BROAD RIVER SPINY CRAYFISH
CAMBARUS SPICATUS
STUDY PLAN

PARR HYDROELECTRIC PROJECT
(FERC NO. 1894)

Prepared for:

South Carolina Electric & Gas Company
Cayce, South Carolina

Prepared by:

Kleinschmidt

Lexington, South Carolina
www.KleinschmidtUSA.com

January 2014

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1.0 INTRODUCTION

South Carolina Electric & Gas Company (SCE&G) is the Licensee of the Parr Hydroelectric Project (FERC No. 1894)(Project). The Project consists of the Parr Hydro Development and the Fairfield Pumped Storage Development. Both developments are located along the Broad River in Fairfield and Newberry Counties, South Carolina.

The Project is currently involved in a relicensing process which involves cooperation and collaboration between SCE&G, as licensee, and a variety of stakeholders including state and federal resource agencies, state and local government, non-governmental organizations (NGO), and interested individuals. The collaboration and cooperation is essential to the identification of and treatment of operational, economic, and environmental issues associated with a new operating license for the Project. SCE&G has established several Technical Working Committees (TWC's) with members from among the interested stakeholders with the objective of achieving consensus regarding the identification and proper treatment of these issues in the context of a new license.

During issues scoping, the TWC identified the potential need for a crayfish survey dependent upon discussions with U.S. Fish and Wildlife Service ("USFWS"). Based upon communications with the USFWS on June 6, 2013, the Broad River Spiny Crayfish (*Cambarus spicatus*), a South Carolina species of special concern, may be located within the Project area. As such, crayfish surveys were recommended to document the presence of this species within the Project area and downstream of the Parr Shoals Dam.

2.0 RELEVANT LIFE HISTORY INFORMATION

As noted, the Broad River Spiny Crayfish (*Cambarus spicatus*) is a species of concern in South Carolina. Eversole (1990) identified *C. spicatus* as having a distribution limited to lotic environments in the Broad River drainage basin. *C. spicatus* collections in the vicinity of the Project occurred within the Little River, a tributary to the Broad River, in Fairfield County. Although *C. spicatus* collections are limited, individuals were primarily associated with leaf litter and other organic debris located along the banks of streams. Preferred substrates have been found to be comprised primarily of sand and tend to be unstable in nature with a lack of rooted aquatic vegetation. Current information indicates that *C. spicatus* reproduces during the summer months (Eversole, 1990). *C. spicatus* was described by Hobbs (1956) as gray-green with cream, pink, purple and brown highlights. The chelae (the "claw" or "pincer") are green with orange tips and a double row of tubercles. Individuals range from about 60 mm (2.4 inches) to 78 mm (3.1 inches) in length.

3.0 STUDY OBJECTIVES

The objective of this survey is to assess the status of *C. spicatus* in the portion of the Broad River located within the Project boundary and an accessible area downstream of the Parr Shoals Dam.

4.0 GEOGRAPHIC AND TEMPORAL SCOPE

Based upon the life history information identified above, sampling sites will be located along the margins of the Broad River and associated tributaries, in areas of leaf litter/detritus, if possible. At least three sampling areas are proposed to be included as a part of this survey. General locations are listed in Table 1 and in Figure 1, below. These locations are approximate and actual sampling sites will be determined in consultation with USFWS prior to start of survey.

TABLE 1 BROAD RIVER CRAYFISH SAMPLING LOCATIONS

	SAMPLING AREAS
1.	Main Reservoir
2.	Broad River Downstream of Parr Shoals Dam
3.	Hwy 34 Boat Ramp

The study season will extend from September 1 through November 1, 2015.

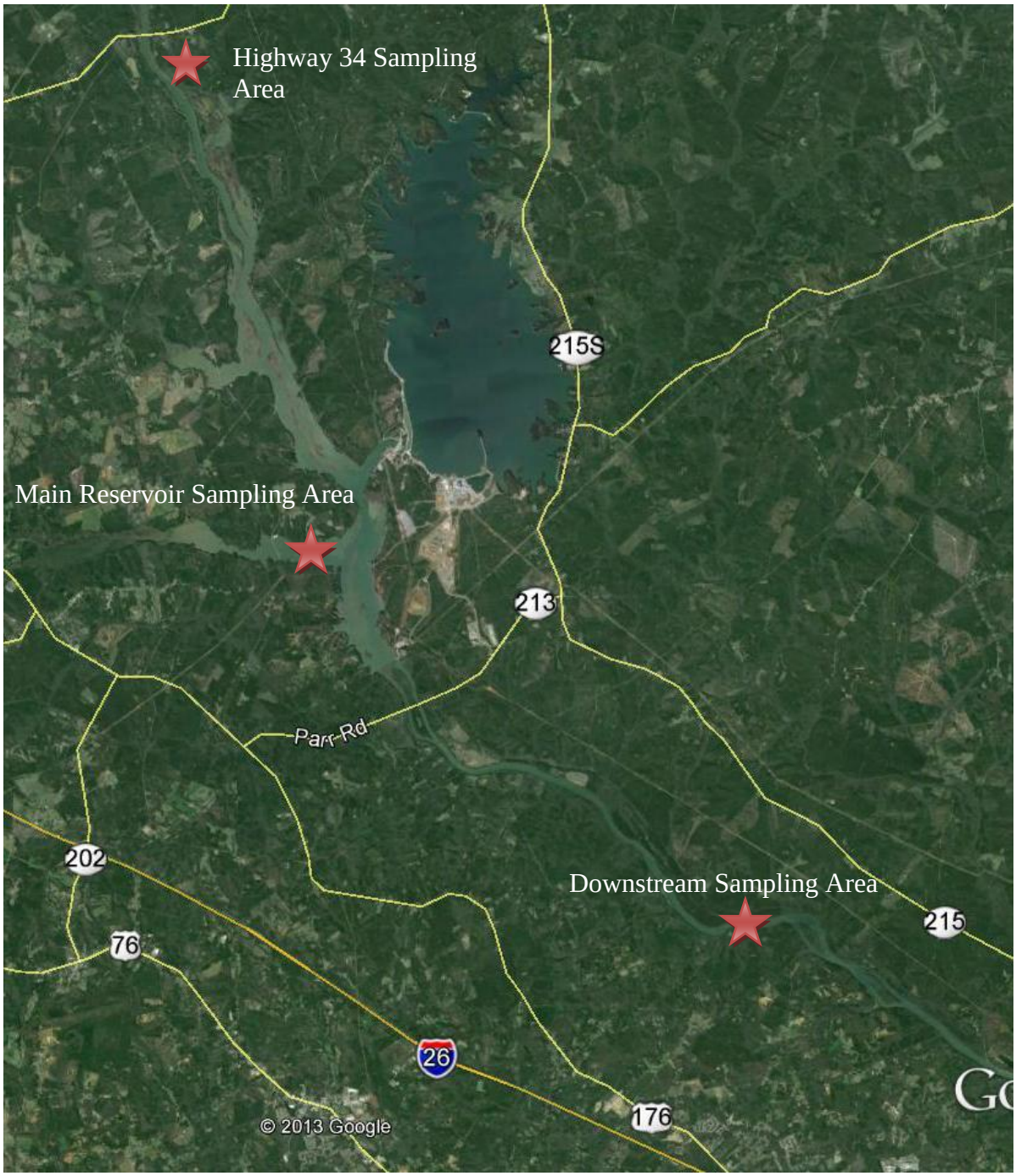

FIGURE 1 CRAYFISH SAMPLING AREAS

5.0 COLLECTION METHODS AND ANALYSIS

Passive trap methods will be utilized for this study. Traps will consist of double-entry, galvanized wire mesh minnow traps with 1" opercula. Traps will be baited with canned fish and will be re-baited when the traps are checked. A one-pound weight will be placed in the traps to ensure that they remain submerged. Traps will be deployed along shoreline, in areas of detritus and/or leaf litter, if possible. The number of traps per area will be determined during sample location reconnaissance. Traps will also be placed in locations where water depth is sufficient to ensure that they remain inundated. They will also be positioned such that they are not readily noticeable in an effort to decrease disturbance and vandalism. In the event of vandalism or theft, the trap will be replaced as soon as possible and the collection site location may be adjusted to prevent future vandalism.

The traps will be checked every 3 to 4 days beginning September 1. Based on collection results in September, the sampling days may be adjusted in October, as appropriate. Data recorded for each collection event will include: location (including site description and GPS coordinates), date, name of water body, basic water quality parameters (temperature, DO and conductivity), trap retrieval and deployment times, the total number of crayfish collected, the number of males and females. For the purposes of identification, only Form I males will be collected from the sample; other individuals will be released. Collected materials will be fixed in 5% neutral formalin, washed in tap water and preserved in 70% ethyl alcohol. Samples will be transported to a qualified astacologist for species identification.

6.0 SCHEDULE

Site location reconnaissance will be conducted in consultation with USFWS prior to start of survey. Crayfish traps will be deployed at the sampling locations on or around September 1, 2015 and will be allowed to sample for approximately eight weeks. The traps will be checked every 3 to 4 days in September and adjusted as appropriate in October.

A final report summarizing the study findings will be issued within 120 days of completion of field work. Study methodology, timing and duration may be adjusted based on consultation with resource agencies and interested stakeholders.

7.0 USE OF STUDY RESULTS

Study results will be used as an information resource during discussion of relicensing issues and developing potential Protection, Mitigation and Enhancement measures with the South Carolina Department of Natural Resources, USFWS, RT&E TWC, and other relicensing stakeholders.

8.0 REFERENCES

Eversole, Arnold G. 1990. Status Report on *Cambarus (Puncticambarus) spicatus* Hobbs, *Distocambarus (Fitzcambarus) youngineri* Hobbs, and *Procambarus (Pennides) echinatus* Hobbs. Completion Report. 21 pp.

Hobbs, H. H., Jr. 1956a. A new crayfish of the genus Procambarus from South Carolina (Decapoda:Astacidae). J. Wash. Acad. Sci. 46(1):117-121.

NatureServe. 2013. *Cambarus spicatus* Hobbs, Broad River Spiney Crayfish. (Available Online)[URL]: http://www.natureserve.org/

Price, Jennifer. Undated. Broad River Spiny Crayfish *Cambarus spicatus*. 2pp.

APPENDIX A

BROAD RIVER SPINY CRAYFISH STUDY – STUDY SITE SELECTION NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
Parr Hydroelectric Project (FERC No.1894)

MEETING NOTES

Rare, Threatened and Endangered Species TWC
Broad River Spiny Crayfish Study – Study Site Selection Notes

July 23, 2014

Final CSB 092214

ATTENDEES:

Shane Boring – Kleinschmidt
Byron Hamstead – USFWS
Milton Quattlebaum – SCANA Environmental Services

These notes serve to be a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

The group met with the purpose of selecting collection spots for the Broad River spiny crayfish (BRSC) as part of one of the proposed relicensing studies for the Parr Hydroelectric Project. The group launched from the Cannon's Creek ramp on Parr Reservoir and examined habitats from Cannon's Creek upstream to approximately 1 mile above the Highway 34 Bridge by boat. The group also examined habitat along Haltiwanger Island downstream of Parr Dam on foot. Prime collection areas included backwater areas with the presence of course woody debris and reasonable access for sampling.

Byron indicated that he was less impressed with habitats observed in Parr Reservoir, although some level of sampling was warranted in that area. The group determined that habitat in the vicinity of Haltiwanger Island in general lack the course woody debris and had higher velocities than are likely suitable for BRSC. Byron expressed an interest in exploring the area in the vicinity of the mouth of Little River for potential access since that is the area closest to where BRSC has been documented. The group made several attempts to examine Little River in that area, but were unable to find an access point. Shane and Milton noted that they would contact local landowners and attempt to facilitate an access point. Byron reiterated his desire to focus on the Little River mouth area.

Based on the field examinations and identifying a local landowner that would allow access to the Little River area, five sampling sites were identified, which are shown below in Figure 1 and Table 1. Two of the selected sites will be established at the Bookman Station Property to accommodate the USFWS request for additional sampling in the Vicinity of the Little River site located downstream of Parr Dam. A minimum of 3 traps will be deployed at each collection site.

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Figure 1. Broad River Spiny Crayfish Sampling Sites

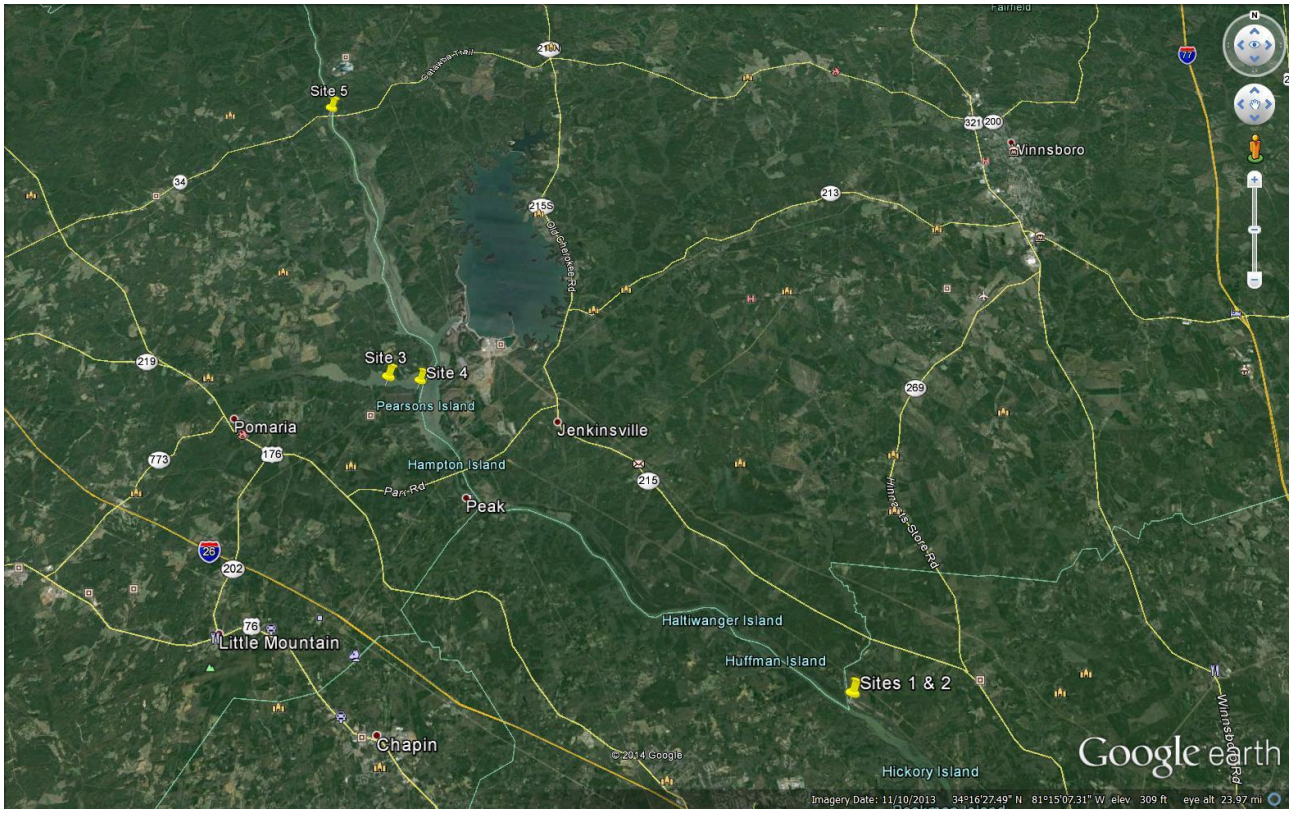

Table 1. Broad River Spiny Crayfish Sites

Site No.	Latitude/Longitude	Description/Notes
1	34°10'33.79"N, 81°10'41.48"W	Sites downstream of Parr Dam at mouth of Little River. Will be accessed from Bookman Station, LLC property. Two set of 3 traps will be positioned sufficiently apart in appropriate habitat to represent 2 sites.
2		
3	34°16'53.04"N, 81°21'35.93"W	Cove directly across from Cannon's Creek launch.
4	34°16'49.39"N, 81°20'48.05"W	Noted by USFWS as a shallow area with more overhead forest cover than other habitat in reservoir.
5	34°23'37.73"N, 81°23'55.93"W	Vicinity of Highway 34 Bridge.

ACTION ITEMS:

- Include these notes in the Final BRSC sampling plan and revise the Plan to note the listed sampling locations and number of sampling traps to be used.

Kleinschmidt