

ENVIRONMENTAL ASSESSMENT
FOR HYDROPOWER LICENSE

Silver Lake Project
FERC Project No. 11478-000
Vermont

Federal Energy Regulatory Commission
Office of Hydropower Licensing
Division of Licensing and Compliance
888 First Street, N.E.
Washington, DC 20426

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SUMMARY

On May 9, 1994, Central Vermont Public Service Corporation (CVPS or applicant) filed an application with the Federal Energy Regulatory Commission (Commission) for an original license to continue to operate the 2.2 megawatt (MW) Silver Lake Hydroelectric Project No. 11478-000. CVPS amended its application on April 21, 1995, and supplemented the application with additional information on February 23, 1995, and February 6, 1996. The project is located on Sucker Brook in Addison County, Vermont. Project facilities are situated adjacent to federal lands under the jurisdiction of the Green Mountain National Forest (GMNF). CVPS does not propose to install new capacity at this project.

On May 6, 1994, pursuant to Section 401 of the Clean Water Act, CVPS applied to the State of Vermont, Agency of Natural Resources - Water Quality Division (VANR), for 401 Water Quality Certification (WQC) for the Silver Lake Project. CVPS withdrew and reapplied for WQC on February 27, 1995, January 3, 1996, and again on November 27, 1996. VANR issued a draft WQC on February 7, 1997.

This environmental assessment (EA) prepared for the Silver Lake Project evaluates the effects associated with issuing an original license for the existing hydropower project, and it recommends terms and conditions to become part of any license issued. For any license issued, the Commission must determine that the project adopted will be best adapted to a comprehensive plan for improving or developing a waterway. In addition to the power and developmental purposes for which licenses are issued, the Commission must give equal consideration to the following purposes: energy conservation; the protection and enhancement of fish and wildlife, aesthetics, and cultural resources; and the protection of recreation opportunities. This EA reflects the Commission's consideration of these factors.

In the comprehensive development section of this EA (Section VI), we study both the environmental resource benefits and the power and economic benefits of the project. Based on our analysis, we recommend that the following measures proposed by CVPS, along with agency and staff recommended measures, be included in any license issued for the Silver Lake Project.

The applicant should implement the following measures:

- Develop and implement an operating plan for the project using the staff's proposed rule curve for maintaining conservation pool elevations at Sugar Hill reservoir and minimum flows below Goshen dam.

- Develop and implement a plan to provide a 2.5 cfs release from April 1 through September 30 and 3.5 cfs release from October 1 through March 31 below Sucker Brook diversion dam.
- Maintain the maximum operating level of Silver Lake between 1,246.5 and 1,247.5 feet mean sea level (msl) from June 1 through December 31; at 1,242.5 feet msl from January 1 through May 31; and either fill or maintain the lake level from March 15 through May 31.
- Develop and implement plans to ramp flows below Goshen dam and the project powerhouse.
- Develop and implement a plan for powerhouse operation during the smelt spawning season.
- Develop and implement a plan to monitor flow releases below both dams and the powerhouse, reservoir inflows and water levels at Sugar Hill and Silver Lake reservoirs, and ramping rates at Goshen dam and the powerhouse.
- Install reaeration baffles below Goshen dam outfall by July 1 and keep them in place until September 1 of each year.
- Monitor dissolved oxygen and temperature below Goshen dam and the powerhouse, and monitor temperature above and below Sucker Brook diversion dam.
- Develop and implement a plan to dispose of debris that collects at project works.
- Maintain the tailrace fish exclusion rack. When the trashrack at Silver Lake is replaced, replace it with a rack having a 1.5-inch or narrower clear bar spacing.
- Consult with the State Historic Preservation Officer prior to any structural modification to project facilities and any ground-disturbing activities.
- Improve access to and recreational facilities at Sugar Hill reservoir on land owned by CVPS.
- Improve the scenic overlook at the Falls of Lana.
- Install interpretive signage at Sucker Brook diversion dam and Silver Lake.

Overall, these environmental measures, along with standard articles provided in any license issued for the project, would

protect, mitigate, or enhance fisheries resources, water quality, cultural resources, and recreational resources. In addition, the electricity generated from the project would be beneficial because it would continue to: reduce the use of fossil-fueled, electric generating plants; conserve nonrenewable energy resources; and reduce atmospheric pollution.

We did not identify any reasonable action alternatives to the project for assessment. The no-action alternative was considered and is addressed in the environmental analysis and the comprehensive development sections of this EA. Denial of the license would mean that about 6,433 megawatt-hours (MWh) of electric energy generation per year at the Silver Lake Hydroelectric Project would be lost, and no measures would be implemented to protect, mitigate, or enhance existing environmental resources.

Under Section 10(j) of the Federal Power Act (FPA), each hydroelectric license issued by the Commission must include conditions based on the recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, and enhancement of fish and wildlife resources affected by the project. We have addressed the concerns of the federal and state fish and wildlife agencies and made recommendations.

Because implementing all the agency recommendations taken together would have substantial adverse effects on project purposes, including economics, we looked at each individual recommendation to determine whether benefits to the environment would be worth the cost of implementing the measure. For the reasons discussed in Section VII of this EA, we determined that the recommendation to release an instantaneous minimum flow of 5 cfs, or inflow, to the bypassed reach of river below Sucker Brook diversion dam is inconsistent with Section 4(e) or 10(a) of the FPA and, therefore, we recommend that it not be adopted.

The Secretary of the U.S. Department of the Interior (Interior) did not make any recommendations pursuant to Section 18 of the FPA.

Based on our independent analysis of the project, we find that issuance of an original license for the Silver Lake Project would not constitute a major federal action significantly affecting the quality of the human environment.

ENVIRONMENTAL ASSESSMENT

FEDERAL ENERGY REGULATORY COMMISSION OFFICE OF HYDROPOWER LICENSING DIVISION OF LICENSING AND COMPLIANCE

Silver Lake Hydroelectric Project FERC Project No. 11478-000 - Vermont

INTRODUCTION

The Federal Energy Regulatory Commission (Commission) issued the Silver Lake Hydroelectric Project Draft Environmental Assessment (EA) for comment on August 29, 1996. In response, we received five comment letters. All timely filed comment letters were reviewed by the staff. The sections of the EA that have been modified as a result of comments are identified in the staff responses to the right of the letters of comment, reproduced in Appendix A.

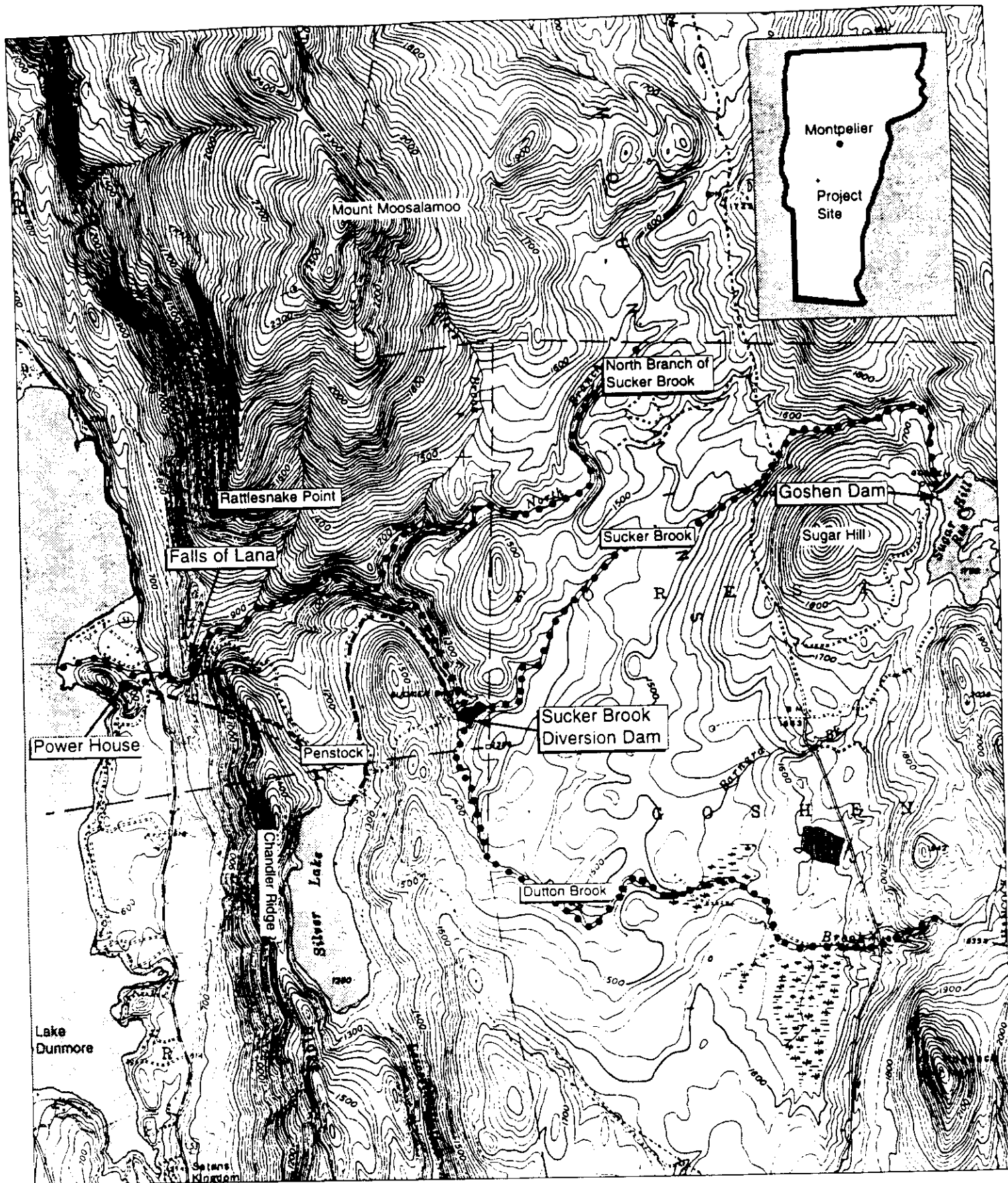
I. PURPOSE AND NEED FOR POWER

A. Purpose of Action

On February 8, 1991, the Commission ordered Central Vermont Public Service Corporation (CVPS or applicant) to apply for an original license for the Silver Lake Hydroelectric Project. On May 9, 1994, CVPS filed an application with the Commission for an original license to operate the 2.2 megawatt (MW) Silver Lake Hydroelectric Project, No. 11478-000, located on Sucker Brook in Addison County, Vermont (Figure 1). CVPS is not proposing to add any new capacity or make any major modifications to the project. The Silver Lake Project occupies federally owned lands that are presently managed by the U.S. Forest Service (USFS).

This environmental assessment (EA) documents our analysis of the effects associated with the continued operation of the existing project. In this document, we also present alternatives to the proposed project and make recommendations to the Commission on whether to issue an original license. Finally, we recommend terms and conditions to become a part of any license issued. The Federal Power Act (FPA) provides the Commission with the exclusive authority to license nonfederal water power projects on navigable waterways and federal lands.

The Commission considers several important factors in its decision to license a facility. In addition to the power and developmental purposes for which licenses are issued, the Commission must give equal consideration to the protection and enhancement of fish and wildlife (including related spawning grounds and habitat), the protection of recreational opportunities, the preservation of other aspects of environmental



map source: United States Geological Survey, as modified by staff
1:24,000 East Middlebury, VT quad. 1972 data

Fig 1 PROJECT AREA AND FEATURES

quality, and opportunities for energy conservation. This EA reflects the Commission's consideration of these factors.

B. Need for Power

To assess the need for power, we reviewed CVPS's use of the project power to date and in the future, together with that of the operating region in which the project is located.

The Silver Lake Project is located in the New England Power Pool (NEPOOL) subregion of the Northeast Power Coordinating Council (NPCC) region of the North American Electric Reliability Council (NERC). NERC annually forecasts electrical supply and demand in the nation and the region for a 10-year period. NERC's 1995 report¹ on annual supply and demand projections indicates that for the period 1994-2005, loads in the NEPOOL area will grow faster than planned capacity additions, resulting in decreased reserve margins. These margins could fall below 15 percent in later years of the forecast period.

The Silver Lake Project has historically generated an annual average of 6,433 megawatt-hours (MWh) of power for CVPS. In addition, the project displaces nonrenewable fossil-fired generation and contributes to diversification of the generation mix in the NEPOOL area.

We conclude that present and future use of the project's power, its displacement of nonrenewable fossil-fired generation, and its contribution to a diversified generation mix support a finding that the power from the Silver Lake Project will help meet a need for power in the NEPOOL area in the short- and long-terms.

II. PROPOSED ACTION AND ALTERNATIVES

A. Applicant's Proposal

1. Project Facilities and Operation

The Silver Lake Project consists of: (1) the Sugar Hill storage reservoir, created by Goshen dam, having a surface area of 74 acres and a gross storage capacity of 1,590 acre-feet at the normal surface elevation of 1,763 feet United States Geological Survey (USGS) datum; (2) Goshen dam, which includes (a) an earthfill embankment section about 680 feet long with a maximum height of about 60 feet, (b) a spillway composed of two sections (eastern and western) having a crest elevation of 1,768 feet USGS, (c) an intake structure constructed of reinforced

¹ NERC's Electricity Supply and Demand Database, 1995-2004 dataset (June 1995).

concrete with wooden trashracks and a concrete gate, and (d) a square reinforced concrete conduit (4 feet by 4 feet) about 232 feet long, controlled by five gate valves discharging into Sucker Brook.

Sucker Brook diversion dam, located downstream of Goshen dam, consists of: (1) an earth embankment, approximately 665 feet long with a maximum height of 38 feet; (2) a 60-foot-long, concrete spillway section; (3) an impoundment with a surface area of about 2 acres and gross storage capacity of 20 acre-feet at the maximum surface elevation of 1,312 feet USGS. At the normal pond elevation of 1,288 feet USGS, the surface area of the impoundment is less than a quarter of an acre, resulting in about 1 acre-foot of storage; (4) an intake structure containing a manually operated, timber headgate with trashracks; and (5) a 7,000-foot-long penstock comprised of corrugated metal, wood stave, and concrete pipe sections ranging in diameter from 36 inches at the intake structure to 42 inches at the Silver Lake outfall.

The Silver Lake development consists of: (1) a dam of buttressed concrete with earthfill on the upstream and downstream sides with a total length of 283.5 feet and a maximum height of about 30 feet; (2) a reservoir with a surface area of 110 acres and a gross storage volume of 3,120 acre-feet at the normal surface elevation of 1,250 feet USGS; (3) a conduit, about 60 feet long, conveying water from the intake structure to the outlet structure, with a wooden superstructure, containing an electrically operated slide gate; (4) a trashrack having 2 and 1/2-inch bar spacing located at the intake structure, and a fish exclusion rack having 1 and 3/4-inch bar spacing located at the downstream end of the tailrace; (5) a 5,200-foot-long penstock ranging in diameter from 48 inches to 36 inches, extending from the Silver Lake outlet structure to the powerhouse, and constructed of fiberglass (2,400 feet), wood stave (100 feet), and steel (2,400 feet); (6) a concrete and brick powerhouse, about 47 feet by 67 feet, containing (a) one horizontal Francis turbine, rated at 3,000 horsepower (hp) with a maximum hydraulic capacity of 60 cfs, and (b) a generator rated at 2,750 kilovolt-ampere (kVA); and (7) appurtenant facilities.

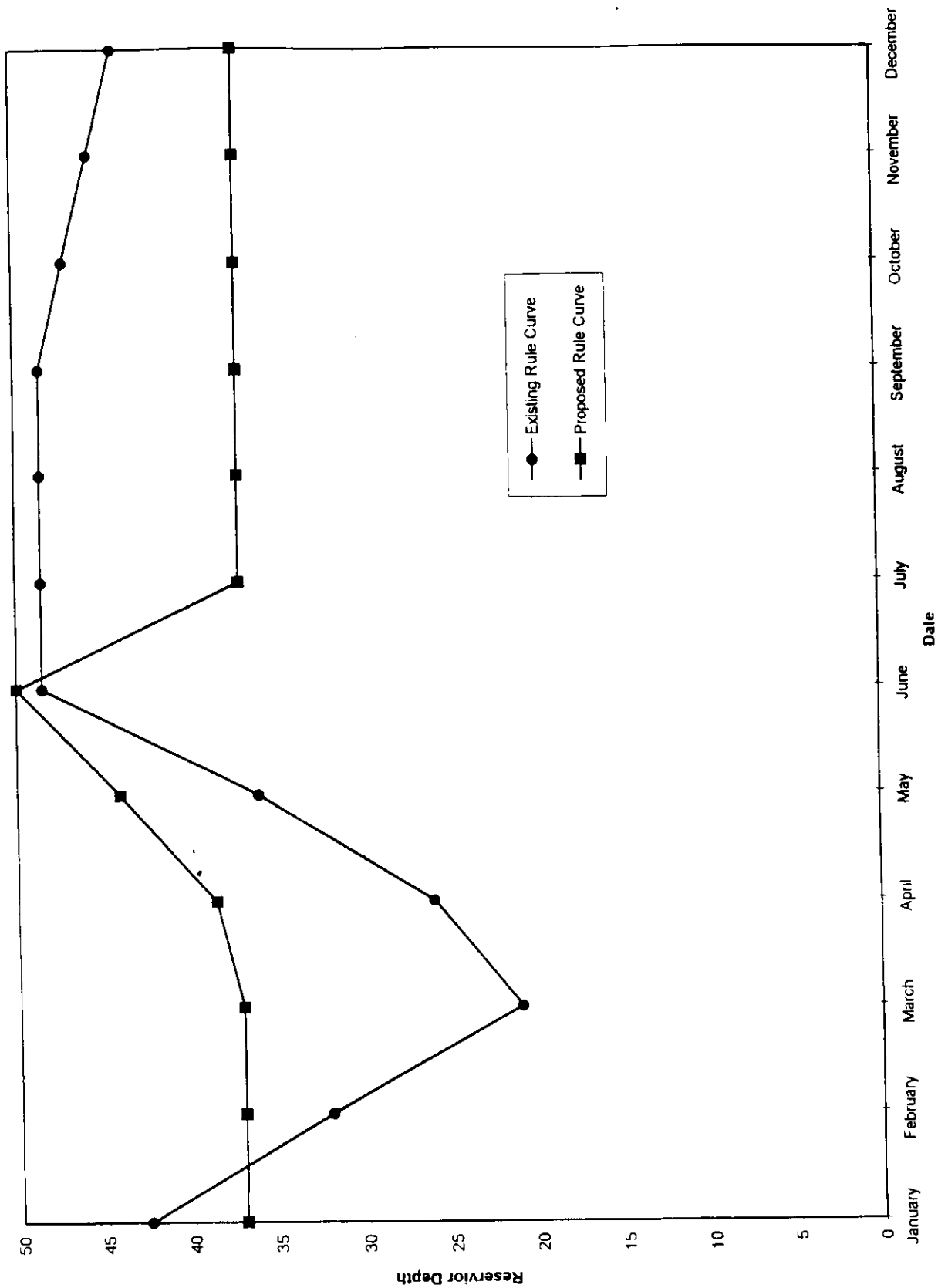
CVPS operates the Silver Lake Project seasonally to regulate annual flows and provide peaking power. Sugar Hill reservoir and Silver Lake capture the annual spring runoff and release water from storage to provide relatively consistent, year-round flow releases. Releases from the Sugar Hill reservoir travel down Sucker Brook to the project's diversion dam, where water is diverted to Silver Lake via a penstock. Water for generation is then transported from Silver Lake to the project's powerhouse via a second penstock. Water exiting the powerhouse passes through the tailrace, rejoins Sucker Brook, and continues on to Lake Dunmore. A minimum flow of 2.5 cfs is currently released from

Sugar Hill reservoir. No minimum flows are released from Sucker Brook diversion dam or Silver Lake dam. When smelt are spawning, the project is run continuously to provide adequate flows to maintain spawning and incubation habitat. Figure 2 shows CVPS's existing and proposed impoundment rule curve for the Sugar Hill reservoir. Figure 3 indicates the estimated monthly generation for the project under CVPS's current and proposed conditions.

2. Proposed Environmental Measures

Under the applicant's proposal, the existing project facilities would remain intact. CVPS proposes to implement the following environmental measures.

- Operate the project with a conservation pool at Sugar Hill reservoir such that water levels are constant from July through March at a depth of 37 feet. The maximum water depth of 50 feet would be reached around mid-May from spring runoff; and levels would return to 37 feet by July 1.
- Improve recreational access at Sugar Hill reservoir by:
 - (1) constructing a circular roadway to aid the movement of vehicles at the access point,
 - (2) upgrading the existing road leading to the boat ramp,
 - (3) reconstructing and extending the existing boat ramp,
 - (4) providing directional signage and trail registers at the gate leading to the dam and boat launch area to collect site usage data for future planning, and
 - (5) installing interpretive signage throughout the project area.
- Continue to release a minimum flow of 2.5 cfs from Goshen dam to Sucker Brook.
- Monitor water quality below Goshen dam. If discharges fail to meet state standards, CVPS would construct reaeration screens or weirs within the concrete raceway that discharges water from Goshen dam.
- Provide a minimum flow release of 1.0 cfs below Sucker Brook diversion dam through a weir in spillway flashboards.



**Fig. 2 Existing and Proposed Rule Curve
Sugar Hill Reservoir**

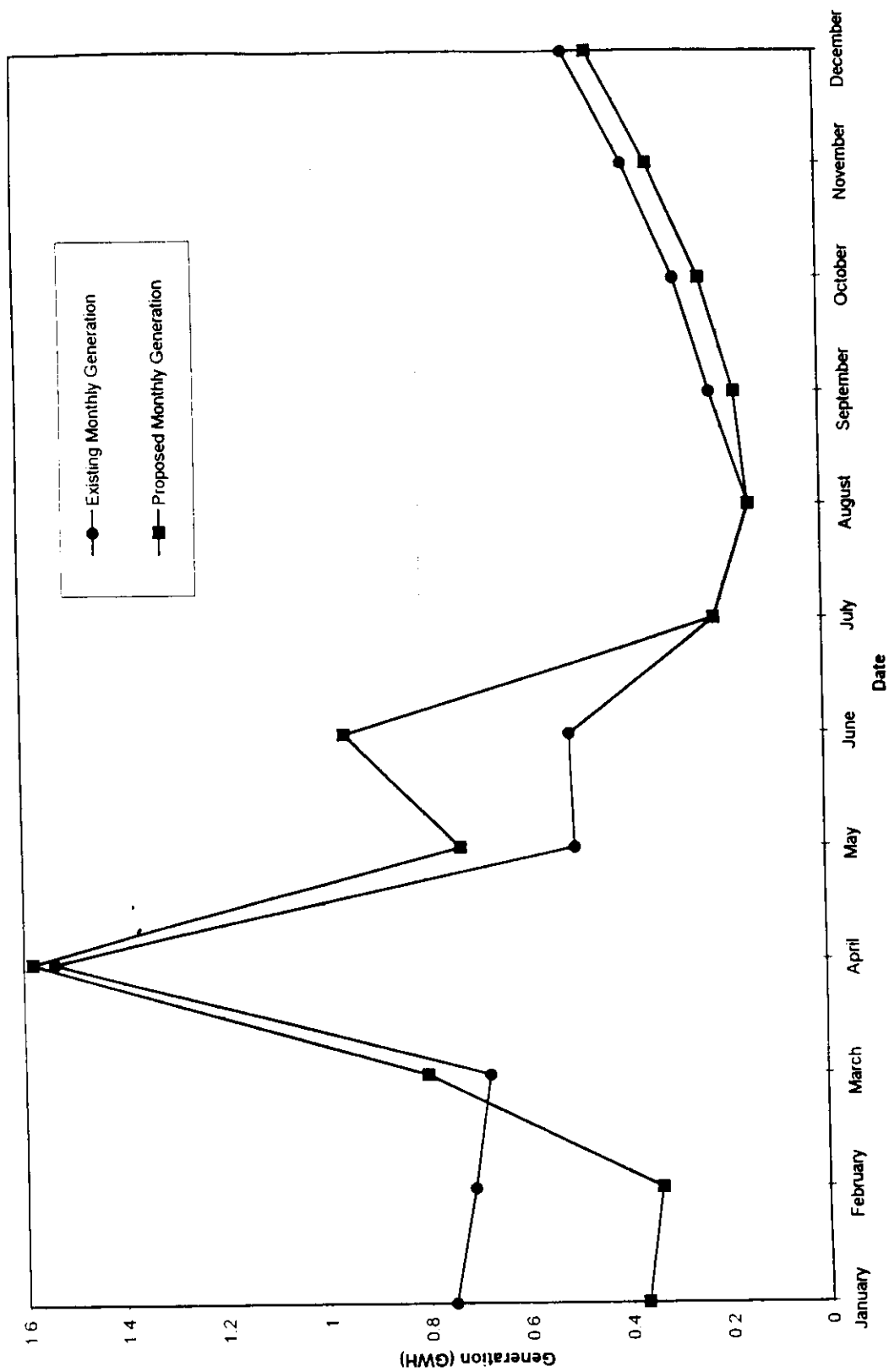


Fig. 3 Average Monthly Project Generation Existing and Proposed

- Improve the scenic overlook at the Falls of Lana by upgrading the area, improving drainage, and managing vegetation which may obstruct views.
- Lower the maximum operating level of Silver Lake to 1,247.5 feet USGS from spring through fall.
- Consult with the State Historic Preservation Officer prior to any structural modification to project facilities and any ground-disturbing activities.

B. Alternatives to the Proposed Project

1. Staff's Alternative

An alternative to licensing the project as proposed by CVPS is to license the project with modifications or other resource protection, mitigation, or enhancement measures. In addition to CVPS's environmental measures, the staff recommends that CVPS do the following:

- Develop and implement an operating plan for the Sugar Hill reservoir utilizing a modified conservation pool regime that would stabilize water levels and would provide continuous minimum flows.
- Develop and implement a plan to provide a minimum flow of 2.5 cfs (or inflow, if less) from April 1 through September 30, and 3.5 cfs (or inflow, if less) from October 1 through March 31, below Sucker Brook diversion dam.
- Maintain the maximum operating level of Silver Lake between 1,246.5 and 1,247.5 feet msl from June 1 through December 31; at 1,242.5 feet msl from January 1 through May 31; and either fill or maintain the lake level from March 15 through May 31.
- Develop and implement a ramping plan for releases below Goshen dam and the Silver Lake powerhouse.
- Develop and implement a plan to control flows below the Silver Lake powerhouse during the smelt spawning season.
- Develop and implement a plan to monitor flow releases below both dams and the powerhouse, reservoir inflows and water levels at Sugar Hill and Silver Lake reservoirs, and ramping rates at Goshen dam and the powerhouse.

- Install reaeration screens below Goshen dam outfall by July 1 and keep them in place through September 1 of each year.
- Monitor DO and temperature below the fish exclusion racks in the tailrace, and monitor temperature above and below the Sucker Brook diversion dam from June 1 through October 31 during the first full season of operation with the Sugar Hill Reservoir at its new conservation pool.
- Develop and implement a plan to dispose of debris that collects at project works.
- Maintain the tailrace fish exclusion rack, and when the trashrack at Silver Lake is replaced, replace it with a rack having a 1.5-inch or narrower clear bar spacing.

2. No-action Alternative

Under the no-action alternative, the project would continue its current operation; no new environmental protection, mitigation, or enhancement measures would be implemented. We use this alternative to establish baseline conditions for comparison with other alternatives.

3. Alternatives Considered but Eliminated From Detailed Study

We considered two retirement alternatives (one involving removal of the dam and one involving retaining the dam but removing power generating equipment) but eliminated them from detailed study because neither are reasonable in the circumstances of this case. Either alternative would involve denial of the license application. In any retirement alternative, project capacity and energy would most likely be replaced with fossil-fueled power that contributes to atmospheric pollution.

No agency or participant has suggested that dam removal would be appropriate, nor have we found a basis for recommending it at this time. The project's reservoirs provide recreation opportunities and habitat for fish and wildlife. Thus, dam removal is not a reasonable alternative to licensing the project with appropriate protection, mitigation, or enhancement measures.

The second retirement alternative would involve retaining the dam and disabling or removing equipment used to generate power. Project works would remain in place and could be used for historic or other purposes. This would require us to identify another government agency willing and able to assume regulatory control and supervision of the remaining facilities. No agency

or other participant has advocated project retirement with equipment removal, nor have we found any basis for recommending it.

III. CONSULTATION AND COMPLIANCE

A. Agency Consultation

The Commission issued a public notice on February 22, 1996, that the project was ready for environmental analysis. The following entities provided comments and recommended license terms and conditions. All comments become a part of the record and are considered during the staff's analysis of the project.

<u>Commenting Agency</u>	<u>Date of Letter</u>
State of Vermont, Agency of Natural Resources	April 19, 1996
U.S. Department of the Interior	April 19, 1996
U.S. Forest Service	April 4, 1996

CVPS responded to the Vermont Agency of Natural Resources' (VANR's) and Interior's recommended license terms and conditions by letters dated June 3, 1996.

B. Interventions

Besides providing comments, organizations and individuals may petition to intervene and become a party to subsequent proceedings. In response to the Public Notice issued by the Commission on October 10, 1995, the Commission received motions to intervene from the following entities:

<u>Intervenor</u>	<u>Date of Motion</u>
State of Vermont, Agency of Natural Resources	December 5, 1995
U.S. Department of the Interior	December 6, 1995
Vermont Natural Resources Council*	December 6, 1995

* Indicates motion was filed in opposition.

We address intervenor concerns in the environmental analysis section (Section V) of this EA.

C. Comments on the Draft Environmental Assessment

The respondents commenting on the DEA are as follows:

<u>Commenting Entities</u>	<u>Date of Letter</u>
Green Mountain & Finger Lakes National Forests	October 10, 1996
Central Vermont Public Service Corporation	November 26, 1996
U.S. Department of the Interior Fish and Wildlife Service	November 26, 1996
State of Vermont Agency of Natural Resources	November 27, 1996
Vermont Natural Resources Council (not timely filed)	December 11, 1996

D. Water Quality Certification

Pursuant to Section 401 of the Clean Water Act (CWA), license applicants must obtain either (1) state certification that any discharge from the project would comply with applicable provisions of the CWA, or (2) a waiver of certification by the appropriate state agency. The Commission requires that applicants apply for such certification or waiver before they file their application with the Commission. Section 401 (a)(1) permits the Commission to deem certification waived if the certifying agency fails to act on a Water Quality Certification (WQC) request within a reasonable period of time, not to exceed 1 year.

CVPS filed an application for WQC with VANR on May 6, 1994. This application was withdrawn and refiled on February 27, 1995, January 3, 1996, and again on November 27, 1996. VANR issued pre-notice draft WQC conditions for the Silver Lake Project on February 7, 1997.

Our past experience with Section 401 water quality conditions indicates that some states routinely include measures that, in our opinion, do not relate to water quality and are therefore outside the scope of Section 401. Staff has reviewed the conditions contained in the pre-notice draft and expects that similar conditions will be included in the final WQC for the project. Only those measures included in the final WQC for the Silver Lake Project considered to be within the scope of Section 401 will become part of any license issued. In the event that the final WQC contains conditions that are substantially different than these in the pre-notice draft, the Commission will evaluate if they are within the scope of Section 401 in any license order issued for the project.

VANR's pre-notice draft WQC for the Silver Lake Project lists terms and special conditions labeled A through U. In the following section, we present the pre-notice draft WQC conditions as listed in the VANR filing of February 7, 1997 and modified by letter dated February 12, 1997.

- A. The applicant shall operate and maintain this project as set forth in the findings of fact and conclusions above except where modified by these conditions.
- B. Reservoir and Flow Management. The project shall be operated in accordance with the minimum flow and reservoir level management schedules tabulated below. Minimum flows shall be released on a continuous basis and not interrupted.

Table 1a. Sugar Hill Reservoir Spring Operating Rule during High Inflow Period.

Reservoir Level (feet)		Flow Management
Elevation	Relative	
1747.0 to maximum	> -3.0	Capture spring runoff while maintaining a release of no less than 2.5 cfs.

Table 1b. Sugar Hill Reservoir Summer Operating Rule from Spring Recession through October 15.

Reservoir Level (feet)		Flow Management
Elevation	Relative	
> 1751.0	> +1.0	Release at rates as necessary to reduce level to 1751 feet or less; no releases less than 2.0 cfs.
1750.0-1751.0	0 to +1.0	2.0 cfs until May 31, then 1.3 cfs
1747.0-1750.0	0 to -3.0	1.3 cfs
1747.0	at -3.0	Match inflow.

Table 1c. Sugar Hill Reservoir Fall Operating Rule from October 16 through October 31.

Reservoir Level (feet)		Flow Management
Elevation	Relative	
> 1750.0	above 0	Release at rates as necessary to bring the reservoir down to 1750.0 by November 1; maintain no less than 2.5 cfs at all times.
1747.0-1750.0	0 to -3.0	Case I. At beginning of period, release at rate equivalent to that released on October 15, if inflow rate is 2.5 cfs or less on that date. If reservoir rises to 1750.0, match inflow for remainder of period. Case II. At beginning of period, release at rate of 2.5 cfs if October 15 flow exceeds 2.5 cfs. If reservoir rises to 1750.0, match inflow for remainder of period.
1747.0	at -3.0	With declining inflows, match inflow to stabilize the reservoir, then if inflows increase, place the additional water in storage and maintain the low preceding flow until 1750.0 is attained.

Table 1d. Sugar Hill Reservoir Fall/Winter Operating Rule from November 1 through March 31.

Reservoir Level (feet)		Flow Management
Elevation	Relative	
> 1750.0	above 0	Release at rates as necessary to reduce level to 1750 feet; no releases less than 2.5 cfs.
1750.0	at 0	Match inflow
October 31 level (if 1750.0) to 1750.0	below 0	2.5 cfs with a rising reservoir; match inflow to prevent a declining reservoir.

Table 2. Sucker Brook Diversion Management Requirements.

Period		Bypass Minimum Flow Release (cfs)
1	April 1 - September 30	2.5
2	October 1 - March 31	3.5

Note: Minimum flows are the values listed, or instantaneous inflow, if less.

Table 3. Silver Lake Water Level Management.

Summer/fall operating range (June - December)	1246.5-1247.5 feet msl
Winter/spring maximum drawdown (January - May)	1242.5 feet msl
March 15 - May 31 water level management	rising or stable

Note: The period for this special operating rule is subject to future revision upon mutual agreement of the Agency, the U.S. Fish and Wildlife Service, and the applicant.

Table 4. Tailrace Flow Management.

March 15 - May 15	Generate during the daylight hours only or, upon commencing nighttime generation, convert to around-the-clock generation for the duration of the period.
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Note: The spring smelt-protection period is subject to future revision upon mutual agreement of the Agency, the U.S. Fish and Wildlife Service, and the applicant.

- C. **Ramping Plan at Goshen Dam.** The applicant shall develop a ramping plan for the adjustment of the valve system at Goshen Dam in order to control the rate of change of downstream flows and protect downstream aquatic organisms. The plan shall cover both upramping and downramping. It shall be filed within one year of the issuance of this certification or 30 days from the issuance of the federal license, whichever is sooner, and shall be subject to Agency approval.
- D. **Ramping Plan at Station Tailrace.** The applicant shall develop a downramping plan to govern reductions in the station discharge in order to prevent stranding and mortality to downstream aquatic organisms. It shall be filed within one year of the issuance of this

certification or 30 days from the issuance of the federal license, whichever is sooner, and shall be subject to Agency approval.

- E. **Plan for Method to Maintain Conservation Flow Below Sucker Brook Diversion Dam.** Within one year of the issuance of this certification or 30 days from the issuance of the federal license, whichever is sooner, the applicant shall file descriptions, hydraulic design calculations, an implementation schedule, and plans for the measures to be used to release the bypass flows with the Department for its review and approval. The design shall provide for the discharge of the minimum flow at the dam spillway on river right, so that none of the natural brook channel remains dewatered.
- F. **Operating Plan for Sugar Hill Reservoir.** Within one year of the issuance of this certification or 30 days from the issuance of the federal license, whichever is sooner, the applicant shall file an operating plan for Sugar Hill Reservoir, indicating how the dam shall be operated to conform to the goals of the operating rules contained in Condition B. The filing shall include performance expectations for the method and equipment to be used and a supporting calculation brief; this would include consideration of how frequently adjustments to the valve system must be made to meet the goals under different background conditions. The operating plan shall be subject to Agency approval and shall be revised as necessary to assure conformance with the Condition B.
- G. **Monitoring Plan for Reservoir and Flow Management.** The applicant shall file for review and approval, within one year of the issuance of this certification or 30 days from the issuance of the federal license, whichever is sooner, a plan for monitoring instantaneous flow releases at the project; both below dams and below the station tailrace, and reservoir levels and inflows. Following approval of the monitoring plan, the applicant shall then measure instantaneous flows and reservoir levels and provide records of such measurements on a regular basis as per specifications of the Department. Upon receiving a written request from the applicant, the Department may waive, this requirement, all or in part, for monitoring at this project provided the applicant satisfactorily demonstrates that the project will at all times be managed consistent with the requirements of the applicable conditions.

- H. **Monitoring of Dissolved Oxygen and Water Temperature at Goshen Dam and at the Station Tailrace.** During the first full season of operation with the Sugar Hill Reservoir at its new conservation pool, dissolved oxygen (DO) and temperature conditions shall be monitored from June through October directly below the Goshen Dam outlet and below the racks in the station tailrace. Sampling shall be done at weekly intervals. A quality assurance/quality control plan shall be filed with the Department within 60 days of issuance of the federal license. Within 90 days of the completion of the sampling, the licensee shall file a data report with the Department. Based on the sampling results, the Department may request either additional sampling or remedial measures to assure maintenance of DO standards in Sucker Brook.
- I. **Monitoring of Water Temperature at the Sucker Brook Diversion Dam.** During the first full season of operation with the Sugar Hill Reservoir at its new conservation pool, temperature conditions shall be monitored from June through October at the diversion dam. Sampling shall be done at weekly intervals at three stations: 1) Dutton Brook just upstream of the backwater from the diversion dam; 2) Sucker Brook just upstream of the backwater from the diversion dam; and 3) the flow release at the dam. Data shall be collected at a time between noon and 4:00 PM. A quality assurance/quality control plan shall be filed with the Department within 60 days of issuance of the federal license. Within 90 days of the completion of the sampling, the licensee shall file a data report with the Department. Based on the sampling results, the Department may request either additional sampling or remedial measures to assure maintenance of temperature standards in Sucker Brook.
- J. **Fish Exclusion from Station Tailrace.** The applicant shall continue to maintain a device at the lower end of the station tailrace to prevent fish from ascending the tailrace and becoming stranded. Any proposal to modify the design shall be subject to Department approval.
- K. **Silver Lake Trashrack.** When the trashrack at Silver Lake is replaced, the new rack shall be designed with a 1.5-inch or narrower bar clear spacing.
- L. **Turbine Rating Curves.** The applicant shall provide the Department with a copy of the turbine rating curves, accurately depicting the flow/production relationship, for the record within one year of the issuance of this certification.

- M. **Debris Disposal Plan.** Within 90 days of the issuance of this certification, the applicant shall submit a plan for proper disposal of debris associated with project operation, including trashrack debris, for written approval by the Department.
- N. **Maintenance and Repair Work.** Any proposals for project maintenance or repair work involving the brook, Sugar Hill Reservoir, or Silver Lake, including desilting, draw-downs to facilitate repair/maintenance work, and tailrace dredging, shall be filed with the Department for prior review and approval.
- O. **Public Access.** The applicant shall allow public access to the project area for utilization of public resources, subject to reasonable safety and liability limitations. Such access should be prominently and permanently posted so that its availability is made known to the public. Any proposed limitations of access to State waters to be imposed by the applicant shall first be subject to written approval by the Department. In cases where an immediate threat to public safety exists, access may be restricted without prior approval; the applicant shall so notify the Department and shall file a request for approval, if the restriction is to be permanent or long term, within 14 days of the restriction of access.
- P. **Recreational Facilities.** Recreational facilities shall be constructed and maintained consistent with the proposed recreation plan. Prior to construction at individual facilities, final design plans and details shall be filed with the Department for review and comment. The applicant is advised to consult with the Agency and the U.S. Forest Service in the development of plans. Where appropriate, filings shall include an erosion control plan that will be subject to Department approval prior to commencement of construction.
- Q. **Erosion Control.** Upon a written request by the Department, the applicant shall install erosion control measures as necessary to address erosion occurring as a result of use of project recreational facilities.
- R. **Compliance Inspection by Department.** The applicant shall allow the Department to inspect the project area at any time to monitor compliance with certification conditions.
- S. **Posting of Certification.** A copy of this certification shall be prominently posted within the project powerhouse.

- T. **Approval of Project Changes.** Any change to the project that would have a significant or material effect on the findings, conclusions, or conditions of this certification, including project operation, must be submitted to the Department for prior review and written approval.
- U. **Reopening of License.** The Department may request, at any time, that FERC reopen the license to consider modifications to the license as necessary to assure compliance with Vermont Water Quality Standards.

Condition A would require CVPS to operate and maintain the project pursuant to the conditions of the WQC. Because some of the conditions are beyond the scope of Section 401, we recommend that Condition A become a part of the license only to the extent that it requires compliance with conditions that are within the scope of Section 401. Further, we note that it is the Commission, not the certifying agency that enforces license conditions and controls the timing of actions under the license. The portions of the WQC conditions pertaining to schedule and VANR approval would grant the VANR authority beyond that provided for in the CWA; consequently these portions should not be included in the license.

We are of the opinion that Conditions B through M,O,P,R, and S are related to the protection and enhancement of water quality or deal with a state-designated use of the river.² Therefore, we recommend that these conditions, except for those parts that specify scheduling or approval authority, be included in any license issued for the project.

Condition N would require CVPS to file for VANR's prior review and approval any proposals for project maintenance or repair work involving the river, including desilting of the dam impoundment, impoundment draw-downs to facilitate repair or maintenance work, and tailrace dredging. The state has no authority to halt or order maintenance and repair of the Silver Lake Project. Section 401 provides that a state may issue its certification, at which point the federal licensing or permitting agency is responsible for making the certification a part of the license or permit. Section 401 gives the state no further role in the federal process. Condition N is, therefore, beyond the scope of Section 401, and we do not recommend that it become part of any license issued for this project.³

² See Great Northern Paper, Inc., 77 FERC ¶ 61,068 at pp. 61,271 - 61,272 (1996).

³ See Great Northern Paper, supra.

Condition Q would require CVPS to install, upon VANR request, erosion control measures to address erosion occurring as a result of the use of project recreational facilities. We find this condition too broad to be included in any license issued for this project. Section 401 provides that a state may issue its certification, at which point the federal licensing or permitting agency is responsible for making the certification a part of the license or permit. Section 401 gives the state no further role in the federal process. Condition Q is, therefore, beyond the scope of Section 401, and we do not recommend that it become part of any license issued for this project.⁴ In addition, erosion control is covered in Condition P and standard license articles.

Condition T would require CVPS to submit to VANR, for its prior review and approval, any changes that would have a significant or material effect on the certificate. This condition would give the state the opportunity to revisit its certification. Section 401(a)(3) of the CWA sets out the exclusive manner in which state certifications may be modified and makes clear that the process is to be initiated by the federal licensing or permitting agency, not the state.⁵ Thus, the Commission determines whether proposed license amendments require new water quality certification.⁶ Condition T, which would provide the state authority beyond that provided for in the CWA, is beyond the scope of Section 401. We, therefore, recommend that it not be included in any license issued for this project.

Condition U states that VANR may request, at any time, that the Commission reopen the license to consider modifications to the license necessary to assure compliance with Vermont water quality standards. This condition is too broad and deals with issues that are addressed by the Commission's standard license articles (Vermont may make such a request at any time). We, therefore, recommend Condition U not be included in any license issued for this project.

⁴ See Great Northern Paper, supra.

⁵ See Great Northern Paper, supra.

⁶ The Commission's regulations, 18 C.F.R. § 4.38(7)(iii), provide that, if an applicant seeks to amend its application or license, it must make a new request for water quality certification if the amendment would have a material adverse impact in the discharge from the project. The Commission makes the determination as to whether a material adverse impact will result from the amendment and thus, whether a new certification is necessary. See, e.g. Joseph M. Keating, 57 FERC ¶ 61,261 (1991), reh'g denied, 61 FERC ¶ 61,215 (1992).

E. Section 18 Fishway Prescription

Section 18 of the FPA gives the Secretary of the Interior (Interior) authority to prescribe fishways at Commission-licensed projects.⁷ Interior did not make any recommendations pursuant to Section 18 of the FPA.

F. Dredge and Fill Permit Conditions

Pursuant to Section 404 of the CWA, the U.S. Army Corps of Engineers (COE) issues dredge and fill permits for specified types of construction in wetlands. These permits generally include conditions applicable to project construction activities. Because licensing the Silver Lake Project would not involve any construction activities that would affect areas we consider to be wetlands, a Section 404 permit may not be required.

If construction activities including new recreation facilities or other improvements are deemed necessary in the future, CVPS might be required to obtain a Section 404 Permit from the COE.

G. Coastal Zone Management Program

The Silver Lake Hydroelectric Project is not in a state-designated coastal zone management area (personal communication between Stephen Sease, VANR, and J.H. Rumpp, Jr., Stone & Webster Environmental Technology and Services, on March 21, 1996).

IV. ENVIRONMENTAL ANALYSIS⁸

We examined geology, water quality and quantity, fisheries, terrestrial, recreation, and cultural resources in the context of how the Silver Lake Hydroelectric Project would affect them for the term of any license issued. In this EA, we include the details of only these affected resources.

In the Scoping Document, we stated that the issuance of an original license for the Silver Lake Project would not result in any significant impacts on socioeconomic resources. We received no comments to the contrary in response. We exclude this

⁷ Section 18 of the FPA provides: "The Commission shall require construction, maintenance and operation by a licensee at its own expense ... such fishways as may be prescribed by the Secretary of Commerce or the Secretary of Interior, as appropriate."

⁸ Unless otherwise indicated, the source of our information is CVPS' application filed on May 9, 1994.

resource from our detailed analysis because CVPS does not propose any major construction activities that would affect employment, business, infrastructure, or tax revenues in the project area.

A. General Description of the Locale

The project is located approximately 20 miles north of Rutland, Vermont, in the towns of Salisbury, Leicester, and Goshen, Addison County, Vermont (Figure 1).

The project includes approximately 9.6 square miles of Sucker Brook drainage and the entire Silver lake drainage (0.6 square mile). From a total drainage of 10.2 square miles, the project feeds the 2,200-kilowatt (kW) powerhouse, which, via a tailrace, discharges into Sucker Brook essentially at Lake Dunmore, a part of the Lake Champlain drainage basin. There are no other existing hydroelectric projects on Sucker Brook.

B. Cumulative Impact Summary

An action may cause cumulative impacts on the environment if it overlaps in space and/or time with the impacts of other past, present, and reasonably foreseeable future actions. The individually minor impacts of multiple actions, when added together, may amount to collectively significant cumulative impacts. The existing environment shows the effects of past and present actions and provides the context for determining the cumulative impacts of future actions.

We reviewed the project's potential to cause adverse cumulative impacts. Given the project's location and the nature of the area's resources, we conclude that the Silver Lake Project has the potential to cumulatively affect water quality and fisheries in the basin. In Sections IV.C.2.c. and IV.C.3.c., we present our evaluation of the project's potential cumulative impact on these resources.

C. Proposed Action and Action Alternatives

In each of the following resource sections, we describe the environmental setting; CVPS's proposed operating procedures and environmental protection, mitigation, or enhancement measures; and recommendations of resource agencies and other entities. We then provide our independent analysis and conclusions on the effects that the project may have on environmental resources, and make recommendations to protect, mitigate, or enhance the affected environmental resources.

Lastly, we discuss any unavoidable adverse impacts on each environmental resource as a consequence of our recommended protection, mitigation, or enhancement measures.

1. Geology Resources

a. Affected environment: The Silver Lake Project lies within the Green Mountains of Vermont, which are part of the New England Province. The soils of the Green Mountains are underlain with Cambrian and Precambrian quartzite, schist, and marble.

Addison County was covered by the Labrador Ice Sheet of the late Wisconsin glaciation. The soils were developed in glacial material, recent alluvium, or organic deposits. The main ridge of the Green Mountains runs near the eastern border of the county, with elevations ranging from 1,000 to 2,000 feet above sea level, but many peaks are higher than 3,000 feet. Mt. Abraham is the highest at 4,052 feet. Topography is predominantly steep, but many of the wider and lower lying ridges are moderately sloping.

The Natural Resources Conservation Service (formerly the Soil Conservation Service), Addison County Soil Survey indicates that the peaks of the Green Mountains are the drainage divide between the Connecticut River Basin and the Lake Champlain Basin. Lake Dunmore and Silver Lake are among the largest lakes in the county. The Green Mountain soils that exist on project lands are of the Lyman-Berkshire-Marlow and the Berkshire-Cabot-Peru Associations. The Lyman-Berkshire-Marlow Association is characterized by steep to very steep, excessively drained to well-drained, loamy soils that are shallow to deep over bedrock and exist on main ranges. The Berkshire-Cabot-Peru Association is characterized by moderately sloping, well-drained to poorly drained, stony, loamy soils located on lower slopes and foothills.

The Berkshire and Marlow unit consists of extremely stony loams with 3 to 20 percent slopes. They are deep, well-drained soils that retain moisture well. These soils were formed in glacial till deposits derived mainly from schistose and quartzitic rocks. Berkshire soils are mainly in the mountains and hills. They have been mapped in Addison County together with Marlow soils. Within the project area, these extremely stony soils are found below woodlands, on the eastern side of Sugar Hill reservoir and Silver Lake, along Sucker Brook, and the lower slopes of Sugar Hill mountain. Erosion is a moderate to severe hazard in bare Berkshire soils.

The Berkshire and Marlow unit consists of extremely stony loams with 20 to 50 percent slopes. They are deep, well-drained soils that retain moisture well. These soils were formed in glacial till deposits derived mainly from schistose and quartzitic rocks. Berkshire soils are mainly in the mountains and hills and typically have steeper slopes than the Berkshire and Marlow unit. These soils are found on the western shore of Sugar Hill reservoir, within Sugar Hill reservoir, the higher

elevations of Sugar Hill, Goshen dam, around Sucker Brook diversion dam, and the northern tip of Silver Lake.

The Lyman and Berkshire unit is a very rocky complex with 20 to 50 percent slopes. The Lyman series consists of very steep loamy soils underlain by schist or phyllite bedrock at a depth of 10 to 20 inches. Glacial material that forms the soil is high in schist or phyllite. Water moves readily through the soil and along the top of the bedrock. The main use of this soil is for woodlands. They are mapped in Addison County together with Berkshire soils as a rocky complex. Chandler Ridge immediately west of Silver Lake consists of this soil unit.

Sugar Hill Reservoir

Sugar Hill reservoir shows very little evidence of wave-induced shoreline erosion. A small stream enters the reservoir at the southwest corner; this area exhibits very minor erosion in the draw-down zone caused by the stream. The boat launch area is subject to erosion and silt deposited from the dirt roadway above the reservoir (Knight, 1994). Silt entering the reservoir creates flocculation in the water column, which can have an adverse impact on aquatic resources and water quality.

Sucker Brook

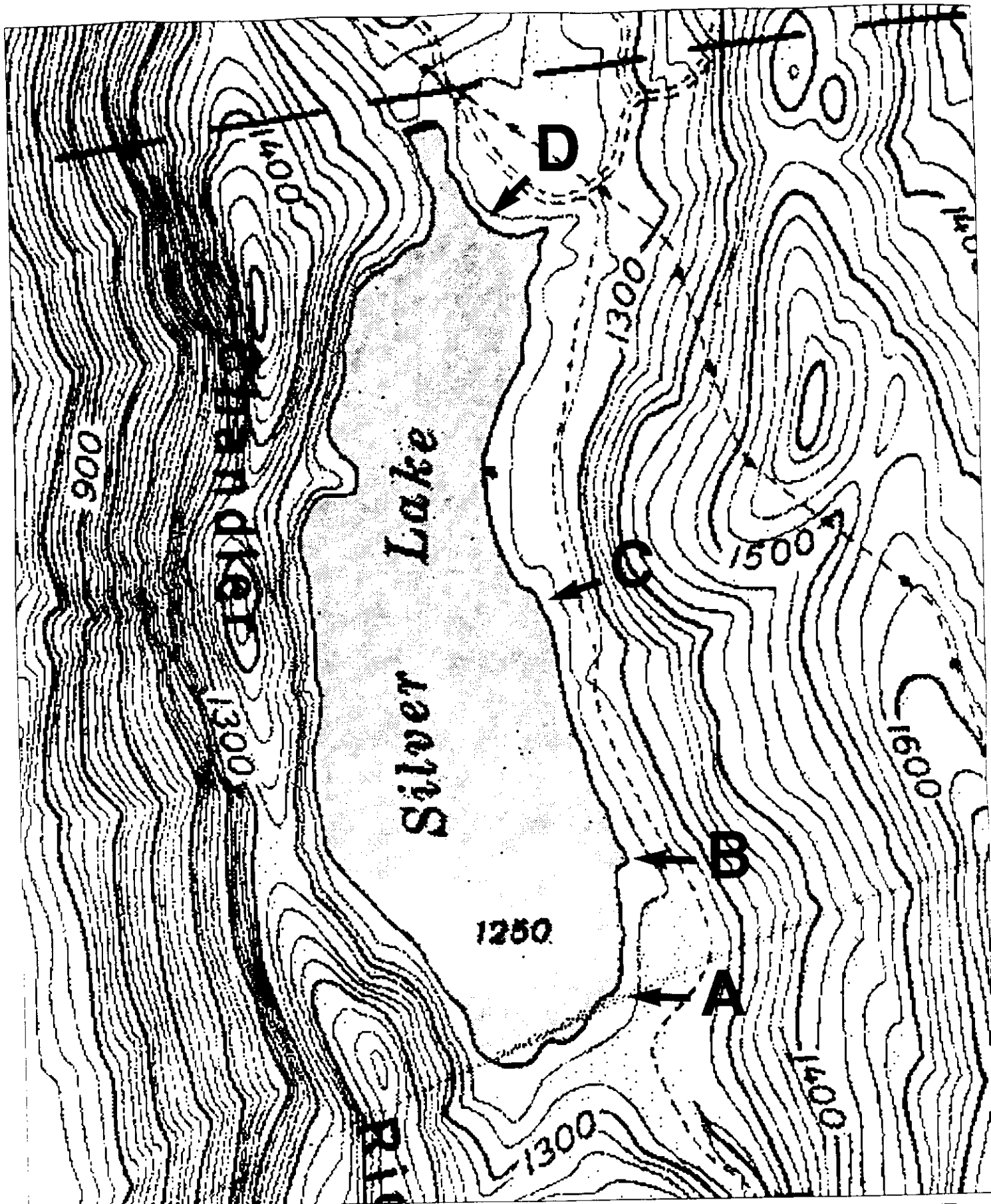
There is no indication of shoreline erosion along Sucker Brook or near the diversion dam. The area adjacent to the bypassed reach is heavily forested and helps stabilize the soils and protect the shoreline from erosion.

Silver Lake

The western shoreline of Silver Lake consists mostly of bedrock outcrops and areas of heavy stone and cobble. This area shows no signs of slope instability or shoreline erosion. The eastern shoreline shows significant erosion from the beach area, where Sucker Brook enters the lake, to the dam at the northeast corner of the lake.

Figure 4 shows four areas of erosion, discussed below.

- (A) Point of land at small inlet - visible localized escarpment where short section of steep; 10-foot-high slope has failed just above the cobble line and may be attributable to wave action at high water.
- (B) Cobble and small boulder strewn waterline of steeper soil slopes. There is heavy tree growth, with occasional signs of minor slippage due to toe erosion at high water.



Base: USGS base map E. Middlebury, VT, 1972 data



0 750 feet

Source: CVPS 1994, as modified by staff

Figure 4: SILVER LAKE EROSION

- (C) Slope instability above shoreline of short (20 foot) area between two large pines. Probably natural slippage of steep slope unrelated to reservoir activity.
- (D) Beach area between flume inlet channel and dam. This is a wide sandy beach area used for swimming and recreational purposes. Behind the beach is a relatively flat, grassy picnic area approximately 4 to 6 feet above the back side of the beach. The slope between the beach and the picnic area is steep with occasional trees. The slope material is a silty sand. At high water, wave action from the prevailing south wind has caused occasional loss of soil at the toe of the slope, which in turn has precipitated some more general sliding in the slope. Several birch trees lean nearly horizontal over the beach in the section closest to the dam.

Since the Knight (1994) report, CVPS has reduced the maximum operating level of Silver Lake from 1,249.0 feet USGS to 1,247.5 feet USGS during the period April 1 through December 31, yearly to reduce wave-induced erosion on shoreline areas.

b. Environmental impacts:

Sugar Hill Reservoir

The boat launch area at Sugar Hill reservoir receives silt washed down from the roadway above the reservoir. A site visit conducted in September 1995, did not reveal any other areas of erosion along the reservoir shoreline.

CVPS proposes to improve access to Sugar Hill reservoir by upgrading and paving the existing roadway leading to the boat launch area. Additionally, at the site visit, CVPS verbally indicated that it plans to place gravel along the hillside leading down to the boat launch area.

VANR, by letter dated April 19, 1996, commented that organic and fine soils in the fluctuating zone of much of the reservoir perimeter have washed away over time, exposing coarse material. The proposed conservation pool operating levels (see Section IV.C.2) would foster revegetation of this area over the long term, as siltation from spring runoff and leaf litter settle in this zone. In its draft WQC dated February 7, 1997, VANR states that CVPS should develop an erosion control plan prior to the construction or maintenance of any recreational facilities.

Our Analysis

We reviewed CVPS's proposed recreational measures. The road improvement and the addition of gravel along the hillside at the boat launch area should reduce the amount of erosion at the site. Additionally, because the fluctuating zone is presently depleted of fine material, and CVPS proposes to add gravel for the redeveloped boat launch area, siltation should be halted, thereby preserving the existing fishery and water quality conditions in the reservoir. To protect water quality in the reservoir during construction, we recommend that CVPS develop erosion control plans for the development of recreational facilities, in consultation with VANR, and file the plans as part of the final design drawings for the proposed recreation facilities.

Silver Lake

Beginning in fall 1994, CVPS began to voluntarily lower the maximum operating level of Silver Lake from 1,249.0 feet USGS to 1,247.5 feet USGS during the period April through December (Knight, 1994). CVPS proposes to maintain this operating scenario to reduce wave-induced erosion affecting the slope below the north shore picnic area.

CVPS states that slumping at the aforementioned site was exacerbated by recreationists using USFS lands. CVPS discusses an alternative option to discourage further slumping of the slope: application of riprap protection along the areas of greatest soil loss, and placement of stone against a layer of stabilized fabric.

USFS plans to hire an architect/engineering consultant to design the rehabilitation of the Silver Lake recreational area. The design will address erosion control, recreational access to the lake, bank revegetation, and control of recreational damage to historic sites. Optimistically, two years will elapse before the design work is completed and funding is received.

USFS (meeting on December 14, 1995) indicates that it would not support the riprap alternative option, as it is concerned with aesthetic values at the site. It also states (January 8, 1996) that the reduction in maximum water level in Silver Lake over the past year seems to have eliminated the wave undercutting that was a source of the shoreline erosion. Also, it does not feel that further immediate action to stop the erosion is warranted.

The State of Vermont, Water Quality Division (January 15, 1996), agrees that the placement of rock riprap is undesirable for stabilization and would compromise the aesthetics of this heavily used recreational area. Also, any erosion control measures would have to be complemented by a design for controlled

access so that foot traffic does not destabilize the area. It indicates that it has substantial experience with vegetative alternatives for shoreline stabilization and offers to assist in the USFS's design development.

VANR (April 19, 1996) recommends that the erosion on the eastern shoreline of Silver Lake be addressed preferably through a bioengineering approach in the USFS' rehabilitation plan.

The Natural Resources Conservation Service (NRCS) (January 23, 1996) provides three suggestions for stabilization of the beach area:

- reduce the maximum water level to 1,247.5 feet;
- bioengineer, using jute logs staked along the toe and native shrubs and grasses on the bank; and
- provide rock riprap with a geotextile filter.

The shoreline area between the restroom and the dam has many white birches that are hanging out over the lake. NRCS suggests cutting overhanging trees at the stump or significantly enough to reduce their weight pulling on the bank. Lastly, it recommends limiting pedestrian travel to the beach by way of constructed access points.

Our Analysis

We conclude that stabilizing the affected area is the responsibility of both CVPS (erosion caused by wave action) and the USFS (erosion caused by foot traffic). CVPS already has reduced shoreline erosion by lowering the reservoir's maximum operating level from elevation 1,249.0 feet USGS to elevation 1,247.5 feet USGS from April through December yearly. During the past 18 months, additional shoreline erosion due to wave action has been significantly reduced (Fred Putnam, USFS, December 8, 1995). Therefore, we recommend that the maximum operating level of Silver Lake be maintained at 1,247.5 feet USGS during the period from April through December of each year to minimize shoreline erosion.

We also recognize that project shoreline areas are under USFS jurisdiction. However, because the recreation opportunities are not a function of the hydroelectric development (i.e. recreation use of Silver Lake predated development of the project) we will not recommend that CVPS take additional actions to stabilize shoreline erosion areas. However, we do concur with the agencies' recommendations regarding a bioengineering approach to slope stabilization for the beach area around Silver Lake, supported by physical restrictions for limiting foot access. We also concur with the agencies that USFS should consider cutting back at the stump all trees on USFS lands leaning over the lake between the beach and the dam.

c. Unavoidable adverse impacts: None.

2. Water Resources

a. Affected environment: In this section, we discuss the quantity and quality of water resources at Sugar Hill reservoir, Sucker Brook diversion dam, and Silver Lake.

Water Quantity

The Silver lake Project includes a total drainage area of 10.2 square miles. Sucker Brook provides inflow to both Sugar Hill reservoir and to Silver Lake. Most of the project's drainage area is Sucker Brook drainage (9.6 square miles). The Silver Lake drainage area is 0.6 square mile.

Because no USGS streamflow data exists for this drainage basin, flow regime information for the Silver Lake Project is based on estimated inflow to the project. Comparisons to USGS flow records from two nearby Vermont gages, representing basins with similar size and drainage characteristics, were used to estimate inflows to the Silver Lake Project. Data from the USGS Ayers Brook gage (No. 01142500) were prorated to account for differences between drainage areas; estimates of inflow to the project were confirmed by evaluating the relationship of the project to the second gage, the Lewis Creek Tributary gage (No. 04282700). The period of record used was 1965 to 1990.

The Ayers Brook gage has a drainage area of 30.5 square miles, compared to the project's 10.2 square miles, and an average annual flow of 50.0 cfs, compared to a prorated estimate of 13.7 cfs at the Silver Lake Project. Based on data from the Ayers Brook gage, estimated maximum and minimum flows at the Silver Lake Project would have been 1,121 cfs (June 30, 1977) and 0.3 cfs (July 27, 1965), respectively.

CVPS provided flow duration curves that chart project inflows over time. The prorated average annual inflow to the Silver Lake Project was estimated to be 13.7 cfs. The monthly flow duration curves indicate that in July, the natural flow for the project is at least 2.5 cfs 80 percent of the time, and by August, a flow of 2.5 cfs is reached 50 percent of the time. By September, flows of 2.5 cfs occur approximately 80 percent of the time once again.

Sugar Hill Reservoir

Sugar Hill reservoir extends approximately 2,000 feet above the dam and has a surface area of approximately 66.5 acres at a normal surface elevation of 1,763 feet USGS. The current reservoir fluctuation ranges from 18 to 31 feet, with an annual average fluctuation of approximately 27 feet. Gradual draw-down

begins in September with maximum draw-down occurring by March. The reservoir begins to refill by early April, surcharged by spring runoff, reaching normal pond elevation of 1,763 feet USGS by June 1.

Sucker Brook Diversion Dam

Water travels downstream from Sugar Hill reservoir to Sucker Brook diversion dam where flows from Sucker and Dutton Brooks are diverted through a penstock to Silver Lake. The segment of stream that extends from Sucker Brook diversion dam to the North Branch of Sucker Brook is approximately 0.75 mile long. This reach of river presently receives a small quantity of local leakage flow (0.1 cfs) which is sufficient to avoid stagnation of otherwise small placid pools. The North Branch of Sucker Brook supplies additional flow to the lower portion of Sucker Brook, adding oxygen-rich water.

Silver Lake

Silver Lake has a surface area of approximately 110 acres. The total amount of storage it provides is 4,445 acre-feet when water levels are at the top of the dam (elevation 1,259 feet USGS), of which 2,875 acre-feet is useable. At normal maximum operating elevation (1,250 feet USGS), the total storage capacity is 3,120 acre-feet, with 1,550 acre-feet of useable storage.

The average annual change in water surface elevation is approximately 7.5 feet, for both wet and dry water conditions (average annual precipitation is 35 inches). Draw-downs typically begin in January and continue through March. During the month of April, the lake begins to receive controlled, spring releases from Sugar Hill and rapidly refills. During a wet year, the lake reaches normal full pond conditions by early June. However, during a dry year, the lake may not reach normal full pond conditions until late June. CVPS holds the level of Silver Lake relatively constant for the remainder of the year (July through December) to accommodate recreational uses.

Water Quality

The Vermont Water Resources Board has designated Sucker Brook drainage, as well as the Sugar Hill reservoir and Silver Lake, as Class B waters and coldwater fish habitat. This designation requires a minimum DO concentration of 6 milligrams per liter (mg/l) or 70 percent saturation at all times. Vermont Water Quality Standards (Water Resources Board, effective February 13, 1996) for Class B waters are as follows:

Class B waters shall be managed to achieve and maintain a high level of quality, which is compatible with the following beneficial values and uses:

1. Values - Water which is of a quality which consistently exhibits good aesthetic value and provides high quality habitat for aquatic biota, fish, and wildlife.

2. Uses - Public water supply with filtration and disinfection; irrigation and other agricultural uses; swimming and recreation.

Sugar Hill Reservoir

Data collected on June 14, 1991, from Goshen dam outlet structure indicate that the DO concentrations from the Sugar Hill reservoir spring runoff are well above standard in early summer. By mid July, however, the reservoir thermally stratifies, and water drawn through the intake has substandard DO concentrations.

During the July 16, 1991, sampling, water quality in Sugar Hill reservoir appeared to support the existing coldwater fishery. DO was consistently at or near 100 percent saturation in the upper 10 feet of the water column, and was well within a concentration range suitable for trout to a depth of at least 15 feet (80 to 94 percent saturation). Water temperatures ranged from 20 to 22 degrees Centigrade to a depth of 10 feet and 14 to 19 degrees Centigrade at greater depths.

In the upstream half of the reservoir, DO levels immediately above the bottom were relatively low (22 to 63 percent saturation). In the deep trough at the downstream end of the reservoir, near the dam outlet structure, the lowermost 10 feet of the water column was stratified with DO levels deficient for trout (12 to 20 percent saturation).

Additional samples were taken below the outfall structure at Goshen dam in 1992. The following substandard conditions were observed:

<u>DATE AND LOCATION</u>	<u>D.O. (mg/l)</u>	<u>SATURATION %</u>
July 26, 1991	5.5	59
July 30, 1992	6.4	66
	6.6	68
August 4, 1992	5.7	59
	5.8	60
August 15, 1992	5.8	60
	6.3	66
August 22, 1992	6.3	67
August 28, 1992	5.8	62
200 feet below outfall	6.4	68
400 feet below outfall	6.7	71
600 feet below outfall	7.4	79

As part of the environmental studies conducted at VANR's request, CVPS collected water quality data in the Silver Lake Project area under the normal mode of operation with a continuously maintained minimum flow of 2.5 cfs below Goshen dam. Pre-dawn samples were taken weekly under worst case situations (summer low flow, unit on line) from mid-July through August, 1992. The data collected at the six sampling locations indicate that the water quality conditions throughout the project generally maintain a high standard with the exception of water quality at the outlet structure of Goshen dam. Six of the eight sampling dates showed substandard DO concentrations at the outfall.

On August 28, 1992, three additional samples were taken at staggered locations below the discharge of Goshen dam to track reaeration within the natural streambed. Samples taken showed that DO concentration levels met the Class B standard within 200 feet of the dam outlet by attaining a DO level of 6.4 mg/l. The saturation level remained deficient at 68 percent.

Sucker Brook

During the 1991 and 1992 sampling, DO was measured at the bridge crossing of Forest Road 32 and Sucker Brook. The data indicate that water quality standards are exceeded at this portion of Sucker Brook during the low flow season.

Sucker Brook Diversion Dam

Sucker Brook diversion dam does not normally impound water, nor are minimum flows currently released. The pond's normal level is maintained at an approximate elevation of 1,288 feet USGS. Water sampled in 1991 and 1992 at the outfall of the diversion dam penstock at Silver Lake well exceeded state water quality standards during the low flow season.

Silver Lake

CVPS collected water quality data in the Silver Lake impoundment during mid-day on June 14, 1991, and pre-dawn on July 16, 1991. Silver Lake's temperature and DO at all locations and depths met Vermont water quality standards for a coldwater lake. The maximum depth sounded was 75 feet, with a pronounced thermocline existing below a depth of 14 feet. Temperature above the 14-foot depth was 21 to 23 degrees Centigrade and DO saturation was 93 to 110 percent. Below the thermocline, temperature ranged from 6 to 13 degrees Centigrade with 71 to 100 percent saturation.

b. Environmental impacts:

Sugar Hill Reservoir

Conservation Pool

As part of the ongoing Water Quality Certification negotiations, an alternative to the current Sugar Hill reservoir draw-down schedule was discussed by the parties. This alternative plan would result in the establishment of a reservoir conservation pool that would be held constant from July through March of each year.

CVPS provided additional information (AIR No. 7, February 1996) that graphically presents the rule curve for the proposed conservation pool. From July through March of each year, the water level would remain constant, providing a water depth of 37 feet. The maximum water level would be attained around mid-May with a water depth of approximately 50 feet. The water depth would then be decreased to 37 feet by mid-June (Figure 2). Therefore, the reservoir elevation would be allowed to rise during spring runoff, and then be brought down to the conservation pool level by July 1. This plan would result in the elevation of the reservoir being up to 13 feet lower than current levels during the critical water quality months of July and August, thereby reducing the likelihood of thermal stratification.

The total acreage calculated for the shoreline area affected by water level changes is approximately 21.3 acres, with more than half of that acreage located at the southern portion of the reservoir (12.7 acres). CVPS concludes that this lower elevation would prevent reservoir stratification that has resulted in deficient DO conditions below Goshen dam outfall.

VANR (draft WQC dated February 7, 1997, and letter dated February 12, 1997) recommends a modified operating protocol for Sugar Hill reservoir that would stabilize impoundment levels and provide minimum flows to the reach below Goshen dam. This proposal would allow for smaller (4-foot) fluctuations of the reservoir. VANR also specifies in its draft WQC that CVPS should develop an operating plan for Sugar Hill reservoir outlining how the dam will be operated within the management objectives presented in Condition B of the draft WQC. VANR states that the operating plan should include performance expectations for equipment, methods, and supporting calculations used as well as consideration of how often the valve system will have to be adjusted under different conditions.

VANR recommends using reservoir storage between 1 foot above the conservation pool elevation (1,750.0 feet) down to 3 feet below the conservation pool elevation to sustain summer to early

fall minimum flows in all but the driest years. When necessary, conditions would become run-of-river to prevent the reservoir from falling below elevation 1,747.0 feet. Otherwise, a minimum flow of between 1.3 cfs and 2.0 cfs would be required from the end of spring runoff (approximately July 1) through October 15.

After October 31, and until the beginning of spring runoff, the objective would be to avoid drawing the reservoir below the fall elevation at which herptiles have selected overwintering habitats in each individual year. VANR recommends that the reservoir be allowed to rise up to the conservation pool level, if not at that level, in late October. If the reservoir were to rise above the conservation pool level due to a winter thaw condition or fall rain event, it would be brought back down to elevation 1,750 feet. Within these constraints, the objective would be to maintain a flow of 2.5 cfs downstream during this period.

With the advent of spring runoff, VANR recommends that the reservoir level be allowed to increase to store additional volumes of water. As spring flows begin to recede, the reservoir would be drawn down to reach the conservation pool elevation by July 1. During this period, CVPS would maintain a minimum flow of 2.5 cfs below Goshen dam.

Our Analysis

We evaluated VANR's proposal for implementing a conservation pool operating plan at Sugar Hill reservoir and find that improved water quality conditions would result from maintaining more constant reservoir elevations from July through March of each year. The recommended operating regime would lower the elevation of the reservoir up to 13 feet below current levels during the critical water quality months, reducing the likelihood of thermal stratification and associated substandard DO levels. Further, this type of operation would enable CVPS to release continuous minimum flows during the low flow season without requiring large magnitude draw-downs. In addition, this regime would protect other environmental resources by maintaining reservoir elevations deep enough to support the existing reservoir fishery, increasing wetland productivity, and protecting hibernating reptiles and amphibians from being frozen during winter draw-downs. Therefore, we recommend that CVPS develop a plan, in consultation with VANR and Interior, to operate Sugar Hill reservoir in a manner that meets the management objectives required in VANR's draft WQC.

Water Quality Monitoring

CVPS's sampling data indicate that natural reaeration of the water in Sucker Brook below Goshen dam enables outflows deficient in DO to reach state standards within approximately 200 feet of

the dam. CVPS set up a temporary baffle during the 1992 sampling effort at Goshen outfall. DO levels significantly improved upon passing through the baffles placed at the outlet structure (66 percent saturation).

CVPS proposes to implement a water quality monitoring plan in the reach below Goshen dam during the first summer following the issuance of any license. The plan calls for a pre-dawn DO sampling program to be repeated at the outfall of Goshen dam control structure and in Sucker Brook approximately 200, 400, and 600 feet below the control structure. Samples would be taken weekly from mid-July through August prior to 6:00 am to avoid photosynthetic influence from algae.

DO readings at each of the four sampling sites would be taken at two locations within the stream cross section, in a reach with uniform flow. If the readings indicate a substandard condition (less than 6.0 mg/l and 70 percent saturation), then CVPS would install a reaeration baffle at the outfall of Goshen control structure. Resampling would be performed the following morning after reaeration conditions have been allowed to stabilize.

CVPS proposes to file its monitoring results by January 1 following the sampling period. In this report CVPS would summarize the data collected, and it would make recommendations regarding the permanent use of the baffle; modifications to the baffle, if necessary; and the need for any additional monitoring.

VANR (letter dated April 19, 1996) indicated that the lower summer operating level of Sugar Hill reservoir would reduce the potential for stratification, but that a DO level higher than 6.0 mg/l and 70 percent saturation should be agreed upon as a trigger level for the installation of the baffle. It also requested that CVPS develop a plan for retaining the baffle in place until the end of the critical water quality season. The agency suggests these higher levels because 6.0 mg/l and 70 percent saturation are minimum, not optimum, levels for productivity. VANR (draft WQC dated February 7, 1997) recommends that CVPS monitor DO and water temperature immediately below the Goshen dam outlet. VANR states that monitoring should occur from June through October during the first full season of operation with Sugar Hill reservoir at conservation pool elevations.

Interior addressed water quality concerns as part of its 10(j) recommendations dated April 19, 1996. Condition No. 1 requires that the applicant manage Sugar Hill reservoir with a stable conservation pool from the beginning of July through the beginning of March. Interior also stated that it supports the applicant's proposed DO monitoring plan below Goshen dam.

Our Analysis

We have reviewed the existing water quality data provided by CVPS for the 1991 pre-dawn DO sampling effort (March 12, 1993). We conclude that substandard releases from Goshen dam would occur by late July, once Sugar Hill reservoir stratifies. Although water withdrawn through the intake structure under the recommended reservoir operating regime would have higher DO concentrations than water that is presently withdrawn, it may still be substandard or nearly substandard.

Because water quality data for Goshen dam indicate that substandard conditions currently exist during July and August, and to try to eliminate potential delays between monitoring efforts and the installation of a baffle system where violations of state water quality standards could occur, we recommend that CVPS install the baffle system for the duration of the low flow period, from July 1 to September 1. This would provide continuous enhancement of water quality conditions below Goshen dam during the low flow season. In addition, we recommend that CVPS monitor downstream DO and temperature to verify that state standards are being met through utilization of the baffle system. The sampling period recommended by VANR, from June through October, represents the time of year during which water quality violations are likely to occur. We, therefore, recommend that CVPS monitor water quality from June through October during the first full season of operation with the Sugar Hill Reservoir at its new conservation pool and report the results to VANR, Interior, and the Commission.

Minimum Flows and Ramping Rates Below Goshen Dam

CVPS proposes to release a minimum flow of 2.5 cfs or inflow, whichever is less, from Sugar Hill reservoir to enhance aquatic resources in the 2.6 mile reach of Sucker Brook below Goshen dam.

VANR recommends (draft WQC dated February 7, 1997, and letter dated February 12, 1997) a modified operating protocol for Sugar Hill reservoir that provides for a range of minimum flows to the reach below Goshen dam. Recommended flows, ranging from inflow to 2.5 cfs, are contingent on time of year and reservoir level. VANR also requires CVPS to develop a ramping plan to control flow fluctuation rates downstream of Goshen dam and to protect downstream aquatic life.

Interior indicates that it recommends a release of 2.5 cfs below Goshen dam, based on stream habitat concerns below Sugar Hill reservoir. Its 10(j) recommendations include Condition No. 5, requiring CVPS to develop ramping procedures for Goshen dam. Because the maximum capacity of the gate release is 60 cfs, large

fluctuations of flows are possible. It recommends that a ramping procedure be implemented for flow changes greater than 10 cfs.

Our Analysis

We reviewed the information on flows below Sugar Hill reservoir, including CVPS's flow demonstration video (February 1995) of existing leakage flow, and releases of 1 cfs, 3 cfs, 5 cfs, and 8 cfs. We conclude that both water quality and aquatic resources in Sugar Hill reservoir would benefit by reducing reservoir fluctuations. However, the maintenance of a relatively stable reservoir elevation would limit the potential to provide a 2.5 cfs minimum flow below Goshen dam. Although water movement in the portion of Sucker Brook below Goshen dam is slow in areas and water depth is shallow, a minimum flow release of 1.3 cfs during the low flow period (from July to September) would provide sufficient flows to protect water quality there. A 1.3 cfs minimum flow below Goshen dam also would maintain the impoundment elevation which would enhance water quality and fisheries in Sugar Hill reservoir. However, VANR's recommendation for releases up to 2.5 cfs represents a valid WQC condition and we are required to adopt it. Therefore, as discussed in the section on the Sugar Hill reservoir conservation pool, we recommend a revised minimum flow regime for Sucker Brook below Goshen dam based on management objectives required by VANR in its draft WQC dated February 7, 1997.

We also reviewed the release capacity of the gate at Goshen dam. Because the maximum release can be as high as 60 cfs, fluctuating flows may adversely affect downstream fish by stranding or flushing. We, therefore, recommend that CVPS develop a plan, as required by VANR and Interior, to ramp Goshen dam releases that exceed 10 cfs. This plan should be developed in consultation with VANR and Interior, and be submitted to the Commission, for its review and approval.

Sucker Brook

Minimum Flows

CVPS proposes to provide a 1.0 cfs release below Sucker Brook diversion dam to enhance the aquatic, vegetative, and aesthetic resources of that reach. This proposed flow would substantially exceed the present leakage conditions. CVPS proposes to release this minimum flow over the spillway portion of the dam through a flashboard weir.

CVPS provided a flow demonstration video (February 1995) of existing leakage flow, and releases of 1 cfs, 3 cfs, 5 cfs, and 8 cfs. An additional flow demonstration was conducted on November 1, 1996, to assess potential coldwater fisheries habitat in the downstream reach under flow releases of 2 and 3 cfs.

VANR states that it has no reason to suspect that water quality problems would occur below Sucker Brook diversion dam provided that flows are released into the reach below the dam, and CVPS does not impound water behind the diversion dam. VANR recommends (draft WQC dated February 7, 1997) that CVPS maintain a minimum flow to the Sucker Brook bypassed reach below Sucker Brook diversion dam of 2.5 cfs from April 1 through September 30 and 3.5 cfs from October 1 through March 31. VANR states that the bypassed flow should be discharged over the dam spillway on the right side of the river to prevent dewatering of the stream channel. VANR specifies that CVPS should submit descriptions, hydraulic design calculations, an implementation schedule, and details of how the bypassed flows will be provided.

Our Analysis

We reviewed the flow release video and water quality data to determine if increased flows in this reach of Sucker Brook are warranted to improve water quality. Under present leakage conditions, water quantity below the diversion dam is limited and results in degraded water quality conditions that may violate state standards. We conclude that CVPS's proposed release of 1.0 cfs would enhance water quality in the stream reach below the Sucker Brook diversion dam.

Although CVPS's proposed 1.0 cfs release would improve water quality over present leakage flow conditions, we conclude that a release of 2.0 cfs would provide consistently better habitat conditions by increasing wetted perimeter, velocity, and depth in the 0.75-mile-long reach from the diversion dam to the confluence with the North Branch. Additionally, surface aeration was visible under a 2.0 cfs release. We conclude that provision of a minimum flow release of 2.0 cfs, or inflow, whichever is less, to Sucker Brook below the diversion dam would adequately enhance aquatic conditions (water quantity and quality) in this reach. However, we are obligated to adopt the minimum flows required by VANR. Therefore, we recommend that CVPS discharge minimum flows into Sucker Brook below the diversion dam of 2.5 cfs from April 1 through September 30 and 3.5 cfs from October 1 through March 31, as specified by VANR in its draft WQC.

We reviewed CVPS's proposed mechanism for releasing minimum flows below the diversion dam. To divert water to the bypassed reach, CVPS proposes to impound water behind the diversion dam and to release flows over the spillway section of the dam. This method would require inundation of a highly productive, 1.8-acre, emergent wetland located behind the dam.

CVPS indicates that a water depth of 6 feet or more would be ponded behind the diversion dam as a result of modifications required to release flows over the spillway, permanently flooding the existing wetland. During low flow, high temperature periods,

this ponded water could increase in temperature, become oxygen-depleted, and experience high nutrient levels due to organic decomposition of the existing wetland vegetation. Flows released in this manner could result in degraded water quality that could potentially affect target aquatic habitat downstream. Although DO levels would quickly return to acceptable levels for Class B waters, temperature would not recover as quickly, and high nutrient loading could occur.

Therefore, to protect the wetland system behind the diversion dam and maintain water quality conditions that meet state standards, we returned to CVPS's original plan to provide continuous flows below the diversion dam via a pipe attached to the existing penstock. This minimum flow pipe would discharge flows approximately 100 yards downstream of the diversion dam.

We conclude that CVPS's original approach to provide minimum flows via a penstock pipe would ensure that water quality would meet state standards below the diversion dam and preserve the existing Class 2 wetland. This wetland is significant in that it provides many functions for wildlife and high values for soil stabilization and water filtration. If water were ponded behind the diversion dam, the emergent wetland marsh would transition to a deep wetland habitat with a much lower filtering capacity to provide clean oxygenated water to the downstream reach of Sucker Brook. However, because the WQC requires that bypassed flow be discharged through the dam spillway on the right side of the river, we are obligated to adopt this VANR WQC condition.

In conclusion, we recommend that CVPS develop a plan to release a minimum flow of 2.5 cfs from April through September 30 and 3.5 cfs from October 1 through September 30 below the Sucker Brook diversion dam over the dam spillway on the right side of the river. This plan should include descriptions, hydraulic design calculations, an implementation schedule, and details of how the bypassed flows will be provided. The plan should be developed in consultation with VANR and Interior, and then filed with the Commission for approval.

Water Temperature

CVPS proposes no measures for the enhancement of water temperature in Sucker Brook below the diversion dam.

VANR recommends (draft WQC dated February 7, 1997) that CVPS monitor water temperature at Sucker Brook diversion dam from June through October during the first full season of operation of Sugar Hill reservoir at its new conservation pool. VANR states that monitoring should occur weekly between noon and 4:00 PM at the following locations: (1) Dutton Brook immediately upstream of the dam backwater; (2) Sucker Brook immediately upstream of the dam backwater; and (3) discharge of the dam.

Our Analysis

Water temperature monitoring at Sucker Brook diversion dam upstream of impounded reaches and below the dam would provide information as to how the dam affects water temperature. While we did not consider Sucker Brook diversion dam to have a negative impact on water temperature, VANR's recommendation represents a valid WQC condition and we are required to adopt it. We, therefore, recommend that CVPS monitor water temperature weekly between noon and 4:00 PM at the following locations: (1) Dutton Brook immediately upstream of the dam backwater; (2) Sucker Brook immediately upstream of the dam backwater; and (3) discharge of the dam. CVPS should monitor DO and temperature from June through October during the first full season of operation following implementation of the new minimum flow releases, and report the results to VANR, Interior, and the Commission.

Silver Lake

Water Quality

CVPS proposes no measures for the enhancement of water quality in Silver Lake.

VANR suggests that CVPS conduct post-licensing studies to determine whether substandard conditions exist below the project tailrace due to stratification in Silver Lake. VANR recommends (draft WQC dated February 7, 1997) that CVPS monitor, during the first full season of operation with the Sugar Hill reservoir at its new conservation pool, DO and water temperature in the powerhouse tailrace below the fish exclusion racks. VANR recommends that sampling occur weekly from June through October.

Our Analysis

We reviewed the limited water quality information for Silver Lake and determined that, although a thermocline existed at 14 feet on July 16, 1991, DO saturation levels were recorded between 71 and 100 percent. In addition, water quality information indicates that standards are met within at least 14 feet of the surface; saturation levels exceed the minimum required; and trout and smelt populations there are self-sustaining. We conclude that project operations are not having an impact on the water quality of Silver Lake and, therefore, we do not recommend additional water quality monitoring in Silver Lake.

We also reviewed water quality data for the powerhouse tailwater discharge to determine the effect of tailwater mixing on ambient stream conditions and ultimately on the quality of water delivered to Lake Dunmore. The sampling occurred 0.25-mile below the confluence of the tailwater with Sucker Brook.

During the 1991 pre-dawn sampling effort in July and August, water quality did not become substandard. On July 26, 1991, the pre-dawn sample recorded a DO concentration of 7.0 mg/l and a saturation level of 86 percent. This was the lowest concentration recorded in the tailwater during that year, but still above state standards for Class B waters.

Our review of water quality data from the 1992 sampling effort indicates that, during July and August, DO never fell below 7.4 mg/l and 91 percent saturation. We, therefore, conclude that, because water drawn from Silver Lake and discharged through the turbine exceeds state standards, the project has no adverse water quality impacts on Lake Dunmore. However, VANR's recommendation for water quality monitoring in the powerhouse tailrace below the fish exclusion rack represents a valid WQC condition and we are required to adopt it. Therefore, we recommend that, from June through October during the first full season of operation with the Sugar Hill reservoir at its new conservation pool, CVPS monitor DO and water temperature below the fish exclusion rack in the powerhouse tailrace. We further recommend that CVPS report the results of the monitoring to VANR, Interior, and the Commission.

Project Flow and Reservoir Level Monitoring

CVPS proposes no measures for monitoring project flow and reservoir levels.

To demonstrate that project operation is consistent with all applicable requirements, VANR specifies in the draft WQC (dated February 7, 1997) that CVPS should develop a plan for monitoring (1) instantaneous flow releases at the project below both dams and below the powerhouse tailrace; and (2) reservoir inflows and water levels of Sugar Hill and Silver Lake reservoirs. VANR states that, following approval of the monitoring plan, CVPS should measure and record instantaneous flows and reservoir level.

Our Analysis

Minimum flow releases and impoundment water levels must be monitored to ensure habitat enhancements and compliance with license conditions. Therefore, we recommend that CVPS develop a monitoring plan that would provide for measuring: (1) flow releases at the project below both dams and below the powerhouse tailrace; and (2) reservoir inflows and water levels at Sugar Hill and Silver Lake reservoirs. The plan should provide for flow and reservoir level records to be made available to agencies and the Commission upon request. The plan should be developed in consultation with VANR and Interior, and filed with the Commission for approval.

Trashrack Debris Disposal

CVPS proposes no measures regarding handling of trashrack debris disposal. VANR recommends (draft WQC dated February 7, 1997) that CVPS develop a plan for disposal of debris, including trashrack debris, that accumulates at project works.

Our Analysis

In general, river debris, including lumber, floating trash, brush, and vegetation, regularly collects on the trashracks of hydroelectric projects. We agree with VANR that trashrack debris should be removed and disposed of in an appropriate manner that meets state, county, and municipal regulations. Therefore, we recommend that CVPS develop a debris disposal plan, in consultation with VANR and Interior, to be implemented following Commission approval.

c. Unavoidable adverse impacts: None.

d. Cumulative impacts: Release of minimum flows over the Sucker Brook diversion dam spillway could degrade water quality conditions by spilling oxygen-depleted water downstream. This would result from an increase in water depth of 6 feet or more behind the dam. This ponded water would become warmer than the water that is presently flowing down Sucker Brook. Consequently, it has a higher potential of becoming oxygen-depleted during the low flow months.

3. Aquatic Resources

a. Affected environment: The aquatic resources affected by the Silver Lake Project include those fish populations and aquatic biota inhabiting: Sucker Brook drainage area (Sugar Hill reservoir, Sucker Brook diversion dam, and stream reaches); Silver Lake drainage area; and the Silver Lake bypassed reach.

Sugar Hill Reservoir

VANR manages Sugar Hill reservoir as a put-and-take brook trout fishery. Sucker Brook enters Sugar Hill reservoir at a wetland area located along the southeastern shoreline of the reservoir. Minnows and other small forage organisms use a shoal adjacent to this wetland. CVPS notes that the section of Sucker Brook upstream from the reservoir supports a small area of spawning habitat for brook and brown trout and sculpin.

Resident fish of the reservoir consists of a warmwater assemblage including rock bass, sunfish, and minnows. Severe draw-downs, primarily during winter months, may have limited aquatic vegetation production and productivity of the warmwater assemblage.

Sucker Brook Between Sugar Hill Reservoir and Sucker Brook Diversion Dam

Habitat types consist of a terraced series of small rapids, eddies, and pocket pools, which appear to be capable of supporting riffle-dwelling small fish such as sculpin. At the Forest Road 32 crossing, Sucker Brook enters a transition zone between the high-gradient upper section and a lower gradient reach immediately upstream from Sucker Brook diversion dam. Transition zone habitat is comprised of small pools, runs, riffles, and some undercut banks and side channels. The stream channel is consistently 20 feet wide; some pools are conceivably deep enough to support a few larger game fish.⁹ Habitat for all life stages of brook trout and other small stream minnow species is present in this reach.

Sucker Brook Diversion Dam

The stream reach that extends from Sucker Brook diversion dam to the North Branch of Sucker Brook presently receives a small quantity of leakage flow from the diversion dam (approximately 0.1 cfs), which is sufficient to avoid stagnation of otherwise small and placid pools. The North Branch of Sucker Brook is an unregulated perennial stream.¹⁰ GMNF previously estimated the fish carrying capacity for salmonids in this section of Sucker Brook and the North Branch based upon a one-time sampling effort. GMNF's fish survey indicates that wild brook trout exist in the North Branch of Sucker Brook.

Habitat types in the stream segment between the North Branch confluence with the main stem of Sucker Brook and the Falls of Lana include pools and rapids similar to the high gradient segment of upper Sucker Brook, except this section is wider (20 to 30 feet in width). One other unnamed stream contributes water to Sucker Brook from the slopes of Mt. Moosalamoo before the descent over the Falls of Lana.

Below the falls, Sucker Brook descends over a series of cascades to State Highway 53, where it becomes a low-gradient gravel-cobble stream, receiving water from the Silver Lake powerhouse tailrace and entering Lake Dunmore approximately 0.25 mile downstream of the powerhouse. According to VANR, this lower segment of Sucker Brook supports all life stages of resident brook and brown trout. VANR also states that smelt spawn below the project tailrace.

⁹ The legal catch for brook trout is 8 inches. Vermont Management Plan for Brook, Brown, and Rainbow Trout, September 1993.

¹⁰ A perennial stream maintains a continuous flow year-round.

Silver Lake

Silver Lake receives water from Sucker Brook diversion dam through a penstock/open conduit, and it is managed to support a coldwater fishery. VANR stocks the lake with both rainbow and brook trout, smelt, and, to a lesser extent, brown trout and perch. Habitat and water quality are satisfactory to support this management activity. A brown trout population is self-sustaining but at a low level. The smelt population is self-sustaining and spawns in the inlet channel and possibly within the lake.

An unnamed streambed located approximately 0.3 miles upstream of the Falls of Lana is wetted by gate leakage (.25 cfs) from Silver Lake dam. This streambed descends through the forest over a moderate gradient, crosses the National Forest access road between Silver Lake and the Falls of Lana, enters a beaver-dam created wetland, and then descends steeply in a narrow wooded gully. The flow becomes subterranean approximately 500 feet below the wetland area and does not reappear. There is no significant fish resource value within this streambed.

b. Environmental impacts:

Sugar Hill Reservoir

Conservation Pool

As previously discussed, CVPS proposes to maintain a conservation pool water elevation in Sugar Hill reservoir from July through March of each year. CVPS provided additional information (February 1996) which graphically presents the rule curve for the proposed conservation pool (see Section IV.C.2 Water Resources).

GMNF (April 6, 1996) expressed concern regarding the selection of conservation pool water elevations. It recommends that water levels be maintained at a sufficient depth to allow fish populations to survive. By letter dated October 10, 1996, GMNF expressed concerns regarding a reduction in flows from the current release of 2.5 cfs and the potential impacts on the existing fishery between Goshen dam and the diversion dam.

VANR (letter dated April 19, 1996, draft WQC dated February 7, 1996, and letter dated February 12, 1997) indicated that the proposed conservation pool elevation would be surcharged by spring runoff. This additional volume of water would be released by July 1, returning the reservoir to the conservation pool level for the remainder of the year. This proposal would reduce the concern over winter holdover of brook trout (put-and-take), resident rock bass, sunfish species, minnows, and for fish that move downstream from small tributaries to overwinter (brook and brown trout and sculpin). The proposed conservation draw-down

would provide an assured reservoir volume approximately 48 times the historical minimum volume. This volume would support overwinter survival of fish and would allow for the production of aquatic macrophytes for the warmwater fish habitats.

Interior (April 19, 1996) concurs with VANR's analysis, and it recommends that Sugar Hill reservoir be managed with a stable conservation pool at a water depth of 37 feet (1,750 feet USGS) from the beginning of March. Spring runoff can then be collected on top of the pool as surcharged from March through June. The conservation pool elevation should be restored by July.

Our Analysis

After evaluating the proposals for establishment of a conservation pool at Sugar Hill reservoir, we conclude that aquatic resources would benefit from implementation of an operating regime that stabilizes water levels. Stable pond elevations during the early summer period are critical for late spring spawners in the reservoir and for establishment of macroinvertebrate and macrophytic populations. This measure would also eliminate the current severe winter draw-down, enhancing the productivity of vegetation that provides suitable spawning habitat and protection from predation for the resident fisheries and benthic invertebrates. Additionally, the conservation pool would enhance water quality by increasing the DO levels for the water passing through Goshen dam. This would be achieved by lowering the impoundment water level so that the Goshen intake receives water from the epilimnion (oxygen-rich water near the surface) as opposed the hypolimnion (oxygen-poor water found deeper in the water column) under current conditions.

This type of operation would also benefit reptiles, amphibians, and, to a lesser extent fish, invertebrates, and macrophytes during the period between October 31 and March 31 of each year when draw-downs can expose overwintering habitat to freezing temperatures.

Therefore, we recommend that the conservation pool be implemented, as proposed in Section IV.C.2 and required by VANR in its draft WQC. These lake level restrictions represent a significant enhancement for aquatic resources.

Minimum Flows and Ramping Rates Below Goshen Dam

CVPS proposes to release 2.5 cfs or inflow, whichever is less, from Sugar Hill reservoir through Goshen dam, which is equal to ten times the 7Q10 flow¹¹ below Goshen dam.

¹¹ The 7Q10 flow is the minimum average 7-day flow expected to occur every 10 years.

As stated in the Water Resources section, VANR recommends (draft WQC dated February 7, 1997, and letter dated February 12, 1997) a modified operating protocol for Sugar Hill reservoir that provides for a range of minimum flows to the reach below Goshen dam. Recommended flows, ranging from inflow to 2.5 cfs, are contingent on time of year and reservoir level. VANR also requires CVPS to develop a ramping plan to control flow fluctuation rates downstream and protect downstream aquatic life.

Interior (April 19, 1996) provided a 10(j) recommendation that would require CVPS to release an instantaneous minimum flow of 2.5 cfs, or inflow, to Sucker Brook below Goshen dam. By letter dated November 26, 1996, they agree with the VANR that a minimum baseflow of 1.3 cfs is the highest available flow during the low flow season if the revised conservation pool elevations are implemented. They also recommend that CVPS develop a ramping procedure for flow changes greater than 10 cfs below Goshen dam to prevent flushing or stranding of fish below the dam.

Our Analysis

We evaluated data on flows, fishery resources, and aquatic habitat between Goshen dam and Sucker Brook diversion dam. Although the fishery in this stream segment is limited, there is habitat for small, riffle-dwelling species and all life stages of brook trout along this reach.

We compared the benefits to water quality and aquatic resources from implementing the conservation pool elevations described in Section IV.C.2 at Sugar Hill reservoir to the associated water quality and aquatic resources habitat impacts in the reach below Goshen dam. We conclude that benefits from the conservation pool elevations outweigh the potential impacts on the limited fishery of the downstream reach between Goshen dam and the diversion dam. The maximum available flow of 1.3 cfs during the low flow season (except during the driest of years) would provide adequate depth, wetted perimeter, and aeration to support the existing aquatic water resources in this stream reach. Therefore, we recommend that CVPS develop a plan, in consultation with VANR and Interior, to operate Sugar Hill reservoir in a manner that meets the management objectives, including the specified minimum flows below Goshen dam, required in VANR's draft WQC.

Because the maximum release from Goshen dam can be as high as 60 cfs, fluctuating flows may adversely affect downstream resources by stranding or flushing. Therefore, as required by VANR and Interior, we recommend that CVPS develop a ramping plan for flow changes that exceed 10 cfs. This plan should be developed in consultation with VANR and Interior and submitted to the Commission for review and approval.

Sucker Brook Diversion Dam

Minimum Flows

CVPS proposes to release a minimum flow of 1.0 cfs, or inflow, whichever is less, below Sucker Brook diversion dam to enhance the aquatic, vegetative, and aesthetic resources of that reach.

GMNF (April 4, 1996) indicates that minimum flows of 3 cfs or higher in Sucker Brook would eliminate or greatly reduce flows into Silver Lake during the peak recreational season. The lack of inflow would reduce flows at the penstock flume, a favorite fishing spot and visual attraction. The agency further states that the resulting lower levels of the impoundment would compromise the aesthetic value of the lake by leaving an "unsightly bathtub ring."

As previously mentioned in the Water Resources section, VANR recommends (draft WQC dated February 7, 1997) that CVPS maintain a minimum flow to the Sucker Brook bypassed reach below Sucker Brook diversion dam of 2.5 cfs (or inflow, if less) from April 1 through September 30 and 3.5 cfs (or inflow, if less) from October 1 through March 31. VANR states that the bypassed flow should be discharged through the dam spillway on the right side of the river to prevent dewatering of the stream channel. VANR specifies that CVPS should submit descriptions, hydraulic design calculations, an implementation schedule, and details of how the bypassed flows will be provided.

Interior (April 19, 1996) originally provided a section 10(j) FPA recommendation that would require CVPS to release an instantaneous minimum flow of 5 cfs, or inflow, whichever is less, to Sucker Brook below the diversion dam. Interior (letter dated November 26, 1996) revised its minimum flow recommendation for this stream reach. The agency now recommends minimum flows of 2.5 cfs from June 1 through October 1, and 3.5 cfs for the remainder of the year to protect spawning and incubation habitat. (The current November 26, 1996, flow recommendation is considered pursuant to Section 10(a) rather than Section 10(j) of the FPA because it was not timely filed.)

Our Analysis

We noted the comments of VANR and Interior regarding the relative improvements to trout habitat of incremental increases in flow releases from Sucker Brook diversion dam into this stream reach. We participated in CVPS's flow demonstration study, reviewed the fisheries and water quality data for this reach of the stream, and observed available habitat during a site visit in September 1995, and during the November 1996, flow demonstration. Based on our observations at 2 cfs, pool depth appeared sufficient and water movement indicated variable velocities and

cover types. We concluded that a minimum flow of 2 cfs provides adequate trout habitat conditions in the reach below Sucker Brook diversion dam. As flows are increased to 5 cfs, pool depths become noticeably deeper, and water velocities appear to increase and become more variable.

From our observations at the site, we identified physical instream barriers that would prohibit upstream trout migration under most flow conditions. These barriers represent a significant factor limiting the potential to establish self-sustaining trout populations. The Falls of Lana and two additional barriers, located in Sucker Brook between the diversion dam and confluence with North Branch of Sucker Brook, would preclude all upstream trout migration, except perhaps during extreme high flow events.

We expect that continued downstream movement of trout in the bypassed reach of Sucker Brook, in the absence of subsequent upstream migration over these barriers, would prohibit the establishment of a self-sustaining trout population regardless of minimum flow conditions. The uppermost reach of Sucker Brook, below Sucker Brook diversion dam, is an especially small reach that is, therefore, unlikely to support a self-sustaining trout population. However, these reaches could support a put-and-take fishery. We conclude that a minimum flow release of 2.0 cfs, or inflow, whichever is less, to Sucker Brook below the diversion dam represents an adequate enhancement of aquatic conditions and would provide trout habitat.

However, we are obligated to adopt the minimum flows required by VANR in its draft WQC. Therefore, we recommend that CVPS discharge minimum flows into Sucker Brook below the diversion dam of 2.5 cfs (or inflow, if less) from April 1 through September 30 and 3.5 cfs (or inflow, if less) from October 1 through March 31. We note that Interior's recommendation (dated November 26, 1996) calls for a release of 3.5 cfs from October 1 through May 31 and would provide slightly more flow during the spring. As discussed in Section VIII, we do adopt Interior's recommended time frame for its recommended minimum flows from Sucker Brook diversion dam under Section 10(a).

Silver Lake

Lake Level

CVPS proposes to maintain the water elevation of Silver Lake at 1,247.5 feet USGS from approximately late April through the end of December each year. From the beginning of January through the middle of March, the water elevation would drop to approximately 1,241.5 feet USGS to provide storage for snowmelt and spring runoff. From late March through late April, the water

elevation would rise until it reaches 1,247.5 feet USGS. The total shoreline area affected by water level changes at Silver Lake is estimated to be 1 acre.

VANR recommends (draft WQC dated February 7, 1997) that Silver Lake be maintained at the following elevations: between 1,246.5 and 1,247.5 feet msl from June through December; at 1,242.5 feet msl from January through May; and either fill or maintain lake level from March 15 through May 31.

Our Analysis

We considered how the proposed 6 foot winter draw-down would adversely affect existing aquatic resources in Silver Lake. Because Silver Lake is managed as a put-and-take fishery for recreational purposes, spawning management was not considered a pertinent issue. In general, the revised pond elevations would enhance conditions for aquatics as they would become more stable. Brook and brown trout, both fall spawners, reproduce to a limited extent within Silver Lake. Typically, brook trout spawn from mid-October through early December. Brown trout spawn slightly later than brook trout into early winter. Even though a thermocline is known to exist during the low flow season below 14 feet, oxygen levels appear to be sufficient to support stocked brook trout and any resident trout.¹²

Rainbow trout are also stocked, but are not known to reproduce in the inlet. Rainbow trout typically occur in lakes, but must have access to streams to reproduce. They are spring spawners (January through May) with high reproduction concentrated in April. Temperatures preferred for spawning, which occurs in streams over gravel bars, are in the range of 50 to 60 degrees F.

Brown trout feed on benthic invertebrates, insects, amphipods, and crustacea. Brook trout are voracious carnivores and eat aquatic insects, fish, salamanders, tadpoles, snakes, and even small mammals and terrestrial insects that fall into the water. Rainbow trout forage on aquatic and terrestrial insects, plankton, and larger invertebrates such as snails and leeches. They also prey on small fishes, especially sculpin and shiners.

CVPS (AIR number 7, February, 1996) provided a discussion on feasible draw-down regimes, including provisions for dry water years for both Sugar Hill reservoir and Silver Lake. CVPS concluded that since water levels would be constant from late April to the end of December, most aquatic insects would be protected in Silver Lake. This period of time includes breeding,

¹² Brook trout require relatively high oxygen levels.

egg laying, and the incubation season for most aquatic insects that are found to utilize Silver Lake.

The staff concludes that the proposed draw-down regime would enhance conditions in Silver Lake for resident species of both fish and macroinvertebrates. As trout populations are self-sustaining, water quality below the thermocline is presumed to be sufficient regarding oxygen and temperature requirements. Additionally, macroinvertebrates, which make up a substantial portion of the diet for resident trout species, would be more productive as a result of more stable pond elevations under the new proposal. Rainbow trout, if they were to spawn, are unlikely to be affected by the winter draw-down, as they will have already moved into the stream reach near the inlet to reproduce.

Therefore, we conclude that the following operation would protect and enhance the lake's fishery: maintain the water elevation of Silver Lake at elevation 1,247.5 feet USGS from April 30 through December 31 of each year; from January 1 through March 15, the reservoir elevation should be reduced to elevation 1,241.5 feet USGS to provide storage for snowmelt and spring runoff; and from March 16 through April 29, the water elevation should rise until it reaches 1,247.5 feet USGS.

In comparison with our findings, VANR's recommended operating levels, specified in its draft WQC, allow for a greater fluctuation during late spring through December (1 foot fluctuation) and a lake level that is 1 foot higher during January and February. VANR's recommended lake levels and times will enhance Silver Lake's fishery. Because we are obligated to adopt conditions of VANR's WQC, we recommend that CVPS maintain the maximum operating level of Silver Lake between 1,246.5 and 1,247.5 feet msl from June 1 through December 31; at 1,242.5 feet msl from January 1 through May 31; and either fill or maintain lake level from March 15 through May 31.

Smelt Spawning

CVPS proposes an operating protocol that protects smelt spawning. Operation of the Silver Lake powerhouse would cease after dark, unless the unit could be operated 24 hours per day for the duration of the 5 week smelt spawning period in the spring. Operation during the day would not be restricted. Because smelt spawn at night, these measures would either: (a) dewater the tailrace during the nighttime spawning period, directing the smelt further up Sucker Brook to suitable spawning habitat, or (b) provide continuous flows in the tailrace to protect any nests from desiccation or fluctuating flows. CVPS also proposes to monitor Lake Dunmore on a daily basis to determine when ice breakup occurs, triggering the onset of the spawning season.

VANR also states that, from March 15 through May 15, CVPS should generate during daylight hours only or around-the-clock. VANR commented (April 19, 1996) that the proposal for 24 hour operation or day-only operation during the duration of the season will be sufficient to protect smelt spawning and incubation. The agency, however, disagrees with the triggering method and duration of the proposed operation. It states that the spawning run may begin before ice out, and that five weeks is too short to provide for both spawning and incubation. It also suggests no decrease in the lake's water elevation during the smelt spawning and incubation period, which VANR identifies as March 15 through May 15.

Our Analysis

We reviewed smelt spawning records for a period of 35 years to determine the timing and duration of smelt spawning and incubation in this reach of Sucker Brook. Spawning records obtained from both CVPS and VANR indicate that spawning can begin by late March and end by early May. Typically spawning occurs over a period of 1 to 2 weeks in this stream reach.

Our analysis indicates that the typical period for fry hatching depends on water temperature; in Maine, another northern New England state, this period is 15 to 30 days long. Incubation trends shorten as water temperature increases. Because Sucker Brook sustains warmer water temperatures, we conclude that the incubation period for smelt in this area does not exceed 15 to 30 days.

If smelt spawning for this stream reach is typically 1 to 2 weeks, and incubation is not greater than 15 to 30 days, the applicant's proposed 5 week period for 24-hour operation or day-only operation is sufficient to protect smelt spawning and incubation. Therefore, we recommend that CVPS, in consultation with the VANR and Interior, develop and implement a project operations plan to regulate powerhouse flows during smelt spawning and incubation periods. The plan should provide for generation during daylight hours only, or, upon commencement of nighttime generation, convert to around-the-clock generation from March 15 through May 15.

Fish Protection Below the Silver Lake Tailrace

CVPS proposes to change the existing instantaneous shutdown mode from 60 cfs to natural flow (approximately 2.5 cfs) in three, 5-minute intervals (reduction from full to zero load over a 15-minute period). This would minimize fish stranding potential below the tailrace.

In 1992, CVPS installed a rigid fence structure at the tailrace confluence with Sucker Brook to prevent fish strandings.

This fish rack is angled at about 35 to 40 degrees downstream and has a clear bar spacing of about 1-3/4 inches and bar width of 1/4 inch. This rack is effective in preventing large fish from swimming into the tailrace section and becoming stranded.

Interior (April 19, 1996) provided a 10(j) recommendation that would require CVPS to develop a ramping plan for the tailrace that calls for the flow for the first and second five-minute periods not to exceed a 20 cfs change from the previous flow.

VANR recommends (draft WQC dated February 7, 1997) that CVPS develop a downramping plan for the Silver Lake tailrace to control reductions in powerhouse discharge and prevent stranding and mortality of downstream aquatic life. VANR notes (April 19, 1996) that the existing fish exclusion device (fish rack bar with spacing of 1-3/4 inches) only prevents large fish from entering the tailrace. VANR recommends (draft WQC dated February 7, 1997) that CVPS continue to maintain the existing fish exclusion device in the powerhouse tailrace.

Our Analysis

We agree that altering the project shutdown protocol would prevent fish strandings in the tailrace. Based upon our review of current operating protocol and the existing fishery resources, we recommend that CVPS develop and implement a plan to control downramping of powerhouse discharge at the Silver Lake tailrace. The plan should provide for downramping from full load (60 cfs) to zero load (inflow) over three, 5-minute intervals. Each interval should reduce the load by no more than 20 cfs. We also recommend that CVPS continue to maintain the fish exclusion rack located below the powerhouse tailrace to prevent fish strands in the tailrace.

c. Unavoidable adverse impacts: None.

d. Cumulative impacts: CVPS proposes a release of 1.0 cfs, or inflow, whichever is less, below Sucker Brook diversion dam to benefit downstream resources. Additionally, this release would not adversely affect the existing water quality, aquatic resources, aesthetic values, or recreational resources of Silver Lake.

The recommended release from Sucker Brook diversion dam of 2.5 cfs from April 1 through September 30, and the release of 3.5 cfs for the remainder of the year would enhance the target habitat, and would reduce flows to Silver Lake during the low flow season. Staff recommends that water quality monitoring be performed in the powerhouse tailrace. This should identify any potential impacts to the water quality of Silver Lake resulting from decreased lake inflow.

4. Terrestrial Resources

a. Affected environment:

Wetlands

Just west of Silver Lake, Chandler Ridge runs in a north-south direction and separates the largest waterbody in the area, Lake Dunmore, from the three waterbodies associated with the project to the east (see Figure 1). The ridge breaks at the Falls of Lana and continues north to Rattlesnake Point and beyond. Dominant overstory species in this area include red and sugar maple, elm, birch, aspen, beech, silver maple, and white pine. Forest types in the Silver Lake Project area include a birch-beech-maple forest at higher altitudes (elevation 1,300 to 1,500 feet USGS), changing to a hemlock-beech mixed forest as the elevation decreases from the ridge westward toward Lake Dunmore.

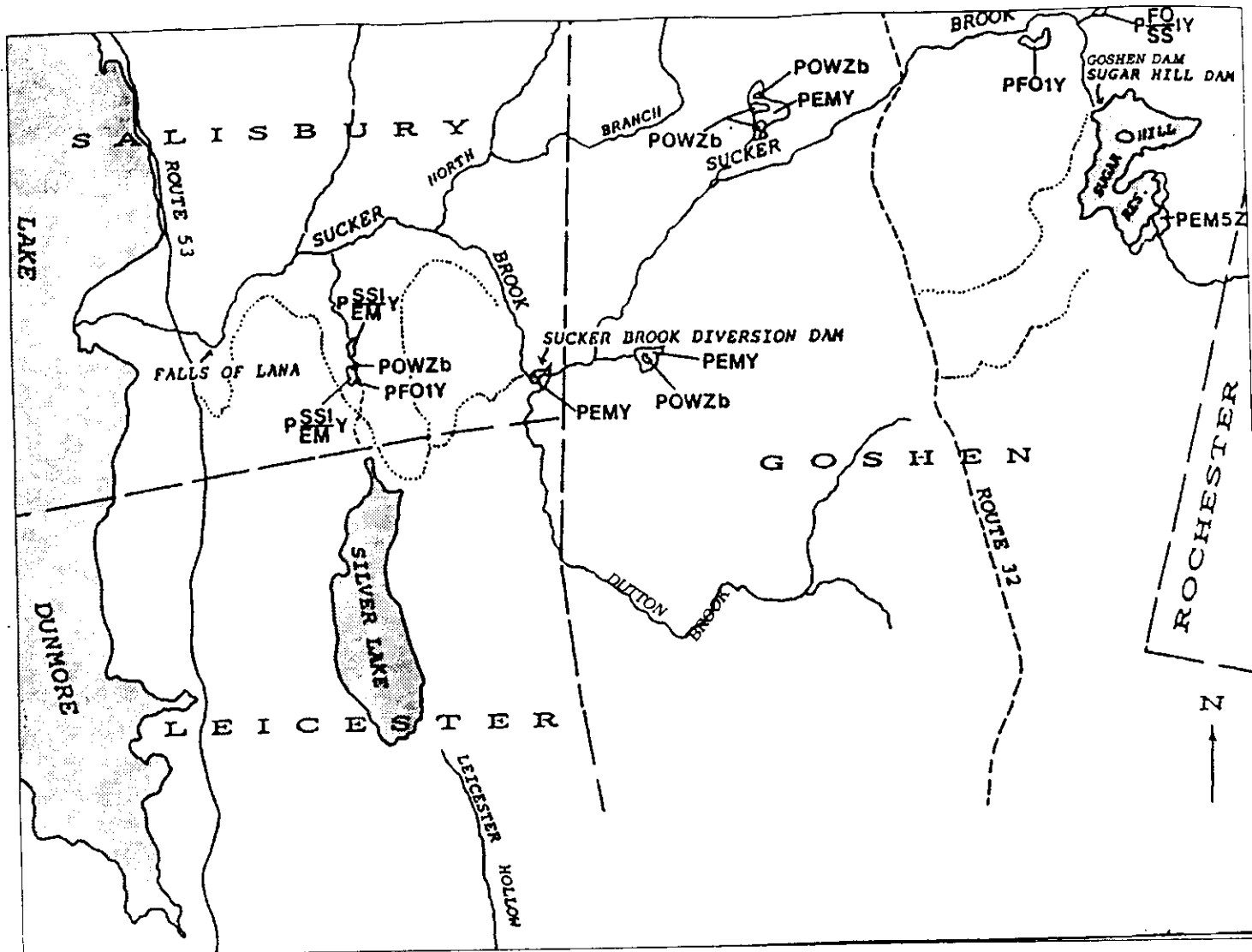
Wetlands mapped by the National Wetland Inventory (NWI) and CVPS are associated with Sugar Hill reservoir and Sucker Brook diversion dam; however, Silver Lake, the largest of the three waterbodies, has no surrounding wetlands that meet state or federal criteria. These wetlands provide important functions such as surface and ground water protection, erosion control, and wildlife and migratory bird habitat.

Addison County contains the second highest acreage of wetlands in Vermont. Many wetlands are found in and around the vicinity of the project, including those associated with the three project developments. Figure 5 shows those wetlands specific to the project area. CVPS identified palustrine wetlands, including forested, scrub-shrub, emergent, and open water wetlands, during its 1992 field investigations.

Sugar Hill Reservoir

Sugar Hill reservoir forms the eastern most waterbody of the Silver Lake Project (Figure 1). It is surrounded by second growth hardwoods, including gray birch, yellow birch, American beech, and sugar maple with scattered white pine and balsam fir (Interior, 1996). Surface waters cover more than 66 acres at normal pond elevation.

Wetlands are found where water depth is shallower, mainly at the southern end of the reservoir. This area contains an emergent wetland (PEM5Z or Palustrine narrow-leaved persistent emergent, intermittently exposed/permanent) approximately 3.5 acres in size containing the following dominant species: bulrushes, rushes, spikerush, and fowl meadow grass. Occasional shrubs such as meadowsweet and steplebush, sweet gale, and willows exist among the emergent vegetation.



key

- PFO1Y: Palustrine, broad-leaved deciduous forest, saturated / semi-permanent /seasonal
- PSS1Y: Palustrine, broad-leaved deciduous scrub / shrub, saturated / semi-permanent /seasonal
- PEMY: Palustrine, emergent, saturated / semi-permanent /seasonal
- PEM5Z: Palustrine, narrow-leaved persistent emergent, intermittently exposed / permanent
- POWZb: Palustrine, open water, intermittently exposed / permanent, influence by beaver

map source: Application for License - Silver Lake Hydroelectric Project CVPSC May 1994

Figure 5: PROJECT AREA WETLANDS
from 1988 aerial photography and 1992 Field Work

Other shoreline areas too small to be mapped as individual communities include wetland species such as shore horsetail, bog clubmoss, and little club-spur orchid (Countryman, 1992).

Sucker Brook

There are several wetlands (forested and/or scrub-shrub) along Sucker Brook from Goshen dam downstream to Sucker Brook diversion dam. There are two Class 2 wetlands¹³ located directly along Sucker Brook and adjacent to project waterbodies. There are other wetlands along Sucker Brook tributaries.

Directly downstream of Goshen dam is a forested wetland classified by NWI as palustrine, broad-leaved deciduous forest, saturated/semi-permanent/seasonal (PFO1Y) (Figure 5). Wetland species that have persisted in this area include turtlehead, willows, sedges, jewelweed, forget-me-not, agrimony, fowl meadow grass, tearthumb, false hellebore, and cowslip.

According to the Addison County, Vermont, Soil Conservation Survey (SCS) and the COE's hydric soil list (1987), three soil types located within the project area can be classified as hydric soils; Walpole silt loam (Wa), Muck and Peat (Mv), and Cabot extremely stony loam (CbC). Walpole soil, classified as an Aeric Haplaquepts, a Low-Humic Gley soil¹⁴, is located along Sucker Brook northwest of Sugar Hill, and adjacent to Lake Dunmore west of the Falls of Lana. Muck and Peat soils are found approximately 1,000 feet southeast of Sucker Brook diversion dam. Cabot soils are found along Sucker Brook, Sucker Brook North Branch, and extensively in the wetland areas south of the project area along Dutton Brook.

CVPS mapped other wetlands that are associated with upland soils. NWI did not assign these wetlands individual map units and they were likely included under the larger series names. Wetlands identified by CVPS along Sucker Brook are included within the soil mapping units of Berkshire and Marlow Stony extremely stony loams with slopes ranging from 3 to 50 percent (BsC and BsE) and Peru extremely stony loam with slopes 0 to 20 percent (PSC).

¹³ Class 2 wetlands are considered "significant" and are protected under Vermont Wetland Rules adopted February 7, 1990. Class 1 wetlands are exceptional or irreplaceable and receive the highest level of protection. Class 3 wetlands are not protected under Vermont rules; however, they may be protected by other federal, state, or local regulations.

¹⁴ Typically a transitional or wetland soil type associated with saturation and reduced oxygen levels.

Sucker Brook Diversion Dam

An emergent wetland has developed behind Sucker Brook diversion dam at the confluence of Sucker and Dutton Brooks. NWI maps classify this wetland as a Palustrine scrub-shrub over emergents (PSS1Y/EMY) (Figure 5). It is a protected Class 2 wetland under Vermont Wetland Rules. Aerial photograph interpretation indicates shrubs as a minor component. CVPS's 1992 field investigations showed an emergent plant community dominated by both annual species (rice cutgrass, bur-reed) and perennial species (reed canary-grass, fowl meadow-grass, blue-joint grass, and lake sedge). Other vegetation included arrowhead, tearthumb, and Joe-Pye weed typically found in Vermont emergent wetlands. A steep rise in elevation to forested uplands surrounds most of this wetland, including a small alder and willow community near the confluence of Dutton Brook.

This emergent wetland consists of 1.8 acres of wet meadow vegetation with vigorous growth resulting from the influx of nutrients provided by silt deposition. According to SCS maps, these soils are dominated by Berkshire and Marlow extremely stony loams. CVPS states in its license application that the wetland developed on the silts deposited in the basin due to operation of the reservoir. The wetland functional evaluation checklist indicates this wetland is valuable for floodwater storage, surface and ground water protection, erosion control, and wildlife and migratory bird habitat.

Under the current operating regime, the wetland is flooded infrequently (2 to 3 weeks each year during spring runoff and 2 to 3 additional times a year for a 1- to 2-day duration following heavy rains).

Silver Lake

Silver Lake is characterized by an abrupt bank over sandy or rocky shores with little or no abutting wetlands. Existing hydrophytic vegetation is limited to an area east of Silver Lake dam where soft stemmed bulrush, wool-grass (*Scirpus cyperinus*), and spike-rush (*Eleocharis acicularis*) are sparsely distributed over the exposed sandy substrate. Low lying forested vegetation at the southeastern end of Silver Lake is not within a mapped wetland unit.

Wildlife

Wildlife in the project area is characteristic of the New England Appalachian Mountains. Likely species include: white-tailed deer, black bear, moose, fisher, bobcat, weasel, striped skunk, red and gray squirrel, little brown bat, cottontail rabbit, snowshoe hare, coyote, raccoon, mink, otter, beaver, and

muskrat. Avian fauna include sparrows, wrens, vireos, warblers, thrushes, swallows, wild turkey, waterfowl, and raptors.

Furbearers. Project forests and emergent wetlands provide both large and small mammals a variety of habitats. Occasional moose and the common white-tailed deer graze on willows and other woody vegetation. Beavers and muskrats can build large houses in area streams and ponds. Small carnivores (coyote, mink, and bobcat) can find prey in the freshwater marshes and wet meadows.

Beavers are active along Sucker Brook and around Sugar Hill reservoir, and area wetlands have been influenced by beaver dams. Their lodges have one or more underwater entrances with living quarters in a hollow area near the top. Both lodge construction material and the beaver's preferred foods consist of woody vegetation, including aspen, willow, birch, and maple found in the project vicinity.

CVPS did not identify muskrats although it was noted that they are common in the area. These animals build large houses containing nesting chambers and underwater entrances, avoiding strong currents and rocky areas.

According to the Vermont Wetland Evaluation Form (CVPS, 1994b), Sugar Hill reservoir wetlands contain evidence of use by muskrat, otter, and mink.

Waterfowl. CVPS reports that a wide variety of waterfowl use the project area for nesting, feeding, and migratory rest stops. Interior (April 19, 1996) noted that approximately 15 ducks were observed at the southeast cove of Sugar Hill reservoir emergent wetland. These included mergansers, wood ducks, and teal. According to the Vermont Wetland Evaluation Form (CVPS, 1996b), Sugar Hill reservoir wetlands: support breeding pairs of waterfowl; provide resting, staging, or roosting habitat; support waterfowl migration nest sites; and provide buffer areas for great blue heron, black-crowned night heron, green-backed heron, and/or snowy egret.

Amphibians and Reptiles. The project area also contains optimal habitat for native Vermont species of amphibians (toads, frogs, and salamanders) and reptiles (turtles and snakes). Common herpetile species that may occur in the project area include the Northern dusky salamander, spring salamander, blue-spotted salamander, red-backed salamander, red-spotted newt, spring peeper, bull frog, green frog, gray treefrog, red-bellied snake, and garter snake.

During a field investigation conducted by CVPS on April 28, 1996, red-spotted newt, green frog, Northern spring peeper, and wood frog were observed (CVPS, 1996b). Three out of these four amphibian species are normally found in habitats related to

beaver ponds. The beaver-dam pools located above the reservoir may provide optimum habitat for these species. Field descriptions indicated that pools were full, ice-free, not turbid, and had little water movement.

Threatened and Endangered Species

VANR and the Vermont Nongame and Natural Heritage Program conducted a search of their databases and found no known occurrences of rare animals in the Silver Lake Project area. Interior (1991) added that there are no federally listed or proposed threatened and endangered species under Interior's jurisdiction within the project area except occasional transient bald eagles (*Haliaeetus leucocephalus*) or Peregrine falcons (*Falco peregrinus anatum*). Habitat, however, may be present for both bald eagle and peregrine falcon (Interior, 1991). Historic records indicate that peregrine falcons nested on the ledges east of Silver Lake, in an area just outside of the project boundary.

b. Environmental impacts:

Sugar Hill Reservoir

Wetlands

CVPS proposes to modify Sugar Hill reservoir's operating mode to provide more stable water conditions. Water levels would increase starting in mid-March to peak at elevation 1,763 feet USGS, and then be drawn down to reach conservation pool elevations by July 1. CVPS proposes to maintain a constant water depth of approximately 37 feet until March of the following year (Figure 2).

CVPS estimates that 21.3 acres of shoreline would be exposed above elevation 1,750 feet USGS with the initiation of the conservation pool operating regime. CVPS states that the proposed conservation pool operating regime would imitate a natural spring-high, summer-low hydrologic regime.

VNRC (December 5, 1995) states that the project's present large magnitude draw-downs have caused adverse environmental impacts, and requests comparison of available alternatives, and adoption of the most beneficial for river management.

VANR (December 15, 1995) states that wetland community development, particularly at Sugar Hill reservoir, is restricted by fluctuating water levels. It suggests that wetland values and functions could be substantially enhanced through stabilization of water levels.

VANR also states that severe winter draw-downs historically have limited aquatic vegetation and invertebrates, which are an

important forage base for waterfowl. VANR concludes that the applicant's proposed operating mode would: avoid the traditional extreme winter draw-downs affecting vegetation and invertebrates and enhance and expand the 3.5-acre wetland located in the southeast bay of Sugar Hill reservoir. This wetland currently is vegetated by annuals with low diversity. The proposed conservation pool would result in the establishment of more classic zonation within a lacustrine wetland. This could include shrubs to emergent shallow marsh, deep marsh, floating-leaved aquatics and aquatic bed perennials for an additional area of up to about 12 acres.

VANR (draft WQC dated February 7, 1997) recommends a modified operating protocol for Sugar Hill reservoir that would stabilize impoundment levels and provide minimum flows to the reach below Goshen dam (see Section III.D and Section IV.C.2).

Interior (April 19, 1996) supports the modified operating mode proposed by CVPS. It considers wetland conditions to be significantly limited by the current dynamic water regime. Vegetative growth is impeded in areas covered with shallow water during the growing season and dewatered during the winter. Interior states that, although these wetlands would be subject to some fluctuation under the proposed hydrologic regime, levels would be stable during most of the growing season and most of the winter. This would allow for a significant increase in vegetative cover and diversity. Interior also notes that water would not be removed as a source of cover for wildlife during the critical fall and winter months under CVPS's proposal.

Our Analysis

We reviewed the alternative operating regime proposed by CVPS and agree that establishment of a conservation pool from July 1 to March 31 of each year would enhance emergent wetland functions and values, increasing productivity and diversity in comparison with the previous draw-down regime.

VANR (draft WQC dated February 7, 1997, and letter filed February 12, 1997) suggests a modified operating protocol that would stabilize impoundment levels from July 1 through March 31, and would provide for the release of continuous minimum flows below Goshen dam. The staff has reviewed this proposal and recommended the operating regime discussed in Section IV.C.2, which requires more stable operation of Sugar Hill reservoir and maintenance of seasonally available minimum flows.

CVPS estimates that 21.3 to 21.5 acres of shoreline would be affected by water level fluctuations under the conservation pool plan. Within this acreage, the proposed hydrologic regime favors formation of emergent wetland area (up to approximately 9 acres), plus increased productivity of current wetland area (3.5 acres),

increasing the total wetland area to approximately 12.5 acres in the shallow southeastern section of Sugar Hill reservoir. The remaining 9 acres of periodically exposed land is mainly on steeper sloped land around the perimeter of the reservoir and around the small island within the reservoir.

An advantage of the proposed conservation pool over the current operating regime is the elimination of late winter (March through April) draw-downs ranging from the 26 foot water level stage (elevation 1,739 feet USGS) to as low as the 16 foot water level stage (elevation 1,729 feet USGS). Under such extremes, the reservoir fluctuates from full pond covering approximately 66 acres to less than one third that amount. These extreme water fluctuations inhibit development of flora and fauna due to the loss of insulating water temperatures.

We also examined variations in seasonal flows to determine optimum timing of spring draw-downs to conservation pool elevations. We found that the earlier in the growing season that water levels are stabilized, the longer the herbaceous plant material would have to become established. The growing season in Vermont's Green Mountains is short. Average time of the last spring freeze at higher elevations is early June. The first fall freeze may come as early as the first half of September (SCS, 1971).

Therefore, we recommend that CVPS manage Sugar Hill reservoir in accordance with the staff recommended operating regime discussed in Section IV.C.2. This operating regime would allow CVPS to take advantage of peak spring runoff and would provide a longer period of vegetative growth, enhancing wetland functions and values, including wildlife habitat for furbearers, waterfowl, and migratory birds.

Wildlife

CVPS states that the modified operation of the project with the conservation pool would not cause any adverse impacts on wildlife, and would benefit some species of salamanders, frogs, and turtles by avoiding the stranding due to winter draw-downs.

USFS (April 4, 1996) recommends that any project-induced alterations on National Forest lands be accompanied by evaluation of impacts on wildlife.

VNRC (December 5, 1995) states that analysis and mitigation for impacts on wildlife throughout the basin must be completed prior to relicensing.

Interior (April 19, 1996) states that existing draw-downs during the late fall and winter have detrimental effects on wildlife. Mammals such as beaver, with established winter

lodging adjacent to water, are left vulnerable as the water recedes. In addition, reptiles and amphibians hibernating in the mud become exposed and subject to freezing temperatures and increased predation. Interior supports the proposed altered water management regime of Sugar Hill reservoir whereby insulating water levels are maintained for wildlife during the critical fall and winter months.

VANR (December 15, 1995) states that existing winter draw-downs adversely affect overwintering of reptiles, amphibians (and some aquatic mammals) that seasonally use the shallow mud areas. Current operation leaves animals vulnerable to freezing and predation as the water level decreases through the fall/winter period. Given the current operating regime, it is unlikely that reptiles or amphibians survive through the winter in Sugar Hill reservoir. The proposed conservation pool would address this concern by generally maintaining a constant pool through the critical winter period.

Our Analysis

Our review indicates that furbearers could increase in number under the management of a more stable water level regime. Beavers require a permanent supply of water with a seasonably stable water level. They are not found on larger rivers and lakes where water depth and/or fluctuation cannot be controlled or ice scouring is severe. Old beaver lodges are in evidence near Sugar Hill reservoir that may become reestablished with a more stable water regime.

The year-round habitat requirements of the muskrat also include permanent surface water levels with minor fluctuations and persistent herbaceous vegetation (Interior, 1984). The large emergent marsh at Sugar Hill reservoir may provide sufficient habitat for this species if the conservation pool is implemented whereby local emergent vegetation such as cattail, waterlily, arrowhead, sedges, and wild rice could increase in productivity thus providing more food to the muskrat.

We agree that winter draw-downs can be fatal to hibernating amphibians and reptiles settled within bottom sediments (usually inhabiting a zone beyond 2 feet of the shoreline). If overwintering sites are dewatered between the time of the draw-down and the next snow, eggs may be exposed. The proposed modified water regime would increase the likelihood of survival of hibernating or semi-active amphibians, and would provide for continuous underwater insulation of eggs from freezing air temperatures.

Under the current water regime, during the March through May initiation of waterfowl nesting, water levels increase from the lowest levels (stage 16 to 27 feet) to highest levels (stage 47

to 50), potentially flooding ground or near-ground nests. Under the proposed, less extreme changes in water levels, nesting success along the shores of the reservoir could increase along with the amount of forage vegetation. Waterfowl usage of the reservoir and associated wetlands for nesting and feeding habitat could therefore increase.

Therefore, we recommend that CVPS manage Sugar Hill reservoir utilizing the staff's recommended operating regime (Section IV.C.2.) to protect and enhance habitat for resident furbearers, amphibians, and waterfowl. These measures would protect underwater lodge entrances and exits for beavers, increase winter survival of amphibians and reptiles, and encourage growth of additional forage for feeding and nesting waterfowl.

Method of Releasing Minimum Flows at Sucker Brook Diversion Dam

CVPS states that, under its proposal to release minimum flows over the diversion dam spillway, the 1.8-acre wetland located immediately adjacent to the diversion dam (Figure 5) would be wholly flooded out and become open-water habitat approximately 4- to 6-feet deep.

Interior (May 22, 1992) requests that CVPS assess the impacts of increasing water elevations at Sucker Brook diversion dam to enhance a small wetland area at that location (and to assess the potential for the release of minimum flows to Sucker Brook via the existing spillway and channel).

VANR (December 15, 1995) recommends that existing values and functions of wetlands behind Sucker Brook diversion dam be evaluated for impacts from the proposed change in dam management. VANR reiterates concern over the inundation of this wetland area (April 19, 1996) and suggests that CVPS modify its proposal for passing minimum flows to a technique that would not have an impact on this wetland. VANR (draft WQC dated February 7, 1997) states that the minimum flow should be released through the dam spillway on the right side of the river.

Our Analysis

Our analysis indicates that flooding of the existing 1.8-acre emergent wetland would reduce the existing habitat to a small fringe area, upslope of the current wet meadow habitat. This reduction in habitat value and the lower productivity level of the replacement aquatic bed, as compared to the existing emergent wetland, lead us to recommend that CVPS implement an alternative method to release minimum flows at Sucker Brook diversion dam.

We conclude that this Class 2 wetland has important functions and values for wildlife and migratory bird habitat, erosion control, and high biomass productivity. Therefore, we conclude that to protect existing emergent wetlands, CVPS should not install spillway flashboards for the release of minimum flows to Sucker Brook that would result in the inundation of this wetland. We conclude that CVPS should develop a plan to install a minimum flow pipe on the penstock below Sucker Brook diversion dam to discharge flows to the bypassed reach of Sucker Brook. However, we are obligated to adopt VANR's draft WQC conditions. Therefore, we recommend that CVPS discharge the minimum flow over the spillway on the right side of the dam.

Federally Listed Threatened and Endangered Species

There are no known federally listed threatened and endangered plant or animal species in the project area, except occasional transient bald eagles (*Haliaeetus leucocephalus*) and Peregrine falcons (*Falco peregrinus anatum*). FWS indicated that further consultation pursuant to Section 7 of the Endangered Species Act was not required.

Our Analysis

Proposed project operations would have no effect on peregrine falcons, which feed exclusively on birds in flight.

CVPS's proposed operation would have no impact on bald eagles. If proposed minimum flows and conservation pool levels in Sugar Hill reservoir result in improved fishery habitat in project waters, foraging eagles may find more prey. Therefore, we conclude that the proposed project would not affect threatened and endangered species and their habitats, and no additional protection or enhancement measures are warranted.

c. Unavoidable adverse impacts: None.

5. Cultural Resources

a. Affected environment: CVPS conducted an historical assessment and Phase 1A and Phase 1B archeological surveys to determine the potential effects of project licensing on the significant cultural resources in the project area. The State Historic Preservation Officer (SHPO) concurred with the Phase 1A scope of work and recommended a Phase 1B survey as part of a future, statewide Programmatic Agreement. These studies identified several significant cultural resources within the project's affected area.

The Silver Lake area contains the highest concentration of significant cultural resources, including two submerged pre-historic wooden dugout canoes of the Late Woodland period, circa

A.D. 1000-1600, and the historic remains of the Silver Lake Hotel and Cottage of the Early Recreation/Hotel period, circa 1875-1915.

The foundations of the Newton-Thompson saw mill complex, constructed in 1864, are located near the mouth of Sucker Brook, downstream of the Falls of Lana. The water-powered saw mill produced wooden bolts for various lathed items. The remains of several additional Newton-Thompson structures, including a boarding house and barn, are located along Sucker Brook upstream of the saw mill site.

The ruins of another saw mill complex, the Selden complex, are located on the south side of Sucker Brook approximately 0.6 mile upstream of Sucker Brook diversion dam. The Selden complex was constructed in the mid to late 1850's. Further upstream near Sugar Hill reservoir, are the remains of a dwelling or toll house, believed to be older than 1871.

The surveys concluded that the Silver Lake Hydroelectric Project and the Silver Lake Hotel could be eligible for listing on the National Register of Historic Places (NRHP). The eligibility basis of the Silver Lake Hydroelectric Project is the project's distinctive characteristics of a type, period, and method of hydroelectric facility engineering and construction, specifically a high-head hydroelectric generating complex constructed during the first quarter of the twentieth century. The Silver Lake Hotel's NRHP eligibility basis is its culturally significant role in local and regional history and its partial integrity. The two other historic sites, the Newton-Thompson and Selden saw mill complexes, were judged to be less significant, but with potential for future NRHP eligibility.

The literature search and field surveys have established that the cultural sensitivity of the project area is largely confined to the Silver Lake area and a few areas along Sucker Brook. The remains of the Silver Lake Hotel and several other sensitive sites in and around the lake are threatened by recreational activity and/or looting. Portions of the Silver Lake Hotel foundations are also threatened by erosion. The cultural sites located along Sucker Brook are not presently threatened, although some of these may be threatened by expanded recreational activity.

b. Environmental impacts: CVPS proposes to perform routine maintenance and repairs at the project according to the Secretary of the Interior's guidelines for rehabilitating historic structures. In the event that additional project developments or significant modifications in project operations are proposed, CVPS would consult with the SHPO to determine what, if any, further studies are required prior to initiating structural modifications or ground breaking activities.

Our Analysis

The staff concludes that there is potential for direct effects on discovered and undiscovered cultural resources from project operations at Silver Lake. The high pond levels contribute to wave induced erosion along the eastern shoreline that currently threaten the identified historic resources of the Silver Lake Hotel. Additionally, recreational use of the lake's picnic and bathing areas threaten the historic remains of the Silver Lake Hotel.

CVPS has reduced the maximum operating level of Silver Lake by 1.5 feet, and proposes to maintain its normal high water level at 1,247.5 feet USGS to prevent soil erosion. USFS proposes to implement a rehabilitation plan for the recreation area, including erosion control, bank revegetation, and control of recreation damage to historic sites. We agree that the proposed actions to ameliorate previous soil erosion and recreational damage would reduce impacts on cultural resources. As discussed in Section IV.3.c., we recommend that Silver Lake be operated at a maximum level of 1,247.5 feet USGS. We further conclude that CVPS's proposal to consult with the SHPO prior to initiating any structural modifications or ground breaking activities would minimize the potential for impacts on known and previously undiscovered cultural resources.

c. Unavoidable adverse impacts: None.

6. Recreational and Visual Resources

a. Affected environment: GMNF provides extensive recreational opportunities, including, hiking, fishing, skiing, boating, camping, and picnicking. Both primitive and developed campsites and over 25 trails for hiking, skiing, snowmobiling, horseback riding, and bicycling are available within a 15-mile radius of Silver Lake dam.

In addition to the recreational facilities associated with the project area, there are a number of other nearby recreational areas. The Moosalamoo Recreation Area, with 19 primitive campsites and nature trails, is located north of Sugar Hill reservoir. Branbury State Park, located on the shores of Lake Dunmore just north of Silver Lake, offers facilities that include campsites, picnic tables, a bathhouse, and a public boat launch. The Blueberry Hill Cross-Country Ski Area and the Churchill House Ski Touring Center offer more than 60 miles of ski trails in and around the Silver Lake Project area.

The Sugar Hill reservoir area, located in the town of Goshen, offers flatwater boating/canoeing, fishing, hiking, cross-country skiing, and snowmobiling opportunities in a remote setting accessed by a private gravel road leading off Forest Road

32. VANR manages the reservoir as a put-and-take brook trout fishery. This component of the project experiences limited recreational use averaging 6 to 10 cars/boats per day during the summer season.

Sucker Brook diversion dam is located in a remote area at the confluence of Sucker Brook and Dutton Brook in the town of Salisbury. The dam directs the flow from the two brooks through a penstock to the Silver Lake reservoir. Typically, there is no impoundment at the dam. There is no public access by motor vehicles to the dam. The few recreationists using the area are limited to hikers, hunters, and snowmobilers passing by the area. The steep topography and low flows of Sucker Brook between Sucker Brook diversion dam and Silver Lake make the stream unsuitable for canoeing.

The Silver Lake dam and reservoir are located in the town of Leicester. Recreation facilities at the lake include a beach, a picnic area, and a 16-unit primitive campsite, operated by GNMNF. Although this site can be accessed only on foot via a 1.6-mile-long trail from Route 53 or a 0.6-mile-long trail from Forest Road 27, it experiences heavy recreational use during the peak summer season.

The Falls of Lana, located northwest of Silver Lake, is a heavily used recreation and aesthetic site. The Waterfalls, Cascades & Gorges of Vermont (Jenkins and Zika, 1986) identifies the falls as having high importance because they are "moderately wild, secluded, and frequently visited by hikers." The Falls of Lana can be accessed by trail from Route 53 or along the penstock trail leading down from Silver Lake. The viewpoint of the falls is reached by a steep and rocky trail running alongside and underneath the penstock. Views of the falls from the overlook are partially obstructed by trees.

b. Environmental impacts: CVPS proposes to develop and implement recreational enhancements, in consultation with the GNMNF, at all project facilities. In the following section, we present CVPS's proposals, USFS and VANR recommendations and our analysis.

Improved Access and Boat Launch at Sugar Hill Reservoir

CVPS proposes to improve recreational access at Sugar Hill reservoir by: constructing a circular drive at the entrance to the site; grading and filling the existing access road to the boat launch; reconstructing the boat launch; planting native vegetation; placing directional and interpretive signage; and installing trail registers.

Our Analysis

Based on our inspection of facilities at Sugar Hill reservoir, we conclude that CVPS's proposed improvements to the badly eroded parking lot, access road, and boat launch areas are necessary to maintain recreational access to the reservoir. We also concur with CVPS's proposal to plant native vegetation and install signage to enhance the scenic and recreational quality of the site. The proposed interpretive signs would identify CVPS as the owner of the site and graphically display the reservoir's placement and function in the entire Silver Lake Project system. In addition, the proposed trail registers would enable CVPS to gather recreational use data at the project for future evaluation of facility needs. Therefore, we recommend that CVPS implement the proposed recreational enhancement measures at Sugar Hill reservoir.

Further, we consider interpretive signs important in providing information about the significance and history of the hydroelectric project to visitors, and directing visitors to project recreational features. Therefore, we recommend that CVPS add information about the significance and history of the project and directions to project recreational areas to the proposed interpretive signs.

Sucker Brook Diversion Dam and Silver Lake

CVPS proposes to install interpretive signs within the project boundary at Sucker Brook diversion dam and at Silver Lake. These signs would identify CVPS as the owner of the particular site and graphically display the placement and function of the site in the entire Silver Lake Project system.

Our Analysis

We agree that installation of interpretive signage would enhance the recreational quality of these sites for visitors. Because interpretive signs are important for informing and directing visitors to project features, we recommend that CVPS install these signs as proposed. Further, we recommend that CVPS add information about the significance and history of the project, and directions to project recreational areas, to the proposed interpretive signs to provide additional project information to visitors at these sites.

Improved Overlook at Falls of Lana

CVPS proposes to improve the existing trail and viewing area at the Falls of Lana located within the project boundary to enhance the scenic and recreational experience of visitors to the site. Proposed improvements include replacement of safety cables at the overlook, placement of gravel on the penstock trail,

drainage improvements on the trail, improvements to interpretive signage, and removal and maintenance of vegetation obstructing views. CVPS proposes to develop and implement these recreational enhancements in consultation with the GMNF.

USFS recommends that CVPS improve the trail and viewing area within the project boundary at the falls for public safety and view enhancement.

Our Analysis

Based on our site visit to the Falls of Lana, we agree that the proposed enhancements would improve the safety, scenic, and educational values of the site for the many recreational users of the falls. Specifically, the proposed safety measures at the overlook and along the steep trail under the penstock would improve access, control erosion on the steep slope, and provide a more secure viewing location at the overlook. Therefore, we recommend that CVPS implement these proposed enhancements.

In addition, views of the falls would be improved by the removal and maintenance of foreground vegetation. Since the Falls of Lana area is located on GMNF property, we concur with CVPS, and recommend that the GMNF be consulted concerning the proposed vegetation removal and maintenance.

We also agree that installation of interpretive signage would improve the recreational experience for visitors to this site. To enhance the benefit of the signs, we recommend that CVPS add information about the significance and history of the project to the proposed interpretive signs.

Increased Flows at Falls of Lana

CVPS proposes to release a minimum flow of 1 cfs or inflow, whichever is less, from Sucker Brook diversion dam to provide flows at the Falls of Lana that create visual interest for visitors. CVPS states that a minimum flow greater than 1 cfs would jeopardize the economic viability of the project.

CVPS conducted a flow demonstration study to evaluate, among other things, the effects of minimum flows released at the Sucker Brook diversion dam on the aesthetics of the Falls of Lana. Flows viewed during the study included existing leakage flows, and releases of 1 cfs, 3 cfs, 5 cfs, and 8 cfs. Below the diversion dam, Sucker Brook flows in a northwest direction for approximately 2,000 feet, where it joins with the North Branch of Sucker Brook. Before reaching the Falls of Lana, this combined stream flow is joined by an unnamed creek. The additional flows contributed by the North Branch of Sucker Brook and the unnamed creek were not determined prior to the flow demonstration.

The flow demonstration revealed that, at existing leakage flows, the visual characteristics of the Falls consist of a combination of frothy, white, aerated water with the darker, smooth unaerated flows and rock formations. At a flow release of 1 cfs at the diversion dam, the volume of water over the falls increases, and the contrast between the white, frothy aerated water and the smooth, dark unaerated water and underlying rocks begins to diminish. At both of these levels, there is a distinct sound of falling water. At flows of 3 cfs and above, the falls no longer produce the high visual diversity and variation found in the lower flows, and the sound of falling water changes to a thundering roar.

USFS states that the majority of visitors see the falls in a very low-flow condition because of project diversions. Both USFS and VANR requested a flow demonstration at the Falls of Lana to determine the aesthetic effect of various flow over the falls.

Our Analysis

We considered the scenic value of the Falls of Lana for site visitors by evaluating alternative flow releases from the Sucker Brook diversion dam. Since the uncontrolled flows from the North Branch of Sucker Brook and the unnamed stream are seasonally variable, continuously released flows at the diversion dam would ensure year-round flows over the Falls of Lana, particularly during seasonal low flow periods.

During our site visit, flows viewed at the falls resulted from a 1 cfs release at the diversion dam. Based on our evaluation of flows at the site and the results of the flow demonstration study, we conclude that a continuous 1 cfs release from the Sucker Brook diversion dam would provide sufficient water volumes to enhance the aesthetic quality of the Falls of Lana for visitors to this site.

Recreation Plans and Designs

VANR recommends that CVPS draft a final enhancement plan in consultation with Vermont agencies and USFS. In a letter dated April 19, 1996, VANR states that, although the recreation plan in CVPS's licensing application was generally adequate, VANR wishes to be consulted on specific designs for project recreational enhancements.

VANR also recommends that CVPS prepare a recreation master plan, including monitoring provisions, for filing with the Commission within one year of licensing. VANR also recommends (draft WQC dated February 7, 1997) that CVPS construct and maintain recreation facilities as outlined in the proposed recreation plan. VANR recommends that CVPS include erosion control plans where appropriate.

Our Analysis

We have reviewed the preliminary plans and designs provided by CVPS for its proposed recreational improvements. We find that they adequately address all relevant recreational concerns at the project. Therefore, we conclude that CVPS does not need to file a new recreation plan as recommended by VANR.

In addition, recreational use on project land is monitored through Section 8.11 of the Commission's regulations, which requires CVPS to collect and file information with respect to existing and potential recreation use at developments within the project area where recreation occurs. This information is submitted to the Commission every six years, based on the previous year's activities, and helps to identify the need for additional facilities. If this information indicates a need for additional recreational facilities, the need can be addressed through the standard license reopener. Therefore, we conclude that an additional recreation master plan is not required to monitor and assess recreation use at this project. However, we recommend that CVPS file final design plans for the proposed recreation facilities, including erosion control plans, where appropriate. CVPS should develop the plans in consultation with VANR and Interior, and file the plans with the Commission.

c. Unavoidable adverse impacts: None.

V. DEVELOPMENTAL ANALYSIS

In this section, we analyze the project's use of the river's water resources to generate hydropower by estimating the economic benefits of the proposed project. We also address the economic effects of various measures considered in the EA for the protection, mitigation, or enhancement of area resources.

We base our independent economic studies on current electric power conditions. We do not consider potential future inflation or escalation of prices.¹⁵

We base our estimate of the cost of alternative capacity on an assumed capacity value of \$109/kW-year (at a fixed charge rate of 14 percent), which is based on a combined-cycle combustion turbine plant fueled by natural gas (the cheapest, most reasonable capacity addition available). The project cost of energy generation is based on natural gas-fueled electric plants in the New England region of the United States. We base our estimate of the amount of fuel that would be displaced on fuel consumption at a heat rate of 6,200 Btu/kWh. We estimate the

¹⁵ See Mead Corporation, Publishing Paper Division, 72 FERC ¶ 61,027 (July 13, 1995).

1996 cost of fuel based on information from the Energy Information Administration (EIA, 1995). We use a composite energy value of 31.9 mills/kWh. We base our economic analysis of the alternatives on the data shown in Table 1.

Table 1. Staff's assumptions for economic analyses of the Silver Lake Hydroelectric Project (Source: Staff)

Assumption	Value	Source
Yearly O & M costs (1996 dollars)	\$100,800	CVPS
Discount rate	8.3%	CVPS
Life extension costs (1996 dollars)	\$263,400	CVPS
Net investment	\$987,000	CVPS
Application preparation cost (through March 1994)	\$121,300	CVPS

Based on these assumptions, we estimate that the annual cost of the existing project to produce about 6.433 gigawatt-hours (GWh) of energy annually would be about \$80,900 (12.6 mills/kWh) more than the currently available alternative.

We discuss, in the following section, the economic benefits for the three alternatives considered in this EA: (1) the project as proposed by CVPS; (2) the project as proposed by CVPS with additional staff-recommended measures based on our review of recommendations of resource agencies; and (3) the no-action alternative. We did not develop a specific agency alternative, as the resource agencies made specific environmental recommendations that we evaluated independently and included, as appropriate, in the staff's alternative. We include the annualized cost of each agency-recommended measure in Section VII.

A. Proposed Project

In this section, we present the applicant's proposal, which consists of continued operation of the Silver Lake Hydroelectric Project with its proposed environmental measures. Table 2 summarizes the costs and current net annual benefits of CVPS's proposal. The current net annual benefits for CVPS's alternative would be about -\$104,000 or about -17.6 mills/kWh.

Table 2. Summary of costs and current net annual benefits of the applicant's proposed project - 1996 \$
(Source: Staff)

Measure	Lost Generation (GWh)	Capital Cost	Yearly O & M	Annual Net Benefit
Operate existing project		--	--	-\$80,900
Operate Sugar Hill reservoir per proposed rule curve and provide 2.5 cfs minimum flow ^a	0.059	--	\$2,400	-\$4,300
Release 1 cfs below diversion dam via spillway weir	0.438	\$2,000	\$1,500	-\$15,700
Provide continuous powerhouse operation throughout smelt spawning season	--	--	\$300	-\$300
Monitor water quality and construct a reaeration screen or weirs at Goshen dam as appropriate	--	\$1,500	\$100	-\$300
Improve access at Sugar Hill reservoir	--	\$8,700	--	-\$1,200
Improve overlook at Falls of Lana	--	\$3,900	--	-\$500
Lower Silver Lake's maximum pond level by 1 foot ^a	0.014	--	--	-\$500
Install interpretive signage	--	\$2,100	--	-\$300
Total:	0.511	\$18,200	\$4,300	-\$104,000

^a CVPS proposes changes to the Sugar Hill reservoir and the Silver Lake rule curves that would reduce its capacity to capture spring runoff and result in lost generation.

B. Staff's Alternative

In this section, we present the additional costs and current net annual benefits of the staff's recommended alternative, which consists of the applicant's proposed project with staff modifications. Table 3 presents the summary of these costs and

the current net annual benefits. The current net annual benefits or the staff's alternative would be about -\$135,800, or about -27.3 mills/kWh.

Table 3. Summary of costs and current net annual benefits of the staff's alternative - 1996 \$ (Source: Staff)

Measures	Lost Generation (GWh)	Capital Cost	Yearly O & M	Annual Net Benefit
CVPS's proposed project	0.511	\$18,200	\$4,300	-\$104,000
Operate project using the staff's proposed rule curve for maintaining conservation pool elevations at Sugar Hill Reservoir and minimum flows below Goshen dam		\$0	\$0	\$0
Release flow below Sucker Brook diversion dam of 2.5 cfs from April 1 to September 30 and 3.5 cfs from October 1 through March 31 over spillway on the right side of the river	0.949	\$0	\$0	-\$30,300
Prepare and implement a plan to monitor flow releases below both dams and the powerhouse, and water level elevations at Sugar Hill and Silver Lake reservoirs ^a		\$4,000		-\$500
Develop a debris disposal plan		\$2,000		-\$300
Develop and implement a plan to ramp releases from Goshen dam and from the powerhouse ^a		\$4,000		-500
Total	1.460	\$30,200	\$4,300	-\$135,800

- ^a Cost is for plan development; cost of implementation is included in normal O&M cost.

C. No-action Alternative

Under the no-action alternative, the project would continue to operate under the current mode of operation, and no new environmental protection, mitigation, or enhancement measures would be implemented.

The annual cost of the existing project, including carrying charges on net investment and application preparation costs, is about \$286,400 (44.5 mills/kWh). Thus, under no-action, the project would produce power at an annual cost of about \$80,900 (12.6 mills/kWh) more than the currently available alternative.

D. Economic Comparison of the Alternatives

Table 4 presents a summary of the current net annual benefits for the various alternatives.

Under the Commission's policy regarding the economics of a project, as articulated in Mead, supra, a proposed project is economically beneficial so long as its projected cost is less than the current cost of alternative energy to any utility in the region that can be served by the project. To determine whether the project proposed is economically beneficial, we compared the cost of energy from the proposed project to the cost of an alternative source of energy.

Table 4. Comparison of economic analyses for Silver Lake Hydroelectric Project alternatives (Source: Staff)

	Alternatives		
	CVPS's	Staff's	No-Action
Installed capacity (MW)	2.2	2.2	2.2
Annual generation (GWh)	5.922	4.973	6.433
Net annual cost of alternative power	\$188.9	\$158.7	\$205.3
(thousands \$)	31.9	31.9	31.9
(mills/kWh)			
Net annual project cost	\$292.9	\$294.5	\$286.2
(thousands \$)	49.5	59.2	44.5
(mills/kWh)			
Current net annual economic benefits	-\$104.0	-\$135.8	-\$80.9
(thousands \$)	-17.6	-27.3	-12.6
(mills/kWh)			

Our economic evaluation of CVPS's proposal and the staff's alternative shows that both appear to cost more than currently available alternative power.

E. Pollution Abatement

The Silver Lake Hydroelectric Project annually generates about 6.433 GWh of electricity. This amount of hydropower generation, when contrasted with the generation of an equal amount of energy by fossil-fueled facilities, avoids the unnecessary emission of atmospheric pollutants. Assuming that the 6.433 GWh of hydropower generation would be replaced by an equal amount of natural gas-fired generation, generating electrical power equivalent to that produced by the Silver Lake Hydroelectric Project would require combustion of about 66 million cubic feet of natural gas annually. Removal of pollutants from the emissions to levels presently achievable by state-of-the-art technology would cost about \$3,000 annually.

VI. COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

Sections 4(e) and 10(a) of the FPA require the Commission to give equal consideration to all uses of the waterway on which a project is located. When the Commission reviews a hydropower project, it considers fish and wildlife, recreational opportunities, and other nondevelopmental values of the waterway equally with its electric energy and other developmental values. In deciding whether or not and under what conditions to issue a

hydropower license, the Commission must weigh various economic and environmental tradeoffs.

We considered CVPS's proposed project; agency recommendations; our recommended protection, mitigation, or enhancement measures; and the no-action alternative under Sections 4(e) and 10(a) of the FPA. From our independent analysis of the environmental and economic effects of the alternatives, we selected CVPS's proposed project with our additional recommended measures (staff's alternative) as the preferred alternative.

This alternative requires CVPS to implement the measures described below.

- Develop and implement an operating plan for the project using the staff's proposed rule curve for maintaining conservation pool elevations and minimum flows at Sugar Hill reservoir.
- Develop and implement a plan to release minimum flows of 2.5 cfs (or inflow, if less) from April 1 through September 30 and 3.5 cfs (or inflow, if less) from October 1 through March 31 below Sucker Brook diversion dam over the spillway on the right side of the river.
- Maintain the maximum operating level of Silver Lake between 1,246.5 and 1,247.5 feet msl from June 1 through December 31; at 1,242.5 feet msl from January 1 through May 31; and either fill or maintain lake level from March 15 through May 31.
- Develop and implement plans to ramp flows below Goshen dam and the project powerhouse.
- Develop and implement a plan to control powerhouse operation during the smelt spawning season.
- Develop and implement a plan to monitor flow releases below both dams and the powerhouse, reservoir inflows and water levels at Sugar Hill and Silver Lake reservoirs, and ramping rates at Goshen dam and the powerhouse.
- Install reaeration screens below Goshen dam outfall by July 1 and keep them in place until September 1 of each year.

- Monitor DO and water temperature below Goshen dam and the powerhouse, and monitor water temperature above and below Sucker Brook diversion dam, from June 1 through October 31, during the first full season of operation with the Sugar Hill Reservoir at its new conservation pool.
- Develop and implement a plan to dispose of debris that collects at project works.
- Maintain the tailrace fish exclusion rack, and when the trashrack at Silver Lake is replaced, replace it with a rack having 1.5-inch clear bar spacing.
- Improve access to, and recreational facilities, at Sugar Hill reservoir on land owned by CVPS.
- Improve the scenic overlook at the Falls of Lana.
- Install interpretive signage at Sugar Hill reservoir, Sucker Brook diversion dam and Silver Lake.
- Consult with the State Historic Preservation Officer prior to any structural modification to project facilities and any ground-disturbing activities.

Implementation of these measures would improve water quality, fisheries, recreation, and aesthetic resources, and provide for the best use of the waterway. The costs of some of these measures would, however, reduce the net benefits of the project.

Specifically, eight of the recommended measures would reduce economic benefits of the project: (1) operating Sugar Hill reservoir under staff's recommended conservation pool regime; (2) releasing seasonal minimum flows of 2.5 cfs and 3.5 cfs below Sucker Brook diversion dam; (3) installing reaeration screens below the Goshen dam outfall and monitoring water quality; (4) improving access and recreational facilities at Sugar Hill reservoir; (5) improving facilities at the Falls of Lana; (6) installing interpretive signage at Sugar Hill reservoir, Sucker Brook diversion dam, and Silver Lake; (7) operating Silver Lake within the recommended limits; and (8) developing and implementing a ramping plan to control project operation during smelt spawning in the project tailrace. We summarize these recommendations in the following section.

A. Sugar Hill Reservoir Operation

The staff recommends that CVPS develop and implement an operating plan for the Sugar Hill reservoir utilizing conservation pool elevations between 1,751 and 1,747 feet USGS

from July through March of each year. The maximum water level would be attained around mid-May, accommodating spring runoff, at a water depth of approximately 50 feet (1,763 feet USGS). CVPS, then, would use the resultant storage from mid-May to mid-June for power generation, returning the reservoir to conservation pool elevations by July 1.

This mode of operation would reduce impacts on winter holdover of brook trout (put-and-take), resident rock bass, sunfish species and minnows, and for fish that move downstream from small tributaries to overwinter in Sugar Hill reservoir (brook and brown trout and sculpin). The proposed conservation pool would provide a consistent reservoir elevation and volume that would support overwinter survival of fish, allow for the production of aquatic macrophytes for the warmwater fish habitats, and enhance wetland productivity and diversity. The operation would protect hibernating amphibians and reptiles during late winter freezes by stabilizing the water level during the hibernation period without interrupting or exposing the insulating ice or water layer. Based on the small amount of lost generation and additional O&M costs, we estimate that the current annual cost of implementing this recommendation would be \$4,300.

B. Flows Below Sucker Brook Diversion Dam

CVPS proposes to release a minimum flow of 1.0 cfs below Sucker Brook diversion dam to enhance the aquatic, vegetative, and aesthetic resources of that reach. Our review indicates that a minimum flow of 2.0 cfs, or inflow, is adequate to ensure that state water quality standards are met below the diversion dam. However, we adopt VANR's required minimum flows of 2.5 cfs (or inflow, if less) from April 1 through September 20, and 3.5 cfs (or inflow, if less) for the remainder of the year.

CVPS also proposes to release the minimum flow over the spillway of Sucker Brook diversion dam through a calibrated flashboard weir. When released, ponded water in this area would vary in temperature from waters in the downstream reach and may become oxygen-depleted during the low flow season. Additionally, a state-protected Class 2 emergent wetland would be wholly flooded out and transition to open-water habitat. The resulting replacement aquatic bed would have a lower productivity level when compared to the existing wetland. This wetland change would result in a loss of functions and values associated with wildlife and migratory bird habitat, erosion control, and high biomass productivity. Because VANR's recommendation to release the flow over the spillway represents a valid WQC condition, we recommend that CVPS discharge the minimum flow over the dam spillway on the right side of the river. We estimate that the current annual cost of these enhancements would be \$30,300.

C. Water Quality Monitoring at Goshen Dam Outfall

CVPS proposes to implement a water quality monitoring plan during the first summer following issuance of any license. This plan would allow for detection of substandard DO levels. Upon detection, CVPS would install a reaeration baffle at the outfall of Goshen control structure. This structure would remain in place until the end of the critical water quality season.

Water quality data for Sugar Hill reservoir indicate that substandard conditions currently exist during July and August. Moreover, to eliminate potential delays between monitoring and the installation of a baffle system during which violations of state water quality standards could occur, CVPS should install the baffle system from July 1 to September 1. This would provide continuous enhancement of water quality conditions below Goshen dam during the low flow season. In addition, we recommend that CVPS monitor downstream water quality below Goshen dam outlet, Sucker Brook diversion dam, and the powerhouse to verify that state standards are being met. We calculate that the current net annual cost of implementing the aforementioned recommendations would be \$300.00.

D. Recreational Facilities at Sugar Hill Reservoir

Based on our inspection of the facilities at Sugar Hill reservoir, we conclude that improvements to the badly eroded parking lot, access road, and boat launch areas are necessary to maintain recreational access to the reservoir. We concur with CVPS's proposal to plant native vegetation and install signage to enhance the scenic and recreational quality of the site. The proposed signs would identify CVPS as the owner and steward of the site and graphically display the reservoir's placement and function in the entire Silver Lake system. In addition, the proposed trail registers would enable CVPS to gather recreational-use data at the project for future evaluation of facility need. Therefore, we recommend that CVPS file final design drawings including, where appropriate, erosion control plans developed in consultation with VANR, and implement its proposed enhancement measures at Sugar Hill reservoir. We calculate the current net annual cost of these enhancements would be \$1,200.

E. Interpretive Signage

CVPS proposes to install interpretive signs at Sucker Brook diversion dam and at Silver Lake. These signs would identify CVPS as the owner and steward of the particular site and graphically display the placement and function of the site in the entire Silver Lake Project system.

We agree that installation of interpretive signage would enhance the recreational quality of these sites for visitors and recommend that this proposal be implemented. We estimate that the current annual cost of these enhancements would be \$300.

F. Enhancements at the Falls of Lana

Based on our site visit to the Falls of Lana, we agree that CVPS's proposed enhancements would improve the safety, scenic, and educational values of the site for the many recreational users of the falls. Specifically, the proposed safety measures at the overlook and along the steep trail under the penstock would improve access, control erosion on the steep slope, and provide a more secure viewing location at the overlook. In addition, views of the falls would be improved by removal and maintenance of foreground vegetation. Therefore, we recommend that CVPS file final design drawings including, where appropriate, erosion control plans developed in consultation with VANR and GMNF, and implement these enhancements. We estimate that the current annual cost of these enhancements would be \$500.

G. Silver Lake Operating Levels

CVPS implemented a step to reduce shoreline erosion by lowering the maximum operating level from elevation 1,249.0 feet USGS to elevation 1,247.5 feet USGS from April through December of each year. Over the past 18 months, additional shoreline erosion due to wave action has been significantly reduced. We estimate that the current annual cost of this enhancement would be \$500.

To enhance conditions for aquatic resources, we recommend that CVPS: maintain the maximum operating level of Silver Lake between 1,246.5 and 1,247.5 feet msl from June 1 through December 31; at 1,242.5 feet msl from January 1 through May 31; and either fill or maintain lake level from March 15 through May 31. This regime is proposed by CVPS and would not add any additional costs to the project.

H. Smelt Spawning in the Project Tailrace

CVPS proposes to discontinue operation of the Silver Lake powerhouse after dark, unless the unit can be operated 24 hours per day for the duration of a 5-week period following the spring ice breakup in the main portion of Lake Dunmore. This operation would provide suitable flows (inflow) for spawning and incubation of smelt. Therefore, we recommend that CVPS develop in consultation with VANR and file with the Commission, for approval, a plan to generate during the daylight hours only, or, upon commencement of nighttime generation, convert to around-the-clock generation from March 15 through May 15. We calculate that there would be no cost for discontinuing project operation after

dark; however, we estimate that the current annual cost of operating continuously for a 5-week period would be \$300.00.

I. Conclusions

Based on our independent review and evaluation of the proposed Silver Lake Hydroelectric Project, agency recommendations, the proposed project with our recommended enhancement measures, and the no-action alternative, we have selected as the preferred alternative CVPS's proposed project with our additional recommended measures. We estimate that the current annual cost of energy for the staff's alternative would be \$135,800 more than the cost of energy from the least cost alternative.

VII. RECOMMENDATIONS OF FISH AND WILDLIFE AGENCIES

Under the provisions of the FPA, as amended by the Electric Consumers Protection Act of 1986, each hydroelectric license issued by the Commission must include conditions based on recommendations of federal and state fish and wildlife agencies for the protection and enhancement of fish and wildlife and their habitat affected by the project.

Section 10(j) of the FPA states that whenever the Commission believes that any fish and wildlife agency recommendation is inconsistent with the purposes and the requirements of the FPA or other applicable law, the Commission and the agency shall attempt to resolve any such inconsistency, giving due weight to the recommendations, expertise, and statutory responsibilities of the agency.

Pursuant to Section 10(j) of the FPA, we made a determination that one of the recommendations of the federal fish and wildlife agency would be inconsistent with the purposes and requirements of Part I of the FPA or other applicable laws. Recommendations or parts of recommendations that were considered inconsistent with Section 10(j) conflict with the comprehensive planning and public interest standards of Section 4(e) and 10(a) of the FPA. We identified only one resource agency recommendation that we determined to be inconsistent with Section 10(j):

- Interior's recommendation that an instantaneous flow of 5 cfs be released below Sucker Brook diversion dam.

By letter dated September 18, 1996, we notified Interior of the inconsistency, and requested that the agency consider other measures, including our initial recommendation for a 1 cfs release below the diversion dam, or provide additional evidence to support the original recommendation. No additional

information supporting the original recommendation was received from Interior.

However, in response to the draft EA for the Silver Lake Project, Interior filed a letter dated November 26, 1996, which provided a new recommendation for minimum flows below Sucker Brook diversion dam. Because this letter was filed beyond the deadline specified in our notice that the application was ready for environmental analysis, it does not qualify as a Section 10(j) recommendation and, therefore, has been considered under Section 10(a) of the FPA.

For the Silver Lake Project, VANR and Interior have had the opportunity to make comments and recommendations. Both agencies have provided recommendations, and we evaluate and discuss all recommendations in the water, fisheries, terrestrial, and recreation resources sections of this EA. We present our conclusions concerning the merits of these recommendations there. In Table 5, we summarize VANR's and Interior's recommendations, show the annual cost of environmental measures, and show if they are within the scope of 10(j) and whether or not they are recommended for adoption under the staff's alternative.

Table 5. Summary of fish and wildlife agency recommendations
(Source: Staff)

Agency	Recommendations	Within Scope of 10(j)	Annual Cost of Environmental Measures	Adopted
Interior/VANR	Manage Sugar Hill reservoir utilizing conservation pool elevations and provide seasonal minimum flows below Goshen dam.	yes	\$4,300	yes
Interior	Release below the diversion dam a seasonal minimum flow of 2.5/3.5 cfs.	no. Considered under Section 10(a).*	\$45,000	no. Would result in adverse impact to economics.
Interior	Prepare and file a plan for maintaining minimum flow releases.	yes**	MC	yes
Interior	Develop a ramping procedure below Goshen dam for releases that are greater than 10 cfs.	yes**	\$300	yes
Interior	Develop a ramping plan for the tailrace, so that the first and second 5-minute periods will not exceed a 20 cfs change from the previous flow.	yes	\$300	yes
VANR	Present normal operating water level at the diversion dam remain unchanged.	yes	NAC	yes
VANR	Develop a report and plans to maintain conservation flows. This plan should include monitoring instantaneous flow releases.	yes	Cost listed under Interior Recommendation 1 (\$4,300)	yes
VANR	Develop post-licensing studies to address DO deficiencies below Goshen dam.	yes	\$300	yes

Agency	Recommendations	Within Scope of 10(j)	Annual Cost of Environmental Measures	Adopted
VANR	Allow public access to project waters.	no. Considered under Section 10(a).	NAC	yes
VANR	Draft a final plan for recreational improvements to be implemented within one year of licensing.	no. Considered under Section 10(a).	\$300	no. Plans already filed are sufficient.
VANR	Draft a recreation master plan including monitoring. To be updated every 5 years.	no. Considered under Section 10(a).	\$300	no. FERC Form 80 already provides for monitoring.

* This recommendation was filed in response to the DEA, not the Commission's Notice of Ready for Environmental Analysis as Section 10(j) requires.

** Agencies cannot dictate timing under a Commission license. We have evaluated the recommendation without the proposed filing schedule.

NAC = No Additional Cost to implement this measure.
MC = Minimal Cost for implementation.

As Table 5 shows, we determined that 7 recommendations made by fish and wildlife agencies are within the scope of Section 10(j) of the FPA. We recommend adopting all of them.

Recommendations Outside the Scope of Section 10(j)

We determined that 4 of the recommendations of the federal and state fish and wildlife agencies are outside the scope of Section 10(j) because they were not timely filed or they do not propose specific measures to enhance fish and wildlife in the project area, but rather deal with public access to the site and the development of recreational plans. We, therefore, consider these recommendations under the public interest standards of Section 10(a) of the FPA.

We determined that 3 of these recommendations are not in the public interest; therefore, we do not recommend them for the reasons cited below.

- We do not recommend that CVPS release a seasonal minimum flow of 2.5 cfs from June 1 through October 1, and 3.5 cfs for the remainder of the year. Our recommended flow of 2.5 cfs from April 1 through September 30, and 3.5 cfs for the remainder of the year

would enhance water quality in the stream reach below the Sucker Brook diversion dam.

- We do not recommend that CVPS prepare a final plan for recreational improvements to be implemented within one year of relicensing. CVPS has provided adequate information regarding recreational improvements and, therefore, no additional plan is required.
- We do not recommend that CVPS prepare a recreation master plan, including monitoring. The agency also recommends that this plan be updated every 5 years. We do not recommend this for the following reasons: the total acreage that CVPS actually owns is very limited; CVPS already has filed adequate preliminary plans and cost estimates of its proposed recreation improvements at the Silver Lake Project; and Section 8.11 of the Commission's regulations requires project recreation monitoring and reporting (Form 80) on a 6 year basis. Therefore, we do not recommend development of a recreation master plan.

VIII. CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2) of the FPA 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. Under Section 10(a)(2), federal and state agencies filed a total of 28 qualifying comprehensive plans of which we identified 6 Vermont and 7 United States comprehensive plans to be applicable. We did not find any conflicts. We list comprehensive plans relevant to this project in Section X.

IX. FINDING OF NO SIGNIFICANT IMPACT

None of the resources that we analyzed - including geologic resources, water quantity and quality, fisheries, terrestrial, cultural, and recreation resources - would experience significant adverse effects under the recommended alternative.

On the basis of our independent analysis, issuing an original license for the project as proposed by CVPS with our additional recommended measures would not constitute a major federal action significantly affecting the quality of the human environment.

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XI. LIST OF PREPARERS

Federal Energy Regulatory Commission

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Stone & Webster

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APPENDIX A

**AGENCY COMMENT LETTERS ON THE DEA FOR THE SILVER LAKE PROJECT
AND COMMISSION'S STAFF RESPONSES**

APPENDIX A

AGENCY COMMENT LETTERS ON THE DEA FOR THE SILVER LAKE PROJECT AND COMMISSION'S STAFF RESPONSES

<u>Commenting Entities</u>	<u>Page #</u>
Central Vermont Public Service Corporation	A-1
U.S. Department of the Interior Fish and Wildlife Service	A-4
State of Vermont Agency of Natural Resources	A-9
Vermont Natural Resources Council (not timely filed)	A-16
Green Mountain & Finger Lakes National Forests	A-19

APPENDIX A

AGENCY COMMENT LETTERS ON THE DEA FOR THE SILVER LAKE PROJECT AND COMMISSION'S STAFF RESPONSES

Introduction

The Notice of Availability of the Draft Environmental Assessment (DEA) was published in the *Federal Register* on Wednesday, March 1, 1995. The DEA was mailed to federal, state, and local agencies and individuals for comments on August 29, 1996.

All timely letters of comment that address specific analyses in the DEA were reviewed by Commission staff. Suggestions for correcting text or data and requests for further discussion of a subject have been considered. Those editorial changes and suggestions that were practicable, reasonable, and that improved the quality of the EA are incorporated herein.

Constructive criticism presenting a major environmental point of view or one in opposition to the staff, when persuasively supported, is treated by making revisions in the appropriate part of the FEA. When the major point of view is not persuasive, reasons are given why the staff did not change its point of view.

Comment Letters Received on the DEA

Four comment letters were received on the DEA prior to the end of the official comment period. This appendix of the FEA provides copies of these and one late-filed letter. Specific comments within the comment letters have been bracketed and numbered sequentially for easy identification. Our responses are numbered to match the comments. Where possible, our responses are presented to the right of the beginning of the comments, which may extend for several pages.

The sections or pages of the EA that we modified as a result of comments received are identified in the staff responses. Other staff responses are self-explanatory.

COPY



Central Vermont Public Service Corporation

FILED
OFFICE OF THE SECRETARY
96 DEC -2 PM 4:31
FEDERAL ENERGY
REGULATORY COMMISSION

November 26, 1996

Lois D. Cashell, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, DC 20426

RE: FERC No. 11478-000 - Silver Lake Hydroelectric Project
Draft Environmental Assessment Comments

Dear Secretary Cashell:

- A-1
- CVPS-1 Central Vermont Public Service Corporation (CVPS) is hereby providing comments on the August 29, 1996 Draft Environmental Assessment (DEA) for the above referenced project.
- CVPS-2 1) Page 3 of the DEA lists acreage and storage capacity for elevation 1768. These numbers appear accurate but elevation 1768 is incorrectly referred to as the normal surface elevation. 1768 is the spillway elevation. Normal maximum pond level is 1763 feet.
- CVPS-3 2) Page 19 of the DEA, has two locations where elevation 1768 should be changed to 1763.
- CVPS-4 3) Page 23 includes a recommendation to monitor Sugar Hill Reservoir level on an hourly basis. While hourly information would be useful, it will be very difficult and expensive to obtain for the following reasons:
- a) There is no power at the dam. The closest electrical line is three miles away. The estimated cost to bring electricity to the site is \$150,000 excluding payments for right of ways. Batteries may be feasible to power a pond level recorder but probably not to power equipment to transmit the reading to the control center.
 - b) Even if power were available, it may be difficult to transmit the signal from this site due to its location high up between the hills.

77 Grove Street,
Rutland, Vermont 05701
802-273-2711

Responses to
Comments of the Central Vermont Public Service Corporation
on the Draft Environmental Assessment
for the Silver Lake Project

Letter dated November 26, 1996

CVPS-1 No response required.

CVPS-2 We have changed the normal pond elevation at Sugar Hill Reservoir to 1,763 feet on page 3 of the EA.

CVPS-3 We have changed the normal pond elevation at Sugar Hill Reservoir to 1,763 feet on pages 28 and 29 of the EA.

CVPS-4 Staff notes the technical limitations of providing hourly monitoring at the Sugar Hill reservoir. Staff has reevaluated the need for hourly monitoring of the Sugar Hill reservoir and determined that because of the type of equipment presently located at the dam, the size of the reservoir, and the slow rate of drawdown, hourly monitoring is not required. In order to ensure that the proposed operating regime at the Sugar Hill reservoir is maintained, we will recommend that CVPS develop a monitoring plan for the Sugar Hill reservoir, in consultation with VANR, that includes methodology and sampling protocols to ensure that conservation pool elevations are kept within the required limits and the appropriate flow releases are maintained.

CVPS-4 | c) Locating a serviceable level transducer where it is secure from vandals and ice damage will also be difficult. The only protected location, the discharge pipe, would be unreliable due to velocity effects of the discharge valves.

CVPS-5 | 4) Page 24 recommends a water quality monitoring program below Goshen Dam to start June 1. The program should start July 1, because the spring run-off drawdown will still be occurring in June and thermal stratification seldom occurs at this high elevation pond before mid July.

CVPS-6 | 5) On pages 25 and 31 project flow duration curves are discussed in relation to a 2.5 cfs minimum flow release below Goshen Dam. It should be pointed out that the drainage area above Goshen Dam is only about 25 percent of the total project drainage area. Proration of the flow duration curves indicates that substantial parts of the summer flow into Sugar Hill Reservoir will be below 2.5 cfs. Settlement discussions were held with the agencies to determine which project condition takes priority, maintaining the conservation pool level or the minimum flow below the dam. The Vermont Agency of Natural Resources has offered a solution that attempts to balance these resource needs. CVPS supports ANR's proposed solution provided that there is some flexibility to modify trigger points based on operating experience.

CVPS-7 | 6) On page 26 staff analysis suggests that releasing water over the diversion dam spillway would degrade water quality. In years of testing water quality below its twenty projects, CVPS has never discovered a dissolved oxygen deficiency in water that has spilled from the top of a headpond over a spillway, especially into a steep rocky creek bed such as below the diversion dam. Perhaps there would be some temperature increase in the impoundment but the surface area and turnover time is small when compared with Sugar Hill Reservoir. Releasing the minimum flow from the penstock is feasible especially at a flow of 1 cfs. However, during penstock maintenance or high Silver Lake water levels, the minimum flow will have to be diverted over the diversion dam spillway by closing the diversion dam penstock headgate. In addition, it was discovered during a flow demonstration on November 1, 1996 (involving agencies and FERC's Stone & Webster consultant) that a release from the penstock would still leave 100 yards of the Sucker Brook streambed dewatered due to elevation differences and hilly terrain between the penstock and the streambed. This could be mitigated somewhat by releasing the flow to the former Dutton Brook streambed 20 yards below the dam. This streambed joins Sucker Brook approximately 120 yards below the diversion dam spillway.

CVPS-10 | 7) Page 31 indicates that a release of 2.5 cfs from Sugar Hill Dam is equal to the 7Q10 flow in Sucker Brook. 2.5 cfs is actually 10 times the 7Q10 flow below the Sugar Hill Dam, and 2.5 times the 7Q10 flow in Sucker Brook below the Diversion Dam.

CVPS-11 | 8) Analysis on page 34 suggests that smelt spawning can begin by late February. CVPS believes that the earliest recorded spawning was actually late March.

CVPS-5 Staff agrees that spring drawdown may still be occurring on June 1 and has modified the requirement for installation of the baffle system below Goshen Dam. Staff recommends that the baffle system be installed from July 1 through September 1 of each year to provide continuous enhancement of water quality conditions below the Goshen dam.

CVPS-6 Staff agrees that the flow duration curves presented in the application represent the entire project. The revised analysis in the FEA uses prorated inflows to Sugar Hill reservoir based on drainage area at that location.

CVPS-7 Opinion noted.

CVPS-8 Staff has adopted VANR's WQC condition requiring release of minimum flows over the diversion dam spillway. Diversion of additional flows over the spillway during penstock repair would not adversely impact the already inundated wetland.

CVPS-9 We agree that flows released from the penstock would bypass approximately 100 yards of Sucker Brook below the diversion dam. In the DEA, staff concluded that the release of minimum flows via the penstock method would preserve the existing wetland system behind the dam and enhance the overall water quality of Sucker Brook. However, in the FEA we recommend adopting VANR's WQC condition requiring release of the required minimum flows over the diversion dam spillway.

CVPS-10 Page 44 of the FEA has been modified to reflect this information.

CVPS-11 Smelt spawning information provided by both CVPS and the VANR over a 30 year period indicate that spawning has occurred as early as March 8th (1976). The analysis in the FEA on page 50 has been revised to reflect the late March date based on actual records compiled for this site over a 30 year period.

Secretary Cashell
Project No. 11478
Page 3

CVPS-12

9) In Table 3 located on page 55, no costs are listed for the requirement to monitor Sugar Hill reservoir levels. As discussed above, these costs will be very high. The cost could be as high as \$200,000 under the worst case scenario of reaming in electricity and communications lines to the site.

CVPS-13

10) On page 57 of the DEA the staff alternative for managing Sugar Hill reservoir indicates that the conservation pool elevation should be reached by June 15. This is contrary to staff analysis on pages 23, 30, and 43 that indicates July 1 is an acceptable date. Footnote number 11 indicating that precise timing will vary yearly is appreciated, but CVPS is concerned that the June 15 date will be carried forward to a license condition.

CVPS-14

This concludes Central Vermont's comments on the August 29, 1996 Draft Environmental Assessment. If there are any questions, please call me at 802-747-5463.

Sincerely,



Bruce M. Penock
Manager of Production Engineering

cc: Attached Service List

CVPS-12 Opinion noted. Staff has revised the recommendation for monitoring headpond elevations at the Sugar Hill reservoir as discussed in Comment CVPS-4.

CVPS-13 July 1 is the recommended date for returning the Sugar Hill reservoir to the conservation pool elevation.

CVPS-14 No response required.



United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Field Office
22 Bridge Street, Unit #1
Concord, New Hampshire 03301-4986

RE: Silver Lake Hydro Project - FERC No. 11478-000

November 26, 1996

Lois D. Cashell, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Dear Ms. Cashell:

This is in response to the request for comments on the Draft Environmental Assessment for the Silver Lake Hydro Project. Central Vermont Public Service Corporation filed an application for an original license to continue operation of this 2.2 megawatt project. The project is located on Sucker Brook in Addison County, Vermont. In the following, we provide a brief description of the project and our comments on the DEA.

PROJECT DESCRIPTION

The project is located in the Towns of Salisbury, Leicester, and Goshen, Vermont and has been in operation since 1917. The project is composed of three parts: Goshen Dam and Sugar Hill Reservoir, the Sucker Brook diversion dam, and the Silver Lake development, including the dam and reservoir, penstock, powerhouse, transmission facilities, and appurtenant equipment.

The most upstream portion of the project is Goshen Dam, which creates Sugar Hill Reservoir. The purpose of the reservoir is to capture spring flood waters from the headwaters of Sucker Brook. The reservoir has a surface area of approximately 74 acres. Water is released from Goshen Dam into Sucker Brook. Duxon Brook meets Sucker Brook and the waters from both are diverted to Silver Lake by a diversion dam that exists about 2.5 miles downstream of Goshen Dam. Water is diverted to Silver Lake through a 7,000-foot-long penstock. Silver Lake is approximately 110 acres in size.

From Silver Lake, water flows through a 5,200-foot-long penstock to the powerhouse which is located on Sucker Brook near its outlet to Lake Dunmore. The powerhouse contains one 2,200 KW unit that uses a flow of approximately 60 cfs. The drainage of the entire project is 10.2 square miles.

Responses to
Comments of United States Department of the Interior,
Fish and Wildlife Service
on the Draft Environmental Assessment
for the Silver Lake Project

Letter dated November 26, 1996

FWS-1 No response required.

FWS-2 No response required.

FWS-3 No response required.

FWS-4 No response required.

FWS-5 Sucker Brook is a high gradient stream with boulders and cobbles and occasional pools. The stretch between Goshen Dam and the diversion dam is approximately 2.5 miles long. The bypass reach between the diversion dam and the powerhouse discharge is a little under two miles long which includes the Falls of Lana. The Falls of Lana is a dramatic cascade that is an impediment to any fish migration from Lake Dunmore, but is a popular tourist attraction.

SUGAR HILL RESERVOIR

FWS-6 The primary issues in Sugar Hill Reservoir relate to the stability of the water level and the seasonal timing of water level fluctuations. We agree with the decision in the DEA to manage the reservoir with a conservation pool operating from the rule curves proposed by CVPS. The existing operating regime draws down the pool as much as 27 feet starting in September and reaching maximum drawdown in March. The drawdown allows for the collection of spring runoff. This storage is then gradually released for generation. The proposed operating regime will hold the reservoir stable from the end of October through the beginning of April. In April the pool will be surcharged with the spring runoff, and then the pool will be drawn down to its original depth and stability by early July.

FWS-7 The proposed operating regime will be significantly more protective of aquatic life in the reservoir. The stable water level should protect hibernating reptiles and amphibians from being frozen during the winter drawdown. It should also protect wintering benthic invertebrates, overwintering fish, and mammals that are lodging along the reservoir. The stable winter water regime should also allow for an increase in the productivity of the wetland in the southeast corner of the reservoir.

FWS-8 The existing operating regime dewateres approximately 12 acres of organic substrate. These sediments are suitable for the development of wetland vegetation, however vegetation does not have the opportunity to establish with the drastic changes in hydrology (inundated in the summer and exposed in the winter). The 3.5 acres of wetland existing around the perimeter of this area will also be expected to improve in productivity. At present, the vegetation consists predominantly of annuals. A more stable water regime should allow a more diverse vegetative community to establish.

FWS-9 From an environmental perspective, it would be preferable to have a stable water level in the reservoir throughout the year. For example, the changing water level in the spring is likely to discourage waterfowl nesting in or along the shores of the reservoir. Also, the vegetation does not receive the opportunity of the full growing season when the water level is not stabilized until early July. However, the proposed operating rule provides a substantial improvement over existing operations and is acceptable.

FWS-5 No response required.

FWS-6 No response required.

FWS-7 No response required.

FWS-8 No response required.

FWS-9 Opinion is noted.

SUCKER BROOK - GOSHEN DAM TO DIVERSION DAM

FWS-10 The primary issue in this reach relates to the minimum flow. We again agree with the DEA that a continuous, year-round 2.5 cfs minimum flow, or inflow, whichever is less, is beneficial to the fishery in this reach. This is the flow that has generally been maintained in this reach. However, we doubt that maintaining a minimum flow of 2.5 cfs is realistic, with the proposed change in management of Sugar Hill Reservoir. This was an augmented flow that was derived from drawing down the reservoir. When the reservoir is maintained at a constant pool, the ability to augment the flow will be limited. Water budget modeling conducted by the Vermont Agency of Natural Resources indicated that with a three foot fluctuation in the reservoir elevation from July through early October, the highest flow that could be guaranteed in Sucker Brook below Goshen Dam is 1.3 cfs. In the interest of balancing protection of both wetland resources and the existing fishery in Sucker Brook below Goshen Dam, we will accept the small fluctuation of the water level in the reservoir and recommend a minimum flow of 1.3 cfs, or inflow, below Goshen Dam.

FWS-11 The DEA also supported our earlier recommendation of requiring ramping from Goshen Dam when flows change more than 10 cfs. We would appreciate being consulted on the development of the ramping plan.

SUCKER BROOK - BYPASS REACH

FWS-12 Minimum flow is again the primary issue for this reach. Flow demonstrations were conducted to allow for comparative analysis. In our letter of April 19, 1996, we recommended a minimum flow of 5 cfs. The 5 cfs flow appeared to be the optimum condition based on our observations, however we had not completed discussions with CVPS at that time. The DEA supported 1 cfs as proposed by CVPS. The DEA argued that since state water quality standards are already being met in the bypass reach with a leakage flow of 0.1 cfs, the proposed flow of 1 cfs should enhance the stream condition. We question the analysis of the DEA that the leakage flow meets state water quality standards. Because the stream has a high gradient, the leakage flow may meet water quality standards for dissolved oxygen, however it is not adequate for the protection of aquatic life simply because it does not provide enough water to the stream bed. In fact, the Application for Initial License (May 1994) described the leakage flow as "sufficient to avoid stagnation of otherwise small and placid pools". We do not believe that this suggests adequate habitat for aquatic organisms.

FWS-13 Our assessment of the 1 cfs flow was that the water was slow and shallow, and offered limited wetted perimeter. Therefore, we believe that 1 cfs will provide little habitat for benthic organisms and no habitat for fish. As a result, productivity of the stream will be very low relative to its potential. In essence, we do not consider 1 cfs to be an acceptable minimum flow for this reach.

FWS-10 The revised analysis in the FEA considers the effects of minimum flows on water level management in the Sugar Hill reservoir and makes recommendations to coordinate minimum flows and conservation pool elevations.

FWS-11 We will recommend that CVPS consult with Interior and VANR in the development of ramping plan for flows below Goshen dam.

FWS-12 Opinion noted. Currently, the reach of Sucker Brook between the diversion dam and the confluence with the North Branch of Sucker Brook receives only limited leakage flows. Staff agrees that a release of 1 cfs does not provide optimal habitat, but minimal habitat for aquatic organisms year round. While a release of 1 cfs is an improvement over existing leakage flows and enhances water quality conditions, based on the flow demonstration conducted on November 1, 1996, we conclude that a release of 2 cfs below the Sucker Brook diversion dam would provide additional habitat and enhance water quality to meet Vermont State Water Quality Standards for Class B Waters. However, we are recommending that CVPS release a minimum flow of 2.5 cfs from April 1 through September 30, and 3.5 cfs from October 1 through March 31, as required by VANR's WQC.

FWS-13 Opinion noted.

FWS-14

We still believe that 5 cfs in the bypass reach provides optimum fish habitat. During the flow demonstration, the 5 cfs flow appeared to provide good depth and velocity, and the channel appeared full and well aerated. The 3 cfs flow still appeared to provide adequate habitat for fish, however depths, velocity, wetted perimeter, and cover were much less than for the 5 cfs flow. The U.S. Fish and Wildlife Service regional guidance regarding minimum flows recommends that the August median flow as the minimum flow. Studies in this part of Vermont suggest that 0.38 csm is the August median flow; this would translate to approximately 4 cfs in the Sucker Brook watershed.

FWS-15

During a conference call of November 15, 1996, which involved VANR, Vermont Natural Resources Council, U.S. Forest Service, U.S. Fish and Wildlife Service, and CVPS, Bruce Peacock of CVPS offered 2 cfs as a possible minimum flow for the bypass reach. He also offered to provide a flow demonstration for the agencies to compare 2 cfs to 3 cfs. This flow demonstration took place on November 1, 1996. In our judgement, 2 cfs was significantly better than 1 cfs. However, 3 cfs was again notably better than the 2 cfs. Specifically, 3 cfs offered more velocity including greater turbulence which provides cover for fish, as well as more depth in pools and riffles. The 2 cfs often provided very shallow water over the riffles, which would probably not allow for fish movement. In general, our assessment remained that 3 cfs was the lowest flow that would be suitable for the bypass reach. However, we understand that the U.S. Forest Service has concerns for maintaining some flow into Silver Lake to maintain water quality for recreation. This flow also serves for generation. Therefore, we will recommend a minimum flow of 2.5 cfs from June 1 to October 1, and 3.5 cfs for the remainder of the year to protect spawning and incubation. This is a compromise to try to accommodate the needs of all of the parties on a project which has limited water and many demands. We hope you are willing to reconsider the DEA's recommendation of 1 cfs.

FWS-16

FWS-17

FWS-18

The DEA recommended that the minimum flow to the bypass be provided by a pipe off of the penstock. We made this recommendation in our original comments. However, through discussions in the field with the other agencies, we have begun to rethink this recommendation. Piping from the penstock would require that several hundred feet of the bypass remain dewatered (except leakage). Water spilling from an orifice in the dam would be simple and would provide water to the whole reach. Our original concern regarded impounding a one-acre area of wetland which would alter the character of the wetland and may cause warming of the water before it is discharged into the bypass. However, we believe our recommendations should be based on returning the system to as natural a condition as possible. Engineering considerations require that we choose between inundating a small wetland or leaving a short section of river dewatered. Given that the wetland values will change through inundation but will not be wholly lost, and the river reach has virtually no value without water, inundating the wetland and releasing water through an orifice in the dam to provide water to as much of the bypass as possible appears to be the better approach. However, warming of the water remains a concern. Therefore, we recommend that the temperature and dissolved oxygen be monitored just above and just below the dam throughout

FWS-14 Opinion noted.

FWS-15 Opinion noted.

FWS-16 Staff recognizes the agencies' beliefs that with appropriate flow releases below the diversion dam, Sucker Brook could have the future potential to support healthy, self-sustaining populations of brook and brown trout (VANR letter April 19, 1996 and GMNF letter dated October 10, 1996). FERC staff does not concur with this theory due to the presence of physical barriers preventing fish passage and the limited gene pool of translocated fish expected to result from these physical barriers. FWS has recommended these increased flows below the diversion dam to support a fishery which does not currently exist, and which staff considers unlikely to be achievable. Therefore, we conclude that a flow of 2 cfs below the diversion dam is adequate for the enhancement of water quality. However, we are recommending that CVPS release a minimum flow of 2.5 cfs from April 1 through September 30, and 3.5 cfs from October 1 through March 31, as required by VANR's WQC.

FWS-17 Staff has compared the function and value of the existing wetland with the potential benefits of providing flows to the reach of Sucker Brook immediately below the diversion dam and continues to recommend release of flows via a penstock pipe. Impounding water at the Sucker Brook diversion dam would result in 2.6 acres of submerged area that would completely cover the existing 1.8 acre wetland. The resulting deepwater regime would not provide equivalent vegetative productivity, wildlife diversity or other wetland functions when compared to the existing wetland. Any fringe wetland that would develop beyond the current wetland boundary would be limited in size due to the surrounding steep slopes and rocky outcrops, only reaching an area of 0.5 acres.

FWS-18 Staff disagrees with a trial and error approach that includes destroying productive habitat. As discussed above, Staff concludes that releasing flows via a penstock pipe would preserve the existing wetland functions and values while enhancing water quality below the Sucker Brook diversion dam. However, we are recommending that CVPS release minimum flows over the spillway, as required by VANR's WQC.

FWS-18 the summer of the first year of operation under the modified conditions. If the temperatures and oxygen concentrations are not acceptable, an alternative approach such as providing the minimum flow from a pipe off of the penstock may be necessary.

THE TAILRACE

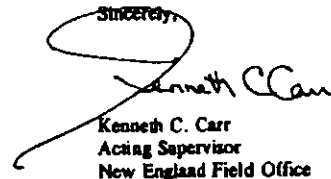
FWS-19 The DEA recommended that a ramping plan be developed for the stream below the powerhouse. We made the same recommendation in our letter of April 19, 1996 and we appreciate the support.

SUMMARY

FWS-20 In general, we agree with the conclusions of the DEA and the recommended measures to be included in the license. However, we have some disagreements with the DEA regarding the minimum flows in the bypass reach and below Goshen Dam. We do not believe that the 1 cfs flow is protective of aquatic life, and we recommend at least a minimum flow of 2.5 cfs be provided through the spring and summer, and 3.5 cfs be provided from October 1 through March 31. We also do not believe that a minimum flow of 2.5 cfs is realistic for Sucker Brook below the Goshen Dam if Sugar Hill Reservoir is held stable. Therefore, we recommend a minimum flow of 1.3 cfs be provided for this upper reach, based on calculations provided by VANR. Lastly, we change our recommendation regarding the method for providing flows below the diversion dam. Rather than leaving several hundred feet of the bypass dewatered, which would be required if the minimum flow is provided from a pipe off of the penstock, we recommend that water be released from an orifice in the dam. This will require impounding water behind the dam which raises concerns for elevated water temperatures. Therefore, we recommend that temperature and dissolved oxygen be monitored above and below the diversion dam through the summer months of the first year.

FWS-24 We thank you for your patience in receiving our comments. If you have any questions, please contact Laura Eaton at 603-225-1411.

Sincerely,


Kenneth C. Carr
Acting Supervisor
New England Field Office

FWS-19 No response required.

FWS-20 No response required.

FWS-21 Staff recommends that CVPS release a minimum flow of 2.5 cfs from April 1 through September 30, and 3.5 cfs from October 1 through March 31, as required by VANR's WQC.

FWS-22 Staff has revised the recommendations for management of the Sugar Hill reservoir and minimum flows below Goshen Dam.

FWS-23 Staff recommends the release of minimum flows below the diversion over the dam spillway as required in VANR's draft WQC.

FWS-24 No response required.



State of Vermont

Department of Fish and Wildlife
Department of Forests, Parks and Recreation
Department of Environmental Conservation
State Geologist
Natural Resources Conservation Council

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FEDERAL ENERGY
REGULATORY COMMISSION

AGENCY OF NATURAL RESOURCES
OFFICE OF THE SECRETARY
103 South Main Street
Center Building
Waterbury, Vermont 05671-0303

802-241-3770

November 27, 1996

COMMENTS ON DRAFT ENVIRONMENTAL ASSESSMENT

**SILVER LAKE HYDROELECTRIC PROJECT
FERC PROJECT NO. 11478-000
CENTRAL VERMONT PUBLIC SERVICE CORPORATION**

Lois Casbell, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, D.C. 20426

Dear Secretary Casbell:

VANR-1

The Vermont Agency of Natural Resources (Agency) herein files comments on the Draft Environmental Assessment (draft EA) for the Silver Lake Hydroelectric Project, for which a "Notice of Availability of Draft Environmental Assessment" was issued on August 29, 1996.

Summary Section

VANR-2

On p. iv of the summary section, it is stated that 6,433 megawatt-hours of generation would be lost if the project is denied a license. Technically, this historical level of generation should be adjusted for projected generation after the institution of minimum flows in the bypassed reach below the diversion dam.

Section III.C. Water Quality Certification

VANR-3

The Agency, U.S. Fish and Wildlife Service, U.S. Forest Service, the Vermont Natural Resources Council, and Central Vermont Public Service Corporation are continuing to negotiate proposed conditions for the draft Section 401 water quality certification. In order to allow time for the completion of those negotiations, the Agency has requested that Central Vermont withdraw and resubmit for certification. As noted in the draft EA, the pending

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Responses to
Comments of the State of Vermont,
Agency of Natural Resources
on the Draft Environmental Assessment
for the Silver Lake Project

Letter dated November 27, 1996

VANR-1 No response required.

VANR-2 All lost generation is compared to baseline (existing) conditions. Therefore, if a license were denied in this case, 6,433 megawatt-hours would be lost.

VANR-3 No response required.

Secretary Caswell
November 27, 1996
Page 2

VANR-3 application was filed on January 3, 1996. Our hope is that the negotiations will be concluded by the end of December, in which case the Section 401 decision would probably be issued in March.

Section IV.C.1. Geology Resources

VANR-4 The Agency concurs generally with the staff analyses in this section. With respect to the removal of overhanging trees along the shoreline of Silver Lake (ref. p. 18), we strongly recommend that care be taken to remove only those trees that realistically pose a threat to bank stability and, where trees are removed, replacing those trees with appropriate trees indigenous to the lake shorelands.

Section IV.C.2. Water Resources

a. Affected environment:

VANR-5 Water Quality

In the introductory paragraph of the section on water quality, p. 20, it would be more correct to state that the designation is Class B waters and cold water fish habitat.

b. Environmental impacts:

VANR-6 Sage Hill Reservoir

Conservation Pool

This topic is discussed under minimum flows below.

Water Quality Monitoring

VANR-7 Regarding the baffle installation at Goshen dam, the draft EA suggests a dissolved oxygen level trigger in the event water quality problems persist after the modified summer reservoir operating level is implemented. If the baffles are needed, the Agency will probably require their installation during a certain calendar period. This would obviate the need for monitoring water quality over the long term and would provide for more consistent enhancement of water quality, rather than deferring installation until releases decline to the minimum standard for dissolved oxygen.

VANR-4 We concur with the VANR that care be taken to remove only those trees that realistically pose a threat to bank stability along the Silver Lake shoreline. However, the GMNF controls these areas and would be responsible for any vegetation management.

VANR-5 The text of the FEA at page 29 has been modified to read "...Class B waters and cold water fish habitat".

VANR-6 No response required.

VANR-7 Staff agrees and has recommended installation of the baffle system at the Goshen Dam outfall.

Sucker Brook Diversion Dam

VANR-8

The staff analysis on p. 26 suggests that dissolved oxygen/temperature conditions below the diversion dam under present leakage flow meet state standards. This is unlikely as portions of the stream are virtually dry. Temperature standards would certainly not be met as at least a portion of the stream would probably rise to or above ambient air temperature during the summer. Algal respiration may also depress dissolved oxygen levels. We are unaware of any data that shows standards are presently met in the upper portion of the bypass.

Minimum Flows

VANR-9

The draft EA indicates that 2.5 cfs is a supportable minimum flow below Goshen dam because inflows to Sugar Hill Reservoir in July and August are in the range of 2.0 to 3.5 cfs. The flow duration curves were drawn to reflect the flows for the full contributing drainage to the project, 10.2 square miles. Flows at Sugar Hill Reservoir are substantially less. Mass hydrograph modeling done by the Agency suggests that the historic practice of sustaining a minimum flow release of 2.5 cfs (guaranteed) through the summer is only feasible with large magnitude drawdowns. In the license application, Central Vermont provides information on how the reservoir was operated in 1989 (Exhibit A, Figure 1a). Summer 1989 was relatively wet. During the period from June through August, Central Vermont consistently released about 2.5 - 3.0 cfs, and the reservoir was drawn as much as six feet. With the proposed smaller conservation pool surface area, the drawdown would have been even greater. Drier conditions would require even greater drawdowns to sustain the 2.5 cfs release. Given that, the parties are presently discussing an operating rule for the reservoir that would generally sustain a summer-to-early-fall base flow of 1.3 cfs in all but the driest of years.

VANR-10

Reservoir storage between one foot above the conservation pool level (1750.0 feet msl) down to three feet below the conservation pool would be used to accomplish this. When necessary, conditions would become instantaneous run-of-river to prevent the reservoir from falling below elevation 1747.0 feet msl. Otherwise, a minimum rate of release of 1.3 cfs would be provided from the end of the spring recession through October 31. Generally, high inflows would be used to replace the storage deficit up to the elevation of the conservation pool rather than for the purpose of enhancing power production by releasing high flows for diversion to Silver Lake. Nor would the reservoir be drawn to enhance power production, as the storage in this elevational range is reserved solely for augmenting downstream flows. In order to protect the biological integrity of the reservoir, no operational drawdowns below elevation 1747.0 feet msl would be allowed.

VANR-11

After October 31 and up to spring runoff, the objective would be to avoid drawing the reservoir below the fall elevation at which herptiles have selected overwintering habitats in each individual year. The reservoir would be allowed to rise up to the conservation pool level,

VANR-8 Staff agrees that existing leakage flows below the diversion dam may not meet state standards and has revised the analysis on page 37 of the FEA.

VANR-9 Staff agrees that the flow duration curves presented in the application represent the entire project. The revised analysis in the FEA uses prorated inflows to Sugar Hill reservoir based on drainage area at that location.

VANR-10 No response required.

VANR-11 No response required.

VANR-11

if not at that level in late October. If the reservoir were to rise above the conservation pool due to a winter thaw condition or a fall rain event, it would be brought back down to elevation 1750 feet. Within these constraints, the objective would be to maintain a flow of 2.5 cfs downstream during this period, and at all times during spring runoff."

VANR-12

The draft operating tables are provided as an attachment to this letter. The Agency would expect that a condition would be placed in the certification to provide for the applicant's development of an operating plan to meet the management objectives upon which the operating rules are predicated. There may be a need to adjust the operating rules as experience is gained after implementation, and we envision the plan as providing the flexibility necessary to reasonably accomplish the environmental goals.

Sucker Brook Diversion Dam

VANR-13

The proposed release of 7Q10 flows (1.0 cfs) into the bypassed reach is inadequate to restore the biological integrity of Sucker Brook and to meet the management objectives of Class B waters, including the provision of high quality habitat and good aesthetic value. A consideration with respect to the latter is the Falls of Lasa.

VANR-14

The flow demonstration work in this reach (AJR No. 3) was supplemented through observations of flows of 2.0 cfs and 3.0 cfs on November 1, 1996. Stone and Webster (Maria Brown) and the negotiating parties observed these flows, and the final proposal for bypass flows is currently under discussion as the primary outstanding issue.

VANR-15

The means of providing the minimum flow release is also being further evaluated. The method discussed in the draft EA, piping the flow from the Silver Lake conduit, has several undesirable characteristics. First, the discharge from the pipe would result in substantially more than 20 yards (ref. p. 26 of draft EA) of the brook remaining bypassed. Second, it would require a costly modification of the pipe where the hydraulic design may be difficult at best. Third, shutting of the headgate at the dam would result in the termination of flows into the bypass, unless special cautions are taken. Fourth, the new pipe may be susceptible to plugging with ice or debris. The issue of permanently flooding the upstream Class Two wetland will be further evaluated in the context of the aforementioned problems and resource values.

VANR-16

The draft EA mentions the potential water quality problems from creating a small impoundment at the diversion dam. The turnover rate and morphometry of this impoundment is such that we do not expect that dissolved oxygen standards would be violated. Further, the discharge over the spillway and ledge falls at the dam would provide a rapid entrainment source for oxygen. With respect to temperature, the forested condition of the watershed and the impoundment size would suggest that temperatures would not be limiting to the

VANR-12 No response required.

VANR-13 Opinion noted.

VANR-14 No response required.

VANR-15 We agree that flows released from a penstock pipe would be discharged approximately 100 yards downstream of the diversion dam. Page 38 of the FEA has been revised to reflect this information. Regarding the cost of implementing this measure, CVPS has already provided cost and design information as part of their original proposal, indicating the viability of constructing a penstock tap for providing minimum flows. Next, flows would continue to be provided below the diversion dam during periods when the headgate is closed for maintenance or other reasons by diverting them over the spillway. Lastly, we consider plugging of the pipe by debris or ice unlikely due to the velocities and pipe sizes being considered. Therefore, staff concludes that release of these flows via a penstock pipe would preserve the existing wetland functions and provide minimum flows below the diversion dam. However, we are recommending that CVPS release the minimum flows over the dam spillway as required by VANR's draft WQC.

VANR-16 VANR's letter dated December 15, 1995, recognized that "maintaining a large, shallow impoundment behind the dam may have significant impacts on water temperature in Sucker Brook as water is released over the spillway". FWS letter dated April 19, 1996, states that "impounding water would likely become too warm to support a cold water fishery in Sucker Brook". Therefore, they recommend developing an alternative for providing flows to Sucker Brook. Staff's analysis concludes that increases to water temperature in the impounded area are likely to occur with corresponding decreases in dissolved oxygen. Based upon the likelihood of water quality degradation resulting from impounding water behind the diversion dam and the associated losses from flooding the wetland area, staff concludes that the release of minimum flows should be via a penstock pipe. However, we are recommending that CVPS release the minimum flows over the dam spillway as required by VANR's draft WQC.

VANR-16 | downstream aquatic community and especially the cold water fishery. However, we would suggest that a follow-up study of the temperature regime be conducted if the minimum flows are provided through spillage.

Silver Lake

VANR-17 | The issue of stratification of Silver Lake and potential for substandard dissolved oxygen levels below the tailrace will be further evaluated by the Agency in the water quality certification process.

d. Cumulative Impacts:

VANR-18 | As discussed above, the Agency does not believe that dissolved oxygen levels would significantly decline if water is impounded behind the diversion dam. Water temperatures would not be expected to increase such that saturation levels of dissolved oxygen would markedly decrease. A follow-up study can easily be completed to verify this, should the final proposal include impounding water at the diversion dam. Although the Agency would prefer to retain the upstream wetland as it presently exists, there does not appear to be a technically feasible way of returning water to the upper reach of the existing Sucker Brook bypass without impounding water to enable spillage at the concrete spillway. As the remnant channel of Dumton Brook continues below the diversion dam, it appears that the area above the diversion dam was originally excavated to join Sucker Brook and Dumton Brook at that point.

Section IV.C.3 Aquatic Resources

VANR-19 | Several of the above comments on water resources also apply to the text in the aquatic resources section of the draft EA.

b. Environmental Impacts:

Minimum Flows

Sucker Brook Diversion Dam

VANR-20 | The draft EA projects that maintenance of a minimum flow in excess of 1.0 cfs in the bypass may result in the degradation of the water quality of Silver Lake from reduced inflow. Silver Lake is a natural waterbody that has been increased in depth by an artificial dam. The lake's direct drainage is very small, at about 0.6 square mile. The amount of water now flowing through the lake has reduced the residence time substantially relative to natural conditions. Even with the restoration of flows to the bypass, the residence time will be relatively short. The Agency does not believe that the reduced flows, even for bypass flows as high as 5 cfs,

VANR-17 No response required.

VANR-18 See response to VANR-16.

VANR-19 No response required.

VANR-20 Opinion noted. Staff has revisited the potential impacts to Silver Lake that may result from increased flows to the bypassed reach. We now conclude that if CVPS is required to maintain stable pond elevations during critical water quality periods, the restoration of flows to Sucker Brook would not impact the water quality of Silver Lake.

VANR-20 would preclude the ability of the lake to support a self-sustaining cold water fishery. Before the EA reaches that conclusion, FERC staff should review the status of other deep, high-elevation lakes in terms of the aquatic community supported.

Silver Lake

VANR-21 As related to the project tailrace flows, the operating protocols to protect smelt spawning, including any calendar period and trigger considerations, will be resolved as part of the Section 401 process.

VANR-22 The draft EA is very limited in its discussion of the impacts of existing drawdowns at Silver Lake on aquatic, terrestrial, and recreational resources. The only issue identified appears to be smelt spawning.

Section IV.C.4. Terrestrial Resources

b. Environmental impacts:

Method of Releasing Minimum Flows at Sucker Brook Diversion Dam

VANR-23 As discussed above, the Agency is continuing its evaluation of the method for releasing minimum flows at the diversion dam. Although it would prefer full protection of the existing wetland above the diversion dam, it does not appear that there is a feasible and practical means of discharging the minimum flow directly below the concrete spillway on Sucker Brook.

Section IV.C.6. Recreational and Visual Resources

b. Environmental impacts:

Improved Overlook at the Falls of Lana

VANR-24 Removal of the vegetation to improve the view should be limited to the minimum necessary to achieve that objective.

Increased Flows at the Falls of Lana

VANR-25 The text does not clarify the relationship between flow releases at the diversion dam and flows extent at the Falls. Because of the intervening drainage, the flow demonstration flows are different than those actually viewed spilling over the Falls. Decision-making should take this fact into account. The Agency does not support the draft EA's conclusion that 1.0 cfs released at the dam is adequate to provide "sufficient visual interest". The Class B management

VANR-21 No response required.

VANR-22 In general, aquatic resources would benefit from the proposed, more stable operating regime at Silver Lake. Both brook and brown trout currently reproduce to a limited extent within Silver Lake. They are both fall spawners. Typically, brook trout spawn from mid-October through early December. Brown trout spawn slightly later than brook trout into early winter. Since brook trout require considerable oxygen levels below the thermocline, we assume that oxygen levels must be high enough to support the brook trout. As trout are self-sustaining, water quality parameters below the thermocline are presumed to be sufficient regarding oxygen and temperature requirements. Additionally, macroinvertebrates, which make up a substantial portion of the diet for resident trout species, will be more productive as a result of the more stable pond elevations under the new proposal.

VANR-23 No response required

VANR-24 CVPS proposes to develop and implement the proposed recreational enhancements at the Silver Lake project area in continuing consultation with the Green Mountain National Forest (GMNF). Since the Falls of Lana area is located on GMNF property, we concur with CVPS that the GMNF should be consulted concerning the extent of vegetation removal and maintenance necessary to facilitate views of the falls for recreational visitors.

VANR-25 We considered the scenic value of the Falls of Lana for site visitors by evaluating alternative flow releases from the Sucker Brook diversion dam. Since uncontrolled flows from the North Branch of Sucker Brook and the unnamed stream are seasonally variable, continuously released flows at the diversion dam would ensure year-round flows over the Falls of Lana, particularly during seasonal low flow periods.

During our site visit, flows viewed at the falls resulted from a 1cfs release at the diversion dam. Based on our evaluation of flows at the site and the results of the flow demonstration study, we conclude that a continuous 1cfs release from the Sucker Brook diversion dam would provide sufficient water volumes to enhance the aesthetic quality of the Falls of Lana for visitors to this site. However, we are recommending that CVPS release a minimum flow of 2.5 cfs from April 1 through September 30 and 3.5 cfs from October 1 through March 31 as required by VANR's draft WQC to enhance water quality in Sucker Brook and provide additional flows at the Falls of Lana.

Secretary Caneill
November 27, 1996
Page 7

VANR-25

objective is a quality which consistently exhibits good aesthetic value. The Agency's opinion is that higher flows are necessary to support that management objective; this is being considered in the ongoing negotiations, and the final water quality certification will be conditioned to provide sufficient flow for this management objective."

Recreation Plans and Designs

VANR-26

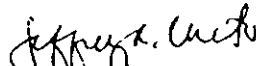
The Agency again recommends that it be consulted in the development of final plans for the proposed recreational enhancements. Most proposed facilities or enhancements are either schematics or narratives in the application. Final site plans, including clearing and grading plans and erosion control plans, will have to be developed and this effort should be coordinated with the Forest Service and the Agency. This would also apply to the design, graphics, and text used in the proposed interpretive signage. In addition to providing the location and function of the project feature, the signage should include cultural and natural resource information, if possible, to broaden interest and education.

VANR-27

VANR-28

Thank you for the opportunity to comment on the draft EA.

Sincerely yours,


Jeffrey R. Cuelo, P.E.
Principal Hydrologist

Attachment A: Sugar Hill Reservoir draft operating rules
c distribution list
FERC service list

VANR-26 The plans and designs provided by CVPS for its proposed recreational improvements adequately address all relevant recreational and visual concerns at the Silver Lake Hydroelectric project. However, the license order will require that CVPS be responsible for, and take reasonable measures to prevent, soil erosion on lands adjacent to streams or other waters, stream sedimentation, and any form of water or air pollution.

VANR-27 The proposed interpretive signs would identify CVPS as the owner of the site and graphically display the placement and function of the site in the entire Silver Lake Project system. Staff will also recommend that CVPS add information regarding the significance and history of the project and directions to project recreational areas to the proposed interpretive signs.

VANR-28 No response required.

Vermont Natural Resources Council

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FEDERAL ENERGY
REGULATORY COMMISSION

December 11, 1996

Lois Cashell, Secretary
Federal Energy Regulatory Commission
825 North Capitol Street, N.E.
Washington, DC 20426

RE: VNRC Comments on Draft EA
Central Vermont Public Service Corp., Silver Lake Hydroelectric Project
FERC Project No. 11478-000-VT

Dear Ms. Cashell:

VNRC-1

The Vermont Natural Resources Council (VNRC) hereby provides comments on the Commission's Draft Environmental Assessment (DEA) for the Silver Lake Hydroelectric Project (August 1996). VNRC generally agrees with the Draft EA recommendations regarding temperature and dissolved oxygen monitoring, stabilization of Sugar Hill Reservoir at conservation pool levels, aeration baffles at Goshen dam, operation protocol for ramping and spawning issues and improvements for recreational opportunities throughout the site. However, VNRC believes that the recommended minimum flows (1 cfs) from Sucker Brook Diversion Dam are inadequate to provide either high quality habitat in the reach below the dam, or to consistently exhibit good aesthetic values at the heavily utilized recreation site at the Falls of Lana. In addition, VNRC believes that the EA inadequately addresses the significant impacts of drawdowns on the habitat and biota in Silver Lake.

VNRC-2

VNRC-3

Minimum Flows

VNRC-4

The DEA recognizes that a minimum flow of 5 cfs would enhance the aquatic resources for the reach of Sucker Brook below the Diversion Dam. Nevertheless, FERC staff recommends an instantaneous minimum flow of 1 cfs, or inflow, whichever is less, in order to provide continuous shunted flows to Silver Lake and its associated aquatic and recreational resources. See DEA at pp. 32-33. Sucker Brook above and below the Diversion Dam are similar in morphology and habitat types, as described in the DEA. *Id.* at 28. Moreover, the DEA recommends that a minimum flow of 2.5 cfs "is sufficient to support the existing fishery" below Goshen Dam and above the Diversion Dam. *Id.* at 31. A minimum flow of at least 2.5 cfs below the

VNRC, 9 Bailey Avenue, Montpelier, Vermont 05602 (802) 223-2328 Facsimile: 223-0287

Responses to
Comments of the Vermont Natural Resources Council
on the Draft Environmental Assessment
for the Silver Lake Project

Letter dated December 11, 1996

VNRC-1 No response required.

VNRC-2 Opinion noted.

VNRC-3 Opinion noted.

VNRC-4 No response required.

VNRC-4 Diversion Dam would support the existing fishery in the approximately 2.5 mile long bypassed reach above the Falls of Lana and would provide habitat for the existing fishery at and above the confluence of the North Branch of Sucker Brook.

VNRC-5 Flows between 3.5 and 5 cfs would also allow for shunting adequate flows to maintain water quality at the Silver Lake recreational area. Hydrographic modeling by VANR supports this system of flow distribution at the diversion dam. The modeling and analysis by VANR show that between 3.5 and 5 cfs are available for bypass flows without impacting the water quality of Silver Lake. Only by providing flows in excess of the 1.0 cfs recommended in the DEA can the operation of the facility comply with VWQS. VNRC recognizes that such flows are not obtainable at times due to the conservation pool stabilization protocol proposed for Sugar Hill Reservoir. However, at worst, 1.3 cfs has been estimated as the minimum continuous flow available during low flow periods.

VNRC-6 The DEA recommends that CVPS install a pipe to the existing penstock to provide a conduit for the proposed minimum flow, rather than discharge minimum flows over the spillway. Demonstration flow observations by all parties on November 1, 1996, indicated that substantially more than twenty yards of Sucker Brook would be bypassed. Releases from the spillway would enhance the habitat available in the bypass reach. Furthermore, releases from the spillway would be immediately saturated with oxygen, given the height of the discharge and ledges cascading downstream of the spillway, rather than oxygen-depleted as suggested in the DEA DEA at 26.

VNRC-7 Staff concludes that CVPS's proposal to "create sufficient visual interest for visitors" by providing 1.0 cfs flow is "adequate to enhance the aesthetic quality of the [Falls of Lana] for visitors." DEA at 50-51. The VWQS require that water is "of a quality that consistently exhibits good aesthetic value" not "create sufficient visual interest." Id. at 20, 50-51. The DEA correctly notes that the Falls of Lana is a heavily used recreational and aesthetic site. DEA at 48-49. As noted above, only by providing flows in excess of the 1.0 cfs recommended in the DEA can the operation of the facility comply with VWQS.

VNRC-8 Staff concludes that CVPS's proposal to "create sufficient visual interest for visitors" by providing 1.0 cfs flow is "adequate to enhance the aesthetic quality of the [Falls of Lana] for visitors." DEA at 50-51. The VWQS require that water is "of a quality that consistently exhibits good aesthetic value" not "create sufficient visual interest." Id. at 20, 50-51. The DEA correctly notes that the Falls of Lana is a heavily used recreational and aesthetic site. DEA at 48-49. As noted above, only by providing flows in excess of the 1.0 cfs recommended in the DEA can the operation of the facility comply with VWQS.

Inadequacy of Studies

VNRC-10 The EA is based upon grossly insufficient information addressing impacts of reservoir level fluctuations at Silver Lake. There is sparse discussion of the impacts of 6.5 ft. proposed winter drawdowns on the aquatic habitat of Silver Lake and its self-sustaining brown trout and smelt populations. The EA minimizes those impacts by estimating the total shoreline area affected by such drawdowns at 1.02 acres, with no discussion regarding impacts on spawning and incubation. DEA at

VNRC-5 No response required.

VNRC-6 No response required.

VNRC-7 Staff agrees that flows would be discharged approximately 100 yards below the diversion dam if released via a minimum flow pipe attached to the penstock.

VNRC-8 Staff's analysis concluded that increases to water temperature in the impounded area would be likely to occur with corresponding decreases in dissolved oxygen. Based upon the likelihood of water quality degradation, and the associated functional losses resulting from flooding the wetland area, staff concludes that the release of flows via a penstock pipe is most appropriate. However, we are recommending that CVPS release the minimum flows over the dam spillway as required by VANR's draft WQC.

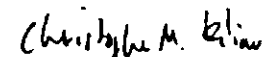
VNRC-9 Staff has revised the recommendation for minimum flows below the Sucker Brook diversion dam to require a release of 2.5 cfs from April 1 through September 30 and 3.5 cfs from October 1 through March 31 as required by VANR's draft WQC to enhance water quality and aesthetic resources.

VNRC-10 Silver Lake is managed as a put-and-take fishery for recreational purposes. Therefore, spawning management issues were not identified as pertinent issues during the scoping process. In general, aquatic resources would benefit from the proposed, more stable operating regime at Silver Lake. Both brook and brown trout currently reproduce to a limited extent within Silver Lake. They are both fall spawners. Typically, brook trout spawn from mid-October through early December. Brown trout spawn slightly later than brook trout into early winter. Since brook trout require considerable oxygen levels below the thermocline, we assume that oxygen levels must be high enough to support the brook trout. As trout are self-sustaining, water quality parameters below the thermocline are presumed to be sufficient regarding oxygen and temperature requirements. Additionally, macroinvertebrates, which make up a substantial portion of the diet for resident trout species, will be more productive as a result of the more stable pond elevations under the new proposal.

VNRC-11 The EA should recommend a study of drawdown impacts on water quality and aquatic habitat in Silver Lake.

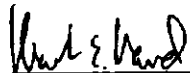
VNRC-12 Finally, VNRC, VANR, USFS, USFWS and CVPS are presently negotiating proposed conditions for the draft § 401 water quality certification. The parties expect that many of the issues raised above will be resolved within that framework. Thank you for this opportunity to comment.

Sincerely,



Christopher M. Kilian, Esq.
Staff Attorney, VNRC

by: hsh.



Mark E. Nasd, Esq.
Legal Clerk, VNRC

VNRC-11 As discussed in VNRC -10, there is no reason to believe that water quality would be adversely affected under the proposed project operations. Instead, water quality should improve, as lake elevations would become more stable, especially during the low flow season. Additionally, brook trout, which are successfully inhabiting and reproducing in Silver Lake, have high oxygen requirements especially during the low flow season below the thermocline. Therefore, water quality appears suitable for sustaining the aquatic resources in Silver Lake and monitoring is not required.

VNRC-12 No response required.

Responses to
Comments of the U.S. Department of Agriculture,
Forest Service
on the Draft Environmental Assessment
for the Silver Lake Project

Letter dated October 10, 1996

GMNF-1 No response required.

GMNF-2 Opinion noted. The revised analysis in the EA considers prorated inflows to the Sugar Hill reservoir and makes appropriate flow recommendations in coordination with reservoir operating protocols.

GMNF-3 Staff concludes that aquatic resources in the reach of Sucker Brook below Goshen dam would benefit from the release of continuous minimum flows and installation of reaeration screens in the Goshen Dam outfall structure. Section IV.C.3. analyzes impacts on aquatic resources in the stream reach below Goshen Dam.

GMNF-4 Staff notes that there is a very limited population of brook and brown trout in the reach between Goshen dam and the Sucker Brook diversion dam. The recommended alternative includes measures to enhance aquatic resources in Sugar Hill reservoir and improve the water quality of the reach below Goshen Dam. Because the value of the fishery in this reach is questionable, staff concludes that the proposed measures already provide improved conditions and that additional monitoring is not justified.

GMNF-5 Opinion noted.

GMNF-6 Staff recommends that CVPS release a minimum flow of 2.5 cfs from April 1 through September 30 and 3.5 cfs from October 1 through March 31 as required by VANR's draft WQC. These flows would provide habitat for trout, but would not ensure recolonization of this stream reach. As discussed previously, natural barriers exist that would prevent passage of fish and ultimately limit the gene pool resulting in low, if any, reproduction of translocated trout.

Staff has revisited the potential impacts to Silver Lake that may result from increased flows to the bypassed reach. We now conclude that if CVPS is required to maintain a stable pond elevation during critical water quality periods, the restoration of flows to Sucker Brook would not impact the water quality of Silver Lake.

A-19


<p>USDA Forest Service FILED OCT 11 1996 FEDERAL ENERGY REGULATORY COMMISSION</p>	<p>Green Mountain & Finger Lakes National Forests 721 North Main Street, Rutland, VT 05701 (802) 747-6700 - (802) 747-6765 TTY - (802) 747-6766 FAX</p>
<p>95 OCT 11 PM 2:49</p>	<p>File Code: 1300 Date: October 10, 1996</p>
<p>Lois D. Cashell, Secretary Federal Energy Regulatory Commission 888 First Street, N.E. Washington, D.C. 20426</p>	<p>cc M. Brown (Home) S. Law - NYSC C. Murphy - NYSC E. Kerkorian - G</p>
<p>CONCURRENCE</p>	
<p>Re: Silver Lake Hydro Project - FERC No. 11478-000</p>	
<p>Dear Ms. Cashell,</p>	
<p>GMNF-1</p>	<p>We have reviewed the Draft Environmental Assessment (EA) for the Silver Lake Project (FERC No. 11478-000) and submit the following preliminary comments. We stress these comments are preliminary because several issues described in this letter remain unresolved between the Vermont Agency of Natural Resources, U.S. Fish and Wildlife Service and this agency. A conference call to discuss these issues is scheduled for October 17, 1996. We believe this discussion could affect certain aspects of the project and result in changes in our final comments. This letter also serves as our request for an extension of the comment period until until Nov. 1 1996 in order to incorporate information from the Oct. 17th conference call.</p>
<p>GMNF-2</p>	<p>We do not believe Central Vermont Power Corporation (CVPS) can operate the Project using the proposed rule curves and designated conservation pool at Sugar Hill Reservoir and still provide a continuous year round 2.5 cfs minimum flow release below Goshen Dam as stated in the EA summary on pg. iii. Under the conservation pool recommendation, flows in Sucker Brook below Goshen dam would be reduced from the current 2.5 cfs continuous flow to less than 1.0 cfs during the summer and winter months. We believe the potential adverse impacts to the trout fishery and aquatic habitat conditions should be addressed in the EA. Further, we feel a condition should be included in the license to monitor trout populations in the reach of Sucker Brook below Goshen Dam over a five year period. If natural reproduction of trout declines substantially from current trend data, then mitigation measures such as additional flow augmentation should be considered to protect and enhance the fishery.</p>
<p>GMNF-3</p>	<p>The Forest Service desires a flow regime at the Sucker Brook diversion dam that assures adequate flows be directed to Silver Lake for maintaining important recreational and water quality values as well as restore suitable flow and aquatic habitat in the Sucker Brook bypass reach. We do not believe the recommended 1.0 cfs release below the diversion dam (EA-pg 26) would meet the aquatic habitat enhancement goal. We also believe the potential effects of the recommended release on aquatic habitat in the bypass reach and on water quality</p>
<p>GMNF-5</p>	
<p>GMNF-6</p>	

GMNF-6

GMNF-7

and recreation in Silver Lake should be addressed in the EA. We will provide additional comment on this aspect of the project when the full extent of flow augmentation available at the diversion dam is known following discussions between the reviewing agencies regarding minimum flow releases below Goshan Dam.

Sincerely,


James W. Bartalme
Forest Supervisor

cc: Jeffrey E. Ometo, P.E.
Principal Hydrologist
Agency of Natural Resources
103 South Main Street
Building 10 North
Waterbury, VT 05671-0408

Kenneth C. Carr
Acting Supervisor
U.S. Fish and Wildlife Service
22 Bridge Street, Unit #1
Concord, New Hampshire 03301-4906

GMNF-7 No response required



Department of Fish and Wildlife
Department of Forests, Parks and Recreation
Department of Environmental Conservation
State Geologist
Natural Resources Conservation Council

State of Vermont

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Waterbury, Vermont 05671-0301

April 19, 1996

COMMENTS
RECOMMENDATIONS
TERMS AND CONDITIONS

SILVER LAKE HYDROELECTRIC PROJECT
FERC PROJECT NO. 11478-040
CENTRAL VERMONT PUBLIC SERVICE CORPORATION

Lois Cashell, Secretary
Federal Energy Regulatory Commission
825 North Capitol Street, NE
Washington, DC 20426

Dear Secretary Cashell:

The Vermont Agency of Natural Resources (Agency) herein files comments on the Silver Lake Hydroelectric Project, for which a "Notice of Application Ready for Environmental Analysis" was issued February 22, 1996. The Agency requests that FERC, in any license it may issue for the project, include articles incorporating Agency recommendations presented in this letter.

The application for a water quality certification for this project remains pending at this time. The final requirements of the water quality certification may differ in some respects from the recommended terms set forth herein. Also, the Agency, the U.S. Fish and Wildlife Service, and the U.S. Forest Service, along with several non-governmental organizations, are currently in negotiations with the utility regarding the licensing proposal. Generally, we have elected not to include specific recommendations on reservoir management and maintenance of conservation flows as alternatives are presently under evaluation with these parties. The technical aspects of this project's design and the many environmental and public use issues involved have made it difficult to define a specific project configuration that satisfactorily distributes the limited water available to meet all of the identified demands.

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Secretary Cashell - Silver Lake
April 19, 1996
Page 2

WATER CHEMISTRY

Sugar Hill Reservoir/Sucker Brook below Sugar Hill Reservoir

Sugar Hill Reservoir becomes thermally stratified under summer low flow conditions. The intake for the valved outlet has an entrance invert elevation of 1717 feet and is 4.0 feet high. The typical summer operating level for the reservoir has been about elevation 1760-1763 feet. The deep intake conditions have resulted in hypolimnetic releases from the reservoir with depressed dissolved oxygen concentrations. Under AIR No. 9, CVPS proposes to conduct a post-licensing water quality study to identify if a stratification problem will persist after the new reservoir management rule is implemented. As indicated in the study proposal, the lower summer operating level for the reservoir will reduce the potential for stratification, and if a dissolved oxygen problem does occur, a reaeration baffle will be tested to determine if dissolved oxygen standards can be met using the baffle.

CVPS cites 6 mg/l as the standard for addressing compliance. Vermont Water Quality Standards also include a percent saturation component, which is 70% saturation for cold water habitat streams.¹ It should be noted that these are minimum standards, and review under the Standards will have to address the need and technical feasibility of restoring dissolved oxygen levels to the higher levels more typically associated with streams of this type. The result of the water quality study should be a management plan that addresses this restoration goal. For Sugar Hill Reservoir, this may entail, for example, simply agreeing on a dissolved oxygen level that would trigger the installation of the baffle and then retaining the baffle in place until the end of the critical water quality season. A study/management plan approach will probably be made a condition of the water quality certification. Because of the anticipated change in the summer operating level and the apparent feasibility of installing a reaeration structure, the Agency supports deferral of the study until after license issuance.

Sucker Brook below Diversion Dam

There is no reason to suspect that water quality problems will exist below the diversion dam. Conservation flows will be released into this reach at the dam, and CVPS does not propose to impound water behind the diversion dam.

¹Standards provide for higher minimums in areas the Secretary determines are salmonid spawning or nursery areas important to the establishment or maintenance of the fishery resource. (Vermont Water Quality Standards, Section 3-01(B)) The Secretary has not made such a determination for Sucker Brook.

Silver Lake and Tailrace Reach

Silver Lake also stratifies according to the license application (page E1-16). The lake was sampled on July 16, 1991, when a thermocline was identified at a depth of 14 feet. The data, including the lake level at the time of the sampling, does not appear to have been included in the application. The penstock intake is at a depth of at least ten feet during the summer. No samples were collected at the powerhouse tailrace on that date; however, a sample taken on July 22 displayed a dissolved oxygen concentration of 8.9 mg/l (102% saturation) and a temperature of 21 deg C. This is similar to the conditions found in the epilimneon on July 16. The intake apparently was not drawing much if any water from the hypolimneon at that time, and the dissolved oxygen concentrations and relatively high temperatures of the tailrace discharge through the summer suggest that this condition did not change through that particular summer. The Agency will be giving further consideration to the Silver Lake stratification issue in its water quality certification review. The difference in water temperature between the above-tailrace Sucker Brook station and the tailrace station is also noteworthy. The tailrace temperature was 4 - 7 deg C higher than the stream during the 1991 sampling days. We assume that this reflects the difference in temperatures between Sucker Brook and the lake epilimneon and that the temperature condition was not influenced by radiant or frictional heating of water in the penstock (sampling was done in the early morning).

AQUATIC BIOTA AND WILDLIFE

Flow Regime Assessments

Methodology

The Agency's study request letter dated July 6, 1994 outlined several stream reaches that required adequate flow regimes to restore and protect aquatic habitat. CVPS elected to schedule releases of certain demonstration flows for visual evaluation by representatives of the Agency, the U.S. Fish and Wildlife Service, and CVPS. Details of flow releases were also studied using the video prepared by CVPS in response to AIR No. 3 and photographs taken during the flow demonstrations. Video sites were selected primarily by CVPS, but additional observation sites were also selected in cooperation with the Agency and the Fish and Wildlife Service.

Alternate flows were observed on October 7, 1994, October 12, 1994, and November 2, 1994; an additional flow (2.5 cfs) was observed below Sugar Hill Reservoir by the Agency District Fisheries Biologist in late November. Flows were observed at several sites that were located along the following reaches of Sucker Brook:

1. Sugar Hill Reservoir to diversion dam

2. Diversion dam to North Branch confluence
3. North Branch confluence to Falls of Lana
4. Falls of Lana to project tailrace
5. Downstream of project tailrace

Each of the demonstration flows is characterized below under the sections dealing with the applicable stream reach.

Sugar Hill Reservoir

Sugar Hill Reservoir is currently managed by the Agency as a put-and-take brook trout fishery. The reservoir historically has typically been drawn about 24 to 31 feet over the fall/winter period to provide seasonal storage which enables the capture of spring runoff without use of the dam spillway. This drawdown has precluded management for a winter holdover of trout and natural reproduction. Given a satisfactory water level management regime, the Agency would continue its management for brook trout, but would expect overwinter survival of fish. With survival of trout to maturity, the Agency expects that natural reproduction both within the reservoir and in Sucker Brook upstream of the reservoir will occur for reservoir-resident trout. This natural reproduction would help offset the need for hatchery support and provide for an angler recreational opportunity of wild spawned fish.

Other fish species, such as rock bass, sunfish species, and minnows, are presently supported in Sugar Hill Reservoir. Severe drawdowns, primarily in the winter, are also believed to have significantly limited aquatic vegetation production and detrimentally affected these warmwater fish species. Aquatic vegetation provides many fish with spawning habitat and protection from predation and enhances production of fish prey items. Severe water level drawdowns also strand and kill aquatic invertebrates which are an important forage base.

Fish in small tributaries will commonly move downstream and overwinter in larger waterbodies. Brook and brown trout and sculpin are found upstream of Sugar Hill Reservoir and may seek overwintering habitat in the reservoir. Under current operating conditions with large winter drawdowns, fish that move into Sugar Hill Reservoir from its tributaries may be subject to overwintering mortality.

Following discussions with the resource agencies, CVPS has modified its proposed reservoir operating mode to provide a more stable reservoir condition and to avoid extreme winter drawdown conditions in the future. This operating mode is discussed in the response to AIR No. 7. A conservation pool would be created at elevation 1750 feet (shown as stage 37 feet on

Figure 2 in the AIR No. 7 response), and the conservation pool would be surcharged by spring runoff, which would be released by July to return the reservoir to the conservation pool level.

This proposal would result in a large-volume conservation pool and would reduce the concern over winter holdover of fish. Reservoir stage/volume information provided to the Agency by CVPS on August 10, 1995 indicates that the remaining reservoir volume at a drawdown to stage 16 feet is 482,000 cubic feet, or 1.0% of the volume that exists under the present typical summer operating level; 99% of the reservoir contents are exported under these conditions. The conservation pool stage of 37 feet, on the other hand, will provide an assured reservoir volume of 22,924,000, or about 48 times the historical minimum volume.

The rapid spring drawdown will be disruptive to spring spawning fish species residing in Sugar Hill Reservoir. However, the Agency supports this management option as the most balanced approach to addressing the protection of wetlands, heptiles (discussed below), fish overwintering, resident fish species, and general reservoir ecology, as well as sport fishing.

Wetlands

The proposed operating regime will expand and enhance the existing wetland in the southeast bay of Sugar Hill Reservoir. This bay is fed directly by Sucker Brook. Under present operating conditions a 3.5 acre wetland has become established north of the inlet of Sucker Brook; however, drawdowns have precluded the establishment of a more expansive quality wetland complex. The existing wetland is dominated by low-diversity annual species of vegetation. Based on available soils and bathymetric information and depending on the timing of the annual surcharge, the Agency believes that creation of a conservation pool as proposed may result in the establishment of classic wetland vegetation zonation of shrub, to emergent shallow marsh, deep marsh, floating-leaved aquatics, and aquatic bed perennials at the southeast bay for an additional area of up to about 12 acres. These conditions would provide high quality habitat for aquatic biota and wildlife.

It would be ideal to reduce the reservoir level to the conservation pool elevation by the beginning of the growing season. CVPS has selected a target date of July 1. This is acceptable to the Agency; however, the reservoir management plan should be refined to complete the spring drawdown by the earliest feasible date each year. The operating rule curve shows the drawdown occurring over the month of June. We assume that this can, in some years, be done earlier depending on the timing of the spring melt. The bathymetry of the southeast bay suggests that much of the wetland would no longer be inundated by mid-June even with completion of the drawdown as late as July 1; however, stabilization of the water levels too late into the growing season may prevent emergent vegetation from becoming established in the littoral zone.

Existing winter drawdowns adversely affect overwintering of some aquatic mammals and reptiles and amphibians which seasonally use the shallow mud areas. Current operation leaves animals vulnerable to freezing and predation as the water level decreases through the fall/winter period. Given the current operating regime, it is unlikely that reptiles or amphibians successfully overwinter in Sugar Hill Reservoir. The proposed operating rule will address this concern by generally maintaining a constant pool through the critical period.

Sucker Brook from Sugar Hill Reservoir to Diversion Dam

Sucker Brook is a free-flowing stream in its 2.5 mile reach from Sugar Hill Reservoir (2.5 square miles) to the dam that shunts the brook flow to Silver Lake via a pipe conduit. Just above the diversion dam, Dutton Brook joins Sucker Brook from the south, providing a total watershed area of 9.6 square miles at the diversion dam. At Sugar Hill Reservoir, five valves are used to adjust reservoir releases from a low of 2.5 cfs to a maximum of 70 cfs. Releases seldom are higher than 30 cfs according to data provided by CVPS. Flow and reservoir level data for 1989, a year of average precipitation, was provided in the license application, Figure 1a. Data on flows, but not levels, was also provided in the response to AIR No. 6 for the full period 1985 to 1994. In the spring of 1989, there was one occasion when flows were released at 31 cfs according to Figure 1a (although the AIR data set shows 23 cfs instead); the secondary highs were a release of 15 cfs in the spring and two releases of 17 cfs in the fall.

Drawdowns in the spring to reestablish the conservation Sugar Hill Reservoir's conservation pool will be very rapid. During the month of June about 30,112,000 cubic feet of water would be dumped in lowering the reservoir from stage 50 feet to stage 37 feet. If released at a constant rate, this would correspond to about 12 cfs (4.6 csm) of flow augmentation in June.

Comparison of the 1985 to 1994 data to peak flow records from other gaged small watersheds shows that the reservoir is effective in dampening peak flows. Even a release of 70 cfs is well below the peaks that commonly occur on unmanaged streams in watersheds of similar size.

The actual spring regulation of the valves and the general management protocol used to maintain the conservation pool, including the rate at which flows are adjusted on a given day, will have to be addressed through the institution of a ramping protocol (down and up) and/or set maximum releases based on factors such as reservoir inflow, downstream flow conditions, reservoir elevation relative to the target level, and the season of the year. Valves are presently manually adjusted as frequently as daily in the spring, but more generally on a weekly schedule. The reservoir management plan, previously discussed, should include consideration of fluctuating flows and maximum flow releases in order to protect downstream fish from stranding or flushing. CVPS has ruled out automation due to the lack of electricity; more frequent site visits may be needed to meet the resource protection objectives.

The available data from past reservoir management should be used to evaluate and refine the management plan. Since the reservoir does not spill, different outlet regulation schemes can be evaluated using the historical reservoir level/valve setting information in a water balance analysis to see how the reservoir would respond.

The U.S. Forest Service has done fish population work in the affected reach. The stream supports wild brook and brown trout. The Forest Service has found that Sucker Brook has a relatively low standing crop of trout when compared to similar area streams not influenced by the project. Specific reasons have not been identified, but flow regulation and/or lack of spawning gravels (due retention of bedload in the reservoir) have been discussed as among the potential causes.

Flow Regime Assessment

Flows were observed at 2.5 cfs, the minimum conservation flow proposed by CVPS, and at approximately 12 cfs. Substrate becomes predominated more by boulder and cobble and less by smaller sediments as stream gradient increases moving downstream. A flow of 2.5 cfs provides some observable water in this reach, but water movement is slow in areas. A large percentage of the rocks are exposed, and the depth is very shallow. Along the bank edge, there is little depth or water movement. This flow provides some habitat near the center of the stream channel for young trout species, but the slow water movement results in only a modest amount of riffle habitat or cover for larger individuals.

The flow of approximately 12 cfs was observed on October 7, 1994 from Forest Road 32. This flow produced a greater depth, velocity, and turbulence than would be necessary to support diverse fish habitat.

A flow of 2.5 cfs is approximately 1.0 csm at the Sugar Hill Reservoir. Although a higher conservation flow would be beneficial to the organisms in the stream reach below Sugar Hill Reservoir, the Agency believes that 2.5 cfs would be an acceptable conservation flow, given the hydrological availability of that flow and the target species involved. Although a flow of 2.5 cfs may commonly be available during the fall/winter spawning and incubation period for brook and brown trout, it is less frequently available during the summer. An option under consideration is the continued provision of 2.5 cfs as a guaranteed flow; the flow would have to be supported by a summer drawdown of the reservoir, and the enhancement of downstream habitat is being balanced against the associated reservoir impacts.

Wetlands

A 1.8 acre emergent wetland exists directly upstream of the diversion dam, and other wetlands exist continuous with Sucker Brook in this reach but above the influence of the diversion dam.

The 1.8 acre wetland is occasionally flooded by backwater from the diversion dam during high flow; however, the diversion dam does not impound water under normal conditions. This wetland is mapped on the National Wetland Inventory and is classified as a protected Class II wetland under the Vermont Wetland Rules. An April 18, 1995 amendment to the license application included a provision to spill water at the diversion dam in order to provide a minimum flow downstream; this would have resulted in permanent flooding of the wetland. This is discussed in the response to AIR No. 2.

This wetland provides at least the following functions: surface water quality protection, erosion control through binding and stabilizing the soils, and wildlife and migratory bird habitat. This wetland appears to be in good condition and would not be enhanced by increasing the water level. The Agency has raised this concern with CVPS and believes that CVPS will be modifying its method for passing minimum flows to a technique that does not inundate this wetland.

Sucker Brook from Diversion Dam to Falls of Lana

Downstream of the diversion dam, Sucker Brook also has excellent potential to support healthy, self-sustaining populations of brook and brown trout. However, this reach is often dewatered as a result of the diversion of virtually all upstream flows to Silver Lake. The first significant tributary inflow to Sucker Brook is the North Branch, which enters about 0.6 mile downstream of the diversion. This tributary provides some water to Sucker Brook, but the flows are not sufficient alone to provide significant habitat for trout species. From the mouth of the North Branch, Sucker Brook flows about 0.8 mile to the Falls of Lana, then another 0.4 mile to the powerhouse tailrace, which is about 0.3 mile upstream of Lake Dunmore.

Flow Regime Assessment

Flow Observations

The flows cited here and in the section addressing the reach below the Falls of Lana are those measured at the diversion dam at the time of the viewing. In the cases of flow observations below tributaries, the actual flows viewed were, of course, higher due to inflow. We do not believe that the tributary flow conditions were such that they need to be factored into the analysis; for example, had there been high inflow conditions from a tributary during one of the study days, the habitat may have looked good even with a very low release at the dam.

Flow of 1 cfs: In all the sites observed, the release of applicant's proposed 1 cfs (0.1 csm) does not provide enough habitat for the aquatic life. This flow does not provide sufficient water, cover, depth, velocity or the diversity of habitat needed by the different lifestages of fish species in this system. At this flow, few areas of mixing turbulent water existed to furnish

cover, diversity of habitat, and aeration for the aquatic organisms. Most of the water at the streambank and some distance from the bank edge was very still, showing no movement at all. Many pools had little or no apparent mixing of water in them, and pools exhibited low velocity, shallow depth, and little water movement. The wetted width appeared very poor for providing a diversity of habitat at this released flow.

Flow of 3 cfs: At some of the observed sites, a flow of 3 cfs appeared to provide a reasonable amount of water and habitat. At other sites, it was judged deficient. The pool substrate and bottom were clearly visible for 50% to 75% of the pools observed. Aeration of the water did occur at several areas, and some cover for fish is provided.

Water flow existed primarily in a central part of the stream at most sites, and the wetted width still appeared to be somewhat small for the channel size. However, the wetted width at a release of 3 cfs was a dramatic improvement over that observed during the 1 cfs release.

Flow of 5 cfs: A flow of 5 cfs was judged to look very good and had the appearance of a healthy streamflow. There is a diversity of habitat provided for different lifestages of fish and for aquatic invertebrates at this flow. These habitats consist of a good mix of pool, riffle, and run habitat with areas of aerating turbulence, good water movement through pools, appropriate cover for fish, and quiet areas or velocity refuges.

Pools showed areas of turbulence, aeration, good water movement plus the existence of sufficient quiet water on edges/perimeters. It was possible to see the bottom of very large pools or on side areas of small pools only. The flow provided better velocity, depth, cover and water movement in the pools and riffle areas than did either a release of 1 cfs or 3 cfs.

Flow of 8 cfs: The release of 8 cfs resulted in a greater amount of moving water through the stream reaches with a noticeable increase in velocity and turbulent flow. Many pools had only bubble/turbulent flow moving through them at a rate that appeared to result in an overall loss in diverse habitat in the pools. Although 8 cfs appears to be providing good movement through all sections of the stream reach, it also appears to be a flow that is greater than that necessary for providing quality habitat for aquatic species.

Conclusions

Of the flows observed, a flow release of 5 cfs appeared to provide the best habitat and zone of passage conditions for the stream reaches below the diversion dam. The flow of 5 cfs provided the best balance of diverse aquatic habitats, including cover, diversity of velocities and depth. There was good movement in the stream and no stagnant areas. Most small pools had some degree of turbulent aerated water entering them, which provided cover, oxygen, and drift of prey items. A flow of 5 cfs also approximates the summer aquatic base flow of 0.5

csm often prescribed through the Fish and Wildlife Service's regional flow policy, *Interim Regional Policy for New England Stream Flow Recommendations*.²

Our specific recommendation for conservation flows at this site is still under evaluation. Several factors are being considered, including the conservation flow release at and possible flow augmentation from Sugar Hill Reservoir; the desirability to maintain flows in the diversion inlet to Silver Lake; the effects of less water being diverted to Silver Lake on its water quality (bacteria levels at the beach and stratification) and levels; flow needs for aesthetics at the Falls of Lana; and the impact on project economics. The Agency will also evaluate whether or not a special fall/winter flow is warranted for spawning and incubation.

Falls of Lana to Lake Dunmore

The intervening watershed between the diversion dam and the Falls of Lana increases the total drainage area of Sucker Brook to about 13 square miles. The lower segment of Sucker Brook supports all life stages of resident brook and brown trout. In addition, landlocked Atlantic salmon from Lake Dunmore utilize Sucker Brook as spawning, incubation and rearing habitat. The reach that is important for salmon spawning and incubation is upstream of the tailrace but below the Falls of Lana, which serves as a barrier to upstream movement of fish. Juvenile lake trout from Lake Dunmore sometimes move into Sucker Brook in the spring and fall.

Smelt from Lake Dunmore utilize the lower portions of Sucker Brook for spawning and incubation. This brook is the primary smelt stream for Lake Dunmore and is critical to sustaining its smelt population. The segment of the brook used for smelt spawning is below the project tailrace. The period of smelt spawning and incubation concern is March 15 to May 15. Smelt spawn at night along stream margins. The stream wetted width maintained during smelt spawning and incubation is, therefore, important.

Presently, the project's regulation of flows impairs fisheries and invertebrate habitat in the lower segment of the brook. Since the project operates in a peaking mode, both minimum and maximum flows downstream of the project are aquatic habitat issues, as are the effects of spatial shifts in suitable habitat and the effects of a frequently fluctuating flow regime.

²On page E2-11 of the license application, CVPS cites the 7Q10 flow as "normally associated with minimum habitat conditions that are acceptable in lieu of studies." The 7Q10 drought flow is not applied in standard setting for conservation flows in Vermont. The Agency instead uses the standards set forth in the U.S. Fish and Wildlife Service policy when site-specific study information is not available.

Flow Observations

The area above and below the tailrace are generally flatter and wider than the upper stream reach. The substrate condition is gravel, cobble, and small boulder.

Flow of 1 cfs: The release of 1 cfs at the diversion dam resulted in a flow below the Falls that displays some ripples on the water surface but no riffle habitat. The water appeared placid and very shallow. Diverse habitat, sufficient cover and depth are not provided at this flow.

Flow of 3 cfs: The velocity increased in the area of the tailrace at a flow release of 3 cfs, but the channel still appeared very shallow. There was better water movement at a release of 3 cfs, but habitat continued to be limited.

Flow of 5 cfs: Water velocity and depth appeared to have increased. Ripples on the water surface and some small riffle areas were evident at this flow. More cover and aeration is available for aquatic organisms and more of the channel is filled. Usable habitat was available at this flow for a greater diversity of aquatic organisms and lifestages.

Flow of 8 cfs: The release of 8 cfs provides diverse habitat for aquatic organisms near the tailrace area. The release of 8 cfs resulted in good aeration of the water with some small riffle areas created across rocks. There are sufficient areas providing velocity refuges for aquatic species, and this flow provides for some depth in this wide channel.

Conclusions

Both releases of 5 cfs and 8 cfs provide some amount of diverse habitat, cover, aeration, and depth for aquatic organisms near the tailrace area. As with the reach above the Falls, a flow of 5 cfs provides for a mix of pool, riffle, and run habitat. The flow is well aerated, with good water movement through pools, some turbulent water that will serve as cover for fish, and quiet areas that provide velocity refuges.

A flow of 3 cfs provides a reasonable amount of water and habitat in most of the observed sites, but not all sites. Aeration of the water did occur at several areas and some cover for fish is provided. The wetted width and habitat provided at a release of 3 cfs was a substantial improvement over that provided by a release of 1 cfs.

Down Ramping from Generation Flow

To address the issue of stranding of stream biota below the tailrace, CVPS has proposed a ramping plan (ref. AIR No. 5) that would result in the station making the transition from full

load to zero load over a 15 minute period. Partial load reductions would occur in three stages of 5 minutes each. Normal shutdown presently occurs over a two minute period.

The proposal is reasonable in terms of timing, but there is a need to specify the flow rate change that will occur in each stage of the shutdown. The Agency recommends that the ramping plan be designed to limit the change in flow for the first and second 5 minute period to no greater than 20 cfs.

Fish Stranding in Tailrace

The project has a long tailrace channel that fish from Sucker Brook enter during periods of generation. Fish have been known to have become stranded following plant shutdowns, resulting in fish mortality. Down ramping would provide one method to decrease the risk of fish becoming stranded in the tailrace.

In past cooperation with the Agency, CVPS voluntarily placed a rack at the end of the tailrace to prevent fish from moving into the tailrace and becoming stranded. The rack is angled at about 35 to 40 degrees downstream and has a bar clear spacing of about 1 3/4 inches and bar width of 1/4 inch. A rack with this bar clear spacing prevents only large fish from entering the tailrace.

Operation During Smelt Spawning Below Tailrace

Currently CVPS voluntarily operates the powerhouse 24 hours daily during smelt spawning after notification that the smelt run has begun. This 24-hour operation is theoretically effective because the smelt eggs deposited at night are still covered with water on succeeding days and nights until egg hatching occurs. However, the notification system may not be adequate to assure that the operation protects the full run-through-incubation period each year. The system has relied on an informal arrangement with the Agency District Fisheries Biologist, who presently lives nearby. The specific beginning and end of the smelt period has not always been identified. The Agency recommends bracketing the period using the dates of March 15 to May 15 to assure protection of this resource.

A second issue is the capability of sustaining plant operation during the period without excessive use of storage in Silver Lake in a dry spring. In a letter dated June 15, 1995 to the Agency and repeated in the response to AIR No. 5, CVPS proposed an alternative operating protocol for the station during the smelt spawning season. This procedure would involve either one of two approaches: 1) 24 hours per day operation similar to the past protocol or 2) operation during the day only. CVPS has proposed to maintain this protocol for the five weeks after ice break up on Lake Dunmore.

The Agency believes that the CVPS proposal for 24 hour operation or day-only operation during the duration of the season will be sufficient to protect smelt spawning and incubation and allow the company to still operate during dry water years. The Agency does not, however, accept the ice out trigger and use of a five week period. The spawning run may begin before ice out. Also, five weeks is too short to cover the cover the both the spawning run and the incubation period, as well as the variation in year-to-year timing of spawning. In the response to AIR No. 5, CVPS provided a table of station records for spring operation from 1965 to 1995 to help provide guidance on the actual timing of past runs. Unfortunately, the data does not indicate in each of the years whether or not operations have been specifically adjusted for the smelt run. The Agency is reviewing this data and records kept by its district biologist to determine if the March 15 to May 15 window can be adjusted.

Silver Lake

Silver Lake is managed by the Department of Fish and Wildlife for rainbow and brook trout (both of which are stocked), smelt and to a lesser extent, brown trout and perch. The brown trout population is self-sustaining but at a low level. A limited amount of natural reproduction of rainbow and brook trout also occurs, due to spawning in the inlet channel and possibly within the lake. The smelt population is self-sustaining and also spawns in the inlet channel and possibly within the lake. Silver Lake, with a natural watershed area of only 0.6 square miles (about a quarter of which is the lake surface), lacks sizeable tributaries that can be accessed for spawning by lake fish.

The regulation of streamflow to the Silver Lake inlet (from the Sucker Brook diversion) does not assure an adequate flow regime in the inlet during the spawning/incubation periods for the fish species that use the inlet stream. Further, the winter drawdown of the lake (which can be up to 9.5 feet) is likely to be negatively affecting in-lake spawning of these target species, the littoral plant community, and the macroinvertebrate community.

The winter drawdown may also result in detrimental effects to amphibians and reptiles that may overwinter in Silver Lake. The winter habitat for amphibians and reptiles in Silver Lake is limited, however, as the shoreline is steep and rocky and does not provide many areas of mud for these animals to use for burrowing. Also, there are no identified wetland areas immediately contiguous with Silver Lake. It is possible however that leaf litter lining the bottom of the lake may have value as winter cover for amphibians. Winter drawdowns would expose such areas, and the animals using them, to freezing conditions.

In order to protect smelt spawning in the Silver Lake inlet, there should be no decrease in the water elevation in Silver Lake during the smelt spawning and incubation period of March 15 through May 15. The response to AIR No. 2 suggests that the seasonal drawdown will typically be completed by late March and the summer level of the reservoir restored by the end

of April. Timing will, of course, vary with spring runoff conditions in each year. The Agency is continuing to evaluate lake management relative to smelt spawning protection, including whether or not there is a need to establish a target water level to support smelt spawning. It appears that CVPS would at least be able to assure that the reservoir is not dropped during the smelt spawning and incubation period.

Limiting the winter drawdown of Silver Lake would provide better habitat and conditions for spawning of target fish species and the littoral and invertebrate community. The proposed operating regime results in a total drawdown of 8 feet which is somewhat less than the current operating regime, but may not result in a significant enhancement of the plant and animal community. Similar to other flow and reservoir management issues discussed above, the Agency is continuing to review the Silver Lake drawdown issue.

Fish Entrainment

Resident fish in Silver Lake may become entrained in the project penstock. Mortality of these fish would then be expected due to the extreme penstock pressures associated with the particular facility. The clear spacing on the intake trashracks is 1 3/4 inches according to the license application. This clear spacing may provide some protection from entrainment, but its spacing alone will not prevent entrainment for most fish in Silver Lake.

Based on U.S. Fish and Wildlife Service standards, the clear spacing of the trashrack to protect warm water species should be 1 1/2 inches, and the intake velocity within one foot of the rack should not exceed 2 ft/sec. The rack spacing of 1 1/2 inches recommended for warmwater species should be sufficient to prevent most entrainment of fish residing in Silver Lake, including cold water species. Because the expected behavior of the fish is to avoid the intake structure and not seek downstream movement and because the existing spacing is close to that recommended by the Service, the Agency accepts the present rack design. If the rack is rebuilt at a future date, the rack spacing should be reduced to 1 1/2 inches.

SHORELINE EROSION

A shoreline erosion problem has been identified at Silver Lake near the inlet. This problem was addressed in the response to AIR No. 3, and the Agency provided consultation comments by letter dated January 15, 1996. Regardless of the party managing this area (CVPS or the Forest Service), we recommend that the erosion be addressed and preferably through a bioengineering approach. The reduced operating summer operating level is expected to reduce the erosion potential at this site.

Organic and fine soils in the fluctuation zone of much of the perimeter of Sugar Hill Reservoir have washed away over time exposing coarse materials. The new more stable operating

regime may foster revegetation of this area over the long term as siltation from spring runoff and leaf litter settle into this zone. It may also be worthwhile to attempt special plantings in certain sections to accelerate the process and reduce the degradation of aesthetics.

RECREATION AND AESTHETICS

The project area has a high value for recreation due to its fairly remote nature and its association with the Green Mountain National Forest. The project area is popular for many recreational uses, including angling, swimming, sunbathing, boating, picnicking, camping, photography, viewing and trail uses (hiking, horseback riding, bicycling, skiing and snowmobiling). A land transaction is pending for the transfer of 1,200 acres surrounding and including Sugar Hill Reservoir to the Forest Service. CVPS would retain 25 acres, including the dam, parking area, and access.

The Agency finds the applicant's recreational plan to be generally adequate given the land ownership circumstances, but we would appreciate an opportunity to be involved in development of specific designs for facilities and other recreational features such as signage.

Sugar Hill Reservoir

The lower summer pool may necessitate modification of the boat launch to provide continued access for trailered boats. The change in level will also reduce the surface area of the reservoir and limit the access to the existing southeast cove, which will become a wetland instead of open water. This will reduce boating opportunities but increase wildlife watching and angling opportunities.

Falls of Lana

The Agency publication The Waterfalls, Cascades, and Gorges of Vermont (1985) describes the Falls of Lana as moderately wild and secluded and popular with hikers. These characteristics resulted in the authors classifying the falls as of high importance to the state. The Agency refers FERC to pages 88-89 of the publication, which has been accepted by FERC as a state comprehensive plan under FPA Section 10(a)(2)(A).

Adequate flows to support the aesthetics of this site are important. CVPS completed a video assessment of flows which is under review by the Agency as part of the negotiation of reservoir and stream issues.

STATE COMPREHENSIVE PLANS

Hydropower in Vermont. An Assessment of Environmental Problems and Opportunities

The Agency's publication Hydropower in Vermont. An Assessment of Environmental Problems and Opportunities is a state comprehensive plan. The hydropower study, which was initiated in 1982, indicated that hydroelectric development has a tremendous impact on Vermont streams. Artificial regulation of natural stream flows and the lack of adequate minimum flows at the sites were found to have reduced to a large extent the success of the state's initiatives to restore the beneficial values and uses for which the affected waters are managed under the Federal Clean Water Act and Vermont law.

In the case of the Silver Lake Project, the plan focuses on the need to address flow and drawdown issues, which are being dealt with in this licensing proceeding.

RECOMMENDED ARTICLES

The Agency requests that articles explicitly covering the following recommendations be included in the final license:

Flow needs

Flow prescriptions will be needed in all of the affected reaches of Sucker Brook. As discussed above, the Agency does not at this time have specific recommendations on minimum conservation flows and controls on fluctuating flows. We do, however, expect that they will be developed soon through the Section 401 process.

Reservoir water level management

As with the prescription of conservation flows, the Agency is developing reservoir water level management rules in cooperation with the applicant and other parties.

Diversion dam water level management

For the protection of the existing Class II wetland at the diversion dam, the present normal operating level of the diversion dam should remain unchanged.

Methods to meet flow standards and reservoir management requirements

A report, including description, hydraulic design calculations, and plans for the measures to be used to maintain conservation flows and reservoir management

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requirements, shall be developed in consultation with the Agency. The plans shall include a proposal for monitoring instantaneous flow releases at the project and reservoir levels and record keeping and reporting that would demonstrate compliance with the flow and reservoir management requirements.

Dissolved oxygen concentrations

A management plan should be developed in consultation with the Agency for addressing possible substandard dissolved oxygen concentrations below Sugar Hill Reservoir as a result of stratification. Post-licensing studies by the applicant are intended to further evaluate this potential problem. Similar issues may exist below the project tailrace due to stratification of Silver Lake, and the Agency is presently reviewing this issue.

Public access

The licensee shall allow continued public access to the public waters within the project area for utilization of the public resources, subject to reasonable safety and liability limitations. Unless waived by FERC in writing, such access shall be permanently posted so that its availability is made known to the public.

Recreational and aesthetic enhancements

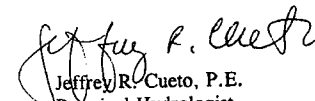
The licensee shall draft a final plan for improvements, to include improvement of the boat launch at Sugar Hill Reservoir, in consultation with the Recreation Section of the Department of Forests, Parks, and Recreation, the Department of Environmental Conservation, and the U.S. Forest Service. Plan implementation shall be within one year of relicensing.

The licensee shall draft a recreation master plan, including monitoring provisions, in consultation with the Recreation Section of the Department of Forests, Parks, and Recreation, the Department of Environmental Conservation, and the U.S. Forest Service, for filing with FERC within one year of relicensing. This plan is to be updated by the end of each subsequent five-year period. The plan shall include a provision guaranteeing additional recreational development/enhancement as deemed appropriate over the duration of the license; as well as a provision for operation and management of recreational facilities.

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Thank you for your consideration of our comments. We are hopeful that we will soon be able to forward a water quality certification satisfactory to all parties for your review as part of the NEPA process.

Sincerely,


Jeffrey R. Cueto, P.E.
Principal Hydrologist

encl. bathymetric map

CERTIFICATE OF SERVICE

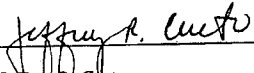
Silver Lake
Service List
4/19/96

Robert de R. Stein, Sr. V.P.
Central Vermont Public Service Corp.
77 Grove Street
Rutland, VT 05701-3402

Director, Division of Project Review
Office of Hydropower Licensing
Federal Energy Regulatory
Commission
888 First Street, N.E.
Washington, DC 20426

I, Jeffrey R. Cueto, hereby certify that I have this day served, by U.S. Mail, postage prepaid, a copy of the Vermont Agency of Natural Resources' Comments, Recommendations, Terms and Conditions on the Notice of Application Ready for Environmental Analysis for the Silver Lake Project (FERC No. 11478) upon each person designated on the attached Service List.

Dated this 19 day of April, 1996.


Jeffrey R. Cueto
Principal Hydrologist

