

**GREEN RIVER WHITEWATER STUDY
FOR THE MORRISVILLE PROJECT
(FERC NO. 2692)**



Submitted by:

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INTRODUCTION AND PURPOSE

The Morrisville Project (FERC Project No. 2629) is located in the northern half of Vermont on the Lamoille and Green rivers in Lamoille County, Vermont. The Project currently consists of four developments: the Morrisville and Cadys Falls dams located on the Lamoille River in Morrisville, the Lake Elmore dam located on Elmore Brook in Elmore, a tributary to the Lamoille River, and the Green River development on the Green River in Hyde Park. This study focuses on the Green River development and its potential to provide whitewater boating opportunities on the Green River.

The Green River drops about 400 feet over the 2.75 miles from the Garfield Road to Route 15 and in to the Lamoille River. The river meanders through an uninhabited, deeply wooded area with several exceptional gorges, falls and drops that provide an exceptional opportunity for whitewater boating.

The original FERC license was issued on August 28, 1981 and required a minimum flow of 5.5 cfs from the generating station on a year round basis. Morrisville Water and Light (MWL) is in the process of relicensing the project which is due in 2015. The purpose of this study is to assess the whitewater boating opportunities while considering any effects on generation or other operational issues associated with the project.

METHODOLOGY

Background:

A study plan was developed in collaboration with MWL, American Whitewater (AW) and the Vermont Paddlers Club (VP) to assess the whitewater boating opportunities at various levels of release from the Green River Generation Plant primarily on the 2.75 mile stretch of river from Garfield Road to Route 15. The goal of the study was to determine an acceptable range of flows, including a minimum and optimum flow, the number of days the current operation of the Plant meets the criteria; operational considerations with providing scheduled releases to meet the required flows; identify access points to accommodate boaters and any other effects that need to be considered with planned releases.

AW and VP developed a systematic evaluation process to be used by participants in the study to aid in the overall assessment of the various flow release levels. This included a single flow evaluation form completed by each participant after each run that captured specific information on such things as the type of boat, acceptable water level, navigability, aesthetics, safety, portages etc. This was followed by a comparative flow evaluation form which provided the opportunity for comparison of runs and thoughts on minimum and maximum acceptable flows. It was determined the study would evaluate four levels of flow over a two day period.

AW and VP assembled a team of boaters of varying skills to participate in the scheduled runs. Two days were identified for scheduled releases, with a morning and afternoon run at different release volumes. MWL installed a staff gauge scaled in inches at the upper and lower ends of the run to provide additional corroboration for evaluating flow levels.

Safety steps were in place by having participants go in several teams and people were positioned on shore at predetermined potentially hazardous locations on the river. No incidents occurred during the two days of scheduled releases. The boaters were able to negotiate the river safely, using appropriate judgment for the hazards and obstacles they encountered. The only notable log jam on the river was a section in the flat water portion of the river which provided easy take-out and access for a portage.

Field Evaluations of Flows:

The field evaluation took place on October 1st and 2nd, 2011. The event was video taped at several locations and supplemented with individual pictures and some participant videos.

The following chart shows the four flow levels run during the evaluation with the corresponding generation level, cubic feet per second (cfs) and the height of the river as shown on the gauges installed in the river:

Flow Levels	Flow 1 1 Tube	Flow 2 1 1/3 Tubes	Flow 3 2/3 Tube	Flow 4 2 Tubes
Date	10/1/2011	10/1/2011	10/2/2011	10/2/2011
Time	AM	PM	AM	PM
Actual Generation	848 kW	1140 kW	635 kW	1790 kW
Calculated Cu. Ft./Sec	-140 cfs	-186 cfs	-105 cfs	-280 cfs
Lower Gauge Hght Rtg	2' 8"	3' 0"	2' 5"	3' 5"
Upper Gauge Hght Rtg	2' 8"	3' 0"	2' 5"	3' 5"

The word "Tube" describing flow levels in the above chart is nomenclature used by the boaters as a general level of flow. The Green River Generation Plant has two identical generators rated at 925 kW each with a four and one-half foot (4 1/2') penstock (tube) connected to each unit. "Tube" was also the nomenclature used on the assessment forms to identify the general level of flow. As an example "2/3 Tube" infers one generator running approximately 66% capacity (approximately 620 kW). A more precise way of evaluating the navigability is by generation level for the utility and gauge height for the boater. Discussion in the balance of the report will reference these two criteria.

A total of 26 individuals participated in the two day event consisting of four different runs. The put in location for boaters was just below the culvert where the river crosses the Garfield Road accessed by a path on MWL property. Arrangements were made with Mr. Bettis on Route 15 behind the Riverview Garage for the take-out location. This was accessed via a private driveway. Participants completed individual assessment forms and a comparative assessment form that allowed the participants to rate access, navigability, technical requirements, whitewater "play" areas, safety, aesthetics, acceptable minimum flow, optimum flow and other factors. An individual form was completed by each participant after each run. The comparative assessment form was filled out after all the runs were completed summarizing the experience and each person's recommendation for minimum and optimum flows. Hard shell kayaks were used by approximately 90% of participants in the first three runs and 100% in the final run. One inflatable kayak and one open canoe with flotation participated in runs one and three. A closed deck canoe also participated in the first three runs. See the following chart:

TYPES OF CRAFT USED IN EACH RUN				
CRAFT	FLOW 1	FLOW 2	FLOW 3	FLOW 4
HARD SHELL KAYAK	20	17	22	15
INFLATABLE KAYAK	1		1	
OPEN CANOE W/FLOTATION	1		1	
CLOSED DECK CANOE	1	1	1	

The area received approximately two inches (2") of rain in the week prior to the October 1st and 2nd field evaluation, and another one and a third inches (1.3") of rain during the two days of the evaluation. This resulted in the boating flows being higher due to tributary and ground water inflow during the study than the dam released flows. MWL coordinated with VP to schedule another evaluation run when there had been little or no precipitation prior or during the release. This evaluation occurred on November 9th and 10th, 2011. The three flow levels were as follows:

Flow Levels	Flow 1	Flow 2	Flow 3
Date	11/9/2011	11/10/2011	11/10/2011
Time	PM	AM	PM
Generation Level	1135 kW	1410 kW	1707 kW
Calculated Cu.Ft./sec	~140 cfs	~227 cfs	~270 cfs
Lower Gauge Hgt.	2' 10"	3' 0"	3' 5"
Upper Gauge Hgt.	2' 10"	3' 0"	3' 5"

MWL also conducted a separate test on December 16, 2011. The flow was as follows:

Flow Level	Flow 1
Date	12/16/2011
Time	AM
Generation Level	815 kW
Calculated Cu.Ft./sec	~128 cfs
Lower Gauge Hgt.	2' 5"
Upper Gauge Hgt.	2' 5"

There was less than one-quarter inch (.25) rain the night before this test.

MWL has checked the gauges several times during non generation times with normal flows on the river and the gauges read four inches (4") in these cases. There was no gauge reading taken before the start of generation during the October evaluation. Both gauges read 4" before the November evaluation and both gauges read 6" before the December test. This is important because during the October evaluation there was consensus that a minimum navigable flow equated to a 2' 5" gauge reading which was achieved at 635 kW of generation. A couple of weeks after the October evaluation, a VP member traversed the river when MWL was running approximately 730 kW and the reading on the gauges was 2' 3", which did not provide an acceptable run based on the results of October's evaluation.

The results of all the above information has been analyzed and used to develop an acceptable minimum flow and an optimum flow.

Results:

A group of 25 people from all over the Northeast and representing various whitewater experience levels participated in the two-day evaluation (October 1-2, 2011) of scheduled flows on the Green River. Four different flow levels were evaluated with morning and afternoon runs during each day. The numbers of boaters for each run differed based on individual boater's skill level and the various flows. The two higher flow levels had a lower number of boaters, however fifteen was the minimum number of participants for any run. The entire group was very enthusiastic and responsive in completing the forms, resulting in a valid evaluation of the river.

Participants were asked to complete a "Single Flow Evaluation" form immediately after each run they participated in and a "Comparative Flow Evaluation" form after the final release on October 2nd which provided an opportunity to compare and rate all of the runs they participated in. The single flow evaluation forms for each release were analyzed and are summarized on the following tables.

Individual Evaluation Summary

Table 1 shows the number of participants and the kW generation level for each individual run. A couple of the categories were rated very similar for each of the runs – aesthetics and length of run. All of the runs were rated a minimum Class IV on the International White Water Scale and as might be expected the Paddler Skill Rating for each of the runs was advanced. All of the runs received an acceptable rating, but the rating for the lowest level run at 635 kW was approximately 33% lower than the next highest level of run at 848 kW. Based on the river gauge readings discussed earlier, the rains around the time of the test runs had an effect on the experience on the river and seems to have more of an impact on the lower level releases, by making the lower flows more boatable due to additional in-flow from tributaries and ground water.

TABLE 1: SUMMARY OF INDIVIDUAL EVALUATION SCORES

Flow Level	Flow 3	Flow 1	Flow 2	Flow 4
Date	10/2/2011	10/1/2011	10/1/2011	10/3/2011
Time	AM	AM	PM	PM
Generation Level	637 kW	848 kW	1140 kW	1790 kW
Calculated Cu.Ft./sec	105	140	186	280
Lower Gauge Hgt.	2' 5"	2' 8"	3' 0"	3' 5"
Upper Gauge Hgt.	2' 5"	2' 8"	3' 0"	3' 5"
Participants	25	23	18	15
CATEGORY	AVG. RATING			
Navigability	0.95	1.74	1.94	1.93
Availability of challenging technical boating	1.43	1.74	1.89	2
Availability of powerful hydraulics	0.45	0.91	1.22	1.67
Availability of whitewater "play areas"	-0.17	-0.17	0.17	0.4
Overall whitewater challenge	1.35	1.74	1.72	1.93
Safety	1.04	1.18	1.61	1.53
Aesthetics	1.95	2	1.94	1.93
Length of run	1.87	1.87	1.89	1.87
Actual number of portages during run	1.74	2.7	1.39	1.67
Overall rating	1.3	1.74	1.94	2
Class Whitewater Difficulty Rating	4.04	4.17	4.18	4.55
Paddler Skill Level Assessment	3	3	3.11	3.17

CATEGORY RATING SCALE

Totally Unacceptable	Unacceptable	Neutral	Acceptable	Totally Acceptable
-2	-1	0	1	2

PADDLER SKILL RATING SCALE

Novice	Intermediate	Advanced	Expert
1	2	3	4

Comparative Evaluation Summary

The comparative form was completed at the end of the October 2nd afternoon run and provided an opportunity for participants to compare the four flows to determine a minimum acceptable flow, a standard trip optimum flow, a high challenge trip optimum flow and if MWL could only provide one flow what level of flow would be recommended. The participants also rated the Green River run compared to other available whitewater opportunities in the area, State, northeast etc. All of the responses are summarized in Table 2:

TABLE 2: COMPARATIVE FLOW ANALYSIS

CATEGORY RATING SCALE				
Not at all important	Slightly important	Moderately important	Very important	Extremely important
1	2	3	4	5
EVALUATION OF FLOWS				
Flow Levels	Flow 1	Flow 2	Flow 3	Flow 4
Generation Level	848 kW	1140 kW	637 kW	1790 kW
Calculated Cu Ft./sec	140	186	105	260
Average Rating	1.27	1.7	0.42	1.53
RATING SCALE				
Totally Unacceptable	Unacceptable	Neutral	Acceptable	Totally Acceptable
-2	-1	0	1	2

RATING OF FLOW LEVELS FOR DIFFERENT TYPE RUNS

Based on their boating trips during the study, each participant was asked to specify the flows (in cfs) that provided the following type of experiences. The participant could specify flows that were not seen during the test, but what they felt would provide the type of experience listed below. It should be noted the maximum output for the generating facility is 283 cfs even though some thought that ideal level for some runs should be higher than that.

TYPE OF RUN	- CFS AVG	CALCULATED - KW GEN. LEVEL	HIGHEST LEVEL LISTED	LOWEST LEVEL LISTED
Minimum Acceptable Flow	128	780	232	93
Optimum Flow for this run	218	1330	300	140
Optimal Flow for "Standard" run	194	1183	280	140
Optimal Flow for "High Challenge" run	273	1700	350	186
Level if MWL released only one flow	215	1320	280	140

OTHER INFORMATION PROVIDED				
		For different types of boating experience	For different skill levels and crafts	
Importance of releasing a variety of		3.25	3.96	
Scale				
Not at all important	Slightly important	Moderately important	Very important	Extremely important
1	2	3	4	5
Rating of boating opportunities on the Green River compared to....				
... other rivers within 1hour drive		3.96		
... other rivers in Vermont		3.52		
... other rivers in the Northeast		3.29		
... other rivers in the country		3.00		
Scale				
Worse than average	Average	Better than average	Excellent	Among the very best
1	2	3	4	5

Based on the tabulated data from the participants input the average minimum acceptable flow was 128 cfs which equates to about 780 kW of generation. The optimum flow and the flow level to select if only one flow was available were almost exactly the same with an average of 215 to 218 cfs which is about 1330kW of generation. The optimum flow listed for a high challenge run was 273 cfs which is approximately 1700 kW of generation.

Although the upper part of the river was not part of the whitewater study, two of the boaters participating in the study paddled this section of the river during one of the test runs to assess its potential as a boating opportunity. The stretch consists of a gentler slope dropping about 150 feet over the 1.6 miles from the dam to the Garfield Road. It offered a relatively short but scenic float that started with a short brushy hike to the river about 100 meters below the dam. The run offered several sections of Class I – II water separated by open meandering meadows with beaver lodges set well away from the road. The takeout is along the road, just upstream of the unrunnable cascade and culvert that separates the upper and lower section. While wood was fairly prevalent, no portages were required. It was estimated that comparable paddling opportunities would be provided at all the studied flows. While this is not a high quality whitewater run, it may appeal to paddlers seeking a short instructional, scenic or angling focused trip for a wide range of craft small and light enough to be carried to the put-in.

Navigational Hazards:

The study also documented the navigational hazards paddlers may experience boating the Green River. The Green River is a Class IV and V river and contains the normal hazards associated with rivers in this difficulty level. These include both dynamic (wood) and static (rocks) hazards. The rock features are what provides the highly attractive recreational resource for paddlers of the appropriate skill level and they will remain relatively static over the course of years. The wood hazards are constantly changing as a result of the flows in the river throughout the year with some existing hazard locations being eliminated and others likely being created. There were only two (2) wood obstructions that were not navigable during the study. These were not classified as hazards in the study. One of the logjams was located just below the culvert and the boaters put in beyond it. The second logjam was located in the flat water section of the river and the participants didn't consider it a hazard because it could be seen from a distance and allowed for an easy portage.

Annual Operation of the Green River Generating Facility:

The Green River Hydro plant operates during the year when it is necessary to prevent water from spilling over the dam, enhance the operation of MVWL two other hydro stations, provide voltage stability for the grid and based on the price of energy on the market. There is a one (1) foot reservoir drawdown limitation from May 1st to November 30th each year and a limit of six (6) feet for the remainder of the year, except that it may be drawn down up to ten (10) feet based on the available snowpack level that year. MVWL also works with the Agency of Natural Resources Loon recovery program and voluntarily keeps the level of the reservoir within six (6) inches of the crest during the loon nesting season.

The ten-year annual average generation at the plant is approximately 1.1 million kWh. The generation for 2011 was approximately 1.3 million kWh which is slightly above the average, but close enough to provide data on typical generation levels and hours of operation of the plant.

For the year 2011, the plant recorded some level of generation during 2475 hours covering a period of 122 days. Based on the conclusions drawn from the test runs, the plant needs to be generating at 800 kW or above to provide a minimum flow for boating. The plant operated at or above this level on 15 days for a total of 216 hours. The following chart summarizes the days, hours and levels of generation:

SUMMARY OF GENERATION =>800KW DURING 2011 OPERATION							
MONTH	DAYS OF OPERATION	LEVEL HRS KW GENERATION 800-1199KW	LEVEL HRS KW GENERATION 1200-1699KW	LEVEL HRS KW GENERATION ABOVE 1699KW	HRS BETWEEN 7AM -7PM	HRS BETWEEN 7PM -7AM	TOTAL HRS OF OPERATION
JANUARY	1	1	3		4		4
APRIL	4	85			44	41	85
MAY	4	72			37	35	72
JUNE	1	11			4	7	11
OCTOBER	3	25		4	17	12	29
NOVEMBER	1	1	5	2	8		8
DECEMBER	1	7			7		7
TOTALS	15	202	8	6	121	95	216

Estimates of Potential Annual Visits

It is difficult to quantify the number of boaters that would utilize the river for paddling on an annual basis. The Vermont Paddlers Association has indicated that about 30 -40, primarily local, paddlers have taken advantage of the site when notified on short notice that MWL would be generating at a sufficient level to make the river navigable. Many of these did more than one run. A general thought is that if a release were scheduled in advance in dry season conditions, it could attract 80 -150 boaters to the site.

As shown on the above chart, there is likely to be up to 100 hours of random boating opportunities for local paddlers within the normal annual operation of the plant. The potential to attract boaters beyond the local area is primarily dependent on a plan to schedule one or two high level releases during the year.

Effect on other Recreational Activities

MWL is not proposing any significant changes in the current operational aspects of the generating plant that may have an effect on other recreational uses. Any additional generation to provide a scheduled whitewater release will be done within the existing drawdown limitation of the reservoir and MWL does not anticipate any impact on the recreational uses at the Green River Reservoir State Park.

The Green River is also used by anglers for trout fishing. Additional scheduled high flows may impact anglers vs. paddlers' time on the river, but it should be minimal if at all. A State of Vermont Fish biologist, familiar with Green River was asked for comments on the potential effect on fishing. Based on a projected minimal change to the annual existing flows, the expectation was that additional impacts to the fishery would be minimal. The fisheries biologist expressed concern that increased use of the river by boaters could result in reduced woody material, which provides important fish habitat in rivers. He cited evidence that many trees had been cut to aid passage down the river. He also indicated that increased flow variability during the spring and fall could have negative consequences for trout and other fish species, but a

scheduled release in the dry summer months may add value for the Green River and Lamoille River.

CONCLUSIONS

The evaluation of the potential for whitewater boating on the Green River provided some clear results for the level of flow required to navigate the Green River at various levels of boating and provided data as to how this run compares to other available venues in the Northeast. The fact that some of the data obtained from the first evaluation with all participants may have been skewed slightly because of the level of rain that occurred during that period did not negate the usefulness of the data. By doing a subsequent run at a time when rainfall was not a factor and taking some readings on the river gauges has allowed the data to be corroborated and yield clear results.

Based on the available data, the minimum acceptable flow for boating occurs when the generation level is approximately 800 kW, or a calculated flow of ~126 cfs. The flow for a standard run equates to a generation level of approximately 1290 kW or a calculated flow of ~222 cfs and a high challenge run is considered to be at a generation level of approximately 1790 kW or a calculated flow of ~280 cfs. Two river gauges were installed as part of the study and these are very useful in determining the navigability of the river. A reading of 2' 5" on either gauge signifies the river is navigable at approximately minimum flow level, a standard run can be assumed with a reading of 3' 0" and a reading at 3' 5" or above indicates a high challenge can be expected. This allows the boater to assess the navigability of the river taking in to effect any recent precipitation beyond the actual generation level.

The normal generation of the Green River Hydro seems to provide ample opportunities to boat on the river at an acceptable flow. MWL performs two annual capability tests for ISO New England when the plant is operated for approximately two hours each time at full capacity. Consideration can be given to extend the time length of these releases to provide a scheduled high challenge run on these dates. MWL may consider other options for scheduled releases provided they meet the general goals of how and when the plant is currently operated. Running the generation level between 1500 -1750 kW over an eight (8) hour period will lower the level of the reservoir approximately four (4) inches. This needs to be taken in to account for any plan utilizing generation beyond the normal annual schedule.

Access to the river is not considered to be a problem. The put-in location by the culvert on Garfield Road is accessible by an existing path located on MWL property. Special arrangements were made for take-out on private property as part of the study, however there is an opportunity to exit the river at a bridge crossing on Route 15 or to continue to the Lamoille River and paddle about 1.7 miles west to an existing State of Vermont fishing access on Route 15.

The participants rated the boating experience above average when compared to other rivers in the Northeast and the length of the run also rated high. This run does require advanced paddler skills and boater safety needs to be considered with higher flows.

The overall conclusion is the Green River can provide a quality whitewater boating experience that includes a variety of advanced paddler challenges with an above average length run in a picturesque setting. A plan would need to be developed that meets the operational parameters and economic goals of the plant and maintains recreational balance between all the affected users.

APPENDIX I

Green River Paddling Recreational Instream Flow Study
FERC #'s 2629-008

Introduction:

Morrisville Water and Light is in the process of relicensing its hydroelectric project with the Federal Energy Regulatory Commission (FERC). The area includes rural mountainous terrain and sections of small rural communities and features a river section that currently provides excellent paddling opportunities. Morrisville Water and Light is working closely with American Whitewater, Vermont Paddlers Club and other organizations. This document describes study goals and objectives of the study.

Study Goals and Objectives:

This study will assess paddling potential on the Green River. This will be done with paddlers using a variety of boat types – kayaks, canoes, and inflatable kayaks (duckies). These paddlers will use their expert experience of other rivers to identify minimum flow levels and optimal flow ranges for paddling on this reach and further identify how flow levels affect various factors that make up the paddling experience.

Specific objectives of the study include:

- Description of current access to each section
- Description of key paddling areas
- Development of relationships between flow levels and quality of paddling experience for the study reach that was paddled to identify minimum and optimum flow ranges for paddling
- Identify other recreation opportunities and assess the relative impacts of paddling flows on these activities.

Dear Green River Recreation Study Participant:

Thank you for your interest in, and willingness to volunteer for, the Green River Recreation Study. This letter serves as an official invitation and orientation to the study. It provides very important information about the study and your participation. Please read it carefully.

Purpose of the Study

The purpose of the Green River Recreation Study is to collect information on how various flows in the Green River may affect recreation opportunities and the quality of those opportunities for whitewater boating. The study will focus on the 3.0 mile section of the Green River below Garfield Road. Morrisville Water and Light is conducting the study in collaboration with study team members from American Whitewater, the Vermont Paddlers Club and others. And, most importantly – YOU.

Schedule and Commitment

The dates for the Green River Recreation Study are October 1 and 2. The study methodology requires a commitment from you for **two full days**. It is necessary that you commit to both days in order to participate in the study.

The study will begin at 7:30 AM on October 1, with a mandatory orientation and safety meeting at _____ located at _____. There will be different flow releases on both days. Participants will be required to sign a liability waiver.

The boating schedule will be as follows:

Day 1 Schedule : Oct 1, 2011

- 6:00 - MWL opens turbine 1 to full capacity = 900KW (150 cfs)
- 7:30 - Study group overview and prep
- 8:00 - Study group(s) on water for 150 cfs level
- 11:00 - MWL turns on 2nd turbine to 300KW (50 cfs) bumping total flow to 1.2MW (200cfs)
- 12:00 - 13:30 - Lunch and fill out flow review for 150 cfs.
- 13:30 - Study group(s) on water for 200cfs level
- 16:00 - MWL cuts water for day
- 17:00 - Study group(s) are off the river and fill out flow report for 200 cfs.

Day 2 Schedule: Oct 2, 2011

- 6:00 - MWL opens turbine 1 to full capacity 900KW (150cfs) & second to 600KW (100cfs) = 1.5KW (250 cfs)
- 7:30 - Study group(s) overview and prep
- 8:00 - Study group(s) on water for 250 cfs level
- 11:00 - MWL turns on 2nd turbine to 900KW (150 cfs) bumping total flow to 1.7 (283cfs)
- 12:00 - 13:30 - Lunch and fill out flow review for 250 cfs
- 13:30 - Study group(s) on water for 283cfs level
- 16:00 - MWL cuts water for day
- 17:00 - Study group(s) are off the river and fill out flow report for 283 cfs and a comparative flow report.

PLEASE NOTE: The Green River study requires all participants boat the river twice each day for two days. The Green River, below Garfield Road, is almost 3 miles long. This section has rapids from class II to IV with a couple of class V. You must be able to fully participate in this study to be considered. Please make sure you are willing and able to commit to this paddling schedule. If you have any reservations about your ability to do two trips in one day, please do not commit to the study.

The Green River Recreation Study will involve paddling on sections of the Green River at several different, pre-arranged flow levels. As a participant, after each flow level, you will be asked to evaluate specific characteristics of the river, as well as the quality of your experience using a standard survey questionnaire. At the end of the two-day evaluation period, after you have experienced several different flows, you will also be asked to complete a second survey questionnaire that compares the different flow levels. The intent of the study is to collect objective information about various aspects of the flows being tested, so it is important that your responses to the survey questions be as objective as possible.

The Green River study begins each day **promptly at 7:30 AM** with an orientation and safety meeting at _____. Paddlers should be ready for paddling at this time. The orientation will consist of a detailed review of the questionnaires, a safety review, and the detailed logistics for each day. These meetings will be **mandatory for all study participants**. To get there take _____. There will be inflatable kayaks, kayaks and canoes utilized in the study. Shuttle logistics will be arranged and provided for as part of the study.

RSVP

If you would like to participate in the Green River study, and can commit to the study dates and plans, please RSVP by Aug 28th by email or by calling:

Ryan McCall at 223-5986 or by email: ryanmtman@gmail.com

Dave Packie at 371-9339 or by email: dpackie@hotmail.com

Bill Hildreth at 326-2077 Or by email: boomzoom@fairpoint.net

Please indicate which craft you will paddle. If you have any questions about the study or need further clarification, please do not hesitate to contact us as indicated above. We appreciate your participation in this important study.

Sincerely,

Ryan McCall, Dave Packie and Bill Hildreth
Green River Study Coordinators

PRE-RUN INFORMATION FORM
Green River Hydroelectric Project, FERC No. 2629-008
Whitewater Controlled Flow Study

Date: ____ / ____ / 2011

Your name: _____

1. What type of craft do you generally use for whitewater paddling? (Circle one)

- | | |
|-------------------------------|---|
| 1. Hard shell kayak | 5. Cataract (please indicate length: ____) |
| 2. Inflatable kayak | 6. Self-bailing raft (please indicate length: ____) |
| 3. Closed deck canoe | 7. Wrap-floor raft (please indicate length: ____) |
| 4. Open canoe with floatation | 8. Other: (please explain) _____ |

2. How many years have you been using this type of craft? ____ years.

3. How would you rate your skill level with this type of craft?

1. Novice (comfortable running Class II whitewater)
2. Intermediate (comfortable running Class III whitewater)
3. Advanced (comfortable running Class IV-V whitewater)
4. Expert (comfortable running Class V whitewater)

4. In general, how many days per year do you spend whitewater boating? ____

5. What is your age? ____ years

6. Are you male or female?

Please respond to each of the following statements about your river-running preferences. (Circle one)

	Moderately Disagree	Strongly Disagree	Slightly Disagree	No Opinion	Slightly Agree	Moderately Agree	Strongly Agree
I prefer running rivers with rapids Class II and III	1	2	3	4	5	6	7
I prefer running rivers with difficult rapids, Class IV and V.	1	2	3	4	5	6	7
Running challenging whitewater is the most important part of my boating trips.	1	2	3	4	5	6	7
I often boat short river segments (under 4 miles) to take advantage of whitewater play areas.	1	2	3	4	5	6	7
I often boat river segments to experience a unique and interesting place.	1	2	3	4	5	6	7
I often boat short river segments to run challenging rapids	1	2	3	4	5	6	7
I select boating opportunities based on	1	2	3	4	5	6	7

APPENDIX II

Acknowledgement and Assumption of Risk And Release of Liability

As a prudent person who has decided to participate in this recreation flow study on the Green River, I understand that this whitewater trip will expose me to numerous known and unknown risks which could result in personal injury, illness, death or damage to myself or my property. A very few of the many risk factors include:

- Travel in a canoe, kayak or inflatable craft, in rough water conditions
- Swimming/floating in unfamiliar and sometimes turbulent water
- The forces of nature including lightning
- Paddling on 4 different water flows during this study
- The physical exertion required to paddle the Green River at 4 flows over 2 days.

My participation in these trips is voluntary and I participate in spite of these named and other unnamed risks. I accept and assume all responsibility for and risk of personal injury, illness, death or damage to myself and my property arising from this trip. In consideration that Morrisville Water and Light has provided the water for these paddle trips I voluntarily release and forever discharge Morrisville Water and Light, American Whitewater, Vermont Paddlers Club and their officers, agents, and employees from any and all liability or claim for any injury, illness, or death, or damage to myself or property arising out of my participation in this trip.

I fully recognize that if injury, illness, death or damage occurs to me while participating in this trip that I will have no right to make a claim or file a lawsuit against Morrisville Water and Light or its officers, agents or employees, even if any of them negligently cause my injury, illness, death, or damage.

I also grant Morrisville Water and Light, American Whitewater and the Vermont Paddlers Club the right to use any photographs or videos taken of me during this trip for documentation and purposes related to studies for the relicensing of the Green River hydropower project.

Signature of Participant Printed Name Date

If participant is under 18 years old, please fill out the following:

Parent or Guardian Signature
Participant's Age _____

APPENDIX III

APPENDIX IV

COMPARATIVE FLOW EVALUATION FORM
Green River Hydropower Project, FERC #2629-0008
Whitewater Recreation Study

Today's Date: _____

Your Name: _____

- 1) What type of craft did you use for this run (Circle one)?
- a. Hard shell kayak
 - b. Inflatable kayak
 - c. Closed deck canoe
 - d. Open canoe with floatation
- 2) For a high quality trip on the Green River, please rate the importance of the following components.

	Not at all important	Slightly important	Moderately important	Very important	Extremely important
Navigability	1	2	3	4	5
Availability of challenging technical boating	1	2	3	4	5
Availability of powerful hydraulics	1	2	3	4	5
Availability of whitewater "play areas"	1	2	3	4	5
Overall whitewater challenge	1	2	3	4	5
Safety	1	2	3	4	5
High quality aesthetics	1	2	3	4	5
Length of run	1	2	3	4	5
Few portages	1	2	3	4	5
Easy put-ins and take-outs	1	2	3	4	5

- 6) Based on your boating trips on the Green River, please specify the flows that provide the following types of experiences. (Note: you can specify flows that you have not seen, but which you think would provide the type of experience in question).

Flow in cfs
(Refer to #5)

From a recreational perspective what is the **minimum acceptable flow** for this run? Note that the minimum acceptable differs from the minimum flow necessary to navigate.

From your perspective what is the optimum flow for this run?

Many people are interested in a "standard" whitewater trip at medium flows. Think of this "**standard trip**" in your craft. What is the best or **optimal flow** for this type of trip?

Some people are interested in taking trips at higher flows for increased whitewater challenge. Think of this "**high challenge trip**" in your craft. What is the best optimal flow for this type of trip?

What is the highest safe flow for your craft and skill level?

If Morrisville Water & Light released only one flow for boating, what flow would you prefer?

- 7) How important is it to release a variety of flow levels on the Green River? Please rate the importance of providing several different flows for the two reasons below, or check the box.

Providing several different flows is necessary to...	Not at all important	Slightly important	Moderately important	Very important	Extremely important
...provide different types of boating experiences.	1	2	3	4	5
...provide opportunities for people with different skill levels and craft types.	1	2	3	4	5

Or... It isn't important to provide a variety of flow levels.

- 8) At the optimum flows for standard and high challenge trips would you recommend this section to others?

Standard trip	yes	no
High challenge trip	yes	no

APPENDIX V



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APPENDIX VI







