STATE OF VERMONT

WATER QUALITY CERTIFICATION

CLYDE RIVER HYDROELECTRIC PROJECT

Vermont Agency of Natural Resources
Department of Environmental Conservation
Waterbury, Vermont
August 1, 2002

Water Quality Certification
Clyde River Hydroelectric Project

Table of Contents

I. Background/General Setting 2

II. Project and Civil Works 5
- Seymour Lake 5
- Echo Lake 6
- West Charleston 7
- Newport 1,2,3 8
- Newport 11 10

III. River Hydrology and Streamflow Regulation 11
- Seymour Lake 12
- Echo Lake 15
- Flooding - Seymour and Echo Lakes 17
- West Charleston 22
- Newport 1,2,3 24
- Newport 11 28
- Summary of Operating Proposal 29

IV. Standards Designation 30

V. Water Chemistry 32

VI. Aquatic Biota and Habitat 34
- Landlocked Atlantic Salmon 35
- Echo Lake/Seymour Lake 41
  - Smelt Run at Seymour Lake 42
- West Charleston 43
  - Bypass 44
  - Downstream 46
  - Reservoir (Charleston Pond) 46
- Newport 1,2,3 and Newport 11 47
  - Newport 1,2,3 - Bypass 47
  - Newport 1,2,3 - Reservoir (Clyde Pond) 62
- Fish passage 63
- Ramping 63
- Flushing Flows 64

VII. Wildlife and Wetlands 64
Clyde Pond 65

VIII. Shoreline Erosion and Desilting 71

IX. Recreational Use 73

X. Aesthetics 78

XI. Other Uses 79

XII. Rare and Endangered Plants and Animals 79

XIII. State Comprehensive River Plans 79

XIV. Analysis 83
Bodies of Water 83
Water Chemistry 89
Bypassed River Reaches 91
Downstream River Reaches 92
Ramping Plans and Flushing Flows 93
Fish Passage 94
Recreation 94
Debris 95

Action of the Department (Conditions) 96

A. Compliance with Conditions. 96
B. Water Level and Flow Management. 96
C. Flow Management following Maintenance Drawdown. 98
D. Flow Management Plan. 98
E. Monitoring Plan for Water Level and Flow Management at West Charleston and Newport 1,2,3. 99
G. Turbine Rating Curves. 100
H. Replacement of Seymour Lake Dam. 100
I. Replacement of West Charleston Penstock. 101
J. Smelt Spawning at Twin Culverts Brook. 101
K. Prevention of Fish Entrainment at West Charleston. 101
L. Upstream Fish Passage at Newport Facility. 102
M. Downstream Fish Passage at Newport Facility. 102
N. Debris Disposal Plan. 104
O. Maintenance and Repair Work. 104
P. Public Access. 104
Q. Recreational Facilities. 104

R. Erosion Control. 105
S. Compliance Inspection by Department. 105
T. Posting of Certification. 105
U. Approval of Project Changes. 105
V. Reopening of License. 105
W. Continuing Jurisdiction. 105

List of Tables

Table 1. Hydrologic Parameters at Project 12

Table 2a. Seymour Lake average summer water levels (height above dam crest) and gate openings, 1986-2001 15

Table 2b. Seymour Lake summer water level frequency distribution (levels equaled or exceeded), 1986-2001 15

Table 3. Seymour Lake record high annual levels (height above dam crest), 1986-2001 20

Table 4a. West Charleston Proposal for Relicensing 29

Table 4b. Newport 1,2,3 Proposal for Relicensing 29

Table 5. Fish species and life stage periodicity 35

Table 6a. Historically available salmon spawning habitat units and estimated adult returns supported 39

Table 6b. Potentially available salmon spawning habitat units and estimated adult returns supported - Newport 1,2,3 bypass 40

Table 6c. Potentially available salmon spawning habitat units and estimated adult returns supported - Upstream of Clyde Pond 40

Table 7. Salmon available for annual lake harvest 41

Table 8. Median flow estimates at West Charleston 46

Table 9a. Habitat availability for salmon fry in the Newport 1,2,3 bypass 52

Table 9b. Habitat availability for salmon juveniles in the Newport 1,2,3 bypass 52

Table 9c. Habitat availability for salmon adults in the Newport 1,2,3 bypass 53

Table 10. Median flow estimates for the lower Clyde River 56

Table 11. Habitat availability for walleye in former Newport 11 bypass 58

Table 12. Flow frequency for exceedence of Newport 1,2,3 station capacity 65

Table 13. Effects of drawdown regimes on establishment of emergent vegetation 68

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

In the matter of: Citizens Communications Company
Administrative Offices
High Ridge Park
PO Box 3801
Stamford, Connecticut 06905

APPLICATION FOR CLYDE RIVER HYDROELECTRIC PROJECT

The Water Quality Division of the Vermont Department of Environmental Conservation (the Department) has reviewed a water quality certification application dated January 24, 2002 and filed by Citizens Communications Company (the applicant), formerly Citizens Utilities Company. The supporting documentation for the application is considered to be the applicant's Federal Energy Regulatory Commission (FERC) license application filed with FERC under a cover letter dated December 20, 1991; subsequent submittals from the applicant, including an October 28, 1993 FERC Additional Information Request (AIR) response; and the FERC Final Environmental Impact Statement (FERC FEIS) dated June 1996[1]. Subsequent to the license application filing, the Newport No. 11 dam was removed, and operation of that facility is no longer included in the licensing proposal; however, the associated project lands continue to be within the project boundary.

The applicant's earlier request of July 7, 1993 for certification was denied on July 8, 1994 based primarily on impacts associated with Newport 11 dam and the insufficiency of proposed regimes for flow and water level management in the lower Clyde River. The applicant appealed the decision to the Vermont Water Resources Boards, but subsequently withdrew the appeal on August 30, 1996.

The current application is subject to review under the Vermont Water Quality Standards adopted by the Water Resources Board on June 10, 1999 (*Standards)*. *Standards* became effective on July 2, 2000. (*Standards*, Section 1-01. Applicability and Definitions)

The Department placed a draft decision on public notice June 11, 2002 under the rules governing certification and received written filings until July 12, 2002.

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[1]In its letter of application, the applicant indicates that it is proposing to operate the project under the same conditions proposed in its January 29, 2001application, those being the concluding recommendations identified in the FERC FEIS.

Attached is a copy of the Department's responsiveness summary, which shall be incorporated into this certification as findings by reference.

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

I. Background/General Setting

1. The applicant has applied to FERC for relicensure of the Clyde River Hydroelectric Project located on the Clyde River in north-central Vermont. The project was first licensed in 1963, and that license expired on December 31, 1993. FERC issued *Notice of Authorization for Continued Project Operation* on January 24, 1994.

2. The project includes four separate facilities. The dams at the outlets of Seymour Lake and Echo Lake, both dams located in the town of Charleston on an unnamed tributary which flows into the Clyde River at river mile 18. Located on the main stem of the Clyde River are the West Charleston dam (river mile 10.8) and powerhouse in the town of Charleston and the Newport 1,2,3 dam (located in the town of Derby at river mile 2.0) and powerhouse, located in the City of Newport. A fifth facility, Newport 11, is no longer operating due to a dam failure on May 1, 1994; the dam was located in the City of Newport at river mile 1.5.

3. The Clyde River drainage basin covers 142 square miles of Vermont's Northeast Kingdom, spanning two counties and ten towns. The basin encompasses 40 miles of river, over 35 miles of tributaries, and more than ten lakes and ponds totaling more than 4,500 acres. The Clyde River basin, with its abundance of water resources, is one of the Kingdom area's greatest natural assets. (*The Clyde River Futures Project Preliminary Report: An Inventory of Uses, Values and Goals*, Department of Environmental Conservation, April 1991)

4. The Clyde River is located entirely within Vermont just south of the Canadian border. Originating as the Pherrins River in Warren Gore at an elevation of 1,350 feet above mean sea level, it becomes known as the Clyde River at the confluence of the Pherrins with Oswegatchie Brook in Brighton. From there, the

Clyde flows some 30 miles in a northwesterly direction through five ponds to empty into Lake Memphremagog at Newport, elevation 682 feet msl. The river is characterized by a variable gradient consisting primarily of slow meandering flows over relatively smooth bottom areas.

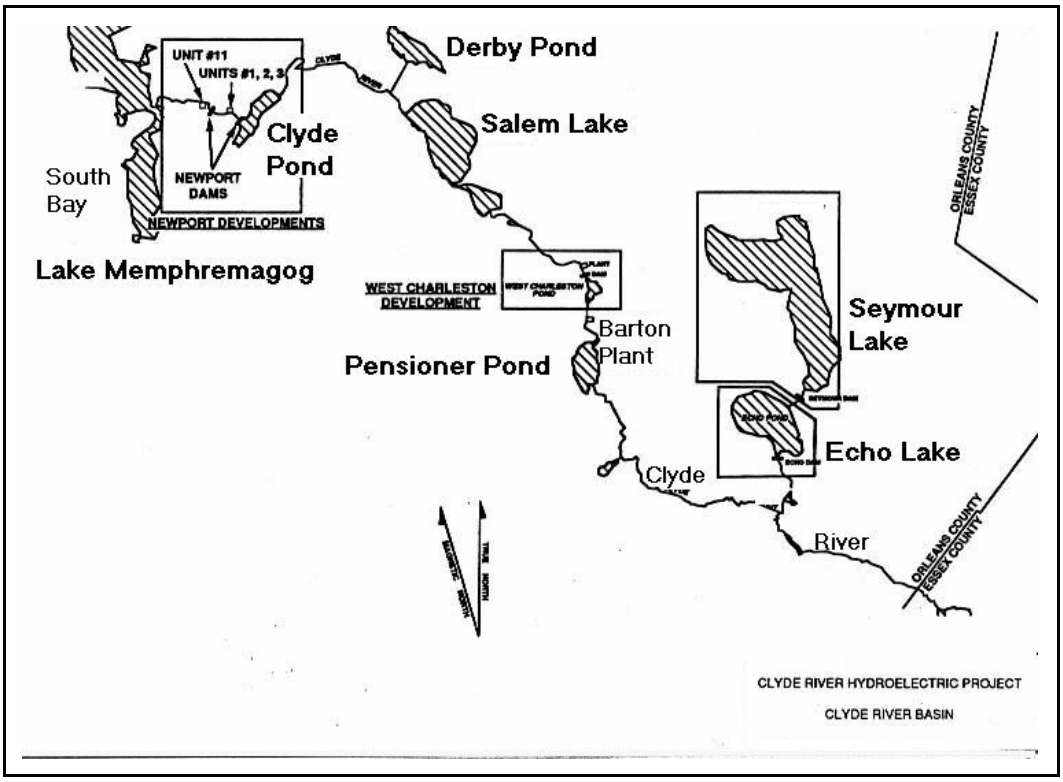
5. The river above Pensioner Pond in Charleston is unregulated and relatively undeveloped, bordered by a significant wetland area along much of its length. The river from Pensioner Pond downstream to Lake Memphremagog dramatically increases in gradient and can be characterized as a highly flow regulated, working river with its numerous dams and associated hydroelectric generating facilities.

6. The Clyde River received its name from an early surveyor by the name of Mr. Whitlaw who gave the river its name from his partiality to a river of that name in Scotland. The river was once the favored route of the St. Francis and Algonquin Indians in their travels from Canada to the southern part of New England. Water routes used during the French and Indian wars extend through the Clyde River watershed.

7. The Clyde River has been harnessed for waterpower since at least the early nineteenth century. The application identifies five historic mill sites within or adjacent to the project boundaries. Three of these are located on applicant property below Newport Dam, formerly Prouty Dam (Clyde Pond). The remaining are located within the Town of Charleston, one at West Charleston and the other at Echo Lake.

8. The most noteworthy of these mills are those that existed in the area of the Newport 1,2,3 and Newport 11 facilities. Referencing License Application, Appendix Volume VI, an 1878 map of the Town of Derby identifies a saw mill, a woodworking shop, and a woolen mill on the north bank of the river within the project boundaries in Derby. In addition, this map shows an impoundment, possibly a mill pond, near the Newport 11 powerhouse, northwest of the mill sites. A comparison of historic maps for this area suggests that these complexes were constructed between 1857 and 1878. No physical evidence of the woolen mill complex were identified by the applicant; however, an abandoned concrete and stone dam extends across the river just upstream of

the Newport 1,2,3 powerhouse and northeast of the mill location. This dam was constructed in 1891 by Charles Prouty, who founded the Newport Electric Light Company at that same time. A mill complex was also located on the north bank of the river just downstream of Newport Dam; this site is known as Arnolds Falls or Prouty Falls. The complex was identified as a saw mill and grist mill constructed in 1844 upon the remains of one of the first grist mills in Newport. During the 1900s, this was the location of a pulp mill. Mill remains include an abandoned stone dam approximately 100 feet long extending across the river just below Newport Dam; for a period, this dam served two of the units in the Newport 1,2,3 powerhouse.



II. Project and Civil Works

Seymour Lake

9. Seymour Lake is a natural lake with a man-made outlet which, as currently operated, has very little effect on the natural lake stage. The dam is located on Seymour's outlet brook about 1,200 feet below the lakes's natural outlet and 1,350 feet upstream of Echo Lake. It is a rock-filled timber crib dam constructed in 1928. It replaced a dam constructed in 1921 by a predecessor company at the lake's natural outlet. The dam was later filled with concrete in 1954 and rehabilitated in 1984.

10. The dam extends horizontally 43 feet with a spillway of 30.6 feet in length. The design crest elevation is 1279.0 feet msl; however, it actually varies from 1279.00 feet msl at the left abutment to 1278.73 feet msl at the opposite end. (*Seymour Lake Dam, Study of New Dam at Existing Location*, Duke Engineering & Services, Inc., Drawing 30S-118, August 17, 2001) The variation is likely due to settlement. A 5 foot wide by 4.3 foot high sluice gate is used to regulate outflow; the invert of the gate opening is 3.7 feet below the spillway crest (elevation 1275.27 feet msl).[2]

11. The dam structure is in poor condition. The applicant has retained Duke Engineering & Services, Inc. to design a replacement structure.

12. The outlet channel between the lake and a point below the present dam was blasted out in 1923, and additional blasting occurred up to 1948. Up until 1939, the applicant or its predecessor maintained 12 inches of flashboards along the length of the spillway. (Public Service Commission Order No. 2564, September 15, 1951)

13. No generating facilities are located at Seymour Lake. For enhanced hydropower production as part of the Clyde River Project, the lake was historically used to augment downstream flows through gate manipulation.

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[2]The license application information conflicts with information from a July 1999 survey done by Duke Engineering & Services and included in an August 6, 1999 letter from Duke Engineering to Citizens Utilities. The application indicated that the sill elevation is about a foot lower (elevation 1274.3 feet msl).

14. Seymour Lake dam has a surface area of 1,750 acres and a useable storage volume of 2,040 acre-feet under the existing license, which establishes a maximum water surface elevation of six inches above the crest and a minimum elevation of eight inches below the crest (1278.33-1279.5 feet msl). The lake is about 3.5 miles in length and up to 167 deep.

Echo Lake

15. Echo Lake is a natural lake which is regulated by a man-made outlet structure which effectively raises the natural lake level by 12 feet. The lake's concrete dam is located one mile upstream of the Clyde River on an unnamed tributary. It was constructed just downstream of the natural outlet in 1922 to replace an earlier wooden dam of the same height; modifications and repairs were done in 1949 and 1984. The dam extends 120 feet horizontally with a spillway length of 69 feet. A 2.5 by 4.5 feet sluice gate is used to regulate outflow; the invert of the gate opening is at about elevation 1236.7 feet msl. The original compound spillway had sections set at elevations 1249.0 feet msl (37-foot length) and 1249.5 feet msl (32-foot length).

16. During the 1999-2000 fall/winter period, the applicant undertook major dam repairs involving the removal and replacement of the upper three feet of the crest. As part of the repair work, the concrete crest was permanently lowered eight inches to elevation 1248.33 feet and flashboard pin sockets were installed. Upon completion of the work, flashboards were installed to raise the effective dam crest back to its original profile at elevations 1249.0 feet and 1249.5 feet msl, pending the completion of relicensing. As part of the dam repairs, a headgate bay which was located to the left of the sluice was eliminated.

17. Waterpower at the site was previously used to serve mills, including a saw, shingle and clapboard mill owned by J.A. Lancier. (*Gazetteer and Business Directory of Lamoille and Orleans Counties, Vermont*, Hamilton Child, 1883)

18. No generating facilities are located at Echo Lake. As with Seymour Lake, Echo Lake was historically used to augment downstream flows through gate manipulation for enhanced hydropower production as part of the Clyde River Project.

19. The surface area of Echo Lake is approximately 530 acres with a previously reported useable storage of 3,180 acre-feet with a maximum drawdown of 6.0 feet. Article 23 of the existing license for the facility requires the applicant to manage the level of the lake to prevent it from rising above the crest (elevation 1249 feet msl). The lake is about one mile in length and up to 129 feet deep.

West Charleston

20. The West Charleston facility is located about 2.3 miles upstream of Salem Lake. The dam, a rock fill and masonry dam with a concrete facing, was constructed around 1900 and modified in 1927, 1955, and 1961. The dam extends 196.5 feet horizontally with a spillway length of approximately 106 feet (elevation 1059 feet msl). The crest is surmounted by 18-inch flashboards. A single 19-foot square forebay extends to a 6-foot and an 8-foot diameter headgate. The invert of the opening for the lowest gate is 16.33 feet below the crest of the dam. On the west end of the dam there is an additional 6-foot diameter sluice gate, which has been plugged with concrete and capped. The trashrack at the forebay has a clear spacing between bars of one inch.

21. A 6-foot diameter steel penstock extends 1,622 feet from the dam to the powerhouse. Under the existing license conditions, the resulting gross head is 63.5 feet with a reported net head of 59 feet. The normal tailwater elevation is approximately 996.8 feet msl.

22. The West Charleston reservoir, also known as Lubber Lake or Charleston Pond, has a surface area of approximately 40 acres and a reported useable storage of approximately 220 acre-feet based on a maximum drawdown of 5.5 feet (elevation 1053.5 feet msl). The reservoir extends upstream one-half mile. The maximum operational drawdown to the top of the intake is 8'4 from the crest to elevation 1050.67 feet msl, and the maximum maintenance drawdown is 16'4 (to elevation 1042.67 feet msl).

23. The facility's powerhouse contains one horizontal twin-runner S. Morgan Smith turbine rated at 1,000 HP with a design head of 57 feet and a hydraulic capacity of 50 to 206 cfs. The turbine is connected to a 800 kw generator. The 2.4 kv output from the generator is transformed to 12.47/7.2 kv by a 1,000 kv transformer

bank. The line connects to the West Charleston substation which connects to distribution feeders.

24. Adjusted for the loss of the Newport 11 plant, a total of 20% of the total project energy production was derived from the West Charleston facility. At the time of the license application, 1991, the 18-year average annual production for West Charleston was 3,903 mwh.

25. The West Charleston station has not been operating since March 1998 due to the need for replacement of the penstock. The applicant has acquired additional land to the east of the existing penstock. This will enable the applicant to provide a greater isolation distance between the penstock and the river. (pers. com. Jeffrey Cueto with Kevin Perry, Citizens Communications, September 21, 1998)

Newport 1,2,3

26. The Newport 1,2,3 facility is located about 9.1 miles downstream of the West Charleston plant. The Newport 1,2,3 dam (Newport Dam) is a masonry structure with concrete buttress, concrete facing and an earthen section. The dam was constructed in 1918, with modification and repairs on several occasions, the most recent being in 1990. The dam extends 713 feet in length, with a spillway 324 feet long (crest elevation 878.0 feet msl); an earthen section 347.5 feet long, with an upstream face concrete retaining wall; and concrete abutments of approximately 41.5 feet in length.

27. The intake structure is located on the northern (river right) side of the spillway and incorporates a trashrack with a 1.75 inch bar spacing. A 21 x 21 foot forebay extends to a 6-foot diameter headgate; the invert of the gate opening is 17.2 feet (860.8 feet msl) below the spillway. Two sluice gates are located on either side of the spillway. A 6-foot diameter steel penstock extends 50 feet from the dam, at which point it bifurcates into a 6-foot diameter and a 5-foot diameter penstock. The larger penstock extends a distance of 2,175 feet, and the smaller penstock extends 1,800 feet to the facility's powerhouse. A surge tank is also located at the powerhouse. The normal tailwater elevation is 741.0 feet msl.

28. Newport Dam creates an reservoir known as Clyde Pond. Prior to the construction of the dam, the river flowed across the strike of the Ayers Cliff member to form a series of falls (License Application, Appendix Volume VI, page 29). Clyde Pond has a surface area of approximately 199 acres at spillway crest and has a maximum depth of approximately 22 feet. The dam is fitted with 18 inches of flashboards, which have an effective height of 15 inches (879.2 feet msl) due to the placement location on the crest; the boards are maintained in place year round.

29. The powerhouse contains three units. Units 1 and 2 are vertical Allis Chalmers Francis turbines, each rated at 2,400 HP, 360 rpm with a design head of 140 feet and a combined hydraulic capacity of about 380 cfs (*Clyde River Hydroelectric Project - FERC No. 2306-VT - Estimates of Annual Energy Production for Newport Station*, Duke Engineering & Services, Inc., July 2001). Each turbine is connected to a 1,700 kw generator. Unit 3 is a horizontal S. Morgan Smith turbine rated at 1,000 HP, 600 rpm with a design head of 132 feet and a hydraulic capacity of about 63 cfs. Unit 3, which is to be rehabilitated under the applicant's proposal, is connected to a 600 kw generator.

30. The operations center for the project is located in the Newport 1,2,3 powerhouse. The West Charleston station is unmanned.

31. Adjusted for the loss of the Newport 11 plant, a total of 80% of the total project energy production is derived from the Newport 1,2,3 facility. At the time of the license application, 1991, the 18-year average annual productions for units 1, 2, and 3 were 7,554 MWh, 7,345 MWh, and 1,027 MWh, respectively. Between 1995 and 1999, the average annual production at this station averaged 17,894 MWh.

Newport 11

32. By letter dated July 26, 1996, FERC authorized the removal of the Newport 11 diversion dam in concert with efforts to stabilize the adjacent river embankment. The action was taken after the dam failed during a flood on May 1, 1994. Although the existing license was not amended to remove the facility, it is not part of the FERC FEIS preferred alternative, and the applicant is no longer proposing to repower the facility. The Newport 11 facility features and reach are described in the following findings to provide background. The associated lands remain part of the project boundary.

33. The diversion dam was located approximately 800 feet downstream of the Newport 1,2,3 tailrace. The dam was a concrete gravity structure built in 1956, with modifications and repairs made in 1981. The dam extended 114 feet in length with a spillway length of 90 feet and a crest elevation of 741 feet msl. A 4 x 4 foot sluice gate with an opening invert elevation of 729 feet msl was located in the western abutment of the dam. The dam diverted stream flows to a man-made canal 2,170 feet in length located on the west (river left) side of the river. At the end of the canal, a headgate admitted water into a 10-foot diameter steel penstock that extended 80 feet to the powerhouse.

34. The project had a gross head of 57.5 feet and a reported net head of 55 feet. The normal tailwater elevation was 683.5 feet msl, or about 1.5 feet above the normal water level of Lake Memphremagog..

35. The dam created a one-acre riverine impoundment which extended upstream to the tailrace of the Newport 1,2,3 facility. The impoundment had a maximum depth in excess of 15 feet.

36. The facility's powerhouse contained a vertical Leffel Kaplan type turbine rated at 2,400 HP at 400 rpm with a net head of 55 feet at 400 cfs. The turbine was connected to a 1,920 kw generator. The powerhouse remains.

37. Electrical output from the facility was carried to a bus at the Newport 1,2,3 station via an aerial line. The transmission line,

which closely followed the south side of the river, has been removed, and the corridor is reverting to forest.

38. At the time of the license application, 1991, the 18-year average annual production for Unit 11 was 5,557 MWh.

III. River Hydrology and Streamflow Regulation

39. Hydrologic information is tabulated below for the five facilities associated with the Clyde River Project. The estimates of mean annual flow and 7Q10 are derived from the data collected at the gaging station (#04296500) operated by the U.S. Geological Survey on the Clyde River in Newport just upstream of the Newport 11 tailrace. The drainage area at the gage is 142 square miles. The gage was placed in service in May 1909. During the period the Newport 11 facility was in operation, the U.S. Geological Survey adjusted the measured flows at the gage based on plant operation in order to account for the physical location of the gage in the bypass.

Over the period of record, natural river flows have been regulated by the operations of the Clyde River Project and the Barton Village Project (Pensioner Pond) and by diversions around the gaging station through the canal and penstock of Newport 11 from March 6, 1957 to May 1, 1994. In 1995, the trustees of the Village of Barton voluntarily offered to convert the operation of the Barton Village Project to a true run-of-river operation[3] in order to protect aquatic habitat. It is currently operated in that mode. Presently, the Newport 1,2,3 facility is the only station which significantly alters the natural river hydrology.

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

Table 1. Hydrologic Parameters at Project.

Facility	Drainage Area (sq. miles)	Mean annual flow (cfs)	7Q10 (cfs)
Seymour Lake	21	38	4
Echo Lake	25	45	5
West Charleston	107	193	21
Newport 1,2,3	140	252	28

Seymour Lake

40. Under the existing FERC license, Seymour Lake can be regulated as an storage facility for the Clyde River Project. The license establishes maximum and minimum water level requirements. With a dam crest elevation at 1279.0 feet msl, maximum lake elevation may not exceed 1279.5 feet msl (crest plus 6 inches) and minimum elevation may not fall below 1278.33 feet msl (minus 8 inches) for operational purposes. The license also requires that the gate in the dam be maintained open at least one inch from its sill to allow for a continuous discharge of water and that any gate adjustments be made gradually to prevent streambed scouring.

41. The outlet gate has historically been controlled by both the applicant and members of the Seymour Lake Association. Typically, the lake association has only made adjustments to the gate during the summer season. In certain cases during extreme low-flow periods or prior to spring runoff, the pond has been lowered below the minimum elevation required in the license, and flow releases below the lake have not always been maintained as required. (*Hydropower In Vermont: An Assessment of Environmental Problems and Opportunities*, Department of Environmental Conservation, 1988)

42. The storage function of Seymour Lake was discontinued before 1987. (pers. com. Jeffrey Cueto with Kevin Perry, Citizens Communications, April 11, 1994) However, the applicant manages the gate as necessary to prevent the lake from exceeding the maximum stage set in the license. The lake stage is normally maintained in the low end of the required range to provide some buffering of high flows. Under the new license, the applicant

proposes to formally discontinue the storage function of Seymour Lake.

43. In 1951, under 30 V.S.A., Chapter 9, the Legislature ordered the State Public Service Commission to define the natural maximum and minimum water levels of Lake Seymour after the applicant had extensively enlarged the outlet channel to enable drawdowns. The Public Service Commission found that a feature called Big Rock, located immediately below the east end of the dam, had caused stillwater in the outlet stream before the present dam was constructed in 1928. The Department infers from its review of the record, including a Vermont Supreme Court decision (117 VT. 367, 91 A.2d 813, October 7, 1952) related to the applicant's challenge of the Public Service Commission's certificate, is that the Public Service Commission had defined the true natural low water elevation and the magnitude of the normal water level fluctuation above that elevation; that the evidence considered related to the water levels as they were before the first damming of the lake outlet in 1921; and that the channel work done by the applicant and the use of flashboards were for the purpose of creating storage that would not otherwise have been available for augmenting downstream flows.

44. The statute prohibits the artificial raising or lowering of the water level outside of the defined natural range, which was established and marked by pins installed at the natural lake outlet and set 6 inches above and 8 inches below the present dam crest (Public Service Commission Order No. 2564, September 15, 1951). These levels were subsequently incorporated in the 1963 federal license.

45. The Seymour Lake Association had indicated a preference for maintaining the lake stage at 4 to 8 inches above "low pin" (Memorandum from Bonnie Gottermeyer, President, Seymour Lake Association to Citizens Utilities, August 25, 1997), but, after a June 29, 1999 meeting with the Agency, the applicant modified its request to *6* to 8 inches above low pin (Letter from Ronald Kolar, Chair, SLA Dam and Lake Level Committee, to David P. Boergers, Secretary, FERC, August 20, 1999). More recently, the Seymour Lake Association, along with the Town of Morgan, restated its preferred lake level, adding that the lake should be at 8 inches above low pin as much as possible; that a two-inch crest board should be installed initially and tested for two years to

determine if that configuration better meets the lake association's target water levels; and that a gate should be installed to control severe floods, such as the 50-year or 100-year flood (Letter from James T. McWain, President, Seymour Lake Association, Ronald Kolar, SLA Dam and Lake Level Committee, and George Fuller, Selectman, Town of Morgan to Jeffrey Cueto, Department, September 29, 2001).

46. The applicant proposes to reconstruct the dam as a concrete gravity structure with the spillway lowered to elevation 1278.67 feet msl, or four inches below the current design elevation 1279.0 feet msl, and the lengthened in order to increase the hydraulic capacity of the spillway. The applicant estimates that the hydraulic grade line from the lake to the dam drops about two inches during normal flow conditions. (*Draft Design Criteria for the Seymour Lake Dam Replacement Project*, Duke Engineering & Services, Inc., October 2001)

47. Under the current license, the applicant maintains the existing slide gate open at least one inch to provide continuous downstream flows. With the lake level at the dam crest, this results in an estimated flow release of 4 cfs. The Department has requested that the new dam design not incorporate a gate and that consideration be given to providing an alternate method for providing downstream conservation flows.

48. The Department reviewed lake elevation for the period 1986-2001 to determine the normal water level during the summer recreational period, Memorial Day through mid-September, and the average gate setting during that period. The water level is commonly maintained below the current crest, and the gate is only closed down to the conservation flow setting of one inch for the driest portion of the summer period. Table 2a shows the average summer water level and gate settings for each calendar year for the period 1986-2001. The long term average condition was a lake level 1.7 inches below the dam crest, or elevation 1278.86 feet msl, and a gate opening of five inches. Table 2b shows the frequency that certain lake levels are equaled or exceeded during the summer period over the long term. The gate was set at one inch about half the time during the summer based on the long-term data.

Table 2a. Seymour Lake average summer water levels (height relative to dam crest) and gate openings, 1986-2001.

Calendar Year	Average Lake Level (inches)	Average Gate Opening (inches)	Calendar Year	Average Lake Level (inches)	Average Gate Opening (inches)
1986	-2	8	1994	-1	6
1987	-2	7	1995	-2	4
1988	-4	5	1996	-1	4
1989	-2	7	1997	-2	3
1990	-1	8	1998	+2	9
1991	-4	2	1999	-1	4
1992	-3	1	2000	-1	3
1993	-1	6	2001	-2	2
			Average	-1.7	5

Table 2b. Seymour Lake summer water level frequency distribution (levels equaled or exceeded), 1986-2001.

Frequency	Lake Level		Frequency	Lake Level	
	inches	feet msl		inches	feet msl
0	+7.5	1279.62	60	-3.0	1278.75
10	+2.0	1279.17	70	-3.25	1278.73
20	+0.5	1279.04	80	-4.0	1278.67
30	-0.75	1278.94	90	-5.0	1278.58
40	-1.0	1278.92	100	-8.0	1278.33
50	-2.0	1278.83			

Echo Lake

49. Echo Lake is also licensed as a storage facility for the Clyde River Project. The license establishes a maximum lake elevation of 1249 feet msl (dam crest). It also requires that the outlet gate be continuously open at least one inch from the sill for a continuous

discharge of water and that any gate adjustments be done gradually to prevent streambed scouring.

50. Lake fluctuations on the order of six feet and more are reported to have occurred. In the past, the outlet gate on the dam has been controlled by both the applicant and members of the Echo Lake Association. In certain cases during extreme summer low-flow periods or prior to spring runoff, the lake was reportedly lowered below the maximum drawdown level. On several occasions, the outlet gate has been closed to control lake levels. (*Hydropower In Vermont: An Assessment of Environmental Problems and Opportunities*, Department of Environmental Conservation, 1988) The maximum drawdown was likely limited by the natural lake control in the vicinity of the town bridge located upstream of the dam; it is doubtful that the lake could have been drawn more than six feet due to this control. Stephen H. Haybrook, an engineer who inspected the dam in September 1950, indicated in a January 22, 1951 report that the useable storage was limited to a four-foot draw below the crest because of "high ground just above the dam." (*Report on Echo Pond Dam*, Stephen H. Haybrook, Vermont Public Service Commission, January 22, 1951.)

51. In January 1939, the applicant petitioned the Vermont Public Service Commission to condemn flowage rights on Echo Lake in order to raise the dam ten feet and enhance the lake's storage function. Objections by the public caused the applicant to withdraw the petition, and the Orleans County Court of Chancery, by order dated October 21, 1939, enjoined the applicant from installing flashboards or rasing the dam height and mandated the control of high lake levels.

52. The storage function of Echo Lake was discontinued before 1987. (pers. com. Jeffrey Cueto with Kevin Perry, Citizens Communications, April 11, 1994) According to a letter of August 23, 1979 from the Vermont Public Service Board to the Echo Lake Protective Association, the applicant had agreed at that time to attempt to restrict drawdowns to no greater than 14 inches below the dam crest. Although the applicant no longer uses lake storage, the gate is operated as necessary to prevent the lake from rising above the maximum stage set in the license.

53. Under the new license, the applicant proposes to formally discontinue the storage function of Echo Lake. To accommodate this change, the applicant has lowered the spillway elevation eight inches to elevation 1248.33 feet msl, meeting the target lake level (one inch above the new crest) desired by the Echo Lake Protective Association (Resolution passed by the Echo Lake Protective Association, July 25, 1992). The new dam crest incorporates flashboard sockets, which will allow for raising the effective crest elevation back to elevation 1249.0 feet msl or an intermediate elevation should that be deemed appropriate.

54. The Department has randomly measured the water level of Echo Lake between May and October since 1980 as part of the establishment of a regulatory mean water level for the purposes of the shoreland encroachment permit program (29 V.S.A., Chapter 11). Measurements were taken in twelve years, with one reading in each of those years. The water level has ranged from the crest elevation to 1.1 feet below the crest. The mean was 0.3 feet below the crest, or 1248.7 feet msl.

55. The existing sluice gate in the dam would be maintained open one inch to assure a continuous downstream flow. With the lake level at the dam crest under the applicant's proposal, the gate opening would result in a flow release of 4 cfs. The gate would be locked in place except for those infrequent times when the lake would be lowered for scheduled dam maintenance or when the gate is used to keep it in operable condition. (License Application, Appendix Vol. VIII, page 49)

56. Other than drawdowns for dam maintenance, water levels would no longer be managed. Unless an emergency condition existed necessitating an immediate drawdown, the Department would expect the applicant to utilize a cofferdam in order to avoid or minimize a drawdown.

Flooding - Seymour and Echo Lakes

57. By letter dated March 29, 1990, the Agency of Natural Resources (the Agency) requested that the applicant determine the impact that elimination of artificial water level control would have on shoreline flooding at both Echo and Seymour lakes. The Agency also requested, in an August 3, 1990 letter, that the applicant

develop a plan for the management of the outlets of the two lakes such that downstream flows would be maintained while optimizing conservation and recreation lake levels.

58. License Application, Appendix Volume II presents the results of a flood study prepared for the applicant by Stetson-Harza and entitled *Seymour Lake and Echo Pond Flood Study* (July 1991). The applicant prepared a HEC-1 model to simulate hypothetical conditions reflecting the existing (manual weekly gate control) and proposed (spillway controlled run-of-river) modes of operation. The modeling assumed no change to the spillway elevations. The purpose of the HEC-1 analysis was to compare flood water levels under run-of-river spillway control operations compared to present operations. For modeling purposes, two types of storm events were considered: one during the March/April period and the second during the summer.

59. Springtime run-of-river conditions resulted in a water level increase of about four inches at both lakes; summertime run-of-river conditions resulted in an increase of about two inches at both lakes. Under the modeled conditions, the applicant's analysis indicated that flood elevations resulting from spillway controlled run-of-river operation would not be significantly different from those experienced under current operation.

60. A more recent analysis done for Seymour Dam by Duke Engineering & Services suggests that the earlier study may have had deficiencies. Two significant factors in the outlet flood hydraulics of Seymour Lake are the effects of downstream tailwater on the dam and the existence of a water level differential between the lake and the dam. These two conditions are not factors at Echo Lake. At Seymour Dam, the dam crest is only about 4.5 feet above the downstream streambed. As a consequence, the dam crest becomes submerged on the downstream side during highwater conditions. By letter dated January 6, 1999, the Department had asked the applicant to identify the significance of submergence. The 1,200-foot stream channel between the lake and the dam also affects lake water levels. These two factors were taken into account in the applicant’s more recent analysis.

61. The existing gate has had limited effectiveness in preventing the lake from rising above the high pin during floods. When open, it partially obstructs the spillway. Tailwater submergence during high flows also reduces its capacity. The applicant provided the Department with lake stage data for the period August 26, 1996 to June 10, 1998. On April 1, 1998, the lake rose to a stage 12 inches above the high pin. The gate had been opened 36 inches on the prior day and was adjusted to 50 inches on that day. (Letter from Kevin Perry, Citizens Communications to Jeffrey Cueto, Department, September 21, 1998) In mid-April 2002, the lake rose to a similar high level (pers. com. Jeffrey Cueto, Department with Kevin Perry, Citizens Communications, May 7, 2002).

62. The drop in water levels from the lake to the dam were first recorded in July 1998, although there may have been an unnoted effect earlier. Water levels are measured at the lake when the pins are accessible, normally from mid-April through November. Otherwise the measurements are taken at the dam. Only more recently has limited data been collected at both locations concurrently. When measurements were taken on July 24, 1998, 4 3/4 inch drop from the lake to the dam was recorded. The drop was attributed to fallen trees and silt in the outlet channel. Three days later, a drop of 5 inches was recorded. The gate was open 25 inches during the period, and the water level was below the dam crest. This would correspond to a lake outflow of about 60-70 cfs, based on Duke Engineering's hydraulic rating for the existing dam.

63. A preliminary dam design done by Duke Engineering lengthens the dam crest from the current 30.6 feet to 52.0 feet. Combined with the lowering of the crest by four inches, the new design substantially increases the spillway capacity. The design also incorporates a bulkhead bay with a five-foot width equivalent to the existing gate bay. The sill elevation for the bulkhead bay would be 1275.0 feet msl, or 0.3 feet lower than the existing gate sill. Although the basis of design is to only discharge water via the spillway (crest controlled run-of-river operation), excepting for the 4 cfs conservation flow, the bulkhead bay provides the ability to install a gate if such an action is determined to be in the public interest.

64. The Department reviewed the 1986-2001 lake elevation and gate setting records furnished by the applicant as the records related to

high lake levels (Table 3). For the period May 13, 1998 - June 11, 1999, the Department has inspection logs that reflect each day that the dam site is visited and oftentimes the gate adjusted. The permanent records reflect only one data set per week, that being the one taken closest to the end of the week. Based on the 1998-99

Table 3. Seymour Lake record high annual levels (height above dam crest), 1986-2001.

Calendar Year	Spring (March-May)		Summer (June-September)	
	Lake Level (inches)	Gate Opening (inches)	Lake Level (inches)	Gate Opening (inches)
1986	+12	40	+4	24
1987	+10	36	+7	1
1988	+9	30	0	16
1989	+7	24	+1.5	12
1990	+10	26	+2	22
1991	+6	37	0	1
1992	+9	36	+0.5	1
1993	+11	46	+3.5	26
1994	+14	48	+2	10
1995	0	26	+3	8
1996	+18	50	+4	1
1997	+4	36	+3.5	10
1998	+16	50	+7	36
1999	+7	28	+2.75	4
2000	+14	42	+2.5	4
2001	+16	53	-1	1
Average	+10	38	+3	11

logs, the site is typically visited two or three times a week. Because there is no continuous monitoring of lake levels, the true peak lake levels are not available. The highest annual levels recorded are typically in the spring when, in the majority of years,

the lake has risen above the high pin (more than 6 inches above the dam crest).

Setting aside the fact that true peaks are not recorded, the data set suggests that it is a rare occurrence for the water level to stage above the high pin during the summer. Only in July 1987 and June/July 1998 did the lake stage above the high pin, and then only slightly.

65. The large surface area of Seymour Lake (1750 acres, or 2.7 square miles) relative to the watershed area of 21 square miles provides a significant amount of peak flow attenuation through storage. Over the 14-inch range between the pins, the lake can store 1.8 inches of watershed runoff. The proposed dam crest is intermediate between the two pins, so the full storage capability cannot be utilized without using a gate to draw the reservoir below the crest. The two-inch drop between the lake and the dam under normal flows further limits the amount of available storage. Effectively, the amount of watershed runoff that will be able to be stored is 1.0 inch. This is still a significant amount relative to the runoff from summer storms. Assuming half of a rainfall event is converted to runoff, the lake is capable of storing most of the runoff from an average annual storm event (water level starting at minus two inches relative to the present crest). The Summer 1998 high water event resulted in the largest gate setting to control water levels. The discharge through the 36-inch opening, based on Duke Engineering's rating, would have been approximately 81 cfs, with a 3-inch spill bringing the total discharge up to 104 cfs; with the proposed dam and no gate discharge, the spillage depth would increase to 9 inches, resulting in a lake stage of about +9 inches (+13 inches from the proposed lower crest). This is only three inches above the high pin.

66. As shown by the historic data set, the issue of high water levels primarily relates to the spring snowmelt runoff period when higher sustained inflows are encountered. The duration of the runoff reduces the flood storage buffer of the lake. The highest recorded stage for the period reviewed was +18 inches on May 4, 1996 with a gate setting of 50 inches, which is about full gate; use of the full gate setting is very uncommon. Based on Duke Engineering's dam rating, this would correspond to a flow condition of about 170 cfs. The proposed 52-foot spillway would be able to discharge this

amount of water with a surcharge of about one foot, assuming it is not backwatered by downstream conditions. Duke Engineering, based on limited data, has estimated that the drop from the lake to the dam under these flow conditions is about 11 inches. Under this assumption, the lake level with the proposed dam spilling one foot of water would be about two feet above the dam crest, or about half a foot higher than it was during the May 1996 runoff event.

West Charleston

67. The West Charleston powerhouse has a hydraulic capacity of 50 to 206 cfs and can be manually controlled at the plant, or remotely controlled from the operations center at the Newport 1,2,3 powerhouse. The annual plant factor is 55.7%.

68. Under the existing license, the facility operates in a peaking mode with no downstream flow requirements. Reservoir drawdowns are limited to 5.5 feet below the crest. Historically, operation of the facility was governed to a large extent by peaking flow releases from the Barton Village Project[4], which discharges directly into the upstream end of Charleston Pond. Barton's generating capacity at full output exceeds the hydraulic capacity of the West Charleston facility (266 cfs as opposed to 206 cfs). In anticipation of Barton's generation, the West Charleston generator would be loaded prior to Barton's generation and allowed to continue generating after Barton has ceased generating. Charleston Pond was used as a storage buffer. Neither station is manned.

69. Barton Village's current license allows it to store water in Pensioner Pond and only release 21 cfs from June 15 through September 15, and 10 cfs during the remainder of the year; higher flow requirements were deferred until the licensing of the Clyde River Project. However, the trustees of the Village authorized conversion of the operation to run-of-river in 1995; run-of-river operation was expected to commence on or about June 30, 1996 after installation of control equipment (Letter from J. Mark

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[4]The Barton Village Project (FERC No. 7725) was constructed in the 1890s and first licensed as Project No. 7725 in 1984. The federal license was issued for a term of twenty years and expires October 1, 2004. The Village will be filing a license application on or before October 1, 2002..

Robinson, FERC to Robert Arnold, Barton Village, March 21, 1996).

70. The Department measured a leakage flow of 2.8 cfs on July 14, 1982 at a point 150 downstream of the West Charleston dam in the facility's bypass. The source of this flow was leakage from the penstock and wastegate. Leakage is the only flow maintained through the bypass when no spillage is occurring and the only flow maintained below the powerhouse during periods of refilling the reservoir other than local runoff. This leakage flow is only 13% of the 7Q10 value at the dam. (*Hydropower In Vermont: An Assessment of Environmental Problems and Opportunities*, Department of Environmental Conservation, 1988)

71. The applicant proposes to convert the operation of West Charleston to a true run-of-the-river mode. The flow regime below the powerhouse will track inflows to Charleston Pond; as discussed above, inflows are controlled by the Village of Barton facility. The flashboards will no longer be used, and reservoir levels will be maintained at a target elevation of 1058.75 feet msl, which is 3 inches below the spillway crest.

72. The applicant proposes to maintain conservation flow releases through the bypass of 46 cfs (July 1 to September 30) and 67 cfs (October 1 to June 30). These flows would be maintained through the 6-foot sluice gate in the dam. The gate will also be calibrated at the target headpond elevation to permit accurate gate settings for the proposed flow releases; when the plant is off line, the gate would be adjusted to maintain a fixed pond level (*Schedule B Information Appending Application*, response to AIR No. 18, October 1993).

73. Modifications of project works will be made to accommodate run-of-river operation with conservation flows in the bypass. The existing turbine will be rehabilitated. The turbine gate structures will also be rehabilitated and will be automated, as will the existing sluice gate. Remote water level sensing equipment for the headpond will be installed. The generator was rewound in 1990. According to the applicant, extensive rehabilitation of the turbine would not be necessary were the station to remain a peaking facility.

74. Under the applicant's proposed bypass flows, during the period July 1 through September 30, the project would not generate when inflows are less than 96 cfs (46 cfs conservation flow plus 50 cfs low end hydraulic capacity of the project's turbine). During the period October 1 to June 30, the project would be unable to generate when inflow is less than or equal to 117 cfs (67 cfs conservation flow plus 50 cfs).

75. Under the applicant's proposal to release bypass flows through a sluice gate, when inflow conditions are less than the proposed bypass flow in effect, a reduction in reservoir levels would occur unless the gate is lowered to compensate.

76. Proposed bypass flows are based on the applicant's aquatic base flow study, initially presented in License Application, Appendix Volume II and later revised pursuant to review by the U.S. Geological Survey. A flow of 46 cfs represents the applicant's estimate of the river's August median flow, and 67 cfs represents the applicant's estimate of the river's median February flow.

77. Under the applicant's operating proposal, a lag time would occur between turbine shutdown and restoration of natural flows below the powerhouse. This lag time would be a function of 1) the time between plant shutdown and adjustment of the gate 2) the travel time for the dam discharge to reach the project tailrace. During the lag time and depending on project inflow, below-project flows would be reduced to the applicant's proposed bypass flows.

78. The applicant has not proposed a method for compensating for potential lag times downstream of the project.

Newport 1,2,3

79. At the Newport 1,2,3 facility, Unit 1 is only operated at a full gate hydraulic capacity of 197 cfs, Unit 2 is operated as a variable unit in a range of 84 cfs (0.35 gate) to 189 cfs (full gate), and Unit 3 is operated at a 0.8 gate fixed release of 50 to 62 cfs (*Clyde River Hydroelectric Project - FERC No. 2306-VT - Estimates of Annual Energy Production for Newport Station*, Table 1, Duke Engineering & Services, Inc., July 2001). In 1994, the applicant intended to refurbish Unit 3 in order to change its range of operation to 32 to 63 cfs (pers. com. Alison DesMeules,

Department with Frank Thomas, Citizens, April 19, 1994); the status of that upgrade is unknown at this time. The facility is manually controlled from the operations center located at the facility's powerhouse. Units 1 and 2 are used for peaking. Historically, Unit 3 has been used primarily during high water conditions.

80. Before the failure of the Newport 11 in 1994, the Newport 1,2,3 powerhouse normally operated in a peaking mode, with a daily and weekly cycle. During low-flow conditions, minimal or no generation occurred over the weekends. Ponded storage was used to satisfy peak demands during the weekdays. Since Mondays typically have the highest peak demands, ponded storage from weekends tended to be utilized fully on Mondays. For the remainder of the weekdays, daytime generation offset nighttime ponding. Under mean flow conditions, generation would occur 13 to 18 hours per day. During periods of high flow, units 1 and 2 generated continuously as conditions allow. Actual generation hours would vary depending on water conditions for a given day. Since 1994, the station has been operated primarily for baseload generation following Clyde Pond infllows with limited use of pond storage for peaking (Letter from Barbara Ripley, representing the applicant, to Jeffrey Cueto, Department, December 5, 2001).

81. The existing license for the facility does not limit reservoir drawdowns. Drawdowns and fluctuations occur due to normal operation and periodic maintenance activities. With the flashboards in place, the maximum operational drawdown is eleven feet (from the crest to the top of the intake), providing a useable storage of 1,540 acre-feet. The normal maximum operational drawdown of Clyde Pond is approximately five feet below the spillway crest, and the maximum seasonal drawdown in anticipation of spring runoff is approximately eight feet below the crest. The maximum maintenance drawdown is an additional six feet.

82. The pond is normally maintained at or below the spillway crest; the storage behind the flashboards is used to reduce spillage during periods of high inflow. In fact, during the year 1988, which the applicant considers to be typical, the reservoir did not spill at any time, even during spring high flows. During 1988, beginning in early February and extending to early March, the pond was drawn

to about elevation 871 feet msl. Spring high flows brought the water level above the dam crest, but not above the boards. The pond was then brought down to about elevation 874 feet msl by mid-June. It then rose and was generally maintained at elevation 876 feet msl plus or minus half a foot during the summer and fall. If this typifies operation, the pond is seldom above elevation 877 feet msl. The hydrographs provided for the other years between 1984 and 1990 are very similar in terms of the seasonal operating regimes. (License Application, Appendix Volume IV, *Clyde Pond Water Level Management Report*, July 1991)

83. The average operational water level of Clyde Pond between 1984 and 1990 was 2.2 feet (elevation 875.8 feet msl) below the crest. Maximum drawdown during non-ice cover months was 8.7 feet (869.3 feet msl) below the crest; this occurred during an extremely dry period in August - September, 1987. Referencing this same period of record, Clyde Pond was operated above elevation 875 feet msl 78% of the time. About 70% of the drawdowns greater than three feet occurred in preparation of spring runoff. The applicant's review of available data indicates that weekly fluctuations in water surface elevation ranged as high as 7.5 feet but averaged one foot. (License Application, Appendix Volume IV, *Clyde Pond Water Level Management Report*, July 1991)

84. Except during periods of high flow, the Newport 1,2,3 bypass receives only leakage and local drainage. The Department measured a leakage flow of 2.0 cfs at a point 114 feet downstream from the dam on July 13, 1982. A flow of 2.0 cfs is about 8% of 7Q10 drought flow (*Hydropower In Vermont: An Assessment of Environmental Problems and Opportunities*, Department of Environmental Conservation, 1988).

85. The applicant proposes to maintain a nominal minimum flow of 5 cfs through the bypass channel. The flow would be passed through a low-level gate opening next to the gatehouse. (*Schedule B Information Appending Application*, response to AIR No. 18, October 1993) The applicant proposed to install the pipe for downstream salmon passage, operated with a flow of 15 cfs, if the Fish and Wildlife Department chooses to undertake a program of

upstream fry stocking.[5] The design for the passage pipe uses a 24-inch high density polyethylene pipe that would transport fish at velocities of up to 20 feet per second and discharge them at the Newport 1,2,3 powerhouse. (Ibid., *Fish Passage Feasibility Study for the Clyde River*, October 1993)

86. The applicant proposes to release, as conservation flows below the tailrace, 363 cfs from April 1 to June 7, 100 cfs from June 8 to September 30, 150 cfs from October 1 to December 15, and 120 cfs from December 16 to March 31.

87. The applicant proposes to continue utilizing storage from Clyde Pond to maximize hydroelectric generation during peak power demand periods. Normal operation of the pond is proposed to be between the top of the flashboards and 2.0 feet below the top of the boards (e-mail from Kevin Perry, Citizens Communications to Jeffrey Cueto, Department, October 15, 2001). This would effectively raise the normal operating level of the pond from elevation 875.8 feet msl to elevation 878.2 feet msl, or about 2.4 feet. During the period April 1 to July 15, the drawdown would be limited to 1.0 feet. The applicant originally proposed using the dam crest as the reference elevation for drawdowns and to continue utilizing the flashboards only as a mechanism to prevent spillage; however, FERC staff recommended permanent removal of the flashboards under those circumstances (*The Clyde River Hydroelectric Project, Final Environmental Impact Statement*, FERC, June 1996, p.4-57). In response, the applicant changed the proposal to using the top of the boards as the reference elevation for drawdowns. FERC staff also noted that, should the applicant elect to operate using the top-of-flashboards reference, the flashboard system would have to be redesigned to allow them to be reset before the pond dropped below elevation 878.2 feet msl following a collapse of the boards during spring highwater. (Ibid., p. 4-57)

88. The applicant originally proposed that it be allowed to intentionally deviate from the two-foot target range during emergency operations, scheduled maintenance, floods (high water), and capacity testing. The applicant also proposed that the Newport facilities of the Clyde River Project be able to increase

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[5]The Department of Fish and Wildlife subsequently began fry stocking in 1993.

generation to maximum output in order to satisfy NEPOOL capability demonstrations or at any time when warranted by circumstances involving local, regional, or New England wide system emergencies as indicated above. (*Schedule B Information Appending Application*, response to AIR No. 18, October 1993) FERC staff concluded, however, that the additional drawdowns would unnecessarily degrade the pond environment, and the drawdowns are no longer part of the licensing proposal as a result. (*The Clyde River Hydroelectric Project, Final Environmental Impact Statement*, FERC, June 1996, p.4-44)

89. Under the applicant's operating proposal, a lag time will occur between turbine shutdown and restoration of flows below the powerhouse.

Newport 11

90. The Newport 11 facility had a hydraulic capacity of 240 to 400 cfs and was manually controlled at the Newport 11 powerhouse or remotely controlled from the operations center located at the Newport 1,2,3 powerhouse. The facility was operated in coordination with the Newport 1,2,3 development. The Newport 1,2,3 facility generally operates in a peaking mode with the operating schedule determined by demand on the system and/or NEPOOL requirements. During low-flow periods, Unit 11 normally generated up to 8 hours a day and followed the operational schedule of the Newport 1,2,3 facility. Under mean flow conditions, the plant operated 13 to 18 hours a day. During high-flow conditions, Unit 11 ran continuously, as flow permitted. Under daily cycling conditions, the drawdown was limited to 3.5 feet (the top of the intake structure).

91. Article 24 of the existing license for the Clyde River Project required that a minimum flow of 10 cfs be maintained through the sluice gate in the diversion dam for the periods April 15 to June 15 and September 15 to November 15 and a flow of 5 cfs for the remainder of the year.

Summary of Operating Proposal

92. The relicensing proposal operating mode and limitations for the two existing generating facilities are tabulated below. As used in

the tables, "r-o-r" means operation in an true run-of-the-river mode.

Table 4a. West Charleston Proposal for Relicensing.

Period	Operating Range (feet)		Conservation Flow (cfs)	
	High	Low	Bypass	Downstream
July 1 - Sept. 30	-0.25	-0.25	46	r-o-r
Oct. 1 - June 30	-0.25	-0.25	67	r-o-r
Hydraulic Capacity		50 cfs 206 cfs		minimum maximum
Flashboards		Use discontinued		

Table 4b. Newport 1,2,3 Proposal for Relicensing.

Period	Operating Range (feet)		Conservation Flow (cfs)	
	High	Low	Bypass	Downstream
April 1 - June 7	0	-1.0	5	363
June 8 - July 15	0	-1.0	5	100
July 16 - Sept. 30	0	-2.0	5	100
Oct. 1 - Dec. 15	0	-2.0	5	150
Dec. 16 - Mar. 31	0	-2.0	5	120
Hydraulic Capacity		Unit 1 Unit 2 Unit 3		197 cfs 84-189 cfs 50-62 cfs
Flashboards		15 inch effective height (actual dimension 18 in.)		

Note: The proposed zero for the operating range is the top of the flashboards, elevation 879.25 feet msl.

IV. Standards Designation

93. The entire length of the Clyde River mainstem is classified as Class B waters. One waste management zone (formerly referred to

as Class C waters) has been designated in the project reach for the purpose of assimilating treated wastewater. The zone begins at the Newport City Wastewater Treatment Facility outfall and extends to Lake Memphremagog, a distance of 0.5 mile. The Water Resources Board has designated the Clyde River; Echo Lake and Seymour Lake; and the unnamed tributary on which the two lakes are located as cold water fish habitat. Lake Memphremagog is also designated as cold water fish habitat.

94. With the adoption of the current version of *Standards*, the Water Resources Board created a system allowing Class B waters to be placed in one of three water management types (WMT). The system allows Class B waters to be assigned different levels of protection based on the attainability of uses or the current level of protection already afforded by the anti-degradation policy (*Standards*, Section 1-03). No waters in the Clyde River basin have as yet been typed. (*Standards*, Section 3-06)

95. Class B stream reaches are managed to achieve and maintain a high level of quality compatible with certain beneficial values and uses. Values are high quality habitat for aquatic biota, fish and wildlife and a water quality that consistently exhibits good aesthetic value; uses are public water supply with filtration and disinfection, irrigation and other agricultural uses, swimming, and recreation. (*Standards*, Section 3-04(A) *Class B Waters: Management Objectives*)

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

97. Dissolved oxygen standard for cold water habitat streams is 6 mg/l and 70 percent saturation. The standard is 7 mg/l and 75 percent saturation at all times, and 95 percent saturation during late egg maturation and larval development of salmonids in areas that serve as salmonid spawning or nursery areas important to the establishment or maintenance of the fishery resource. The temperature standard limits increases from background to 1.0EF (*Standards*, Section 3-01(B)(1) *Temperature*). The turbidity standard is 10 ntu (*Standards*, Section 3-04(B)(1) *Turbidity*).

98. Under the Class B criteria for aquatic biota, fish, and wildlife, all waters, except mixing zones, are managed to achieve, as in-stream conditions, aquatic habitat with "[n]o change from reference conditions that would have an undue adverse effect on the composition of the aquatic biota, the physical or chemical nature of the substrate or the species composition or propagation of fishes." (*Standards*, Section 3-04(B)(4))

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

100. *Standards*, Section 3-01(C) *Hydrology Criteria* requires that, for Class B waters that have not been classified as WMT 1, streamflows be protected in such a manner that the change from the natural flow regime "provide for maintenance of flow characteristics that ensure the full support of uses and comply with the applicable water quality criteria." *Standards* indicates a preference for study-based, site specific streamflow protection standards; however, use of general hydrologic standards is also accepted. Both approaches have been used for this project.

101. In 10 V.S.A. §1250, the legislature enumerated the State water quality policy. The State's policy is to upgrade the quality of its waters and reduce existing risks to water quality over the long term and to protect and enhance the quality, character and usefulness of its surface waters. Further, it is the State's policy to allow beneficial and environmentally sound development.

102. Existing hydroelectric projects are beneficial developments in terms of serving the public good, if they are properly controlled for consistency with *Standards*, including the designated and existing uses of the waters.

103. On July 11, 2000, the Department issued, under Section 303(d) of the Federal Clean Water Act, a list of waters considered to be impaired based on water quality monitoring efforts. The only waterbody listed in the project area is Salem Lake. Salem Lake

supports walleye, which are subject to a statewide fish consumption advisory related to mercury fish tissue contamination.

104. The Department also issued a four-part list, *List of Priority Surface Waters* (July 13, 2000). The Part F list contains those waters for which water quality or habitat is altered by flow regulation. Regulation of lake levels and streamflow by the project is listed as impacting uses including aquatic life support, aesthetics, and primary and secondary contact recreation.

V. Water Chemistry

105. The river receives permitted discharges from five sources: the Brighton and Newport wastewater treatment facilities; the cooling water discharges at Barton Village electric plant and the Newport 1,2,3 electric plant; and a stormwater discharge from a subdivision in Derby. Nonpoint sources include hydroelectric facilities, logging jobs, agricultural runoff, failed or poorly operating septic systems, and a former hazardous waste site.

106. In the lower Clyde River section from the confluence of the tributary from Echo and Seymour lakes, downstream to the river's mouth, designated uses of 3.6 miles are threatened by contaminants, and designated uses of 4.6 river miles are not fully supported. The remaining riverine portions of the lower Clyde River fully support designated uses. The non-support and partial support is primarily attributed to flow regulation and impounding, not contamination. Due to mercury contamination, fish consumption is only partially supported in the Newport 1,2,3 and Charleston tailrace reaches. (*General Report on all Waterbody Data*, Department of Environmental Conservation, February 1996)

107. Temperature and dissolved oxygen data collected by the Department in 1982 from stations at the West Charleston and Newport facilities indicated supersaturated dissolved oxygen concentrations at points above and below each project, with stratification and dissolved-oxygen depletion occurring in Charleston Pond. (*Hydropower In Vermont: An Assessment of Environmental Problems and Opportunities*, Department of Environmental Conservation, 1988). The recorded supersaturated conditions are evidence of algal activity in the river. Such activity can cause large diurnal fluctuations in dissolved oxygen levels.

108. *Charleston Pond.* Data collected by the Department on August 6, 1982 at Station I-2 located 410 feet upstream of the Charleston Pond dam revealed a dissolved oxygen profile displaying stratified conditions. Samples were taken to a depth 26.2 feet (elevation 1030.8 feet msl). A dissolved oxygen concentration at 59% of saturation was recorded at a depth of 23 feet. This was the lowest saturation recorded. The Department recorded dissolved oxygen concentrations of 88% saturation at elevations 1037.3 and 1043.9 feet msl; the inverts of the headgate and the bypass-flow gate are at elevation 1042.7 feet msl. The bypass-flow gate would have a free discharge 12 feet above the riverbed, providing an opportunity for reaeration of the conservation flow release.

109. *Clyde Pond.* The applicant provided dissolved oxygen profiles (License Application, Appendix Volume VIII) for Clyde Pond based on water qualities studies conducted by the applicant in October 1990 and August 1991. These profiles displayed oxygen-depleted conditions at the deeper sampling points. The sampling locations were about 600 and 500 feet upstream of the dam, respectively, and samples were taken over the full water column (20 feet) to a depth of about 858 feet msl. The intake for the penstock at Newport Dam is at elevation 864.5 to 870.5 feet msl. Standards were met over that range of depth.

110. The application also presents the results of a study in which the applicant continuously monitored temperature at several locations throughout the basin and collected dissolved oxygen samples at biweekly intervals during the summer of 1990. Unfortunately, the dissolved oxygen sampling was done during mid-day, when photosynthetic oxygen production from algae can predominate, and without regard to ambient flows and temperatures. Additional temperature data was collected during the summer of 1991.

111. The timing of the applicant's sampling was such that the information has little value in describing water quality conditions in the sampled river reaches. The summer of 1990 was extremely wet and did not well represent critical conditions for the river. Further, the few replicated samples done for quality control did not show good sampling reliability.

VI. Aquatic Biota and Habitat

112. *Aquatic biota* are defined in *Standards*, Section 1-01(B) as "all organisms that, as part of their natural life cycle, live in or on waters." Included, for example, are fish, aquatic insects, amphibians, and some reptiles, such as turtles. *Aquatic habitat* is defined as "the physical, chemical, and biological components of the water environment."

113. The Clyde River basin contains a diversity of recreationally important fishery resources in lake and riverine habitats. In addition to its resident fish populations, the river historically supported runs of adult salmon from Lake Memphremagog[6] for spawning and continues to support runs of walleye, yellow perch[7], and suckers, contributing significantly to those lake populations. (*Clyde River Futures Project Preliminary Report*, April 1991)

114. For reference, life stage periodicity information for three of the more important game fish is contained in the following table. This information is key to the determination of the adequacy of proposed flow regimes to support use by these fish.

Table 5. Fish species and life stage periodicity.

Fish Species	Life Stage	Period
Walleye	Spawning	April 1 - May 15
	Incubation	May 16 - June 7
Rainbow trout	Spawning	April 1 - May 21
	Incubation	May 22 - June 30
Landlocked salmon	Spawning	October 1 - December 15
	Incubation	December 16 - May 31

[6]Lake Memphremagog is 25 miles long and has a surface area of 37.8 square miles; 73% of the lake surface is in Quebec. The Black, Barton, and Clyde rivers comprise 65% of the lake's watershed, only 29% of which is in Quebec.

[7]Based on a winter creel survey in 1991, the Department of Fish and Wildlife estimated that the winter harvest for yellow perch is 100,000 to 150,000 fish in the Vermont portion of the lake. (*Responses to Lake Memphremagog Basin Fisheries Management Questions*, Agency, March 5, 1992)

The periods do not bracket all life-stage activity in all years; timing is highly variable. The incubation periods shown below are intended to begin after the end of most, if not all, spawning activity; the spawning periods include early egg incubation.

Landlocked Atlantic Salmon

115. A Department of Fish and Wildlife management goal in salmon management within the Clyde River watershed is the restoration and protection of habitat critical to the natural production of the species and support throughout all of its life stages. As part of an overall goal of restoring ecosystem health, a specific goal is the restoration and perpetuation of an abundant, wild (meaning stream-born) salmon population to the basin, a population that is both genetically fit and self sustaining through natural reproduction.

116. Atlantic salmon are known to have historically ascended the St. Lawrence River and its tributaries, including the St. Francis River. Anadromous salmon may also have entered Lake Memphremagog via its outlet, the Magog River, and ascended the lake's tributaries, including the Clyde River, before dam construction and pollution eliminated the sea-run fish from the St. Lawrence basin.

117. Based on Department of Fish and Wildlife records, salmon were stocked in the upper Clyde River watershed in the 1860s, in Newport in 1885, and in the Clyde River in Newport in 1899. A self-sustaining, natural run of fish became established, with large salmon returning to spawn each year. A viable population and river and lake fishery supported by natural reproduction was actively managed. The Clyde River supported the spawning of the lake population. (Memorandum from Roderick Wentworth, Department of Fish and Wildlife to Alison DesMeules, Department, March 25, 1994)

118. Efforts were later made to capture adults to provide eggs for hatchery rearing. There have been supplemental stockings off and on since 1926. Based on trap data, the number of returning adult salmon, collected on the Clyde River from 1933 to 1943, ranged from 51 to 247. This is not an estimate of the total number of returning adult salmon since some salmon would have escaped capture by the trap; the trap was not necessarily in operation

during the entire spawning run of each year; and some fish would have been caught by anglers before reaching the trap. (Ibid.)

119. The number of natal adult salmon returning to spawn in the Clyde River was functionally zero before the failure of Newport 11 dam in May 1994; all natal production had been lost. Following the construction of the Newport 11 dam and powerhouse, the salmon fishery declined and never recovered. The decline is attributed to obstruction of access to spawning and nursery habitat above the Newport 11 diversion dam; the lack of adequate flows to support spawning below the dam; and changes from historical baseload operation to a store-and-release operation. (Ibid.)

120. From the 1960s to the 1980s, stocking of juveniles in the lake and lower river resulted in low returns of mature salmon to the river, with negligible successful natural reproduction. The salmon population and fishery are only now beginning to show a slow recovery. With the failure of Newport 11 dam, its impoundment reverted to the natural river channel and its powerhouse inactivated, ending the diversion of river flow. Since this event, all flow leaving Clyde Pond now courses down the restored natural river channel from the Newport 1,2,3 powerhouse to Lake Memphremagog, and fish have upstream access as far as the Newport 1,2,3 powerhouse. Adult salmon from Lake Memphremagog spawned successfully in the restored river reach from the Newport 11 powerhouse to the Newport 1,2,3 powerhouse in Fall 1994 and in subsequent years. From 1995 to 2001, the Vermont Fish and Wildlife Department observed wild young-of-year salmon at a densities ranging from 2.2 to 3.9 per unit (1 unit = 100 square meters) at electrofishing sampling sites downstream of the breached Newport 11 dam. No population sampling was done upstream of the dam site. Multiple age classes of wild salmon juveniles are now present.

121. There is an international interest in protecting spawning habitat for migratory lake species of fish:

> In general, Lake Memphremagog fish spawn and are raised in the streams and wetlands in Vermont. They then migrate to the colder, deeper waters in Quebec until they return to Vermont to spawn again. Although fisheries management objectives of each country are not necessarily compatible, they are very dependent on each other. Fish do not recognize the international border, and the results of management actions in one country affect the fisheries resource in the

other. For example, maintaining adequate stream flows in the major tributaries to Lake Memphremagog in Vermont is important for fish spawning. The loss of river spawning habitat in Vermont negatively impacts Quebec fisheries. (*Final Report and Recommendations*, Quebec/Vermont Working Group on Managing Lake Memphremagog and its Environment, June 1993)

122. After the 1891 construction of the now abandoned dam adjacent to the Newport 1,2,3 powerhouse and prior to the construction of Newport 11 in 1956, salmon were able to ascend upstream to the dam adjacent to the Newport 1,2,3 powerhouse. The Agency has conservatively estimated the amount of habitat available in the lower Clyde River during this period as 231 units (1 unit = 100 square meters). Now that the Newport 11 dam has been removed, this same reach of river is again accessible. Based on the estimates of available habitat, the Agency has estimated the natal adult return levels that could be supported. The adult return estimates are based on parr densities for wild rainbow and brown trout as measured in the Johns River, another Lake Memphremagog tributary, and expected lake mortality, which was set at 65% to 95%[8]. The return estimates were corroborated through separate development of a deterministic age-structured model that projected steady-state returns that would be attained after an initial period of stocking. The model includes as variables the carrying capacity of the system (in habitat units), survival rates for each life stage of the fish, smoltification schedules, lake survival rates based on varying rates of fishing mortality, and brood stock removal (under certain conditions). The following table contains the model estimates of

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[8]Assumptions about parr density and smolt production from other waters are now supported by findings related to wild (see Finding 120) and stocked salmon juveniles in the Clyde River itself. In 1993, the Department of Fish and Wildlife began annual stocking of Memphremagog-origin salmon fry in available nursery habitat of the Clyde River upstream of Clyde Pond. The target stocking rate has been 25 per unit, and most of the stocking has been in the range of 20 to 30 per unit. The Department of Fish and Wildlife has monitored river-phase survival and growth of these fish by annual sampling. Spring-stocked fry have generally achieved smolt size in one growing season. Fall densities of 0^+ parr (virtually all pre-smolt size), based on September sampling by electrofishing, have ranged from 2 to 24 per unit. Survival from stocking to pre-smolt stage has ranged from 7% to 100%. Average survival at the two sampling sites is 29% and 40%, with average densities of 6.2 to 8.8 pre-smolts per unit. Overwinter survival of Clyde River salmon from pre-smolt to smolt is unknown, but 65 % has been applied conventionally in modelling for sea-run Atlantic salmon juveniles. Accordingly average survival from stocking and average smolt production at these two sites are on the order of 19% to 26%, and 4 to 5.7 smolts per unit, respectively.

habitat and adult returns[9] for the three segments below the Newport 1,2,3 tailrace. (Memorandum from Roderick Wentworth, Department of Fish and Wildlife to Alison DesMeules, Department, March 25, 1994; Memorandum from Cheryl Ryder, Department of Fish and Wildlife to Alison DesMeules, Department, April 12, 1994)

Table 6a. Historically available salmon spawning habitat units and estimated adult returns supported.

Reach	Number of 100 m^2 habitat units	Adult salmon return range
Western Ave. to the Newport 11 tailrace	60	46-116
Newport 11 Bypass	117	89-226
Diversion dam to Newport 1,2,3 tailrace (diversion dam removed)	54	41-104
REPEAT SPAWNERS FROM PRIOR YEAR CLASS		35-90
TOTAL	231	211-536

123. The estimated returns in the lower Clyde River are produced by 25 spawning pairs according to the model.[10] The number of fish returning above the base number of 50 would be eligible for harvest during the run.

124. Spawning habitat is also available in the Newport 1,2,3 bypass but is presently inaccessible due to the abandoned dam adjacent to the powerhouse. The dam is partially breached; removal would

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[9]The estimated returns are considered to be the best model estimates. "Pessimistic" and "optimistic" model runs produce total returns of 52 fish and 876 fish, respectively. The optimistic estimate can reasonably be expected to be attained with restrictions in the lake harvest. Beginning in 1996, the salmon minimum length limit was increased to 17 inches total length in Vermont and the equivalent, 15.7 inches (40 cm) fork length, in Canada. The accompanying reduction of harvest of immature fish is expected to result in higher returns.

[10]Each female is assumed to deposit 2,800 eggs, and the egg density is assumed to be 300 eggs per habitat unit. The egg density is set based on the number of fry that can be supported by the habitat available. More than 25 pairs would actually be expected to spawn, but mortality would reduce the fry density to 300 per unit.

provide access to the spawning habitat in the bypass and restore the habitat impacted by the dam's backwater. The number of habitat units estimated to be available in the Newport 1,2,3 bypass is 58 units. If access is provided, as well as adequate flows, it would be capable of producing approximately the same number of returns as the reach from the former diversion dam site to the Newport 1,2,3 tailrace.

Table 6b. Potentially available salmon spawning habitat units and estimated adult returns supported - Newport 1,2,3 bypass.

Reach	Number of 100 m^2 habitat units	Adult salmon return range
Newport 1,2,3 bypass	58	44-112
REPEAT SPAWNERS FROM PRIOR YEAR CLASS		9-22
TOTAL	58	53-134

125. Access to the habitat in the river upstream of Clyde Pond would substantially enhance production. An estimated additional 1,345 units of habitat would be made available in the mainstem between Clyde Pond and Charleston Pond. Smolt production for current fry stocking, discussed in Footnote 12, is considered highly successful by the Department of Fish and Wildlife. Access to this additional habitat would increase sustained salmon returns by 900 to 2,288 fish according to the best model estimate.[11]

Table 6c. Potentially available salmon spawning habitat units and estimated adult returns supported - Upstream of Clyde Pond.

Reach	Number of 100 m^2 habitat units	Adult salmon return range
Upstream of Clyde Pond to Charleston Pond	1,345	900-2,288
REPEAT SPAWNERS FROM PRIOR YEAR CLASS		180-458
TOTAL	1,345	1,080-2,746

[11]The pessimistic and optimistic estimates for production and repeat spawners for the trap-and-truck contribution are 284 fish and 4,704 fish, respectively.

126. Salmon in Lake Memphremagog are subject to natural mortality and angling harvest.[12] The Agency has conservatively estimated the number of natal fish that are available for lake harvest annually. The estimates, shown in the following table, represent best estimates and are based on an assumed angler harvest which accounts for 70% to 85% of the salmon that do not survive to spawn for the first time. These estimates do not include repeat spawners, which would increase the number harvested. (Memorandum from Cheryl Ryder to Jeffrey Cueto, April 20, 1994)

Table 7. Salmon available for annual lake harvest.

Clyde River Spawning Habitat Used	Harvest Rate	Salmon available for lake harvest
Western Ave. to the Newport 1,2,3 tailrace (diversion dam removed)	70%	860-905
	85%	1,045-1,375
Western Ave. to Charleston Pond	70%	5,485-7,230
	85%	6,665-8,780

Echo Lake/Seymour Lake

127. Echo Lake and Seymour Lake both support coldwater fish populations of lake trout, brook trout, burbot, and round whitefish. Current fisheries management for Seymour Lake also includes

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[12] The Department of Fish and Wildlife examined fishing activity on the lower Clyde River in Spring and Fall 1988 and 1998 and is just completing a survey of fishing activity in the 2001 seasons on the Clyde and the Vermont waters of Lake Memphremagog. Anglers dedicated an estimated 5,377, 2,758, and 2,883 angler-hours of spring fishing effort in the lower Clyde in 1988, 1998 and 2001, respectively, a portion of this directed at salmon. An additional 2,312 angler-hours was fished at the Causeway bridge in Spring 1998, but the respective amounts in 1988 and 2001 cannot be ascertained from available data. In spring 1988, 156 (95% confidence bounds: 13 -311) legal-length salmon were estimated caught in the river; 45 (4-113) in Spring 1998, and 130 (41-219) in 2001. An additional 2 (2-6) legal-length salmon were estimated caught in Fall 1988, 30 (5-67) in Fall 1998 and 86 (22-149) in Fall 2001. Clyde River spring catch rates in fish/angler-hour for legal-length salmon are 0.029, 0.016 and 0.030, for the years 1988, 1998 and 2001, respectively; fall catch rates are 0.004, 0.024 and 0.113 in 1988, 1998, and 2001, respectively. Legal length increased from 15 inches to 17 inches in 1996; some fish considered legal length in the 1988 catch rate computation would not be included in catch rate computations for 1998 and 2001.

landlocked Atlantic salmon, brown trout, rainbow smelt, yellow perch, smallmouth bass, chain pickerel and brown bullhead, and for Echo Lake, landlocked Atlantic salmon, rainbow trout, rainbow smelt, yellow perch, smallmouth bass, chain pickerel and brown bullhead. A management objective for both lakes is maintenance of a lake trout population that is self sustaining, supplemented through stocking, and capable of supporting a moderate harvest by anglers.

128. Past water level fluctuations of both lakes have impaired the ability of the lakes to sustain healthy, abundant, self-sustaining fish populations. Winter drawdowns impacted lake-trout spawning success by subjecting eggs to ice damage and desiccation. (*Hydropower In Vermont: An Assessment of Environmental Problems and Opportunities*, Department of Environmental Conservation, 1988)

129. At Seymour Lake, poor design of a stream crossing on Vermont Route 111 and low water levels in the spring have prevented rainbow smelt from accessing spawning waters. The stream in question, called "Twin Culverts" brook, enters the north end of the lake after going through a pair of pipe arch culverts.

130. The stream reaches between the two lakes and between Echo Lake and the Clyde River have moderate to high gradient and good habitat potential for brook, brown, and rainbow trout in all life stages. (*Clyde River Futures Project Preliminary Report*, April 1991)

Smelt Run at Seymour Lake

131. To provide spring lake levels conducive to migration of smelt through the twin culverts, at least 3-4 inches of water depth is needed in the culverts, assuming that velocities are not excessive. (Agency comment letter on Draft License Application, October 25, 1991) The culverts were first surveyed in 1991; the outlet of the east culvert is partially obstructed. On August 25, 1992, the applicant again surveyed the culverts; the outlet invert elevation was found to be 1278.89 feet msl, or 1.7 inches higher than reported in Appendix Volume VIII of the license application.

(Letter from Frank Thomas, Harza Engineering to Julie Bernt, FERC, December 28, 1992) According to the earlier survey, the culverts drop 4 inches over their length. For the planned dam reconstruction, the design crest elevation is 1278.67 feet msl.

132. To fully flood the culvert to a depth of 4 inches, without considering the flow of the brook, the lake would have to attain an elevation of 1279.56 feet msl, which is 11 inches above the dam crest. As previously indicated, the applicant has estimated that the drop the hydraulic grade line from the lake to the dam is normally two inches. Assuming that the drop is the same in the spring, a spillage of 9 inches at the dam would provide sufficient backwater in the culvert. This corresponds to a flow condition of about 110 cfs at the dam. Flows on that order would be available for only a portion, perhaps half, of the spawning period. The elevation corresponds to an elevation slightly above the high pin.

133. The FERC staff recommended alternative includes modification of the twin culverts to assure that the culverts do not act as a barrier to smelt. Two options are proposed in the FEIS: installation of a third culvert to provide for smelt passage or resetting the twin culverts to a lower elevation. Given that the brook channel may not be wide enough to accommodate a third culvert, the second option is probably more practicable. Other options include replacement of the existing structures with an arch or a bridge. These structures would allow for the reestablishment of a natural channel with assuring that the hydraulic capacity to pass flood flows is not diminished.

West Charleston

134. In the two-mile river reach from the dam downstream to Little Salem Lake, the Department of Fish and Wildlife's current management objective is a stream fishery for resident brown trout maintained in part by hatchery support. With adequate flows, the reach contains excellent habitat for brown trout and rainbow trout in all life stages. The walleye populations of Big Salem and Little Salem lakes spawn and incubate in West Charleston village a short distance downstream of the powerhouse. This river reach is also targeted by the Department of Fish and Wildlife as critical spawning and nursery habitat for use by landlocked Atlantic

salmon migrating upstream from Lake Memphremagog once upstream and downstream passage is provided and an improved flow regime is established. (Clyde River Futures Project Preliminary Report, April 1991)

Bypass

135. The bypass, which is 1,600 feet in length, comprises about 13% of the two-mile reach from the dam to Little Salem Lake. It is a relatively high gradient section of stream dropping in elevation about 36 feet over its length. Substrate is characterized as boulder, cobble, and ledge.

136. The applicant has proposed a flow regime for the West Charleston bypass of 46 cfs (0.43 csm[13]) for the period July 1 - September 30, and 67 cfs (0.63 csm) for the period October 1 - June 30. When the minimum station capacity of 50 cfs cannot be met by inflows, while maintaining the bypass conservation flows, all inflows would be discharged at the dam.

137. The minimum-flow proposal is based on minimum-flow prescriptions contained in the U.S. Fish and Wildlife Service *Flow Recommendation Policy for the New England Area*, February 13, 1981. The flow standards, or aquatic base flows, are the August median flow (regional average, 0.5 csm) for non-spawning periods; the February median flow (regional average, 1.0 csm) for the fall/winter spawning and incubation period; and the April/May median flow (regional average, 4.0 csm) for spring spawning. The two proposed flows are the August median flow and February median flow, estimated from an aquatic base flow study, which was revised in 1993 and included in *Schedule B Information Appending Application for License*, Response to AIR No. 3, October 1993. The values were derived from a parametric hydrologic analysis to determine Clyde River monthly median flows and were estimated by averaging the median flow values at

[13] *csm* means cfs (cubic feet per second) per square mile of watershed area

four unregulated gaging stations on other streams within forty miles of project.[14]

138. The *Agency Procedure for Determining Acceptable Minimum Stream Flows*, July 1993 (Agency flow procedure) endorses the standards used by the Fish and Wildlife Service; however, it does not accept estimation of revised monthly median flow values without site-specific flow data.

139. By letter dated October 25, 1991, the Agency indicated its acceptance of flows of 50 cfs (July - September) and 74 cfs (October - June), which were the proposed flows at that time, based on the original aquatic base-flow study. Acceptance was based in part on the assumption that future fish passage facilities would make the substantial amount of habitat below the project accessible to the steelhead rainbow trout run from Lake Memphremagog. The downstream reach is expected to have a more favorable flow regime to support spawning use.

140. The following table compares the median monthly flow estimates for the months of August and February at West Charleston, including estimates using the pre-Newport 11 gage record for the U.S. Geological Survey gaging station operated on the lower Clyde River. The Department did not update the estimates using the lower Clyde gage data by including the data collected subsequent to the failure of Newport 11, since it is believed that the older record probably better reflects the natural hydrology of the river.

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[14]The gaging stations used were the Missisquoi River near North Troy, the Black River at Coventry, the Moose River at Victory (discontinued), and Halls Stream at East Hereford, Quebec (discontinued).

Table 8. Median flow estimates at West Charleston.

Method of analysis	Monthly Median Flow			
	August		February	
	cfs	csm	cfs	csm
USF&WS New England average	54	0.50	107	1.00
Citizens ABF study	50	0.47	74	0.69
Citizens ABF study as revised	46	0.43	67	0.63
Agency estimate	74	0.69	92	0.86

Downstream

141. Flows below the tailrace will no longer be regulated by the West Charleston facility. Maintenance of a natural flow condition downstream would optimize conditions for fish and other aquatic biota downstream of the facility.

Reservoir (Charleston Pond)

142. Charleston Pond contains self-sustaining populations of largemouth bass, smallmouth bass, and yellow perch and seasonally occurring trout species attributable mainly to downstream drift. The Department of Fish and Wildlife's current principal management objective is maintenance of a black-bass fishery supported entirely by natural production.

143. Aquatic habitat conditions for plants, invertebrates, fish, and other aquatic organisms will be stabilized by the conversion of the station to a run-of-the-river operation.

Newport 1,2,3 and Newport 11

144. This section provides findings related to the aquatic habitat and fisheries management in the lower Clyde River from Clyde Pond to Lake Memphremagog. Riverine reaches include the Newport 1,2,3 bypass and the reach from the Newport 1,2,3 tailrace to Lake Memphremagog. Because the Newport 11 station and diversion dam were intact at the time habitat studies were completed, the latter reach is divided into three sections: the riverine reach that was formerly the Newport 11 impoundment, the former Newport 11 bypass, and the reach from the old Newport 11 tailrace to Lake Memphremagog. Those three segments are now all accessible to lake fish and subject to the same flow regime.

Newport 1,2,3 - Bypass

145. The Newport 1,2,3 facility bypasses approximately 1,800 feet of the Clyde River. The upper 400 feet of the reach, from Newport Dam to the breached mill dam, consists primarily of a moderate-gradient gravel riffles with ledge outcroppings. Three channels form at the base of Newport Dam and converge to pass under Crawford Road. Below the breached mill dam, for a distance of about 250 feet, is the steep bedrock cascade, known as Arnolds Falls, then a plunge pool and a small cascade, which is adjacent to the mill ruins. The next 500 feet, extending to the impoundment behind the abandoned dam, is a section of slight-to-moderate gradient with riffles and braided conditions. The substrate is composed of cobbles and rock with pockets of gravel in the lower braided reach. The ponded area behind the abandoned dam is about 300 feet in length with a bed material of deposited sediment. Below the dam is a 100-foot long section of cascade, then a boulder/rock riffle grading into the Newport 1,2,3 tailrace.

146. Because this reach of the river is virtually dry for most and sometimes all of the year, the Department of Fish and Wildlife does not currently manage this reach for any fish resources or fisheries. Spawning gravels and pools in the bypass have habitat potential for all life stages of brown trout, rainbow trout, and landlocked Atlantic salmon. Gravel areas are degraded by the existing flow regime, which results in dewatering, sedimentation, and vegetative encroachment into these substrates.

147. With provision of access and a compatible flow regime, the bypass could provide habitat for fish and other aquatic life. An objective of the Department of Fish and Wildlife's was to establish conditions in this reach that would have resulted in the support of spawning and juvenile landlocked Atlantic salmon and resident brown trout and rainbow trout populations (*Clyde River Futures Project Preliminary Report*, April 1991)

148. Before the construction of dams, salmon would probably have been able to ascend what is now the bypass of the Newport 1,2,3 project, under certain flow conditions. The abandoned concrete dam at the lower end of the bypass presently obstructs passage (Letter from Gordon Beckett, U.S. Fish and Wildlife Service to Frank Thomas, Harza Engineering, February 8, 1993). Removal of this abandoned dam would allow migratory salmonids to ascend into the bypass, possibly as far as the Clyde Pond dam, and utilize the reach as spawning and nursery habitat.

149. By letters dated February 28, 1992 and March 13, 1992, the Agency requested that the applicant conduct a flow demonstration at the Newport 1,2,3 bypass for evaluation of the habitat/flow relationship for the following target species and life stages: landlocked salmon, rainbow trout and brown trout; upstream and downstream migration, spawning, incubation, fry, juvenile, adult (bright fish and kelts).

150. The applicant conducted this habitat assessment study in May 1993, and the study results are presented in the response to AIR No. 6 (*Schedule B Information Appending Application for License*, October 1993). The study consisted of habitat assessments at four locations (U-2, U-3, U-4, and U-7) and zone of passage assessments at four locations (U-1, U-5, U-6, and U-8) in the bypass, at eight flows over the range from leakage (about 2.5 cfs) to 506 cfs. For the assessment of spawning and incubation habitat, since suitable substrate was generally located in small discrete pockets, the percent wetted area criterion used for the other life stages and in the Newport 11 bypass for all life stages was not deemed appropriate. Instead, the final assessment is a qualitative description of spawning/incubation potential at each observed flow rather than a quantification in terms of useable habitat as developed for the other assessments.

151. Where wading was possible, numerous depth measurements were made and velocities were estimated. At locations U-2, U-3, U-4, and U-7, wetted width measurements were taken at each study flow. For each flow, the wetted widths were then multiplied by the percent of habitat that was assessed as "good" by the study team to develop estimates of useable habitat expressed as weighted wetted widths (WWW), which reflects both habitat quality and quantity.

152. Observations of salmon spawning and incubation habitat suitability were that a flow of about 300 cfs or more is required to provide suitable depths and velocities over the gravel areas in U-2, which is the location representing the impounded reach upstream of the abandoned dam adjacent to the powerhouse, and that the lowest conservation flow that provides any significant spawning habitat is 149 cfs at the remaining stations. For U-2, the assessment was done under the assumption that the dam would remain in place. The substrate type behind the abandoned dam is silt and, therefore, is presently of limited spawning value. For all locations, few areas were useable for spawning at a flow of 30 cfs, and none at 2.5 cfs.

153. For review of habitat conditions for the fry, juvenile, and adult salmonid life stages, the Agency divided the bypass into two segments: the segment above Arnolds Falls and the segment below Arnolds Falls to the head of the impounded reach. The segments are represented by U-7 and by U-3 and U-4, respectively. The upper segment (from Crawford Road to the head of the cascade), when contrasted to the lower segment, is narrow and steep and about half the length. Together the two segments characterize 42% of the bypass length.

Table 10 at Finding 162 lists the median monthly flows for times of the year when the flow regime is particularly significant to certain life stages of fish. As shown in Table 5, rainbow trout and certain other species spawn and incubate their eggs during the spring, whereas landlocked Atlantic salmon and brown trout spawn during the fall and incubate their eggs during the winter. Habitat for adult and juvenile fish is often most limited during the periods of lowest flow. August is usually the lowest flow month during the summer, when high water temperatures and lower dissolved oxygen can add further stress. February is the lowest flow month

during the winter, when ice and cold temperature conditions are additional stressors. The amount of habitat available at the applicant-proposed 5 cfs was compared to the amount naturally available to the trout/salmon life stages of interest during the period the life stages would be present in the Clyde River. The fry stage is present from spring emergence through the fall when the juvenile life stage begins. Both juvenile and adult salmon are in the river system year round. The fry critical month for the purpose of the analysis is August. For the juvenile and adult life stages, the February, April/May, and August medians are considered.

For fry, the amount of habitat available at the August median flow was used to assess the range of habitat available at alternate flows, including that proposed by the applicant. Table 9a displays the amount of habitat available at the study flows and at the August median flow. In the upper segment, the estimated amount of fry habitat available at the August median flow of 98 cfs is 21 feet over a corresponding transect wetted width of 70 feet. At 30 cfs, 34 feet of "good" useable habitat is available, and the amount declines to 22 feet at a flow of 2.5 cfs. Fry habitat decreases as flows increase above the August median flow, reflecting the low velocity tolerance of this particular life stage. The lower segment is a wider channel and, as a result, requires higher flows to provide comparable habitat quality. Compositing locations U-3 and U-4, the amount of good fry habitat was found to be relatively constant (46.0 ± 8% useable feet) over a flow range of 75-301 cfs even though the average wetted width increased by 64%. The amount of habitat at 30 cfs was about half of the amount available at the August median flow, and the amount declined another 13% down to 2.5 cfs.

For juvenile habitat in the upper segment (ref. Table 9b) over the range of flows between 30 cfs and 149 cfs, the amount of habitat remained within 8% of the amount available at the August median flow of 98 cfs (50 feet useable for a 70 foot wetted width), with the amount of habitat actually increasing with declining flows. With flows dropping from 75 cfs to 30 cfs, the amount of habitat actually increased slightly. Only a small amount of habitat remained available at 2.5 cfs, however. During the average spring flow conditions, the amount of habitat is roughly a quarter of the amount available under average August and February conditions. In the lower segment, the juvenile habitat decreased by almost two

thirds with flows dropping from the August median flow to 30 cfs and by 59% more when dropping from 30 cfs to 2.5 cfs. Under average spring flow conditions, about half again as much habitat is available compared to average August conditions.

In the upper segment (ref. Table 9c) over the range of flows from 30-149 cfs, the trend is the opposite of what was observed with juveniles: the amount of habitat increases with increasing flows. Similar amounts of habitat are available at 30 cfs and 75 cfs, but the amount of habitat improves by about 12% when flows rise to the August median flow and by roughly the same amount when flows rise to the February median flows. However, there was virtually no adult habitat at a flow of 2.5 cfs; the wetted width had contracted to 30 feet. Spring flow conditions were judged to reduce the amount of habitat in this section to 20 feet over the wetted width of 80 feet. In the lower segment, adult habitat decreased by almost three quarters with flows dropping from the August median flow to 30 cfs and was almost nil at 2.5 cfs. The February median flow provided about 16% more habitat than the August median flow, and the April/May median more than tripled the amount of adult habitat.

The following tables present the assessment data upon which this is based. The values for median flow conditions are interpolated. The last column represents the total amount of habitat included in both the upper and lower study segments assuming the wetted widths at the transects are representative; again, note that these two segments represent 42% of the bypassed reach length.

Table 9a. Habitat availability for salmon fry in the Newport 1,2,3 bypass.

Flow (cfs)	U-7 (upper)		U-3/U-4 Composite (lower)		Both Segments
	Wetted Width (ft)	Useable Habitat (ft)	Wetted Width (ft)	Useable Habitat (ft)	Useable Habitat (sq. ft.)
2.5	30	22	51	20	15,870
30	62	34	85	24	20,350
75	68	24	95	46	29,130
98 (Aug. median)	70	21	105	47	29,100
149	76	15	127	46	26,910
276	78	12	153	50	27,940
301	78	4	156	42	22,420
506	80	4	171	37	19,860

Table 9b. Habitat availability for salmon juveniles in the Newport 1,2,3 bypass.

Flow (cfs)	U-7 (upper)		U-3/U-4 Composite (lower)		Both Segments
	Wetted Width (ft)	Useable Habitat (ft)	Wetted Width (ft)	Useable Habitat (ft)	Useable Habitat (sq. ft.)
2.5	30	7.4	51	10	6,980
30	62	52	85	25	25,820
75	68	51	95	60	43,310
98 (Aug. median)	70	50	105	66	45,540
122 (Feb. median)	73	48	116	70	47,540
149	76	46	127	75	49,360
276	78	27	153	104	59,060
301	78	16	156	122	65,390

506	80	12	171	97	52,080
525 (April/May median)	80	12	173	95	50,680

Table 9c. Habitat availability for salmon adults in the Newport 1,2,3 bypass.

Flow (cfs)	U-7 (upper)		U-3/U-4 Composite (lower)		Both Segments
	Wetted Width (ft)	Useable Habitat (ft)	Wetted Width (ft)	Useable Habitat (ft)	Useable Habitat (sq. ft.)
2.5	30	0.3	51	0.2	160
30	62	40	85	8.5	14,340
75	68	41	95	28	24,490
98 (Aug. median)	70	46	105	33	28,100
122 (Feb. median)	73	51	116	38	32,090
149	76	57	127	45	36,850
276	78	39	153	96	58,350
301	78	24	156	119	65,720
506	80	20	171	107	58,800
525 (April/May median)	80	20	173	105	58,040

154. For the zone-of-passage assessment related to salmon outmigration, the study team deferred to the Fish and Wildlife Service fish-passage engineer for flow recommendations necessary to provide safe downstream passage. The engineer, present for the 75 and 149 cfs flow demonstrations in May 1993 and leakage conditions in October 1990, utilized videos, photographs and geodesic-survey information as a basis for concluding that 1) flows of at least 150 to 300 cfs are necessary to ensure safe passage over the cascade area (U-5, U-6) and 2) a notch in the remnant dam

adjacent to the powerhouse is necessary to provide concentrated flow over the ledge outcropping (U-1).

Newport 1,2,3 - Downstream

155. The reach from the Newport 1,2,3 tailrace to Lake Memphremagog contains spring runs of lake fish; access formerly was limited to the section below the Newport 11 diversion dam. Resident and lake-run brown trout, rainbow trout, and landlocked Atlantic salmon are present, along with walleye, smallmouth bass, yellow perch, longnose and white suckers and a variety of minnow species. Notable spawning concentrations of walleye, yellow perch, suckers, and minnow species are well known, as are seasonal spawning and feeding runs of various salmonid species. Salmon smolts are presently stocked in this reach. They emigrate to Lake Memphremagog soon after being stocked. Fry stocking is also done above Clyde Pond. Spawning efforts by returning landlocked Atlantic salmon are now commonly observed in the reach. From 1995 to 2001 the Vermont Fish and Wildlife Department observed multiple age classes of wild salmon juveniles, demonstrating that successful reproduction is now occurring.

156. The Newport 1,2,3 tailrace was formerly the head of the impoundment behind the Newport 11 diversion dam. The flow regime from the tailrace to the lake is regulated to enhance peak power generation from the Newport 1,2,3 facility.

157. Prior to its removal, the Newport 11 dam impounded about 960 feet of the Clyde River immediately downstream of the Newport 1,2,3 tailrace. Historically, it served as landlocked Atlantic salmon and walleye spawning and juvenile habitat. The adverse flow regulation and impounded condition of the river have precluded fisheries management by the Agency. Returned to a riverine state, it has a moderate gradient and consists of riffles and pools. The substrate is characterized by boulders, cobble, and gravel. It is now again accessible for use by salmon and walleye.

158. The Newport 11 diversion dam and canal previously bypassed 2,800 feet of the Clyde River. In this segment, the channel

gradient is moderate, and substrate is characterized by boulders, cobble, and gravel. Artificial regulation of natural stream flow through this section of river from 1956 - 1994 resulted in the establishment of herbaceous and woody vegetation over much of the stream substrates. Silt was deposited and embedded in the substrate as well. Much of the stream channel through this area was overgrown with vegetation and only wetted during periodic high flows. Given a compatible flow regime, the habitat potential for spawning, juvenile and adult salmonids, walleyes, and sucker species is good to excellent in this segment.

159. The segment from the old Newport 11 tailrace downstream to Lake Memphremagog is about one mile in length. This segment is also subject to flow regulation caused by peaking by the Newport 1,2,3 facility. From the old tailrace roughly to the Sias Avenue bridge, the gradient is moderate, and the substrate is dominated by gravel and cobble. Downstream of the bridge, the river is rectangular in cross section due to past relocation/channelization activities related to road construction[15], has a low gradient, and is increasingly influenced by the elevation of Lake Memphremagog.

160. The Department of Fish and Wildlife's current management focus for the reach between the Newport 1,2,3 tailrace and the river mouth is as a spawning and nursery area for species that migrate in from Lake Memphremagog. Regionally important fisheries for self-sustaining walleye[16] and hatchery-contributed landlocked Atlantic salmon[17] continue to attract a devoted following of anglers, some from great distances. Protective angling regulations that enforce gear limitations, spawning sanctuary, and "no-kill" autumn salmon fishing are in place.

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[15]A major reach of the lower Clyde River was straightened in the vicinity of Western Avenue when the access highway to Interstate 91 was constructed about 30 years ago.

[16]The lower Clyde River is the major source of walleye for Lake Memphremagog. The walleye run on the Black River has declined. (*Responses to Lake Memphremagog Basin Fisheries Management Questions*, Agency, March 5, 1992)

[17]From 1973 through 1989, the Department of Fish and Wildlife stocked over one-quarter million salmon fry and three-quarter million fingerling or larger salmon to support the fishery; however, returns do not approach levels experienced in the 1950s and earlier. (Ibid.)

161. The Department of Fish and Wildlife's management objectives for this reach emphasize restoration of viable spawning, incubation, and year-round rearing of landlocked Atlantic salmon (and in upstream areas); expansion of the walleye population through improved natural reproductive success following spawning in the bypassed reach; and establishment of viable and fishable populations of resident and migratory brown trout and rainbow trout and healthy associated non-game fish species. (*Responses to Lake Memphremagog Basin Fisheries Management Questions*, Agency, March 5, 1992)

162. The following table provides estimates of critical monthly median flows based on the Clyde River gaging station.

Table 10. Median flow estimates for the lower Clyde River.

Period	Median Flow	
	cfs	csm
February	122	0.86
April	663	4.67
May	426	3.00
April - May	525	3.70
August	98	0.69
October - November	146	1.03

163. The applicant completed several aquatic habitat studies in the reach downstream of the Newport 11 dam site to describe habitat/flow relationships and to form the basis for decision making on the flow regime. The applicant first, in 1990, conducted an Instream Flow Incremental Methodology (IFIM) study upstream of the access bridge to the Newport 11 powerhouse. A representative-reach analysis was done using as target species salmon (spawning to juvenile); rainbow trout (spawning to adult); and macroinvertebrates. To supplement this IFIM study, critical reach analyses were later done in the former Newport 11 bypass using a flow demonstration and an abbreviated IFIM study in the upper section of the bypass. The study objective was to evaluate the habitat/flow relationships for walleye spawning and incubation in the "Before Hole" area of the bypass; for salmon,

brown trout and rainbow trout spawning/incubation in specific channel locations identified as having suitable substrate for these life stages; and in the upper portion of the bypass, for the following target species and life stages: landlocked salmon, rainbow trout, and brown trout; upstream and downstream migration, fry, juvenile and adult (bright fish and kelts). The applicant later conducted an IFIM study below the Newport 11 tailrace.

The applicant also completed a low-flow-frequency analysis for application to the bypass and below-tailrace sections of the river; however, this analysis has limited applicability to the applicant's current flow proposal.

Details for these studies are included in the applicant's response to FERC AIR No. 6.

164. *Flow demonstration study.* Based on the Newport 11 bypass flow demonstration, 462 cfs provided the greatest amount of habitat for walleye spawning and incubation. The majority of the so-called "hummock area" adjacent to the Before Hole was too shallow for walleye spawning at this flow. After spawning, a flow of at least 363 cfs would be necessary to protect walleye eggs incubating in the hummock area. The next lowest observed flow (199 cfs) did not provide sufficient water to protect incubating eggs. It has not been determined whether walleye actually spawn in the hummock area under high flow conditions or whether the fish actually spawn

Table 11. Habitat availability for walleye in former Newport 11 bypass.

Flow		Average Weighted Wetted Width (ft)	Difference in habitat relative to that available at 462 cfs
cfs	csm		
72	0.51	6.6	-87%
108	0.76	19.9	-60%
363	2.56	41.8	-16%
430 (capacity)	3.03	47.2 (interpolated value)	-5%
462	3.25	49.8	0

immediately upstream in the Before Hole. In either case the area would need flow to incubate eggs. If the fish spawn upstream, the eggs would drift into the hummock area and settle or attach to vegetation. Walleye eggs have been observed in the hummock area.

165. During April and early May, high flow conditions well in excess of project capacity typically occur in the river. In the past, the applicant has drawn Clyde Pond in advance of high spring flows to reduce spillage at Newport Dam. The reduced drawdown now proposed will increase the incidence of higher flows in the tailrace reach, and walleye can be expected to spawn when flows will be beyond the project's control. Based on the Clyde River gage, the estimated median flows for April and May of 663 cfs (4.67 csm) and 426 cfs (3.00 csm), respectively. The Newport 1,2,3 maximum capacity is 430 cfs.

166. Since walleye are known to migrate upstream to the Newport 1,2,3 tailrace, spawning and incubation may also occur in locations upstream of the Before Hole.

167. The flow demonstration indicates that 363 cfs is the lowest flow that provides reasonably good habitat for salmonid spawning at locations L-3 and L-4 (the stations with important spawning habitat).

168. *IFIM study in upper section of former Newport 11 bypass.* The Upper Section IFIM results suggest that salmonid spawning habitat is limited, although it may be sufficient within the reach and just not defined well by the limited number of transects. As recognized by Citizens in its discussion of the study results, this problem often occurs when IFIM transects are used to assess spawning habitat where it tends to occur in pockets. However, the results from both of the IFIM sections suggest that a flow near 100 cfs provides adequate habitat for other life stages. This flow provides enough depth in most areas to protect incubating eggs, provided that they have not been deposited during high flow conditions.

169. *IFIM study in lower section of former Newport 11 bypass.* The IFIM study conducted near the downstream end of the former

bypass assessed habitat conditions for salmon, rainbow trout, and macroinvertebrates. This study indicates that, for habitat represented by the study reach, the target species and life stages are best accommodated by a flow of about 100 cfs.

170. *IFIM study below old Newport 11 tailrace.* The IFIM study conducted below the Newport 11 powerhouse examined the habitat/flow relationship and the influence of lake backwater effects on habitat availability. Habitat/flow curves were produced for salmon (spawning and incubation, early fry, late fry, and juvenile) and rainbow trout (spawning and incubation, fry, juvenile, and adult) at high, middle and low lake levels. Habitat conditions change both with respect to lake levels and artificial daily flow cycling.

171. At the high lake level (elevation 682.0 feet msl), available habitat for salmon spawning and incubation, late fry, and juveniles increases rapidly up to about 150 cfs. Above this flow, habitat continues to increase but at a lesser rate, reaching a maximum near 250 to 300 cfs. The habitat curve for early fry is nearly flat, suggesting that the total available habitat changes little with increases in flow, over the range modeled.

The habitat curves for rainbow trout spawning and incubation, juveniles, and adults were similar to the salmon results, except that adult habitat peaked near 200 cfs and declined at higher flows. Fry habitat was greatest at a flow of about 100 cfs and declined thereafter as flow increased.

172. At the middle lake level (elevation 681.6 feet msl), a flow of about 150 cfs provides the highest quality habitat conditions for all life stages taken collectively. Available habitat declines significantly for flows less than 100 cfs. For all the life stages, there is roughly 25% less habitat available at 400 cfs than at 150 cfs.

For the rainbow trout spawning and incubation and juvenile life stages, the greatest amount of habitat is available at about 200 cfs. Habitat is maximized for fry and for adults at about 50 cfs and 150 cfs, respectively. A flow of 400 cfs does not provide high quality habitat conditions for fry, juveniles, or adults.

173. At the low lake level (elevation 680.8 feet msl), the salmon habitat curves are much flatter than at the other lake levels. They suggest that a flow of about 150 cfs provides the best overall habitat conditions and that almost as much habitat exists at 400 cfs. The amount of available habitat declines significantly at flows less than 100 cfs.

The rainbow trout curves for the low lake level are relatively flat at flows above 100 cfs. Below this flow, the curves for the four life stages are disparate.

174. Although a flow of 150 cfs seems to provide overall high quality habitat for all the target species and life stages, a factor that must be considered is the daily variability of flow due to peaking. Shifting between a conservation flow and a generation flow reduces the amount of effective habitat. The above results do suggest that the total available habitat declines significantly at 400 cfs, compared to 150 cfs, at high and middle lake levels. A dual-flow analysis, if used, would show an even greater impact since it would take into consideration the spatial shifts in useable habitat.[18] Higher conservation flows reduce the extent of shifting habitat.

175. Fluctuating flow releases below Newport 1,2,3 have been observed to disrupt upstream migration by salmonids, which return to the lake when flows become reduced for the off-peak cycle. (Memorandum from Roderick Wentworth, Department of Fish and Wildlife to Alison DesMeules, Department, March 25, 1994)

A rapid transition between peak and base flow conditions can be highly disruptive to aquatic life. Frequent fluctuation between the generation flow and base flow is an issue in riverine reaches

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[18]The effective habitat based on a dual-flow analysis would be less than the lower of the two weighted useable areas associated with the peak and off-peak flow releases. The dual-flow analysis quantifies individual stream cells that remain useable when subjected to fluctuating flows.

downstream of powerhouse discharges. Thuemler et al.[19] summarize the peaking issue well:

> Hydroelectric peaking operations can cause impacts to aquatic habitat at both the low and high flow events. Low flow events mainly limit habitat by reducing both stream depth (dewatering habitat and stranding organisms) and water velocity. High flow events mainly limit habitat by increasing velocities beyond that used by organisms.

The effects of hydropeaking differ depending on how mobile the organism in question is. Highly mobile organisms can move to find suitable habitat, which may change in location as flow changes. Forcing fish to relocate frequently exposes them to predation, expends additional energy that might otherwise go into growth, and may have behavioral effects as well. Immobile species and life stages cannot relocate or move to suitable habitat if it shifts in location between the minimum and generation flows. Since given depth and velocity conditions tend to move away from the thalweg (the deepest part of the channel) and toward the shore as flows increase, suitable habitat often shifts spatially between the two flows. Macroinvertebrates, small fish and fish eggs are generally assumed to be immobile within the context of a daily peaking environment. For immobile organisms, it is reasonable to assume that an organism is controlled by whichever flow (base or generation) provides poorer habitat conditions *at its location*.

176. Aquatic species differ in the ability to adapt to a fluctuating environment. A study on the Deerfield River[20] showed that hydropeaking reduced the complexity of the aquatic community and favored some fish species over others. A Kennebec River study[21] found a reduction in the diversity and abundance of swift-water aquatic insects downstream of a peaking hydropower

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[19]Thuemler, T.F., G.E. Whelan and J.D. Fossum. 1991. Assessment of the effects on aquatic habitat from a hydroelectric peaking project using the instream flow incremental methodology. Instream Flow Chronicle VIII(1):1-3.

[20]Bain, M.B., J.T. Finn and H.E. Booke. 1988. Streamflow regulation and fish community structure. Ecology 69(2):382-392.

[21]Trotzky, H.M. and R.W. Gregory. 1974. The effects of water flow manipulation below a hydroelectric power dam on the bottom fauna of the Upper Kennebec River, Maine. Transactions of the American Fisheries Society 103(2):318-324.

project. Additional hydropeaking impacts are described by Cushman.[22]

177. Operation of the Newport 1,2,3 facility includes daily flow fluctuations that subject aquatic organisms to both high and low flows on a rapidly changing basis. A non-steady state analysis addressing the effects of hydropeaking has not been conducted for the reach below Newport 1,2,3. Provision of a reasonable base flow requirement and ramping protocols to slow the transition between peak and base flows should minimize the impacts on aquatic habitat.

Newport 1,2,3 - Reservoir (Clyde Pond)

178. Clyde Pond contains naturally reproducing walleye, smallmouth bass, largemouth bass, chain pickerel, and yellow perch populations and various seasonally present salmonid species that drift into or through the reservoir from upstream. The resident walleye population spawns in the Clyde River upstream of Clyde Pond. The Department of Fish and Wildlife manages the pond principally for self-sustaining walleye and smallmouth bass fisheries.

179. The characteristics of the pond-level management and affected fish habitat are discussed below in Section VII (Wildlife and Wetlands).

Fish passage

180. The applicant presents conceptual designs and cost estimates in the license application for fish passage facilities. These facilities consist of downstream passage at Newport 1,2,3 via a fish pipe from Newport Dam to the Newport 1,2,3 powerhouse vicinity and upstream passage provided via a trap, hold, and truck operation at the Newport 11 diversion dam. The trap location would now be at the Newport 1,2,3 station.

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[22]Cushman, R.M. 1985. Review of ecological effects of rapidly varying flows downstream from hydroelectric facilities. North American Journal of Fisheries Management 5:330-339.

181. The target species relative to fish passage include landlocked Atlantic salmon, steelhead rainbow trout and brown trout. The period of operation for upstream fish passage facilities (adult salmonids) is April 1 - May 21 and September 1 - December 15. The period of operation for downstream fish passage (pre-smolts, smolts and kelts) is April 1 - June 15 and September 15 - December 31. These operational periods would be subject to revision based on new information about fish movement.

Ramping

182. In a letter dated November 24, 1992, the Department requested a ramping plan for the West Charleston, Newport 1,2,3, and Newport 11 facilities. The purpose of a ramping protocol is the prevention of stranding of fish and fish eggs in bypasses under circumstances where facilities commence operation after a period of shutdown, causing an immediate and significant drop in flow levels. Several well documented fish kills have occurred in the Newport 11 bypass, one as recently as May 1991.

183. Specific ramping protocols for the two bypasses is an outstanding need. At West Charleston, the applicant had stated that bypass flows were under the control of the Village of Barton and would cycle between the proposed minimum bypass flow and Barton's peak release (plus Barton's minimum bypass flow). Barton Village's conversion of its station to a run-of-river mode of operation, however, has ended the fluctuating inflows to West Charleston. At Newport 1,2,3, the applicant had indicated that the bypass flows would recede slowly as the pond level would drop over a 6.5-hour period after restart of the station. The issue is more or less moot under the applicant's flow proposal as the flow is too low to provide continuous support of aquatic biota. (License Application, *Resource Agency and Interested Parties Additional Study Requests and Citizens Utilities Company Responses*, Section 6, March 1992)

Flushing Flows

184. As a consequence of dewatering and reduced high flows, deposition of sediment and encroachment of vegetation into the

channel of the Newport 1,2,3 bypass has altered physical habitat conditions for fish and other aquatic organisms.

185. Although the applicant has provided no proposal for mitigation of this phenomenon, it is reasonable to expect that the reduced utilization of storage at Clyde Pond will result in a greater frequency of high flows in the bypass and, as a result, an improved ability to scour and transport sediment through the reach.. Encroachment by terrestrial vegetation can only be counteracted, however, by increasing the river's base flow so that the channel area is restored to an aquatic habitat condition.

VII. Wildlife and Wetlands

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

187. There are extensive wetlands associated with the Clyde River in the project area. The majority of these wetlands are located between East Charleston and Pensioner Pond, although sizable wetland communities are also present adjacent to Seymour Lake, Echo Lake, Charleston Pond, Salem Lake, Little Salem Lake, Clyde Pond, and are scattered along other stretches of the Clyde River. Many of these wetlands are Class Two wetlands[23] and within the influence of the project.

188. Stabilization of Seymour Lake, Echo Lake, and Charleston Pond, as proposed by the applicant, will be beneficial to wetland protection and wildlife use. Clyde Pond, however, will continue to be subject to water-level management for enhanced on-peak power production.

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[23]Class Two wetlands are so designated by the Water Resources Board for protection as significant wetlands under 10 V.S.A., Chapter 37, Section 905. Most wetlands shown on the National Wetland Inventory maps are designated as Class Two wetlands.

Clyde Pond

189. The proposed management regime at Clyde Pond would eliminate the extreme operational drawdowns that presently occur. The 18-inch flashboards, which are maintained year round, effectively raise the dam crest by 15 inches. Under current conditions, with a low average operating level relative to the top of the boards, the dam spills infrequently. Since under the current proposal water levels would be maintained much closer to the point of spillage, the frequency of occurrence of spillage will increase. The following table provides an estimated frequency of occurrence for spillage over the flashboards were the facility to be operated without drawdowns.

Table 12. Flow frequency for exceedence of Newport 1,2,3 station capacity.

Month	Percent Exceedence	Month	Percent Exceedence
January	3	July	2
February	2	August	1
March	17	September	2
April	73	October	6
May	53	November	8
June	11	December	6

190. Based on mapping done at a water-surface elevation of 877 feet msl (minus 1.0 feet relative to the dam crest), the applicant estimates that 2.3 acres of palustrine emergent wetlands and 22.1 acres of lacustrine submersed and floating-leaved aquatic wetlands have developed under the present operating regime of Clyde Pond. (License Application, Appendix Volume IV, *Clyde Pond Water Level Management Report*, Addendum July 1991, Table 5-2) Submersed and floating-leaved plants of the lacustrine wetland type are the least tolerant of wide water-level fluctuations, as they are the most susceptible to mortality from desiccation, either in winter or summer. Although the plants may be tolerant to frequent, short-term cycling, large magnitude, longer-duration cycling may limit the extent and species richness of these plant

communities. Stabilization of water levels throughout the year would serve to allow greater spatial distribution, species diversity and density of submersed and floating-leaved plants in Clyde Pond. (Ibid., Section 5, Page 8) The plants are also highly susceptible to mortality from exposure to freezing.

191. The littoral, or inshore, zone is critical habitat, especially for spawning or rearing and/or feeding by various fish species, such as walleye, yellow perch, largemouth bass, smallmouth bass, chain pickerel and several minnows, present and/or managed in Clyde Pond. Stands of submersed and floating-leaved plants provide cover, food (invertebrates that live on plants), and shelter from current and wave action, especially for larval fishes. Limitation of lacustrine plant communities by dewatering or inadequate depth limits the availability of suitable habitat for larval fishes, and indirectly threatens their growth and survival. Habitat suitability of the littoral zone can be degraded by frequent or rapid water level fluctuations that strand or displace larval and older fish.

192. During the period 1984 through 1990[24], the average weekly operational level of Clyde Pond was minus 2.2 feet (median of minus 1.5 feet) from the dam crest (crest elevation 878 feet msl), and the weekly cycle typically was 1.0 feet in range or less. During the dry summer conditions of 1987, the pond was drawn to minus 8.7 feet; however, the normal maximum operational drawdown is minus five feet. Pond management is discussed further in findings 81-83.

193. Through the period January 1984 to April 1990, Clyde Pond was at a drawdown elevation of minus 1.0 foot or lower approximately 82 percent of the time. The pond was at a drawdown elevation of minus 2.0 feet or lower 51 percent of the time for the period of record.

194. It is not possible to determine from the applicant's wetland and bathymetric mapping the current minimum elevation limits of lacustrine submersed and floating-leaved wetlands.

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[24]Data for this period was provided in the License Application, Appendix Volume IV, Section 5. The data set does not include the second half of 1985.

195. During 1988, the year considered average by the applicant, the portion of lacustrine wetland area out to minus 3.8 feet was subjected to dewatering for 12 percent of the time; that portion that is out to minus 3.0 feet was dewatered 22 percent of the time.

196. The frequency, duration, and timing of water level fluctuations related to the current operating regime at Clyde Pond limit the development and distribution of diverse and dense lacustrine wetland communities. This in turn limits the habitat availability and productivity of various fish, invertebrate, amphibian, reptile, mammal, and avian species in their various life stages.

197. In a November 24, 1992 letter to the applicant, the Department requested that the applicant expand on the analysis in its report *Clyde Pond Water Level Management Report* (License Application, Appendix Vol. IV, December 1991) by using the U.S. Fish and Wildlife Service Habitat Evaluation Procedure (HEP) methodology to qualitatively compare existing project operation with the operating regime recommended for waterfowl management by the Department of Fish and Wildlife, as well as any other regimes that the applicant may propose. Changes in the aquatic plant community and in substrate composition that would be expected were to be considered as part of this request.

198. Referencing the response to AIR No. 5 (*Schedule B Information Appending Application for License*, Volume I, October 1993), the applicant used a simple conceptual model that predicts the development of aquatic macrophytes based on persistence of inundation. The applicant then applied the predicted distribution of aquatic vegetation in a qualitative analysis of habitat suitability based on the HEP models for six target species (wood duck, muskrat, beaver, red-winged blackbird, snapping turtle, and bullfrog). The four water level management regimes considered and the total acreage of emergent vegetation projected to develop under each regime are shown in the following table; 2.3 acres presently exist. The applicant also estimated that 35.2 acres of floating-leaved vegetation would develop under each of the four regimes; 22.1 acres presently exists. The applicant did not evaluate the regime recommended for evaluation by the Department of Fish and Wildlife: water level at dam crest

November 15 to July 30, maximum one-foot drawdown allowed August 1 to November 15.

Table 13. Effects of drawdown regimes on establishment of emergent vegetation.

	Period	Operating Range (relative to crest)	Area of Emergent Vegetation (acres)	Change from R-O-R Condition (%)
Regime I	Year round	at crest (r-o-r)	25.0	
Regime II	Year round	0 to -1.0	16.7	-33
Regime III	Year round	0 to -2.0	8.5	-66
Regime IV	May 15 - July 15	0 to -1.0	8.5	-66
	July 16 - May 14	0 to -2.0		

199. The model assumes that areas where water-level fluctuations would result in exposure of the substrate to air would not support the development of emergent vegetation. The model does not take into account the freezing of substrate and perennial aquatic plant rootstocks and ice damage that would occur in the fluctuating shallow water zones of regimes II, III, and IV. These factors would preclude the establishment of some species of emergent and floating-leaved plants in shallow-water areas below the minimum water level.

200. The applicant's proposal is to utilize a 2.0 foot drawdown during the summer, fall, and winter (July 16 - March 31) and a 1.0 foot drawdown in the spring (April 1 - July 15).

201. *Muskrat.* Muskrats build lodges in shallow zones of 1.0 to 1.5 feet in depth or less and have a very low tolerance for fluctuations in water level. Muskrats are likely to establish lodges in shallow water areas of Clyde Pond; the 2.0 foot drawdown would result in the lodges being left high and dry and/or with frozen plungeholes. Consequently, muskrats could be either frozen into their lodges

(and thus not able to feed) or subjected to increased predation rates while traveling over exposed mudflats.

202. *Snapping turtles.* Snapping turtles are most often found in zones with a depth of eight feet or less, and hibernate, as do other herps, in areas with depths of four feet or less. In a study conducted on a 106 acre reservoir in Algonquin Park, Ontario, where maximum water depth was about 30 feet, mean water depth for eight radio-tagged snapping turtles was 3.3 feet when active and 1.4 feet when inactive, and, almost all sightings of radio-tagged animals were in water less than 8.25 feet deep. The turtles in this study entered winter dormancy in early October, and emerged in early May. Most turtles were observed to over-winter buried in the mud in shallow water, although one turtle remained below an undercut bank in a stream which flowed all winter. Hibernating turtles have been known to use muskrat lodges. Preferred sites for hibernation have combined characteristics that may include water depths shallow enough for the turtle to reach the surface to breathe without having to swim upward; water depths deep enough that it is unlikely to freeze to the bottom; a location that ices in late or thaws early; mud deep enough for the turtles to bury; additional cover, such as dead or dormant vegetation, roots, brush, a muskrat house, or overhanging bank. (Memo from Cedric Alexander to Alison DesMeules, Department, March 25, 1994)

203. The applicant does not address the potential loss of target species (muskrat, bullfrog, snapping turtle) and other organisms (such as green frog, painted turtle, red-spotted newt, and snails), from freezing caused by the winter drawdowns.

204. *Waterfowl.* Winter drawdowns, as proposed, would negatively impact 66% of potential emergent vegetation zones (brood habitat), preventing the establishment of aquatic emergents for both food and cover, and reducing other food sources such as amphibians and snails and other invertebrates. (Memo from Cedric Alexander to Alison DesMeules, Department, March 25, 1994)

205. In its March 29, 1990 study request letter to the applicant, the Agency identified specific fish species of concern: smallmouth bass, largemouth bass, walleye, yellow perch and chain pickerel. The concern associated with reservoir water level fluctuations was

listed as "interference with natural reproductive success and reduction of littoral productivity."

206. The applicant conducted fish sampling in Clyde Pond during 1990 and 1991. The sampling provides data on species of fish presence but cannot be used to determine population structure or relative abundance.

207. *Bass.* Present management of Clyde Pond is not conducive to successful natural reproduction of smallmouth bass and largemouth bass. Water level reduction during the period of spawning and nest guarding by males dewaters nests and causes the male guards to abandon the nests and/or broods of fry. These water level fluctuations also prevent the establishment of aquatic vegetation in the littoral zone. Optimal habitat suitability for fish species of management interest in Clyde Pond requires the presence of moderate amounts of aquatic vegetation (20 - 60% coverage of the surface area).

208. The smallmouth bass population in Clyde Pond, based on August 1991 sampling, shows a relatively normal age distribution and representation of fry hatched in 1991. This suggests that suitable conditions have been available for smallmouth bass reproduction in recent years in the pond and/or in the Clyde River. Some lacustrine populations of smallmouth bass ascend tributaries to spawn. For example, significant numbers of smallmouth bass are known to migrate annually from Lake Champlain into Lewis Creek to spawn. Current maintenance of a smallmouth bass population in Clyde Pond may rely in part on in-river spawning.

209. Largemouth bass were not collected from Clyde Pond in fish sampling in 1990 or 1991, despite the existence of populations immediately upstream in Derby Pond and the Salem Lakes. The absence or very low abundance of largemouth bass is likely to be due in part to water level decreases in late spring and early summer that routinely affect nests and cause reproductive failure. Further, water level fluctuations that have inhibited the development of a moderately vegetated littoral zone are resulting in habitat of low suitability for all life stages.

210. *Walleye.* Sampling done in 1990 and 1991 suggests that the Clyde Pond walleye population exhibits a discontinuous age structure. Fish sampled ranged in age from young-of-year to 12; only five year classes were found to be present. Problems with recruitment may be attributable to poor egg survival or high fry mortality. Spawning habitat conditions may be poor in Clyde Pond due to its size, configuration and water level regime. However, the suitability of the Clyde River upstream of Clyde Pond is excellent physically and hydrologically for walleye spawning (flow changes gradually due to Salem Lakes attenuation). Successful spawning should be highly successful in most years. Conditions for fry survival are suspect. Low food availability at the critical time when fry enter Clyde Pond could cause fry starvation and subsequent recruitment failure. Existing conditions in the littoral zone are not conducive to invertebrate production and sheltering ichthyoplankton that are key to walleye fry survival.

VIII. Shoreline Erosion and Desilting

211. *West Charleston.* As AIR No. 2, FERC requested an assessment of pond shoreline and riverbank erosion associated with operation of the West Charleston station to determine if remediation is necessary.

212. The applicant identified four erosion areas in a two mile river reach beginning 0.5 mile downstream of West Charleston dam to Little Salem Lake. This section has a gradient of 10 feet/mile and exhibits meandering. All four erosion areas identified are located on the outside of river bends. Water level fluctuations and velocities downstream of the West Charleston tailrace were recorded to determine the influences of project operation on this section of the Clyde River. At Site No. 1, located 1.25 miles downstream, water levels were found to fluctuate 1.6 feet due to the current operation of the hydroelectric facility. According to the report, fluctuations at the other erosion sites would be equivalent or less depending upon the degree of backwater from Little Salem Lake. Velocities of operation flows measured at the erosion areas are low. (*Schedule B Information Appending Application for License*, Volume I, Response to AIR No. 2, October 1993)

213. The applicant states that the change in operation of the West Charleston plant from peaking to true run-of-river will reduce the rate of erosion at the four sites identified but will not likely change the meandering process as a whole. Stabilization of the erosion areas with armoring blankets, revetments, walls, and/or groins would not be expected to stabilize meandering but rather, to induce erosion at other areas of the river bank adjacent to the stabilized embankments. Therefore, the applicant does not propose to stabilize the existing erosion areas.

214. *Clyde Pond.* License Application, Appendix Volume II.2 contains a report *Erosion and Bank Stability Study for Clyde River and Clyde Pond* (July 1991, rev. December 1991). At Clyde Pond, the applicant identified three shoreline erosion areas. The applicant identified one of these areas as possible being influenced by project operation. The other two areas apparently are not influenced by project operation. One area is above the normal high-water level, and the other is due to a broken water pipe. No remediation measures are proposed for these areas.

215. *Newport 11 impoundment.* The applicant identified only one erosion site in the Newport 11 impoundment. The site is located at the northern end of the diversion dam. The applicant proposed remediation measures for this site; however, the diversion dam failed at the right abutment area in 1994, and the embankment was subsequently stabilized as part of the dam removal project. (*Schedule B Information Appending Application for License*, Volume I, Response to AIR No. 1, October 1993)

216. *Newport 11 downstream.* The applicant identified one other erosion site located below the Newport 11 tailrace. Erosion consisted of bank slumping and erosion of lawn areas at the Day property. The applicant attributed these erosion problems to the downstream realignment of the Clyde River about 27 years ago for a transportation project and discharges from the Newport 11 powerhouse. The applicant identified riprapping of this area as an appropriate remedial measure. Subsequently, measures were instituted as a joint project with local members of Trout Unlimited.

217. Reservoir desilting can result in significant degradation of water quality if not executed properly. The applicant has no records

showing that the reservoirs at Newport 1,2,3 and West Charleston have been desilted since 1975. (License Application, Appendix Volume VIII, December 1991)

IX. Recreational Use

218. The Clyde River in the project vicinity is popular for several recreational uses, including fishing, swimming, boating, hunting, hiking and nature watching. The river is enjoyed by regional residents and tourists as well. The river offers a variety of recreational opportunities and settings from remote flatwater canoeing to whitewater paddling to boating on lakes and reservoirs; and both lake and river fishing. The river and its associated lakes and ponds have high recreational value, and there is a demand for additional recreational facilities such as canoe portages and fishing access areas. (*Clyde River Futures Project Preliminary Report*, April 1991).

219. Project lands include the shoreline between the outlet of Seymour Lake and the Seymour Lake dam; the area surrounding the Echo Lake dam; the east shore of Charleston Pond adjacent to West Charleston dam; the area along the east bank of the river between the West Charleston dam and the powerhouse; the area around Clyde Pond; and the area along the river between the pond and the former Newport 11 powerhouse.

220. Project lands provide opportunities for public access to the outlet of Echo Lake and the stream below the dam. There is potential for a canoe/kayak take out at the West Charleston dam and a put-in in the vicinity of the powerhouse, with a portage trail connecting the two. A launch area for small boats at Clyde Pond and access for angling between the Newport Dam and former Newport 11 powerhouse is possible.

221. Additional lands owned by the applicant along the Clyde River include the public access areas on Echo Lake and Pensioner Pond and several riparian parcels between West Charleston and Clyde Pond.

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

223. The *AMC River Guide--New Hampshire and Vermont* (Appalachian Mountain Club, 1989) describes canoeing opportunities on the Clyde River. The guide partitions the river into five sections; three are considered runnable. The first two sections (from Island Pond to Pensioner Pond and from Pensioner Pond to West Charleston) meander through farmland, marshes, and small villages. The third section (from West Charleston to Salem Lake) is a whitewater stretch which flows between beautiful cedar-laden banks remote from the road. There is a half-mile section of Class II rapids directly below the West Charleston facility. The fourth section (between Salem Lake and Clyde Pond), which is also identified in a 1989 Agency report entitled *Vermont's Whitewater Rivers - Their Geology, Biology and Recreational Use*, consists of 3.5 miles of rapids, solid Class II with a little Class III at high water. According to this report, the many swamps and lakes in the Clyde River basin moderate flows and provide higher volumes later in the season when other similar-sized rivers have become too shallow for boating. For the same reason this stretch provides very good opportunities for wildlife observation. This stretch, which receives heavy local use, was the site of a popular whitewater boating race in years past. The fifth section (from Clyde Pond down to Lake Memphremagog) is considered canoeable below the diversion dam if there is sufficient water. Otherwise, the user must put in at the bridge below Newport 11 powerhouse and canoe the final mile to the Lake.

224. On May 10, 1993 during the fish habitat assessment study, a representative from the Northern Vermont Canoe Cruisers canoed the Newport 11 bypass under flows of approximately 270 and 621 cfs. The reach was found to present considerable whitewater paddling potential. It has good access and is considered to be of local to regional importance due to its location in an urban area and proximity to other populous communities nearby, including communities across the border in Canada. The river reach can be divided into two sections. The upper section from the Newport 11 dam downstream to the end of an "S" turn (about half way downstream of the lower of two islands in the bypass) is considered to be Class II at flows of 300 cfs and Class III at flows of 600 to 650 cfs. Due the steepness of this section, the difficulty rating increases much more quickly than the lower section as flows increase. This upper section is described as being technical and tumultuous (due to its shallowness). The lower

section from the bottom of the "S" turn to the flat water section below the Newport 11 powerhouse was considered to be Class II at both 300 cfs and 600 to 650 cfs. This section would be a reasonable place to put gates to use for whitewater practice. There is a nice surfing wave by the bridge to the Newport 11 powerhouse and a few holes. A cap of approximately 700 to 750 cfs is recommended for boating the entire Newport 11 bypass. Higher flows would create safety concerns as water would be flowing in amongst the trees under present day channel configurations and streambank characteristics. A site inspection under higher flows would need to be undertaken to determine the exact flow at which safety would be a concern. Even under current conditions at the flows paddled, there are a few trees which create safety problems for boaters. (pers com. with Ray Gonda, Northern Vermont Canoe Cruisers, June 1, 1993)

225. The U.S. Geological Survey operates a surface water gaging station in the former Newport 11 bypassed reach. The gage is funded by the applicant under the terms of the current license. Real-time flow data is available to recreationalists via the Internet, enhancing the planning for boating, angling, and other uses.

226. The applicant currently leases the boat access area at Echo Lake to the Department of Fish and Wildlife, but the access is not within the project boundary; the applicant has offered to transfer ownership of this access to the Agency conditional on the Agency also accepting ownership of the dam. The applicant does not own the access at Seymour Lake.

227. In the FERC FEIS, FERC staff recommended that the applicant obtain rights for public access from the town road to the stream between Seymour Lake and Echo Lake and provide signage directing the public to the dam. The benefits would include public access where it is currently lacking, making the fishery of this stream and the lake itself available.

228. The application notes that there is no public access to Charleston Pond and limited access to the river from the access road to the West Charleston powerhouse. The application also notes that there are no facilities set aside for access or recreation in the Newport 1,2,3 and Newport 11 area. There is access to Clyde Pond from a

dirt road near Newport Dam. This access is used primarily for fishing. Open access for fishing is generally provided except during the winter.

229. At West Charleston, existing parking areas near the powerhouse are to be maintained with a sign installed by the driveway entrance to identify a canoe put-in access to provide access to the river reach from the powerhouse to Salem Lake. The applicant states that the ability to provide a canoe put-in/take-out at the dam is precluded by the physical characteristics of the area around the dam and property ownership limitations. Northern Vermont Canoe Cruisers (now the Vermont Paddlers Club) identified the northeastern shore of Charleston Pond as a good location for a primitive overnight camping site. The Clyde River Futures Project supports this concept as well. The applicant does not propose to develop such a site due to property ownership limitations. In a November 24, 1992 letter, the Department requested that the applicant explore all reasonable alternatives for accessing Charleston Pond with cartop boats, including a joint venture with the Village of Barton, access via the limited ownership at Charleston Dam, and/or use of an easement across private lands.

230. At Newport 1,2,3, the applicant proposes to provide improved public access to Clyde Pond by including provisions for handicapped access by the dam; signs; picnic/day use area; adequate parking for cartop-boat usage at the dam; grading of unimproved access roads; and limited access to lands designated as nature conservation areas. A canoe access is proposed adjacent to the south abutment of the dam. Canoes can be unloaded/loaded from the road next to the disabled parking area. The project lacks a formal portage from the dam to the Newport 1,2,3 powerhouse; a canoe put in by the powerhouse; and formal river access locations in the vicinity of the Newport 1,2,3 powerhouse.

231. At Newport 11, the applicant proposes to provide angler parking facilities with signs at Vincents bridge.

232. Detailed descriptions, site plans, and construction drawings of proposed recreational improvements are provided in *Schedule B Information Appending License Application*, Volume I, October 1993.

233. The applicant also proposes to install informational signs at various project structures to relate project history and the historical significance of hydroelectric developments within the region. The exact location and design of these signs have not yet been identified.

234. One of the most limiting recreational conditions is the lack of provisions for portaging the West Charleston and Newport 1,2,3 dams. The dams impair boating on a navigable river. Recreation and recreational boating are designated uses for the Clyde River. Where designated uses have been impaired or eliminated, all reasonable steps should be taken to restore such uses. The Clyde River Futures Project identifies the need for canoe portages as well.

X. Aesthetics

235. The project is located along a river corridor which is accessible, highly visible to the public, and receives substantial public use. The river corridor is somewhat unusual in that it includes not only riverine habitat but a series of lakes as well. The river corridor, with its numerous lakes, relatively undeveloped streambanks and shorelines, together with the surrounding rural environment of forest and agricultural land, create a visually appealing setting. The West Charleston and Newport 1,2,3 facilities include cascades in their bypasses. The cascade bypassed by Newport 1,2,3 is known as Arnold Falls, or Prouty Falls. These natural morphological features create both a visually and aurally appealing environment with the sight and sound of falling water over them.

236. The historic management of reservoir levels, natural lakes, and flows have resulted in extensive dewatering of shoreline areas and stream channels, with associated visual effects.

237. The applicant conducted an aesthetics study of the West Charleston and Newport 1,2,3 bypasses in response to FERC AIR No. 10. Flows were videotaped. (*Schedule B Information Appending License Application*, Volume I, Response to AIR No. 10, October 1993)

238. *West Charleston bypass.* Four flows were observed at West Charleston: 2 cfs (leakage/direct inflow), 28 cfs, 35 cfs, and 62 cfs. The evaluation focused on the cascade area in the bypass. The flow of 62 cfs increased the extent and intensity of whitewater. It did not exhibit a change in the aural impact of the flow over the 35 cfs level, but it did give the channel a more full appearance. A dramatic change occurred visually and aurally between 2 cfs and 35 cfs.

239. *Newport 1,2,3 bypass.* Eight flows were observed at Newport 1,2,3: 2.5 cfs (leakage), 30 cfs, 75 cfs, 115 cfs, 149 cfs, 276 cfs, 301 cfs, and 506 cfs. Three observation points were included: from the river- right abutment of the Newport Dam, from the downstream town bridge on Crawford Road; and from the area of the mill ruins next to Arnolds Falls. Under leakage flows, the channel was characterized as exposed and bony, and aurally at trickle level. The noise of moving water was much louder at 30 cfs, but the water did not cover the substrate. Flows of 75 cfs, 115 cfs, and 149 cfs were similar both aurally and visually. As they were gate releases, the flows followed the right channel between the dam and the bridge. The sound was characterized as "prevalent". Flows of 276 cfs and 301 cfs exhibited coverage of all of the bed except for the boulders and created much more whitewater. Notable at 506 cfs was the sense of power expended by flowing or cascading high water.

XI. Other Uses

240. The Department has not identified any non-designated existing uses that would be affected by the project.

XII. Rare and Endangered Plants and Animals

241. No rare or endangered plant or animal species have been identified in the project area.

XIII. State Comprehensive River Plans

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

Hydropower In Vermont: An Assessment of Environmental Problems and Opportunities, Department of Environmental Conservation, 1988

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

Three specific recommendations of the plan are that a conservation flow requirement be established in the bypass and downstream of the West Charleston facility; that the existing license's minimum flow requirements for the Newport 11 bypass be amended and expanded to encompass the river reach below the powerhouse; and that a conservation flow requirement be established below the Newport 1,2,3 powerhouse and in the bypass to assure provision of adequate flows to meet the Newport 11 requirements for protection of fishery resources, water quality, and aesthetics. The removal of the Newport 11 diversion dam make these recommendations somewhat out of date.

1988 Vermont Recreation Plan

243. The *1988 Vermont Recreation Plan* (Department of Forests, Parks and Recreation), through extensive public involvement, identified water resources and access as top priority issues. The planning process disclosed that, while Vermonters and visitors focus much of their recreational activities on surface waters, growing loss of

public visual and recreational access to those waters causes substantial concern to the users. The plan projects that access is "likely to become the critical river recreational issue of the 1990s." The need for development of portage trails and canoe access sites is cited as among the major issues relative to canoe trails in Vermont.

244. The Water Resources and Access Policy is:

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

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

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

247. The Scenic Resources Protection and Enhancement Policy is:

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

248. Maintenance of bypass and downstream flows will protect the scenic characteristics of the shoreline area and river.

Clyde River Futures Project Final Report

249. The Department's *Clyde River Futures Project Final Report* (November 1992) is another state comprehensive river plan. The Project, which was initiated in 1990 and involved a public participation process, has resulted in a plan that identifies river management goals and recommended actions to reach those goals. The plan also identifies current river issues.

The impact of the Clyde River Hydroelectric Project on river uses and values, particularly the landlocked Atlantic salmon fishery, was the major issue identified through the public participation process. The impact of the Newport 1,2,3 and Newport 11 facilities drew the most attention as a result of their impact on the natural flow regime of the river. Project participants identified river management goals which relate to hydroelectric use, including:

a. Continue to use the river for the generation of electricity; however, this use must be more compatible with the many other uses and values, in particular fish habitat, and must preserve, maintain, and enhance a healthy functioning river ecosystem which can be enjoyed by everyone.

b. Improve fisheries and restore the historic salmon fishery to the Clyde River. The river's fisheries have a value in and of themselves and have been and could again be a great economic asset to the area. Restoration of the salmon fishery and improving fisheries overall equates with a healthy river environment.

c. Maintain water level management regimes in lakes and impoundments that eliminate extreme drawdowns and reflect more natural water level fluctuations to protect and enhance uses and values.

d. Restore river uses and values by maintaining run-of-river flows below Seymour Lake, Echo Lake, and West Charleston powerhouse and, as a minimum, improved flow regimes in project bypasses and downstream of the Newport 1,2,3 and Newport 11 powerhouses in accordance with the State flow procedure.

e. Improve river water quality and minimize threats to aquatic life.

f. Have more complete utilization of the available spawning and nursery habitat and the realization of the fishery resource potential of the Clyde River by providing access to spawning waters and downstream fish passage facilities.

g. Provide improved public access to the Clyde River and basin impoundments through acquisition and/or development of sites that meet the needs of a variety of water-based recreational activities, particularly canoeing and fishing.

h. Increase public's awareness and resulting use of the Clyde River as an important recreational resource for activities ranging from bird watching to whitewater canoeing.

i. Improve public viewing at hydroelectric facilities.

XIV. Analysis

Bodies of Water

250. *Seymour Lake.* Historic use of Seymour Lake as a storage facility with significant artificial fluctuations in water levels ended before 1987. After hearings held in August 1951, the Vermont Public Service Commission, acting under the direction of the Legislature, issued an order establishing the natural lake level variation as being a 14 inch range between elevations 1278.33 feet msl and 1279.50 feet msl.[25] State statute (30 V.S.A. §402) requires that "[t]he waters of Lake Seymour shall not by any artificial means be raised higher or drawn lower, or permitted through neglect to become lower or higher, than the maximum and minimum levels established by the board." The current federal license, issued in 1963, contains similar language. Because the dam crest is 8 inches above the low end of the natural range, the applicant continued to have the some ability after 1951 to release water through the slide gate and draw Seymour Lake in order to augment the flows of the Clyde River for hydroelectric power production. The use of flashboards to increase available storage was, however, no longer possible. The gate has also been used, although with limited success, to attempt to prevent the lake from staging up above the

[25]The Department has had limited success in finding records related to this proceeding.

high pin, which frequently occurs in the spring but rarely in the summer.

251. Although originally it was the applicant's intent to only lower the dam crest and modify the gate, full replacement of the structure is now planned, and an engineering company has been retained to develop design plans. The licensing proposal is to construct a dam that will accommodate passive control over lake levels. This would involve providing sufficient spillway capacity to avoid the incorporation of a gate structure. Current plans are to both lengthen (from the current 30.6 feet to about 52 feet) and lower the dam crest by four inches (to elevation 1278.67 feet msl).

252. The applicant's proposal results in conditions closer to natural conditions for Seymour Lake. Aquatic habitat and use by wildlife will be protected by the institution of crest controlled run-of-river conditions and resulting stable water levels. High inflows to the lake would continue to cause it to rise, but the dam design is intended to maintain high levels that mimic natural conditions.

253. The Seymour Lake Association and the Town of Morgan have expressed an interest in maintaining the lake level 6-8 inches above the low pin during most flow conditions. The Public Service Commission had determined that the natural low level of the lake was at the low pin elevation. The dam crest could be lowered an additional four inches in order to further reduce the incidence of the lake rising above the high pin, but this would result in summer levels falling below the goal set by the lake association. The applicant's past practice has been to maintain the lake at a level averaging about 1.7 inches below the dam crest (elevation 1278.86 feet msl, or 6.3 inches above the low pin); the lake association request is fairly consistent with past operation. The average summer gate setting is five inches.

254. The Department has estimated that the average July/August inflow to Seymour Lake is about 17 cfs[26]. Subtracting the 4 cfs minimum flow and assuming a crest length of 52 feet and a water surface

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[26]This value is similar to the Department's estimation of 18 cfs for the average flow release at the dam for the June - mid-September period based on the data contained in Table 2.

drop of two inches from the lake to the dam, the spillway crest would have to be set at elevation 1278.64 feet msl to support a lake level eight inches above the low pin (spillage depth of about two inches). This is approximately the proposed design crest elevation of 1278.67 feet msl. Based on a review of past water level data, during summer low flows, the water level would not be expected to fall significantly below the lake association's 6-8 inch range, even with the conservation flow release of 4 cfs. The Department does, however, support the lake association's recommendation that the dam be designed to allow the final crest elevation to be adjusted slightly based on experience. This issue is particularly important to shoreline property owners where the near-shore area is particularly shallow and boating difficult. The dam spillway should be set two inches lower than proposed to provide additional flexibility in assuring that the target lake levels are attained. The lower spillway would also increase the dam's flood capacity.

255. The Department was unable to locate any data or information on the flood history of Seymour Lake preceding the alteration of its natural outlet. The Seymour Lake Association and the Town of Morgan have expressed an interest in the incorporation of a gate in the new dam in order to increase the dam's hydraulic capacity during severe flood events. A preliminary analysis done by the applicant's consultants suggests that the use of a gate could reduce high lake stages; however, the analysis has limitations with respect to the methods used and the availability of data to calibrate the models used for the tailwater rating and for estimating the water level drop from the lake to the dam. The significance of this issue to shoreline property owners merits a more rigorous analysis, and such an analysis is being required as a condition of this certification.

256. The current design proposal for the dam reconstruction includes a bulkhead bay, 5.0 feet wide with a sill elevation of 1275.00 feet msl. The bay could be fitted with a slide gate. However, doing so would counter the effort to provide for a naturally varying lake level in Seymour Lake and would potentially cause flooding and a disruption of habitat below the dam and possibly even affect Echo Lake. It would also create the potential for Seymour Lake to be drawn below the lake association's target elevation and even the low pin. The Department does, however, believe that it is prudent to incorporate the bulkhead bay in the structure should post-

construction experience indicate that a gate is necessary to prevent excessive lake levels or should refinement of the hydrologic/hydraulic analysis completed for the final dam design indicate a gate is warranted. Available information, including the lake stage records collected by the applicant, do not indicate that a gate is necessary. If it is determined that a gate must be used periodically to prevent significant flooding, the gate manipulation shall be limited to use for this purpose.

257. A lower spring lake stage hydrograph, caused by the increase in spillway capacity and lower spillway elevation, may reduce the ability of rainbow smelt to run up Twin Culverts brook. To counter this, the applicant is proposing to modify the highway culverts such that there will be adequate depths in the brook channel during the spring to accommodate the smelt spawning use. Since it involves a State highway, the work would have to be coordinated with the Vermont Agency of Transportation. A preferred alternative would be to replace the culverts with an arch or a bridge in order to provide for the restoration of a natural channel connecting the brook to the lake.

258. Recreational use would no longer be impaired by drawdowns for enhanced project operation. Historic periodic exposure of the lake shoreline zones void of vegetation will no longer occur, protecting the beauty of the lake.

259. Although natural flows will pass downstream, it would be desirable to incorporate a hydraulic section in the dam (eg. an orifice or spillway notch) that would pass a minimum flow of 4 cfs, or 0.19 csm, to assure that downstream brook flows are continuous and uninterrupted by wind seiche or evaporative losses.

260. The licensing proposal for Seymour Lake is in full compliance with *Standards*. The final dam design and culvert crossing modification plans are being made subject to Department approval as a condition of this certification to assure that the objectives are being met.

261. *Echo Lake.* The applicant's proposal results in the restoration of close-to-natural conditions for Echo Lake. The dam crest has been

rebuilt with the elevation reduced from 1249.0 feet msl to 1248.33 feet msl. This change allows passive control over lake levels (no gate manipulation) and meets an expressed goal of the Echo Lake Protective Association to maintain the normal lake level at an elevation at about elevation 1248.4 feet msl. The lower crest and longer spillway length at the lower elevation (the older crest stepped up six inches) provide the capacity to pass high flows without excessive lake levels. Under extreme flood conditions, the lake may rise above elevation 1249.0 feet msl; however, this would be a rare condition.

262. The crest was rebuilt with flashboards sockets, and flashboards were installed after the work to restore the effective crest elevation to 1249.0 feet msl pending issuance of the new federal license. The boards will be removed.

263. Aquatic habitat and use by wildlife have been restored where historically impaired. Recreational use will no longer be impaired by drawdowns for enhanced project operation. Historic periodic exposure of the lake shoreline zones void of vegetation will no longer occur, protecting the beauty of the lake.

264. Although natural flows will pass downstream, the fixed gate opening of one inch (4 cfs, or 0.16 csm) will assure that flows are continuous and uninterrupted by wind seiche or evaporative losses.

265. The licensing proposal for Echo Lake is in full compliance with *Standards*. This certification is being conditioned to provide the Department with continuing jurisdiction over operation of the dam and to prohibit the use of the gate without prior Department approval.

266. *Seymour and Echo Lakes.* Maintenance activities that entail drawdowns or flow management pose a threat to water quality. Such events should be regulated to reduce or eliminate the threat to aquatic habitat, wildlife, and recreational uses. The Department has included a special condition requiring prior review and approval of any construction or maintenance activities at the dam, including any associated drawdowns. After reconstruction of the Seymour dam without a gate, the potential for a drawdown will be

significantly diminished. Pollution control measures, including erosion and sediment control, during maintenance, repair, or reconstruction activities will also be subject to Department review and approval.

267. Protection of lake levels and downstream flows will depend on insuring that the outlets are not tampered with. This will be a moot issue at Seymour Lake dam. The gate will no longer be operated unless subsequently approved by the Department, in which case controls would be placed on the use of the gate such that protection of lake levels and downstream flows is assured. At Echo Lake dam, protective fencing has been installed around the outlet works, insuring that the gate setting will not be altered by unauthorized personnel.

268. *Charleston Pond.* Charleston Pond would be stabilized under the licensing proposal to convert the West Charleston station to a true run-of-the-river operation. Except during periods of high inflow, the level would be maintained at an elevation 3 inches below the crest. Operation in this manner will assure maintenance of high quality aquatic habitat in Charleston Pond, even with the continued regulation of inflows by the Village of Barton. Historic periodic exposure of the pond shoreline zones void of vegetation will no longer occur, protecting the beauty of the pond.

269. The applicant's current proposal is to automate and use the existing sluice gate to maintain a stable pool during periods when inflow exceeds a combination of plant capacity and bypass conservation flows. This certification provides for the filing of a flow management plan, subject to Department approval. An approval alternative is to allow the pond to rise and spill over the crest during high inflow periods, as long as normal levels are maintained within three inches of the crest.

270. *Clyde Pond.* The applicant proposes to shift the normal operating level of Clyde Pond higher, drawing it in a range down from the top of the flashboards either one foot or two feet depending on the season. Currently the typical operating range during the growing season is a band from elevation 875.5 to 876.5 feet msl. Assuming that the typical fluctuation in the summer continues to be one foot and that the fluctuation is behind the flashboards, the pond would

effectively be raised about 2.5 feet. This would cause permanent inundation of areas that are only now occasionally flooded. It would cause a change in the vegetative and hydrologic characteristics of these areas. It would also cause additional flooding of riverine habitat in the Clyde River. It may cause shoreline erosion for an adjustment period. By condition of this certification, the Department is requiring that the dam crest be established as the reference point for drawdowns and that, if flashboards are installed, the facility be operated at full capacity any time that the pond rises above the concrete crest.

271. Reduction of the drawdowns to one or two feet, depending on the season, will substantially improve habitat conditions in the pond and improve recreational use. The littoral zone will be better able to support production of and use by the range of aquatic organisms, including plants, amphibians, and fishes and use by wildlife, including waterfowl and furbearers. Current cycling of pond levels dewaters extensive areas of organic fine substrate and prevents the development of healthy, natural, submergent and floating-leaved plant communities. Such weedy areas, and maintenance of adequate depths of water in these areas, are extremely important to the growth and survival of larval and juvenile walleye, yellow perch, and black basses, as well as other species. Productivity of the pond is strongly linked to the integrity and viability of these areas. A critical remaining issue, however, is hibernacula habitat conditions. Animals normally select overwintering habitat during the month of October. These shallow areas are very susceptible to freezing if dewatered, and mortality can result. The proposed winter drawdowns would also render the wetland habitats uninhabitable by muskrats and snapping turtles. A more protective drawdown limitation of one foot from October through March is appropriate for those reasons and is being made a condition of this certification, except for the early part of the period through December 15, which is subject to a tighter restriction due to the flow needs of the downstream aquatic habitat. The applicant's proposal to limit spring drawdowns to one foot will better support spring spawning of warmwater fish species inhabiting the pond, including smallmouth and largemouth bass, pickerel, yellow perch, and numerous minnow species.

. 272. Institution of a run-of-the-river operating mode at Echo Lake, Seymour Lake and West Charleston will protect wetlands adjacent

to the waterbodies and along downstream river reaches. Wildlife that use the riparian zone and river will be better supported by the improved operating regime at these three sites.

Water Chemistry

273. Stratification of Charleston Pond during the summer can cause substandard dissolved oxygen levels to result. However, the intake and bypass-flow gate at West Charleston are elevated above the identified zone of oxygen-depleted water, limiting the risk of the water becoming entrained and becoming discharged downstream. Even were oxygen depletion to occur to a higher level, the free discharge from the bypass-flow gate and the amount of conservation flow proposed for the bypass would assure that dissolved oxygen standards are met. The bypass flow proposed for the critical summer period, 46 cfs, is more than twice the 7Q10 drought flow. Furthermore, all flows would be spilled at the dam when inflows recede below 100 cfs, providing full reaeration for much of the summer low-flow period.

274. At Clyde Pond, it is unlikely that dissolved oxygen standards would be violated directly below the tailrace, based on the limited sampling and the height of the intake.

275. Under the applicant's proposal, the lack of flow in the Newport 1,2,3 bypass would result in stagnant conditions in the bypass pools, with oxygen depletion due to algal respiration and increases in water temperatures that do not meet standards.

276. Because natural flows will be continuously available downstream of Echo Lake, Seymour Lake, and West Charleston, and improved flows will continuously be available in the West Charleston bypass and below the Newport 1,2,3 powerhouse, the impact of the project on concentrations or levels of the following parameters will not be significant:

Phosphorus
Nitrates
Oil, grease, and scum

Alkalinity
pH
Toxics
Escherichia coli
Color
Taste and odor

Bypassed River Reaches

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

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

278. *West Charleston.* With adequate flows, this reach would provide suitable habitat for brown trout and salmon spawning and incubation and salmon fry rearing. The flows proposed by Citizens are slightly less than the flow standards set forth in the procedure for summer aquatic base flows and the fall/winter base flow. The records from the existing gage on the Clyde were not used by the applicant in its estimation of the monthly base flow values. The Agency procedure prescribes site specific values when available, which is the case here. To provide for high quality habitat for fish, a designated value for Class B waters, this certification sets flow requirements of 50 cfs from July through

September and 74 cfs from October through June (applicant's proposal is 46 cfs and 67 cfs, respectively).

279. The applicant's bypass flow proposal would be adequate to support the aesthetic values of the river.

280. *Newport 1,2,3.* The applicant's proposal of 5 cfs does not provide an adequate flow regime in the Newport 1,2,3 bypass and would result in continued nonsupport of designated uses and values: good aesthetic value; high quality habitat for aquatic biota, fish and wildlife; and recreation. The habitat evaluation work done by the applicant in response to AIR No. 6 showed that, under the present and proposed condition of leakage flows, virtually no habitat is available for support of cold-water fish. Because the flow regulation in the bypass would continue to result in a change from reference conditions (natural flows) that has an undue adverse effect on the composition of the aquatic biota and has an undue adverse effect on the species composition and propagation of fish, it would violate the general criteria for aquatic habitat (*Standards*, Section 3-04(B)(4).

281. Based on the findings provided above, this certification is being conditioned to provide year-round viable habitat conditions in this reach of river. The flow needs for base habitat support for fish and other aquatic organisms is 30 cfs. The flow procedure indicates that the Agency will generally recommend flows at least equivalent to 7Q10, which, in this case, is estimated to be 28 cfs. This bypassed reach will continue to offer limited habitat value as it is isolated from the river system due to the dams at the upper and lower end of the reach.

The 5 cfs bypass flow proposal would not be adequate to support the aesthetic values of the river. Based on the flow demonstration study, the existing leakage does not provide visual or aural benefits. A flow of 30 cfs will substantially improve the appearance of this reach.

Downstream River Reaches

282. *West Charleston.* The true run-of-the-river operating mode will provide full support of all designated uses and values, assuming the new license for the upstream Barton Village plant is similarly conditioned.

283. *Newport 1,2,3.* The proposal to maintain 363 cfs downstream of the Newport 1,2,3 tailrace from April 1 through June 7 will protect walleye spawning and egg incubation, although a flow of 430 cfs, the station capacity, would provide a higher level protection closer to the optimum level observed during the habitat study.

The proposal to maintain 100 cfs from June 8 through September 30 will be adequate to provide high quality aquatic habitat.

The proposal to maintain 150 cfs coupled with artificial flow fluctuations from October 1 through December 15 would disrupt the behavior of spawning salmonids. Peaking operations have been observed to disrupt upstream migration of fish. Because of the use by landlocked salmon during the fall spawning run, it is critical to provide suitable flow conditions at that time of year for upstream migration and habitat use. For these reasons, this certification is being conditioned to require true run-of-river operations from October 1 - December 15. To attain that regime by October 1, it will be necessary for Clyde Pond water levels to be managed in such a way that the pond is at the dam crest by October 1.

The proposal to maintain 120 cfs from December 16 through March 31 will be adequate to provide high quality habitat.

284. These findings are contingent upon implementation of acceptable ramping protocols that address the effects of hydropeaking on stranding, habitat and fish behavior.

285. The flow proposal would be adequate to support the aesthetic values of the river.

Ramping Plans and Flushing Flows

286. Without ramping plans for each of the project bypasses, there is no assurance that fish and egg kills will not continue to occur at the project.

287. With the change in the flow regime in the lower Clyde River, flushing flows to restore the Newport 1,2,3 bypass should not be necessary. Because drawdowns are being reduced, the reach will more frequently experience high natural flows above the plant capacity. This and the increase in base flows through the reach will make the channel somewhat less conducive to the support of terrestrial plants.

288. Ramping protocols that address the effects of hydropeaking on stranding, habitat and fish behavior are necessary for the Newport 1,2,3 bypass and tailrace reach.

Fish Passage

289. The applicant proposes to construct and operate a trap-and-truck facility, as well as outmigrant facilities, at the Newport 1,2,3 dam and powerhouse. A successful program will substantially enhance the Department's current efforts to reestablish historic salmon runs to the Clyde River and to improve the lake fishery. Over time, the passage facilities would reduce the Department's reliance on upstream fry stocking. The Clyde River upstream of Clyde Pond to Charleston Pond offers proportionally a much greater amount of spawning and nursery habitat compared to the lower Clyde.

290. Fish passage facilities are necessary to prevent an interference with the propagation of fish and to minimize fish mortality during downstream movement. From the information available, it is reasonable to conclude that salmon historically had access to the Clyde River upstream of Clyde Pond before the influence of man. Lack of facilities would result in an undue adverse effect on the species composition or propagation of fish and, therefore, constitute a violation of *Standards*, Section 3-04(B)(4) *Aquatic Habitat*.

291. To provide reliable fish passage, this certification is being conditioned to require both the approval of final plans for the facilities and a passage effectiveness study.

Recreation

292. Vermont Water Quality Standards require the protection of existing water uses, including the use of water for recreation. *Standards* also requires the management of the waters of the State to improve and protect water quality in such a manner that the beneficial uses and values associated with a water's classification are attained. Beneficial values and uses of Class B waters include water that exhibits good aesthetic value and swimming and recreation.

293. Because of the impact on fisheries habitat under the applicant's proposal, the bypass flow proposals for the West Charleston and Newport 1,2,3 and the tailrace flow proposal for Newport 1,2,3 would have an undue adverse impact on recreational use, specifically angling. Sports-fish production would be reduced, lowering the potential angler harvest both in the river and in Lake Memphremagog. Viewing of the fish runs by non-anglers would be affected as well; viewing of migratory runs is very popular as evidenced by the rainbow run on the Willoughby River.

294. The proposal to provide portages at both West Charleston and Newport 1,2,3 will remove an impairment to boating use of the river.

295. If the applicant elects to repower the West Charleston powerhouse, the penstock will be replaced. The additional land recently acquired by the applicant will enable the penstock to be relocated further from the river. This would reduce the intrusiveness of the structure.

296. Availability of access to the lower Clyde River on project lands from the Newport Dam through the former Number 11 reach will continue to support several recreational uses including angling, boating, wildlife viewing, and aesthetic enjoyment.

Debris

297. The applicant does not provide information on how trashrack debris and other project-related debris would be handled and disposed of properly. The depositing or emission of debris and other solids to state waters violates the state solid waste laws and *Standards*, Section 3-01(B)(7) *Settleable solids, floating solids, oil, grease, scum, or total suspended solids*. The Department is requiring as a condition of this certification that the applicant file a debris management plan for approval.

Action of the Department

Based on its review of the applicant's proposal and the above findings, the Department concludes that there is reasonable assurance that operation and maintenance of the Clyde River Hydroelectric Project as proposed by the applicant and in accordance with the following conditions will not cause a violation of Vermont Water Quality Standards and will be in compliance with sections 301, 302, 303, 306, and 307 of the Federal Clean Water Act, P.L. 92-500, as amended, and other appropriate requirements of state law:

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

B. **Water Level and Flow Management.** The project shall be operated in accordance with the minimum flow and water level management schedules tabulated below. Minimum flows shall be released on a continuous basis and not interrupted; minimum flows are the values listed below, or instantaneous inflow, if less, unless otherwise noted. True run-of-river operation, or r-o-r, where referenced, means no utilization of headpond storage and that outflow from the facility is equal to inflow to the pond on an instantaneous basis, as further described in Footnote 3, page 11.

Seymour Lake Dam: Except as allowed in conditions C and H below, the dam shall be operated in a true run-of-the-river mode. A provision will be made in the new dam to pass a minimum flow of 4 cfs.

Echo Lake Dam: Except as allowed in Condition C below, the dam shall be operated in a true run-of-the-river mode. A minimum flow of 4 cfs shall be released through the gate at all times. The existing flashboards will be removed within one month of license issuance to set the effective dam crest elevation at 1248.33 feet msl. Flashboards shall not be installed unless prior approval is granted by the Department.

West Charleston: Flashboards shall be permanently removed, and the pond maintained at or above 0.25 feet below the fixed dam crest. Operation shall be in accordance with the following table. When the station is not operating, all inflows shall be released at the dam.

Table A. West Charleston Operation

Period	Conservation Flow (cfs)	
	Bypass	Downstream
Jul 1 - Sep 30	50	r-o-r
Oct 1 - Jun 30	74	r-o-r

Notes 1. Target elevation is 0.25 feet below fixed dam crest.
2. Exception to r-o-r operation provided in Condition C.

Newport 1,2,3: If flashboards are retained, the station shall be operated at full capacity any time that the pond level rises above the concrete crest. Operation shall be in accordance with the following table. When the station is not operating, all inflows shall be released at the dam, except for any flows necessary to operate fish passage facilities.

Table B. Newport 1,2,3 Operation

Period	Operating Range[1] (feet)		Conservation Flow (cfs)	
	High	Low	Bypass	Downstream
Jan 1 - Mar 31	0	-1.0	30	120
Apr 1 - June 7	0	-1.0	30	363
Jun 8 - July 15	0	-1.0	30	100
July 16 - Sept 30	0	-2.0	30	100
Oct 1 - Dec 15	0		30	r-o-r
Dec 16 - Dec 31	0	-1.0	30	120

Notes 1. Operating range is relative to the dam crest.

C. **Flow Management following Maintenance Drawdown.** Following an approved maintenance drawdown at any project facility, up to 10 percent of instantaneous inflow may be placed in storage in order to restore the water level without significantly reducing downstream flows. This provision is intended to apply only when low inflows would otherwise result in a protracted refill were the full prescribed minimum flows to be released.

D. **Flow Management Plan.** The applicant shall develop and file with the Department a flow management plan detailing how the project will be operated to comply with the conservation flow and impoundment fluctuation limitations described above. The plan shall include descriptions, hydraulic design calculations, an implementation schedule, and design drawings. At the West Charleston and Newport 1,2,3 facilities, the plan shall address 1) ramping and measures to be used to control lag times and avoid related non-compliance with the conservation flow requirements; 2) how Clyde Pond will be restored to the dam crest elevation by October 1 and maintained at that elevation after that date to meet the downstream run-of-river flow requirements; and 3) flow management during the refill period following a maintenance drawdown. After Department approval of the plan, the plan shall be filed with FERC no later than 120 days from the date of license issuance. FERC shall either approve the plan or return the plan to the applicant for revision to incorporate FERC-recommended changes. After revision, the applicant shall submit the plan to the Department for approval of the changes. The plan shall then be filed with FERC for final approval. The Department reserves the right of review and approval of any material changes made to the plan.

E. **Monitoring Plan for Water Level and Flow Management at West Charleston and Newport 1,2,3.** The applicant shall develop a plan for continuous monitoring and reporting of flow releases, pond levels, and inflows at the West Charleston and Newport facilities. Flow release monitoring shall include the dam spillage, the dam gate discharge, and the turbine discharge at West Charleston and spillage, turbine discharge, and discharge through the fishway at Newport. The plan shall include procedures for reporting deviations from prescribed operating conditions and a provision for the inclusion of contemporaneous records from the U.S. Geological Survey gage (Clyde River at Newport, Vt., Gage

No. 04296500) located below the Newport 1,2,3 powerhouse. The applicant shall continue to fund the gage in order to facilitate compliance monitoring and to furnish data for quality control purposes. The applicant shall maintain continuous records of flows and impoundment levels and provide such records on a regular basis as per specifications of the Department. The plan shall be developed in consultation with the Department and the U.S. Fish and Wildlife Service. After Department approval of the plan, the plan shall be filed with FERC no later than 120 days from the date of license issuance. FERC shall either approve the plan or return the plan to the applicant for revision to incorporate FERC-recommended changes. After revision, the plan shall be filed for Department approval. The plan shall then be filed with FERC for final approval. The Department reserves the right of review and approval of any material changes made to the plan.

F. **Monitoring Plan for Water Level and Flow Management at Echo and Seymour Lakes.** The applicant shall record the levels of Echo and Seymour lakes daily during high flow events, including spring runoff, and weekly during extended dry periods to determine if the water level conditions consistent with the design projections are occurring. Data reports for each calendar year shall be filed annually with the Department no later than January 31 of the following year. The Department may require changes to the data collection frequency and may suspend data collection once a sufficient record is available. At Seymour, data shall be collected both at the dam (headwater and tailwater) and at the natural outlet so that the difference in water surface elevation between the points can be determined over a range of flows.

G. **Turbine Rating Curves.** The applicant shall provide the Department with copies of the turbine rating curves for both project facilities, accurately depicting the flow/production relationship, for the record within one year of the issuance of the license.

H. **Replacement of Seymour Lake Dam.** Prior to the replacement of Seymour Lake Dam, the applicant shall develop, in consultation with the Department, plans for the replacement structure. Final plans, along with the hydrology/hydraulics design brief, shall be submitted to the Department at least 90 days prior to the

commencement of construction and shall be subject to Department review and approval. The hydraulic performance of the proposed structure shall be supported at a minimum by 1) a refined tailwater rating curve for the downstream brook channel, developed using a standard step analysis calibrated with available tailwater data; 2) a refined water surface profile for the 1,200-foot reach from the lake to the dam, developed using the standard step method and addressing whether deposition or snags in that reach are significantly affecting its hydraulics; and 3) an updated reservoir routing analysis to define the high flow lake stages with the existing and proposed dams, using the new tailwater rating curve and the updated upstream water surface relationship and analyzing appropriate events selected from the 1986-to-present lake water level records and simulating floods with frequencies of 2, 5, 10, 25, 50, and 100 years. The analysis shall include information on whether removal of snags or other depositional material between the natural outlet and the dam is warranted.

The design shall include a feature that provides the ability to permanently adjust the crest elevation based on post-construction experience. The crest shall initially be set at an elevation that would achieve a normal summer lake level of elevation 1278.86 feet msl, based on the refined analysis. Unless the Department determines, based on the analysis, that such a feature is unnecessary, the design shall also include a bulkhead bay, as presently proposed, to enable future installation of a gate if the Department determines that the modified dam has increased the magnitude, frequency, or duration of shoreline flooding. However, the bulkhead shall not be removed, raised, replaced nor modified in any way without prior approval by the Department. If prior approval is granted and a gate is installed, a gate management guide shall be drafted, subject to Department approval, detailing the manner and circumstances under which the gate would be operated and providing for ramping if determined by the Department to be necessary to protect downstream habitat and channel integrity. After sufficient monitoring, the permanent crest elevation shall be set so as to result in the normal summer lake level remaining at elevation 1278.86 feet msl, with any crest adjustments subject to the Department's prior review and approval.

I. **Replacement of West Charleston Penstock.** Prior to the replacement of the West Charleston penstock, the applicant shall

develop, in consultation with the Department, plans for the design of the replacement. The design shall provide for increased isolation distances between the penstock and the river where feasible in order to provide an enhanced riparian buffer. Final plans shall be submitted to the Department at least 90 days prior to the commencement of construction, and shall be subject to Department review and approval.

J. **Smelt Spawning at Twin Culverts Brook.** Within two years of license issuance, the applicant shall modify or replace the culverts on Vermont Route 111 at Twin Culverts brook at Seymour Lake to provide access to spawning habitat by rainbow smelt. Plans for the modifications shall be developed in consultation with the Department, the Vermont Agency of Transportation, and the Vermont Department of Fish and Wildlife and shall be submitted to the Department at least 90 days prior to the commencement of construction. The plans shall be subject to Department review and approval.

K. **Prevention of Fish Entrainment at West Charleston.** Prior to the next replacement of the intake trashrack, the applicant shall consult with the Department of Fish and Wildlife with respect to trashrack design to determine the appropriate bar clear spacing. The final design shall be subject to Department approval prior to commencement of work.

L. **Upstream Fish Passage at Newport Facility.** Within two years of license issuance, unless extended for good cause with Department approval, the applicant shall design, construct, and initiate the operation of a fish trap-and-truck facility at Newport 1,2,3. Applicant responsibility for maintenance and operation of the facility shall continue for the term of the license. An upstream fish passage plan shall be developed in consultation with the Department, the Department of Fish and Wildlife, and the U.S. Fish and Wildlife Service and shall be submitted to the Department at least 180 days prior to the commencement of construction. The plans shall be subject to Department review and approval. This plan shall include:

1) Design and construction plans and specifications;
2) Plans for operation and maintenance;

3) Provisions to minimize injury of fish;

4) Provisions to minimize undue delay in moving fish upstream; and

5) Provisions to convey fish safely and effectively upstream, without undue injury of fish or delay in transport.

The upstream fish passage facility shall be operated 24 hours per day, April 1 - May 21 and September 1 - December 15, with the period subject to adjustment based on knowledge gained about migration periods for migratory salmonids.

Within one year of license issuance, the applicant shall develop, and file with the Department, a plan for an effectiveness study. The study plan shall include an implementation schedule; shall be developed in consultation with the Department of Fish and Wildlife and U.S. Fish and Wildlife Service; and shall be subject to Department approval prior to implementation. Based on the outcome of the study, the Department may require modifications to the facility in order to attain reasonable effectiveness.

M. **Downstream Fish Passage at Newport Facility.** Within two years of license issuance, unless extended for good cause with Department approval, the applicant shall install a downstream fish passage facility at Newport Dam to convey fish safely and effectively to the river immediately below the bypassed reach. A downstream fish passage plan shall be developed in consultation with the Department, the Department of Fish and Wildlife, and the U.S. Fish and Wildlife Service and shall be submitted to the Department at least 180 days prior to the commencement of construction. The plan shall be subject to Department review and approval prior to construction. The plan shall include:

1) Design and construction plans and specifications;

2) Plans for operation and maintenance;

3) Provisions to minimize entrainment of fish into the penstock and generating units(s);

4) Provisions to minimize impingement of fish on devices or structures used to prevent entrainment;

5) Provisions to convey fish safely and effectively downstream of the facility; and

6) Plans for a notch in the remnant dam adjacent to the powerhouse that will concentrate bypass flows, and a flume, if necessary to provide safe and effective downstream passage past the ledges below the notch, for fish that enter the Newport 1,2,3 bypass reach during times of spillage at Newport Dam.

Downstream passage shall be provided 24 hours per day, April 1 - June 15 and September 15 - December 15 and shall be functional at all impoundment operating levels, with the period subject to adjustment based on knowledge gained about migration periods for migratory salmonids.

Within one year of completion of the downstream fish passage facility, the applicant shall conduct a study to determine its effectiveness. The study plan shall include an implementation schedule; shall be developed in consultation with the Department of Fish and Wildlife and the U.S. Fish and Wildlife Service; and shall be subject to Department approval prior to implementation. Based on the outcome of the study, the Department may require that the structure be modified or replaced in order to assure safe passage.

N. **Debris Disposal Plan.** The applicant shall develop a plan for proper disposal of debris associated with project operation. The plan shall be developed in consultation with the Department. After Department approval of the plan, the plan shall be filed with FERC no later than 120 days from the date of license issuance. FERC shall either approve the plan or return the plan to the applicant for revision to incorporate FERC-recommended changes. After revision, the applicant shall submit the plan to the Department for approval of the changes. The plan shall then be filed with FERC for final approval. The Department reserves the right of review and approval of any material changes made to the plan at any time.

O. **Maintenance and Repair Work.** Any proposals for project maintenance or repair work, including drawdowns below the fixed dam crests to facilitate repair/maintenance work, shall be filed with the Department for prior review and approval, if said work may

have a material adverse effect on water quality or cause less-than-full support of an existing use or a beneficial value or use of State waters.

P. **Public Access.** The applicant shall allow public access to the project lands for utilization of public resources, subject to reasonable safety and liability limitations. Such access should be prominently and permanently posted so that its availability is made known to the public. Any proposed limitations of access to State waters to be imposed by the applicant shall first be subject to written approval by the Department. In cases where an immediate threat to public safety exists, access may be restricted without prior approval; the applicant shall so notify the Department and shall file a request for approval, if the restriction is to be permanent or long term, within 14 days of the restriction of access.

Q. **Recreational Facilities.** Recreational facilities shall be constructed and maintained consistent with a recreation plan approved by the Department. The plan shall be filed with the Department within 180 days of license issuance and shall include an implementation schedule. The recreation plan shall address public access to the Seymour Lake outlet stream, development of portages at West Charleston and Newport, a boat access at Clyde Pond, and pedestrian access to and parking at Vincents bridge. Where appropriate, the recreation plan shall include details on erosion control. Modifications to the recreation plan shall also be subject to Department approval over the term of the license.

R. **Erosion Control.** Upon a written request by the Department, the applicant shall design and implement erosion control measures as necessary to address erosion occurring as a result of use of the project lands for recreation. Any work that exceeds minor maintenance shall be subject to prior approval by the Department and FERC.

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

T. **Posting of Certification.** A copy of this certification shall be prominently posted within the West Charleston and Newport project powerhouses.

U. **Approval of Project Changes.** Any change to the project that would have a significant or material effect on the findings, conclusions or conditions of this certification, including project operation, must be submitted to the Department for prior review and written approval where appropriate and authorized by law and only as related to the change proposed.

V. **Reopening of License.** The Department may request, at any time, that FERC reopen the license to consider modifications to the license as necessary to assure compliance with Vermont Water Quality Standards.

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

/s/

Scott Johnstone, Secretary
Agency of Natural Resources

Dated at Waterbury, Vermont
this 1st day of August, 2002.

SJ/JRC

State of Vermont
WATER RESOURCES BOARD

RE: Clyde River Hydroelectric Project
Docket Nos. WQ-02-08(A) and (B) (Consolidated)

AMENDED WATER QUALITY CERTIFICATE: FINDINGS OF FACT, CONCLUSIONS OF LAW, AND ORDER

This decision pertains to an application for a Section 401 Water Quality Certificate (Certificate) from the State of Vermont filed by Citizens Communications Company (Citizens or Applicant) in conjunction with its request for relicensure by the Federal Energy Regulatory Commission (FERC) of the Clyde River Hydroelectric Project (Project). The Applicant filed its application with the Department of Environmental Conservation (Department), Vermont Agency of Natural Resources (ANR) on January 24, 2002, and was granted a Certificate by the Secretary of ANR on August 1, 2002, pursuant to 10 V.S.A. § 1004 (Secretary's Action). This Certificate was timely appealed to the Water Resources Board (Board), which conducted a *de novo* contested case hearing with respect to the issues raised on appeal.

In order to obtain a Certificate, the Applicant was required to show that its Project complies with the Vermont Water Quality Standards (VWQS) and other state law provisions applicable under § 401 of the Federal Water Pollution Control Act, 33 U.S.C. § 1251 *et seq.*, commonly known as the Clean Water Act (CWA). As explained more fully below, the Board concludes that there is sufficient credible evidence in the record before the Board upon which to find that the Project, as proposed by the Applicant and conditioned by the Secretary of ANR, is largely in compliance with the VWQS and other applicable law. However, the Board concludes that certain Findings and Conditions imposed by the Secretary of ANR and identified by the Appellants, must be modified to ensure that compliance with the VWQS and other applicable state law will be achieved during the period of the license with respect to the operation of the Newport 1, 2, 3 facilities and the Seymour Lake Dam. Accordingly, the Board grants the Applicant's request for a Certificate, but modifies the Secretary's Action in part, by amending certain Conditions to reflect the Board's own Findings of Fact and Conclusions of Law (Amended Certificate).

I. PROCEDURAL HISTORY AND JURISDICTIONAL STATEMENT

The parties to this appeal are the Applicant, ANR, and two sets of Appellants, the Seymour Lake Association (SLA) and the Vermont Natural Resources Council (VNRC) joined by the Northeast Kingdom Chapter of Trout Unlimited (NEKTU).

The Project is an existing hydroelectric facility on the Clyde River, a water body within the boundaries of the State of Vermont, subject to the Secretary of ANR's jurisdiction and protection under the CWA and 10 V.S.A. § 1004. The Secretary of ANR issued a Certificate to the Applicant on August 1, 2002. On August 15, 2003, timely appeals were filed by SLA and

VNRC/NEKTU pursuant to 10 V.S.A. § 1024(a), thereby vesting jurisdiction in the Board. SLA's appeal was docketed as WQ-02-08(A) and VNRC/NEKTU's appeal as WQ-02-08(B).

A prehearing conference was held on October 15, 2002. A Prehearing Conference Report and Order was issued on October 25, 2002 (Prehearing Order), consolidating SLA's and VNRC/NEKTU's appeals for hearing, dismissing a third appeal[1], and setting forth the Chair's preliminary rulings regarding the scope of the proceeding and a schedule of filing deadlines leading to a hearing on the merits. The Prehearing Order is hereby incorporated by reference.

On October 29, 2002, the Board conducted a site visit of the Project, focusing on the Seymour Lake Dam and Newport 1, 2, 3 facilities. A Site Visit Report was approved by the Board on January 7, 2003, subject to the right of the parties to object to its inclusion in the record. There were no objections to the Site Visit Report, in whole or in part, it was incorporated into the record.

Throughout the months of January and February, the parties prefiled direct and rebuttal testimony and exhibits in this matter. They also filed specific evidentiary objections. In particular, on February 25, 2003, VNRC/NEKTU filed a Motion to Limit the Scope of the Proceeding (Motion). That Motion was heard by the Chair, along with other evidentiary objections, at a second prehearing conference on March 11, 2003. The Chair granted VNRC/NEKTU's Motion in a Second Prehearing Conference Report and Order issued on March 26, 2003 (Second Prehearing Order). The Second Prehearing Order is hereby incorporated by reference.

The Board conducted an evidentiary hearing on April 1, 2 and 8, 2003. A transcript was prepared by Capitol Court Reporters, Inc., and is a part of the Board's record in these consolidated appeals. As a preliminary matter on April 1, 2003, the Board heard oral argument on and reviewed certain objections to the Chair's rulings contained in the Second Prehearing Order, including the Chair's ruling of VNRC/NEKTU's Motion. The Board unanimously affirmed the Chair's ruling granting VNRC/NEKTU's Motion.

On April 8, 2003, ANR filed on behalf of itself, the Applicant, and SLA, a Stipulated

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[1] A third Appellant filed a timely appeal, Public Employees for Environmental Responsibility (PEER). It's appeal was docketed as WQ-02-08(C). PEER, however, was subsequently determined to lack standing and the Board's Chair dismissed its appeal. See Re: Clyde River Hydroelectric Project, Docket No. WQ-02-08(A), (B) and (C), Prehearing Conference Report and Order at 4-9 and 18, Order, Item 1 (Oct. 25, 2002). PEER did not appeal the Chair's ruling as provided in the Prehearing Order and Rule 23 of the Board's Rules of Procedure (Procedural Rule). Therefore, the Chair's ruling became final.

Agreement setting forth Proposed Findings of Fact and Certificate Conditions settling the disputed issues in SLA's appeal, Docket No. WQ-02-08(A). At the hearing on April 8, 2003, VNRC indicated that it did not object to the Stipulated Agreement. Accordingly, the Board has incorporated the Proposed Findings of Fact and Conditions relevant to the reconstruction and operations of the Seymour Lake Dam into the Board's Amended Certificate.

The parties filed proposed Findings of Fact, Conclusions of Law, and Orders on March 21, 2003, and supplemented these on May 7, 2003, following the hearing.

The Board deliberated in this matter on April 15, May 12, June 3, June 24 and July 10, 2003 . On July 10, 2003, the Board declared the record complete and adjourned the hearing. This matter is now ready for decision.

II. ISSUES

The issues in these consolidated appeals may be summarized as follows:

1. Whether the Certificate issued by the Secretary of ANR fails to provide adequate flow in the bypass reach of the Newport 1, 2, 3 facility to achieve compliance with the VWQS?

2. Whether the Certificate issued by the Secretary of ANR fails to provide adequate upstream and downstream fish passage at the Newport 1, 2, 3 facility to achieve compliance with the VWQS?

3. Whether the proposed changes to reconstruction and operation of the Seymour Dam comply with the VWQS?

The specific Findings and Conditions in the Certificate to which VNRC/NEKTU initially filed objections were: Findings 153, 177, 183, 188, 270, 281, 283-291 and Conditions B (as it relates to Newport 1, 2, and 3), D, L, and M, as well as any and all tables, charts, or other information contained or referred to therein. See Prehearing Order at 12-13. These Findings and Conditions were addressed to the operations of the Newport 1, 2, 3 facility only. Most of the Findings of Fact and Conditions contained in this Amended Certificate address Issues 1 and 2, the key matters in dispute in VNRC/NEKTU's appeal.

On March 10, 2003, VNRC/NEKTU withdrew its appeal of issues related to wetlands adjacent to Clyde Pond and the management of Clyde Pond with the addition of flashboards. Specifically, VNRC/NEKTU withdrew its objections to Findings 188 and 270.

The specific Findings and Conditions in the Certificate to which SLA filed objections

were: Findings 254-256 and Condition H. See Prehearing Order at 12. These address the reconstruction and operation of the Seymour Lake Dam. By the terms of the Stipulated Agreement, the parties have filed proposed Findings of Fact 47, 60, 63, 255, and 256 and amended Conditions F and H for the Board's consideration. The Board concludes that these stipulated Findings of Fact and Conditions resolve the concerns set forth in SLA's appeal and also dispose to the Board's satisfaction the question of whether the proposed reconstruction and operation of the Seymour Lake Dam complies with the VWQS, Issue 3.

None of the parties contest those Findings and Conditions in the Certificate that relate to other aspects of the Project, such as those that relate to the management of Echo Lake, the West Charleston facility, and the historical operations of Newport 11.

Accordingly, the Findings of Fact and Conditions set forth below specifically amend the Findings and Conditions of the Certificate issued by the Secretary of ANR. In all other substantive respects, the Findings and Conditions of the Certificate are incorporated herein by reference. Where greater clarity could be achieved by specifically repeating in the Board's decision certain Findings and Conditions from the Certificate, with or without modifications, the Board has taken the liberty to include such text in its Amended Certificate.

III. FINDINGS OF FACT

To the extent that any proposed finding of facts are explicitly included below, they are granted; otherwise, they are denied. See Secretary, Agency of Natural Resources v. Upper Valley Regional Landfill Corporation, 167 Vt. 228, 241-42 (1997); Petition of Village of Hardwick Electric Department, 143 Vt. 437, 445 (1983).

The Board takes official notice of and incorporates by reference the following Findings that are contained in the Certificate and which were *not* contested by the parties. See Prehearing Order at 12-13. They are Findings 1-46, 48-59, 61-62, 64-152, 154-176, 178-182, 184-254, 257-280, 282 and 292-297.

The Board adopts and incorporates herein the Findings of Fact that are contained in the parties' Stipulated Agreement, filed on April 6, 2003, which revise certain Findings and Condi-tions with regard to the Seymour Lake Dam contained in the Certificate. These comprise revised Findings 47, 60, 63, 255 and 256.

I. Background/General Setting

Certificate Findings 1-8 were not contested and therefore are incorporated by reference.

II. Project and Civil Works

Certificate Findings 9-38 were not contested and therefore are incorporated by reference. These findings are generally descriptive of the civil works are Seymour Lake, Echo Lake, West Charleston, and Newport 1, 2, 3.

III. River Hydrology and Streamflow Regulation

Certificate Finding 39 was not contested and therefore is incorporated by reference.

Seymour Lake

Certificate Findings 40-46 and 48 were not contested. Some of these Findings are repeated here, with minor changes, in order to provide a context for Finding 47, which was amended by Stipulated Agreement.

40. Under the existing FERC license, Seymour Lake can be regulated as a storage facility for the Clyde River Project. The license established maximum and minimum water level requirements. With a dam crest elevation at 1279.0 feet msl, maximum lake elevation may not exceed 1279.5 feet msl (crest plus 6 inches) and minimum elevation may not fall below 1278.33 feet msl (minus 8 inches) for operational purposes. The license also requires that the gate in the dam be maintained open at least one inch from its sill to allow for a continuous discharge of water and that any gate adjustments be made gradually to prevent streambed scouring.

41. The outlet gate has historically been controlled by both the Applicant and members of the SLA. Typically, the SLA has only made adjustments to the gate during the summer season. In certain cases during extreme low-flow periods or prior to spring runoff, the pond has been lowered below the minimum elevation required in the license, and flow releases below the lake have not always been maintained as required. (*Hydropower in Vermont: An Assessment of Environmental Problems and Opportunities*, Department of Environmental Conservation, 1988)

42. The storage function of Seymour Lake was discontinued before 1987. However, the Applicant manages the gate as necessary to prevent the lake from exceeding the maximum stage set in the license. The lake stage is normally maintained in the low end of the required range to provide some buffering of high flows. Under the next license, the Applicant proposes to formally discontinue the storage function of Seymour Lake.

43. In 1951, the Legislature ordered the State Public Service Commission (now Public Service Board) to define the natural maximum and minimum water levels of Lake Seymour after the Applicant had extensively enlarged the outlet channel to enable drawdowns. 30 V.S.A. § 401. The Public Service Commission defined the true natural low water elevations and the magnitude of the normal water level fluctuation above that

elevations, considering the water levels as they were before the first damming of the lake outlet in 1921. *(Public Service Commission Order No. 2564, September 15, 1951.)*

44. The artificial raising or lowering of the water level outside of the defined natural range, is prohibited by statute. 30 V.S.A. § 402. The defined natural range established by the Public Service Commission was marked by pins installed at the natural lake outlet and set 6 inches above the 8 inches below the present dam crest. (*Public Service Commission Order No. 2564, September 15, 1951.*) These levels were subsequently incorporated in the 1963 license.

Certificate Finding 45 was not contested and therefore is incorporated by reference.

46. The Applicant proposes to reconstruct the dam as a concrete gravity structure with the spillway lowered to elevation 1278.67 feet msl, or four inches below the current design elevation 1279.0 feet msl, and lengthened in order to increase the hydraulic capacity of the spillway. The Applicant estimates that the hydraulic grade line from the lake to the dam drops about two inches during the normal flow conditions. (*Draft Design Criteria for the Seymour Lake Dam Replacement Project, Duke Engineering & Services, Inc., October 2001.*)

47. Under the existing FERC license, the Applicant maintains the existing slide gate open at least one inch to provide for continuous downstream flows. With the lake level at the dam crest, this results in an estimated flow release of 4 cfs. The Department had requested that the new dam design not incorporate a gate and that consideration be given to providing an alternate method for providing downstream conservation flows.

Certificate Finding 48 and Tables 2a and 2b were not contested and therefore are incorporated by reference.

Echo Lake

Certificate Findings 49-56 are incorporated by reference. This portion of the Project was not the subject of any appeal filed with the Board.

Flooding – Seymour and Echo Lakes

Certificate Findings 57-59 are incorporated by reference. Findings related to Seymour Lake were not contested. The Echo Lake portion of the Project was not the subject of any appeal filed with the Board.

60. A January 2002 analysis done for Seymour Dam by Duke Engineering & Services (Duke Engineering) suggested that the earlier study may have had deficiencies. Two significant factors in the outlet flood hydraulics of Seymour Lake are the effects of downstream tailwater on the dam and the existence of a water level differential between

the lake and the dam. These two conditions are not factors at Echo Lake. At Seymour Dam, the dam crest is only about 4.5 feet above the downstream streambed. As a consequence, the dam crest becomes submerged on the downstream side during highwater conditions. By letter dated January 6, 1999, the Department had asked the Applicant to identify the significance of submergence. The 1,200-foot stream channel between the lake and the dam also affects lake water levels. These two factors were taken into account in the Applicant's January 2002 analysis.

Certificate Findings 61-62 were not contested and therefore are incorporated by reference.

63. A preliminary dam design done by Duke Engineering lengthens the dam crest from the current 30.6 feet to 52.0 feet. Combined with the lowering of the crest by four inches, the new design substantially increases the spillway capacity. The design also incorporates a bulkhead bay with a five-foot width equivalent to the existing gate bay. The sill elevation for the bulkhead bay was 1275.0 feet msl, or 0.3 feet lower than the existing gate sill. Although the basis of the design is to only discharge water via the spillway (crest controlled run-of-river operation), excepting for the 4 cfs conservation flow, pursuant to a stipulated agreement between the Applicant, the Department, and the SLA discussed below in Finding 256, the design will be revised to include a gate.

Certificate Findings 64-66 and Table 3 were not contested and therefore are incorporated by reference.

West Charleston

Certificate Findings 67-78 are incorporated by reference. This portion of the Project was not the subject of any appeal filed with the Board.

Newport 1, 2, 3

Certificate Findings 79-89 are incorporated by reference. These findings, concerning historical and proposed operation of this portion of the Project, were not contested.

Newport 11

Certificate Findings 90-91 are incorporated by reference. This portion of the Project was not the subject of any appeal filed with the Board.

Summary of Operating Proposal

Certificate Finding 92 and Tables 4a and 4b are incorporated by reference. This

finding concerning the relicensing proposal operating mode and limitations for the two exsiting generating facilities, West Charleston and Newport 1,2,3, was not contested.

IV. Standards Designation

Certificate Findings 93-104 were not contested and therefore are incorporated by reference.

V. Water Chemistry

Certificate Findings 105-114 and Table 5 were not contested and therefore are incorporated by reference.

Landlocked Atlantic Salmon

Certificate Findings 115-126 and Tables 6a, 6b, 6c, and 7 were not contested and therefore are incorporated by reference.

Echo Lake/ Seymour Lake

Certificate Findings 127-30 are incorporated by reference. Findings related to Seymour Lake were not contested. The Echo Lake portion of the Project was not the subject of any appeal filed with the Board.

Smelt Run a Seymour Lake

Certificate Findings 131-133 were not contested and therefore are incorporated by reference.

West Charleston

Certificate Finding 134 is incorporated by reference. This portion of the Project was not the subject of any appeal filed with the Board.

Bypass

Certificate Findings 135-143 are incorporated by reference. This portion of the Project was not the subject of any appeal filed with the Board.

Newport 1,2,3 and Newport 11

Certificate Finding 144 was not contested and therefore is incorporated by reference.

Newport 1,2,3 Bypass

Certificate Findings 145-152 are incorporated by reference. Where greater clarity could be achieved by repeating, with or without amendment, certain Findings from the Certificate related to the Newport 1,2,3 Bypass in order to provide a context for the Board's own findings regarding this topic, the Board has included such Findings below.

145. The Newport 1,2,3 facility bypasses approximately 1,800 feet of the Clyde River. The upper 400 feet of the reach, from Newport Dam to the breached mill dam, consists primarily of moderate-gradient gravel riffles with ledge outcroppings. Three channels form at the base of Newport Dam and converge to pass under Crawford Road. Below the breached mill dam, for a distance of 250 feet, is the steep bedrock cascade known as Arnolds Falls, then a plunge pool and a small cascade, which is adjacent to the mill ruins. The next 500 feet, extending to the impoundment behind the abandoned dam, is a section of slight-to-moderate gradient with riffles and braided conditions. The substrate is composed of cobbles and rock with pockets of gravel in the lower braided reach. The ponded area behind the abandoned dam is about 300 feet in length with a bed material of deposited sediment. Below the dam is a 100-foot long section of cascade, then a boulder/rock riffle grading into the Newport 1,2,3 tailrace.

146. Because this reach of the river is virtually dry for most and sometimes all of the year, the Department of Fish and Wildlife (DFW) does not currently manage this reach for any fish resources or fisheries. Spawning gravels and pools in the bypass have habitat potential for all life stages of brown trout, rainbow trout, and landlocked Atlantic salmon. Gravel areas are degraded by the existing flow regime, which results in dewatering, sedimentation, and vegetative encroachment into these substrates.

147. With provision of access and a compatible flow regime, the bypass could provide habitat for fish and other aquatic life. An objective of the DFW has been to establish conditions in this reach that would result in the support of spawning and juvenile landlocked Atlantic salmon and resident brown trout populations. (*Clyde River Futures Project Preliminary Report*, April 1991) Nevertheless, the Secretary of ANR has not approved a revised basin plan for the Clyde River in accordance with 10 V.S.A. § 1253(d) and recommended a Water Management Type (WMT) for the bypass reach that recognizes the salmonid fishery as "an exceptional resource value in need of restoration or protection" and reflects DFW's water management goal.

148. Before the construction of dams, salmon would probably have been able to ascend what is now the bypass of the Newport 1,2,3 facility, under certain flow conditions, at least as far as the base of Arnolds Falls. The abandoned concrete dam at the lower end of the bypass presently obstructs passage. *(Letter from Gordon Beckett, U.S. Fish and Wildlife Service to Frank Thomas, Harza Engineering, February 8, 1993.)* Removal of

this abandoned dam would allow migratory salmonids to ascend into the bypass, and utilize the reach as spawning and nursery habitat. Notching the remnant dam and providing a flume, as necessary, would enable downstream migrating fish that passed over the Newport Dam to move safely through the bypass reach to that portion of the Clyde River below the Newport 1,2,3 facility.

149. By letters dated February 28, 1992 and March 13, 1992, ANR requested that the Applicant conduct a flow demonstration at the Newport 1,2,3 bypass for evaluation of the habitat/flow relationship for the following target species and life stages: landlocked salmon, rainbow trout and brown trout; upstream and downstream migration, spawning, incubation, fry, juvenile, adult (bright fish and kelts).

150. The Applicant conducted this habitat assessment study in May 1993, and the study results are presented in the response to AIR No. 6 *(Schedule b Information Appending Application for License, October 1993)*. The study consisted of habitat assessments at four locations (U-2, U-3, U-4, and U-7) and zone of passage assessments at four locations U-1, U-5, U-6, and U-8) in the bypass, at eight flows over the range from leakage (about 2.5 cfs) to 506 cfs. For the assessment of spawning and incubation habitat, since suitable substrate was generally located in small discrete pockets, the percent wetted area criterion used for the other life stages and in the Newport 11 bypass for all life stages was not deemed appropriate. Instead, the final assessment is a qualitative description of spawning/incubation potential at each observed flow rather than a quantification in terms of useable habitat as developed for the other assessments.

151. Where wading was possible, numerous depth measurements were made and velocities were estimated. At locations U-2, U-3, U-4, and U-7, wetted width measurements were taken at each study flow. For each flow, the wetted widths were then multiplied by the percent of habitat that was assessed as "good" by the study team to develop estimates of useable habitat expressed as weighted wetted widths (WWW), which reflects both habitat quality and quantity.

152. Observations of salmon spawning and incubation habitat suitability were that a flow of about 300 cfs or more is required to provide suitable depths and velocities over the gravel areas in U-2, which is the location representing the impounded reach upstream of the abandoned dam adjacent to the powerhouse, and that the lowest conservation flow that provides any significant spawning habitat is 149 cfs at the remaining stations. For U-2, the assessment was done under the assumption that the dam would remain in place. The substrate type behind the abandoned dam is silt and, therefore, is presently of limited spawning value. For all locations, few areas were useable for spawning at a flow of 30 cfs, and none at 2.5 cfs.

153. For review of habitat conditions for fry, juvenile, and adult salmonid life stages, ANR divided the Newport 1,2,3 bypass into segments: the segment above Arnolds Falls and the segment below Arnolds Falls to the head of the impounded reach. The segments

are represented by U-7 and by U-3 and U-4, respectively. The upper segment (from Crawford Road to the head of the cascade), when contrasted to the lower segment, is narrow and steep and about half the length. Together the two segments characterize 42% of the bypass length.

Table 10 at Finding 162 of the Certificate, incorporated by reference, lists the median monthly flows for times of the year when the flow regime is particularly significant to the life stages of fish. As shown in Table 5 at Finding 114 of the Certificate, incorporated by reference, rainbow trout and certain other species spawn the incubate their eggs during the spring, whereas landlocked Atlantic salmon and brown trout spawn during the fall and incubate their eggs during the winter. Habitat for adult and juvenile fish is often most limited during the period of lowest flow. August is usually the lowest flow month during the summer, when high water temperatures and lower dissolved oxygen can add further stress. February is the lowest flow month during the winter, when ice and cold temperature conditions are additional stressors. The amount of habitat available at the Applicant's proposed 5 cfs was compared to the amount naturally available to the trout/salmon life stages of interest during the period that the life stages would be present in the Clyde River. The fry stage is present from spring emergence through the fall when the juvenile life stage begins. Both for juvenile and adult life stages, the February, April/May, and August medians were considered.

For fry, the amount of habitat available at the August median flow was used to assess the range of habitat available at alternate flows, including that proposed by the Applicant. Table 9a of the Certificate, incorporated by reference, displays the amount of habitat available at the study flows and at the August median flow. In the upper segment, the estimated amount of fry habitat available at the August median flow of 98 cfs is 21 feet over a corresponding transect wetted width of 70 feet. At 30 cfs, 34 feet of "good" useable habitat is available, and the amount declines to 22 feet at a flow of 2.5 cfs. Fry habitat decreases as flows increase above the August median flow, reflecting the low velocity tolerance of this particular life stage. The lower segment is a wider channel and, as a result, requires higher flows to provide comparable habitat quality. Compositing locations U-3 and U-4, the amount of good fry habitat was found to be relatively constant (46.0 ± 8% useable feet) over a flow range of 75-301 cfs even though the average wetted width increased by 64%. The amount of habitat at 30 cfs was about half of the amount available at the August median flow, and the amount declined another 13% down to 2.5 cfs.

Referring to Table 9b of the Certificate, incorporated by reference, for juvenile habitat in the upper segment over the range of flows between 30 cfs and 149 cfs, the amount of habitat remained within 8% of the amount available at the August median flow of 98 cfs (50 feet useable for a 70 foot wetted width), with the amount of habitat actually increasing with declining flows. With flows dropping from 75 cfs to 30 cfs, the amount of habitat actually increased slightly. Only a small amount of habitat remained available at 2.5 cfs, however. During the average spring flow conditions, the amount of

habitat is roughly a quarter of the amount available under average August and February conditions. In the lower segment, the juvenile habitat decreased by almost two-thirds with flows dropping from the August median flow to 30 cfs and by 59% more when dropping from 30 cfs to 2.5 cfs. Under average spring flow conditions, about half again as much habitat is available compared to average August conditions.

Referring to Table 9c of the Certificate, incorporated by reference, in the upper segment over the range of flows from 30-149 cfs, the trend is the opposite of what was observed with juveniles: the amount of habitat increases with increasing flows. Similar amounts of habitat are available at 30 cfs and 75 cfs, but the amount of habitat improves by about 12% when flows rise to the August median flow and by roughly the same amount when flows rise to the February median flows. However, there was virtually no adult habitat at a flow of 2.5 cfs; the wetted width had contracted to 30 feet. Spring flow conditions were judged to reduce the amount of habitat in this section to 20 feet over the wetted width of 80 feet. In the lower segment, adult habitat decreased by almost three quarters with flows dropping from the August median flow to 30 cfs and was almost nil at 2.5 cfs. The February median flow provided about 16% more habitat than the August median flow, and the April/May median more than tripled the amount of adult habitat.

The incorporated Tables, referenced above, present the assessment data upon which the Department based its analysis. The values for median flow conditions were interpolated. The last column represents the total amount of habitat included in both the upper and lower study segments assuming the wetted widths at the transects are representative. These two segments represent 42% of the bypass reach.

Put in perspective, the total bypass reach for the Newport 1,2,3 facility represents 1.1 % of riverine habitat and 4.4% of potentially available spawning and incubation habitat of the Clyde River, while the percentage of habitat for salmon spawning and nursery habitat above Clyde Pond is estimated to be as much as 80%, if made accessible to migrating salmonids.

Certificate Findings 154-152 were not contested and therefore are incorporated by reference.

Newport 1,2,3 - Downstream

Certificate Findings 155-176 and Table 10 were not contested and therefore are incorporated by reference.

177. Operation of the Newport 1,2,3 facility currently includes daily flow fluctuations that subject aquatic organisms to both high and low flows on a rapidly changing basis. A non-steady state analysis addressing the effects of hydropeaking has not been

conducted for the reach below Newport 1,2,3. However, provision of a reasonable base flow requirement and ramping protocols to slow the transition between peak and base flows, as provided for in this Amended Certificate, should minimize the impacts on aquatic habitat.

Certificate Findings 178-179 were not contested and therefore are incorporated by reference.

Fish Passage

Certificate Findings 180-181 are largely adopted by the Board and incorporated by reference. However, the Board makes amendments to the findings as follows.

180. The Applicant has presented conceptual designs for fish passage facilities. These facilities consist of downstream passage at Newport 1,2,3 via a fish pipe from Newport Dam to the vicinity of the Newport 1,2,3 powerhouse and upstream passage via a trap, hold, and truck operation at the Newport 1,2,3 station.

181. The target species relative to fish passage include landlocked Atlantic salmon, steelhead rainbow trout and brown trout. The period of operation for upstream fish passage facilities (adult salmonids) is April 1 - May 21 and September 1 - December 15, for each year beginning with the first year of upstream fish passage operations. The period of operation for downstream fish passage (pre-smolts, smolts, and kelts) is April 1 - June 15 and September 15 - December 31, for each year beginning with the first year of downstream fish passage operations.

Ramping

Certificate Finding 182 was not contested and therefore is incorporated by reference.

183**.** Specific ramping protocols for the two bypasses is an outstanding need.

That portion of Certificate Finding 182 relating to ramping at the West Charleston facility was not challenged by the parties, so it is incorporated by reference That portion relating to ramping at Newport 1,2,3, however, was contested and therefore is addressed here.

At Newport 1,2,3, the Applicant had previously indicated that the bypass flows would recede slowly as the pond level of Clyde Pond would drop over a 6.5-hour period after restart of the station. The issue was more or less moot under the Applicant's flow proposal of 5 cfs as that flow is too low to provide continuous support of aquatic biota.

(License Application, *Resource Agency and Interested Parties Additional Study Requests and Citizens Utilities Company Responses*, Section 6, March 1992)

However, with the imposition of a base flow of 30 cfs in the Newport 1,2,3 bypass reach and the requirement that the remnant dam be breached to facilitate downstream migration of salmonid, a ramping protocol is necessary at the Newport 1,2,3 facility in order to assure that migrating fish will not become stranded in the bypass reach.

Flushing Flows

Certificate Findings 184-185 were not contested and therefore are incorporated by reference; however, minor changes are made to Finding 185, consistent with the Board's other Findings.

184. As a consequence of dewatering and reduced high flows, deposition of sediment and encroachment of terrestrial vegetation into the channel of the Newport 1,2,3 bypass has altered physical habitat conditions for fish and other aquatic organisms.

185. It is reasonable to expect that the reduced utilization of storage at Clyde Pond will result in a greater frequency of high flows in the bypass and, as a result, an improved ability to scour and transport sediment through the reach. Encroachment by terrestrial vegetation can only be counteracted, however, by increasing the river's base flow so that the channel area is restored to an aquatic habitat condition.

VII. **Wildlife and Wetlands**

Certificate Findings 186-188 are not contested and therefore are incorporated by reference. Certificate Finding 188 was initially objected to by VNRC/NEKTU but subsequently withdrawn.

Clyde Pond

Certificate Findings 189-210 and Tables 12 and 13 were not contested and therefore are incorporated by reference.

VIII. **Shoreline Erosion and Desilting**

Certificate Findings 211-217 were not contested and therefore are incorporated by reference.

IX. **Recreational Use**

Certificate Findings 218-234 were not contested and therefore are incorporated by reference.

XI. **Other Uses**

Certificate Finding 240 was not contested and therefore is incorporated by reference.

XII. **Rare and Endangered Plants and Animals**

Certificate Finding 241 was not contested and therefore is incorporated by reference.

XIII. **State Comprehensive River Plans**

Certificate Findings 254-249 were not contested and therefore are incorporated by reference.

XIV. **Analysis**

Bodies of Water

Certificate Findings 250-254 were not contested and therefore are incorporated by reference. These findings address Seymour Lake, the Applicant's proposal for replacement of the dam, and the concerns of SLA. They were not contested. Finding 254 was contested by SLA in its Notice of Appeal, but not proposed for amendment by the parties in their Stipulated Agreement. Therefore, it is incorporated by reference.

255. The Department was unable to locate any data or information on the flood history of Seymour Lake preceding the alteration of its natural outlet. SLA and the Town of Morgan had expressed an interest in the incorporation of a gate in the new dam in order to increase the dam's hydraulic capacity during severe flood events. Operation of the gate would, however, counter the effort to provide for a naturally varying lake level in Seymour Lake and would potentially cause flooding and disruption of habitat below the dam and possibly even effect Echo Lake. It would also create the potential for Seymour Lake to be drawn down below SLA's target elevation and even the low pin. As a result of the January 2002 analysis discussed in Finding 60 above, the Department requested that the Applicant collect site-specific data to calibrate the hydraulic model primarily with respect to the tailwater rating and the water surface profile from the lake to the dam. The resulting analysis suggested that an operable gate is not necessary to reduce high lake stages. Nevertheless, because of the significance of the issue to SLA, Conditions F and H have been amended so as to set forth monitoring requirements and a consultation process between the Applicant, the Department, and SLA which the Board finds are reasonable to assess the performance of the new dam and to verify the conclusions of the current analysis, while ensuring compliance with the VWQS.

256. The current design proposal for the dam reconstruction includes a bulkhead bay, 5.0 feet wide with a sill elevation of 1275.00 feet msl. Pursuant to a stipulated agreement between the Applicant, the Department, and SLA, the design will be revised to include

a gate but the frame, stem and wheel will not be installed and the gate will not be operated for at least the two year period following construction of the new dam. The Department's staff believe and the Board finds, however, that it is prudent to initially incorporate the non-operable gate in the new dam and consider operation of the gate should future monitoring and analysis indicate that it is necessary to prevent excessive lake levels. If it is determined that a gate must be used periodically to prevent significant flooding, the gate manipulation shall be limited to use for this purpose only.

Certificate Findings 257-260 were not contested and therefore are incorporated by reference.

Certificate Findings 261-265, related to Echo Lake, are incorporated by reference. This portion of the Project was not the subject of any appeal filed with the Board.

Certificate Findings 266-267, related to maintenance activities and flow management at Seymour and Echo Lakes, are incorporated by reference. Findings related to Seymour Lake were not contested. The Echo Lake portion of the Project was not the subject of any appeal filed with the Board.

Certificate Findings 268-269, related to flow management at Charleston Pond, were not the subject of any appeal filed with the Board.

Certificate Finding 270 , related to hydrologic impacts of management of Clyde Pond. was initially objected to by VNRC/NEKTU but subsequently withdrawn. However, this objection was withdrawn and therefore this Finding is incorporated by reference.

Certificate Findings 271-272, regarding impacts on the literal zone of Clyde Pond and wetlands in the Project area, were not contested and therefore are incorporated by reference.

Water Chemistry

Certificate Findings 273-276 were not contested and therefore are incorporated by reference.

Bypassed River Reaches

Certificate Finding 277 was not contested and therefore is incorporated by reference.

Certificate Findings 278-279, regarding the Applicant's bypass flow proposal at the West Charleston facility, is incorporated by reference. This Finding was not the subject of any appeal filed with the Board.

Newport 1,2,3.

Certificate Finding 280, which finds that the Applicant's proposed bypass flow of 5 cfs does not provide an adequate flow regime to support designated uses and values, was not contested and therefore is incorporated by reference.

281. Based on the findings provided above, this Amended Certificate is being conditioned to provide year-round viable habitat conditions in the Newport 1,2,3 bypass reach. The flow needed for base habitat support for fish and other aquatic organisms is 30 cfs. The ANR Flow Procedure supports the Secretary of ANR's position that flows should be at least equivalent to 7Q10, which, in this case, is estimated to be 28 cfs. This bypass reach will continue to offer limited habitat value for salmonids as it is isolated from the river system due to the dams and other obstructions at and between the upper and lower end of the reach. However, the notching of the remnant dam will improve egress by fish that have passed over Clyde Pond and are migrating downstream through the bypass reach. The total removal of the dam would improve fish migration and spawning upstream of the Newport 1,2,3 powerhouse at least as far as Arnolds Falls should flows in the bypass reach be suitably increased, however, the Board is not requiring removal of the remnant dam at this time and such removal will be necessary only if the Secretary has determined that such removal is required as a result of the assessment studies required in Conditions L and M.

The 5 cfs. flow proposal would not be adequate to support the aesthetic values of the river. Based on the flow demonstration at the Board's Site Visit and the Applicant's videos showing various flow regimes, the Board finds that the existing leakage flow and the Applicant's proposed flow of 5 cfs do not provide visual or aural benefits. A flow of 30 cfs, however, will substantially improve the appearance of this reach to the point of providing good aesthetic value.

Downstream River Reaches

Certificate Finding 282 is incorporated by reference. This Finding relates to the support of designated uses and values at the West Charleston portion of the Project which was not the subject of any appeal filed with the Board.

283. *Newport 1,2,3.* The proposal to maintain 363 cfs downstream of the Newport 1,2,3 tailrace from April 1 through June 7 will protect walleye spawning and egg incubation, although a flow of 430 cfs, the station capacity, would provide a higher level of protection closer to the optimum level observed during the habitat study performed in 1993.

The proposal to maintain 100 cfs from June 8 through September 30 will be adequate to provide high quality aquatic habitat.

The proposal to maintain 150 cfs coupled with artificial flow fluctuations from October 1 through December 15 would disrupt the behavior of spawning salmonids. Peaking operations have been observed to disrupt upstream migration of fish. Because of the use of the Clyde River by landlocked salmon during the fall spawning run, it is critical to provide suitable flow conditions at that time of year for upstream migration and habitat use. For these reasons, this Amended Certificate is being conditioned so as to require true run-of-river operations from October 1 - December 15. To attain that regime by October 1, it will be necessary for Clyde Pond water levels to be managed in such a way that the pond is at the dam crest by October 1.

The proposal to maintain 120 cfs from December 16 through March 31 will be adequate to provide high quality habitat.

284. These findings are contingent upon implementation of acceptable ramping protocols that address the effects of hydropeaking on stranding, habitat and fish behavior.

285. The flow proposal would be adequate to support the aesthetic values of the river.

Ramping Plans and Flushing Flows

286. Without ramping plans for each of the project bypasses, there is no assurance that fish and egg kills will not continue to occur at the Project.

287. With the change in the flow regime in the lower Clyde River, flushing flows to restore the Newport 1,2,3 bypass should not be necessary. Because drawdowns are being reduced, the reach will more frequently experience high natural flows above the plant capacity. This and the increase in base flows through the reach will make the channel somewhat less conducive to the support of terrestrial plants.

288. Ramping protocols that address the effects of hydropeaking on stranding, habitat and fish behavior are necessary for the Newport 1,2,3 bypass and tailrace reach and will be a requirement of Condition D of the Amended Certificate.

Fish Passage

289. The Applicant proposes to construct and operate a trap-and-truck facility, as well as outmigrant facilities, at the Newport 1,2,3 dam and powerhouse. A successful program

will substantially enhance the Department's current efforts to reestablish historic salmon runs to the Clyde River and to improve the lake fishery. Over time, the passage facilities are expected to reduce the Department's reliance on upstream fry stocking. The Clyde River upstream of Clyde Pond to Charleston Pond offers proportionally a much greater amount of spawning and nursery habitat compared to the lower Clyde. *See Finding 151.*

Trap-and-truck facilities have been used at other hydroelectric facilities with varying degrees of success. One reason that such facilities can be problematic is that they are subject to human failure, whether this be mechanical, work-force related, or otherwise. As proposed by the Applicant, operation of the trap-and-truck facility requires the taking of migrating fish out of the trap, placing them in a truck, driving them to the designated release area, and placing the fish into Clyde Pond. Serious mortality in salmonids can occur from the stress of poor handling, temperature shock, and disorientation. Therefore, for such a facility to work well, it is imperative that any plan for its design and implementation must receive careful scrutiny, approval, and evaluation. Additionally, because a trap-and-truck facility is so dependent upon the daily intervention of persons hired to trap, truck, and release fish during upstream migration periods, it is essential that any contract to provide those services be carefully scrutinized and those services monitored for compliance with the upstream fish passage plan.

290. Fish Passage facilities are necessary to prevent an interference with the propagation of fish and to minimize fish mortality during downstream movement. Lack of facilities would result in an undue adverse effect on the species composition or propagation of fish and, therefore, constitute a violation of the VWQS, Section 3-04(B)(4) *Aquatic Habitat*.

In order to facilitate the downstream passage of fish, the Applicant proposes to install a pipe to transport fish over a quarter of a mile from the Newport Dam to the tailrace of the Newport 1,2,3. While this proposal is expected to transport many fish during their downstream migration, it is not without flaws. Some fish will pass directly through the penstock and the turbines, while a certain percentage of fish will pass directly over the Newport Dam into the bypass reach. With respect to those fish that do make it into the bypass reach, there is the additional obstacle of the abandoned dam adjacent to the Newport 1,2,3 powerhouse (remnant dam). In order to facilitate safe passage from the bypass reach to the river below, this dam must be notched so that it will concentrate bypass flows during times of spillage at the Newport Dam. Additionally, if deemed necessary by the Department, a flume must be installed to provide safe and effective downstream passage past the ledges below the notch.

291. To provide reliable fish passage, this Amended Certificate is being conditioned to

require both the approval of final plans for the facilities and passage effectiveness studies.

Recreation

Certificate Findings 292-296 were not contested and therefore are incorporated by reference.

Debris

Certificate Finding 297 was not contested and therefore is incorporated by reference.

Public Trust and Constitutional Considerations

298. The Clyde River falls within the definitions of "waters of the State" and "waters of the United States" as defined under state law and the CWA. The Clyde River is also a "navigable" water under the CWA and a "boatable" water under Vermont state law. It is also an important fishery resource.

IV. CONCLUSIONS OF LAW

A. Standard and Scope of Review

Title 10 V.S.A. § 1024(a) provides that an appeal of a § 401 water quality certificate (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). However, the *scope* of any such appeal is limited to the issues identified by an appellant in its notice of appeal, unless the Board determines that substantial inequity or injustice would result from such limitation. Procedural Rule 19(C). Furthermore, in the interests of administrative efficiency, the issues set forth in a notice of appeal may be clarified and narrowed at a prehearing conference, as was done in this case and in previous complex hydroelectric proceedings. Procedural Rule 28(A)(2);see Re Hannaford Bros. Co. And Lowes Home Centers, Inc., Docket No. WQ-01-01, Findings of Fact, Conclusions of Law, and Order at 18-20 (Jan. 18, 2002) (Hannaford); In re Lamoille River Hydroelectric Project, Docket Nos. WQ-94-03 and WQ-94-05, Prehearing Conference Report and Order at 3 (Sept. 26, 1994) (Lamoille).

Both the standard and scope of review were addressed in the initial Prehearing Order issued on October 25, 2002. See Prehearing Order at 10-16, Sections VII(C), VIII, and X. No party objected to the Prehearing Order and on November 18, 2002, the Board determined that the Prehearing Order was final and binding. Order at 1 (Nov. 21, 2002).

Accordingly, in these consolidated appeals, 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 Procedural Act (APA). 3 V.S.A. § 809(c). As in any proceeding that is quasi-judicial in nature, the process of decision in a certificate appeal must be governed by the principle of the exclusiveness of the record. The applicability of a *de novo* standard has required the Board to collect anew evidence to create a comprehensive record upon which its decision is based.

In the course of this process, the Board may and in fact did consider information from the ANR's administrative record offered as evidence by the parties and admitted by the Board, including both the draft Certificate issued on November 13, 2001 (Exhibit C-8), the final Certificate issued by the Secretary of ANR on August 1, 2002 (Exhibit C-3), and a number of the documents upon which Secretary relied in reaching his decision. Nevertheless, even though the Board considered this evidence, as in any *de novo* proceeding, it was not restricted to the record considered by the Secretary nor was it *required* to give deference to the Secretary's decision. Chioffi v. Winooski Zoning Board, 151 Vt. 9, 11 (1989) (emphasis added). Indeed, the parties offered and the Board admitted new testimony and exhibits on contested issues. However, the fact that the Board has reached an outcome similar to that of the Secretary of ANR, based on *both* uncontested findings and its own record on contested issues, does not mean that the Board has deferred to the Secretary's final decision and all of the conclusions contained therein. For example, the Board specifically excluded from the record evidence on the economic and social impacts of the Project.

In conclusion, the Board has weighed the evidence, including the conflicting and sometimes inconclusive testimony of expert witnesses, and determined that an Amended Certificate should be issued to the Applicant, containing modifications to some of the Conditions imposed by the Secretary in the Certificate.

B. Burden of Proof

The general rule in administrative proceedings is that the applicant or petitioner bears the burden of proof. Lamoille, Findings of Fact, Conclusions of Law, and Order at 45 (Nov. 5, 1996), citing Petition of Lyndonville Village, 121 Vt. 185, 190-191 (1959). Citizens is the applicant in this consolidated proceeding and, therefore, it bears the burden of proof.

The burden of proof includes both the burden of production and burden of persuasion. The burden of production in this *de novo* proceeding means the burden of producing sufficient evidence upon which the Board can make positive findings that the Project, including the proposed operational protocol, complies with the applicable provisions of the CWA. At a minimum, limitations imposed by state water quality standards adopted pursuant to § 303 of the CWA are "appropriate" requirements of state law. P.U.D. No. 1 of Jefferson County and

City of Tacoma v. Washington Department of Ecology, 511 U.S. 700, 114 S.Ct.1900 (1994) (Tacoma) However, "appropriate" requirements of state law may and do encompass more than the VWQS, as VNRC/NEKTU have argued.

The burden of persuasion refers to the burden of persuading the Board that certain facts are true. Lamoille at 46. 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. Id. *and authorities cited therein*. 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 Lake Corporation, 154 Vt. 543, 553 (1989) (Quechee Lakes). Thus, as in the Quechee Lakes decision, the Board may consider all of the evidence, including that provided by parties other than the applicant in determining whether the burden of persuasion has been met.

Where, as in these consolidated appeals, only certain specific issues have been appealed to the Board for its *de novo* review, the Applicant must produce evidence and persuade the Board, in connection with those preserved issues only, that the Project and proposed operational protocol complies with applicable provisions of law. See Hannaford at 10,18-20. For the reasons set forth below, the Board concludes that Citizens has met its burden of production and and the record as a whole supports the conclusion that an Amended Certificate should issue.

C. Compliance with the Clean Water Act

Section 401 of the CWA provides: "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 navigable water, shall provide the licensing or permitting agency a certificate of 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 the Act." 33 U.S.C. § 1341(a)(1). FERC is the licensing agency in this case. Pursuant to the U.S. Supreme Court's Tacoma decision, FERC is required to incorporate the Certificate, as issued by the State, into the federal license for a hydroelectric facility. Tacoma at 722. Citizens, as an applicant for relicensure of its hydroelectric facility on the Clyde River, is required to obtain a Certificate from the State of Vermont.

In Tacoma, the Court stated that a state's water quality standards must include both designated uses and water quality criteria, and that a project for which a federal license is required must comply with both the designated uses and the water quality criteria. Tacoma at 715. A project must also comply with other applicable state law that relates to water quality.

Lamoille at 47. The State of Vermont has adopted water quality standards that are applicable to Citizens' Project. As set forth in the Prehearing Order, the applicable VWQS are those adopted June 10, 1999, and effective July 2, 2000 (2000 VWQS). Prehearing Order at 4. Other appropriate requirements of state law may include, but are not limited to, consideration of constitutional, common law, statutory, or regulatory provisions that bear some relationship to water quality. See Lamoille at 47-48 and 66-68. In these consolidated appeals, VNRC/ NEKTU have asserted that, in addition to the VWQS, the Board must take into consideration relevant fish and wildlife statutes, the Public Trust Doctrine, and the Constitutional right to fish.

Despite the fact that they were built many years ago, Citizens' hydroelectric facilities on the Clyde River have never been reviewed for compliance with the VWQS or other applicable
state law. It is only now that a relicensing application has been prepared for FERC that Citizens is required to obtain a certificate from Vermont.

The U.S. Court of Appeals for the Ninth Circuit identified the significance of such a relicensing decision when reviewing the first dam built on the Columbia River. It stated:

> Relicensing, then, is more akin to an irreversible and irretrievable commitment of a public resource than a mere continuation of the status quo. (Citation omitted.) Simply because the same resource had been committed in the past does not make relicensing a phase in a continuing activity. Relicensing involves a new commitment of the resource, which in this case lasts for a forty-year period.

Confederated Tribes and Bands v. FERC, 746 F.2d 466, 476-77 (9th Cir. 1984).

A fundamental objective of the CWA is to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." 33 U.S.C. § 1251(a). The goals of the CWA include a statement demonstrating that Congress intended that individual States should play a leading role in formulating State-specific water quality policies: "It is the policy of the Congress to recognize, preserve, and protect the primary responsibilities and rights of the States to prevent, reduce, and eliminate pollution...." 33 U.S.C. § 1251(b).

The State of Vermont has exercised this responsibility for the protection of its water resources, in part through the authority delegated to the Secretary of ANR to issue water quality certificates pursuant to 10 V.S.A. § 1004 and the *de novo* appellate authority of the Board to hear appeals of those certificate decisions, 10 V.S.A. § 1024(a). That authority includes the right to impose conditions to assure compliance with the VWQS and any "other applicable requirement[s] of state law" relating to water quality. 33 U.S.C. § 1341(d).

The U.S. Supreme Court has affirmed that state authority to issue and condition water

quality certifications is broad and includes authority to require minimum stream flows and appropriate conditions to protect aesthetics. It also includes consideration of project *activities as a whole* once jurisdiction has attached. Tacoma at 711. This means that the activities which are subject to state review include not only the civil works but also Project-created influences both upstream and downstream of the dams and others structures involved in the Project. Importantly, this includes activities such as the reduction or increase in flow levels in the river channel, on a daily or seasonal basis.

With this framework in mind, the Board now reviews the Project for compliance with the VWQS, followed by review under other applicable requirements of state law.

D. Compliance with the VWQS

The entire length of the Clyde River impacted by the Project is classified as Class B waters in the 2000 VWQS. This classification applies to *all* segments of the Project, including the bypass reaches. No part of the Clyde River has undergone recent review by the Secretary of ANR as part of a comprehensive basin planning process as required by 10 V.S.A. § 1053(d) and consequently no rulemaking has been initiated by the Board to amend the VWQS to designate certain portions of the Clyde River by one of three Class B Management Types (WMT), as provided in the VWQS, Section 1-02(D).[2]

The VWQS identify designated uses for each water body or segment thereof, and provide that the State of Vermont must manage for these uses whether or not they are being attained. Such designated uses include in the case of the Clyde River, aquatic biota, wildlife, and aquatic habitat; aesthetics; recreational uses, and agricultural and industrial uses. The VWQS also set out criteria necessary to support these designated uses. In addition to the designated uses and the criteria necessary to support them, the VWQS set forth other relevant requirements and general policies for the management of the waters of Vermont, including reference to the state water quality policy at 10 V.S.A. § 1050. The Board is therefore mindful of the clear directive that it is not enough to merely maintain the minimum allowable level of water quality which secures all designated uses, but to strive to improve and enhance the water quality of state waters.

Certificate review under the CWA and VWQS limits the Board's consideration of Project impacts to only those related to water quality. In other words, the Board may not consider economic and social impacts in determining whether to grant, deny, or modify a certificate. Unlike the Secretary of ANR who has been statutorily granted two roles under 10 V.S.A. § 1004 – one, as certifying agent and, two, as the agent to "coordinate the state interest

[2] 10 V.S.A. §1053(d) was amended in1999 by Act No. 114 (Adj.Sess.) to change the deadline by which the Secretary needed to complete revisions to all 17 basin plans for state waters from January 1, 2000, to January 1, 2006.

before the FERC" – the Board is limited in its appellate role to acting as the certifying agent. This distinction is important, because while the Secretary may request economic and social impacts data and analysis from the Applicant and other state agencies in order to formulate the "state interest" in FERC licensing proceedings, the Board has been granted authority under 10 V.S.A. § 1024(a) to perform only the first role in its appellate capacity and therefore the evidence and argument which are relevant to its consideration must be water-quality related.[3] The Board dealt decisively with the issue of whether it could consider economic and social impacts evidence in its Lamoille decision. In that case, the Board held that it was "not authorized by applicable state law to consider evidence regarding economic and societal impacts in deciding whether an existing hydroelectric facility should receive a § 401 certificate." Lamoille at 51. The Board reiterated this position at the hearing on April 1, 2003, in its affirmance of the Chair's preliminary ruling on evidentiary objections. See Second Prehearing Order at 1-5.

Finally, it is important to note that all parties to this proceeding agree that the Anti-Degradation section of the VWQS is not at issue in these consolidated appeals. Section 1-03(A) of the VWQS sets forth the General Policy regarding anti-degradation: "All waters shall be managed in accordance with these rules to protect, maintain, and improve water quality." There is no dispute that the waters at issue are Class B waters and that the existing water quality of these waters does not exceed any applicable water quality criteria. See VWQS, Section 1-03(C). Accordingly, the parties, prior to the hearing in these consolidated appeals, conceded that compliance with Section 1-03 was not an issue in this proceeding. See Second Prehearing Order at 4. Therefore, the Board will consider other sections of the VWQS that are in dispute.

With the above context in mind, the Board addresses the issues central to the consolidated appeals in light of the VWQS management goals and objectives for the Clyde River.

1. Whether the Certificate issued by the Secretary of ANR fails to provide adequate flow in the bypass reach of the Newport 1, 2, 3 facility to achieve compliance with the VWQS?

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[3] There are, however, other circumstances, none of which are within the ambit of the present consolidated appeals, which would allow the Board to consider economic and social impacts data or evidence. The CWA and state law provide that consideration of economic and social factors may be relevant in the classification and reclassification process, when applying the Anti-Degradation Policy of the VWQS, and when applying a Use Attainability Analysis. Also, the Secretary of ANR may take such information into consideration when reserving assimilative capacity for a use in allocating pollutant loads.

In order to answer this question, it is necessary first to understand what specific designated uses and values must be protected in the Clyde River and what standards must be achieved in order to assure their protection.

As noted above, the Clyde River is classified as Class B waters. Pursuant to 10 V.S.A. § 1252(a), Class B waters are defined as and to be managed for the following designated uses: "Suitable for bathing and recreation, irrigation and agricultural uses; good fish habitat; good aesthetic value; acceptable for public water supply with filtration and disinfection. Section 3-04(A) of the VWQS sets forth the management objectives for achieving and maintaining a level of water quality that fully supports the designated uses for Class B waters. The designated uses which VNRC/NEKTU claim are impaired by the Project, including the Applicant's proposed operating protocol, are aquatic biota, wildlife, and aquatic habitat (primarily, although not exclusively, fish and fish habitat); aesthetics; and recreational uses (primarily, fishing).

The narrative standards which must be achieved and maintained for each of these designated uses in Class B waters is the following:

1. Aquatic Biota, Wildlife, and Aquatic Habitat - aquatic biota and wildlife sustained by high quality aquatic habitat with additional protection in those water where these uses are sustainable at a higher level based on Water Management Type designation.

2. Aesthetics - water character, flows, water level, bed and channel characteristics, exhibiting good aesthetic value and, where attainable, excellent aesthetic value based on Water Management Type designation.

....

6. Boating, Fishing, and other recreational uses - Suitable for these uses with additional protection in those waters where these uses are sustainable at a higher level based on Water Management Type designation.

VWQS, 3-04(A).

As the Secretary of ANR has not recently adopted or revised a basin plan for Clyde River and consequently WMTs have not been adopted by the Board for the segments of the river affected by the Project, the VWQS require that with respect to aquatic biota, wildlife and aquatic habitat: "no change from reference conditions that would have an undue adverse effect on the composition of the aquatic biota, the physical or chemical nature of the substrate or the species composition or propagation of fishes." VWQS, Section 3-04(B)(4)(d); see also VWQS

Section 1-01(B)(39).[4] With regard to aesthetics, the criterion that must be achieved if all Class B waters that have not been designated by WMT is: "water of a quality that consistently exhibits good aesthetic value." VWQS, Section 3-04(B)(5). No specific standard is established for "fishing,"although the Clyde River is protected and managed as cold water fish habitat. VWQS, Section 3-05 and Appendix A.(B)(1). In order for a river to be suitable for fishing, there must be suitable habitat for fish and the aquatic biota upon which they feed. This requires that there be adequate minimum habitat flows, which in turn may provide good aesthetic value. The question, then, is what minimum flow regime is necessary to support the designated uses in that portion of the Project affected by the Newport 1,2,3 facility and its operations.

Section 1-02(E) of the VWQS sets forth the hydrology policy intended to be applied in conjunction with other criteria in the VWQS. It states, in relevant part:

(1) The proper management of water resources now and for the future requires careful consideration of the interruption of the natural flow regime and the fluctuation of water levels resulting from the construction of new, and the operation of existing dams, diversions, and other control structures. These rules, in conjunction with other applicable law, provide a means for determining conditions which preserve, <u>to the extent practicable</u>, the natural flow regime of waters.

VWQS, Section 1-02(E)(1) (Emphasis added.) Furthermore, Section 2-02(B)(1), which addresses situations where the natural flow regime has been altered by human-made structures, provides that where there is no minimum flow agreement, the following default value shall apply:

> For waters where the natural flow regime is altered by human-made structures and where no minimum flow agreement or requirement has been established, compliance with the applicable numeric water quality criteria shall be calculated on the basis of the 7Q10 flow value or at the absolute low flow resulting from flow regulation, whichever

[4] As noted previously, the Secretary of ANR has not approved a revised basin plan for the Clyde River in accordance with 10 V.S.A. § 1253(d) and VWQS Section 1-02(D)(5) nor recommended Water Management Type or Types (WMT) that reflects the State's water management goals for the bypass reach and other waters influenced by the Newport 1,2,3. Accordingly, there is no ANR policy determination that either: (1) establishes salmonid fisheries as "an exceptional resource value in need of restoration or protection" in the area influenced by the Newport 1,2,3 facility and assigns a recommended WMT to support this resource management goal, for example, WMT B-1; or (2) establishes that these waters should be managed according to WMT B-3 as a reach in which "moderate" changes and differences from the reference condition for aquatic biota, including fish assemblages, may occur, as in hydrologically-modified bypass reaches.

> is less, unless an alternate flow statistic is specified in Section 3-01 of these rules.

VWQS, Section 2-02(B)(1).

In order to implement these policies, the VWQS contain hydrology criteria for streamflow protection. For Class B waters which have not been designated by WMT, the relevant portion of hydrology criteria is Section 3-01(C)(1)(c), which provides:

> Any change from the natural flow regime shall provide for maintenance of flow characteristics that ensure the full support of uses and comply with the applicable water quality criteria. The preferred method for ensuring compliance with this subsection is a site-specific flow study or studies. In the absence of site specific studies, the Secretary may establish hydrologic standards and impose additional hydrologic constraints, consistent with any applicable Agency of Natural Resources rule or procecdure, to ensure compliance with the requirements of this subsection.

The VWQS recognize that human activity has, can and does affect the waters of the state. As such, in evaluating compliance with the numeric criteria, the VWQS utilize a different baseline for waters that are altered by human-made structures. In cases where there is no minimum flow agreement, as in the case of the Newport 1,2,3 facility, compliance with the numeric criteria is calculated on the basis of the 7Q10 flow value unless an alternate flow value is set by VWQS, section 3-01. No such alternate flow value has been set.

ANR utilizes the "Agency Procedure for Determining Minimum Stream Flow, dated July 14, 1993 (Agency Procedure) to determine minimum stream flows for, among other things, hydroelectric bypasses. The procedure states, in part, that: "Bypasses shall be analyzed case-by-case," but that unless otherwise indicated, the ANR shall recommend bypass flows of at least 7Q10 to protect aquatic habitat and maintain dissolved oxygen in the bypass and below a project.

Section 3-01(B)(1)(c) of the VWQS recognizes that, in the absence of site-specific studies, procedures of the Secretary of ANR may establish hydrologic standards to ensure the full support of designated uses. Thus, the Board cautiously accepts the concept that default minimum flow values may be used, in the absence of conclusive site-specific studies, although site-specific studies are generally preferred.

The minimum flow rate of 30 cfs in the Newport 1,2,3 bypass exceeds the 7Q10 value. Although there is some disagreement about what the correct 7Q10 value actually is, a range of values has been estimated from 18.2 cfs (the Applicant's proposed value) to values higher than 30 cfs (VNRC/NEKTU's proposed values). Having considered the conflicting expert opinions in this proceeding, the Board concludes that the Applicant's default value is not adequate to support designated uses within the bypass reach. Therefore, the Board concurs with the

Secretary of ANR that a minimum flow value of 30 cfs must be imposed to support good aquatic habitat in the bypass reach and that a flow regime and management plan need to be imposed to support high quality aquatic habitat in other reaches downstream and upstream of the bypass reach. This does not mean that *all* life stages of salmonid will be supported *in the bypass reach*; rather, the minimum flow value has been set so as not to result in "an undue adverse effect on the composition of the aquatic biota, the physical or chemical nature of the substrate or the species composition or propagation of fishes" generally within the segment of the riverine system influenced by the Newport 1,2,3 facility. Thirty cfs will allow for a complete or nearly complete wetted channel width, deeper pools, and less terrestrial vegetative growth in the bypass channel than has historically been the case. Thus, there will be significantly improved habitat for aquatic biota and wildlife that do utilize the bypass reach. In conclusion, the 30 cfs minimum flow requirement represents a substantial improvement over existing and historic conditions in the Newport 1,2,3 bypass reach and, coupled with the various other management requirements of this Amended Certificate, represents a substantial improve-ment in fisheries habitat both downstream and upstream of the bypass reach, thereby achieving high quality aquatic habitat overall.

Accordingly, the Board concurs with and adopts the minimum flow value and the water level and flow management plan set forth in Condition B and Table B of the Certificate, with the proviso that any revisions to that plan shall require the Department to provide public notice and an opportunity for comment prior to the approval of such revisions.

The Board further concludes that the imposition of a *minimum* flow value of 30 cfs in the bypass reach of the Newport 1,2,3 facility provides good aesthetic value. While this flow value, in and of itself, will not support good spawning and incubation habitat for salmonids in the bypass reach, in the Board's opinion, recreational fishing will be greatly enhanced by the provision of previously inaccessible high quality habitat for migrating fish in those reaches of the Clyde River above Clyde Pond. Accordingly, the Board concludes that the Certificate issued by the Secretary of ANR, as amended by the Board, provides adequate flow in the bypass reach to achieve compliance with the VWQS.

The Board observes that throughout the course of this proceeding, there has been considerable debate and briefing concerning the applicability of the term "background condition" as it was applied in a decision issued under a version of the VWQS pre-dating the standards applicable in this proceeding. In re Passumpsic River Hydroelectric Project, Memorandum of Decision at 8 (Aug. 15, 1995) (Passumpsic). Accordingly, the Board believes that some clarification of the import of that decision is in order.

Passumpsic stands for the proposition that the term reference condition, as previously defined in the VWQS, did not refer to pre-dam conditions for purposes of application of the VWQS in § 401 water quality certification proceeding for hydroelectric dams. In part, the Board's reasoning was based on the fact that dams "may have significantly altered historical

riverine habitat, converting many to lacustrine ecosystems." Id. at 3. The Board recognized that impoundments created as a result of dams "would fail to meet one or more specific water quality criteria in the VWQS if they were to be evaluated using a pre-dam interpretation of the term "background conditions." As ANR has noted in its Supplemental Conclusions of Law, "comparing an impoundment created by a dam to the reference condition of a river would be a comparison of apples to oranges." Such a comparison would lead to absurd results.

The present case, however, is distinguishable from that in Passumpsic. First, the Board in its revision of the VWQS eliminated the term "background condition" and instead adopted the use of the term "reference condition."[5] Second, the Board's decision did not specifically address the question of how bypass reaches should be evaluated.

In the Board's opinion, an assessment of the bypass section of a river can be properly compared to other sections of the existing river, including downstream and upstream reaches that "have been minimally affected by human influences," as well as other "reference" streams. It would be improper and legally inconsistent with the VWQS to find, as the Applicant has argued, that reference conditions for a bypass reach are distinct from other sections of the same river or comparable rivers, and should be compared with other bypass reaches, particularly where the goal of the VWQS is to support designated uses. Thus, in evaluating the impacts of the Newport 1,2,3 facilities on designated uses, the Board is mindful that the entirety of the Project's influences, including the impacts of various flow regimes both upstream and downstream of the Newport 1,2,3 facility, need to be taken into consideration when evaluating whether a change in reference conditions would have "an undue adverse effect on the composition of the aquatic biota, the physical or chemical nature of the substrate or the species composition or propagation of fishes." VWQS, Section 3-04(B)(4)(c).

2. Whether the Certificate issued by the Secretary of ANR fails to provide adequate upstream and downstream fish passage at the Newport 1, 2, 3 facility to achieve compliance with the VWQS?

An assessment of the use of the Clyde River for fish passage is complicated, especially in regard to the reproductive needs and upstream and downstream passage of salmonids. It appears that there is very good fishery habitat in the Clyde River both below the bypass reach and above the Newport Dam. However, fish cannot now gain access to the habitat above the Newport 1,2,3 powerhouse because of obstructions in the bypass reach.

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[5] VWQS, Section 1-01(B)(39): "Reference condition means the range of chemical, physical, and biological characteristics of waters minimally affected by human influences. In the context of an evaluation of biological indices, or where necessary to perform other evaluations of water quality, the reference condition establishes attainable chemical, physical, and biological conditions for specific water body types against which the condition of waters of similar water body type is evaluated."

There is no conclusive evidence that fish were ever able to ascend the bypass reach at Arnolds Falls. Even if fish could reach the Newport Dam, a human-made conveyance would have to be constructed to allow the fish to pass around the Newport Dam. Thus, an upstream fish passage requirement is a necessary component of this Amended Certificate.

The Applicant has proposed a trap-and-truck facility for the upstream passage of fish. This would require the installation of a trap at the Newport 1,2,3 trailrace and the trucking of fish to a drop off area above the Newport Dam. VNRC/NEKTU oppose this idea. They prefer that the bypass itself be made accessible to fish because there is potential habitat there to support reproduction and also because there is the possibility that fish may be able to migrate upstream as far as the base of the Newport Dam. If fish can reach the Newport Dam, VNRC/ NEKTU argue that a fish ladder could be constructed to facilitate the "natural" upstream migration of fish.

The Board has carefully considered the various arguments in support of VNRC/ NEKTU's "adaptive" approach to fisheries management and disagrees with some of its assumptions. First, the Newport 1,2,3 bypass may contain some usable habitat for salmonid spawning and nursery, but it is fragmented and isolated. At best, there are only 58 habitat units in the bypass reach, as compared with 231 habitat units immediately below the Newport 1,2,3 powerhouse, and another 1,345 units above the Newport Dam. Stated differently, the total bypass reach for the Newport 1,2,3 facility represents 1.1 % of riverine habitat and 4.4% of potentially available spawning and incubation habitat of the Clyde River, while the percentage of habitat for salmon spawning and nursery habitat *above* Clyde Pond is estimated to be as much as 80%, if made accessible to migrating salmonids.

Second, the Board is not persuaded that salmonids were ever able to ascend Arnolds Falls, let alone the upper reaches of the Clyde River. On the other hand, there is merit in enhancing the fisheries of the Clyde River by providing upstream passage for migrating fish, and the Applicant has proposed a means for doing so using a trap-and-truck facility. While there are some potential drawbacks to this approach, not the least of which is the chance of human error in both the design of the facility and its operations, the Board believes that, on balance, the trap-and-truck option affords the most certain and readily implementable means of providing upstream passage for fish in the interest of achieving a self-sustaining population of migratory salmonids both downstream and upstream of the Newport 1,2,3 facility.

Nevertheless, given the doubts raised by VNRC/ NEKTU concerning the details of the plan's design and implementation and the quality of any assessment to be done prospectively to evaluate the effectiveness of this mode of fish passage, the Board has specifically conditioned this Amended Certificate, to require that the ANR provide public notice and an opportunity to comment on any upstream passage plan or effectiveness study filed by the Applicant with ANR for approval. If the Applicant's proposal and the operating protocols that are set forth in this Amended Certificate are not achieving the objective of transporting

migrating fish upstream safely and effectively (with a minimum of delay and injury to fish), all in the interest of achieving a self-sustaining population of migratory salmonids both downstream and upstream of the Newport 1, 2, 3 facility, then VNRC/NEKTU may offer comment on why adjustments to the flow regime or additional measures need to be taken to achieve this objective.

Accordingly, the Board concurs with the Secretary of ANR that approval of a trap-and-truck facility to support the upstream migration of fish is preferable to the iterative and somewhat speculative approach put forward by VNRC/NEKTU. However, the Board amends Condition L. to incorporate additional safeguards and specific standards by which to assure either that the trap-and-truck facility will work effectively as designed and implemented or that the Secretary of ANR can, in the public interest, require the implementation of other measures, including but not limited to, the adjustment of flows and operating protocols, to assure that the fisheries of the Clyde River are not only maintained but enhanced.

The Board also concurs with the Secretary of ANR that the Applicant's proposed means for providing downstream passage of migrating fish will reasonably achieve the objective of safely transporting many migrating fish from Clyde Pond to the tailrace of the Newport 1,2,3 powerhouse. Therefore, the Board concurs with the Secretary of ANR in authorizing a fish pipe for downstream fish passage, but it does so by imposing additional safeguards and specific standards in Condition of M. of the Amended Certificate.

The Board heard credible evidence that some fish in their downstream migration will pass through the penstock and turbines, while others will not enter the fish pipe at all, but rather will pass directly over the Newport Dam. While the estimates concerning the number of fish that are likely to pass through the fish pipe vary, the Board is persuaded that additional measures need to be imposed to assure the safe passage of those fish that do use the Clyde River channel as their means of downstream migration. Accordingly, the Board has adopted Condition M. of the Certificate with the following modifications: (1) within one year of license approval, the Applicant shall notch the remnant dam adjacent to the Newport 1,2,3 powerhouse so as to concentrate bypass flows, and (2) it shall install a flume, if necessary, to provide safe and effective downstream passage past the ledges below the notch during times of spillage at Newport Dam. Additionally, when the Applicant files its downstream passage plan and, subsequently, an effectiveness study for the Department's review and approval, the Department shall provide notice to the public and an opportunity for public comment *prior* to the respective approvals of those documents. Additionally, the Board has modified Condition M. to assure that the Secretary of ANR can, in the public interest, require the implementation of other measures, including but not limited to, the adjustment of flows and operating protocols, and the removal of additional obstacles in the bypass, to assure that the fisheries of the Clyde River are not only maintained but enhanced.

In conclusion, the Certificate issued by the Secretary of ANR, as amended by the

Board, provides adequate upstream and downstream fish passage to achieve compliance with the VWQS in that portion of the Clyde River influenced by the civil works and operations of the Newport 1,2,3 facility.

3. Whether the proposed changes to reconstruction and operation of the Seymour Dam comply with the VWQS?

The Board has considered the Stipulated Agreement of the parties, and the evidence and argument that was prefiled in Docket No. WQ-02-08(A). The Board concludes that the terms and assurances contained in the parties' stipulated Conditions, as supported by their proposed stipulated findings of fact, will not be contrary to law and, indeed, will provide a rational basis for determining how water levels at the reconstructed Seymour Dam will achieve both the objectives of the SLA and assure continuing compliance with the VWQS and the Public Service Board's lake level order.

For these reasons, the Board adopts the parties stipulated Conditions F. and H. and incorporates them into the Board's Amended Certificate.

E. Other Applicable Requirements of State Law

VNRC/NEKTU included in their proposed Findings of Fact, Conclusion of Law, and Order, as well as their supplemental filing, argument concerning the applicability of the Public Trust Doctrine and the Public Right to Fish under Chapter II, Section 67, of the Vermont Constitution. They offered these arguments in support of their position that the Secretary of ANR, and the Board on appeal, have both a common law and Constitutional obligation to protect the feeding and spawning habitat of fish and other aquatic life in the waters of the State.

The Board agrees with VNRC/NEKTU's general premise that as trustees of a public trust resource and also of an important fishery resource, the Board must not only protect those resources for the benefit of all Vermonters, but work for their enhancement. By ensuring that the Project as a whole complies with the applicable provisions of the VWQS, the Board believes that it is meeting obligations its under the law. See Lamoille at 66-67.

V. ORDER - ACTION OF THE BOARD

Based on its review of the record in these consolidated appeals and the above Findings of Fact, the Board concludes that there is reasonable assurance that operation and maintenance of the Clyde River Hydroelectric Project as proposed by the Applicant and in accordance with the Conditions imposed by the Secretary of ANR in the Certificate issued on August 1, 2002, as amended below, will not cause a violation of the Vermont Water Quality Standards and will

be in compliance with §§ 301, 302, 303, 306, and 307 of the CWA, P.L. 92-500, as amended, and other appropriate requirements of state law. The Board takes official notice of and expressly incorporates by reference, with minor amendments, Conditions A, B, C, D, E, G, I-K, and N-W, and incorporates by reference but significantly modifies Conditions L and M, all from the Certificate issued by the Secretary. The Board also adopts and incorporates Conditions F and H from the parties' Stipulated Agreement.

A. **Compliance with Conditions.** The Applicant and any successors in interest shall operate and maintain the Project consistent with the Findings and Conditions set forth in the Certificate issued by the Secretary of ANR on August 1, 2002, as amended herein, where those Findings relate to protection of water quality and the support of designated and existing uses under the Vermont Water Quality Standards and other appropriate requirements of state law.

B. **Water Level and Flow Management**. The Project shall be operated in accordance with the minimum flow and water level management schedules tabulated below. Minimum flows shall be released on a continuous basis and not interrupted; minimum flows are the values listed blow, or instantaneous inflow, if less, unless otherwise noted. True run-of-river operation, or r-o-r, where referenced, means no utilization of headpond storage and that outflow from the facility is equal to inflow to the pond on an instantaneous basis, as further described in Footnote 3, page 11, of the Certificate, incorporated by reference.

Seymour Lake Dam: Except as allowed in Conditions C and H below, the dam shall be operated in a true run-of-river mode. A provision will be made in the new dam to pass a minimum flow of 4 cfs.
....

Newport 1, 2, 3: If flashboards are retained, the station shall be operated at full capacity any time that the pond level rises above the concrete crest. Operation shall be in accordance with the following table. When the station is not operating, all inflows shall be released at the dam, except for any flows necessary to operate fish passage facilities.

Table B. Newport 1, 2,3 Operation

Period	Operating Range (feet) [1]		Conservation Flow (cfs)	
	High	Low	Bypass	Downstream
Jan 1 - March 31	0	-1.0	30	120
April 1 - June 7	0	-1.0	30	363

June 8 - July 15	0	-1.0	30	100
July 16 - Sept 30	0	-2.0	30	100
Oct 1 - Dec 15	0		30	r-o-r
Dec 16 - Dec 31	0	-1.0	30	120
Note 1 Operating range is relative to the dam crest.				

....

D. **Flow Management Plan.** The Applicant shall develop and file with the Department a flow management plan detailing how the Project will be operated to comply with the conservation flow and impoundment fluctuation limitations described above in Condition B. The plan shall include descriptions, hydraulic design calculations, an implementation schedule, and design drawings. At the West Charleston and Newport 1, 2, 3 facilities, the plan shall address: 1) ramping and measures to be used to control lag times and avoid related non-compliance with the conservation flow requirements; 2) how Clyde Pond will be restored to the dam crest elevation by October 1 and maintained at that elevation after that date to meet the downstream run-of-river flow requirements; and 3) flow management during the refill period following a maintenance drawdown. After Department approval of the plan, the plan shall be filed with FERC no later than 120 days from the date of license issuance. FERC shall either approve the plan or return the plan to the Applicant for revision to incorporate FERC-recommended changes. After revision, the Applicant shall submit the plan to the Department for approval of the changes. The Department shall provide notice to the public of receipt of any proposed revisions to the plan and an opportunity for public comment prior to approval of such revisions. The plan shall then be filed with FERC for final approval, and implemented by the Applicant upon notice of approval. The Department reserves the right of review and approval of any material changes made to the plan.

....

F. **Monitoring Plan for Water Level and Flow Management at Echo and Seymour Lakes.** The Applicant shall record the levels of Echo Lake daily during high flow events, including spring runoff, and weekly during extended dry periods, and at Seymour Lake on a daily basis, to determine if water level conditions consistent with the design projections are occurring. Data reports, in a form acceptable to the Department, for each calendar year, shall be filed for the periods of June 16 to September 15 and September 16 to June 15 respectively, no later than the last day of the month for each reporting period. The Department may require changes to the data collection frequency and may suspend data collection once a sufficient record is available. At Seymour Lake, data shall be collected both at the dam (headwater and tailwater) and at the lake so that the difference in water surface elevation between

points can be determined over a range of flows, and in addition the crest elevation shall be recorded. Should gate operation be approved pursuant to Condition H below, the Applicant shall also record gate setting data. If requested, data reports for Seymour Lake shall also be filed with the Seymour Lake Association.

....

H. **Replacement of Seymour Lake Dam.** Prior to the replacement of the Seymour Lake Dam, the Applicant shall develop, in consultation with the Department and the Seymour Lake Association, plans for the replacement structure. Final plans, along with a hydrology/hydraulics design brief, shall be submitted to the Department at least 90 days prior to the commencement of construction and shall be subject to Department review and approval with copies to the Seymour Lake Association. The final plans shall include design of the gate, frame, stem and wheel needed to operate the gate, should it be determined to be necessary. The hydraulic performance of the proposed structure shall be supported at a minimum by spillway and gate rating curves and an updated reservoir routing analysis to define the high flow lake stages with the existing and proposed dams, using the new tailwater rating curve and the updated upstream water surface relationship and analyzing appropriate events selected from the 1986-to-present lake water level records and simulating floods with frequencies of 2, 5, 10, 25, 50, and 100 years.

The design shall include a feature that provides the ability to permanently adjust the crest elevation based on post-construction experience. The crest shall initially be set at an elevation tat would achieve a normal summer lake level of elevation 1278.86 feet msl, based on the refined analysis. The design shall also include a gate bay to enable future operation of the gate if the Department determines that the modified dam has significantly increased the magnitude, frequency, or duration of shoreline flooding, and this impact cannot be reasonably abated. However, the gate operator shall not be installed and the gate shall not be operated in any way without prior approval by the Department.

The need for gate operation, if any, shall be determined after an initial period of two calendar years of data collection as provided in Condition F above. The two-year period will be an ongoing evaluation process. If, based on the data collected at any time during the two-year period, the Department determines that there has been a significant adverse impact on the water levels, the Department can require the operator to be installed at any time. The Applicant shall schedule annual meetings in July, if requested by any party, and October of the first two calendar years (e.g. 2005 and 2006, if dam is constructed in 2004) following reconstruction of the dame and include the Seymour Lake Association and the Department.

If approval is granted and a gate operator is installed, the Applicant shall draft a gate

management guide, subject to Department approval, detailing the manner and circumstances under which the gate would be operated and providing for ramping if determined by the Department to be necessary to protect downstream habitat and channel integrity.

After sufficient monitoring, the permanent crest elevation shall be set so as to result in the normal summer lake level remaining at elevation 1278.86 feet msl, with any crest adjustments subject to the Department's prior review and approval.

In any event, the Department shall retain the authority to require, based on an evaluation of any data collected by the Applicant, or any other available data, initiation or suspension of gate operation, modification of the gate management guide, or any other modification of the structure or operation of the dam.

....

L. **Upstream Fish Passage at Newport Facility.** Within two years of license issuance, the Applicant shall design, construct, and initiate the operation of a fish trap-and-truck facility at Newport 1, 2, 3. Applicant responsibility for maintenance and operation of the facility shall continue for the term of the license.

An upstream fish passage plan shall be developed by the Applicant in consultation with the Department, the Department of Fish and Wildlife, and the U.S. Fish and Wildlife Service and shall be submitted to the Department at least 180 days prior to the commencement of construction. The plan shall be subject to Department review and approval. The Department shall provide notice to the public of receipt of the upstream fish passage plan and provide an opportunity for public comment prior to approval of such a plan. This plan shall include:

1) Design and construction plans and specifications;
2) Plans for operation and maintenance;
3) Provisions to minimize injury of fish;
4) Provisions to minimize undue delay in moving fish upstream; and
5) Provisions to convey fish safely and effectively upstream, without undue injury of fish or delay in transport.
6) A copy of any proposed contract between the Applicant and any third party for the trapping and transport of fish. A copy of any finally executed contract shall be filed with the Department.

The upstream fish passage facility shall be operated 24 hours per day, April 1 - May 21 and September 1 - December 15, with the period subject to adjustment based on knowledge gained about migration periods for migratory salmonids.

Within one year of license issuance, the Applicant shall develop and file with the Department, a plan for an effectiveness study. The study plan shall include an implementation schedule; shall be developed in consultation with the Department of Fish and Wildlife and U.S. Fish and Wildlife Service; and shall be subject to Department approval prior to implementation. The Applicant shall be responsible for timely completion of the effectiveness study. The Department shall provide notice to the public of receipt of the effectiveness study and provide an opportunity for public comment prior to approval of such a study.

Based on the outcome of the study, the Department may require modifications to the trap-and-truck facility, its operation, and maintenance in order to attain reasonable effectiveness. Such modifications may include, but are not limited to changes in the flow regime for the Newport 1, 2, 3 facility set forth in Condition B and Table B. If, after review of the effectiveness study, the Department determines in consultation with the Department of Fish and Wildlife and U.S. Fish and Wildlife Service that the trap-and truck facility fails to achieve its objective of transporting migrating fish upstream safely and effectively, with a minimum of delay and injury to fish and in the interest of achieving a self-sustaining population of migratory salmonids both downstream and upstream of the Newport 1, 2, 3 facility, the Department may direct the Applicant to study and implement alternative means of providing upstream passage including, but not limited to, the increase of flows in the bypass reach in combination with the removal of the remnant dam and other man-made physical obstructions in the bypass reach which prevent safe and effective upstream passage of migrating fish and the provision of fish ladders or other means of moving fish over the Newport Dam.

M. **Downstream Fish Passage at Newport Facility.** Within two years of license issuance, the Applicant shall install a downstream fish passage facility at Newport Dam to convey fish safely and effectively to the river immediately below the bypass reach. Within one year of license approval, the Applicant shall notch the remnant dam adjacent to the

powerhouse that will concentrate bypass flows, and install a flume, if necessary, to provide safe and effective downstream passage past the ledges below the notch, for fish that enter the Newport 1,2, 3 bypass reach during times of spillage at Newport Dam.

A downstream fish passage plan shall be developed by the Applicant in consultation with the Department, the Department of Fish and Wildlife and the U.S. Forest Service, and shall be submitted to the Department at least 180 days prior to the commencement of construction. The plan shall be subject to Department review and approval prior to construction. The Department shall provide notice to the public of receipt of the upstream fish passage plan and provide an opportunity for public comment prior to

approval of such a plan. The plan shall include:

1) Design and construction plans and specifications;
2) Plans for operation and maintenance;
3) Provisions to minimize entrainment of fish into the penstock and generating unit(s);
4) Provisions to minimize impingement of fish on devices or structures used to prevent entrainment; and
5) Provisions to convey fish safely and effectively downstream of the facility.

Downstream passage shall be provided 24 hours per day, April 1 - June 15 and September 15 - December 15 and shall be functional at all impoundment operating levels, with the period subject to adjustment based on knowledge gained about migration periods for migratory salmonids.

Within one year of completion of the downstream fish passage facility, the Applicant shall conduct a study to determine its effectiveness. The study plan shall include an implementation schedule; shall be developed in consultation with the Department of Fish and Wildlife and the U.S. Fish and Wildlife Service; and shall be subject to Department approval prior to implementation. The Applicant shall be responsible for timely completion of the effectiveness study. The Department shall provide notice to the public of receipt of the effectiveness study and provide an opportunity for public comment prior to approval of such a study.

Based on the outcome of the study, the Department may require modifications to the downstream fish passage facility at the Newport Damand also direct that other measures be taken including, but not limited to, changes in the flow regime for the Newport 1, 2, 3 facility set forth in Condition B and Table B.

If, after review of the effectiveness study, the Department determines in consultation with the Department of Fish and Wildlife and U.S. Fish and Wildlife Service that the downstream fish passage facility at the Newport Dam fails to achieve its objective of transporting migrating fish downstream safely and effectively, with a minimum of delay and injury to fish and in the interest of achieving a self-sustaining population of migratory salmonids both downstream and upstream of the Newport 1, 2, 3 facility, the Department may direct the Applicant to study and implement alternative means of providing downstream passage including, but not limited to, the increase of flows in the bypass reach in combination with the removal of the remnant dam and other man-made physical obstructions in the bypass reach which prevent safe and effective downtream passage of migrating fish.

....

W. **Continuing Jurisdiction.** The Board returns jurisdiction over this matter to the

Secretary of ANR to assure Project implementation and compliance with the Certificate issued on August 1, 2002, as amended herein**.** The Department may add and alter the terms and conditions of this amended Certificate, when authorized by law and as appropriate to carry out its responsibilities with respect to the protection and enhancement of water quality during the license period.

Dated at Montpelier, Vermont, this 11th day of July, 2003.

WATER RESOURCES BOARD
By its Chair

/s/ David J. Blythe

David J. Blythe

Concurring:
John D.E. Roberts
Mardee Sánchez

DISSENTING OPINION, Jane Potvin and Lawrence H. Bruce, Jr.

We respectfully dissent from the Board's decision.

We do not believe that Citizens has met its burden of proof. Like the applicant in the Lamoille proceeding, Citizens must demonstrate that its proposal will comply with each of the applicable provisions within the VWQS for each of the segments of river influenced by project facilities under appeal. In re: Lamoille River Hydroelectric Project, Docket Nos. WQ-94-03 and WQ-94-05, Findings of Fact, Conclusions of Law and Order at 49 (Nov. 5, 1996).

Citizens has not done this.

Unlike the majority of the Board, we believe that the *existing* salmonid fishery of the Clyde River *is* an exceptional resource value in need of restoration and protection, regardless whether the Secretary of ANR has formally recognized it as such. No one disputes that, since the removal of the Newport 11 facility, salmonids have been able to migrate to and use the habitat of the Clyde River as far upstream as the tailrace of the Newport 1,2,3 facility. Therefore, the only question is whether the Applicant should be allowed to appropriate the bypass reach for the next half century almost exclusively for private power production or whether it will be required to increase flows in the bypass reach such that high quality aquatic habitat is made available for spawning and other critical life stages of salmonids.

As the Applicant has noted, the bypass reach has not been designated by rule as a WMT 3. Therefore, the State has made no determination that the bypass reach should be managed any differently than other segments of the Clyde River. Indeed, all parties agree that the bypass reach is a Class B water, designated as cold water fish habitat, subject to the requirement of VWQS § 3-04(B)(4)(d). Therefore, in our opinion, the bypass reach *must* be managed so that there is no undue adverse effect on," among other things, "the species composition or propagation of fishes" in the Clyde River, measured against "reference condition" waters, meaning those minimally affected by human influences, not against similarly impacted bypass reaches. See VWQS 1-01(B)(39).

We believe that this requires the Applicant to present the Board with an operating protocol that will assure the existence of high quality aquatic habitat in the bypass reach so that the existing mix of fish species in the Clyde River may propagate and otherwise be supported in *all* segments of the river influenced by the Newport 1,2,3 facility, beginning first with those portions of the river downstream of the Newport Dam and, eventually, through the introduction of appropriate fish passage, in those segments above the dam. Therefore, in the absence of credible site-specific studies supporting a minimum base flow of 30 cfs or lower in the bypass
reach, we conclude that Citizens has not demonstrated that its proposal will achieve compliance with the VWQS, at least with regard to those criteria that address aquatic biota, wildlife, and aquatic habitat in Class B waters.

Does this mean that Citizens should be denied a Certificate? The Board in Lamoille concluded that this was the proper outcome for failure of an applicant to meet its burden of proof. See In re Lamoille River Hydroelectric Project at 69. The effect of such a ruling, however, would be to preserve the status quo while Citizens operates year-to-year with the approval of the FERC; but, in our opinion, the current leakage flow of between 2 to 3 cfs is totally unacceptable.

Accordingly, we would urge a different approach than that taken by the majority. As

an alternative, we would adopt the iterative, "adaptive" approach recommended by VNRC and NEKTU. We would rely on the record as a whole in this matter to support the issuance of an Amended Certificate that would start from the premise that the best way to support the exceptional salmonid fishery of the Clyde is to establish flows and management practices that will allow fish to move, feed, and reproduce with as little direct intervention by humans as possible.

Rather than presume, as the Applicant and a majority of the Board members have, that salmonid have never and will never ascend Arnolds Falls, we would allow the fish themselves to demonstrate whether they can or cannot reach the base of Newport Dam. We would do this by conditioning the Certificate so as to: (1) require the immediate removal of the remnant dam near the Newport 1,2,3 powerhouse; (2) increase the flows in the bypass reach during critical migration periods as recommended by the Appellants and ANR's own fisheries biologists; (3) require study of the fish for at least five years to see if they get as far as the plunge pool beneath Arnolds Falls and attempt to ascend those falls; and (4) give the Secretary of ANR the authority to require the removal of additional man-made obstacles at and above Arnolds Falls, if deemed appropriate, to facilitate upstream fish passage to the base of the Newport Dam. Depending on the conclusions of an effectiveness study developed by the Applicant in consultation with DFW and USFW, the Secretary of ANR could decide whether a fish ladder should be constructed to move migrating fish over the Newport Dam to Clyde Pond and the upper reaches of the Clyde River *or*, alternatively, whether to abandon the concept of "natural" upstream passage of salmonids in the bypass reach by authorizing the Applicant to construct a trap-and-truck facility, as proposed in this proceeding or modified based on information gathered during the study period.

We prefer this approach because we believe that it is consistent with the long-held policy of the State of Vermont to "protect and enhance the quality, character and usefulness of its surface waters" and to "assure the maintenance of water quality necessary to sustain existing aquatic communities." See 10 V.S.A. § 1250(1) and (4). We believe that as *public* servants charged with the management of the *public* waters of this State, it is our duty to assure that rivers like the Clyde receive the water quality protection that the *public* expects and deserves. See Vt. Const. Ch. II, § 67. To sustain an exceptional salmonid fishery in the Clyde, while permitting the river's continued use for hydroelectric generation, demands careful planning, study, and on-going stewardship. Although Citizens has had the benefit of operating hydro-electric facilities on the Clyde River for many years, this is the *first* opportunity that the State has had to issue a Certificate with conditions that assures that the Project operations will comply with the VWQS. Accordingly, we should not hesitate to exercise our authority fully and aggressively, making restoration of the bypass reach and protection of the salmonid fishery a first priority.