

**SCOTT'S MILL HYDROELECTRIC  
PROJECT (FERC No. 14425)**

---

**DRAFT STUDY PLANS**

**Liberty University**

**2/1/2016**

## TABLE OF CONTENTS

<b>Study Plan</b>	<b>Page</b>
1. Assessment of Pre- and Post-Project Water Levels Upstream and Downstream of Scott’s Mill Dam.....	1
2. Bathymetric Survey Assessment.....	5
3. Water Quality Effects of Flow and Water Level Changes.....	7
4. Sediment Chemical Analysis.....	10
5. Impoundment Fish Species Presence.....	14
6. Evaluation of Entrainment Potential and Turbine Passage Survival.....	17
7. Project Effects on Fish Habitat.....	21
8. Evaluation of Fish Passage.....	23
9. Mussel Survey.....	26
10. Wetland Assessment.....	31
11. Terrestrial Resources.....	36
12. Protected Species.....	40
13. Bat Survey.....	45
14. Recreation Resources.....	48
15. Cultural Resources.....	51
16. Visual Resources.....	55
17. Decommissioning.....	57



## LIST OF ACRONYMS

APCO – Appalachian Power Company  
APE – Area of Potential Effect  
ASMFC – Atlantic States Marine Fisheries Commission  
C – coefficient of discharge  
cfs – cubic feet per second  
CPUE – catch per unit effort  
CWA – Clean Water Act  
DEM – Digital elevation model  
ESA – Endangered Species Act  
FE – Federally endangered  
FERC – Federal Energy Regulatory Commission  
FT – Federally threatened  
ft - feet  
GPS – Global positioning system  
H – head (ft)  
HPMP – Historic Properties Management Plan  
IPaC – Information Planning and Conservation  
KVA – key viewing area  
L – length (ft)  
LOD – limits of disturbance  
LU – Liberty University  
M – meter  
NEPA – National Environmental Policy Act  
NH – Natural Heritage  
NHPA – National Historic Preservation Act  
NMFS – National Marine Fisheries Service  
NWI – National Wetlands Inventory  
NRHP – National Register of Historic Places  
PA – Programmatic Agreement  
PAD – Pre-Application Document  
PPE – personal protective equipment  
Q – discharge (cfs)  
SCORP – State Comprehensive Outdoor Recreation Plan  
SE – State Endangered  
ST – State Threatened  
USACE – U.S. Army Corps of Engineers  
USDA – U.S. Department of Agriculture  
USFWS – U.S. Fish and Wildlife Service  
USGS – U.S. Geological Survey  
V-CRIS – Virginia Cultural Resources Information System  
VAFWIS – Virginia Fish and Wildlife Information System  
VDCR – Virginia Department of Conservation and Recreation  
VDEQ – Virginia Department of Environmental Quality  
VDGIF – Virginia Department of Game and Inland Fisheries

VDHR – Virginia Department of Historic Resources  
VLM – Virginia Landmarks Register  
VMRC – Virginia Marine Resources Commission



**STUDY PLAN 1**  
**ASSESSMENT OF PRE- AND POST-PROJECT WATER**  
**LEVELS UPSTREAM AND DOWNSTREAM OF SCOTT’S**  
**MILL DAM**

**1. Introduction**

Although planned operation of the Scott’s Mill Hydropower Project will be run-of-river, the project will affect upstream water levels. Under existing conditions, water flows over the dam and resultant upstream water levels are governed by the relationship between James River discharge and the associated water elevation over the dam crest. The head (or water level over the dam) can be estimated using the weir equation:  $Q=C*L*H^{1.5}$  where H=head or water level above the dam crest, C is a coefficient which is typically about 3 but could vary from as low 2 (typically at a very low flow) to 4, L=spillway or dam crest length, and Q is the James River discharge.

The spillway length is 875 feet with the left side being 735 feet long with a crest elevation of 511 feet and the right spillway is 140 feet long with a crest elevation of 512 feet. Assuming a coefficient of 3, for a one foot head (i.e., water level of 512 feet), flow over the dam would be 2,200 cfs. Table 1 below illustrates the relationship between upstream water levels and James River flows assuming equilibrium conditions.

Table 1 – James River Discharge and Upstream Water Level Relationship

Head (ft)	Water Elevation (ft)	Discharge (cfs)
0	511	0
0.5	511.5	780
1	512	2,200
2	513	6,650
3	514	12,600
4	515	19,800
5	516	28,000
6	517	37,100
7	518	47,000
8	519	57,700
9	520	69,000
10	521	81,000

No specific water level measurements have been taken upstream of the Scott’s Mill dam. Therefore, Liberty University (LU) plans to measure water levels to more accurately determine the discharge coefficient.

Although the flows downstream of Scott's Mill Dam should remain about the same during operating conditions, no discharge/water level relationship currently exists. Availability of this information will allow LU to accurately calculate project energy generation under different flow conditions to estimate annual energy production. The information will also be used to determine changes in flow patterns from project operation.

## **2. Resource Management Goals and Objectives**

For this study, resource agency goals are to understand the changes in upstream water levels between existing conditions and proposed project operations. Water level changes will be used in part to determine water quality effects, fish habitat effects, wetlands effects, and associated impacts on terrestrial species. The impact information will be used to minimize impacts to water quality, fishery and terrestrial resources.

## **3. Consultation with Agencies and Other Interested Parties**

LU discussed the need for this study during the December 2, 2015 joint meetings. No party disagreed on the need for this study.

## **4. Existing Information and Need for Additional Information**

As noted in the Introduction, no specific upstream or downstream water level relationship with James River discharge has been established, although the weir equation can be used to estimate upstream water levels. Downstream water levels are roughly known but a specific discharge/water level has not been established. Further it is not known if there is a water level variation from the left side to the right side of the James River. Accordingly, LU proposes to install staff gauges upstream and downstream of the dam. Differential water levels across the river are needed both upstream and downstream of the dam.

The water level information will allow LU to determine water level changes under post-project conditions once the hydraulic capacity of the turbines is established. This will also require the bathymetry information from the Bathymetric Study (Study 2). To assess effects associated with flashboard installation, LU will estimate water level changes from both 2 and 3-foot high flashboards. LU will use flow coefficients determined from similar flashboard installations at other hydropower projects to estimate upstream post-project water levels.

Flows in the James River have been recorded for over 87 years. No additional flow data is needed. Flow duration curves, flood discharges and low flow discharges will be used to determine water level changes during critical periods and associated durations to assess project effects.



## **5. Geographic Scope**

The geographic scope of the study includes the area immediately upstream and downstream of Scott's Mill Dam on both sides of the river.

## **6. General Description of Proposed Study**

LU will measure water levels at varying James River discharges to establish the relationship between flows and water levels upstream and downstream of Scott's Mill Dam. For post-project flows, LU will determine upstream water levels for the following alternatives: no flashboards, 2-foot high flashboards, and 3-foot high flashboards. Pre-and post-project water levels will be compared based on both run-of-river and peaking flow operations at Reusens. The water level comparisons will be used in other studies to determine effects on water quality, impoundment fish habitat, wetlands, terrestrial resources, recreation, and visual studies.

## **7. Study Methods**

LU will establish staff gauges on both sides of the James River, both upstream and downstream of Scott's Mill Dam. The gauges will be surveyed to determine relative water level differences. Water levels will be measured over various flow conditions.

Pre- and post-project water levels will be compared. LU will assume that flows up to the hydraulic capacity of the powerhouse (currently estimated to be between 3,000 and 4,500 cfs) will be passed through the powerhouse. Flows above the hydraulic capacity will flow over the spillway. Resultant water levels will then be determined based on the spillway rating curve developed for existing conditions. Similarly, water levels for 2-foot and 3-foot flashboards will be determined for both run-of-river and peaking conditions at the upstream Reusens Project. For flows above the hydraulic capacity of the powerhouse, upstream water levels will be the same for both run-of-river and peaking operations. Water level statistics will be generated for use in other studies to determine project effects. The resource effects studies will inform this study on how water level statistics should be developed.

The water levels will be used to calculate the energy generated by the project. Both a tailwater rating curve and a headwater rating curve will be developed for no flashboard and flashboard conditions.

## **8. Consistency with Generally Accepted Scientific Practice**

Development of tailwater and headwater rating curves based on staff gauge readings is standard practice.

## **9. Schedule**

LU will establish the staff gauges as soon as practicable. Rating curves and pre-post project comparisons will be undertaken once the hydraulic capacity of the powerhouse is determined. All water level comparisons will be completed in the first half of 2016.

## **10. Results**

Water level statistics will be developed for use in other studies to determine project impacts on resources.

## **11. Literature Cited/ References**

Linsley, R. K. and Franzini, J. B., Water Resources Engineering, McGraw-Hill Publishing Company, 1992.

## **STUDY PLAN 2 BATHYMETRIC SURVEY ASSESSMENT**

### **1. Introduction**

Scott's Mill Dam was constructed in the 1840s. As such it is likely that sediment transport in the vicinity of the dam is in dynamic equilibrium. However, little bathymetric data exists immediately upstream or downstream of Scott's Mill Dam. Bathymetric information is needed for the powerhouse design upstream and downstream of Scott's Mill Dam. This data is also needed to assess water quality and fish habitat impacts upstream and downstream of the dam.

### **2. Resource Management Goals and Objectives**

Resource agency goals include protecting and minimizing impacts to water quality and fishery resources. Bathymetric data is needed for the assessment.

### **3. Consultation with Agencies and Other Interested Parties**

LU discussed the need for this study during the December 2, 2015 joint meetings. No party disagreed on the need for this study.

### **4. Existing Information and Need for Additional Information:**

No bathymetric data is available for the James River upstream and downstream of Scott's Mill Dam. Bathymetric data is needed along with water level data and powerhouse operations information to assess changes in flow patterns near Scott's Mill Dam. The flow changes will be used to assess changes in water quality and fish habitat.

### **5. Geographic Scope**

The geographic scope of the study extends from the upstream end of Woodruff Island to about 2,000 feet downstream of Scott's Mill Dam to an area upstream of Blackwater Creek.

### **6. General Description of Proposed Study**

LU will use sidescan sonar to map the bathymetry of the James River.

## **7. Study Methods**

LU will use sidescan sonar mounted to a boat to map the water depths in the study area. GPS measurements will be taken simultaneously. Measurements will be undertaken during low flow conditions for safety reasons, particularly immediately upstream of the dam. Special attention will be given to the gap between the dam and Daniel Island. The depths will be indexed to the water level measured during the bathymetric survey. The bathymetric map will be used with water levels to determine pre-and post-project flow patterns. The changes in flow patterns will be used in the water quality and fisher habitat studies to determine project effects and identify any necessary mitigation measures.

## **8. Consistency with Generally Accepted Scientific Practice**

LU will use standard bathymetric mapping techniques in conducting the study.

## **9. Schedule**

LU will conduct the bathymetric study during low flow conditions in 2016.

## **10. Results**

The results of this study will be a bathymetric map that can be used to determine flow pattern changes for both existing and post-project operations.

## **11. Literature Cited/ References**

<https://en.wikipedia.org/wiki/Bathymetry>

# **STUDY PLAN 3**

## **WATER QUALITY EFFECTS OF FLOW AND WATER LEVEL CHANGES**

### **1. Introduction**

Construction of the Scott's Mill Hydroelectric Project has the potential to affect water quality during both construction and operation. LU will work with Virginia Department of Environmental Quality (VDEQ) to develop best management practices to protect water quality and meet water quality standards. Because operation of the powerhouse has the potential to change flow patterns, particularly in the impoundment immediately upstream of Scott's Mill Dam and immediately downstream, LU will use the water level and bathymetry data obtained during the execution of Study Plans 1 and 2, combined with the powerhouse location to assess changes in flow patterns and subsequent water quality. LU will assess the effects for three powerhouse alternative locations (arch section, Scott's Mill gristmill on the north side and near the canal on the south side). The primary water quality parameters to be evaluated will be water temperature and dissolved oxygen.

### **2. Resource Management Goals and Objectives**

Resource agency goals include protecting and minimizing impacts to water quality. LU will be required to meet Commonwealth of Virginia water quality standards.

### **3. Consultation with Agencies and Other Interested Parties**

Water quality affects from construction and operation were discussed during the December 2, 2015 Joint Meeting. LU has developed this study based on licensing participant input. LU intends to meet with VDEQ to discuss water quality and instream flow requirements.

### **4. Existing Information and Need for Additional Information:**

Based on available existing water quality data, there is no need to collect additional water quality data. The baseline water quality data will be used to assess the effects of flow pattern changes.

### **5. Geographic Scope**

The geographic scope of the study extends from approximately the upstream end of Woodruff Island downstream to the mouth of Blackwater Creek.

## **6. General Description of Proposed Study**

LU will use the information garnered in the bathymetry study and water level data obtained from staff gage measurements to predict flow patterns particularly on the north side of the James River. Existing water quality data, most notably water temperature and dissolved oxygen during low flow summer conditions, will be used in conjunction with modified flow patterns to predict water quality changes. Water quality changes will be qualitatively assessed based on changes in residence time. Should there be unacceptable changes in water temperature or dissolved oxygen, LU will consider mitigation measures including enlarging the inlet between the downstream end of Daniel Island and Scott's Mill Dam, relocating the powerhouse to the grist mill location, or operational changes.

## **7. Study Methods**

LU will review existing maximum water temperature and minimum dissolved oxygen levels experienced during low flow conditions during summer and early fall. LU will then combine bathymetry information and staff gauge water levels during these minimum flows for both flashboard and non-flashboard conditions. LU will initially assume that all James River flow will pass through the powerhouse. Based on the above data, LU will estimate approach velocities near the powerhouse intake and then estimate the percentage of flow that will flow on the north and south sides of Daniel Island. LU will compare existing flow patterns and residence time to determine if water temperature increases and dissolved oxygen decreases could affect aquatic resources. It may be necessary to measure water velocities upstream of Scott's Mill dam to verify existing flow patterns during low flow conditions. Such measurements would be used to verify the accuracy of flow pattern predictions based on bathymetry and water level data.

Based upon expected changes in water temperature and dissolved oxygen LU will consider necessary steps to protect water quality including relocating the powerhouse, enlarging the opening at the downstream end of Daniel Island, or providing minimum flows over Scott's Mill Dam during critical conditions.

Similarly, the bathymetry and water level data will be combined with powerhouse discharges to determine downstream water levels and water quality on the north and south sides of the James River.

## **8. Consistency with Generally Accepted Scientific Practice**

The approach LU is considering is expected to be cost-effective. Typically a modeling effort would be undertaken to assess changes in flow patterns. However, this approach should yield reasonable results. LU will monitor water quality during low flow conditions to verify that water quality parameters are not violated. Should conditions warrant, LU can divert flow up to the total flow in the James River. If flashboards are installed, it may be possible to

lower some flashboards to obtain the necessary flow balance to protect water quality.

## **9. Schedule**

LU will conduct the study in 2016 after Study Plans 1 and 2 have been completed.

## **10. Results**

The results of this study will be incorporated in the draft license application and will be included in a joint 401 water quality certification application.

## **11. Literature Cited/ References**

Linsley, R. K. and Franzini, J. B., Water Resources Engineering, McGraw-Hill Publishing Company, 1992.

## **STUDY PLAN 4 SEDIMENT CHEMICAL ANALYSIS**

### **1. Introduction**

When undertaking dam projects, concerns often arise about accumulated sediment on the upstream side of an existing dam structure, particularly the potential for such sediment to contain ‘legacy’ pollutants (typically from previous upstream industrial activities). In order to help assess the potential for such pollutants within the study area, sediment sampling and chemical analysis will be conducted for the Scotts Mill Hydropower Project.

### **2. Resource Management Goals and Objectives**

Resource agency goals are to protect water quality. The specific goal of this effort will be to assess the potential presence and concentration of higher-risk pollutants, in order to evaluate the potential effects of dredging at the Scotts Mill Dam (necessary for efficient intake and tailrace function). Particular emphasis will be on pollutants that may be bound to sediment particles.

### **3. Consultation with Agencies and Other Interested Parties**

LU has coordinated on the need for this study at the December 2, 2015 Joint Meeting and during preparation of the Pre-Application Document (PAD). Results of the proposed sampling will be reported directly to state water quality regulatory agencies responsible for reviewing water chemistry data (VDEQ and Virginia Marine Resources Commission (VMRC)), and will be available through the project website for other stakeholders to review.

### **4. Existing Information and Need for Additional Information**

Available VDEQ ambient water quality monitoring data will be reviewed prior to sediment sampling<sup>1</sup>, as well as other publicly-accessible data from unrelated James River sediment sampling projects (or from other nearby Virginia Atlantic Slope river basin sediment sampling projects). If sediment sampling reveals elevated pollutant levels at a sampling site,

---

<sup>1</sup> Water quality monitoring data from a nearby water quality monitoring station is provided in the Scott’s Mill Pre-Application Document.



repeat sampling may be necessary near this site (for confirmation purposes).

## **5. Geographic Scope**

The proposed sediment sampling study area will be defined by the limits of the proposed dredging/sediment excavation efforts at (upstream of) the intake, and within the downstream tailrace channel. At this point, the preliminary upstream intake area is anticipated to be approximately 6,000 square feet (sf 80-foot powerhouse width and about 80 feet upstream), while the downstream tailrace area will likely be approximately 12,000 sf, assuming a tailrace is needed. These areas may need to be adjusted slightly, if ongoing engineering efforts indicate that a change to the proposed dredging extent is necessary.

## **6. General Description of Proposed Study**

The focus of this study will be assessment of potential pollutants in sediments at the Scott's Mill Dam, at locations where excavation/dredging will be required. Specifically, this will include the intake site and the proposed tailrace channel. While ambient (background) water quality in the James River will not be a specific part of this study, the following water quality parameters will be measured while sediment samples are being collected (pH, temperature, conductivity, total dissolved solids, and salinity).

This study will seek to determine presence/absence of potential pollutants in existing riverine sediments, as well as pollutant concentrations (when practical).

For this study, a total of four (4) composite sediment samples will be collected, as follows:

Upstream of dam: - 2 composite samples, from 2', 4, and 6' depth (or refusal) at intake location

Downstream of dam: - 2 composite samples, from 2' and 4' depth (or refusal) – within proposed tailrace channel

Composite samples will be taken from each sampling location. It is anticipated that sediment deposits downstream of the dam may not be as deep as upstream sediment deposits. Therefore, composite samples will only include sampling to 4' depths. Sediment samples will be analyzed at a Virginia-certified analytical laboratory, and will include the following:

- 1) RCRA 8 metals: Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium, Silver
- 2) PCB's: NOAA 20 PCB congener list, USACE 22 PCB congener list, USEPA SW-846-8082 19 PCB congener list, or WHO 12 congener list will be used, depending on regulatory agency requirements.
- 3) DDT/DDE/DDD
- 4) Nitrate/Nitrite
- 5) Total Phosphorus

## **7. Study Materials/Methods:**

The objectives of this effort will be to assess the potential presence and concentration of higher-risk pollutants, in order to evaluate the potential effects of dredging at the Scott's Mill Dam (necessary for efficient intake and tailrace function). Particular emphasis will be on pollutants that may be bound to sediment particles.

### **Materials**

Handheld core sampler with extensions and sediment capture tubes/caps  
Sonde or handheld multi-parameter water chemistry meter  
Secchi disk or turbidity tube  
Sample bottles/containers  
Sample cooler  
Boat, PPE gear  
Global positioning system (GPS)  
Digital camera

### **Methodology**

USGS/USEPA sample collection methodologies and USEPA-approved sample analysis methods will be followed, but the specific methodologies used will be dependent upon the final list of analytes approved by regulatory review agencies.

Compliance with professional standards will be maintained by reviewing USGS and USEPA sampling methodologies prior to fieldwork, and using a state-approved water chemistry laboratory for sample analyses.

Work products from the sediment chemical analysis effort will include completed sediment sample Chain of Custody (CoC) forms, sample

shipping/delivery confirmation forms, analytical laboratory report, and a summary of sampling/analysis results.

## **8. Consistency with Generally Accepted Scientific Practice**

USEPA/USGS-approved sampling and USEPA-approved laboratory analysis methodologies will be followed for the proposed sediment chemical analysis effort.

## **9. Schedule**

The proposed sampling will be implemented in Spring 2016, following approval of a final study plan by regulatory review agencies. Laboratory analysis data and the review summary should be completed within 30 days of sediment sampling.

## **10. Results**

The laboratory results will be presented to appropriate resource agencies to determine if further action is needed.

## **11. References**

Scott's Mill Hydroelectric Project Pre-Application Document, Liberty University, August 31, 2015.

## **STUDY PLAN 5 IMPOUNDMENT FISH SPECIES PRESENCE**

### **1. Introduction**

The Scott's Mill Hydropower Project has the potential to impact resident, diadromous and anadromous fish species that reside within or pass through the project boundary. Additionally, the Virginia Department of Game and Inland Fisheries (VDGIF), U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) are working to restore both diadromous and anadromous fish species to the James River. As a result, an assessment of both resident and migratory fish species within the Scott's Mill Dam impoundment is necessary for LU to design appropriate mitigation measures to ensure minimal effects on any fish species.

### **2. Resource Management Goals**

Agency resource management goals are to minimize the effect of the project on both resident and migratory fish species. The objectives of the study are to estimate the presence/absence of resident and migratory fish species located within the project boundaries.

### **3. Consultation with Agencies and Other Interested Parties**

LU has had informal discussions with state and federal resource agencies and other interested parties. On December 2, 2015 the Federal Energy Regulatory Commission (FERC), state agencies, non-governmental organizations (NGOs), and other interested parties participated in a Joint Meeting to identify issues that required further study.

### **4. Existing Information and Need for Additional Information**

VDGIF has conducted electro-fishing studies within the project area dating from the present back to 1991. This information should be sufficient in determining the presence/absence of all fish species located within the project boundary. As a result of this, there is no need for additional field information. The lack of a necessity for additional field studies has also been confirmed by regional fishery managers at VDGIF.

### **5. Geographic Scope**

The geographic scope of the study includes the Scott's Mill Dam pool and adjacent areas immediately below and above the impoundment.

## **6. General Description of Proposed Study**

This study will utilize existing information from fisheries studies done by VDGIF.

## **7. Study Methods**

This study will draw upon pre-existing information gathered from electro-fishing studies done by the VDGIF. CPUE (catch per unit effort) studies encompass the areas directly below Scott's Mill Dam, the pool above Scott's Mill Dam, as well as the pool above Reusens Dam. These studies gather information from years as far back as 1991 to present day. Thus, this study will draw upon this information to determine the presence/absence of both migratory and resident fish species located within the Scott's Mill Dam Hydro project boundaries.

## **8. Consistency with Generally Accepted Scientific Practice**

Similar studies have been conducted at other proposed projects. This study draws upon pre-existing information collected by VDGIF. As a result, the methods used for capturing the information in this study align with standard techniques used for fisheries throughout the scientific community.

## **9. Schedule**

This effort is scheduled to be complete within the first half of 2016.

## **10. Results**

The results of this survey will be used in conjunction with other studies to mitigate any potential impacts to resident and migratory fish species within the project boundaries.

## **11. Literature Cited/ References**

Record of conversation with Scott Smith, Virginia Department of Game and Inland Fisheries, December 29, 2015.

Unpublished Virginia Department of Game and Inland Fisheries 1991-2014.

## **RECORD OF TELEPHONE CONVERSATION**

Person Called- Scott Smith

Affiliation- Virginia Department of Game and Inland Fisheries

Phone Number- (434) 525-7522

Call Originator- Luke Graham

Date- December 29, 2015

### Summary of Discussion

I contacted Scott Smith of Virginia Department of Game and Inland Fisheries to ask for any pre-existing fish studies done near the Scotts Mill dam impoundment. Scott said that (VDGIF) had several years worth of fisheries studies data available from both directly above Scotts Mill dam (Reusens dam impoundment) as well as directly below Scotts Mill dam. Scott said he would send this information to me via email when possible.

I also asked Scott if he felt that any additional fisheries studies needed to be done for the project and he replied that there was no need for additional studies due to the pre-existing available information. However, he did state that additional studies may be necessary to test for the presence of Green floater (*Iasmigona subviridis*) and James Spiny mussel (*Pleurobema collina*).

Prepared by

Luke Graham

# **STUDY PLAN 6**

## **EVALUATION OF ENTRAINMENT POTENTIAL AND TURBINE PASSAGE SURVIVAL**

### **1. Introduction**

The Scott's Mill Hydropower Project has the potential to entrain fish during project operations. Further, the USFWS, NMFS, and the VDGIF are working to restore diadromous fish to the James River. An assessment of passage survival for resident and anadromous fish will allow LU to design appropriate mitigation measures in consultation with resource agencies. LU is considering use of innovative turbines that reduce entrainment mortality, as well as conventional turbines.

### **2. Resource Management Goals and Objectives**

Agency resource management goals are to minimize entrainment injury and mortality of both resident and diadromous fish and allow for safe and timely downstream passage of anadromous fish. A further goal is to avoid impingement effects on resident and diadromous fish. The objectives of the study are to estimate resident and diadromous fish entrainment and survival through the project turbines.

### **3. Consultation with Agencies and Other Interested Parties**

LU has had informal discussions with state and federal resource agencies and other interested parties. On December 2, 2015 FERC, state agencies, NGOs, and other interested parties participated in a Joint Meeting to identify issues that required further study. Entrainment and impingement was identified as an issue requiring further study.

### **4. Existing Information and Need for Additional Information:**

Given that there is no powerhouse at Scott's Mill, there is no entrainment or impingement data available for the site.

### **5. Geographic Scope**

The geographic scope of the study is the area in the vicinity of the intake and the powerhouse turbines.

## **6. General Description of Proposed Study**

This study will be a desk top study and will include the results of entrainment studies being conducted in 2016 by Natel Energy for their hydroEngine turbine.

## **7. Study Methods**

The characterization of entrainment potential and fish passage survival at the Scott's Mill Hydropower Project will be based on the existing fish population composition as well as characteristics of the proposed turbine units for a range of fish sizes. We propose to estimate entrainment and survival for fish of different size categories based on site-specific information regarding the species and size of fishes likely to be entrained. To estimate survival of fish passing through the proposed hydroelectric turbines, we will use a combination of existing survival study results at similar hydroelectric project turbines (and passage via spill if needed), and a predictive model to estimate turbine survival. This dual approach for estimating passage survival will provide a characterization and range of passage survival values. This approach to characterizing entrainment potential and estimating turbine passage survival will be useful for making decisions on plant structures (e.g., trash racks), possibly operations, and the need (if any) for empirical studies. This study plan assumes that adequate information on existing fish species, relative fish size distributions, and migration/dispersal timing, and that any agencies comprehensive plans related to fish passage are provided. It also assumes that the new project design specifications (e.g., intakes area/design; turbines flow range; desired trash rack spacing; turbine specifications; among others) are available.

### Fish Entrainment Evaluation

This evaluation will utilize existing information to assess the potential of fishes in the vicinity of the new project to be entrained and pass downstream through the Project when operating. The assessment will use available fish data, other fisheries management information (such as stocking records), and known characteristics of these fishes to estimate the likelihood of fish entrainment and passage through the proposed project intakes. In evaluating entrainment susceptibility and effects, target species and life stages (fish size) will be identified and considered separately. Life history accounts for each of the target species identified will be performed. The assessment will integrate information from numerous available sources, which may include:

- 1— Pertinent lake survey information,
- 2— Large body of literature describing fish characteristics, focusing on those features such as seasonal movements, depth distributions, etc., that might predispose a species to entrainment, or confer resistance to entrainment.



3— Large body of fish entrainment literature that compiles and reviews large numbers of field studies, such as prepared by FERC (1995), EPRI (1997), etc. These data sources discuss common trends in entrainment among reviewed projects, including seasonal and other types of variability (e.g., species composition) in entrainment, etc.

In addition to using existing fisheries data regarding life history, LU will incorporate an EPRI (1997) compilation of fish entrainment data from selected sites comparable to the Scott's Mill Hydropower Project. LU proposes using a thorough screening of the EPRI database that will enable a calculation of reliable seasonal and annual estimated entrainment rates for fishes of three size groups; small (< 6 inches), medium (6-12 inches), and large (> 12 inches) fish for target species considered for this estimate. Qualitative estimates (i.e. five categories ranging from low to high) of seasonal and annual entrainment densities per target species and fish size will be developed based on turbine flow, anticipated project operations, and river flow to characterize the potential for fish entrainment during a dry year and a wet year to illustrate potential bounds for fish entrainment.

#### Turbine Passage Survival Estimates:

Turbine specifications and operating characteristics of the proposed Project will be compared to turbines at other hydroelectric projects where empirical studies of fish turbine passage survival were conducted. This information will be derived from an EPRI (1997) database, which provides an examination of fish survival results for sites operating turbines similar to those proposed at the Scott's Mill Project. Physical attributes and operating characteristics of the Project turbines will be compared to turbines at other hydroelectric projects where empirical studies of fish turbine passage survival were conducted.

In addition to the empirical studies comparative analysis, LU will use a predictive model developed to estimate turbine survival. The formula developed by Franke *et al.* (1997) grew out of efforts for the Department of Energy (DOE) to design more "fish-friendly" turbines. The Franke predictive model calculates the probability of blade strike (i.e., mortality) by relating such turbine parameters as the number of buckets, runner diameter, and runner height to fish length and operating condition. Fish length and available passage space are the principal drivers of the output. Representative fish lengths will be established based on existing fisheries data to estimate survival for a range of fish sizes that are present at the project. Results will be expressed as an estimated survival percentage. A matrix of survival estimates based on multiple values for some of the key input variables will be included in the deliverable.

## **8. Consistency with Generally Accepted Scientific Practice**

Similar studies have been conducted at other proposed projects. Results have been compared to actual studies.

## **9. Schedule**

Natel anticipates conducting entrainment studies in 2016. Natel's results will be incorporated into the desk top study results. The desk top study will be conducted once conceptual turbine design has been completed, which is anticipated in the first half of 2016.

## **10. Results**

The results will be used in conjunction with the engineering design to meet resource agency entrainment and survival requirements for resident and anadromous survival.

## **11. Literature Cited/ References**

EPRI 1997, Turbine Entrainment and Survival Database – Field Tests.  
Prepared by Alden Research Laboratory, Inc. EPRI Report No. TR-108630.  
13pp.

Franke, G. F., *et al.* (nine co-authors). 1997. Development of environmentally advanced hydro.

# **STUDY PLAN 7**

## **PROJECT EFFECTS ON FISH HABITAT**

### **1. Introduction**

Operation of the Scott's Mill Hydroelectric Project has the potential to affect fish habitat upstream and downstream of the Scott's Mill Dam. Important parameters for fish habitat include water depth, flow velocity, water level fluctuation, water quality, and cover. All of these parameters could be affected during project operations in both the impoundment and immediately downstream.

### **2. Resource Management Goals and Objectives**

Resource agency goals include protecting the quality of fish habitat for existing fish species during each life stage. This includes resident fish, anadromous and catadromous fish.

### **3. Consultation with Agencies and Other Interested Parties**

LU discussed the potential effects of project operation of fish habitat during the December 2, 2015 Joint Meetings. The parties were in agreement that LU should evaluate the effects of the project on the quality of fish habitat.

### **4. Existing Information and Need for Additional Information:**

LU has existing information on the presence of fish species in the impoundment and immediately downstream of Scott's Mill Dam.

### **5. Geographic Scope**

The geographic scope of the study extends from the Reusens tailrace to the mouth of Blackwater Creek downstream of Scott's Mill Dam.

### **6. General Description of Proposed Study**

LU will use flow data, water level data, the bathymetry survey, and water quality data obtained from other studies and combine that with life history data for key fish species to provide a relative index for the existing fish habitat. LU will then superimpose proposed operating conditions to determine effects on fish habitat quality. Operating conditions will include with and without flashboards, powerhouse location, and peaking/run-of-river conditions. Both resident and select anadromous fish species will be evaluated, along with critical life stages like spawning and incubation. If adverse effects are identified mitigation measures will be proposed including limitations on hourly

water level fluctuations, provision of flow over the spillway and limitations on total water level fluctuation.

## **7. Study Methods**

Representative species to evaluate will be selected in consultation with VDGIF. Critical habitat needs will be identified such as the need for stable water levels during spawning. Based on the bathymetry study and potential inundation from flashboard installation, LU will identify if there is a potential for stranding during daily flow fluctuations. If three-foot high flashboards are installed and full use is made of that storage, then the water level changes would be 2¼ inches per hour over the 16 hour non-peak period. LU will consider the effect of such changes and propose restrictions should that be necessary.

LU will consider existing water level changes based on historic flow fluctuations and compare that to proposed operations.

LU will incorporate the results from Study Plans 1, 2, 3 and 4 to determine habitat changes between existing and post-project conditions. As appropriate, project operations can be modified during critical periods to protect fish species.

## **8. Consistency with Generally Accepted Scientific Practice**

LU is not proposing an instream flow assessment to quantitatively assess habitat changes. LU believes that the proposed approach is reasonable to assess changes in fish habitat quality.

## **9. Schedule**

LU will conduct the in 2016. Studies 1, 2, 3 and 5 will need to be conducted before this study.

## **10. Results**

The results of this study will be discussed with resource agencies and appropriate protection, mitigation, and enhancement measures will be included in the draft license application.

## **STUDY PLAN 8 EVALUATION OF FISH PASSAGE**

### **1. Introduction**

The Scott's Mill Hydropower Project has the potential to impede or prohibit the upstream/downstream passage of anadromous, diadromous and resident fish species within the James River. Further, the USFWS, NMFS and VDGIF are currently working to restore diadromous fish species to the James River. An assessment of upstream/downstream passage of fish species will allow LU to design appropriate mitigation measures in consultation with resource agencies.

### **2. Resource Management Goals and Objectives**

Agency resource management goals are restore diadromous fish to their historic habitats. There is currently an active fish restoration program. In addition, a specific goal of this study is to improve the safety and timeliness of downstream/upstream fish passage at all seven James River dams from Scott's Mill to Cushaw Dam. Specific species to be passed include resident species (including bass and centrarchids), freshwater mussels, American shad, river herring, lamprey, and American eel.

### **3. Consultation with Agencies and Other Interested Parties**

LU has had informal discussions with state and federal resource agencies and other interested parties. On December 2, 2015 FERC, state agencies, NGOs, and other interested parties participated in a joint meeting to identify issues that required further study. The downstream/upstream passage of resident, catadromous and anadromous fish species was an issue that was identified as an issue that required further study.

### **4. Existing Information and Need for Additional Information**

VDGIF has conducted specific electro-fishing studies in the project area dating from present back to 1991. However, for some species such as American Shad there is a lack of historic information due to the fact that Boshers Dam inhibited fish passage since its construction in 1835. Since Boshers Dam was breached in 1999, anadromous fish have been able to migrate upstream of that dam. However, with the exception of American eels restoration of diadromous fish has had limited success. The Scott's Mill PAD provides additional information on the success of the restoration program.

## **5. Geographic Scope**

The geographic scope of the study includes the James River upstream of Boshers Dam, with an emphasis on Scott's Mill Dam and the six hydropower projects that are upstream of Scott's Mill.

## **6. General Description of Proposed Study**

This study will be a desktop study that utilizes existing information from fisheries studies done by the VDGIF, USFWS, and NMFS. It will include anticipated restoration timetables and conceptual approaches for moving fish upstream of Scott's Mill Dam. It also will incorporate conceptual approaches for moving fish upstream of the subsequent six dams upstream of Scott's Mill. LU anticipates a trap and haul program to be the most effect means for upstream transport. For upstream passage, concepts for trapping facilities at Scott's Mill will be identified along with estimates for numbers of fish needed before upstream transport of anadromous fish species would be initiated. Downstream passage will rely on data provided by the entrainment study.

For American eel downstream passage, LU will review current studies being conducted on the east coast to develop a plan and timetable for downstream passage.

## **7. Study Methods**

LU will work with fisheries agencies (VDGIF, VMRC, USFWS, NMFS, and the Atlantic States Marine Fisheries Commission (ASMFC)) to obtain the most current restoration plans and restoration data for the James River reach between Boshers Dam and Scott's Mill Dam. This information will be used to project the timetable and restoration success of anadromous fish reaching Scott's Mill Dam. Working in consultation with resource agencies and licensing participants, LU will develop trigger numbers for implementing upstream fish passage.

LU will work with a qualified fish passage engineering consultant to establish parameters for a successful trap and haul program. This will include factors to attract and trap fish, which could include use of turbine discharge or flow over the spillway. Sizing of the trapping facility will be based upon agency passage goals and the timing of the various runs. LU will develop a conceptual cost estimate for the trapping facility and will estimate transport costs based on transport costs on other east coast river systems. LU anticipates transporting the fish to a location upstream of Cushaw Dam because there is likely little habitat between Scott's Mill and Cushaw available for restoration. However, there is a significant amount of habitat available for restoration upstream of Cushaw Dam.

LU will engage other dam owners upstream of Scott's Mill to obtain their input and support for the restoration program. LU anticipates that the dam owners would also work with LU to develop a comprehensive program for downstream passage. The downstream program would work to minimize entrainment injury and mortality once the upstream fish passage program is implemented.

LU intends to make maximum use of existing fish passage efforts on other rivers like the Susquehanna, Potomac and Roanoke. Results of studies on similar large rivers will be incorporated to increase the likelihood of implementing a successful passage program on the James River.

## **8. Consistency with Generally Accepted Scientific Practice**

Similar studies have been conducted for other east coast rivers. LU will leverage that information. However, the fish passage program will rely on the experience of resource agency staff and fish passage consultants.

## **9. Schedule**

The study will be conducted in 2016. It will rely on the entrainment study results to assess downstream passage effectiveness.

## **10. Results**

LU anticipates entering into an agreement with resource agencies and other licensing participants to restore diadromous fish to their historic spawning areas. The timing and restoration goals will be important aspects of the agreement.

## **11. Literature Cited/References**

[https://en.wikipedia.org/wiki/Bosher\\_Dam](https://en.wikipedia.org/wiki/Bosher_Dam)

## **STUDY PLAN 9 MUSSEL SURVEY**

### **1. Introduction**

The Scott's Mill Hydropower Project has the potential to impact freshwater mussels during construction and operation. The VDGIF and the USFWS work together in the management and conservation of freshwater mussel species found within the project area. A presence/absence survey for freshwater mussel (and suitable habitat) will allow LU to design appropriate mitigation measures in consultation with these resource agencies.

### **2. Resource Management Goals and Objectives**

Agency resource management goals are to minimize any potential impact to freshwater mussels species and critical mussel habitat within the project boundary (as well as adjacent areas downstream). The objective of this study is to determine if there are any freshwater mussel species within the project area. Additionally, the study will also determine if any critical mussel habitat is present within the project boundary or nearby.

### **3. Consultation with Agencies and Other Interested Parties**

LU has had informal discussions with state and federal resource agencies and other interested parties. On December 2, 2015 FERC, state agencies, NGOs, and other interested parties participated in a Joint Meeting to identify issues that required further study. The need for a mussel presence study was identified in that meeting. Furthermore, LU has also been in contact with VDGIF biologist Brian Watson via telephone conversation (1/6/2016) to ensure all required study aspects are met.

### **4. Existing Information and Need for Additional Information:**

A mussel study was conducted in 2002 along the James River near Amherst/Bedford County and Lynchburg City. This study had two locations; upstream of Reusens Dam, as well as 250 m downstream of the John Lynch Bridge. The first location of the study (Reusens) only revealed one species of freshwater Asian clam *Corbicula Fluminea*. The second location (John Lynch Bridge) also revealed this species (*Corbicula Fluminea*). However, three species of freshwater mussels were also found within this area; Eastern Elliptio (*Elliptio Complanata*), Green Floater (*Lasmigona Subviridis*) and Yellow Lance (*Elliptio Lanceolata*). This is of particular concern to this study because of the location's close proximity to the project area. Also, it is noteworthy that



the Green Floater (*Lasmigona Subviridis*) is listed as a threatened species (see Study Plan 12).

In a January 6, 2016 telephone conversation, Brian Watson, DGIF, pointed out that this study might have misidentified the Yellow Lance (*Elliptio Lanceolata*) for another species, Atlantic Spike (*Elliptio Producta*). According to Brian, this is probably due to taxonomic issues.

## 5. Geographic Scope

The Geographic scope of the study would include the pool above Scott's Mill Dam, as well as the area downstream of the dam to the confluence with Blackwater Creek.

## 6. General Description of Proposed Study

This study will be a field survey, which tests for the presence/absence of mussel species within the surrounding project area. The survey will identify suitable mussel habitat, as well as evidence of mussels living within the study area (both shells and/or live mussels).

## 7. Study Methods

LU will contract a mussel surveyor approved by both USFWS and DGIF. This surveyor will conduct a mussel and mussel habitat study for the project in accordance with the "Freshwater Guidelines for Virginia."

Extracts from the guidelines are as follows. "There are four general assessment/survey types including: **Land-based review** - land-based site visit used to determine whether a water-based survey (site assessment, abbreviated, or full survey) is warranted. During a land-based review, the surveyor should look for obvious signs that would negate the need for additional, water-based surveys. For example, if it can be determined that the water body is non-perennial and/or contains no potential mussel habitat, it is unlikely that additional surveys would be needed or recommended by VDGIF or USFWS. If it is determined that suitable habitat is present, the appropriate survey will be recommended. Photographs of the project site clearly showing instream habitat conditions, as well as a thorough site description, will be sent to VDGIF and USFWS for review in lieu of the site assessment. If it is determined that suitable habitat is present, the appropriate survey will be recommended.

1. **Site assessment** - 20 m upstream / 80 m downstream. A site assessment is recommended to determine if suitable habitat is present at a project location and may be recommended if the presence of a listed species is questionable. If suitable habitat is present, the appropriate survey will be recommended even in the absence of mussels, since the site assessment

does not serve as a substitute for a mussel survey; however, the presence of freshwater mussels should be documented during the assessment.

2. **Abbreviated survey** - 100 m upstream / 400 m downstream of project footprint.
3. **Full survey** - 200 m upstream / 800 m downstream of project footprint.

The assessment/survey type is based on the scope of the project, potential impacts, and known species distributions. Survey lengths are measured from the project footprint. *Survey distances have primarily been developed for projects where physical alteration/disturbance of the stream is the primary impact (e.g., bridge repair/replacement, utility line crossings, etc.). Potential impacts from projects involving activities such as point and non-point source discharges, water intakes, and mining may require greater survey lengths and different methods.* “

The approved surveyor will use these guidelines to determine which study/study methods are appropriate for the project area. It is assumed that a full survey will be needed. Given that there is a potential to increase the normal Scott's Mill impoundment pool elevation up to three feet, the survey may need to extend upstream to Reusens Dam.

## **8. Consistency with Generally Accepted Scientific Practice**

This study will strictly adhere to the guidelines for mussel surveys/studies found in the pamphlet; “Freshwater Guidelines for Virginia” which is posted by the USFWS. Since all other studies for similar projects are completed with these parameters, there should be no differences or inconsistencies with this particular study.

## **9. Schedule**

LU anticipates this study to be completed in 2016, as soon as weather/river conditions are favorable to complete the study. According to USFWS published guidelines the survey should be completed between April 1 and October 31.

## **10. Results**

The results of this study will be used to meet resource agency requirements regarding the impact this project has on mussel species and critical habitat.

## **11. Literature Cited/ References**

Mair R, Neves R. 2002. Survey for Freshwater Mussels at Proposed Project Sites on the James River, Amherst and Bedford Counties, City of Lynchburg Virginia. Blacksburg, Virginia.

U.S. Fish and Wildlife Service. September 4, 2013. Freshwater Mussel Guidelines for Virginia. Gloucester, Virginia.



# **STUDY PLAN 10 WETLAND ASSESSMENT**

## **1. Introduction**

As part of the proposed Scott's Mill Hydropower Project, potentially-jurisdictional wetland areas that could be affected by project construction of operation will be delineated and surveyed within the study area. This assessment will include up to five (5) acres of area surrounding the existing Scott's Mill Dam. To assess the effects of flashboard installation on wetlands, this wetland delineation effort will also include the shoreline of the upstream impoundment that will be subject to additional inundation. A preliminary jurisdictional determination (PJD) request will be submitted to the US Army Corps of Engineers (USACE), and will be copied to both the VMRC and VDEQ. An inter-agency PJD site visit can then typically be scheduled within 30 days. Once any necessary revisions to the PJD map are made, a final PJD map will be sent to the USACE for approval. PJD approvals are normally valid for five (5) years).

## **2. Resource Management Goals and Objectives**

Resource agency goals are to protect wetlands and their associated functions. The goals of this effort will be to determine the presence/absence of potentially-jurisdictional wetlands within the study area, in order to evaluate the proposed project's impacts on such areas and to develop any required mitigation.

## **3. Consultation with Agencies and Other Interested Parties**

The USACE is normally the lead federal agency responsible for verification of jurisdictional wetland boundaries. Since wetland impacts are regulated under the Clean Water Act (CWA), there is often both a federal (USACE, Section 404) and state (VMRC/VDEQ, Section 401) review/oversight component for these types of projects. In the case of the Scott's Mill Hydropower Project, the VMRC may be the lead state wetland agency. All three agencies will receive a copy of this proposed study.

## **4. Existing Information and Need for Additional Information**

Available aerial photographs, topographic/terrain maps, VDEQ stream maps, USDA hydric soils maps, and USFWS NWI maps will be utilized to provide background information for the study area, prior to the site visit.

Depending upon the accuracy of available elevation data, a Digital Elevation Model (DEM) may need to be developed.

Based on a preliminary assessment of water levels under varying flow conditions (see Study Plan 1), about 50 percent of the time, the water level upstream of Scott's Mill Dam is less than one foot above the crest elevation. If three-foot high flashboards are added then an additional two feet (vertical elevation) of shoreline will typically be inundated on a daily basis. LU will need to assess the effects of these project operations on the wetlands upstream of Scott's Mill Dam.

Under existing conditions, water levels in the impoundment exceed a height of 3 feet over the spillway about 5 percent of the time. This equates to a flow of 12,000 cfs or greater. Under post-project conditions, water levels would not exceed the flashboard elevations until flows exceed the hydraulic capacity of the powerhouse, which is expected to be between 3,500 and 4,500 cfs. Accordingly when flows exceed about 4,000 cfs (i.e., about 25 percent of the time), water will begin to flow over the flashboards and the water level in the Scott's Mill impoundment will rise.

For flows above this level, the difference in water level between existing and post-project conditions will vary between zero and three feet until the flashboard failure is reached.<sup>2</sup> They will be designed to fail at about a flow of 50,000 to 80,000 cfs, depending upon the frequency for resetting the flashboards and environmental effects. For example, at a flow of 12,000 cfs the water level over conventional flashboards would be about 2.4 feet higher than under natural conditions. At a flow of 25,000 cfs, the pre-and post-project water level differential would be closer to 3 feet. However, when the failure discharge is reached, pre- and post-project water levels would be about the same. Therefore, LU will investigate wetland effects for water levels between elevation 511 feet msl and elevation 520 msl to ensure project effects can be adequately addressed.

If additional information is necessary following the USACE/VMRC/VDEQ site visit, then supplemental soil sampling may be required. If potential wetland boundaries are changed as a result of the inter-agency site visit, then additional surveying may also be necessary.

## **5. Geographical Scope**

The proposed sediment sampling study area will be defined by the estimated five-acre limits of disturbance (LOD), which includes material storage areas, construction limits, vehicle parking areas, and temporary

---

<sup>2</sup> If Fusegate System flashboards are used, they are designed to pass more flow per unit width so the water level differential would be less than those described here.

disturbance areas. The wetland assessment efforts will also include all upstream shoreline areas that are subject to additional inundation from flashboard installation. This includes the four islands that are upstream of Scott's Mill Dam and the island immediately downstream of it.

## **6. General Description of Proposed Study**

The focus of the initial part of this study will be assessment of vegetation, hydrology, and soils within the study area, to determine the extent of potentially-jurisdictional wetland areas. This study will seek to determine the presence/absence (and areal extent) of potentially-jurisdictional wetlands within the study area.

For this assessment, the following steps will be followed:

### 1) Review of available background data

This effort will include review of USFWS National Wetland Inventory (NWI) online wetland mapping information, US Department of Agriculture (USDA) soils data, as well as current and previous aerial photographs.

### 2) Field investigation

Field investigation will include evaluation of hydric soils, hydrophytic vegetation, and wetland hydrology characteristics, using the 1987 USACE Wetland Delineation Manual and the 2012 Eastern Mountains and Piedmont Regional Supplement.

LU will then assess project effects from land disturbance and from project operations. LU will develop protection, mitigation and enhancement measures based upon the level of impact anticipated.

## **7. Study Materials/Methods**

LU will determine the presence/absence of potentially-jurisdictional wetlands within the study area, in order to evaluate the proposed project's impacts on such areas.

Materials used will include:

Tile/trenching spade ('sharpshooter')

Soil auger

Munsell soil color handbook

Plant field guide(s)

Fieldbook

PPE gear

Global positioning system (GPS)

Digital camera

Field investigation will include evaluation of hydric soils, hydrophytic vegetation, and wetland hydrology characteristics, using the 1987 USACE Wetland Delineation Manual and the 2012 Eastern Mountains and Piedmont Regional Supplement.

Professional standards will be maintained during fieldwork implementation and project review efforts, by using experienced wetland delineation staff, and by submitting PJD documentation to the USACE, VMRC, and VDEQ for review and comment/revision.

LU will examine how the wetlands may be impacted by the additional flooding attributed to flashboard installation. In particular, the additional percent of time that wetlands are flooded in the two-to-three foot band between the spillway crest elevation and flashboard height will be assessed for Reusens peaking and non-peaking operations. Secondly, LU will assess how the wetlands will be affected in the zone above the height of the flashboards. LU will take into account the timing and duration of these high flows that exceed the hydraulic capacity of the powerhouse.

Work products from the wetland assessment effort will include a draft 'Waters of the US Map', PJD submittal package, final 'Waters of the US Map', and the associated effects of project operations.

## **8. Consistency with Generally Accepted Scientific Practice**

Field investigation will include evaluation of hydric soils, hydrophytic vegetation, and wetland hydrology characteristics, using the 1987 USACE Wetland Delineation Manual and the 2012 Eastern Mountains and Piedmont Regional Supplement.

## **9. Schedule**

The proposed wetland assessment fieldwork can typically be completed within three weeks of final study plan approval (weather permitting), to be followed by surveying of wetland flagging.

Scheduling of the PJD site visit is dependent on agency schedules, but can often be conducted within four to six weeks of PJD submittal. Approval of the final PJD map required).

The impact assessment will be completed in the first half of 2016.



## **10. Results**

The results of this study will be a wetlands map and an impact assessment. Depending upon the results a wetlands mitigation plan will be developed. The results will be presented in the draft license application.

## **11. Literature Cited/ References**

US Army Corps of Engineers, 1987. Wetland Delineation Manual - Wetlands Research Program Technical Report Y-87-1. USACE Waterways Experiment Station, Vicksburg, MS.

US Army Corps of Engineers, 2012. Eastern Mountains and Piedmont Regional Supplement Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region ERDC/EL TR-12-9 (Version 2.0), April 2012. USACE Engineer Research and Development Center, Vicksburg, MS.

# **STUDY PLAN 11**

## **TERRESTRIAL RESOURCES**

### **1. Introduction**

The proposed Scott's Mill Hydroelectric Project will primarily involve work within the channel of the James River. However, some activities may occur on the shoreline of the river and flashboard installation may result in upstream water level changes that could affect terrestrial resources. In order to assess potential effects of these activities, existing upland conditions (e.g., habitats, vegetation, land cover, etc.) will be assessed within the study area limits of disturbance (LOD), and potential effects of the project will be evaluated. Impacts to aquatic resources and wetlands will be coordinated with this study, but evaluated separately.

### **2. Resource Management Goals and Objectives**

No specific resource goals have been identified for this study. However, to the extent terrestrial resources are present in the area, a resource goal would be to protect the resource and mitigate any potential effects. The goals of this effort will be to: 1) describe existing natural resources, habitats, vegetative communities, and previous impacts within the study area (approximate five acre LOD area), 2) describe terrestrial resources within an approximate 10 foot elevation band above the spillway crest elevation to account for water level changes from flashboard installation and operation, and 3) evaluate potential project impacts in these areas/on these resources.

Previous/existing land use activities (relic mill foundation and roadway on the northeast shoreline, and operational pipe foundry on the southwest shoreline) have significantly altered natural resources within these portions of the study area. Portions of islands within the study area have also been previously affected by various land uses, but such land uses largely ended following a devastating 1985 flood (and these islands have since become largely naturalized).

### **3. Consultation with Agencies and Other Interested Parties**

LU has consulted with licensing participants on this issue and has developed the proposed study plan to reflect this consultation.

#### **4. Existing Information and Need for Additional Information**

US Department of Agriculture (USDA) soils data, US Geological Survey (USGS) topographic mapping, USFWS habitat information, and current/previous aerial photographs will be reviewed for this study.

Additional information/research may be needed, depending on observations made during the site visit. Vegetation mapping within the 10 foot zone above the spillway crest elevation including the zone around the four islands upstream of Scott's Mill dam will be needed to assess project effects.

#### **5. Geographic Scope**

The proposed study area will be defined as the estimated five-acre LOD extent, which includes material storage areas, construction limits, vehicle parking areas, and temporary disturbance areas. To assess flashboard effects, terrestrial area assessment efforts will also include all upstream shoreline areas that are subject to a greater frequency of inundation, up to 10 feet above the existing spillway crest elevation.

#### **6. General Description of Proposed Study**

The focus of this study will be assessment of existing terrestrial/upland natural resources within the study area, including vegetation, wildlife, and soils. To assess flashboard effects, an additional terrestrial area that includes all upstream shoreline areas that are subject to a greater frequency of inundation will be assessed.

The study will document existing conditions and natural resources (flora, fauna, and soils) within the project study area / LOD area. The following steps will be followed:

1) Review of available background data

This effort will include review of USDA soils data, USGS topographic mapping, USFWS habitat information, as well as current and previous aerial photographs.

2) Field investigation

Field investigation will include documentation of vegetative communities/species, soil conditions, wildlife observations, and the extent of existing/previous impacts.

The study will assess how construction and operation may affect the vegetation and the wildlife that use those habitats.

## **7. Study Materials/Methods**

The objectives of this effort will be to document existing conditions and natural resources within the areas likely to be affected by the proposed project.

### **Materials**

Binoculars  
Game/Trail cameras  
Wildlife field guide(s)  
Plant field guide(s)  
Fieldbook  
PPE gear  
GPS  
Digital camera

A field visit will be conducted to the study area, to evaluate existing natural resources. Vegetative species will be documented, wildlife observations will be noted, previous impacts will be described, existing land uses will be detailed, and representative photographs will be taken. Latitude/longitude (position) of significant features will also be noted. Game/trail cameras may be positioned within portions of the study area, to help obtain a more-complete list of wildlife species present.

Field investigation will include assessment of existing vegetation (health/vigor, species composition, evidence of stress), wildlife observations (species, available habitats, hibernacula, loafing, feeding, roosting areas, hazards, etc.), and soils (e.g., presence of strata, evidence of disturbance, indications of fill or excavation, soil moisture, and compaction).

Professional standards will be maintained during fieldwork implementation and project review efforts, by using experienced environmental scientists to perform background research, conduct the site visit, and prepare the report.

LU will consider the effects that land disturbance may have on the terrestrial resources in the immediate area of the dam. Effects on vegetation, particularly in the zone between the spillway crest elevation and the top of flashboards will be assessed. Impacts to vegetation above the crest of the flashboards will be qualitatively assessed as there will be

some increased frequency of inundation in the zone that is typically flooded when flows are between 4,000 cfs and 50,000 cfs.

The work product from this effort will be included in the draft license application. LU will summarize the study area observations (and including maps, photographs, and database records).

## **8. Consistency with Generally Accepted Scientific Practice**

The proposed study will be largely qualitative in nature particularly in describing project effects on resources that are above the top of the flashboards. The study may be modified to include wildlife surveying, vegetation sampling, and/or detailed soils analysis (depending on observations made during the initial site visit).

## **9. Schedule**

The proposed terrestrial assessment fieldwork will be completed in the second quarter of 2016. Fieldwork will be preceded by background research and mapping. The impact assessment will follow as design details become available.

## **10. Results**

The results will include a characterization of the vegetation in the project area and immediate area downstream, and an assessment of project effects. The assessment will be included in the draft license application.

## **STUDY PLAN 12 PROTECTED SPECIES**

### **1. Introduction**

The proposed Scott's Mill Hydropower Project will primarily involve work within the James River and along the shoreline. As a result, it will unavoidably affect existing aquatic habitat. It is unlikely that impacts to high-quality terrestrial habitat will occur, but some upland land disturbance will occur. In order to help ensure compliance with Section 7 of the Endangered Species Act (ESA), the following activities are proposed.

### **2. Resource Management Goals and Objectives**

Pursuant to the ESA, the resource goals will be to avoid or not adversely affect impacts to threatened or endangered species. Specific goals of this effort will be to: 1) document species present within the terrestrial and aquatic habitats in the project study area, and 2) evaluate potential project effects on these species.

Previous/existing land use activities (relic mill foundation and roadway on the northeast shoreline, and operational pipe foundry on the southwest shoreline) have already significantly altered natural resources within these portions of the study area. Portions of islands within the study area have also been previously affected by various land uses, but such land uses largely ended following a devastating 1985 flood (and these islands have since become largely naturalized).

Aquatic habitats have been previously affected by the original construction of the Scott's Mill Dam, and the subsequent alteration of bedload transport, water velocity, sediment deposition patterns, and island formation/alteration (along with canal activities during the 18<sup>th</sup> and 19<sup>th</sup> Centuries).

The project area is highly disturbed with very few trees, no known hibernacula, industrial land uses, roadways, structures, and stored pipe materials. As a result, only low-quality wildlife habitats may remain within the study area at this point.

### **3. Consultation with Agencies and Other Interested Parties**

The FERC has designated LU as its non-federal representative for purposes of informal endangered species consultation. ESA issues have been coordinated with the USFWS, VDGIF and VDCR.

#### 4. Existing Information and Need for Additional Information

The USFWS Information Planning and Conservation (IPaC) system lists the following protected species that may be present near the study area:

James Spinemussel (*Pleurobema collina*) – freshwater mussel (FE)

The VDGIF lists the following protected species in the Virginia Fish and Wildlife Information System (VAFWIS):

James Spinemussel (*Pleurobema collina*) – freshwater mussel (FESE)

Northern long-eared bat (*Myotis septentrionalis*) – mammal (FT)

Green floater (*Lasmigona subviridis*) – freshwater mussel (ST)

Atlantic pigtoe (*Fusconaia masoni*) – freshwater mussel (ST)

Peregrine falcon (*Falco peregrinus*) – bird (ST)

Upland sandpiper (*Bartramia longicauda*) – bird (ST)

Loggerhead shrike (*Lanius ludovicianus*) – bird (ST)

Migrant loggerhead shrike (*Lanius ludovicianus migrans*) – bird (ST)

The Virginia Department of Conservation and Recreation (VDCR) Natural Heritage (NH) database lists the following protected species within the Middle James River-Buffalo River Basin (HUC 02080203), James River-Opossum Creek sub-watershed (JM11):

Green floater (*Lasmigona subviridis*) – freshwater mussel (ST)

Smooth coneflower (*Echinacea laevigata*) – vascular plant (FE)

<i>FE – Federally Endangered</i>	<i>SE – State Endangered</i>
<i>FT – Federally Threatened</i>	<i>ST – State Threatened</i>

In order to document species present within the study area, a terrestrial habitat survey and freshwater mussel survey are proposed. No acoustic bat survey is proposed at this time, but the minimal tree clearing potentially necessary would not occur within the April 15-September 15 time-of-year restriction period for northern long-eared bat. Specific study plans have been developed to address freshwater mussel impacts and impacts to bats. See Study Plans 9 and 13.

Available USFWS, VDGIF, and VDCR data will be reviewed, along with results from other project-related studies (e.g., wetlands, terrestrial habitats, bathymetry, etc.), and other James River / Atlantic Slope river studies.

Additional information/research may be needed, depending on observations made during site visits.

## **5. Geographic Scope**

The proposed terrestrial habitat study area will be defined as the estimated five-acre LOD extent, which includes material storage areas, construction limits, vehicle parking areas, and temporary disturbance areas. Additionally to account for potential flashboard-related affects, the study area will be expanded to include all upstream shoreline areas that are subject to additional inundation, including the four islands upstream of Scott's Mill Dam located in the impoundment.

## **6. General Description of Proposed Study**

The focus of this study will be assessment of existing terrestrial habitats and aquatic species within the study area. The goals of this study will be documentation of existing conditions, and natural habitat resources within the project study area / LOD area.

For this assessment, the following steps will be followed:

### 1) Review of available background data

This effort will include review of available USFWS, VDGIF, and VDCR data, along with results from other project-related studies (e.g., wetlands, terrestrial habitats, bathymetry, etc.).

### 2) Field investigation

Field investigation will include documentation of terrestrial/upland habitats and freshwater mussel species (community composition). Available habitats will be evaluated for their suitability to support the noted protected species. The extensive industrial and commercial



development in close proximity to the dam itself in past decades may have already significantly reduced habitat quality within the study area.

## **7. Study Materials/Methods**

The objectives of this effort will be to document existing terrestrial habitat resources and natural resources within the study area.

### **Materials**

Boat  
SCUBA gear/divers  
Binoculars  
Game/Trail cameras  
Wildlife field guide(s)  
Plant field guide(s)  
Fieldbook  
PPE gear  
GPS  
Digital cameras

The proposed terrestrial habitat assessment will be largely qualitative in nature, but may be modified to include wildlife surveying and/or vegetation sampling (depending on observations made during the initial site visit). As noted in Study Plan 9, the freshwater mussel survey will be conducted by a USFWS-approved survey firm, in accordance with standard survey methodologies.

The proposed terrestrial habitat assessment will be largely qualitative in nature, but may be modified to include quantitative wildlife surveying and/or vegetation sampling (depending on observations made during the initial site visit).

Professional standards will be maintained during fieldwork implementation and project review efforts, by using experienced biologists and environmental scientists to perform background research, conduct the site visits / investigations / surveys, and prepare the reports.

The effort will entail summarizing the study area observations and freshwater mussel species present (including maps, photographs, and database records).

## **8. Consistency with Generally Accepted Scientific Practice**

The proposed terrestrial habitat assessment will be largely qualitative in nature, but may be modified to include wildlife surveying and/or

vegetation sampling (depending on observations made during the initial site visit).

## **9. Schedule**

The majority of terrestrial habitat assessment fieldwork can typically be completed within two to three weeks of final study plan approval (weather permitting). Smooth coneflower surveying would need to occur during the flowering season (typically from May to July).

## **10. Results**

The results of this effort will be presented in the draft license application.

# **STUDY PLAN 13**

## **BAT SURVEY**

### **1. Introduction**

The Scott's Mill Hydropower project has the potential to impact bat roosting habitat during construction and operation. The VDGIF and the USFWS work together in the management and conservation of bat species located within the project area. A presence/absence survey for bats and critical bat habitat (roosting areas) will allow LU to design appropriate mitigation measures in consultation with different resource agencies

### **2. Resource Management Goals and Objectives**

Agency resource management goals are to minimize any potential impact to bat species and critical bat habitat found within the project area. The objective of this study is to determine if there are any bat species or critical habitat areas utilized by bats located within the project area. The presence/absence of bat roosting trees/habitat will be one of the main focuses of this study.

### **3. Consultation with Agencies and Other Interested Parties**

LU has had informal discussions with state and federal resource agencies and other interested parties. On December 2, 2015 FERC, state agencies, NGOs, and other interested parties participated in a Joint Meeting to identify issues that required further study. The need for a bat/bat habitat presence study was identified in that meeting. Furthermore, LU has also been in contact with VDGIF biologist Rick Reynolds via telephone conversation (1/15/2016) to ensure all required study aspects are met.

### **4. Existing Information and Need for Additional Information**

Currently there is no pre-existing information regarding bat species and habitat located within the project area. A presence/absence study is necessary to determine if there are any bat species or critical bat habitat located within the project area.

### **5. Geographic Scope**

The Geographic scope of the study will include riparian/forested areas from the pool above Scott's Mill Dam to the confluence of Blackwater Creek downstream.

## **6. General Description of Proposed Study**

The study will be a field survey which tests for the presence of bat species within the project area. Additionally, the study will also identify any critical bat habitat (roosting areas) located within the project area.

## **7. Study Methods**

LU will contract with a bat surveyor approved by both USFWS and VDGIF. This surveyor will conduct a bat and bat habitat study for the project in accordance with USFWS and VDGIF regulations.

## **8. Consistency with Generally Accepted Scientific Practice**

This study will strictly adhere to commonly accepted protocol regarding field surveys for bats and bat habitat.

## **9. Schedule**

LU anticipates this study to be completed within 2016.

## **10. Results**

The results of this study will be used to meet resource agency requirements regarding the impact this project has on bat species and critical habitat.



## **STUDY PLAN 14 RECREATION RESOURCES**

### **1. Introduction**

The Statewide Comprehensive Outdoor Recreation Plan (SCORP) identifies river recreation as an important need. Although there are boat launches downstream from Scott's Mill Dam, participants at the December 2, 2015 Joint Meeting identified boating access in the Scott's Mill impoundment as a need. Further, a portage or canoe flume was identified as a second important need. Additional clarification of recreational needs was provided via telephone conference call with Amherst County and by the James River Association in a letter dated February 2, 2016.

LU proposes to conduct a recreation resources study to assess the viability of proposed recreation enhancements. FERC regulations (18 Code of Federal Regulations Section 2.7) require an applicant to consider recreation facilities as part of hydropower development. Because of the industrial nature and confined river corridor in the Scott's Mill area, incorporation of hydropower at Scott's Mill affords an opportunity for recreational enhancements for local and regional recreationists.

### **2. Resource Management Goals and Objectives**

Agencies and interested parties have identified several recreation enhancements that they would like implemented as part of the recreation plan for the Scott's Mill Hydroelectric Project.

### **3. Consultation with Agencies and Other Interested Parties**

LU discussed the need for this study during the December 2, 2015 Joint Meeting. No party disagreed on the need for this study.

### **4. Existing Information and Need for Additional Information:**

The PAD describes the existing resources in the vicinity of Scott's Mill Dam. Several additional needs have been identified including boat passage (providing either a portage or flume) to safely pass Scott's Mill Dam, public boating access to the project impoundment, public fishing access to the impoundment and immediately downstream, public walking/multi-use trails, public camping, public parkland, and historical interpretation. Public boating access would entail conceptual plans for a boat launch within the impoundment.

## **5. Geographic Scope**

The geographic scope of the study extends from Reusens Dam downstream to the Blackwater Creek Trail Network.

## **6. General Description of Proposed Study**

LU will develop a recreation plan that assess potential recreation enhancements proposed by licensing parties, including a portage or safe navigation, a boat access in the impoundment, public fishing access, trails, camping, parkland, historical interpretation (signage), and possibly other recreation facilities consistent with identified local needs.

## **7. Study Methods**

LU will evaluate the feasibility of installing a safe passage past Scott's Mill Dam or portage on the north side of the river. LU will consider the hydraulic head to be dissipated based on similar Virginia projects like the Bartlick Dam on Russell Fork. If determined feasible, LU will develop conceptual plans and a cost estimate and compare the cost to a conventional portage. LU will select an option for canoeists and kayakers to bypass the Scott's Mill Dam in consultation with licensing participants.

LU will consult with VDCR, Lynchburg, Bedford County and Amherst County to identify a location for public boating access in the impoundment. Consideration will be given to areas along River Road in Amherst County and on the Lynchburg side of the river. However, LU notes that access on the southeast (Lynchburg) side of the river would be more complicated due to the railroad.

LU will also consult with these parties to assess the feasibility of using River Road for public fishing access and a public walking/multi-use trail. Areas both upstream and downstream of the Scott's Mill Dam will be considered. LU will also consult with the City of Lynchburg on the potential for a connector trail to the Blackwater Creek Trail Network.

LU will also consider a public camping and parkland for Treasure Island and Daniel Island. Such facilities would likely require bridge access and may be beyond the scope of the licensing, but could be put into a longer-term plan.

LU will develop a historical interpretation plan in consultation with licensing participants. The cultural resources study (Study Plan 15) will provide the basis for information to be conveyed. LU will estimate the cost and assess the maintenance requirements of posted signage.

As part of the study LU will also consider the effects that flashboard installation and changing water levels from peaking and storage operations would have on existing recreation uses within the impoundment and immediately downstream. This would draw upon the fishery effects study (Study Plan 7). Effects of upstream fish restoration on recreation will be qualitatively assessed.

## **8. Consistency with Generally Accepted Scientific Practice**

It is standard practice to provide a recreation plan as part of a license application. The plan will be developed with licensing participants.

## **9. Schedule**

LU will conduct the in 2016.

## **10. Results**

The results of this study will be incorporated in a recreation plan to be included with the draft license application.



# **STUDY PLAN 15 CULTURAL RESOURCES**

## **1. Introduction**

The Scott's Mill Hydropower Project has the potential to affect cultural resources that are eligible for or listed in the Virginia Landmarks Register (VLR) and the National Register of Historic Places (NRHP). A cultural resources inventory and assessment within the project's preliminary Area of Potential Effect (APE) will allow LU to avoid, minimize or mitigate potential adverse effects to historic properties (Appendix A). LU is considering use of innovative turbines that reduce the project footprint and take advantage of the existing historic structures with minimal modifications.

## **2. Resource Management Goals and Objectives**

Agency resource management goals are to avoid, minimize or mitigate effects to historic properties in the project's APE. The objectives of the study are to inventory and assess cultural resources in the APE.

## **3. Consultation with Agencies and Other Interested Parties**

LU has had informal discussions with state and federal resource agencies and other interested parties. On December 2, 2015 FERC, state agencies, NGOs, and other interested parties participated in a Joint Meeting to identify issues that required further study. Cultural Resources was identified as an issue requiring further study at this meeting and during a subsequent conference call with the Virginia Department of Historic Resources (VDHR) on December 16, 2015. LU has also identified potential consulting parties according to Section 106 of the National Historic Preservation Act (NHPA). This list is included herein as Appendix B.

## **4. Existing Information and Need for Additional Information:**

Several historic resources have been recorded within the project's APE. These consist of two architectural resources (James River and Kanawha Canal Sites in Lynchburg, Virginia (VDHR ID# 118-0209) and the Glamorgan Pipe and Foundry Company (VDHR ID# 118-0109)) and one archaeological site, called simply "canal lock" (VDHR Site # 44CP0069).

The James River and Kanawha Canal Sites in Lynchburg, Virginia (VDHR ID# 118-0209) are a series of discontinuous features that are listed in the VLR and NRHP as the last visible remnants of the c. 1830s canal in Lynchburg (Attachment 1: 118-0209 Site Form). Elements of the historic property that are located in the current APE consist of the waterworks dam, water works

canal, James River (Scott's Mill) dam and guard locks. The guard locks are also recorded as archaeological site 44CP0069, although the location specified in the VDHR's Virginia Cultural Resources Information System (V-CRIS) seems to erroneously place them in a location identical to the gate at the head of the waterworks canal (Attachment 2: 44CP0069 Site Form). A Civil War period map indicates that the guard locks were located further away from river right, beneath the current railway tracks (Appendix C: 14). Photographs of the project vicinity taken on February 5, 2016 confirm that only the waterworks canal remains visible on river right (Appendix C: 1-8).

The Glamorgan Pipe and Foundry Company (VDHR ID# 118-0109), now the Griffin Pipe Company, is located east of the mill dam along river right. The pipe company property serves as an access route to the project and will be subject to installation of an underground electrical line to serve the powerhouse. The resource was recorded on January 1, 2000 by the Louis Berger Group and found not eligible for listing in the NRHP by the VDHR on June 8, 2000 (Attachment 3: 118-0109 Site Form).

Although several extant structures in the APE have been listed in the VLR and NRHP as part of a larger district, the site form and nomination form provide very limited detail regarding the sequence of construction, reconstruction and repair of these resources. Further, there is little information given concerning construction methods and materials. For example, one source states that the original water works dam, built in the late 1820s, was destroyed by an 1847 flood and rebuilt ([www.lynchburgonline.com/history.html](http://www.lynchburgonline.com/history.html)). An architectural survey of the water works dam, water works canal, James River (Scott's Mill) Dam and James River and Kanawha Canal guard locks would provide the missing information. Furthermore, the stone foundation of Scott's Mill is extant on river left and should be recorded as an archaeological site. Additionally, archival research should be undertaken to predict the potential for underwater archaeological sites in the James River immediately above and below the existing dam.

## **5. Geographic Scope**

The geographic scope of the study is the preliminary APE as identified in Appendix A. It includes the Scott's Mill Dam, the potential location of a powerhouse on river left and two potential locations of a powerhouse on river right at the head of the former Water Works Canal and James River and Kanawha Canal. It also includes the downstream end of Daniel Island, a smaller island immediately downstream of the dam and a portion of the Griffin Pipe property where an approximately 500-ft. long underground electrical line will be installed.

The current APE purposefully does not include the entire retention pool for the hydro project. The normal headwater elevation of the James River is 511 feet.

The project proposes installation of flashboards that would bring the normal elevation to a maximum of 514 feet. However, this level is frequently attained by the river currently and there are no projected additional effects to cultural resources predicted in the larger pool. The current downstream elevation of 497 feet is not anticipated to be significantly impacted by the proposed project. The final APE, however, including the APE for visual effects, will be arrived at through consultation with the VDHR as project alternatives are more fully developed.

## **6. General Description of Proposed Study**

This study will consist of three parts. First, an intensive (Phase II) architectural survey will be completed which includes the individual elements of the James River and Kanawha Canal Sites in Lynchburg, Virginia (VDHR ID# 118-0209). This includes the entire existing dam (water works dam and James River (Scott's Mill) Dam), water works canal, and guards locks. Second, the ruins of Scott's Mill, located on river left, will be recorded as an archaeological site. The site's potential for listing in the VLR and NRHP will then be coordinated with the VDHR. Third, archival research will be used to determine the potential for underwater archaeological sites in the APE. The results of this research will also be coordinated with the VDHR.

## **7. Study Methods**

All proposed work will be conducted pursuant to the National Historic Preservation Act of 1966 (as amended), the Archaeological and Historical Preservation Act of 1974, Executive Order 11593, and Title 36 of the Code of Federal Regulations, Parts 60-66 and 800 (as revised). All field survey and preparation of materials will be consistent with the procedures established by the U.S. Department of the Interior, National Park Service *Guidelines for Local Surveys: A Basis for Preservation Planning* and VDHR's *Guidelines for Conducting Historic Resources Survey in Virginia* (2011). Project personnel will meet or exceed the qualifications contained in the Secretary of the Interior's Professional Qualifications Standards (48 *Federal Register* 44738-44739).

### **Intensive Architectural Survey:**

Prior to beginning fieldwork, the senior architectural historian will complete the background research needed for this project. LU will examine records at the VDHR Archives, the Library of Virginia, the Virginia Historical Society, local historical societies, as well as Lynchburg City and Amherst County government records.

The reconnaissance-level survey will be completed by the senior architectural historian. The survey will include the exterior of all canal-related resources in

the APE. A site plan will be drawn of the resources, exterior photos taken and boundaries will be proposed.

#### Preparation of Survey Materials: VCRIS Entry, Photo Labeling, Digital Images, and Site Plans

The preparation of survey materials will include a site plan. The V-CRIS form for the resource will be updated with the information gathered during the survey. In addition, the photos and digital images will be prepared and labeled according to VDHR standards.

#### **Archaeological Studies**

LU's archaeological Principal Investigator will lead a reconnaissance level investigation of the Scott's Mill ruins. The investigation will result in recording the ruins in V-CRIS and assessing their potential eligibility for listing in the VLR and NRHP.

The Principal Investigator will also use archival sources and reconnaissance survey to determine the potential for the presence of underwater sites in the APE. The results of the archaeological studies will be presented in a report conforming to the VDHR's guidelines.

#### **8. Consistency with Generally Accepted Scientific Practice**

The proposed studies will adhere to all state and federal guidelines for cultural resources surveys, recording and assessments. Project personnel will meet or exceed the federal professional qualifications standards.

#### **9. Schedule**

LU anticipates conducting cultural resources studies in 2016. The architectural study, archival research and archaeological recordation of the Scott's Mill ruins will be completed in the first half of 2016.

#### **10. Results**

The results will form the basis for consultation and the preparation of a Programmatic Agreement (PA) and Historic Properties Management Plan (HPMP).

#### **11. Literature Cited/ References**

[www.lyncburgonline.com/history.html](http://www.lyncburgonline.com/history.html) (accessed on February 7, 2016).

2011 *Guidelines for Conducting Historic Resources Survey in Virginia*. Virginia Department of Historic Resources, Richmond.

# **STUDY PLAN 16 VISUAL RESOURCES**

## **1. Introduction**

Scott's Mill Dam has been in existence since the 1840s. Water has continuously flowed over the spillway since the dam was constructed. The local public can observe the flow over the dam from River Road and the 5<sup>th</sup> Street bridge immediately downstream of the dam. When the Scott's Mill Hydroelectric Project is completed, flow over the dam would occur about 25 percent of the time. LU plans to assess the effects of reducing the percentage of time when flow would no longer pass over the spillway.

## **2. Resource Management Goals and Objectives**

Although the Scott's Mill Dam is located in an industrial setting, a public interest goal would be to preserve the visual quality of the area to the extent possible.

## **3. Consultation with Agencies and Other Interested Parties**

LU discussed the need for a visual resources study during the December 2, 2015 Joint Meeting. No party disagreed on the need for this study.

## **4. Existing Information and Need for Additional Information:**

There is no existing information to document the visual resources of the project area, other than existing photos of the dam with water flowing over the spillway. To assess the visual effects of the project, LU will need to document the visual quality of flow over the spillway from key viewing areas (KVA) at various flow conditions.

## **5. Geographic Scope**

The geographic scope of the study will primarily be the Scott's Mill dam itself as seen from KVAs. The KVAs will be from River Road and the 5<sup>th</sup> Street bridge downstream of the dam. LU will also document the visual quality of the existing impoundment to assess visual effects from water level changes attributed to flashboard installation.

## **6. General Description of Proposed Study**

LU will document existing views from KVAs and assess changes to the visual resources from proposed powerhouse operations and flashboard installation.

## **7. Study Methods**

LU will photograph spillway flow during low flow, median flow, and high flow conditions. Low flow conditions will be defined as flows under 1,000 cfs. Median flows are flows at about 2,000 cfs. LU will document at least two high flow conditions of about 5,000 cfs and 12,000 cfs or higher. Flows about 12,000 cfs occur only about 5 percent of the time (i.e., about 17 days per year). Photographs will be taken from KVAs upstream and downstream of the project on River Road and from the 5<sup>th</sup> Street bridge, assuming they can be taken safely. For the impact analysis, LU will consider the change in views from having less flow over the spillway and no flow over the spillway about 75 percent of the time.

LU will also consider effects on the visual resources of the upstream water level changes as they may affect vegetation, particularly in the up to three foot fluctuation zone. This aspect of the study will draw upon the results of the terrestrial resources study (Study Plan 11). Based on the visual resources assessment, LU will consult with licensing participants to develop any mitigation measures deemed appropriate.

## **8. Consistency with Generally Accepted Scientific Practice**

Although the study will be somewhat qualitative in nature, it is consistent with studies done on other low head dams that have added hydropower.

## **9. Schedule**

LU will conduct the in 2016.

## **10. Results**

The results of this study will be presented in the draft license application.

## **11. Literature Cited/ References**

## **STUDY PLAN 17 DECOMMISSIONING**

### **1. Introduction**

American Rivers and the James River Association requested that LU conduct a decommissioning study as part of the licensing effort for the proposed Scott's Mill Hydropower Project. LU stated at the Joint Meeting that removal of Scott's Mill would only reopen about 3.8 miles of river and that the dam facilitates Lynchburg's emergency water supply. LU further stated that they would work with resource agencies to restore the diadromous fishery upstream of Scott's Mill and had thought that was the primary goal of non-government organizations and resource agencies. To fully return the James River to natural flow conditions would require the removal of seven dams within a 22 mile stretch of river. Nonetheless, LU agreed to include a decommissioning study as part of the license application process. LU proposed to work with NGOs and resource agencies to identify the advantages and disadvantages of removing Scott's Mill dam and removing the additional 6 dams upstream of Scott's Mill (i.e., Resuens, Holcomb Rock, Coleman Falls, Big Island, Bedford and Cushaw). Although LU will not propose decommissioning in its license application, it will do its best to present arguments for and against decommissioning in the application for FERC's decision-making.

### **2. Resource Management Goals**

Resource agencies have a goal to restore diadromous fish to the James River upstream of Boshers dam. Some licensing participants are interested in restoring the James River to a naturally flowing river. This would not be solely for restoring the fishery but would allow unimpeded river recreation on the James River. Other participants are interested in harnessing the renewable hydropower energy of the James River, providing water supply to local communities and allowing industrial use of the river (e.g., continued operation of Georgia Pacific's Big Island facility). The VDHR desires to protect the cultural resources of the James River.

### **3. Consultation with Agencies and Other Interested Parties**

LU has had informal discussions with state and federal resource agencies and other interested parties. American Rivers sent a letter to Luminaire Technologies in June 2015 suggesting that the dam owner consider decommissioning the dam. The issue was raised again on December 2, 2015 during the Joint Meeting.

#### **4. Existing Information and Need for Additional Information**

There is no information on decommissioning of the Scott's Mill Dam. The concept of decommissioning was raised during the relicensing of both the Reusens and Cushaw Projects. This information will be used to provide basic information for the study. Information on the advantages and disadvantages of decommissioning will need to be generated. Information from the fish passage study, sediment chemical analysis, cultural resources and recreation study will be used to identify potential benefits and impacts of dam removal. Impacts on water supply and flooding will be identified. Dam removal costs will need to be developed. These costs will be at a reconnaissance level. Energy and greenhouse gas effects will also be needed.

#### **5. Geographic Scope**

The geographic scope of the study includes the Scott's Mill Dam pool and the upstream six dams on the James River.

#### **6. General Description of Proposed Study**

This study will be a desktop study that describes advantages and challenges associated with dam removal.

#### **7. Study Methods**

This study will draw upon information gathered from other Scott's Mill licensing studies and other relicensing efforts on the James River. The study will consider advantages of dam removal including removal of only Scott's Mill dam and removal of all seven dams from Scott's Mill to Cushaw Dam. How dam removal will affect fish restoration and the timing of restoration will be assessed based upon the success of the current fish restoration program and through consultation with resource agency personnel. LU will assess how dam removal is consistent with the SCORP, including how boat navigation and fishing could be affected by removal of the dams.

Dam removal obstacles including regulatory issues associated with water rights, water supply, and FERC approval will be identified. Reconnaissance dam removal costs will be developed based upon removal of similar sized dams in the United States. Energy losses for each hydropower project will be tabulated and associated greenhouse gas emissions reductions that would be forgone would be estimated. Effects on water quality during dam removal will be estimated. Socio-economic effects associated with dam removal (e.g., industrial effects, job losses, job



additions, effects on water supply) will be summarized. Loss of cultural resources will be identified through consultation with the VDHR.

LU will work with American Rivers and the James River Association to identify the advantages and disadvantages of dam removal.

## **8. Consistency with Generally Accepted Scientific Practice**

The study will be consistent with other decommissioning studies conducted for FERC licensing projects for rivers in Virginia and neighboring states.

## **9. Schedule**

This study is scheduled to be complete within the first half of 2016.

## **10. Results**

The results of this survey will be presented in the license application. LU will not advocate for dam removal, but the information will be available for FERC to use in its National Environmental Policy Act (NEPA) document, which is expected to be an Environmental Assessment.