

***VIA ELECTRONIC FILING***

June 26, 2015

The Honorable Kimberly D. Bose, Secretary  
Federal Energy Regulatory Commission  
888 First Street, N.E.  
Washington, D.C. 20426

**SUBJECT: Hawks Nest Hydroelectric Project (FERC No. 2512-069)  
Glen Ferris Hydroelectric Project (FERC No. 14439-000)  
Summary of Updated Study Report Meeting**

Dear Secretary Bose:

Hawks Nest Hydro, LLC (“Hawks Nest Hydro” or “Licensee”), a subsidiary of Brookfield Renewable Energy Group, owns and operates the Hawks Nest Hydroelectric Project (Hawks Nest) (FERC No. 2512) and the Glen Ferris Hydroelectric Project (Glen Ferris) (FERC No. 14439) (collectively, the “Projects”) in Fayette County, West Virginia. Hawks Nest Hydro is pursuing new licenses from the Commission for the continued operation and maintenance of the Projects in accordance with the Integrated Licensing Process (ILP) defined at 18 CFR Part 5.

In accordance with 18 CFR § 5.15, Hawks Nest Hydro filed the Updated Study Report (USR) with the Commission on May 29, 2015. The timely filing of the USR was consistent with the requirements of the ILP and with the pre-filing process plan and schedule presented in Hawks Nest Hydro’s July 24, 2012 Pre-Application Document and in the Commission’s Scoping Document 1 and Scoping Document 2, dated September 20, 2012 and January 2, 2013, respectively.

The Commission’s regulations direct license applicants to convene a USR Meeting within 15 days of filing the USR. Therefore, concurrent with the May 29, 2015 filing of the USR, Hawks Nest Hydro filed notification that the USR Meeting would be held on June 11, 2015.

The USR Meeting was held as scheduled from 9:00 a.m. to 2:00 p.m. on June 11, 2015. The Commission’s regulations at 18 CFR § 5.15(c)(3) and (f) require Hawks Nest Hydro to file this summary of the USR Meeting, including any proposed modifications to ongoing studies or new studies proposed by the Licensee, within 15 days of the USR Meeting.

## **1.0 Purpose and List of Participants**

### **1.1 Purpose**

In accordance with 18 CFR § 5.15, Hawks Nest Hydro held a USR Meeting with the relicensing participants and the Commission staff to discuss the study results and the Licensee's or other participant's proposals, if any, to modify the study plan in light of the progress of the study plan and data collected.

The study plan approved by the Commission directed Hawks Nest Hydro to conduct 10 studies in support of relicensing the Projects:

- Water Quality Study
- Fish Entrainment Study
- Aquatic Species Composition and Abundance Survey
- Rare, Threatened, and Endangered Aquatic Species Study
- Bypass Reach Aquatic Habitat Use and Instream Flow Study
- Wetland and Riparian Habitat Survey
- Rare, Threatened, and Endangered Terrestrial Species Study
- Recreation Flow Assessment
- Recreation Use and Needs Assessment
- Cultural Resources Study

The following five studies were completed in 2014, and complete draft study reports were filed with the ISR on May 30, 2014:

- Water Quality Study
- Fish Entrainment Study
- Aquatic Species Composition and Abundance Survey
- Wetland and Riparian Habitat Survey
- Rare, Threatened, and Endangered Terrestrial Species Study

The results of these studies were presented at the ISR meeting on June 12, 2014. No study modifications were made or required by FERC subsequent to comments received at or following the ISR meeting, and no changes were made to the draft study reports. As such, the studies listed above were not discussed at the USR meeting, and the USR meeting focused on the studies listed below:

- Rare, Threatened, and Endangered Aquatic Species Study
- Bypass Reach Aquatic Habitat Use and Instream Flow Study
- Recreation Flow Assessment
- Recreation Use and Needs Assessment
- Cultural Resources Study

The specific objectives of and information presented by Hawks Nest Hydro and HDR at the USR meeting were as follows:

- Present results of the relicensing studies listed above;
- Present any upcoming or ongoing study activities (not applicable, as all studies are complete);
- Review the relicensing schedule for the Projects; and
- Allow for input on any proposed study modifications and/or proposals based on the results and data provided at the meeting.

## 1.2 Participants

Concurrent with the May 29, 2015 filing of the USR, resource agencies, Tribes, non-governmental organizations, and other interested parties were invited to participate in the USR Meeting. Table 1 presents the meeting participants and their respective organization/affiliation.

**TABLE 1  
 HAWKS NEST AND GLEN FERRIS PROJECTS USR MEETING PARTICIPANTS**

<b>Participant</b>	<b>Organization / Affiliation</b>
Dave Bassage	ACE Adventure Resort
Kevin Colburn	American Whitewater
Steve Keenan	Beckley Newspapers
Courtney Wait	New River Conservancy
George Santucci	New River Conservancy
Russ Lang	WVA Manufacturing, LLC
Bobby Bower	West Virginia Professional River Outfitters
Monir Chowdhury*	FERC
John Mudre*	FERC
Allyson Conner*	FERC
Jeremy Bailey	Brookfield
Jeff Morton	Brookfield
Steven Murphy	Brookfield
Jarvis Caldwell	HDR
David Culligan	HDR
Sarah Kulpa	HDR
Mary McCann*	HDR
Rob Quiggle	HDR
Ty Ziegler	HDR

\*Indicates participation via conference call.

## 2.0 Summary of Updated Study Report Meeting

As noted above, Hawks Nest Hydro and HDR presented information regarding the relicensing process, approved pre-filing schedule, and study results. This information is summarized in the

presentation attached to this USR Meeting Summary. The following sections summarize the information presented and the discussion/questions in regards to the approved studies.

## **2.1 Introduction**

Steve Murphy (Brookfield) provided an introduction to the meeting, including Brookfield's relicensing team, the purpose of the meeting, and an overview of the relicensing process and ILP milestones to date and next steps. At the introduction and at the close of the meeting Steve Murphy and Sarah Kulpa (HDR) further explained the opportunities and timeframes for filing comments or disputes in response to the USR and USR Meeting Summary.

Steve also presented the proposed agenda for the meeting, which was subsequently revised to accommodate the requests of meeting participants and to cover additional studies in the morning, as the schedule allowed.

## **2.2 Recreation Flow Assessment**

Rob Quiggle (HDR) presented the objectives, methods, and results for the Recreation Flow Assessment.

- This study is complete, and the draft study report was filed with the USR.
- Rob stated that the study area primarily focused on existing and potential whitewater opportunities in the Hawks Nest Project bypass reach.
- As provided by the approved study plan, the primary tasks for this study consisted of six controlled whitewater releases (500, 1000, 1500, 2000, 2500, and 3000 cfs) into the Hawks Nest bypass reach and an extended whitewater evaluation.
- Rob noted the considerable coordination and communications that were required to conduct the controlled flow releases in the summer of 2013 and the spring of 2014 and thanked the Recreation Flow study working group for their participation in this process, as well as the local whitewater outfitters who provided logistical support.
- Three surveys were administered for the controlled flow releases: a Pre-Run Survey, Post-Run Survey, and Comparative Flow Survey. Rob presented some key findings from each survey and directed meeting participants to the draft study report for additional information.
- Rob provided an overview of the extended whitewater evaluation and noted that only one individual elected to complete the extended whitewater evaluation survey.
- The surveys administered for this study also provided an opportunity for controlled whitewater release participants to provide recommendations for put-in and take-out access to and potential recreational facility enhancements for the study area. Rob

presented the list of recommendations received and noted that recreational facility enhancements, including these recommendations, would be discussed further during the Recreation Use and Needs Assessment presentation.

- Rob noted that one of the objectives of the study was to determine the number of days per month that the minimum and optimal flows for whitewater boating are available under the current project operation. A table of average number of days per month that flows suitable for recreation are exceeded in the bypass reach (based on historical hydrological data) is provided in the study report.
- During open discussion, George Santucci of the New River Conservancy (NRC) noted that the statement was made during the presentation that the majority of the study participants were of expert whitewater ability, and that the majority of participants preferred or deemed suitable for recreation flows in or above the higher range of the controlled whitewater releases. George pointed out that the higher flows were observed to be safer, and that this preference is not necessarily tied to ability. Dave Bassage (ACE Adventure Resort) added that the controlled whitewater release range may be appropriate for novice rafters, so long as they were accompanied by an expert guide. Kevin Colburn of American Whitewater (AW) expressed support for these points and noted that it is common during whitewater studies for expert participants to make judgments for other users. Both Kevin and Steve Murphy noted that based on experiences with other whitewater studies, it is not surprising (and indeed, a best practice) that the experience level of the participants skewed high.
- Dave Bassage stated that the characterization of the minimum acceptable flows for whitewater (1,500 or 2,000 cfs) seemed accurate, though the optimal flows were potentially higher than the range of the controlled whitewater releases.
- Kevin noted that in general the study seemed robust and in line with industry standards and that AW would be filing comments on the study report.
- FERC Recreational Resources staff (Allyson Conner) suggested that the final study report include clarifications on how each of the study objectives was addressed through the Recreation Flow Assessment and where that information is specifically included in the study report.

### **2.3 Recreation Use and Needs Assessment**

Sarah Kulpa presented the objectives, methods, and results for the Recreation Use and Needs Assessment.

- This study is complete, and the draft study report was filed with the USR.
- Sarah stated that the study area primarily focused on existing and potential recreation facilities and opportunities in or immediately adjacent to the Hawks Nest and Glen Ferris

project boundaries. The study report also provides information about recreational opportunities and amenities in the surrounding region; this provides the context for assessment of needs for additional recreational measures or enhancements at the Projects.

- One of the first activities completed for this study was consultation with the Recreation Use and Needs Assessment working group to develop a map of popular bouldering and climbing locations in the vicinity of the bypass reach, along with known whitewater rapids, river access, and parking locations. Sarah requested that meeting participants let this group know if there are other recreation areas or uses at the Projects that have not been suitably addressed by this study.
- Sarah described the data collection components of this study, including the recreation facility inventory, supplemental recreation facility data collection, County Resident Survey, Recreation Activities and Facilities Survey, and Area Event Survey.
- Sarah noted that much of the river access and recreation at the Hawks Nest and Glen Ferris project boundaries is concentrated at areas managed by the West Virginia Department of Natural Resources (WVDNR).
  - Access to the Glen Ferris reservoir is one exception. Boat access to the Glen Ferris reservoir is typically provided by the launch at the New River Campground, or the steep paved launch further downstream. This group was unaware who owns the land on which the informal launch is located or who performs any maintenance at this area, though the launch area does appear to be used.
    - Bobby Bower of the West Virginia Professional River Outfitters (WVPRO) pointed out that access to the Glen Ferris reservoir is also provided by the Town of Gauley Bridge's informal access area at the confluence of the Gauley and New Rivers.
  - Steve Murphy added that one of the common comments received on the surveys administered for this study was the recommendation that the shoreline at the Kanawha Falls recreation area be cleared of vegetation. In visiting this site recently, Brookfield and HDR observed signage at the site that indicates the WVDNR is presently allowing vegetation to reestablish along the shoreline for erosion protection.
- Dave Bassage noted that many visitors to the Cotton Hill Bridge area use this area for river access, not just for kayaking during higher flow events but also for swimming during low flow periods.
  - Steve Murphy emphasized the importance Brookfield places on public safety at its projects. Steve noted that there are numerous warning signs in place (as well as

an active siren warning system), but this does not preclude occasional river rescues.

- Dave noted that these types of events or safety incidents are typically not the result of activities by private skilled boaters or outfitters. Steve agreed but noted that Brookfield appreciates any help that the local whitewater community or other recreational interest groups can provide educating recreational users and visitors of the need to obey warning sirens and safety signage in the Hawks Nest bypass reach.
- Bobby Bower pointed out recreational users of the bypass reach commonly rely on the rule of thumb that the flows in the bypass reach will be approximately that of upstream USGS gauges minus the station capacity (about 10,000 cfs). Bobby stated that changes in typical operations (e.g., if a unit is non-operational) not communicated to the public or such users can present a safety issue. To this end, Bobby emphasized that WVPRO and others would appreciate public notice of operational changes that may impact flows in the bypass reach and additional real-time data about actual flows (i.e., USGS Hawks Nest Dam gauge display flow in cfs instead of just stage). The group discussed potential means to communicate this type of information (e.g., American Whitewater site) as well as the importance of maintaining the operational flexibility needed to account for load changes by the powerhouse or WVAM facility. Sarah noted the role of the existing recreation season ramping rate and impoundment level requirements to preserve this flexibility.
- Three qualitative surveys were administered for the Recreation Use and Needs Assessment (in addition to the numerous surveys conducted for the Recreation Flow Assessment): the General Recreation Visitor Questionnaire (i.e., survey boxes at Kanawha Falls and Cotton Hill Bridge parking area), County Resident Survey, Recreation Activities and Facilities Survey, and Area Event Survey (New River Rendezvous rock climbing festival). Sarah presented some key findings from each survey and directed meeting participants to the draft study report for additional information.
- Sarah described how the various Recreation Use and Needs Assessment surveys provided opportunities for participants to recommend enhancements to recreational access or improvements to the existing recreational facilities at the Projects and presented the most commonly recommended measures, as well as measures recommended during the Recreation Flow Assessment. The group further discussed these and additional measures, as summarized in the bullets below.
  - Dave Bassage noted that WVDNR has in the past placed trash cans at the Cotton Hill Bridge Day Use Area (parking area), and that has made a big difference, so long as the trash cans are regularly emptied. The WVDNR is responsible for this.

- Kevin Colburn voiced the need for improvements to the existing trail and whitewater put-in access right below Hawks Nest Dam. Kevin stated that the Recreation Flow Assessment showed there are some good rapids up near the base of the dam, and whitewater boaters would like to be able to drive up the road (dam access road currently closed to unauthorized vehicles). AW is interested in pursuing a more direct option to get down to the dam (i.e., either vehicle drop off to the existing trail, or potentially development of a more direct trail) and would be willing to contribute design ideas or suggestions.
  - Dave Bassage noted that the National Park Service's Cunard access in the New River Gorge would be a great example. Something for Hawks Nest may not necessarily be as elaborate, but this could be a good starting point.
  - Steve noted that vehicular access is a concern from a safety perspective, as the access road is essentially one lane (with a very steep drop off on one side) and there are no guardrails installed. Steve also noted that in 2014 a pedestrian was seriously injured after falling from the road down the steep embankment.
  - Kevin added that an improved put-in at the dam may be appropriate only for kayakers, with rafts entering downstream at Cotton Hill. Kevin restated that identifying a means or providing improved access to below the dam is important, as this would facilitate whitewater on an additional portion of the bypass reach.
  - Dave Bassage raised idea for a whitewater play area below the dam, which may be suited for lower flow releases (e.g., 500 cfs).
- Kevin asked if there would be future opportunities to discuss and evaluate collaborative proposals for the relicensing of the Hawks Nest and Glen Ferris Projects and offered that this summer would be a good time for such discussions. Steve explained that Brookfield has not identified additive consultation (beyond that required by the ILP) at this time, and that one significant challenge for these projects is that the major agencies are not currently very involved. Bobby noted that he had met recently with the Director of WVDNR and was assured there would be WVDNR involvement.
- Allyson Conner of FERC indicated that she did not have any comments or questions on the Recreation Use and Needs Assessment.

## **2.4 Rare, Threatened, and Endangered Aquatic Species Study**

Ty Ziegler (HDR) presented the objectives of, methods for, and results of the Rare, Threatened, and Endangered (RTE) Aquatic Species Study. In addition to Ty, Mary McCann (HDR), the

study lead and a Senior Aquatic Scientist, participated by phone and rounded out the discussion and responded to questions during the presentation.

- This study utilizes data collected from other studies, in particular the Aquatic Species Composition and Abundance Survey.
- Ty provided a high level summary of the study results and referred meeting participants to the RTE Aquatic Species and Aquatic Species Composition and Abundance Survey study reports for detail.
  - No federally listed RTE aquatic species (fish, benthic macroinvertebrate, or eastern hellbender) were documented during the Aquatic Species Composition and Abundance Survey.
  - Numerous WV Natural Heritage Program RTE aquatic species were documented in the 2013 aquatic species surveys, including several species of mussels that were found within a mussel bed located in the Glen Ferris reservoir.
  - Bigmouth chub, which is listed by WVDNR as a rare and endemic species to the New River drainage, was captured during the fish survey in the Hawks Nest reservoir and the upper Hawks Nest bypass reach.
  - Additionally, two shovelnose sturgeon were captured below Kanawha Falls during this survey. Shovelnose sturgeon and the paddlefish (both federal species of concern) are known to be present in the Kanawha River. (No paddlefish were captured during this survey.) The shovelnose sturgeon is federally listed as threatened in river systems where the distribution overlaps with the endangered pallid sturgeon due to their similarity in appearance. However, it is not federally protected in the New or Kanawha River system since pallid sturgeon do not occur here. Currently, an ongoing reintroduction program is in place by the WVDNR to stock and reintroduce the shovelnose sturgeon and paddlefish to the Kanawha River. However, both shovelnose sturgeon and paddlefish are not expected to occur upstream of Kanawha Falls, as it is a natural barrier that hinders the upstream migration of fish.
- Ty reminded the group that, with WVDNR concurrence, the studies did not include a survey of the dense mussel bed below Kanawha Falls, which is known to support 28 mussel species (including the federally endangered pink mucket and sheepsnose), as this bed is actively monitored and managed by WVDNR. Mary noted that The Kanawha Falls mussel bed is one of DNR's long-term monitoring sites and is considered to be a healthy one. Indeed, the DNR have translocated endangered mussels from other locations to this bed and monitoring has shown they are doing well and reproducing.

- In response to a question from George Santucci, Ty clarified that no sampling was done in the tributaries to the New or Kanawha Rivers. George noted mussels may be present in the tributaries.
- Mary clarified that the points shown on the map of sampling locations represent an approximate centerpoint to the larger area surveyed, and not a discrete sample point.
- Kevin Colburn asked if any reference reaches or rivers were looked at as part of this study for comparison of the bypass reach to an unregulated reach. Mary responded that we had not, as this was not part of the scope of the approved study plan, though the literature review portion of this and the Aquatic Species Composition and Abundance Survey did include information about mussels and other aquatic species in the upper New River.
  - As described in the PAD and study reports, Mary described the New River as generally depauperate of mussels, and that where mussels occur they tend to be low diversity. In contrast, the Kanawha River is known to support a diverse assemblage of freshwater mussels. The group discussed the role of Kanawha Falls as a natural barrier to upstream migration.
- Mary and Ty explained the favorable physical conditions that occur where the mussel bed in the Glen Ferris reservoir was found (near the Gauley confluence) and noted that prior to the field survey HDR's subconsultant for this study (and WV mussel expert) John Alderman predicted that mussels may be found there.
  - Ty and Mary reminded the group that, as described in the USR and study report, no quantitative sampling was conducted at the Glen Ferris reservoir mussel bed based on consultation with WVDNR that they preferred the bed not be disturbed, particularly since there was evidence of recent reproduction.
- Ty and Mary characterized potential mussel habitat in the Hawks Nest bypass reach. High seasonal / scouring flows significantly affect this reach, which is dominated by bedrock and boulder substrate, though the reach does contain limited pockets of suitable mussel habitat. Additionally, mussel host fish species do occur upstream of Kanawha Falls and in the bypass reach.
  - Kevin noted that gravel supplementation was found to be appropriate at other projects where high gradient systems (like the Hawks Nest bypass reach) keep material moving and made the point that it may be the case that if there is no sediment source then there is no substrate.
- FERC Aquatic Resources staff (John Mudre) indicated that he did not have any questions or comments on this study, which he noted seems straightforward.

## 2.5 Cultural Resources Study

Rob Quiggle presented the objectives of, methods for, and results of the Cultural Resources Study.

- Rob described the role of HDR's subconsultant, Cultural Resource Analysts, Inc. (CRA) in performing the surveys described below.
- Rob reviewed activities completed for this study, including consultation with the West Virginia State Historic Preservation Office (WVSHPO) and Tribes to define the Area of Potential Effect and the completion of the Phase 1 Archaeological Identification Survey ("Phase I Survey") and a Cultural Historic Survey.
- Rob noted that final reports for the Phase 1 and Cultural Historic Surveys were filed with FERC on June 9, 2015, but in accordance with FERC's regulations were filed as Privileged and are not publically available.
- Rob noted that the Phase 1 Survey included a geomorphological assessment.
- Rob provided a high level summary of the survey results.
  - The Phase 1 Survey identified 12 archaeological sites within the APE:
    - Two prehistoric period resources were identified during previous cultural resources studies that were not associated with the Projects, and one prehistoric period archaeological site was identified by CRA during field investigations conducted in 2013.
    - Of these three prehistoric archaeological sites, one has previously been recommended as ineligible for inclusion in the National Register of Historic Places (NRHP), and the NRHP eligibility of the remaining two prehistoric period archaeological sites has not been evaluated.
    - CRA also identified nine historic period archaeological sites within the APE during the Phase I archaeological identification survey. The NRHP eligibility of these historic period archaeological sites has not been evaluated; however, data collected by CRA indicates that one of these sites lacks integrity and therefore may be ineligible for the NRHP.
  - The Cultural Historic Survey identified eight architectural resources, including one architectural resource previously listed on the NRHP and seven additional architectural resources that are recommended as eligible for the NRHP. The existing historic property within the APE is a portion of the Hawks Nest State Park Historic District that contains no contributing resources, but is considered to be part of the park setting.

- The seven additional architectural resources within the APE recommended by CRA as eligible for the NRHP include three resources that are within the APE but are not Project facilities or associated with the Projects' operations: the Hawks Nest State Park Gondola Landing and Nature Center, and the Chesapeake and Ohio Railroad Bridge at Hawks Nest.
- The remaining four architectural resources within the APE were recommended by CRA as eligible for the NRHP as part of two historic sites: the Glen Ferris Development Historic Site and the Hawks Nest Development Historic Site. These sites include the primary elements of Hawks Nest and Glen Ferris, including the Hawks Nest Tunnel.
- Rob described how Hawks Nest Hydro consulted with Indian tribes over the course of this study to identify any additional information regarding properties of traditional religious or cultural significance that may be located within the Projects' APE. No party has identified any TCPs within the Projects' APE.
- Rob noted that the Projects are not adversely affecting any of the historic architectural resources or archaeological sites within the APE. Therefore, CRA recommended that Hawks Nest Hydro develop an HPMP to provide for the protection and appropriate management of historic architectural resources within the APE during the term of the new license (or licenses) in consultation with the WVSHPO and other parties, as appropriate. Rob noted that the WVSHPO has concurred with the recommendations of the survey reports.
- Rob explained that Hawks Nest Hydro intends to develop an HPMP that will describe appropriate management measures for archaeological and historic resources within the APE and expects to file the HPMP with FERC later this year, in accordance with the guidelines of FERC and the Advisory Council on Historic Preservation.
- Allyson Conner, who is also FERC's team lead for Cultural Resources, asked if any further work was planned to determine the NRHP eligibility of the identified resources. Rob replied that Hawks Nest Hydro did not plan to pursue NRHP listing, as under the HPMP the properties will be treated and managed as NRHP-eligible.
- Allyson also asked for clarification regarding the APE and the FERC project boundary (i.e., whether the resources or sites within the APE are also within the project boundary). Rob stated that the APE was defined to include all lands within the FERC Projects' boundaries and any lands outside of the Projects' boundaries where cultural resources may be affected by project-related activities that are conducted in compliance with the FERC license(s). Sarah Kulpa added that the project boundary used to determine the APE was based off of the existing FERC Exhibit G, which is being reproduced in accordance with FERC's current guidelines and requirements as part of the new license applications. Sarah added that statements as to whether sites or resources are within the FERC project boundaries can be included in the Exhibit E of the license applications.

## **2.6 Bypass Reach Aquatic Habitat Use / Instream Flow Study**

Jarvis Caldwell (HDR) presented the objectives of, methods for, and results of the Bypass Reach Aquatic Habitat Use / Instream Flow Study (“Instream Flow Study”).

- The objective of this study is to provide information for an analysis of Project effects on aquatic habitat in the bypass reach to determine whether additional flows are needed.
- Jarvis presented an overview of the Instream Flow Study process, which consists of three major phases: study design and data collection, hydraulic modeling, and habitat modeling. An illustrative handout was also distributed, with an excerpted figure (process flowchart) from the study report. Jarvis noted that significant detail is included in the study report and while today’s presentation is intended to provide a fairly high level overview, because of its complex nature, this study requires a fairly “deep dive” into detail to provide even an overview.
- Jarvis reviewed the process and criteria for selection of the 2D study site (the Cotton Hill study site, located just downstream from the Cotton Hill Bridge), which was also presented and discussed at the ISR meeting last year.
- Jarvis explained the methods, quality control measures, and results of the three main parts of the field data collection component for the Instream Flow Study:
  - Bed topography, including LiDAR data, bathymetric survey, and topographic survey. (In response to a question, Jarvis clarified that the LiDAR data was matched to field locations through standard surveying techniques, including the establishment of benchmarks for the study area and RTK to survey all elements in the same network.)
  - Substrate and cover mapping.
  - Site discharge and calibration measurements. (Jarvis noted that a 2D study such as this one requires significantly more model calibration than would be done for a 1D study.)
- Jarvis described the methods and technical specifications for the hydraulic modeling component of the Instream Flow Study, which was conducted using River 2D, a widely and commonly used and publically available program. Jarvis noted that other models are available, but River 2D can perform the habitat computation needed for this type of study.
  - Jarvis noted that topography is the primary variable for a good model, and the point density achieved for the Instream Flow Study was better than industry standard.

- Jarvis explained how the computational mesh is built on top of the topographic surface, to facilitate depth and velocity calculation. Jarvis clarified that the model allows for a variable mesh, so a lot of detail could be included for areas of topographic complexity/heterogeneity (e.g., cascades). George Santucci asked if the mesh fluctuates with flow level. Jarvis explained that the mesh is developed based on the highest flow to be modeled (in this case 2,000 cfs) and the process of “wet refinement” that was used, which entails starting with one base mesh but refining it through the flow simulation process.
- Jarvis briefly explained the model calibration process, noting that the model calibration for this study exceeded stated and industry standards for mean error in water surface elevations.
- Next, Jarvis described how a series of 18 flows from 100 to 2,000 cfs were modeled and the development of a site-specific rating curve to provide accurate water surface elevations over a range of simulations. George asked if this curve was the same as that developed in support of the Recreation Flow Assessment. Jarvis clarified that the curve is similar but was developed for a location at the downstream end of the study site (and, as such, a different channel shape). Jarvis described how the model propagates water upstream starting at the downstream end of the 2D study site.
- Jarvis presented the target species and guilds that were modeled for the Instream Flow Study and described how this list, and corresponding Habitat Suitability Criteria (HSC), were identified. Jarvis explained that HSC are based on variables that define habitat requirements for a species, including depth and velocity, instream cover, and bottom substrate. HSC values range from 0 (unsuitable) to 1 (preferred, or very suitable).
  - John Mudre pointed out a typo in the presentation in that the Claytor Project is located in Virginia.
  - Kevin Colburn asked if the HSC used as the input to the River 2D model for this Instream Flow Study had ever been field tested (as part of this or other studies). In response, Jarvis explained how HSC are typically developed (based on observations of at least 250 individuals, then tested). The HSC selected for use in this study were the most suitable candidates as they were developed for the New River or similar rivers in the region and tested as part of those processes.
- Jarvis further explained Weighted Usable Area (WUA) and its role in this Instream Flow Study. In response to a question, Jarvis clarified that the location of substrate in the model does not change over a range of flow, though as flows increase more substrate becomes inundated and usable.
  - Jarvis explained how WUA is used in both 1D and 2D models. In 1D models, WUA is applied to a transect and how much area the transect represents (of the

study reach). In 2D, WUA represents a single node, and the summation of WUA for these single nodes represent a site or habitat index.

- In response to a question from Courtney Wait (NRC), Jarvis explained that WUA were calculated for each of 18 simulation flows (and that results can be interpolated between flows in this range).
- Jarvis pointed out that the WUA calculation is a static relationship between flow suitability and flow magnitude (i.e., a single flow at a single time) and that to evaluate changes in habitat over time, a time series of hydrologic data must be integrated with WUA (to generate a “Habitat Time Series”). Jarvis explained the Habitat Time Series analysis performed for this study, based on the period 1989 to 2013. As explained during the presentation, the Habitat Time Series is analogous to a flow hydrograph, except it conveys change in habitat over time.
- With respect to the periodicity charts presented in the slides and study report, which convey when life stages of species are present in the reach (based on the three previously cited studies), Jarvis and Ty Ziegler noted that the practice for this study was to err on the side of caution and assume a life stage is present throughout an entire month, even if that life stage may likely only be present for a portion of a month.
- George asked if any modeling was conducted or considerations otherwise given to mussels. Jarvis noted that mussels were not specifically addressed by this Instream Flow Study. Jarvis explained that the primary concern for mussels is that they stay wetted. Mary McCann reiterated this point and noted that it is extremely difficult to develop HSC curves for mussels, and that the permanently wetted area and suitable substrate are stronger drivers for mussels. Mary reminded the group that mussels require stable, mixed substrate and noted that some researchers have attempted to account for complex hydraulic parameters and the sediment interface in instream flow modeling, but that she has rarely seen this done successfully. George noted that NRC is interested in mussel habitat that may be present all the time if the baseflow were significantly higher (e.g., 1,000 cfs).
- Jarvis talked the group through the Habitat Time Series analysis (daily analysis, exceedance curves and bar charts for habitat). He also explained habitat modeling results in terms of habitat suitability for individual species and life stages (e.g., Appendix C of the study report). Using the example of common shiner, Jarvis explained how habitat shifts around within the range of modeled flows.
  - Kevin asked if the suitability as shown in these figures was due only to depth and/or velocity. Jarvis explained this is correct if substrate is not limiting and that while not indicated on these figures, it would be possible to determine if depth or velocity were the limiting factor by drilling into detailed model output, and that depth, velocity, and substrate suitability could be modeled individually if desired.

- In response to a follow up question/comment from Kevin regarding changes in velocity over the depth of the water column, Jarvis clarified that this is a depth average model, and there are no 3D hydraulic habitat models available to his knowledge that can account for variable velocity with depth at this time. This is one reason models like this are not used for mussels, because velocity would not be calculated for the streambed versus upper layer. Kevin pointed out this is a limiting factor for these types of flow studies. Jarvis acknowledge the limitation but noted that the existing (2D) model is a major leap forward from the 1D model for the previous relicensing, and that the current instream flow body of knowledge/state of practice is not yet at the level of allowing for examination of “slices” of a point. Jarvis further reminded the group that River 2D is a widely used tool.
- Jarvis talked the group through example WUA curves developed during habitat modeling for this study and noted that these curves provide a magnitude of habitat but not a corresponding indication of the quality of the habitat or where it occurs.
- Jarvis briefly reviewed the Habitat Time Series summary tables included in the study report, which were developed to present the percent difference in habitat availability when comparing wet and dry and normal years to the period of analysis. The magnitude and direction of changes in habitat availability differ across species and life stages. Jarvis further reviewed how to read the graphical presentation of the Habitat Time Series results included in the draft study report (bar charts).
  - George asked if any attempt had been made to verify model assumptions/output with actual field sampling, or to otherwise validate the HSC used versus the real world “results”. Jarvis explained that limited attempts have been made at other projects (particularly in the west) to monitor species composition following a change in flow regime.
  - George asked if anything further might be done for this model, e.g., utilizing data collected by Hawks Nest Hydro and WVDNR to validate the model output either in the near-term or over longer/future periods of time. Jarvis explained that there is no way to do this at this time without significant further study, such as identification of a similar river where a flow regime had changed that may have in turn caused geomorphological change, performing additional or updated fishery sampling, and trying to understand why changes may have occurred. Jarvis acknowledged the challenge of adopting a continuously adaptive management program to adjust flows for varying desired outcomes and objectives.
  - Dave Culligan emphasized that the existing Instream Flow Study had been executed in full accordance with the FERC-approved study plan and expressed concern with the notion of continuous study. George noted that NRC may recommend or request examination of additional data collection, potentially by

others or agencies, but that first and foremost NRC is currently trying to gain a more in depth understanding of the subject study.

- Kevin asked if the model accounted for only average conditions, or also acute events (or “bottlenecks”). Jarvis explained that the model is designed to be able to analyze any period of time, and tease out these types of impacts. He reiterated that extended low flow summer conditions would be accounted for as they occurred in the historical hydrology dataset. Jarvis also pointed out that model results are fairly speculative at very high river flows (above the model range) as the HSC input data were not developed during flood conditions.
- Jarvis briefly compared the framework for the current instream flow study to the 1D instream flow study conducted for the previous relicensing, which did notably include a transect in the 2D study site. Jarvis noted that while the previous study was state-of-the-art at the time, the current 2D study addresses some of its major limitations, including the 1D study’s inability to account for substrate and lack of a habitat time series component.
- In response to a question from Kevin, Jarvis noted that the model results or output for a range of flows are presented in the draft study report.

## **2.7 Closing**

Sarah Kulpa reminded study participants about the deadlines for comments on the USR and USR meeting summary and encouraged participants to file comments earlier or contact Brookfield directly to discuss any comments or recommendations that would be potentially addressed in the draft license applications.

## **3.0 Conclusion**

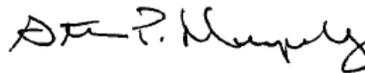
Hawks Nest is filing this USR Meeting summary in accordance with 18 CFR § 5.15. As provided in 18 CFR §§ 5.15(c)(4) and (f), any participant or the Commission’s staff may file a disagreement concerning Hawks Nest Hydro’s meeting summary within 30 days of the filing of this meeting summary (on or before July 26, 2015).

Any such filing must set forth the basis of the disagreement and must also include any modifications to ongoing studies or new studies proposed by the Commission staff or other participants. Pursuant to the ILP, proposals for modifications of approved studies must meet the criteria described at 18 CFR § 5.15(d) of the Commission’s regulations. Any request for new or proposed studies must be accompanied by a showing of good cause why the proposal should be approved, and must include, as appropriate to the facts of the case, a statement explaining the items listed below, except that at this stage the proponent must demonstrate extraordinary circumstances warranting approval:

- Any material changes in the law or regulations applicable to the request;
- Why the goals and objectives of any approved study could not be met with the approved study methodology;
- Why the request was not made earlier;
- Significant changes in the Project proposal or that significant new information material to the study objectives has become available; and
- Why the new study request satisfies the Commission's criteria for study requests under the ILP, found at 18 CFR § 5.9(b).

As always, I welcome the opportunity to further discuss these matters with the Commission further. Should you have any additional questions or concerns, please do not hesitate to contact me at (315) 598-6130.

Very truly yours,



Steven P. Murphy  
Manager, Licensing

Attachment