State of Vermont
WATER RESOURCES BOARD

In re: Lamoille River Hydroelectric Project (CVPS)
§ 401 Certification
Docket Nos. WQ-94-03 and WQ-94-05

FINDINGS OF FACT, CONCLUSIONS OF LAW, AND ORDER

This decision pertains to an application for a § 401 water quality certificate ("Certificate") from the State of Vermont filed by Central Vermont Public Service Corporation ("CVPS") in conjunction with its request for federal relicensure of four hydroelectric facilities on the Lamoille River ("Project"). In order to obtain a Certificate, an applicant must show that the project in question complies with the Vermont Water Quality Standards ("VWQS") and other state law provisions made applicable through § 401 of the Federal Water Pollution Control Act, 33 U.S.C. § 1251 *et seq.* (commonly known as the Clean Water Act and referred to herein as "CWA"). The Board has extended its deliberations in this matter in an attempt to find sufficient credible evidence in the record upon which to base a decision to issue a Certificate.

As explained more fully below, the Board has concluded that there simply is not sufficient evidence in the record to find that the Project, as proposed by CVPS, complies with the VWQS and other applicable state law. The Board has also concluded that it lacks sufficient evidence upon which to fashion appropriate conditions that would reasonably ensure compliance with the VWQS and other applicable state law. Accordingly, the Board denies CVPS's application for a Certificate.

I. PROCEDURAL HISTORY AND JURISDICTIONAL STATEMENT

On April 14, 1994, the Vermont Agency of Natural Resources ("ANR") issued a Certificate to CVPS pursuant to 10 V.S.A. § 1004 and 33 U.S.C. § 1251 *et seq.* in connection with the Project. On April 21, 1994, the Vermont Natural Resources Council ("VNRC") appealed the issuance of the Certificate to the Board. On April 29, 1994, CVPS also appealed the issuance of the Certificate to the Board on different grounds. The appeals were filed pursuant to 10 V.S.A. § 1024(a) and 10 V.S.A. § 1004.

The Board held a prehearing conference with respect to those appeals on May 20, 1994 and issued a Prehearing Conference Report and Order ("Prehearing Conference Report") on September 26, 1994. The Prehearing Conference Report ordered the consolidation of the appeals, clarified the issues in dispute, and determined party status.

On March 3, 1995, VNRC filed a Motion for Preliminary Ruling on Admissibility of Evidence and Scope of Review. By a memorandum dated March 17, 1995, parties were advised that the Board Chair had determined VNRC's Motion to be premature.

In accordance with a Revised Supplemental Prehearing Order issued on March 16, 1995, the parties submitted prefiled testimony and exhibits. VNRC supplemented its Motion for Preliminary Ruling on June 16, 1995, by filing objections to certain CVPS prefiled testimony and exhibits. Also on June 16, 1995, CVPS and ANR filed their respective objections to certain prefiled testimony and exhibits.

On June 30, 1995, VNRC, CVPS and ANR each filed responses to the various evidentiary objections. On July 13, 1995, the Board heard oral argument with respect to the parties' objections. The Board issued its Preliminary Rulings on the Admissibility of Evidence and Scope of Review on August 15, 1995 ("Preliminary Rulings"). VNRC sought modification of the Preliminary Rulings in a Motion for Modification and Clarification of Preliminary Ruling dated August 30, 1995 ("Motion for Modification"). By a Memorandum of Decision dated October 18, 1995, the Board denied VNRC's Motion for Modification.

The Board conducted a site visit of the Project on July 14, 1995 and held evidentiary hearings on November 16, 17, 18, and 29 and December 1, 2, 29, and 30, 1995. On December 30, the Board recessed this matter pending receipt of proposed findings of fact, conclusions of law, and certificates, and deliberation with respect to the record.

On January 15, 1996, VNRC filed a Motion to Admit Documentary Evidence. By a Memorandum of Decision dated April 18, 1996, the Board denied VNRC's motion. In addition, on December 30, 1995, the final day of hearings on the merits in this matter, CVPS orally moved to reconsider Section II.A. of the Board's Preliminary Rulings, which excluded evidence addressing economic and social impacts. On January 29, 1996, CVPS filed a written Motion for Reconsideration Regarding Evidence Addressing Economic and Social Impacts. Also on January 29, 1996, ANR and VNRC each filed responsive memoranda on this issue. VNRC and CVPS filed supplemental responsive memoranda on February 8, 1996. The Board heard oral argument on CVPS's motion on February 13, 1996, at which CVPS, VNRC and ANR presented their arguments to the full Board. On May 10, 1996, the Board issued a Memorandum of Decision denying CVPS's motion.

On November 4, 1996, the Board declared the record complete. This matter is now ready for decision. To the extent that any proposed findings of fact and conclusions of law are explicitly approved below, they are granted; otherwise, they are denied. Petition of Village of Hardwick Electric Department, 143 Vt. 437, 445 (1983).

II. FINDINGS OF FACT

A. Project Overview

1. CVPS has applied to the Federal Energy Regulatory Commission ("FERC") for relicensure of the Project. The present FERC license application is for a license for an unspecified period of time of between 30 and 50 years (hereinafter referred to as the "FERC License").

2. CVPS filed its application for a new FERC License in 1984. The last FERC License for the Project, Project Number 2205, was issued in 1969, with an expiration date of December 31, 1987.

3. In order to operate its Project during the period between the expiration of one FERC License and the issuance of another, CVPS is required each year to obtain an annual license ("annual FERC license"). The Project has been operating since 1987 under a series of annual FERC licenses.

4. The Project consists of four facilities on the Lamoille River: the farthest upstream facility is the Fairfax Falls facility (river mile 19.0); the next facility proceeding downstream is the Clark Falls facility (river mile 8.9); followed by the Milton facility (river mile 8.5); and finally the Peterson facility (river mile 5.6). There are two major impoundments associated with the Project: Arrowhead Mountain Reservoir, also known as Arrowhead Mountain Lake ("Arrowhead Reservoir"), created by the dam at Clark Falls facility, and the Peterson Impoundment, created by the dam at Peterson facility. The total length of the river affected by the Project ("Project reach") is approximately 20 miles.

5. Most of the Project facilities are controlled and monitored remotely from CVPS's Rutland control center.

6. The Public Electric Light Company constructed the Project's four facilities between 1919 and 1948 and operated the facilities until 1953, when they were acquired by CVPS.

7. Each of the Project's facilities diverts water from the river through a penstock which allows the water to operate one or more turbines within a powerhouse. Once the water has passed through the powerhouse at each facility, it is released back into the river in the tailrace. The Project

produces an average of 100 MW (100,000,000 watts) per year for use by CVPS customers.

8. The three upstream facilities, Fairfax, Clark Falls, and Milton, create bypassed sections of the river ("bypass reaches"). The bypass reaches of the Project are subject to diminished flows, since much of the natural flow is diverted through the penstocks for power generation. The Peterson facility does not create a bypass reach.

9. The Lamoille River is a major tributary of Lake Champlain, rising out of Horse Pond in the town of Greensboro. From Horse Pond, the river flows westerly 85 miles to empty into Malletts Bay of Lake Champlain, about ten miles north of Burlington. It descends more than 1,200 feet in elevation and drains an area of about 706 square miles, including all or part of 29 towns.

10. The entire length of the Lamoille River mainstem has been classified by the Board as Class B waters. Two waste management zones have been designated within the Project reach. One such zone exists from the Town of Fairfax wastewater treatment plant outfall downstream 1.5 miles to the confluence with Swift Brook. The other begins at the Clark Falls dam and extends 3.2 miles downstream to Peterson dam. There is no evidence in the record that any mixing zones are located within the Project reach.

11. Arrowhead Reservoir is designated by the VWQS as warm water fish habitat. The 5.6 mile long section of river from Peterson dam to Lake Champlain is also designated warm water fish habitat for the period June 1 through September 30. The balance of the Project reach, including the section below Peterson dam for the period October 1 through May 31, is designated by the VWQS as cold water fish habitat.

B. Current Operating Regime and CVPS's Proposed Operational Protocol

12. A run-of-river facility is one which does not operate out of storage and therefore does not artificially regulate downstream flows. Outflow from the facility is equal to inflow to the impoundment on an instantaneous basis. There may be limited exceptions to this mode of operation, during the period following the reinstallation of flashboards for example, when outflow is temporarily reduced below inflow while the impoundment refills.

13. Operation from storage is called store-and-release mode. Under store-and-release, water is allowed to collect in an impoundment and is then drawn down over a certain period or cycle, hence the names daily or weekly cycling mode.

14. The Fairfax Falls facility is operated independently of the other Project facilities. Because it has negligible storage capacity, it is operated in a run-of-river mode throughout most of the year, with daily ponding only during low summertime flows. No minimum flow, other than leakage, is currently maintained at the site.

15. The three remaining facilities -- Clark Falls, Milton, and Peterson -- are, with limited exceptions noted herein, operated in tandem. The mode of operation at each of these facilities is dictated by natural river flow or releases from storage at Arrowhead Reservoir.

16. The Clark Falls facility is operated in a store-and-release mode. Except during periods of high inflow, Arrowhead Reservoir is drawn down on a weekly basis according to demand throughout the week and is refilled each weekend.

17. The extent of the drawdowns at Arrowhead Reservoir has varied based on the amount of inflow from the Lamoille River upstream and power generation needs. During periods of high flow, the Clark Falls facility is run at full load twenty-four hours per day, and the taintor gates of the dam are used as crest control to keep the reservoir level from exceeding 290 feet National Geodetic Vertical Datum ("NGVD") elevation. Currently, no minimum flow, other than leakage, is maintained at this site.

18. The dam at the Milton facility has almost no storage capability. Operation is dependent on releases from Arrowhead Reservoir. Therefore, the Milton facility has approximately the same discharge as the Clark Falls facility.

19. During the period April 1 through June 15, the Milton facility is operated in a run-of-river mode to provide continuous flows downstream to the Peterson facility. During the balance of the year, unless stream flow above the site exceeds hydraulic capacity, operation of the Milton facility is controlled by the store-and-release mode of operation at the Clark Falls facility. Currently, no minimum flow, other than leakage, is maintained at the Milton facility.

20. As with the Milton facility, the mode of operation at the Peterson facility is largely dependent on the operation of the Clark Falls facility.

21. During the period April 1 through June 15, the Peterson facility is operated in a run-of-river mode, and at other times in a store-and-release mode in concert with releases from Arrowhead Reservoir. During low water years, the Peterson facility has generally been operated in a store-and-release mode, with the operating schedule determined by electrical demand on the system and/or New England Power Pool ("NEPOOL") requirements.

22. During low to moderate flow periods, the weekly drawdowns of the Peterson Impoundment are typically up to four feet. During high flow periods, the plant is operated continuously at full load, using the bascule gate for crest control when necessary.

23. Currently, no constant minimum flow is maintained at the Peterson facility, although time-specific releases of water are made from mid-September to mid-October and upon the request of the Department of Fish and Wildlife's ("DFW") regional fisheries biologist.

Fairfax Falls Facility

24. The dam at Fairfax Falls is a concrete gravity structure founded on bedrock. It was placed in operation in 1919.

25. The dam at Fairfax Falls creates an impoundment with a surface area of approximately 152 acres at full storage. The impoundment has a gross storage volume of 1,080 acre-feet and is not considered to have a useable storage capacity.

26. Historically, the Fairfax Falls facility has operated on a cycling or peaking basis. During certain low flow periods, this mode of operation has dewatered portions of the river.

27. Under the terms of the current annual FERC license, the Fairfax Falls facility is operated as a daily cycle station. Currently, leakage is the only consistent source of flow in the 550-foot bypass reach of the river between the dam and the powerhouse tailrace.

28. In its present FERC License application, CVPS proposes to operate the Fairfax Falls facility in a run-of-river mode.

Arrowhead Reservoir

29. The dam at the Clark Falls facility creates the Arrowhead Reservoir, an impoundment extending about four miles upstream to a point approximately six miles downstream from the Fairfax Falls facility.

30. At full storage (290.0 feet NGVD), Arrowhead Reservoir has a surface area of approximately 750 acres, a volume of 10,000 acre-feet, and a reported useable storage capacity of approximately 5,080 acre-feet.

31. The historical operating mode at the Clark Falls facility has resulted in frequent drawdowns of Arrowhead Reservoir of five feet, with occasional drawdowns of as much as ten feet. The greatest drawdowns have occurred between December and March and have lasted as long as sixteen days.

32. CVPS's proposed operational protocol would limit drawdowns to a maximum of one foot between April 1 and June 15 and, generally, to a maximum of two feet during the rest of the year. From June 16 to March 31, however, CVPS proposes three exceptions to the two-foot restriction: (1) NEPOOL requests, (2) forecasted high water, and (3) dam repairs at the Clark Falls or Milton Falls sites. The proposed exceptions would allow drawdowns of as much as three and one-half feet.

Clark Falls Facility

33. The Clark Falls dam is a concrete gravity structure founded on bedrock. It was originally constructed and placed in operation in 1937.

34. The intake is located at the west end of the spillway. From the intake, a 12-foot-diameter steel penstock extends about 360 feet to a 28-foot by 22-foot forebay at the powerhouse. Two headgates are located between the forebay and the powerhouse water passages. The plant discharges to an excavated tailrace.

35. The Clark Falls bypass reach flows through a bedrock gorge approximately six to seven hundred feet in length.

36. Under the terms of the current annual FERC license, the Clark Falls facility is operated as a weekly cycle station in coordination with the Milton and Peterson facilities. Currently, leakage flow of approximately 9 cfs is the only consistent source of flow in the bypass reach.

37. During the Board's site visit of July 14, 1995, the Board observed leakage of about 9 cfs at the Clark Falls facility.

38. CVPS proposes to operate the Clark Falls facility in a run-of-river mode between April 1 and June 15 and to release a minimum flow of 9 cfs to the bypass reach at all times. At other times of the year, the facility would be operated in a weekly cycling mode.

Milton Falls Facility

39. The dam for the Milton Falls facility is a concrete gravity structure founded on bedrock and is located at the top of a natural falls. It was originally constructed and placed in operation in 1929.

40. From the intake structure, an 11-foot-diameter penstock extends about 380 feet to a 16-foot-diameter surge tank, then divides into two 7-foot, 9-inch-diameter penstocks that extend about 70 feet to the powerhouse. The facility discharges into an excavated tailrace.

41. The dam creates an impoundment with a surface area of approximately 11 acres at full storage, extending about 1/4 mile upstream to the Clark Falls tailrace. The impoundment has a gross storage capacity of 93 acre-feet and is not considered to have any useable capacity.

42. The Milton Falls facility creates a 600-foot-long bypass section that contains three channels. The north channel (which is on the right, looking downstream) consists of a series of pools separated by steep cascades which lead to a large pool and then to a riffle reach.

43. The middle channel in the Milton Falls bypass likewise consists of a series of pools and cascades, but broadens out toward its lower end into a gravel and cobble riffle.

44. Where the middle and north channels divide, CVPS proposes ledge alterations to allow 7 cfs to pass into the north channel during the release

of 47 cfs into the bypass.

45. Under the terms of the current annual FERC license, the Milton facility is operated as a weekly cycling station in coordination with the Clark Falls and Peterson facilities. Currently, a leakage flow of between 5 and 10 cfs is the only consistent source of flow in the bypass reach.

46. During the Board's site visit of July 14, 1995, the Milton facility was operating at about 200 cfs. The Board observed approximately 55 to 65 cfs bypassing the penstock. This bypass flow spilled through the flashboards, with most of it passing down the middle channel and approximately 3 cfs passing into the north channel.

47. CVPS proposes to operate the Milton facility in a run-of-river mode between April 1 and June 15. At all other times, the facility would be operated in a store-and-release mode.

48. CVPS also proposes to operate the Milton facility so that a minimum of 47 cfs is released from the dam into the bypass reach at all times.

Peterson Impoundment

49. The Peterson Impoundment has a surface area of approximately 136 acres at full storage. The impoundment has a gross storage capacity of 2,840 acre-feet and a usable storage capacity of 1,070 acre-feet.

50. When the Peterson Impoundment is at full storage, its backwater extends upstream to the so-called "riffle" area of the middle channel of the Milton plant bypass, thereby slowing the movement of water in that channel.

51. Under the terms of the current annual FERC license, drawdowns of the Peterson Impoundment have been limited to 4 feet, except for emergency situations or maintenance. From April 1 through June 15, the Peterson Impoundment is maintained at a constant elevation to provide a relatively stable water level in the river below Peterson, which is used by walleye and lake sturgeon for spawning and incubation.

Peterson Facility

52. The Peterson facility, also known as the Woods Falls Station, is located in

a gorge at the approximate site of a natural cascade, referred to historically as Woods Falls. The natural cascade is no longer visible.

53. The dam for the Peterson plant is a concrete gravity structure founded on bedrock. It was originally constructed and placed in operation in 1948.

54. The Peterson facility does not create a bypassed reach of river. Rather, the facility's tailrace empties into a large plunge pool at the base of the Peterson dam. The plunge pool was historically known as the "sturgeon hole."

55. Below the dam at the Peterson facility, the aquatic habitat is riverine, except during those limited periods when the level of Lake Champlain is high enough to create a backwater effect, which can extend as far up as the facility's tailrace.

56. For the last eight years, the Peterson facility has been operated in a run-of-river mode from April 1 through June 15 to sustain adequate flows downstream during the walleye and lake sturgeon spawning and incubation periods. CVPS releases additional water in the early fall to provide attractant flows for landlocked salmon, to accommodate angling, or upon the request of the DFW regional fisheries biologist for scientific studies.

57. During its site visit on July 14, 1995, the Board observed the Peterson facility in operation with about 250 cfs of water passing through the unit. The Board also observed some leakage through the flashboards and down the face of the dam.

58. CVPS proposed to operate the Peterson facility as a run-of-river facility from April 1 to June 15. During the balance of the year, CVPS proposed operation in a store-and-release mode in concert with releases from Arrowhead Reservoir.

C. Impacts of Stream Flow Regulation

59. Hydroelectric projects such as the Lamoille Project regulate the natural flow of the river. Artificial flow regulation can have a number of impacts, including alteration of the shape of the river channel and the bottom substrate. Some areas of the natural river channel may be dewatered or

contain flows that make the river too shallow or stagnant to provide suitable aquatic habitat. Diminished flows exacerbate dissolved oxygen deficiencies in warm summer months.

60. The impacts of a hydroelectric facility's manipulation of downstream flow are most pronounced when there is low inflow into the facility's impoundment, as occurs during periods of low rainfall, and when the facility is refilling the impoundment. Run-of-river operation, such as that proposed at Fairfax Falls, has less severe impacts than store-and-release operation, both upstream of the dam and downstream of the tailrace, but it still has a potential to significantly reduce flows in bypassed river reaches.

61. Depth, velocity, and substrate are important determinants of where aquatic organisms choose to live within a stream. By altering these features, flow regulation affects both the quantity and the quality of aquatic habitat. Changes in aquatic habitat influence both the presence and abundance of particular aquatic species.

62. The alteration of natural flows by hydroelectric projects frequently changes the natural landscape and often has an impact on areas such as gorges, cascades, and waterfalls. Artificial flows affect aesthetic values as well as aquatic habitat values.

D. Determining Minimum Stream Flow

63. The U.S. Fish and Wildlife Service's ("USFWS") *Interim Regional Policy for New England Stream Flow Recommendations* ("USFWS Flow Policy") is used by USFWS as a basis for determining recommended seasonal minimum flow releases sufficient to sustain indigenous aquatic organisms throughout the year. This policy provides guidance to agencies that are charged with the maintenance of minimum stream flows for habitat protection.

64. The USFWS Flow Policy was originally adopted in 1981 and subsequently amended in 1983. In adopting the policy, the USFWS relied on historical flow records for New England streams and rivers to describe minimum stream flow conditions that will sustain and perpetuate indigenous aquatic organisms. These conditions are referred to in the policy as the Aquatic Base Flow ("ABF").

65. The USFWS Flow Policy describes three alternative methods by which an acceptable ABF can be determined. The first is used when inadequate flow records exist or when stream flow is substantially regulated by dams or upstream diversions. In such instances, regional median flows are used to approximate the flow which would occur without the dams or diversions in place ("Default ABF").

66. The second method is to derive ABF from a minimum of 25 years of U.S. Geological Survey ("USGS") gage data collected in a segment of a river that is basically free-flowing at or near a project site ("ABF Derived from Gage Data"). From this database, the USFWS Policy recommends an ABF equivalent to the August median flow at the project site during the period of record unless superseded by spawning and incubation flow recommendations.

67. The third method is to determine an ABF on the basis of site specific studies ("Site Specific ABF").

68. Typically, low flow conditions that result in the greatest metabolic stress to aquatic organisms, including fish, occur in August and February, which, statistically, are the lowest flow months of the year.

69. August low flows can result in stressful temperature and dissolved oxygen conditions, as well as reductions in usable habitat. During the winter period, low flow conditions can also metabolically stress aquatic organisms, due to ice impacts and the physiological demand associated with overwintering. Since seasonal low flow conditions can result in substantial fish mortality, a flow value that does not deviate substantially from the flow regime occurring naturally during the lowest flow month of the season should be maintained. Thus, the August median flow is a critical low flow which identifies the lowest flow value to which aquatic organisms have adapted over the long term to be able to survive without major population changes.

70. In the absence of either relevant gage data or site specific studies, the USFWS Flow Policy generally recommends the Default ABF derived from the average of median August monthly records for representative New England streams. In Vermont, the Default ABF, measured in cubic feet per square mile of drainage ("csm"), is 0.5 csm. The Default ABF applies at all times of year except in fall and winter, when the USFWS

Flow Policy recommends flows of 1.0 csm, and during a period of spring, when it recommends 4.0 csm. In each of these seasons additional flows are deemed necessary to support spawning and incubation.

71. Since August, 1929, the USGS has operated gaging station #04292500 at East Georgia on the Lamoille River below the Fairfax facility and above Arrowhead Reservoir ("the gage"). Hourly flows measured at the gage are affected by the operation of the Fairfax facility. However, since the station generally operates in a daily peaking mode, daily average flow values may be used to estimate natural river hydrology.

72. Seven Day Low Flow, Ten Year Return Period, also known as 7Q10, is defined in the VWQS as "that instantaneous flow equal to the lowest mean flow for seven consecutive days that has a 10 percent chance of occurring in any given year."

73. 7Q10 describes a drought flow condition that rarely occurs under natural conditions, and when it does occur, a 7Q10 flow generally occurs in either August or September.

74. The drainage area at the gage is 686 square miles. When the Default ABF of 0.5 csm is applied to the drainage area at each of the Project's four facilities, the results range from 296 to 392 cfs, as indicated in the table below.

75. Using the USGS gage data, flow statistics at the four facilities are shown in the following table:

Facility	River Mile	Drainage Area (sq. mi.)	Mean Runoff (cfs)	7Q10 (cfs)	ABF (cfs)
Fairfax Falls	19	529	960	122	296
Clark Falls	8.9	690	1250	159	386
Milton Falls	8.5	690	1250	159	386

Peterson	5.6	700	1270	161	392

76. The ABF conditions can be stressful to fish due to high water temperatures, diminished living space, or deficiencies in dissolved oxygen, and they can contribute to a shortage in food supply. In addition, although the ABF purports to define a default minimum flow value for aquatic habitat, it does not represent "ideal" or optimal flow conditions, nor has it been demonstrated to ensure high quality habitat for aquatic biota in the Project reach.

77. The most reliable ABF is one derived from site specific data.

78. The Instream Flow Incremental Methodology ("IFIM"), which the USFWS Flow Policy recommends, is the most commonly used method of determining, on a site-specific basis, the impact of specific flows on aquatic habitat.

79. IFIM looks at how the physical characteristics of fish habitat change as stream flow changes. Since the physical nature of a stream is relatively stable over time, compared to fish abundance, IFIM provides a good basis for assessing the effects of stream flow variations on aquatic life.

80. An IFIM study collects depth, velocity, and substrate data at specific sampling points on a transect (a straight line) across the stream. Typically, data are gathered at several transects. The sampling points are used to represent conditions for some distance around them -- an area called a "cell." At a measured flow, each cell is given a habitat quality rating, based on how closely its depth, velocity, and substrate characteristics resemble those preferred by an individual species at a particular life stage. This rating, called a suitability index, is multiplied by the cell area to produce a single measure of habitat quality and quantity called weighted usable area ("WUA.")

81. The WUA values for all cells are then added to produce the total WUA for the segment of the stream under consideration at the measurement flow. This process is repeated over a range of flows, either by field measurement or hydraulic modeling, to produce a habitat-flow relationship. This relationship is usually developed for a number of species and life stages of concern. Computer models developed by the USFWS are commonly used to do the analysis.

82. An IFIM study does not yield a single, objective flow recommendation to satisfy aquatic habitat needs. Instead, professional judgment must be applied to the IFIM results to determine an appropriate flow. Typically, WUA increases rapidly with flow up to a point, after which the incremental gain in WUA is less with each incremental increase in flow. In general, this "inflection" point on the WUA curve can determine an appropriate minimum flow.

83. When multiple species and life stages are studied, a WUA curve is produced for each. A flow regime is then selected that reasonably accommodates all of these organisms and their various life stages. Other variables, such as the natural hydrology and the seasonal needs of individual species, must also be considered.

84. CVPS conducted several studies using an incremental approach for this Project. However, as indicated elsewhere in these findings, the studies were either flawed in their methodology or incomplete, and therefore they did not provide sufficient data upon which to determine a site-specific ABF.

85. The "ANR Procedure for Determining Acceptable Minimum Stream Flows" ("ANR Flow Procedure"), dated July 14, 1993, is a written practice that provides guidance in establishing minimum stream flows for a variety of regulatory processes, including the issuance of water quality certificates pursuant to § 401 of the CWA.

86. The ANR Flow Procedure is derived, in part, from the USFWS Flow Policy. The ANR Flow Procedure recommends a default ABF (0.5 csm) as the minimum flow needed to protect aquatic habitat downstream of an existing hydroelectric facility's tailrace in the absence of site-specific studies justifying different flows.

87. Within the ANR Flow Procedure is a section addressing hydroelectric and hydromechanical projects ("ANR hydro procedure") which encourages hydroelectric facilities to operate in a true run-of-river mode. The ANR hydro procedure also distinguishes between acceptable minimum flows in river reaches downstream of an existing hydroelectric project's tailrace and acceptable minimum flows in the bypass reaches of such facilities.

88. The specific guidance offered by the ANR hydro procedure for bypass reaches is as follows:

> Bypasses shall be analyzed case-by-case. Generally, the ANR 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. Higher or lower amounts of bypass flows shall be prescribed as a function of the uses and values to be restored and protected in the bypass reach. 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.

89. Bypassed reaches can be highly variable in terms of the type and value of the aquatic habitat which they support, and also in their physical appearance. The term “bypassed reach” only connotes a spatial relationship to the penstock and powerhouse, and the bypassed reach does not inherently possess a greater or lesser potential to provide high quality aquatic habitat than other parts of a project reach.

90. Both the ANR Flow Procedure and the USFWS Flow Policy provide standards that might be used for determining the required minimum flows needed to protect aquatic habitat in the absence of adequate site-specific information. However, the Board was not presented with sufficient evidence to support the application of these standards in this proceeding.

91. Artificial flow conditions can affect fish migration and movement. During spawning season, migratory fish such as salmon are induced to migrate upstream by flow increases of a sufficient magnitude. Such "attractant flows" appear to be necessary to trigger the behavioral response to migrate.

92. Attractant flows are of particular importance in the Project reach below the Peterson dam for salmon, sturgeon, and walleye in their respective spawning seasons.

93. Many resident fish species within the Lamoille River system migrate up and downstream. Fish seek the cooler water found in tributaries and areas of groundwater inflow during the warm summer months, move between

feeding areas, and seek out highly oxygenated water to the extent they are able to do so. In addition, fish migrate in order to locate suitable spawning habitat. There must be sufficient water flow and depth to enable fish to migrate up or downstream.

E. The Criteria of the VWQS

E-1. Dissolved Oxygen

94. Streams and rivers obtain dissolved oxygen ("D.O.") through two principal mechanisms: atmospheric transfer, and photosynthesis by algae and aquatic plants.

95. Reaeration through atmospheric transfer is the most consistent and reliable source of D.O. Free-flowing rivers in Vermont typically have relatively high natural reoxygenation rates.

96. During daylight hours, aquatic plants produce oxygen in the water column through photosynthesis. These plants also consume oxygen in respiration, both during the day and at night. Because photosynthesis does not occur at night, this daily variation in oxygen production and consumption can create a pre-dawn oxygen deficit condition which must be considered in evaluating instantaneous minimum concentrations of D.O.

97. Respiration by invertebrates and fish also consumes D.O. in streams and rivers. In addition, D.O. in the water is utilized by bacteria in stabilizing organic compounds and by the chemical oxidation of dissolved metals.

98. Oxygen is only slightly soluble in water, with the solubility inversely related to temperature. Consequently, there is generally less D.O. available during the summer when water temperatures are high.

99. Like other animals, fish and aquatic invertebrates need oxygen for respiration. Their health and survival depend on their ability to efficiently obtain an adequate supply of oxygen from the external environment.

100. Because fish are cold-blooded, their metabolic rate, and therefore their oxygen needs, are directly related to water temperature. Fish require more oxygen in warmer weather. This increased oxygen need at times of decreased availability makes the summer period the time of greatest

concern regarding D.O. concentrations. During low flow periods in the summer, the demand on instream oxygen resources can become critical.

101. A fish's gills are like underwater lungs. They provide a large surface area of capillaries for diffusion of D.O. from the water into the fish's bloodstream.

102. Levels of D.O. must be sufficiently high to meet the fish's metabolic needs. Any reduction in D.O. concentrations below the saturation value proportionally reduces the physiological oxygen transfer rate to the fish, causing stress to the fish.

103. Extremely low D.O. concentrations, even for a limited period of time, can have catastrophic consequences, such as widespread fish kills. Smaller decreases in D.O. concentrations have more subtle, but nonetheless significant, impacts on the aquatic biota. Effects of chronically lowered D.O. concentrations on fish can include reduced spawning, diminished swimming ability, suppressed feeding, depressed growth rates, increased susceptibility to disease, greater sensitivity to toxicants, and general sluggishness. Chronically lowered D.O. can also result in reduced population numbers of aquatic biota, and even the complete disappearance of some species.

104. The amount of D.O. needed by fish depends on a number of factors, and varies by species and life stage. For example, trout (a cold water species) need higher oxygen concentrations than carp (a warm water species), and incubating salmonid eggs require higher D.O. levels than do mature fish.

105. The DFW requires its salmonid hatcheries to maintain D.O. concentrations above 80 percent saturation. At lower concentrations, salmonid growth is stunted and disease is more likely.

106. D.O. criteria established in the VWQS are calibrated to protect fish and other aquatic biota. D.O. levels can serve as an indicator of aquatic community health.

107. The frequency, magnitude, duration, and seasonality of reductions in D.O. concentrations below saturation values determine the relative impacts of those reductions.

108. Hydroelectric facilities can reduce instream D.O. concentrations by reducing the reaeration that would have occurred naturally when the river flowed over cascades and falls that existed in the absence of the dams.

109. Impoundments can further reduce D.O concentrations because of upstream organic waste stabilization or increased algal respiration.

110. In reservoirs of sufficient depth, under certain conditions, typically in the summer, the water may stratify thermally in such a manner that below certain depths D.O. levels become depleted.

111. At the Clark Falls facility, water is drawn from Arrowhead Reservoir at a depth of between 15 and 27 feet below the surface level at full storage. Because this reservoir stratifies in most years, D.O. depleted waters are commonly released from Arrowhead Reservoir during the operation of that facility.

112. D.O. data from Arrowhead Reservoir were collected during the period of greatest stratification (July 19 through August 4) for 1982. Those data demonstrate a range of D.O. levels between 5.3 mg/l (64% saturation) and 8.1 mg/l (100% saturation) at a depth of 15 feet, and D.O. levels between 4.1 mg/l (48% saturation) and 7.4 mg/l (86% saturation) at a depth of 20 feet.

113. Any D.O. deficit in Arrowhead Reservoir tends to be passed downstream to Lake Champlain, with little opportunity for reaeration, because of the presence of other Project facilities.

114. Under the operating protocol CVPS has proposed, only enough water would necessarily be released into the bypasses of the Clark Falls and Milton plants to maintain the river at, or slightly above, minimum D.O. standards during the warm summer months.

115. CVPS's proposed operating protocol for the lower three facilities is based on the assumption that providing the minimum required concentration of D.O. at the Clark Falls tailrace would ensure the minimum required concentrations at all downstream locations. This assumption is apparently based on limited D.O. data collected by CVPS in 1983 and 1990.

116. The 1983 data were collected during a single twenty-four hour period in

July.

117. The 1990 data were collected on ten different occasions from June 26 through September 14, 1990 ("1990 sampling period"). During the 1990 sampling period, flows were from three to twenty times 7Q10 and were consistently well above the ABF.

118. Data from the 1990 sampling period further show that D.O. concentrations below Clark Falls were close to 6.0 mg/l on July 23, 1990, immediately before Arrowhead Reservoir was flushed out by high river flows.

119. During the 1990 sampling period, even the lowest reported flows greatly exceeded the minimum flows proposed by CVPS. In fact, every minimum bypass flow identified in CVPS's proposed operational protocol was less than 10% of the lowest flows reported during the 1990 sampling period. Likewise, CVPS's proposed minimum downstream flows at both Clark and Milton were less than 10% of the lowest flows reported during the 1990 sampling period.

120. When the level of Lake Champlain is less than or equal to 95.3 feet NGVD, the minimum downstream flow proposed by CVPS below Peterson dam, absent special circumstances for spawning, was only 14.5% of the lowest reported flows from the 1990 Sampling Period. When the lake level exceeds 95.3 feet, CVPS proposed no minimum downstream flow.

121. The fact that D.O. concentrations almost dropped below acceptable levels during the 1990 Sampling Period strongly suggests that D.O. levels would fall to lower than acceptable levels if CVPS were operating the Project as proposed during summers of average flows.

122. CVPS's assumption about the relationship of D.O. levels at the Clark Falls tailrace to D.O. levels farther downstream is not borne out by the available data. Moreover, CVPS conducted no predictive modeling of D.O. levels downstream of Clark Falls to support its assumption. The data from the 1990 Sampling Period demonstrate that at times D.O. concentrations actually decline downstream of Clark Falls. Therefore, at locations downstream of the Clark Falls tailrace, the minimum D.O. levels required by the VWQS are not assured under CVPS's proposed operating protocol.

E-2. Temperature

123. Impoundments and restricted flows in bypass reaches contribute to elevated water temperature during warm and sunny summer days beyond that which would occur naturally.

124. Under CVPS's proposed operating protocol, poor water circulation would be likely to result in high water temperatures in a portion of the lower pool in the Fairfax Falls bypass. These high temperatures, particularly on sunny summer days, could exceed the temperature criterion of the VWQS.

125. Thermal stratification in the impoundments may exacerbate summer water temperature increases by "locking" cooler, heavier water in the deeper portion of the impoundments. Because the warmer water is less dense and may be drawn into the powerhouse intake, depending upon the depth from which water is drawn, the temperature increase in the upper levels of a stratified impoundment could be passed downstream.

126. Temperature increases above acceptable levels in the Project reach would have a significant impact on fish populations, most notably on salmonids.

F. Beneficial Uses and Values of the VWQS

F-1. Aquatic Habitat

127. Habitat is the sum of environmental conditions in a specific area occupied by an organism, population, or community. Consequently, aquatic habitat includes the biological community and the physical environment.

128. Water quality and quantity are fundamental components of aquatic habitat. Water quality variables such as temperature and D.O. affect the biological community throughout the Project reach. Microhabitat features, by contrast, deal with the actual living space occupied by an organism.

129. Microhabitat features include water depth and velocity, bottom substrate, and hiding cover. Fish and invertebrates are not randomly distributed within a river, but instead occupy specific microhabitats. Depth, velocity, substrate, and cover determine a species' distribution and abundance within a river.

130. In order to effectively assess microhabitat needs of aquatic biota, detailed, site-specific studies must be conducted. One such study is based on what

is called the habitat suitability model. This model derives habitat requirements from a variety of habitat suitability indices and may be conducted for specific species and specific life stages of those species.

131. Studies that provide data about many species residing in or passing through the study area, and which include data regarding the species' various life stages, are generally more valuable than studies targeted at a single life stage of a single species.

132. Fish and other aquatic organisms require certain favorable habitat conditions in order to survive and thrive. Favorable conditions differ for different species of fish, and for different stages of life for a given fish species. For example, newly hatched brook trout fry prefer quiet, shallow water areas, whereas adult brook trout prefer pools and undercut banks. For spawning, the adult trout seeks clean gravels. In addition, fish depend upon suitable habitat conditions for the organisms they eat.

133. The Lamoille River within the Project reach contains a variety of lake and riverine habitats. Approximately twenty-five fish species inhabit the main stem and impoundments. At least ten of these are popular recreational species: walleye, yellow perch, smallmouth bass, largemouth bass, rock bass, rainbow trout, brown trout, northern pike, chain pickerel, and sunfish. Other fish species found in the Lamoille include bowfin, American eel, carp, brown bullhead, trout perch, burbot, banded killifish, tesselated darter, eastern sand darter, logperch, suckers, quillback, redhorse, and limited runs of lake sturgeon.

134. The lake sturgeon (*Acipenser fulvescens*) is the only state-listed endangered fish species. The eastern sand darter is a threatened species in Vermont and is a candidate for listing as an endangered species by the federal government.

135. Several rare or threatened non-fish species of aquatic biota inhabit the Project reach below Peterson dam. The spiny softshell turtle is listed as a threatened species in Vermont and three species of mussels -- the pink heelsplitter, the fragile papershell, and the pocketbook -- are designated as rare.

136. The lower Lamoille River is a targeted spawning tributary in a cooperative program among the states of New York and Vermont and the USFWS to

develop salmonid fisheries in Lake Champlain. The Lamoille is included in the program's initiatives to develop a steelhead rainbow trout fishery and to restore the landlocked Atlantic salmon fishery.

Fairfax Falls

137. CVPS's proposed conversion of its operation of the Fairfax Falls facility to run-of-river would enhance the quality of six miles of free-flowing aquatic habitat downstream of the tailrace.

138. Even when operated in a run-of-river mode, the 550-foot bypass reach of the Fairfax Falls facility is subject to dewatering, unless special provisions are made to ensure minimum flows.

139. The bypass reach at Fairfax Falls includes a small pool at the base of the falls ("upper pool"), formed primarily within bedrock. This pool is steep-sided and narrow, and it is difficult for fish to gain access to it from downstream due to a ledge drop at its outlet. Fish that are strong swimmers, such as trout, could probably ascend to this pool, but only under high flow conditions. However, when flows are high, the water velocity through the pool is so great that the fish could not remain there. Consequently, the upper pool has very limited, if any, value as fish habitat.

140. Immediately downstream is a second pool ("lower pool"), with a surface area approximately seven times greater than the upper pool. The lower pool provides valuable fish habitat.

141. Below the lower pool is a riffle area. Riffles provide important habitat for some riverine fish species.

142. With adequate flow, the Fairfax Falls bypass reach can provide high quality habitat for smallmouth bass and other fish, including rainbow trout and brown trout.

143. ANR proposed to alternate flows from a 100 cfs nighttime flow, to a 229 cfs daytime flow for aesthetic purposes. Neither ANR nor CVPS conducted studies or presented evidence regarding the effects of such a daily fluctuation on aquatic habitat.

144. On behalf of CVPS, Jeffrey Wallin conducted a study to determine a recommended fishery stream flow in the Fairfax Falls bypass. The study

focused on the turnover rate in the two pools and water depth at a single transect ("turnover rate study"), but did not adequately examine other habitat components in the two pools.

145. The goal of the turnover rate study was to identify a flow rate that would exchange the volume of water in the upper pool within four hours. The scientific rationale for the four hour objective was not explained but was selected after consultation with the district fisheries biologist of the DFW.

146. The turnover rate study was based on the assumption that there was uniform mixing in each of the pools. However, because there is a small channel of inflow in each pool, resulting in good flows through the center of each pool but stagnant conditions on the sides, uniform mixing in the pools does not occur.

147. Based on his turnover rate study, Mr. Wallin recommended that CVPS provide 4 cfs in the Fairfax Falls bypass as a fisheries stream flow.

148. Four cfs is only 3.3 percent of the 7Q10 drought flow at Fairfax Falls. A flow as low as four cfs would not be expected to ever occur naturally at Fairfax Falls.

149. The turnover rate study does not provide meaningful habitat or water quality information. Since the channel has a complex relief and flow (i.e., shallow and deep areas, boulders obstructing flow, and water moving at different speeds within the stream), other factors would have to be considered in order for the study to have any biological significance.

150. In addition to studying turnover rates below Fairfax, CVPS provided data from one transect at the lip of the lower pool for the purpose of assessing whether or not a zone-of-passage ("ZOP") would be provided for adult smallmouth bass moving into and out of the lower pool through the riffle at a given flow value. Those data show only that, at a flow of 28 cfs, there are depths greater than 0.6 feet at one particular transect across the river.

151. A ZOP study does not determine habitat quality. Rather, it seeks to define a corridor for passage between one area of adequate or high quality habitat and another.

152. There is no ZOP unless the target depth exists throughout the length of the zone within the riffle. By measuring depths across only a single transect,

the Wallin study could not demonstrate a continuous ZOP through the entire length of the riffle.

153. Mr. Wallin also took depth measurements in the riffle area below the lower pool. Mr. Wallin indicated that the depth measurements along the one transect that he measured were representative of depth conditions downstream to the tailrace. However, Mr. Wallin's depth measurements were not provided in this proceeding. The data that were provided are inadequate to determine whether a ZOP exists at 28 cfs.

154. Neither the turnover rate nor the ZOP study considered the microhabitat needs of biota present at the site, such as water depth, velocity, substrate, and cover.

155. Despite its limited value as aquatic habitat (see Finding 139), Mr. Wallin conducted a study of the Fairfax Falls bypass that focused on the WUA of the upper pool ("Fairfax WUA study").

156. A properly conducted WUA study combines the results of indices that measure a variety of values ranging from substrate conditions to stream velocity. The Fairfax WUA study used only the velocity suitability index for smallmouth bass adults. The study failed to consider requirements of juvenile and young-of-year smallmouth bass, or requirements of other species.

157. A habitat suitability model for smallmouth bass includes over 20 different indices which assess such variables as water depth and velocity, but which also analyze differing needs of the species based on its life stage.

158. At flows above 50 cfs, velocities in the upper pool become unsuitable for adult smallmouth bass.

159. The lowest flow considered in the Fairfax WUA study for the upper pool at Fairfax Falls was 58 cfs.

160. ANR's assessment of aquatic habitat concerns at the Fairfax Falls facility was based primarily upon visual observation and the professional judgment of ANR staff. ANR concluded that 100 cfs would adequately address aquatic habitat needs in the Fairfax Falls bypass reach, but it provided no scientific basis for that flow value.

161. In addition to the turnover rate study in the upper pool, the Fairfax WUA study, and the ZOP study in the riffle, CVPS conducted a flow demonstration at the Fairfax Falls bypass in order for ANR staff to observe different flow releases. The flows released were 4, 10, 28, 50, and 100 cfs.

162. Flow releases below 50 cfs produced minimal water movement in much of the lower pool, resulting in poor quality aquatic habitat. With adequate flow, large boulders at the side areas of the pool would provide good cover for bass. At 50 cfs the water circulation in the vicinity of these boulders was apparently insufficient to support use of the habitat by bass.

163. Overall fisheries habitat quality and quantity in the bypass improved with each flow increase, except for the upper pool, where water velocities appeared to be high at 50 cfs and excessive at 100 cfs. The habitat loss in the upper pool at higher flows, however, is more than offset by habitat gains in the lower pool.

164. CVPS and ANR declined to observe flow releases above 100 cfs. The 100 cfs flow value was derived merely from a visual inspection and is not the product of site-specific habitat studies or other incremental assessments. Neither CVPS nor ANR explained the decision not to observe flows greater than 100 cfs.

165. The Fairfax Falls bypass provides significant habitat for salmonids and other species that favor higher flows than those necessary to support adult smallmouth bass, the target species for the studies that were conducted by CVPS.

Arrowhead Reservoir

166. Arrowhead Reservoir is a lacustrine habitat that supports a warm-water fishery. The reservoir supports self-sustaining populations of walleye, northern pike, yellow perch, smallmouth bass, and other fish.

167. The littoral zone of a lake or reservoir is extremely productive, and it thus serves as the "breadbasket" of the lake. The abundance of plants in the littoral zone provides food for other aquatic life, serves as spawning substrate for fish such as perch and pike, and creates cover for juvenile fish, forage fish and predator fish. Most aquatic invertebrate production occurs

in the littoral zone. Many fish species use the littoral zone on a seasonal basis for spawning. A littoral zone that is frequently dewatered cannot perform these important functions well, reducing the overall productivity of the lake.

168. Northern pike (*Esox lucius*) scatter their eggs over flooded vegetation in the early spring, soon after ice breakup. Most Northern pike spawn in less than 18 inches of water, so maintenance of a stable water level regime in the spring is critical for egg and fry survival. The northern portion of Arrowhead Reservoir would provide excellent Northern pike spawning habitat but for the current reservoir drawdowns, which render much of that potential spawning habitat unusable.

169. The Northern pike population was in decline at Arrowhead Reservoir when studied in 1968. Because of the lack of subsequent studies, the Board cannot find that this trend has changed in recent years. A vibrant Northern pike population is an important factor in maintaining healthy populations of many other aquatic species in the lake, as this predatory fish performs the vital function of thinning lake perch and bass populations to enable the trophic structure to achieve balance. Accordingly, the spawning needs of Northern pike are important to the quality of Arrowhead Reservoir's aquatic habitat, and particularly its game fish.

170. In Arrowhead Reservoir, smallmouth bass typically spawn from late May to early June. Smallmouth bass typically construct their nests in water between one and three feet deep. Incubation takes four to ten days, depending on temperature. Fry leave the nest after seventeen to nineteen days and school in shallow areas.

171. Water level fluctuations can adversely affect smallmouth bass by interfering with nest site selection and spawning. Drawdowns dewater nests and cause fry abandonment. Fry abandonments and the forcing of fry out of protective vegetative cover cause extremely high mortality due to predation. Rapid fluctuations can strand these small fish in areas that become dewatered, killing the fish. In addition, the vegetation that provides cover for smallmouth bass can itself be directly reduced by water level fluctuations.

172. A rapid drawdown of 1.6 to 3.3 feet at Arrowhead Reservoir during smallmouth bass spawning or during the ensuing forty-five days would

greatly reduce the productivity of the littoral zone habitat and could render it unsuitable for smallmouth bass reproduction.

173. Water level fluctuation at Arrowhead Reservoir also affects the abundance and viability of other fish species, particularly minnows, which find protection, cover, spawning areas, and rearing habitat in vegetation in the littoral zone.

174. The loss of aquatic plant cover due to fluctuating water levels at Arrowhead Reservoir also reduces the number of invertebrates on which small fish feed.

175. Wetland resources in the northeastern bay of the reservoir are designated as Class II Wetlands under the Vermont Wetland Rules ("VWR") adopted pursuant to 10 V.S.A. § 905 (7-9).

176. Most aquatic plants are adapted to constant inundation. Consequently, the overwintering structures of many deep marsh and aquatic bed plants are extremely susceptible to freezing and desiccation. If they are dewatered in typical Vermont mid-winter temperatures, the freezing process breaks their cell walls and inflicts great damage to the plants.

177. The current operating regime at Clark Falls has resulted in physical conditions, primarily winter exposure and freezing due to drawdowns, that have precluded the establishment of diverse, robust emergent and aquatic-bed wetland plant communities.

178. The floating-leaved plants are especially vulnerable to winter drawdowns because they have large root stocks which are particularly susceptible to freezing.

179. One of the aquatic plants found in Arrowhead Reservoir is the broad-leaf arrowhead (*Sagittaria latifolia*). Broad-leaf arrowhead, or "duck potato," is a perennial plant with a characteristic, overwintering tuber. The tuber is generally of a relatively large size.

180. The arrowhead plants in Arrowhead Reservoir are quite small, with narrow leaves, and they appear to have only a single year's growth. They lack the tubers that normally develop in plants that have been growing for several years. In Arrowhead Reservoir the arrowhead is acting as an annual,

confirming that the plants' overwintering structures are being killed by freezing or desiccation and that the plant is reproducing by seed.

181. The current operation of the Clark Falls facility results in frequent drawdowns of Arrowhead Reservoir.

182. CVPS's proposed operational protocol would alter the historical operating regime by limiting reservoir drawdowns to a maximum of one foot between April 1 and June 15, and a maximum of two feet during the rest of the year, with the exceptions noted in the following findings.

183. CVPS also proposed that periodic drawdowns of up to three and one-half feet be allowed for forecasted high water, for dam repair, or to prevent flooding. CVPS proposed that drawdowns to perform dam repairs would only occur with ANR approval and sought to develop a protocol with the ANR to avoid all such drawdowns when temperatures are below freezing. However, no such protocol was submitted as evidence in this proceeding.

184. A three and one-half foot drawdown for dam repairs would usually last for less than one day. However, because dam repairs are typically scheduled during dry periods, it could take days for Arrowhead Reservoir to refill.

185. CVPS also seeks the ability to periodically draw down Arrowhead Reservoir by as much as three and one-half feet in response to a NEPOOL request in order to maintain the weekly cycle capability "NEPOOL rating" for the Clark Falls, Milton Falls, and Peterson hydroelectric plants.

186. NEPOOL weekly cycle calculations require CVPS to have sufficient water in the reservoir to operate at claimed capacity for ten hours with an assumption that there is no flow into the reservoir. A two-foot limitation in reservoir drawdown might result in a reduced capability rating for the Clark Falls, Milton Falls, and Peterson stations.

187. Based on experience over the past seven years, CVPS contends that NEPOOL requests are unlikely to result in a drawdown of greater than two feet more often than once every five years. However, CVPS has provided no assurance that the frequency of NEPOOL requests will not change over the life of the FERC License for these facilities.

188. The following table shows the surface area of the reservoir at different

water levels and the extent of the littoral zone that is dewatered relative to a stage of 290.0 feet NGVD, at which point Arrowhead Reservoir reaches the crest of the flashboards and is considered "full."

Arrowhead Reservoir Surface Area/Stage Relationship

Elevation (ft. NGVD)	Stage (feet)	Surface Area (acres)	Littoral Zone Dewatered (acres)	Percent Reduction in Area from Full
290	Full	740	0	0
288	-2	729	11	1
287	-3	660	80	11
286	-4	583	157	21

189. Drawdowns of up to three and one-half feet, such as those proposed for NEPOOL requests and forecasted high water, may adversely impact fish species that spawn in shallow water of the littoral zone during the spring. Young fish that use shallow water areas as nursery habitat might lack the cover they need, because the abundance of aquatic plants in the littoral zone could be greatly reduced by an extended drawdown, or a drawdown occurring at a critical time. Furthermore, the young fish might have little food available because invertebrate populations could be severely reduced in the areas that would periodically be dewatered.

190. A more nearly stable water regime in Arrowhead Reservoir would improve the aquatic habitat and would increase the prospects for the survival of juvenile fish. Other life stages of fish will also benefit from a more stable habitat.

191. Limiting drawdowns of Arrowhead Reservoir to no more than one foot in the period from April 1 to June 15 and no more than two feet during the balance of the year would create a more nearly stable aquatic habitat for bass and pike populations and other warmwater fish species. The improved stability of the habitat should improve survival of juveniles, particularly young-of-the-year. It might also reduce the extent of fish population fluctuations from year to year.

192. Other wetland functions and values are impaired by drawdowns of

Arrowhead Reservoir. Freezing and desiccation of littoral zone substrate results in the exclusion of sensitive aquatic plant species and reduction in species diversity, and in the oxidation and compaction of exposed organic soils. These factors adversely affect the wetland functions of wildlife and migratory bird habitat and fish habitat. The recreational value of the wetlands is also closely tied to the quality of the wildlife and fish habitat. The aesthetic function of the wetland and reservoir is likewise adversely affected by drawdowns that expose mud bottoms of the reservoir.

193. In addition to freezing and desiccation, ice damage to the littoral zone results from winter drawdowns of Arrowhead Reservoir. The damage occurs when the heavy ice compacts the lake bed as the water level drops. Additional damage can ensue if the ice pack freezes to the substrate and plants, which are then dislodged from the lake bed by the floating ice when the water level subsequently rises.

194. Floating-leaved plants, which are, in an ecological sense, comparable to a forest canopy, decrease light penetration. The absence of floating-leaved aquatic plants and the exposure of bare substrate resulting from draw-downs have increased the abundance of annual plants in the reservoir. A more nearly stable water regime would favor establishment of more perennial plants, including floating-leaved aquatic plants.

195. Although drawdowns can be especially damaging in the winter, drawdowns at any time of the year can have adverse impacts on aquatic plants. Aquatic plants have adapted to constant inundation, and they lack protective cell structures to protect them from desiccation. When they are removed from water, they dry out, wilt, and die quickly. Summer drawdowns can also lead to oxidation of the organic soils, which in turn results in oxygen depletion of the water.

196. Greater stabilization of the water levels of Arrowhead Reservoir, especially during the winter months, would result in significant increases in the extent and diversity of emergent and aquatic bed wetlands in the northern portion of the reservoir that is currently exposed by winter drawdowns.

Clark Falls

197. Because the Clark Falls bypass is short, very ledgy, and lacks a substrate that is suitable for many aquatic organisms, it apparently provides relatively

little aquatic habitat. While habitat quality in this bypass may increase at higher flows, given the inherently limited aquatic habitat value of the bypass, flows less than the ABF, and perhaps even less than the 7Q10 at Clark Falls, may be adequate**.**

Milton Falls

198. The habitat provided for fish, including salmonids, by the Milton bypass varies in quality. Many of the pools may not be accessible to fish from downstream because of steep ledge drops, but fish moving down from upstream could gain access to the pools.

199. Below the Milton Falls facility is a riffle reach approximately 130 feet in length which provides important aquatic habitat between Milton and the Peterson impoundment.

200. The riffles at the lower end of the bypass provide excellent habitat for invertebrates such as mayflies, caddis flies, and stoneflies. These invertebrates and other aquatic insects that inhabit flowing water are important food sources for fish.

201. The riffles in the Milton Falls bypass contribute to the fisheries of the Peterson impoundment by providing a feeding and spawning area for fish species such as sucker and minnow.

202. In 1990, CVPS consultant Jeffrey Wallin conducted a study, with input from the DFW, to determine minimum flow requirements needed to support aquatic life in the Milton Falls bypass.

203. For the 1990 study, the DFW identified the middle and north channels as areas of concern. DFW required the release of flows sufficient to maintain a wetted area within specified locations on the streambank. The locations on the streambank were established by DFW solely on the basis of a visual inspection. The record in this proceeding provides no scientific basis for the evaluation or the methodology used to determine either the "wetted area" or its relationship to providing high quality habitat.

204. CVPS determined that to achieve the wetted area requested by the DFW inspection, flows of 7 cfs in the north channel would be required. Without any modification of the ledge or other stream dynamics, a total bypass flow of 93 cfs was required to achieve 7 cfs in the north channel. The 93 cfs

flow results in a flow of 70 cfs in the middle channel.

205. In 1991, CVPS conducted a "refinement" or "reassessment" study of fisheries habitat needs in the middle channel of the Milton Falls bypass ("1991 Reassessment").

206. The 1991 Reassessment evaluated a variety of flows through the middle channel to determine incremental differences in the wetted area in the north channel.

207. The 1991 Reassessment studied flows metered at 14 cfs (leakage), 28, 40, 48, and 60 cfs. Since the 1991 Reassessment did not study any actual measured flow greater than 60 cfs, it leaves unanswered the extent to which habitat might improve with additional flows.

208. The 1991 Reassessment calculated WUA for a variety of macro invertebrates. For several reasons this study was not reliable.

209. The 1991 Reassessment recommended a minimum flow of 40 cfs in the middle channel of the Milton Falls bypass on the grounds that there is a distinct inflection point (leveling off) at 40 cfs on the curves that plot WUA versus flow. Two of the WUA curves, for "Stonefly" and for "Macroinvertebrate Community," actually showed a decrease in WUA when metered flows increased from 40 to 48 cfs.

210. The decrease in the WUA when flows increased from 40 to 48 cfs may have been due to CVPS's failure to maintain a constant water level in the Peterson impoundment during the data collection for the 1991 Reassessment. The Peterson impoundment apparently exerted a backwater influence on the lower transect when the data at measured flows of 24 and 48 cfs were collected.

211. The data collected in the 1991 Reassessment contain other discrepancies not explained by the Peterson backwater influence or by the study itself. For example, at the metered flow of 40 cfs, the flow measured at Transect 1 was 35 cfs, while a short distance downstream at Transect 2 the measured flow was 46 cfs, an increase of more than 30%. This anomaly is not attributable to Peterson backwater influence, because that would have reduced flows at Transect 2, not increased them. The data at Transect 2 showed that when flows *increased* by over 17 cfs, the wetted width of the river *shrank* by 11 feet and the average depth *dropped* by 0.22 feet.

212. The 1991 Reassessment also suffers from several methodological shortcomings. First, the study unrealistically assumed that the substrate is 100 percent suitable at all locations; second, it applied the wrong type of suitability index curves for the velocity measurements that it collected; and third, WUA values were not calculated individually for each cell and then summed.

213. While substrate does not change with flow, it does vary from cell to cell. If substrate in a cell is not suitable for the species or life stage of interest, it will remain unsuitable regardless of changes in depth and velocity. Substrate affects cell suitability and must be considered; omitting this variable introduces error.

214. The 1991 Reassessment therefore does not provide a reliable measure of aquatic habitat.

215. CVPS proposed to modify the channel hydraulics of the Milton Falls bypass by removing certain rock ledge, so that 7 cfs would pass through the north channel when 40 cfs is flowing in the middle channel.

216. CVPS did not present any testimony or exhibits demonstrating the design for, or feasibility of, accomplishing the proposed channel modification. Thus, there is no assurance that the work would result in the precise redistribution of flows intended. CVPS likewise presented no credible testimony analyzing the water quality or ecological impacts of its proposed channel modification and no evidence to show that its proposed channel modification would or could satisfy the requirements for a stream alteration permit under 10 V.S.A. § 1021.

Peterson

217. The steep sides of the Peterson impoundment are not conducive to the development of a highly productive littoral zone, and thus CVPS's proposed maximum drawdown of four feet between June 16 and March 20 would not jeopardize aquatic habitat in the impoundment.

218. Because the powerhouse at the Peterson facility is located immediately below the dam there is no bypass reach. At the base of Peterson dam there is a large plunge pool. Fish such as salmon seasonally migrate upstream into this pool. Immediately downstream of the plunge pool is a riffle reach.

219. In order to maintain habitat quality in the plunge pool and riffle reach, sufficient flow must be provided to maintain a continuous ZOP through the riffle reach, so that the plunge pool does not become isolated.

220. There are self-sustaining populations of a variety of warmwater fish species, including Northern pike, largemouth bass, and smallmouth bass in the Lamoille River downstream of the Peterson dam. This river reach also supports seasonal spawning runs of walleye and lake sturgeon.

221. Cold water species, including steelhead trout and salmon, seasonally inhabit the Lamoille River downstream of Peterson.

222. An IFIM study conducted by CVPS indicates that its proposal to operate the Peterson facility in a run-of-river mode from April 1 through June 15 would protect walleye and sturgeon spawning and incubation.

223. Historically, the lower Lamoille River supported abundant salmon and sturgeon spawning migrations, or runs. Landlocked Atlantic salmon (*Salmo salar*) ascended some distance up the Lamoille River, which is reputed to have been one of the best salmon rivers in Vermont. The historic upstream limit of salmon and sturgeon migration is uncertain.

224. Currently, steelhead, rainbow trout, brown trout, and salmon (collectively "salmonids") are stocked in the Lamoille downstream of the Peterson dam, and a salmonid run has been partially re-established.

225. The salmon migration and spawning period on the Lamoille River occurs during the approximate dates October 1 through November 15, whereas steelhead spawning occurs during the spring.

226. CVPS's proposed operation of the Peterson facility would result in fluctuations in the flow immediately downstream of the dam that would seasonally disrupt salmonid behavior and migration. Currently, adult salmon that migrate up to the vicinity of the Peterson dam are forced to move back downstream about one-half mile when the Peterson facility stops generating. The continued operation of this facility in a store-and-release mode during migration periods could severely limit the number of salmon that move upstream, adversely affecting both angling and the effectiveness of upstream fish passage facilities, when and if constructed.

227. Run-of-river operation of the Peterson facility during both the spring and

fall spawning and migration periods would best support spawning salmonids.

228. During fall salmon migration, flows significantly above the ABF may be necessary below Peterson to induce upstream migration. No evidence was introduced to establish the flows required to support steelhead migration.

229. A study of the behavior and movements of salmonids under various flow conditions, using methods such as radio telemetry, would allow the development of a specific seasonal operating protocol that would: (1) adequately attract migrating salmonids, (2) allow them to hold in the river without downstream drop-back, and (3) provide good angling opportunities.

230. CVPS conducted a ZOP study in 1991 in the riffle reach below the plunge pool ("Peterson ZOP study"). This study sought to identify the flow needed to ensure a ZOP of sufficient depth for smallmouth bass to swim upstream to the plunge pool.

231. The Peterson ZOP study design was approved by ANR and employed a minimum depth criterion of 0.6 feet (7.2 inches). This depth represents a bare minimum for smallmouth bass passage. In such shallow water the fish are more vulnerable to predation and are subject to physical injury from contact with rocks, as they seek to ascend a limited route.

232. The Peterson ZOP study measured water depths at four transects that spanned the river. Depth measurements were recorded at flows of 53, 97, and 111 cfs.

233. Based on the Peterson ZOP study, CVPS proposed a flow of 70 cfs as sufficient to provide a ZOP throughout the entire length of the riffle reach below Peterson dam. However, the ZOP study did not measure actual river depths at the flow of 70 cfs, but instead estimated those depths by interpolating data derived from the flows it did measure.

234. The Peterson ZOP study assumes that the river depth measured at each transect is representative of actual river depths between transects. However, the study showed that at 97 cfs, river channel depths were not uniform between two of the four transects.

235. The 0.6 foot minimum depth criterion for the Peterson ZOP study was

selected based upon scientific literature. This same scientific literature made recommendations for minimum widths at the shallowest cross sections of the reach being studied. These minimum width requirements were not met by the Peterson ZOP study.

236. A flow of 70 cfs below Peterson dam, less than half of the 7Q10 flow, might diminish the otherwise excellent bass habitat in the riffle reach. CVPS's proposal not to pass any flow under certain lake level conditions could be even more damaging from a habitat perspective.

237. Fish passage through the riffle would be facilitated by flows substantially higher than 111 cfs, the highest flow included in the Peterson ZOP Study. At such higher flows fish would be able to select from among a variety of ZOP routes.

238. The Peterson ZOP study did not attempt to determine habitat quality in the riffle reach.

239. The riffle reach below the plunge pool at Peterson, with sufficient water flows, contains good cover and would, with sufficient flows, provide excellent bass habitat. This riffle reach is especially important because it is the only habitat of its type in the 5.6 mile river reach between Peterson dam and Lake Champlain.

240. Because CVPS limited its aquatic habitat study below Peterson to the issue of ZOP, CVPS proposed a minimum downstream flow of 70 cfs only when the lake level was less than or equal to 95.3 ft. NGVD. At higher lake levels, CVPS proposed no minimum flow due to the influence of Lake Champlain's backwater effect.

241. The record is not sufficient to reasonably determine the point at which the Lake Champlain backwater influence might obviate the need for additional outflow from the Peterson Dam.

242. Even if lake levels of 95.3 feet NGVD result in sufficient inundation of the riffle reach to ensure a ZOP for smallmouth bass adults, the record is inadequate to show that additional flows from Peterson are not necessary to support other habitat-related flow requirements.

243. The 7Q10 flow in the reach below Peterson dam is 160 cfs, whereas the ABF is 392 cfs.

244. Each of the four CVPS facilities within the Project reach prevents fish from moving upstream past it, and impedes downstream migration as well.

245. The ANR is attempting to restore salmon to the Lamoille River and may also attempt to create a new run of migratory steelhead and rainbow trout. The Lamoille River, as a major tributary to Lake Champlain, is a component of the Lake Champlain Salmonid Restoration and Enhancement Program ("LCSREP").

246. The four CVPS facilities have eliminated much of the salmonid spawning and nursery habitat in the Lamoille River downstream of Fairfax Falls dam. This habitat has been eliminated directly, by inundating riverine habitat, or indirectly, by providing lacustrine habitat for warmwater fish that prey on salmonid fry. For adult salmonids to gain access to remaining spawning and nursery habitat above Peterson dam, upstream passage beyond the Project facilities would need to be provided; for post-spawn salmonids and smolts to reach Lake Champlain, downstream passage facilities would also need to be provided.

247. The long-term direction of the LCSREP is not expected to be decided until at least 1998, following the evaluation period for the sea lamprey control program. At that time, it is highly likely that the LCSREP will continue its efforts to restore salmonids to the Lamoille, and that fish passage facilities will need to be constructed.

248. CVPS has agreed to provide and maintain fish passage facilities if they are required.

F-2. Aesthetics

249. In 1990, CVPS retained Elizabeth Courtney, a licensed landscape architect, to study the visual aesthetics of water flow over the Fairfax Falls, Clark Falls and Milton Falls dams (“Courtney study”).

250. The Courtney study was specifically designed to respond to a FERC request for an evaluation of the minimum flows needed to provide “adequate visual aesthetic effect” at each of the four facilities in the Project reach.

251. The Courtney study and testimony addressed elements of aesthetic analysis

recognized by professionals in the landscape design field including, but not limited to, the uniqueness of the landscape feature, scale, scope, contrast, context, and naturalness. The Courtney study did not specifically address the standard required by the VWQS that the Project "consistently exhibit good aesthetic value."

252. The flows evaluated in the Courtney study were videotaped for subsequent review by the parties and the Board. The flows considered in this study were: 28, 58, 103, 229, and 315 cfs at Fairfax Falls; 9, 60, 100, and 160 cfs at Clark Falls; and 62, 86, and 150 cfs at Milton Falls. In each instance, water spilled across the entire length of the dam.

253. As a result of the study, Courtney recommended the lowest flow observed at each site as the minimum flow needed to provide an adequate visual effect: 28 cfs at Fairfax Falls; 9 cfs at Clark Falls; and 62 cfs at Milton Falls.

254. Fairfax Falls, Clark Falls, and Milton Falls are *water*-related landscape features. Water flowing over these falls is an essential part of the visual integrity of these landscape features.

255. Water-related landscape features, especially moving water, help provide contrast to a landscape, and contrast contributes significantly to the scenic quality of a landscape.

Fairfax Falls

256. Fairfax Falls is located within a recognized scenic area in the Town of Fairfax, which is oriented to tourism. The falls are adjacent to, and visible from, Vermont Route 104, a popular tourist route. The falls are also visible to canoeists and other river users from downstream and from the canoe portage area.

257. Fairfax Falls lies within a ten-mile reach of the river, from Fairfax Falls to Jeffersonville, that is listed in the U.S. Department of Interior's Nation-wide Rivers Inventory for its "outstandingly remarkable" scenic and botanical values. Only four other Vermont rivers have designated scenic reaches.

258. Fairfax Falls is one of twenty-two large Vermont falls and cascades that were identified in a study conducted in 1983 for the ANR and published

under the title of Waterfalls, Cascades and Gorges of Vermont. In this study, a waterfall or cascade with a vertical fall of greater than twenty feet was considered to be large. In the Lamoille River basin, there are only two other large cascades, one of which is Milton Falls.

259. Fairfax Falls is a unique scenic resource. The bedrock at Fairfax Falls consists of massive blocks of sandstone (green greywacke) that form an irregular series of ledges about 60 feet high, down which the river cascades in a series of low falls. The bedrock provides strikingly handsome colors and shapes. The diversity and uniqueness of the rock formation, in conjunction with the river itself, make this site especially appealing visually.

260. The rock formation cascading down from the dam creates a dramatic focal point. Such focal points are important considerations in assessing the aesthetics of landscapes.

261. Given the size of Fairfax Falls and its rock formations and the scale of the surrounding landscape, flows over the falls must be sufficient to appear in reasonable proportion to those surroundings. Flows that are too low do not appear "natural."

262. Flows of 28 cfs and 58 cfs are lower than would ever occur naturally on the Lamoille at Fairfax Falls. Such flows are not in scale with either the river or the surrounding landscape. Consequently, flows of 28 cfs and 58 cfs would appear extremely artificial and conspicuously out of scale. Higher flows are necessary to provide good aesthetic value.

263. ANR recommended that flows in the bypassed reach at Fairfax Falls be allowed to fluctuate between a daytime flow of 229 cfs and a nighttime flow of 100 cfs.

264. The water becomes a more dominant visual feature once flows reach 103 cfs. At this flow rate, water movement is much more pronounced to the right and left of the center of the Falls than at lower flow values, and the rock in the center channel becomes obscured. Flows less than 103 cfs are out of scale with the surrounding landscape.

Clark Falls

265. The Clark Falls area is visually dominated by the massive rock ledges of the

bypass and several major structural features, including the dam, powerhouse and connecting penstock, the U.S. Route 7 highway bridge, and two large buildings with a parking lot adjacent to the dam and bridge. There is a small park on the riverfront just upstream of the Route 7 bridge. The park affords a view of the cascades and dam through a chainlink fence.

266. The Courtney study included observations at flows of 9 cfs (leakage), 60 cfs, 100 cfs, and 160 cfs. As the flows increased from 9 cfs to 160 cfs, there was more aerated water, producing a frothy effect, in contrast to the dark rock formation.

267. Ms. Courtney concluded from the study that 9 cfs is the minimum flow needed at Clark Falls to provide an adequate visual effect. However, a flow of at least 60 cfs is needed to produce a clear impression of flowing water over the rocks by the small park, and to provide contrast with the dark rock formations in the bypass reach.

Milton Falls

268. Milton Falls is located in a broad wooded ravine near Milton village. Below the dam, a cascade drops about 20 feet, followed by a 15-foot falls into a large pool. Below this lies a visually complex area of rocks, channels, and pools, in which the water divides into two gorges. At the side of the south gorge is a 30-foot high waterfall.

269. Milton Falls is a combination cascade and gorge. According to the 1983 ANR publication Waterfalls, Cascades and Gorges of Vermont, it is one of 22 large waterfalls or cascades and one of 16 large gorges in Vermont. Only one other large gorge (Brewster River Gorge) lies within the Lamoille River basin.

270. Milton Falls and the associated gorge are identified in the 1983 ANR publication as a feature of statewide significance because it is one of the three largest limestone gorges in western Vermont. There are only five other comparable limestone gorges in Vermont, and only one (Quechee Gorge) that is significantly larger and more spectacular. The most important distinctive characteristics of the Milton Falls gorge are its size and sculptured rock formations.

271. Ms. Courtney concluded from the study that 62 cfs is the minimum flow

needed in the Milton Falls bypass to provide an adequate visual effect, because all three observed flows created similarly frothy and turbulent water which provided high visual contrast with its surroundings.

272. Ms. Courtney's testimony did not address the relative uniqueness of Milton Falls as a waterfall of statewide significance nor did it evaluate the effect of the Project on the natural character of those falls.

273. While water in the two gorges at Milton Falls exhibits some frothiness at at 62 cfs proposed by CVPS, the falls do not become dominant visual features in scale with the surrounding landscape until the total bypass flow at the Milton facility reaches approximately 150 cfs.

274. Access to Milton Falls itself is limited, but the waterfalls are visible to canoeists and other river users. The falls also can be viewed from a promontory of land dividing the two channels.

275. CVPS has proposed to modify the bypass by removing ledge to change the natural distribution of flows between the north and middle channels. Ms. Courtney did not assess the aesthetic impact of CVPS's proposed channel modification. CVPS's proposed channel modification might create an artificial, engineered appearance in comparison to the natural, smooth rock features, but because CVPS provided no evidence addressing the design of the proposed modifications it is impossible to assess the actual aesthetic impacts upon Milton Falls.

For All Three Upper Falls

276. To support consistently good aesthetic value at the dams at Fairfax Falls, Clark Falls and Milton Falls, water should be spilled evenly across the entire crest of each dam.

Peterson

277. Natural falls no longer exist at the Peterson facility. The large concrete dam, the bedrock walls on river right, and the river dominate views from the riverbank access points below the facility.

278. The Courtney study for CVPS did not assess the aesthetic impacts at the Peterson facility. Likewise, neither VNRC nor ANR prepared aesthetics

studies relating to the Peterson facility.

F-3. Recreation

279. The Project reach offers a variety of opportunities for both lake and river recreation, including swimming, fishing, and boating. Boating includes both flatwater and whitewater canoeing on the river and the use of motorized and non-motorized craft on the impoundments, especially on Arrowhead Reservoir.

280. The large pool in the Milton Falls gorge is used for swimming by local youngsters. CVPS allows, but does not encourage, swimming in this area.

281. The ANR publication Waterfalls, Cascades and Gorges of Vermont rates the Milton Falls gorge as highly important for swimming.

282. The 7Q10 flow at Milton Falls is 159 cfs and the ABF is 386 cfs. However, these flows may be too high to allow safe swimming in some of the pools within the gorge.

283. Within the Project reach, the Lamoille River and the impoundments provide diverse and valuable recreational fishing opportunities.

284. A 1.6-mile reach of the river downstream of the Fairfax dam is part of a special trout management program initiated in 1994 on only three Vermont river reaches statewide. These reaches will be stocked with two-year old trout to give anglers an opportunity to catch large trout under restrictive creel limits.

285. Arrowhead Reservoir provides fishing for smallmouth bass, walleye, northern pike, chain pickerel, yellow perch, and other panfish.

286. Downstream of Peterson Dam, anglers fish for walleye, salmon, and steelhead trout that seasonally migrate into the river from Lake Champlain.

287. The Lamoille River in the Project reach is a navigable and boatable water of the State.

288. The river downstream from Fairfax Falls to the inlet to Arrowhead Reservoir consists of a series of Class I and Class II rapids including the challenging Two Island Rapids and the Five Chutes. This 6-mile reach is

one of only two remaining extensive sets of whitewater rapids on large rivers in the State. It is considered of high importance for whitewater boating.

289. Arrowhead Reservoir provides a variety of recreational boating opportunities for motorized and nonmotorized vessels.

290. CVPS's four dams, like the natural falls and cascades that existed earlier at these sites, impede passage during low water for some forms of recreational boating on the Lamoille River. However, CVPS has installed canoe portages at Fairfax Falls and the Peterson dam, and a combined portage around Clark Falls and Milton Falls.

291. CVPS has agreed to maintain its current canoe portages for the full term of the new FERC License for these hydroelectric facilities.

III. CONCLUSIONS OF LAW

A. STANDARD OF REVIEW AND SCOPE OF REVIEW

Title 10 V.S.A. § 1024(a) provides that an appeal of a § 401 water quality certificate ("§ 401 certificate") to the Board "shall be *de novo* and shall be conducted as a contested case." The Vermont Supreme Court has held that "[i]n a *de novo* proceeding, the [reviewing] Board is required to hear the matter as if there had been no prior proceedings." In re Killington Ltd., 159 Vt. 206, 214 (1992). The Board in its Preliminary Rulings addressed the scope of review and acknowledged the requirement to hear this matter as if there had been no prior proceeding. In re: Lamoille River Hydroelectric Project, Preliminary Rulings, Dockets No. WQ-94-03 and WQ-94-05 at 2-3 (Aug. 15, 1995).

In this consolidated appeal the Board has afforded all parties an opportunity "to respond and present evidence and argument on all issues involved," as required by the Vermont Administrative Procedure Act ("Vermont APA"). 3 V.S.A. § 809(c). As in any proceeding that is quasi-judicial in nature, the process of decision in a § 401 certificate appeal must be governed by the principle of the exclusiveness of the record.[1] The

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[1] Neither the document entitled "Questions and Answers on Antidegradation" nor the "Cavendish Hydroelectric Project Water Quality Certificate Public Responsiveness Summary," both of which were appended to VNRC's proposed findings and conclusions, was relied upon by the Board, because neither was properly introduced as evidence in this matter.

applicability of a *de novo* standard requires the Board to collect new evidence and to create a comprehensive record upon which a decision shall be based.

B. BURDEN OF PROOF

The general rule in administrative proceedings is that the applicant or petitioner bears the burden of proof. 73A C.J.S. *Public Administrative Law And Procedure* §128 (1983). This general rule has been followed by both the Vermont Supreme Court and the Board. Petition of Lyndonville Village, 121 Vt. 185, 190-191 (1959); In re: Champlain Oil Company, Docket No. CUD-94-11, Findings of Fact, Conclusions of Law, and Order (Oct. 4, 1995, *revised* Nov. 1, 1995) at 11. CVPS is the applicant in this proceeding and, therefore, it bears the burden of proof.

The burden of proof is generally considered to include both the burden of production and the burden of persuasion. The burden of production, in this *de novo* appeal, means the burden of producing sufficient evidence upon which the Board can make positive findings that the proposed operational protocol of CVPS's Project complies with the applicable provisions of sections 301, 302, 303, 306 and 307 of the Federal Clean Water Act "and with any other appropriate requirement of State law." 33 U.S.C. § 1341. At a minimum, limitations imposed by state water quality standards adopted pursuant to § 303 are "appropriate" requirements of state law. P.U.D. No.1 of Jefferson County and City of Tacoma v. Washington Department of Ecology, 114 S.Ct. 1900, 1910 (1994) ("Tacoma").

The burden of persuasion refers to the burden of persuading the Board that certain facts are true. *See* Re: Killington, Ltd. and International Paper Realty Corp., #1R0584-EB-1, Findings of Fact and Conclusions of Law and Order (Revised) at 21 (Sep. 21, 1990). Generally, the party with the burden of persuasion must establish the elements of its case by a preponderance of the evidence. That generally occurs when the factfinder is satisfied that a proposition is more likely to be true than not true. 29 Am. Jur. 2d *Evidence* § 157 (1994). The Vermont Supreme Court has provided further guidance with respect to the allocation of the burden of proof, specifically the risk of non-persuasion in an administrative proceeding. "The fact that a party has the burden of proof does not mean that he must necessarily shoulder it alone; it simply means that he, and not the other party, bears the risk of non-persuasion." In re Quechee Lakes Corporation, 154 Vt. 543, 553 (1989). Here, as in Quechee Lakes Corp., the Board is at liberty to consider all of the evidence, including that garnered from parties other than CVPS and by the Board itself during its site visit, in determining whether the applicant has met its burden of persuasion.

For the reasons set forth in these Findings of Fact and Conclusions of Law, the Board concludes that CVPS has not proven by a preponderance of the evidence that its

proposed operating protocols would provide the level of water quality required by the VWQS in the Lamoille River. The Board has also found insufficient evidence in the record upon which to formulate its own conditions that would ensure compliance with the VWQS and other applicable state law. Consequently, the Board concludes that there is insufficient evidence upon which to grant a Certificate to CVPS.

C. COMPLIANCE WITH CLEAN WATER ACT SECTION 401

1. Section 401 of the Clean Water Act

Section 401(a)(1) of the CWA requires:

> Any applicant for a Federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may result in any discharge into the navigable waters, shall provide the licensing or permitting agency a certificate from the State in which the discharge originates, or will originate, . . . that any such discharge will comply with the applicable provisions of sections 301, 302, 303, 306, and 307 of th[e Clean Water] Act.

33 U.S.C. § 1341(a)(1). CVPS's application for the present FERC License triggers the requirement for a § 401 certificate.

CWA § 401(d) requires a project subject to federal licensure to comply with "any applicable effluent limitations and other limitations . . . and with any other appropriate requirement of State law." 33 U.S.C. § 1313(d). In Tacoma, the U.S. Supreme Court determined that, although not specifically listed in Section 401(d), Section 303 of the CWA is incorporated by reference into Section 401(d), so that state water quality standards are "other limitations" as a matter of law.[2] Tacoma, 114 S.Ct. at 1909. The Supreme Court in Tacoma also made clear that state water quality standards include both designated uses and water quality criteria:

> [T]he language of § 303 is most naturally read to require that a project be consistent with *both* components, namely the designated use *and* the water quality

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The Tacoma Court declared:

> As a consequence, *state water quality standards adopted pursuant to § 303 are among the "other limitations" with which a State may ensure compliance through the § 401 certificate process*. This interpretation is consistent with EPA's view of the statute [citations omitted]. Moreover, limitations to assure compliance with state water quality standards are also permitted by § 401(d)'s reference to "any other appropriate requirement of State law."

Id. (emphasis added).

> criteria. Accordingly, under the literal terms of the statute, a project that does not comply with a designated use of the water does not comply with the applicable water quality standards.

Id. at 1910 (emphasis in original).

In addition, where other applicable state law relating to water quality would guide the Board's review of a § 401 certificate on appeal, such law is deemed an appropriate state law requirement that is binding on the applicant. As the Oregon Court of Appeals has declared, "only if a [state law provision] has absolutely no relationship to water quality would it not be an 'other appropriate requirement of State law.'" Arnold Irrigation District v. Department of Environmental Quality, 717 P.2d 1274, 1279 (Or. App. 1986), *review denied*, 726 P.2d 377 (1986). The Vermont Supreme Court has likewise acknowledged that the CWA allows the state to impose conditions in a § 401 certificate to ensure an applicant's compliance with certain criteria, including "any other appropriate requirement of State law." Georgia Pacific Corporation and Simpson Paper (Vermont) Co., Inc. v. Department of Environmental Conservation and Sierra Club, Vermont Supreme Court Docket No. 91-530 at 3, 628 A.2d 944 (1992) (table) ("Georgia Pacific"), *citing*, 33 U.S.C. § 1341 (d).

In short, § 401 requires states to certify compliance with state water quality standards. State of Washington, Department of Ecology v. P.U.D. No. 1 of Jefferson County and City of Tacoma, Department of Public Utilities, 849 P.2d 646, 650 (1993), *aff'd*, Tacoma, 114 S.Ct. 1900 (1994). Other state law may also be applicable. For example, the Vermont Wetland Rules are applicable where protected wetland resources are affected by a project. 10 V.S.A. § 1021, governing stream alteration permits, may also be applicable.

As is more fully explained below, CVPS has submitted insufficient evidence to demonstrate that its proposed operating protocol for the Project complies with the VWQS.

The parties have identified the proposed license term as a period lasting between 30 and 50 years. The Federal Power Act appears to allow FERC to issue a permit for an unspecified term. When a hydroelectric project is being reviewed for compliance with § 401 of the CWA, however, it is imperative that the certifying agency fully understand the ramifications of its decision, including the length of time over which it is certifying compliance. The extreme unpredictability of changing conditions that might affect water quality over a long period of time strongly suggests the need for review of compliance with contemporary rules, including the applicable provisions of the VWQS, at least once every 30 years. See for example, Confederated Tribes and Bands v. FERC, 746 F.2d 466,

476-77 (9th Cir. 1984).

D. COMPLIANCE WITH VERMONT WATER QUALITY STANDARDS

As required by CWA § 303(c)(2)(A), the VWQS include both "designated uses . . . and the water quality criteria for such water based upon such uses." 33 U.S.C. § 1313(c)(2)(A); *see* Tacoma at 1910. Standards adopted by Vermont, or any state, are required to take into consideration the use and value of those waters for, among other objectives, "propagation of fish and wildlife [and] recreational purposes." CWA § 303(c)(2)(A), 33 U.S.C. § 1313(c)(2)(A).[3]

Designated uses are specified in the water quality standards for each waterbody or segment, whether or not they are being attained. Such designated uses include such categories as public water supply; the protection and propagation of fish, shellfish and wildlife; recreational uses; and agricultural and industrial uses. The VWQS use the phrase "beneficial values and uses" rather than "designated uses." The terms are synonymous. The VWQS also set out criteria necessary to support such values and uses.

In addition to the beneficial values and uses and the related criteria, the VWQS set forth other relevant requirements, as well as general policies for the management of the waters of Vermont. Among these is the policy to "protect and *enhance* the quality, character and usefulness of its surface waters and to assure the public health." VWQS §1-02(A)(1) (emphasis added). The VWQS also echo the state water quality policy adopted by the Vermont Legislature that "[i]t is further the policy of the state to seek over the long term to *upgrade* the quality of waters and to reduce existing risks to water quality." 10 V.S.A. § 1250 and VWQS §1-02(A) (emphasis added).

The Anti-degradation Policy in the VWQS provides:

> The Secretary shall manage the waters of the State in accordance with the Water Quality Standards to protect, maintain and *improve* water quality in such a manner that the beneficial values and uses associated with their classification are attained. All waters, except mixing zones, shall be managed so that, at a *minimum*, a level of water quality compatible with all beneficial values and uses associated with the assigned classification is obtained and maintained.

VWQS § 1-03(A) (emphasis added). There was no evidence in the record to show that

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3 Because CVPS submitted its application for a § 401 certificate to the ANR on April 16, 1993, the VWQS that apply in this proceeding are those adopted on April 17, 1991.

there are any mixing zones within the Project reach and therefore no need to determine whether the VWQS for Class B waters should be relaxed in any particular river segment.

The clear directive to not only protect but also to enhance, upgrade, and improve water quality, as well as to maintain at least the minimum allowable level of water quality which secures all beneficial values and uses, must guide the Board's application of the VWQS. The Board further notes that the directive to enhance, upgrade, and improve water quality is in concert with the general policy statement of the CWA to "*restore* and maintain the chemical, physical, and biological integrity of the Nation's waters." 33 U.S.C. § 1251(a) (emphasis added).

CVPS's proposed operational protocol would result in a limited enhancement in water quality over current conditions.[4] However, more is required in order for CVPS to satisfy its burden of proof. CVPS must also affirmatively demonstrate that its proposal would comply with each of the applicable provisions within the VWQS for each facility throughout the Project reach. As the Board has noted in another § 401 proceeding in which CVPS is the applicant:

> CVPS, as applicant for 401 certificates for its hydroelectric facilities, has an obligation to remediate water quality conditions further degraded by the presence and operations of its dams. Such facilities must not only meet water quality criteria, taking into consideration the rules' Anti-degradation Policy and present in-stream conditions, but must also attain the designated uses ("beneficial values and uses" as specified in the VWQS) for the public waters in the reaches where those facilities exist.

In re: Passumpsic River Hydroelectric Projects, Memorandum of Decision at 8 (August 15, 1995) ("Passumpsic").

All waters within the Project reach are designated as Class B waters pursuant to 10 V.S.A. § 1253(b) and the Classification Order for the Lamoille River dated February 13, 1970. The VWQS at § 3-03(A) establish the following beneficial values and uses for Class B waters such as the Project reach of the Lamoille River:

Class B waters shall be managed to achieve and maintain a high level of quality,

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[4] The Board recognizes that some enhancement in water quality within the Project reach would result from the adoption of CVPS's proposed operational protocol. The Board therefore strongly encourages CVPS to immediately implement the improvements that it has proposed such as limiting drawdowns at Arrowhead Reservoir and converting the Fairfax Falls facility to instantaneous run-of-river mode.

that is compatible with the following beneficial values and uses:

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

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

The beneficial values and uses established by the Class B designation of the waters of the Project reach have not been removed or modified.[5] The beneficial values and uses of particular significance in this proceeding are the values for aquatic habitat, aesthetics, and recreational uses. The water quality criteria ("criteria") of particular significance to the current proceeding are those for D.O. and temperature. VWQS §3-01(B)(1) and (2).

Chapter 2 of the VWQS provides additional guidance for the application of the standards. In particular, § 2-02(B) addresses application of the VWQS under artificial flow conditions. It provides 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*" (emphasis added). This requirement must be read in conjunction with § 3-03(A) of the VWQS, which sets forth a positive standard. In order to comply with the VWQS, a § 401 applicant must carry its burden of proving that its project will conform with the specific standards set forth at § 3-03(A). For example, where the VWQS require that Class B waters be managed to provide high quality aquatic habitat, or consistently exhibit good aesthetic value, the applicant must comply with those affirmative directives of the VWQS.

Section 2-02(B) also acknowledges the additional requirement in the VWQS that "existing uses" be protected. Section 1-03(B)(1) of the VWQS provides that "[e]xisting water uses and the level of water quality necessary to protect those existing uses shall be maintained and protected." This section specifies that the determination of existing uses shall be made on a case-by-case basis, taking into account beneficial values and uses and other factors such as habitat, including wetlands, and fish and aquatic life present in the water body.

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Federal law provides for the removal of designated uses, otherwise required by a classification, on a site-specific basis through the "use attainability analysis" process. 40 C.F.R. 131.10 (I), (j), and (k). A use attainability analysis may include a consideration of economic factors. 40 C.F.R. 131.3.

The VWQS further provide that if the existing use of a water body includes use by aquatic biota, fish or wildlife, a § 401 water quality certificate can be issued only if the activity would not have a "significant impact" on that use. "Significant impact" means:

> Impairing the viability of the existing population, including significant impairment to growth and reproduction or an alteration of the habitat which impairs viability of the existing population . . . .

VWQS § 1-03(b)(2). Population viability is a measure that focuses not on a mere "snapshot" of existing populations of aquatic biota, but rather on the assessment of habitat conditions that are necessary for the reproductive success of existing organisms, and the assurance of self-sustaining populations. Thus, where aquatic habitat issues are at stake, the applicant must demonstrate not only that the project will provide high quality aquatic habitat in general, but it must, in addition, ensure that its project does not result in a significant impact upon the viability of existing populations.

The Board is not authorized by applicable state law to consider evidence regarding economic or societal impacts in deciding whether an existing hydroelectric facility should receive a § 401 certificate, as CVPS has suggested. Such impacts are properly considered prior to the § 401 certification process through the establishment of water quality management goals for the waters in question (i.e. the classification process) and the adoption of specific policies and criteria in the VWQS. Both the classification of any water body and the specific policies and criteria in the VWQS are adopted in a public rulemaking process and are subject to revision or amendment by petition as provided for in 3 V.S.A. § 806 and 10 V.S.A. § 1253. As such, they reasonably reflect management goals that have previously been determined to be in the "public interest."

As the Board noted in a recent memorandum of decision in another § 401 certification appeal involving CVPS hydroelectric facilities, a general determination of what is in the "public interest," including consideration of relevant economic and societal issues, is properly made in the context of a classification or reclassification proceeding under 10 V.S.A. § 1253. Passumpsic at 7. In a classification or reclassification proceeding the Board may properly consider a wide range of issues, including the costs of energy production and other societal impacts. Consideration of other societal impacts may include the evaluation of: existing and potential uses of the water for industrial and other legitimate purposes, consistency with the state water quality policy (10 V.S.A. § 1250), consistency with state plans, and any other factors relevant to determining the maximum beneficial use of the waters. 10 V.S.A. § 1053(e)(2), (3), (5), (9), and (10).

Moreover, within the constraints established by state statute and federal law, the Board considers broad public interest issues, including economic and societal impacts, when it adopts by rule specific policies and criteria in the VWQS. See 3 V.S.A. §§ 801 - 849. Thus, economic and societal impacts and a broad determination of the public interest are decided legislatively, either in the enactment of the underlying state and federal statutes or in rulemaking proceedings authorized by those statutes.

When a Certificate is appealed under 10 V.S.A. § 1024(a), as in this case, the Board is required to determine whether the project under consideration complies with the public interest as previously determined and expressed in the VWQS and other applicable state law as they exist at the time of that application. Further consideration of economic and societal impacts is limited to the application of the express provisions of the Anti-degradation policy (VWQS § 1-03). As noted in the Board's Preliminary Rulings, the applicability of the Anti-degradation Policy in this proceeding has been waived by the parties.

The approach adopted by the Board in this case is to identify discrete segments of the "river" in which compliance with a given criterion, use, or value is in issue. This approach facilitates review based on the Project's impacts. In its Preliminary Rulings in Passumpsic, the Board specifically noted that an applicant must "attain the designated uses . . . for the public waters *in the reaches where those facilities exist*." Passumpsic at p. 8 (emphasis added). EPA's regulations also recognize that designated uses and water quality criteria must be achieved throughout the impacted waters, including each affected segment of the river. *See* 40 CFR § 131.3(f).

1. The VWQS and Default Minimum Aquatic Habitat Flow Requirements

In accordance with the statutory definition of Class B waters, the VWQS require that high quality habitat be provided for "aquatic biota, fish and wildlife." However, the VWQS do not specify how the minimum flows necessary to meet this requirement should be determined.

The USFWS Flow Policy guides the formulation of recommendations that the USFWS makes to other regulatory agencies on issues relating to minimum stream flow. This Policy is not designed to set minimum flows that meet a specified regulatory standard, such as providing high quality aquatic habitat, but rather is, by its own words, intended "to encourage releases that perpetuate indigenous aquatic organisms."

The USFWS Flow Policy establishes a default minimum flow requirement of ABF, except when superseded by specified seasonal spawning and incubation requirements. This Policy encourages the development of project-specific studies to

determine site-specific minimum aquatic habitat flow needs. This Policy makes no distinction between hydroelectric projects and other projects affecting stream flow. Where hydroelectric projects are at issue, the Policy also makes no distinction between the bypassed reach and the reach downstream of the tailrace.

The ANR Flow Procedure is generally modeled on the USFWS Flow Policy, although it is different in some key areas. This procedure serves to guide ANR's recommendations to other regulatory agencies, as well as regulatory decisions made directly by ANR, including decisions on applications for water quality certifications pursuant to Section 401 of the Federal Clean Water Act. Because ANR is the Vermont agency with the initial jurisdiction to make such decisions and is responsible for implementing the VWQS generally in a variety of regulatory settings, the Board has looked carefully at the ANR Flow Procedure in its evaluation of the record in this proceeding.

The USFWS Flow Policy and the ANR Flow Procedure provide frameworks for analyzing minimum flows needed to meet the aquatic habitat requirements of the VWQS. However, these procedures are not dispositive in determining compliance with the VWQS. Indeed, the Board notes two of their potentially important limitations.

First, neither procedure has been adopted via a formal rulemaking process in which the scientific methodology upon which it is based has been subjected to the full rigors of public review and comment. Additionally, there has been no showing of a clear nexus between the range of flow values determined under these procedures and the range of water quality criteria and other requirements of the VWQS.

The Board notes that both procedures establish default minimum aquatic habitat flow values based on historical flow records and provide for the determination of different acceptable minimum flow values based on site-specific studies, such as the USFWS's IFIM protocols. The Board accepts in concept the approach, followed in both procedures, of establishing a default minimum aquatic flow value for use in the absence of creditable site-specific studies. However, the Board expresses a clear preference for flow values based on site-specific studies. Moreover, the Board reiterates that any default minimum flows must meet all the requirements of the VWQS, of which the provision of "high quality habitat" was only one, albeit a major, consideration in this proceeding.

Unlike the USFWS Flow Policy, the ANR Procedure makes a distinction between the river reach downstream of the project tailrace and the bypassed reach between the intake and the tailrace. In the bypassed reach the ANR Procedure requires a case-by case analysis, but generally establishes flows of at least 7Q10 as the default minimum aquatic habitat flow. The scientific basis for establishing the 7Q10 flow as the "general"

default aquatic habitat flow in the bypassed reaches is not clear. Unlike the ABF, which has been shown to be an aquatic habitat based flow, the 7Q10 represents a drought flow condition used in the VWQS to measure the adequacy of treatment for potential discharges. On the basis of the record in this proceeding, the Board cannot conclude that the use of 7Q10 as a default bypass flow would be consistent with the provision of high quality habitat.

The Board notes that the ANR did not follow its own procedure in this proceeding when it determined minimum flows necessary to meet all the requirements of the VWQS. ANR approved minimum flows in bypass reaches substantially below the default minimum flow of 7Q10 without either requiring site-specific studies by CVPS or conducting its own site-specific studies to justify such a result. In addition, ANR approved minimum flows downstream of the tailrace at the Peterson facility well below the default minimum flow of ABF required by both the USFWS Flow Policy and the ANR Flow Procedure without either requiring site specific studies by CVPS or conducting its own site-specific studies to justify such a result. The reasons for these deviations from its own flow procedure were not adequately explained.

2. Criteria

Section 3-01 of the VWQS sets forth general water quality criteria applicable to all classes of water, except mixing zones, while Section 3-03(B) describes additional criteria specifically applicable to Class B waters. Each of CVPS's Lamoille facilities within the Project reach must comply with the following criteria in order to receive a § 401 certificate.

a. Dissolved Oxygen

The VWQS establish minimum D.O. levels for cold water and warm water fish habitats. For cold water fish habitat, the VWQS require that not less than 6 milligrams per liter ("mg/l") or 70 percent saturation be achieved at all times. For warm water fish habitat, the minimum D.O. requirements are not less than 5 mg/l or 60 percent saturation at all times. VWQS § 3-01(B)(1). The reaches of the Lamoille River affected by the CVPS hydroelectric facilities are designated cold water fish habitat, except for warm water habitat in Arrowhead Reservoir and seasonally in the river below Peterson dam.

The D.O. criteria in the VWQS are designed to support the beneficial value of providing high quality aquatic habitat. Thus, maintenance of adequate D.O. furthers the objective that "Class B waters shall be managed to achieve and maintain a *high level of quality*, that is compatible with . . . [w]ater of a quality that consistently . . . provides *high quality* habitat for aquatic biota, fish and wildlife." VWQS § 3-03(A)(1) (emphasis

added).

CVPS's proposed operational protocol failed to reliably ensure compliance with D.O. criteria from the Clark Falls tailrace to the upstream limit of the Lake Champlain backwater. CVPS's protocol is based on the premise that if minimum D.O. criteria are met at the Clark Falls tailrace, minimum required D.O. levels will necessarily be attained at all downstream locations as well. No study or modeling to test the validity of this assumption was introduced into evidence. As indicated in Findings 116-120, the limited D.O. analysis that CVPS did introduce as evidence was conducted under conditions which do not reflect typical operational conditions. The Board declines to extrapolate D.O. measurements from this limited database; to do so would be purely speculative.

Because CVPS has failed to prove that the minimal flows it proposed to release at Clark Falls would ensure compliance throughout the lower Project reach, the Board has no reasonable basis upon which to issue a certificate for the Project to be operated in the manner proposed by CVPS. Neither is the Board able, from information in this record, to formulate other conditions which would ensure compliance with the D.O criteria of the VWQS. The Board concludes that CVPS has failed to prove that its proposed operational protocol would ensure compliance with the D.O. criteria of the VWQS throughout the Project reach.

b. Temperature

The Board concludes that CVPS has failed to show that its proposed operational protocol would ensure compliance with the criteria for temperature in the VWQS in the lower pool of the Fairfax Falls bypass, as well as in other shallow pools or slow-moving segments, during the warm summer months.

3. Beneficial Values and Uses

Compliance with the VWQS is not achieved merely by complying with minimum numeric criteria of the VWQS. For example, merely maintaining the minimum levels of D.O. to satisfy that single criterion does not ensure compliance with the VWQS as a whole. Indeed, the weight of the evidence supports the conclusion that sustaining minimum D.O. levels over an extended period of time in the Project reach would be highly stressful for fish. Section 303 of the CWA provides that state water quality standards "shall consist of the *designated uses* of the navigable waters involved and the water quality criteria for such waters *based upon such uses*." 33 U.S.C. § 1313(c)(2)(A) (emphasis added). Both the VWQS and the CWA therefore emphasize that achieving beneficial values and uses are of paramount concern.

a. Aquatic Habitat

Section 3-03(A)(1) of the VWQS requires that, as Class B waters, the Project reach of the Lamoille River be managed to achieve and maintain "high quality habitat for aquatic biota, fish and wildlife." Aquatic biota are defined in the VWQS to mean "all organisms that spend all or part of their life cycle in or on the water." VWQS § 1-01(B)(4). Although habitat is not specifically defined in the VWQS, it can be defined as the sum of environmental conditions in a specific area occupied by an organism, population, or community of species. Aquatic habitat includes both the biological community and the physical environment.

The Board has relied on information about individual species of fish to assess aquatic habitat for the purpose of determining compliance with the VWQS. The reasons for this are twofold: 1) the testimony provided by the parties on the issue of aquatic habitat generally pertained to specific species, typically, sport fish; and 2) the "guild approach" to assessing habitat in a given context relies on data regarding abundance and feeding habits of one or two organisms, often called "keystone species," as the basis for conclusions about the health of an entire trophic structure, the broader community, and, to some degree, water chemistry.

The parties have presented data and prepared limited analysis of habitat needs of species which, if not "keystone species," are at least appropriate biological indicators. From these incremental data, the Board may draw a reasonable inference as to whether the entire Project reach provides high quality habitat. For example, salmonids, which are cold water fish, have demanding habitat and flow requirements. Certain salmonids, most notably the Atlantic salmon, are species which are indigenous to the lower Lamoille River. Maintenance of high quality salmonid habitat in the cold water fisheries will most likely provide high quality habitat for other species, including invertebrates, in those reaches.

CVPS has failed to meet its burden of proving that its proposed operational protocol will achieve and maintain high quality habitat for aquatic biota, fish and wildlife in the affected reaches of the Lamoille River.

i. *Fairfax Falls*

CVPS's proposed conversion of the Fairfax Falls facility to a true run-of-river facility would provide high quality, free-flowing riverine habitat downstream of the project tailrace. This mode of operation would reduce some current adverse water quality impacts from its Project and would benefit aquatic habitat between the Fairfax Falls tailrace and Arrowhead Reservoir. However, water used for power generation bypasses a 550-foot reach of the river between the dam and powerhouse. With sufficient flows, the lower pool and riffle area of the bypass reach can provide valuable aquatic habitat.

CVPS has failed to discharge its burden of proving that a proposed bypass flow of 28 cfs at Fairfax Falls would provide high quality aquatic habitat in the lower pool and riffle area. In addition, CVPS and ANR failed to provide evidence to support ANR's proposal to allow flows to vary between 100 cfs (at night) and 229 cfs (during the day). Indeed, ANR's own fisheries biologist stated that, from a habitat standpoint, he would prefer a consistent flow at all times. The Board concludes that such a fluctuation of flows has not been shown to consistently provide high quality aquatic habitat in the Fairfax Falls bypass.

ii. *Arrowhead Reservoir*

CVPS has not demonstrated that its proposed drawdowns of Arrowhead Reservoir would provide high quality habitat for aquatic biota, fish, and wildlife.

Reservoir drawdowns limited to a maximum of one foot between April 1 and June 15, and a maximum of two feet during the rest of the year, would support high quality aquatic habitat. In addition, drawdowns required for flood control measures or dam repairs that are authorized in advance by the governing agency would not jeopardize compliance with the VWQS.

CVPS proposes two additional exceptions to the two-foot restriction from June 16 to March 31: NEPOOL requests and forecasted high water. CVPS contends that drawdowns for NEPOOL and for projected high water would occur extremely infrequently and for only a limited duration. However, both the unpredictable frequency and unknown duration of such drawdowns warrant a denial of CVPS's proposal to depart from the two foot limitation. The Board concludes that CVPS has furnished insufficient evidence to prove that such a drawdown, even if conducted only once annually, would be consistent with maintaining high quality habitat in Arrowhead Reservoir.

The proposed three and one-half foot drawdowns would dewater 120 acres of the littoral zone of the reservoir, whereas two foot drawdowns would dewater only approximately 11 acres. Three and one-half foot drawdowns also could significantly degrade the wetland areas in the northern end of the reservoir and preclude the maintenance of a healthy community of aquatic plants. Aquatic plants, as organisms that spend all or part of their life cycles in water, are "aquatic biota" for which high quality habitat must be maintained. VWQS § 1-01(B)(4). These plants also provide important habitat for fish, invertebrates, and wildlife. With more nearly stable water levels, the littoral zone would provide more valuable habitat for fish spawning, rearing, and cover, and for the invertebrates on which young fish feed.

iii. *Clark Falls*

In the Clark Falls bypass, even at flows higher than the leakage flow proposed by CVPS, the nature of the substrate and the rock ledges could limit its value as aquatic habitat.[6] However, ANR suggested that because the Clark Falls facility discharges directly into the Milton impoundment, there are no riverine aquatic habitat issues between Clark Falls and the Milton Falls facilities. The Board declines to adopt ANR's suggestion. The Board concludes that while the aquatic habitat value of the Clark Falls bypass reach may be limited, evidence in the record does not allow the fixing of minimum flows to preserve whatever habitat value exists there.

iv. *Milton Falls*

The Milton Falls bypass, with sufficient flows, can provide excellent habitat for fish and invertebrates. Except for a short riffle area immediately downstream, it is the only unimpounded reach of river between the Milton Falls and Peterson dams.

The Board concludes that CVPS failed to prove that its proposal to limit flows to 47 cfs in the Milton bypass complies with the VWQS and other applicable law. The Board also concludes that no evidence was presented to show that CVPS's proposal to remove ledge from the Milton Falls bypass has obtained the approval required by state law to conduct ledge alteration. Moreover, CVPS failed to demonstrate that the proposed flow redistribution would in fact be achieved with the channel modification. The proposed channel modification also risks permanent degradation of the aquatic habitat. Finally, CVPS failed to meet its burden of proving that a proposed flow of 40 cfs in the middle channel or 7 cfs in the north channel would provide high quality aquatic habitat in either channel.

According to ANR, the lowest bypass flows that would provide high quality aquatic habitat are 70 cfs in the middle channel and 7 cfs in the north channel. To provide these minimum flows in the natural river channels, the ANR proposed a bypass flow of at least 93 cfs. The Board finds that neither ANR's choice of 70 cfs in the middle channel nor 7 cfs in the north channel was supported by the evidence presented. A DFW fishery biologist merely visited the site, looked at the middle bypass channel, and suggested locations on the streambank up to which a wetted area should be maintained. This visual assessment presumed that resultant water depths and velocities would be adequate to support high quality habitat. Such an assessment, not supplemented by supporting data

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The Clark Falls bypass reach might be an appropriate place to apply the Use Attainability Analysis provided for in federal law.

from either an incremental or other site-specific study, is simply not credible. Although woody vegetation that has encroached into the north channel appears to restrict the channel's flow capacity to 7 cfs, increased flows would enhance the aquatic habitat value of the Milton bypass.

The Board finds that the aquatic habitat value of the Milton bypass is high in spite of its less than 600 foot length. Accordingly, the Board declines to adopt either CVPS's proposed flow of 40 cfs or ANR's recommended flow of 93 cfs as sufficient to provide high quality aquatic habitat.

v. *Peterson*

Since there is no bypassed reach at the Peterson facility, provision of high quality aquatic habitat concerns minimum flows downstream of Peterson dam and drawdown limitations at the impoundment. CVPS proposed to operate the Peterson facility run-of-river from April 1 through June 15. Run-of-river operation will provide high quality aquatic habitat during this period if the Milton and Clark Falls facilities are operated in the same manner. Outside of the spring run-of-river period, CVPS proposes to limit the drawdown of the Peterson impoundment to four feet. This limitation supports the beneficial value of high quality aquatic habitat because the steep-sided impoundment does not have the potential for a highly productive littoral zone. Drawdowns at Peterson, therefore, do not produce the same kinds of impacts to aquatic habitat that were of concern at Arrowhead Reservoir.

During the fall salmon migration period of October 1 through November 15, CVPS proposed to operate the Peterson station during the daytime at minimum load, which is 350 cfs. This mode of operation may not adequately support salmon spawning runs or fishing opportunities. There are insufficient data in the record upon which to establish a specific fall flow regime that will support migrating salmon and fishing. That deficiency might be met by requiring CVPS to provide releases during this period according to a schedule prescribed each year by ANR.

The riffle reach below Peterson offers excellent bass habitat if sufficient flows are provided. In addition, the endangered lake sturgeon apparently spawns in this reach of the river. Outside of the spring and fall periods, CVPS proposed a minimum flow of 70 cfs below the Peterson dam when the downstream riffle reach is not inundated by high levels of Lake Champlain. When the downstream riffle reach is inundated by the Lake Champlain backwater (CVPS claims that such inundation occurs when the lake reaches 95.3 feet NGVD), CVPS proposes no minimum flow. The Board has received no credible testimony that would justify a minimum flow as low as 70 cfs.

CVPS did not assess habitat quality in the riffle reach, other than strictly from a passage perspective. As previously noted, a ZOP alone does not constitute high quality aquatic habitat, since ZOP is merely an area of marginal habitat that allows a species to move from one area of suitable habitat to another.

The Board concludes that during periods other than spawning and fish migration, when higher flows are required, a flow of at least 392 cfs would be necessary to ensure successful and frequent fish passage through the riffle, and to ensure that D.O. minimum levels are maintained. This minimum flow is recommended by both the USFWS Flow Policy and the ANR Flow Procedure. Nevertheless, this flow has not been shown to ensure compliance with the VWQS as a whole.

The Board notes that if upstream fish passage facilities are ordered by the Secretary of ANR at some time in the future, CVPS might expect to be required to provide additional flows determined by the Secretary to be necessary to attract salmonids to migrate upstream. The required attraction flows would need to be determined by a future study.

b. Aesthetics

The General Assembly has directed the Secretary and Board to protect those aesthetically pleasing elements of Vermont's landscape within its jurisdiction. 10 V.S.A. § 1252 (a) ("Class B [waters shall be] [s]uitable for . . . good aesthetic value"). One of the values established by the VWQS for Class B waters is that the water "consistently exhibit good aesthetic value." VWQS, §3-03(1). The United States Supreme Court has held that aesthetics is a legitimate management goal under §401(d). "The [Clean Water] Act permits enforcement of broad, narrative criteria based on, for example, 'aesthetics.'" P.U.D. No.1 of Jefferson County v. Washington Department of Ecology, 114 S.Ct. 1900, 1911 (1994).

The VWQS require CVPS to operate its facilities in a manner that will protect beneficial values and uses for Class B waters over the entire project reach. Thus, CVPS has the burden to prove that its proposal will achieve and maintain good aesthetic value throughout the portion of the Lamoille River subject to its proposed license.

Although CVPS must operate its facilities so that a "consistently good aesthetic value" is achieved and maintained throughout the Project reach, the parties in this case have addressed aesthetics only in four narrowly defined areas of the reach, specifically, the waterfalls at Fairfax, Clark, and Milton Falls, and the wetland areas of Arrowhead Reservoir. Accordingly, the Board limits its aesthetic analysis in this case to the same areas.

In determining the aesthetic impacts of a project, the Board has looked to the aesthetics analysis developed by the Vermont Environmental Board. See In re: Champlain Oil Company, Docket No. CUD-94-1 (Oct. 4, 1995) at 13 n.3, citing In re: Quechee Lakes Corp., No. 3W0364-1A-EB (VT Env. Bd., Feb. 3, 1987). The Environmental Board's Quechee Lakes analysis addresses the standard set forth in 10 V.S.A. 6086(a)(8), Act 250's Criterion 8. While the "Criterion 8" standard is different from that expressed in the VWQS, the Board is guided in its analysis by many of the principles that shaped the Quechee Lakes standard.[7] The test adopted by the Board today, therefore, resembles the Quechee Lakes analysis in function rather than form.

The Board recognizes that the very notion of aesthetics presumes perception. The addition of the term "exhibits" to the VWQS merely confirms that aesthetic values are perceived values. The Board finds that "aesthetics" relates to a sensory appreciation and is typically concerned with the perception of beauty: qualities that are perceived as pleasing, pleasurable, or heartening. A feature's aesthetics may be visually pleasing; they may also be appealing to other senses.

CVPS has argued that only those areas which can be readily viewed by the public need to meet the aesthetics standard. According to this argument, if only a few people can see a waterfall, its aesthetic value need not be protected. However, every part of this Project reach is at least potentially accessible to members of the public. The public has access to the water and waterways of the Lamoille River and can paddle or swim along the river to see the falls. Moreover, while a waterfall or watercourse is a relatively permanent natural feature, the location and ownership of access points to that feature may change over time. What is inaccessible to the public this year may be highly accessible next year. The Board has a duty to protect the resource for members of the public, regardless of present ownership patterns. See In re: Appeal of Larivee, Docket No. CUD-92-09, Findings of Fact, Conclusions of Law and Order (March 24, 1994) ("The applicant may exclude the public from its property through lawful posting, however, the applicant may not engage in development . . . impairing the important

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Act 250's Criterion 8 requires the District Commission or Environmental Board, on appeal, to determine that a project "will not have an undue adverse effect on the scenic or natural beauty of the area [or] aesthetics...." 10 V.S.A. **§** 6086(a)(8). The project applicant has the burden of production and those opposing the development have the burden of persuading the decisionmaker that the project will have "an unreasonable or adverse effect." 10 V.S.A. § 6088(b). By contrast, the VWQS require a petitioner to carry both the burden of production and persuasion to demonstrate that the waters in the Project reach will "consistently exhibit good aesthetic quality." In other words, the VWQS place an affirmative burden on the applicant to demonstrate not only that a proposed project will "do no harm," but that the applicant's use of the water will continue to promote consistently good aesthetic value. Moreover, while Criterion 8 typically anticipates the placement of a new project in a preexisting setting on private property, the VWQS consider the impacts of a project on the aesthetic quality of a public resource.

functions of that resource which make it valuable for educational use by future generations. . . . Since it is recognized that the ownership of property may change over time, protection . . . ensures that [the resource] . . . will be preserved regardless of whether physical access to the [resource] is [available].")

The VWQS, as well as Vermont statutory law, require Class B waters to exhibit "good" aesthetic value. The Board understands "good" to be a measure on a continuum: excellent, good, adequate, poor. On a scale of A to D, "good" aesthetics would rate a B. By contrast, "adequate" aesthetics would rate a C.

CVPS claims that it has presented evidence to show that its Project will consistently exhibit good aesthetic value at the waterfalls at each of the upper three facilities. However, CVPS prepared its aesthetics study for FERC to satisfy a different and lower standard than the one applicable in this proceeding. FERC asked CVPS to show that its project will have an "adequate" visual effect. CVPS claims that the FERC "adequate" standard and the VWQS "good" standard are, in fact, the same or equivalent. However, this contention has no basis in law, and it ignores the common sense meanings of the adjectives "good" and "adequate." Even CVPS's own witness acknowledged at hearing that, had she been asked to apply VWQS's criterion for "good" aesthetic value, her analysis might have been different from the analysis she offered to show that certain features of the Project provided for "adequate" aesthetics.

CVPS therefore has failed to demonstrate that its Project as proposed would consistently exhibit good aesthetic value.

The parties disagree about whether "aesthetics" is an "in stream" or "out of stream" use of water. CVPS argues that when one watches a waterfall, one is enjoying that aesthetic feature of the river from a vantage point outside of the water, but that the VWQS govern only "in stream" uses of water. CVPS insists that the Board's consideration of aesthetics is limited to evaluating how water looks in the stream. CVPS therefore contends that water should be evaluated for its color and clarity, but cannot be evaluated for the path it takes through a gorge or over a waterfall or for the background of non-water features against which it is viewed.

In support of its assertion, CVPS cites the Board's decision in In re: Appeal of Richard Balagur. In that case, the Board held that water could only be evaluated for its "in-stream" character. See In re: Appeal of Richard Balagur, Docket No. WQ-86-06 (Feb. 18, 1989), reversed on other grounds, No. s22-920dC (VT Orange Sup. Ct. Jan. 1993). However, Balagur was decided long before the United States Supreme Court held in Tacoma that "aesthetics," even as a broad narrative criterion, is a legitimate water quality standard. Thus, it is clear that under § 3-03 of the VWQS analysis of aesthetics requires consideration both of the color and clarity of the stream, and of the watercourse

itself, including prominent features such as waterfalls, and cascades.

The elements of an aesthetics analysis required by the VWQS include the "uniqueness" of the landscape feature; the "scale," "scope," "contrast," and "context" of the feature in relation to its immediate surroundings; and the "naturalness" of the feature where natural elements are present at the site. [8]

The Board concludes that CVPS' proposed flows for each of the three falls at issue are insufficient to ensure that consistently good aesthetic value will be achieved and maintained. Furthermore, CVPS has proposed that at Fairfax Falls the flows should vary seasonally and from night to day. The Board concludes that such fluctuation in flows would not comply with the requirement to "consistently" exhibit good aesthetic value.

The Board concludes that in order to ensure that the waters at Milton Falls consistently exhibit good aesthetic values, no ledge removal should be authorized at the Project site.

Finally, the Board concludes that in order to maintain consistently good aesthetic quality at the upper three facilities, flows would have to be spilled evenly across the entire face of each dam.

c. Recreation

Section 3-03(A)(2) of the VWQS requires that, as Class B waters, the Lamoille

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In Quechee Lakes, the Environmental Board looked to expert witnesses to discern the methodology by which a professional landscape architect measures a proposed project's impacts upon aesthetics. See In re: Quechee Lakes Corp., No. 3W0364-1A-EB at 17-18 (VT Env. Bd.,. Feb. 3, 1987). Using a Quechee Lakes analysis, the Environmental Board considers:

- The nature of a project's surrounding, be it urban, suburban, village or rural; existing surrounding land uses; surrounding vegetation; the area's particular scenic values.
- The compatibility of the project's design with its surroundings; architectural compatibility of building style with surrounding styles.
- The colors and materials selected for project, and the suitability of those materials for the surrounding context.
- The vantage point from which the feature would be viewed; whether the project would be seen by a stationary viewer or quickly-moving viewer.
- The project's impact on open space.
- Whether the project "fits" with its surroundings.

It is important to note that Act 250 primarily contemplates review of new projects, while the VWQS apply not only to new projects but also to all existing projects involving waters of the state.

River be managed to achieve and maintain a high level of quality that is compatible with its use for "public water supply with filtration and disinfection; irrigation and other agricultural uses; swimming, and recreation." Indeed, Class B waters, as defined in the relevant statute, are those waters "suitable for bathing and recreation," among other beneficial uses. 10 V.S.A. §1252(a). Moreover, § 1-03(B)(2)(b) of the VWQS requires Class B waters to be managed for "recreation in or on the water." The VWQS also prohibit regulation of river flows in a manner that would result in an undue adverse effect on any beneficial use, including recreational use. VWQS, §2-02(B). These provisions, collectively, require that recreational uses, including fishing, swimming, and recreational boating, be attained and adequately protected. When there is a potential for conflict among the flows required to support each of the respective beneficial uses and values, the Board should assess recreation studies that depict the type of recreational uses in a particular river segment, the frequency of each use, and the compatibility of each recreational use with other values, such as aesthetics and aquatic habitat. No such studies were presented as evidence in this proceeding.

The Lamoille River in the Project reach is currently used for swimming, fishing, and recreational boating. However, evidence in the record of the extent and nature of these uses and the impacts of CVPS's Project on them is very limited. CVPS did offer anecdotal testimony concerning use of the Milton Falls gorge for swimming, principally to demonstrate that the flows required to support safe swimming at this site conflict with flows required to provide high quality habitat for aquatic biota.

The Lamoille River in the Project reach is a navigable water within the meaning of 10 V.S.A. § 1422(4) and is boatable. Flatwater boating and whitewater canoeing are popular recreational activities in various sections of the river between Fairfax Falls and Lake Champlain. While the four dams are physical barriers to navigation, CVPS has provided portage at its hydroelectric facilities to support boating on the river. CVPS has voluntarily agreed to keep and maintain canoe portages at its facilities, but it contends that the provision of such facilities should not and cannot be a requirement of any certificate issued by the Board. Because recreation is a beneficial use specifically identified in the VWQS for the Lamoille River, this Board has not only the authority, but also the obligation, to protect the recreational use of the River by requiring the maintenance of such portages.

Fishing is another water-based beneficial use of the Lamoille River within the Project reach. Successful fishing depends on a healthy fishery, which in turn depends on high quality aquatic habitat. Minimum river flows and operational protocols for the Project to achieve and maintain high quality aquatic habitat will also support the recreational activity of fishing.

The Board concludes that while CVPS's Project does not appear to prohibit the attainment of a variety of recreational uses within the Project reach of the Lamoille River, CVPS has failed to prove that its Project, as proposed, would ensure the adequate protection of these recreational uses.

4. The Board's Conclusions on Compliance with the VWQS

As previously stated herein, in order to demonstrate compliance with the VWQS, a § 401 certification applicant must discharge its burden of proving that the proposed operation of its Project will ensure compliance with each of the requirements of the VWQS. Thus, an applicant must prove that operation of its Project would support the specific criteria, as well as the beneficial values and uses. Based on the record in this proceeding, the Board concludes that CVPS's Project, as proposed, fails to ensure compliance with the VWQS. Accordingly, the Board cannot certify compliance with the VWQS.

E. FISH PASSAGE

CVPS has agreed to provide fish passage facilities should they be deemed necessary in conjunction with the LCSREP. A final decision on the need for fish passage is scheduled to be made within the next few years by ANR in consultation with the DFW. The Board therefore declines to address the specific requirements of fish passage in this decision.

F. PUBLIC TRUST DOCTRINE

The common law public trust doctrine was first articulated by the Vermont Supreme Court in Hazen v. Perkins, 92 Vt. 414 (1918). In that case, the Court made it clear that boatable public waters, such as those involved in this § 401 certificate appeal, are held in trust "for the common public use of all." Id. at 419. The Board has adopted this principle, and it has indicated that where appropriate it will conduct a public trust analysis, even in the absence of an explicit legislative directive to do so or rules to govern the Board's discretion. In re Dean Leary, Docket No. MLP-94-08, Memorandum of Decision: Public Trust Doctrine (April 13, 1995). In this proceeding, the Board has not been furnished with sufficient evidence to enable it to rule on compliance with the public trust doctrine, and it accordingly declines to so rule.

G. CONSTITUTIONAL PROVISIONS

VNRC's constitutional claims bear upon Vermont's police power authority to

enact regulations which guarantee the right to fish.[9] The Vermont Constitution affirmatively protects Vermont inhabitants' right to fish in both boatable and non-boatable waters. By ensuring compliance with § 3-03 (A)(1) of the VWQS, which requires CVPS's proposed Project to provide high quality habitat for aquatic biota, *fish*, and wildlife, the Board ensures compliance with Chapter II, § 67 of the Vermont Constitution.

H. COMPLIANCE WITH OTHER APPLICABLE STATE LAW

The U.S. Supreme Court in Tacoma declined to speculate about what other state laws, if any, might be applicable under § 401(d). Tacoma at 1909. Likewise, in this proceeding, the Board finds it both improper and unnecessary to address this issue.

The parties' witnesses made limited reference to the Vermont Wetland Rules, which constitute other applicable state law under § 401(d). There is clearly a nexus between the VWR and the preservation and enhancement of the state's water quality. However, in this case the parties have framed the legal issues involving wetlands in terms of compliance with the VWQS, not the VWR. Since no party has argued that in this case compliance with the VWQS would not also result in compliance with the VWR, no separate analysis is required. Concerning CVPS's proposed channel modification in the Milton bypass, the Vermont statute governing stream alteration permits codified at 10 V.S.A. 1021 may also be applicable law, but the Board declines to determine that such law is applicable in this proceeding.

I. RIPARIAN RIGHTS

CVPS maintains that the right to use water for particular purposes, such as the generation of hydroelectric power, is not one acquired through proceedings before the Board, but is a property right. The Vermont Supreme Court has recognized that riparian rights constitute property. State v. Morse, 84 Vt. 387, 392. To further support its position, CVPS cites a Vermont Supreme Court case involving a riparian user's rights to use the Kingsbury branch of the Winooski River for assimilating waste water discharges. Vermont Woolen Corp. v. Wackerman ("Wackerman"), 122 Vt. 219, 225-226 (1960). However, such riparian rights do not preclude the state's proper regulation of their exercise through the police power. As the Vermont Supreme Court stated in State v. Quattropanni, 99 Vt. 360 (1926):

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9 Vermont Constitution, Chapter II, Section 67 provides that ". . . the inhabitants of this State shall have liberty in seasonable times . . . to fish in all boatable and other waters (not private property) under proper regulations, to be made and provided by the general assembly."

> [The police power] signifies the governmental power of conserving and safeguarding the public safety, health, and welfare. In this sense, it covers a very wide field of operation. All contracts entered into, all charters granted, all rights possessed, and all property held, are subject to its proper exercise, and must submit to its valid regulations and restrictions.

Quattropanni at 363 *citing* Waterbury v. Central Vermont Ry. Co., 93 Vt. 461; State v. Speyer, 67 Vt. 502; State v. Morse, 84 Vt. 387.

Wackerman also addressed the allocation of costs to a riparian user who has, in some form, degraded the quality of a waterbody. The Court held that "[m]anifestly, there is nothing unfair in requiring one who contributes to the creation of a detrimental situation to be responsible for its correction, to the extent of his contribution." The Court further held that when legislation is, as here, supported by strongly favored policy considerations, neither legislation nor orders will be struck down as unreasonable solely because a financial hardship is necessarily worked on a particular individual, even to the point of being destructive to his business. Wackerman at 228.

The CWA requires the implementation of state water quality standards to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. 33 U.S.C. § 1251(a). Both Wackerman and Quattropanni strongly validate the authority of the Board to promote such goals and, specifically, to classify state waterbodies and regulate their water quality "in furtherance of public health and for the protection of fish and game." Wackerman at 224. A state's authority to issue, deny or condition § 401 certificates to effectuate these goals is in no way limited by the common law doctrine of riparian rights.

IV. ORDER

For the foregoing reasons, the Board denies CVPS's application for a § 401 Water Quality Certificate.

Dated at Montpelier, Vermont, this 5th day of November, 1996.

Water Resources Board
by its Chair

_____
William Boyd Davies
Stephen Dycus
Ruth Einstein
Gail Osherenko
Jane Potvin

State of Vermont
WATER RESOURCES BOARD

In re: Lamoille River Hydroelectric Project (CVPS)
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