Water Quality Certification
(33 U.S.C. §1341)

In the matter of: Village of Lyndonville Electric Department
119 Park Avenue, P.O. Box 167
Lyndonville, VT 05851

APPLICATION FOR VAIL HYDROELECTRIC PROJECT

The Water Quality Division of the Vermont Department of Environmental Conservation (the Department) has reviewed a water quality certification application filed by the Village of Lyndonville Electric Department (the applicant) for the Vail Hydroelectric Project. The application was filed by letter dated September 12, 2000. The application was reviewed under the Vermont Water Quality Standards (Standards) adopted by the Water Resources Board, effective July 2, 2000, in accordance with Section 1-01(A) *Applicability*. The application includes the applicant's Federal Energy Regulatory Commission (FERC) license application, filed with FERC under a cover letter dated January 26, 1999. Supplemental filings by the applicant include responses to a FERC Additional Information Request, filed under cover letters dated April 21, 2000 and November 9, 2000.

The Department, based on the application and record before it, makes the following findings and conclusions.

Findings

Background and General Setting

1. The Vail Project is located at river mile 17.7 on the Passumpsic River in the Town of Lyndon, two miles downstream of the village of Lyndonville. Of the Passumpsic River's 507 square mile watershed, the project utilizes runoff from an area of 200 square miles.

2. The Passumpsic River drains the major portion of Caledonia County and minor portions of Essex, Orleans and Washington Counties. The mainstem of the river begins at the confluence of the West and East branches just north of Lyndonville, and the river flows south to the Connecticut River in Barnet. The West Branch headwater is the south

slope of Mt. Pisgah east of Lake Willoughby. The East Branch originates in Brighton, south of Island Pond. The topography of the basin is most rugged in the area of the eastern headwaters and less so in the western portion of the basin. The length of the mainstem is 22.6 miles with an approximate total fall of 230 feet. The average gradient is 13.8 feet per mile from Lyndonville to the river's mouth in the town of Barnet.

3. Major tributaries of the Passumpsic River include the Moose River, Sleepers River and Joes Brook. All three enter the Passumpsic below the Vail Project.

4. The headwaters of the Passumpsic is comprised of pristine streams that flow through undeveloped areas that are predominantly woodlands and wetlands with only sparse settlement. The village centers of Lyndonville and St. Johnsbury are located in the central part of the basin, along the mainstem, and are the commercial and industrial centers for village residents and the surrounding rural population. The lower portion of the basin is again rural with small villages such as Passumpsic and East Barnet along the main stem.

5. The Federal Energy Regulatory Commission first licensed the project on January 23, 1981, with the term of the license running for a period of twenty years, through January 31, 2001. The project was licensed as a run-of-river facility. The project is operating under a one-year license extension issued by FERC on February 28, 2001.

Project and Civil Works

6. Little Falls, the site of the Vail Project, was originally developed for water power in the 1790s. Over the years, an extensive mill operation, the Lyndon Mill Complex, was built at the site. Around 1905, much of the mill complex was destroyed by fire, and the Vail station was built in 1911. The applicant acquired the plant in 1921. The station sustained extensive damage in the 1927 flood and was completely reconstructed in 1949. The dam was resurfaced in 1952.

7. The brick and concrete powerhouse houses a single Kaplan-type turbine unit manufactured by General Electric Co. and operating under a design head of 20 feet. The hydraulic capacity of the turbine is 70 to 285 cfs. The turbine drives a 350 kW General Electric generator.

8. The dam is a 96-foot long ogee-shaped concrete gravity structure founded on irregular bedrock. A rock ledge forms the right abutment and the headworks the left. The dam height varies from between 8 and 15 feet above the river bed, with a crest elevation of 686.91 feet msl. The dam is topped with 20 ⅝-inch wooden flashboards with a top-of-boards elevation of 688.63 feet msl. Partial or complete flashboard failure occurs during winter or spring runoff events. The flashboards are replaced between mid-May and early June. The applicant has not submitted detailed information on the timing of flashboard failure and replacement.

9. The project headworks and powerhouse are located at the left end of the dam spillway. The headworks consist of a headrace with two trashracks with 2 ¾-inch clear spacing and two 8-foot wide by 9-foot high headgates. A skimming sluice and sand sluice on the side of the headrace discharge into the bypass.

10. The dam creates an impoundment with a backwater influence of approximately 10,000 feet and a gross storage capacity of approximately 79 acre-feet. The gross storage capacity has declined over time due to sedimentation.

11. A reach of the Passumpsic River 120 feet long is bypassed by the project.

12. The normal tailwater elevation is 668.9 feet msl. The tailrace and bypassed reach are frequently influenced by backwater from the Great Falls dam, which is located one mile downstream. That dam carries 2.0 feet of flashboards, which can raise the effective crest elevation to 668.4.

13. The plant produces an average annual output of 1,850 MWh.

14. Project transmission facilities include a 2.4 kV transmission line that carries power for 0.8 mile to the Great Falls Substation No. 1.

River Hydrology and Streamflow Regulation

15. There are seven hydroelectric projects on the mainstem of the Passumpsic River. Starting with the lowermost project on the river, they are East Barnet (River Mile 0.9), Passumpsic (River Mile 5.5), Gage (River Mile 7.2), Arnold Falls (River Mile 9.5), Pierce Mills (River Mile 14.9), Great Falls (River Mile 16.7) and Vail (River Mile 17.7). Great Falls and Vail are operated by the applicant, while the

other projects are operated by Central Vermont Public Service Corporation.

16. All of the projects operate in run-of-river[1] mode. East Barnet operates under a FERC exemption issued in 1982, while Passumpsic, Gage, Arnold Falls and Pierce Mills operate under individual FERC licenses issued in 1994. Great Falls operates under a FERC license issued in 1979.

17. Half of the river length, or almost ten miles, is impounded from the head of the Vail Project to the Connecticut River. Of the 230-foot drop in the river from Vail to the Connecticut River, 81 percent is harnessed for electrical generation.

18. The Great Falls impoundment begins immediately below the Vail Project.

19. The Vail Project is unattended, with operations monitored during the day from the applicant's Great Falls station.

20. Since 1928, the U.S. Geological Survey has operated a surface water gaging station (No. 01135500) on the Passumpsic River below the village of Passumpsic. The drainage area measured by the gage is 436 square miles, or roughly twice the drainage area of 200 square miles at the Vail dam. The following hydrologic statistics are available based on a direct proration of statistics from the gage data through water year 2000:

Mean annual flow	345 cfs
Annual runoff	23.44 inches
10 percent exceeds	775 cfs
50 percent exceeds	197 cfs
90 percent exceeds	77 cfs
7Q10	41 cfs (p.o.r. through 1992)

21. Flow fluctuations caused by flow regulation at hydroelectric dams on the Passumpsic River have been documented at the USGS gage.

[1] A true run-of-river project is one which does not operate out of storage and, therefore, does not artificially regulate streamflows below the project's tailrace. Outflow from the project is equal to inflow to the project's impoundment on an instantaneous basis. The flow regime below the project is essentially the river's natural regime, except in special circumstances, such as following the reinstallation of flashboards and project shutdowns. Under those circumstances, a change in storage contents is necessary, and outflow is reduced below inflow for a period.

These fluctuations are the result of deviations from run-of-river operations at one or more of the six projects upstream of the gage.

Applicant Proposal for Relicensing

22. The applicant proposes to continue operation of the Vail Project in run-of-river mode.

23. The applicant has not proposed a detailed plan for operation during flashboard replacement. Project operation would deviate from true run-of-river mode when flashboards are being replaced. In the past, the impoundment has been drawn over a period of a few hours through turbine discharge, the flashboards replaced, and the impoundment gradually refilled. The length of time to refill the impoundment has been dependent on river flows.

24. The applicant has not proposed a bypass flow release, but has proposed a 20 cfs release through the sluice gate to provide downstream fish passage between April 1 and June 15 and September 15 and November 15.

25. The station is equipped with automatic float controls that maintain the impoundment between 0.5 inch below and 1.5 inches above the flashboard crest.

Standards Designation

26. The *Vermont Water Quality Standards* (Standards) are promulgated by the Vermont Water Resources Board pursuant to 10 V.S.A., Chapter 47, *Water Pollution Control*. Section 1252 of the chapter provides for the classification of State waters as either Class A or Class B and authorizes the Board to adopt standards of water quality to achieve the purpose of classification. The application is subject to review under the Standards effective July 2, 2000.

27. The Passumpsic River has been designated by the Vermont Water Resources Board as Class B waters.

28. Class B waters are managed to achieve and maintain a high level of quality that: is suitable for bathing; consistently exhibits good aesthetic value; provides high quality habitat for aquatic biota, fish and wildlife; is suitable for public water supply with filtration and disinfection; is suitable for irrigation and other agricultural uses (Standards, Section 3-04(A)).

29. All waters affected by the proposal under consideration are designated cold water fish habitat for the protection and management of fisheries (Standards, Section 3-05).

30. In Class B waters, the dissolved oxygen standard for coldwater fish habitat streams is not less than 7mg/L and 75 percent saturation at all times, nor less than 95 percent saturation during late egg maturation and larval development of salmonids in areas that the Secretary determines are salmonid spawning or nursery areas important to the establishment or maintenance of the fishery resource. At all times in all other waters designated as a cold water fish habitat, the standard is not less than 6 mg/L and 70 percent saturation (Standards, Section 3-04(B)(2)(a)). The temperature standard limits increases to 1.0° from background (Standards, Section 3-01(B)(1)(b)). The turbidity standard is 10 NTU (Standards, Section 3-04(B)(1)(a)).

31. Under the Class B criterion for aquatic biota, wildlife and aquatic habitat, the Standards require "[n]o change from the reference condition that would prevent the full support of aquatic biota, wildlife, or aquatic habitat uses. Biological integrity is maintained and all expected functional groups are present in a high quality habitat. All life-cycle functions, including overwintering and reproductive requirements are maintained and protected." (Standards, Section 3-04(B)(4)

32. The *Hydrology Policy* requires that "[t]he proper management of water resources now and for the future requires careful consideration of the interruption of the natural flow regime and the fluctuation of water levels resulting from the construction of new, and the operation of existing, dams, diversions, and other control structures." (Standards Section 1-02(E)(1))

33. The *Anti-Degradation Policy* provides for protection of existing uses and water quality of all waters (Standards, Section 1-03).

34. On July 11, 2000, the Department issued, under Section 303(d) of the Federal Clean Water Act, a list of waters considered to be impaired based on water quality monitoring efforts. The project reach is not listed as impaired.

35. The Department also issued a four-part list, *List of Priority Surface Waters* (July 13, 2000). Part F lists those surface waters where water quality or habitat are being altered by flow regulation. The project reach is not listed.

36. The Village of Lyndonville wastewater treatment plant discharges into the Passumpsic River approximately 500 feet upstream of the upper end of the project impoundment. The river for one mile downstream of the discharge is designated as a waste management zone (Standards, Section 2-04(B)).

Water Chemistry

37. The Village of Lyndonville wastewater treatment facility is designed to treat 700,000 gallons per day. Based on 1999 data, influent flows averaged 330,000 gallons per day.

38. The applicant collected dissolved oxygen and temperature data more or less weekly from August 8 to September 19, 1998 at five stations: the head of the impoundment, impoundment midpoint, immediately upstream of the dam, the tailrace and the bypass. Flows were estimated (based on station generation data) to range from 140 to 280 cfs, which is higher than the August/September median flow of 100 cfs. With the possible exception of one sampling day, spillage into the bypass did not occur. All sampled dissolved oxygen concentrations exceeded 7.5 mg/L and 80 percent saturation, and were, therefore, above the minimum standards for Class B waters.

Aquatic Biota and Habitat

39. Class B waters are managed to provide high quality habitat for aquatic biota (Standards, Section 3-03(A)). Aquatic biota are defined as "organisms that spend all or part of their life cycle in or on the water." (Standards, Section 1-01(B)) Included, for example, are fish, aquatic insects, amphibians and some reptiles, such as turtles.

40. The Passumpsic River is managed to support coldwater fish. Species found in the vicinity of the project include Atlantic salmon; brook, brown and rainbow trout; fallfish and other minnow species; and sucker species.

41. The trout fishery is supported by both natural reproduction and annual stocking. The trout species have been stocked in the Passumpsic at least since the 1970s.

Flow Needs for Protection of Aquatic Habitat

42. Flows discharged by the project into the reach impounded by the Great Falls dam will essentially be unregulated, except during impoundment refilling following flashboard reinstallation.

43. The bypass reach provides habitat for juvenile Atlantic salmon, resident salmonids (brook, brown and rainbow trout), and for a variety of other non-game fishes and macroinvertebrates.

44. The applicant conducted a bypass habitat mapping survey in 1998 to characterize the aquatic habitat in the bypass reach. Data were collected along three transects across the river bed. Data collected included bed profile, wetted perimeter, depth, substrate, cover, velocity and water surface elevation. Data were collected at two flows: leakage (assumed to be approximately 0.5 cfs) and 30 cfs.

45. The survey results show that the bypass habitat consists of a pool/run approximately 120 feet long and 70 feet wide. The substrate is bedrock or large boulders. Instream cover is provided by bedrock fractures, boulders and depth.

46. The bypass can provide high quality aquatic habitat if adequate flows are provided. In order to provide a base of information on the flow needs of aquatic life in the bypass, the applicant conducted a flow study in 1999. The study used a modified version of the Instream Flow Incremental Methodology, a commonly used modeling technique originally developed by the U.S. Fish and Wildlife Service, to determine habitat availability under different flow regimes.

47. The study used field data related to water depth and velocity and substrate characteristics collected along the same three transects used for the habitat mapping survey. Data were collected at several flows between leakage and 125 cfs, with the Great Falls impoundment alternately at top-of-boards and at dam crest. Adult brown trout and juvenile Atlantic salmon were used as the target species.

48. The Agency of Natural Resources and U.S. Fish and Wildlife Service analyzed the data from the bypass flow study. The habitat/flow relationships for both target species were similar and were combined for analysis purposes. Weighted useable area (WUA) data were transformed to a percent scale, where each value is expressed as a percentage of the maximum WUA value observed. The Agency used a target of 80 percent of the maximum WUA to provide high quality aquatic habitat.

49. When the Great Falls flashboards are in place, 42 percent and 76 percent of the maximum WUA in the bypass would be provided by leakage and 20 cfs, respectively. When the Great Falls impoundment is lower than the top of the flashboards, the value for leakage is 29 percent, and 61 percent for 20 cfs.

50. When the Great Falls impoundment is at or above 668.4 feet msl (flashboards in place), 80 percent of the maximum WUA in the bypass is achieved at a flow of approximately 31 cfs. When the Great Falls impoundment is lower than 668.4 msl, a bypass flow of 54 cfs is needed to provide equivalent habitat conditions.

Impoundment

51. Fisheries habitat that was formerly riverine has been impounded by the dam. The substrate is primarily sand and gravel and instream cover is sparse.

Fish Passage and Movement

52. The *Strategic Plan for the Restoration of Atlantic Salmon to the Connecticut River Basin* (Connecticut River Atlantic Salmon Commission, 1998) targeted the Passumpsic River as a tributary to be utilized extensively for natural spawning by adult salmon returning from the ocean. It is the sixth largest of 39 major tributaries to the Connecticut River and contains approximately seven percent of the Atlantic salmon rearing habitat in the basin. There are an estimated 9,000 rearing units upstream of the Vail Project.

53. The habitat conditions for spawning in the East Branch of the Passumpsic are considered to be among the best in the basin. The East Branch has been targeted as nursery habitat for salmon since the onset of fry stocking in the Passumpsic in 1993.

54. Atlantic salmon fry have been stocked in the Passumpsic River basin since 1991 to utilize its abundant nursery habitat to produce outmigrating smolts with more wild behavioral traits and greater homing tendency than hatchery-reared smolts. At present between one-half and three-quarters of a million salmon fry are stocked each spring throughout Vermont's Northeast Kingdom, with over two-thirds of them stocked in the Passumpsic River basin. In 2001, 181,000 fry were stocked upstream of the Vail Project.

55. Of the six hydroelectric projects downstream of Vail, five have installed permanent downstream fishways for outmigrating salmon smolts. The remaining facility, Great Falls, is also owned by the applicant. In January 1997, the U.S. Fish and Wildlife Service initiated a license article reopener to obtain effective fish passage at Great Falls, which is not up for relicensing until 2019.

56. The applicant has provided downstream fish passage on an interim basis by releasing 20 cfs through a sluice gate adjacent to the turbine intake. The release occurs annually between April 1 and June 15 and September 15 and November 15.

57. In 2000, the applicant conducted a desktop modeling exercise to estimate the mortality rate of smolts passing downstream through the sluice gate (interim passage facility), turbine and spillway. The results showed that 88 to 89 percent of smolts would successfully pass downstream without mortality or significant injury.

58. Fish injury and mortality due to intake entrainment and trashrack impingement may occur. Fish entering the headrace may pass through the 2 ¾-inch spaces between the trashrack bars and become subject to turbine mortality or injury.

59. Fish injury and mortality may result from migrant fish impacting on the concrete apron or bedrock below the sluice gate.

60. In a letter to FERC dated March 27, 2001, the U.S. Fish and Wildlife Service exercised its authority under Section 18 of the Federal Power Act to reserve authority to prescribe fishways at the Vail Project. The preliminary fishway prescription includes installation of a collection chamber, transport sluice or pipe, plunge pool and trashrack with 1.0-inch clear bar spacing. The fishway would require a 20 cfs flow. The prescription calls for installation within one year of licensing and operation of the fishway between April 1 and June 15 and September 15 and November 15.

61. Upstream fish passage for returning adult salmon is now provided up to the dam at Dodge Falls on the Connecticut River at East Ryegate (Dodge Falls Hydroelectric Project, FERC No. 8011). When a threshold number of returning adult salmon is reached at the fishway at Wilder Dam, construction of a passage facility (either a fish trap-and-truck facility or a fish ladder) at Dodge Falls will be triggered. There is a similar trigger for construction of a fish passage facility at

McIndoes Dam (Fifteen Mile Falls Project, FERC No. 2077). Salmon will then have access to the Passumpsic River.

62. Upstream fish passage facilities for dams on the Passumpsic River are in the deferred category of the *Strategic Plan for the Restoration of Atlantic Salmon to the Connecticut River Basin*. Construction of upstream fishways is not needed until adult Atlantic salmon have access to the mouth of the Passumpsic River.

Wildlife and Wetlands

63. Four wetlands are located adjacent to the project impoundment. Two of them (Wetlands 1 and 6) are subject to protection under the Vermont Wetland Rules as Class Two wetlands. Another wetland (Wetland 5) is located adjacent to the river below the tailrace.

64. Wetland 1 is located approximately one mile upstream of the dam. It is a palustrine scrub-shrub/emergent wetland that is seasonally flooded and is used as pasture during the drier summer months. Wetland 6 is a palustrine unconsolidated bottom wetland located near Wetland 1.

65. Wetlands 2 and 4 are palustrine emergent wetlands. Wetland 2 is located at the mouth of a small tributary approximately 2,200 feet upstream of the dam. Wetland 4 is located at the mouth of an intermittent stream approximately 1,400 feet upstream of the dam Both are less than one-quarter acre in size.

66. Wetland 5 is a palustrine scrub-shrub wetland located on the west bank of the river approximately 600 feet below the dam. It is approximately one-quarter acre in size.

Rare and Endangered Species and Outstanding Natural Communities

67. No endangered or threatened plants or animals are known to inhabit the project reach.

68. The eastern pearlshell mussel (a state threatened species) has been found on the Moose River, a tributary to the Passumpsic. The Vermont Natural Heritage Program zoologist believes there is a good chance that this mussel occurs in the upper Passumpsic River. However, it is likely that mussel diversity and abundance are low in the project reach due to the heavy silt deposits. (Memorandum, Cheryl Ryder Kieffer to Brian T. Fitzgerald, July 7, 1997)

69. Osprey, a state-threatened species, are likely to use this reach of the river on a transitory basis, but there are no known nesting attempts.

70. Transient bald eagles and peregrine falcons are likely to occur in the project area. Bald eagles are listed as federally threatened and state endangered, while peregrine falcons are listed as state endangered.

Shoreline Erosion and Desilting

71. In 1998, the applicant conducted a shoreline erosion survey for the reach between the railroad bridge below the dam to the head of the impoundment. Four areas of active or recent erosion totaling approximately 150 feet of shoreline were found along the impoundment shoreline. Two of these areas were located adjacent to a sharp bend in the river. Soils consisted of sands and silts.

72. The river upstream of the project impoundment was also investigated during the survey. Exposed and unvegetated banks and evidence of past erosion were common.

73. Impoundment desilting can result in significant degradation of water quality if not executed properly. The applicant states that the only mechanical desilting of the impoundment consists of removing silt deposits adjacent to the forebay. This operation is typically performed on an annual basis. Approximately 8 to 10 cubic yards of material are removed during low-flow periods with equipment stationed on the river bank. The material is stored on site and used for fill. The applicant did not indicate that precautionary measures to protect water quality are taken.

Recreational Use

74. Recreational use at the project includes angling, boating, swimming and picnicking. Most fishing and swimming takes place in the vicinity of the beach below the powerhouse. No quantitative estimates of the amount of recreational use exist, but there is physical and anecdotal evidence of recreational use at the project.

75. The river is a navigable and boatable water of the State.

76. The project is located at the end of a town highway, providing good public access to the Passumpsic River.

77. In 1995, the applicant, in cooperation with Lyndon State College, constructed canoe portages at the Vail and Great Falls projects. The Vail take-out is located approximately 100 yards above the dam on the left bank. There is a short, rocky path up the bank and through the woods to Light Plant Road. After following the road for a short distance, a path leads to a small beach located below the tailrace. Some erosion is occurring at the take-out and along the path up the bank.

78. The applicant proposes to develop a recreation plan following issuance of a license for the project.

Aesthetics

79. The Vail Project is located in a rural area secluded from highway noise and development. The dam and powerhouse fit with the character of the area, and the site has been well maintained making it attractive to the visitor.

80. Spillage over the dam is a key element in the project's aesthetics. Falling water has a strong visual appeal, and without sufficient spillage over the dam the site lacks context and its attractiveness suffers. The amount of spillage needs to be in scale with the size of the project. The applicant conducted a flow demonstration to document several spillage conditions on videotape.

State Comprehensive River Plans

81. The Agency, pursuant to 10 V.S.A. Chapter 49, is mandated to create plans and policies under which Vermont's water resources are managed and uses of these resources are defined. The Agency must, under Chapter 49 and general principles of administrative law, act consistently with these plans and policies, whenever possible.

Hydropower in Vermont, An Assessment of Environmental Problems and Opportunities (May 1988)

82. The Department publication *Hydropower in Vermont, An Assessment of Environmental Problems and Opportunities* is a state comprehensive river 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.

83. With respect to the Vail Project, the plan included recommendations that the Department follow-up on compliance issues related to run-of-river operation and contact the applicant regarding the Agency's desilting policy. These issues have been considered in the Department's current review.

Passumpsic River Watershed Comprehensive River Plan (August 1992)

84. The Agency of Natural Resources, with extensive public involvement, has completed a comprehensive river plan for the Passumpsic River Watershed. The plan, entitled *Passumpsic River Watershed Comprehensive River Plan* defines a balance of river uses and values including state hydropower management goals and actions. The state management goals and actions contained in the plan are derived from state law, written state policies, and the public interest as determined through a three-year public participation process. Members of the public who participated in the planning process expressed as major issues of concern the restoration of the river's water quality and the fishery.

State hydropower management goals from this report include:

Goal 1 Continue to use the Passumpsic River, Sleepers River, and Joes Brook for the generation of electricity and permit other legitimate commercial uses of river water but make these uses compatible with other river uses and values.

Goal 2 Wherever possible, establish and maintain natural river flows to improve and maintain aquatic habitat, water quality, recreation, and aesthetics.

Goal 3 Establish and maintain minimum flows in the bypass segments of the hydropower facilities to maintain water quality, aesthetic and recreational values, and aquatic habitat, including: deep-aerated pools that are well circulated and serve as adult fish refugia, steeper gradient areas with high macroinvertebrate production, and fish spawning and nursery areas, all of which are limited habitat types, especially in the mostly impounded waters of the Passumpsic River mainstem.

Goal 4 Maintain riverbank stability and enhance river water clarity, aesthetics, and habitat for fish, wildlife, and other aquatic biota by minimizing river flow and pond height fluctuations.

Goal 5 Enhance the ability of fish to negotiate passage of hydro dams. Create downstream passage facilities for resident trout species and Atlantic salmon smolts (from both natal and non-natal production). Create upstream passage facilities when

sufficient numbers of adult salmon have returned to the Passumpsic River.

Goal 9 Enhance the Passumpsic River's role in a recreation/tourism based economy, preserve historic and archeological resources, and restore the aesthetics and productivity of local rivers by permitting a continuous vegetation buffer to grow on and near the banks of the river and its tributaries.

Goal 12 Enhance the desirability to live and conduct business in Lyndonville and St. Johnsbury by conserving and beautifying open spaces along the rivers as accessible recreational, cultural, scenic, and educational amenities in the urban corridor.

Goal 13 Maintain existing boating runs, for car-top boats and create a Passumpsic River boating trail where boaters can portage around dams and put-in and take-out at hydroelectric facilities on the mainstem river.

Goal 14 Increase watershed awareness and stewardship and local interest to maintain clean water, safe for swimming and compatible with other existing stream uses and values.

The project as proposed, and with the conditions imposed below, will be in compliance with the plan.

1993 Vermont Recreation Plan

85. The 1993 Vermont Recreation Plan (Department of Forests, Parks and Recreation), through extensive public involvement, identified water resources and access as top priority issues. The planning process disclosed that recreational use of surface waters is increasing, resulting in greater concern about water quality, public access to Vermont's waters, and shoreland development.

86. The plan's Water Resources and Access Policy is:

It is the policy of the State of Vermont to protect the quality of the rivers, streams, lakes, and ponds with scenic, recreational, cultural and natural values and to increase efforts and programs that strive to balance competing uses. It is also the policy of the State of Vermont to provide improved public access through the acquisition and development of sites that meet the needs for a variety of water-based recreational opportunities.

87. The applicant proposes to provide continued access to the river in the project area. This access and improved aesthetic and bypass flows would be compatible with this policy and balance the competing uses of recreation and hydropower. Failure to provide access would exacerbate a critical state recreational problem.

88. Another priority issue identified in the Recreation Plan is the loss or mismanagement of scenic resources. The plan notes "[t]he protection of the scenic and visual resources in Vermont is paramount if Vermont is to maintain its renowned charm and character."

89. The Scenic Resources Protection and Enhancement Policy in the Recreation Plan is:

> It is the policy of the State of Vermont to initiate and support programs that identify, enhance, plan for, and protect the scenic character and rural traditions of Vermont.

Analysis

Water Chemistry

90. Available water quality sampling by the applicant does not disclose any critical water quality issues at the project. However, the sampling was conducted during a period when flows were higher than normal for the sampling period of August and September. The presence of a wastewater treatment facility upstream of the project also will have an effect on dissolved oxygen concentrations during critical low flow periods. Currently, the project can operate when inflow is less than 7Q10, and there is no reaeration occurring as a result of spillage.

    The project, as proposed, will operate in run-of-river mode. The minimum flow at which the station could operate with a 31 cfs bypass flow is 101 cfs. At this flow, approximately 30 percent of the flow will be subject to reaeration by passing over the dam and through a fishway. Flows will meet or exceed this level 60 percent of the time in July and 50 percent of the time in August and September. The station would not operate below flows of 101 cfs and all water would be spilled or discharged through the fishway. Water discharged over the spillway can be expected to be at or near saturation for dissolved oxygen when it enters the bypass, so the proposed conservation flow requirements will address any dissolved oxygen deficits.

Flow and Water Level Management

Habitat Protection – Downstream

91. Run-of-river operation will provide aquatic habitat and wetland protection below the project.

92. During periods when the impoundment is refilled following flashboard replacement, adequate flows must be provided to protect downstream habitat.

Habitat Protection – Bypass

93. The applicant proposes to discharge 20 cfs into the bypass only seasonally, for the support of salmon outmigration. At other times, only leakage or spillage during high flow periods would discharge into the bypass. While the bypass is small in size, it has the capability of providing high quality habitat for fish and other aquatic organisms, including juvenile Atlantic salmon, if adequate flows are provided. There is essentially a complete lack of moving water during most periods. Leakage provides only about 0.5 cfs (or 0.003 csm) of flow into the bypass, which is about two percent of the flow necessary to support aquatic habitat. This condition is not attractive to the riverine fish species that inhabit the river and for which it is managed. It further reduces the cover available to fish that normally would be provided by a broken water surface associated with flowing water. The lack of water circulation may result in areas with elevated and unsuitable water temperatures and depressed dissolved oxygen conditions. Given the small size of the bypass, flows that provide 80 percent of the available habitat give a reasonable level of protection.

    Based on the Agency's analysis of data from the applicant's bypass reach aquatic flow study, the flows necessary to meet this objective are 31 cfs when the Great Falls impoundment is at or above the top of the flashboards, and 54 cfs when it is below this elevation. Under natural conditions, these flows are available 100 percent and 98 percent of the time, respectively, on an annual basis.

Habitat Protection – Impoundment

94. The project is proposed to be operated in run-of-river mode, so frequent impoundment fluctuations will be avoided. Some water level fluctuations will occur during periods of flashboard failure and replacement. These infrequent changes in impoundment elevation will not compromise wetland habitat or exacerbate shoreline erosion.

Aesthetics

95. The dam is highly visible from the shoreline below the powerhouse. This area is accessible to the public, which uses the river for swimming, boating, and general enjoyment of the water. A veil of

water flowing over the dam is important for aesthetic purposes, as well as providing certain water quality benefits.

96. Based on a review of videotape footage of the aesthetic flow study, 1.0-inch of spillage provides adequate water to address aesthetics. By condition of this certification, the applicant shall be required to provide 1.0-inch (8 cfs) of spillage over the dam at all times.

Conclusions

97. Run-of-river operation will be necessary to protect impoundment and downstream habitat. A limited deviation from run-of-river may occur when the impoundment is being refilled following flashboard replacement or maintenance drawdown. During these periods, 90 percent of inflow will released downstream.

98. Adequate bypass flows will be needed to provide high quality aquatic habitat in that reach. Other flow management objectives are proper function of the downstream fishway and providing a veil of water over the dam for aesthetic purposes. Bypass flows of 31 cfs or 54 cfs (depending on the elevation of the Great Falls impoundment) will be provided by a combination of 8 cfs of spillage over the dam and flow through the fishway.

99. Precise control of the impoundment elevation will be necessary to provide the required flows over the spillway and through the fishway.

100. By condition of this certification, the applicant shall be required to maintain run-of-river operation and provide bypass flows of 31 cfs or 54 cfs through a combination of spillage and discharge through the fishway. A further condition shall be to prepare a flow management plan that addresses these issues. The plan shall be subject to review and approval by the Department.

Fish Passage

Downstream

101. The Passumpsic River upriver of the Vail Project provides rearing habitat important for the restoration of Atlantic salmon to the Connecticut River watershed. Smolts migrating downriver must negotiate seven hydroelectric dams to reach the mainstem of the Connecticut, and seven more hydroelectric dams before reaching

Long Island Sound. Provision of efficient downstream fishways at these facilities is essential to restore salmon to the watershed.

102. In addition to Atlantic salmon, other fish species inhabiting the Passumpsic River (trout, minnows, suckers) would benefit from a fishway that allows fish to disperse and inhabit areas downriver of the project. These species do not necessarily move on a seasonal basis, so the greatest benefit would be provided by a fishway that operates year-round.

103. The current 2 ¾-inch bar spacing on the trashracks increases the risk of fish entrainment. The U.S. Fish and Wildlife Service recommends a clear spacing of 1.0 inch to exclude most fish.

104. The U.S. Fish and Wildlife Service preliminary fishway prescription includes a design that would require a 20 cfs release through the fishway.

105. Installation of a fishway is needed to ensure safe downstream passage of Atlantic salmon and other species. The facility must be designed to reduce impingement and entrainment, provide sufficient attraction flows, and provide an adequate pool to prevent injury at the bottom of the fishway. By condition of this certification, the applicant shall be required to install downstream fish passage facilities consistent with the specifications developed by the U.S. Fish and Wildlife Service. Plans for the passage facilities shall be subject to prior review and approval by the Department.

Upstream

106. Consistent with other mainstem power dams, upstream fish passage may be deferred until adult Atlantic salmon are present below the East Barnet Project (FERC No. 3051) and the Agency or Natural Resources and U.S. Fish and Wildlife Service determine that upstream passage facilities are required. By condition of this certification, the applicant will be required to provide for upstream fish passage at that time.

Recreation

107. Vermont Water Quality Standards require the protection of existing water uses, including the use of water for recreation. Standards also requires the management of the waters of the State to improve and protect water quality in such a manner that the beneficial uses and

values associated with a water's classification are attained (Standards, Section 1-03).

108. Beneficial values and uses of Class B waters include water that exhibits good aesthetic value and swimming and recreation (Standards, Section 3-03(A)). Regulation of river flows in a manner that would result in an undue adverse effect on any existing use or beneficial value or use are prohibited (Standards, Section 2-02(B)).

109. The applicant has proposed certain minor recreational improvements and will provide continued public access to the project area. The existing portage will accommodate through boating as well serve as a starting point to boat the impoundment or the downstream reach. By condition of this certification, the applicant shall be required to develop a recreation plan, subject to review and approval by the Department.

Erosion

110. Erosion, if severe, can impair recreational use and cause turbidity and the discharge of suspended solids, potentially violating the standards for those parameters (Standards, Section 3-03(B)(1) and Section 3-01(B)(7)). No unusual shoreline erosion problems clearly attributable to project operation have been documented at the project.

111. Recreational use of project lands may cause some localized erosion. Proper recreation planning limits the risk of significant erosion. However, the Department will maintain continuing jurisdiction over this issue and require modifications where found necessary to abate erosion.

Debris

112. The applicant does not provide information on the handling and disposal of trashrack debris and other project related debris. The depositing or emission of debris and other solids to state waters violates the state solid waste laws and Standards, Section 3-01(B)(7). Debris may also impair aesthetics and boating. A debris disposal plan shall be required as a condition of this certification.

113. The applicant does not provide information on flashboard materials or methods used to prevent their loss downstream.

Sediment

114. A detailed procedure for desilting the forebay is needed. The procedure must incorporate measures that control or prevent a discharge of sediment to state waters during desilting operations. By condition of this certification, such a procedure is being required, subject to review and approval by the Department.

Action of the Department

Based on its review of the applicant's proposal and the above findings, the Department concludes that there is reasonable assurance that operation and maintenance of the Vail Hydroelectric Project as proposed by the applicant and in accordance with the following conditions will not cause a violation of Vermont Water Quality Standards and will be in compliance with sections 301, 302, 303, 306, and 307 of the Federal Clean Water Act, 33 U.S.C. §1251 et seq., as amended, and other appropriate requirements of state law:

A. **Compliance with Conditions.** The applicant shall operate and maintain this project consistent with the findings and conditions of this certification, where those findings and conditions relate to protection of water quality and support of designated and existing uses under Vermont Water Quality Standards and other appropriate requirements of state law.

B. **Flow Management.** Except as allowed in Condition C below, the facility shall be operated in a true run-of-the-river mode where instantaneous flows below the tailrace shall equal instantaneous inflow to the impoundment at all times. When the facility is not operating, all flows shall be released through the fishway and spilled at the dam. The impoundment elevation shall be maintained so that at least 1.0 inch of water (approximately 8 cfs) is spilled at all times uniformly over the full dam crest.

   Conservation flows for the bypassed reach shall be provided by a combination of spillage over the dam (to address aesthetics) and flow through the fishway.

   When the Great Falls Project impoundment is at or above the top of the flashboards (668.4 feet msl), 31 cfs, or inflow if less, shall be released into the bypass. When inflow is at or above 31 cfs, a minimum of 23 cfs shall be released through the fishway, and at least 8 cfs shall be spilled over the dam. When inflow is less than 31 cfs, 8

cfs shall be spilled, and the remainder of inflow shall be released through the fishway.

When the Great Falls Project impoundment is below the top of the flashboards (below 668.4 feet msl), 54 cfs, or inflow if less, shall be released into the bypass. When inflow is at or above 54 cfs, a minimum of 46 cfs shall be released through the fishway, and at least 8 cfs shall be spilled over the dam. When inflow is less than 54 cfs, 8 cfs shall be spilled, and the remainder of inflow shall be released through the fishway.

C. **Flow Management During Impoundment Refill.** During refilling of the project impoundment after flashboard replacement, an approved dam maintenance operation or an emergency drawdown, the applicant shall release 90 percent of instantaneous inflow below the project. While the impoundment is being refilled, bypass flow requirements shall be met at all times.

D. **Flow Management Plan.** The applicant shall develop and file with the Department a flow management plan detailing how the project will be operated to comply with the conservation flow and impoundment fluctuation limitations described above. The plan shall include information on how the project will be managed to control lag times and avoid related non-compliance with the conservation flow requirements. After Department approval of the plan, the plan shall be filed with FERC no later than 120 days from the date of license issuance. FERC shall either approve the plan or return the plan to the applicant for revision to incorporate FERC-recommended changes. After revision, the applicant shall submit the plan to the Department for approval of the changes. The plan shall then be filed with FERC for final approval. The Department reserves the right of review and approval of any material changes made to the plan.

E. **Monitoring Plan for Impoundment and Flow Management.** The applicant shall develop a plan for continuous monitoring and reporting of flow releases at the project (spillage, turbine discharge, and discharge through the fishway), impoundment levels at the Vail and Great Falls projects, and inflows. The plan shall include procedures for reporting deviations from prescribed operating conditions. The applicant shall maintain continuous records of flows and impoundment levels and provide such records on a regular basis as per specifications of the Department. The plan shall be developed in consultation with the Department and the U.S. Fish and Wildlife Service. After Department approval of the plan, the plan shall be filed

with FERC no later than 120 days from the date of license issuance. FERC shall either approve the plan or return the plan to the applicant for revision to incorporate FERC-recommended changes. After revision, the plan shall be filed for Department approval. The plan shall then be filed with FERC for final approval. The Department reserves the right of review and approval of any material changes made to the plan.

F. **Downstream Fish passage.** The applicant shall implement permanent downstream fish passage within one year of license issuance. The design shall include provisions to prevent entrainment and impingement, and shall function at all normal impoundment levels. The design shall be developed in consultation with the Department and the U.S. Fish and Wildlife Service, and shall be subject to Department approval prior to implementation.

G. **Upstream Fish Passage.** Within two years of a written request by the U.S. Fish and Wildlife Service, the applicant shall provide for upstream fish passage, subject to plan approval by the Department. The U.S. Fish and Wildlife Service and the Vermont Department of Fish and Wildlife shall be consulted during plan development. The plan shall include an erosion control and water management plan designed to assure compliance with water quality standards during construction.

H. **Turbine Rating Curve.** The applicant shall provide the Department with a copy of the turbine rating curve, accurately depicting the flow/production relationship, for the record within one year of the issuance of the license.

I. **Debris Disposal Plan.** The applicant shall develop a plan for proper disposal of debris associated with project operation, including trashrack debris. The plan shall include information on flashboard construction, including materials, the method used for sealing leakage, and methods used to prevent the loss of flashboards downstream. The plan shall be developed in consultation with the Department. After Department approval of the plan, the plan shall be filed with FERC no later than 120 days from the date of license issuance. FERC shall either approve the plan or return the plan to the applicant for revision to incorporate FERC-recommended changes. After revision, the applicant shall submit the plan to the Department for approval of the changes. The plan shall then be filed with FERC for final approval. The Department reserves the right of review and approval of any material changes made to the plan at any time.

J. **Maintenance and Repair Work.** Any proposals for project maintenance or repair work, including drawdowns below the fixed dam crest to facilitate repair/maintenance work, shall be filed with the Department for prior review and approval, if said work may have a material adverse effect on water quality or cause less-than-full support of an existing use or a beneficial value or use of State waters.

K. **Forebay Desilting.** The applicant shall develop, within 180 days of the effective date of the FERC license, a procedure for desilting the forebay. The procedure shall include a detailed description of measures taken to protect water quality by preventing the discharge of sediment downstream, the storage location for the material, and information on disposal or use. The procedure shall be filed with the Department within 180 days of license issuance and shall be subject to Department approval. Modifications to the procedure shall be subject to Department approval over the term of the license.

L. **Public Access.** The applicant shall allow public access to the project lands 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.

M. **Recreational Facilities.** Recreational facilities shall be constructed and maintained consistent with a recreation plan approved by the Department. The plan shall be filed with the Department within 180 days of license issuance and shall include an implementation schedule. The applicant shall investigate and propose improvement of the existing canoe take-out and other riverbank access points to curb erosion, and, if feasible, relocation of the canoe take-out to another riverbank location that is less steep and provides for safer use. Where appropriate, the recreation plans shall include details on erosion control. Modifications to the recreation plan shall also be subject to Department approval over the term of the license.

N. **Erosion Control.** Upon a written request by the Department, the applicant shall design and implement erosion control measures as necessary to address erosion occurring as a result of use of the project

lands for recreation. Any work that exceeds minor maintenance shall be subject to prior approval by the Department and FERC.

O. **Compliance Inspection by Department.** The applicant shall allow the Department to inspect the project area at any time to monitor compliance with certification conditions.

P. **Posting of Certification.** A copy of this certification shall be prominently posted within the project powerhouse.

Q. **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 where appropriate and authorized by law and only as related to the change proposed.

R. **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.

S. **Continuing Jurisdiction.** The Department reserves the right to add and alter the terms and conditions of this certification, when authorized by law and as appropriate to carry out its responsibilities with respect to water quality during the life of the project.

Christopher Recchia
Commissioner

By /s/
Wallace McLean, Director
Water Quality Division

Department of Environmental Conservation

Dated at Waterbury, Vermont
this 13th day of September, 2001

c: Distribution List

WMcL/BTF