ENVIRONMENTAL ASSESSMENT
FOR HYDROPOWER LICENSE

Goose River Hydroelectric Project
FERC Project No. 2804-035
Maine

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

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ACRONYMS AND ABBREVIATIONS

APE	area of potential effect
C	Celsius
C.F.R.	Code of Federal Regulations
CMP	Central Maine Power Company
cfs	cubic feet per second
certification	water quality certification
Commerce	U.S. Department of Commerce
Commission	Federal Energy Regulatory Commission
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
EA	environmental assessment
EFH	essential fish habitat
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
FPA	Federal Power Act
FWS	U.S. Fish and Wildlife Service
GOM DPS	Gulf of Maine Distinct Population Segment
GRH	Goose River Hydro, Inc.
Interior	U.S. Department of the Interior
IPaC	U.S. Fish and Wildlife Service Information for Planning and Consultation
IWWH	inland waterfowl and wading bird habitat
kW	kilowatt
Maine DEP	Maine Department of Environmental Protection
Maine DIFW	Maine Department of Inland Fisheries and Wildlife
Maine DMR	Maine Department of Marine Resources
mg/L	milligrams per liter
MWh	megawatt-hours
National Register	National Register of Historic Places
NERC	North American Electric Reliability Council
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NPCC	Northeast Power Coordinating Council, Inc.
NRCS	National Resources Conservation Service
RM	river mile
SCORP	Statewide Comprehensive Outdoor Recreation Plan
SHPO	Maine Historic Preservation Commission Officer
USGS	U.S. Geological Survey

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1.0 INTRODUCTION

1.1 APPLICATION

On February 2, 2018, Goose River Hydro Inc. (GRH or applicant) filed an application with the Federal Energy Regulatory Commission (Commission) for a subsequent license to continue to operate and maintain the existing Goose River Hydroelectric Project (Goose River Project or project).[1] The 375-kilowatt (kW) project is located on the Goose River, in Waldo County, Maine (figure 1). The project does not occupy federal land.

1.2 PURPOSE OF ACTION AND NEED FOR POWER

1.2.1 Purpose of Action

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

[1] The Commission issued the current, original license for the project on March 24, 1980 with an effective date of March 1, 1980, and a term of 40 years. *See Maine Hydroelectric Development Corporation*, 10 FERC ¶ 62,236 (1980).

Figure 1. Location of the Goose River Project. (Source: Esri, as modified by Staff)

Issuing a subsequent license for the Goose River Project would allow GRH to generate electricity at the project for the term of the license, making electric power from a renewable resource available to the regional grid.

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

In this EA, we assess the environmental and economic effects of operating and maintaining the project: (1) as proposed by the applicant, and (2) as proposed with staff recommended measures (Staff Alternative). We also considered the effects of the no-action alternative. Important issues addressed in this EA include the effects of project operation on aquatic resources in Swan Lake and the Goose River.

1.2.2 Need for Power

To assess the need for power, we looked at the needs in the operating region in which the project is located. The average annual generation of the Goose River Project is

expected to be 1,500 megawatt-hours (MWh). The power generated is to be sold to Central Maine Power Company (CMP).

The North American Electric Reliability Council (NERC) annually forecasts electrical supply and demand nationally and regionally for a 10-year period. The Goose River Project is located within the Northeast Power Coordinating Council, Inc.'s New England region (NPCC-New England) of the NERC. According to NERC's 2018 Long-Term Reliability Assessment, the total internal demand for this region is projected to decrease by approximately 0.43 percent from 2019 to 2025, and to subsequently increase by 0.12 percent from 2025 to 2028.

Although the demand for power is initially expected to decrease in the region, the power from the Goose River Project would continue to help meet the need for power in the NPCC-New England region over the short and long term. In addition, the project provides power that can displace non-renewable, fossil-fired generation and contribute to a diversified generation mix. Displacing the operation of non-renewable facilities may avoid some power plant emissions and create an environmental benefit.

1.3 STATUTORY AND REGULATORY REQUIREMENTS

A subsequent license for the project would be subject to numerous requirements under the FPA and other applicable statutes. The major regulatory and statutory requirements are described below.

1.3.1 Federal Power Act

1.3.1.1 Section 18 Fishway Prescriptions

Section 18 of the FPA states that the Commission is to require construction, operation, and maintenance by a licensee of such fishways as may be prescribed by the Secretaries of the U.S. Department of Commerce (Commerce) or the U.S. Department of Interior (Interior). Neither the Secretary of Commerce nor the Secretary of the Interior filed section 18 fishway prescriptions.

1.3.1.2 Section 10(j) Recommendations

Under section 10(j) of the FPA, each hydroelectric license issued by the Commission must include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, or enhancement of fish and wildlife resources affected by the project. The Commission is required to include these conditions unless it is determined that they are inconsistent with the purposes and requirements of the FPA or other applicable law. Before rejecting or modifying an agency recommendation, the Commission is required to attempt to resolve any such

inconsistency with the agency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency.

No section 10(j) recommendations were filed for the Goose River Project

1.3.2 Clean Water Act

Under section 401(a)(1) of the Clean Water Act (CWA), 33 U.S.C. § 1341(a)(1), a license applicant must obtain either a water quality certification (certification) from the appropriate state pollution control agency verifying that any discharge from the project would comply with applicable provisions of the CWA, or a waiver of such certification. A waiver occurs if the state agency does not act on a request for certification within a reasonable period of time, not to exceed one year after receipt of such request.

On January 22, 2019, GRH applied to the Maine Department of Environmental Protection (Maine DEP) for section 401 certification for the project. Maine DEP received this request on January 23, 2019. Maine DEP has not yet acted on the application.

1.3.3 Endangered Species Act

Section 7 of the Endangered Species Act (ESA), 16 U.S.C. § 1536, requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered species or result in the destruction or adverse modification of the critical habitat of such species. On March 27, 2019, staff accessed the U.S. Fish and Wildlife Service's (FWS) Information for Planning and Consultation (IPaC) database to determine federally listed species that could occur in the project vicinity.[2] According to the IPaC database, the endangered Atlantic salmon Gulf of Maine Distinct Population Segment (GOM DPS), and the threatened northern long-eared bat may occur in the project area. There is no designated critical habitat for either species in the project area.

Our analysis of project effects on Atlantic salmon and northern long-eared bat is presented in section 3.3.3, *Threatened and Endangered Species* and our recommendations are in section 5.1, *Comprehensive Development and Recommended Alternative*. There is no recent documentation of Atlantic salmon in the Goose River and there is no reason to believe that Atlantic salmon would occupy the project area over the term of any subsequent license issued for the project based on available information.

[2] *See* Interior's official list of threatened and endangered species, accessed by staff using the IPaC database (https://ecos.fws.gov/ipac/) on March 27, 2019, and filed on March 28, 2019.

Therefore, relicensing the project as proposed with staff-recommended measures would have no effect on the Atlantic salmon GOM DPS.

Penstock replacement work at the CMP Development would likely require disturbing riparian habitat adjacent to the bypassed reach that could serve as summer roosting and foraging habitat for the northern long-eared bat. We recommend that any necessary tree removal be conducted outside of the bat's active period of April 1 to October 31 to avoid disturbing roosting northern long-eared bats. Therefore, we conclude that relicensing the project under the Staff Alternative is not likely to adversely affect the northern long-eared bat, and would not cause prohibited incidental take. We will request concurrence from FWS on this finding using the optional streamlined consultation framework for the northern long-eared bat.[3]

1.3.4 Coastal Zone Management Act

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

In a letter to the Maine Department of Marine Resources (Maine DMR) filed on April 10, 2019, the applicant summarized an exchange with Maine DMR in which both parties agreed to stay the decision on CZMA consistency certification so that it may be issued concurrently with the Maine DEP water quality certification decision. On June 6, 2019, GRH filed a signed stay agreement with the Maine DEP. The agreement stated that GRH's CZMA application was received on May 3, 2019 and that the review period would ordinarily end on November 3, 2019 but that the review period will be stayed from October 3, 2019 until February 10, 2020 and the consistency certification will be due March 10, 2020.

1.3.5 National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA), 54 U.S.C. § 306108, requires that a federal agency "take into account" how its undertakings could

[3] *See* Programmatic Biological Opinion: http://www.fws.gov/midwest/endangered/mammals/nleb/bos/16_NLEBRange_Final4d01052016.pdf

affect historic properties. Historic properties are districts, sites, buildings, structures, traditional cultural properties, and objects significant in American history, architecture, engineering, and culture that are eligible for inclusion in the National Register of Historic Places (National Register).

Commission staff designated GRH as its non-federal representative for the purposes of conducting section 106 consultation under the NHPA on June 30, 2015. Pursuant to section 106, and as the Commission's designated non-federal representative, GRH initiated consultation with the Maine State Historic Preservation Commission, which functions as the State Historic Preservation Officer (SHPO) to identify historic properties, determine National Register eligibility, and assess potential adverse effects on historic properties within the project's area of potential effects (APE). The results of GRH's cultural resources investigations indicate that the project dams are not eligible for listing on the National Register and that no historic resources would be adversely affected by the proposed relicensing of the project. The Maine SHPO concurred with these findings by a letter dated September 26, 2017, and filed with the license application.

Our analysis in section 3.3.6 of this EA also concludes that relicensing the project under the Staff Alternative would not affect any historic properties.

1.3.6 Magnuson-Stevens Fishery Conservation and Management Act

Section 305 of the Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C. § 1855(b)(2), requires federal agencies to consult with NMFS on all actions that may adversely affect Essential Fish Habitat (EFH). EFH for Atlantic salmon has been defined as, "all waters currently or historically accessible to Atlantic salmon within the streams, rivers, lakes, ponds, wetlands, and other water bodies of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut."

The project area includes EFH for Atlantic salmon because it is located on the Goose River, which is currently accessible to Atlantic salmon from the river mouth at Belfast Bay upstream about 1 mile to the project's CMP Dam. Additionally, prior to dam construction throughout the watershed, the Goose River was historically accessible to Atlantic salmon. Our analysis of project effects on Atlantic salmon EFH is presented in section 3.3.4.2. We conclude that relicensing the project would adversely affect Atlantic salmon EFH due to minor, short-term effects on aquatic habitat during penstock replacement construction activities within and proximate to the Goose River stream channel below CMP Dam. We are providing NMFS with our EFH assessment and requesting that NMFS provide any EFH recommendations in response to our assessment.

1.4 PUBLIC REVIEW AND COMMENT

The Commission's regulations (18 C.F.R. § 16.8) require applicants to consult with appropriate resource agencies, tribes, and other entities before filing an application for a license. This consultation is the first step in complying with the Fish and Wildlife Coordination Act (16 U.S.C. § 661 *et seq*.), ESA, NHPA, and other federal statutes. Pre-filing consultation must be completed and documented according to the Commission's regulations.

Relicensing of the project began May 29, 2015, when GRH filed with the Commission a Pre-Application Document and a Notice of Intent to license the project using the Traditional Licensing Process. The Commission issued a Notice Approving Use of the Traditional Licensing Process on June 30, 2015.

1.4.1 Scoping

Before preparing this EA, we conducted scoping to determine what issues and alternatives should be addressed. A scoping document (Scoping Document 1) was distributed to interested agencies and others on August 23, 2018. Scoping meetings were held in Belfast, Maine on September 25 and 26, 2018. A court reporter recorded all comments and statements made at the scoping meetings, and these are part of the Commission's public record for the project. An environmental site review was held on September 25, 2018.

In addition to comments provided at the scoping meetings, Maine Department of Inland Fisheries and Wildlife (Maine DIFW) and Maine DEP filed written comments on October 24 and October 25, 2018, respectively. None of the verbal or written comments affected the content of Scoping Document 1;[4] therefore, staff did not prepare a second scoping document.

1.4.2 Interventions

On July 30, 2018, the Commission issued a notice accepting the application and setting September 28, 2018, as the deadline for filing protests and motions to intervene. The notice was published in the *Federal Register* on August 29, 2018. The Maine DIFW filed a notice of intervention on August 16, 2018.

1.4.3 Comments on the Application

[4] Maine DIFW's comments related to GRH's operation of Swan Lake for the protection of lake trout spawning that were generally listed in section 4.2.2, *Aquatic Resources* of Scoping Document 1, and are addressed in section 3.3.2.2 of this EA. Maine DEP's comments were procedural in nature and stated they had no further comment on Scoping Document 1.

On November 8, 2018, the Commission issued a notice setting January 7, 2019 as the deadline for filing comments, recommendations, terms and conditions, and fishway prescriptions. The following entities commented:

Commenting Entity	Date Filed
Erwin Hood	December 23, 2018
Interior	January 29, 2019[5]
Christopher Dupuis	March 6, 2019

Goose River Hydro did not file reply comments.

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 NO-ACTION ALTERNATIVE

Under the no-action alternative, the project would continue to operate under the terms and conditions of the existing license, and no new environmental protection, mitigation, or enhancement measures would be implemented. However, as explained below, the project is not currently fully operational; only one development (Mason's Development) is currently capable of generating power. We use this alternative to establish the baseline environmental condition for comparison with other alternatives.

2.1.1 Existing Project Facilities

The Goose River Project is located on the Goose River in the town of Swanville near the city of Belfast, Maine. The project includes five developments located along approximately 8 miles of the Goose River: Swan Lake, Mason's, Kelly, Mill, and CMP. The relative project development locations are shown in figure 2. The project boundary includes the dams, intakes, gates, penstocks, powerhouses, tailraces, and transmission lines at each project development. The project boundary also encloses the impoundments at the Swan Lake, Kelly, Mill, and CMP Developments, and a portion of the impoundment at the Mason's Development.

[5] The end of the comment period occurred during a lapse in appropriations for some federal agencies, including Interior, between December 22, 2018 and January 25, 2019. Interior indicates that its comments were filed at the earliest practicable date following resumption of its operations.

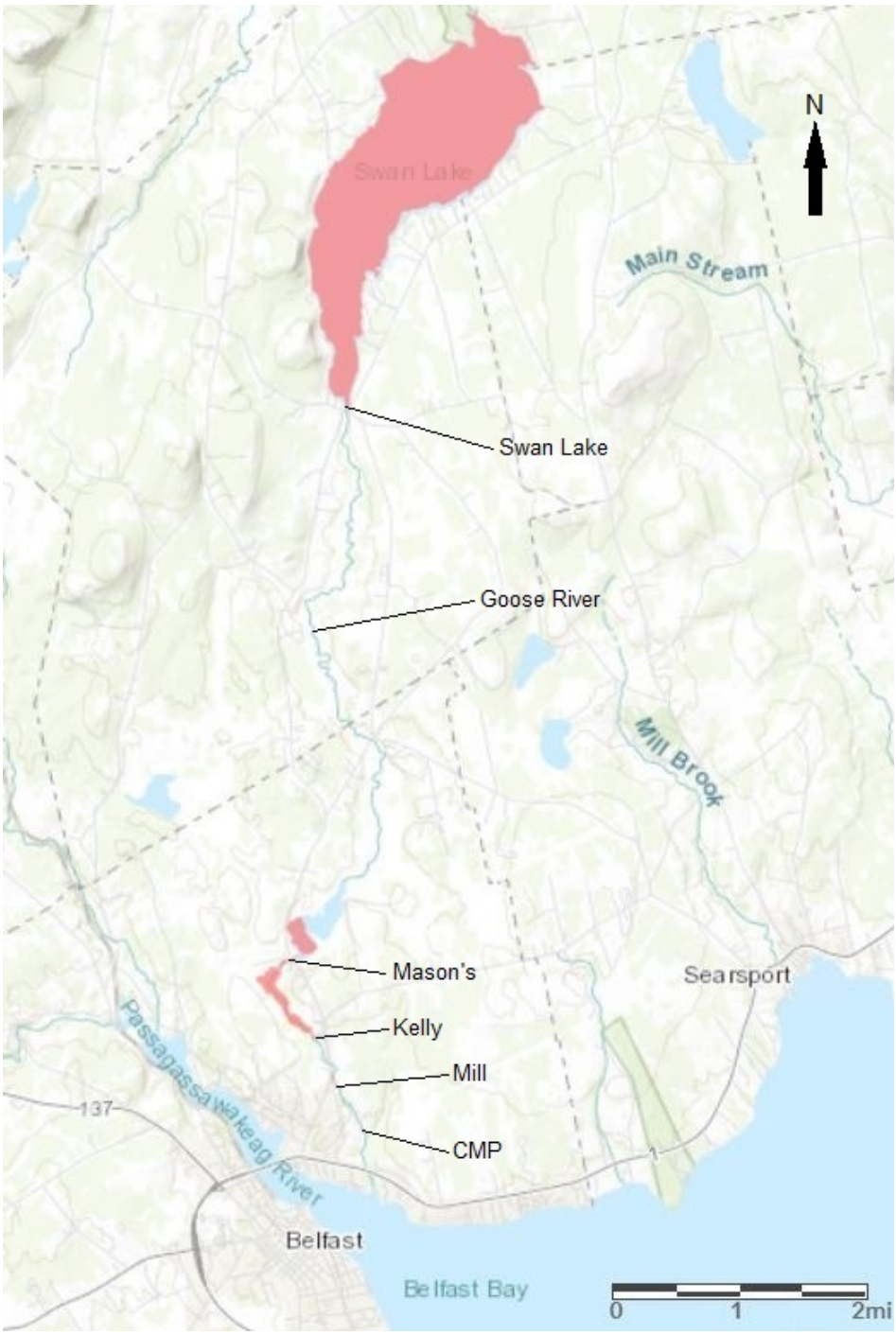

Figure 2. Location of project developments for the Goose River Hydroelectric Project. (Source: Esri, as modified by Staff).

Swan Lake

Swan Lake Dam is a 14-foot-high, 250-foot-long rock masonry gravity dam with a crest elevation of 202 feet.[6] The dam includes a concrete inlet structure with a trashrack and three 3.5-foot-high, 4-foot-wide manually operated butterfly gates that regulate flow through the inlet structure.

The dam impounds the 1,510-surface-acre Swan Lake at a normal maximum surface elevation of 199.5 feet. Swan Lake is approximately 3 miles long and has a usable storage capacity of approximately 7,500 acre-feet between a normal minimum surface elevation of 197 feet and a normal maximum surface elevation of 199.5 feet. There is no spillway on Swan Lake Dam. All flows are released to the Goose River through the butterfly gates.

The Swan Lake Development is used for water storage and has no generation or transmission facilities.

Mason's

Mason's Dam is a 15-foot-high, 86-foot-long rock masonry dam with a crest elevation of 190.5 feet. The dam includes a 30-foot-long overflow spillway, and a concrete inlet structure with a trashrack and a manually operated butterfly gate to control flow into the penstock.

Mason's Dam impounds the 0.7-mile-long Upper Mason's Pond, which has a surface area of 70 acres and volume of 1,621 acre-feet at the normal operating elevation of 188.1 feet.

The generation facilities at this development are operational. Flow is conveyed to the concrete powerhouse through the inlet structure via a 3-foot-diameter, 350-foot-long steel penstock with a vertical slide gate at the penstock terminus to regulate flow into the two Kaplan turbine and generating units. The turbines have an installed capacity of 45 and 55 kW. Flow is discharged back into Goose River directly from the powerhouse, bypassing about 340 feet of Goose River. Power is transmitted from the powerhouse via a 300-foot-long, 12-kilovolt (kV) transmission line.

Kelly

[6] Unless otherwise noted, all elevations are referenced to the 1929 National Geodetic Vertical Datum.

Kelly Dam is a 15-foot-high, 135-foot-long masonry gravity dam with a crest elevation of 160.1 feet. The dam has a 100-foot-long overflow spillway and three 3-foot-high, 2.5-foot-wide manually operated butterfly gates to pass flows downstream. The dam impounds the 3,600-foot-long, 16-acre Lower Mason's Pond, which has a storage capacity of approximately 200 acre-feet at the normal operating elevation of approximately 159 feet. The dam also includes a deep gate that is used only if there is a need for maintenance drawdowns.

The Kelly Development has no generation or transmission facilities.

Mill

Mill Dam is a 6-foot-tall, 70-foot-long masonry dam with a crest elevation of 129.2 feet. The dam has a 60-foot-long concrete overflow spillway, a concrete inlet structure, and a trash sluice that is currently sealed off with wooden stop logs. Flow into the inlet structure is regulated by one manually operated gate.

The dam creates a small 240-foot-long impoundment with a storage capacity of approximately 4 acre-feet at an elevation of approximately 128 feet. Historically the development included a 115-foot-long penstock that conveyed flows to the wood-framed and concrete powerhouse containing a Francis-type turbine and generator unit with an installed capacity of 75 kW. Flow diverted for power generation was discharged back into the Goose River directly from the powerhouse, bypassing about 180 feet of Goose River. The powerhouse is still on-site but the penstock and turbine have been removed and require replacement. The Mill Development also includes a 100-foot-long 12-kV transmission line.

CMP

CMP Dam is a 21-foot-high, 231-foot-long concrete buttress dam with a crest elevation of 110 feet. Flow regulation facilities at the dam include a manually operated slide gate to regulate flows into the penstock, a manually operated deep gate to draw down the impoundment for maintenance, and a 111-foot-long concrete overflow spillway.

The dam creates a 750-foot-long impoundment with a surface area of 5 acres and a storage capacity of approximately 72 acre-feet at an elevation of approximately 109 feet.

Historically, flows were conveyed through the lift gate into a 5-foot-diameter, 1,200-foot-long steel penstock leading into a 300-square-foot concrete and timber powerhouse with a Kaplan-type turbine and generator unit with a nameplate capacity of 200 kW. Flow diverted for power generation was discharged back into the Goose River directly from the powerhouse, bypassing about 1,400 feet of Goose River. Power was

transmitted from the powerhouse via an approximately 500-foot-long, 12-kV transmission line. Although the penstock, powerhouse, and turbine are still located on-site, all of these facilities are off-line and require rehabilitation or replacement.

2.1.2 Project Safety

The Goose River Project has been operating for 39 years under the existing license. During this time, Commission staff conducted operational inspections focusing on the continued safety of the structures, identification of unauthorized modifications, efficiency and safety of operations, compliance with the terms of the license, and proper maintenance.

As part of the relicensing process, Commission staff will evaluate the continued adequacy of the project's facilities under a subsequent license. Special articles will be included in any license issued, as appropriate. Commission staff will continue to inspect the project during the term of any subsequent license to assure continued adherence to Commission-approved plans and specifications, special license articles relating to construction (if any), operation and maintenance, and accepted engineering practices and procedures.

2.1.3 Current Project Operation

The project is operated for water storage (Swan Lake Development), and power generation (Mason's, Mill, and CMP Developments). However, as discussed below, the Mill and CMP developments have not generated electricity since January of 2003. The Kelly Development was originally licensed for power generation, but generating facilities were never constructed and the license was subsequently amended to exclude generation at the Kelly Development.[7]

Swan Lake

The Swan Lake Development stores water to supplement downstream generation at the Mason's, Mill, and CMP Developments. Storage generally follows a seasonal pattern where the impoundment is drawn down during the fall and refilled in the winter and spring.

In accordance with Article 26 of the current license,[8] GRH operates the Swan Lake Development according to the terms of a written agreement between the licensee

[7] 36 FERC 62,264 (1986).

[8] 10 FERC 62,236 (1980).

and the town of Swanville. The agreement is intended to balance the competing uses of the lake for recreation, aesthetics, flood control, and water storage for power generation at the downstream developments. The agreement provides that the normal elevation of Swan Lake is not allowed to rise above 2.5 feet below the top of the dam and may not be drawn down for hydroelectric generation purposes more than 5 feet from the top of the dam between June 15 and Labor Day, and more than 7.5 feet at all other times. The agreement allows for deviations in the lake level limits for maintenance and repair to Swan Lake Dam, emergency situations, and for unusually heavy spring runoff.

Article 28 of the current license requires GRH to maintain a continuous minimum flow of 5 cubic feet per second (cfs) from Swan Lake Dam.[9] GRH provides the minimum flow by leaving open one of the manually operated butterfly gates at all times. There is no minimum flow requirement at the remaining developments.

Mason's

The Mason's Development is operated in a run-of-river mode. The powerhouse operates 24-hours per day when an operator is present and there is sufficient inflow to efficiently operate the turbine,[10] while also maintaining a stable lake level in Upper Mason's Pond and spilling some flow over the dam to maintain some flow in the bypassed reach. Flow into the turbines is manually regulated using a slide gate in the powerhouse. Any flow in excess of the turbines' operating range is passed over the spillway to the bypassed reach. When inflow is insufficient to operate the turbines and spill some flow into the bypassed reach, the turbines are shut down and all inflow is passed over the spillway.

Kelly, Mill and CMP

Because the Kelly Development lacks power generation facilities and the generating facilities at the Mill and CMP Developments are off-line, all three

[9] Article 28 required an interim minimum flow release of 5 cfs from Swan Lake Dam until the licensee completed a post-licensing study to evaluate minimum flow effects on the fish and wildlife resources of the Goose River. On December 10, 1997, the licensee filed a report indicating that it was proposing to establish a permanent minimum flow release of 5 cfs from Swan Lake Dam.

[10] Although the license application states that the minimum hydraulic capacity of the Mason's powerhouse is about 18 cfs, GRH explained at the September 25, 2018 site visit that it typically only operates when inflows range from about 30 to 40 cfs in order to ensure that it can maintain a stable impoundment level and spill some flow into the bypassed reach.

developments are operated to continually pass inflow over the dams. At the Kelly Development, flow is continually passed through the butterfly gates, which are kept open. Any flow in excess of the hydraulic capacity of the gates passes over the spillway. At the Mill and CMP Developments, the penstock intake gates are closed and all inflow is passed over the dams' spillways. Substantial leakage from the Kelly, Mill, and CMP dam gates also contributes to flow.

2.2 APPLICANT'S PROPOSAL

2.2.1 Proposed Project Facilities

GRH proposes to replace the penstocks and turbines at both the Mill and CMP Developments in order to restore power generation at the developments. GRH states that it would initiate construction of the project facility repairs within one month, and complete the repairs within three years, of the date of any subsequent license issued for the project.

2.2.2 Proposed Project Operation

After the penstocks and turbines are replaced at the Mill and CMP Developments, GRH proposes to operate both developments in a run-of-river mode similar to how it currently operates the Mason's Development. The turbines would be designed to operate within a range of about 30-40 cfs. When inflow exceeds about 30 cfs, GRH would manually start up the powerhouses and continually generate electricity while ensuring stable impoundment levels and providing some flows over the spillways and into the bypassed reaches. Inflow in excess of the approximately 40-cfs maximum hydraulic capacity of each development's turbine would likewise be spilled into the bypassed reaches. When inflows are insufficient to operate the turbines while also maintaining stable impoundment levels and some bypassed reach flows, the powerhouses would be shut down and all flow would be spilled over the dams as occurs under existing conditions.

The Swan Lake Development would continue to operate according to the operating agreement with the town of Swanville, while the Mason's and Kelly Developments would continue to operate in a run-of-river mode as described in section 2.1.3.

2.2.3 Proposed Environmental Measures

GRH proposes to:

- Continue the current license requirement to manage lake levels at Swan Lake Dam according to the operating agreement between GRH and the town of Swanville

that restricts lake levels to: (1) a maximum of 2.5 feet below the top of the dam, (2) a minimum not to exceed 5 feet below the top of the dam from June 15 through labor day, (3) and no more than 7.5 feet below the top of the dam at all other times to protect aquatic resources in Swan Lake and reduce the potential for flooding.

- Continue the current license requirement to release a year-round minimum flow of 5 cfs or inflow, whichever is less, at Swan Lake Dam for the protection of aquatic resources in the Goose River downstream.

- Install a remote monitoring system to monitor compliance with Swan Lake levels, rather than relying on visual monitoring of a staff gauge as occurs under existing conditions.

- Continue its current practice of monitoring compliance with run-of-river operation at the Mason's, Kelly, Mill, and CMP Developments by visually monitoring lake levels at least once per day using a staff gauge installed in each impoundment.

- Conduct project maintenance activities between August and November to minimize disturbance to nesting bald eagles.

2.3 STAFF ALTERNATIVE

Under the Staff Alternative, the project would include GRH's proposed measures and the following staff-recommended additions or modifications:

- To minimize erosion and sedimentation during penstock replacement at the Mill and CMP Developments, develop an erosion and sediment control plan (ESCP).

- Include in the ESCP best management practices to minimize the transport, establishment, and spread of invasive and noxious weeds.

- To protect spawning lake trout in Swan Lake, complete the fall drawdown to the minimum lake level of no more than 7.5 feet below the top of the dam by October 15, and maintain the lake level above the minimum reached on October 15 through May 1 of the following year.

- Develop an operation compliance monitoring plan that includes provisions for: monitoring compliance with the operating requirements of the license (e.g., minimum flows), maintaining a log of project operation and lake levels at each of the developments, reporting deviations to the Commission, and a schedule for installing the proposed lake level monitoring system at Swan Lake.

- To protect the federally listed northern long-eared bat, limit the removal of large trees (greater than three inches diameter-at-breast height) to between November 1 and March 31.

- To protect nesting bald eagles, maintain a buffer zone of at least 660 feet between maintenance activities and any active nests during the nesting period (i.e., February 1 through August 15) instead of routinely scheduling all project maintenance between August and November as proposed.

- Notify the Commission and the Maine SHPO if previously unidentified cultural resources are discovered during the course of constructing, maintaining, or operating the project works or other facilities.

- Consult with the Maine SHPO prior to making changes to project operation or facilities that do not require Commission approval but could affect cultural resources.

- Modify the proposed project boundary for the Mason's Development in Exhibit G of the Final License Application to include the entirety of Upper Mason's Pond.

2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

We considered several alternatives to GRH's proposal, but eliminated them from further analysis because they are not reasonable in the circumstances of this case. They are: (1) issuing a non-power license, (2) federal government takeover of the project, and (3) retiring the project.

2.4.1 Non-Power License

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

2.4.2 Federal Government Takeover

Federal takeover and operation of the project would require Congressional approval. While that fact alone would not preclude further consideration of this alternative, there is currently no evidence to indicate that federal takeover should be

recommended to Congress. No party has suggested federal takeover would be appropriate, and no federal agency has expressed an interest in operating the project.

2.4.3 Project Decommissioning

As the Commission has previously held, decommissioning is not a reasonable alternative to relicensing a project in most cases, when appropriate protection, mitigation, and enhancement measures are available. The Commission does not speculate about possible decommissioning measures at the time of relicensing, but rather waits until an applicant actually proposes to decommission a project, or there are serious resource concerns that cannot be addressed with appropriate license measures, making decommissioning a reasonable alternative to relicensing.[11] This is consistent with NEPA and the Commission's obligation under section 10(a) of the FPA to issue licenses that balance developmental and environmental interests.

Project retirement could be accomplished with or without dam removal.[12] Either alternative would involve denial of the license application and surrender or termination of the existing license with appropriate conditions.

No participant recommended project retirement in response to the Commission's July 30, 2018 notice accepting the application and soliciting protests and motions of intervention, and we have no basis for recommending project retirement. The Goose River Project is a source of clean, renewable energy. This source of power would be lost if the project were retired. There also could be significant costs associated with retiring the project's operating powerhouse and appurtenant facilities.

Project retirement without dam removal would involve retaining the dams and disabling or removing equipment used to generate power. Certain project works could

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[11] *See generally Project Decommissioning at Relicensing; Policy Statement*, FERC Stats. & Regs., Regulations Preambles (1991-1996), ¶ 31,011 (1994); *see also City of Tacoma, Washington*, 110 FERC ¶ 61,140 (2005) (finding that unless and until the Commission has a specific decommissioning proposal, any further environmental analysis of the effects of project decommissioning would be both premature and speculative).

[12] In the unlikely event that the Commission denies relicensing of a project or a licensee decides to surrender an existing project, the Commission must approve a surrender "upon such conditions with respect to the disposition of such works as may be determined by the Commission." 18 C.F.R. § 6.2 (2017). This can include simply shutting down the power operations, removing all or parts of the project (including the dam), or restoring the site to its pre-project condition.

remain in place and could be used for historic or other purposes. This approach would require the State of Maine to assume regulatory control and supervision over the remaining facilities. However, no participant has advocated for this alternative, nor do we have any basis for recommending it. Removing the dam would be more costly than retiring it in place, and removal could have substantial, negative environmental effects.

3.0 ENVIRONMENTAL ANALYSIS

This section includes: (1) a general description of the project vicinity, (2) an explanation of the scope of cumulative effects analysis, and (3) our analysis of the proposed action and recommended environmental measures. Sections are organized by resource area (aquatic, recreation, etc.). Historic and current conditions are described under each resource area. The existing conditions are the baseline against which the environmental effects of the proposed action and alternatives are compared, including an assessment of the effects of the proposed mitigation, protection, and enhancement measures, and any cumulative effects of the proposed action and alternatives. Staff conclusions and recommended measures are discussed in section 5.1, *Comprehensive Development and Recommended Alternative*.[13]

3.1 GENERAL DESCRIPTION OF THE GOOSE RIVER BASIN

The Goose River Project is located between approximately river miles (RM) 9 and 1 on the Goose River in the Waldo County, Maine. The Belfast Bay watershed has a total drainage area of 91.8 square miles. The Goose River basin, where the project is located, is a sub-basin of the Belfast Bay watershed and has a total drainage area of 21.2 square miles. The Goose River originates at the project's Swan Lake Dam and flows about 9 miles to where it empties into Belfast Bay. Downstream of Swan Lake, the project's four other developments are located as follows: Mason's (RM 2.3), Kelly (RM 1.5), Mill (RM 1.1), and CMP (RM 1).

Waldo County is located in south-central Maine and has a land area of approximately 853 square miles. The topography is characterized by small mountains and bedrock outcrops. The major topographic feature of Waldo County is the Camden Hills, located in the southern tip of the county along the coast. Lands and land uses within the project vicinity are primarily forested marshland and light residential areas. Portions of the Goose River flow through the towns of Swanville and Belfast.

[13] Unless otherwise indicated, our information is taken from the application for license filed by GRH on February 2, 2018, and responses to requests for additional information filed on February 13, 2018, February 15, 2018, February 22, 2018, July 15, 2018, and November 7, 2018.

There are no other FERC-regulated hydroelectric projects on the Goose River; however, there is one breached non-hydropower dam located just upstream from the Goose River mouth at Belfast Bay.

3.2 SCOPE OF CUMULATIVE EFFECTS ANALYSIS

According to the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act (40 C.F.R. § 1508.7), an action may cause cumulative effects on the environment if its impacts overlap in time and/or space with the impacts of other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time, including hydropower and other land and water development activities.

Based on our review of the license application and agency and public comments, we have identified diadromous fisheries[14] as a resource that may be cumulatively affected by the proposed operation and maintenance of the Goose River Project in combination with other activities in the basin.

3.2.1 Geographic Scope

The geographic scope of analysis for cumulatively affected resources is defined by the physical limits or boundaries of: (1) the proposed action's effect on the resources, and (2) contributing effects from other hydropower and non-hydropower activities within the basin.

We have identified the geographic scope for our cumulative effects analysis for diadromous fisheries to include the Goose River from Swan Lake downstream to the river mouth at Belfast Bay. We chose this geographic scope because the operation and maintenance of the Goose River Project, in combination with the historic dam at the river mouth, has affected diadromous fish species such as American eel and Atlantic salmon and their habitat throughout this 12-mile reach of the river.

3.2.2 Temporal Scope

The temporal scope of our cumulative effects analysis in the EA will include a discussion of past, present, and future actions and their effects on each resource that could be cumulatively affected. Based on the potential term of a license, the temporal scope will look 30-50 years into the future, concentrating on the effect to the resources

[14] Diadromous fisheries include species that spend portions of their life cycles in both fresh and saltwater.

from reasonably foreseeable future actions. The historical discussion will, by necessity, be limited to the amount of available information for each resource. The quality and quantity of information, however, diminishes as we analyze resources further away in time from the present.

3.3 PROPOSED ACTION AND ACTION ALTERNATIVES

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

Only the resources that would be affected, or about which comments have been received, are addressed in detail in this EA. We have not identified any substantive issues related to socioeconomics and aesthetic resources associated with the proposed action; and therefore, these resources are not addressed in the EA. We present our recommendations in section 5.1, *Comprehensive Development and Recommended Alternative*.

3.3.1 Geologic and Soil Resources

3.3.1.1 Affected Environment

The Goose River Project extends across two biophysical regions in the State of Maine: the Central Interior and Penobscot Bay regions. The geology within these biophysical regions is heavily influenced by the most recent ice age in Maine, occurring approximately 30,000 years ago. Upon the retreat of glaciers formed during this ice age, quantities of till, glaciomarine[15] silt, clay, and sand were deposited in the project area. Bedrock in the area is predominantly granite.

Soils within the Goose River basin consist mainly of Boothbay silt loams, Borosaprists, Brayton fine sandy loams, Peru fine sandy loams, Swanville silt loam, and Tunbridge-Lyman complex. The majority of these soils are poorly drained, with the exception of the Peru fine sandy loams and Tunbridge-Lyman complex, which are moderately well and well drained, respectively. Soil slopes range from 0 to 8 percent for Brayton fine sandy loams and Swanville silt loam. The Boothbay silt loams and Peru fine sandy loams slopes range from 0 to 45 percent and 0 to 15 percent, respectively. The Tunbridge-Lyman complex has rocky slopes ranging from 8 to 25 percent.

[15] Glaciomarine sediments are those sediments that are deposited by glaciers with a marine origin.

The erosion potential along the shoreline of Swan Lake and the other project impoundments varies from somewhat erodible to stable soils and deposits. Of the project's five developments, shoreline erosion potential is the greatest at Swan Lake due to the annual water level fluctuations of up to 5 feet under project operation. Residential and recreational development along the Swan Lake shoreline includes stabilization measures (e.g., retaining walls) that have helped to control erosion and protect against property damage.

Shoreline erosion at the four downstream developments is minimal due to the small impoundment fluctuations associated with run-of-river operation. The shorelines at the Kelly and Mason's impoundments are well vegetated, consisting of marsh containing dense grasses, lilies, and sedges and are not generally susceptible to shoreline erosion.

In addition to the areas along the Swan Lake shoreline where erosion is occurring, there is some identified erosion along the right downstream embankment adjacent to CMP Dam.

3.3.1.2 Environmental Effects

Construction Effects on Soil Resources

GRH proposes to replace the turbines and penstocks at the Mill and CMP Developments. Turbine replacement would predominately consist of replacing mechanical and electrical equipment within the footprints of the existing powerhouses and would not affect environmental resources of the project area. Penstock removal and replacement, however, would require heavy equipment operation, vegetation clearing, soil disturbance, and potential stockpiling of soils, all of which could cause soil erosion, compaction, and the release of sediment to the Goose River.

GRH did not propose and no entity recommended any measures to prevent erosion and sedimentation during proposed penstock construction activities.

Our Analysis

The penstock at the Mill Development is 115 feet long and is located near the top of the stream bank and adjacent to a home site that would provide construction access. GRH has not determined the methods that it would use to replace the Mill penstock, but it has already removed and replaced some of the concrete penstock supports. Therefore, construction would be limited to clearing and grading relatively small areas of land along the penstock alignment, potentially replacing some of the remaining concrete penstock supports, and installing a new above-ground pipe on top of the supports. Because there is an area of developed land adjacent to the penstock alignment that could be used for

construction staging and access, there would be no need to clear additional land for this purpose.

According to the NRCS (2017), the Mill Development is located atop Boothbay silt loam soils at a slope of 3 to 8 percent, which are not considered highly erodible. The low potential for soil erodibility coupled with the minor amount of ground disturbance needed for penstock construction would minimize the potential for soil erosion.

The penstock at the CMP Development extends approximately 1,200 feet from the dam to the powerhouse in an area of dense riparian vegetation with limited existing vehicle or construction access. About 1,000 feet of the penstock is located above-ground on concrete supports and the remaining 200 feet is buried. GRH has not determined the methods that it would use to replace the penstock, but based on GRH's replacement of some of the existing concrete penstock supports at the Mill Development, it's possible that it would also need to replace some of the existing concrete supports for the CMP penstock, in addition to installing about 1,200 feet of new pipe. Additionally, unlike the Mill penstock, the existing CMP penstock is still in place and needs to be removed prior to installation of a new penstock. Therefore, construction activities for penstock replacement at the CMP Development would include removal of about 1,200 feet of existing 5-foot-diameter steel pipe, potential removal and replacement of some of the existing concrete penstock supports, and installation of about 1,200 feet of new pipe. Because of the limited existing access along the penstock alignment, construction would likely also require GRH to clear some riparian vegetation and disturb existing soils for access, staging, and stockpiling areas.

The CMP Development is located partially atop Boothbay silt loams ranging from a slope of 8 to 15 percent in some areas and 25 to 45 percent in others, the latter of which is classified as highly erodible soil (NRCS, 2017). Therefore, because some of the soils are highly erodible and there would be a substantial amount of vegetation clearing and ground disturbance needed to replace 1,200 feet of pipe, there is a potential for construction activities to cause soil erosion, compaction, and sediment runoff to the Goose River.

The Commission typically requires licensees to develop erosion control plans for major ground-disturbing activities such as these and submit them to the Commission for approval prior to construction. An erosion control plan would include site-specific best management practices to control erosion and sedimentation in the vicinity of disturbed sites and to stabilize the site after construction. These measures would typically include monitoring of areas sensitive to erosion, use of silt bales or fencing to control erosion, use of dust palliatives or other controls as may be needed to control dust, revegetation of disturbed soils, and monitoring of revegetation. The measures included in such a soil erosion control plan would help to ensure that construction effects on soil erosion are minor, localized, and short-term.

Swan Lake Shoreline Erosion

GRH currently operates Swan Lake as a storage facility according to an existing operating agreement with the town of Swanville. The agreement specifies that GRH restrict lake levels to: (1) a maximum of 2.5 feet below the top of the dam, (2) a minimum not to exceed 5 feet below the top of the dam from June 15 through Labor Day, and (3) no more than 7.5 feet below the top of the dam at all other times.

GRH proposes to continue to manage lake levels at Swan Lake Dam according to the operating agreement with the town of Swanville.

In his comments on the final license application, Mr. Dupuis states that there is no maximum limit on Swan Lake levels in the winter and that levels over the last two winters have been the highest in more than 15 years. Mr. Dupuis contends that these high levels are causing damage to both land and structures around the lake and that continuing to maintain these high levels in the winter could undermine a large concrete retaining wall on his property, leading to its collapse and corresponding property damage and flooding of the nearby Swan Lake Avenue (Maine Route 141). Although he doesn't recommend a limit on winter lake levels, Mr. Dupuis indicates a reasonable limit could be set that would effectively balance the concerns of property owners with GRH's desire to store water for power generation.

It his comments filed on December 24, 2018, Mr. Hood states that the existing agreement with the town of Swanville has no provision for a prudent water level management when the lake freezes. He believes that high water levels under these circumstances can cause shore erosion and property damage and that this has happened more than once since Maine Hydro ceased its operations.[16] He states that GRH has followed the original agreement almost to the letter in their quest for licensing renewal, which resulted in no icing concerns. He states that while Maine Hydro monitored water levels closely and used the water for energy generation as much as possible, which resulted in fall and winter water levels almost always being low, heavy fall rains and GRH's storage of water instead of generating has brought Swan Lake nearly to its spring level during winter. He adds that he has raised this concern previously.[17]

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[16] Maine Hydro transferred the license to GRH in 1987. The owner at the time were the Gleesons, who sold the project to the current owners in 2013.

[17] Erwin Hood previously filed comments on January 7, February 11, and February 25, 2016. In the filings, Mr. Hood states that since 2009, non-generating conditions have caused high water during winter months with severe ice damage to several cottages and many of the lake cottage owners are seeking a winter month high

No other entity recommended any limits on winter lake levels to prevent shoreline erosion and property damage.

Our Analysis

The operating agreement between the town of Swanville and GRH states that the goal of the year-round maximum lake level limit of 2.5 feet below the top of the dam is to reduce the potential for high water damage to properties around the lake. However, the agreement, which was originally drafted in 1979, does not explain how this level was set. While holding the lake level lower during the winter may help to reduce the risk of winter flooding around the lake shoreline, there is no available historic lake level information that could be used to evaluate the circumstances that led to the flooding and property damage concerns raised by Mr. Dupuis and Mr. Hood or to establish a minimum lake level.

Under existing operation, GRH monitors compliance with lake levels in coordination with volunteers associated with the Swan Lake Dam Committee. Volunteers visually check the staff gauge installed on the dam once per day. If a volunteer identifies that the lake level is either too low or too high, the volunteer communicates directly with GRH, who then manually adjusts the butterfly gates to either increase or decrease flow releases and adjust lake levels. Because monitoring has historically been done visually by volunteers, GRH does not maintain any records of lake level observations and there is no data logging equipment on the dam to use for this purpose. Therefore, there is no way to evaluate whether lake levels exceeded the maximum limits set in the operating agreement, or to determine the levels that were reached during the winters when Mr. Dupuis and Mr. Hood reported flooding or property damage.

GRH proposes to discontinue visual lake-level monitoring and instead install a remote monitoring system for compliance monitoring purposes. GRH states that the monitoring system would either store lake elevation data to be retrieved at a later date, or would be capable of uploading the data to the internet in real time. Either method would provide GRH and the Commission with accurate data on lake levels that would improve GRH's ability to maintain compliance with license requirements for preventing flooding around the lake. The new monitoring system would also provide accurate information for GRH and the Commission to use to determine whether the existing limits in the operating agreement are adequate to protect against winter flooding and shoreline erosion.

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water limit of "6 feet below the dam's top." However, there has been no known damage since 2013.

3.3.2 Aquatic Resources

3.3.2.1 Affected Environment

Water Quantity

There are no operating stream gages or historic gaging records available for the Goose River. The closest operating stream gage on a similarly sized watershed is USGS gage no. 01037380 located on the Ducktrap River near Lincolnville, Maine, about 8 miles southwest of the project area. To assess flow conditions in the Goose River at the project, staff prorated 19 years of available flow data from the Ducktrap River gage for the period of January 1, 1999 – December 31, 2018.[18] Because the project facilities are located along about 8 river miles of the Goose River between Swan Lake Dam and CMP Dam, staff developed a synthetic flow record at both of these locations as they represent the upstream and downstream extent of potential project effects on stream flows. Table 1 summarizes monthly flow data for the Goose River based on the prorated data.

Water Quality

Maine's water quality laws (38 M.R.S.A. §464 *et. Seq.*) establish the State's classification system for surface waters. The Goose River downstream of Swan Lake Dam is classified as Class B waters.

Class B waters 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 processes, cooling water supply, hydroelectric power generation, navigation, and unimpaired habitat for fish and other aquatic life. The dissolved oxygen content of Class B waters may not be less than 7 milligrams per liter (mg/L) or 75 percent of saturation, whichever is higher. Maine has not established water quality standards for temperature. Discharges to Class B waters may not cause adverse impact to aquatic life, such that the receiving waters must be of sufficient quality to support all aquatic species indigenous to the receiving water without detrimental changes in the resident biological community.

[18] Staff's hydrology analysis was based on a proration of the USGS's Ducktrap River gage data based on the drainage area at Swan Lake Dam and CMP Dam. The drainage area at the Ducktrap River gage site is 14.4 square miles, while the drainage area at Swan Lake Dam and CMP Dam is 11.2 square miles and 19.9 square miles, respectively, according to the USGS's StreamStats web application. Therefore, the daily average flow data from the Ducktrap River gage were prorated by a factor of 0.8 (i.e., 11.2/14.4=0.8) for the Swan Lake Dam site and 1.4 (i.e., 19.9/14.4=1.4) for the CMP Dam site.

Maine DEP classifies Swan Lake as "GPA" waters, which are defined, in part, as any inland body of water artificially formed or increased with a surface area exceeding 30 acres. There are no numeric water quality standards for dissolved oxygen for GPA waters, but water quality conditions in hydropower impoundments classified as GPA waters must satisfy Class C aquatic life requirements, which states that 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.

Water Quality Monitoring

To characterize baseline conditions and assess the potential effects of the project on water quality, Goose River Hydro collected water quality data during eight sampling events at 10 sampling sites in the project area from late May to early September 2016. The sampling sites included all five of the project's impoundments, and each of the riverine sections below the five dams. The results of Goose River Hydro's water quality studies are summarized below.

Table 1. Mean, median, minimum, and maximum flow data for the Goose River at Swan Lake Dam and CMP Dam based on prorated gage data for the period 1999-2018. (Source: Staff)

Month	Goose River at Swan Lake				Goose River at CMP Dam			
	Mean (cfs)	Median (cfs)	Minimum (cfs)	Maximum (cfs)	Mean (cfs)	Median (cfs)	Minimum (cfs)	Maximum (cfs)
January	32	17	3	363	56	30	5	643
February	25	13	3	393	45	23	5	696
March	46	33	3	563	82	68	6	996
April	66	44	5	729	117	77	10	1289
May	30	20	3	480	52	36	5	849
June	19	9	0	278	33	16	1	491
July	8	2	0	211	14	4	0	373
August	3	1	0	136	6	1	0	240
September	4	1	0	135	6	1	0	239
October	22	6	0	496	39	10	0	878
November	35	23	0	431	62	41	0	762
December	39	2	0	395	70	50	0	700

Swan Lake dissolved oxygen concentrations in the epilimnion exceeded 7 mg/L during all sampling events, but were less than 7 mg/L in samples collected after July 31 and below a depth of about 13 meters. The lowest recorded concentration was 2.9 mg/L at a depth of 25 meters near the bottom of the lake in early September.

Dissolved oxygen levels in the four downstream impoundments nearly always met the state standard of 7 mg/L or 75 percent saturation, whichever was greater. The exceptions were for Upper Mason's Pond and the CMP impoundment. At Upper Mason's Pond, dissolved oxygen levels were less than 7 mg/L, ranging from 6.2 to 6.6 mg/L, during the late July and early September sampling events near the surface, but exceeded 7 mg/L at all depths during all other sampling events. At the CMP impoundment, dissolved oxygen levels were measured at 6.9 mg/l at 5 meters (near bottom) in early July, but exceeded 7 mg/L at all depths during all other sampling events.

Dissolved oxygen levels at all riverine sampling sites exceeded 7 mg/L on all sampling dates.

Water temperatures ranged from a low of about 16 degrees Celsius (C) at the riverine sampling site below Swan Lake Dam in May to a high of about 26 to 27 degrees C during July at Upper Mason's Pond and at all sampling sites downstream. Water temperatures at all sites followed a general pattern with the lowest levels beginning in late May and early June, the highest levels occurring in mid to late July, and a gradual cooling thereafter.

By letter filed on January 22, 2018, Maine DEP states that project operation does not cause a measureable negative effect on water quality, and studies performed by the applicant demonstrate that the project would not cause or contribute to non-attainment of state water quality standards.

Aquatic Habitat

Swan Lake

Swan Lake is about 3 miles long, and has a gradual increasing width ranging from about 200 feet near the dam to about 1 mile at the upstream end of the lake. The lake has a surface area of about 1,510 acres at the normal maximum pool elevation of 199.5 feet. Depths vary but the average depth is about 34 feet and the maximum depth is about 90 feet. The shoreline consists primarily of residential home sites and forest land.

Goose River

The Goose River originates at the Swan Lake Dam outlet works and flows about 9 miles to the mouth at Belfast Bay. From Swan Lake Dam, the river flows unimpeded for

about 6 miles to Upper Mason's Pond, which is the impoundment created by the project's Mason's Dam. In the approximately 2-mile-long reach between Upper Mason's Dam and CMP Dam where most of the project facilities are located, the river consists of a series of small impoundments created by the project's dams and short segments of riverine habitat downstream of the dams that range from about 0.1 to 0.25 mile in length. Downstream of CMP Dam, the river flows about 1 mile before passing through a non-project breached dam at the river mouth and into Belfast Bay.

The project creates three bypassed reaches below the Mason's, Mill, and CMP Dams and their respective powerhouses. The bypassed reaches are about 340 feet (Mason's), 180 feet (Mill), and 1,400 feet long (CMP).

Fish Community

Resident Fish

The Goose River including the project's impoundments currently supports a variety of coldwater and warmwater resident fish species including brook trout, chain pickerel, smallmouth bass, and largemouth bass. Swan Lake also supports a self-sustaining population of lake trout. In its scoping comments, Maine DIFW indicates that Swan Lake is one of only five lakes in the central and mid-coast management region that supports a wild population of lake trout.

Lake trout typically occur in large, deep, cold lakes in which they spend their entire lives. Lake trout in Maine waters typically spawn in the fall from mid-October to mid-November (Johnson, 2001). They do not dig nests and instead broadcast eggs over the bottom where they settle into crevices among the rocks and other substrate. Lake trout often spawn within 30 feet of shore over broken ledges, large rocks, boulders and/or rubble ranging in size from 5 inches to 25 inches in diameter (Johnson, 2001). Eggs incubate over the winter and hatch in the spring. After hatching, sac fry stay in the substrate until they absorb their yolk sac and then swim up and move to deeper water.

Anadromous Fish

The Goose River watershed is located within the range of numerous anadromous fish species, including: American shad, alewife, blueback herring, sea lamprey, and Atlantic salmon. However, the project's dams have been in place since the mid- to late-1800's and none of them include dedicated upstream or downstream fish passage facilities. Therefore, any anadromous fish that enter the river from Belfast Bay would be limited to about 1 mile of riverine habitat downstream of CMP Dam. The historical abundance and distribution of anadromous fish in the Goose River are unknown, and there is no information indicating that any of these species currently occurs in the Goose River.

Because Atlantic salmon are listed as an endangered species, we describe the species and its habitat in section 3.3.4, *Threatened and Endangered Species*.

Catadromous Fish

The American eel is a catadromous fish that spends most of its life in fresh or brackish water before migrating to the Sargasso Sea to spawn. It occurs throughout warm and cold waters of the Atlantic Ocean and Atlantic coastal drainages in North America (Boschung and Mayden, 2004). American eel have been documented in Swan Lake, suggesting that some eel are able to ascend all of the project's dams. To assess the current relative abundance and distribution of eel in the project area, GRH conducted seven nighttime surveys for eel below Mason's Dam during June through August 2018. The surveys took place at the downstream face of the dam and spillway and associated bedrock. No eel were observed.

3.3.2.2 Environmental Effects

Project Facility Construction

As discussed in detail in section 3.3.1.2, GRH proposes to replace the penstocks and turbines at the Mill and CMP Developments to enable it to restore power generation at these facilities. Although GRH does not specify the methods it would implement to remove and replace the existing penstocks and support structures, these types of construction activities typically require heavy equipment operation, vegetation clearing, and ground disturbance. Ground disturbing construction activities in or near flowing waters can cause erosion and sedimentation of aquatic habitat if measures are not implemented to protect these sensitive habitats.

GRH did not propose and no entity recommended any measures to control sediment runoff to the Goose River during proposed penstock construction.

Our Analysis

The 115-foot-long penstock at the Mill Development is located near the top of the stream bank and outside of the wetted channel. The penstock has been removed and some of the concrete support structures have been replaced. Therefore, construction activities at the Mill Development would be limited to potentially replacing some of the remaining concrete supports along the top of the stream bank and installing about 115 feet of pipe above-ground on the new supports. Because the penstock is located near the top of the stream bank and away from the stream channel, and ground disturbance would predominately be limited to relatively small areas along the 115-foot-long alignment, replacing the Mill Development penstock would not affect aquatic resources.

At the CMP Development, some of the existing concrete supports for the 1,200-foot-long penstock are located within the stream channel. Although GRH does not specify how it would construct the new penstock, based on GRH's replacement of the existing concrete supports at the Mill Development, some of the CMP penstock supports could also need to be replaced. Removing the existing penstock supports and constructing new ones within the stream channel would typically require installing small cofferdams to isolate the work area and disturbing the stream bed, both of which would cause short-term increases in turbidity and sedimentation of aquatic habitat in the Goose River. In addition, because the CMP Development penstock is located in an area of dense riparian forest with limited existing vehicle access, construction would likely include disturbing and clearing riparian vegetation in order to provide access for heavy equipment and enable installation of the penstock. Vegetation clearing and ground disturbance in riparian habitats near flowing waters would cause soil erosion and sediment runoff to aquatic habitat.

While no entity recommended any measures to protect water quality and aquatic habitat during penstock replacement activities, Commission licenses typically require licensees to develop erosion control plans for major ground-disturbing activities and submit them to the Commission for approval prior to construction. The measures included in such an erosion control plan would help to ensure that construction effects on soil erosion, water quality, and aquatic habitat are localized and short-term.

Swan Lake Levels

As described in section 3.3.1.2, GRH proposes to continue to manage lake levels at Swan Lake Dam according to the operating agreement with the town of Swanville.

In its scoping comments, Maine DIFW states that it supports GRH's proposal, but also makes the following additional recommendations to protect lake trout spawning habitat in Swan Lake:

(1) complete the fall draw down to the minimum lake level elevation of no more than 7.5 feet below the top of the dam by October 15 of any year, and

(2) maintain lake levels above the minimum level reached on October 15 through May 1 of the following year.

Maine DIFW states that these additional operating limits would ensure lake trout are able to spawn in preferred near-shore habitat while protecting incubating eggs from freezing or desiccation due to dewatering that could occur over the winter if the lake is drawn down after the spawning period.

GRH did not respond to Maine DIFW's recommendations to protect lake trout spawning habitat.

Our Analysis

Under existing and proposed operations, GRH would typically draw down Swan Lake to its lowest level of no more than 7.5 below the top of the dam during the fall and winter to enable it to capture and store water during periods of high flow in the winter and the following spring. However, GRH does not propose any limits on the timing of when it must reach the minimum lake elevation over the fall and winter.

The peak of lake trout spawning typically occurs in mid-October on the lake bottom in near shore areas that are prone to dewatering when GRH draws down the lake over the winter. Maine DIFW's recommendation to complete the fall draw down to the minimum lake level by October 15 when most lake trout spawning activity occurs, and then maintain it above this level until May 1, would benefit lake trout by ensuring that spawning and incubation habitat located in near-shore areas within the impoundment fluctuation zone remains inundated over the fall and winter.

Run-of-River Operation

Flow fluctuations during the operation of hydropower projects can affect shoreline littoral and riverine habitat in impoundments and downstream reaches by exposing them to periodic dewatering, making them unsuitable for aquatic biota.

With the exception of Swan Lake Dam, which is a storage facility, GRH proposes to continue operating the downstream developments in run-of-river mode where outflow at each development approximates inflow.

Our Analysis

Continuing to operate the developments downstream of Swan Lake in a run-of-river mode would minimize fluctuations in the four impoundments and the associated riverine reaches below the dams. Maintaining stable impoundment levels would protect shoreline habitat and fish and other aquatic organisms that rely on near-shore habitat in the impoundments for spawning, foraging, and cover. Minimizing flow fluctuations downstream of the dams would also maintain aquatic habitat connectivity and minimize fish stranding potential.

Minimum Flows

Under the existing license, GRH is required to release a continuous minimum flow of 5 cfs into the Goose River below Swan Lake Dam. GRH typically provides the

minimum flow by opening one of the butterfly gates in the dam. There are no minimum flow requirements for the four downstream developments, but GRH states that it operates the Mason's powerhouse to ensure some flow is always maintained in the bypassed reach below the dam. When the powerhouse is shut down, all flow is passed over the spillway.

GRH proposes to continue to provide a 5-cfs minimum flow below Swan Lake Dam or inflow, whichever is less, under any subsequent license issued. GRH does not propose any minimum flows at the other four project developments.

No entity recommended any minimum flow requirements for the project.

Our Analysis

GRH assessed aquatic habitat under minimum flow levels by measuring discharge, wetted width, and channel width at the ordinary high water elevation at 14 sites in the project area during September 2016. The study was completed during an unusually dry period when stream flows were at very low levels. At the time of the study, none of the powerhouses were operating and GRH was maintaining a stable level in Swan Lake and passing all inflow downstream. The purpose of the study was to determine the percent of the channel that remains wetted under low-flow conditions that approximate the 5-cfs minimum flow requirement from Swan Lake Dam. The study sites were located downstream of each of the project's dams. The data were then used to determine if a 5-cfs minimum flow met Maine DEP's water quality standard that at least 75 percent of the bankfull width remains wetted under minimum flow levels in order to maintain the structure and function of the aquatic habitat. The flow and channel width data are shown in table 2.

Table 2. Flow and wetted channel characteristics in Goose River below project dams September 2016 (source: license application as modified by staff).

Location		**Flow (cfs)**	**Wetted Width (feet)**	**Ordinary High Water Width (feet)**	**Percent of High Water Width Wetted (%)**
Below Swan Lake	Site 1[a]	--	--	--	--
	Site 2	4.7	20.5	21.0	98
	Site 3	5.2	15.8	16.5	96
Below Mason's Dam	Site 1	10.2	12.0	14.5	83
	Site 2	8.7	15.0	18.0	83
	Site 3	10.3	10.0	11.0	91
	Site 1	12.9	16.0	17.0	94

Below Kelly Dam	Site 2	12.6	33.5	35.0	96
	Site 3	6.4	28.8	28.8	100
Below Mill Dam	Site 1	9.7	24.5	25.0	98
	Site 2	8.1	43.3	44.4	98
	Site 3	7.5	47.5	48.0	99
Below CMP Dam	Site 1	5.7	17.0	17.5	97
	Site 2	11.5	27.2	28	97
	Site 3	8.2	16.5	17.5	94

[a] GRH did not collect stream channel data at site 1. Data from this site were used to measure the discharge capacity of the Swan Lake Dam outlet works.

Based on the study results, GRH's proposal to continue to provide a 5-cfs minimum flow release at Swan Lake Dam would maintain a wetted channel equal to at least 96 percent of the bankfull width in the Goose River downstream of the dam.

Although GRH does not propose a minimum flow in the Mason's Development bypassed reach, GRH would continue its current practice of spilling some flow into the bypassed reach whenever the powerhouse is operating. This spill flow would augment the existing leakage at the dam, thereby maintaining some wetted channel and aquatic habitat connectivity in the 340-foot-long bypassed reach.

Compared to existing conditions where the powerhouses are off-line and GRH passes all inflows to the Goose River below the Mill and CMP Dams, restoring power generation at the Mill and CMP Developments would reduce flows in the bypassed reaches of these developments whenever the powerhouses are operating. Although GRH does not propose a minimum flow at either of these developments, it would operate both developments the same as it does at the Mason's Development, whereby it would only generate electricity when there is sufficient inflow to efficiently operate the turbines, maintain stable impoundment levels, and spill some flow into the bypassed reaches. The spill flows coupled with the existing leakage at the dams would maintain some wetted channel and aquatic habitat connectivity in the bypassed reaches whenever the powerhouses are operating.

Because the Kelly Development does not generate power and is operated in a run-of-river mode, continued operation of the Kelly Development would not affect stream flow or aquatic habitat in the approximately 0.25-mile riverine reach of the Goose River

between Kelly Dam and the Mill Dam impoundment.

Operation Compliance Monitoring

Under existing conditions, GRH monitors lake levels at Swan Lake and the other four project impoundments by visually checking impoundment levels once per day using staff gauges installed in each of the impoundments. GRH then makes any necessary adjustments to the flow regulating equipment at each of the dams to ensure that it is meeting the requirements of the operating agreement at Swan Lake, and operating in a run-of-river mode at the four downstream developments. GRH does not specify how it monitors compliance with the 5-cfs minimum flow requirement below Swan Lake Dam, but it does indicate that one of the butterfly gates at the dam is always kept open to provide a minimum flow.

Under its proposed action, GRH would continue its current practice of visually monitoring lake levels at the four downstream developments (i.e., Mason's, Kelly, Mill, and CMP) once per day and adjusting flow regulating equipment as needed to ensure it is maintaining stable lake levels and complying with its proposed run-of-river operation. At the Swan Lake Development, GRH proposes to discontinue visual lake-level monitoring and instead install a remote monitoring system for compliance monitoring purposes. GRH states that the monitoring system would either store data to be retrieved at a later date, or would be capable of uploading the data to the internet in real time. GRH does not specifically propose a method for monitoring compliance with its proposed 5-cfs minimum flow below Swan Lake Dam, but we assume that it would continue its current practice of leaving open one of the butterfly gates to provide the minimum flow.

Our Analysis

GRH does not currently have formalized monitoring protocols or reporting requirements to verify compliance with lake levels, run-of-river operation, or minimum flow releases. Although compliance measures do not directly affect environmental resources, they do allow the Commission to ensure that a licensee complies with the environmental requirements of a license and thus ensure the implementation of operational measures that are designed to protect and enhance the environmental resources of the project area.

Diadromous Fish Passage

Dams can affect diadromous fish populations by limiting upstream and downstream movement between spawning and rearing areas. Currently, there are no dedicated upstream or downstream passage facilities for diadromous fish at the Goose

River Project.

GRH does not propose and no entity recommends any fish passage measures for the project.

Our Analysis

Although runs of anadromous river herring, sea lamprey, and Atlantic salmon are widely distributed throughout Maine river systems, there has been no recent documentation of any anadromous fish in the Goose River watershed. Should any anadromous fish enter the river from Belfast Bay, they would be limited to about 1 mile of available riverine habitat between the river mouth and the project's CMP Dam, which blocks all upstream passage of anadromous fish.

Catadromous American eels have been documented in Swan Lake within the Goose River watershed. Although there is no information on recent long-term abundance trends for American eel in the Goose River, GRH did not detect any eels during its 2018 nighttime eel surveys below Mason's Dam. These survey results suggest that eel abundance in the project area is low. Because there are no dedicated upstream passage facilities for eel at the project, any juvenile eel migrating upstream would have to climb over or around the project's dams to access upstream habitats.

Downstream migrating adult eels would have to pass through a combination of trash racks, butterfly or slide gates, penstocks, Kaplan-type turbines, or spillways to migrate past the project's five dams and enter the marine environment. Because most of the project's flow regulating equipment is not designed to safely pass adult eel, some downstream migrants would likely be injured or killed during passage.

3.3.2.3 Cumulative Effects

The project's dams in combination with the non-project dam that historically blocked upstream passage at the river mouth, have adversely affected diadromous fish habitat by impeding or disrupting sediment transport, fragmenting aquatic habitat, and blocking access to spawning habitat in the basin. Although there is no recent documentation of anadromous fish species in the Goose River and their historical abundance is unknown, the non-project dam at the river mouth is currently breached, which allows anadromous fish access to about 1 mile of riverine habitat downstream of the project's CMP Dam.

Relicensing the project would cause short-term adverse effects on currently accessible anadromous fish habitat downstream of CMP Dam due to minor increases in erosion and sedimentation of the stream channel during penstock replacement. Over the long term, the project's CMP Dam would continue to block upstream anadromous fish

passage, thereby continuing to limit available habitat to the reach downstream of CMP Dam. Catadromous juvenile American eels could continue to access the entire project area for growth to the adult life stage because they are capable of climbing over or around dams. However, some adult eels emigrating to the marine environment would continue to be injured or killed by the project's turbines and other flow regulating equipment during downstream passage. Therefore, continued project operation would adversely affect diadromous fish species over the long term.

3.3.3 Terrestrial Resources

3.3.3.1 Affected Environment

The project is located in the Central Maine Coastal and Embayment ecological subregion of the Northeastern Mixed Forest Province of Maine (McNab *et al.*, 2007). Flat to gently rolling terrain is characteristic of this ecological subregion except around Penobscot Bay, where the terrain is dominated by bedrock ridges and high hills. The vegetation is mainly spruce-fir, oak-hickory, and maple-beech-birch forested cover types. Coastal pitch pine communities are represented on sand dunes and outcrops in the coastal zone. Agriculture and urbanization are increasingly important land uses near coastal areas. Many perennial streams, small lakes, and ponds serve as surface water sources, with the coastal zones receiving saltwater from tidal influence (McNab and Avers, 1995).

Wetlands

The project lies within the Goose River subwatershed of the larger Belfast Bay watershed. Goose River is a low gradient riverine system originating at Swan Lake, and flowing south about 9 miles to its mouth at Belfast Bay, an arm of the larger Penobscot Bay. According to FWS's National Wetlands Inventory system (FWS, 2018a), there are several freshwater lakes, ponds, forested/shrub wetlands, and emergent wetlands within the Goose River subwatershed.

Botanical Resources

The dominant upland habitat type occurring within or adjacent to the project boundary at the project's developments is classified as Laurentian-Acadian Pine-Hemlock-Hardwood Forest.[19] White pine, eastern hemlock, and red oak are typical canopy dominants, with red maple and other hardwoods often present. Plants in the understory can include Appalachian barren strawberry and sand violet (Anderson *et al.*,

[19] http://maps.tnc.org/nehabitatmap/

2013). Some forested habitat bordering Swan Lake, mainly at the northern end and along the southwestern end to the west of Swan Lake Road, is classified as Laurentian-Acadian Red Oak-Northern Hardwood Forest. The overstory of the Red Oak-Northern Hardwood Forest habitat type is dominated by red oak with other hardwoods such as sugar maple, American beech, and yellow birch. Understory plants include species such as broad beech fern, flowering dogwood, and American squawroot (Anderson *et al*., 2013).

The majority of forested/shrub wetlands within the project area are classified as Laurentian-Acadian Alkaline Conifer-Hardwood Swamp. Common dominant tree species in this cover type include northern white cedar, red maple, and black ash, with red-osier dogwood being a common shrub species.

Developed areas, comprised mainly of small homes and lawns, are present along Swan Lake Road, which runs along the southwestern shore and southern end of the Swan Lake Development, between the Upper and Lower Mason's Ponds, along the southern end of the Kelly Development, and to the west of the Mill and CMP Developments.

Invasive Species

Several invasive plant species are known to occur within Waldo County. Invasive species are often found near roadsides, forest edges, and areas with disturbed soils, such as those present within the boundaries of the individual project developments. No official surveys have been conducted at the project, but there has been an observation of purple loosestrife at the north end of Swan Lake (EDDMapS, 2019). Also, Swan Lake is considered to be at high risk for infestation by aquatic invasives based on Maine DEP's Lake Vulnerability Analysis, which uses certain parameters (e.g., boat access, lake surface area, proximity to a state highway) to assess risk.[20] However, as of 2017, there were no indications of any aquatic infestations in the waterbodies within the Goose River subwatershed.

Wildlife

Freshwater wetlands provide habitat for a variety of reptiles and amphibians such as the northern green frog, American toad, painted turtles, and snapping turtles. The shoreline of Goose River likely provides habitat for mammal species such as striped skunk and raccoon, and bird species such as sora, swamp sparrow, common yellowthroat, red-winged blackbird, and great blue heron. Bird species that could forage at the deepwater lake habitats include bald eagles and ospreys, and waterfowl species such as common merganser, American black duck, Canada goose, mallard, and wood duck.

[20] https://www.maine.gov/dep/water/invasives/vulnerability.html

Aquatic furbearers that are found within the project area include muskrat, mink, beavers, and river otters.

Within forested areas, common mammals likely found with the project area and immediate vicinity include red fox, white-tailed deer, eastern chipmunk, eastern gray squirrel, red squirrel, deer mouse, and red-backed vole. Birds inhabiting these forests include the pine warbler, hermit thrush, white-breasted nuthatch, song sparrow, ovenbird, downy woodpecker, sharp-shined hawk, and broad-winged hawk. Other transient bird species can use this habitat during spring or fall migratory periods.

Sensitive Species and Maine Significant Wildlife Habitat

Bald eagles are known to forage and nest within the project vicinity. The bald eagle was delisted from the ESA in 2007 and from Maine's state list in 2009, but remains federally protected under the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act (FWS, 2007b). Bald eagles have a long nesting period consisting of five phases: courtship and nest building, egg laying, incubation and hatching, early nestling period, and late nestling period. The nesting period varies by latitude, but is generally from February 1 to August 15 in Maine (FWS, 2014). Aerial survey nesting data from 2013 indicates that a cluster of three bald eagle nests are located along the southeastern shore of Swan Lake, and another nest is located at approximately 1.25 miles west of Lower Mason's Pond, along the Passagassawakeag River (FWS, 2014).

According to Maine DEP data,[21] three types of "Significant Wildlife Habitat," as defined by Maine's Natural Resource Protection Act[22] occur within the project vicinity. Inland waterfowl and wading bird habitat (IWWH) is defined as wetland complexes surrounded by a 250-foot-wide upland zone buffer or is an inland wetland complex that has documented outstanding use by waterfowl or wading birds. The majority of forested/shrub wetlands and emergent wetlands along Goose River between Swan Lake and Lower Mason's Pond are considered IWWH. All of Upper Mason's Pond is considered IWWH, and therefore the northern half of the Mason's Development is considered significant wildlife habitat. Tidal waterfowl and wading bird habitat occurs at the mouth of Goose River, approximately one mile downstream of the CMP

[21] https://webapps2.cgis-solutions.com/beginningwithhabitat/map2/

[22] *See* Title 38 M.R.S.A. §§480-B. "Significant Wildlife Habitats" include habitat for species appearing on the official state or federal list of endangered or threatened animal species; high and moderate value deer wintering areas and travel corridors; seabird nesting islands; and critical spawning and nursery areas for Atlantic salmon. It also includes the following areas: (1) significant vernal pool habitat; (2) high and moderate value waterfowl and wading bird habitat, including nesting and feeding areas; and (3) shorebird nesting, feeding and staging areas.

Development. This type of habitat provides breeding, migration-staging, or wintering areas for coastal wading birds and waterfowl and include aquatic beds, eelgrass, emergent wetlands, mudflats, seaweed communities, and reefs. Lastly, there are several forest patches throughout the project vicinity that are considered deer wintering areas, including a forested area adjacent to the western shore of Lower Mason's Pond. Deer wintering areas are forested areas that provide shelter for deer when deep snow restricts their mobility and food availability.

All eight bat species occurring in Maine (i.e., little brown bat, northern long-eared bat, eastern small-footed bat, big brown bat, red bat, hoary bat, silver-haired bat, and tricolored bat) are either state or federally listed, or are considered species of concern, and could potentially use the project area during breeding or migration. For example, species such as the big brown bat and tri-colored bat (state species of concern) could be found at the edges of the project's northern hardwood forested areas. The northern long-eared bat, a federally threatened species, could also be present in the project area, and is discussed below in section 3.3.4, *Threatened and Endangered Species*.

3.3.3.2 Environmental Effects

Effects of Construction Activities

GRH proposes to replace the penstocks and turbines at both the Mill and CMP Developments. The penstock replacement work, including any necessary effort to replace or stabilize the above-ground, concrete support structures for the penstocks along each development's bypassed reach, would likely require the use of heavy equipment and establishment of staging areas. Operation of heavy equipment would cause ground disturbance including compaction of soils, removal and trampling of vegetation, and temporary disturbance of wildlife, particularly at the CMP Development, which is located in a forested area with limited access. Additionally, construction vehicles could transport invasive weed species to recently disturbed areas, potentially leading to establishment and increased competition with existing plant communities. Construction activities in or near aquatic environments can cause erosion and increased sedimentation, resulting in reduced water quality and covering of sensitive aquatic habitats.

To prevent disturbing bald eagles during nesting, GRH proposes to conduct all maintenance at the project between August and November.

Our Analysis

As described in section 3.3.2.2, effects of construction on terrestrial resources would be confined to the replacement of the penstock and potentially some of the penstock supports at the Mill and CMP Developments. At the Mill Development, wildlife disturbance due to construction activities would be short-term, localized, and

minor. Wildlife displaced from the construction activities would likely return following completion of construction. Best management practices that control erosion and sedimentation would reduce the potential for degradation of aquatic and riparian habitats and minimize the area of disturbance to a small area of grassy and herbaceous vegetation.

At the CMP Development, replacement of the penstock would require disturbing and clearing of riparian vegetation, particularly along the northern end of the penstock near CMP Dam. Vegetation clearing for construction access would result in the conversion of about 0.25 acre of riparian vegetation dominated by trees and shrubs to more early successional stages of grasses and forbs. For future access, inspection, and maintenance of the project, we expect that a narrow corridor on either side of the penstock would have to be maintained in this early successional stage, but that regrowth of the pine-hemlock-hardwood forest would occur over time in the remaining areas disturbed by construction. As at the Mill Development, some wildlife would likely be temporarily displaced from the site due to the increase in noise and human activity during construction. However, given the small affected area, this would not substantially affect the composition and use by area wildlife. Additionally, there are other, unaffected riverine, riparian, and forested areas close to the project for wildlife to inhabit until the construction activity subsides, particularly to the east and south of the CMP Development.

Soil disturbance, particular close to roads, creates conditions that promote the establishment and spread of invasive and noxious weeds, which can compete with native vegetation and reduce the quality of wildlife habitats. Taking steps to control introduction and colonization as part of the ESCP would minimize adverse effects on native vegetation and area wildlife.

Significant Wildlife Habitats (e.g., inland and tidal waterfowl and wading bird habitats, deer wintering areas) are not expected to be affected by project construction activities as they are all located over 0.5 mile from either development. Bald eagle nesting or foraging activity is unlikely to be affected by construction activities at the Mill and CMP Developments because the two closest nesting areas (about 1.75 and 6 miles away, as measured from the Mill Development) are well beyond the buffer distance of 660 feet recommended in FWS's National Bald Eagle Management Guidelines (FWS, 2007a). Additionally, there is an abundance of alternative foraging habitat near where the nests are located and as well as throughout the project area. Conducting all maintenance activities at the project in the months outside of the nesting period and during the normally dry part of the year (August to November) as proposed by GRH would ensure that bald eagles in the project area would not be disturbed during their nesting period. However, given that there are few known bald eagle nests in the project area, restricting all project maintenance to only a few months of the year (August to November) appears overly restrictive and impracticable. Instead, establishing a buffer distance of 660 feet around an active nest consistent with FWS's guidelines (FWS,

2007a), would provide greater flexibility for conducting maintenance requirements, while still minimizing potential disturbance to nesting eagles, if they begin nesting in areas subject to maintenance activities.

Effects of Project Operation

GRH proposes to continue to operate Swan Lake Dam as a storage facility according to the operating agreement with the town of Swanville. The agreement provides that the normal elevation of Swan Lake would not be not allowed to rise above 2.5 feet below the top of the dam. For hydroelectric generation, the agreement specifies that drawdown of the reservoir would be limited to a maximum of 5 feet from the top of the dam during the period beginning June 15 and ending Labor Day, and a maximum drawdown of 7.5 feet at all other times. GRH also proposes to release a minimum flow of 5 cfs from Swan Lake Dam.

GRH also proposes to continue to operate the Kelly Development and the Mason's Development in a run-of-river mode, generating power when flows are available at the Mason's Development. After rehabilitating the Mill and CMP Developments, GRH proposes to operate these developments in run-of-river mode.

To protect spawning lake trout in Swan Lake (*see* section 3.3.2.2), Maine DIFW recommends that GRH complete the fall draw down of Swan Lake to the minimum lake level elevation of no more than 7.5 feet below the top of the dam by October 15 of any year, and maintain lake levels above the minimum level reached on October 15 through May 1 of the following year.

Our Analysis

Because the Swan Lake, Mason's and Kelly Developments would continue to operate as they have over the last 39 years, we do not expect to see any changes in the composition, structure, or function of existing riparian and wetland communities along the project impoundments or downstream of the developments. Maine DIFW's recommendation for an additional restriction of Swan Lake's water levels could reduce some fluctuations in Swan Lake that might otherwise occur in the fall and winter, but the changes are not expected to substantially affect any hydraulically connected wetlands because of the small magnitude of the change in fluctuations and their occurrence outside the growing season. Predictable and stable flows would continue to provide aquatic habitat suitable for various wildlife species, including providing IWWH for waterfowl and wading birds, as well as habitat for aquatic and semi-aquatic mammals that inhabit the project area.

Once power generation is restored at the Mill and CMP Developments, flows between about 30 and 40 cfs would be routed through the penstocks and powerhouses to

generate power instead of flowing through the bypassed reaches. Therefore, flows in the bypassed reaches would be lower during certain times of the year when the powerhouses are operating as compared to existing conditions. Also, the level of noise and human presence would be greater than what occurs under existing conditions, due to power generation noises and the occasional need for operators to conduct maintenance. The additional noise and human activity could discourage some wildlife use of these areas for foraging or for cover.

3.3.4 Threatened and Endangered Species

3.3.4.1 Affected Environment

The Goose River is located within the historical range of the federally endangered Gulf of Maine Distinct Population Segment (GOM DPS) of anadromous Atlantic salmon. Additionally, the northern long-eared bat could occur in the project area.

Atlantic Salmon

The GOM DPS of Atlantic salmon were initially listed as endangered on November 17, 2000, in eight coastal Maine watersheds by NMFS and the FWS (65 Federal Register 69459). NMFS and FWS later expanded the listing to include Atlantic salmon that inhabit large Maine rivers (Androscoggin, Kennebec, and Penobscot) that were partially or wholly excluded in the initial listing (74 Federal Register 29344; June 19, 2009). Currently, the GOM DPS includes Atlantic salmon that occupy freshwater from the Androscoggin River to the Dennys River, as well as anywhere Atlantic salmon occur in the estuarine and marine environments. The Goose River watershed is within the Penobscot Bay Salmon Habitat Recovery Unit.[23]

There is no documentation of Atlantic salmon in the Goose River and there is no reason to believe that they would occur in the foreseeable future within the approximately 1-mile reach of accessible habitat between CMP Dam and the river mouth at Belfast Bay. We conclude that Atlantic salmon do not occur in the affected project area and the project would not affect this species; therefore, we do not discuss it further.

[23] SHRUs are separate geographic units within the Gulf of Maine DPS. The Gulf of Maine DPS is separated into three SHRUs to ensure that Atlantic salmon are well distributed across the Gulf of Maine DPS range. The separation is based on life history characteristics, as well as demographic and environmental variation. This type of separation is designed to buffer the DPS from adverse demographic and environmental events that could negatively affect recovery of the Gulf of Maine DPS.

Critical Habitat

Critical habitat was designated for Atlantic salmon on June 19, 2009.[24] However, the Goose River was not included in the designation. Therefore, there is no Atlantic salmon critical habitat in the project area.

Essential Fish Habitat

EFH refers to those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity and covers a species' full life cycle.[25] EFH for Atlantic salmon has been defined as, "all waters currently or historically accessible to Atlantic salmon within the streams, rivers, lakes, ponds, wetlands, and other water bodies of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut." The project area constitutes EFH for Atlantic salmon because the Goose River downstream of CMP Dam is currently accessible to this species, while the Goose River upstream of CMP Dam was historically accessible.

Northern Long-eared Bat

The traditional range for the northern long-eared bat includes large forested areas in the central and eastern U.S., as well as the southern and central provinces of Canada. They generally forage under the canopy of mature, upland forests, but they are also known to forage in open areas at forest clearings or over water or roads (FWS, 2015). Summer roosting sites include caves and mines, buildings and other man-made structures, or under the bark of trees and snags. Tree species that provide cavities and crevices for roosting are generally hardwoods such as northern red oak, silver maple, and American beech, with the diameter-at-breast height of roost trees being most commonly 4 to 10 inches (FWS, 2015). Northern long-eared bats are generally active from April through October (FWS, 2015; FWS, 2016b), and hibernate over the winter season. Hibernation typically occurs in caves or mines, and the areas around them can be used during the fall-swarming season and during spring-staging before migration to summer habitat. Their diet is primarily comprised of spiders and flying insects such as moths and beetles. Several factors affect the persistence of this species, such as loss of forest habitat

[24] *See* 74 Federal Register 29300-29341 (June 19, 2009).

[25] 50 C.F.R. § 600.10 (2018).

and disturbance during hibernation, but the most severe and predominant threat to this species is the disease white-nose syndrome (FWS, 2015).[26]

The northern long-eared bat is listed as threatened under the ESA (FWS, 2015) and is state-listed as endangered. FWS has not designated critical habitat (FWS, 2016b), but in January 2016 it finalized the 4(d) rule for this species which provides regulatory provisions to protect vulnerable life stages (i.e., while in hibernacula or maternity roost trees) within the white-nose syndrome zone (FWS, 2016a).[27] According to the 4(d) rule, activities occurring within the white-nose syndrome zone that could result in incidental take caused by tree removal are not prohibited provided that two conservation measures are followed: (1) application of a 0.25-mile (0.4 km) buffer around known occupied hibernacula; and (2) the activity does not cut or destroy known occupied maternity roost trees, or any other trees within a 150-foot (45-m) radius around the maternity roost tree, during the pup season (June 1 through July 31).[28]

The project is located within the northern long-eared bat species range and within the white-nose syndrome zone (FWS, 2018b). There are no known hibernacula or maternity roost sites occurring in the project vicinity; however, small areas of suitable habitat for summer roosting and foraging activities are present along and proximate to the individual developments.

3.3.4.2 Environmental Effects

Essential Fish Habitat

As discussed in section 3.3.2.2, GRH's proposal to replace the penstock at the CMP Development would require heavy equipment operation, vegetation clearing, and ground-disturbing activities within and proximate to the Goose River stream channel. These construction activities would cause short-term adverse effects on aquatic habitat

[26] White-nose syndrome is a fungal disease that agitates hibernating bats, causing them to rouse prematurely and burn fat supplies. Mortality results from starvation or, in some cases, exposure.

[27] Hibernacula are where a bat hibernates over the winter, such as in a cave or abandoned mine. The white-nose syndrome zone encompasses counties within the range of the northern long-eared bat and within 150 miles of a U.S. county or Canadian district in which white-nose syndrome or the fungus that causes white-nose syndrome has been detected.

[28] Incidental take is defined as any taking otherwise prohibited, if such taking is incidental to, and not the purpose of, an otherwise lawful activity. Pup season refers to the period when bats birth their young.

due to soil erosion and the potential for runoff and sedimentation of aquatic habitat. The construction activities could also require physical disturbance of the stream bed if any of the concrete penstock supports located within the stream channel need to be replaced. Therefore, although EFH in the project area is currently unoccupied by Atlantic salmon, the penstock replacement activities under the proposed action would cause short-term minor adverse effects on currently accessible EFH in the Goose River downstream of CMP Dam.

Northern Long-Eared Bat

There are no known hibernacula near the project, so construction activities at the Mill and CMP Developments would not likely disturb wintering bats. Additionally, there is no summer roosting habitat (only grasses and other herbaceous plants) within what would likely be the construction zone for the penstock replacement at the Mill Development. However, replacing the penstock at the CMP Development would likely require removing some large trees along the riparian zone of the Goose River, which could disturb or destroy summer roosting habitat. Limiting tree removal activities to outside of the bat's active period of April 1 to October 31 would avoid disturbing roosting northern long-eared bats. Therefore, we conclude that relicensing the project as proposed with staff-recommended measures is not likely to adversely affect the northern long-eared bat if present.

3.3.5 Land Use, Recreation, and Aesthetics

3.3.5.1 Affected Environment

Land Use

Waldo County is primarily forested. Agriculture accounts for the next largest land use, but agricultural lands make up only a small fraction of the land dedicated to forestry. There are numerous small towns, of which Belfast is the largest and most developed. Residential areas are also scattered throughout the county, with most of them being located along major roads. Searsport, which has Maine's second-largest deepwater port, is the only large industrial area in the county (World Port Source, 2019). Waldo County has many lakes, and the entirety of its eastern border is coastline along Penobscot Bay.

No federal land exists within or adjacent to the project boundary.

Local and Regional Recreation Resources

The project is located on private land within the city of Belfast and the town of Swanville in Waldo County, Maine. Numerous recreation sites, facilities, and opportunities exist within Belfast and the surrounding areas, including a number of state

and regional parks, conservation sites, and river access areas located within a 10-mile radius of the project. Swan Lake State Park is located along the lake shoreline on the opposite end of the lake from Swan Lake Dam. The park is open from Memorial Day to the week after Labor Day.

Moose Point State Park is located two miles from the project. The Goose River flows into Belfast Bay, which is part of Penobscot Bay and a popular boating and fishing destination. The waterfront towns along Penobscot Bay, including Belfast, Camden, and Rockport, are popular summer tourist destinations.

The Maine Statewide Comprehensive Outdoor Recreation Plan 2014-2019 (SCORP) (Maine DACF, 2015) identified hiking, walking, boating, and fishing as among the more popular outdoor recreation activities in the state. Two-thirds of Maine's population enjoys hiking, with more than 25 percent using non-motorized trails at least weekly, based on SCORP surveys. The SCORP supports development of both local and regional trails, including local trail planning that increases "access to key community attributes." Surveys indicate that the greatest need is for easy trails in natural settings. Interest in marine and freshwater boating access and water trails for canoeing and kayaking has increased in recent years, while the demand for fishing opportunities is considered strong but not increasing.

Recreation Resources at the Project Site

GRH does not maintain developed recreational facilities at the project, but does allow public use of project land and waters for informal recreation. Public recreational use of the project includes fishing, boating (hand-carry only), hiking, and wildlife viewing. Fishing and occasional boating occur in the Goose River, Swan Lake, and Upper and Lower Mason's Ponds.

The project provides recreational access to Swan Lake and the Goose River immediately downstream of Swan Lake Dam on project lands located adjacent to the dam. This site consists of a small sandy beach about 50 feet wide, as well as a grassy area on the downstream side of the dam along the Goose River. This access site is within the small downtown area of the town of Swanville. Parking is available along the road. Visitors also park unofficially at the nearby Swan Lake Grocery. A concrete boat ramp, owned by the town of Swanville and operated by the Swan Lake Association, is located a half-mile drive from the project's informal recreation area at Swan Lake Dam (Swanville.org, 2019). The boat ramp has a parking lot and a port-a-john, and provides boat access to Swan Lake. Swan Lake State Park, located on the opposite end of the lake from the Swan Lake recreation area, offers a beach for swimming, fishing, and launching hand-carry boats (Maine DACF, 2019).

Recreational access at the project is also available at the Mason's Development.

This site, which is owned and operated by the city of Belfast, includes a parking area for roughly six vehicles and a dirt launch for hand-carry boats located adjacent to Mason's Dam. The launch provides boat access to Upper Mason's Pond and a portage around the dam for boaters continuing downstream.

Additional recreation access at Upper Mason's Pond is easily accessible by the Goose River Canoe Launch Area public right-of-way owned by the city of Belfast. Access to the reach of the Goose River between Swan Lake Dam and Upper Mason's Pond is available along Smart Road where it crosses the river near the intersection with Blake and Achorn Roads. The other project impoundments and sections of the Goose River are only accessible over private property that is not owned by the licensee.

As part of the relicensing process, GRH conducted a recreation study[29] of the project area using motion-activated cameras throughout the summer of 2017. GRH also collected visitor use data from Swan Lake State Park. Swan Lake was determined to have the highest usage of all project impoundments, with peak weekend use determined to be approximately 17 people at Swan Lake Dam, 126 at the Swan Lake boat ramp, and 193 at the state park. Non-peak weekends were determined to have approximately 4.5 users per day at Swan Lake Dam, 26 for the boat ramp, and 183 for the state park. Mason's Dam had much lower usage rates, with only an estimated 9.33 users per day on peak weekends, and 2.59 users per day on non-peak weekends. Hand-carry boating also occurs on the Goose River. It is not known how popular this activity is, but there are advertised float trips online. The trip down the river is relatively easy when the water is high enough, with no rapids and easy portaging around the dams (Penobscot Bay Pilot, 2016; Water Walker Sea Kayak, LLC, 2011). The study did not cover winter months. Based on recreational trends reported by Black Bear Hydro (2015) at the nearby Ellsworth Project (FERC project No. 2727), located about 30 east, some snowmobiling, cross-country skiing, and ice fishing may occur on Swan Lake when winter ice permits.

Overall recreational use at the project is relatively low. GRH estimated that recreation use was at less than 20 percent of capacity, and Mason's Dam was at about 13 percent of capacity. Fishing, boating in Swan Lake (e.g., canoeing and kayaking), and nature viewing are the most popular activities at the project.

Aesthetic Resources

The project is located in a heavily-wooded rural area with numerous wetlands. Swan Lake and Swan Lake Dam are easily viewed because Maine Route 141 closely follows the lake for approximately one mile. Swan Lake Avenue provides a view of the

[29] *See* Form 80—Filing Form 80 Recreation Report, Goose River Project #2804 filed August 30, 2018.

front of Mason's Dam, and Upper Mason's Pond is visible from a stretch of Route 141. Other portions of the project near roads are obscured by trees. Most of the project waters and facilities are only visible from private lands or from the water.

3.3.5.2 Environmental Effects

Recreational Access

GRH is not proposing any measures to enhance recreation opportunities at the project, and no entities have recommended any recreation measures at the project.

Our Analysis

Recreation at the project is light and well below capacity. Although GRH does not provide formal recreational access, Swan Lake and the project's four downstream impoundments are open to the public, and informal recreation access is available across project lands at Swan Lake Dam and Mason's Dam. This access would continue to be available under any subsequent license issued. Therefore, continued project operation would not change or adversely affect recreation within the project boundary.

Aesthetic Resources

GRH does not propose any measures to enhance the aesthetic resources of the project area; however, its proposal to replace the penstocks at the Mill and CMP Developments would improve the aesthetic quality of these project facilities because the current facilities are either partially constructed (Mill penstock) or in poor condition (CMP penstock). Although these proposed facility improvements would generally not be visible to the public because the penstocks are only visible from the river or on private lands, improving on their condition would nevertheless enhance the visual environment of the project area.

3.3.6 Cultural Resources

3.3.6.1 Affected Environment

Section 106 of the National Historic Preservation Act requires that the Commission evaluate the potential effects on properties listed or eligible for listing in the National Register. Such properties listed or eligible for listing in the National Register are called historic properties. In this document, we also use the term "cultural resources" for properties that have not been evaluated for eligibility for listing in the National Register. Cultural resources represent things, structures, places, or archeological sites that can be either prehistoric or historic in origin. In most cases, cultural resources less than 50 years old are not considered historic. Section 106 also requires that the

Commission seek concurrence with the Maine State Historic Preservation Commission Officer (SHPO) on any finding involving effects or no effect to historic properties, and allow the Advisory Council on Historic Preservation an opportunity to comment on any finding of effects to historic properties. If any Native American (*i.e.*, aboriginal) properties have been identified, section 106 also requires that the Commission consult with interested Indian tribes that might attach religious or cultural significance to such properties.

Area of Potential Affect

Pursuant to section 106, the Commission must take into account whether any historic property could be affected by the issuance of a subsequent license within a project's area of potential affect (APE). The APE is determined in consultation with the SHPO and 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, if any such properties exist.

The APE for this relicensing includes all lands within the proposed project boundary and any lands outside the project boundary where cultural resources may be affected by project-related activities.

Cultural Historic Context

The Goose River flows into Belfast Bay, which is a part of Penobscot Bay. Penobscot Bay and the Penobscot River served as a major waterway for Native American Tribes throughout much of the Pre-Contact period and continued as such for tribes and EuroAmerican settlers after contact. In the Post-Contact period, the Penobscot Bay and Penobscot River was used for travel and trade and eventually for industrial purposes.

Maine's archeological record dates back more than 11,000 years before the present. Archeologists have divided the Pre-Contact segment of this record into three major cultural periods: the Paleoindian, Archaic, and Ceramic cultural period. Traditions within these cultural periods represent subdivisions that can be made based on similarities in artifact forms and cultural adaptations (Spiess, 1990, 1994). Post-Contact history can also be divided into broad time periods reflecting the cultural integration of EuroAmerican cultural lifeways and practices into the history of Maine.

The earliest inhabitants of the region and throughout North America were the Paleoindian people, who rapidly colonized the continent in pursuit of large game (Martin, 1973). The hallmark of the Paleoindian tradition is the fluted spear point, which was presumably used to hunt large game. In Maine, the Paleoindian period dates from approximately 9,500 to 7,500 B.C., when much of the landscape was still tundra and/or woodlands. Paleoindian people living in the region are characterized as highly mobile

hunters and gatherers reliant mainly on the caribou that were abundant at that time. They crafted their tools out of fine-grained, colorful rocks obtained from a limited number of sources in the region, and they camped in locations typically removed from present day water bodies (Spiess *et al.*, 1998).

The Archaic period (ca. 7,500 – 1,000 B.C.) represents the longest cultural period in the region. This timeframe is indicative of persistent cultural adaptations over several millennia. This period is subdivided into the Early, Middle, and Late Archaic period. Although Early and Middle Archaic people probably continued a nomadic hunter and gatherer lifestyle, their subsistence and settlement patterns were different from those of the Paleoindian people. This distinction is suggested by the location of most Early and Middle Archaic sites along present-day water bodies and the presence of food remains of aquatic species, particularly beaver, muskrat, and fish (Robinson, 1992). The close of the Late Archaic period is characterized by a transition to the Susquehanna Tradition, which is widespread in Maine and New England. The people of the Susquehanna Tradition appear to have been more focused on a terrestrial economy than a marine economy (Sanger, 1979).

The introduction of pottery manufacturing and use in Maine defines the onset of what Maine archaeologists call the Ceramic period, but is known more widely as the Woodland period in other parts of the Northeast. Ceramics first appear in the archaeological record of Maine around 3,000 years ago, and they persist until contact with Europeans when clay pots were replaced in favor of iron and copper kettles that were traded for beaver pelts and other animal furs. Ceramic period sites are abundant in Maine, along the coast and in the Maine interior. Sites in the interior are most common along waterways, especially rivers, ponds, and lakes. The presence and nature of artifact forms, and certain types of stone recovered from Ceramic period sites, indicate trade and communication with peoples far to the north, south, and west. By the end of the period, historical and archaeological evidence suggests horticulture was practiced in southern Maine. The Ceramic period ends with European contact around 450 years ago. At this time, most of the artifacts attributable to Pre-contact inhabitants of Maine disappear from the archaeological record (Sanger, 1979).

Contact and Post-Contact period (500 – Present)

At the time of European contact, a number of tribal groups were living in the region of Maine and the maritime Canadian provinces. Collectively, these groups identified as the Wabanaki, meaning "people of the land of the dawn." The term generally applies to the Passamaquoddy, Penobscot, Maliseet, and Abenaki, although there is no consensus on use of the term Wabanaki and the peoples who identify as Wabanaki (American Friends Service Committee, 1989).

The coast of Maine was explored as early as 1524 by Giovanni da Verrazano, who made contact with local inhabitants. After this, a long period of Native American and European contact occurred off the Maine coast between natives and Basque fishermen, initiating a trade system. European exploration continued into the early 17th century including early attempts by the French in 1604 and the English in 1607 to establish settlements in the region of Maine (Maine History Online, 2017). However, the European introduction of epidemic diseases to the native people, who had no natural immunity to them, led to a sudden decrease of the Native American population of Maine and New England. This dramatic decrease in the native population of the region lead the way for European colonization of Maine and New England. European and native groups forged trading partnerships allowing Europeans to acquire furs and natives to gain European goods which often replaced many of their traditional tools.

Relationships between the native inhabitants and the European explorers alternated between civil partnership and open hostility. By the late 17th century, open hostilities between the predominantly English settlers of the New England region and the remaining native groups took a toll on both populations, resulting in the near abandonment of the Maine region by the English. Hostilities continued off and on until the conclusion of the Seven Years War in 1763. Many of the native groups in Maine had allied themselves with the French, so with their defeat the native people were forced to sign treaties with the English settlers that were unfavorable to them.

European settlement of the Belfast area first occurred in the 1770 when Scots-Irish families moved up from Londonderry, New Hampshire. The town was incorporated in 1773, but was mostly abandoned during the American Revolution because they feared a British attack due to the town's location on the water, but they returned after the war (Maine League of Historical Societies and Museums, 1970). Belfast quickly became the market center for the surrounding area, as well as a thriving port. By the mid-1800s, it had developed into a shipbuilding center. After the wooden shipbuilding industry began to fade around 1900, Belfast's economy shifted to harvesting seafood and manufacturing shoes. By the mid-1900s, poultry processing had become the prominent industry (City of Belfast, 2019). Belfast has since become a popular tourist destination, and also houses offices of banking and insurance companies (Belfast Area Chamber of Commerce, 2019).

The area around the Goose River was settled along with Belfast, and provided hay, wood, and other natural products for the Belfast market. In 1866, a tidal grist mill with a stone dam was constructed at the mouth of the Goose River. Sixteen years later, a generator at the same site produced electricity to power five lamps in Belfast (Williamson, 1877).

The project's Swan Lake Dam was constructed in 1868 and may have been used in conjunction with a shingle mill.

It is not known when the first dam at the Mason's Dam site was constructed, but a map from 1855 includes a small version of Upper Mason's Pond so a dam must have been present then. A map from 1859 shows a sawmill at the site. A new dam was built at the site in 1890 by Sherman & Company to control the water for their leatherboard mill.[30] Remains of the mill, consisting of an access road and some concrete walls, still exist (Rodrigue, 2018).

Kelley Dam was constructed by Benjamin Kelley between 1855 and 1859 to support his axe factory and fulling mill.[31] A paper mill was later constructed nearby. The dam was repaired in September 2015, and the masonry was refaced with concrete (Rodrigue, 2018).

Mill Dam was constructed in conjunction with a paper mill in 1852. An axe factory was later constructed near the paper mill in 1881. In 1887, the paper mill was torn down, and the site was converted into making leatherboard. The mill building still stands, and is used as offices by Goose River Hydro.

An earlier version of CMP Dam may have been constructed as early as the late 18th Century to support a sawmill. A paper mill was later erected at this site, which was converted to making leatherboard in 1879. A grist mill was also built with a dam in the vicinity of CMP Dam between 1859 and 1873. The remains of that dam are in the forest along the east bank of the Goose River. The current CMP Dam was built by the Penobscot Bay Electric Company in 1915 (Rodrigue, 2018).

Archeological, Traditional Ethnographic, and Historic Resources Investigations

James Clark, the applicant's contractor, conducted a literature search and a reconnaissance survey within the project's APE in late 2016 and early 2017, which was followed by a Phase IA/IB Pre-Contact Archeological survey conducted between June 1 and August 27, 2017. The survey did not reveal evidence of sites or resources that could potentially be affected by project operation. This is because: (1) the areas around the dams have seen extensive modification and the likelihood of archeological evidence remaining intact is small; (2) the four downstream developments have operated in a run-of-river mode for decades, and would continue to do so, lessening any chance of project-

[30] Leatherboard is a waterproof leather-like material produced by combining the waste products from leather manufacturing, including leather scraps, paper, and fibers. It can be used in the lining of shoes, luggage, or in book bindings (Clapp, 1909).

[31] A fulling mill, also known as a walking mill, processes woolen cloth to eliminate oil, dirt, and other impurities. The process also makes the cloth thicker (Witheridge Historical Archive, 2006).

caused erosion along the impoundment shorelines and stream banks; and (3) the terrain bordering the lower Goose River watershed is not particularly sensitive for Pre-Contact occupation because the soil is poorly-drained and frequently wet, making it undesirable for settlement.

The applicant's Phase I survey of the Swan Lake shoreline revealed five locations that retain archeological sensitivity and have evidence of erosion. Access was only granted for the examination of one site. No Pre-Contact materials were found at the site, and the likelihood of the Swan Lake shoreline preserving intact archeological remains was determined to be low. Two previously reported sites along the Swan Lake shoreline were also inspected. Both had been altered by development, and no artifacts were found. No archeological sites are listed, or eligible for listing, on the National Register.

Historic Architectural Resources located within the APE

Barry Rodrigue, GRH's contractor, conducted a survey of historic architectural resources within the APE in July of 2017. The survey consisted of a review of literature and an on-site investigation that included all of the dam sites as well as their vicinities. Historical remains were found at some of the locations, including the remains of the Sherman & Company leatherboard mill at Mason's Dam and the remains of the Hiram Pierce grist mill below CMP dam. However, it was determined that the operation of the project would have no effect on the historical remains within the APE because these sites had been demolished and reconfigured to other uses in the 1800s and 1900s. The dams are the only structures with integral unity, and they have been continually rebuilt since the mid-1800s from wood to stone to concrete. No structures or remains are listed, or eligible for listing, on the National Register. The Maine SHPO concurred in a September 26, 2017 letter,[32] that there are no architectural or archaeological properties that would be affected by the relicensing of the project.

3.3.6.2 Environmental Effects

GRH is not proposing any changes to current project operation, but is proposing to replace the penstocks and turbines at the Mill and CMP Developments to restore

[32] *See* September 26, 2017 letter from Kirk Mohney, Maine SHPO, to Nicholas Cabral included in the appendix of Goose River Hydro's application.

generating capacity. GRH did not propose and no entity recommended any measures for managing historic properties within the project's APE.

Our Analysis

The project's dams are not eligible for listing on the National Register and no historic properties were identified within the project's APE during pre-filing studies. Therefore, the proposed relicensing of the project, including replacement of project facilities at the Mill and CMP Developments, would not affect any known historic properties. However, there is always a possibility that unknown archaeological resources could be discovered in the future as a result of project activities. In the event of any such discovery, Commission licenses typically include a requirement to discontinue any ground-clearing, ground-disturbing, or spoil-producing activities and consult with the SHPO to resolve any potential adverse effect to such properties though the development and implementation of an HPMP.

3.4 NO-ACTION ALTERNATIVE

Under the no-action alternative, the project would continue to operate under the terms of the existing license. There would be no changes to the physical, biological, or cultural resources of the area. None of the proposed or recommended measures would be implemented and there would be no further enhancement of environmental resources.

4.0 DEVELOPMENTAL ANALYSIS

In this section, we look at the project's use of the Goose River for hydropower purposes to see what effects various environmental measures would have on the project's costs and power generation. Under the Commission's approach to evaluating the economics of a hydropower projects, as articulated in *Mead Corp*.,[33] the Commission compares the current project cost to an estimate of the cost of obtaining the same amount of energy and capacity using a likely alternative source of power for the region (cost of alternative power). In keeping with Commission policy as described in *Mead Corp*, our economic analysis is based on current electric power cost conditions and does not consider future escalation of fuel prices in valuing the hydropower project's power benefits.

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

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

4.1 POWER AND ECONOMIC BENEFITS OF THE PROJECT

Table 3 summarizes the assumptions and economic information we use in our analysis for the project. This information was provided by GRH in its license application or estimated by staff. We find that the values provided by GRH are reasonable for the purposes of our analysis. Cost items common to all alternatives include: taxes and insurance costs, net investment, estimated future capital investment required to maintain and extend the life of facilities, relicensing costs, normal operation and maintenance cost, and Commission fees.

Table 3. Parameters for economic analysis of the Goose River Project.

Parameter	Values (2018$)	Source
Period of analysis	30 years	Staff
Term of financing	20 years	Staff
Discount rate	6 percent	Staff
Federal tax rate	22%	Staff
Local tax rate	3.5%[a]	Staff
Alternative energy value	$100/MWh[b]	GRH
Relicensing cost	$120,000	GRH
Mill and CMP rehabilitation construction cost	$750,000	GRH
Undepreciated net investment	$276,000	GRH
Annual operation and maintenance costs	$45,000[c]	GRH

[a] Based on an annual energy production of 1,500 MWh priced at $100/MWh.
[b] Based on the value of the applicants power purchase agreement with CMP.
[c] Value provided by the applicant in the Final License Application less the anticipated $5,000 allotted for mitigation measures.

4.2 COMPARISON OF ALTERNATIVES

Table 4 summarizes the installed capacity, annual generation, annual cost of alternative power, annual project cost, and difference between the cost of alternative power and project cost for each of the alternatives considered in this EA: no-action, GRH's proposal, and the Staff Alternative.

Table 4. Summary of the annual cost of alternative power and annual project cost for the three alternatives for the Goose River Project. (Source: Staff).

	No Action	**GRH's Proposal**	**Staff Alternative**
Installed capacity	375 kW	375 kW	375 kW
Annual generation	400 MWh[a]	1,500 MWh	1,500 MWh
Annual cost of alternative power	$40,000 $100/MWh	$150,000 $100/MWh	$150,000 $100/MWh
Annual project cost	$55,104 $137.76/MWh	$147,545 $98.36/MWh	$147,725 $98.84/MWh
Difference between the cost of alternative power and project cost	($15,104)[b] ($37.76/MWh)	$2,455 $1.64/MWh	$2,275 $1.52/MWh

[a] Staff estimate of generation from the Mason's Development only.
[b] Numbers in parentheses are negative.

4.2.1 No-Action Alternative

Under the no-action alternative, the project would continue to operate as it does now. The project would have an installed capacity of 375 kW, with a generating capacity of 100 kW, and generate an average of 400 MWh of electricity annually. The average annual cost of alternative power would be $40,000, or about $100/MWh. The average annual project cost would be $55,104, or about $137.76/MWh. Overall, the project would produce power at a cost that is $15,104, or $37.76/MWh, more than the cost of alternative power.

4.2.2 Applicant's Proposal

Under Goose River Hydro's proposal, the project would have an installed capacity of 375 kW, and generate an average of 1,500 MWh of electricity annually. The average annual cost of alternative power would be $150,000, or about $100/MWh. The average annual project cost would be $147,545, or about $98.36/MWh. Overall, the project would produce power at a cost that is $2,455, or $1.64/MWh, less than the cost of alternative power.

4.2.3 Staff Alternative

Under the Staff Alternative, the project would have an installed capacity of 375 kW, and generate an average of 1,500 MWh of electricity annually. The average annual cost of alternative power would be $150,000, or about $100/MWh. The average annual project cost would be $147,725, or about $98.84/MWh. Overall, the project would produce power at a cost that is $2,275, or $1.52/MWh, less than the cost of alternative power.

4.3 COST OF ENVIRONMENTAL MEASURES

Table 5 provides the cost of each of the environmental mitigation and enhancement measures considered in our analysis. All dollars in table 5 are year 2018. We convert all costs to equal annual (levelized) values over a 30-year period of analysis to give a uniform basis for comparing the benefits of a measure to its cost.

Table 5. Cost of environmental mitigation and enhancement measures considered in assessing the environmental effects of the Goose River Project (Source: Staff).

Enhancement / Mitigation Measure	Entity	Capital Cost (2018$)	Annual Cost[a] (2018$)	Levelized Cost[b] (2018$)
Geologic and Soil Resources				
1. Develop an erosion and sediment control plan (ESCP) for the replacement of penstocks at the Mill and CMP Developments.	Staff	$1,000[c]	$0	$90
2. Maintain a maximum lake level in Swan Lake of 6 feet below the top of the dam during winter months.	Erwin Hood	$0	$2,360[c]	$2,360
3. Develop a new winter maximum lake level that is determined in consultation with property owners and GRH.	Christoper Dupuis	Undefinable[d]	Undefinable	Undefinable
Aquatic Resources				
4. Continue to operate the Swan Lake Development according to the operating agreement with the town of Swanville, by restricting lake levels to: (1) a maximum of 2.5 feet below the top of the dam, (2) a minimum not to exceed 5 feet below the top of the dam from June 15 through labor day, (3) and no more than 7.5 feet below the top of the dam at all other times.	GRH, Staff	$0	$0	$0
5. Complete fall drawdown of Swan Lake by October 15 and maintain lake level above the minimum level reached by October 15 until May 1, to protect spawning lake trout.	Maine DIFW, Staff	$0	$0[e]	$0
6. Continue to operate the Mason's, Kelly, Mill, and CMP Developments in a run-of-river mode, and visually monitor impoundment levels using staff gauges for run-of-river compliance monitoring.	GRH, Staff	$0	$0	$0

Enhancement / Mitigation Measure	Entity	Capital Cost (2018$)	Annual Cost[a] (2018$)	Levelized Cost[b] (2018$)
7. Continue to release a 5-cfs minimum flow or inflow, whichever is less, to the Goose River below Swan Lake Dam.	GRH, Staff	$0	$0	$0
8. Install a remote monitoring system for lake level compliance monitoring at Swan Lake Dam.	GRH, Staff	$1,200	$500[c]	$610
9. Develop an operation compliance monitoring plan.	Staff	$1,000[c]	$0	$90
Terrestrial Resources				
10. Include in the ESCP best management practices to minimize the transport, establishment, and spread of invasive and noxious weeds.	Staff	$0	$0	$0
11. Restrict the removal of large trees from April 1 to October 31 to protect the northern long-eared bat.	Staff	$0	$0	$0

Enhancement / Mitigation Measure	Entity	Capital Cost (2018$)	Annual Cost[a] (2018$)	Levelized Cost[b] (2018$)
12. Conduct project maintenance activities between August and November to minimize disturbance to nesting bald eagles.	GRH	$0	$0	$0
13. Protect nesting bald eagles by maintaining a buffer zone of at least 660 feet between project maintenance activities and active nests during the nesting period (February 1 through August 15).	Staff	$0	$0	$0
Cultural Resources				
14. Notify Commission and Maine SHPO if previously unidentified archaeological or cultural artifacts are encountered during project construction.	Staff	$0	$0	$0
15. Consult with Maine SHPO prior to making changes to project operation or facilities.	Staff	$0	$0	$0

[a] Annual costs typically include operational and maintenance costs and any other costs that occur on a yearly basis.

[b] All capital and annual costs are converted to equal annual costs over a 30-year period to give a uniform basis for comparing all costs.

[c] Staff estimate.

[d] The recommendation is non-specific with respect to what lake level is needed; therefore, there is no way to determine a cost for for the measure.

[e] Staff assumes there would be no additional costs for this measure because GRH typically manages lake levels in a similar fashion under existing conditions.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

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

Based on our independent review of comments filed on the project and our review of the environmental and economic effects of the proposed project and project alternatives, we selected the Staff Alternative as the preferred alternative. We recommend this alternative because: (1) issuing a subsequent license for the project would allow GRH to continue to operate its Goose River project as a dependable source of electrical energy; (2) the 0.375 MW of electric capacity comes from a renewable resource that does not contribute to atmospheric pollution; (3) the public benefits of the Staff Alternative would exceed those of the no-action alternative; and (4) the proposed and recommended measures would protect and enhance fish and wildlife and recreation resources at the project.

In the following section, we make recommendations as to which environmental measures proposed by GRH or recommended by agencies or other entities should be included in any license issued for the project.

5.1.1 Measures Proposed by GRH

Based on our environmental analysis of GRH's proposal in section 3, and the costs presented in section 4, we conclude that the following environmental measures proposed by GRH would protect and enhance environmental resources and would be worth the cost. Therefore, we recommend including these measures in any license issued for the project.

- Continue the current license requirement to manage lake levels at Swan Lake Dam according to the operating agreement between GRH and the town of Swanville that restricts lake levels to: (1) a maximum of 2.5 feet below the top of the dam, (2) a minimum not to exceed 5 feet below the top

of the dam from June 15 through labor day, (3) and no more than 7.5 feet below the top of the dam at all other times to protect aquatic resources in Swan Lake and reduce the potential for flooding.

- Continue the current license requirement to release a year-round minimum flow of 5 cfs or inflow, whichever is less, at Swan Lake Dam for the protection of aquatic resources in the Goose River downstream of the dam.

- Install a remote monitoring system to monitor compliance with Swan Lake levels, rather than relying on visual monitoring of a staff gauge as occurs under existing conditions.

- Continue its current practice of monitoring compliance with run-of-river operation at the Mason's, Kelly, Mill, and CMP Developments by visually monitoring lake levels at least once per day using a staff gauge installed in each impoundment.

5.1.2 Additional Measures Recommended by Staff

In addition to the above measures, we recommend the following staff-recommended modifications or additional measures be included in any license issued for the project:

- To reduce erosion and sedimentation during the penstock replacement at the Mill and CMP Developments, develop an ESCP.

- To protect spawning lake trout in Swan Lake, complete the fall drawdown to the minimum lake level of no more than 7.5 feet below the top of the dam by October 15, and maintain the lake level above the minimum reached on October 15 through May 1 of the following year.

- Develop an operation compliance monitoring plan that includes provisions for: monitoring compliance with all of the operating requirements of the license, maintaining a log of project operation and lake levels at each of the developments, reporting deviations to the Commission, and a schedule for installing the proposed lake level monitoring system at Swan Lake.

- Include in the ESCP best management practices to minimize the transport, establishment, and spread of invasive and noxious weeds.

- To protect the federally listed northern long-eared bat, limit the removal of large trees (greater than three inches diameter-at-breast height) to between November 1 and March 31.

- To protect nesting bald eagles, maintain a buffer zone of at least 660 feet between maintenance activities and any active nests during the nesting period (i.e., February 1 through August 15) instead of routinely scheduling all project maintenance between August and November as proposed.

- Notify the Commission and the Maine SHPO if previously unidentified cultural resources are discovered during the course of constructing, maintaining, or operating the project works or other facilities.

- Consult with the Maine SHPO prior to making changes to project operation or facilities, including maintenance activities, land-clearing or land-disturbing activities that do not require Commission approval but could affect cultural resources.

- Modify the proposed project boundary for the Mason's Development in Exhibit G of the Final License Application to include the entirety of Upper Mason's Pond.

Below, we discuss the basis for the staff-recommended modifications and measures.

Erosion and Sediment Control Plan

GRH proposes to replace the penstock and turbines at the Mill and CMP Developments to restore power generation at these facilities. Our analysis in sections 3.3.1.2 and 3.3.3.2 indicates that heavy equipment operation and land disturbing activities associated with these construction activities could cause soil erosion, compaction, and sediment runoff to the Goose River, and could cause the introduction and spread of invasive and noxious weeds to adjoining riparian habitats. To minimize the potential for these adverse effects, we recommend that GRH develop an ESCP that includes site-specific best management practices to control erosion and the establishment and/or spreading of weeds during replacement of the penstocks at the Mill and CMP Developments. We estimate that the levelized annual cost of the plan would be $90 and conclude that the benefits of this measure would outweigh its cost.

Lake Trout Spawning Protection

Under existing and proposed operation, GRH would draw down Swan Lake to its lowest level of no more than 7.5 feet below the top of the dam during the fall and winter to enable it to capture and store water over the winter and the following spring. However, GRH does not propose any limits on the timing of when it must reach the minimum lake elevation over the fall and winter. To protect spawning and incubating

lake trout in Swan Lake, Maine DIFW recommends that GRH draw down the lake to the minimum level of no more than 7.5 feet below the top of the dam by October 15, and maintain lake levels above the minimum level reached on October 15 until May 1.

Our analysis in section 3.3.2.2 indicates that lake trout spawn in mid-October along the lake bed in near shore areas that are prone to dewatering when GRH draws down the lake over the winter. Maine DIFW's recommendation to complete the fall drawn down to the minimum lake level by October 15 when most lake trout spawning activity occurs, and then maintain it above this level until May 1, would ensure that lake trout spawning and incubation habitat within the impoundment fluctuation zone remains inundated over the fall and winter. In section 4.3, we estimate that there would be no additional costs for this recommended lake-level limit because it is similar to how GRH operates Swan Lake Dam under existing conditions, but without any formal requirement to do so. We conclude that the benefits to lake trout are justified. Therefore, we recommend this measure under the Staff Alternative.

Operation Compliance Monitoring Plan

GRH proposes several operational measures to protect the environmental resources of the project area. Specifically, these include: (1) continuing to operate Swan Lake according to the operating agreement with the town of Swanville; (2) continuing to operate the four downstream developments (i.e., Mason's, Kelly, Mill, and CMP) in a run-of-river mode; and (3) providing a 5-cfs minimum flow release or inflow, whichever is less, to the Goose River below Swan Lake Dam.

Under its proposed action, GRH would continue to monitor compliance with run-of-river operation at the four downstream developments by visually checking impoundment levels once per day using a staff gauge installed at each of the dams. At the Swan Lake Development, GRH proposes to install a remote monitoring system for lake-level compliance monitoring purposes. However, GRH does not provide a schedule for when it would install the remote monitoring system, nor does it specify how it would monitor compliance with its proposed 5-cfs minimum flow, or report deviations from the operating requirements of the license to the Commission.

Therefore, to enable the Commission to track and enforce the operating requirements of the license for the protection of environmental resources, we recommend that GRH develop an operation compliance monitoring plan that includes provisions for: (1) monitoring compliance with all of the operating requirements of the license, (2) maintaining a log of project operation and lake levels at each of the developments, (3) reporting operation data and deviations from operating requirements to the Commission, and (4) a schedule for installing the remote lake-level monitoring system at the Swan Lake Development.

We estimate that the levelized annual cost of developing an operation compliance monitoring plan would be $90, and conclude that the compliance benefits justify the cost.

Northern Long-eared Bat Protection Measure

The project boundary falls within the range of the northern long-eared bat and contains upland, riparian, and open-water areas that provide suitable foraging and summer roosting habitat for the northern long-eared bat. The penstock replacement work at the CMP Development would likely require the cutting of trees that provide roosting habitat for the northern long-eared bat. Tree removal in the summer months could disturb northern long-eared bats during roosting periods. Implementing a seasonal clearing restriction for trees greater than three inches diameter-at-breast height, between April 1 and October 31, would avoid the months when northern long-eared bats are active and may be occupying nearby roosting trees. Implementing this measure would minimize the potential for northern long-eared bats to be directly affected by tree cutting in the project area, and would come at no additional cost to GRH.

Nesting Bald Eagle Protection Measure

GRH proposes to protect nesting bald eagles by conducting maintenance activities outside of the nesting season and during the normally dry part of the year (i.e., August through November). However, this would restrict the applicant's ability to conduct minor project maintenance and repairs during other times of the year and could unduly restrict other construction, such the penstock replacement at the CMP Development. We recommend, instead, that GRH establish a buffer zone of 660 feet around active nests to minimize disturbance to nesting eagles, as recommended in the National Bald Eagle Management Guidelines (FWS, 2007a). Should project maintenance or construction be required in areas within the buffer zone, we recommend that GRH conduct that work during the non-nesting period (August 16 to January 31). Overall, we expect that incorporating these spatial and temporal restrictions for project maintenance would allow for greater flexibility in scheduling maintenance needs, and is not expected to add an additional cost to GRH.

Historic Properties Protection

There are no known historical or archaeological properties within the project's APE that are listed or eligible for listing in the National Register. However, archaeological or historic sites could be discovered during any land-disturbing activities that occur during the term of any subsequent license that is issued. Therefore, to ensure that any previously-unknown cultural resources are adequately protected, we recommend that GRH notify the Commission and the Maine SHPO if previously unidentified archaeological or historic properties are discovered during the course of constructing, operating, and maintaining project works or other facilities at the project. In the event of

any such discovery, GRH would discontinue any activities related to the discovery until the proper treatment of any potential archaeological or cultural resources is established.

During the term or any license issued for the project, GRH would occasionally need to conduct maintenance activities in the project area or on project facilities. These activities could include replacement of broken windows on the powerhouse, powerhouse roof or masonry repairs, or general landscaping and yard maintenance within the project boundary. These activities would not require prior Commission approval; however, they could affect historic resources in the project area. Therefore, to ensure that historic resources are not adversely affected from maintenance activities, we recommend that GRH consult with the Maine SHPO prior to conducting any maintenance activities that do not require Commission approval but could affect cultural resources.

Project Boundary

GRH proposes to include only a portion of the Mason's Development impoundment, Upper Mason's Pond, in the project boundary. However, the entire reservoir is impounded by the project dam and is a necessary part of the land and waters needed for project operation. Therefore, we recommend that GRH revised the Exhibit G drawings to include the entire impoundment in the project boundary.

5.1.3 Measures Not Recommended

Maximum Swan Lake Level during the Winter Season

To minimize the potential for flooding along Swan Lake, the existing license requires GRH to operate Swan Lake Dam according to the operating agreement with the town of Swanville. The operating agreement specifies that lake levels not exceed 2.5 feet below the top of the dam at all times. During the winter, the agreement allows GRH to draw Swan Lake down to 7.5 feet below the top of the dam for power generation. Under its proposed action, GRH would continue to operate the Swan Lake Development according to the limits specified in the operating agreement.

Christopher Dupuis states that winter lake levels during the past two winters have been higher than any levels observed in the past 15 years, and such high levels could undermine a retaining wall on his property causing failure of the wall and corresponding flooding and property damage. To protect against property damage, Christopher Dupuis recommends that the Commission require GRH to develop a new winter maximum lake level that is determined in consultation with property owners and GRH. Similarly, Erwin Hood states that shoreline flooding that occurred from 2009 to 2013 during winter ice-cover conditions on the lake caused property damage. Therefore, Erwin Hood recommends that the Commission require a new winter maximum lake level limit of 6 feet below the top of the dam.

Our analysis in section 3.3.1.2 suggests that requiring a lower limit on winter lake levels might prevent encroachment of water or ice onto private property. However, changes in ownership and operation, disrepair and lack of generation at the downstream developments, and lack of operation records at Swan Lake and the other developments, prevent staff from fully evaluating the lake levels and operating conditions that led to the reported higher than normal water levels and property damage. In fact, since GRH took over operations, flooding conditions may have subsided. For this reason, there is no way to evaluate the benefits or need for a more-restrictive winter lake level limit.

We estimate Erwin Hood's recommended maximum winter lake level of 6 feet would result in an annual levelized loss of $2,360 in lost generation at the downstream developments, and conclude that since there is insufficient information to determine the benefits of such a measure, the costs are not justified. In regard to Christopher Dupuis's recommendation, the measure is non-specific with respect to what limit might be required; therefore, there is no way to determine a cost for such a limit and we have no basis for recommending it.

Instead, we recommend that GRH install its proposed remote lake-level monitoring system on Swan Lake Dam so that more information would be available in the future to evaluate whether project operations are affecting flood conditions. As explained in section 3.3.1.2, the proposed monitoring system would either utilize a data logger that can store lake elevation data to be downloaded at a later date, or would be capable of uploading the data to the internet in real time. We are also recommend that GRH develop an operation compliance monitoring plan that includes a provision to maintain a log of project operation and lake levels at each of the developments. If further damage and flooding is observed, this operation record of Swan Lake levels could then be used by property owners, GRH, and the Commission to determine if the seasonal lake level limits specified in the operating agreement are adequate to protect against shoreline flooding in the winter.

5.2 UNAVOIDABLE ADVERSE IMPACTS

Construction of the penstock replacements at the Mill and CMP Developments would require vegetation clearing and ground disturbance, both of which would temporarily cause soil erosion. Replacement of the penstock at the CMP Development would also temporarily disturb aquatic habitat and increase turbidity and sedimentation of the Goose River if GRH is required to remove and replace some of the existing concrete penstock supports that are located within or proximate to the stream channel.

Although eel abundance in the project area is low, they have been documented in Swan Lake; therefore, continued project operation would likely cause some injury and

mortality of downstream migrating adult eels passing through the project's flow regulating equipment.

5.3 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2) of the FPA, 16 U.S.C., § 803(a)(2)(A), requires the Commission to consider the extent to which a project is consistent with federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project. We reviewed 18 qualifying comprehensive plans that are applicable to the Goose River Project, located in Maine. No inconsistencies were found.

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6.0 FINDING OF NO SIGNIFICANT IMPACT

If the Goose River Project is issued a subsequent license as proposed with the additional staff-recommended measures, the project would continue to operate while protecting aquatic, terrestrial, recreation, and cultural resources in the project area.

Based on our independent analysis, issuance of a subsequent license for the Goose River Project, with additional staff-recommended environmental measures, would not constitute a major federal action significantly affecting the quality of the human environment.

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