**REVIEW OF APPLICATION**

**OF THE BARTON VILLAGE HYDROELECTRIC FACILITY**

**FOR CERTIFICATION**

**BY THE LOW IMPACT HYDROPOWER INSTITUTE**

Prepared by Diane Barr

12 June 2019

# I. INTRODUCTION

This report reviews the original application submitted by Barton Village, Inc (Applicant), on February 5, 2019 to the Low Impact Hydropower Institute (LIHI) for Low Impact Hydropower Certification for the Barton Village Hydroelectric Project (Barton Village or Project). A LIHI Intake Review was completed March 25, 2019. The Applicant promptly provided supplemental information for review in response to the Intake Review. The Application was posted for public review on April 3, 2019.

Originally constructed in the 1890's, the Project has a nameplate generation capacity of 1.4 MW and generates approximately 4.2 million kWh per year. A Federal Energy Regulatory Commission (FERC) license #7725 was issued for the Project on June 9, 2004, with an effective date of October 2, 2004. A corresponding Vermont Water Quality Certification (WQC) was issued on May 19, 2003. The FERC license and WQC both require run-of-river operation of the Project.

# II. PROJECT'S GEOGRAPHIC LOCATION

The Project is located on the Clyde River at river mile 11.3 in the Northeast Kingdom of Vermont. As shown in Figure 1, the Project is in the Town of Charleston, which is approximately ten miles south of the United States-Canada border and fifteen miles northeast from Barton Village. From Barton Village, it can be reached by following Route 16 east to US 5A north to where it intersects with US 105. The Project is located on the Clyde River which is a tributary to Lake Memphremagog. The coordinates of the Project are 44.887286, -72.055550-

**Figure 1: Charleston, Vermont**

# III. PROJECT AND IMMEDIATE SITE CHARACTERISTICS

The Clyde River watershed area is approximately 108 square miles, and the river flows northwesterly for approximately twenty more miles to Lake Memphremagog in Newport, Vermont. It includes two headwater impoundments, Seymour Lake and Echo Pond, which are located on an unnamed tributary. This tributary drains from the north and joins the Clyde River approximately six miles upstream from the Town of West Charleston.

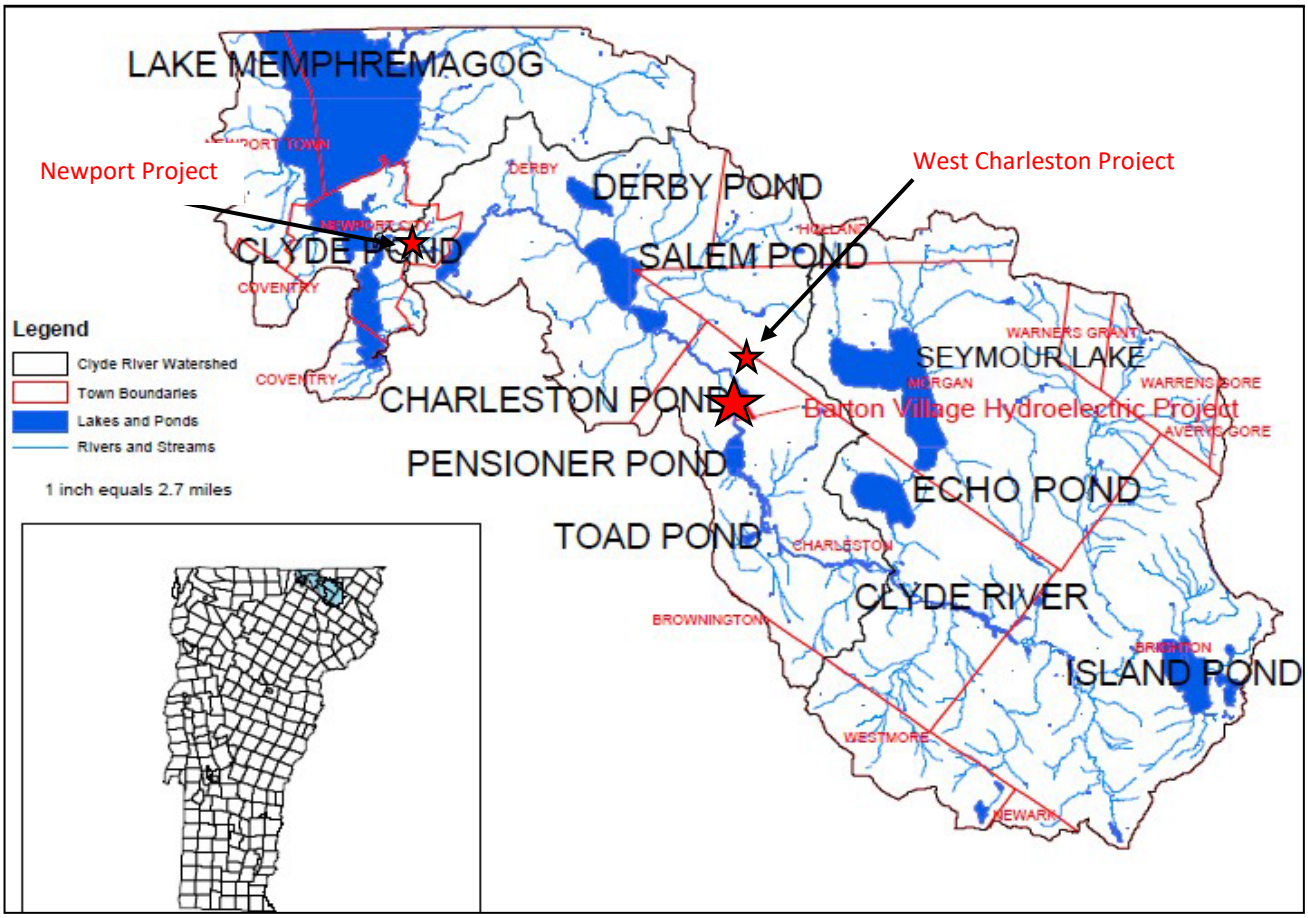
**Figure 2: Project Lands**


Seymour Lake, which is a natural lake with a man-made outlet structure, is 1,350 feet upstream from Echo Pond. Echo Pond is also a natural lake regulated by a man-made outlet structure.

The Project land ownership is of approximately 10 acres. The Project land is located between Charleston Pond and Pensioner Pond. The bypassed reach associated with the Project is a significant natural fall, known as the Great Falls of the Clyde, and is characterized by a large vertical-walled limestone gorge with several waterfalls.

There are two other hydroelectric developments located along the Clyde River, downstream as shown in Figure 3. The Clyde River Hydroelectric Project (FERC No. 2306) is owned by Gravity Renewables and consists of the West Charleston (0.675 MW) and Newport (4 MW) sites, located at river mile 10.8 and 1.2 respectively. The Barton Village Hydroelectric Project is approximately 0.5 miles upstream of the West Charleston project and approximately 5.5 miles downstream of the confluence of the unnamed tributary and the Clyde River.

**Figure 3: Watershed Area**



Approximately 800 feet of the Clyde River is bypassed by the Project as shown in Figure 4.

The Project consists of the following features:

- A 77-foot-long, 24-foot-high masonry and concrete gravity dam;
- 187-acre impoundment (Pensioner Pond) at a normal elevation of 1141.25 feet msl;
- 665-foot-long, 7-foot-diameter steel penstock;
- (2) 105-foot-long, 5.5 and 5.8-foot-diameter steel penstocks leading to:
- The powerhouse containing two turbine/generating units with a total installed capacity of 1.4 MW; and
- 2 tailraces
- Fish passage collection box and discharge pipe (Figure 5)

Figure 4-Bypass Reach


Figure 5-Collection box and discharge pipe

The powerhouse contains two Francis turbines with a total installed capacity of 1,400 kW. The primary water conveyance structure at the dam is the flashboard-topped spillway with a total length of approximately 53 feet.

In addition, the west gate structure consists of three conveyances that allow water to pass into the bypass reach. These conveyances include a five-foot by five-foot low- level slide gate with a manual hoist. The sill elevation of the gate is approximately 1,131.94 feet, mean sea level (msl).

Directly above the slide gate, there are two flashboard spanning arched openings. There is a five-foot-wide by five-foot-high opening and a smaller 1.9- foot-wide by five-foot-high opening.

**Project Operation**


Figure 6-Minimum flow release

The Project is installed with an automation system to remotely control and record operation of the project. The automation system utilizes both mechanical relays and a series of PLCs connected to a Human Machine Interface (HMI). The control system automation allows for continuous monitoring of Project key features for operations such as the pressure transducer which measures water level in front of the trash rack and adjusts the wicket gate position to load/unload the powerhouse turbines that ensures the dam level is maintained at the minimum setting of 1,141.25 feet msl. The pressure transducer is routinely calibrated via a staff gauge near the associated stilling well. The PLC allows for trip alarms to dispatch when a unit trips from any number of conditions including low dam water level, high bearing temperature, low cooling water flow rate or loss of grid frequency/voltage.

# IV. ZONES OF EFFECT

The Project consists of three Zones of Effects (ZOEs), Zone 1: Impoundment, Zone 2: Bypass, and Zone 3: Downstream. The Zone 1 Impoundment consists of Pensioner Pond for a river distance of approximately 1.4 miles and surface area of 187 acres. The Zone 2 Bypass reach is approximately 800 feet in length. Zone 3 Downstream is approximately 3000 feet from Project's tail race to the West Charleston dam and includes West Charleston Pond. The Applicant selected the following Standards in each ZOE.

## ZONE 1 UPSTREAM STANDARDS SELECTION

| | Criterion | 1 | 2 | 3 | 4 | Plus |
|---|---|---|---|---|---|---|
| A | Ecological Flow Standards | | X | | | |
| B | Water Quality Standards | | X | | | |
| C | Upstream Fish Passage Standards | X | | | | |
| D | Downstream Fish Passage Standards | | X | | | |
| E | Shoreline and Watershed Protection Standards | X | | | | |
| F | Threatened and Endangered Species Standards | | X | | | |
| G | Cultural and Historic Resources Standards | | X | | | |
| H | Recreational Resources Standards | | X | | | |

## ZONE 2 BYPASS STANDARDS SELECTION

| | Criterion | 1 | 2 | 3 | 4 | Plus |
|---|---|---|---|---|---|---|
| A | Ecological Flow Standards | | X | | | |
| B | Water Quality Standards | | X | | | |
| C | Upstream Fish Passage Standards | | X | | | |
| D | Downstream Fish Passage Standards | | X | | | |
| E | Shoreline and Watershed Protection Standards | X | | | | |
| F | Threatened and Endangered Species Standards | | X | | | |
| G | Cultural and Historic Resources Standards | | X | | | |
| H | Recreational Resources Standards | | X | | | |

## ZONE 3 BYPASS STANDARDS SELECTION

| | Criterion | 1 | 2 | 3 | 4 | Plus |
|---|---|---|---|---|---|---|
| A | Ecological Flow Standards | | X | | | |
| B | Water Quality Standards | | X | | | |
| C | Upstream Fish Passage Standards | | X | | | |
| D | Downstream Fish Passage Standards | | X | | | |
| E | Shoreline and Watershed Protection Standards | X | | | | |
| F | Threatened and Endangered Species Standards | | X | | | |
| G | Cultural and Historic Resources Standards | | X | | | |
| H | Recreational Resources Standards | | X | | | |

Figure 5-ZOEs

## V. REGULATORY AND COMPLIANCE STATUS

The Project was issued FERC License #7725 on June 9, 2004 which expires on October 31, 2043. A Clean Water Act (CWA) 401 Water Quality Certificate was issued on May 19, 2003 by the Vermont Department of Environmental Conservation (VDEC). These documents can be found in the Application Appendix A 1.1 and A3, respectively. As part of this review, the FERC e-library was reviewed for the past 10 years. There were no compliance issues or records that depicted the Project different from the information contained in the application.

## VI. PUBLIC COMMENTS RECEIVED OR SOLICITED BY LIHI

LIHI solicited public comments on the Application on April 1, 2019. LIHI did not receive any public comments during the 60-day comment period which ended on May 31, 2019. Based on the evidence presented by the Applicant, it was determined that direct outreach to state and federal agencies within the Project's regulatory jurisdiction is not warranted. Therefore, no comments were directly solicited for the Application beyond the standard Public Comment period.

## VII. DETAILED CRITERIA REVIEW

### A. Ecological Flow Regimes

***Goal:*** The flow regimes in riverine reaches that are affected by the facility support habitat and other conditions suitable for healthy fish and wildlife resources.

The Applicant selected Standard 2 for all three ZOEs:

> ***STANDARD A-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 protective)

The Applicant provided sufficient evidence as to their adherence to the FERC and VDEC agency requirements. In addition, the Project meets these conditions as a run-of-river facility with the automation controls matching inflow to outflow. The impoundment is held at a consistent elevation with installed pressure gauges allowing for spill of any flow beyond the generation capacity flow. The application included a VDEC letter of support dated December 18, 2018 in which the agency requested one year of operations data to confirm run of river operations required by the Project's WQC. This request has been incorporated into a condition of certification.

Based on the review of the application and supporting documentation, the Project conditionally satisfies the Ecological Flow Regimes criterion.

### B. Water Quality

***Goal:*** Water quality is protected in waterbodies directly affected by the facility, including downstream reaches, bypassed reaches, and impoundments above dams and diversions.

The Applicant selected Standard 2 for all three ZOEs:

> ***STANDARD 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 Project received a 401 Water Quality Certification from the VDEC in 2004. The Project adheres to the Impoundment Flow Management Plan and Impoundment/Flow Monitoring Plan developed in 2005. The Applicant provided a letter of support from the Vermont Agency of Natural Resources (Appendix A.9 of Application). The water quality management commitments at the Project include:

Water quality compliance activities are listed in the Flow Management & Impoundment / Flow Monitoring Plan (Appendix A.6). These include compliance requirements related of:

- Run-of-River Operation
- Flashboard Maintenance and Repair
- Impoundment Refilling
- Minimum Bypass Flows
- Water Levels
- Rating Curves
- Monitoring of Water Level Elevations and Flows & Maintenance of Records

Upon review of the 401 Water Quality Certification, the Impoundment Flow and Monitoring Plan, the FERC e-library, and the VDEC letter of support, the Applicant has both chosen the correct Standard and has evidenced their compliance to the Standard.

Based on the review of the application, supporting documentation the Project satisfies the Water Quality criterion.

### C. Upstream Fish Passage

***Goal:*** The facility allows for the safe, timely, and effective upstream passage of migratory fish. This criterion is intended to ensure that migratory species can successfully complete their life cycles and maintain healthy, sustainable fish and wildlife resources in areas affected by the facility.

The Applicant chose Standard C1 for Zone 1 and Standard C-2 for Zone 2 and 3.

***STANDARD C-1.*** **Not Applicable / De Minimis Effect:**

- Explain why the facility does not impose a barrier to upstream fish passage in the designated zone.
- Document available fish distribution data and the lack of migratory fish species in the vicinity.
- If migratory fish species have been extirpated from the area, explain why the facility is or was not the cause of this.

The Applicant provided the FERC License (June 9, 2004) and the VDEC Water Quality Certificate (2003) as evidence to meet the Standard. The impoundment does not create an upstream passage barrier.

***STANDARD 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 Applicant provided the FERC License (June 9, 2004) and the VDEC Water Quality Certificate (WQC) (2003) as evidence to meet the Standard. The Bypass and Downstream ZOEs do not create upstream passage barriers based on the following factors.

(1) There are two dams downstream of the Project; West Charleston and Newport. While the Newport project has both up and downstream fish passage, the West Charleston project has neither. As a result, the West Charleston project is currently a barrier to further upstream fish passage.
(2) The FERC license did not contain a U.S. Fish and Wildlife Service (USFWS) prescription for fish passage, but did contain reservation of authority to prescribe fish passage in the future.
(3) The WQC required a habitat study. The results of the study concluded fish and wildlife protection was not required in the bypass reach due to the reach lacking sufficient salmonid habitat with the coarse nature of the substrate.

It is further noted that no agency has requested any fish passage requirements since 2003 when the FERC license was issued. No USFWS comments were received on the Application during the public review period.

<u>Based on the review of the application, supporting documentation the Project satisfies the Upstream Passage criterion.</u>

**D. Downstream Fish Passage**

***Goal:*** The facility allows for the safe, timely, and effective downstream passage of migratory fish. For riverine (resident) fish, the facility minimizes loss of fish from reservoirs and upstream river reaches affected by facility operations. All migratory species can successfully complete their life cycles and to maintain healthy, sustainable fish and wildlife resources in the areas affected by the facility.

The Applicant chose Standard D-2 for all Zones.

> ***STANDARD 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 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 Applicant provided the FERC License (June 9, 2004), the VDEC Water Quality Certificate (2003), the FERC Environmental Inspection Report-Fish Passage (2012) and the FERC Environmental Inspection Report (2016) and letter of support from the VDEC (2018) as evidence to meet the Standard. Based on the evidence provided as well as a review of the FERC e-library the following factors demonstrated meeting the D2-Standard.

(1) The WQC Item 49 lists the following fish species in the Clyde River above Pensioner Pond: white sucker, longnose sucker, smallmouth bass, slimy sculpin, chain pickerel, brook trout, brown trout, and several minnow species. In addition, lake trout, landlocked Atlantic salmon, rainbow trout, round whitefish, burbot, rainbow smelt, largemouth bass, yellow perch, walleye, pumpkinseed, rock bass and brown bullhead. To minimize the impacts to these species the Project installed a trash rack 1" spacing to limit the draw of fish into the turbines.

(2) The FERC license did not contain a U.S. Fish and Wildlife Service (USFWS) prescription for fish passage but did contain reservation of authority to prescribe fish passage in the future.

(3) The Impound Flow Management Plan further minimizes the impacts on resident species with a prescribed 45 cfs minimum flow which is passed via a flashboard opening and low-level slide gate. When the plant is not in operation excess flow is passed over the flashboards and the slide gate is not used. The Project was also required to install additional measures per WQC Item 71. The Project removed flashboards adjacent to the intake and installed an elbow to direct the water with adequate depth to allow for safe fish movement. The VDEC letter (2018) supported the measures stated that repairs at the low-level sluice gate were prescribed and had been completed in full compliance with the WQC.

<u>Based on the review of the application, supporting documentation the Project satisfies the Downstream Passage criterion.</u>

### E. Shoreline and Watershed Protection

***Goal:*** The facility has demonstrated that sufficient action has been taken to protect, mitigate or enhance the condition of soils, vegetation and ecosystem functions on shoreline and watershed lands associated with the facility.

The Applicant selected Standard E-1 -Not Applicable/De Minimis Effect for all three ZOEs

> ***STANDARD E-1. Not Applicable/De Minimis Effect:*** There are no lands associated with the facility where the facility owner has direct or indirect ownership or control over lands surrounding the facility and its riverine zones that have significant ecological value for protecting water quality, aesthetics, or low-impact recreation, and the facility is not subject to any Shoreline Management Plan (SMP) or similar protection plan.

The Application provided evidence from the FERC license (2004) which did not require a Shoreline Management Plan or other provisions for protection. The FERC license identifies 14 acres of land ownership which is limited to the Project features and no adjacent or adjoining lands. The Project operation, as a run-of-river facility, does not create shoreline impacts to vegetation or slopes. Upon review of aerial photography via Google Earth the shoreline has not changed its characterization over the life of the FERC license. Based on the information provided there are not lands of significant ecological value.

Based on the review of the application, supporting documentation the Project satisfies the Shoreline and Watershed Protection criterion.

### F. Threatened and Endangered Species Protection

***Goal:*** The facility does not negatively impact federal or state listed species.

The Applicant selected Standard F-2, Finding of No Negative Effects.

> ***STANDARD 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.

The Applicant provided a statement that no Federal listed or proposed endangered or threatened botanical species are known to exist in the Project area. This was verified via the USFWS online endangered species mapping, see link here which listed the Canada Lynx (*Lynx canadensis*) and the Northern Long-Eared Bat (*Myotis septentrionalis*). Even though no Northern long eared bats are known to occur at the Project, the Project minimizes any potential impact on bats by scheduling their distribution line tree maintenance from October 1-April 14, in accordance with Vermont's Regulatory Review Guidance for protecting Northern Long-eared Bats. In addition, the Application included evidence from the

Vermont Nongame and Natural Heritage database which identified rare (State) plant species adjacent to Pensioner Pond and Charleston Pond. No rare animal species were detected. The WQC identified the plant as the Mare's tail. The operations of the Project do not interfere with the rare plant species.

Based on the review of the application, supporting documentation the Project satisfies the Threatened and Endangered Species Protection criterion.

### G. Cultural and Historic Resource Protection

***Goal:*** The facility does not unnecessarily impact cultural or historic resources that are associated with the facility's lands and waters, including resources important to local indigenous populations, such as Native Americans.

The Applicant selected Criterion G2 – Approved Plan for all three zones.

> ***STANDARD 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.

The Applicant provided the FERC License, the Historic Properties Management Plan (2005) and the Historical Properties Management Plan Report (2008) as evidence of meeting the Standard. In review of these documents the Project was required to conduct a cultural resources inventory of the Project to include both archeological and historical properties. To fulfill this requirement the Applicant developed the Barton Village Historic Properties Management Plan (HPMP). The Applicant completed the required elements of the HPMP which included historic assessment of buildings and the environmental and cultural context for historical properties. The Project was nominated for the National Register for Historic Places, but review of the Register did not include the Project. This is not an uncommon condition. Nomination does not necessarily result in inclusion. The Applicant is required to consult with the State Historic Preservation Office if any alterations to the facility are necessary.

Based on the review of the application, supporting documentation the Project satisfies the Cultural and Historic Resource Protection criterion.

### H. Recreational Resources

***Goal:*** The facility accommodates recreation activities on lands and waters controlled by the facility and provides recreational access to its associated lands and waters without fee or charge.

The Applicant selected Criterion H2 – Agency Recommendation for all three zones.

***STANDARD 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 Applicant provided License Article 407, Recreation Plan and the FERC 2016[1] Inspection Report-Fish Passage as evidence in meeting the Standard. The Project provides recreational facilities for canoeists/kayakers and fishermen. Access is provided with parking for boaters and fishermen across from the powerhouse and along the entrance to the Project. Access to the tailrace is from a newly-constructed wooden stairway. A portage trail through the woods is provided for river access for fishermen and canoeists/kayakers into Charleston Pond. The FERC Recreation Report (Form 80), was last filed January 8, 2008, and indicates minimal use of the Project's recreational facilities. The 2016 FERC Environmental Inspection report did not note any compliance issues with the Project.

Based on the review of the application, supporting documentation the Project satisfies the Recreational Resources criterion.

## VIII. GENERAL CONCLUSIONS AND REVIEWER RECOMMENDATION

Based on this review, the Barton Village Project meets the LIHI criteria for certification as a Low Impact Hydropower facility and a five (5)-year term is recommended, with one condition as recommended by VDEC:

- **Condition 1:** Upon completion of the current water year (Oct. 1, 2018 – Sep. 30, 2019), the Facility Owner shall provide a report to VDEC by December 31, 2019 that documents run of river compliance. The Facility Owner shall confirm the submittal to VDEC and provide any response from the agency in annual compliance submittals to LIHI.

[1] The Application incorrectly referenced the FERC Inspection report as 2012. The 2016 FERC Inspection report was provided in the Application as Appendix A.8.2.