flood control and power generation. Federal oversight of the Waterbury Dam is continuing and significant. Because of federal oversight, the dam and reservoir are not part of the Waterbury Hydroelectric Project works or Project boundary.

The Waterbury Project was issued a new operating license by the Federal Energy Regulatory Commission (FERC or Commission) on February 19, 2016. The Waterbury Project, as licensed, consists of: (a) an existing concrete intake structure and broom gate; (b) an existing 825-foot-long, 10.5-foot-high, 14-foot-wide horseshoe shaped reinforced concrete tunnel; (c) two existing 205-foot-long, 4.5-foot-diameter penstocks; (d) an existing 25-foot-long, 6.7-foot-diameter penstock with a new 6.5-foot diameter butterfly valve; (e) an existing 58-foot-long, 35-foot-wide powerhouse containing a 5.52-megawatt turbine-generator unit with a new turbine runner with a minimum and maximum hydraulic capacity of 49 cubic feet per second (cfs) and 391 cfs; (f) an existing 12-foot-long, 2.0-foot-diameter penstock drain pipe and valve; (g) a new 60-foot-long,

4.0-foot-diameter bypass penstock with a 4.0-foot-diameter butterfly valve connected to a 2.0-foot-diameter Howell-Bunger valve; (h) an existing 50-foot-long, 33 kilovolt transmission line from the powerhouse to the substation; and (i) appurtenant facilities. The Project works are limited to the powerhouse, penstock, and the transmission lines from the powerhouse to the adjacent substation.

The license includes three Stages of operation. Stage I covered operations before the Project modifications described below. Stage II operations began in Spring 2018 when the modifications were complete. Stage III operations will commence when VT and the USACE complete improvements to the Tainter Gates and spillway. In accordance with the conditions included in the 2016 FERC license, GMP designed and constructed a number of modifications at the Project. Project modifications required by the FERC license include:

1. Installation of a new turbine runner. The new runner will be designed to operate between 49 and 391 cfs[1].
2. Installation of a new bypass flow pipe. The new bypass pipe will be a 60-inch diameter pipe designed to pass 250 cfs. The pipe will terminate with an adjustable Howell-Bunger valve to the east of the powerhouse (but west of an existing State-owned bypass pipe).
3. Installation of a butterfly valve for the bypass pipe.
4. Installation of a new, automated bypass pipe Programmable Logic Controller (PLC) for transitioning of flow between the unit and bypass pipe.
5. GMP also provides funds to the USGS for the installation and operation of a new gage on the Little River upstream of the reservoir to monitor inflow. Additionally, funds are provided annually for continued operation of USGS Gages 04288500, 04289000, and the newly installed gage upstream of the reservoir. This new Gage installation was completed in August 2016[2].

GMP completed construction of the pipes, valves, and runner replacement described above in Spring 2018.

The Vermont Department of Environmental Conservation (VTDEC) issued a Project WQC on December 11, 2014[3] (Appendix A of 2016 License). The WQC was conditioned such that drawdowns will no longer occur as part of regular Project operations and that the Project operating mode will become year-round instantaneous run-of-river. In its earlier set-up, the

[1] Although GMP is licensed for operation of a 5.52-MW turbine, the new turbine runner replacement has reduced the maximum turbine output to 4.102-MW.
[2] https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14535308
[3] https://elibrary-backup.ferc.gov/idmws/common/opennat.asp?fileID=14150313

Project could not immediately switch over to run-of-river operations due to constraints with the installed equipment along with dam safety considerations. In order to comply with WQC requirements, GMP completed an extensive construction project that included the installation of a new bypass pipe and valve to allow for continuous bypass flows, a new turbine with a reduced upper flow range for run-of-river operations, plus modern electrical equipment to fully automate run-of-river facility operations. Spillway and Tainter gate replacement work (Stage III) is also planned to improve spillway capacity, reservoir control and to increase the amount of dam freeboard.

Prior to the Project converting to year-round instantaneous run-of-river, and while modifications are being designed and constructed, the Project will operate in accordance with one of three operating stages generally described above and as outlined within the 2014 WQC:

Stage I (complete) – Operations utilizing the existing Project components;
Stage II (ongoing) - Operations following completion of the new turbine and automated valve installation;
Stage III (future) – Year-round run-of-river operation following completion of the State's spillway and Tainter gate replacement.

The Waterbury Project is currently operating under Stage II procedures. Stage III procedures will begin after the State's completion of the spillway and Tainter gate work. As described in the State's email dated February 21, 2018 (Appendix A), a work start and work completion date for the Waterbury spillway and Tainter gate replacement is yet to be determined. The State is looking to perform a risk assessment and conceptual design in the next year and hopes to see the replacement work occur in the next 5-10 years.

In accordance with current Stage I operating procedures, GMP maintained the reservoir levels within +/- 1.0 foot of the normal operating level (NOL) 589.5 feet from the end of the spring refill period (no later than May 15) until the seasonal drawdown commences (no earlier than January 1). Under Stage I procedures, the reservoir was drawn down seasonally beginning no earlier than January 1 to an elevation no lower than 550 feet. Spring refill commences no later than March 15 with reservoir levels rising or stable at all times until the NOL is reached by no later than May 15.

During Stage II operations, the reservoir level is maintained at the NOL except during high inflows. Two-foot cycling allowed during Stage I no longer applies. The timing and maximum drawdown of the seasonal drawdown/refill will be the same as in Stage I.

During Stage III operations in the future, GMP will operate the Project in year-round instantaneous run-of-river mode. Seasonal drawdowns will no longer apply and the year-round target elevation of the reservoir will be NOL (589.5 feet). When inflow to the reservoir exceeds Project capacity, the Project will operate at its maximum capacity (maximum turbine capacity plus maximum bypass capacity) and the elevation of the Reservoir will exceed 589.5 feet. On these occasions, GMP will operate the Project at its maximum capacity until inflows recede and the reservoir returns to elevation 589.5 feet.

Under Article 402 of the 2016 License, GMP must operate the Project, insofar as the interests of flood control are concerned, as set forth at 33 C.F.R. § 208.11 (2015), consistent with the USACE September 2005 Revised Waterbury Dam and Reservoir Regulation Manual. GMP must comply with any future regulations prescribed by the USACE in the interests of flood control.

TABLE 1 FACILITY DESCRIPTION INFORMATION FOR WATERBURY HYDROELECTRIC PROJECT

INFORMATION TYPE	VARIABLE DESCRIPTION	RESPONSE (AND REFERENCE TO FURTHER DETAILS)
Name of the Facility	Facility name (use FERC project name if possible)	Waterbury Hydroelectric Project (FERC No. 2090) (Project).
Location	River name (USGS proper name)	Little River
	River basin name	Winooski River Basin
	Nearest town, county, and state	Town of Waterbury, Washington County, Vermont
	River mile of dam above next major river	River Mile (RM) 2.5
	Geographic latitude	44°22'54.41"N
	Geographic longitude	72°46'17.29"W
Facility Owner	Application contact names (IMPORTANT: you must also complete the Facilities Contact Form):	Jason Lisai – Green Mountain Power Corporation John Greenan – Green Mountain Power Corporation Andy Qua – Kleinschmidt Associates Katie Sellers – Kleinschmidt Associates Green Mountain Power Corporation 2152 Post Road Rutland, VT 05701 Please see Section 4.0 for the Facility Contacts Form.
	- Facility owner (individual and company names)	Green Mountain Power Corporation (GMP or Licensee)
	- Operating affiliate (if different from owner)	N/A
	- Representative in LIHI certification	John Greenan, GMP
Regulatory Status	FERC Project Number (e.g., P-xxxxx), issuance and expiration dates	FERC No. 2090. 40-year License issued on February 19, 2016, effective February 1, 2016 and expires on January 31, 2056.
	FERC License type or special classification (e.g., "qualified conduit")	Minor License
	Water Quality Certificate identifier and issuance date, plus source agency name	-A WQC was issued by the Vermont Department of Environmental Conservation (VTDEC) on December 11, 2014

INFORMATION TYPE	VARIABLE DESCRIPTION	RESPONSE (AND REFERENCE TO FURTHER DETAILS)
	Hyperlinks to key electronic records on FERC e-library website (e.g., most recent Commission Orders, WQC, ESA documents, etc.)	2004 Environmental Assessment: https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=10227098 2014 WQC (Attached to License): https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14150313 2016 License: https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14150313
Power Plant Character-istics	Date of initial operation (past or future for operational applications)	Construction of the hydroelectric facilities began in 1951 and was completed in 1953. Project operation began in 1953.
	Total name-plate capacity (MW)	The Project originally had and is licensed for a single 5.52-megawatt (MW) turbine generator unit. The recent turbine runner replacement has reduced the turbine nameplate capacity to 4.102-MW.
	Average annual generation (MWh)	The Project's average annual generation is approximately 17,562 MWh (2016 License)
	Number, type, and size of turbines, including maximum and minimum hydraulic capacity of each unit	The powerhouse originally contained one 5.52-MW turbine-generator unit. The turbine runner was just recently replaced in accordance with current FERC approved efforts for conversion of the Project to future run-of-river operations. The new turbine runner replacement has reduced the maximum turbine output to 4.102-MW. Turbine: -Type = Vertical Francis -Manufacturer = James Leffel Company -Minimum hydraulic capacity = 49 cfs -Maximum hydraulic capacity = 391 cfs Generator: -Manufacturer = General Electric -Nameplate KW = 5520
	Modes of operation (run-of-river, peaking, pulsing, seasonal storage, etc.)	The Project is in the process of converting over to run-of-river operations in accordance with its 2016 FERC license.

INFORMATION TYPE	VARIABLE DESCRIPTION	RESPONSE (AND REFERENCE TO FURTHER DETAILS)
	Dates and types of major equipment upgrades	In accordance with the conditions of the Project's new 2016 FERC license, GMP conducted modifications at the Project in late 2017 and early 2018. Major equipment upgrades required by the FERC license include: 1. Installation of a new turbine runner. The new runner will be designed to operate between 49 and 391 cfs. 2. Installation of a new bypass flow pipe. The new bypass pipe will be a 60-inch diameter pipe designed to pass 250 cfs. The pipe will terminate with an adjustable Howell-Bunger valve to the east of the powerhouse (but west of the existing State-owned bypass pipe) and provide flow to the tailrace. 3. Installation of a butterfly valve for the bypass pipe. 4. Installation of a new, automated bypass pipe Programmable Logic Controller (PLC) for transitioning of flow between the unit and bypass. Upgrades were completed in spring 2018[4]. In addition to GMP's planned Project work, the State of Vermont will conduct spillway and Tainter gate replacement work. A work start and work completion date for the Waterbury spillway and Tainter gate work is yet to be determined by the State (see Appendix A). GMP will keep the Low Impact Hydropower Institute (LIHI) updated on the status of this work.
	Dates, purpose, and type of any recent operational changes	Construction activities surrounding the bypass pipe, runner replacement, and electrical upgrades project began in the fall of 2017 and were complete in the spring of 2018.

[4] https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=15048534

INFORMATION TYPE	VARIABLE DESCRIPTION	RESPONSE (AND REFERENCE TO FURTHER DETAILS)
	Plans, authorization, and regulatory activities for any facility upgrades	Authorization for the bypass pipe, runner replacement, and electrical upgrades project was received in the 2016 FERC license and within the 2014 Vermont WQC.
Character-istics of Dam, Diversion, or Conduit	Date of construction	USACE construction of the dam (non-Project) and reservoir (non-Project) was initially completed in 1938.
	Dam height	Waterbury dam (non-Project) consists of an 1,845-foot-long, 187-foot-high rolled earth embankment and a 261-foot-long spillway. The spillway includes a 161-foot-long ungated concrete ogee weir.
	Spillway elevation and hydraulic capacity	The spillway (non-Project) includes a 161-foot-long ungated concrete ogee weir with a crest elevation of 617.5 feet msl and a 100-foot-long section that includes three Tainter gates with a crest elevation of 592.0 feet msl. Hydraulic capacity of the spillway is not available at this time.
	Tailwater elevation	Normal tailwater elevation is approximately 439.5 feet.

INFORMATION TYPE	VARIABLE DESCRIPTION	RESPONSE (AND REFERENCE TO FURTHER DETAILS)
	Length and type of all penstocks and water conveyance structures between reservoir and powerhouse	At the completion of improvements in spring 2018, flow from Waterbury reservoir continues to enter the Project through a submerged gated intake structure and then pass into an 825-foot-long, 10.5-foot-high, 14-foot-wide horseshoe-shaped tunnel. Flow from the tunnel enters into two 205-foot-long, 4.5-foot-diamater steel penstocks and then passes into a single 25-foot-long, 6.7-foot-diameter penstock with a 6.5-foot diameter butterfly valve that supplies water to the turbine. A 12-foot-long, 2.0-foot-diamater penstock drain pipe and valve is used to drain the Project's penstock. A 60-foot-long, 4-foot-diamater bypass penstock with a 4.0-foot-diamater butterfly valve is connected to a 2.0-foot-diamater Howell-Bunger valve will be used to supply conservation flows to the tailrace during Stage II and Stage III operations. Water can also be released from Waterbury reservoir through a bypass penstock that was constructed in 1985 by the State of Vermont. The 60-foot-long, 4.0-foot-diameter bypass penstock connects to the project penstock upstream of the powerhouse and releases water into the project tailrace though a Howell-Bunger discharge valve. This state owned, non-Project bypass penstock provides a means for emergency reservoir drawdown in the event of a powerhouse shutdown or mechanical failure.

INFORMATION TYPE	VARIABLE DESCRIPTION	RESPONSE (AND REFERENCE TO FURTHER DETAILS)
	Dates and types of major, generation-related infrastructure improvements	In accordance with the conditions of the Project's new 2016 FERC license, GMP modified the Project. Major generation related infrastructure improvements required by the FERC license include: Installation of a new turbine runner. The new runner is designed to operate between 49 and 391 cfs.
	Designated facility purposes (e.g., power, navigation, flood control, water supply, etc.)	Green Mountain Power supports the State of Vermont operation of Waterbury dam and reservoir for flood control and GMP operates the hydroelectric Project for power generation. The Waterbury dam is considered a government dam pursuant to section 3(10) of the FPA, 16 U.S.C. § 796 (2012). Operation and maintenance of the Waterbury dam and reservoir was delegated to the State of Vermont pursuant to a 1935 agreement between the United States and the State of Vermont. In 1937, the State of Vermont deeded certain rights to operate the Waterbury dam to GMP.
	Water source	Little River
	Water discharge location or facility	Little River
Character-istics of Reservoir and Watershed	Gross volume and surface area at full pool	Waterbury dam impounds the 890-acre Waterbury reservoir that has a usable storage capacity of 37,000 acre-feet at a water surface elevation of 592.0 feet msl.
	Maximum water surface elevation (ft. MSL)	Within the 2016 Reservoir and Flow Management Plan, GMP selected a normal operating level (NOL) of 589.5 feet msl. The NOL is utilized throughout all Project operational stages (I, II, III).
	Maximum and minimum volume and water surface elevations for designated power pool, if available	No power pool present – flood control reservoir currently being converted into run-of-river facility.

INFORMATION TYPE	VARIABLE DESCRIPTION	RESPONSE (AND REFERENCE TO FURTHER DETAILS)
	Upstream dam(s) by name, ownership, FERC number (if applicable), and river mile	The Waterbury Project is the only hydroelectric facility located on the Little River. Dams located upstream of Waterbury Project include: -Moscow Mills Dam owned by Moscow Mills Inc. and located at RM 9.3. -Pike Dam owned by Tim Meehan and located at RM 11.6. See Appendix C, Figure 9 for a map of the Little River Dam Locations.
	Downstream dam(s) by name, ownership, FERC number (if applicable), and river mile	Waterbury is the first dam on the Little River. No dams are located downstream of Waterbury Dam. The Bolton Falls Hydroelectric Project (FERC No. 2879), located on the Winooski River, and owned by GMP is the first dam located downstream of the Waterbury Project. See Appendix C, Figure 9 for a map of the Little River Dam Locations.
	Operating agreements with upstream or downstream reservoirs that affect water availability, if any, and facility operation	No operating agreements are in effect with other surrounding facilities.
	Area inside FERC project boundary, where appropriate	The Project boundary encloses the project's hydroelectric generation related facilities including the intake, tunnel, penstocks, powerhouse, and transmission line. The Waterbury dam and reservoir are federal facilities (USACE), therefore, they are not included in the license boundary. The area inside the FERC project boundary is approximately 4 acres.

<table>
<tr><th>INFORMATION TYPE</th><th>VARIABLE DESCRIPTION</th><th>RESPONSE (AND REFERENCE TO FURTHER DETAILS)</th></tr>
<tr><td rowspan="3">Hydrologic Setting</td><td>Average annual flow at the dam</td><td>As tabulated in the 1999 Waterbury Project License Application, average annual flow at the dam from 1953-1980; 1987-1995 is 194 cfs.

*Flows from 1981-1986 were excluded because the reservoir was drained.</td></tr>
<tr><td>Average monthly flows</td><td>As tabulated in the 1999 Waterbury Project License Application, average monthly flows as measured at USGS Gage 04289000 on the Little River in Waterbury VT:

<table>
<tr><th rowspan="2">Month</th><th>Recorded Flows</th></tr>
<tr><th>1953-80;
1987-95*</th></tr>
<tr><td>January</td><td>216 cfs</td></tr>
<tr><td>February</td><td>259 cfs</td></tr>
<tr><td>March</td><td>308 cfs</td></tr>
<tr><td>April</td><td>518 cfs</td></tr>
<tr><td>May</td><td>336 cfs</td></tr>
<tr><td>June</td><td>149 cfs</td></tr>
<tr><td>July</td><td>106 cfs</td></tr>
<tr><td>August</td><td>90 cfs</td></tr>
<tr><td>September</td><td>100 cfs</td></tr>
<tr><td>October</td><td>141 cfs</td></tr>
<tr><td>November</td><td>202 cfs</td></tr>
<tr><td>December</td><td>228 cfs</td></tr>
<tr><td>Annual Average</td><td>194 cfs</td></tr>
</table>

*Flows from 1981-1986 were excluded because the reservoir was drained.</td></tr>
<tr><td>Location and name of relevant stream gauging stations above and below the facility</td><td>-USGS gauge 04289000 on the Little River in Waterbury VT – approximately 1-mile downstream from the Project.
-USGS Gage 4288500 Waterbury Reservoir near Waterbury, VT is located in the Waterbury Reservoir and adjacent to the Dam.
-USGS Gage 04288295 Little River near Stowe, VT is located approximately 5.5-miles upstream of the dam and was recently installed in August 2016.</td></tr>
</table>

INFORMATION TYPE	VARIABLE DESCRIPTION	RESPONSE (AND REFERENCE TO FURTHER DETAILS)
	Watershed area at the dam	The drainage area of the river at the dam is 109 square miles.
Designated Zones of Effect	Number of zones of effect	There are two zones of effect: 1) Impoundment (approximately 3.6 miles long) and 2) Downstream (approximately 2.5 miles long). As stated in the 2004 FERC Environmental Assessment, there is no bypassed reach present at the Project. A state-owned 48-inch bypass flow pipe currently runs underground and traverses from the intake to the powerhouse and terminates at a Howell Bunger valve located at the powerhouse. The state-owned pipe is operated by the State for emergency drawdown purposes. In spring 2018, a new 60-inch bypass flow pipe (second bypass pipe) was installed and commissioned to the west of the existing State-owned bypass pipe and it terminates with an adjustable Howell-Bunger valve. This bypass pipe and valve is utilized to provide conservation flow releases from the powerhouse now during Stage II operations and it will continue to do so during future Stage III operations.
	Upstream and downstream locations by river miles	The Impoundment ZOE stretches from RM 2.5 to RM 6.1 (3.6 miles) upstream of Waterbury Dam. The Downstream ZOE stretches from RM 2.5 to RM 0 (confluence with the Winooski River).
	Type of waterbody (river, impoundment, by-passed reach, etc.)	The water located within the Downstream ZOE, is classified as riverine and the water within the reservoir is classified as lake by the U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (USFWS 2017).

INFORMATION TYPE	VARIABLE DESCRIPTION	RESPONSE (AND REFERENCE TO FURTHER DETAILS)
	Delimiting structures	The Upstream ZOE stretches from the Waterbury Dam to the end of the Waterbury Reservoir. The Downstream ZOE stretches from the powerhouse downstream approximately 2.5 miles to the confluence of the Winooski River.
	Designated uses by state water quality agency	The Little River is designated as Class B. Class B waters are managed to achieve and maintain a high level of quality that: is suitable for bathing; consistently exhibits good aesthetic value; provides high quality habitat for aquatic biota, fish and wildlife; is suitable for public water supply with filtration and disinfection; and is suitable for irrigation and other agricultural uses.
Additional Contact Information	Names, addresses, phone numbers, and e-mail for local state and federal resource agencies	Please see Section 4.0 for the Project Contacts Form
	Names, addresses, phone numbers, and e-mail for local non-governmental stakeholders	Please see Section 4.0 for the Project Contacts Form
Photographs and Maps	Photographs of key features of the facility and each of the designated zones of effect	Please see Appendix B for photographs of key features of the facility and identification of each ZOE.
	Maps, aerial photos, and/or plan view diagrams of facility area and river basin	Please see Appendix C for aerial photos of facility area and river basin.

2.0 STANDARDS MATRICES

2.1 IMPOUNDMENT ZOE

		ALTERNATIVE STANDARDS				
	CRITERION	*1*	*2*	*3*	*4*	*Plus*
A	**Ecological Flow Regimes**	***X***				
B	**Water Quality**		***X***			
C	**Upstream Fish Passage**	***X***				
D	**Downstream Fish Passage**	***X***				
E	**Watershed and Shoreline Protection**	***X***				
F	**Threatened and Endangered Species Protection**		***X***			
G	**Cultural and Historic Resources Protection**		***X***			
H	**Recreational Resources**		***X***			

2.2 DOWNSTREAM ZOE

		ALTERNATIVE STANDARDS				
	CRITERION	*1*	*2*	*3*	*4*	*Plus*
A	**Ecological Flow Regimes**		***X***			
B	**Water Quality**		***X***			***X***
C	**Upstream Fish Passage**	***X***				
D	**Downstream Fish Passage**	***X***				
E	**Watershed and Shoreline Protection**	***X***				
F	**Threatened and Endangered Species Protection**		***X***			
G	**Cultural and Historic Resources Protection**		***X***			
H	**Recreational Resources**		***X***			

3.0 SUPPORTING INFORMATION

3.1 ECOLOGICAL FLOWS STANDARDS: IMPOUNDMENT ZOE

Criterion	*Standard*	*Instructions*
A	1	<u>Not Applicable / De Minimis Effect:</u> • Confirm the location of the powerhouse relative to other dam/diversion structures to establish that there are no bypassed reaches at the facility. • If Run-of-River operation, provide details on how flows, water levels, and operation are monitored to ensure such an operational mode is maintained. • In a conduit project, identify the water source and discharge points for the conduit system within which the hydropower plant is located. • For impoundment zones only, explain how fish and wildlife habitat within the zone is evaluated and managed – ***NOTE:*** this is required information, but it will not be used to determine whether the Ecological Flows criterion has been satisfied. All impoundment zones can apply Criterion A-1 to pass this criterion.

- The Impoundment ZOE is made up of the impounded Little River above the Project dam, this ZOE does not have a bypassed reach.
- Under Article 402 of the License, GMP must operate the Project, insofar as the interests of flood control are concerned, as set forth at 33 C.F.R. § 208.11 (2015), consistent with the USACE September 2005 Revised Waterbury Dam and Reservoir Regulation Manual. GMP must comply with any future regulations prescribed by the USACE in the interests of flood control.
- VTDEC issued a Project WQC on December 11, 2014, (Appendix A of 2016 License). The WQC requires the Licensee to operate the Project in a true run-of-river mode using the turbine and/or bypass flow pipe to match instantaneous inflow up to the hydraulic capacity of the system.

  The 2014 WQC provides a plan that includes three stages under which different Project operational requirements and procedures are detailed and the three stages move the Project toward run-of-river operations:

  - **Stage I** (complete) – Operations utilizing existing Project components;
  - **Stage II** (ongoing) – Operations following completion of the new turbine and automated valve installation;
  - **Stage III** (future) – Year-round run-of-river operation following completion of the spillway and Tainter gate replacement.

  In accordance with license Article 401 and Condition E of the VTDEC Water Quality Certification (WQC) (Appendix A of 2016 license), GMP filed a Reservoir and Flow

Management Plan[5] on August 18, 2016, as supplemented on March 16, 2017[6], for Commission approval within 6 months of license issuance. The filing included documentation that GMP developed the plan in consultation with the VTDEC and U.S. Fish and Wildlife Service (FWS). FERC approved the plan on April 6, 2017[7] and the plan is now a requirement of the license.

In accordance with the 2014 WQC and Flow Management Plan, GMP is currently operating under Stage II conditions.

During ongoing Stage II operations, GMP operates the elevation of Waterbury reservoir the same as Stage I during the winter drawdown and spring refill. During Stage II the Reservoir level will be maintained at the NOL except during high inflows. The two-foot cycling previously allowed during Stage I no longer applies.

Stage I and Stage II reservoir level requirements are summarized in Table 2 below.

TABLE 2 STAGE I AND II RESERVOIR MANAGEMENT LICENSE REQUIREMENTS

DESCRIPTION	WATER SURFACE ELEVATION	TIMEFRAME	STAGE
Maintenance of Normal Operating Level (NOL)	589.5 ft. (NOL) ± 1.0 ft.	Commence on reservoir refill and continue through January 1, or the commencement of seasonal drawdown if later	Stage I
Maintenance of Normal Operating Level (NOL)	589.5 ft. (NOL)	Year round except during seasonal drawdown/refill	Stage II
Seasonal Drawdown	No lower than 550 ft	January 1 to March 14	Stage I & II
Spring Refill	Rising or stable at all times until the NOL is reached	Commence no later than March 15, reach the NOL no later than May 15	Stage I & II

- During **Stage III**, GMP will operate the Project in year-round instantaneous run-of-river mode. Seasonal drawdowns will no longer apply. The year-round target elevation of the reservoir will be the NOL (589.5 feet). Given that water levels may be influenced by non-operational factors such as wind and wave action, GMP anticipates that during times when inflows are less than the Project's operating capacity, pond levels will be maintained within a tolerance of +/- 1 foot of the NOL. When inflow to the reservoir exceeds Project capacity, the Project will operate at its maximum capacity (minimum turbine capacity plus maximum bypass capacity) and the elevation of the reservoir will exceed 589.5 feet. On these occasions, GMP will operate the Project at its maximum capacity until inflows receded and the reservoir returns to elevation 589.5 feet.

[5] https://elibrary.ferc.gov/IDMWS/common/opennat.asp?fileID=14333647
[6] https://elibrary.ferc.gov/IDMWS/common/opennat.asp?fileID=14520106
[7] https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14548771

- GMP has and will continue to operate under the first two stages of operation prior to the State of Vermont's replacing of the spillway and Tainter gates. Upon completion of the State's work, the Project will then be able to operate in Stage III as a year-round run-of-river facility. GMP completed the construction of pipes, valves, and runner replacement in the spring of 2018 and began Stage II operations. Implementation of Stage III operations cannot occur until State work is complete. A work start and work completion date for the Waterbury spillway and Tainter gate replacement is yet to be determined (see Appendix A).
- Electrical modernization is a major component to the Project upgrades. As a result of the electrical improvements alone, GMP will see operational efficiencies by improving the remote functions of the plant. As with other recent modernizations, this modernization will improve the Control Center's ability to remotely operate, monitor and diagnose issues at the plant. The new equipment meets GMP's ARC Flash requirements, improves Lock-out/Tag Out procedures for electrical safety and the new gate allows workers to safely work downstream of the facility without dewatering the entire penstock.
- GMP currently monitors the following parameters in accordance with the WQC: 1) reservoir level using the USGS Gage at Waterbury Reservoir (Gage No. 04288500); 2) inflow using a USGS Gage on the Little River at the upstream end of the reservoir (04288295 Little River near Stowe, VT) - which was installed during 2016 and maintained by the USGS with funds provided by GMP; 3) turbine output; 4) turbine discharge; 5) bypass valve setting; 6) bypass valve discharge; 7) total outflow (calculated as turbine discharge + bypass discharge); and 8) discharge downstream using USGS Gage No. 04289000 located on the Little River downstream of the Project. GMP logs all these parameters once per hour and makes the data available on the licensee's SCADA system for monitoring and recording.
- Stage I, II, and III flow management conditions required by the WQC to get the Project to run-of-river operations will create a more stable impoundment environment over time.

3.2 ECOLOGICAL FLOWS STANDARDS: DOWNSTREAM ZOE

Criterion	*Standard*	*Instructions*
A	2	<u>Agency Recommendation (see Appendix A for definitions):</u> • Identify the proceeding and source, date, and specifics of the agency recommendation applied (NOTE: there may be more than one; identify and explain which is most environmentally stringent). • Explain the scientific or technical basis for the agency recommendation, including methods and data used. This is required regardless of whether the recommendation is or is not part of a Settlement Agreement. • Explain how the recommendation relates to agency management goals and objectives for fish and wildlife. • Explain how the recommendation provides fish and wildlife protection, mitigation and enhancement (including in-stream flows, ramping and peaking rate conditions, and seasonal and episodic instream flow variations).

- Within the 2014 WQC, the VTDEC outlined specific requirements for Stage I, II, and III flow management within the Downstream ZOE:

  Stage I (complete) - The WQC requires that when inflow to Waterbury reservoir is less than 300 cfs during winter drawdown, the maximum flow that can be released from the Project is 300 cfs, or inflow if greater. From May 16 to December 31 (non-drawdown or refill time periods), operations either match inflow if inflow is within the hydraulic range of the turbine (300-670 cfs) or be at full turbine capacity (670 cfs) if inflow exceeds turbine capacity.

  In addition, during Stage I operations, GMP voluntarily releases a minimum flow of approximately 20-30 cfs through a small 8-inch pipe that taps off the unit's cooling water pipe. GMP releases this flow during normal operations as well as during the drawdown and refill periods. Furthermore, since this pipe can only be manually adjusted, GMP has water flowing from this pipe at all times, including during generation releases.

- Stage II (ongoing) – During Stage II operations, GMP will modify run-of-river operations consistent with the new hydraulic capabilities provided by the automated valve and the new turbine. The timing and maximum drawdown during Stage II will be the same as Stage I, except the maximum instantaneous outflow during the drawdown will be 200 cfs, or inflow if greater. Additionally, during the winter drawdown period, a 60 cfs conservation flow will be a fixed minimum flow ("or inflow if less" will *not* apply) until the drawdown maximum is reached at which time outflows shall match inflows. GMP will maintain a conservation flow of 60 cfs or inflow if less from March 16 through March 31, and 108 cfs or inflow if less from April 1 through May 15. Outside of the drawdown/refill period, GMP will use the valve, up to its full capacity, when inflows exceed the turbine capacity, except after June 15 when use of the valve may be suspended if the reservoir level is below elevation 592.0 feet and inflow is less than the maximum capacity of the turbine.

- Stage III (future) **–** GMP will operate the station in a true-run-of-river mode using the turbine and/or bypass flow pipe to match instantaneous flows up to the system's

hydraulic capacity[8]. When inflow to Waterbury reservoir exceeds Project capacity, the Project will operate at its maximum capacity until inflows recede and the reservoir begins to approach NOL at which point the system will be ramped down to match inflow while avoiding a sudden drop in releases.

- As stated within the 2014 WQC, ramping procedures are additionally applicable during all stages of operation (I, II, III). While the WQC requires ramping procedures for all three stages of operation, ramping was not possible during Stage I due to the turbine limitations and because there were no mechanical means to divert sufficient water from the powerhouse. The ramping procedures provide for incremental changes in flow that do not exceed 60 cfs per 30-minute period for up-ramping and 30 cfs per 30-minute period for down ramping during Stage II and III. In cases of operator error or unanticipated problems, a greater ramping rate may be used if necessary to avoid drawdowns below the NOL during Stage II and III. Unit ramping will be provided by the PLC as a Gate %/minute input, selectable by the station operators and/or a pre-determined calendar.
- As stated within the 2004 Environmental Assessment, resource agencies determined that run-of-river operations, where inflows equal outflows, will protect downstream aquatic communities. FERC further agreed that operating in run-of-river would help to prevent shoreline erosion. This operational mode protects and enhances the aquatic community in the reservoir and downstream of the Project by minimizing elevational and water velocity changes. This also reduces the impacts to the riparian habitat from stream bank erosion and other river bed morphological changes that short-term flow alterations can cause.

  For Stage I interim downstream minimum flows, the 20-30 cfs minimum flow was chosen as it is the highest minimum flow GMP could provide given the powerhouse infrastructure. There was no habitat value in justifying this flow, it is simply the most the infrastructure can pass.

  For Stage II minimum flow operations of (60 cfs from March 16 – March 31 and 108 cfs from April 1 – May 15), the 60 cfs flow was tied to the Vermont Agency of Natural Resources (VANR) review of the IFIM study for species present during the winter period. This flow provides greater than 90% of the maximum habitat available for all fish species except for spawning brown trout and spawning longnose sucker where greater than 80% of the maximum habitat will be provided. The 108 cfs flow was also reviewed by VANR in the context of the IFIM study as well as the drainage area prorated using the GMP Essex 19 Project minimum spring flow of 1,000 cfs. This 108 cfs flow will assist with meeting walleye and lake sturgeon spawning flows below Essex 19 (See Appendix D for GMP's 2012 Revised WQC Certification Proposal).
- The reduction from the Project's current maximum generation flow will provide significant fisheries benefits in the Little River, including improved habitat conditions for invertebrates and immobile life stages of fish species.

[8] After installation of the new aerated turbine (maximum capacity 391 cfs) and Howell-Bunger valve (250 cfs), maximum Project capacity will be 641 cfs.

3.3 WATER QUALITY STANDARDS: IMPOUNDMENT ZOE

Criterion	*Standard*	*Instructions*
B	2	Agency Recommendation: • If facility is located on a Water Quality Limited river reach, provide an agency letter stating that the facility is not a cause of such limitation. • Provide a copy of the most recent Water Quality Certificate, including the date of issuance. • Identify any other agency recommendations related to water quality and explain their scientific or technical basis. • Describe all compliance activities related to the water quality related agency recommendations for the facility, including on-going monitoring, and how those are integrated into facility operations.

- The Little River in the Project-affected reach is designated as Class B waters by the State of Vermont.

  Class B waters are managed to achieve and maintain a high level of quality that: is suitable for bathing; consistently exhibits good aesthetic value; provides high quality habitat for aquatic biota, fish and wildlife; is suitable for public water supply with filtration and disinfection; and is suitable for irrigation and other agricultural uses.

  The VANR manages the reservoir as a mixed-water fishery, with the sections of the river below and above the reservoir are managed as coldwater fisheries.

- The 2016 State of Vermont 303(d) List of Impaired Waters lists the Waterbury Reservoir as an impaired waterway, due to sedimentation and turbidity[9].

- The 2014 WQC issued by the VTDEC is included as Appendix A within the 2016 FERC license[10].

- During Project relicensing, erosion or sedimentation, resulting from Project winter drawdown operations was identified as a concern by the VANR. GMP's study of the reservoir during the seasonal drawdown period indicated that reservoir sediments were mobilized during the winter drawdown and flushed from the reservoir during high spring inflows and reservoir refilling. GMP monitored turbidity in the tailrace during 1997, 1998, and 2000. The monitoring documented periods when tailrace turbidity exceeded the state standard of 10 NTUs. The standard was exceeded on two occasions in March and April of 1998, and again in April of 2000 when the reservoir was refilling. During relicensing the VANR determined that to protect water quality in the Little River, the winter drawdown would have to be eliminated to prevent suspension of sediments in the impoundment.

  Within the 2014 WQC Condition B and included in the new 2016 Project license, it was therefore prescribed by the VTDEC for GMP to phase out the reservoir's seasonal

[9] http://dec.vermont.gov/sites/dec/files/documents/WSMD_mapp_303d_Part_A_2016_final_complete.pdf
[10] https://elibrary.ferc.gov/IDMWS/common/opennat.asp?fileID=14150313

drawdowns and convert the Waterbury Project over to run-of-river operations over a series of three operational stages.

GMP is currently undergoing the prescribed process to convert the Project over to run-of-river operations.

3.4 WATER QUALITY STANDARDS: DOWNSTREAM ZOE

Criterion	*Standard*	*Instructions*
B	2	Agency Recommendation: • If facility is located on a Water Quality Limited river reach, provide an agency letter stating that the facility is not a cause of such limitation. • Provide a copy of the most recent Water Quality Certificate, including the date of issuance. • Identify any other agency recommendations related to water quality and explain their scientific or technical basis. • Describe all compliance activities related to the water quality related agency recommendations for the facility, including on-going monitoring, and how those are integrated into facility operations.

- The Little River in the Project-affected reach is designated as Class B waters by the State of Vermont.

  Class B waters are managed to achieve and maintain a high level of quality that: is suitable for bathing; consistently exhibits good aesthetic value; provides high quality habitat for aquatic biota, fish and wildlife; is suitable for public water supply with filtration and disinfection; and is suitable for irrigation and other agricultural uses.

  The river in the Project Downstream ZOE vicinity is designated cold water fish habitat for the protection and management of fisheries, Dissolved Oxygen (DO) levels must be maintained above 7 mg/l and 80 percent saturation and turbidity below 10 NTU's (1nephelometric turbidity unit is ~1 part per million [ppm]).

- The 2016 State of Vermont 303(d) List of Impaired Waters[11] and the 2012 EPA Waterbody Assessment Report[12] do not list the waters of the Little River located downstream of the reservoir as impaired.

- The 2014 WQC issued by the VTDEC is included as Appendix A within the 2016 FERC license[13].

- During Project relicensing, GMP conducted water quality monitoring for dissolved oxygen (DO) and temperature both within the Waterbury reservoir and downstream of the dam. GMP's monitoring showed that the tailrace exhibited low DO levels (from 4.6 to 6.9 mg/l), below state standards during the late summer months. Low DO levels are attributed to the Waterbury Project's deep-water intake that during periods of reservoir stratification, draws oxygen deficient water from the hypolimnion, which is discharged into the tailrace.

  In order to meet DO standards for Class B coldwater habitat, GMP and agencies agreed to Conditions F (Tailrace Dissolved Oxygen Plan) and G (Dissolved Oxygen Effectiveness Monitoring) of the 2014 WQC, incorporated as 2016 license Article 401. On August 18, 2016, GMP filed a Tailrace Dissolved Oxygen Enhancement and

[11] http://dec.vermont.gov/sites/dec/files/documents/WSMD_mapp_303d_Part_A_2016_final_complete.pdf
[12] https://watersgeo.epa.gov/mwm/
[13] https://elibrary.ferc.gov/IDMWS/common/opennat.asp?fileID=14150313

Monitoring Plan[14] pursuant to Article 401 and WQC Conditions F and G with FERC. FERC approved the plan on January 24, 2017[15].

In accordance with the Plan, GMP proposes to implement a four-phased approach, if needed, to meet DO standards in the area immediately downstream of the Project powerhouse. Phase I through III would rely on using the new turbine and draft tube modification to re-aerate the water to increase DO exiting the powerhouse. Phase IV would entail exploring alternative methods if Phase I through III are not successful. GMP implemented Phase I enhancements during the first stratification period following completion of GMP construction activities in Spring of 2018. The data collection period is nearly complete. If this data shows that DO standards are not being met, Phase II could be implemented during the summer of 2019. Phase III would be implemented in 2020 if warranted. If needed, Phase IV would be implemented most likely after the summer of 2022, due to a two-year or longer design and construction phase in order to implement Phase IV.

GMP will monitor water temperature and DO in the Project's penstock and downstream of the Project's powerhouse during periods of reservoir stratification to confirm that the Project is meeting state class B coldwater fish habitat standards for temperature and DO. The monitoring will be performed for five consecutive years after physical modifications at the Project are complete. After five years, GMP will consult with the VTDEC and Commission to determine whether additional monitoring is necessary.

GMP will file an annual report with the VTDEC and the Commission each year beginning on February 28, 2019. The reports will include a summary of the data collected relative to the Vermont water quality standards. GMP will provide graphs, charts and/or time series plots for comparing the penstock DO measurements to the downstream DO concentration. The reports will also include operation data, flow through the turbine, flow through the bypass pipe, and will indicate when the reaeration mechanism in the penstock was utilized. The annual reports will also include documentation of any consultation with the VTDEC, including copies of comments and recommendations made by the agency. If violations of DO standards persist after the implementation of the plan, GMP will revise the Plan to include additional or alternate measures to meet DO standards. Any revised plan would be subject to approval by the VTDEC prior to implementation.

- GMP will keep LIHI updated on the status of the Tailrace Dissolved Oxygen Enhancement and Monitoring Plan.

[14] https://elibrary.ferc.gov/IDMWS/common/opennat.asp?fileID=14333647
[15] https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14471759

B	PLUS	<u>Bonus Activities:</u> • Describe any advance technologies that have been deployed at the facility to enhance ambient water quality and how its performance is being monitored. • If adaptive management is being applied, describe the management objectives, the monitoring program pursuant to evaluating performance against those objectives, and the management actions that will be taken in response to monitoring results.

- As described in the section above, GMP is implementing a Tailrace Dissolved Oxygen Enhancement and Monitoring Plan at the Project. DO enhancement protocols will be implemented annually during periods of reservoir stratification. In summer 2018, GMP began implementing a phased approach to meet dissolved oxygen standards in the area immediately downstream of the powerhouse. Phase I will be based on a passive re-aeration method where powerhouse air is passively drawn into the draft tube sleeve. Phase II would involve the pumping of ambient air into the draft tube sleeve, while Phase III would involve pumping pure oxygen into the draft tube sleeve. Should Phases I-III not be successful in attaining DO standards, Phase IV will entail exploring alternative methods to re-aerate and increase DO levels. Phases II-IV would only be implemented if attainment of DO standards is not met during the previous phase.

  For initiation of Phase I (Passive Re-aeration), GMP worked closely with NORCAN Hydraulic Turbine, Inc (NORCAN) to explore the most effective way to configure the new turbine so that passive re-aeration can occur in the draft tube. A CFD model was developed and runs were executed to explore the various options. In accordance with the modelling outcomes, GMP installed an aeration chamber within the existing discharge cone/draft tube along with the replacement runner to increase the dissolved oxygen from the discharge of the turbine. This installation reduces the Project's overall capacity from 5.52-MW to 4.102-MW so that passive re-aeration may occur. GMP has willingly reduced licensed plant capacity for the purposes of environmental stewardship. Appendix E includes the Draft Tube Aeration Possibility CFD Study conducted for the Waterbury Project.

  GMP monitors water temperature and DO at the Project's penstock tap and downstream of the Project's powerhouse during periods of reservoir stratification to confirm that the Project is meeting State Class B Coldwater Fish Habitat standards for temperature and DO. This monitoring will be performed for five consecutive years. After five years, GMP will consult with the VTDEC to determine whether additional monitoring is necessary. Monitoring in accordance with the Plan began once Project modifications were completed, the station went back online, and the reservoir is stratified (summer 2018). Monitoring will continue for five years from that date. During the monitoring period, data will be logged every 16 minutes by Onset HOBO data loggers. The loggers have and will be downloaded once per month.

  Annual reports will be filed with VTDEC and FERC beginning on February 28, 2019. GMP will keep LIHI updated on the status of the Tailrace Dissolved Oxygen Enhancement and Monitoring Plan.

- The Tailrace Dissolved Oxygen Enhancement Plan is based on an adaptive management framework as the Plan may be altered over time in consultation with resource agencies should it be needed. As stated within the Plan, the proposed approach is based on GMP's current understanding of the issue. If DO standards are not met following implementation of Phase I, GMP reserves the right to explore alternative methods beyond what is described within the Plan, in consultation with VTDEC, based on any new information that may become available.

3.5 UPSTREAM FISH PASSAGE STANDARDS: IMPOUNDMENT AND DOWNSTREAM ZOES

Criterion	*Standard*	*Instructions*
C	2	Agency Recommendation: • Identify the proceeding and source, date, and specifics of the agency recommendation applied (NOTE: there may be more than one; identify and explain which is most environmentally stringent). • Explain the scientific or technical basis for the agency recommendation, including methods and data used. This is required regardless of whether the recommendation is or is not part of a Settlement Agreement. • Describe any provisions for fish passage monitoring or effectiveness determinations that are part of the agency recommendation, and how these are being implemented.

- The Waterbury Dam does not impose a barrier to upstream fish passage and does not have any current fish passage requirements. In accordance with Article 403 of the License, authority is reserved to the Commission to require GMP to construct, operate, and maintain, or to provide for the construction, operation, and maintenance of such fishways as may be prescribed by the Secretary of the Interior pursuant to Section 18 of the Federal Power Act. In addition, under Condition H of the WQC, upon a request of the Department of Fish and Wildlife, the Department may require the applicant to provide upstream or downstream fish passage facilities or participate in a trap-and-transport facility that moves migratory fish upstream of Waterbury Dam.
- As stated within the 2004 Environmental Assessment, the Little River is managed by the VANR for self-supporting populations of resident and migratory salmonids and cold water fish, particularly brook, brown, and rainbow trout. The impoundment supports brook, brown, and rainbow trout, rainbow smelt, smallmouth bass and yellow perch. Trout and smelt within the reservoir move upstream into the Little River and other tributaries to spawn.

  Little River downstream of the Project supports an assemblage of resident coldwater fish species including trout, dace, suckers, and sculpin. As stated within the 2004 Environmental Assessment, the Vermont Department of Fish and Wildlife (VDFW) electrofishing surveys indicate that fish abundance in the Little River is low, especially downstream of the Waterbury Project. Little River downstream of the Project consists of riffles (39 percent), runs (30 percent), and pools (18 percent). There is little structure or cover habitat for fish other than the pools, the substrate is rather uniform and comprised of cobble and gravel.

  The fish community in the Project area is supported by both natural reproduction and periodic stocking and no state or federally listed threatened or endangered species are known to occur in the Waterbury Project area.
- As stated within GMP's recent downstream Bolton Falls Hydroelectric Project (FERC No. 2879) Pre-Application Document[16], several species of migratory fish are present in Lake Champlain and the downstream Winooski River, including lake sturgeon,

[16] https://elibrary.ferc.gov/IDMWS/common/opennat.asp?fileID=14480216

landlocked Atlantic salmon, and steelhead rainbow trout. The Bolton Falls Project, located at Winooski River Mile 43, is located upstream of the extent of the natural range for lake sturgeon, but landlocked Atlantic salmon and steelhead rainbow trout are present in the Bolton Falls Project area due to upstream fish passage efforts at downstream projects. At Chace Mill, the downstream-most dam on the Winooski River, an upstream fish lift and a trap and truck program, funded in cooperation with other upstream dam owners (including GMP), provides access to upstream Winooski River areas above the Essex 19 Project (located downstream of the Bolton Falls Project).

Due to downstream blockages on the Winooski River, the Little River is not currently accessible to fish migrating upstream from Lake Champlain. In accordance with the 2016 FERC license, the Waterbury Project is not currently slated for the provision of upstream passage.

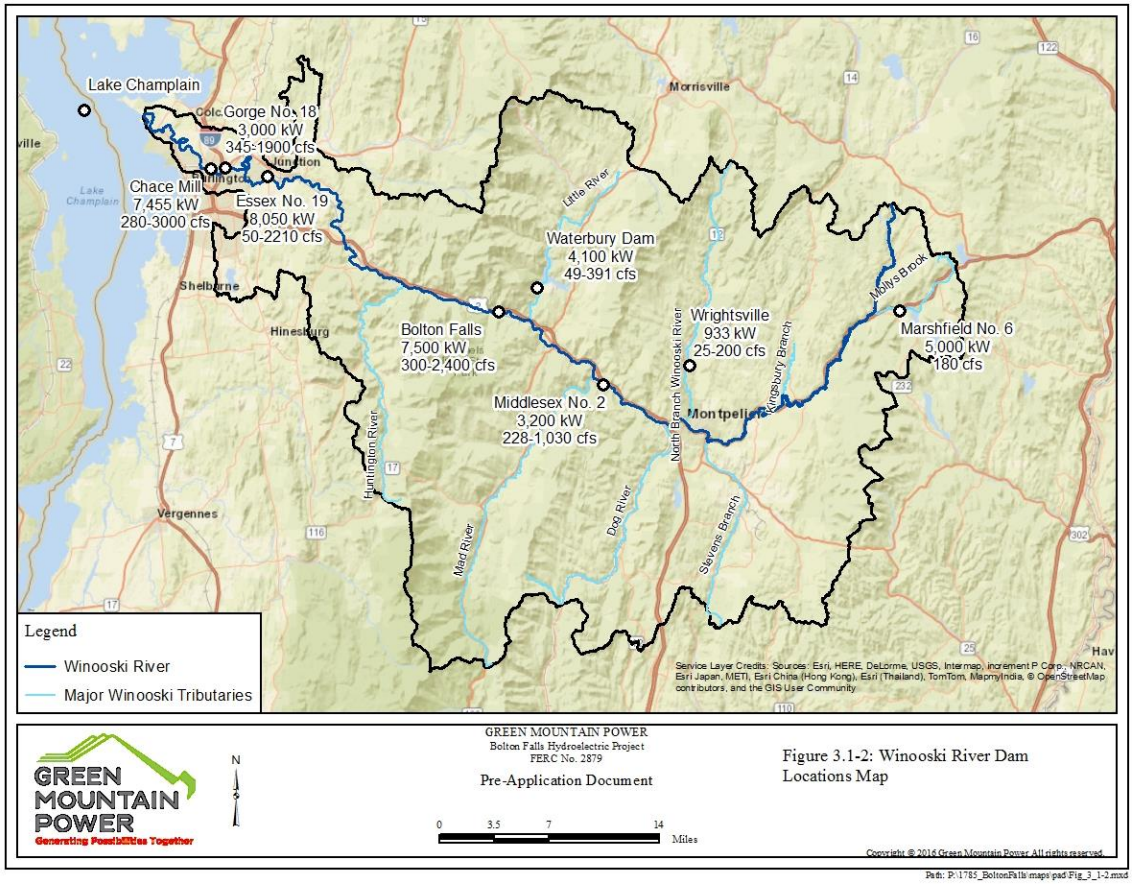

FIGURE 3 WINOOSKI RIVER DAM LOCATIONS

3.6 DOWNSTREAM FISH PASSAGE AND PROTECTION STANDARDS: IMPOUNDMENT AND DOWNSTREAM ZOES

Criterion	*Standard*	*Instructions*
D	2	Agency Recommendation: • Identify the proceeding and source, date, and specifics of the agency recommendation applied (NOTE: there may be more than one; identify and explain which is most environmentally stringent). • Explain the scientific or technical basis for the agency recommendation, including methods and data used. This is required regardless of whether the recommendation is part of a Settlement Agreement or not. • Describe any provisions for fish passage monitoring or effectiveness determinations that are part of the agency recommendation, and how these are being implemented.

- The Waterbury Dam does not impose a barrier to downstream fish passage and does not have any current fish passage requirements. In accordance with Article 403 of the license, authority is reserved to the Commission to require GMP to construct, operate, and maintain, or to provide for the construction, operation, and maintenance of such fishways as may be prescribed by the Secretary of the Interior pursuant to Section 18 of the Federal Power Act. In addition, under Condition H of the WQC, upon a request of the Department of Fish and Wildlife, the Department may require the applicant to provide upstream or downstream fish passage facilities or participate in a trap-and-transport facility that moves migratory fish upstream of Waterbury Dam.
- As stated within the 2004 Environmental Assessment, the Little River is managed by the VANR for self-supporting populations of resident and migratory salmonids and cold water fish, particularly brook, brown, and rainbow trout. The impoundment supports brook, brown, and rainbow trout, rainbow smelt, smallmouth bass and yellow perch. Trout and smelt within the reservoir move upstream into the Little River and other tributaries to spawn.

  Little River downstream of the Project supports an assemblage of resident coldwater fish species including trout, dace, suckers, and sculpin. As stated within the 2004 Environmental Assessment, the VDFW electrofishing surveys indicate that fish abundance in the Little River is low, especially downstream of the Waterbury Project. Little River downstream of the Project consists of riffles (39 percent), runs (30 percent), and pools (18 percent). There is little structure or cover habitat for fish other than the pools, the substrate is rather uniform and comprised of cobble and gravel.

  The fish community in the Project area is supported by both natural reproduction and periodic stocking and no state or federally listed threatened or endangered species are known to occur in the Waterbury Project area.
- As stated within GMP's recent downstream Bolton Falls Project Pre-Application Document, several species of migratory fish are present in Lake Champlain and the downstream Winooski River, including lake sturgeon, landlocked Atlantic salmon, and steelhead rainbow trout. The Bolton Falls Project is located upstream of the extent of the natural range for lake sturgeon, but landlocked Atlantic salmon and steelhead rainbow

trout are present in the Bolton Falls Project area due to upstream fish passage efforts at downstream projects. At Chace Mill, the downstream-most dam on the Winooski River, an upstream fish lift and a trap and truck program funded in cooperation with other upstream dam owners (including GMP) provides access to upstream Winooski River areas above the Essex 19 Project (located downstream of the Bolton Falls Project).

Due to downstream blockages on the Winooski River, the Little River is not currently accessible to fish migrating upstream from Lake Champlain. In accordance with the 2016 FERC license, the Waterbury Project is not currently slated for the provision of downstream passage.

3.7 SHORELINE AND WATERSHED PROTECTION STANDARDS: IMPOUNDMENT AND DOWNSTREAM ZOES

Criterion	*Standard*	*Instructions*
E	1	Not Applicable / De Minimis Effect: • If there are no lands with significant ecological value associated with the facility, document and justify this (e.g., describe the land use and land cover within the project boundary). • Document that there have been no Shoreline Management Plans or similar protection requirements for the facility.

- The watershed upstream of the Waterbury Project is about 109 square miles. As stated within the 2004 Environmental Assessment, eighty percent of the watershed upstream of the Waterbury Project is forested, 15 percent is agricultural, 3 percent is urban, and 2 percent is residential.
- Land cover units identified within 100 feet of the Upstream and Downstream ZOEs are listed in Figure 4 as identified within the National Land Cover Database, 2011 (http://www.mrlc.gov/nlcd11_leg.php):
- During the Project relicensing process, GMP conducted a shoreline erosion study to locate any erosion sites along the reservoir shoreline and the Little River downstream and to assess the influence of hydroelectric operations on the erosion[17]. Erosion was documented at 12 sites along the Waterbury Reservoir shoreline. The study concluded that the principal causes of the erosion are natural erosive processes (e.g., wind, waves, ice scour, and surface runoff) and human and animal influences. Reservoir fluctuations, considered a secondary cause, are identified to influence the occurrence of erosion in 11 of the 12 sites along the reservoir. As stated in the 2004 Environmental Assessment, in 2001 a study by BBC&M Engineering, Inc. revealed that when the reservoir was drawn down to 550.1 feet msl in the winter, the lacustrine silt deposits that occur along the reservoir shoreline were exposed. When lacustrine silt deposits froze, needle ice formations occurred. Needle ice formation can loosen the soil and increase the erosion potential. In addition, the repeated freeze-thaw cycles prevalent in the region continue to loosen the soil that is already susceptible to the erosion caused by the needle ice.

  The BBC&M Engineering report concluded that to lessen the amount of sediment eroding, the exposure of loosened soil to moving water must be reduced. This could occur through submerging the silt deposits, either by filling the reservoir earlier than normal in February or by limiting the winter reservoir drawdown. However, the report noted that at any minimum reservoir elevation, the silt that erodes from the lacustrine silt deposits will continue to deposit in the reservoir, and the silt deposits would continue to move into the Little River even if the reservoir did not exist.
- As determined, within the 2016 license and 2014 WQC, the Waterbury Project will eventually operate as a true run-of-river facility with no winter drawdowns once enhancements to the Waterbury Dam and Tainter gates are complete. As prescribed by VTDEC and in earlier sections of this application, GMP is actively pursuing run-of-river operations in a three-stage process. As depicted within consultation, it is expected that

[17] https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=10227098

run-of-river operations with no seasonal drawdowns and a resulting stable reservoir will result in reduced shoreline erosion.

- No shoreline management plan or similar protections were prescribed within the recent Project relicensing process.

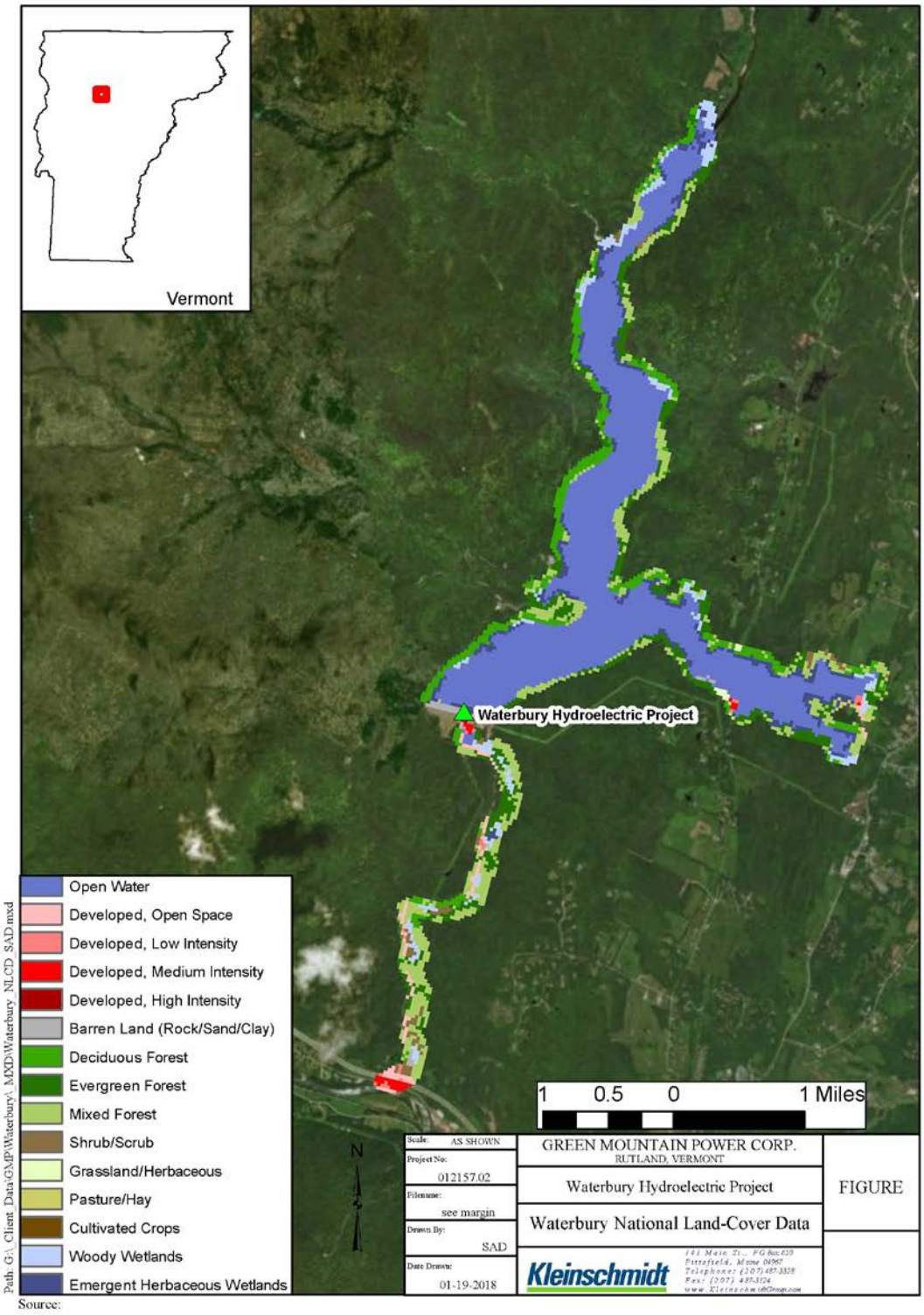

FIGURE 4 PROJECT LAND COVER CLASSIFICATION

3.8 THREATENED AND ENDANGERED SPECIES STANDARDS: IMPOUNDMENT AND DOWNSTREAM ZOE

Criterion	*Standard*	*Instructions*
F	2	Finding of No Negative Effects: • Identify all listed species in the facility area based on current data from the appropriate state and federal natural resource management agencies. • Provide documentation of a finding of no negative effect of the facility on any listed species in the area from an appropriate natural resource management agency.

- In accordance with FWS letter dated August 30, 2000, the FWS stated that no federally listed threatened or endangered species or critical habitat are known to occur in the Project area (letter reference is included in the 2016 Project license). However, subsequent to the issuance of the 2000 FWS letter, FWS listed the northern long-eared bat as threatened under the federal Endangered Species Act (ESA). An August 24, 2017 review of FWS's *Information, Planning, and Conservation System* (IPaC) decision support system confirms that the federally threatened northern long-eared bat (State of Vermont engendered species) could occur in Washington County, Vermont (see Appendix F for a copy of the IPaC Report). However, because this species is not known to inhabit the Project area, the Project was determined to have no effect on the threatened northern long-eared bat.

  A review of the Vermont Natural Resources Atlas Endangered and Threatened Species Layer does not identify any endangered or threatened state species presence within the Project ZOEs[18].

[18] https://anrmaps.vermont.gov/websites/anra5/

3.9 CULTURAL AND HISTORIC RESOURCES STANDARDS: IMPOUNDMENT AND DOWNSTREAM ZOES

Criterion	*Standard*	*Instructions*
G	2	Approved Plan: • Provide documentation of all approved state, provincial, federal, and recognized tribal plans for the protection, enhancement, and mitigation of impacts to cultural and historic resources affected by the facility. • Document that the facility is in compliance with all such plans.

- As part of relicensing, GMP contracted cultural resource professionals in 1998 to do a cultural resources investigation and Phase 1A archeological sensitivity study within the Project's Area of Potential Effect (APE). Based on additional information requests from the Commission, and as a result of proposed repairs to the Waterbury Dam and drawdown of the Waterbury Reservoir, GMP contracted in 2001 and 2002: (1) a historic and photographic documentation study of the Waterbury Dam; (2) an intensive archeological survey in proposed dam reconstruction areas around Waterbury Dam; and (3) a historic/archeological mapping and testing study around the drawdown area of the Waterbury Reservoir[19].

  No prehistoric archeological sites, or other Native American properties were identified within the Project APE. Probable causes for the lack of prehistoric sites or Native American properties may be principally due to the massive ground disturbing activities associated with original construction of the Waterbury Dam which may have removed pre-existing early artifacts or historic sites.

- Article 405 of the 2016 license requires that GMP implement the "Programmatic Agreement Between the Federal Energy Regulatory Commission and the State of Vermont, State Historic Preservation Officer (Vermont SHPO), for Managing Historic Properties that May be Affected by a License Issuing to Green Mountain Power Corporation for the Continued Operation of the Waterbury Hydropower Project in Washington County, Vermont (FERC No. 2090)," executed on October 19, 2004. Pursuant to the requirements of this Programmatic Agreement, GMP must file, for Commission approval, an Historic Properties Management Plan (HPMP) within one year of license issuance. On February 16, 2017[20], GMP filed a request with FERC to gain a 60-day extension of time for submission of the HPMP. FERC granted an extension of time until April 20, 2017. On April 19, 2017, GMP requested a second extension of time until July 19, 2017[21] for submission of the HPMP. FERC granted the second extension of time[22] and on July 19, 2017, GMP filed an HPMP for Commission approval[23]. On January 26, 2018 GMP filed an updated HPMP which incorporated a revision requested by the Vermont SHPO[24] and on February 14, 2018 FERC issued its Order Approving the

[19] https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=10733542
[20] https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14495217
[21] https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14565355
[22] https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14580005
[23] https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14639748
[24] https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14807832

HPMP[25]. In accordance with the HPMP, GMP will submit an annual report to the Vermont SHPO and the Commission to summarize projects completed during the preceding year. If no work was completed, the report will document that no work occurred.

[25] https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14822475

3.10 RECREATIONAL RESOURCES STANDARDS: IMPOUNDMENT ZOE

Criterion	*Standard*	*Instructions*
H	2	Agency Recommendation: • Document any comprehensive resource agency recommendations and enforceable recreation plan that is in place for recreational access or accommodations. • Document that the facility is in compliance with all such recommendations and plans.

- The Waterbury Project offers year-round recreational opportunities to the public and is an integral part of the recreational resources of central Vermont. Between Memorial Day and Labor Day, GMP maintains a stable reservoir to support popular reservoir activities such as boating and fishing. During the winter, snowmobiling, and ice fishing occur on or near the reservoir. Nearly all the lands surrounding the Project and the reservoir are owned by Vermont and are managed either as a State Forest (Mt. Mansfield State Forest) or as State Parks.

  The Vermont Department of Forest Parks and Recreation (VDFPR) manages two state parks, the Little River State Park and Waterbury Center State Park, located on the west and east side of the reservoir, respectively. The Little River State Park, open from mid-May to Columbus Day, provides camp sites for RVs and tents; hiking trails; a swim area; and a boat launch available to park campers. Waterbury Center State Park is a day-use park open from mid-May to Labor Day weekend, provides a swim area, a boat launch, and picnic facilities. Both boat launches provide boat trailer parking and charge a fee for use.

  Along the reservoir, and within the Mt. Mansfield State Forest, three additional boat launches and 29 primitive campsites are provided. Two of the boat launches, located adjacent to the dam and at the Blush Hill site, southeast, of the dam, provide boat trailer parking. A car-top boat launch is located at the north end of the reservoir at the Moscow Access Site. No fee is required to launch a boat at these sites. Water-skiing opportunities are also available. Two slalom ski courses have been designated on the reservoir; one is permanent, while the buoys for the other can be lowered when not in use.

  All of the reservoir's recreation facilities are located outside of the Project boundary. With exception for Blush Hill Boat Ramp which is owned and operated by the town of Waterbury, all facilities are owned and maintained by VDFPR or VTDEC.

- Article 404 of the 2016 license, requires that GMP file a Recreation Plan, as prescribed by Condition K of the VTDEC's WQC, within 6 months of license issuance. Condition K requires that recreational facility improvements be constructed consistent with a Department-approved recreation plan developed in consultation with the departments of VTDEC, VDFW, and VDFPR.

  GMP submitted a Recreation Plan on October 19, 2016[26], as supplemented on January 6, 2017. FERC approved the plan on March 1, 2017[27].

[26] https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14379702
[27] https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14507078.

In accordance with the agency and FERC approved Recreation Plan, GMP will make the following improvements within the Impoundment ZOE:

- Waterbury Reservoir Boat Launch – GMP will install a one lane boat ramp made of precast concrete planks in place of the existing gravel ramp at the Waterbury Reservoir Boat Launch (See Figure 5 for boat launch location). GMP proposes to resurface the gravel parking lot and install a waterless restroom and "No Swimming" signs. Stormwater and erosion will be controlled by minor grading, adding and removing gravel in select locations, and cleaning and reconstructing, if necessary, an existing ditch.
- Blush Hill Boat Ramp - At the Blush Hill Boat Ramp GMP will replace the existing gravel ramp with a precast concrete ramp, regrade and stabilize the area between the parking area and shoreline with biomatting and native plantings, add riprap next to the boat ramp to prevent erosion, and reestablish a drainage ditch to channel runoff away from the ramp (See Figure 5 for boat ramp location).
- Moscow Canoe Access – GMP will install wooden steps at the Moscow Canoe Access point, stabilize the shoreline adjacent to the access, resurface the gravel parking lot, and install a vegetated swale and level spreader for stormwater management (See Figure 5 for canoe access location).

In accordance with the March 1, 2017 FERC Order Approving Recreation Plan Paragraph B, GMP is to complete construction of the recreation facilities at the Little River Boat Access and Moscow Canoe Access by December 31, 2017 and complete construction of the recreation facilities at the Waterbury Reservoir Boat Launch and Blush Hill Boat Ramp by December 31, 2019 [28]. On December 13, 2017[29], GMP filed a request to extend the construction completion date for the Moscow Canoe Access Site and Little River Boat Access as GMP was working through the necessary environmental permits surrounding recreation enhancement construction. On December 20, 2017[30], GMP received an Order Granting Extension of Time to extend the construction completion date for the Moscow Canoe Access Site and Little River Boat Access to December 31, 2019 to align with completion of the other recreation facilities.

GMP is beginning recreation enhancements work in October 2018 and plans to complete improvements in spring 2019. GMP is tracking to complete the enhancements by the end of 2019 per FERC's 2017 order.

Upon completion of upgrades, ongoing operation and maintenance of the upgraded facilities will be the responsibility of the State of Vermont.

- GMP will keep LIHI updated on recreation enhancements progress and will notify LIHI upon completion.

[28] https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14507078
[29] https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14776567
[30] https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14781347

FIGURE 5 WATERBURY RECREATION ENHANCEMENT LOCATIONS

3.11 RECREATIONAL RESOURCES STANDARDS: DOWNSTREAM ZOE

Criterion	*Standard*	*Instructions*
H	2	Agency Recommendation: • Document any comprehensive resource agency recommendations and enforceable recreation plan that is in place for recreational access or accommodations. • Document that the facility is in compliance with all such recommendations and plans.

- The Little River below the Waterbury Dam to the confluence with the Winooski River offers local canoeing/kayaking and angling opportunities. Hiking trails from the Little River Road provide trout anglers access to the river, and beginner and intermediate boaters take advantage of flatwater and Class I/II whitewater. The Little River Boat Access is also located downstream of the Project and is part of Mt. Mansfield State Forest. All recreational facilities in the Downstream ZOE are located outside of the Project boundary.
- 2016 license Article 404 and WQC Condition K require implementation of a recreation plan at the Project. Please see the Impoundment Section ZOE above for further details on Project compliance with recreation plan implementation.
- In accordance with the agency and FERC approved Recreation Plan, GMP will make the following improvements within the Downstream ZOE:
    - Little River Boat Access- Construct a five-vehicle gravel parking lot at the Little River Boat Access and stabilize nearby trails using foot bridges or similar structures (See Figure 5 for boat access location). GMP will clean and reconstruct an existing ditch and may, if necessary, install a culvert under the parking entrance for stormwater management. GMP proposes to relocate the gate northwest of the entrance to the parking lot such that public access to the hydroelectric plant can be controlled without limiting access to the parking lot.
    - Notification System – GMP will provide notification of flow conditions through the USGS gage located downstream of the Project and corresponding USGS website (see FERC Order Dated May 3, 2017[31] for clarification and final decision on notification system).
    - Safety Signage – GMP will post signs warning boaters of in-stream hazards and take-out areas in the Little River downstream of the Project. GMP plans to install the signs at the same time it improves the Little River Boat Access. Signage is planned to be placed downstream of the dam including, gate across driveway, trailhead parking, snowmobile access bridge, and USGS gauging station (See Figure 6, 7, 8 for signage locations). The final locations of the signs, though, will be determined in consultation with appropriate state agencies and stakeholders.

  In accordance with the March 1, 2017 FERC Order Approving Recreation Plan Paragraph B, GMP is to complete construction of the recreation facilities at the Little

[31] https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14581451

River Boat Access and Moscow Canoe Access by December 31, 2017 and complete construction of the recreation facilities at the Waterbury Reservoir Boat Launch and Blush Hill Boat Ramp by December 31, 2019. On December 13, 2017, GMP filed a request to extend the construction completion date for the Moscow Canoe Access Site and Little River Boat Access as GMP is working through the necessary environmental permits surrounding recreation enhancement construction. On December 20, 2017, GMP received an Order Granting Extension of Time to extend the construction completion date for the Moscow Canoe Access Site and Little River Boat Access to December 31, 2019 to align with completion of the other recreation facilities.

GMP completed some recreation improvement work in 2018 and has worked collaboratively with resource agencies and the town in the design of recreation site upgrades. Ongoing operation and maintenance of the upgraded facilities will be the responsibility of the State of Vermont upon completion of GMP work.

- GMP will keep LIHI updated on recreation enhancements progress and will notify LIHI upon completion.

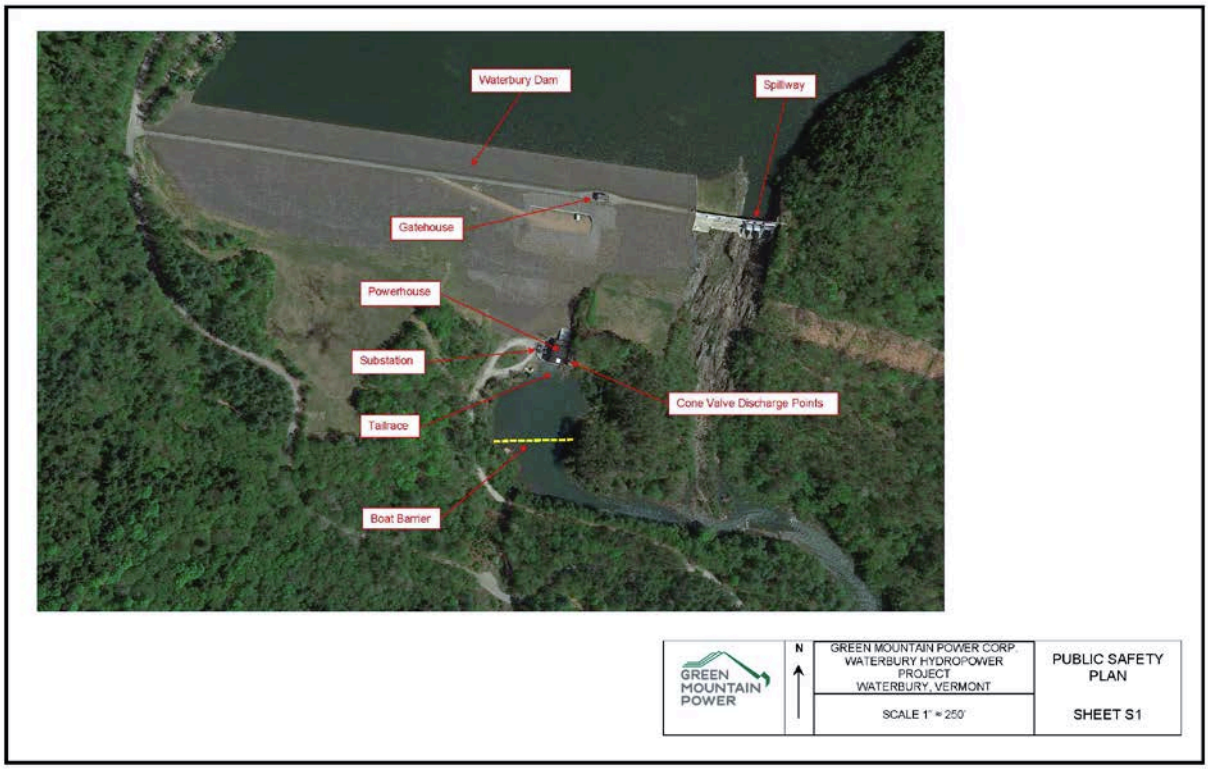

FIGURE 6 WATERBURY HYDROELECTRIC PROJECT PUBLIC SAFETY PLAN MAP 1 (GMP, 2018)

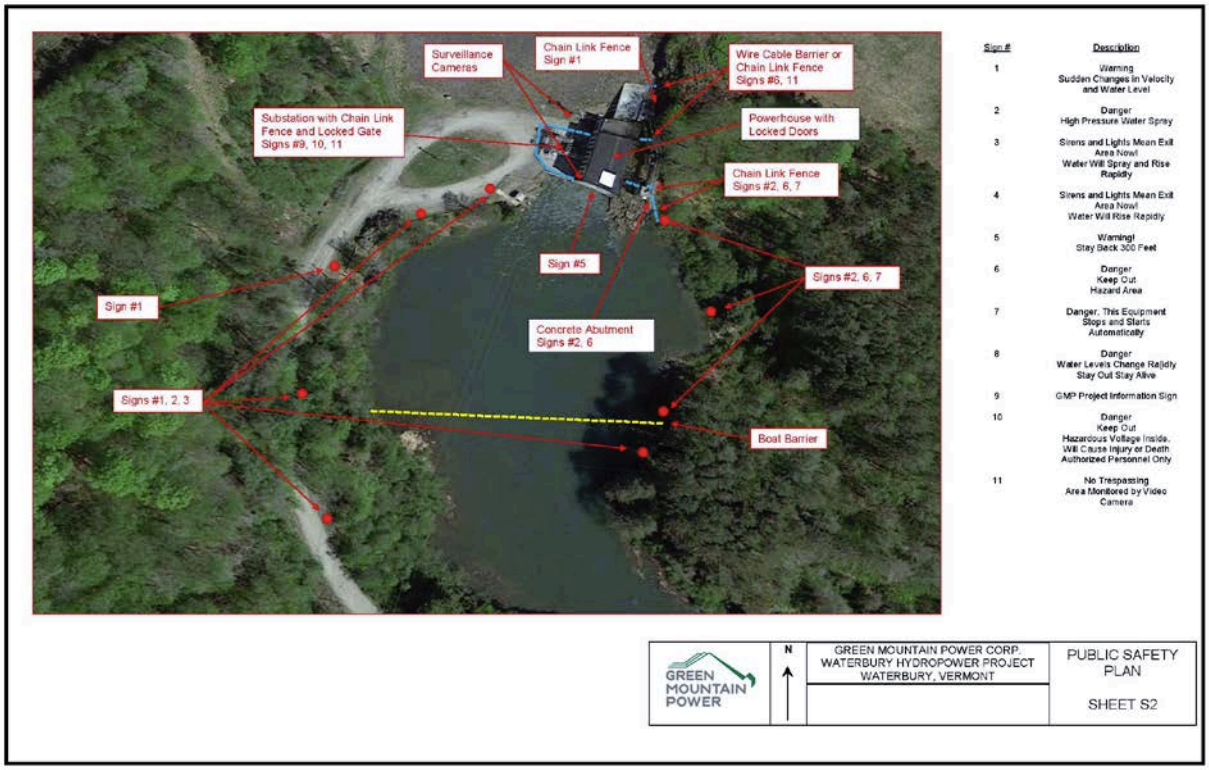

FIGURE 7 WATERBURY HYDROELECTRIC PROJECT PUBLIC SAFETY PLAN MAP 2 (GMP, 2018)

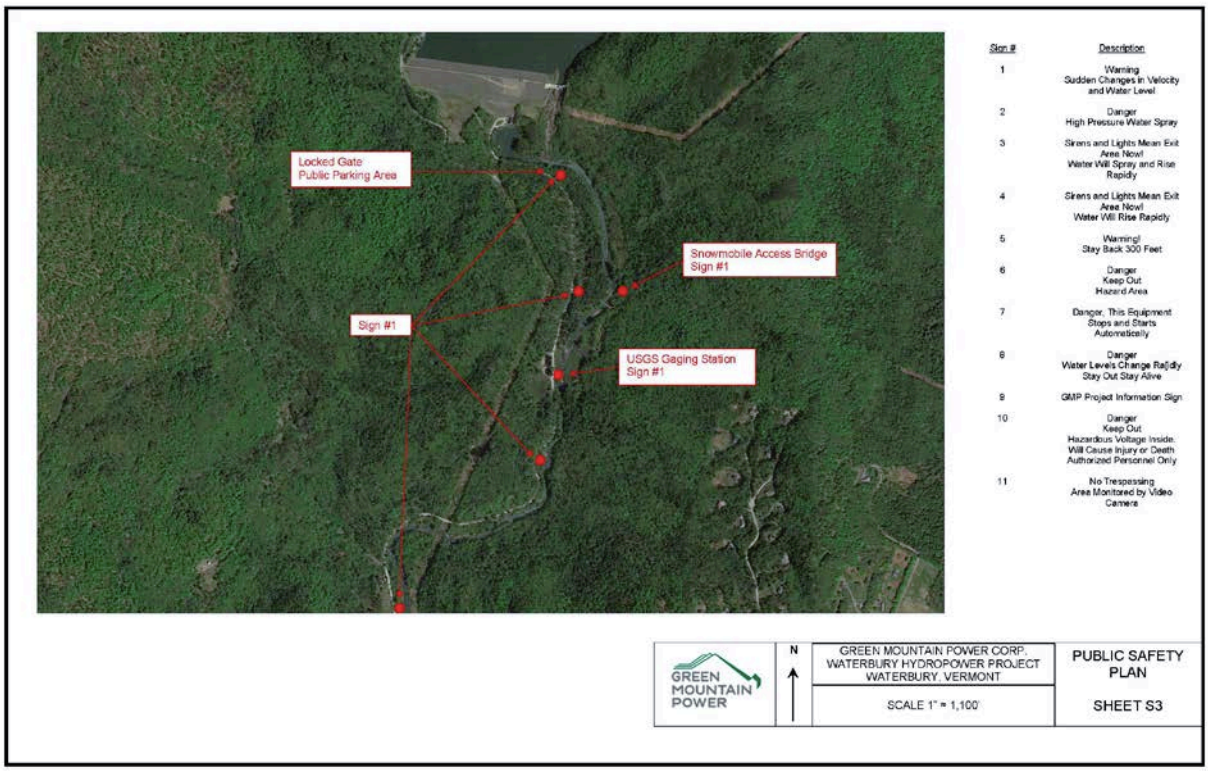

FIGURE 8 WATERBURY HYDROELECTRIC PROJECT PUBLIC SAFETY PLAN MAP 3 (GMP, 2018)

4.0 CONTACTS FORMS

1. **All applications for LIHI Certification must include complete contact information to be reviewed.**

Project Owner:	
Name and Title	Jason Lisai
Company	Green Mountain Power Corporation
Phone	(802) 655-8723
Email Address	Jason.Lisai@greenmountainpower.com
Mailing Address	163 Acorn Lane, Colchester, Vermont 05446
Consulting Firm / Agent for LIHI Program (if different from above):	
Name and Title	Andy Qua, Katie Sellers
Company	Kleinschmidt Associates
Phone	207-416-1246 & 207-416-1218
Email Address	Andy.Qua@KleinschmidtGroup.com, Katie.Sellers@KleinschmidtGroup.com
Mailing Address	P.O. Box 650, Pittsfield, Maine 04967
Compliance Contact (responsible for LIHI Program requirements):	
Name and Title	John Greenan, Environmental Engineer
Company	Green Mountain Power Corporation
Phone	(802) 770-3213
Email Address	John.Greenan@greenmountainpower.com
Mailing Address	2152 Post Road, Rutland, Vermont 05701
Party responsible for accounts payable:	
Name and Title	John Greenan, Environmental Engineer
Company	Green Mountain Power Company
Phone	802-770-3213
Email Address	John.Greenan@greenmountainpower.com; invoices@greenmountainpower.com
Mailing Address	Accounts Payable Processor, 2152 Post Road, Rutland, Vermont 05701

Agency Contact (Check area of responsibility: Flows_**X**_, Water Quality _**X**_, Fish/Wildlife Resources __, Watersheds _**X**_, T/E Spp. _X_, Cultural/Historic Resources __, Recreation _**X**_):	
Agency Name	Vermont Department of Environmental Conservation
Name and Title	Jeff Crocker, Streamflow Protection Coordinator
Phone	(802) 490-6151
Email address	jeff.crocker@vermont.gov
Mailing Address	Watershed Management Division, Main Building-2nd Floor, One National Life Drive, Montpelier, VT 05620

Agency Contact (Check area of responsibility: Flows_**X**_, Water Quality _**X**_, Fish/Wildlife Resources __, Watersheds **_X_,** T/E Spp. _X_, Cultural/Historic Resources __, Recreation _X_):	
Agency Name	Vermont Department of Environmental Conservation
Name and Title	Eric Davis, River Ecologist
Phone	802-490-6180
Email address	eric.davis@vermont.gov
Mailing Address	Watershed Management Division, Main Building – 2nd Floor, One National Life Drive, Montpelier, VT 05620

Agency Contact (Check area of responsibility: Flows_**X**_, Water Quality _**X**_, Fish/Wildlife Resources _X_, Watersheds **_X_,** T/E Spp. _X_, Cultural/Historic Resources __, Recreation __):	
Agency Name	Vermont Fish and Wildlife Department
Name and Title	Peter McHugh, Streamflow Protection Biologist
Phone	802-622-4305
Email address	peter.mchigh@vermont.gov
Mailing Address	One National Life Drive, Dewey Building, Montpelier, VT 05620-3208

Agency Contact (Check area of responsibility: Flows__, Water Quality __, Fish/Wildlife Resources __, Watersheds __, T/E Spp. __, Cultural/Historic Resources _**X**_, Recreation __):	
Agency Name	Vermont Division for Historic Preservation
Name and Title	Elizabeth Peebles, Historic Resources Specialist
Phone	(802) 828-3049
Email address	elizabeth.peebles@vermont.gov
Mailing Address	One National Life Drive, Davis Building, 6th Floor, Montpelier, VT 05620-0501

Agency Contact (Check area of responsibility: Flows__, Water Quality __, Fish/Wildlife Resources __, Watersheds __, T/E Spp. __, Cultural/Historic Resources _**X**_, Recreation __):	
Agency Name	Vermont Division for Historic Preservation
Name and Title	Scott Dillon, Survey Archaeologist
Phone	(802) 272-7358
Email address	scott.dillon@vermont.gov
Mailing Address	One National Life Drive, Davis Building, 6th Floor, Montpelier, VT 05620-0501

Agency Contact (Check area of responsibility: Flows__, Water Quality __, Fish/Wildlife Resources _**X**_, Watersheds __, T/E Spp. _**X**_, Cultural/Historic Resources __, Recreation __):	
Agency Name	US Fish and Wildlife Service
Name and Title	Melissa Grader, Wildlife Biologist
Phone	(413) 548-8002
Email address	Melissa_Grader@FWS.gov
Mailing Address	New England Field Office, 70 Commercial Street, Suite 300, Concord, NH 03301

Agency Contact (Check area of responsibility: Flows__, Water Quality __, Fish/Wildlife Resources __, Watersheds __, T/E Spp. __, Cultural/Historic Resources __, Recreation _X_):	
Agency Name	Vermont Department of Forests, Parks and Recreation
Name and Title	Susan Bulmer, Northeast Parks Regional Manager
Phone	(802) 476-0129
Email address	susan.bulmer@vermont.gov
Mailing Address	5 Perry Street, Suite 20 Barre, VT 05641-4265

Agency Contact (Check area of responsibility: Flows__, Water Quality __, Fish/Wildlife Resources __, Watersheds __, T/E Spp. __, Cultural/Historic Resources __, Recreation __, Dam Safety_):	
Agency Name	Vermont Dam Safety Program
Name and Title	Benjamin Green, P.E.
Phone	(802) 622-4093
Email address	benjamin.green@vermont.gov
Mailing Address	One National Life Drive, Montpelier, VT 05620-3501

5.0 SWORN STATEMENT

SWORN STATEMENT AND WAIVER FORM

All applications for LIHI Certification must include the following sworn statement before they can be reviewed by LIHI:

SWORN STATEMENT

As an Authorized Representative of Green Mountain Power's Waterbury (Little River) Hydroelectric Project, the Undersigned attests that the material presented in the application is true and complete.

The Undersigned acknowledges that the primary goal of the Low Impact Hydropower Institute's Certification Program is public benefit, and that the LIHI Governing Board and its agents are not responsible for financial or other private consequences of its certification decisions.

The undersigned further acknowledges that if certification of the applying facility is issued, the LIHI Certification Mark License Agreement must be executed prior to marketing the electricity product as LIHI Certified.

The undersigned Applicant further agrees to hold the Low Impact Hydropower Institute, the Governing Board and its agents harmless for any decision rendered on this or other applications, from any consequences of disclosing or publishing any submitted certification application materials to the public, or on any other action pursuant to the Low Impact Hydropower Institute's Certification Program.

PLEASE INSERT ONLY FOR PRE-OPERATIONAL CERTIFICATIONS (See Section 4.5.3)**:**

For applications for pre-operational certification of a "new" facility the applicant must also acknowledge that the Institute may suspend or revoke the certification should the impacts of the project, once operational, fail to comply with the certification criteria.

Company Name: **Green Mountain Power Corporation**

Authorize Representative Name: John C. Greenan Title **Engineer**

State of **Vermont**

County of **Rutland**

On this, the **20th** day of **February**, 2018, before me a notary public, the undersigned officer, personally appeared **John Greenan**, known to me (or satisfactorily proven) to be the person whose name is subscribed to the within instrument and acknowledged that he executed the same for the purposes therein contained. In witness hereof, I hereunto set my hand and official seal.

Notary Public Colleen A. Kelly

6.0 REFERENCES

USFWS (U.S. Fish and Wildlife Service). 2017. National Wetlands Inventory. https://www.fws.gov/wetlands/Data/Mapper.html. Accessed January 17, 2018.

APPENDIX A

WATERBURY DAM - STATE CONSTRUCTION TIMELINE

From: Green, Benjamin
To: Katie Sellers
Cc: Greenan, John
Subject: RE: Waterbury Dam Timeline?
Date: Wednesday, February 21, 2018 10:58:12 AM

Good morning Katie,

It is hard to say. We will hopefully be entering into an agreement with the USACE to perform an Risk Assessment of the dam ($615k) and conceptual design for the project, to be completed next year. From there, it is not clear where the funding will come from to complete design, permitting, and construction. It will likely require modification of an existing act. Hopefully the project will become a reality in the next 5 to 10 years, but no one can say for certain.

On a side note, Ali is no longer in the Dam Chief position at the Corps. I will send along contact information for her replacement when I get it as I just learned they hired someone.

Best,

Ben

VERMONT
Benjamin T. Green, PE
Dam Safety Program
Facilities Engineering Division
1 National Life Drive
Montpelier, VT 05620-3510

Phone: 802-622-4093
Email: Benjamin.Green@vermont.gov

http://dec.vermont.gov/facilities-engineering/dam-safety

From: Katie Sellers [mailto:Katie.Sellers@KleinschmidtGroup.com]
Sent: Tuesday, February 20, 2018 2:08 PM
To: Ali.M.Bachowski@usace.army.mil; Green, Benjamin <Benjamin.Green@vermont.gov>
Cc: Greenan, John <John.Greenan@greenmountainpower.com>
Subject: Waterbury Dam Timeline?

Afternoon Ali and Ben – I am working with John Greenan/GMP to develop a Low Impact Hydropower Institute (LIHI) Certification Application for the Waterbury facility. Within the Application, we are hoping to include an approximate timeline for when the Waterbury Tainter gate work might begin and end. That said, would you be able to provide a preliminary start and end date for this work?

I understand the Tainter gate work is not currently scheduled or budgeted, so I understand if "TBD"

is the appropriate answer to this question for the time being.

Thank you
Katie Sellers

Katie E. Sellers, M.S.
Regulatory Coordinator
Kleinschmidt
Office: 207-416-1218
www.KleinschmidtGroup.com
*Providing **practical** solutions for **complex** problems affecting energy, water, and the environment*

APPENDIX B

PROJECT PHOTOS AND ZOES

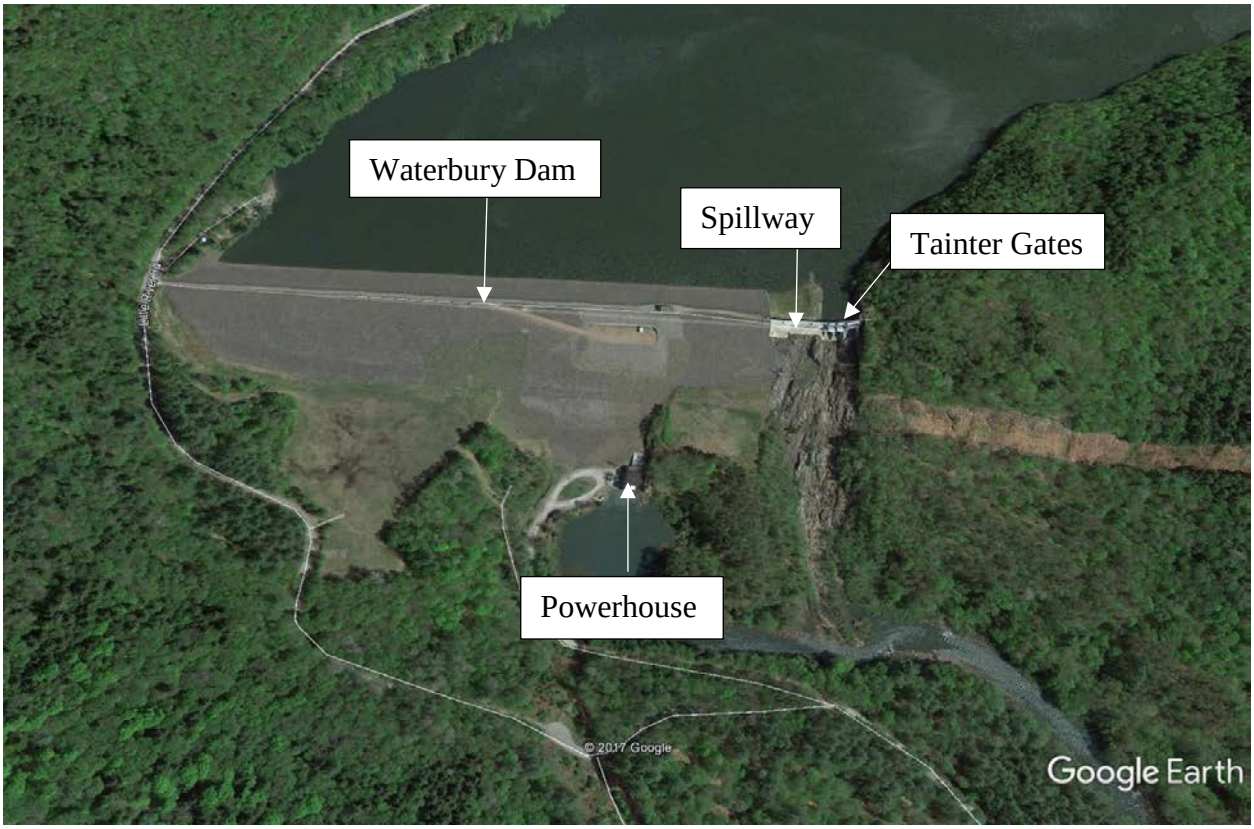

PHOTO 1 PROJECT/IDENTIFICATION OF PROJECT PARTS

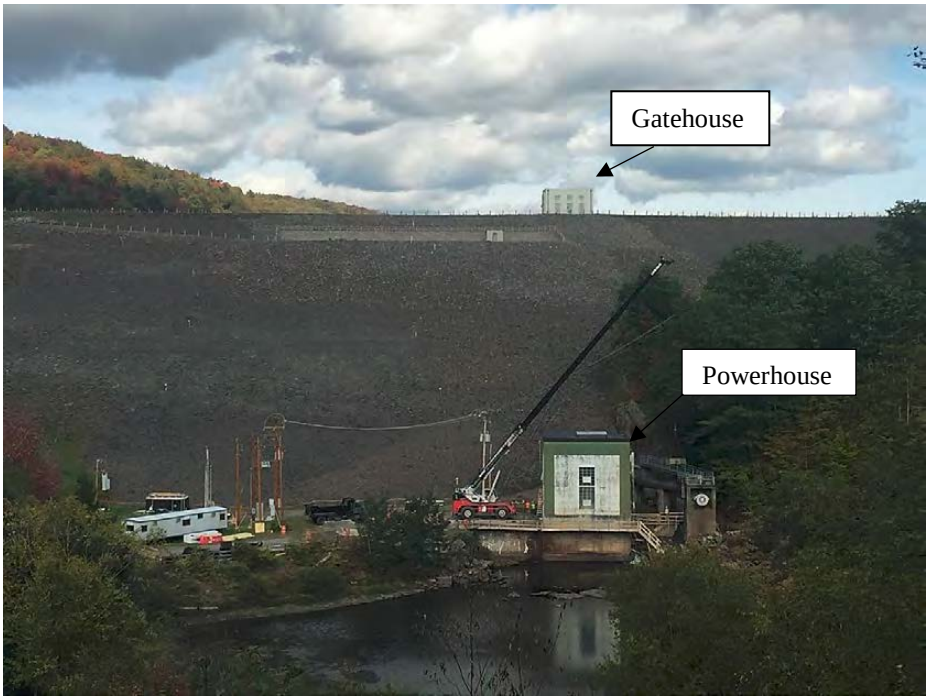

PHOTO 2 WATERBURY DAM, POWERHOUSE, AND GATEHOUSE (VIEW LOOKING UPSTREAM FROM TAILRACE DURING CONSTRUCTION REQUIRED BEFORE STAGE II OPERATIONS).

PHOTO 3 WATERBURY TAINTER GATES (VIEW LOOKING UPSTREAM FROM TAILRACE AREA).

PHOTO 4 VIEW OF WATERBURY POWERHOUSE AND TAILRACE (VIEW LOOKING DOWNSTREAM FROM TOP OF DAM DURING CONSTRUCTION REQUIRED FOR STAGE II OPERATIONS).

PHOTO 5 WATERBURY POWERHOUSE (VIEW LOOKING UPSTREAM FROM TAILRACE)

PHOTO 6 **INSTALLING THE NEW 78" BUTTERFLY VALVE WITHIN THE WATERBURY POWERHOUSE FOR STAGE II OPERATIONS.**

PHOTO 7 **NEWLY INSTALLED FLOW DISCHARGE VALVES FOR STATION TRIPS OR UNIT SHUTDOWN.**

PHOTO 8 CRANE REMOVING EXISTING RUNNER FROM THE POWERHOUSE SO TO PREPARE FOR RUN-OF-RIVER OPERATIONS/STAGE II OPERATION.

PHOTO 9 VIEW OF VALVE DISCHARGE FROM TAILRACE.

PHOTO 10 **VIEW OF THE GATEHOUSE ON THE CREST OF THE WATERBURY DAM. THE STATE OF VERMONT OWNS AND MAINTAINS THE DAM AND HEADPOND ELEVATION SENSOR IN THE GATEHOUSE; GMP HAS ACCESS TO THE GATEHOUSE.**

PHOTO 11 **WATERBURY GATEHOUSE AND RESERVOIR (VIEW FROM DAM CREST).**

PHOTO 12 VIEW OF THE WATERBURY RESERVOIR AND THE BOAT RAMP AT LITTLE RIVER STATE PARK (VIEW FROM DAM CREST).

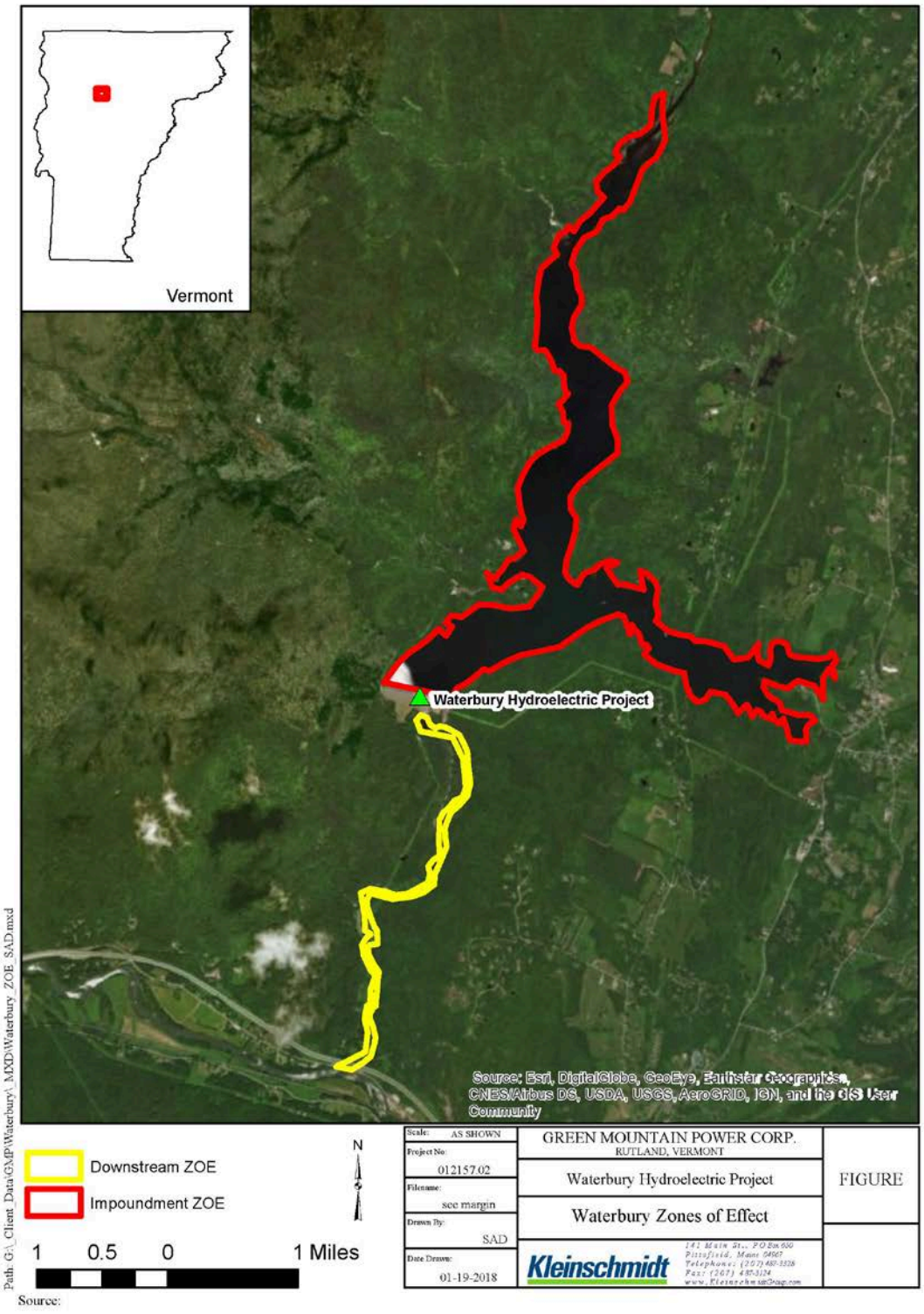

FIGURE 7 WATERBURY PROJECT ZONES OF EFFECT

APPENDIX C

FACILITY AREA RIVER BASIN

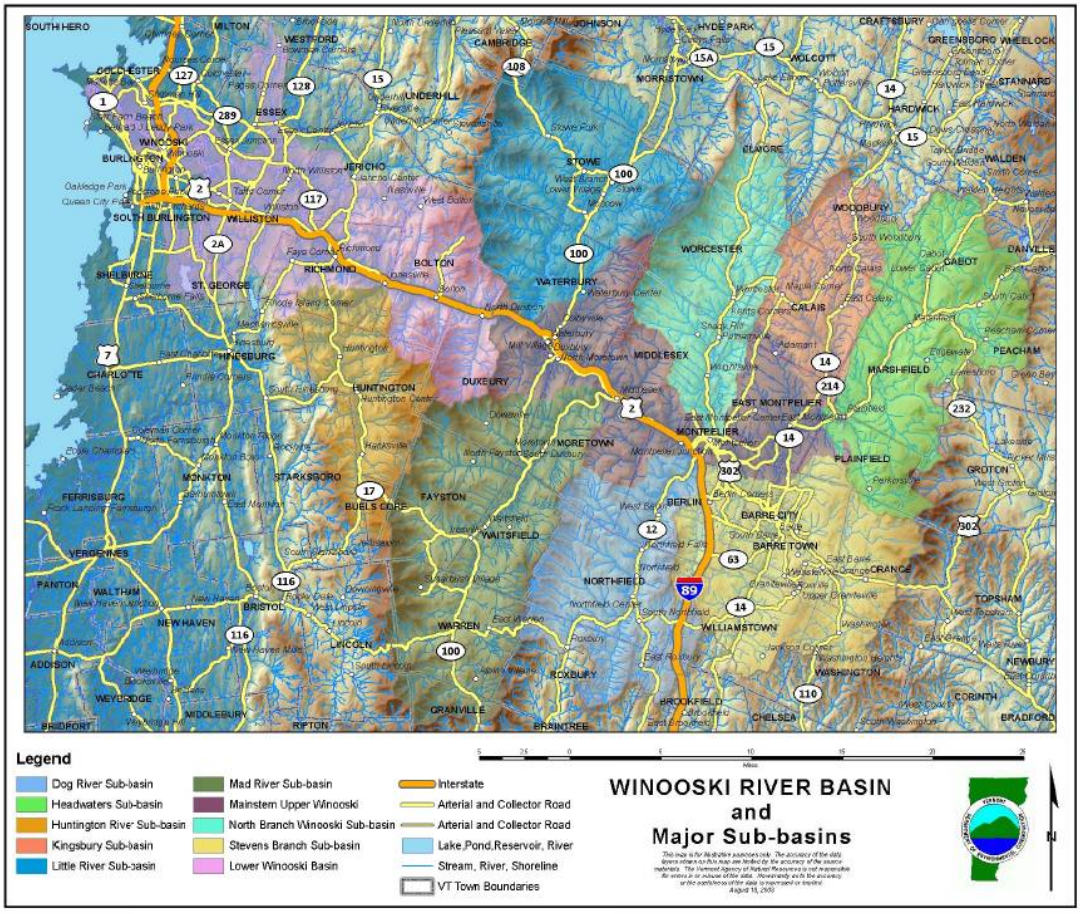

FIGURE 8 WINOOSKI RIVER BASIN AND MAJOR SUB-BASINS

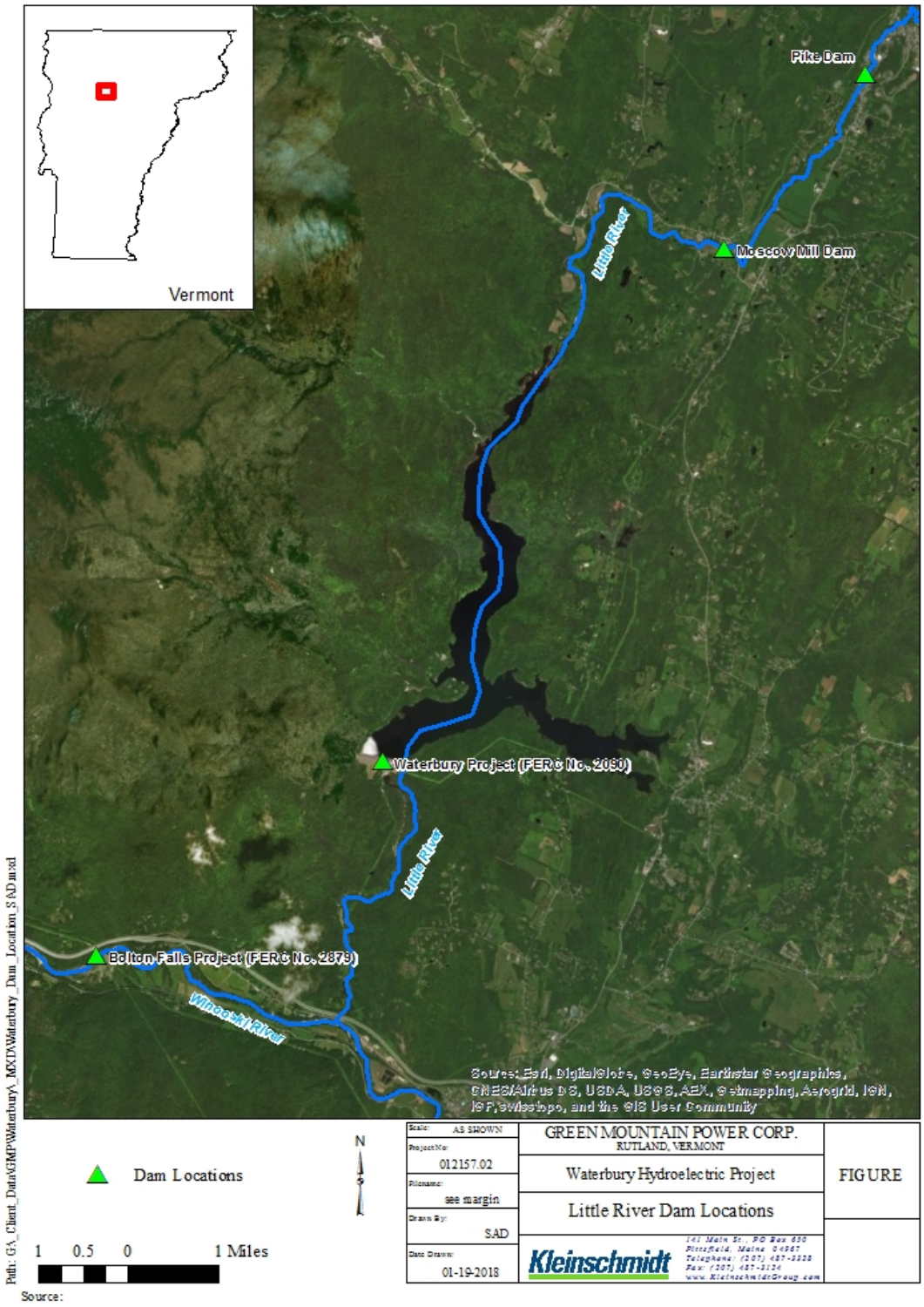

FIGURE 9 LITTLE RIVER DAM LOCATIONS

APPENDIX D

FLOWS

KING & KING
P.O. BOX 879
PRENTIS HOUSE, 4219 MAIN STREET
WAITSFIELD, VERMONT 05673

TELEPHONE 802/496-4371
FAX 802/496-5360
EMAIL KINGKING@WCVT.COM

RICHARD JOHNSTON KING
HARRIET ANN KING

DOROTHY M. PECK
Administrator

December 4, 2012

Jon Groveman, General Counsel
Vermont Agency of Natural Resources
103 South Main Street
Waterbury, Vermont 05671-0301

Re: Green Mountain Power Corporation, Waterbury Hydroelectric Project
401 Certification

Dear Jon:

GMP is presenting for the Agency of Natural Resources' consideration a proposal for revised operations at its Waterbury Hydroelectric Project, to be reflected in a 401 certification by the State and in a new FERC license. GMP has developed the attached proposal to meet the following goals:

- Comply with Vermont's Water Quality Standards
- Carry out GMP's environmental stewardship goal of providing electricity to its customers from low-cost, low-carbon, clean renewable energy sources
- Comport with State energy policy, as reflected in Vermont's 2011 Comprehensive Energy Plan, to improve output and efficiency at existing hydroelectric facilities through equipment upgrades
- Maintain dam safety and preserve flood control benefits

As described in the attached proposal, GMP proposes to install a new turbine runner at the Project. The new runner will provide a number of water quality benefits, including reducing the velocity of generation flows while allowing the Project to operate and comply with the range of lower conservation flows. The Water Quality Standards benefits are described under the heading "Rationale" in the attached proposal.

The second significant change relates to the winter drawdown of the reservoir. The proposed active management of the drawdown, plus delay of drawdown commencement until full ice cover in the reservoir, will meet requirements of the Water Quality Standards as described under the heading "Rationale". Implementation of the proposed winter drawdown levels is made subject to review of an independent panel of three experts to assure that dam safety and flooding impacts are protected under the new operations.

GMP looks forward to discussing this proposal with you and to answering any questions you may have.

Thank you.

Sincerely,

Harriet Ann King

HAK/dp
GMPjg
cc: Donald Rendall, Jr., Esq.
Josh Castonguay
Mike Scarzello
Jason Lisai
Tom Sullivan
Gary Lemay
Sharon Lucia

GREEN MOUNTAIN POWER CORPORATION
WATERBURY HYDROELECTRIC PROJECT
401 WATER QUALITY CERTIFICATE PROPOSAL
December 4, 2012

Conservation Flows

Proposal: The minimum flows set forth below, proposed for the entire license term, are consistent with the conservation flows proposed by ANR.

April 1 – June 30: 108 cfs or inflow[1], whichever is less

July 1 – March 31: 60 cfs or inflow, whichever is less

Rationale:

April 1 – June 30:

Drainage area prorated using the Essex 19 minimum spring flow of 1,000 cfs. This will assist with meeting walleye and lake sturgeon spawning flows below Essex 19.

July 1- March 31:

This flow will provide greater than 90% of the maximum habitat available for all fish species with the exception of spawning brown trout and spawning longnose sucker. For the latter two species this flow will provide greater than 80% of the maximum habitat.

Downstream Flow Management

Proposal:

2013 until new turbine runner is installed: Existing operations with turbine aeration (form to be determined) and automatic switching between turbine and low level outlet discharge during non-generation periods to be installed as soon as practicable.

New Turbine Runner: GMP will install a new turbine runner at the Waterbury Hydroelectric Facility within two years of FERC license issuance. The new runner will have a design maximum generation discharge of 391 cfs with an associated electrical capacity of 4.1 MW.

Rationale:

- It is anticipated that the upgraded unit will be capable of providing the full range of conservation flows.

[1] Inflow will be calculated on a daily basis using the following equation: Inflow - Outflow = Change in Storage, where Outflow = Little River flow as measured at the USGS gage downstream of Waterbury Dam (Gage No. 0428900) and Change in Storage = Start of Day Storage – End of Day Storage, as measured using the reservoir stage-storage curve and starting and ending water surface elevations for the day.

- The reduction from the current maximum generation flow will provide significant fisheries benefits in the Little River, including improved habitat conditions for invertebrates and immobile lifestages of fish species.
- Turbine aeration will address seasonal dissolved oxygen deficit concerns

Reservoir Management

Proposal: GMP is proposing significant changes to the winter drawdown after the new tainter gates become operational as described below. The proposed changes are subject to review by an independent panel of three experts chosen by GMP and VANR to determine if the proposed drawdown levels are adequate to protect dam safety as well as minimize reservoir and downstream flooding.

2013 until New Tainter Gates are Operational:	Post New Tainter Gates becoming Operational:
3/15 to 5/14: stable or rising to 589.5 ± 1.0 ft. on a daily average basis but allow drawdown if a rainfall/snowmelt event is anticipated to fill the reservoir to an elevation greater than 592 ft. Refill to pre runoff event elevation as soon as possible.	**3/15 to 5/14:** Same as column 1.
5/15 – Columbus Day: 589.5 ± 1.0 ft.	**5/15 to Columbus Day:** 589.5 ± 1.0 ft. Same as column 1.
Columbus Day until full ice cover in Waterbury Reservoir: 589.5 ± 1.0 ft, but allow drawdown to 586.0 ft. if a 2" or greater precipitation event is anticipated. Refill to 589.5 ± 1.0 ft. as soon as possible after the storm danger has passed.	**Columbus Day until full ice cover in Waterbury Reservoir:** Same as column 1.
Full ice cover to 3/14: max drawdown to 550 ft.	**Full ice cover to 3/14:** ➢ Base drawdown to 570 ft. ➢ Additional drawdown to 560 ft. if a 2" or greater precipitation event (1-yr, 24-hr storm) is anticipated regardless of snowpack equivalent. ➢ Develop snowpack/water equivalent monitoring system and associated drawdown in consultation with VANR. Based on snowpack water equivalent, additional drawdown to elevation 550 ft. allowed

Rationale:

3/15 – 5/14

- Within the constraints of spring runoff and filling the reservoir, allows for tributary access by spawning rainbow trout and rainbow smelt.

- Spring and fall drawdown and refill flexibility is needed to minimize increased dam safety/flooding risk of significant runoff events, the exact timing and magnitude of which are unknown (i.e. spring 2011 where reservoir rose to elevation 611 ft.)

5/15 – Columbus Day:

- Extend the summer full pool from Labor Day, as currently operated, to Columbus Day to facilitate later boating use of the reservoir

Columbus Day – Full Ice Cover:

- Within the constraints of fall runoff to the reservoir, allow for tributary access by spawning brown trout.
- Extending the period of high reservoir levels until full ice cover will protect the littoral zone from desiccation until an insulating layer of ice is formed.
- The drawdown to 586 ft. pending a 2" precipitation event (1 yr, 24 hour storm) is designed to accommodate fall rains within the reservoir.

Full ice cover to 3/14:

- For dam safety purposes until the tainter gates are repaired, GMP's existing winter drawdown operations are maintained.
- During this period GMP and VANR will convene an independent panel to review if the proposed drawdown levels (post tainter gate repair) are adequate to protect dam safety as well as minimize reservoir and downstream flooding.
- During this period GMP will develop, in consultation with VANR, a snow survey/anticipated runoff system for active winter management of the reservoir storage volume.
- If the drawdown levels proposed adequately protect dam safety and flooding, the 570 ft. base elevation drawdown will reduce needle ice formation on reservoir sediment deltas. Needle ice reduction is anticipated to reduce turbidity.
- Waiting to drawdown until full ice cover will insulate the littoral zone areas.

Recreation

Proposal:

GMP is proposing the following capital improvements for recreation facilities consistent with its FERC license application. For the reservoir sites with the exception of the Blush Hill Boat Ramp, all of the facilities are owned and maintained by VDFPR or VDEC and are outside the Project Boundary. Ongoing operation and maintenance of the facilities will be the responsibility of the State of Vermont.

Location	Enhancement	Estimated Cost (1999 Dollars)
Little River	Powerhouse access road improvements	$ 8,681
	Improvements to user-created trails/access points	$ 11,754
	Provision of one or more boat carry-in sites	$ 17,171
	Provision of safety and other signing	$ 250
	Improved parking conjunction with the snowmobile crossing	$ 10,585
	Installation of a flow phone system	minimal
Reservoir	Sanitary facilities at the boat launch adjacent to the dam	
	2-unit vault	$ 8,000
	2-unit composting	$ 22,000
	Concrete launch pads at the dam and at Blush Hill access sites	$ 69,168
	Provision of an ADA accessible fishing platform	$ 7,334
	Blush Hill access parking and turn-around improvement	$ 10,167
	Stabilization/hardening of the Moscow canoe-launch	$ 5,118
	Approximate Total	$ 170,000

Rationale:

These facility improvements were developed in consultation with VDFPR and VDEC during the consultation on the original license application. At a 4% annual escalation rate the equivalent cost of these facilities in 2012 dollars is approximately $283,000.

APPENDIX E

DRAFT TUBE AERATION POSSIBILITY CFD STUDY

Waterbury GS
Draft tube aeration possibility
- CFD study -

Swiderski Engineering Inc.

For

NORCAN Hydraulic Turbine Inc.

April/2016

Table of content

Preamble

This work was undertaken as a result of discussions with the owner of the Waterbury G.S. on the subject of necessity to increase dissolved oxygen (D.O.) level in the river downstream of the powerplant. As there is a possibility of utilizing the turbine for this purpose, it was decided to study this issue further in order to determine a possible method to aerate the water flow as well as to attempt to determine what the expected D.O. level would be.

CFD domain and zone of interest

Entire turbine unit, as used in the previous phase (hydraulic design of the new runner) was used for the purpose of the flow simulations to determine possibility of flow aeration by injecting air into the draft tube flow.

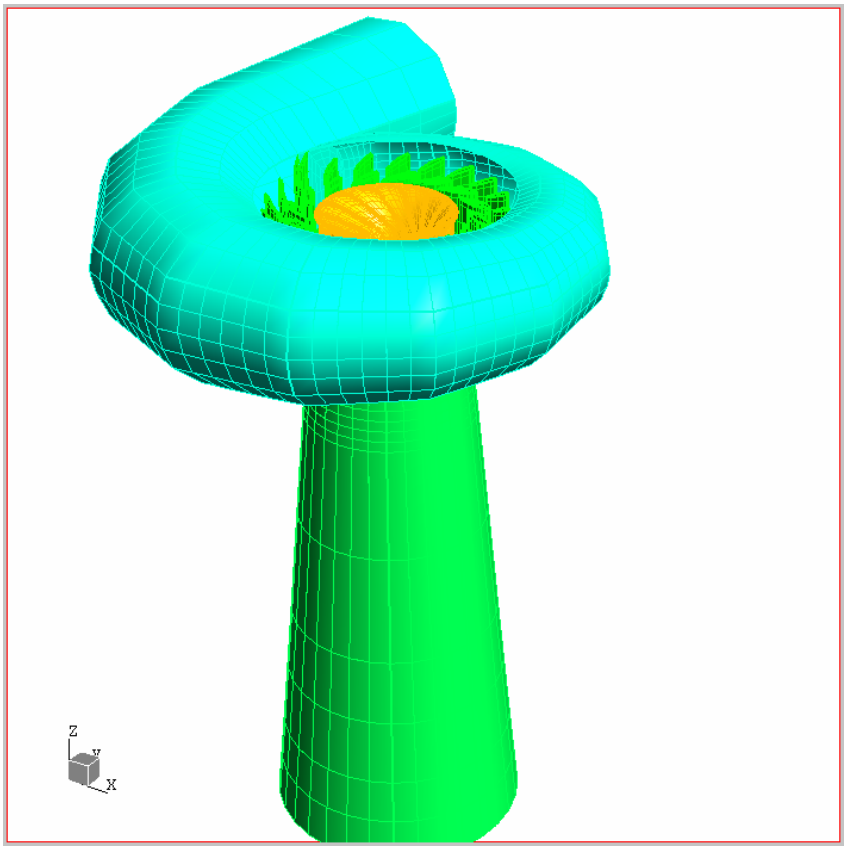

Fig. 1 Domain used for the CFD analysis

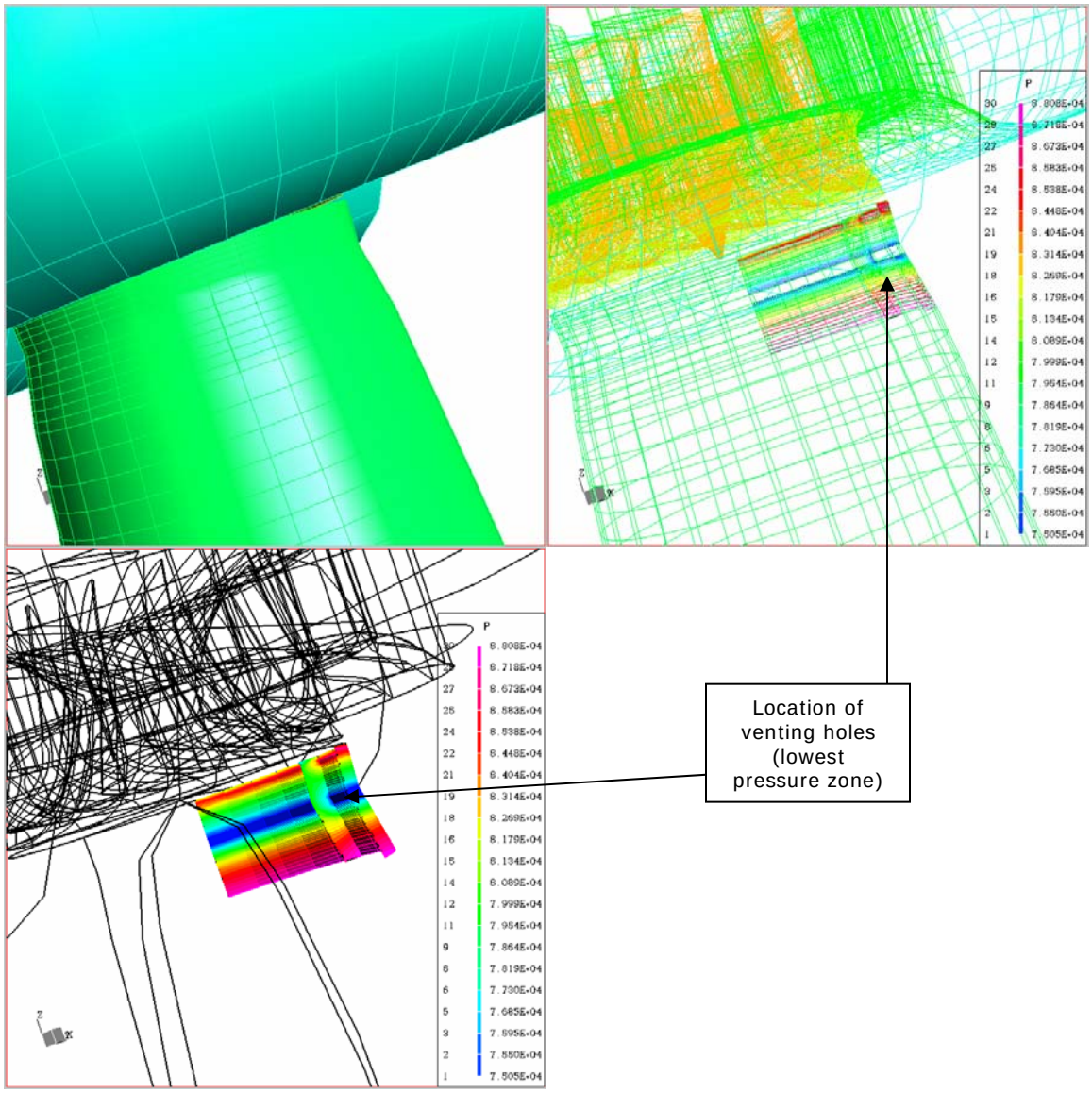

Fig. 2. Zone of interest; parameters monitored are: minimal static pressure and its location, water velocity at the same location.

The zone of interest is located just below the draft tube inlet flange at the shell of the draft tube.

Aerating structure - concept

Fig 3. General parameterization of the aeration structure.

For the purpose of current studies, four tested configurations were defined by varying angles Alpha (from 10deg to 3deg) and Beta (12deg or 6deg)

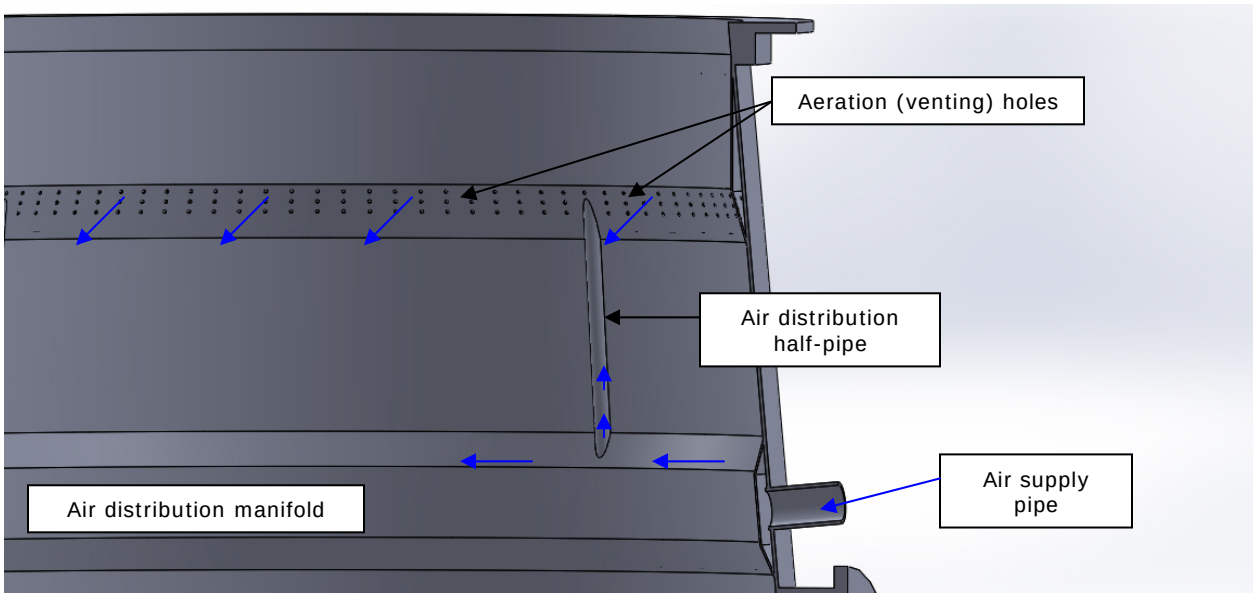

Fig. 4a General view of aeration structure (shown: 300, 0.25in dia holes); there should be total of 4 1.25in dia air supply half-pipes.

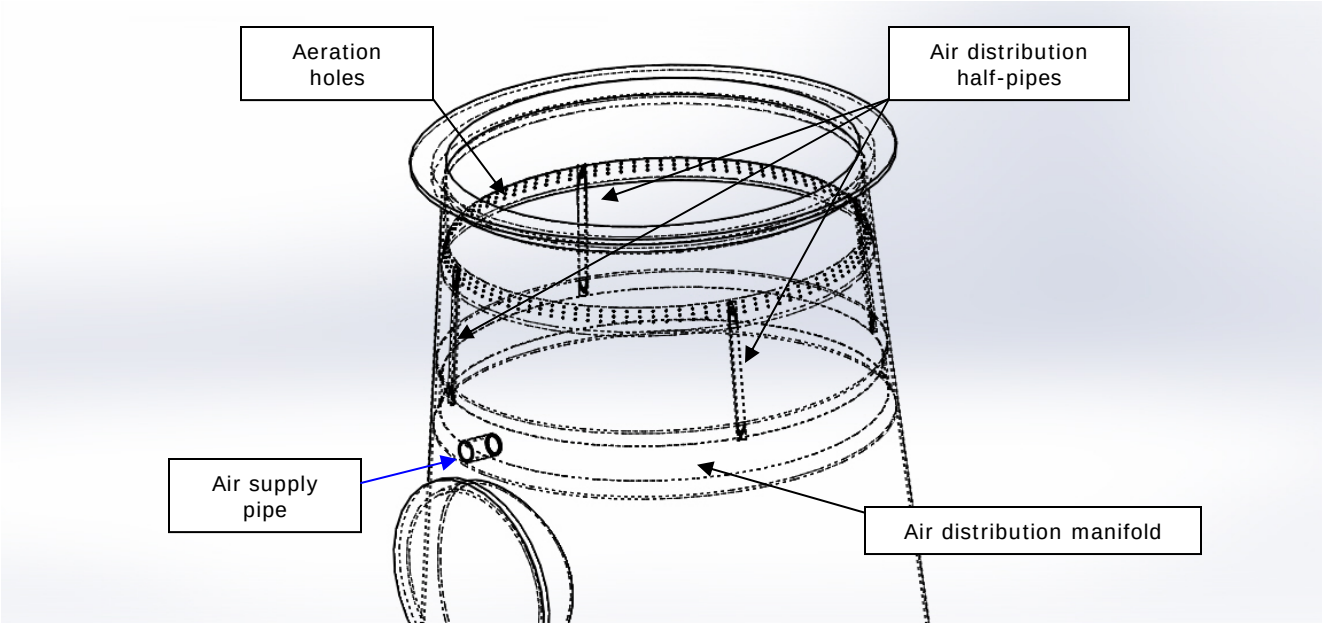

Fig. 4b General view of aeration structure – transparent view.

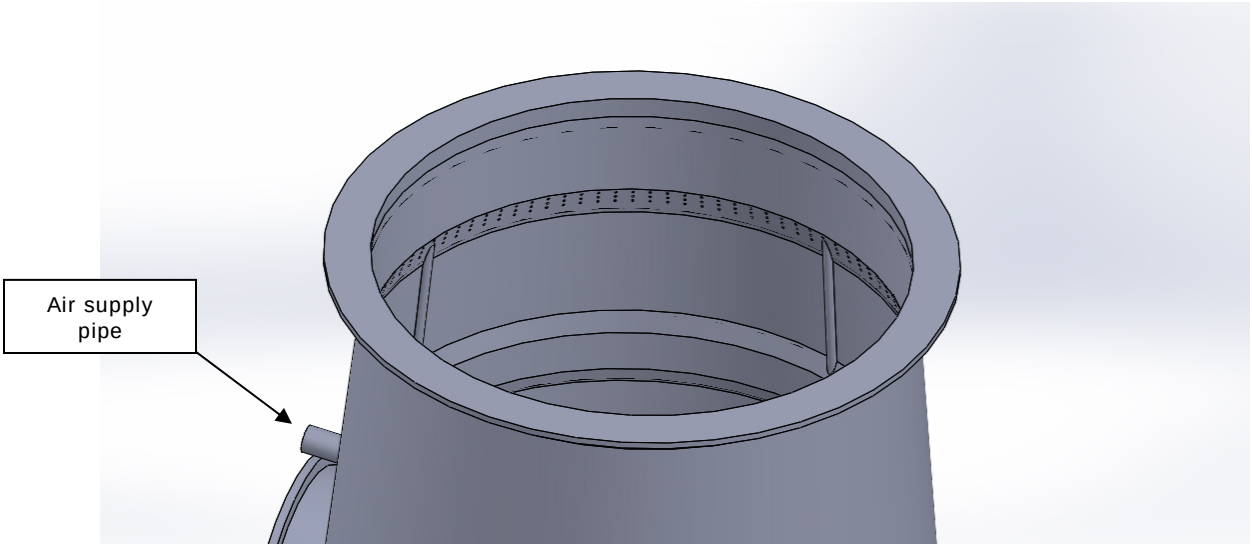

Fig. 4c General view of aeration structure – view 3.

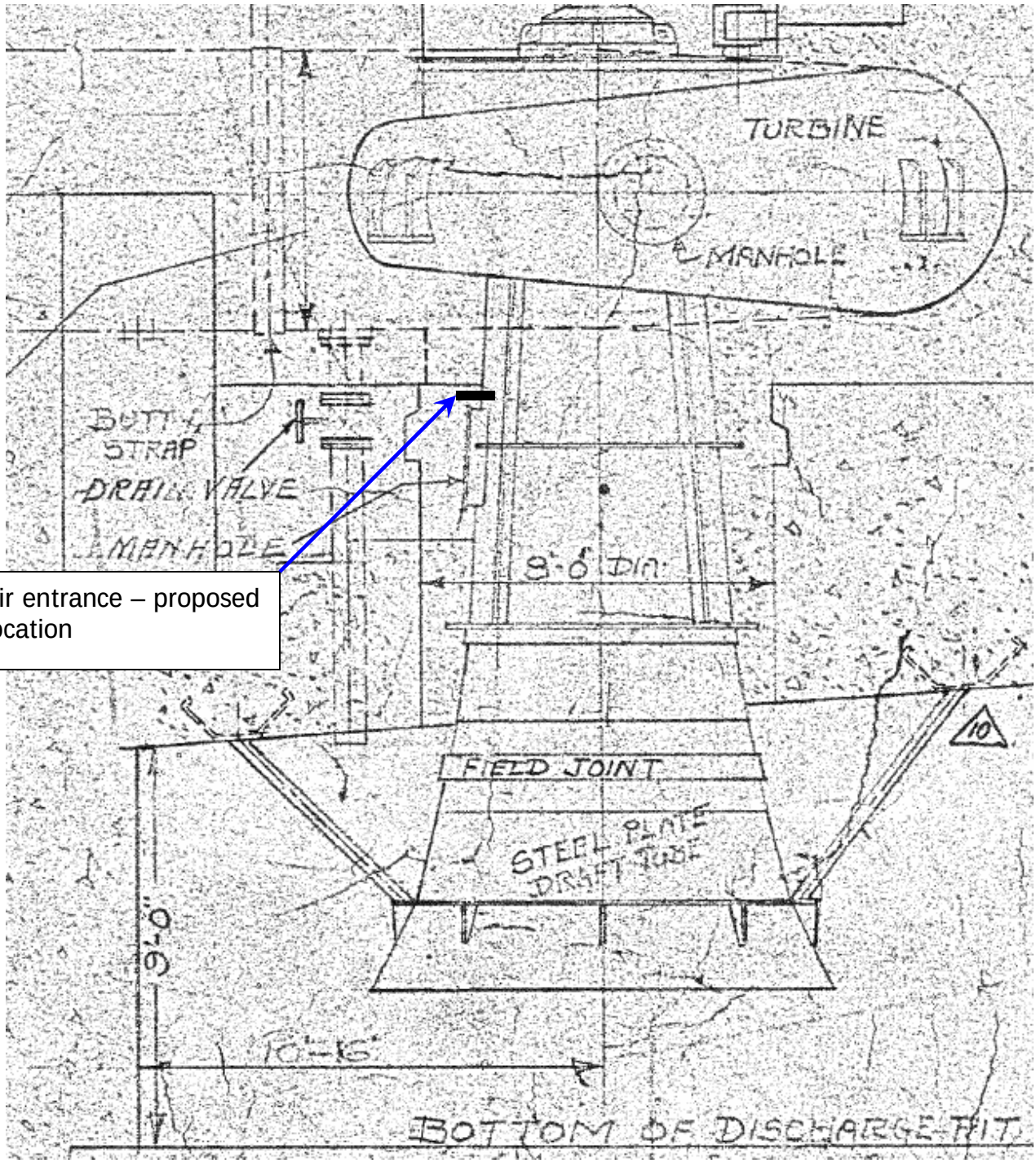

Fig. 4d Location of the proposed main air intake.

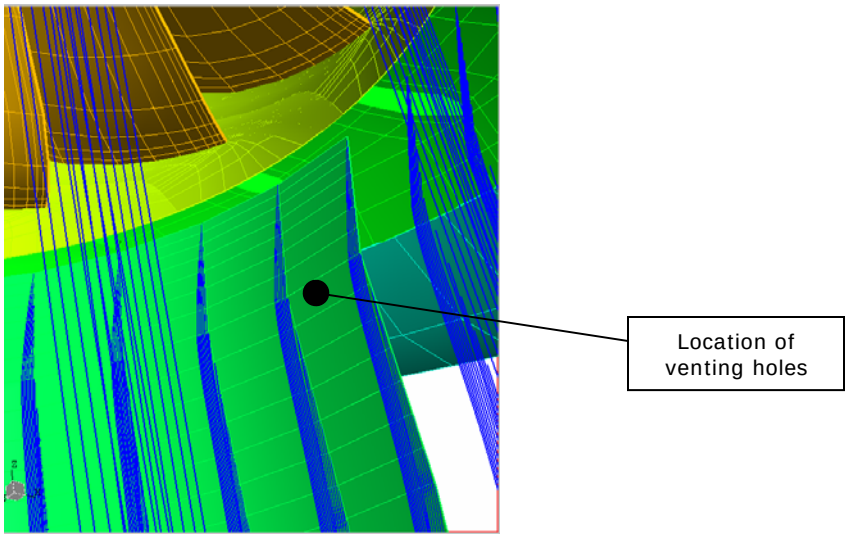

Fig. 5 Illustration of water flow at the zone of interest at full load

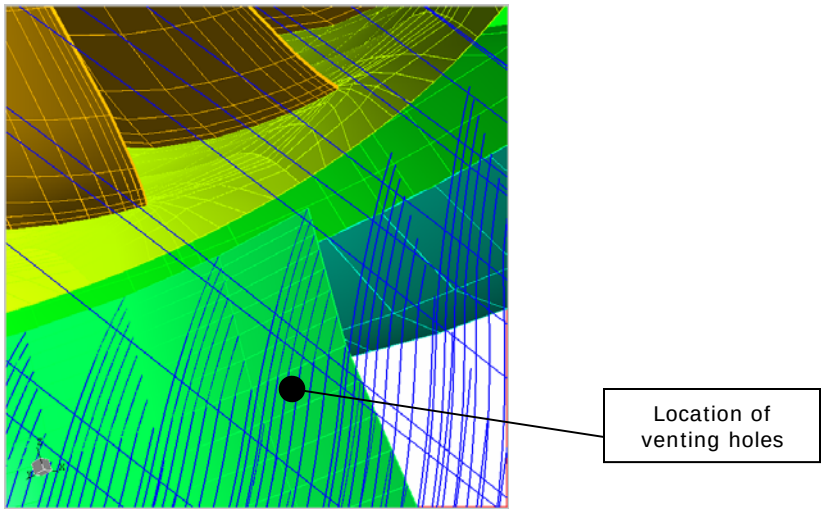

Fig. 6 Illustration of water flow at the zone of interest at best efficiency point

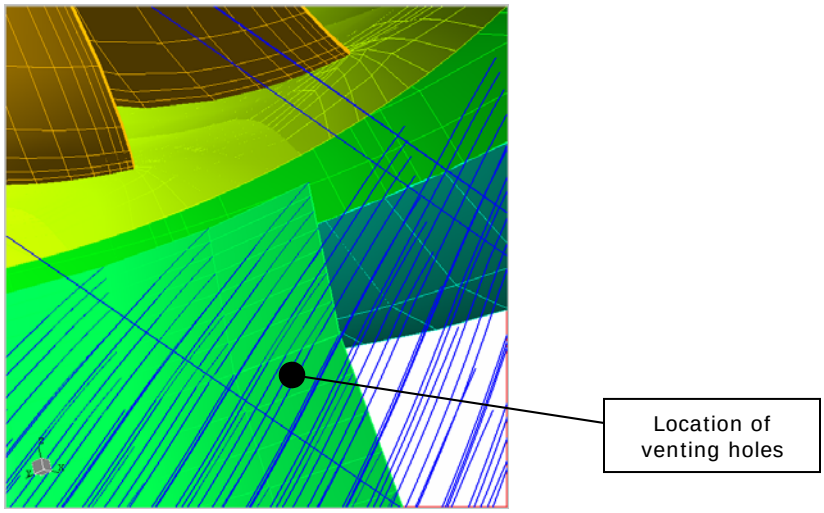

Fig. 7 Illustration of water flow at the zone of interest at 40% load

Calculation results

Four configurations of the aeration structures were tested at the CFD stage to determine:

1) what influence they would have on the overall turbine efficiency
2) where would the most effective suction conditions be located.

The results show very small, almost negligent (within a field measurement error) reduction of turbine efficiency. The effectiveness, measured by the differential suction pressure (amount of static pressure below the atmospheric pressure) also varies amongst the configurations and in the extreme options differs by approximately 10%.

In order to determine magnitude of the D.O. level it is proposed that the ratio of volume flow rates between water and the air be used;

D.O. FACTOR = Qair/Qwater

Where:
Qair [cms] – calculated anticipated volume of air, which enters the water stream
Qwater [cms] – water flow through the turbine

Calculated theoretical airflow through the assumed size of the aerating hole (0.25in dia) based on the differential pressure far exceeds ability of a water flow to evacuate the delivered volume of air, due to limited velocity of water flow. It was therefore assumed that maximum velocity of the airflow through the aerating holes is limited by the velocity of the water flow in the vicinity of the airflow entrance.

Tables showed on final pages show results of calculations at the recent stage of the design.

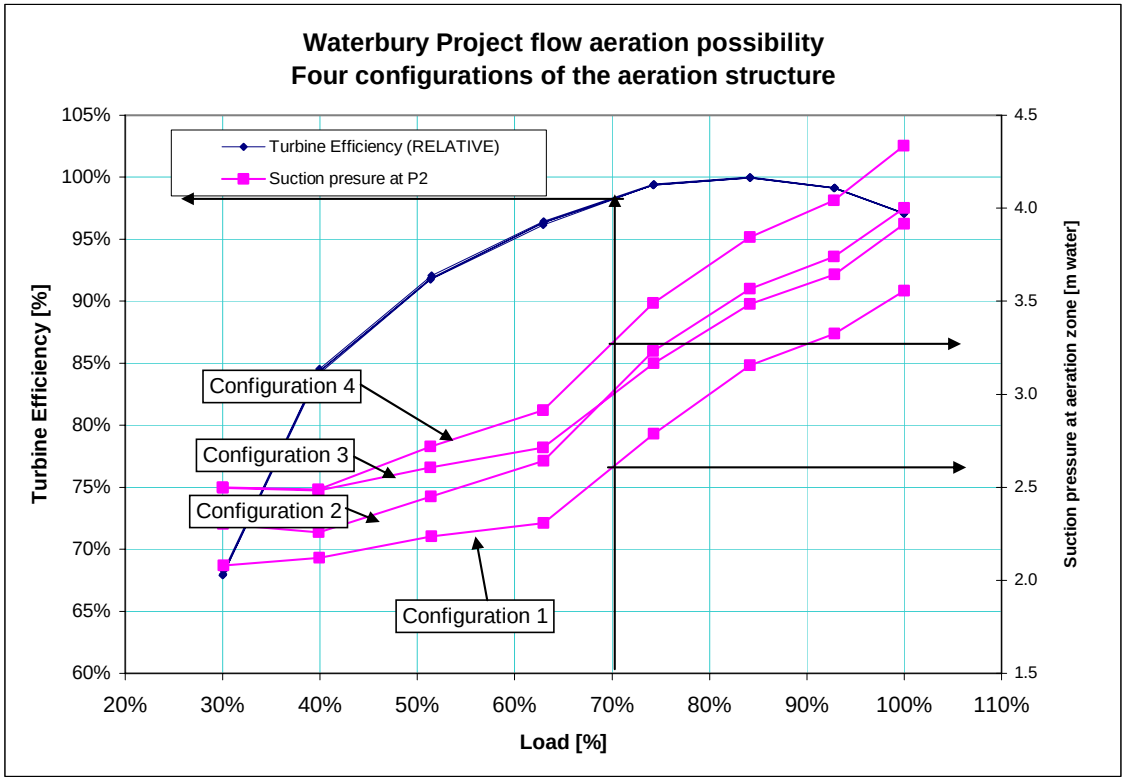

Fig. 8. Graph showing negligible influence of tested aeration structures on turbine efficiency, while the localised suction pressure varies by approx. 20% to 25%.

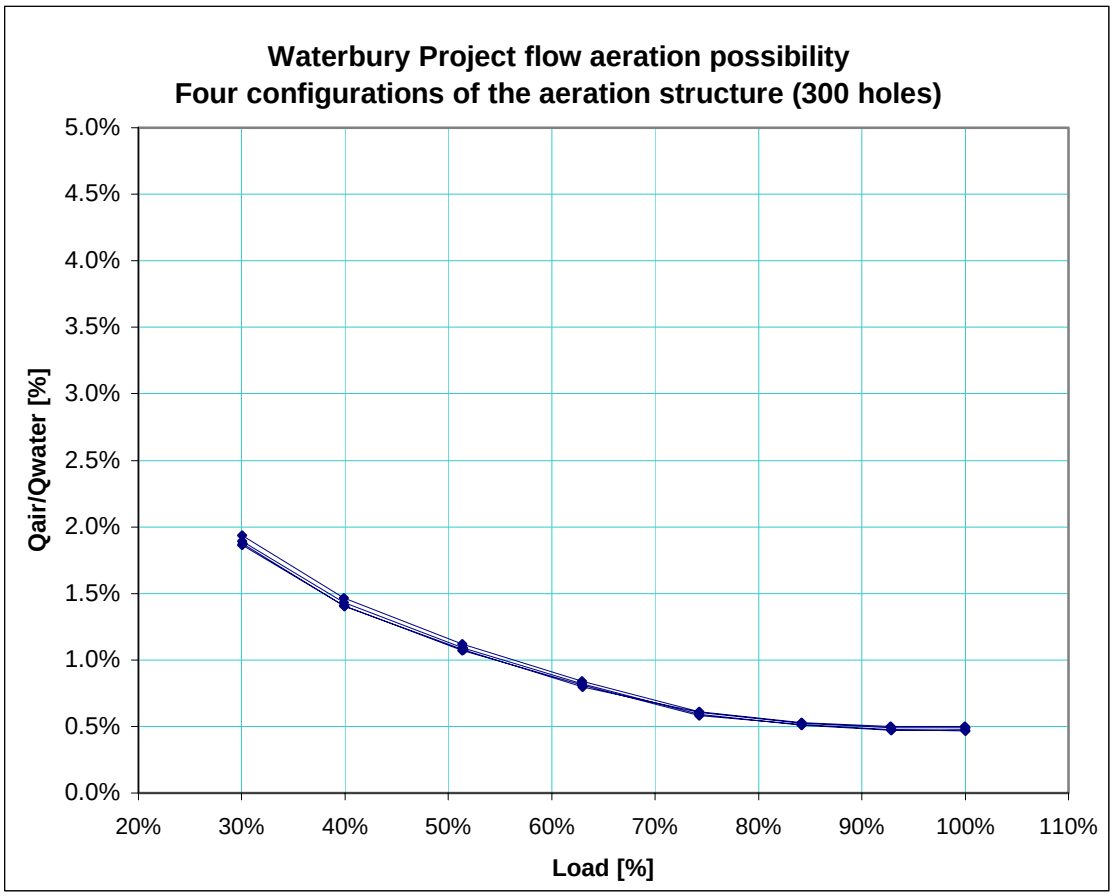

Fig. 9. Calculated proportion of the airflow to the main water flow at various turbine loads: 300 holes option (ref. Fig. 4 and TABLE 1)

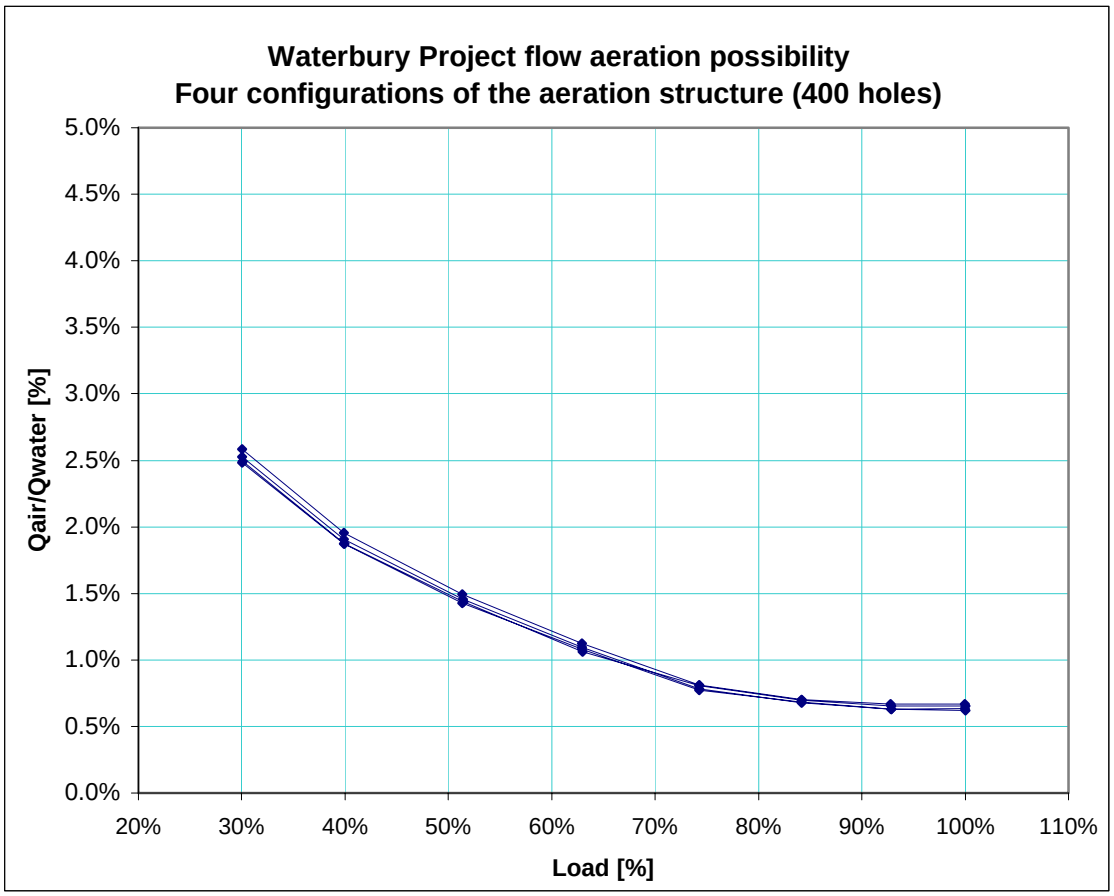

Fig. 10. Calculated proportion of the airflow to the main water flow at various turbine loads: 400 holes option (ref. Fig. 4 and TABLE 2)

	Turbine Power	Turbine Flow	Turbine Efficiency (RELATIVE)	Suction presure at P2	P1 (atm)	P2 (draft tube inlet)	dP	Vmax_air _possible	V_hole	Water Drift velocity (from CFD)	Actual air inflow velocity	Total expected air flow through n_holes	Qair /Qwater
	% of full power	[cms]	[%]	[m H2O]	[kPa]	[kPa]	[kPa]	[m/s]	[m/s]	[m/s]	[m/s]	[cms]	[%]
Configuration 1	30%	3.7	68.3%	2.079	101.33	76.90	24.42	202	100.9	7.53	7.53	0.0693	1.87%
	40%	4.9	84.5%	2.120	101.33	76.50	24.82	203	101.7	7.50	7.50	0.0690	1.40%
	51%	6.3	92.1%	2.235	101.33	75.38	25.95	208	104.0	7.41	7.41	0.0682	1.08%
	63%	7.8	96.5%	2.308	101.33	74.68	26.65	211	105.4	6.70	6.70	0.0617	0.80%
	74%	9.1	99.4%	2.788	101.33	70.01	31.32	228	114.2	6.00	6.00	0.0552	0.60%
	84%	10.4	100.0%	3.154	101.33	66.46	34.87	241	120.5	5.88	5.88	0.0541	0.52%
	93%	11.4	99.1%	3.325	101.33	64.80	36.52	247	123.4	6.10	6.10	0.0561	0.49%
	100%	12.3	97.1%	3.554	101.33	62.57	38.75	254	127.1	6.53	6.53	0.0601	0.49%
Configuration 2	30%	3.7	67.9%	2.497	101.33	72.84	28.48	218	108.9	7.48	7.48	0.0688	1.86%
	40%	4.9	84.1%	2.483	101.33	72.98	28.35	217	108.7	7.50	7.50	0.0690	1.41%
	51%	6.3	91.7%	2.607	101.33	71.77	29.55	222	111.0	7.35	7.35	0.0676	1.07%
	63%	7.7	96.2%	2.712	101.33	70.75	30.58	226	112.9	6.83	6.83	0.0629	0.81%
	74%	9.1	99.4%	3.167	101.33	66.33	34.99	241	120.7	5.75	5.75	0.0529	0.58%
	84%	10.4	100.0%	3.485	101.33	63.25	38.07	252	126.0	5.77	5.77	0.0531	0.51%
	93%	11.4	99.1%	3.643	101.33	61.72	39.61	257	128.5	5.88	5.88	0.0541	0.47%
	100%	12.3	97.1%	3.915	101.33	59.07	42.25	265	132.7	6.21	6.21	0.0572	0.46%
Configuration 3	30%	3.7	68.0%	2.301	101.33	74.74	26.59	210	105.2	7.61	7.61	0.0700	1.89%
	40%	4.9	84.3%	2.256	101.33	75.18	26.15	209	104.4	7.62	7.62	0.0702	1.43%
	51%	6.3	91.9%	2.449	101.33	73.31	28.02	216	108.0	7.50	7.50	0.0691	1.09%
	63%	7.7	96.4%	2.642	101.33	71.43	29.90	223	111.6	6.90	6.90	0.0635	0.82%
	74%	9.1	99.4%	3.233	101.33	65.70	35.63	244	121.8	5.85	5.85	0.0538	0.59%
	84%	10.4	99.9%	3.567	101.33	62.45	38.88	255	127.3	5.70	5.70	0.0525	0.51%
	93%	11.4	99.1%	3.739	101.33	60.78	40.54	260	130.0	5.86	5.86	0.0539	0.47%
	100%	12.3	97.1%	4.002	101.33	58.23	43.09	268	134.0	6.34	6.34	0.0584	0.47%
Configuration 4	30%	3.7	67.9%	2.500	101.33	72.81	28.51	218	109.0	7.77	7.77	0.0715	1.94%
	40%	4.9	84.3%	2.488	101.33	72.93	28.40	218	108.8	7.81	7.81	0.0718	1.46%
	51%	6.3	91.8%	2.720	101.33	70.68	30.65	226	113.0	7.70	7.70	0.0708	1.12%
	63%	7.7	96.3%	2.915	101.33	68.79	32.54	233	116.4	7.09	7.09	0.0652	0.84%
	74%	9.1	99.3%	3.489	101.33	63.21	38.11	252	126.0	6.04	6.04	0.0556	0.61%
	84%	10.4	99.9%	3.843	101.33	59.77	41.55	263	131.6	5.92	5.92	0.0545	0.53%
	93%	11.4	99.1%	4.040	101.33	57.86	43.47	269	134.6	6.21	6.21	0.0571	0.50%
	100%	12.3	97.0%	4.336	101.33	54.99	46.34	278	139.0	6.71	6.71	0.0618	0.50%

TABLE 1 Calculation results – 300 holes option (Fig. 9)

	Turbine Power	Turbine Flow	Turbine Efficiency (RELATIVE)	Suction presure at P2	P1 (atm)	P2 (draft tube inlet)	dP	Vmax_air_possible	V_hole	Water Drift velocity (from CFD)	Actual air inflow velocity	Total expected air flow through n_holes	Qair /Qwater
	% of full power	[cms]	[%]	[m H2O]	[kPa]	[kPa]	[kPa]	[m/s]	[m/s]	[m/s]	[m/s]	[cms]	[%]
Configuration 1	**30%**	**3.7**	68.3%	2.079	101.33	76.90	24.42	202	100.9	7.53	**7.53**	0.0924	**2.49%**
	40%	**4.9**	84.5%	2.120	101.33	76.50	24.82	203	101.7	7.50	**7.50**	0.0920	**1.87%**
	51%	**6.3**	92.1%	2.235	101.33	75.38	25.95	208	104.0	7.41	**7.41**	0.0909	**1.44%**
	63%	**7.8**	96.5%	2.308	101.33	74.68	26.65	211	105.4	6.70	**6.70**	0.0822	**1.06%**
	74%	**9.1**	99.4%	2.788	101.33	70.01	31.32	228	114.2	6.00	**6.00**	0.0736	**0.81%**
	84%	**10.4**	100.0%	3.154	101.33	66.46	34.87	241	120.5	5.88	**5.88**	0.0722	**0.70%**
	93%	**11.4**	99.1%	3.325	101.33	64.80	36.52	247	123.4	6.10	**6.10**	0.0749	**0.66%**
	100%	**12.3**	97.1%	3.554	101.33	62.57	38.75	254	127.1	6.53	**6.53**	0.0801	**0.65%**
Configuration 2	**30%**	**3.7**	67.9%	2.497	101.33	72.84	28.48	218	108.9	7.48	**7.48**	0.0918	**2.48%**
	40%	**4.9**	84.1%	2.483	101.33	72.98	28.35	217	108.7	7.50	**7.50**	0.0920	**1.88%**
	51%	**6.3**	91.7%	2.607	101.33	71.77	29.55	222	111.0	7.35	**7.35**	0.0902	**1.43%**
	63%	**7.7**	96.2%	2.712	101.33	70.75	30.58	226	112.9	6.83	**6.83**	0.0838	**1.08%**
	74%	**9.1**	99.4%	3.167	101.33	66.33	34.99	241	120.7	5.75	**5.75**	0.0706	**0.77%**
	84%	**10.4**	100.0%	3.485	101.33	63.25	38.07	252	126.0	5.77	**5.77**	0.0708	**0.68%**
	93%	**11.4**	99.1%	3.643	101.33	61.72	39.61	257	128.5	5.88	**5.88**	0.0722	**0.63%**
	100%	**12.3**	97.1%	3.915	101.33	59.07	42.25	265	132.7	6.21	**6.21**	0.0762	**0.62%**
Configuration 3	**30%**	**3.7**	68.0%	2.301	101.33	74.74	26.59	210	105.2	7.61	**7.61**	0.0933	**2.52%**
	40%	**4.9**	84.3%	2.256	101.33	75.18	26.15	209	104.4	7.62	**7.62**	0.0935	**1.91%**
	51%	**6.3**	91.9%	2.449	101.33	73.31	28.02	216	108.0	7.50	**7.50**	0.0921	**1.46%**
	63%	**7.7**	96.4%	2.642	101.33	71.43	29.90	223	111.6	6.90	**6.90**	0.0847	**1.09%**
	74%	**9.1**	99.4%	3.233	101.33	65.70	35.63	244	121.8	5.85	**5.85**	0.0717	**0.78%**
	84%	**10.4**	99.9%	3.567	101.33	62.45	38.88	255	127.3	5.70	**5.70**	0.0700	**0.68%**
	93%	**11.4**	99.1%	3.739	101.33	60.78	40.54	260	130.0	5.86	**5.86**	0.0719	**0.63%**
	100%	**12.3**	97.1%	4.002	101.33	58.23	43.09	268	134.0	6.34	**6.34**	0.0778	**0.63%**
Configuration 4	**30%**	**3.7**	67.9%	2.500	101.33	72.81	28.51	218	109.0	7.77	**7.77**	0.0954	**2.58%**
	40%	**4.9**	84.3%	2.488	101.33	72.93	28.40	218	108.8	7.81	**7.81**	0.0958	**1.95%**
	51%	**6.3**	91.8%	2.720	101.33	70.68	30.65	226	113.0	7.70	**7.70**	0.0944	**1.49%**
	63%	**7.7**	96.3%	2.915	101.33	68.79	32.54	233	116.4	7.09	**7.09**	0.0869	**1.12%**
	74%	**9.1**	99.3%	3.489	101.33	63.21	38.11	252	126.0	6.04	**6.04**	0.0741	**0.81%**
	84%	**10.4**	99.9%	3.843	101.33	59.77	41.55	263	131.6	5.92	**5.92**	0.0727	**0.70%**
	93%	**11.4**	99.1%	4.040	101.33	57.86	43.47	269	134.6	6.21	**6.21**	0.0762	**0.67%**
	100%	**12.3**	97.0%	4.336	101.33	54.99	46.34	278	139.0	6.71	**6.71**	0.0823	**0.67%**

TABLE 2 Calculation results – 400 holes option (Fig. 10)

APPENDIX F

THREATENED AND ENDANGERED SPECIES

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104
http://www.fws.gov/newengland

In Reply Refer To: August 24, 2017
Consultation Code: 05E1NE00-2017-SLI-2535
Event Code: 05E1NE00-2017-E-05527
Project Name: Waterbury Hydroelectric Project FERC No. 2090

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the

human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
(603) 223-2541

Project Summary

Consultation Code: 05E1NE00-2017-SLI-2535

Event Code: 05E1NE00-2017-E-05527

Project Name: Waterbury Hydroelectric Project FERC No. 2090

Project Type: DAM

Project Description: Certification for LIHI, The Waterbury Hydroelectric Project (FERC No. 2090) (Project) is located on the Little River in the town of Waterbury, Washington County, Vermont and is one of seven dams built on Winooski River and its tributaries. The Project's hydroelectric facilities are owned and operated by the Green Mountain Power Corporation. The existing project boundary encloses the project's hydroelectric generation related facilities including the intake, tunnel, penstocks, powerhouse, and transmission line. The Waterbury dam and reservoir are federal facilities, they are not included in the license.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/44.38018165563221N72.77050992551659W

Counties: Washington, VT

Endangered Species Act Species

There is a total of 1 threatened, endangered, or candidate species on this species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

Mammals

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Critical habitats

There are no critical habitats within your project area under this office's jurisdiction.