Water Quality Certification
(P.L. 92-500, Section 401)

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

APPLICATION FOR ARNOLD FALLS 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) and dated June 21, 1993. This application has been supplemented by a copy of the Federal Energy Regulatory Commission (FERC) license application filed with the FERC on December 31, 1991; an October 1992 certification application; and subsequent submittals from the applicant, including a September 1993 FERC Additional Information Request (AIR) response to FERC. The Department held a public hearing on April 26, 1994 under the rules governing certification and received testimony during the hearing and, as written filings, until May 13, 1994; attached is a copy of the Department's responsiveness summary, which shall be incorporated into this certification as findings by reference. The Department, based on the application and record before it, makes the following findings and conclusions:

I. Background/General Setting

1. The applicant has applied to FERC for relicensure of the Arnold Falls Hydroelectric Project located at river mile 9.7 on the Passumpsic River in the Town of St. Johnsbury.

2. The Passumpsic River drains 507 square miles of area, including 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. Two of the major tributaries of the Passumpsic River, the Moose and Sleepers rivers, enter downstream of the Arnold Falls Project. The applicant operates five projects in succession on the mainstem of the Passumpsic River. Two hydroelectric facilities, owned by the Town of Lyndonville, located at Vail Dam and Great Falls Dam, are upstream of the Arnold Falls Project. Below these projects, but upstream of Arnold Falls is the Pierce Mills facility operated by Central Vermont Public Service. Downstream of the project are the Gage, Passumpsic, and East Barnet hydroelectric projects, all owned by the applicant.

4. 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% is harnessed for electrical generation.

5. The headwaters of the Passumpsic comprise pristine streams that flow through wildland areas that are predominantly woodlands and wetlands with only sparse settlements. 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.

6. The site was first developed for hydroelectric generation by the St. Johnsbury Electric Light and Power Company in 1926. After damage during the 1927 flood, the facilities were repaired and returned to service by the Twin State Gas and Electric Company.

II. Project and Civil Works

7. The existing dam structures consist of north and south timber crib dams founded on rock and separated by an island. The integral intake powerhouse is located between the south timber crib dam and the right river bank serving as a continuation of the south dam. The south dam is approximately 66 feet in length extending from the intake powerhouse to the island. The north dam is approximately

189 feet in length, extending from the island to the left bank of the river. The south dam crest elevation is 572.80 feet (msl) and about 15 feet above the foundation. The north dam crest elevation is 572.72 feet (msl) and is about 18 feet above the foundation. The normal headwater elevation is 574.3 feet (msl), and the normal tailwater elevation is 556.12 feet (msl), providing a gross head of about 18 feet.

8. The dam is fitted with 1.5 feet of flashboards, creating an impoundment with a surface area of 7.2 acres; a usable storage capacity of about 11 acre-feet; and a backwater influence of 2,400 feet.

9. Under historic operation, the headwater elevation fluctuates within the range of the project flashboards.

10. Flashboards are always removed by winter ice and normally reinstalled in late May. Storm events seldom cause flashboard failure during the summer.

11. The powerhouse contains a single S. Morgan Smith vertical shaft, fixed blade propeller-type turbine with a 335 kw capacity generator. The average annual generation for the twenty year period through 1990 was 1,580,000 kwh. (applicant's response to FERC AIR No. 9) Except for routine monitoring, inspection and maintenance, the plant operates automatically and unattended. The turbine is a fixed-blade unit and not under remote control from the applicant's dispatch center in Rutland.

12. A powerhouse substation is located on the right bank adjacent to the substation. A 12.5 kv transmission line carries output from the facility to the Bay Street substation in St. Johnsbury.

III. River Hydrology and Streamflow Regulation

13. The drainage area at the dam is 254 square miles. Gaging stations have been operated by the U.S. Geological Survey on the mainstem below Passumpsic Dam since October 1928; on the East Branch near East Haven from water years 1940 to 1979; and on the Moose River at St. Johnsbury from water years 1929 to 1984. The drainage area at the gages are 436 square miles, 53.8 square miles, and 128 square miles, respectively. Several of the flow parameters for the

project have been estimated by Department staff based on gage data and are shown in the following table. All three gages were used in estimating these parameters. Some of the parameters may be influenced by the artificial flow regulation caused by upstream hydroelectric facilities.

Table 1. Hydrologic Parameters at Project.

Parameter	Value
Mean runoff	490 cfs (26.20 in/yr)
7Q10	65 cfs
95% Exceedance	91 cfs
50% Exceedance	255 cfs
10% Exceedance	955 cfs

14. The hydraulic capacity of the single turbine is 150 cfs to 262 cfs. All flows in excess of 262 cfs are released over the spillways.

15. Present operation of the project is as a daily peaking plant with headpond drawdown from storage of 1.5 feet. Currently, when water is being placed in storage, the only flow downstream of the powerhouse is leakage and local drainage.

16. The project as described in the application will operate in an true run-of-the-river mode.[1]

17. Routine monitoring, inspection and maintenance will continue as in the past. The plant will operate in a semi-automatic and unattended mode.

18. The applicant proposes to maintain a bypass flow of 20 cfs. (original license application and response to FERC AIR No. 3) To provide this flow, CVPSC would adjust the project headwater sensors so that 1.25 inches of water will spill at all times over the 189 foot north

[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.

spillway section of the dam. For this proposal, the targeted minimum headwater elevation will be 574.40 feet. The flashboards on the south spillway section would be increased in height by 1.25 inches to accommodate this proposal. (AIR No. 12) The flow sensor will automatically and continually adjust the generator load so that the spillage is prerequisite to generation. As river flows diminish, the flow sensors will reduce generation slowly to keep the required amount of water spilling over the flashboards. As the flow continues to diminish, the flow sensors will remove the unit from the line and all water will spill over the dam.

19. The project automation (SCADA) system has an accuracy of ± 1.0 inch. To provide the applicant's targeted minimum headwater elevation, the SCADA system would have to be set to a fixed level 2.25 inches above the top of the flashboards on the north spillway, providing a spillage of 1.25 to 3.25 inches, and the boards on the south spillway would have to be further increased in height. This would result in a variable bypass flow of approximately 20 cfs to 88 cfs, plus leakage, even assuming the south-spillway boards are raised.

20. To allow workers access for the reinstallation or repair of flashboards, the impoundment is drawn to the crest of the log crib using the plant turbine when inflows first drop to plant capacity of 262 cfs. When the work is complete, the plant discharge is reduced to refill the impoundment; the applicant proposes to release about half of inflows, or 130 cfs, downstream during the refill period of about one hour. In cases when the inflows are substantially less than 262 cfs, the refill time would become more extended.

21. A release of 130 cfs (0.51 csm) is essentially equal to the summer aquatic base flow of 0.5 csm prescribed by the U.S. Fish and Wildlife Service Flow Recommendation Policy for the New England Area (USF&WS Flow Policy) and the Agency of Natural Resources Interim Procedure for Determining Acceptable Minimum Stream Flows, July 1993 (Agency Flow Procedure). Brook, brown and rainbow trout may spawn in the mainstem of the Passumpsic River below the project. The USF&WS Flow Policy and the Agency Flow Procedure prescribe 1.0 csm for the fall/winter period and 4.0 csm for the spring period to protect spawning and incubation.

22. Flashboard leakage would not be sealed until after the impoundment refills. However, no provision is made for maintaining the proposed bypass flow during flashboard replacement.

23. The project will not be cycled for audits nor for local emergency energy demands.

IV. Bypass

24. The bypass is made up of two channels, one on each side of an island that divides the dam and spillway into separate sections. The channel on the powerhouse side (south) quickly merges with the tailrace and is basically a moderate to low gradient gravel/cobble riffle with limited bedrock at the base of the dam and draft tube. The channel on the Concord Avenue side (north) is about 300 feet long by 100 feet wide. It is a rapids of moderate gradient. Its substrate includes irregular bedrock, boulders, cobble and gravel.

25. The bypass is virtually dewatered for much of the year by the present operating mode of the project, receiving only leakage from the dam. No dam leakage estimates have been made available.

V. Standards Designation

26. The Passumpsic River in the project-affected reach is designated by the Water Resources Board as Class B waters. The project impoundment is in the upper end of a waste management zone extending 4.8 miles from the upstream village limit of St. Johnsbury to Passumpsic Dam. The Board has also designated the entire Passumpsic River as cold water fisheries habitat.

    The lengths of waste management zones are being reviewed by the Department and will be reset based on rules to be promulgated by the Water Resources Board. The Agency plans to reset waste management zones for streams at the time discharge permits for treatment facilities located on those streams come up for renewal. The existing discharge permit for the Town of St. Johnsbury wastewater treatment facility came up for renewal in March of 1993; however, due to an issue related to how the village would be dealing with combined sewer overflows, the waste management zone for the treatment facility will not be reset until sometime after June 1994.

27. Waste management zones, although Class B waters, present an increased level of health risk to contact recreational users due to the discharge of treated sanitary wastewater.

28. 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 a 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)

29. The dissolved oxygen standards for cold water streams are 6 mg/l or 70 percent saturation unless higher concentrations are imposed for areas that serve as salmonid spawning or nursery areas important to the establishment or maintenance of the fishery resource. The temperature standard limits increases from background to 1.0°F. (Standards, Section 3-01 (B)) The turbidity standard is 10 ntu. (Standards, Section 3-01 (B)(5))

30. 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))

31. Section 2-02 Hydrology of the Vermont Water Quality Standards requires that "[the] 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 streamflow.

VI. Water Quality - Water Chemistry

32. The application presents data from limited water quality sampling done by the applicant in 1986 and 1988. Subsequent to these sampling periods, the Town of St. Johnsbury upgraded its wastewater treatment facility from primary to secondary. The

earlier data cannot, therefore, be used in assessing the project's impact on river's dissolved oxygen regime.

33. The Town of St. Johnsbury wastewater treatment facility, with a design capacity of 1.6 mgd has the largest discharge on the river and is an important influence on the river's dissolved oxygen regime. Based on 1993 records, the facility is at 68% of its design capacity.

34. The application includes a supplemental report for 1991 water quality sampling and analysis done by Aquatec, Inc.. The report concludes that the project under the proposed configuration will not violate the minimum water quality standards for dissolved oxygen.

    Data for the 1991 study was collected from July 16-19. Of the 15 sampling sets for the three-day study, no samples were less than 90% saturation; substantial algal influence was apparent, however, as more than three-quarters of the samples were supersaturated. The generally supersaturated conditions demonstrate substantial algal influence, which will become a very important influence on dissolved oxygen levels as the St. Johnsbury wastewater plant loading increases in the future.

35. The Aquatec study's analysis of reaeration coefficients demonstrated a significant aeration efficiency for spillage at the Arnold Falls Dam. Spillage at Arnold Falls removed 70% of the dissolved oxygen deficit from saturation. (Diurnal Dissolved Oxygen and Temperature Study, Passumpsic River from St. Johnsbury Center to East Barnet, Vermont, July 16-19, 1991, September 1991, page 5)

VII. Water Quality - Aquatic Biota and Habitat

36. Aquatic biota are defined in Standards Section 1-01(B) 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.

37. Wild and hatchery-origin brook, brown and rainbow trout occur in the Passumpsic basin. Vermont Department of Fish and Wildlife studies conducted in the early 1970's indicate the Passumpsic River drainage basin contained a higher percentage of brook trout than any other drainage basin studied throughout the state. The Department of Fish and Wildlife currently supplements natural

populations by stocking one or more of the three species in reaches of the mainstem and tributaries. Also occurring in the Passumpsic basin are sucker and minnow species, sculpins, darters, yellow perch, sunfish species, and brown bullhead. The latter three are mostly found in mainstem impoundments.

Below Project

38. A free-flowing reach of about 1 1/2 miles exists between the project tailrace and the Gage impoundment. The Moose River enters the Passumpsic about 1/4 mile downstream of the project.

39. Flows below the tailrace will essentially be unregulated. This proposed flow regime will optimize conditions for fish life downstream of the project powerhouse.

40. Artificial flow regulation below the tailrace is only anticipated to occur during impoundment refilling following flashboard reinstallation. The applicant proposes to release 130 cfs (0.51 csm) during the refill period.

Bypass

41. The Agency's management goal for the bypasses at the Passumpsic River projects is to establish and maintain cold water 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. (Comprehensive River Plan for the Passumpsic River Watershed, Vermont Department of Environmental Conservation, August 1992) The project bypass provides valuable habitat for juvenile Atlantic salmon, all life stages of resident salmonids (brown and rainbow trout) and a variety of non-game fishes. Cover and velocity refuges, in the form of large substrate objects and pockets of moderate depth, are abundant. (Memorandum from Leonard Gerardi, District Fisheries Biologist, to Department, October 21, 1991)

42. High quality fish habitat of the caliber that exists in both channels of the bypass is in extremely short supply in the mainstem of the Passumpsic, principally due to hydroelectric project impoundments. The Arnold Falls bypass also constitutes a major macroinvertebrate

production area.[2] The turbulence and air entrainment caused by the rapids also make such areas very attractive to fish that require water with abundant dissolved oxygen (trout and salmon), especially during hot weather when the oxygen-carrying capacity of water otherwise diminishes. Although short in length relative to the total river length below the dam, the bypass at Arnold Falls represents some of the best habitat in this reach of the Passumpsic River.

43. The large pool below the bypass may hold adult trout. During plant operation, these trout may move into the right bypass to spawn, and subsequent dewatering or inadequate flow after plant shutdown could imperil these fish or reduce spawning success, due to egg or fry mortality. Macroinvertebrate production would also be affected.

44. Full consideration of the issue of bypass minimum flows must include a determination of the appropriate minimum flow for each of the channels and a method for partitioning of the bypass release between the two channels. The issue of partitioning depends on the amount of water necessary for habitat purposes in each channel and how the flow regime will be affected by plant operations/shutdown (conditions in the right channel are largely influenced by project operation). During plant operation, all of the bypass flow can be discharged into the left channel. During periods when the plant is off line, spillage is necessary to support the right-channel habitat that is available during operation.

45. During fall 1992 and summer 1993, the applicant, in consultation with the Agency and the U.S. Fish and Wildlife Service, conducted a study to determine how much habitat is available at alternate minimum bypass flows. The results of this study are presented in the applicant's response to FERC AIR No. 3 (September 1993). The study approach is patterned after the U.S. Fish and Wildlife Service Instream Flow Incremental Methodology, which quantifies physical habitat based on organism preference for certain conditions of stream depth, velocity, substrate, and cover.

46. The bypass as described in the study is comprised of three separate reaches. The first reach is the approximately 250 foot long **north bypass channel** between the main dam spillway and the powerhouse tailrace. The upper section is shallow pocket pools in ledge

---

[2]Aquatic insects are an important food source for fish and other aquatic organisms.

substrate (represented by Transect 1); the middle section is moderate to steep runs through ledge (represented by Transect 2); and the lower section is shallow riffle with ledge/boulder substrate (represented by Transect 3). The second reach is the approximately 40 foot long **south bypass channel** between the dam spillway section and the confluence with the powerhouse tailrace. Most of this short reach is steep gradient ledge. The third reach is described as the approximately 150 foot long **tailrace channel** between the powerhouse and the junction with the north bypass channel. This is predominantly a cobble riffle represented by Transect 4.

47. Juvenile Atlantic salmon and adult rainbow trout were selected as the target species and life stages for the north bypass channel evaluation. For the tailrace channel, brown trout spawning and incubation was selected. The scope of the study was to conduct assessments of the suitability of habitat at flows of 20 cfs, 44 cfs, 67 cfs, 106 cfs, and 145 cfs. All of these target flows were assessed except 145 cfs. These flows were apportioned between the two channels based on spillway length; 74% was spilled into the north channel and the remainder into the south channel. Necessary depth of flow over the spillways were estimated using the standard weir equation; no adjustments were made to correct for the substantial leakage at the dam. The applicant recommended that the headpond elevation be prescribed instead of the minimum flow rate for regulatory purposes.

48. By letter dated March 24, 1993, the Agency requested that flows be measured in the bypass using wading measurements where physically possible and that the head on the dam be monitored but not be used as the exclusive means of estimating flow. Estimation of flow using the weir formula is imprecise and does not account for leakage.

49. The applicant indicated that it would be difficult to measure flows as requested by the Agency due to the irregular characteristics of the bypass; the nature of the substrate with its ledge and large boulders; and the lack of opportunity to measure laminar flow regardless of where a transect is located. The applicant did measure total river flow on a transect located 100 yards downstream of the bypass. The comparative study target flows and actual river flow measurements were:

Table 2. Flow measurement comparison.

STUDY TARGET FLOW (cfs)	MEASURED RIVER FLOW (cfs)
20	91
44	67
67	69
106	99

The target flows were released over the spillway on alternate days. The measured river flow should reflect an addition of dam leakage and turbine discharge. It is unclear why the total river flow is not substantially higher. The data is, therefore, unuseable.

50. The Agency had requested that the study include habitat measurements in the tailrace channel under low river flow conditions when the plant is off line. Unfortunately, the only data available was collected when the plant was operating, and under those conditions the turbine discharge was variable. It is, therefore, impossible to determine a biologically based minimum flow for the tailrace channel.

51. The Department analyzed the flow data from the north-channel transect information to estimate leakage through the log crib and flashboards and to adjust the flow estimates for the north channel. It is recognized that the transect data may be less than ideal for flow measurement; however, sufficient data is available to support estimation of leakage. A fixed rate of leakage of 25 cfs was assumed from a review of the data. Additionally, the second target spillage rate (74% of 44 cfs = 33 cfs) was reduced to 25 cfs to make the data set consistent.

52. Weighted usable area (WUA) was used as the measurement unit to describe the habitat/flow relationships for juvenile salmon and adult rainbow trout in the north channel. WUA is expressed in units of square feet. The results are shown in the following table, with WUA combined for the three habitat types.

Table 3. Results of habitat study in the north bypass channel.

North Channel Flow (cfs)	Wetted Area (s.f.)	Habitat (s.f.)	
		Juvenile Salmon	Adult Rainbow Tr.
40	18,690	7,850	5,790
50	20,540	9,450	6,980
75	21,860	10,710	8,090
103	23,200	12,300	9,050

Note: Flow is the total of spillage (15,25,50,78 cfs) and estimated leakage (25 cfs).

53. As shown in the above table, the habitat availability for both target organisms increases substantially when bypass flows are increased over the range of flows studied. In large part, this change is due to enhanced quality of the habitat; the area of streambed wetted increases by 24%, while habitat increases by 56% for juvenile salmon and 56% adult rainbow trout.

54. With respect to the habitat data provided for the north channel, the habitat/flow curves suggest that habitat continues to improve as flows increase beyond 103 cfs, the highest study flow measured in the north channel.

55. The applicant argues that the potential production or support of fish is not warranted by the cost in lost energy production. The applicant estimates that the salmon smolt production capability of the north bypass channel would provide virtually no sea returns to the Connecticut River and that the production capacity for rainbow trout adults are only 8 fish for 15 cfs (spillage) and 13 fish for 78 cfs (spillage). The applicant also states that competition between the trout and salmon would further limit the value of the bypass. Sea returns are low primarily due to the assumed marine mortality of 99.5%.

Impoundment

56. Fisheries habitat that was formerly riverine (lotic) has been transformed into lacustrine habitat due to the impounding of water by the dam. The quality of the impoundment as lacustrine habitat is marginal.

57. Major drawdowns below the dam crest can cause dewatering of the riparian-zone habitat. Fish and other aquatic organisms that use the impoundment would be subject to stranding or freezing when such major drawdowns occur.

Fish passage

58. A Strategic Plan for the Restoration of Atlantic Salmon to the Connecticut River Basin (1982) identified the Passumpsic River as potential non-natal smolt production habitat for stocking consideration at such time that the program's hatchery fry production capacity expands to meet the needs of non-natal streams. The plan estimates that there are 6000 units (one unit = 100 sq. yards) of salmon nursery habitat in the Passumpsic basin. However, subsequent to the 1982 restoration plan, the Department of Fish and Wildlife has revised the estimate of available habitat in the Passumpsic basin. The estimated total habitat is about 20,000 units, with about half of the habitat above Arnold Falls.

59. The Department of Fish and Wildlife stocked 15,000 age 0+ Atlantic salmon parr in the Moose River between St. Johnsbury to Concord in fall of 1991. The Moose River was selected for salmon stocking because it has excellent physical habitat conditions and because its warmer-than-average temperature regime is likely to be very favorable for salmon development. Subsequently, parr have been stocked in both 1992 and 1993, and fry have been stocked in spring 1993 in the Moose River and in the East Branch, which is upstream of the applicant's Pierce Mills Project. More extensive basin-wide stocking of fry is planned for spring of 1994.

60. The applicant has agreed to provide downstream passage when and if the Passumpsic River becomes an integral part of the salmon restoration effort supported by a detailed plan documenting location of habitat units, an annual release schedule supported by hatchery capability, and a monitoring plan (license application, Page E-47). The restoration plan was last revised in September 1982 and is once again under revision.

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 now-operational 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. Salmon will then have access to the Passumpsic River.

62. Upstream passage facilities are not needed as part of the current restoration plan, as the Passumpsic River is not targeted for natural reproduction of salmon. However, the status of all passage needs may be reviewed as part of the revision of the Strategic Plan or annual program (U.S. Fish and Wildlife Service) reviews. Expansion of and/or changes in the plans for the river may necessitate upstream passage facilities in the future. (U.S. Department of Interior letter to FERC, December 23, 1993)

VIII. Water Quality - Wildlife and Wetlands

63. Vermont Water Quality Standards requires the Agency Secretary to identify and protect existing uses of state waters. Existing uses to be considered include wetland habitats and wildlife that utilize the waterbody.

64. No Class I or Class II wetlands exist within the influence of the dam backwater zone. Institution of a run-of-the-river operating mode will protect any downstream wetlands that may exist and Class III wetlands present in the backwater zone.

65. Wildlife that use the riparian zone and river will be better supported by the improved operating regime. Typical wildlife would include furbearers such as otter, beaver, muskrat, mink, and deer and birds such as kingfisher, herons, ducks, and osprey.

IX. Water Quality - Rare and Endangered Plants and Animals; Outstanding Natural Communities

66. Populations of the hare figwort (Scrophularia lanceolata) exist along the Passumpsic River in the vicinity of the project. The figwort is on the Vermont Natural Heritage Program's list of rare plants. According to the Heritage Program, this species is known from five sites, chiefly in southern Vermont. The plants at Arnold Falls are found outside the area influenced by project operations. (License application, Volume III, Appendix B).

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

X. Water Quality - Shoreline Erosion and Impoundment Desilting

68. Shoreline erosion occurs along the margin of the impoundment at least in part as the result of elevated water levels in the impoundment. (Appendix F, FERC license application) The applicant indicates that most of the impoundment is bordered by Route 5 on the east and the Canadian Pacific railroad on the west. Rip rap and retaining walls protect the banks.

69. Monitoring of shoreline erosion appears to be unnecessary at this site. The applicant's proposed operating mode will minimize the potential for new problems to develop in the future.

70. Impoundment desilting can result in significant degradation of water quality if not executed properly. The applicant has not disclosed any desilting problems at this project in the past. Development of a desilting plan is unnecessary at this time. Should the need to desilt arise in the future, the applicant should seek review by and approval from the Agency. This has been proposed by the applicant.

XI. Water Quality - Recreation and Aesthetics

71. The river in the project vicinity is popular for several recreational uses, including fishing, swimming, picnicking, boating, photography and viewing. (Comprehensive River Plan for the Passumpsic River Watershed and staff observations)

72. The project is located in a heavily commercialized section of St. Johnsbury. The town has initiated a planning effort to develop a recreation plan for the reach of river between the Gage Dam and the Arnold Falls site.

73. Vermont Water Quality Standards require the protection of existing water uses, including the use of the water for recreation. The Standards also require the management of the waters of the State to improve and protect water quality in such manner that the beneficial values and uses associated with a water's classification is attained.

74. Beneficial values and uses of Class B waters include water that exhibits good aesthetic value and swimming and recreation. Section 2-02 of the Standards prohibits regulation of river flows in a manner that would result in an undue adverse effect on any existing use, beneficial value or use.

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

76. As a result of extensive impounding by utility dams along the length of the Passumpsic River, flatwater boating opportunities are created that enable extension of the boating season well into low water periods when other rivers are not canoeable. Referencing the Appalachian Mountain Club River Guide - New Hampshire/Vermont, 2cd ed., 1989, the Passumpsic River has suffered in the past from industrial pollution and consequent bad press in earlier canoeing guides. It does have an excessive number of dams, but it is an attractive river in a rural area. The dams are easier to deal with at low water.

77. The River Guide describes canoeing the river in the project area. According to the guide, "Below the US 5 bridge at St. Johnsbury Center, an island can be seen from the road. It has a ledge on each side...the right may be easier. When the water is medium or high, take out in the vicinity of the next US 5 bridge, above St. Johnsbury, since the Concord Avenue bridge has no access. The dam immediately below the Concord Avenue bridge can be portaged on the island when the dam is not spilling. Pleasant Class I rapids run through town past the confluence of the Moose River on the left. The river gradually slow to the backwater of the next dam, which can be dropped on the left."

78. One of the most limiting factors to boating the river is the lack of provisions for portaging the applicant's dam. The dam impairs boating on a navigable river. Recreation is a designated use for the Passumpsic River. Where designated uses have been impaired or eliminated, all reasonable steps should be taken to restore such uses.

79. Referencing the applicant's March 1991 Site Assessment concept proposal (Appendix G, License application), a portage route is proposed starting at point A' on Arnold Island and following a proposed path to the foot of the island at point A. A proposed

public access area (Site B) affords the optimal view of the Arnold Falls and Arnold Island. This site will also provide for bank fishing. The applicant also proposes a public parking area (Site C) to allow the visitor arriving by car convenient access to the river.

80. The public will become aware of the applicant's proposed facilities through appropriate signage and annual advertising.

81. Disabled visitors to the project area will be enabled access to the parking, picnic, and fishing facilities. Grades along walkways will not be in excess of 8% slope.

82. The applicant had offered to explore river access development at its Bay Street distribution facility 1/2 mile below the project where land and river frontage may offer parking, picnicking, and river access though extensive site work would be required.

83. Provision of a canoe portage across the island requires sufficient safety features to allow paddlers safe access to the portage route, including upstream warning signs for the dam and location of the portage.

84. The applicant does not own the island, but presently holds an easement for access for construction and maintenance of civil structures. The applicant is pursuing the feasibility of relocating the existing boat barriers to allow canoeist access to the island and a portage route across the island. The town has agreed to transfer title to the island to the applicant, and the transaction is pending. Additionally, the applicant has the necessary rights to access the river and use the existing parking area on the east shore of the river (Site B) below the dam. (letter from the applicant to FERC, December 14, 1993)

85. It may also be feasible to provide portage capability through a take out at the upstream bridge, with a carry down the road to below the dam.

86. The project boundary is very limited, encompassing the project civil works, tailrace, dam, and the impoundment flowage.

87. The site has some special visual qualities in a classic New England urban setting with old structures bordering the river prescribing its

character. The hydro plant and dam are focal points of this scene, and important elements in maintaining full aesthetic appreciation of the area. Key aesthetic issues are facilities maintenance and spillage flows. No landscaping of the project area is proposed at this time.

88. Spillage over the dams is extremely important to the setting, providing aural ambience and visual capacity necessary to give meaning to the structures and deliver aesthetic fulfillment. The site lacks context and its attractiveness suffers without sufficient spillage. The amount of spillage needs to be in scale with the size of the project. The applicant documented on video-cassette tape the existing and proposed spillage conditions.

XII. Existing Uses

89. No existing uses, other than those discussed above, have been identified. Existing uses, as defined in the Standards, are provided special protection under the anti-degradation provisions of the Standards (Section 1-03 (B) Protection of Existing Uses).

XIII. Other Applicable State Laws

Vermont Endangered Species Law (Title 10, Sections 5401 to 5403)

90. The Vermont Endangered Species Law (Title 10, Sections 5401 to 5403) governs activities related to the protection of endangered and threatened species. Generally, a person shall not "take, possess or transport wildlife or plants that are members of an endangered or threatened species." Disturbance of an endangered plant is considered a taking. (Title 10, Section 4001)

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

Agency Regulatory Powers over Fish and Wildlife

92. Under 10 V.S.A. Chapter 103, "[i]t is the policy of the state that the protection, propagation control, management and conservation of fish, wildlife and fur-bearing animals in this state is in the interest of the public welfare, and that safeguarding of this valuable resource

for the people of the state requires constant and continual vigilance."

93. The water use as proposed, with the conditions imposed below, will be consistent with this state policy.

XIV. State Comprehensive River Plans

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

Hydropower in Vermont, An Assessment of Environmental Problems and Opportunities

94. The Department's 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.

At the Arnold Falls Project, the plan recommends that minimum flow requirements be established for this project in order to improve the bypass and downstream fishery, water quality, and aesthetics, and that impoundment water levels be stabilized to protect upstream fisheries resources.

Passumpsic River Watershed Comprehensive River Plan

95. The Agency, with extensive public involvement, has completed a comprehensive river plan for the Passumpsic River Watershed. The plan, entitled Passumpsic River Watershed Comprehensive River Plan (August 1992) 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. River basin citizens 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 as 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.

1988 Vermont Recreation Plan

96. The 1988 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, while Vermonters and visitors focus much of their recreational activities on surface waters, growing loss of public visual and recreational access to those waters causes substantial concern to the users. The plan projects that access is "likely to become the critical river recreational issue of the 1990s." The need for development of portage trails and canoe access sites is cited as among the major issues relative to canoe trails in Vermont.

97. 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, 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.

98. Enhancement of access, provision of a portage, and improved flow management would be compatible with this policy and balance competing uses of the river for recreation and hydropower. Nonassurance of access or failure to provide a convenient portage trail would exacerbate a critical state recreational problem.

99. Another priority issue identified in the Recreation Plan is the loss or mismanagement of scenic resources. The plan notes "[few] recreational activities in Vermont would be the same without the visual resources of the landscape," and that protection of those resources is "necessary if the state is to remain a desirable place to live, work, and visit."

100. 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 charm of Vermont.

101. Provision of dam spillage, and maintenance of bypass and downstream flows will protect the scenic characteristics of project area and river.

Vermont Comprehensive Energy Plan

102. Pursuant to Executive Order No. 79 (1989), the Department of Public Service produced the Vermont Comprehensive Energy Plan, January 1991. This plan sets out an integrated strategy for controlling energy use and developing sources of energy. Several goals of the plan are to reduce global warming gases and acid rain precursors by 15% by the year 2000 through modified energy usage; to reduce by 20% by the year 2000 the per capita consumption of energy generated using non-renewable energy sources; and to maintain the affordability of energy.

103. Prescription of an appropriate minimum flow for the bypass is important to project economics. The applicant's response to AIR No. 7 (September 1993) provides the energy output losses for a range of minimum bypass flows from 20 to 145 cfs. A continuous special release of 20 cfs would reduce project output by about 128 mwh, or 8% of the average annual energy output, for the 30-year term of the federal license; a special release of 78 cfs year round, would result in about a 400 mwh, or 25%, reduction in output.

104. The loss of electrical power production associated with mitigation needed to meet water quality standards will have a negligible effect on overall power availability and rates.

    The expected regional power surplus from the New England and New York power pools is 13,389 megawatts for Winter 2002-2003. Because the facility would be operated in a base-load fashion (run-of-the-river), no operating reserve (storage function) is available. The applicant has large amounts of base-load power at its disposal. (testimony of Robert Howland, Central Vermont Power's Manager of Power Supply, before the State Public Service Board in Docket No. 5171)

105. Continued availability of electricity generated by this renewable source, with proper environmental constraints in place, is consistent with the State energy plan.

XV. Analysis

Operations

Impoundment

106. The conversion of Arnold Falls to a run-of-the-river station will result in a more stable impoundment. Occasional loss or removal of flashboards will cause a lowering of the impoundment by 1.5 feet, but should not significantly impair the upstream aquatic biota in this riverine impoundment. Major drawdowns for construction or repair would have to be reviewed case specifically to insure protection of the upstream resource.

Bypassed reach

107. The Agency Procedure for Determining Acceptable Minimum Stream Flows (July 14, 1993) provides guidance to the Department in setting minimum stream flows at hydroelectric projects. With regard to project bypasses, the procedure states:

> Bypasses shall be analysed case-by-case. Generally, the Agency shall recommend bypass flows of at least 7Q10 in order to protect aquatic habitat and maintain dissolved oxygen concentration in the bypass and below the project. In assessing values, consideration shall be given to the length of the bypass; wildlife and fish habitat potential; the aesthetic and recreational values; the relative supply of the bypass resource values in the project area; the public demand for these resources; and any additional impacts of such flows upon citizens of the State of Vermont. Bypass flows shall be at least sufficient to maintain dissolved oxygen standards and wastewater assimilative capacity. Where there are exceptional values in need of restoration or protection, the general procedure shall be followed. In most cases, a portion or all of the bypass flows must be spilled over the crest of the dam to reoxygenate water, provide aquatic habitat at the base of the dam and assure aesthetics are maintained.

108. The applicant proposes to maintain a 20 cfs bypass release, which is only 31% of the 7Q10 drought flow condition (65 cfs, or 0.25 csm) at the project. This will have limited value for reaeration as it represents only a small fraction of the total flow of the river during operation. However, the project will be spilling all inflows during the period of greatest concern, providing full reaeration potential. The project's low-end capacity is 150 cfs, which with the applicant's

proposed operating mode would require about 0.67 csm in order to operate.

109. There is no present need for a special bypass-flow release to meet dissolved oxygen standards downstream. However, algal respiration will become an important influence on dissolved oxygen levels as the St. Johnsbury wastewater plant loading increases in the future. Use of the dam spillage as a point source of reaeration may become necessary at some point in the future to maintain dissolved oxygen standards as wastewater loadings become more significant. However, the spillage required to serve aquatic habitat needs in the bypass is in excess of 7Q10, and will preclude the need to monitor water quality to assure that dissolved oxygen standards are met.

110. The Passumpsic River is heavily dammed and the large majority of its length is under impounded conditions. The bypasses represent a disproportionate amount of the high quality habitat for salmonids on the river mainstem. The Department considers the maintenance of habitat values within the bypasses as very important. The applicant's proposed bypass flow of 20 cfs through the north channel only would cause an undue adverse effect on the composition of the aquatic biota and the species composition and propagation of fish in both bypass channels, and would not support Agency management goals for this reach.

111. The summer aquatic base flow for the project is 127 cfs. Given the lack of specific data for the south channel, a reasonable alternative for flow setting is to apportioning 26% of this flow, or 33 cfs to the tailrace channel for habitat protection for periods when the plant is off line. The 26% is based on the lengths of the north and south spillways.

112. A spillage flow of 78 cfs into the north channel of the bypass reach, combined with a leakage of 25 cfs would be sufficient to support juvenile Atlantic salmon, all life stages of resident salmonids (brown and rainbow trout) and a variety of non-games fishes and provide habitat for macroinvertebrates.

113. When inflow declines below 253 cfs (103 cfs north bypass channel flow requirement plus 150 cfs station minimum hydraulic capacity), the station will cease operation. When flows decline further to below 136 cfs, the standards for the two channels cannot be met,

and flows should be simply apportioned between the two channels in accordance with the spillway lengths (74% of the flow maintained in the north channel and 26% maintained in the south channel).

114. Based on the video assessment completed by the applicant, the proposed spillage of 20 cfs (1.25 inches) would be adequate to support good aesthetic value, a Class B management objective. Higher flows as required for habitat support would further enhance conditions.

Below Project

115. The conversion of the project to a true run-of-river facility is expected to improve water quality below the project, as downstream flows will no longer be subject to artificial drought conditions and concomitant poor water quality. The project as proposed and with Department conditions below related to bypass flows and impoundment refilling will meet dissolved oxygen and temperature standards and the anti-degradation provisions of the water quality regulations.

116. Because natural river flows will be continuously available downstream, the impact of the project on concentrations or levels of the following parameters will not be significant:

Phosphorus
Nitrates
Settleable, floating or suspended solids
Oil, grease, and scum
Alkalinity
pH
Toxics
Turbidity
Escherichia coli
Color
Taste and odor

Flashboard Replacement

117. During special events when water must be placed in storage, the applicant proposes to release 130 cfs (0.51 csm) below the project. The USF&WS Flow Policy and the Agency Flow Procedure

prescribe certain minimum flows for the perpetuation of indigenous fish species. The base flows are 4.0 csm for spring spawning and incubation, 1.0 for fall/winter spawning and incubation, and 0.5 csm for the remaining period and for cases where there is no use for spawning and incubation. When instantaneous inflows are less than these values, the inflow must be passed on an instantaneous basis. At the Arnold Falls Project, these aquatic base flows are 1,016 cfs (4.0 csm), 254 cfs (1.0 csm), and 127 cfs (0.5 csm). Reduction of flows substantially below these minimums for the purpose of refilling the impoundment may imperil fish below the project. Mainstem spawning in the spring and fall is believed to occur downstream.

118. A continuous release of the U.S. Fish and Wildlife Service aquatic base flows or 90% of inflows, depending on inflow circumstances, will adequately protect downstream fish and other aquatic organisms during the occasional refill periods. During the spring period, the aquatic base flow is higher than project capacity; flashboard replacement will only be possible during lower inflows. The 90% requirement would apply during this periods. For the summer period and the fall/winter period, the 90% requirement would apply to inflow conditions less than the 127 cfs and 254 cfs standards, respectively.

Fish Passage

119. Operational passage facilities will be needed for outmigration in 1995 at Arnold Falls. Passage facilities should include structures or devices to safely convey fish downstream of the dam and may include screening to minimize entrainment and impingement and a conveyance conduit.

120. Adequate flows to operate these facilities will also be required. Passage facilities will also benefit resident trout species. Standard design for downstream passage facilities utilize operating flows equivalent to 2% of the plant hydraulic capacity, or the flow through a 3x2 foot rectangular weir, whichever is greater. For this project, the flow need would equate to about 20 to 25 cfs. It will be necessary to operate these facilities continuously during the periods April 1 through June 15 and September 15 through November 15. These periods are subject to adjustment based on knowledge gained about migration periods for salmon in the Connecticut River basin.

121. Changes to the salmon restoration plan may require the provision of upstream passage facilities within the term of the new license, although such facilities are not envisioned in the existing plan. The U.S. Fish and Wildlife Service has reserved a general passage prescription right under Section 18 of the Federal Power Act. (U.S. Department of Interior letter to FERC, December 23, 1993)

122. Any passage facilities at Arnold Falls Dam must be provided and operated consistent with the most current restoration plan.

Recreation

123. Without the provision of a portage, the project would fail to support the Class B designated use for recreation and boating as an existing use. Access improvement, under investigation by the applicant, will support fishing in the project boundary.

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 of this 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 as set forth in the findings of fact and conclusions above and these conditions.

B. Except as allowed in Condition D 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 spilled at the dam.

   The applicant shall, within 90 days of issuance of this certification, furnish a description, hydraulic design calculations, and plans for the measure to be used to maintain true run-of-river flows below the project tailrace.

C. Whenever the project is operating, a minimum instantaneous flow of 78 cfs shall be spilled over the left-section crest at the dam at all times. If the instantaneous inflow falls below the hydraulic capacity of the turbine unit plus this spillage requirement, all flows shall be spilled at the dam. This spillage requirement, when combined with leakage, is intended to provide a total flow of 103 cfs in the north (left) channel; should leakage diminish substantially from 25 cfs, spillage will have to be adjusted accordingly.

   When the project is not generating, a minimum flow of 33 cfs shall be released into the south (right) channel at the dam, unless inflows have declined below 139 cfs, in which case 26% of inflow shall be maintained in the south channel and the remainder maintained in the north channel.

   Within 90 days of the issuance of this certification, the applicant shall furnish a description, hydraulic design calculations, and plans for the measure to be used to pass these minimum flows. The filing

shall address conditions with and without flashboards in place, including conditions when the impoundment is being drawn for flashboard replacement and subsequent refilling.

D. Following the reinstallation of flashboards or an approved special maintenance operation necessitating a drawdown, the impoundment shall be refilled by reducing downstream flows, but to no less than 127 cfs from June 1 to September 30 and 254 from October 1 to May 31. During the period April 1 to May 31 or under circumstances during the other periods when the natural inflow to the project is insufficient to permit both passage of these minimum flows and refilling of the impoundment, the impoundment shall be refilled while releasing 90% of instantaneous inflow downstream at all times.

E. The applicant shall file for review and approval, within 90 days of the issuance of this certification, a plan for monitoring instantaneous flow releases at the project, both in the bypass and below the tailrace. Following approval of the monitoring plan, the applicant shall then measure instantaneous flows and provide records of discharges at the project on a regular basis as per specifications of the Department. Upon receiving a written request from the applicant, the Department may waive the requirement for flow monitoring at this project provided the applicant satisfactorily demonstrates that the required flow will be discharged at all times.

F. Within six months of the issuance date of the license, the applicant shall submit a plan for downstream fish passage to the Department of Fish and Wildlife for review and written approval. Downstream passage shall be provided April 1 - June 15 and September 15 - November 15 and shall be functional with and without flashboards in place, with the period subject to adjustment by the Department based on knowledge gained about migration periods for migratory salmonids. The approved plan shall be fully implemented within two years of license issuance and shall include provisions to:

1. minimize passage of fish into the generating unit(s);

2. minimize impingement of fish on trashracks or on devices or structures used to prevent entrainment; and

3. convey fish safely and effectively downstream of the project, including flows as necessary to operate conveyance facilities.

The plan shall include an implementation/construction schedule and a proposal for an interim fish bypass method for use until permanent facilities are completed; the interim method shall be utilized beginning with the spring 1995 passage period. The U.S. Fish and Wildlife Service and the 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.

G. Within two years of a written request by the Agency, the applicant shall provide for upstream fish passage, subject to plan approval by the Department of Fish and Wildlife. The U.S. Fish and Wildlife Service and the 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. The applicant shall provide the Department with a copy of the turbine rating curves, accurately depicting the flow/production relationship, for the record within one year of the issuance of this certification.

I. Within 90 days of the issuance of this certification, the applicant shall submit a plan for proper disposal of debris associated with project operation, including trashrack debris, for written approval by the Department. The plan shall include the method used for flashboard construction, including materials used and means of sealing to prevent leakage. The plan shall be designed to prevent or minimize the discharge of debris or trash downstream.

J. Any proposals for project maintenance or repair work involving the river, including desilting of the dam impoundment, impoundment drawdowns to facilitate repair/maintenance work, and tailrace dredging, shall be filed with the Department for prior review and approval.

K. The applicant shall provide a canoe portage around Arnold Falls dam by October 1, 1995. The applicant shall consult with the Recreation Section of the Department of Forests, Parks and

Recreation and the Department of Environmental Conservation in the planning, siting, and design of the portage. Design and maintenance plans for the portage shall be filed with the Department of Environmental Conservation and the Department of Forests, Parks and Recreation for review and approval before construction of the portage.

L. The applicant shall allow continued public access to the river for utilization of the public resources, subject to reasonable safety and liability limitations. Any proposed limitations of access to State waters to be imposed by the applicant shall first be subject to written approval by the Department.

M. The applicant shall allow the Department to inspect the project area at any time to monitor compliance with certification conditions.

N. A copy of this certification shall be prominently posted within the facility.

O. 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.

P. The Department may request, at any time, that FERC reopen the license to consider modifications to the license necessary to assure compliance with Vermont Water Quality Standards.

Barbara Ripley
Secretary
Agency of Natural Resources

Dated at Waterbury, Vermont this 16 day of June, 1994.

cc: distribution list