

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

In the matter of: Central Vermont Public Service Corporation
77 Grove Street
Rutland, Vermont 05701

APPLICATION FOR MIDDLEBURY LOWER
HYDROELECTRIC PROJECT

The Water Quality Division of the Vermont Department of Environmental Conservation (the Department) has reviewed a water quality certification application filed by Central Vermont Public Service Corporation (the applicant) for the Middlebury Lower Hydroelectric Project. The application was filed by letter dated June 9, 1998. The application was reviewed under the Vermont Water Quality Standards adopted by the Water Resources Board on April 2, 1997, 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 June 23, 1998.

The Department held a public hearing on May 17, 1999 under the rules governing certification and received testimony during the hearing and, as written filings, until May 21, 1999. No formal comments were received.

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

I. Background/General Setting

1. Otter Creek, Vermont's longest river, flows about one hundred miles from its source at Emerald Lake in Dorset to its mouth at Lake Champlain in Ferrisburgh. The river has been heavily developed for hydroelectric power generation, hosting seven active dams on the mainstem. The applicant operates hydroelectric facilities at Middlebury Lower Dam and Weybridge Dam, the fifth and second dams, respectively, above the river's mouth. The other dams are owned by Green Mountain Power Corporation (GMP) and OMYA, Inc.
2. Middlebury Lower Dam is located at a natural cascade at River Mile 24.7, a little over one mile below the Frog Hollow area of Middlebury village. The cascade historically has been known alternatively as Paper Mill Falls, Pulp Mill Falls, Weybridge Falls,

or the Lower Falls. The project impounds a reach of river about one mile in length. Directly upstream is Middlebury Falls, or the Upper Falls, a site which was used for hydroelectric generation by the applicant up until 1964.

3. Of Otter Creek's 936 square mile watershed, the project utilizes runoff from an area of 629 square miles.
4. The Federal Energy Regulatory Commission licensed the project on July 8, 1980, with the term of the license running from April 1, 1962 through July 1, 2000. Federal jurisdiction over the project was determined based on the Commission having found in 1965 that Otter Creek is a navigable waterway.

II. Project and Civil Works

5. The Hortonia Power Company acquired the assets of the Green Mountain Pulp Company and developed the Middlebury Lower site for hydroelectric generation in 1917. The original powerhouse collapsed during the initial watering of the turbines, and it was rebuilt and placed in service by 1920. The powerhouse, located on the right (east) bank about 400 feet below the dam, houses three James Leffel Francis-type turbine units operating under a design head of 28 feet. The powerhouse is a concrete and brick structure, 77 feet long, 59 feet wide, and 40 feet high. The turbines drive General Electric generators with a capacity of 750 kW each.
6. The existing dam consists of two spillway sections separated by a small island. The dam is a concrete gravity structure founded on bedrock. The crest elevation is 314.5 feet NGVD. The left (west) spillway is 123 feet long and incorporates two 6 feet x 8 feet high stoplog sections. The right spillway, 260 feet long, extends from the island to the headrace intake. A sluice gate, 9 feet x 5.5 feet high, is located adjacent to the intake.
7. A concrete and bedrock headrace about 400 feet in length and 40 feet wide carries water along the right riverbank from the dam to the powerhouse. The headrace intake structure incorporates two 23 feet x 13 feet high steel slidegates operated by a 25-ton electric trolley hoist. A set of trashracks with a 1.75-inch clear spacing is located at the downstream end of the headrace. Debris is removed from the racks through the use of a bubbler system; debris is

sluiced through a sluice/waste gate and down a race located along the north side of the powerhouse.

8. The impoundment has a surface area of approximately 16 acres and a gross storage capacity of approximately 46 acre-feet.
9. The normal tailwater elevation is 285.4 feet NGVD. The project discharges into the head of the Beldens Dam impoundment.
10. The plant, with its total installed capacity of 2,250 kW, produces an average annual output of 8,300,000 kWh.

III. River Hydrology and Streamflow Regulation

11. The flow of Otter Creek is regulated by several of the hydroelectric facilities in the basin. Five hydroelectric dams are located on the river mainstem between the river's mouth and Middlebury. Starting at the mouth and going upstream, the five are Vergennes (River Mile 7.4), Weybridge (River Mile 19.5), Huntington Falls (River Mile 21.0), Beldens (River Mile 23.0), and Middlebury Lower (River Mile 24.7). GMP's Vergennes Hydroelectric Project is currently in relicensing with an expiration date of May 29, 1999 for the current license. The Weybridge Hydroelectric Project, owned by the applicant, is also in relicensing; both the Weybridge and Middlebury Lower licenses expire about a year after Vergennes' license. The Huntington Falls and Beldens facilities are owned by OMYA, Inc. and were redeveloped under a license amendment issued in 1986 to increase the installed capacity at both facilities. OMYA, Inc. also owns two upstream facilities on the mainstem of the river, Proctor Station at Sutherland Falls and the Center Rutland Hydroelectric Project in Rutland. The applicant owns several facilities in the Leicester River and East Creek watersheds.
12. The Beldens and Huntington Falls plants are operated as strict run-of-the-river facilities. As such, they no longer regulate flows to preferentially generate on peak. The applicant proposes to operate the Middlebury Lower facility to a strict run-of-the-river operation under the new license. The utility, however, proposes to maintain a daily cycle operation at the Weybridge facility except during the spring period, April 15 - June 15 (*Application for New License for Major Project (5 MW or Less) - Weybridge Project*, May 1994, Volume I). As proposed by GMP, the Vergennes Hydroelectric

Project will be operated as a strict run-of-the-river station. The Center Rutland and Proctor facilities are also operated as run-of-the-river stations. Inflows to Middlebury Lower can be considered as almost unaffected by artificial flow regulation.

13. The Middlebury Lower Project is currently operated as a strict run-of-the-river facility, maintaining a fixed headpond level within one inch of the dam crest. Typically a small amount of spillage, estimated at 77 cfs (*Middlebury Lower Project - Application for New License for Major Project (5 MW or Less)*, June 1998, vol. I, p. E-64), is maintained over the dam crest at least in part to discourage people from trying to walk across the dam. The station was automated in 1993. Although the onsite computer system normally controls the operation, the utility's dispatch office in Rutland monitors operation and can assume control at any time. The facility's three turbine units are brought on line and adjusted to match their combined capacity to the impoundment inflow. Two turbines have a maximum capacity of about 270 cfs, and the third has a capacity of about 405 cfs; the total station capacity is about 945 cfs. The minimum hydraulic capacity for each unit is 100 cfs.
14. Since 1903, the U.S. Geological Survey has operated a surface water gaging station (No. 04282500) on Otter Creek in Middlebury village. The intervening watershed between the gage and the project dam is only about one square mile. The following hydrologic statistics are available from the gage data:

Mean annual flow	1,000 cfs
Annual runoff	21.64 inches
10% exceeds	2,320 cfs
50% exceeds	630 cfs
90% exceeds	260 cfs
7Q10	157 cfs

Applicant proposal for relicensing:

15. The applicant proposes to continue to operate the Middlebury Lower Project as a strict run-of-the-river project with a stable impoundment at an elevation set slightly above the dam crest.
16. The applicant proposes to maintain a full crest spillage of 157 cfs, or instantaneous inflow if less, at all times. When inflows exceed 1,102 cfs (the station hydraulic capacity of 945 cfs plus the

minimum spillage), the additional inflow would be spilled. Discounting plant outages, spillage would exceed 157 cfs about 30% of the time.

IV. Standards Designation

17. Otter Creek has been designated by the Vermont Water Resources Board as Class B waters. The Water Resources Board has also designated the reach from the Proctor wastewater treatment plant outfall to the river's mouth, with the exception of the segment between the Beldens and Huntington Falls dams, as warmwater fish habitat.
18. Class B stream reaches are managed to achieve and maintain a high level of quality compatible with certain beneficial values and uses. Values are high quality habitat for aquatic biota, fish and wildlife and water quality that consistently exhibits good aesthetic value; uses are public water supply with filtration and disinfection, irrigation and other agricultural uses, swimming, and recreation. (Standards, Section 3-03(A) *Class B Waters: Management Objectives*)
19. The dissolved oxygen standard for warmwater fish habitat streams is 5 mg/l and 60 percent saturation at all times. Depending on ambient stream temperature conditions, the temperature standard limits increases to values between 1.0 and 5.0 deg F from background. (Standards, Section 3-01(B)(2) *Temperature*) The turbidity standard is 25 NTU. (Standards, Section 3-03(B)(1) *Turbidity*)
20. Under the general water quality criteria, all waters, except mixing zones, are managed to achieve, as in-stream conditions, aquatic habitat with "[n]o change from background conditions that would have an undue adverse effect on the composition of the aquatic biota, the physical or chemical nature of the substrate or the species composition or propagation of fishes." (Standards, Section 3-01(B)(5) *Aquatic Habitat*)
21. Standards Section 2-02(B) *Hydrology: Artificial Flow Conditions* requires that "[t]he flow of waters shall not be controlled or substantially influenced by man-made structures or devices in a manner that would result in an undue adverse effect on any existing use, beneficial value or use or result in a level of water quality that

does not comply with these rules." The project dam is a man-made structure that artificially regulates water levels and streamflows.

Present status:

22. By letter dated December 30, 1998, 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.
23. Also by letter dated December 30, 1998, the Department issued a draft four-part list, *List of Priority Surface Waters*. Part F lists those surface waters where water quality or habitat are being altered by flow regulation, obstructions, and other water level manipulations. A 0.1 mile segment of Otter Creek (the bypassed reach) is listed as having all uses impaired by artificial flow regulation caused by this project.

V. Water Chemistry

24. During 1982, the Department of Environmental Conservation completed limited summer sampling of dissolved oxygen and temperature at the project. Dissolved oxygen samples were near saturation. The substantial extent of algal and weed growth in the impoundment and the location of the Middlebury wastewater treatment plant 1/4 mile upstream were a basis of concern that diurnal swings in dissolved oxygen concentrations may result in substandard conditions under predawn conditions. The Agency, therefore, asked the applicant, by letter dated April 2, 1996, to complete additional water quality sampling. The applicant collected dissolved oxygen and temperature data more or less weekly from July 15 to September 2, 1997 at four stations: the head of the impoundment, in the headrace just upstream of the trashracks, the tailrace, and the bypass. Flows were relatively low at estimated generation flows of 80 - 400 cfs. About 0.1 foot of spillage was maintained. All dissolved oxygen concentrations measured in excess of 7 mg/l and 80% saturation, well above the minimum standards for dissolved oxygen.

VI. Aquatic Biota and Habitat

25. Class B waters are managed for high quality habitat for aquatic biota (Standards Section 3-03(A) *Class B Waters: Management*

Objectives). Aquatic biota are defined in Standards Section 1-01(B) *Definitions* as "organisms that spend all or part of their life cycle in or on the water." Included, for example, are fish, aquatic insects, amphibians, and some reptiles, such as turtles.

26. Otter Creek is managed to support both coldwater and warmwater fish. Otter Creek upstream of the town of Middlebury has extensive and highly productive wild trout populations. Fishes found above and below the Middlebury Lower project include northern pike, smallmouth bass, largemouth bass, brown trout, rainbow trout, perch, white sucker, brown bullhead, sunfish species and various minnow species which furnish a forage base for many predatory species. The Middlebury Lower impoundment is managed primarily for warmwater fisheries, but there is an early spring fishery for trout managed as a stocked put-and-take fishery. Both brown and rainbow trout are stocked in the impoundment above the dam. Additional stocking occurs below Middlebury Falls to provide an early trout fishery in Middlebury village.
27. The project bypasses about 750 feet of river between the dam and the tailrace. The bypass has a relatively steep gradient, dropping about 20 feet in elevation over its length. The channel is highly irregular and dominated by ledge outcrops. These outcrops form pools, narrow chutes, and small vertical drops. About 300 feet upstream of the project tailrace, there is a ledge drop that prevents upstream fish movement. The water level at the base of this drop is controlled by the Beldens impoundment.
28. Although the applicant has normally maintained a small amount of spillage over the dam, providing flows through the bypass, the amount of flow and the periodic interruption of this flow have resulting in a condition not favorable to support of aquatic organisms. Due to the channel steepness and shape and the lack of refuge areas, high flows through the bypass are likely to force some fish that inhabit the reach to move downstream. Recruitment then must come from fish moving down from the project impoundment.

Flow needs for protection of aquatic habitat

29. In order to provide a base of information on the flow needs of aquatic life in the bypass, the applicant conducted an instream flow study in cooperation with the Department of Fish and Wildlife. Due to the irregular configuration and complex flow patterns of the

bypass channel, a determination was made that modeling the habitat/flow relationship using the Instream Flow Incremental Methodology, a commonly used modeling technique, would be inappropriate. A more-qualitative Delphi flow assessment was instead conducted to determine the habitat conditions for several aquatic species.

30. From the dam to the tailrace, the bypass was divided into four channel segments each with different characteristics. The boundary and area of each segment was determined for each study flow. A representative transect was selected in each segment, and depth and velocity measurements were taken along each of these transects. Habitat conditions were assessed and transect data measured at four study flows: 77 cfs, 157 cfs (7Q10), 236 cfs and 314 cfs (0.5 csm).
31. For management of a warmwater and coldwater fish community in the bypass, the evaluation species and life stages shown in the following table were targeted for study purposes.

Table 1. Evaluation Species and Life Stages

Species	Life Stage
Brown Trout	Adult
Rainbow Trout	Adult
Smallmouth Bass	Adult, Juvenile
Fallfish	Adult, Juvenile, Fry, Spawning and Incubation
Macroinvertebrates	

Suitability criteria were developed for each life stage by specifying a range of conditions (depth, mean column velocity, substrate type) that provide "good" or "suitable" habitat. Based on substrate type, it was determined that limited if any potential for trout and bass spawning exists in the bypass.

32. Within each segment and for each flow and evaluation organism, the percentage of the segment with suitable habitat was determined by professional fisheries biologists. This determination was made based upon visual observation, spot depth and velocity measurements, and the previously collected transect data. The

available suitable habitat in square feet was then determined by multiplying this percentage by the wetted area of the segment. The following table lists those flows of the ones observed that maximize useable habitat for the different species and life stages targeted.

Table 2. Study flows providing the greatest amount of suitable habitat

Species/Life Stage	Flow
Brown Trout Adult	157 cfs
Rainbow Trout Adult	157 cfs
Smallmouth Bass Adult	236 cfs
Smallmouth Bass Juvenile	236 cfs
Fallfish Adult	236 cfs
Fallfish Juvenile	157 cfs
Fallfish Fry	157 cfs
Fallfish Spawning/Incubation	No suitable habitat
Macroinvertebrates	314 cfs

For all fish evaluation species and life stages, the difference in amount of suitable habitat between 157 and 236 cfs was small. Macroinvertebrate habitat continued to increase over the entire range of flows studied, although the increase between 236 and 314 cfs was small (7%). The macroinvertebrate habitat/flow relationship differed from that of the other evaluation species, all of which exhibited maximum habitat levels at lesser flows.

Fish passage/movement

33. Historically, migratory fish from Lake Champlain ascended many of its tributaries to access spawning waters. To meet the goals of the bistrate plan for the development of the Lake's salmonid fishery (*A Strategic Plan for Development of Salmonid Fisheries in Lake Champlain*, NYS Department of Environmental Conservation, October 4, 1977), upstream and downstream passage provisions are being sought at dams on certain Lake tributaries. In Vermont, the Winooski River and the Lamoille River are included in this effort; however, this initiative has not been extended to Otter Creek as the

other tributaries present a better opportunity for coldwater fish spawning.

34. Fish injury and mortality due to intake entrainment and trashrack impingement may occur. Fish entering the headrace may not be able to exit and may pass through the 1.75-inch spaces between the trashrack bars and become subject to turbine mortality.

Mussels

35. Lower Otter Creek also contains a rich diversity of mussel species. On August 13, 1986, the Vermont Natural Heritage Program completed a survey of mussel resources in the impoundment for the Otter Creek Audubon Society (*Significant Natural Features of Otter Creek, Middlebury to Pulp Mill Bridge, Middlebury, Vermont*, Thompson and DesMeules, Vermont Natural Heritage Program, undated). Six mussel species were found: eastern elliptio (*Elliptio complanata*), heavy-toothed wedge mussel (*Alasmidonta undulata*), eastern floater (*Anodonta cataracta cataracta*), squaw foot (*Strophitus undulatus*), eastern lampmussel (*Lampsilis radiata*), and fluted shell (*Lasmigona costata*). The Vermont Endangered Species Committee has recently recommended that the fluted shell be listing as endangered. The other species are relatively common. The Heritage Program survey did not collect data on relative abundance.

VII. Wildlife and Wetlands

36. The project impounds an area that contains four State-protected Class Two wetlands. Fringing the impoundment are smaller wetland areas that did not appear on the National Wetland Inventory map for that area.
37. The most northern of the four mapped wetlands, located on the east bank about 1,500 feet upstream of the dam, is a small (4 acres) forested palustrine wetland dominated by red maple, American elm, and green ash. South of this wetland on the western bank is a shrub/scrub palustrine and emergent wetland. This wetland contains box-elder, honeysuckle, black willow, red osier dogwood, and highbush cranberry. Herbaceous species include cattails and sedges, sensitive fern, Joe-pye weed, goldenrods, asters, and spotted touch-me-not. This wetland is approximately ten acres in size. In the study completed by the Vermont Natural Heritage

Program for the Otter Creek Audubon Society, this wetland was identified as the most interesting natural feature in the project area due to its size and plant diversity.

38. On the opposite bank and to the south are the wetlands at the Marble Works complex. This wetland community is not identified on the National Wetland Inventory map but was reclassified from Class Three to Class Two by the Vermont Water Resources Board on October 20, 1995 (Docket # WET 94-03). This 4.5-acre wetland was determined to be significant for the functions of wildlife and migratory bird habitat, recreation and economic benefits, and open space and aesthetics. The area is used by great blue herons, muskrats, otter, and beaver. It is readily visible from public access points.
39. Further to the south on the west bank below the Frog Hollow area is a small (1 acre) palustrine shrub/scrub wetland.

VIII. Rare and Endangered Plants and Animals; Outstanding Natural Communities

The Vermont Endangered Species Law (10 V.S.A. § 5401 to 5403) governs activities related to the protection of endangered and threatened species.

40. As discussed above, the impounded reach above the project dam provides habitat for several mussel species one of which is proposed for state listing as endangered.

IX. Shoreline Erosion

41. Shoreline erosion is common for valley-bottom rivers like Otter Creek as they change their channel form through meander processes that erode the alluvial floodplain soils. No unusual erosion problems have been identified at the project, and continued run-of-the-river operation can be expected to minimize the potential erosion induced by fluctuating water levels.

X. Recreational Use

42. Recreational uses at the project include angling, boating, sightseeing, and wildlife observation. In 1996, approximately 109 people visited the project and participated in some form of

recreation (*Middlebury Lower Project - Application for New License for Major Project (5 MW or Less)*, June 1998, vol. I, p. E-26). The applicant estimates that 11% of the project shoreline is accessible to the public. The impoundment is generally remote from roads, and the surrounding lands are mostly undeveloped or in agricultural use.

43. A day use area with a picnic table and parking currently exists on the west side of the river. The applicant proposes several improvements to the facility, including an interpretive sign, directional signs, a walking trail, and improved parking. Also, the applicant has obtained an easement from a landowner upstream of the dam and highway bridge to permit construction of a functional and safe portage. The portage will be constructed on the west side of the river and will extend across the day use area to a downstream location. This will also necessitate the construction of a small footbridge to cross an old millrace below the day use area. The reach is popular for canoeing. Some boaters put in at the Frog Hollow area and boat the impoundment returning to the put-in site.
44. Extensive clearing of shoreline vegetation has occurred on project lands adjacent to the day use area. The applicant proposes to restore riparian vegetation along the river. A forested buffer would be reestablished in consultation with the Department.

XI. Aesthetics

45. The Middlebury Lower Project is located directly downstream of a historic covered bridge, which is notable for being both the only two-lane covered bridge in Vermont and the oldest Vermont covered bridge still in use (*An Archaeological Phase 1A Study of the Middlebury Lower Project Area (FERC No. 2737)*, Addison County, Vermont, Peterson and Peterson, 1997, p. 41). The dam is a highly visible structure, especially given the fact that a portion of the structure is oriented parallel with the river channel, giving it a length much greater than the channel width. The stream channel consists primarily of bedrock cascades, pools, and chutes formed in the Middlebury limestone formation; the flow of the river over time has resulted in the limestone becoming highly sculpted, with many potholes evident.
46. The site is readily accessible. The road along the west side of the river below the dam leads to the University of Vermont Morgan

Horse Farm, a popular tourist attraction. The project area is in close proximity to the Middlebury village area. Spillage and flows through the bypass channel can be viewed from several vantage points along the west side of the river; views from the roads, however, are limited primarily to the project civil works, including the dam.

47. The project diverts a substantial amount of flow from the bypassed reach. Historically, about two thirds of the time the project has diverted all of the flows from the bypass except for the small amount of spillage (about 77 cfs) that is currently maintained. The diversion of water and the project civil works have substantially changed the character of the falls; however, development of the falls for hydropower has a long history going back to about 1793-94 (*An Archaeological Phase IA Study of the Middlebury Lower Project Area (FERC No. 2737), Addison County, Vermont*, Peterson and Peterson, 1997, p. 41).
48. In order to assess the value of alternate flows for support of aesthetics, the applicant videotaped the bypassed reach under a range of flows from 77 cfs to 314 cfs viewed from different vantage points along the west bank. Consistent with the relicensing proposal, the flows were provided as full crest spillage to provide a veil of water over the dam. (*Middlebury Lower Hydroelectric Project (FERC No. 2737) - Aesthetics Flows - October 16, 1997*, narrated videotape)

XIII. State Comprehensive River Plans

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)

49. 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.

50. With respect to the Middlebury Lower Hydroelectric Project, the plan made several recommendations for further study: effects of flow regulation on assimilation of Middlebury's wastewater treatment plant discharge; confirmation of impoundment cycling during low flow; assessment of flow needs in the bypass for support of fish; and determination of the status of implementation of the recreation plan cited in the 1980 FERC license. All of these topics have been considering in the Department's current review.

1993 Vermont Recreation Plan

51. 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.

52. The 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.

53. Enhancement of access and improved flow management 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.

54. 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."

55. The Scenic Resources Protection and Enhancement Policy 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.

XIV. Analysis

Water Chemistry

56. Available water quality sampling by the Department of Environmental Conservation and by the applicant does not disclose any critical water quality issues at the project. The dissolved oxygen concentrations met the concentration and saturation standards set forth in Vermont Water Quality Standards. The project, as proposed, will spill a minimum of 157 cfs at all times. This flow is an estimate of the river's 7Q10 value based on the U.S. Geological Survey gage located in Middlebury village. Spillage of this flow will provide a point source for reaeration to offset in part the loss of reaeration caused by the impoundment and the routing of flows through the station's closed generation system instead of through the natural cascade in the bypassed reach. Also, because about 100 cfs is needed to maintain the station on line, the project will be spilling all inflows when inflows recede below 257 cfs. As a result, all flows will be spilled at the dam and subject to bypass reaeration during critical low flow periods. Based on the U.S. Geological Survey gage data, spillage of all inflows will occur, on the average, about 6% of the time in June, 19% of the time in July, 32% of the time in August, and 29% of the time in September.

Flow Needs in Stream Reaches for Habitat Protection

57. Operation of the project in a strict run-of-the-river mode will provide for the protection of downstream habitat. Downstream flow needs are somewhat reduced by the fact that the river has been flooded by backwater from the dam at Beldens.
58. The Agency examined the amount of habitat available at each of the test flows by averaging the percentage of maximum values for each target species and life stage. The targets were given equal weighting. The flow providing the best habitat conditions was found to be 236 cfs; however, that flow only provided 4% more total average habitat than a flow of 157 cfs. With the exclusion of macroinvertebrates, flows of 157 and 236 cfs provided the same

level of habitat. With a change to averaging the combined values for brown and rainbow trout adults, the combined values for the two life stages of bass, the combined values for the three fallfish life stages, and the values for macroinvertebrates, a flow of 236 cfs provides about 9% more total average habitat than a flow of 157 cfs. This difference is not great enough to conclude that 236 cfs is necessary to protect aquatic life in the bypass. A flow of 157 cfs will provide for the needs of aquatic life in the bypass. Bypass flows will also provide localized habitat improvement where highly oxygenated water will exist prior to mixing with the water below the ledge drop. The entrained bubbles in that zone will provide cover for fish.

Impoundment Habitat

59. Impoundment aquatic habitat, including the wetland habitats, will be protected by the continued stable impoundment level.

Screening

60. The 1.75-inch bar spacing on the trashracks and the location of the racks at the end of the headrace may promote fish entrainment. Consideration should be given to using racks with a one-inch clear spacing at such time as the racks need replacement. Locating racks upstream of the headrace intake may also reduce mortality by preventing fish from becoming trapped in the headrace. Under full station capacity, velocities in the headrace are on the order of 3 fps (945 cfs / 40 feet wide x 8 feet deep). By condition of this certification, the applicant shall be required to consult the Department of Fish and Wildlife at the time the trashracks for the plant are scheduled for replacement, and to obtain Department approval for the design.

Recreation and Aesthetics

61. 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 *Anti-degradation Policy*)

62. Beneficial values and uses of Class B waters include water that exhibits good aesthetic value and swimming and recreation. (Standards Section 3-03(A) *Class B Waters: Management Objectives*) Standards Section 2-02(B) *Hydrology: Artificial Flow Conditions* prohibits regulation of river flows in a manner that would result in an undue adverse effect on any existing use, beneficial value or use.
63. The applicant will be preparing a final recreation plan for the project. By condition of this certification, the applicant shall be required to obtain Department approval of the plan, including any related erosion control provisions. The applicant will be providing a canoe take out and portage; these will facilitate through boating as well as local use. The applicant's proposal, with continued access to the river, will provide support for the designated use of recreation.
64. The dam site has high visual quality. Restoration of a forested buffer along the west shoreline at the upper end of the bypass and release of the bypass minimum flow will add to the site's attractiveness. The buffer will also help protect water quality and improve wildlife values at the site. The videotaped discharge of 157 cfs indicates that the bypass flow provided as full crest spillage supports good aesthetics value.

Erosion

65. Erosion, if severe, can impair recreational use and cause turbidity and the discharge of suspended solids, potentially violating the standards for those parameters (Turbidity: Standards Section 3-03(B)(1); Total Suspended Solids: Standards Section 3-01(B)(7)). No unusual shoreline erosion problems have been documented at the project. Operation of the project in a run-of-the-river mode reduces the risk of shoreline erosion that is associated with projects that cycle their impoundments and fluctuate downstream flows.
66. 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

67. 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) *Settleable solids, floating solids, oil, grease, scum, or total suspended solids*. A plan is being required as a condition of this certification.

General Conclusions

68. The project, if operated consistent with the conditions of this certification, will support the designated uses for Class B waters (Standards Section 3-03(A) *Class B Waters: Management Objectives*); will not have a significant impact on aquatic biota, fish or wildlife such that the existing populations would have their viability impaired (Standards Section 1-03(B)(2)(a) *Anti-degradation Policy: Protection of Existing Uses*); and will not significantly degrade the use of the water body for recreation, fishing, water supply or commercial purposes (Standards Section 1-03(B)(2)(a) *Anti-degradation Policy: Protection of Existing Uses*).
69. As required under Standards Section 2-02 *Hydrology*, the applicant's artificial regulation of flows, if consistent with the conditions of this certification, will not result in an undue adverse effect on any existing or designated use, including high quality habitat for aquatic biota, fish and wildlife. In making this determination, the Water Quality Policy (10 V.S.A. § 1250) has been considered, including the need to allow beneficial and environmentally sound development.
70. All of the restrictions and conditions set forth herein, in conjunction with the applicant's proposal, are necessary to ensure compliance with all applicable provisions of the Vermont Water Quality Standards and other appropriate requirements of state law.

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 Middlebury Lower 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, P.L. 92-500, as amended, and other appropriate requirements of state law:

- A. 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 project shall equal instantaneous inflow to the impoundment at all times. A minimum flow of 157 cfs, or instantaneous project inflow if less, shall be spilled along the full spillway crest at all times. When the facility is not operating, all flows shall be spilled at the dam.
- C. **Flow Management during Impoundment Refill.** Following an approved maintenance drawdown, up to 10% of instantaneous project inflow may be placed in storage in order to refill the impoundment without significantly reducing downstream flows.
- D. **Plan for Method to Maintain Bypass Flows and Run-of-the-River Operating Conditions.** The applicant shall develop a plan, including descriptions, hydraulic design calculations, an implementation schedule, and design drawings for the measures to be used to release the bypass flows set forth in Condition B and to maintain a stable headpond with true run-of-the-river operating conditions. 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.

- E. **Monitoring Plan for Impoundment and Flow Management.** The applicant shall develop a plan for continuous monitoring of flow releases at the project (spillage into the bypass and discharges from the powerhouse), impoundment levels, and inflows. 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 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.
- F. **Prevention of Fish Entrainment at Intakes.** Prior to the next replacement of the intake trashrack, the applicant shall consult with the Department of Fish and Wildlife with respect to trashrack design to determine the appropriate bar clear spacing and rack location and shall file the trashrack design information with the Department of Environmental Conservation for approval prior to commencement of work.
- G. **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 the license.
- H. **Debris Disposal Plan.** The applicant shall develop a plan for proper disposal of debris associated with project operation, including trashrack debris. 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.

- I. **Maintenance and Repair Work.** Any proposals for project maintenance or repair work, including desilting, drawdowns below the spillway crest to facilitate repair/maintenance work, and tailrace dredging, shall be filed with the Department for prior review and approval, if said work may adversely affect water quality or cause less-than-full support of designated and existing uses of State waters.
- J. **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.
- K. **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 60 days of license issuance and shall include an implementation schedule. The applicant is advised to consult with the Department in the development of plans. 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.
- L. **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.

- M. **Compliance Inspection by Department.** The applicant shall allow the Department to inspect the project area at any time to monitor compliance with certification conditions.
- N. **Posting of Certification.** A copy of this certification shall be prominently posted within the project powerhouse.
- O. **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.
- P. **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.
- Q. **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 during the life of the project with respect to water quality.

Wallace McLean
Wallace McLean
Director, Division of Water Quality
for Canute Dalmasse
Commissioner
Department of Environmental Conservation

Dated at Waterbury, Vermont
this 2nd day of June 1999.

c Distribution List