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March 10, 2020

VIA E-FILING

Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Subject: Rumford Falls Hydroelectric Project (FERC No. 2333-091)
Proposed Study Plan

Dear Secretary Bose:

Rumford Falls Hydro LLC (RFH or Licensee), a subsidiary of Brookfield Renewable (Brookfield), is submitting to the Federal Energy Regulatory Commission (FERC or Commission) the Proposed Study Plan (PSP) for the Rumford Falls Hydroelectric Project (Project) (FERC No. 2333). The Project is a two-development hydroelectric facility on the Androscoggin River in the Town of Rumford, Oxford County, Maine.

The current license for the Project was issued on October 18, 1994, and expires on September 30, 2024. Accordingly, the Licensee is pursuing a new license from FERC for the continued operation of the Project through the Commission's Integrated Licensing Process (ILP). In accordance with 18 Code of Federal Regulations (CFR) §5.11, the PSP describes the studies that RFH is proposing to conduct in support of relicensing the Project.

RFH filed a Pre-Application Document (PAD) and associated Notice of Intent (NOI) with the Commission on September 27, 2019, which initiated the ILP. The Commission issued Scoping Document 1 (SD1) for the Project on November 19, 2019. SD1 was intended to advise resource agencies, Indian Tribes, non-governmental organizations, and other stakeholders as to the proposed scope of FERC's Environmental Assessment (EA) for the Project and to seek additional information pertinent to the Commission's analysis.

On December 17, 2019, the Commission held public scoping meetings in the Town of Rumford, Maine. During these meetings, FERC staff presented information regarding the ILP and details regarding the study scoping process and how to request a relicensing study, including the Commission's study criteria in 18 CFR §5.9(b). In addition, FERC staff solicited comments regarding the scope of issues and analyses for the EA.

The Commission requested that resource agencies, Indian Tribes, and other interested parties request studies and provide comments on the PAD and SD1. The comment period was initiated with the Commission's November 19, 2019 notice and concluded on January 25, 2020. During the comment period, a total of five stakeholders filed letters with the Commission providing general comments, comments regarding the PAD, comments regarding SD1, and/or study requests. On

February 27, 2020, FERC indicated that issuance of a second scoping document (SD2) was not warranted.

Proposed Study Plan

RFH has evaluated all the study requests submitted by the stakeholders, with a focus on the requests that specifically addressed the seven criteria set forth in §5.9(b) of the Commission's ILP regulations, as discussed above. The purpose of this PSP is to present the studies that are being proposed by RFH and to address the comments and study requests submitted by resource agencies and other stakeholders. This PSP also provides FERC, regulatory agencies, Indian Tribes, and other stakeholders with the methodology and details of RFH's proposed studies. At this time, RFH is proposing to conduct the following studies as described in detail in the PSP:

1. Water Quality Study;
2. Angler Creel Survey;
3. Recreation Study; and
4. Historic Architectural Survey Study.

RFH is filing the PSP with the Commission electronically and is distributing this letter to the parties listed on the attached distribution list. For parties listed on the attached distribution list who have provided an email address, RFH is distributing this letter via email; otherwise, RFH is distributing this letter via U.S. mail. All parties interested in the relicensing process may obtain a copy of the PSP electronically through FERC's eLibrary system at https://elibrary.ferc.gov/idmws/search/fercgensearch.asp under docket number P-2333.

Comments on the PSP, including any additional or revised study requests, must be filed within 90 days of the filing date of this PSP which is no later than June 8, 2020. Comments must include an explanation of any study plan concerns and any accommodations reached with RFH regarding those concerns (18 CFR §5.12). Any proposed modifications to this PSP must address the Commission's criteria as presented in 18 CFR §5.9(b).

As necessary, after the comment period closes, RFH will prepare a Revised Study Plan (RSP) that will address interested parties' comments to the extent practicable. Pursuant to the ILP, RFH will file the RSP with the Commission on or before July 8, 2020, and the Commission will issue a final Study Plan Determination by August 7, 2020.

Proposed Study Plan Meeting

In accordance with 18 CFR §5.11(e) of the Commission's regulations, RFH intends to hold a Proposed Study Plan Meeting (PSP Meeting) to describe the background, concepts, and study methods described in the PSP. The PSP Meeting will begin at 10:00 AM on April 7, 2020, at the Rumford Town Offices in Rumford, Maine.

To assist with meeting planning and logistics, RFH respectfully requests that individuals or organizations who plan to attend the meeting please RSVP by sending an email to me at luke.anderson@brookfieldrenewable.com on or before March 24, 2020.

If there are any questions regarding the PSP or PSP Meeting, please do not hesitate to contact me at (207) 755-5613 or at the email address above.

Sincerely,

Luke Anderson
Licensing Specialist
Brookfield Renewable

Enclosures

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Proposed Study Plan
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RUMFORD FALLS PROJECT
FERC PROJECT NO. 2333

PROPOSED STUDY PLAN

RUMFORD FALLS HYDRO LLC
Rumford, Maine

MARCH 2020

PROPOSED STUDY PLAN
RUMFORD FALLS PROJECT
FERC PROJECT NO. 2333

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Acronym List

Brookfield	Brookfield Renewable
CFR	Code of Federal Regulations
cfs	cubic feet per second
EA	Environmental Assessment
FERC	Federal Energy Regulatory Commission or Commission
ILP	Integrated Licensing Process
ISR	Initial Study Report
kV	kilovolt
kW	kilowatt
MDEP	Maine Department of Environmental Protection
MDIFW	Maine Department of Inland Fisheries and Wildlife
SHPO	State Historic Preservation Office
MW	megawatt
NEPA	National Environmental Policy Act
NGOs	non-governmental organizations
NGVD29	National Geodetic Vertical Datum of 1929
NOI	Notice of Intent
PAD	Pre-Application Document
PHABSIM	Physical Habitat Simulation
PM&E	protection, mitigation and enhancement
PSP	Proposed Study Plan
RFH	Rumford Falls Hydro LLC
RM	River Mile
RSP	Revised Study Plan
SD1	Scoping Document 1
TU	Trout Unlimited
USGS	U.S. Geological Survey
USR	Updated Study Report
U.S.C.	United States Code

Section 1
Introduction and Background

Rumford Falls Hydro LLC (RFH or Licensee), a subsidiary of Brookfield Renewable (Brookfield), is the Licensee of the 44.5 megawatt (MW) Rumford Falls Hydroelectric Project (FERC No. 2333) (Project), a multi-development hydroelectric facility located on the Androscoggin River in Rumford, Maine.

1.1 General Project Location and Description

The Project is located at River Mile (RM) 80 on the Androscoggin River in Oxford County in the Town of Rumford, Maine. A map of the Project vicinity is provided in Figure 1-1. The Project consists of two discrete developments, the Upper Station Development and the Lower Station Development. The total nameplate capacity of the Project is 44.5 MW. The Upper Station Development's total installed nameplate capacity is 29.3 MW, with a maximum hydraulic capacity of 4,550 cubic feet per second (cfs). The Lower Station Development's total nameplate capacity is 15.2 MW with a maximum hydraulic capacity of 3,100 cfs.

The Project is operated in a run-of-river mode within 1 foot of full pond elevation (elevation 601.24 feet U.S. Geological Survey [USGS]) at the Upper Dam impoundment and elevation 502.74 feet USGS at the Middle Dam impoundment) and shall at all times act to minimize the fluctuations of the reservoir surface elevation (i.e., maintain a discharge from the Project so that, at any point in time, flows immediately downstream from the Project tailraces approximate the sum of the inflows to the Project reservoirs, minus withdrawals). During low flows, the Licensee releases a minimum flow of 1 cfs from the Upper Dam and 21 cfs from the Middle Dam into the bypassed reaches per Article 402. No changes to the Project's current operations are being proposed at this time.

1.1.1 Upper Station Development

The Upper Station Development's principal features consist of a dam, a forebay, a gatehouse, four short penstocks, a powerhouse, an impoundment, two overhead transmission lines, and appurtenant facilities. The Upper Station Development has a total installed nameplate capacity of 29.3 MW and a maximum hydraulic capacity of 4,550 cfs.

The Upper Station Development consists of: 1) a concrete gravity dam, having a 464-foot-long by 37-foot-high, ogee-type spillway section with a crest elevation of 598.74 feet National Geodetic Vertical Datum of 1929[1] (NGVD29), topped with 32-inch-high, pin-supported, wooden flashboards and an Obermeyer spillway system; (2) a forebay about 2,300 feet long by 150 feet wide; (3) a gatehouse with eight headgates (two headgates for each of the four penstocks)[2], trashracks, and other appurtenant equipment; (4) four underground steel-plate penstocks, each about 110 feet long, three of which are 12 feet in diameter, and one 13 feet in diameter; (5) a masonry powerhouse integral with the dam, which includes two stations: (a) the Old Station, about 30 feet wide by 110 feet long by 92 feet high, equipped with one horizontal generating unit with a capacity of 4,300 kilowatt (kW), and (b) the New Station, about 60 feet wide by 140 feet long by 76 feet high, equipped with three vertical generating units, two with a capacity of 8,100 kW each, and one with a capacity of 8,800 kW; (6) an impoundment with a gross storage capacity of 2,900 acre-feet, surface area of about 419 acres, normal maximum headwater elevation of 601.24 feet, and tailwater elevation of 502.74 feet; (7) four overhead 11.5 kilovolt (kV) transmission lines; and (8) appurtenant facilities.

1.1.2 Lower Station Development

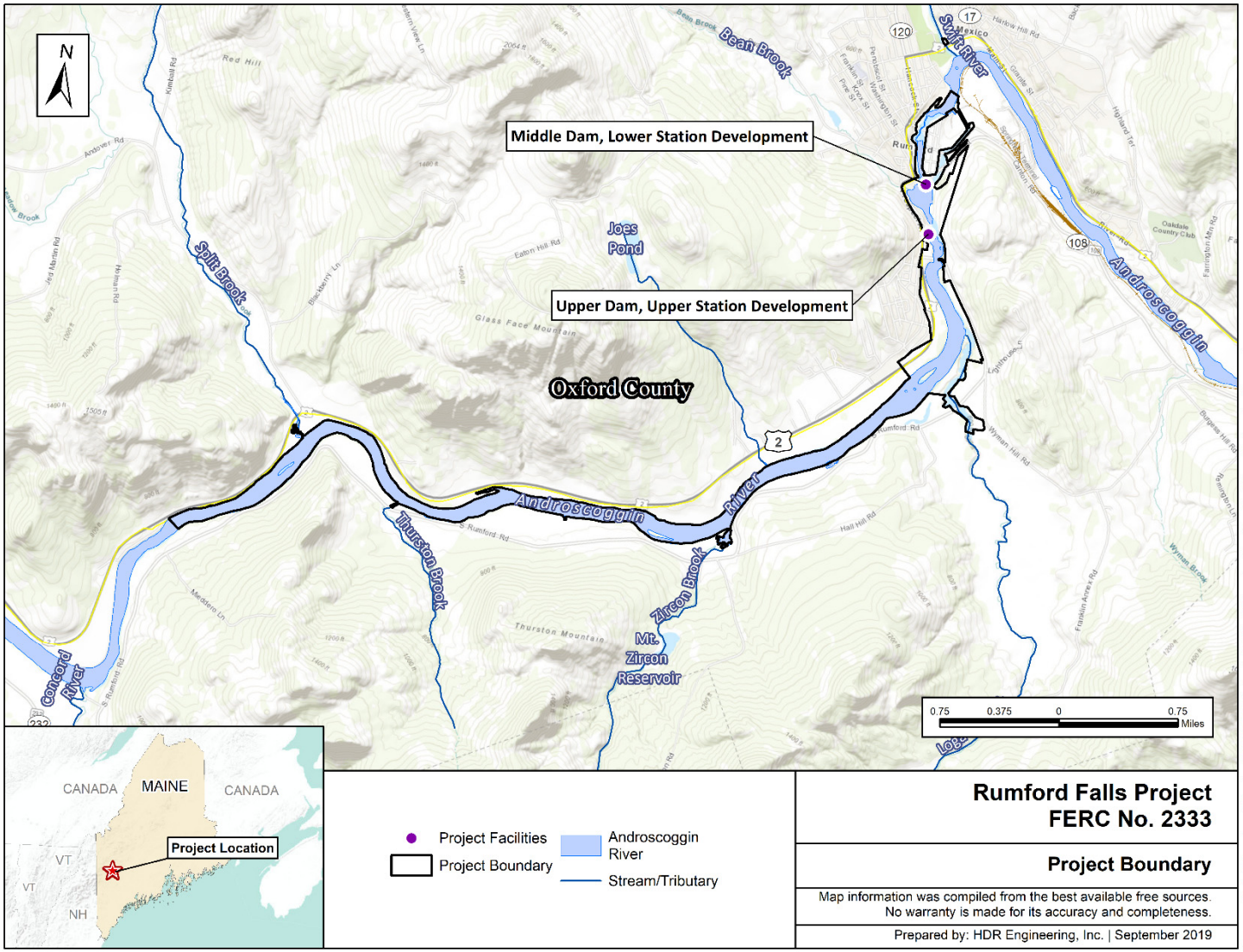
The principal features of the Lower Station Development consist of the Middle Dam, the Middle Canal headgate structure with a waste weir, the Middle Canal, a gatehouse, two penstocks, a powerhouse, an impoundment, a short transmission line, and appurtenant facilities. The existing development has a total nameplate capacity of 15.2 MW and a total maximum hydraulic capacity of 3,100 cfs.

The Lower Station Development consists of: (1) a rock-filled, wooden-cribbed, and concrete-capped Middle Dam, having a 328.6-foot-long by 20-foot-high gravity spillway section, with a crest elevation at 502.74 feet with 16-inch-high, pin-supported, wooden flashboards; (2) a Middle Canal concrete headgate structure, located adjacent to the dam, about 120 feet long, with 10 steel headgates and a waste weir section perpendicular to the headgate structure, about 120 feet long,

[1] Brookfield is currently reviewing and updating Project elevations to new datum. These changes will be reflected in the Final License Application.
[2] There are also two additional unused gates associated with a retired fifth penstock.

with a crest elevation of 502.6 feet with 12-inch-high flashboards; (3) a Middle Canal, about 2,400 feet long, with width ranging from 75 to 175 feet and depth from 8 to 16 feet; (4) a gatehouse containing two headgates, trashracks, and other appurtenant equipment; (5) two 12-foot-diameter, steel-plate penstocks, each extending about 815 feet to two cylindrical surge tanks, each about 36 feet in diameter by 50.5 feet high, and the penstocks continuing 77 feet to the powerhouse; (6) a masonry powerhouse equipped with two identical vertical units, each with 7,600 kW capacity; (7) an impoundment with a gross storage capacity of 141 acre-feet, surface area of about 21 acres, normal maximum headwater elevation of 502.74 feet, and tailwater elevation of 423.24 feet; (8) 600-foot-long, 11.5 kV generator leads; and (9) appurtenant facilities.

FIGURE 1-1
PROJECT LOCATION



1.2 Background

On October 18, 1994, the Federal Energy Regulatory Commission ("FERC" or "Commission") issued a new 30-year license for the Project in accordance with the Commission's authority under the Federal Power Act.[3] The current operating license for the Project expires on September 30, 2024. Consequently, RFH is pursuing a new license for the Project through the Commission's Integrated Licensing Process (ILP), detailed at 18 Code of Federal Regulations (CFR) Part 5 of the Commission's regulations. This Proposed Study Plan (PSP) is being filed with the Commission pursuant to 18 CFR §5.11. Notice of this PSP is also being distributed to the stakeholders and interested parties on the distribution list.

1.3 Study Plan Overview

On September 27, 2019, RFH filed a PAD and associated Notice of Intent (NOI) to initiate the ILP. The PAD provides a comprehensive description of the Project and summarizes existing, relevant, and reasonably available information to assist the Commission, resource agencies, Indian tribes, non-governmental organizations (NGOs), and other stakeholders in identifying issues, determining information needs, preparing study requests, and analyzing the license application. A preliminary list of potential studies and information needs was included in Section 6 of the PAD, which included studies or surveys that may provide additional information regarding the Project's effects on specific resources.

The National Environmental Policy Act of 1969 (NEPA), the Commission's regulations, and other applicable statutes require the Commission to independently evaluate the environmental effects of relicensing the Project and to consider reasonable alternatives to relicensing. At this time, the Commission has expressed its intent to prepare an Environmental Assessment (EA) that describes and evaluates the site-specific and cumulative potential effects of relicensing (if any) and other alternatives (FERC 2019). The EA will be supported by a scoping process to identify issues, concerns, and opportunities for enhancement or mitigation associated with the proposed action (FERC 2019). Accordingly, the Commission issued Scoping Document 1 (SD1) for the Rumford Falls Project on November 19, 2019. SD1 advises resource agencies, Indian tribes, NGOs, and

[3] 16 United States Code (U.S.C.) §791(a), *et seq.*

other stakeholders as to the proposed scope of the EA and to seek additional information pertinent to the Commission's analysis. As provided in 18 CFR §§5.8(a) and 5.8(c), the Commission issued a notice of commencement of proceeding concurrent with SD1.

On December 17, 2019, the Commission held two public scoping meetings in Rumford, Maine, to solicit comments regarding the scope of issues and analysis for the EA. The Commission typically conducts a site visit in conjunction with the scoping meetings. However, due to potential issues with access to Project facilities during the winter season, the Commission conducted a site visit on October 24, 2019.

FERC requested resource agencies, Indian tribes, and other interested parties request studies and provide comments on the PAD and SD1. The comment period was initiated with the Commission's November 19, 2019 notice issuance and concluded on January 25, 2020. Comments and study requests were received through January 28, 2020, and although some were received after the regulatory deadline, all comments and study requests were considered in the development of this PSP.

FERC's ILP regulations specify required components of study requests to allow the Licensee, as well as Commission staff, to determine a proposed study's appropriateness and relevancy to the proposed action. As described in 18 CFR §5.9(b) of the Commission's ILP regulations, the seven required components of a study request are as follows:

(1) Describe the goals and objectives of each study and the information to be obtained (§5.9(b)(1));

This section describes why the study is being requested and what the study is intended to accomplish, including the goals, objectives, and specific information to be obtained. The goals of the study should clearly relate to the need to evaluate the effects of the Project on a particular resource. The objectives are the specific information that needs to be gathered to allow achievement of the study goal.

(2) If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied (§5.9(b)(2));

This section should clearly establish the connection between the study request and management goals or resource of interest. A statement by an agency connecting its study request to a legal, regulatory, or policy mandate needs to be included that thoroughly explains how the mandate relates to the study request, as well as the Project impacts.

(3) If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study (§5.9(b) (3));

This section is for non-agency or Indian tribes to establish the relationship between the study request and the relevant public interest considerations.

(4) Describe existing information concerning the subject of the study proposal, and the need for additional information (§5.9(b) (4));

This section should discuss any gaps in existing data by reviewing the available information presented in the PAD or information relative to the Project that is known from other sources. This section should explain the need for additional information and why the existing information is inadequate.

(5) Explain any nexus between project operation and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements (§5.9(b) (5));

This section should clearly connect Project operations and Project effects on the applicable resource. This section can also explain how the study results would be used to develop protection, mitigation, and enhancement (PM&E) measures. The PM&E measures should include those related to any mandatory conditioning authority under Section 401 of the Clean Water Act[4] or Sections 4(e) and Section 18 of the Federal Power Act, as applicable.

(6) Explain how any proposed study methodology is consistent with generally accepted practices in the scientific community or, as appropriate, considers relevant tribal values and knowledge. This includes any preferred data collection and analysis techniques, or

[4] 33 U.S.C. §1251 *et seq.*

objectively quantified information, and a schedule including appropriate field season(s) and the duration (§5.9(b) (6));

This section should provide a detailed explanation of the study methodology. The methodology may be described by outlining specific methods to be implemented or by referencing an approved and established study protocol and methodology.

(7) Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs (§5.9(b)(7));

This section should describe the expected level of cost and effort to conduct the study. If there are proposed alternative studies, this section should address why the alternatives would not meet the stated information needs.

A total of five letters were received providing comments on the PAD, SD1, and/or study requests from FERC, the Maine Department of Environmental Protection (MDEP), the Maine Department of Inland Fisheries and Wildlife (MDIFW), Trout Unlimited (TU), and the Town of Rumford. Copies of the correspondence are presented in Appendix A of this PSP. A total of 10 individual studies were requested by the stakeholders. Consistent with the ILP, RFH evaluated the studies proposed by stakeholders that independently addressed the criteria set forth in 18 CFR §5.9(b) of the Commission's ILP regulations. The ILP requires RFH to file this PSP within 45 days from the close of the comment period.

The purpose of this PSP is to address the comments and study requests submitted by agencies and interested parties. This PSP also provides FERC, regulatory agencies, Indian tribes, and other stakeholders with a draft plan and descriptions of the studies proposed by RFH. The intent is that goals, methodology, scope, and schedule will be refined in consultation with the above-referenced parties during the next several months. RFH will prepare a Revised Study Plan (RSP) that will incorporate the interested parties' comments to the extent practicable. Pursuant to the ILP, RFH will file the RSP with the Commission on or before July 8, 2020. The Commission will then issue a final Study Plan Determination letter by August 7, 2020.

1.3.1 RFH's Proposed Study Plan

RFH has evaluated all the study requests submitted by stakeholders that independently addressed the seven criteria set forth in §5.9(b) of the Commission's ILP regulations and/or were originally proposed by RFH in the September 27, 2019 PAD. Section 5.9 of FERC's regulations defines the seven specific criteria that each study request must address to justify the conduct of such a study by the applicant. These seven criteria are discussed above. The results of RFH's initial assessment of each study request with respect to the seven criteria are summarized in Table 1-1 below.

Additionally, consistent with the proposed studies identified in the PAD, RFH proposes to conduct a Recreation Survey for the Project, which is described in the "Recreation Study Plan" in this PSP.

TABLE 1-1
STAKEHOLDER STUDY REQUESTS AND RFH'S DETERMINATION

Study Request	Stakeholder	RFH's Determination
Water Quality		
Water Quality Monitoring	FERC	Appropriate for study. Incorporated into the "Water Quality Study Plan."
Impoundment Trophic State Study	MDEP	Appropriate for study. Incorporated into the "Water Quality Study Plan."
Temperature and Dissolved Oxygen Monitoring	MDEP	Appropriate for study. Incorporated into the "Water Quality Study Plan."
Aquatic Habitat		
Impoundment Aquatic Habitat Study	MDEP	Per the option presented to RFH in the MDEP study request, RFH is providing three years of impoundment elevation data for the Upper Dam impoundment and outflow data for the Project in lieu of conducting this study.
Outlet Stream Aquatic Habitat Study	MDEP	Per the option presented to RFH in the MDEP study request, RFH is providing three years of impoundment elevation data for the Upper Dam impoundment and outflow data for the Project in lieu of conducting this study in the lower bypass reach. RFH proposes to conduct this study in the Project's tailrace, which is incorporated into the "Water Quality Study Plan."

Study Request	Stakeholder	RFH's Determination
Macroinvertebrates		
Benthic Macroinvertebrate Study	MDEP	Appropriate for study. Incorporated into the "Water Quality Study Plan."
Minimum Flows		
Minimum Flow Analysis	MDIFW (supported by TU)	Not appropriate for study.
Fisheries		
Brown Trout and Rainbow Trout Telemetry Study	MDIFW (supported by TU)	Not appropriate for study.
Recreation		
Angler Creel Survey	MDIFW (supported by TU)	Appropriate for study. See "Angler Creel Survey Study Plan."
Historical Resources		
Historic Architectural Survey	FERC	Appropriate for study. See "Historic Architectural Survey Study Plan."

Based on RFH's review of the requested studies and FERC criteria for study requests under the ILP, RFH has proposed a total of four studies to address the majority of requests summarized above. For the requests deemed appropriate for study, RFH has described:

- The goals and objectives of the study;
- A summary of resource management goals identified by resource agencies;
- The stakeholders requesting the study;
- A summary of existing information pertaining to the study;
- The nexus between Project operations and effects on the resources to be studied;
- The proposed study methodology;
- Schedules for conducting the study and submitting the reports; and
- The level of effort and cost.

RFH's proposed studies are attached as Appendices B through E to this PSP.

1.3.2 Comments on Proposed Study Plan

Comments on this PSP must be filed with the Commission within 90 days of the filing date of this PSP, or by June 8, 2020. Comments must include an explanation of any study plan concerns and any accommodations reached with RFH regarding such concerns (18 CFR §5.12). Any proposed modification to RFH's PSP must address the criteria provided by 18 CFR §5.9(b).

1.3.3 Initial Study Plan Meeting and Additional Meetings

In accordance with 18 CFR §5.11(e), RFH plans to hold a PSP Meeting at 10:00 AM on April 7, 2020, at the Rumford Town Offices in Rumford, Maine. The purpose of the PSP Meeting will be to clarify the intent and contents of RFH's PSP, explain any initial information gathering needs, and, if applicable, resolve outstanding issues associated with the proposed studies. Additional details regarding the meeting are presented in Section 4 of this document.

Section 2
Additional Information Requested

Two information requests were made in letters received from FERC and other stakeholders, which are discussed below.

FERC request:

> On pages 5-10 of the PAD, you state that minor, local erosional undermining of the riverbanks of the Upper Dam impoundment is occurring but that the erosion and slumping that currently occurs is unavoidable and the adverse impacts are minor in nature. On pages 6-1 and 6-2, you do not propose any studies related to the erosion or slumping and you state that no change to geology and soils would be expected. We are aware of the erosion monitoring associated with identified cultural sites that occurred since 2015, but we are not aware of any other information of how much erosion may be occurring in the upper impoundment or where. Please explain how you concluded that the adverse impacts of the local erosional undermining are minor in nature.

RFH's response:

As cited in the PAD, FERC's 1993 EA of the Project specified that the impoundment intersects unstable alluvium in certain areas, and as a result, wave action, rafted ice, and flood currents have caused minor local erosional undermining of the riverbanks. FERC concluded that the shoreline erosion and slumping that occurred at the Upper Dam impoundment was unavoidable and the adverse impacts were minor in nature. During the last decade (2010-2018) annual monitoring has been conducted to determine whether erosion is affecting National Register-eligible archaeological sites identified in several locations on both sides of the Upper Dam impoundment. Photographic documentation shows that no erosion is occurring at these places despite some existing bank undercutting and ice rafting observed during the winter. The archaeological sites are located in areas both buttressed by bedrock outcrops and underlain by friable alluvial deposits. In fact, the lack of documented erosion over the observation period permitted the State Historic Preservation Officer (SHPO) to agree to (and for FERC to approve) a change in archaeological site monitoring from an annual to biannual cycle. The archaeological erosion data from the Upper Dam

impoundment support and strengthen the conclusion that under the current operating regime, no changes would be expected to occur in either the intensity or frequency of erosion in the impoundment. The monitoring of archaeological sites for changes caused by erosion will continue on a biannual basis to corroborate this conclusion. Therefore, RFH did not propose any studies related to geology and soils.

MDIFW request:

> We request a five-year history of any drawdown events that exceeded the 1-foot maximum including the date(s) of occurrence, duration, and extent of drawdown.

RFH's response:

As discussed previously, the current license requires RFH to operate the Project in a run-of-river mode within 1 foot of full pond elevation (elevation 601.24 feet at the Upper Dam impoundment and elevation 502.74 feet at the Middle Dam impoundment) and shall at all times act to minimize the fluctuations of the reservoir surface elevation (i.e., maintain a discharge from the Project so that, at any point in time, flows immediately downstream from the Project tailraces approximate the sum of the inflows to the Project reservoirs, minus withdrawals). Run-of-river operations may be temporarily modified if required by operating emergencies beyond the control of the Licensee, or for short periods upon mutual agreement between the Licensee and the USFWS, MDEP, and MDIFW.

Drawdown events over the past five years (2015 through 2019) exceeding one foot have been identified below for the Project. Pursuant to the notification requirements of Article 401, RFH has conducted these scheduled drawdowns in coordination with the USFWS, MDEP, and MDIFW. Impoundments were gradually drawn down, where the head pond was typically lowered slowly (up to three feet over a period of three days) and minimum flows were maintained to avoid potential resource impacts during these periods. See Section 5.2 of the Water Quality Study Plan for elevation data for the Upper Dam impoundment and the outflow of the Project.

FERC-Required Annual Inspections

- August 26, 2019 – the headpond of the Upper Dam impoundment was drawn down to elevation 598.5 feet for five days to conduct the FERC-required annual Obermeyer dam inspection, as well as a Dam Toe Inspection per request by FERC, to maintain dam safety and reliability.
- September 10, 2018 – the headpond of the Upper Dam impoundment was drawn down to elevation 598.5 feet for three days to conduct the FERC-required annual Obermeyer dam inspection to maintain dam safety and reliability.
- October 2, 2017 – the headpond of the Upper Dam impoundment was drawn down to elevation 598.0 feet for a week to conduct the FERC-required annual Obermeyer dam inspection to maintain dam safety and reliability.
- August 19, 2016 – the headpond of the Upper Dam impoundment was drawn down 18 inches below dam crest through September 12, 2016, to conduct the FERC-required annual Obermeyer dam inspection during concrete repairs at the Upper Dam.
- August 7, 2015 – the headpond of the Upper Dam impoundment was drawn down to elevation 598.0 feet until August 12, 2015, to conduct the FERC-required annual Obermeyer dam inspection to maintain dam safety and reliability.

Maintenance and Repairs

- July 2, 2018 – the headpond of the Upper Dam impoundment was drawn down to elevation 599.5 feet until July 29, 2018, to accommodate concrete repairs at the Upper Dam.
- June 14, 2017 – the headpond of the Upper Dam impoundment was drawn down to elevation 598.5 feet for four hours to facilitate flashboard repairs. The impoundment was down all spring because of high flows and inability to repair flashboards. The agencies were notified.
- August 19, 2016 – the headpond of the Upper Dam impoundment was drawn down 18 inches below dam crest through September 12, 2016 to accommodate concrete repairs at the Upper Dam.

- May 1, 2016 – the headpond of the Upper Dam impoundment was drawn down to slightly below crest through May 4, 2016, to replace flashboards. The impoundment was down in early spring because of high flows and inability to repair flashboards.

Periodically, the impoundment was also down from mid-November 2017 to late-May 2018 and from mid-April to early-June 2019 because high flows removed flashboards and precluded repairs until water levels were safe. The agencies were notified of both of these events. See Section 3.3 of Appendix B of this PSP for additional information.

Over the past five years, there have been two occasions where the unit(s) at the Upper Station have tripped for relatively short periods of time. On January 12, 2018, the Middle Dam impoundment was 0.41 feet below the minimum allowable operating elevation of the Upper Dam impoundment (i.e., within 1 foot of full pond elevation [502.74 feet]) for 29 minutes. On October 3, 2018, the Middle Dam impoundment was 1.92 feet below the allowable limit for 53 minutes. RFH notified the MDIFW, MDEP, and USFWS and a report was filed with FERC.

Section 3
Requested Studies Not Adopted

3.1 Studies Not Adopted

As previously stated, RFH has developed four study plans to address the majority of the stakeholders' study requests. A number of the study plans (i.e., Water Quality Study Plan) combine similar study requests into a single study plan. In addition to the study requests that have been incorporated into a study plan, there were two study requests that were deemed by RFH to not meet one or more of the seven criteria required by FERC in Section 5.9(b) of its ILP regulations.

In reviewing each of the individual study requests, those not deemed appropriate to undertake within the context of the relicensing of the Project are not being incorporated into a study plan for one or more of the following five reasons:

Lack of connection between Project operations and an effect on a resource: Under FERC policy and regulations, a study requestor must substantiate a connection between Project operations and effects on the resource in question. This "nexus" between the Project's operation and a resource impact must be supported by some evidence of a specific resource impact, not just a belief that an impact might be occurring. Additionally, the study request should not be a request to search for an impact in the absence of any evidence that one is occurring. In the Centralia decision (City of Centralia v FERC, 213 F.3d 742, 749 (D.C Cir., 2000)), the Court of Appeals held that while "FERC is certainly empowered to require an applicant to conduct a study when there is some evidence of a problem and a study is necessary to determine the extent of the harm," an applicant does not have "a duty to determine if a problem exists." Since the Centralia decision, FERC has consistently noted that "where evidence of a problem has not been shown, the licensee does not have a duty to perform studies to determine whether a problem exists." City of Jackson, Ohio, 105 F.E.R.C, ¶61,136 n. 9 (2003); see FPL Energy Maine Hydro, LLC, 95 F.E.R.C. ¶61,106 n.15 (2001); Allegheny Energy Supply Company, LLC, 109 F.E.R.C. ¶61,028, 61,117 (2004).

There is no evidence of a problem and/or the study request is an attempt to search for the existence of a "nexus": This is related to the reasoning above in that the requestor indicates the possibility of or suspects there is a resource impact, but needs a study to determine if a Project effect actually exists. If the study request is an attempt to search for a Project effect, then it does

not meet the criteria for a study request. As indicated above, the courts have found that an applicant could be required to conduct a study when there is evidence of a problem and a study is necessary to determine the extent of the impact. The Court of Appeals further held in Centralia v FERC that it is not enough to speculate that a problem may exist or that the "evidence" of a problem is simply based on a "prediction based on opinions."

Study request constitutes basic research and/or is not likely to inform the development of license conditions: FERC policy and regulations indicate that a study requestor must specify how the results of the study will inform the development of license conditions. It is not the purpose of relicensing to begin or support programs of multi-year research at an applicant's expense, and studies should recognize the timeframes available under the ILP. A study request must show how the results of the study will provide information relevant to potential PM&E measures and not just contribute to general knowledge of a resource.

Study request does not propose a specific methodology, proposes a methodology that is untried or uncertain, or proposes a methodology that will not meet the stated objective or yield the intended results: A study request should identify a specific methodology for performing the requested work. If such methodology is untried, or is unlikely to obtain the information needed, then the study request is not able to be adopted because of a lack of a clear scope of effort, or an alternate methodology may be proposed by the applicant.

Study request is not necessary because existing information is sufficient to answer the questions posed: FERC policy and regulations indicate that if existing information is sufficient to understand the Project effects on the subject resource, then additional study is not needed.

Specifically related to the Rumford Falls Project, the following requested studies were deemed by RFH as not appropriate for study for the reasons explained below.

Brown Trout and Rainbow Trout Telemetry Study

The MDIFW requested a telemetry study to document the seasonal movements of stocked trout in the Androscoggin River sections immediately above and below the Project site. As specified in the MDIFW comments, brown and rainbow trout presence within the Androscoggin River in the

vicinity of the Project is driven by annual stockings with some contribution from holdover fish. Specifically, the MDIFW study request looks to (1) collect biometric data to characterize brown and rainbow trout population dynamics, (2) evaluate movement and behavior of newly stocked brown and rainbow trout, (3) evaluate movement and behavior of older-age brown and rainbow trout, (4) evaluate potential Project effects on movement and behavior of stocked brown and rainbow trout, and (5) aid fisheries managers in determining cause of decline in brown and rainbow trout above and below the Project.

RFH respectively disagrees with the need to conduct this study, since the study request does not meet the seven criteria required by FERC in 18 CFR §5.9(b). Specifically, there is no nexus between Project operations and effects to the presence or abundance of seasonally stocked trout in the Project area. Article 401 of the current FERC license requires the Licensee to operate in a run-of-river mode within 1 foot of full pond elevation at the Upper and Middle Dam impoundments. The Licensee has operated the Project in this manner since the last license was issued in 1994. The MDIFW states that brown and rainbow trout fisheries in the upper Androscoggin River collapsed in 2005 and have been unable to rebound since that time. MDIFW suggests that changes in Project discharges over time could be a contributing factor to that decline. However, the seasonal pattern of Project discharges has not changed during the current license period since 1994. Although MDIFW expresses concern related to understanding the movements of both trout species above and below the dams, no rationale or evidence is provided on how the Project may impact stocked individuals. In addition to the lack of Project nexus, it remains unclear how this study would inform the development of license requirements as defined in 18 CFR 5.9(b)(5).

Minimum Flow Analysis

In response to the MDIFW request for a Minimum Flow Analysis for the reach from the middle dam downstream to the confluence with the lower station tailrace, RFH has reviewed available information on the fishery and habitat characteristics of the Rumford Falls bypass reach (Main 1989) and has come to the conclusion that an Instream Flow Study proposed by MDIFW is not justified, for the reasons discussed below.

The C.T. Main (1989) study[5] involved an assessment of fish habitat values in the lower bypass reach of the Project (FERC No. 2333). Downstream of Middle Dam, the longer (920 feet) bedrock falls and cascades located in the middle of the lower bypass reach does not contain any suitable or persistent habitat for rearing or spawning life-stages of any game or non-game fish species inhabiting the Project area. For the reach from this bedrock falls and cascade, upstream to Middle Dam, the Main (1989) assessment further concluded that this 1,400-foot pool habitat does not provide quality habitat for fish or for recreational fishing. Although RFH believes this pool habitat does in fact provide some suitable juvenile or adult rearing habitat for various pool-dwelling species, this habitat lacks suitable spawning habitat, such as clean gravel substrates for trout, bass, and fallfish, or rooted aquatic vegetation for perch or pickerel. Given that conditions have remained unchanged, this lack of suitable spawning habitat, in combination with the migration barriers upstream (i.e., the dam) and downstream (i.e., the lower bedrock falls and cascades) of the pool, restricts the development of a healthy and stable resident population. As noted in Main (1989), the limited access and steep banks of this habitat also restricts angler use and safety in comparison to more accessible locations outside of the Project bypass reaches. Access conditions remain unchanged since the initial assessment.

Assessing flow requirements in this pool habitat using Physical Habitat Simulation (PHABSIM) or other quantitative flow analysis is also unjustified because of the relatively insensitive nature of pools to managed flow releases. The abrupt and dramatic change in habitat formed by the bedrock lip of the cascade will effectively constrain water surface elevations in the upstream pool habitat. Minor to moderate changes in flow will have minimal effect on the depth and velocity characteristics of the pool habitat due to this dominating hydraulic control, and this insensitivity to flow changes makes the application of an incremental instream flow study of limited utility. Only very large changes in flow, akin to spill events, would be expected to result in significant changes in the amount or quality of fish habitat, and such changes are beyond the scope of this Project.

Unlike the Main (1989) assessment, the downstream 350 feet of the lower bypass reach (from the bedrock falls and cascades to the Lower Station [powerhouse]) may contain suitable habitat for

[5] According to C.T. Main (1989), the study plan for this study was submitted to and reviewed by the appropriate agencies (i.e., MDIFW and USFWS) and determined to be adequate in scope.

juvenile and adult rearing for several fish species. In particular, the lowermost bedrock pool along the northwest river bank may provide both habitat and fishing opportunities for bass and sunfish, and the riffle habitat on the southeast river bank may provide habitat for white suckers or trout; however, neither habitat is likely to contain suitable spawning habitat for bass, fallfish, or trout. Although assessing flow:habitat relationships in this lower end of the lower bypass reach is feasible, the short length (350 feet) and the small overall percentage that this habitat represents in the Project area (11% by length, or approximately 15% by area) does not, in RFH's view, justify the utility of an incremental flow study, such as the PHABSIM analysis requested by MDIFW (2020).

3.2 Deviations from Requested Studies

There are no notable deviations from requested studies in the proposed study plans, with the exception of the following:

- Historic Architectural Survey

FERC requested a historic architectural survey of all Rumford Falls Project components that have become historic (50 years or older) since the previous licensing of the Project. FERC also requested the study be prepared in consultation with the Maine SHPO, which require components that are 45 years or older be included within the survey. Therefore, we proposed to conduct a historic architectural survey of Project components 45 years of age or older, consistent with the Maine SHPO protocol.

- Water Quality Study Plan

The MDEP requested RFH either conduct an Impoundment Aquatic Habitat Study and an Outlet Stream Aquatic Habitat Study in the lower bypass reach, as well as the tailrace, or provide three years of impoundment elevation data for the Upper Dam impoundment and inflow/outflow data for MDEP analysis. In lieu of conducting an Impoundment Aquatic Habitat Study and the Outlet Stream Aquatic Habitat Study in the lower bypass reach, RFH is providing the requested data. This data is graphically provided in the Water Quality Study Plan and will be submitted to the MDEP concurrent with the filing of this PSP.

Section 4
Proposal for Study Plan Meeting

Pursuant to 18 CFR §5.11(e) of the Commission's ILP regulations, RFH will hold a PSP Meeting for the purpose of clarifying the PSP, explaining any initial information gathering needs, and, as applicable, resolving outstanding issues associated with the proposed studies. The Commission's regulations and the Process Plan and Schedule require RFH to conduct a PSP Meeting within 30 days of the filing of this PSP. Accordingly, RFH will hold the PSP Meeting on April 7, 2020, at the Rumford Town Offices in Rumford, Maine. Additional details regarding the meeting are presented below.

Date: Tuesday, April 7, 2020

Time: 10:00 AM

Location: Rumford Town Offices
145 Congress Street
Rumford, Maine 04276

For additional information, please contact:

Luke Anderson
Licensing Specialist
Brookfield Renewable
150 Main Street
Lewiston, ME 04240
Telephone: 207-775-5613
E-mail: Luke.Anderson@BrookfieldRenewable.com

Section 5
Schedule for Conducting Proposed Studies

RFH proposes to conduct the studies described in this PSP in accordance with the master study schedule presented in Table 5-1 below. All studies will be conducted in 2020 or 2021 and RFH will distribute a progress report required pursuant to 18 CFR §5.15(b) to appropriate resource agencies, Project stakeholders, and the Commission.

The final technical study reports prepared for each study will be filed with the Commission in the Initial Study Report (ISR) on or before August 7, 2021. Any studies occurring in study year two would be issued under the Updated Study Report (USR) on or before August 7, 2022.

TABLE 5-1
SCHEDULE FOR CONDUCTING PROPOSED STUDIES[1]

Activity	Date
File PSP with FERC	March 10, 2020
Hold Initial Study Plan Meeting and Site Visits	April 7, 2020
Stakeholders File Comments on PSP with FERC	June 8, 2020
File RSP with FERC	July 8, 2020
Stakeholders File Comments on RSP with FERC	July 23, 2020
FERC Issues Study Plan Determination Letter	August 7, 2020
Water Quality Study[2]	2020
Angler Creel Survey[3]	2020
Recreation Study	2020
Historic Architectural Survey	2020
2020 Progress Report	November 1, 2020
File ISR with FERC	August 7, 2021
Hold ISR Meeting	August 22, 2021
File ISR Meeting Summary with FERC	September 6, 2021
Stakeholders File Study Disagreements and Requests to Modify Study Plans	October 6, 2021
File Responses to Disagreements/Modified Study Requests	November 5, 2021
FERC Resolves Disagreements	December 5, 2021
Conduct Second Season of Studies (if necessary)	2022
File USR (if necessary)	August 7, 2022
Hold USR Meeting (if necessary)	August 22, 2022
File USR Meeting Summary with FERC (if necessary)	September 6, 2022
Stakeholders File Study Disagreements and Requests to Modify Study Plans	October 6, 2022
File Responses to Disagreements/Modified Study Requests	November 5, 2022
FERC Resolves Disagreements	December 5, 2022
File Preliminary Licensing Proposal or Draft License Application	May 3, 2022

Activity	Date
Stakeholders File Comments on Preliminary Licensing Proposal or Draft License Application with FERC	August 1, 2022
File Final License Application with FERC	September 30, 2022
Issue Public Notice of Final License Application Filing	October 14, 2022

[1] Shaded milestones are unnecessary if there are no study disputes. If a due date falls on a weekend or holiday, the due date is the following business day.

[2] Completion of the Water Quality Study in 2020 is dependent on review and approval of the associated study plan by the MDEP.

[3] Completion of the Angler Creel Survey in 2020 is dependent on review and approval of the associated study plan by the MDIFW.

Section 6
Literature Cited

Federal Energy Regulatory Commission (FERC). 2019. Scoping Document 1 for the Rumford Falls (P-2333-091) Hydroelectric Project. November 19, 2019.

Main, C.T. 1989. Field Investigations at the Bypassed Reaches of the Rumford Falls Project FERC No. 2333. Prepared for Rumford Falls Power Company. July.

APPENDIX A
STUDY REQUEST LETTERS

TOWN OF Rumford
OFFICE OF THE TOWN MANAGER

145 Congress Street
Rumford, Maine 04276
(207) 364-4576 Ext. 212
(207) 364-5642 Fax

Mr. Ryan Hansen
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426
Docket Number: P-2333-091

January 17, 2020

Dear Mr. Hansen,

The following written comment is submitted for the record by the Town of Rumford, Maine with regards to the relicensing process of the Rumford Falls Hydroelectric Project (FERC No. 2333).

In order to provide for a permanent and stable solution to the question of recreational use of the facilities within the project boundary the Town of Rumford believes that it is in the best interest of the public for the Federal Energy Regulatory Commission to direct the establishment of a formal, written recreation plan in accordance with established policies and procedures of the Commission for the establishment of such plans.

The Town notes the recent closure of the Falls Hill Trail (formerly South Rumford Road), and West Viewing Area amenities and other access issues which have contributed to concerns in regards to protecting the public interest.

The Town also notes a desire for aesthetic improvements at Veterans Park which at one time had ornamental fencing (two panels of which remain to this day) and requests a return and replacement of existing dilapidated chain link fencing with new ornamental fencing.
The Town also notes the recent establishment of a hand carry boat launch for paddle craft at Hastings Landing on US Route 2 in Rumford Center. Hastings Landing is open to the public and operated by the Mahoosuc Land Trust. At the moment it appears that this facility is missing from project maps.

Finally, the Town notes the 2013 Rumford Comprehensive Plan which as adopted states the following in regards to recreation, "Outdoor recreation assets and opportunities can play a role in the economic diversification in Rumford and region." (Rumford Comprehensive Plan 2013, Page 104)

Outdoor recreation has been clearly and formally recognized by the people of the Town of Rumford as a critical means to providing for economic sustenance. Given the importance of outdoor recreation to the future of Rumford's economic development it is imperative that the Town's best recreation assets remain open and accessible to the public to every extent possible. Several prime assets, the Falls Hill Trail in particular are within the project boundaries and currently closed to the public.

This letter summarizes the most significant issues at hand in the current relicensing process for the Rumford Falls Hydroelectric Project. The Town notes that other smaller questions and concerns may arise over the course of the relicensing process and looks forward to communicating with all parties concerned.

We appreciate your consideration and concern for the needs of our community.

Sincerely,

Stacy L. Carter

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, DC 20426
January 21, 2020

OFFICE OF ENERGY PROJECTS

Project No. 2333-091- Maine
Rumford Falls Hydroelectric Project
Rumford Falls Hydro, LLC

Luke Anderson
Brookfield Renewable
150 Main Street
Lewiston, ME 04240

VIA FERC Service

Reference: Requests for Studies and Additional Information

Dear Mr. Anderson:

After reviewing the Pre-Application Document (PAD) for the Rumford Falls Hydroelectric Project, staff have determined that studies on water quality and cultural resources are likely needed. The study requests are discussed in the enclosed Schedule A. Additionally, staff have identified a need for certain additional information which is included in Schedule B. Unless otherwise specified, the additional information should be included with your proposed study plan, which needs to be filed on or before March 10, 2020.

Please include in your proposed study plan a master schedule that includes the estimated start and completion date of all field studies, when progress reports will be filed, who will receive the reports and in what format, and the filing date of the initial study report. All studies, including field work should be initiated and completed during the first study season, and the study reports should be filed as a complete package to avoid piecemeal review. Finally, if you are likely to propose any plans for measures to mitigate project impacts, drafts of those plans should be filed with the initial study report.

If you have any questions, please contact Ryan Hansen at (202) 502-8074, or via e-mail at ryan.hansen@ferc.gov.

Sincerely,

David Turner, Chief
Northwest Branch
Division of Hydropower Licensing

Enclosure: Schedule A
Schedule B

STUDY REQUESTS

After reviewing the information in the PAD, we have identified a gap between the information in the PAD and the information needed to assess project effects. As required in section 5.9 of the Commission's regulations we have addressed the seven study request criteria for each of the study requests that follow.

Water Quality Monitoring

Criterion (1) – Describe the goals and objectives of each study proposal and the information to be obtained.

The goal of this study is to provide information sufficient to enable staff to understand current water quality conditions at the project and assess any effects of project operation on dissolved oxygen and temperature in upper impoundment, Middle Dam impoundment, and downstream of the lower development. The study plan should be developed in consultation with the Maine Department of Environmental Protection (Maine DEP).

Criterion (2) – If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resources to be studied.

Not applicable.

Criterion (3) – If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study.

Sections 4(e) and 10(a) of the Federal Power Act require that the Commission give equal consideration to all uses of the waterway on which a project is located. When reviewing a proposed action, the Commission must consider the environmental, recreational, fish and wildlife, and other non-developmental values of the project, as well as power and developmental values.

Criterion (4) – Describe existing information concerning the subject of the study proposal and the need for additional information.

The PAD contains limited water temperature and dissolved oxygen data from four sites in the vicinity, none of which is closer than one river mile from the project. The PAD includes 24 days of temperature data and 28 days of dissolved oxygen data taken 10 miles upstream of the Upper Dam between 1995 and 2017. Also included are 7 days of temperature data collected two miles downstream of the lower development collected in 2017 and one dissolved oxygen measurement taken in 2008 one mile downstream of the lower development. While this data is useful, staff need additional information on

current water quality collected near the project to assess whether continued project operation could affect water quality.

Criterion (5) – Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements.

The two project dams impound the river, slowing the flow of water through the project reach. This can affect DO and temperature levels which in turn affect aquatic biota and habitat. Current water quality data are necessary to establish a baseline against which proposed or required enhancements may be compared, as well to determine if project operation could affect water quality.

Criterion (6) – Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge.

If the information is not already available from other studies, standard sampling methodologies such as in-situ water quality monitors or grab samples should be used to measure dissolved oxygen and temperature in both project impoundments, as well as downstream of the lower development.

Criterion (7) – Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.

Staff recommend summer season sampling (June, July, August) at one location in the upper impoundment, one location in the Middle Dam impoundment, and one location downstream of the lower development. In the upper and Middle Dam impoundments, dissolved oxygen and temperature should be monitored at the surface, middle water column, and bottom at a location near the center of the reservoir. The same parameters should be monitored downstream of the lower development during the summer immediately below the lower tailrace. Staff estimate that this sampling and reporting would cost approximately $20,000. The specific methodology and scope can be refined during a study plan meeting(s).

Historic Architectural Survey

Criterion (1) – Describe the goals and objectives of each study proposal and the information to be obtained.

The goal of this study is to identify and determine the potential effects of continued project operation and maintenance on historic architectural resources that have become historic over the course of the existing license for the Rumford Falls Project and

are eligible for the National Register of Historic Places (National Register). The study and study report should be prepared after consultation with the Maine State Historic Preservation Officer (Maine SHPO). The specific objectives of the study and subsequent report are to:

(1) Conduct a historic architectural survey of all Rumford Falls project components that have become historic (50 years or older) since the previous licensing of the project.
(2) Identify all components that are 50 years or older.
(3) Assess the National Register-eligibility of each identified historic component.
(4) Evaluate the potential effects of continued operation and maintenance on each identified historic component.

Criterion (2) – If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied.

Not applicable.

Criterion (3) – if the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study.

Section 4(e) and 10(a) of the Federal Power Act require that the Commission give equal consideration to all uses of the waterway on which a project is located. When reviewing a proposed action, the Commission must consider the environmental, recreational, fish and wildlife, and other non-developmental values of the project, as well as power generation and other developmental values.

Cultural resources are resources of particular interest to the public. Preserving and protecting cultural resources provides a venue for understanding our Nation's past and respecting the various cultures of this county. Project operation and maintenance may affect the value and integrity of National Register-eligible historic properties in the vicinity of the project. Ensuring that potential measures associated with cultural resources are analyzed is relevant to the Commission's public interest determination.

Furthermore, pursuant to section 106 of the National Historic Preservation Act (section 106), the licensing of the proposed project would be a federal undertaking and a license issued by the Commission would permit activities that may "…cause changes in the character or use of historic properties, if any such historic properties exist…"[1] The Commission must, therefore, comply with section 106, which requires the head of any federal department or independent agency having authority to license an undertaking to take into account the effect of the undertaking on historic properties. In the case of this project, assessment of historic properties would be conducted in consultation with the Commission, the Maine SHPO, and other interested parties.

[1] *See* 36 C.F.R. § 800.16(d) of the regulations implementing section 106.

Criterion (4) – Describe existing information concerning the subject of the study proposal, and the need for additional information.

The PAD states that the Rumford Falls project facilities were evaluated during the previous licensing proceeding, but none were found to be eligible for listing on the National Register. It is possible, however, that some project components have become historic since this time and therefore might be eligible. Therefore, all components of the project that have become 50 years or older during the current license term need to be identified and evaluated for National Register eligibility, and, if eligible, assessed for project-related effects so that the nature and extent of potential project effects and measures to avoid, lessen, or mitigate adverse effects can be properly determined.

Criterion (5) - Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements.

Section 106 requires that federal agencies take into account the effect of proposed undertakings on any district, site, building, structure, or object that is included in or eligible for the National Register. Operation and maintenance of project facilities could adversely affect historic properties through ground-disturbing activities and cause other indirect adverse effects on historic properties.

An evaluation of the Rumford Falls facilities for eligibility and project effects would provide updated information on historic resources located at the project sites. If appropriate, an applicant-prepared historic properties management plan (HPMP), would be needed to avoid, lessen, or mitigate any adverse effects on the National Register-eligible project facilities. A draft and final HPMP, if necessary, should be filed with the preliminary licensing proposal and the final license application, respectively.

Criterion (6) – Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge.

The scope of work that would be required to complete a Historic Architectural Survey and evaluate the National Register-eligibility of each historic project component would be identified through consultation with the Maine SHPO and other interested parties. Prior to conducting the survey and completing a survey report, the applicant should consult with the Maine SHPO on: (a) methods and techniques on how the survey should be conducted; (b) anticipated effects (direct and indirect) on each project component; (c) whether each identified project component is considered eligible for the National Register, and (d) any other relevant details involving the survey and report. All

methods used to conduct the survey and National Register-eligibility evaluation should conform to the Maine SHPO guidelines.[2]

A preliminary report on the survey should be completed after the field inventory phase. At a minimum, this report should be reviewed by the Maine SHPO and the Commission. The applicant should seek concurrence from the Maine SHPO on its determination of whether or not each project component is considered eligible for the National Register. The applicant should also seek concurrence from the Maine SHPO on what, if any, adverse effects may occur on each project component as a result of project operation and/or maintenance, or project-related activities.

The evaluation of project effects on each historic project component should include both site-specific effects and indirect effects. The report should also be kept confidential and filed with the Commission and other consulting parties as "privileged," a non-public document.

If any historic project component would be adversely affected by continued operation or maintenance of the project or from project-related activities, then an HPMP should be developed after consultation with the Maine SHPO, and other interested parties. When developing an HPMP the generally acceptable practice is to use the "Archaeology and Historic Preservation: Secretary of the Interior's Standard and Guidelines" (*Federal Register,* September 29, 1983, Vol. 48, No. 190, Park IV, pp. 44716-11740) and the Advisory Council of Historic Preservation and Commission's "Guidelines for the Development of Historic Properties Management Plans for FERC Hydroelectric Projects" [3] (issued May 20, 2002).

Criterion (7) – Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.

The anticipated cost for the historic architectural survey is estimated to be about $20,000.

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[2] Survey methodology should conform to the guidelines provided at https://www.maine.gov/mhpc/programs/project-review, unless the Maine SHPO provides alternative guidance.

[3] This document was issued jointly by the Commission and the Advisory Council on Historic Preservation on May 20, 2002. The document is available at http://www.ferc.gov/industries/hydropower/gen-info/guidelines/hpmp.pdf.

ADDITIONAL INFORMATION REQUESTS

1. On pages 5-10 of the PAD, you state that minor, local erosional undermining of the riverbanks of the Upper Dam impoundment is occurring but that the erosion and slumping that currently occurs is unavoidable and the adverse impacts are minor in nature. On pages 6-1 and 6-2, you do not propose any studies related to the erosion or slumping and you state that no change to geology and soils would be expected. We are aware of the erosion monitoring associated with identified cultural sites that occurred since 2015, but we are not aware of any other information of how much erosion may occurring in the upper impoundment or where. Please explain how you concluded that the adverse impacts of the local erosional undermining are minor in nature.

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

JANET T. MILLS
GOVERNOR

GERALD D. REID
COMMISSIONER

January 25, 2020

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

RE: Comment on Pre-Application Document and Study Request
Rumford Falls Hydroelectric Project (FERC No. 2333)

Dear Secretary Bose:

The Maine Department of Environmental Protection (Department) received and reviewed the Notice of Intent (NOI) to File License Application and Pre-Application Document (PAD), submitted on September 27, 2019, by Rumford Falls Hydro (Applicant), for the Rumford Falls Hydroelectric Project (Project) (FERC No. 2333). Department staff attended a project facilities site visit on October 24, 2019 and a joint agency meeting on December 17, 2019. Staff also reviewed appropriate project documents to prepare the following comments and study requests.

The proposed relicensing of the Rumford Falls Hydroelectric Project is subject to the water quality certification provisions of Section 401 of the Federal Water Pollution Control Act (a.k.a. Clean Water Act). By Executive Order of the Governor of the State of Maine, the Department is the certifying agency for project located wholly or partially in organized towns and cities, and as such has jurisdiction over the Project.

The existing Rumford Falls Project is comprised of two generating stations. The Upper Station Development consist of a concrete gravity dam with a 464-foot-long, 37-foot-high ogee type spillway section with a crest elevation of 598.74 feet, topped with a 32-inch-high, pin-supported wooden flashboards; a forebay about 2,300 feet long by 150 feet wide; a gatehouse with eight headgates (two headgates for each of the four penstocks), trashracks, and other appurtenant equipment; underground steel-plate penstocks, each approximately 110 feet long, three being 12 feet in diameter and one being 13 feet in diameter; a masonry powerhouse integral with the dam which include the Old Station, equipped with one horizontal generating unity with a capacity of 4,300 kW, and the New Station, equipped with three vertical generating units, two with a capacity of 8,100 kW each and one with a capacity of 8,800 kW; an impoundment with a gross storage capacity of 2,900 acre-feet and a surface area of about 419 acres at a normal maximum headwater elevation of 601.24 feet and tailwater elevation of 502.74 feet; four overhead 11.5-kilovolt (kV) transmission lines; and appurtenant features. The Lower Station Development consists of a rock-filled, wooden-cribbed, and concrete-capped Middle Dam, having a 328.6 -foot-long, 20-foot-high gravity spillway section with a crest elevation of 502.74 feet with 16-

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inch-high, pin-supported, wooden flashboards; a Middle Canal concrete headgate structure, located adjacent to the dam, approximately 120 feet long, with 10 steel headgates and a waste weir section perpendicular to the headgate structure, about 120 feet long with a crest elevation of 502.6 feet with 10-inch-high flashboards; a Middle Canal approximately 2,400 feet long, with width ranging from 75 to 175 feet and a depth from 8 to 11 feet; a gatehouse containing two headgates, trashracks, and other appurtenant equipment; two 12-foot-diameter, steel-plat penstocks, each extending approximately 815 feet to two cylindrical surge tanks, each abou8t 36 feet in diameter by 50.5 feet high, and the penstocks continuing an additional 77 feet to the powerhouse; a masonry powerhouse, equipped with two vertical generating units, each with 7,600 kW capacity; an impoundment with a gross storage capacity of 141 acre-feet and a surface area of approximately 21 acres at a normal maximum headwater elevation of 502.7 feet and tailwater elevation of 423.24 feet; eight 600-foot-long 11.5 kV generator leads; and appurtenant facilities.

Comments on PAD

The Department appreciates the effort that Rumford Falls Hydro, LLC and their consultants have made to prepare the PAD. The PAD provides an understanding of the project, the surrounding resources, and proposed Project operations. The PAD provides information about the Project that allows resource agencies to identify issues related to relicensing.

No changes to Project operations are proposed in the PAD; however, if operational changes are contemplated in its final license application additional studies and data may be required to establish conformance with Maine's water quality standards.

Water Quality Classifications and Standards

Water Quality Standards and the water quality classifications of all surface water of the State have been established by Maine Legislature (38 M.R.S. §§ 464-467). The following classifications apply to the water affected by the Rumford Falls Project.

Androscoggin River, main stem, including all impoundments.

(b) From its confluence with the Ellis River to a line formed by the extension of the Bath-Brunswick boundary across Merrymeeting Bay in a northwesterly direction – Class C.

Class C water must be of such quality that they are suitable for the designated uses of drinking water supply after treatment; fishing; agriculture; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation except as prohibited under Title 12, section 403; navigation; and as habitat for fish and other aquatic life.

The dissolved oxygen content of Class C waters shall be not less than 5 parts per million or 60% of saturation, whichever is higher, except that in identified salmonid spawning areas where water quality is sufficient to ensure spawning, egg incubation and survival of early life stages, that water quality sufficient for these purposes must be maintained. In order to provide additional protection for the growth of indigenous fish, the following standards apply.

(1) The 30-day average dissolved oxygen criterion of a Class C water is 6.5 parts per million using a temperature of 22 degrees centigrade or the ambient temperature of the water body, whichever is less, if:
   a. A license or water quality certification other than a general permit was issued prior to March 16, 2004 for the Class C water and was not based on a 6.5 parts per million 30-day average dissolved oxygen criterion; or
   b. A discharge or a hydropower project was in existence on March 16, 2005 and required but did not have a license or water quality certificate other than a general permit for the Class C water.

   This criterion for the water body applies to the licenses and water quality certificates issued on or after March 16, 2004.

(2) In Class C waters not governed by subparagraph (1), dissolved oxygen may not be less than 6.5 parts per million as a 30-day average based upon a temperature of 24 degrees centigrade or the ambient temperature of the water body, whichever is less. This criterion of the water body applies to licenses and water quality certificates issued on or after March 16, 2004.

Discharges to Class C waters may cause some changes to aquatic life, except that the receiving waters must be of sufficient quality to support all species of fish indigenous to the receiving waters and maintain the structure and function of the resident biological community.

The State's anti-degradation policy provides that water quality certification may be approved only if the applicable standards of classification of the affected water body are met, and existing in-stream uses and the level of water quality necessary to protect those existing uses are maintained and protected.

Water Quality Certification Data Requirements

In Section 6.1.2.2 (Water Resources, Proposed Studies), Rumford Falls Hydro, LLC indicates its intent to conduct water quality studies in cooperation with the Department and other stakeholders. It has been the Department's practice to determine specific metrics, methods, timing and duration of water quality monitoring and measurement necessary to ensure that the water quality data collected to demonstrate that the Project meets water quality standards under proposed operating conditions meets data quality objectives. The Department requests that Rumford Falls Hydro, LLC design the water quality studies to include the following parameters and follow the Department's established sampling protocols in support of water quality certification.

Impoundment Trophic State Studies – Water quality data presented in the PAD for the Rumford Falls Project does not indicate that data was collected from the deepest location within the impoundments (upper impoundment and lower impoundment), in accordance with the Department's *Sampling Protocol for Hydropower Studies* (September 2019), and therefore is insufficient to demonstrate that each of the impoundments exhibit a steady or improving trophic state; therefore, the Department is requesting that an Impoundment Trophic State Study be conducted in each of the two Project impoundments to determine if Maine's water quality standards are met. Sampling Protocols, including sample collection and analysis parameters, are

provided under "Lakes, Ponds, and Impoundments" in *Sampling Protocol for Hydropower Studies* (September 2019), which is attached to this letter.

Impoundment Aquatic Habitat Studies – The purpose of this study is to determine the effect of impoundment drawdowns on the impoundment's littoral zone and the ability of the impoundment to support fish and other aquatic life. The Rumford Falls Project is reportedly operated in run-of-river mode but it's upper spillway has an inflatable Obermayer spillway system (rubber dam) in addition to 32-inch-high wooden flashboards that could, potentially, lower the impoundment water level as much as 32 inches rather than the 1-foot water level fluctuation that defines run-of-river operations. Therefore, certain operating conditions at the upper spillway can affect the littoral zone and its ability to support fish and other aquatic life. The Applicant must demonstrate that water level fluctuations associated with operations do not adversely impact aquatic life and habitat standards, and so must conduct an Impoundment Aquatic Habitat Study in the upper impoundment following the "Habitat Study" protocol under Lake, Ponds, and Impoundments" in *Sampling Protocol for Hydropower Studies* (September 2019), which is attached to this letter or, alternatively, provide three years of impoundment elevation and inflow/outflow data for the Rumford Falls Hydro Project for Department analysis. The Department understands that the lower impoundment water level fluctuations are limited to one foot in conformance with run-of-river operations and so no adverse effects on littoral habitat within the impoundment are expected; if this is not the case and water levels in the lower impoundment also fluctuate more than one foot, an Impoundment Aquatic Habitat Study will also be necessary in the lower impoundment.

Temperature and Dissolved Oxygen Monitoring – The PAD indicates that dissolved oxygen (DO) measured in 1991 met Class C water quality standards. The PAD does not propose DO monitoring, but indicates that Rumford Falls Hydro, LLC will coordinate with the Department to collect water quality data to support water quality certification, which the Department finds must include DO monitoring. DO data must be collected in accordance with the Department's "Temperature and Dissolved Oxygen Study" under "Rivers and Streams" in the *Sampling Protocol for Hydropower Studies* (September 2019), which is attached to this letter. Temperature and DO monitoring must be conducted in the bypass reach below the middle dam, and in the free-flowing tailwater reach below the confluence of the bypass reach and the lower powerhouse discharge.

Benthic Macroinvertebrate Studies – Assessment of the macroinvertebrate community is critical to determine whether current in-stream flow releases are affecting attainment of classification standards for habitat and aquatic life in the river below the dams. Rumford Falls Hydro, LLC did not propose to study benthic macroinvertebrates, but indicated it would coordinate with the Department to collect water quality data in support of water quality certification, which the Department finds must include benthic macroinvertebrate studies. To ensure data meets WQC compliance objectives, the study plan must be developed in accordance with the Department's *Methods for Biological sampling and Analysis of Maine's Rivers and Streams* (revised April 2014), which is attached to this letter. Benthic Macroinvertebrate monitoring must be conducted in the bypass reach below middle dam, and in the free-flowing tailwater reach downstream of the confluence of the bypass reach and the lower powerhouse discharge.

Outlet Stream Aquatic Habitat Study – This study evaluates whether current in-stream flow releases are affecting attainment of habitat standards for fish and other aquatic life in the river downstream of the dams. It is the Department's position that there must be both sufficient quality and quantity of habitat for aquatic organisms to meet the aquatic life and habitat standards. The Department has found that, generally, flows providing wetted conditions in a weighted average of 3/4th of the cross-sectional area of the affected river or stream, as measured from bankfull conditions, are sufficient to meet aquatic life and habitat standards. Rumford Falls Hydro, LLC indicated it would coordinate with the Department to collect water quality data in support of water quality certification, which the Department finds must include an outlet stream habitat study, in the form of a cross-section flow study as described in the "Habitat and Aquatic Life Studies" section under "Rivers and Streams" in the *Sampling Protocol for Hydropower Studies* (September 2019), which is attached to this letter. The outlet stream aquatic habitat study must be conducted in the bypass reach below middle dam to demonstrate that minimum flows to the bypass reach are adequate to provide habitat for fish and other aquatic species. An outlet stream habitat study is not required downstream of the upper dam because the bypass reach primarily consist of ledge and habitat in that reach is limited, with no free-flowing reach between the ledge and impoundment.

In addition to meeting requirements of the water quality certification, the Department supports study requests prepared by other natural resource agencies including, but not limited to, US Fish and Wildlife Service (USFWS), Maine Department of Inland Fish and Wildlife (MDIFW), and Maine Department of Marine Resources (MDMR).

Thank you for the opportunity to comment on the Pre-Appliction Document and Scoping Document for the Rumford Falls Project. Please direct any questions regarding these comments and study requests to my attention at Kathy.Howatt@maine.gov or 207-446-2642.

Sincerely,

Kathy Davis Howatt
Hydropower Coordinator

cc: Randy Dorman, Brookfield Renewable (email)
Kelly Maloney, Brookfield Renewable (email)

Maine Department of Environmental Protection
Study Request
Rumford Falls Hydroelectric Project (FERC No. 2333)

Impoundment Trophic State Study

1. **Describe the goals and objectives of each study proposal and the information to be obtained.**
   Trophic state is an important indicator of water quality within the impoundment. Assessment of this criteria provides information to evaluate the health of the Rumford Falls impoundment and the impact of the dam structure and operation on the Androscoggin River. The objective of this study is to determine if the project impoundment meets Maine Water Quality Standards, including dissolved oxygen and the designated use of recreation in and on the water. As noted below and in the Department's PAD comments, the trophic state study is required because the project impounds the Androscoggin River over a surface area of approximately 419 acres with a reported storage capacity of 2,900 acre-feet. This study will assess whether the trophic state of the impoundment is stable improving.

2. **If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied.**
   The resource management goal is to evaluate attainment of Maine Water Quality Standards pursuant to the provisions of the *Water Classification Program*, 38 M.R.S. Sections 464-468 and to certify attainment of such, with any necessary conditions, under Section 401 of the Federal Water Pollution Control Act (a.k.a. Clean Water Act).

3. **If the requestor is not a resource agency, explain any relevant public interest considerations in regard to the proposed study.**
   Requestor is a resource agency.

4. **Describe existing information concerning the subject of the study proposal, and the need for additional information.**
   Agency file review indicates there is insufficient data in support of these criteria for impounded waters upstream of the Rumford Falls dam. Rumford Falls Hydro proposes to conduct water quality studies in compliance with the MDEP standards. As described in the Department's PAD comment letter, the applicant will need to demonstrate that the project operations meet dissolved oxygen and other water quality standards in the impoundment. A trophic state study must be conducted to demonstrate attainment of Maine Water Quality Standards under the proposed operations.

5. **Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements.**
   Data collected will be used to identify the trophic state of impounded waters and may identify stratification effects on the dissolved oxygen within the impoundment. Information will be used to evaluate whether the project meets Maine water quality parameters, which will inform the water quality certification process.

6. **Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge.**
   The DEP Sampling Protocol for Hydropower Studies (most recently revised in September 2019) was established by Department staff and has been used successfully throughout the State by the DEP and others. A copy of the Department protocol is attached to the PAD comment letter.

7. **Describe considerations of level of effort and cost, as applicable, and why proposed alternative studies would not be sufficient to meet the stated information needs.**
   Trophic state samples are collected twice each month for five consecutive months during open water season. Costs are considered reasonable given that this study is required for Maine water quality certification and is routinely completed at hydropower projects being relicensed in the State. No alternatives to this study are proposed.

Maine Department of Environmental Protection
Study Request
Rumford Falls Hydropower Project (FERC No. 2333)

Impoundment Aquatic Habitat Study

1. **Describe the goals and objectives of each study proposal and the information to the obtained.**
   The objective of this study proposal is to determine if the project impoundment meets Maine Water Quality Standards for habitat and aquatic life criteria. Measurements of Secchi disk transparency are applied to determine the extent of the littoral zone of the impoundment and an assessment of the volume and surface area dewatered under normal operating conditions, including operations of the rubber dam, to determine if at least 75% of the littoral zone remains watered at all times. If the project operates as a run-of-river facility, the impoundment aquatic habitat study will not be required if the applicant submits at least three years of impoundment elevation and inflow/outflow data for the Rumford Falls Project.

2. **If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied.**
   The resource management goal is to ensure attainment of Maine Water Quality Standards pursuant to the provisions of the *Water Classification Program*, 38 M.R.S.A. Sections 464-468 and to certify attainment of such, with any necessary conditions, under Section 401 of the Federal Water Pollution Control Act (a.k.a. Clean Water Act).

3. **If the requestor is not a resource agency, explain any relevant public interest considerations in regard to the proposed study.**
   Requestor is a resource agency.

4. **Describe existing information concerning the subject of the study proposal, and the need for additional information.**
   Existing data indicates that the Rumford Falls Hydroelectric Project operates in run-of-river mode. The applicant does not propose to conduct any water quality studies in the PAD. As described in the Department's PAD comment letter, the applicant will need to submit a minimum of three years of impoundment water level and flow data to demonstrate run-of-river operations or must conduct an impoundment aquatic habitat study.

5. **Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements.**
   Data collected will identify drawdown effects on the littoral zone habitat. Information will be used to evaluate whether the project meets Maine's habitat and aquatic life criteria and designated use, which will inform the water quality certification process.

6. **Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate filed season(s) and duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge.**
   The DEP Sampling Protocol for Hydropower Studies (September 2019) was established by Department staff and has been used successfully throughout the State by the DEP and others. A copy of the Department protocol is attached to the PAD comment letter.

7. **Describe considerations of level of effort and cost, as applicable, and why proposed alternative studies would not be sufficient to meet the stated information needs.**
   The Impoundment Aquatic Habitat Study is a desktop study using data collected in the Trophic State Study. If required, an impoundment aquatic habitat study can be completed in one field season. Costs are considered reasonable given that this study is required for Maine water quality certification and is routinely completed at hydropower projects being relicensed in the State. No alternatives to this study are proposed.

Maine Department of Environmental Protection
Study Request
Rumford Falls Hydropower Project (FERC No. 2333)

Downstream Temperature and Dissolved Oxygen Study

1. **Describe the goals and objectives of each study proposal and the information to the obtained.**
   Temperature and dissolved oxygen (DO) are important indicators of water quality to ensure that discharges from the hydropower project are sufficient to maintain the resident biologic community downstream of the Rumford Falls dams. Assessment of temperature and DO data in the downstream reaches will be used to determine if the hydropower project meets Maine Water Quality Standards including Class C DO criteria.

2. **If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied.**
   The resource management goal is to ensure attainment of Maine Water Quality Standards pursuant to the provisions of the *Water Classification Program*, 38 M.R.S.A. Sections 464-468 and certify attainment of such, with any necessary conditions, under Section 401 of the Federal Water Pollution Control Act (a.k.a. Clean Water Act)

3. **If the requestor is not a resource agency, explain any relevant public interest considerations in regard to the proposed study.**
   Requestor is a resource agency.

4. **Describe existing information concerning the subject of the study proposal, and the need for additional information.**
   Dissolved oxygen concentrations downstream of the Rumford Falls dams must meet Maine water quality criteria for Class C waters. Agency file review indicates temperature and dissolved oxygen data is insufficient to assess attainment of these criteria. The PAD does not indicate that a study of this nature is planned for the project.

5. **Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements.**
   Data collected will be used to evaluate project effects on water temperature and DO concentrations in the Androscoggin River downstream of the Rumford Falls dams. Information will be used to evaluate whether the project meets Maine DO criteria for Class C waters and will inform the water quality certification process.

6. **Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate filed season(s) and duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge.**
   The DEP Sampling Protocol for Hydropower Studies (September 2019) was established by Department staff and has been used successfully throughout the State by the DEP and others. A copy of the Department protocol is attached to the PAD comment letter.

7. **Describe considerations of level of effort and cost, as applicable, and why proposed alternative studies would not be sufficient to meet the stated information needs.** The DEP Sampling Protocol for Hydropower Studies (September 2019) offers two options for the temperature and DO study that can be completed in one field season. Temperature and DO samples can be collected one day per week for at least 10 weeks or measured hourly using data sondes placed at designated locations during summer low flow, high water temperature conditions (e.g. July and August). The Department prefers the second method. Costs are considered reasonable given that this study is required for Maine water quality certification and is routinely completed at hydropower projects being relicensed in the State. No alternatives to this study are proposed.

Maine Department of Environmental Protection
Study Request
Rumford Falls Hydropower Project (FERC No. 2333)

Benthic Macroinvertebrate Study

1. **Describe the goals and objectives of each study proposal and the information to the obtained.**
   Assessment of the benthic macroinvertebrate community is critical to determine whether current in-stream flow releases affect attainment of Maine habitat and aquatic life criteria for Class C waters in the Androscoggin River below the Rumford Falls dams. The assessment provides biological data to evaluate potential impacts caused by project operations.

2. **If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied.**
   The resource management goal is to ensure attainment of Maine Water Quality Standards pursuant to the provisions of the *Water Classification Program*, 38 M.R.S.A. Sections 464-468 and certify attainment of such, with any necessary conditions, under Section 401 of the Federal Water Pollution Control Act (a.k.a. Clean Water Act)

3. **If the requestor is not a resource agency, explain any relevant public interest considerations in regard to the proposed study.**
   Requestor is a resource agency.

4. **Describe existing information concerning the subject of the study proposal, and the need for additional information.**
   The Androscoggin River must meet Maine aquatic life criteria in the vicinity of the Rumford Falls Project. Agency file review indicates data is insufficient to evaluate the current aquatic community in the bypass and tailrace reaches downstream of the Rumford Falls dams. However, as noted in Department PAD Comment 1, the Department will only require benthic macroinvertebrate sampling in the tailrace reach given the dominance of bedrock in the bypass reach. The PAD does not indicate that a study of this nature is planned for the project.

5. **Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements.**
   Data collected will be used to evaluate the benthic macroinvertebrate community in the tailrace reach downstream of the Rumford Falls dams. Information will be used to evaluate whether the project meets Maine aquatic life criteria and will inform the water quality certification process.

6. **Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate filed season(s) and duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge.**
   The DEP Methods for Biological Sampling and Analysis of Maine's Rivers and Streams (August 2002, revised April 2014) was established by Department staff and has been used successfully throughout the state by DEP and others since 1983. A copy of the Department manual is attached to the PAD comment letter.

7. **Describe considerations of level of effort and cost, as applicable, and why proposed alternative studies would not be sufficient to meet the stated information needs.**
   Replicate benthic macroinvertebrate sample collectors (rock baskets or cones) are deployed for a 28-day study period in the tailrace reach of the hydropower project during low flow, high temperature conditions. Samples must be collected by a professional aquatic biologist and evaluated by a professional freshwater macroinvertebrate taxonomist. Methods are documented in the DEP manual Methods for Biological Sampling and Analysis of Maine's River and Streams (August 2002, revised April 2014). Costs are considered reasonable given that this study is required for Maine water quality certification and is routinely completed at hydropower projects being relicensed in the State. No alternatives to this study are proposed.

Maine Department of Environmental Protection
Study Request
Rumford Falls Hydropower Project (FERC No. 2333)

Aquatic Habitat Cross-Section Flow Study

1. **Describe the goals and objectives of each study proposal and the information to the obtained.**
   Assessment of aquatic habitat downstream of the Rumford Falls dams is required to determine whether current in-stream flow releases meet Maine habitat and aquatic life criteria. An aquatic habitat cross-section flow study measures depth, velocity, and wetted width along established transects at various discharges to determine flows where at least 75% of the stream cross-sectional area has enough water to provide sufficient habitat for fish and other aquatic organisms. Data will be evaluated to determine if the downstream waters provide sufficient quantity of water to maintain riverine aquatic habitat in the bypass and tailrace reaches.

2. **If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied.**
   The resource management goal is to ensure attainment of Maine Water Quality Standards pursuant to the provisions of the *Water Classification Program*, 38 M.R.S.A. Sections 464-468 and to certify attainment of such, with any necessary conditions, under Section 401 of the Federal Water Pollution Control Act (a.k.a. Clean Water Act).

3. **If the requestor is not a resource agency, explain any relevant public interest considerations in regard to the proposed study.**
   Requestor is a resource agency.

4. **Describe existing information concerning the subject of the study proposal, and the need for additional information.**
   The Androscoggin River downstream of the Rumford Falls dams must meet Maine habitat and aquatic life criteria. Agency file review indicates data is insufficient in the bypass and tailrace reaches of the Rumford Falls Project to assess attainment of these criteria. The PAD does not indicate that a study of this nature is planned for the project.

5. **Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements.**
   Data collected will be used to evaluate aquatic habitat in the Androscoggin River downstream of the Rumford Falls dams. Information will be used to evaluate whether the project meets Maine habitat and aquatic life criteria and will inform the water quality certification process.

6. **Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate filed season(s) and duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge.**
   The DEP Sampling Protocol for Hydropower Studies (September 2019) was established by Department staff and has been used successfully throughout the State by the DEP and others. A copy of the Department protocol is attached to the PAD comment letter.

7. **Describe considerations of level of effort and cost, as applicable, and why proposed alternative studies would not be sufficient to meet the stated information needs.**
   A cross-section flow study measures depth, velocity, and wetted width along established transects in the bypass and tailrace reaches at various discharges to determine flows where at least 75% of the stream cross-sectional area has enough water to provide sufficient habitat for fish and other aquatic organisms. This type of study can typically be accomplished in one or two days. The Department may exclude the bypass reach from the study after reviewing run-of-river operations data requested in the PAD comment letter. Costs are considered reasonable given that this study is required for Maine water quality certification and is routinely completed at hydropower projects being relicensed in the State. No alternatives to this study are proposed.

DEP SAMPLING PROTOCOL FOR HYDROPOWER STUDIES September 2019

LAKES, PONDS, AND IMPOUNDMENTS

Trophic State Study

Sampling personnel must be certified annually for this sampling protocol by DEP's Division of Environmental Assessment Lakes Section.

Each basin shall be sampled at the deepest location twice each month for at least five consecutive months during one open water season as follows.

Parameter	Sampling method	Detection limits
Secchi disk transparency	water scope	0.1 meter
Temperature	profile[1]	0.1 C
Dissolved oxygen	profile[1]	0.1 mg/l
Total phosphorus	integrated core[2]	0.001 mg/L
Chlorophyll a	integrated core[2]	0.001 mg/L (trichromatic)
Color	integrated core[2]	1.0 SPU
pH	integrated core[2]	0.1 SU
Total alkalinity	integrated core[2]	1.0 mg/l

[1]Profiles shall consist of temperature and dissolved oxygen measurements taken every meter up to 15 meters, every other meter to 25 meters, then every 5 meters thereafter.

[2]Integrated core samples should be obtained 1) in thermally stratified ($\Delta T \geq 1°C/m$ at any depth below the top 3 m depth) waters from an epilimnetic core, unless there is a spike in dissolved oxygen concentration deeper, in which case the core depth should be extended to capture the dissolved oxygen spike, or 2) in non-thermally stratified waters, to twice the Secchi disk depth, 1 m from the bottom, or 10 m, whichever is less.

In addition, during late summer (mid to late August depending on latitude and weather conditions), water samples shall be collected and analyzed from up to three depths in the water column for the parameters below except Chlorophyll *a*. If the waterbody is thermally stratified samples will be collected from an epilimnetic core, at the top of the hypolimnion, and at one meter above the sediment. If the waterbody is not thermally stratified, only one integrated core sample is needed from the surface to two times the Secchi disk depth, to 1 m from the bottom, or 10 m, whichever is less.

Parameter	Detection limit
Total phosphorus	0.001 mg/l
Nitrate	0.01 mg/l
Chlorophyll a (uncorrected)	0.001 mg/l (trichromatic determination)
Color	1.0 SPU
DOC	0.25 mg/l
pH	0.1 SU
Total alkalinity	1.0 mg/l
Total iron	0.005 mg/l
Total & dissolved aluminum	0.010 mg/l
Total calcium	1.0 mg/l
Total magnesium	0.1 mg/l

Total sodium	0.05 mg/l
Total potassium	0.05 mg/l
Total silica	0.05 mg/l
Specific conductance	1 ms/cm
Chloride	1.0 mg/l
Sulfate	0.5 mg/l

Additional sampling may be required due to the hydraulic or physical characteristics of a given waterbody or to the presence of significant water quality problems.

Habitat Study

For lakes, ponds, and riverine impoundments, determination of attainment of the designated use 'habitat for fish and other aquatic life' will be determined as follows. Using a depth of twice the mean summer Secchi disk transparency, determined from the Trophic State Study or historic DEP data, as the bottom of the littoral zone, the volume and surface area dewatered by the drawdown will be calculated to determine if at least 75% of the littoral zone remains watered at all times. Alternatively, studies of fish and other aquatic life communities, including freshwater mussels, may be conducted to demonstrate that the project maintains 'structure and function of the resident biological community' despite a drawdown that results in less than 75% of the littoral zone remaining watered at all times.

Fishing (Mercury Contamination) Study

To ensure that the project does not contribute to the Statewide Fish Consumption Advisory due to mercury, projects with excessive drawdowns (generally >10 feet) may be required to analyze sport fish from the project waterbody and one or more reference waters for mercury. Contact DEP for specific requirements for each project.

Temperature and Dissolved Oxygen Study

Applicability

This rivers and streams sampling protocol shall apply to tailwater areas that are not impoundments where existing data are insufficient to determine existing and future water quality.

Sampling Stations

Sampling shall occur in the tailwater downstream from the turbine/gate outlet or dam at a location representative of downstream flow as agreed by DEP on a case by case basis. Initially, measurements of temperature and dissolved oxygen should be made along a transect across the stream at the first, second and third quarter points across the width. If there is no violation of dissolved oxygen criteria and no significant (<0.4 mg/l) difference in concentrations among the quarter points, subsequent measurements may be made at the location shown to be representative of the main flow. Otherwise, measurements should be made at the location of the lowest concentration and the location of the main flow. Sampling should also occur in any bypassed segment of the river created by the project. Additional sampling stations may be required in the upstream or downstream areas where significant point or nonpoint sources exist or where slow moving or deep water occurs. The number and spacing of any additional stations will be determined by DEP on a case-by-case basis.

Parameters

Temperature and dissolved oxygen shall be sampled at mid-depth in rivers less than 2 m deep or in a profile of 1 meter increments of depth in rivers greater than 2 m deep. In rivers where it is already known that attainment of required statutory dissolved oxygen criteria is questionable, sampling for additional parameters (e.g. BOD, nitrogen, phosphorus) may be necessary.

Frequency and Timing

Sampling should be conducted during the summer low flow high temperature period, with the ideal conditions being the 7Q10 flow (the 7 day average low flow with a 10 year recurrence interval) combined with daily average water temperatures exceeding 24 ^{O}C. Measurements of temperature and dissolved oxygen shall be made every hour with a datasonde in remote unattended mode continuously during July and August, unless high flows well above seasonal median flows occur.

Alternatively, with concurrence by DEP, sampling could be undertaken one day per week for a minimum of ten weeks throughout the summer low flow, high temperature period. Each discrete grab sampling event for temperature and dissolved oxygen would consist of a minimum of two daily runs, the first of which should occur before 7 AM and the second of which should occur after 2 PM. Sampling results will not be considered complete unless a minimum of 5 sampling days meets the following conditions: The product of the water temperature (^{O}C) and the flow duration (the percentage of the time a given flow is statistically exceeded) at the time of sampling exceeds 1500. For cycling hydropower projects, in addition to twice daily monitoring, continuous monitoring may be required at some locations for a duration equivalent to the period of one cycle of the storage and the release of flow.

For either method, a summer in which low flows and high temperatures are not experienced may result in additional sampling requirements for the next summer. Low flow conditions may occur naturally, as an unregulated river or may be artificially induced, as in the case of upstream flow regulation or flows downstream from a cycling or peaking power project or in the case of a bypassed segment which receives flow only by spillage, leakage or specific releases.

Available Data

The use of data already available is encouraged provided that adequate QA/QC procedures have been followed. Old data may not be acceptable for considerations of meeting minimum sampling requirements, but could still provide useful information. Acceptance/rejection of data will be determined on a case by case basis, but generally data more than 10 years old may be rejected.

Habitat and Aquatic Life Studies

For rivers and streams, determination of attainment of the designated use 'habitat for fish and other aquatic life' and "structure and function of the resident biological community" will be determined as follows. A Cross-Section Flow Study is required that measures width and depth at various flows to determine the flow at which at least 75% of the bank full cross-sectional area of the river or stream is continuously watered. At least three cross-sections representative of the river or stream must be measured. Alternately, a combination of ambient measurements in one cross-section, flow data from existing flow gages, and/or modelling may be approved by DEP.

In addition, to determine if the project 'attains the aquatic life criteria, i.e. 'maintains the structure and function of the resident biological community', biological monitoring of the benthic macroinvertebrate community must be conducted following DEP's standard protocol in Methods for Biological Sampling and Analysis of Maine's Rivers and Streams, DEP LW0387-B2002.
A copy can be found at www.maine.gov/dep/water/monitoring/biomonitoring/material.html

Methods for Biological Sampling and Analysis of Maine's Rivers and Streams

Susan P. Davies
Leonidas Tsomides

DEP LW0387-C2014
Revised April, 2014

MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION

METHODS

FOR

BIOLOGICAL SAMPLING AND ANALYSIS OF

MAINE'S RIVERS AND STREAMS

Susan P. Davies

Leonidas Tsomides

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Bureau of Land and Water Quality
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CONTENTS

FOREWORD

This manual describes the field, laboratory and data preparation methods required by the Maine Department of Environmental Protection to collect and analyze benthic macroinvertebrate samples for the River and Stream Biological Monitoring Program. The biological classification of Maine's inland waters was authorized by the Maine State Legislature with the passage of Public Law 1985 Chapter 698 - The Classification System for Maine Waters. This law states that it is the State's objective "to restore and maintain the chemical, physical and biological integrity" of its waters, and establishes a water quality classification system to enable the State to manage its waters so as to protect their quality. The classification system further establishes minimum standards for each class, which are based on designated uses, and related characteristics of those uses, for each class of water.

Each water quality class contains standards that, among other things, describe the minimum condition of the aquatic life necessary to attain that class. The Maine Department of Environmental Protection (the Department) has developed numeric criteria in support of the narrative aquatic life standards in the Water Quality Classification Law. The Department has collected a large, standardized database consisting of benthic macroinvertebrate samples from above and below all significant licensed discharges in the State, from areas impacted by non-point sources, as well as from relatively unperturbed areas. These sampling locations were chosen to represent the range of water quality conditions in the State. This information has been used to develop numeric criteria which are specific to the natural biotic community potential of the State of Maine (see Davies et al., 1995 and 1999 for a description of the development and application of numeric criteria) and is established in DEP regulation Chapter 579 : Classification Attainment Evaluation Using Biological Criteria for Rivers and Streams.

Standardization of data collection and analytical methods is fundamental to the consistent, unbiased and scientifically sound evaluation of aquatic life impacts. This manual sets forth the standardized practices and procedures used by the Department to acquire or accept benthic macroinvertebrate data for use in regulation, assessment or program development.

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I GENERAL METHODS FOR RIVER AND STREAM AQUATIC LIFE CLASSIFICATION ATTAINMENT EVALUATION

Each water quality class is defined by standards that describe the minimum condition of the aquatic community necessary to attain that class. The benthic macroinvertebrate community is used as an indicator community of the general state of the aquatic life in flowing waters for the purpose of assessment of classification attainment. Standardized sampling techniques and sample analysis are required for assessment of biological attainment of stream water quality classification. This manual presents the standard practices and procedures that have been adopted by the Department to acquire benthic macroinvertebrate data for purposes of aquatic life classification attainment evaluation.

Purpose:

To determine the water quality class attained by a particular river or stream reach in terms of the aquatic life standards set forth in 38 MRSA Sec. 465 (The Classification System for Maine Waters).

Requirements:

All samples of aquatic life that are collected for purposes of classification attainment evaluation, whether collected by the Department or by any party required to make collections by the Department, must be collected, processed and identified in conformance with the standardized methods outlined in this manual. Selection of appropriate sampling sites and micro-habitat to sample, as well as procedures for quantitative analysis of the sample must conform to methods set forth in this manual. Data submitted by any party required to make collections by the Department must be accompanied by a Quality Assurance Plan, approved by the Commissioner.

1. Qualifications of Sampling Personnel

Biological sampling must be performed by a professional aquatic biologist or by qualified personnel under the supervision of a professional aquatic biologist. The professional aquatic biologist must have, as a minimum, a Bachelor of Science degree in biological sciences with aquatic entomology, invertebrate zoology, fisheries or closely related specialization, and greater than 6 months experience working with macroinvertebrate sampling methods and taxonomy. (See also Qualifications of Laboratory Personnel, Sec. II-1.)

2. Apparatus, Equipment, Supplies, Instruments

(1) Sampling devices

a) Rock-filled wire basket introduced substrate

Use: flowing wadeable, eroded, mineral-based bottom rivers and streams.

Description: cylindrical plastic coated or chrome wire, baskets with at least 1.5 cm spaces between wires, a hinged opening, and secure closure (Klemm, D.J. et al, 1990).

Substrate material: clean, washed, bank-run cobble, graded to uniform diameter range of 3.8 to 7.6 cm (1.5 to 3 inches) in size (#2 roofing stone).

Baskets must be filled to 7.25 +/- 0.5 kg (16 lbs +/-1 lb) of substrate material.

b) Rock-filled mesh bag introduced substrate

Use: small flowing streams, too shallow for rock baskets to be fully submerged.

Description: mesh bags of sufficient size to hold 7.25 +/- 0.5 kg of cobble substrate as described above, with at least 2.54 cm aperture mesh, and secure closures.

c) Closing introduced substrate cone

Use: deep, non-wadeable rivers having sufficient flow to have an eroded, mineral based bottom.

Description: cone shaped wire, or plastic coated wire basket filled with substrate material and closed by means of an inverted, weighted funnel (Courtemanch, 1984).

Substrate material: (see above Rock-filled wire basket substrate material).

(2) Sieves, sieve buckets, nets

Samples are concentrated on sieves having a mesh size between 500 - 600 microns (USA Standard Testing Sieve ASTM-E-11 Specification size No. 30 or No. 35).

(3) Optical equipment

a) Binocular microscope: Magnification range from 10x or less to 30x or greater.

b) Compound microscope: Magnification range from 10x to at least 400x; 100x with oil immersion lens is advisable.

3. Sampling Season, Sampler Exposure Period, Placement and Retrieval

(1) Sampling season

The standard sampling season upon which all macroinvertebrate classification criteria are based is the late summer, low flow period (July 1 to September 30). All baseline data for the biological classification program has been collected during this time period. This period often presents conditions of maximal stress to the biological community due to decreased dilution of pollutional material and increased stream water temperatures. Furthermore, because the composition of the benthic macroinvertebrate community changes with season, due to natural life history features, this period defines a standardized seasonal community.

As noted, the Department's linear discriminant models define biological classification criteria derived from a macroinvertebrate community defined by the specific sampling methods and index season under which they were collected. Samples collected at other times of year may yield valuable water quality related information, however classification attainment may not be assigned solely on the basis of results of the linear discriminant models for these non-standard samples.

(2) Exposure period

Standard methods require that substrate samplers be exposed in the water body for a period of 28 days +/- four days within the above-specified sampling season. However, extended exposure periods may be necessary to allow for adequate colonization in the case of assessments of low velocity or impounded habitats. If such conditions exist a 56 days +/- four days exposure period may be used.

(3) Sampler placement

Rock Baskets/Bags

The actual sampler location should be approached so as to avoid any disturbance in, or upstream of, the sampled site. Position baskets in locations of similar habitat characteristics. Orient baskets with the long axis parallel to stream flow. Provide for relocation of baskets by flagging trees in the vicinity and/or by drawing a diagram with appropriate landmarks indicated.

Cones

Cone samplers should be marked with individual marker buoys (milk jugs or other suitable float) leaving about 5 extra feet of line to allow for water level changes and to provide for easy retrieval. They should be placed on the substrate with a minimum of disturbance, in an apex-up position, and located in the approximate middle fifty percent of the channel. (Note however, care should be taken not to create an obstruction to boat traffic.) In areas subject to vandalism, or in rivers having extensive macrophyte beds, it may be necessary to attach the sampler lines to a common anchor and thence to one unobtrusive surface float. Retrieval funnels will not properly close when lines are fouled with drifting macrophytes.

(4) Sampler retrieval

Rock Baskets/ Bags

Baskets are approached from downstream. Excessive accumulations of macrophytes, algae or debris clinging to the outside of the basket should be carefully removed, taking care to avoid jarring the basket itself. An aquatic net or drift net (mesh size 500 - 600 microns) is positioned against the substrate immediately downstream of the basket which is then quickly lifted into the net. The contents of the basket and all net washings are emptied into a sieve bucket (500 - 600 microns); the basket wires are carefully cleaned first, then rocks are hand washed and inspected and returned to the basket. All sieve bucket contents are placed in sample jars. A small amount of stream water and 95% ethyl alcohol is added to yield an approximately 70% solution of alcohol. Especially dense samples should be re-preserved in the laboratory, with fresh 70% ethyl alcohol. Rock baskets should be thoroughly cleaned and allowed to desiccate prior to re-use.

Cones

Cone samplers should be retrieved with the boat anchored directly upstream of the samplers. Once the float is retrieved and removed, the line should be held as vertically as possible while the weighted funnel is released down the line to enclose the cone. Cone and funnel should be retrieved quickly and smoothly from the bottom, and released directly into a sieve bucket or tub. Field processing should then proceed as described above for rock baskets.

4. Site Selection Criteria

Classification criteria apply to a strictly defined sample of the benthic macroinvertebrate community. Habitat type from which the community is obtained is a significant determinant of the make-up of the target community. Benthic macroinvertebrate communities of flowing streams and rivers having a hard, eroded substrate comprise the majority of samples in the baseline data set. This habitat is characteristic of the majority of the river and stream waters of the State. Exceptions to these conditions may require special consideration and the exercise of professional judgment. (Note: See Section III-2. (3) "Classification attainment evaluation of waters subjected to flow regulation" page 13, for procedures relating to the assessment of regulated flow sites.) While it is useful to obtain both an upstream and downstream sample to evaluate the effect of a pollution source, classification attainment evaluation does not require data from a matched reference site in order to arrive at a determination of aquatic life class. Analytical methods for classification attainment evaluation are described in Section III.

(1) Site attributes

a) The area selected should be generally representative of the habitat of the stream reach as a whole;
b) Where there is alternating riffle/pool habitat, the riffle/run is the habitat of choice;
c) A location should be selected where there is a high degree of certainty that the rock basket samples will remain fully submerged even if the water level drops significantly.

(2) Precautions

a) Avoid atypical influences such as bridges, entering culverts, channelized areas such as road crossings, culverts, or obstructions to flow;
b) Avoid bank effects: samplers should be located in the middle 50% of the bank to bank width, or in an area with a flow regime typical of the overall character of the stream segment;
c) Avoid slackwater areas and eddies immediately upstream or downstream of large rocks or debris.

(3) Matching reference and effluent impacted sites

If possible both stream reaches should be viewed prior to selection of sampling sites. Efforts should be made to sample habitats which are comparable in the following characteristics:

a) Water velocity;
b) Substrate composition (i.e., size ranges and proportions of particles making up the substrate);
c) Canopy coverage;
d) Depth;
e) Other upstream influences except the pollution source in question (for example, use caution when one site is just below a lake outfall and the other is not).

(4) Factors to be considered in site selection below point sources

The area of initial dilution of an effluent should be determined by visual observation of the plume pattern; by observations of biotic effects attributable to the plume, if evident (periphyton growth, die-off patterns); and by transects of specific conductance measurements from the outfall, in a downstream direction. The site selected should be in an area where reasonable opportunity for mixing of the effluent has occurred. If a mixing zone has been defined in a license, sampling should occur immediately downstream of it. In cases where the effluent plume channels down one bank for great distances (>1 km), or where localized effluent impact is expected to be severe for a distance beyond the zone of initial dilution, it is advisable to have a sampling site upstream of the source, one or more in the plume, and at least two farther downstream. One downstream site should be located at the point of presumed bank to bank mixing and subsequent sites should be located to assess the extent of impact downstream.

5. Sample Size

The biological community is evaluated on the basis of benthic macroinvertebrates obtained from at least three samplers which yield an average of at least 50 organisms per sampler. Matched upstream and downstream sites must be sampled using identical methods and level of effort, preferably by the same personnel.

Subsampling may be performed on samples if the mean number of organisms in a sampler exceeds 500 and subsampling will yield at least 100 organisms per rock/cone sampler. All samplers in a site should be treated consistently. Subsampling methods are described in Section II-5. Note: Subsampling will

reduce sample richness by an indeterminate amount. This may affect the outcome of linear discriminant analysis. See Section III-2. (2).

6. Physical Habitat Evaluation

A field data sheet (Appendix A) is to be completed at the time of sampler placement. This form records site specific information concerning natural variables that may affect community structure. Items addressed include exact site location (latitude and longitude, narrative description of the mapped location and/or a topographic map with site indicated); substrate composition; canopy coverage; land use and terrain characteristics; water velocity, temperature, dates of exposure and investigator name. The form is to be completed by observation as well as instrument measurement of water velocity, specific conductance, dissolved oxygen, global positioning device, temperature, etc.

II LABORATORY METHODS

1. Qualifications of Laboratory Personnel

Sample processing and taxonomy in the laboratory must be performed or supervised by a professional freshwater macroinvertebrate taxonomist who is certified by the Society of Freshwater Science in the identification of eastern US taxa. Certification must include Genus level categories, such as Ephemeroptera, Plecoptera and Trichoptera (EPT), General Arthropods and Chironomidae taxa. Taxonomic data will not be accepted without verification that the supervising laboratory taxonomist has been certified in relevant categories.

2. Sample Preservation, Sorting

All sample material collected in the field, as described in Section I, is preserved in 70% ethyl alcohol. Samples are stored in airtight containers until sorted. Sorting of macroinvertebrates from detritus and debris should follow methods described in Appendix B. One out of every ten samples is evaluated by a biologist for sorting completeness.

After sorting, recommended storage for macroinvertebrates is in 70% ethyl alcohol with 5% glycerin, in vials sealed with tightly fitting rubber stoppers.

3. Sample Labeling

All samples are labeled in the field immediately upon collection. The label must include the following information:

Date of sample retrieval
Waterbody
Town or target discharge
Whether above or below the discharge (if applicable)
Replicate number

4. Sample Log Book

In the laboratory, the samples from each sampled site are to be assigned a sample log number, written on all items generated by the sample (e.g., sample vials, slides, records, count sheets, etc.). Log numbers are sequentially recorded in a master log book. The log book shall also contain site identification, date of placement and retrieval, investigator name, sampler type and any comments regarding sampler retrieval or data quality.

5. Subsampling

(1) Methods

If it is determined that a sample should be subsampled (see criteria in Section I-5 Sample Size) methods of Wrona et al, (1982) are followed. These are summarized below:

a) Fit a plastic or glass Imhoff-type settling cone with an aquarium air stone sealed in the bottom and connected to a compressed air supply.

b) Place the sorted macroinvertebrate sample in the cone and fill the apparatus with water to a total volume of one liter.

c) Agitate gently for 2 to 5 minutes with the air stone.

d) Remove 25% of the sample in 5 aliquots with a wide-mouth 50 ml dipper and combine into one sample vial. The dipper should be submerged and withdrawn over a five second interval.

e) Ascertain whether or not the required 100 organisms have been obtained in the subsample.

f) Indicate clearly on the sample label and on the data sheet the fraction of the sample that the subsample represents.

(2) Precautions

a) Especially large or dense organisms such as crayfish, molluscs or caddisflies with stone cases, which do not suspend randomly in the sample, should not be included in the subsample. They should be counted separately.

b) When removing aliquots, the subsampler should be careful to avoid biased capture of organisms in the cone. Avoid watching the cone as the dipper is withdrawn.

This method has been tested by the Department and has been found to randomly distribute the sample. The five separate counts conform to a Poisson series and thus can be combined into one sample (Elliott, 1979).

(3) Chironomidae subsampling

A subsampling plan for Chironomidae shall be approved by the Department. A Department recommended subsampling plan follows the following criteria:

a) For samples having less than 100 midges, all midges will be identified to genus/species level.

b) For samples having 100 to 199 midges, a subsample of one half (0.5) will be removed by randomly selecting the specimens to be identified and identified to genus/species level. Remaining unsampled midges will be examined for unusual or rare specimens, which will be removed and identified to genus/species level separate from the subsample of the sample.

c) For samples having 200 to 499 midges, a subsample of one quarter (0.25) will be removed by randomly selecting the specimens to be identified and identified to genus/species level. Remaining unsampled midges will be examined for unusual or rare specimens, which will be removed and identified to genus/species level separate from the subsample of the sample.

d) For samples having 500 or more midges, midges will be grouped by genus for those for which it is possible to confidently identify them to genus level without mounting. For remaining midges not grouped by genus, a subsample of 100 specimens will be randomly selected and identified to genus/species level. Remaining unsampled midges will be examined for unusual or rare specimens, which will be removed and identified to genus/species level separate from the subsample of the sample.

e) Reporting of the subsample of the sample will be as follows. Numbers reported on the Excel spreadsheet will be converted to reflect the sample total. Any round-off errors between the subsample total and the sample total will be equalized by adding or deducting the difference from the most numerous taxon. If unusual or rare specimens are removed from the sample following the subsample removal, the conversion of the subsample total to a "partial" sample total will be based on the sample total minus the number of unusual or rare specimens. Following this procedure, the number of unusual or rare specimens will be added to the "partial" sample total to bring it back to the sample total.

6. Sample Taxonomy

All taxonomic data submitted to the Department must be accompanied by the name(s) of the individual(s) actually performing the identifications. A list of taxonomic references used, and a reference collection of organisms must also be submitted (see below).

(1) Taxonomic resolution

Macroinvertebrate organisms are identified to genus in all cases where possible. If generic keys are not available or taxonomic expertise is lacking for a taxon it should be identified to the lowest level possible. Identification of organisms to species is highly recommended whenever possible. Although quantitative analysis of benthic macroinvertebrate samples by the Department is based on counts adjusted to the generic level of resolution, species designations are recorded in the Department database and can contribute to the final stage of data analysis, Professional Judgment Evaluation of the model outcome. This is especially important for Class Insecta. Taxonomists submitting data for use by the Department must use current taxonomic references.

(2) Identification of Chironomidae

Specimens of chironomid midges are identified from slide mounts of the cleared head capsule and body parts. Euparol or Berlese mounting medium is recommended for preparation of slides. CMCP-9 is recommended for the preparation of permanent slide mounts of reference material, for voucher specimens or for permanent collections. These slides should be prepared under a fume hood. Instructions for preparation and slide mounting may be found in Wiederholm, (1983). In samples in which a given taxon is represented by a large number of individuals, the identification to genus may be made from slide mounts of a sufficient proportion of the individuals to give a high degree of certainty that they are all the same (10-50% depending on

the distinctiveness of the taxon visible under binocular microscope). A subsampling plan for Chironomidae is described in Section II-5. Each permanent slide mount is to be fully labeled or coded in a manner which positively associates the slide with the sample from which it originated.

(3) Quality control

All organisms and records from any sampling event intended to serve regulatory purposes must be preserved for a period of at least ten years. In the course of identifying taxa collected as part of the Department's biological monitoring program, or in other collection activities, a special reference collection of separate taxa is established. This collection allows subsequent identifications of the same taxon to be confirmed and thus serves to standardize taxonomy for the program.

Each contracted taxonomist, working for the Department or working for anyone submitting data to the Department, will be required to submit a reference collection of taxa identified, as well as a list of the taxonomic references used in the identifications. Organism identifications will be checked against the Department's collection by a Department taxonomist.

III ANALYTICAL METHODS

In general, it is the responsibility of the Department, or its agents, to conduct sampling for the purpose of making decisions on the attainment of water quality classification. Under certain conditions, sampling may be required of applicants for waste discharge licenses, or applicants requiring Section 401 Water Quality Certification. Sampling may be performed by corporations, businesses, organizations or individuals who can demonstrate their qualifications and ability to carry out the Department's sampling and analytical protocol, described in this manual. Such monitoring will be conducted according to a quality assurance plan provided to the Department and approved by the Commissioner.

Classification attainment evaluation is established in DEP regulation Chapter 579: Classification Attainment Evaluation Using Biological Criteria for Rivers and Streams. Davies et al, 1995 details the conceptual and technical basis for the State’s application of linear discriminant analysis to assess attainment of aquatic life standards. A synopsis of Chapter 579 follows in this section.

1. Minimum Provisions

Properly collected and analyzed samples that fail to achieve the following criteria are unsuitable for further analysis through the numeric criteria statistical models:

- Total Mean Abundance must be at least *50* individuals (average per basket/bag/cone);
- Generic Richness for three replicate basket/bag/cone samplers must be at least *15*.

Samples not attaining these criteria shall be evaluated by Professional Judgment. A determination will be made whether the affected community requires re-sampling or whether the community demonstrates non-attainment of minimum provisions of the aquatic life standards.

2. Aquatic Life Statistical Decision Models

The four statistical decision models consist of linear discriminant functions developed to use quantitative ecological attributes of the macroinvertebrate community (Appendix C-1) to determine the strength of the association of a test community to any of the water quality classes (Appendix D). The coefficients or weights are calculated using a linear optimization algorithm to minimize the distance, in multivariate space, between sites within a class, and to maximize the distance between sites between classes.

(1) Linear discriminant models

The discriminant function has the form:

$$Z = C + W_1X_1 + W_2X_2 + ...W_nX_n$$

Where: Z = discriminant score
C = constant
W_i = the coefficients or weights
X_i = the predictor variable values

Association values are computed, using variable values from a test sample, for each classification using one four-way model and three two-way models. The four-way model uses nine variables pertinent to the evaluation of all classes and provides four initial probabilities that a given site attains one of three classes (A, B, or C), or is in non-attainment (NA) of the minimum criteria for any class. These probabilities have a possible range from 0.0 to 1.0, and are used, after transformation, as variables in each of the three subsequent final decision models. The final decision models (the three, two-way models)

are designed to distinguish between a given class and any higher classes as one group and any lower classes as the other group (i.e., Classes A+B+C vs. NA; Classes A+B vs. Class C+NA; Class A vs. Classes B+C+NA). The equations for the final decision models use the predictor variables relevant to the class being tested (Appendix E). The process of determining attainment class using association values is outlined in Appendix F.

(2) Application of professional judgment

Where there is documented evidence of conditions which could result in uncharacteristic findings, allowances may be made to account for those situations by adjusting the classification attainment decision through use of professional judgment as provided in DEP regulation Chapter 579: Classification Attainment Evaluation Using Biological Criteria for Rivers and Streams. The Department may make adjustments to the classification attainment decision based on analytical, biological, and habitat information or may require that additional monitoring of affected waters be conducted prior to issuing a classification attainment decision.

Professional Judgment may be utilized when conditions are found that are atypical to the derivation of the linear discriminant model. Factors that may allow adjustments to the model outcome include but are not limited to:

a) Habitat factors
- Lake outlets
- Impounded waters
- Substrate characteristics
- Tidal waters

b) Sampling factors
- Disturbed samples
- Unusual taxa assemblages
- Human error in sampling

c) Analytical factors
- Subsample vs. whole sample analysis
- Human error in processing

(3) Classification attainment evaluation of waters subjected to flow regulation

The Maine State Legislature, in 38 MRSA Article 4-A Sec. 464 (9)-(10), *The Water Classification Program*, acknowledges that changes to aquatic life and habitat occur as the result of the impoundment of riverine waters and has modified the standards of waters so affected. The habitat and aquatic life criteria of riverine impounded waters of Class A, Class B or Class C are

deemed to be met if the impoundment attains the standards of Class C (e.g., maintenance of structure and function of the resident biological community). Impoundments managed as Great Ponds must also attain Class C aquatic life standards. If the actual water quality attains any more stringent characteristic or criterion than the Class C standards dictate, then the waterbody must be managed so as to protect those higher characteristics. Class C standards also apply to the *downstream* waters below certain specified riverine impoundments on the Kennebec River and the Saco River (Wyman Dam, Moosehead East Outlet Dam, West Buxton Dam and Skelton Dam) that are classified as A or B. All other waters subjected to flow regulation are managed according to standards of the water quality classification assigned by the Legislature.

(4) Adjustments of a decision

It is the responsibility of the Department to decide if adjustments of a decision should occur. The following adjustments may be made to correct for these conditions:

a) Resample
The Department may require that additional monitoring of the test community be done before a determination of class attainment can be made, based on documented evidence of specific sampling factors that may have influenced the results.

b) Raise the finding
   i. The Department may raise the classification attainment outcome predicted by the model from non-attainment of any class to indeterminate or to attainment of Class C, based on documented evidence of specific conditions, as defined above.

   ii. The Department may raise the classification attainment outcome predicted by the model from attainment in one class to attainment in the next higher class, based on documented evidence of specific conditions, as defined above.

c) Lower the finding
The Department may decide to lower the classification attainment finding, on the basis of documented, substantive evidence that the narrative aquatic life criteria for the assigned class are not met.

d) Determination of non-attainment: minimum provisions not met
Samples having any of the ecological attributes not attaining the minimum provisions, and where there is no evidence of conditions which could result in uncharacteristic findings, as defined above, must be determined to be in non-attainment of the minimum provisions of the aquatic life criteria for any class.

e) Determination of attainment: minimum provisions not met
Where there is evidence of factors that could result in minimum provisions not being met, professional judgment may be used to make a professional finding of attainment of the aquatic life criteria for any class. Such decisions will be provisional until appropriate resampling is carried out.

(5) Sampling procedures do not conform

For classification attainment evaluation of test communities that do not conform to criteria provided in Section I General Methods, or Section III-1, Minimum Provisions, of this manual, and are therefore not suitable to be run through the linear discriminant models, the Department may make an assessment of classification attainment or aquatic life impact in accordance with the following procedures:

a) Approved assessment plan
A quantitative sampling and data analysis plan must be developed in accordance with methods established in the scientific literature on water pollution biology, and shall be approved by the department.

b) Determination of sampling methods
Sampling methods are determined on a site-specific basis, based on habitat conditions of the sampling site, and the season sampled:

i. Soft-bottomed substrates shall, whenever ecologically appropriate and practical, be sampled by core or dredge of known dimension or volume.

ii. The preferred method for sampling hard-bottomed substrates shall be the rock basket/cone/bag as described in Section I-2.

iii. Other methods may be used where ecologically appropriate and practical.

c) Classification attainment decisions
Classification attainment decisions may be based on a determination of the degree to which the sampled site conforms to the narrative aquatic life classification criteria provided in 38 MRSA Section 465 and found in Appendix D. The decision is based on established principles of water pollution biology and must be fully documented.

d) Site-specific impact decisions
Site-specific impact decisions may rely on established methods of analysis of comparative data between a test community and an approved reference community.

e) Determination of detrimental impact
A determination of detrimental impact to aquatic life of a test community without an approved reference community may be made if it can be documented, based on established methods of the interpretation of macroinvertebrate data, and based on established principles of water pollution biology, that the community fails to demonstrate the ecological attributes of its designated class as defined by the narrative aquatic life standards in the water quality classification law.

Maine DEP Biological Monitoring Unit
Stream Macroinvertebrate Field Data Sheet

Log Number _____ Directions_____ Type of Sample_____
Station Number_____ _____ Date Deployed_____
Waterbody_____ _____ Number Deployed_____
River Basin_____ Lat-Long Coordinates (WGS84, meters) Date Retrieved_____
Municipality_____ Latitude_____ Number Retrieved_____
Stream Order_____ Longitude_____ Agency/Collector(s)_____

1. Land Use (500 m radius upstream)
☐ Urban ☐ Upland conifer
☐ Cultivated ☐ Swamp hardwood
☐ Pasture ☐ Swamp conifer
☐ Upland hardwood ☐ Marsh

2. Terrain (500 m radius upstream)
☐ Flat
☐ Rolling
☐ Hilly
☐ Mountains

3. Canopy Cover (upstream view)
☐ Dense (75-100% shaded)
☐ Partly open (25-75% shaded)
☐ Open (0-25% shaded)
(% daily direct sun) _____

4. Physical Characteristics of Bottom (estimate % of each component over 12 m stretch of site; total = 100%)
[ ] Bedrock [ ] Rubble (3" – 10") [ ] Sand (<1/8")
[ ] Boulders (<10") [ ] Gravel (1/8" – 3") [ ] Silt-clay-muck [ ] Detritus

5. Habitat Characteristics (immediate area)

Time _____AM PM	Time _____AM PM
Width (m) _____	Width (m) _____
Depth (cm) _____	Depth (cm) _____
Flow (cm/s) _____	Flow (cm/s) _____
Diss. O_2 (ppm)_____	Diss. O_2 (ppm)_____
Temp (°C) _____	Temp (°C) _____
pH _____	pH _____
SPC (µS/cm) _____	SPC (µS/cm) _____
TDS (ppm) _____	TDS (ppm) _____

Temperature Probe # _____
☐ deployed ☐ retrieved

6. Observations (describe)
Fish_____
Algae_____
Macrophytes_____
Habitat quality_____
Dams/impoundments_____
Discharges_____
Nonpoint stressors _____

7. Water Samples
☐ Standard
☐ Metals
☐ Pesticides

Lab Number

8. Photographs

9. Landmarks of Sampler Placement (illustrate or describe landmarks to be used for relocation)

Appendix B

Instructions for Macroinvertebrate Sorters

1. Pick the sample **in small portions** (1-2 TBS of material) at a time.

2. Pick all organisms you can see. If in doubt it's usually best to include it.

3. Some types of samples can be easily floated by adding a saturated solution of Epsom salt or sugar to the water. Maintain the saturated solution for the lab by adding enough salt or sugar to water to maintain a thick layer of crystals on the bottom of the storage jar. Use the supernatant solution for picking. Large numbers of organisms can be removed with a sieve spoon from the water surface. After the floaters have been removed, proceed to pick the rest of the sample as usual. A significant portion of the sample will not float and must be picked out with forceps.

4. The sample can be considered done when a careful 45 second search, after swirling the sample, yields no further organisms.

5. The samples are picked in water but should not remain unpreserved for more than 8 hours. Be certain that the final sample vial is preserved with 70% alcohol and 5% glycerin solution when done.

6. Return the detrital material to the original sample jar and preserve with 70% alcohol.

7. Write on the sample jar label "Picked X1 (your initials)".

8. Include in the vial of organisms a slip of index card label in hard pencil (No. 2) including **all information appearing on the original jar label**:

   Log Number — River
   Date - month/day/year — Location (Town or industry name)
   whether above or below
   Basket or Cone number
   Vial number if more than 1 vial is needed per basket

   ex. Log 621 Sandy R. 9/5/97
   Below Farmington (disturbed)
   Basket 2 vial #1 of 2

9. Complete all samples from one log number before beginning a new log number.

10. Keep a record of samples picked including log number

    Basket number — Time spent per basket
    Your name — Date

Appendix C-1

Methods for the Calculation of Indices and Measures of Community Structure Used in the Linear Discriminant Models

Variable Number

1 **Total Mean Abundance**

Count all individuals in all replicate samples from one site and divide by the number of replicates to yield mean number of individuals per sample.

2 **Generic Richness**

Count the number of different genera found in all replicates from one site.

Counting rules for Generic Richness:

a) All population counts at the species level will be aggregated to the generic level.

b) A family level identification which includes no more than one taxon identified to the generic level is counted as a separate taxon in generic richness counts.

c) A family level identification with more than one taxon identified to generic level is not counted towards generic richness. Counts are to be divided proportionately among the genera that are present.

d) Higher level taxonomic identifications (Phylum, Class, Order) are not counted toward generic richness unless they are the only representative.

e) Pupae are ignored in all calculations.

3 **Plecoptera Mean Abundance**

Count all individuals from the order Plecoptera in all replicate samplers from one site and divide by the number of replicates to yield mean number of Plecopteran individuals per sampler.

4 **Ephemeroptera Mean Abundance**

Count all individuals from the order Ephemeroptera in all replicate samplers from one site and divide by the number of replicates to yield mean number of Ephemeropteran individuals per sampler.

5 **Shannon-Wiener Generic Diversity (Shannon and Weaver, 1963)**

After adjusting all counts to genus following counting rules in Variable 2:

$$\bar{d} = \frac{c}{N}\left(N \log_{10} N - \sum n_i \log_{10} n_i\right)$$

where: $\bar{d}$ = Shannon-Wiener Diversity
c = 3.321928 (converts base 10 log to base 2)
N = Total abundance of individuals
n_i = Total abundance of individuals in the i^{th} taxon

6 **Hilsenhoff Biotic Index (Hilsenhoff, 1987)**

$$HBI = \sum \frac{n_i a_i}{N}$$

where: HBI = Hilsenhoff Biotic Index
n_i = number of individuals in the i^{th} taxon
a_i = tolerance value assigned to that taxon
N = total number of individuals in sample with tolerance values.

7 **Relative Chironomidae Abundance**

Calculate the mean number of individuals of the family Chironomidae, following counting rules in Variable 4, and divide by total mean abundance (Variable 1).

8 **Relative Diptera Richness**

Count the number of different genera from the Order Diptera, following counting rules in Variable 2, and divide by generic richness (Variable 2).

9 ***Hydropsyche* Mean Abundance**

Count all individuals from the genus *Hydropsyche* in all replicate samplers from one site, and divide by the number of replicates to yield mean number of *Hydropsyche* individuals per sampler.

10 **Probability (A + B + C) from First Stage Model**

Sum of probabilities for Classes A, B, and C from First Stage Model.

11 ***Cheumatopsyche* Mean Abundance**

Count all individuals from the genus *Cheumatopsyche* in all replicate samplers from one site and divide by the number of replicates to yield mean number of *Cheumatopsyche* individuals per sampler.

12 **EPT - Diptera Richness Ratio**

EPT Generic Richness (Variable 19) divided by the number of genera from the order Diptera, following counting rules in Variable 2. If the number of genera of Diptera in the sample is 0, a value of 1 is assigned to the denominator.

13 **Relative Oligochaeta Abundance**

Calculate the mean number of individuals from the Order Oligochaeta, following counting rules in Variable 4, and divide by total mean abundance (Variable 1).

14 **Probability (A + B) from First Stage Model**

Sum of probabilities for Classes A and B from First Stage Model.

15 **Perlidae Mean Abundance (Family Functional Group)**

Count all individuals from the family Perlidae (Appendix C-3) in all replicate samplers from one site and divide by the number of replicates to yield mean number of Perlidae per sampler.

16 **Tanypodinae Mean Abundance (Family Functional Group)**

Count all individuals from the subfamily Tanypodinae (Appendix C-3) in all replicate samplers from one site and divide by the number of replicates to yield mean number of Tanypodinae per sampler.

17 **Chironomini Mean Abundance (Family Functional Group)**

Count all individuals from the tribe Chironomini (Appendix C-3) in all replicate samplers from one site and divide by the number of replicates to yield mean number of Chironomini per sampler.

18 **Relative Ephemeroptera Abundance**

Variable 4 divided by Variable 1.

19 **EPT Generic Richness**

Count the number of different genera from the Order Ephemeroptera (E), Plecoptera (P), and Trichoptera (T) in all replicate samplers, according to counting rules in Variable 2, generic richness.

20 **Variable Reserved**

21 **Sum of Mean Abundances of**: ***Dicrotendipes, Micropsectra, Parachironomus* and *Helobdella***

Sum the abundance of the 4 genera and divide by the number of replicates (as performed in Variable 4).

22 **Probability of Class A from First Stage Model**

Probability of Class A from First Stage Model.

23 **Relative Plecoptera Richness**

Count number of genera of Order Plecoptera, following counting rules in Variable 2, and divide by generic richness (Variable 2).

24 **Variable Reserved**

25 **Sum of Mean Abundances of *Cheumatopsyche, Cricotopus, Tanytarsus* and *Ablabesmyia***

Sum the number of individuals in each genus in all replicate samplers and divide by the number of replicates (as performed in Variable 4).

26 **Sum of Mean Abundances of *Acroneuria* and *Stenonema***

Sum the number of individuals in each genus in all replicate samplers and divide by the number of replicates (as performed in Variable 4).

27 **Variable Reserved**

28 **Ratio of EP Generic Richness**

Count the number of different genera from the order Ephemeroptera (E), and Plecoptera (P) in all replicate samplers, following counting rules in Variable 2, and divide by 14 (maximum expected for Class A).

29 **Variable Reserved**

30 **Ratio of Class A Indicator Taxa**

Count the number of Class A indicator taxa as listed in Appendix C-2 that are present in the community and divide by 7 (total possible number).

Appendix C-2

Indicator Taxa: Class A

Brachycentrus (Trichoptera: Brachycentridae)
Serratella (Ephemeroptera: Ephemerellidae)
Leucrocuta (Ephemeroptera: Heptageniidae)
Glossosoma (Trichoptera: Glossosomatidae)
Paragnetina (Plecoptera: Perlidae)
Eurylophella (Ephemeroptera: Ephemerellidae)
Psilotreta (Trichoptera: Odontoceridae)

Appendix C-3

Family Functional Groups

PLECOPTERA

Perlidae
Acroneuria
Attaneuria
Beloneuria
Eccoptura
Perlesta
Perlinella
Neoperla
Paragnetina
Agnetina

CHIRONOMIDAE

Tanypodinae
Ablabesmyia
Clinotanypus
Coelotanypus
Conchapelopia
Djalmabatista
Guttipelopia
Hudsonimyia
Labrundinia
Larsia
Meropelopia
Natarsia
Nilotanypus
Paramerina
Pentaneura
Procladius
Psectrotanypus
Rheopelopia
Tanypus
Telopelopia
Thienemannimyia
Trissopelopia
Zavrelimyia

Appendix C-3

Family Functional Group (continued)

Chironomini
Pseudochironomus
Axarus
Chironomus
Cladopelma
Cryptochironomus
Cryptotendipes
Demicryptochironomus
Dicrotendipes
Einfeldia
Endochironomus
Glyptotendipes
Goeldichironomus
Harnischia
Kiefferulus
Lauterborniella
Microchironomus
Microtendipes
Nilothauma
Pagastiella
Parachironomus
Paracladopelma
Paralauterborniella
Paratendipes
Phaenopsectra
Polypedilum
Robackia
Stelechomyia
Stenochironomus
Stictochironomus
Tribelos
Xenochironomus

Appendix D

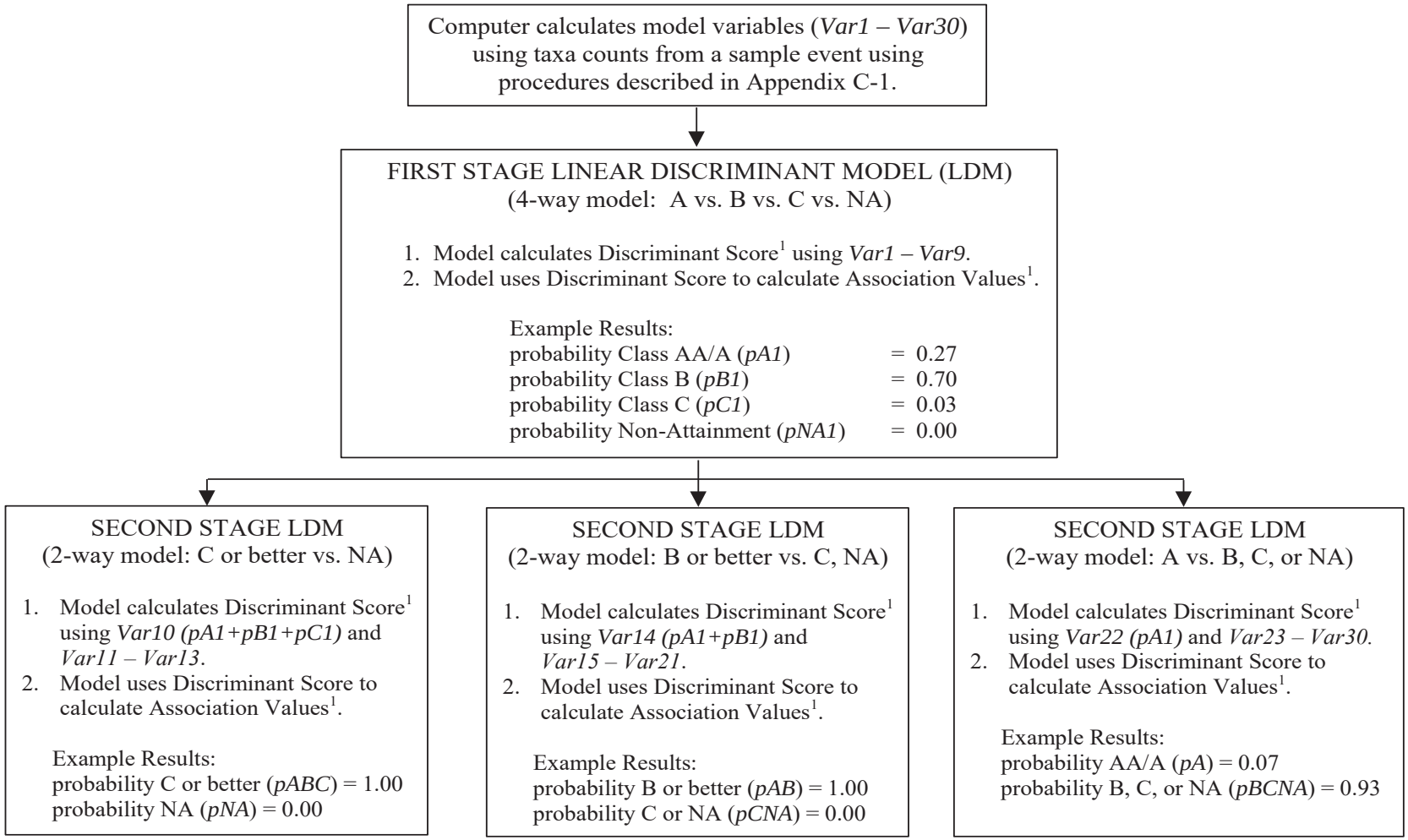
MRSA 38, 4-A Sec 464-465

Aquatic Life Standards for the State of Maine

Classification	Biological Standards
AA	No direct discharge of pollutants; aquatic life shall be as naturally occurs.
A	Natural habitat for aquatic life; aquatic life shall be as naturally occurs.
B	Unimpaired habitat for aquatic life; discharges shall not cause adverse impact to aquatic life in that the receiving waters shall be of sufficient quality to support all aquatic species indigenous to the receiving water without detrimental changes in the resident biological community.
C	Habitat for aquatic life; discharges may cause some changes to aquatic life, provided that the receiving waters shall be of sufficient quality to support all species of fish indigenous to the receiving waters and maintain the structure and function of the resident biological community.

Appendix E

Process of Calculating Model Variables and Association Values Using Linear Discriminant Models

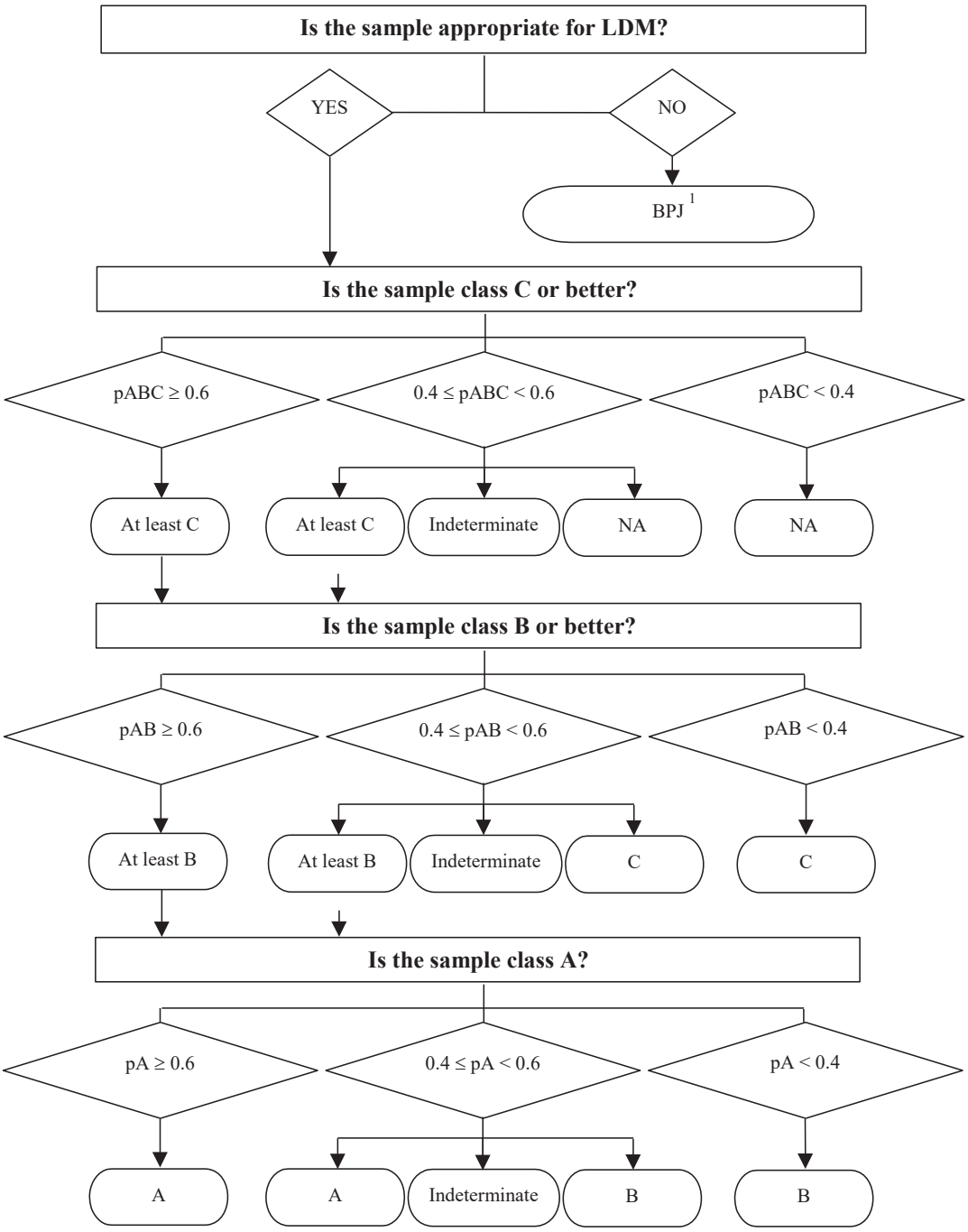


[1] Discriminant Score and Association Values are defined in Section III-2.(1).

Chart by Thomas J. Danielson

Appendix F

Process for Determining Attainment Class Using Association Values



[1] Best Professional Judgment (BPJ) is defined in Section III-2. (2), (4), and (5)

Chart by Thomas J. Danielson

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Maine DEP Biological Monitoring Unit
Stream Macroinvertebrate Field Data Sheet

Location: _____

_____

Potential Stressor: _____

_____

Log Number _____
Station Number _____
Waterbody _____
River Basin _____
Town _____
Stream Order _____

Directions _____
_____
_____
Lat-Long Coordinates (WGS84, meters)
Latitude _____
Longitude _____

Type of Sampler _____
Date Deployed _____
Number Deployed _____
Date Retrieved _____
Number Retrieved _____
Agency/Collector(s) Put-In:
Take-Out:

1. Land Use (surrounding watershed)
- ☐ Urban
- ☐ Cultivated
- ☐ Pasture
- ☐ Upland hardwood
- ☐ Upland conifer
- ☐ Swamp hardwood
- ☐ Swamp conifer
- ☐ Marsh

2. Terrain (surrounding watershed)
- ☐ Flat
- ☐ Rolling
- ☐ Hilly
- ☐ Mountains

3. Canopy Cover (surrounding view)
- ☐ Dense (75-100% shaded)
- ☐ Partly open (25-75% shaded)
- ☐ Open (0-25% shaded)

(% daily direct sun) _____

4. Physical Characteristics of Bottom (estimate % of each component over 12 m stretch of site; total = 100%)

[ ] Bedrock [ ] Cobble (2.5" – 10") [ ] Sand (<1/8") [ ] Clay
[ ] Boulders (>10") [ ] Gravel (1/8" – 2.5") [ ] Silt [ ] Muck [ ] Detritus

5. Habitat Characteristics (immediate area)

Time _____ AM PM	Time _____ AM PM
Wetted Width (m)_____	Wetted Width (m) _____
Bank Full Width (m) _____	Bank Full Width (m) _____
Depth (cm) _____	Depth (cm) _____
Velocity (cm/s) _____	Velocity (cm/s) _____
Diss. O_2 ___ (ppm) ___ (%)	Diss. O_2 ___ (ppm) ___ (%)
Temp (°C) _____	Temp (°C) _____
SPC (µS/cm) _____	SPC (µS/cm) _____
pH _____	pH _____
DO Meter #_____ Cal? Y / N	DO Meter #_____ Cal? Y / N
SPC Meter # _____ Cal? Y / N	SPC Meter # _____ Cal? Y / N

Flag location where measured

Temperature Probe # _____
☐ deployed ☐ retrieved

6. Observations (describe, note date)

7. Water Samples
- ☐ Standard
- ☐ Other

Lab Number:

8. Photograph #

Put-In
- Up
- Down

Take-Out
- Up
- Down

9. Landmarks of Sampler Placement (illustrate or describe landmarks to be used for relocation)

Options for Potential Stressor:
Agricultural Runoff
Altered Habitat
Altered Hydrology
BOD (Low DO)
Bog Headwaters
Chlorine
Gravel Pit
Impounded
Inorganic Solids
Lake Outlet
Logging
Low Gradient
Low pH
Metals
NPS Pollution
Nutrients
Organic Solids
Pesticides
Regulated Flows
Sedimentation
Superfund Site
Thermal
Tidal/Estuary
Toxic Organics
Urban Runoff

Options for 6. Observations:
Fish
Algae
Macrophytes
Habitat quality
Dams/impoundments
Discharges
Nonpoint stressors

Options for Location:
Above Road Crossing
Below Road Crossing
Above Town
Below Town
Above Fish Hatchery
Below Fish Hatchery
Above POTW
Below POTW
Above Landfill
Below Landfill
Below Airport
Below In-Place Contamination
Above In-Place Contamination
Above Point Source
Below Point Source
Above Urban NPS
Below Urban NPS
Above Agriculture NPS
Below Agriculture NPS
Above Forestry NPS
Below Forestry NPS
Above Dam
Below Dam
Impoundment
Lake Outlet
Main Stem (only for larger systems)
Above Confluence
Below Confluence
Below Falls
Pristine Landscape
Designated Ecoreserve
Minimally Disturbed

JANET T. MILLS
GOVERNOR

STATE OF MAINE
DEPARTMENT OF
INLAND FISHERIES & WILDLIFE
284 STATE STREET
41 STATE HOUSE STATION
AUGUSTA ME 04333-0041

JUDITH CAMUSO
COMMISSIONER

January 28, 2020

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Division
888 First Street, N.E.
Washington, D.C. 20426

Re: MDIFW Study Requests for the Rumford Falls Hydroelectric Project (FERC No. 2333)

Dear Secretary Bose:

On September 27, 2019, Rumford Falls Hydro LLC (RFH), a subsidiary of Brookfield Renewable (Brookfield), submitted Notice of Intent (NOI) to file an application for a new license and a Pre-Application Document (PAD) for the Rumford Falls Hydroelectric Project (Project) (FERC No. 2333). Subsequently, FERC issued its Notice of Intend to File License Application, Filing of Pre-Application Document, Commencement of Pre-Filing Process, and Scoping; Request for Comments on the PAD and Scoping Document, And Identification of Issues and Associated Study Requests for the Project on November 19, 2019. The Project is located on the Androscoggin River in the Town of Rumford, Oxford County, Maine. The Maine Department of Inland Fisheries and Wildlife (MDIFW) is a cabinet level agency of the State of Maine, and under Maine State Law (12 MRSA, §10051) MDIFW's mandate is "*…to preserve, protect, and enhance the inland fisheries and wildlife resources of the State; to encourage the wise use of these resources; to ensure coordinated planning for the future use and preservation of these resources; and to provide for effective management of these resources*." Based on our statutory responsibility we have prepared the following comments on the PAD and Study Requests:

PAD Section 4: Project Location, Facilities, and Operations

Impoundment Drawdowns

The document states on page 4-11, **"***Article 401 requires the Licensee to operate the Project in a run-of-river mode within 1 foot of full pond elevation (601.24 feet U.S. Geological Survey [USGS]) at the Upper Dam impoundment and 502.74 feet USGS at the Middle Dam impoundment) and shall at all times act to minimize the fluctuations of the reservoir surface elevation (i.e., maintain a discharge from the Project so that, at any point in time, flows immediately downstream from the Project tailraces approximate the sum of the inflows to the Project reservoirs, minus withdrawals).*"

MDIFW Comments: Stable impoundment levels are important to many aquatic species, and in previous correspondence MDIFW indicated we might request some impoundment water level data. We request a five-year history of any drawdown events that exceeded the 1-foot maximum

including the date(s) of occurrence, duration, and extent of the drawdown. We do not feel this rises to the level of a formal study request.

PAD Section 4: Project Location, Facilities, and Operations and Section 5: Description of Existing Environment and Resource Impacts

Bypass reach minimum flows

The document states on page 4-6, *"The upper bypass reach is 650 feet long and is steep with exposed bedrock. Leakage from the dam provides a minimum flow of approximately 1 cfs."*

On page 4-9, *"The Middle Dam bypassed reach is 2,865 feet long and consists of bedrock outcroppings and steep cascades. Leakage from the dam provides a minimum flow of approximately 21 cfs."*

On page 4-11, *"During low flows, the Licensee releases a minimum flow of 1 cfs from the Upper Dam and 21 cfs from the Middle Dam into the bypassed reaches per Article 402.*

No changes to the Project's current operations are being proposed at this time."

On page 5-18, *"During the previous relicensing, and in coordination with the USFWS and MDIFW, a study was conducted to assess flows within the bypassed reaches of the Project (Rumford Falls Power Co. 1991). Habitat within the bypass reaches is poor to non-existent. The upper bypassed reach is steep and consists predominantly of bedrock substrate. Habitat within the lower bypassed reach is also steep with cascades over bedrock and boulders. Based on the affected habitat and assessment of flows, the study found that modifying the flow regime within the bypassed reaches would not enhance instream habitat. The USFWS concurred with these findings and agreed to limit recommendations regarding minimum flows to the Project's tailrace areas, which are primarily driven by inflow to the Project given that the Project is operated as a run-of-river facility. The MDIFW also concurred that altering the existing flow regime was not warranted (Rumford Falls Power Co. 1991). The MDIFW also concluded "…little benefit to fisheries resources or their utilization would be gained by additional releases into the bypassed reaches…"*

MDIFW Comments: These comments are largely intended to address the underlined sections noted above. The river has become substantially cleaner and more aesthetically pleasing since the 1991 assessment. Recreational and angler use of the river has increased dramatically, and MDIFW has initiated a regular stocking program for rainbow and brown trout immediately below the Project. In addition, MDIFW has reviewed the earlier bypass study conducted in 1989 and the methodologies employed did not quantitatively evaluate the potential benefit of various minimum flows. Consequently, minimum flows in the bypass reaches, particularly the bypass below Middle Dam, should be revisited. MDIFW has proposed a bypass flow study later in this document.

Public Access

The document states on page 4-10, *"A carry-in canoe facility was implemented per Article 407 of the current license, which is located at the Carlton Bridge site and includes a parking area and a launching ramp with Americans with Disabilities Act (ADA) access. It is owned and operated by RFH. RFH also owns the Veteran's Park in the Town of Rumford…"*

On page 5-44 and 5-45, *"Boating and fishing are the primary recreational activities that occur in the Project Boundary; however, recreational use in the Project vicinity is limited and typically comprised of local residents. Due to the size of the Middle Dam impoundment, most of the recreational use occurs on the Upper Dam impoundment (FERC 1993).*

Under the current license, RFH developed a carry-in canoe facility at the Carlton Bridge site, located on the eastern edge of the Swift River just upstream of its confluence with the Androscoggin River, which includes a parking area and a launching ramp with ADA access (RFH 2007). RFH currently operates and maintains the facility.

The previous licensee, Rumford Falls Power Company, also installed a boat launch facility in Hanover, Maine, the town just to the east of the Town of Rumford. The Project was a cooperative venture between the MDIFW, Town of Hanover, and the original licensee. Rumford Falls Power Company purchased the land on January 27, 1999, but conveyed half of the site to the MDIFW on December 15, 1999 and the other half of the site to the Town of Hanover on February 2, 2000. The facility was designed by MDIFW and is operated and maintained by the Town of Hanover (Rumford Falls Power Company 2000).

There is also a trailer-accessible public boat ramp, which is not owned by RFH, located approximately 2 miles south of the Project on the Androscoggin River along Route 2. It has a concrete ramp and parking (Bureau of Parks and Lands 2019).

Fishing access to the Middle Dam impoundment is obtained via informal access at J. Eugene Boivin Park. Due to the relatively small size of the Middle Dam impoundment and the close proximity to the Lower Station Development, the Licensee discourages in-water recreational activities in this area due to access and safety concerns. Access to the tailrace areas and bypassed reaches is limited to shoreline fishing along the western shoreline at the Lower Station tailrace (FERC 1993).

The previous licensee investigated the need for additional public access for fishing in the tailrace area, but due to safety concerns related to the steep and rocky slopes along both banks and the poor fishing opportunities resulting from the discontinuation of trout stocking it was not recommended (FERC 1993)."

MDIFW Comments: The Licensee made some significant improvements to public access during the previous re-licensing and has proposed a study to evaluate recreational access facilities in the Project vicinity. MDIFW would have requested a similar study, but the one proposed should suffice. In addition, the underlined statement above is dated and should be revisited, particularly for the bypass area below Middle Dam. As much of the river is floated by paddled craft, it will be important for the Licensee to consider various put-in and take-out relationships among the

access sites above and below the dam areas, including necessary portage trail(s). Based on findings from the Licensee's proposed study, MDIFW may seek additional access improvements.

PAD Section 5: Project Location, Facilities, and Operations.

Aquatic Resources

The document states on page 5-18, *"Historically, Rumford Falls is believed to be the upstream limit for American eel (MDMR and MDEP 2008; as cited in Moore and Reblin 2010). In 2019, the MDIFW indicated that there are no confirmed occurrences of this species on the mainstem of the Androscoggin River or tributaries to the river upstream of the city of Auburn (MDIFW 2019a), which is well downstream of the Project. However, the MDIFW also noted that there was one confirmed occurrence of American eel in 2001 in Joe's Pond, which is located upstream of the Project dams on an unnamed tributary to the Androscoggin River in the town of Rumford. However, additional consultation with the regional office regarding this occurrence was associated with a pond that is not tributary to the Androscoggin River (MDIFW 2019a).*

MDIFW Comments: Although relatively rare, a review of our regional records indicate that American eel have been documented above the Town of Auburn in several waters including: East Branch of the Nezinscot River, South Pond in Buckfield, Bunganut Pond in Hartford, and Canton Lake in Canton. This data certainly suggest American eel can reach the base of Rumford Falls. More interestingly, our records suggest Gerald Cooper reported the presence of American eel in South, Round, and North Ponds in Greenwood in the 1940's. If true, this would place them above Rumford Falls.

The Yoder data on the upper Androscoggin River provides a good sense of species presence but lacks the more recent presence of the very invasive Rock Bass. MDIFW has observed or received reports of this species from Gilead to Brunswick.

Study Request 1: Minimum Flow Analysis

This study request relates to the evaluation of the existing minimum flows, specifically in the reach from Middle Dam downstream to the confluence with the Lower Station tailrace.

1. The goal of this study is to inform the decision process for determining the best timing and extent of minimum flow releases required to maximize fishery resources in terms of both aquatic habitat and fishing opportunities. The objectives of this study are to (a) generate a comparative analysis of the various scenarios for minimum flow levels that best addresses and/or maximizes the needs of inland fishery resources; and (b) evaluate how various minimum flows influence the fishable aquatic habitat in the various lotic and lentic reaches of the Androscoggin River in the identified reach.

2. The study is requested to ensure that any agreed upon minimum flow releases occur at levels that meet inland fisheries needs. The amount of minimum flow releases is required to maximize aquatic freshwater fisheries habitat as well as fishable habitat.

3. MDIFW is a cabinet level agency of the State of Maine. Under Maine State Law (12 MRSA, §10051), MDIFW's mandate is "…to preserve, protect, and enhance the inland fisheries and wildlife resources of the State; to encourage the wise use of these resources; to ensure coordinated planning for the future use and preservation of these resources; and to provide for effective management of these resources."

4. Given changing Agency management objectives since the original license was issued, MDIFW requests that minimum flows be re-evaluated.

5. Minimum flow provisions are commonly required for hydropower operations in relation to how they impact the quality and quantity of aquatic habitat, fish passage, and/or recreational use of the site (e.g. fishability). An evaluation of minimum flow provisions is necessary to determine how best to meet the various resource needs including those of the Licensee, which may not be consistent among the various agencies and other interested parties.

6. Minimum flow evaluations are commonly requested for hydropower project relicensing. This study request may parallel other agency flow study requests and should be a collaborative effort between MDIFW, other interested agencies, and the Licensee. Therefore, the study details, including the actual methodology, should be developed after a review of all study requests to minimize redundancy and meet the collective need for flow analyses. However, for the purpose of more clearly addressing expectations, MDIFW proposes an Instream Flow Incremental Methodology employing a Physical Habitat Simulation Model to quantify flow and habitat relationships, and the development of Weighted Usable Area outputs to characterize habitat suitability for target species (adult rainbow trout, brown trout, and smallmouth bass). Additionally, MDIFW and interested resource agency staff, along with the Licensee, could visually rate various flow(s) with the intent of identifying a minimum flow that will enhance aquatic habitat and recreational angling opportunities below the dam. The actual test flows would be selected through a collaborative process involving MDIFW, other interested agencies, and the Licensee.

7. The level of effort and cost is commensurate with a project the size of the Rumford Falls Project and the likely license term. Several days of field work and subsequent analyses may be needed to assess pre-determined locations of the river under various minimum flows. Only an evaluation of various minimum flow scenarios, whether modeled or conducted in situ can effectively determine the best approach for addressing flow releases for the Project.

Study Request 2: Brown Trout and Rainbow Trout Telemetry Study

1. Through annual stockings, the Androscoggin River in the Rumford area supports seasonal brown and rainbow trout with some holdover fish. These fisheries have not been thoroughly evaluated, and movement is likely important for trout survival in this more temperature-limited reach. Historically, the brown and rainbow trout fisheries were more robust in the upper Androscoggin River. However, around 2005 these fisheries collapsed, and it has been unable to rebound despite annual MDIFW stocking. It was believed that many of the brown trout stocked in the impoundment migrated to the upper river reaches, and perhaps they are no longer surviving or exhibiting that behavior. Our Agency's concern is twofold: first, what are the movements of both brown and rainbow trout above and below the dams, and how are these

movements influenced by Project operations? Secondly, have there been changes in Project discharges over time that could be contributing to displacement of these species at present time over historical levels? It is our Agency's position that a telemetry study is important in determining the movements of stocked brown and rainbow trout to ascertain what effects, if any, Project discharges are having on these species.

The objectives of this study will document the seasonal movements of stocked trout in the river sections immediately above and below the Project site. MDIFW has documented that brown and rainbow trout stocked in this section of the river create a desirable recreational fishery in the Androscoggin River. Specific goals and objectives include:

- Collection of biometric data to characterize brown and rainbow trout population dynamics.
- Movements and behaviors of newly stocked brown and rainbow trout.
- Movements and behaviors of older-age brown and rainbow trout.
- Effects of Project operations on the movement and behaviors of stocked brown and rainbow trout.
- Aid fishery managers in determining the cause of the decline in brown and rainbow trout fisheries above and below the Project.

2. MDIFW is responsible for managing the inland fishery resources in the Androscoggin River. To date, we have little information on the status of the trout fisheries in the Rumford Project area, and to what extent fish stocked in the river still contribute to the upstream/downstream fishery. In addition to the data gap for the Rumford brown trout and rainbow trout fisheries, MDIFW is attempting to determine the cause of the severe decline in the upper river fishery. A severe decline in trout survival began around 2005, to the extent that only one age class of fish was supporting a very limited fishery. This decline negatively impacted the local fishing economy by suppressing angler interest and effort. The formerly robust trout fisheries attracted anglers from substantial distances, and the stocking program below the dam attracted anglers from nearby areas. If we are to ever regain a higher quality recreational fishery in the Rumford area, we must understand how brown and rainbow trout move within this system and how operation of the Project may impact this effort.

3. The Maine Department of Inland Fisheries and Wildlife is a cabinet level agency of the State of Maine. Under Maine State Law (12 MRSA, §10051), MDIFW's mandate is "…to preserve, protect, and enhance the inland fisheries and wildlife resources of the State; to encourage the wise use of these resources; to ensure coordinated planning for the future use and preservation of these resources; and to provide for effective management of these resources." MDIFW is the natural resource agency responsible for managing inland fisheries resources in the Androscoggin River.

4. MDIFW is requesting this study because the data do not currently exist. We need to determine how these trout fisheries function, their seasonal movements, and what impacts Project operations may have on each species.

5. Operation of the Rumford Falls Project has a direct impact on the brown and rainbow trout fisheries in the Androscoggin River. Major perceived impacts include flow, water levels,

temperature, and mortality. A study of this nature is necessary for MDIFW to better understand why both brown and rainbow trout fisheries in the upper river declined and how best to manage the newer fishery below the Project, whether by determining it is a function of brown trout life history, or if Project operations are influencing the fisheries in ways we have yet to determine.

6. Radiotelemetry studies are routinely requested and utilized during the hydrorelicensing process in Maine and elsewhere. The proposed study is essentially a replication of recent salmonine telemetry studies, many of which have occurred at other hydroelectric projects within the Kennebec River drainage (most recently at the Shawmut Project). Radio telemetry is a highly effective means of determining salmonine movement and habits and determining potential Project-related impacts to their populations.

7. This study is commensurate with the scale of the Project and the importance of the resource. MDIFW needs a better understanding of the status of the brown and rainbow trout fisheries below Middle Dam to the Swift River confluence area, how the Project may or may not be impacting these fisheries, and how we may be able to recover these to historic levels.

MDIFW is willing to collaborate with the Licensee on this study. MDIFW would assist in various phases of the study including study design and scoping, tagging and stocking of study fish, collection of fish "at large", and mobile tracking. A portion of this study would entail surgically implanting radio tags into hatchery-reared trout. This will require use of MDIFW hatchery facilities and associated staff. MDIFW is willing to assist in the tagging efforts to offset some of the associated time and labor. MDIFW is also willing to provide at least some of the labor and equipment (electrofishing boat) necessary in collecting brown and rainbow trout from the Androscoggin River to be included in this study.

Study Request 3: Comprehensive Angler Creel Survey

1. This study will provide information regarding the status of the recreational fishery both above and below the Rumford Falls Project. Specific study goals and objectives include:

- Deriving an overall estimate of angler use.
- Deriving estimates of angler success (harvest, catch rates, etc.)
- Collection of biometric data on harvested fish.
- Determine overall status of the fishery. Findings will dovetail with above studies to give a comprehensive understanding of the fishery and potential Project impacts.

2. MDIFW uses angler creel surveys to assess the overall success of our inland fisheries management programs. This type of study provides a comprehensive view of angler use and the success of stocking programs or wild fisheries as well as providing MDIFW with critical information related to the status of the fishery and an estimate of angler use. Data obtained from this effort will allow MDIFW to make informed management decisions to improve the fisheries in the Project area.

3. The Maine Department of Inland Fisheries and Wildlife is a cabinet level agency of the State of Maine. Under Maine State Law (12 MRSA, §10051), MDIFW's mandate is "…to preserve, protect, and enhance the inland fisheries and wildlife resources of the State; to encourage the

wise use of these resources; to ensure coordinated planning for the future use and preservation of these resources; and to provide for effective management of these resources." MDIFW is the natural resource agency responsible for managing inland fisheries resources in the Androscoggin River.

4. To date, MDIFW has very limited data regarding the status of the recreational fishery in the Project area, and its proximity to the regional boundary make it difficult for local regional staff to assess. The reach downstream of Middle Dam is a relatively new stocking program and there is a lack of good angling data for the reach. The upper Androscoggin River once supported robust brown and rainbow trout fisheries which experienced a severe decline around 2005. It was believed most of the brown trout in the upper river were fish from the impoundment that migrated upstream. In order to better understand the status of this fishery and to recover this valuable fishery resource, MDIFW needs a better understanding of its current status. The creel survey information, when combined with information gained from studies mentioned above will provide a clearer picture as to the status of the fishery, and how the Project may impact the success of this public resource.

5. Operation of the Rumford Falls Project has a direct impact on the recreational fishery in the Androscoggin River. Major perceived impacts include flow, water levels, temperature, and mortality. These variables affect the success of inland fish management above and below the Project.

6. MDIFW uses randomly stratified angler creel surveys to assess many of its stocked and wild fisheries resources. Angler creel surveys are widely accepted as a standard method of assessing public use of the recreational fishery. MDIFW requests a roving clerk survey of both the area above the Project (impoundment and flowing water reach in Rumford area), and the entirety of the Project tailwater (extending downstream to the Webb River confluence).

7. This study is commensurate with the scale of the Project and the importance of the resource. Neither the Telemetry Study nor the Minimum Flow Study proposed above will provide the information detailed in this study request. MDIFW needs a better understanding of the status of the recreational fishery above and below the Project, how the Project may impact the fishery, and in particular how we may be able to recover the brown and rainbow fisheries.

MDIFW is willing to collaborate with the Licensee on this study. This type of study is quite economical, generally requiring funding for 1-2 seasonal staff and their associated transportation. Although the Rumford area sections of the Androscoggin River are open to year-round fishing, MDIFW seeks to survey the fishery from April – November.

Please feel free to contact my office if you have any questions regarding this information, or if I can be of any further assistance.

Best regards,

John Perry
Environmental Review Coordinator

Cc: Francis Brautigam, Joe Overlock--MDIFW Fisheries Division, Augusta Headquarters
James Pellerin, Nicholas Kalejs--MDIFW Fisheries Division, Region A
Kathy Howatt, Christopher Sferra--MDEP
Antonio Bentivoglio--USFWS

January 28, 2020

Ms. Kimberly D. Bose
Secretary Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

TROUT UNLIMITED
MAINE COUNCIL

Via online submission to: http://www/ferc.gov

Subject: **Comments of Maine Council of Trout Unlimited on the Pre-application Document for the Rumford Falls Hydroelectric Project (FERC No. 2333)**

Dear Secretary Bose:

On behalf of its chapters and their nearly 2,000 members, Maine Council of Trout Unlimited (TU) submits these comments on the Rumford Falls Hydro LLC (RFH) Notice of Intent to File Application for a New License and Pre-Application Document for the Rumford Falls Project (P-2333-0091) on the Androscoggin River in Rumford Maine.

The project contains the third largest generation capacity of any single generation facility in Maine. Located on the site of one of Maine's largest waterfalls, the two dams the project contains marginalize views of the falls, and under low flow conditions, currently authorized minimum flows dewater the falls and the bypass.

Maine TU Council strongly supports the study requests submitted by Maine Department of Inland Fisheries and Wildlife:

- Minimum Flow Analysis
- Brown Trout and Rainbow Trout Telemetry Study
- Comprehensive Angler Creel Survey

We think that it is especially important that the Minimum Flow Analysis and the Telemetry Study be conducted together to adequately assess the impact of the low flows on trout and other fish species in the project area, and determine future flow prescriptions to replace those currently in place that are so obviously harmful to aquatic habitat. We also request that telemetry studies be expanded to include both upstream and downstream American eel passage. Eels form a large part of many watershed's biomass, and occur throughout the state, see Attachment A. MDIFW PAD comments include specific documentation of American eels occurring upstream of Rumford Falls Dam. Accordingly, the burden should be on the applicant to demonstrate that they are not present. Failure to conduct appropriate studies to determine this would result in an incomplete environmental assessment.

Maine TU Council appreciates the opportunity to comment on this project and looks forward to proceeding under the ILP process.

Respectfully,

Stephen G. Heinz
Maine TU Council FERC Coordinator

Attachment: American Eel Native Freshwater Range

ATTACHMENT A

Source: American Eel Biological Species Report
Supplement to: Endangered and Threatened Wildlife and Plants;
12-Month Petition Finding for the American Eel (Anguilla rostrata)
Docket Number FWS-HQ-ES-2015-0143
U.S. Fish and Wildlife Service, Region 5
June 2015

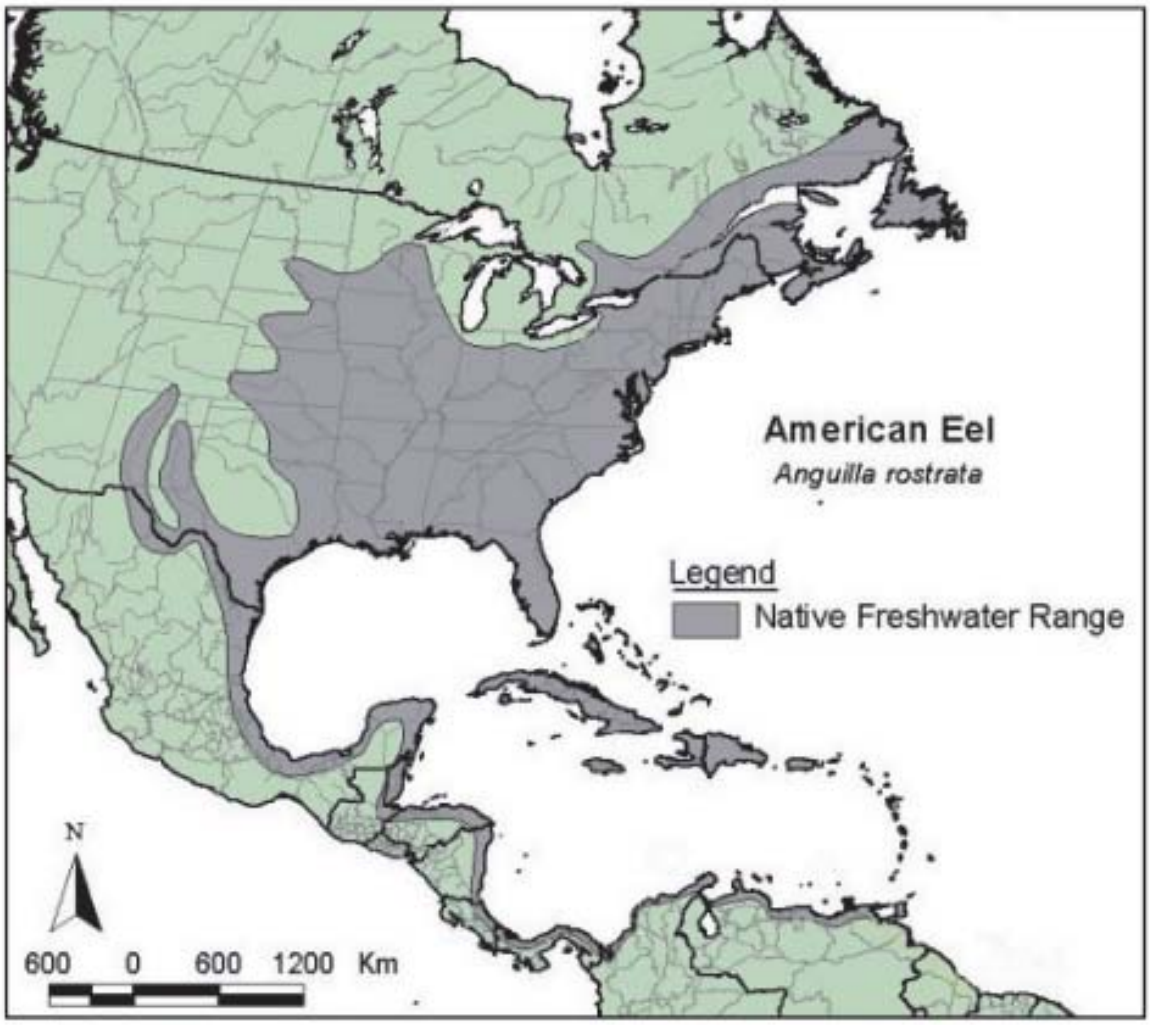


FIGURE 1—Native freshwater range of American eel (*Anguilla rostrata*) in the Americas (updated from NatureServe, 2006).

APPENDIX B
WATER QUALITY STUDY PLAN

Water Quality Study

The Licensee is proposing to conduct a Water Quality Study on the Androscoggin River in the vicinity of the Rumford Falls Hydroelectric Project (Project) developments. The Maine Department of Environmental Protection (MDEP) requested a Water Quality Study for the Rumford Falls Project (Project) because existing and available water quality information provided in the Pre-Application Document (PAD) were determined to be insufficient to demonstrate attainment of Maine's water quality standards and to inform the water quality certification process under Section 401 of the Clean Water Act. The proposed Water Quality Study plan addresses five of the MDEP's study requests and one of FERC's study requests.

The MDEP requested RFH either conduct an Impoundment Aquatic Habitat Study and an Outlet Stream Aquatic Habitat Study in the lower bypass reach, as well as the tailrace, or provide three years of impoundment elevation data for the Upper Dam impoundment and inflow/outflow data for MDEP analysis. In lieu of conducting an Impoundment Aquatic Habitat Study and the Outlet Stream Aquatic Habitat Study in the lower bypass reach, RFH is providing the requested data. This data is graphically provided in this study plan and will be submitted to the MDEP concurrent with the filing of this PSP.

This study plan is consistent with MDEP protocol for hydropower studies (MDEP 2019a).

1.0 Goals and Objectives

The goal of the study is to demonstrate that the Project meets water quality standards. The objectives of the study are to complete the following:

- An Impoundment Trophic State Study within the deepest locations of the upper and lower impoundments;
- Temperature and dissolved oxygen (DO) monitoring within the lower bypass reach and in the free-flowing tailwater reach below the confluence of the lower bypass reach with the lower powerhouse discharge;
- A Benthic Macroinvertebrate Study in the lower bypass reach and in the free-flowing tailwater reach below the confluence of the lower bypass reach with the lower powerhouse discharge; and,

- An Outlet Stream Aquatic Habitat Study conducted in the Project's tailrace.

2.0 Study Area

The study area includes the Androscoggin River in the vicinity of the Project.

3.0 Background and Existing Information

3.1 Water Quality Standards

The Androscoggin River is classified by MDEP as a Class C water "from its confluence with the Ellis River to a line formed by the extension of the Bath-Brunswick boundary across Merrymeeting Bay in a northwesterly direction" and includes all Project affected waters. Class C waters must be of such quality that they are suitable for the designated uses of drinking water supply after treatment, fishing, agriculture, recreation, industrial process and cooling water supply, hydroelectric power generation (except as prohibited under Title 12, section 403), navigation, and as habitat for fish and other aquatic life.

Class C waters must meet an instantaneous DO standard of 5.0 parts per million (ppm) or 60 percent saturation, whichever is higher. In identified salmonid spawning areas where water quality is sufficient to ensure spawning, egg incubation, and survival of early life stages, the water quality sufficient for these purposes must be maintained. In addition, DO must meet a 30-day average 6.5 ppm requirement using a temperature of 24 degrees centigrade or the ambient temperature of the water body, whichever is less. Discharges to Class C waters may cause some changes to aquatic life, except the receiving waters must be of sufficient quality to support all species of fish indigenous to the receiving waters and maintain the structure and function of the resident biological community.

3.2 Existing Water Quality Data

The Androscoggin River has a history of industrial and municipal use over the last 200 years (MDEP 2019b). The Androscoggin River historically experienced substantial pollution and low

DO levels caused by the discharge of paper mills and untreated or partially treated municipal sewage; however, water quality has since improved substantially (Rumford Falls Power Co. 1991).

During the previous relicensing, a Water Quality Study was conducted to characterize the DO within the Project vicinity (Rumford Falls Power Co. 1991). The study revealed that DO concentrations were consistently high within the entire Project vicinity. It also showed that there was little, if any, horizontal or vertical stratification of DO concentrations within the Project vicinity. Thermal stratification and preferential withdrawals from low-DO strata are the primary mechanism for causing downstream DO impairments at hydropower facilities (Sale et al. 1991). Therefore, it was determined that significant DO increases could not be realized from modifying the operating mode of the Project because the existing DO concentrations were consistently high. The MDEP concurred and stated that "based upon the data collected for this report, together with MDEP's data, it appears that the DO requirements for Class C are being met above and immediately below the Rumford Falls Project… Because of relatively high DO levels (relative to percent saturation) above the Project, only a small increase in DO (<1 milligram per liter [mg/L]) can be realized even with substantial (50%) spillage. Spillage (or turbine venting) does not appear to be required to meet current Class C limits." The U.S. Fish and Wildlife Service (USFWS) and Maine Department of Inland Fisheries and Wildlife (MDIFW) also concurred with the conclusions of the report. Immediately below the Project vicinity, the velocity of the Androscoggin River is swift and natural aeration is good (Rumford Falls Power Co. 1991).

Recent water quality data collected within the Project vicinity were obtained from the following sources for the PAD, and provide a more recent indication that water quality within the Project vicinity meets applicable water quality standards. A summary of these sources are provided below. In addition, in support of a turbine upgrade at the Project, the MDEP issued a new water quality certificate for the Project in 2009.

- Upon request from RFH, the MDEP provided the:
    - 2018 Aquatic Life Classification Attainment Report by the Biological Monitoring Program, which analyzed the macroinvertebrate community in the Androscoggin

River in Mexico, Maine (the town abuts Rumford to the east), to determine aquatic life classification; and

  - Various monitoring data collected at numerous sample sites along the Androscoggin River from 1995 to 2008. A portion of these data were collected by the Androscoggin River Watershed Council (ARWC) in collaboration with the MDEP.
- ARWC water quality data were available from 2013 to 2017 (MDEP 2019b).

Table 1 provides the discrete water quality data obtained from the MDEP and the ARWC. Sites AR2 and the Rt. 232 sample sites were located approximately 10 river miles (RM) upstream from the upper dam. Sample Site AR6 was located approximately 2 RM upstream from the upper dam. Veterans Bridge was located approximately 1 RM downstream from the lower station powerhouse. The water quality data reviewed showed no evidence of impairment, and DO levels met applicable water quality standards.

The Aquatic Life Classification Attainment Report for 2018, which includes macroinvertebrate data collected on the Androscoggin River in the Town of Mexico, attains Class A aquatic life criteria (see Appendix E of the PAD). Water quality data were collected during the deployment and retrieval of rock baskets and met water quality standards (Table 2).

TABLE 1
DISCRETE WATER QUALITY DATA COLLECTED WITHIN RUMFORD FALLS PROJECT VICINITY, 1995-2017 (MDEP 2019C).

Site*	Year (June - September)	Parameter	Water temperature	DO (ppm)	DO (%)	pH	Specific Conductance (microsiemens per centimeter [µS/cm])
AR2 – Rumford Point	2013	No. Sample Days	4	4	4	-	1
		Mean	19.2	7.8	87.4	-	30
		Minimum	22.0	8.3	90.3	-	30
		Maximum	20.4	8.0	89.1	-	30
Rt. 232	2008	No. Sample Days	-	4	4	4	4
		Mean	-	6.8	73.5	-	29
		Minimum	-	6.1	71.4	6.1	20
		Maximum	-	7.4	76.4	6.3	37

Site*	Year (June - September)	Parameter	Water temperature	DO (ppm)	DO (%)	pH	Specific Conductance (microsiemens per centimeter [µS/cm])
Rt. 232	1999	No. Sample Days	9	9	-	9	-
		Mean	20.4	8.1	-	-	-
		Minimum	17.5	7.7	-	6.8	-
		Maximum	23.0	8.5	-	7.1	-
Rt. 232	1995	No. Sample Days	11	11	-	-	-
		Mean	18.1	8.9	-	-	-
		Minimum	12.0	7.8	-	-	-
		Maximum	23.0	11.6	-	-	-
AR6 – Rumford Boat Launch	2017	No. Sample Days	7	7	7	-	7
		Mean	20.1	8.2	89.9	-	32
		Minimum	16.1	7.5	84.2	-	22
		Maximum	21.7	9.3	98.0	-	38
Veterans Bridge Mexico, ME	2008	No. Sample Days	-	4	4	4	4
		Mean	-	6.7	75.0	-	42
		Minimum	-	6.5	73.5	6.0	27
		Maximum	-	6.9	76.8	6.3	55
Minimum			12.0	6.1	71.4	6.0	20.0
Maximum			23.0	11.6	98.0	7.1	55.3

*Sites AR2 and the Rt. 232 sample sites were located approximately 10 river miles (RM) upstream from the upper dam. Sample Site AR6 was located approximately 2 RM upstream from the upper dam. Veterans Bridge was located approximately 1 RM downstream from the lower station powerhouse.

TABLE 2
WATER QUALITY DATA COLLECTED DURING THE DEPLOYMENT (7/23/2018) AND RETRIEVAL (8/20/2018) OF MACROINVERTEBRATE ROCK BASKETS FROM THE ANDROSCOGGIN RIVER IN MEXICO, MAINE (MEXICO ABUTS RUMFORD TO THE EAST)

Parameter	7/23/2018	8/20/2018
Water temperature (degrees Celsius [ºC])	23.2	22.8
Dissolved oxygen (mg/L)	9.3	10.0
Dissolved oxygen (%)	107.2	114.3
Specific conductance (µS/cm)	79.4	70.3
pH	7.3	7.3

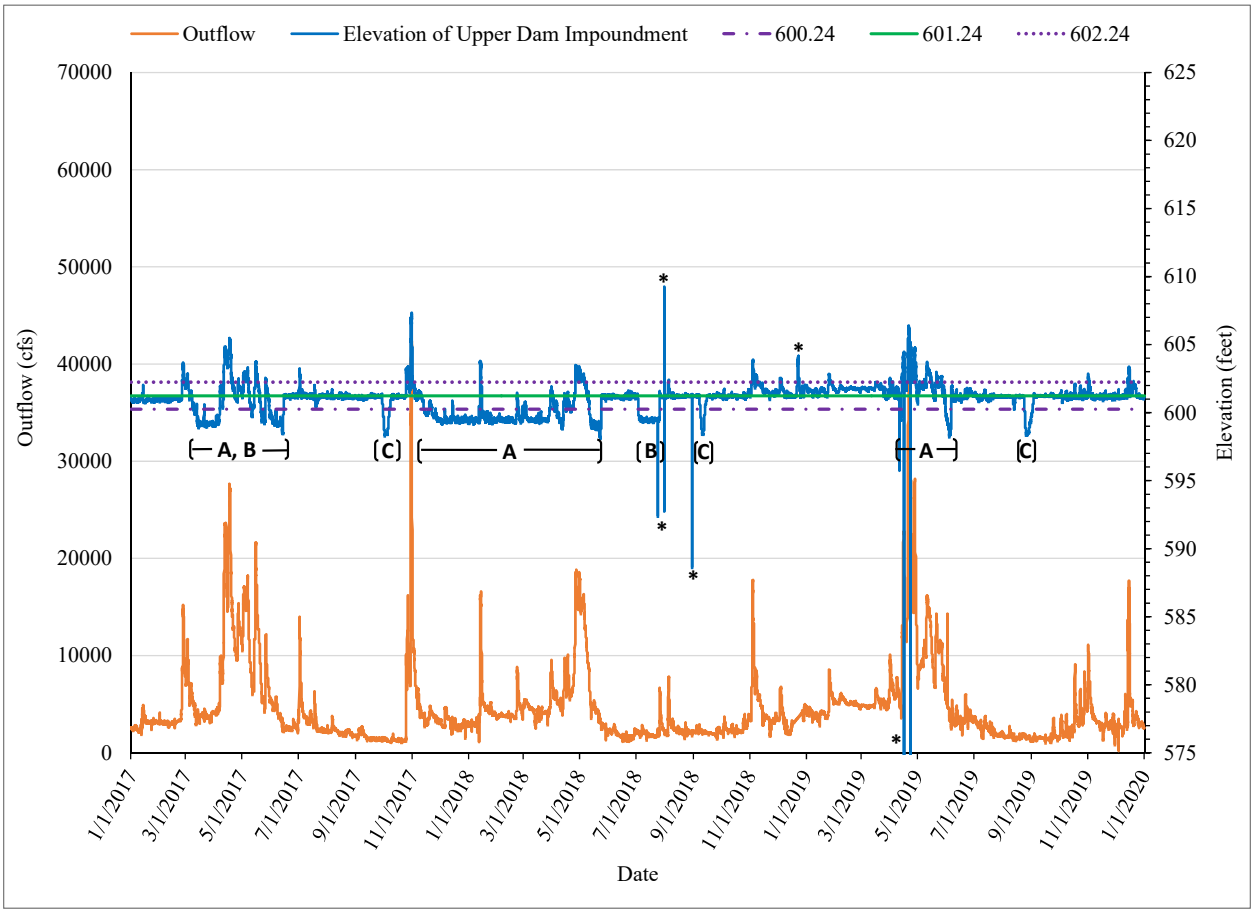
3.3 Impoundment Elevation and Project Flow Data

As discussed previously, RFH is providing three years of impoundment elevation data for the Upper Dam impoundment and flow data for the Project in lieu of conducting an Impoundment Aquatic Habitat Study or an Outlet Stream Aquatic Habitat Study in the lower bypass reach. The data is graphically displayed below in Figure 1 and the electronic data will be submitted to the MDEP for analysis concurrent with the filing of this PSP.

The Project is required to operate in a run-of-river mode within 1 foot of full pond elevation (elevation 601.24) at the Upper Dam impoundment and shall at all times act to minimize the fluctuations of the reservoir surface elevation (i.e., maintain a discharge from the Project so that, at any point in time, flows immediately downstream from the Project tailraces approximate the sum of the inflows to the Project reservoirs). Consequently, as shown in Figure 1, the elevations of the Upper Dam impoundment often mimic flow.

Per Article 401 of the current license, run-of-river operations may be temporarily modified if required by an operating emergency beyond the control of the Licensee. Periodically, the Project has experienced high flow events, which have removed flashboards and precluded repairs until water levels were safe. Run-of-river operations may also be temporarily modified for short periods upon mutual agreement between the Licensee and the USFWS, MDEP, and MDIFW. RFH has drawn down the Upper Dam impoundment for maintenance and repairs as well as FERC-required inspections. RFH has conducted these scheduled drawdowns in coordination with the USFWS, MDEP, and MDIFW. Impoundments were gradually drawn down and minimum flows were maintained to avoid potential impacts to resources during these periods.

FIGURE 1
IMPOUNDMENT ELEVATION OF THE UPPER DAM IMPOUNDMENT AND FLOW DATA FOR THE RUMFORD FALLS PROJECT, 2017 - 2019



Notes:
A – High flows removed flashboards and precluded repairs until water levels were safe.
B – Repair or maintenance activities were conducted.
C – FERC-required inspections were conducted.
* – Instrumentation error

4.0 Project Nexus

The Project is operated in a run-of-river mode and continued operation of the Project is not expected to negatively impact water quality in affected waterbodies. The information obtained from this study will help confirm the Project meets Maine's Class C water quality standards and supports MDEP's water quality certification process under Section 401 of the Clean Water Act.

5.0 Methodology

The Water Quality Study will include the following five independent assessments: impoundment trophic state, impoundment aquatic habitat, temperature and DO, benthic macroinvertebrates, and outlet stream aquatic habitat as requested by MDEP and consistent with MDEP guidance for hydropower studies (MDEP 2019a).

5.1 Impoundment Trophic State Study

The proposed Impoundment Trophic State Study will be conducted in the deepest spot of each of the two Project impoundments, as requested by MDEP, and will be conducted consistent with the latest MDEP protocol for hydropower studies (MDEP 2019a). The trophic State Study will consist of water quality sampling twice per month for a consecutive five-month period within the timeframe of May through October 2020. During the initial site reconnaissance for the study, a survey of the two impoundments will be made by boat to determine the deepest spot in each impoundment using a depth finder and confirmed with a weighted tape measure. The final field-identified sampling locations will need to be located upstream of any boat barriers and will need to be safely accessible. Sampling locations will be recorded and relocated using a Global Positioning System (GPS) position. Field personnel involved with this study will be certified by MDEP's Division of Environmental Assessment Lakes Section for the sampling protocol. If agreed to by MDEP, training and certification will preferably take place on-site prior to commencement of the field study.

Sampling parameters for the Trophic State Study are summarized in Table 3. The listed detection limits are based on MDEP guidance (MDEP 2019a); however, the final detection limits will be determined by the contracted laboratory. If the contracted laboratory cannot meet the targeted detection limits, MDEP will be contacted for approval of the revised detection limits.

TABLE 3
TROPHIC STATE STUDY SAMPLING PARAMETERS, METHODS, AND DETECTION LIMITS

Parameter	Sampling method	Detection Limits
Secchi Disk Transparency	Water scope	0.1 meter
Temperature	Profile	0.1 ºC
Dissolved Oxygen	Profile	0.1 mg/L
Total Phosphorus	Integrated core	0.001 mg/L
Chorophyll *a*	Integrated core	0.001 mg/L
Color	Integrated core	1.0 Standard Platinum Units (SPU)
Ph	Integrated core	0.1 Standard Units (SU)
Total Alkalinity	Integrated core	1.0 mg/L

Water clarity will be measured with a Secchi disk and a viewscope following standard methods. The reported depth will be the average of at least two separate readings. To obtain a reading, a Secchi disk is lowered on the sunny side of the boat while looking through the viewscope until the disk disappears from view. The disk is then slowly raised until the white portion of the disk is just visible and the depth noted from the chain or rope markers.

Water quality profiles of temperature and DO will be measured using a YSI ProDSS or equivalent water quality meter with the required sensor accuracy. The YSI ProDSS has a DO sensor accuracy of +/- 0.1 mg/L or 1 percent of reading (whichever is greater) and a temperature accuracy of +/- 0.2°C. The water quality instrument will be calibrated for DO on site prior to use and post-calibrated at the end of the field day with all calibration data recorded in a field book or field data sheet. Profiles will be conducted by lowering the water quality meter to the desired depth, then allowing the instrument to stabilize, and recording the water quality readings on a field data sheet. Measurements will be taken from just below the water surface (0.1 meter [m]) and then at 1 m intervals to 0.5 m from the bottom depth. At depths below 15 m, readings will be taken every other meter, and at depths below 25 m readings will be taken every 5 meters.

Water samples will be collected using an integrated core method conducted by lowering a weighted tube to the desired water depth, sealing (e.g., crimping) the open end of the tube at the water

surface, extracting the water core and transferring to a sample container. In thermally stratified waters ($\Delta T \geq 1°C/m$ below 3 m depth) an integrated core sample will be taken from the epilimnion. If the thermally stratified impoundment also features a spike in DO at depths below the epilimnion, then the integrated core sample will be extended to the depth of the increased DO. In non-thermally stratified waters, the integrated core sample will be extended to twice the Secchi disk depth, 1 m from the bottom or 10 m, whichever is less.

The monthly sampling from May to October will be supplemented with an additional sample collected from each of the two impoundment deep spots in late summer 2020 (mid – late August) and analyzed for an expanded set of water quality parameters. If the water is thermally stratified, three samples will be collected (with the exception of chlorophyll *a*) from an epilimnetic core, at the top of the hypolimnion, and at one meter above the sediment. Chlorophyll *a* will be collected as an epilimnetic core. If thermal stratification is not present, an integrated core sample will be collected from a depth equivalent to twice the Secchi disk depth, 1 m from the bottom or 10 m, whichever is less. Water samples will be collected using an integrated core sampler (weighted tubing, as discussed previously) and a Kemmerer type sampler for collecting samples from discrete depths, if required. Samples will be analyzed for the list of parameters and detection limits presented in Table 4.

TABLE 4
TROPHIC STATE STUDY ADDITIONAL LATE SUMMER SAMPLING PARAMETERS, METHODS, AND DETECTION LIMITS

Parameter	Sampling method	Detection Limits
Total Phosphorus	Integrated core/Kemmerer	0.001 mg/L
Nitrate	Integrated core/Kemmerer	0.01 mg/L
Chlorophyll *a*	Integrated core	0.001 mg/L
Color	Integrated core/Kemmerer	1.0 SPU
DOC	Integrated core/Kemmerer	0.25 mg/L
pH	Integrated core/Kemmerer	0.1 SU
Total Alkalinity	Integrated core/Kemmerer	1.0 mg/L
Total Iron	Integrated core/Kemmerer	0.005 mg/L
Total and Dissolved Aluminum	Integrated core/Kemmerer	0.010 mg/L
Total Calcium	Integrated core/Kemmerer	1.0 mg/L

Parameter	Sampling method	Detection Limits
Total Magnesium	Integrated core/Kemmerer	0.1 mg/L
Total Sodium	Integrated core/Kemmerer	0.05 mg/L
Total Potassium	Integrated core/Kemmerer	0.05 mg/L
Total Silica	Integrated core/Kemmerer	0.05 mg/L
Specific Conductance	Integrated core/Kemmerer	1 mS/cm
Chloride	Integrated core/Kemmerer	1.0 mg/L
Sulfate	Integrated core/Kemmerer	0.5 mg/L

All samples will be collected and preserved in accordance with MDEP sampling protocol, laboratory protocols, and analytical method protocols and will be transferred to the contracted laboratory within the required hold times. A final report will be produced for the Trophic State Study, including contracting laboratory reports, that details the methods and results of the study, quality control (QC) results, comparison with water quality standards, and any deviations from the study plan, if applicable.

5.2 Temperature and Dissolved Oxygen Monitoring

A Temperature and DO Study will be completed at two stations in July and August 2020 as requested by MDEP and will be conducted in accordance with the MDEP sampling protocol for hydropower studies (MDEP 2019a). The stations proposed for temperature and DO monitoring are located in the lower bypass reach below the middle dam and in the free-flowing tailwater reach below the confluence of the lower bypass reach with the lower powerhouse discharge (outside of the area of influence of the Nine Dragons Paper (ND Paper) mill discharge at the Project's tailrace). Sampling stations will be determined in the field and will need to be chosen to be representative of the targeted site conditions and safely accessible. Preliminary temperature and DO measurements will be made at the proposed site along a transect across the river at the first, second, and third quarter points across the width. If there is no violation of DO criteria and no significant (<0.4 mg/L) difference in concentrations among the quarter points, subsequent measurements may be made at the location shown to be representative of the main flow. Otherwise, measurements will be made at the location of the lowest DO concentration and the location of the main flow.

Temperature and DO will be sampled at mid-depth if the depth is less than 2 m deep or in a profile of 1 m increments if depth is greater than 2 m deep.

Sampling will be planned to be conducted during the summer low-flow, high-temperature period, tentatively July – August 2020. If high flows well above seasonal median flows occur, the study may need to be delayed (e.g., August – September) to capture low DO/ high temperature conditions. The proposed study will utilize HOBO Dissolved Oxygen Data Loggers deployed with an anchor and buoy system to record temperature and DO once per hour for the duration of the study period. Five trips will be planned to deploy, maintain, and retrieve the water quality sondes, with approximately a two-week period between site visits. Water quality data sondes will be field calibrated prior to deployment and will be QC checked, maintained, downloaded of data, and recalibrated during subsequent site visits. QC checks (e.g., side-by-side comparison readings with another field meter, pre- and post- calibration readings of calibration standards/ sample water) will be recorded. QC data will be compared to acceptance criteria (typically 2.5 times the reported sensor accuracy) to determine whether data are valid and/or require flagging or correction due to measured instrument drift.

A final report will be produced for the Temperature and DO Study that details the methods and results of the study, QC results, comparison with water quality standards, and any deviations from the study plan, if applicable.

5.3 Benthic Macroinvertebrate Study

Assessment of the macroinvertebrate community is commonly used to determine whether current in-stream flows are affecting attainment of classification standards for habitat and aquatic life below dams. MDEP requested a Benthic Macroinvertebrate Study as part of their evaluation of whether water quality standards are being attained and in support of the water quality certification process under Section 401 of the Clean Water Act. To ensure data meets water quality criteria compliance objectives, the study plan will be adopted from the MDEP Methods for Biological Sampling and Analysis of Maine's Rivers and Streams (MDEP 2014). Benthic macroinvertebrate monitoring will be conducted in the lower bypass reach and in the free-flowing tailwater reach downstream of the confluence of the lower bypass reach and the lower powerhouse discharge.

Recently, macroinvertebrate community data were collected from the Androscoggin River in the Town of Mexico, Maine (immediately east of Rumford) in 2018 and the results of that study were provided to the Licensee by MDEP and are included in Appendix E of the PAD. The sample results from that study were analyzed by MDEP and determined that the aquatic community attained the Class A water quality standard within the Class C reach of the Androscoggin River.

The proposed bypass reach/tailwater Benthic Macroinvertebrate Study will be conducted in conformance with MDEP's Methods for Biological Sampling and Analysis of Maine's Rivers and Streams (MDEP 2014). Two sampling stations will be established – one in an accessible location of the lower bypass reach and one in an accessible location below the confluence of the lower tailwater and lower bypass reach (outside of the area of influence of the ND Paper mill discharge at the Project's tailrace). Rock-filled wire baskets will be deployed for macroinvertebrate collection if the total water depth is adequate; otherwise mesh bags or cone samplers will be used if the water is too shallow or deep (respectively) for deployment of rock baskets. A total of three samplers will be deployed at each of the two sites with their long axis parallel to water flow. Sampling will be conducted during the summer low flow period, typically in the timeframe of July 1 – September 30, with a deployment period of 28 days +/- 4 days. Site conditions and deployment details will be recorded on standard field data sheets in accordance with MDEP protocols.

At retrieval, the samplers will be approached from downstream to avoid disturbance. A 600-micron mesh aquatic net will be positioned downstream of a sampler prior to collection. The sampler will then be placed quickly into the net. The basket will be opened and all contents will carefully be transferred into a 600-micron sieve bucket. The wire cages will be rinsed into the sieve bucket before removing, rinsing and placing each rock back into the basket. All sieve bucket contents will then be transferred into sample jars and preserved with approximately 70 percent ethyl alcohol. Samples will be labeled in the field immediately upon collection and will include the date of retrieval, waterbody, and sampler number. A slip of rite-in-the-rain paper with the same information (written in pencil) will also be placed into each sample jar. Each sample will be treated as consistently as possible. Sample jars will be transferred to the Normandeau taxonomy laboratory

for evaluation by a professional freshwater macroinvertebrate taxonomist who is certified by the Society of Freshwater Science.

Results from the taxonomic analysis will be provided to the MDEP for further analysis using the Department's linear discriminant analysis to assess the attainment of aquatic life standards. A final report will be produced summarizing the study methods and results, QC results, and any deviations from the study plan, if applicable.

5.4 Outlet Stream Aquatic Habitat Study

Hydropower operations have the potential to affect downstream habitats through fluctuations in flows and water levels. The Project is operated in a run-of-river mode and is not expected to significantly affect downstream habitat. MDEP has requested the Licensee complete an Outlet Stream Habitat Study, in the form of a cross-section flow study as described in the "Habitat and Aquatic Life Studies" section under "Rivers and Streams" in the Sampling Protocol for Hydropower Studies (MDEP 2019a). The proposed study addresses the request from MDEP and, as proposed, will help determine attainment of habitat standards and support water quality certification under Section 401 of the Clean Water Act and is consistent with MDEP protocols for hydropower studies (MDEP 2019a). MDEP has determined that, generally, flows providing wetted conditions in a weighted average of 3/4 of the cross-sectional area of the affected river or stream, as measured from bank full conditions, are sufficient to meet aquatic life and habitat standards (MDEP 2020).

The Rumford Outlet Stream Aquatic Habitat Study will be conducted in the tailrace reach below Middle Dam to demonstrate that minimum flows in that section are adequate to provide habitat for fish and other aquatic species. As previously discussed, in lieu of conducting this study in the lower bypass reach, RFH is providing three years of impoundment elevation data for the Upper Dam impoundment and outflow data to the MDEP for analysis. An Outlet Stream Habitat Study was not requested from MDEP in the upper bypass reach because the reach primarily consists of ledge and habitat is limited, with no free-flowing reach between the ledge and impoundment.

The Licensee proposes to complete a Transect-Based Habitat Study in combination with HEC-RAS modeling to determine whether operations meet the MDEP guideline (i.e., maintain 75% of bank full cross-sectional area). The proposed methods include:

- Establishing transects in the Androscoggin River within the tailwater area – transects will be selected in consultation with the MDEP;
- Performing river bed and bank profile surveys at the transects up to the bank full elevation;
- Measuring river width and water depth across each transect at approximately 20 stations at a low flow release from the dam to characterize the river bed cross-sectional profile and water surface elevation;
- Gaging river flow to determine the amount of water released from the dam during the study;
- Estimating bank full conditions based on physical stream bank characteristics (e.g., top of flat depositional benches; lower extent of persistent woody debris) – bank full conditions will be determined in consultation with the MDEP; and
- Using a HEC-RAS model to determine at which flow 75 percent of the bank full cross-sectional area of the river is continuously watered.

The data will allow documentation that the current minimum flows provide for the MDEP requirements.

6.0 Schedule

The proposed schedule for the Water Quality Study is presented in Table 5. Completion of the Water Quality Study in 2020 is dependent on review and approval of the Water Quality Study plan by MDEP with sufficient time to plan and execute the required studies and is also dependent on flow and weather conditions. If there is insufficient time to plan and execute one or more of the studies, it may be necessary to delay parts or all of the Water Quality Study until 2021.

TABLE 5
PROPOSED WATER QUALITY STUDY SCHEDULE

Water Quality Study Component	Anticipate Start	Anticipated Completion
Impoundment Trophic State Study – Field Work	May 2020	October 2020
Temperature and DO Monitoring – Field Work	July 2020	September 2020
Benthic Macroinvertebrate Study – Field Work	July 2020	September 2020
Outlet Stream Aquatic Habitat Study – Field Work	July 2020	October 2020
MDEP Water Quality Initial Study Report Filing	-	August 10, 2021

7.0 Level of Effort

The estimated cost for the Water Quality Study is $65,000. The proposed level of effort is adequate to obtain the information needed to determine whether the Androscoggin River in the Project area meets Maine's water quality standards.

8.0 References

Maine Department of Environmental Protection (MDEP). 2014. Methods for Biological Sampling and Analysis of Maine's Rivers and Streams. DEP LW0387-C2014. Revised April, 2014

Maine Department of Environmental Protection (MDEP). 2019a. DEP Sampling Protocol for Hydropower Studies. September, 2019.

Maine Department of Environmental Protection (MDEP). 2019b. VRMP Reports. Online [URL]: https://www.maine.gov/dep/water/monitoring/rivers_and_streams/vrmp/reports.html (Accessed July 26, 2019).

Maine Department of Environmental Protection (MDEP). 2019c. Personal communication between B. Mower of MDEP and R. Dorman of Brookfield Renewable dated June 21, 2019.

Maine Department of Environmental Protection (MDEP). 2020. Comment on Pre-Application Document and Study Request Rumford Falls Hydroelectric Project (FERC No. 2333).

Rumford Falls Power Company. 1991. Final License Application for Rumford Falls Hydroelectric Project (FERC NO. 2333). December 23.

Sale, M. J., Cada, G. F., Chang, L. H., Christensen, S. W., Railsback, S. F., Francfort, J. E., Rinehart, B. N., and Sommers, G. L. 1991. Environmental mitigation at hydroelectric projects: Volume 1. Current practices for instream flow needs, dissolved oxygen, and fish passage. Web. doi:10.2172/1218135.

APPENDIX C
ANGLER CREEL SURVEY STUDY PLAN

Angler Creel Survey

1.0 Goals and Objectives

The goal of the Angler Creel Survey is to provide information on the status of the recreational fishery both above and below the Project. Specifically, this study seeks to:

- Derive an overall estimate of angler use;
- Derive estimates of angler success (harvest, catch rates, etc.);
- Collect biometric data on harvested fish; and
- Provide information related to overall status of the fishery.

2.0 Study Area

The survey reach will cover areas upstream and downstream of the Project. It will run from the upper extent of the Rumford impoundment downstream to the confluence of the Androscoggin and Webb Rivers, located in Dixfield, Maine, approximately 5.7 miles downstream of Middle Dam.

3.0 Background and Existing Information

The current recreational trout fishery is dependent upon annual stocking of hatchery Brook Trout, Rainbow Trout, and Brown Trout (MDIFW 2014). Brown Trout and Rainbow Trout have been the focus of Maine Department of Inland Fisheries and Wildlife's (MDIFW's) trout management on the upper river, partly because these species are more tolerant of elevated water temperatures that occur during much of the angling season. Habitat within the Gilead to Bethel reach, which is upstream of the Project, has been considered more suitable for Rainbow Trout, while habitat from Bethel to Rumford Falls has been considered more suitable for Brown Trout and bass (MDIFW 2014). MDIFW performs annual fish stocking of Brook, Brown, and Rainbow Trout in the mainstem of the upper Androscoggin River at three locations upstream of the Project (Gilead, Bethel, and Hanover) and one location downstream of the Project (Mexico). Fish stocking records for the last five years are presented in Table 1 below.

TABLE 1
MDIFW FISH STOCKING IN THE MAINSTEM OF THE ANDROSCOGGIN RIVER FOR THE LAST 5 YEARS (GILEAD, BETHEL, HANOVER, AND MEXICO, MAINE)

City/Town	Species	Number of Fish Stocked				
		2015	2016	2017	2018	2019
Gilead	Brook Trout	1,145	1,700	1,100	1,075	1,075
Gilead	Brown Trout	750	750	750	750	750
Gilead	Rainbow Trout	1,000	1,180	1,105	1,300	1,500
Bethel	Brook Trout	675	745	700	675	675
Bethel	Brown Trout	1,600	1,600	1,600	1,600	1,600
Bethel	Rainbow Trout	700	616	595	700	-
Hanover	Brook Trout	1,000	1,150	1,100	1,000	1,000
Hanover	Brown Trout	2,000	2,000	2,000	2,000	2,000
Mexico	Brook Trout	250	260	270	250	250
Mexico	Brown Trout	250	250	250	250	250
Mexico	Rainbow Trout	1,350	1,188	1,148	1,350	940

Source: MDIFW 2019.

4.0 Project Nexus

Limited data exists to describe the current status of the recreational fishery in the Project area; specifically, angling opportunities for trout species in the Project impoundment and the reach downstream of Middle Dam. Fisheries for two hatchery-maintained salmonid species (Brown Trout and Rainbow Trout) have declined from former levels in the upper Androscoggin and the reach downstream of Middle Dam is a relatively new stocking area. This study should provide baseline information on recreational angling in the Project area.

5.0 Methodology

This study will employ a stratified random survey design to conduct roving creel surveys of the targeted study area. Prior to conducting any surveys, a schedule for the period of interest (April-November) will be developed. The survey will be stratified by day-type (weekday or weekend) and two sample days will be selected per week consisting of one randomly selected weekday and one weekend day. Next, a start time will be selected for each sample date. An individual sample date will consist of an eight-hour work day (including drive time) that occurs between sunrise and sunset.

Once a set of randomized sample dates has been selected, each survey date will be sampled in the form of two main activities: effort counts and angler interviews. Effort counts will provide an estimate of angler pressure (i.e., how many people are targeting the resource) and angler interviews will provide information on rates of success. Prior to the first sample date, a predetermined list of index sites will be determined for use during the study. It is expected that MDIFW will coordinate with the development of this site list based on their knowledge of the local fishing locales. Likely index sites may include the trailer accessible launch area along Route 2 downstream of the Project and the shore access to Middle Dam impoundment at J. Eugene Boivin Park. Within a survey date, one or two effort counts will be conducted (ideally one AM and one PM). Each effort count will consist of a visit to all index sites to get a count of recreational fisherman. In addition to angler counts, creel technicians will also conduct interviews. Information collected during these interviews may include (but not limited to) number of anglers in the group, angling start time, interview time, status of trip (finished or still fishing), fishing location, and number of fish caught. In the event an angler reports catch, the creel technician will attempt to record, species, fate (i.e., catch and release, harvest), and other biological information.

6.0 Schedule

The survey effort will be conducted during the period from April to November 2020.

7.0 Level of Effort

The estimated cost for the proposed stratified random roving creel survey is approximately $61,000. The proposed level of effort is sufficient to provide baseline information on recreational angling in the Project area.

8.0 References

Maine Department of Inland Fisheries and Wildlife (MDIFW). 2014. Upper Androscoggin River Fishery Management Plan. January 2014.

Maine Department of Inland Fisheries and Wildlife (MDIFW). 2019. Fish Stocking Reports. Online [URL]: https://www.maine.gov/ifw/fishing-boating/fishing/fishing-resources/fish-stocking-report.html. (Accessed February 6, 2020).

APPENDIX D
RECREATION STUDY PLAN

Recreation Study

No study requests were received regarding recreation for the Rumford Falls Hydroelectric Project (Project); however, Rumford Falls Hydro (RFH) proposed to conduct a Recreation Survey in the Pre-Application Document (PAD) based on the initial interest expressed by the Maine Department of Inland Fisheries and Wildlife (MDIFW) and the Town of Rumford. The Town of Rumford has provided more recent comments regarding recreation in the Project vicinity, but no formal study requests (See Appendix A). Given the Town of Rumford's level of interests in recreation associated with the Project area, RFH continues to coordinate with the town regarding potential recreational enhancements.

1.0 Goals and Objectives

The goal of this study is to determine if there is a need for enhancements to existing recreation facilities or the need for additional recreational facilities to support the current and future demand for public recreation at the Project and Project vicinity.

The objectives of this study are to:

- Conduct an inventory of recreational facilities at the Project and within the Project vicinity to summarize existing recreational opportunities;
- Assess the condition of RFH's Federal Energy Regulatory Commission (FERC)-approved recreation facility and other RFH-owned and operated recreation facilities to identify any need for improvements; and
- Characterize current recreational use and future demand of the FERC-approved recreational facility and other RFH-owned and operated recreation facilities.

2.0 Study Area

The study area will include the Project Boundary and recreation facilities in the Project vicinity.

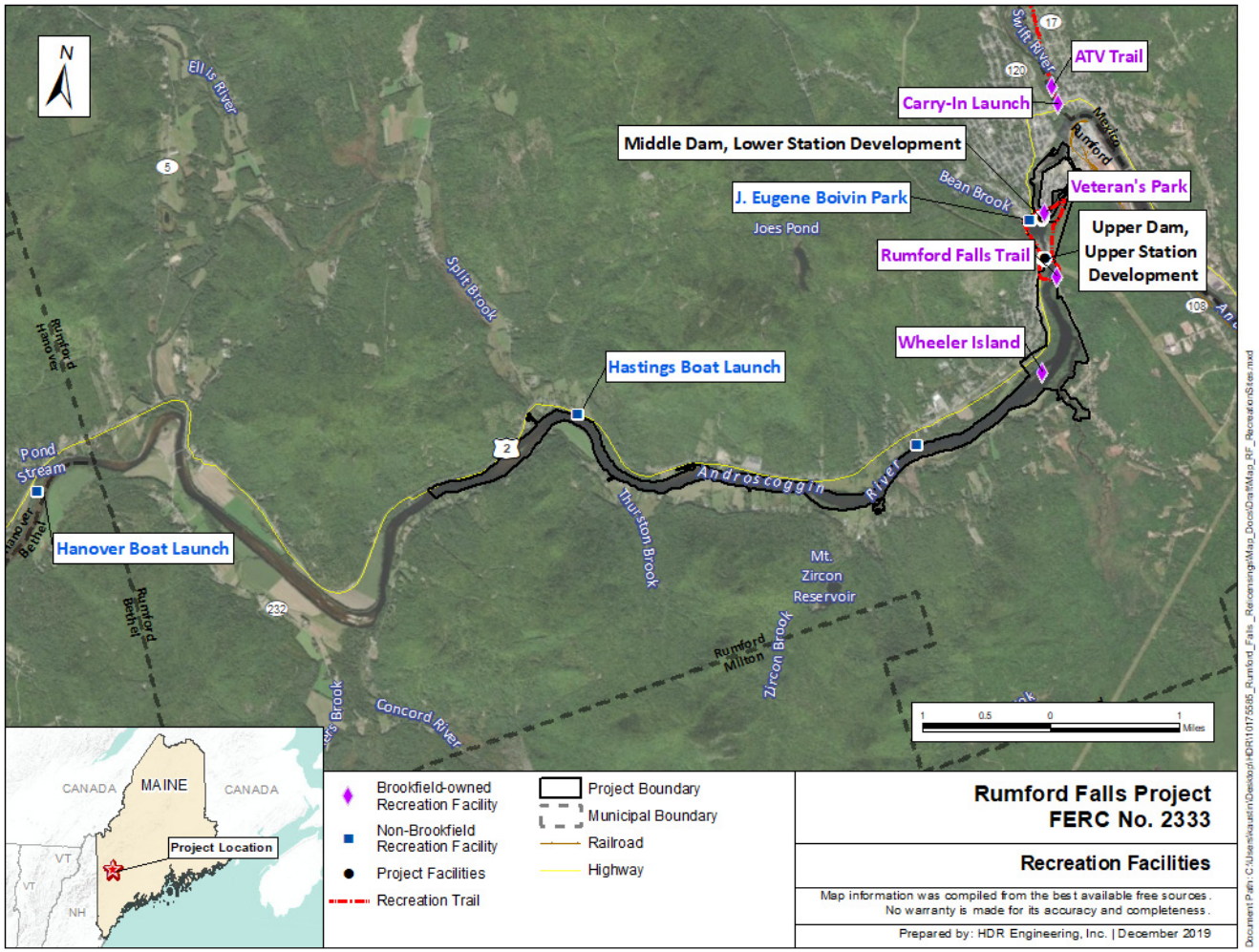
3.0 Background and Existing Information

Boating and fishing are the primary recreational activities that occur in the Project Boundary; however, recreational use in the Project vicinity is limited and typically comprised of local

residents. Due to the small size of the Middle Dam impoundment (21 acres), most of the recreational use occurs on the Upper Dam impoundment (FERC 1993).

There is one FERC-approved recreation facility at the Project, a carry-in canoe facility at the Carlton Bridge site, located on the eastern edge of the Swift River just upstream of its confluence with the Androscoggin River (Figure 1). Informal RFH-owned and/or operated recreation facilities include Wheeler Island, as well as a portion of the Rumford Falls Trail and another trail, which is used solely as a recreation trail to pass by foot, ATV, or snowmobile. Veteran's Park is owned/operated by RFH and has formal facilities, but is not a FERC-approved recreation facility. Non-FERC approved recreation sites in the Project vicinity, not owned or operated by RFH, that provide access to Project lands and waters include the Hanover Boat Launch, Hastings Boat Launch, and J. Eugene Boivin Park.

FIGURE 1
RECREATION FACILITIES IN THE PROJECT BOUNDARY AND PROJECT VICINITY



Appendix D-3

4.0 Project Nexus

The Project currently provides public recreational opportunities. The results of this study, in conjunction with existing information, will be used to inform analysis in and recommendations for the license application regarding potential Project effects on public recreation and potential protection, mitigation, and enhancement (PM&E) measures to be included in the new license, as needed.

5.0 Methodology

This study contains four primary tasks: 1) conducting an inventory of recreation facilities at the Project and within the Project vicinity to summarize existing recreation opportunities; 2) assessing the condition of the Project FERC-approved recreation site and other RHF-owned/operated recreation facilities to identify any need for improvements; 3) characterizing current recreational use and future demand of the FERC-approved recreational site, and other RHF-owned/operated recreation facilities; and 4) compiling information into a final study report.

Task 1 – Conduct an Inventory of Recreational Facilities at the Project and within the Vicinity of the Project

A recreational facility inventory will be conducted of the existing Project and non-Project recreational sites identified in Figure 1. RFH will record the following information at sites:

- A description of the type and location of the existing recreation facility (including relationship to Project Boundary);
- Ownership and party responsible for operation and maintenance of the facility;
- The type(s) of recreation activities supported;
- Hours and season of operation;
- Length and base materials of any trails, boat launches, etc.;
- Existing facilities, signage, and sanitation;
- The type of vehicular access and parking (if any);
- General observations of site use, visibility, and accessibility;

- Any facilities providing access for persons with mobility impairments (i.e., compliance with current ADA standards for accessible design); and
- Photographic documentation of the recreation facility and Global Positioning System (GPS) location.

Task 2 – Assess the Condition of Project Recreation Sites

The condition of the FERC-approved recreation facility (i.e., Carry-In Launch) and four other RFH-owned/operated recreation facilities will be assessed to identify any potential improvements that may be made to enhance recreation at the Project.

Task 3 – Recreational Observations at FERC-Approved Recreation Sites

Recreational use data will be obtained from late May through early September to capture the primary peak recreational season, particularly in light of the fact that these facilities provide amenities supporting summer recreation activities. Recreational use observations would be conducted at the FERC-approved recreation facility, and other RFH-owned/operated recreation facilities, during other relicensing field studies (e.g., Water Quality Study and Angler Creel Survey) conducted in support of relicensing as well as during the daily activities of RFH operators. Use data will be obtained on a minimum of two randomized week days, two randomized weekend days per month, and major holidays. An observation form will be completed and include the following information:

- Date and time;
- Observer;
- Weather conditions;
- Number of people or cars observed;
- Observed recreation activities; and
- Additional pertinent notes.

Task 4 – Reporting

Results of the inventory and use observations will be analyzed and compiled into a study report.

Results of this study will be summarized in the final study report. Brookfield anticipates that the Recreation Study Report will include the following elements:

- Project information and background;
- Study area;
- Methodology;
- Study results;
- Analysis and discussion;
- Any agency correspondence and/or consultation; and
- Literature cited.

6.0 Schedule

The recreational use survey will be conducted from late May through early September 2020.

7.0 Level of Effort

Based on presently-available information, this study is estimated to cost approximately $25,000.

8.0 References

Bureau of Parks and Lands. 2019. Pubic Boat Launches. Online [URL]: https://www.maine.gov/dacf/parks/water_activities/boating/public_boat_launches/index.shtml (Accessed August 2, 2019).

Federal Energy Regulatory Commission (FERC). 1993. Environmental Assessment for the Rumford Falls Hydroelectric Project (FERC Project No. 2333). March 25, 1993.

Maine Trail Finder. 2019. Rumford Falls Trail. [Online] URL: https://www.mainetrailfinder.com/trails/trail/rumford-falls-trail. (Accessed July 2, 2019).

Rumford Falls Hydro LLC (RFH). 2007. Environmental Inspection Report. Rumford Falls Project (FERC No. 2333).

Rumford Falls Power Company. 2000. Boat Access, Rumford Falls Power Co., FERC No. 2333-005. October 25.

APPENDIX E
HISTORIC ARCHITECTURAL SURVEY

Historic Architectural Survey

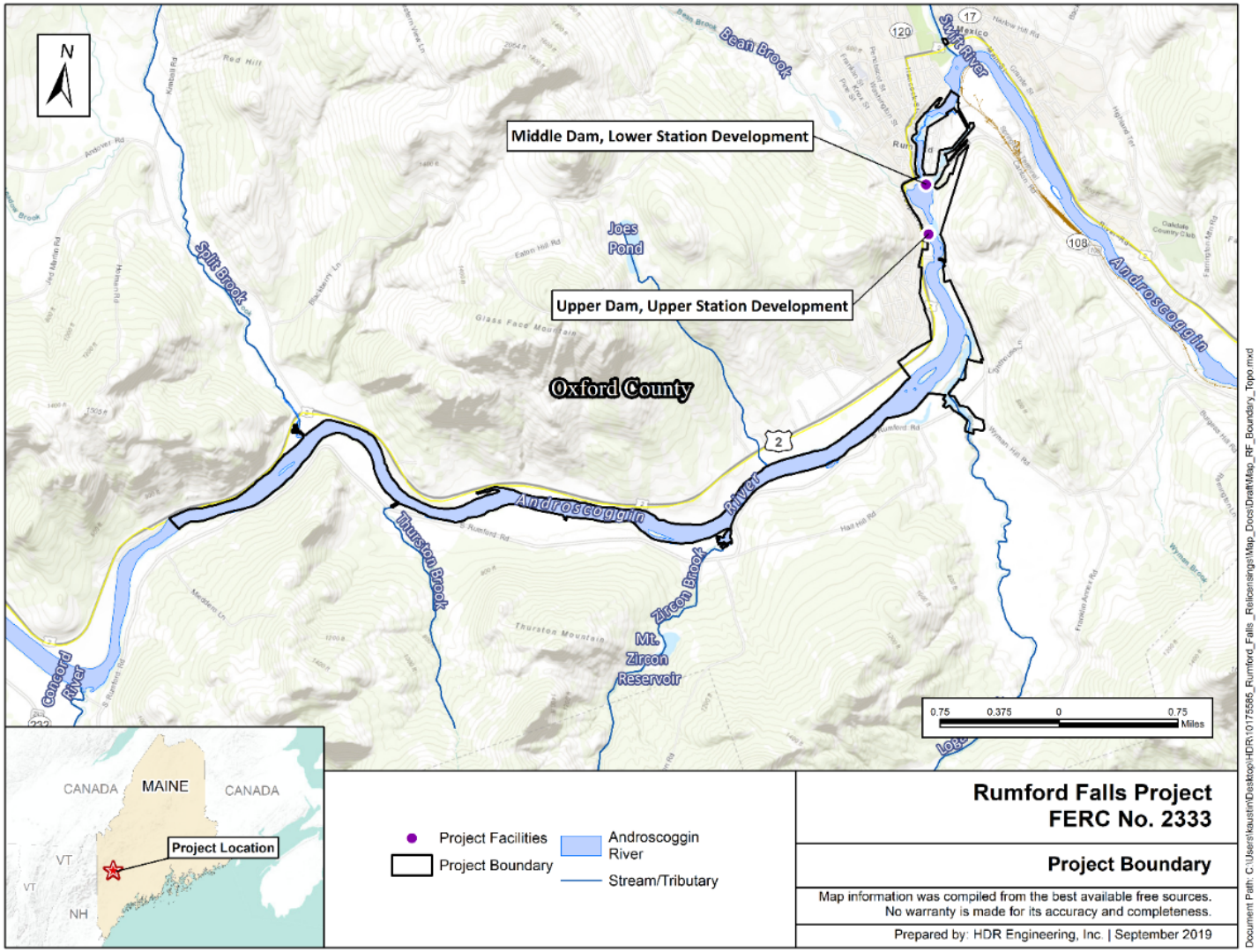
1.0 Goals and Objectives

Pursuant to Section 106 of the National Historic Preservation Act (NHPA) (Section 106), the licensing of the Project would be a Federal undertaking and a license issued by the Federal Energy Regulatory Commission (FERC) would permit activities that may "…cause changes in the character or use of historic properties, if such properties exist…" The goal of the Historic Architectural Survey is to identify and determine the potential effects of continued Project operation and maintenance on historic architectural resources eligible for the National Register of Historic Places (NRHP). The specific objectives of the study and subsequent report are to: conduct a historic architectural survey of Project components 45 years of age or older (threshold used by the State Historic Preservation Office and the Maine Historic Preservation Commission [MHPC]); assess the NRHP eligibility of each identified component; and evaluate the potential effects of continued operation and maintenance on each component so that the nature and extent of potential Project effects and measures to avoid, lessen, or mitigate adverse effects can be properly determined.

2.0 Study Area

The study area for historic architectural resources will include the Project's Area of Potential Effects (APE). Per 36 Code of Federal Regulations (CFR) 800.16, the Project's APE is defined as "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties." Because the Project Boundary encompasses lands that are necessary for Project purposes, Project-related operations, potential enhancement measures, and routine maintenance activities associated with the implementation of a license issued by FERC are expected to take place within the Project Boundary. The APE is expected to be the Project Boundary; however, it may be refined based on consultation with MHPC (Figure 1). Additionally, background research will be conducted for the Project vicinity, which will include a 2-mile radius around the Project APE.

FIGURE 1
PROJECT LOCATION AND PROJECT BOUNDARY MAP



Appendix E-2

3.0 Background and Existing Information

No historic properties listed on, or eligible for listing on, the NRHP have been identified in the Project Boundary. The Project's facilities were evaluated during the previous relicensing and were determined not eligible for listing in the NRHP (MHPC 1993).

3.1 Need for Additional Information

Per MHPC guidelines, the previously recorded facility components need to be revisited to verify their current condition. The components of the Project that will be 45 years or older at the conclusion of the current license term will need to be identified and evaluated for NRHP eligibility, and if eligible, assessed for Project-related effects so that the nature and extent of potential Project effects and measures to avoid, lessen, or mitigate adverse effects can be properly determined.

4.0 Project Nexus

Section 106 requires that Federal agencies consider the effect of proposed undertakings on any district, site, building, structure, or object that is included in or eligible for the NRHP. Operation and maintenance of Project facilities could adversely affect historic properties through ground-disturbing activities and cause other indirect adverse effects on historic properties. An evaluation of the Project facilities for eligibility and Project effects will provide updated information on historic resources located at the Project sites.

5.0 Methodology

5.1 Consistency with Generally Accepted Scientific Practice

The methodology for this proposed study is consistent with FERC and MHPC regulations and guidance for conducting historic architectural investigations. The proposed methodology also complies with Section 106. The Historic Architectural Survey will be conducted in consultation with the FERC, MHPC, and other interested parties.

5.2 Identifying Historic Architectural Resources

Background research and an inventory for architectural resources will be conducted by architectural historians that meet or exceed the Secretary of the Interior's *Professional Qualification Standards* for Architectural History (36 CFR 800 2 (a)(1)). The requisite scope of work for the Historic Architectural Survey will be identified through consultation with MHPC and other interested parties. Prior to conducting the survey and completing a survey report, the following will be decided in consultation with MHPC: methods and techniques on how the survey should be conducted, anticipated effects (direct and indirect) on each Project component, whether each identified Project component is considered eligible for the NRHP, and other relevant details involving the survey and report. Methods used to conduct the survey and NRHP eligibility evaluations will conform to MHPC guidelines. Assumptions regarding the scope of work based on MHPC guidelines are provided below, but are subject to change pending consultation with the MHPC.

Background research will consist of a review of previously conducted studies in the area and a review of literature describing the development of hydroelectric facilities with a focus on activities in western Maine. A copy of existing resources recorded in MHPC's Cultural and Architectural Resource Management Archive (CARMA) will be obtained and reviewed in order to identify the location of previously recorded resources. Site file research will be conducted at MHPC's file room to determine previous surveys conducted in the Project area. Remote and local research sufficient to complete MHPC reconnaissance survey forms for each resource and make NRHP eligibility recommendations will be conducted at repositories including, but not limited to, the Rumford Area Historical Society, Rumford Falls Hydro (RFH) archives, and the Maine Memory Network.

Architectural historians will conduct the field survey of the existing hydropower facilities and other architectural resources identified in the field and will follow MHPC's guidelines for previously surveyed resources in the *Above Ground Cultural Resources Survey Manual* (MHPC 2006). Documentation will include photographic overviews of the Project area and photographic documentation of extant buildings and structures 45 years of age or older. Photographs taken

during site visits and included in the CARMA Survey Forms will follow MHPC photograph and form policies.

Mapping of the facilities will require development of an overview map of the property and boundaries on a U.S. Geological Survey (USGS) topographic quadrangle map, as well as a "site plan" map of the property. The maps required for the form will be developed using a Geographic Information System (GIS) to manage and display resource data.

A preliminary survey report will be completed after the field inventory phase according to MHPC guidelines for reconnaissance survey reporting. The report will be submitted to MHPC and FERC for review and comment. The report will be kept confidential and filed with FERC and other consulting parties as "privileged," a non-public document.

5.3 Evaluating Historic Architectural Resources

The NRHP Criteria of Evaluation will be applied to historic architectural resources identified during field survey. These criteria are described more fully below.

Criterion A: Resources are associated with events that have made a significant contribution to the broad patterns of our history; or

Criterion B: Resources are associated with the lives of persons significant in our past; or

Criterion C: Resources embody the distinctive characteristics of a type, period, or method of construction or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

Criterion D: Resources yield, or may be likely to yield, information important in prehistory or history (36 CFR Part 60).

In order to be eligible for the NRHP, a resource must also possess integrity of location, design, setting, materials, workmanship, feeling, and association. Following the background research, field survey, and resource evaluation, a survey report containing applicable determinations of

eligibility will be prepared and submitted to MHPC and FERC. Evaluations will consider the individual Project components as well as the assemblage as an integrated whole or larger district. Concurrence on recommendations of NRHP eligibility will be requested from MHPC.

5.4 Assessing Effects

For historic properties, the Criteria of Adverse Effect (as outlined in 36 CFR 800.5) will be applied to Project activities that have the potential to affect historic properties. Project effects include direct or indirect alterations to the historic characteristics of a historic property that qualify the property for inclusion in the NRHP in a manner that diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Types of effects to historic properties caused by the Project may include:

- Development or Project operation proposals developed during the FERC relicensing process that involve soil disturbance.
- Introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's historic features.
- Changes of the character of the property's use or of physical features within the property's setting that contribute to its historic significance.
- Demolition or Alteration of a Property: Demolition or extensive alteration of all or part of the resource.
- Isolation/Alteration of Surrounding Environment: Temporary or permanent restrictions of access to a historic resource or a change in the setting of the property.
- Introduction of New Construction: Addition of new construction that is not compatible with the existing architecture of historic resources.
- Noise: Introduction of audible elements that are out of character with the historic resource and its established use such that its use may be altered or abandoned.
- Vibration: Construction or operation techniques that would create vibrations such that a resource may experience damages such as the loosening of paint or mortar, cracking of mortar or plaster, weakening of structural elements, or crumbling masonry.

- Neglect: Neglect of a resource resulting in its deterioration or demolition. This is a potential effect under no-build alternatives.

The effects will be described in the survey report and provided for review by MHPC and FERC. Concurrence on recommendations of assessment of effects will be requested from MHPC.

6.0 Schedule

The schedule will be consistent with Table 1 but may be modified on an as-needed basis. FERC will be alerted when changes to the relicensing schedule are made. Schedule may be affected by study disputes and/or Project description modifications.

TABLE 1
HISTORIC ARCHITECTURAL SURVEY SCHEDULE

Component	Completion Date
Historic Architectural Resources Inventory	September 2020
Evaluation	February 2021
Assessment of Project Effects	February 2021
Initial Study Report filed with FERC	August 2021
Final Technical Report	December 2021

7.0 Level of Effort

In accordance with 36 CFR 800.4, RFH will make a reasonable and good faith effort to carry out appropriate identification efforts for historic architectural resources, including background research and field survey. RFH will take into account past planning, research, and studies; the likely nature and location of historic properties within the APE; and the nature and extent of potential Project effects on historic properties. This consideration will also include applicable professional, state, and Federal guidelines, regulations, and standards. Further, the level of effort

will be commensurate with the size of the Project and its limited potential for effects on historic properties. The cost of the Historic Architectural Survey is estimated at $30,000.

8.0 References

Maine Historic Preservation Commission (MHPC).1993. Programmatic Agreement Among the Federal Energy Regulatory Commission, the Maine Historic Preservation Commission, and the Advisory Council on Historic Preservation for Licensing the Continued Operation of the Rumford Falls Hydroelectric Project. April 9, 2007

Maine Historic Preservation Commission (MHPC). 2006. Above Ground Cultural Resource Survey Manual: Guidelines for Identification: Architecture and Cultural Landscapes. Historic Preservation Documents. Paper 1. Online [URL]: http://digitalmaine.com/mhpc_docs11.