Progress Energy

Serial: NPD-NRC-2009-099
June 5, 2009

10CFR52.79

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-0001

SHEARON HARRIS NUCLEAR POWER PLANT, UNITS 2 AND 3
DOCKET NOS. 52-022 AND 52-023
SUPPLEMENT 2 TO RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION REGARDING THE ENVIRONMENTAL REVIEW

Reference:

1. Letter from Donald Palmrose (NRC) to James Scarola (PEC), dated November 13, 2008, "Request for Additional Information Regarding the Environmental Review of the Combined License Application for Shearon Harris Nuclear Power Plant, Units 2 and 3"

2. Letter from Garry D. Miller (PEC) to U.S. Nuclear Regulatory Commission dated February 12, 2009, "Response to Request for Additional Information Regarding the Environmental Review", Serial NPD-NRC-2009-017

3. Letter from Garry D. Miller (PEC) to U.S. Nuclear Regulatory Commission dated April 28, 2009, "Supplement 1 to Response to Request for Additional Information Regarding the Environmental Review", Serial NPD-NRC-2009-082

Ladies and Gentlemen:

Progress Energy Carolinas, Inc. (PEC) herby submits a second supplemental response to the Nuclear Regulatory Commission's (NRC) request for additional information (RAI) provided in Enclosure 1 of Reference 1.

A revised response to two of the NRC RAI questions (RAI 4.3.1-2 and 9.4-1) is provided in Enclosure 1 along with associated attachments. This revised response is provided to clarify items identified by your staff's review of the reference supplement dated April 28, 2009.

If you have any further questions, or need additional information, please contact Bob Kitchen at (919) 546-6992, or Garry Miller at (919) 546-6107.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on June 5, 2009.

Sincerely,

Garry D. Miller
General Manager, Nuclear Plant Development

Progress Energy Carolinas, Inc.
P.O. Box 1551
Raleigh, NC 27602

D084
NRO

Enclosures/Attachments

cc : U.S. NRC Region II, Regional Administrator
U.S. NRC Resident Inspector, SHNPP Unit 1
Mr. Brian Hughes, U.S. NRC Project Manager
Dr. Donald Palmrose, U.S. NRC Environmental Project Manager

Shearon Harris Nuclear Power Plant Units 2 and 3
Supplement 2 to Response to NRC Request for Additional Information Regarding the Environmental Review, dated November 13, 2008

NRC RAI #	Progress Energy RAI #	Progress Energy Response
7.4-1	H-0287	February 12, 2009; NPD-NRC-2009-017
5.2.1.3-1	H-0288	February 12, 2009; NPD-NRC-2009-017
5.2.2-1	H-0289	February 12, 2009; NPD-NRC-2009-017
5.2.2-2	H-0290	February 12, 2009; NPD-NRC-2009-017
5.2.2-3	H-0291	February 12, 2009; NPD-NRC-2009-017
2.3.1.3-1	H-0292	February 12, 2009; NPD-NRC-2009-017
2.7-1	H-0293	February 12, 2009; NPD-NRC-2009-017
2.7-2	H-0453	April 28, 2009; NPD-NRC-2009-082
5.3.3.1-1	H-0295	February 12, 2009; NPD-NRC-2009-017
5.3.3.1-2	H-0296	February 12, 2009; NPD-NRC-2009-017
7.1-1	H-0297	February 12, 2009; NPD-NRC-2009-017
7.2-1	H-0298	February 12, 2009; NPD-NRC-2009-017
7.2-2	H-0299	February 12, 2009; NPD-NRC-2009-017
7.3-1	H-0300	February 12, 2009; NPD-NRC-2009-017
7.3-2	H-0301	February 12, 2009; NPD-NRC-2009-017
7.3-3	H-0302	February 12, 2009; NPD-NRC-2009-017
9.2-1	H-0303	February 12, 2009; NPD-NRC-2009-017
9.4-1	H-0470	Revised response enclosed – see following pages
9.4-2	H-0305	February 12, 2009; NPD-NRC-2009-017
5.4.2-1	H-0306	February 12, 2009; NPD-NRC-2009-017
4.5-1	H-0307	February 12, 2009; NPD-NRC-2009-017
4.5-2	H-0308	February 12, 2009; NPD-NRC-2009-017
2.5.3-1	H-0309	February 12, 2009; NPD-NRC-2009-017
2.5.3-2	H-0310	February 12, 2009; NPD-NRC-2009-017
2.5.3-3	H-0311	February 12, 2009; NPD-NRC-2009-017
2.4.1-1	H-0449	April 28, 2009; NPD-NRC-2009-082
2.4.1-2	H-0450	April 28, 2009; NPD-NRC-2009-082
2.4.1-3	H-0314	February 12, 2009; NPD-NRC-2009-017
4.3.1-1	H-0315	February 12, 2009; NPD-NRC-2009-017
4.3.1-2	H-0471	Revised response enclosed – see following pages
4.3.1-3	H-0317	February 12, 2009; NPD-NRC-2009-017
4.3.1-4	H-0318	February 12, 2009; NPD-NRC-2009-017
2.4-2	H-0319	February 12, 2009; NPD-NRC-2009-017
4.3.2-1	H-0320	February 12, 2009; NPD-NRC-2009-017
4.3.2-2	H-0321	February 12, 2009; NPD-NRC-2009-017
4.3.2-3	H-0322	February 12, 2009; NPD-NRC-2009-017

NRC RAI #	Progress Energy RAI #	Progress Energy Response
4.3.2-4	H-0455	April 28, 2009; NPD-NRC-2009-082
2.4.2-1	H-0324	February 12, 2009; NPD-NRC-2009-017
6.5.2-1	H-0325	February 12, 2009; NPD-NRC-2009-017
2.4.2-2	H-0326	February 12, 2009; NPD-NRC-2009-017
2.4.2-3	H-0327	February 12, 2009; NPD-NRC-2009-017
2.4.2-4	H-0328	February 12, 2009; NPD-NRC-2009-017
5.3.1.2-1	H-0329	February 12, 2009; NPD-NRC-2009-017
4.3.2-5	H-0330	February 12, 2009; NPD-NRC-2009-017
4.3.2-6	H-0331	February 12, 2009; NPD-NRC-2009-017
5.3.4-1	H-0332	February 12, 2009; NPD-NRC-2009-017
2.4-1	H-0333	February 12, 2009; NPD-NRC-2009-017
4.1.1-1	H-0451	April 28, 2009; NPD-NRC-2009-082
3.7-1	H-0452	April 28, 2009; NPD-NRC-2009-082
2.5.2-1	H-0336	February 12, 2009; NPD-NRC-2009-017
2.5.2-2	H-0337	February 12, 2009; NPD-NRC-2009-017
2.5.4-1	H-0338	February 12, 2009; NPD-NRC-2009-017
4.4.2-1	H-0339	February 12, 2009; NPD-NRC-2009-017
2.5.2-3	H-0340	February 12, 2009; NPD-NRC-2009-017
4.4.1-2	H-0341	February 12, 2009; NPD-NRC-2009-017
4.4.1-3	H-0342	February 12, 2009; NPD-NRC-2009-017
2.5.2-4	H-0343	February 12, 2009; NPD-NRC-2009-017
10.4.2-1	H-0344	February 12, 2009; NPD-NRC-2009-017
10.4.2-2	H-0345	February 12, 2009; NPD-NRC-2009-017
10.4.1-1	H-0346	February 12, 2009; NPD-NRC-2009-017
10.4.2-3	H-0347	February 12, 2009; NPD-NRC-2009-017
10.4.3-1	H-0348	February 12, 2009; NPD-NRC-2009-017
4.1-1	H-0349	February 12, 2009; NPD-NRC-2009-017
1.2-1	H-0350	February 12, 2009; NPD-NRC-2009-017

Attachments	Associated NRC RAI #	# pages
Attachment 4.3.1-2A	4.3.1-2	12
Attachment 4.3.1-2B	4.3.1-2	9
Attachment 4.3.1-2C	4.3.1-2	3
Attachment 9.4-1A	9.4 -1	27

NRC Letter No.: HAR-RAI-LTR-ER-NRC-001

NRC Letter Date: November 13, 2008

NRC Review of Environmental Report

NRC RAI #: 4.3.1-2

Text of NRC RAI:

Confirm the locations of various proposed construction project areas and activities and provide information from the most recent terrestrial and wetland surveys of areas that will be impacted during construction.

Also provide RFI-158 CH2M Hill or most current plan and design – for depiction of temporary construction areas.

Discussions held at the site audit indicated that there may be changes to the proposed locations of various construction activities and construction materials sites and/or that some construction and roadway improvement areas have not been surveyed to characterize the resources. Please provide information and figures describing the proposed locations of temporary construction and laydown areas. Provide recent survey data for wetlands and terrestrial habitats, including wildlife and plants that may be impacted by both temporary and permanent construction not addressed in the ER, including but not limited to: temporary laydown areas for unit 3, construction parking areas, cooling tower locations for units 2 and 3, Wastewater Treatment Plant (WWTP) and any expanded WWTP lines, and any roadway improvement or construction projects outside the 220 to 240 contour around the reservoir. Provide the number of acres to be affected and the dominant habitat types for each area.

PGN RAI ID #: H-471

PGN Response to NRC RAI:

Potentially disturbed areas related to temporary and permanent construction, including temporary laydown areas for HAR 3, construction parking areas, cooling tower locations for HAR 2 and HAR 3, wastewater treatment plant (WWTP), any expanded WWTP lines, and any roadway improvement or construction projects outside the 220-ft. to 240-ft. contour around the reservoir, are shown in Attachment 4.3.1-2A. This set of figures was developed based on the information included in RFI-158, as well as available subsequent information regarding construction plans.

Wetland delineation surveys were performed from November 2008 through February 2009. This delineation effort addressed the complete Harris Reservoir shoreline and included planned temporary laydown areas, construction parking areas, cooling tower locations for HAR 2 and HAR 3, and any roadway improvement projects outside the 220-ft. to 240-ft. contour. Additionally the information contained in response to RAI 2.4.1-1 is applicable to the additional areas identified in RFI-158.

The results of wetland delineation efforts are summarized in Attachment 4.3.1-2B. The final U.S. Army Corps of Engineers (USACE) verification visit has not been completed and these results should be considered preliminary until the USACE has approved the jurisdictional delineation. The USACE-approved Jurisdictional Wetland map will include tables of wetland areas (emergent, fringe, and forested/herbaceous); individual stream segments identifying

length and type of stream (intermittent or perennial); and individual ponds. The summary includes approximate totals of these areas, as the USACE has not given final approval of these areas yet.

Attachment 4.3.1-2B provides an approximate total of intermittent and perennial stream lengths. Previously, ER Subsection 2.4.2.2 reported that approximately 89,450 linear ft. of ephemeral streams, 96,860 linear ft. of intermittent stream channels, and 171,490 linear ft. of perennial streams occurred between the 220-ft. and 240-ft. contours. However, these lengths are actually all stream lengths that are shown in HAR ER Appendix 2.4-1 and include lengths above the 240-ft. contour. The ER text and tables will be revised to clarify the lengths associated with the perennial, intermittent, and ephemeral streams and Appendix 2.4-1 will be revised to incorporate the stream data from the wetland delineations. The correct lengths of streams are as follows: approximately 82,300 linear ft. of ephemeral streams, 65,600 linear ft. of intermittent stream channels, and 70,200 linear ft. of perennial streams.

The wetland surveys included identifying fringe area wetlands between the 220-ft. and 221-ft. elevations, which typically covered approximately an 8-ft. width of slope distance. Therefore, an approximate area of the potential fringe wetlands can be calculated as 84 ac. by using the current perimeter of Harris Lake and an approximate width of 8 ft. [(457,281 ft. * 8 ft.)/43,560 ft^2/ac. = 84 ac.]. A similar area can be calculated for the potential fringe area at the new lake level of 240 ft. of 144 ac. [(784,327 ft. * 8 ft.)/43,560 ft^2/ac. = 144 ac.].

The two fire ponds located north of the existing Shearon Harris Nuclear Power Plant Unit 1 (HNP 1) were included in the wetland delineation surveys. The fire ponds are approximately 5 ac. in total surface area and were constructed as part of the HNP 1 by using a natural depression and creating an earthen bank. The inflow to the ponds comes from a small stream fed by rainfall and flow from a railroad ditch. The ponds are hydrologically linked through a culvert; water from the ponds discharges through an outfall structure and eventually flows to Harris Lake. The elevation of the earthen bank and orientation of the outflow limits flow from Harris Lake into the ponds. Little sampling has been conducted on these ponds and the communities associated with them are known only from anecdotal records. These ponds are typical of unmaintained farm ponds with a limited vascular plant vegetative community consisting primarily of emergent wetland plants, such as woolgrass (Scirpus cyperinus), soft rush (Juncus effusus), and sedges (Carex spp.).

The invertebrate community of the fire pond would be expected to contain typical species associated with warm-water lentic systems. Smaller invertebrates would likely include members of the phyla Rotifera (rotifers), Nematoda (roundworms), and Platyhelminthes (flatworms) (References 4.3.1-2 01 and 4.3.1-2 02). Multiple representatives of the phylum Arthorpoda would be expected, including spring tails (Class Collembola), crustaceans (Class Crustacea), and aquatic insects (Class Insecta) (References 4.3.1-2 01, 4.3.1-2 02, and 4.3.1-2 03). Common crustaceans would likely include water fleas (Order Cladocera), sowbugs (Order Isopoda), copepods (Order Copepoda), and crayfish (Order Decapoda).Common aquatic insects would include dragonflies and damselflies (Order Odonata), multiple two-winged flies (Order Diptera) including midges (Family chironomidae), mosquitos (Family culicidae) and blackflies (Family simulidae), true bugs (Order Hemiptera), and numerous beetles (Order Coleoptera) (References 4.3.1-2 01, 4.3.1-2 02, and 4.3.1-2 03). Table 1 includes aquatic insects that could be found in permanent vegetated ponds similar to the fire ponds.

TABLE 1
Aquatic Insects Found in Permanent Vegetated Ponds

Taxon		
Collembola	Diptera	Lepidoptera
Ephemeroptera	Tabanidae	Pyralidae
Baetidae	Chironomidae	Odonata
Caenidae	Chaoboridae	Aeshnidae
Leptophlebiidae	Culicidae	Libellulidae
Siphlonuridae	Hemiptera	Coenagrionidae
Coleoptera	Hydrometridae	Trichoptera
Dytiscidae	Veliidae	Phryganeidae
Hydrophilidae	Gerridae	Limnephilidae
Haliplidae	Belostomatidae	Lepidostomatidae
Gyrninidae	Nepidae	
Helodidae	Pleidae	
Chrysomelidae	Corixidae	
	Notonectidae	

Source: Reference 4.3.1-2 04

The vertebrate community of the fire pond would be expected to be limited to species using the periphery of the pond, which would include amphibians (Class Amphibia, Order Salienta - frogs and toads) and reptiles, including turtles (Order Chelonia) and water snakes (Order Serpentes). Table 2 presents a list of amphibian and reptile species common to similar ponds in the piedmont of North Carolina. It should be noted that the presence of fish will diminish the abundance and possible presence of species.

TABLE 2
Amphibian and Reptile Species Common Ponds

Amphibians

Ambystoma maculatum (Spotted salamander)	*Pseudacris triseriata* (Upland chorus frog)
Ambystoma opacum (Marbled salamander)	*Gastrophrne carolinensis* (Eastern narrowmouth toad)
Notophthalmus viridescens (Eastern newt)	*Psuedoacris crucifer* (Spring peeper)
Bufo americanus (American toad)	*Rana castebeiana* (Bullfrog)
Bufo fowleri (Fowler's toad)	*Rana clamitans* (Green frog)
Acris crepitans (Northern cricket frog)	*Rana palustris* (Pickerel frog)
Acris gryllus (Southern cricket frog)	*Rana sphenocephala* (Southern leopard frog)
Hyla chrysocelis (Cope's gray treefrog)	

TABLE 2
Amphibian and Reptile Species Common Ponds

Reptiles	
Carphophis amoenus (Worm snake)	*Sternotherus odoratus* (Common musk turtle)
Chelydra serpentine (Snapping turtle)	*Storeria dekayi* (Brown snake)
Chrysemys picta (Painted turtle)	*Storeria occipitomaculata* (Redbelly snake)
Diadophis punctatus (Ringneck snake)	*Terrapene Carolina* (Eastern box turtle)
Nerodia sipedon (Northern water snake)	*Thamnophis sirtalis* (Common garter snake)
Opheodrys aestivus (Rough green snake)	

References: 4.3.1-2 05, 4.3.1-2 06 and 4.3.1-2 07

Sampling of the fire ponds is not performed as part of the environmental monitoring activities of Harris Lake. However, in 2009 PEC staff performed limited seining of the fire ponds and confirmed the presence of fish. The dominant species was *Lepomis macrochirus (bluegill).* Attachment 4.3.1-2C is a summary of this sampling event.

PEC is coordinating with the USACE Wilmington District, the U.S. Fish and Wildlife Service (USFWS), and the North Carolina Department of Environment and Natural Resources (NCDENR) (including the North Carolina Wildlife Resources Commission [NCWRC]) to develop appropriate mitigation plans for the impacts from the proposed project. No additional surveys are planned at this time.

Additional information related to wetland impacts is included as part of the Least Environmentally Damaging Practicable Alternative (LEDPA) analysis. PEC submitted the LEDPA analysis in letter NPD-MISC-2009-007 to the USACE and the NRC on May 15, 2009.

The following land cover table quantifies the habitat characteristics of the potential areas of disturbance outside of the 220-ft. to 240-ft. contours around the reservoir, as shown on Attachment 4.3.1-2A. Southern yellow pine is the predominant type of land cover that would be impacted, representing almost half, 54 percent, of the total 660 ac. Approximately 20 percent of the impacted area is either bottomland forest / hardwood swamps associated with Harris Reservoir and its embayments. Roadway improvements along US-1, as well as the intake corridor, will primarily impact southern yellow pine habitats with small pockets of bottomland swamps and mixed hardwoods / conifers. Sixty-five acres of managed herbaceous cover is mostly located adjacent to high intensity developed lands that represent the HNP 1.

TABLE 3
Land Cover Summary

Land Cover Category	Acres	% of Total
Southern Yellow Pine	354.0	54%
Bottomland Forest / Hardwood Swamps	138.0	21%
Managed Herbaceous Cover	65.2	10%
Mixed Hardwoods / Conifers	56.5	9%
High Intensity Developed	35.1	5%
Evergreen Shrubland	7.2	1%
Mixed Upland Hardwoods	3.3	0%
Low Intensity Developed	0.1	0%
Deciduous Shrubland	<0.1	0%
Mixed Shrubland	<0.1	0%
Grand Total	**659.4**	

Source: North Carolina Land Cover Data Set, 2005. Based on 2001 source data. ftp://gisdata.lib.ncsu.edu/fedgov/usgs/landcov/nlcd2001/.

References

Reference 4.3.1-2 01

Barnes, R.D. 1986. Invertebrate Zoology. 5th Edition. Saunders College Publishing. 893 pp.

Reference 4.3.1-2 02

Thorp, J.H. and A.P. Covitch. 1991. Ecology and Classification of North American Freshwater Invertebrates. Academic Press, Inc. 911 pp.

Reference 4.3.1-2 03

Borror, D.J., C.A. Triplehorn, and N.F. Johnson. 1989. An Introduction to the Study of insects. 6th Edition. Saunders College Publishing. 875 pp.

Reference 4.3.1-2 04

J. V. Ward. 1992. Aquatic Insect Ecology. Wiley-Interscience Publishing. 456 pp.

Reference 4.3.1-2 05

Russell, K.R., C.E. Moorman, J.K. Edwards, B.S. Metts, D.C. Guynn, Jr. 1999*a*. Amphibian and reptile communities associated with beaver (*Castor canadensis*)

ponds and unimpounded streams in the Piedmont of South Carolina. Journal of Freshwater Ecology 14(2): 149-158.

Reference 4.3.1-2 06

North Carolina Cooperative Extension Service. 2009. Working With Wildlife # 19 Pools for Amphibians. Raleigh, NC.

Reference 4.3.1-2 07

CH2M HILL. 2009. North Carolina GAP Project Analysis for Affected Project Areas. (ER RAI Attachment 2.4.1-2B).

Associated HAR COL Application Revisions:

ER Subsections 2.4.2.2, 4.1.2, 4.3.2.2.1, 4.3.2.2.3, and 5.2.1.1 and Tables 2.4-8, 2.4-9, and 2.4-10 will be updated to revise stream totals to correct lengths associated with the 220-ft. to 240-ft. contour lines. Appendix 2.4-1 will be revised to include the latest information on stream and wetland features from the recent wetland delineations.

Attachments/Enclosures:

1. Attachment 4.3.1-2A, Figures 1 through 12 [12 pages]
2. Attachment 4.3.1-2B, Summary of Wetlands Delineation (Preliminary Results) [9 pages]
3. Attachment 4.3.1-2C, Harris Nuclear Plant Fire Pond Fish Survey [3 pages]

NRC Letter No.: HAR-RAI-LTR-ER-NRC-001

NRC Letter Date: November 13, 2008

NRC Review of Environmental Report

NRC RAI #: 9.4-1

Text of NRC RAI:

Provide supporting data and information demonstrating a quantifiable alternative site selection process in the revised ER that can be cited in the NRC EIS for the proposed construction and operation of Harris Units 2 and 3.

Please provide the missing information and/or clarification so staff can provide timely and effective support to the NRC with the technical review of the need for power assessment:

The alternative site selection process should follow a clear and defensible process to determine the final alternative sites, and the proposed site. Analysis performed on the four alternative sites to determine the proposed Harris site is clear and logical; however it is not clear how the region of interest was screened to provide candidate areas, potential sites, and candidate or alternative sites. Please provide a clear analysis of the site screening process from the defined region of interest to the selection of the four alternative sites.

PGN RAI ID #: H-470

PGN Response to NRC RAI:

The following information will be incorporated into Subsection 9.3.1.1 in a future revision of the ER in order to address the comment.

The site selection process followed by PEC was consistent with the siting process outlined in ESRP Section 9.3 (Reference 9.4-1 01) as discussed in ER Subsection 9.3.1. The first step of PEC's site selection process was to identify the Region of Interest (ROI). The next step in the site selection process was to identify suitable candidate areas by screening the ROI using exclusionary criteria. Candidate areas refer to one or more areas within the ROI that remain after unsuitable areas have been removed. ROI screening was done at a high level with the purpose of quickly identifying areas within the ROI that would not be suitable for the siting of a nuclear power station.

The criteria used in the ROI screening process to identify candidate areas were consistent with those identified in ESRP Section 9.3 (Reference 9.4-1 01). The criteria included the following, as identified on Attachment 9.4-1A:

Exclusionary criteria used in screening the ROI to identify candidate areas include:

- Proximity to major population centers (that is, not located in an area with greater than or equal to 300 ppsm [or 300 persons per 2.6 km^2]).
- Proximity of adequate transmission lines (that is, within 30 mi. [48.3 km]) of 345-kV or 500-kV transmission lines). The 345-kV or 500-kV transmission lines are needed for the EPR standard grid connection design. It should be noted that areas with proximity to 230-kV lines that could potentially be upgraded were also considered.

- Lack of a suitable cooling water source (that is, within 15 mi. [24.1 km] of an adequate cooling water source).
- Dedicated land (that is, not located within national, state parks, historic sites, or tribal lands).

Screening information was obtained from publically accessible geographic information system (GIS) database websites. The GIS information was layered to produce a figure that represented the suitable candidate areas for the potential placement of a nuclear power facility (Attachment 9.4-1A).

Next, the candidate areas were screened and evaluated in order to develop a list of potential geographic locations for the placement of the proposed nuclear station. Information used in the screening and evaluation of the candidate areas was obtained from PEC personnel, GoogleEarth™ images, publicly held information on GIS database Web sites, topographic maps showing roads, urban areas, wetlands, parks, and other dedicated lands.

The screening process used to identify the potential sites considered discretionary criteria (that is, distance of a site from population centers, proximity of transmission lines, proximity to suitable source of cooling water) similar to those used in the process of identifying the candidate areas. However, identifying potential sites required a more detailed review of available information (Reference 9.4-1 01). The goal of the screening process was to use a logical process that produced a list of the best potential sites located within the candidate areas. (Reference 9.4-1 01)

The screening process also included consideration of existing site conditions, including whether the site was improved or potentially contained wetlands or floodplains. Aerial screening was used to identify areas within which potential sites were identified. The screening of the potential sites was conducted as an iterative process by applying refined criteria until an appropriate number of potential sites were identified. In addition, the potential sites needed to satisfy PEC's overall business objectives, and offer the ability of constructing and operating future nuclear units to provide PEC customers with reliable, cost-effective electric service.

The screening and evaluation of the Candidate Areas resulted in the identification of the 11 potential sites as identified in Attachment 9.4-1A. The 11 potential sites were chosen by PEC based on their understanding and knowledge of the ROI. Three of the potential sites are existing nuclear sites, 5 are previously considered greenfield sites, and 3 are newly considered greenfield sites.

Sites outside the ROI were considered only in specific instances. The Savannah River Site (which is outside the PEC service territory and the ROI) was considered as a potential site because the site aggressively pursued a new nuclear plant with PGN, Duke, and SCANA. PEC eliminated the Savannah River Site from further consideration because it is not close to the PEC service territory and because of high transmission costs and an undesirable cooling water source.

As noted in Attachment 9.4-1A, different criteria were used for different stages of the evaluation (ROI, Candidate Areas, Potential Sites, and Candidate Sites). In one instance, the criteria used in the evaluations of both the ROI and candidate areas are similar, as identified in the ESRP. In the evaluation of the ROI, the criteria (water, population, transmission, dedicated lands) are used as exclusionary criteria, that is, to identify areas that are not suitable for the placement of a nuclear facility (sites that lack water, are located

in high population density areas, sites near dedicated land use areas, and sites located far from transmission load areas). In the evaluation of the candidate areas, the same criteria (water, population, transmission, dedicated lands) were used as discretionary criteria, that is, to identify areas that are suitable sites for a new nuclear facility (sites that were located in proximity to water, in proximity to low population density areas, near transmission load centers, and would not impact dedicated lands). Further, evaluating both the potential sites and candidate sites required different refined criteria than those used in early stages of the siting process in order to select the proposed site and alternative sites.

References

Reference 9.4-1 01

NRC. 2007. NUREG-1555, "Environmental Standard Review Plan, Section 9.3: Site Selection Process," October.

Associated HAR COL Application Revisions:

Subsection 9.3.1.1 will be clarified in Revision 1 of the ER.

Attachments/Enclosures:

Attachment 9.4-1A, Alternative Site Selection Process [27 pages]

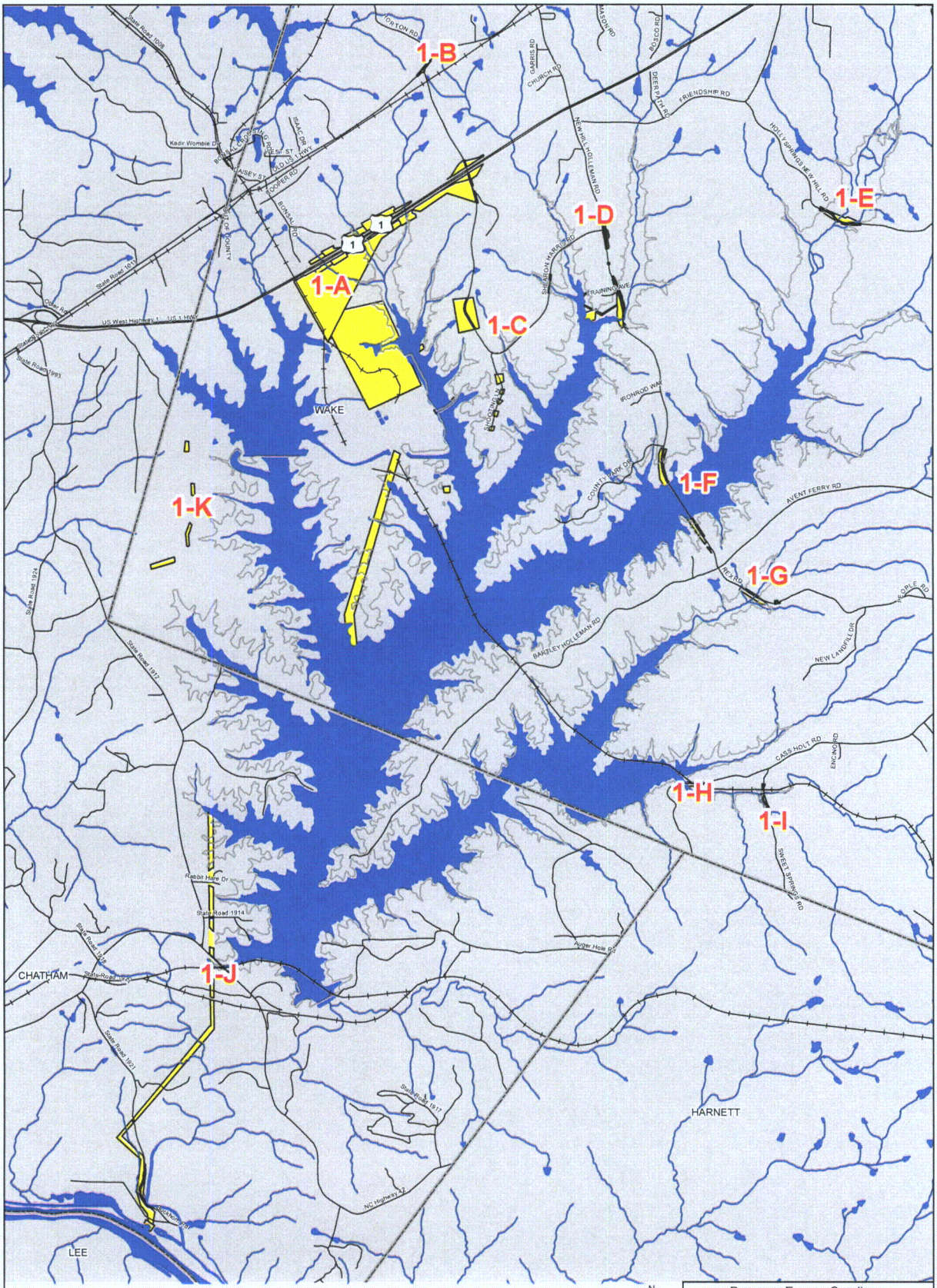
List of Attachments:

1. NRC RAI # 4.3.1-2 (PGN RAI ID # H-0471):
   Attachment 4.3.1-2A, Figures 1 through 12 [12 pages]

2. NRC RAI # 4.3.1-2 (PGN RAI ID # H-0471):
   Attachment 4.3.1-2B, Summary of Wetlands Delineation (Preliminary Results) [9 pages]

3. NRC RAI # 4.3.1-2 (PGN RAI ID # H-0471):
   Attachment 4.3.1-2C, Harris Nuclear Plant Fire Pond Fish Survey [3 pages]

4. NRC RAI # 9.4-1 (PGN RAI ID # H-0470):
   Attachment 9.4-1A, Alternative Site Selection Process [27 pages]


1-A
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WAKE
CHATHAM
HARNETT
LEE
LEGEND
Roads
Railroad
Harris 240 Contour
Streams
Lakes
County Boundary
Potentially Disturbed Areas
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Meters
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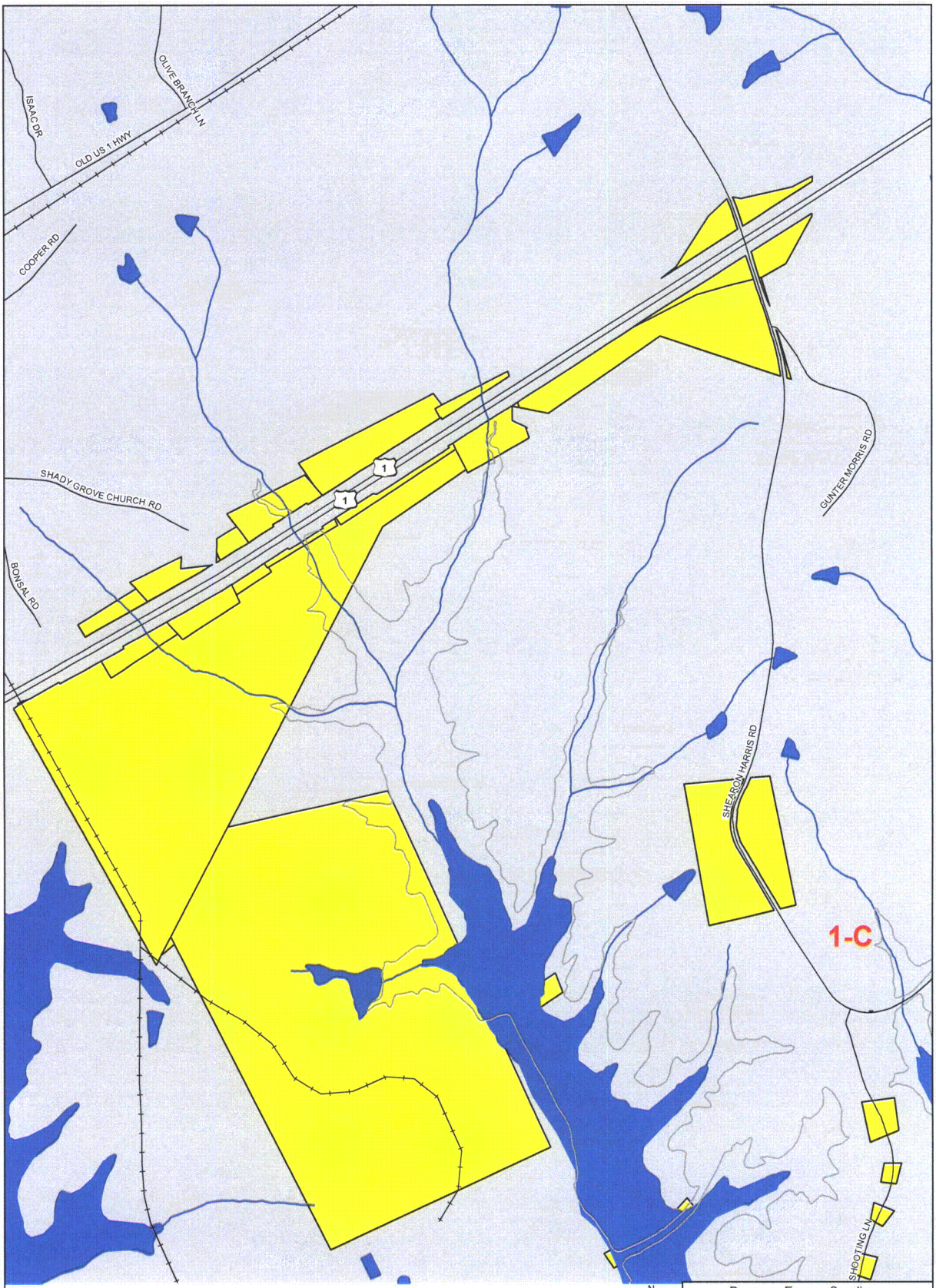
Feet
Progress Energy Carolinas
Shearon Harris Nuclear Power Plant Units 2 and 3
New Hill, North Carolina
Potentially Disturbed Areas
Attachment 4.3.1-2A,
Figure 1



Progress Energy Carolinas

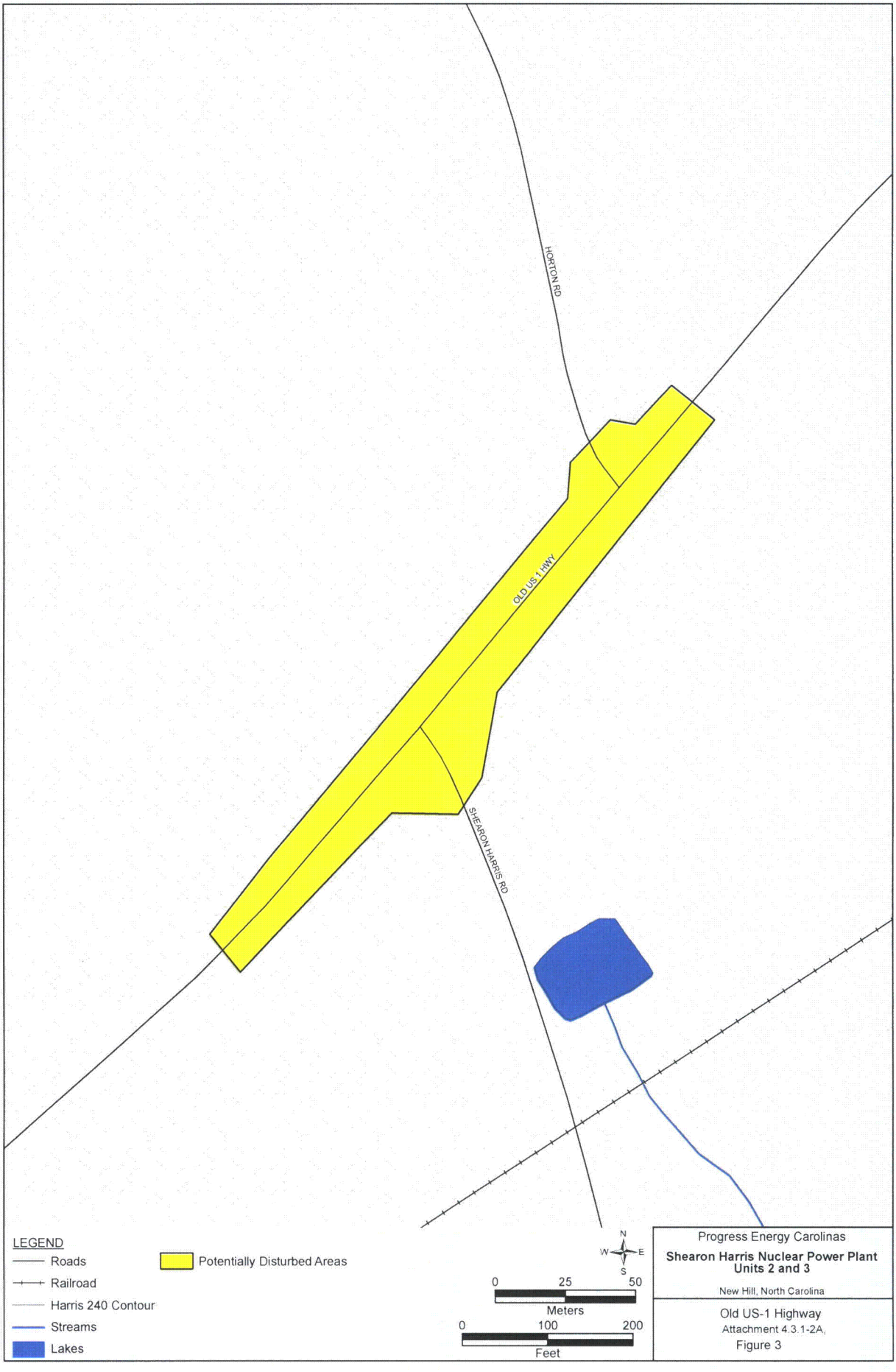
Shearon Harris Nuclear Power Plant Units 2 and 3

New Hill, North Carolina

US-1 and Plant Area

Attachment 4.3.1-2A,

Figure 2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OLD US 1 HWY
SHEARON HARRIS RD
LEGEND
Roads
Railroad
Harris 240 Contour
Streams
Lakes
Potentially Disturbed Areas
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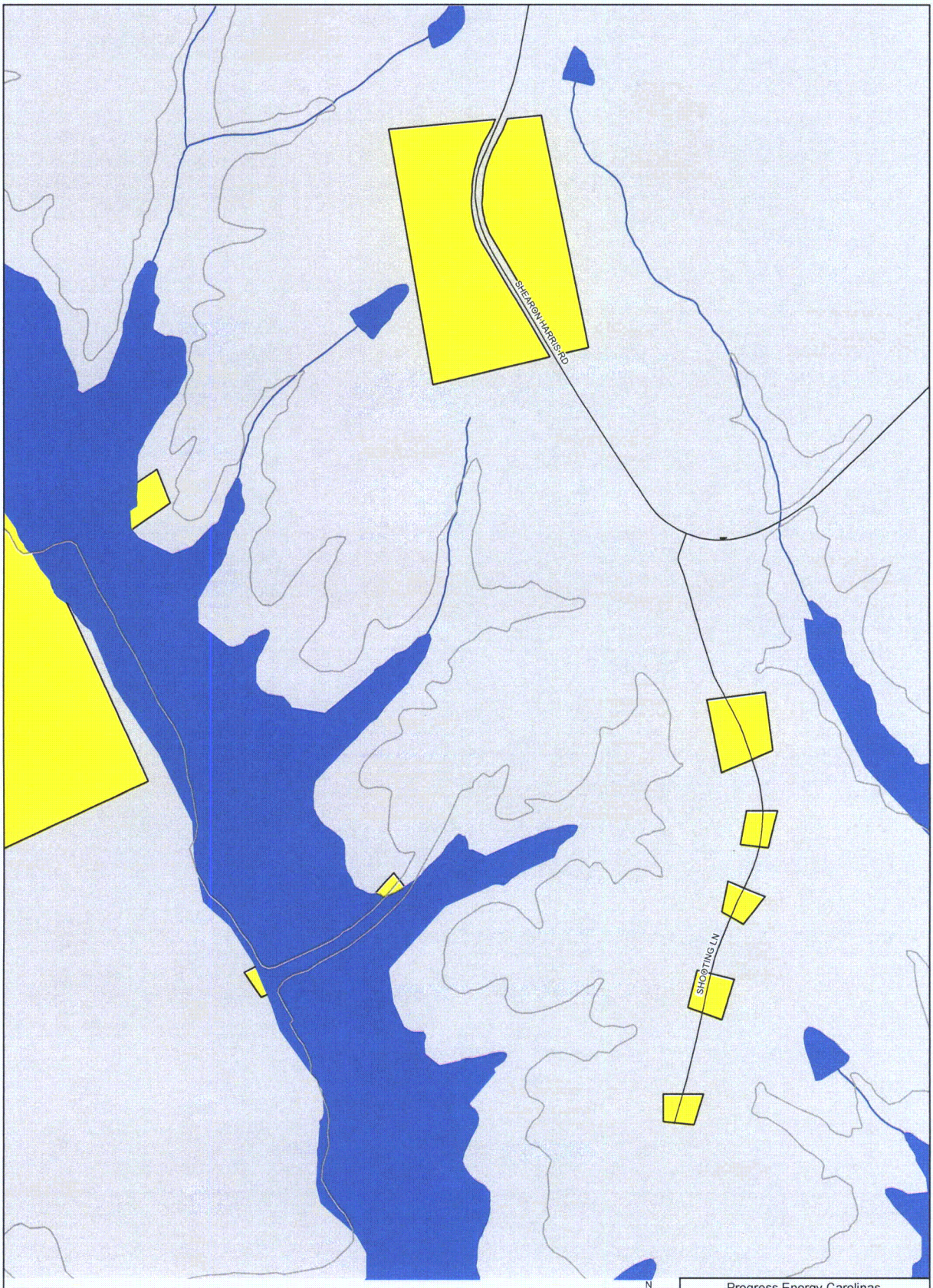
Progress Energy Carolinas
Shearon Harris Nuclear Power Plant Units 2 and 3
New Hill, North Carolina
Old US-1 Highway
Attachment 4.3.1-2A,
Figure 3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SHOOTING LN
LEGEND
Roads
Railroad
Harris 240 Contour
Streams
Lakes
Potentially Disturbed Areas
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Feet
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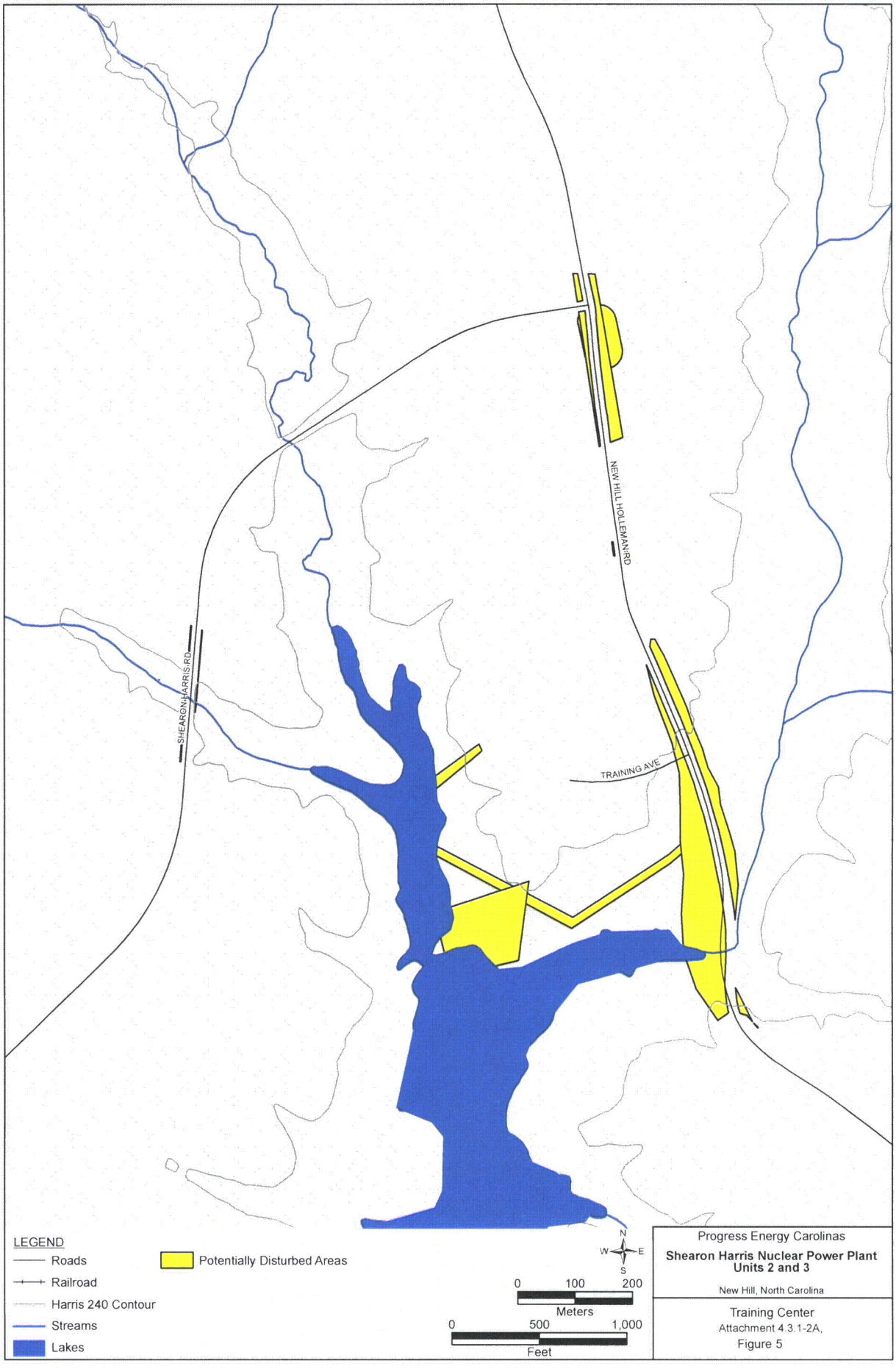
Shearon Harris Nuclear Power Plant
Units 2 and 3
New Hill, North Carolina
Locations near the Plant
Attachment 4.3.1-2A,
Figure 4


NEW HILL HOLLEMAN RD
SHEARON HARRIS RD
TRAINING AVE
LEGEND
Roads
Railroad
Harris 240 Contour
Streams
Lakes
Potentially Disturbed Areas
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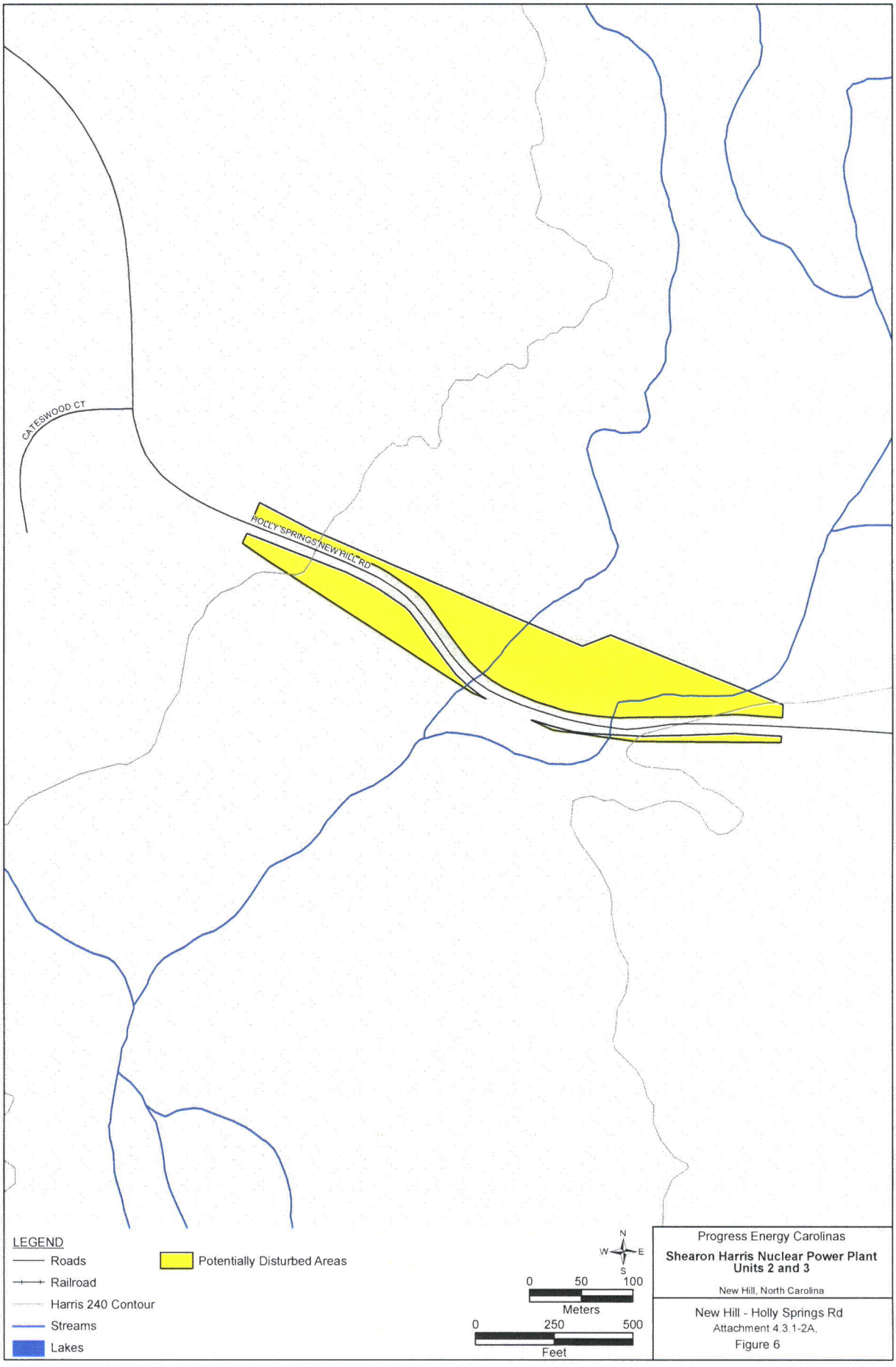
Progress Energy Carolinas
Shearon Harris Nuclear Power Plant Units 2 and 3
New Hill, North Carolina
Training Center
Attachment 4.3.1-2A,
Figure 5


CATESWOOD CT
HOLLY SPRINGS NEW HILL RD
LEGEND
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Railroad
Harris 240 Contour
Streams
Lakes
Potentially Disturbed Areas
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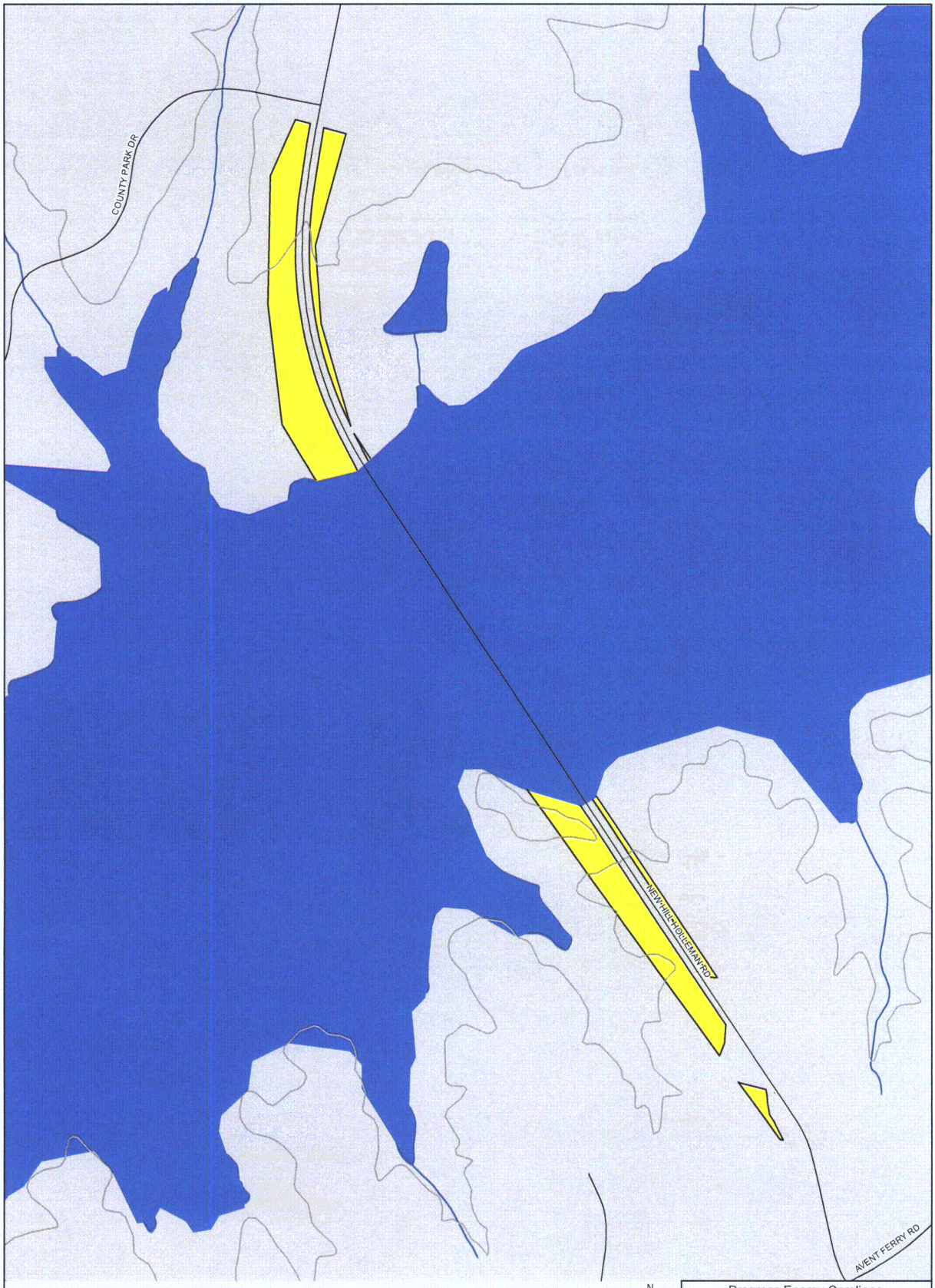
Progress Energy Carolinas
Shearon Harris Nuclear Power Plant Units 2 and 3
New Hill, North Carolina
New Hill - Holly Springs Rd
Attachment 4.3.1-2A,
Figure 6


COUNTY PARK DR
NEW HILL-HOLLEMAN RD
AVENT FERRY RD
LEGEND
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Harris 240 Contour
Streams
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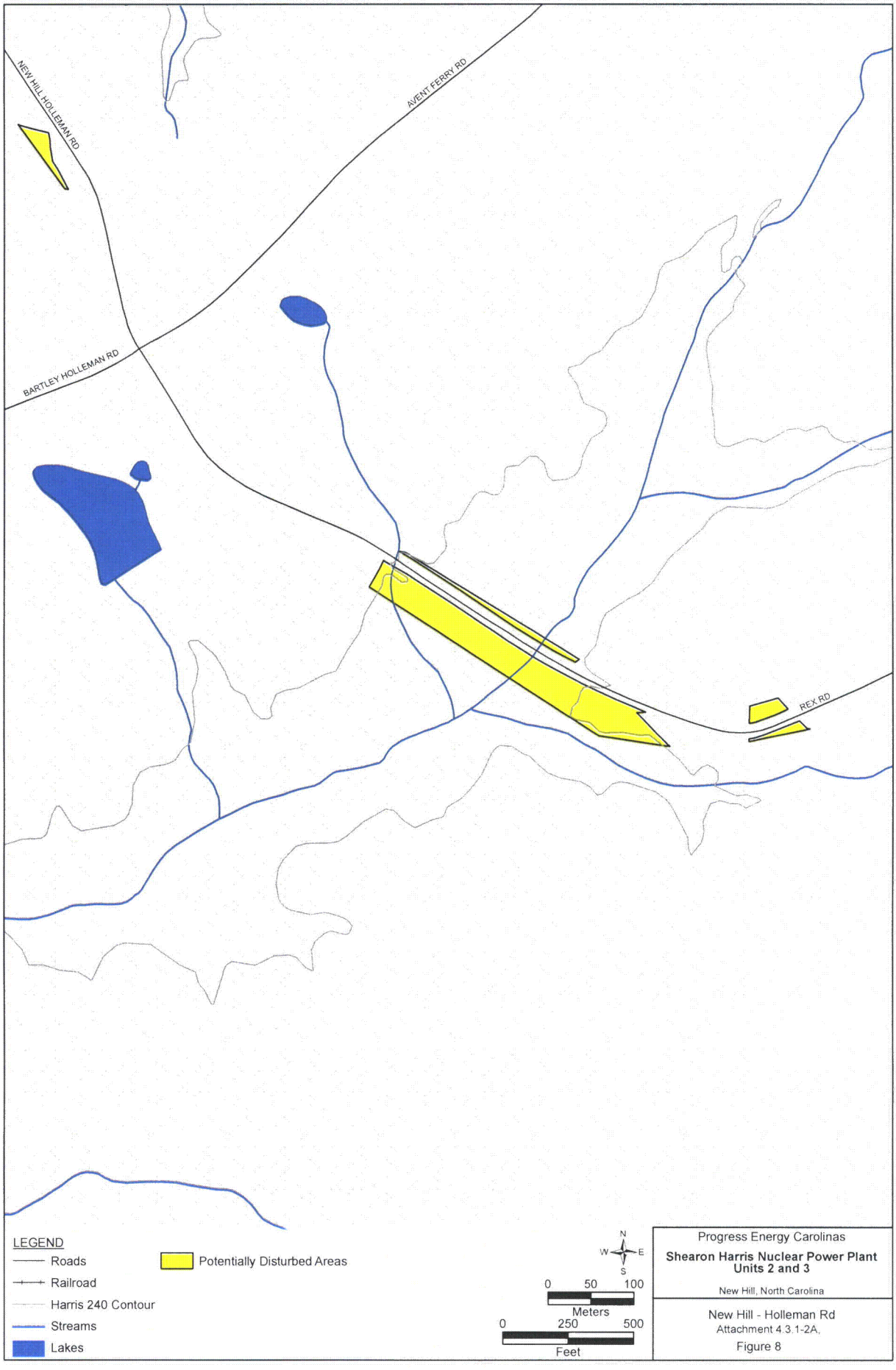
Progress Energy Carolinas
Shearon Harris Nuclear Power Plant
Units 2 and 3
New Hill, North Carolina
New Hill - Holleman Rd
Attachment 4.3.1-2A,
Figure 7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AVENT FERRY RD
BARTLEY HOLLEMAN RD
REX RD
LEGEND
Roads
Railroad
Harris 240 Contour
Streams
Lakes
Potentially Disturbed Areas
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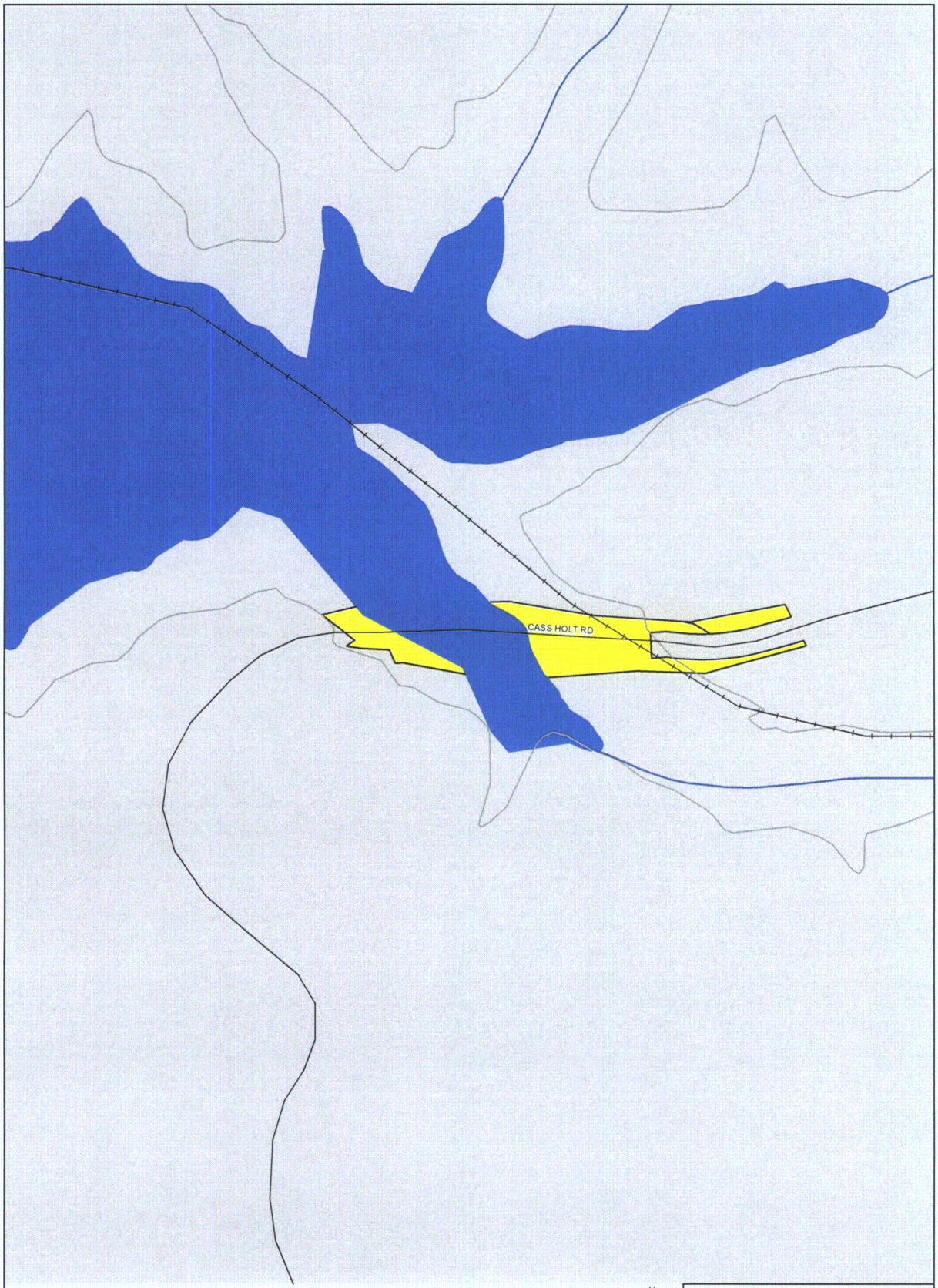
Progress Energy Carolinas
Shearon Harris Nuclear Power Plant
Units 2 and 3
New Hill, North Carolina
New Hill - Holleman Rd
Attachment 4.3.1-2A,
Figure 8



Progress Energy Carolinas

Shearon Harris Nuclear Power Plant Units 2 and 3

New Hill, North Carolina

Cass Holt Road

Attachment 4.3.1-2A,
Figure 9


CASS HOLT RD
SWEET SPRINGS RD
LEGEND
Roads
Railroad
Harris 240 Contour
Streams
Lakes
Potentially Disturbed Areas
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Meters
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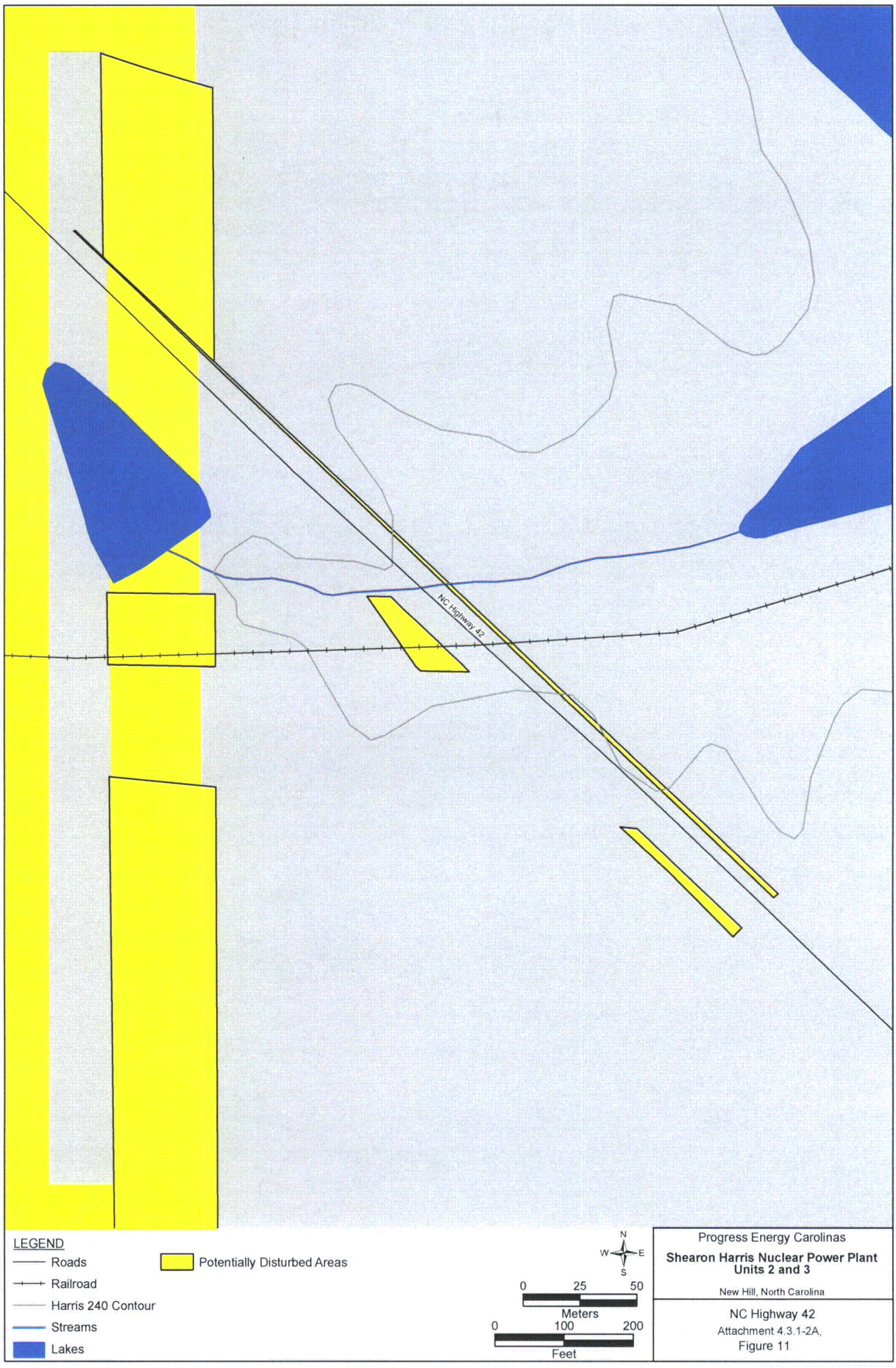
Feet
Progress Energy Carolinas
Shearon Harris Nuclear Power Plant Units 2 and 3
New Hill, North Carolina
Cass Holt - Sweet Springs Rd
Attachment 4.3.1-2A,
Figure 10


NC Highway 42
LEGEND
Roads
Railroad
Harris 240 Contour
Streams
Lakes
Potentially Disturbed Areas
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Meters
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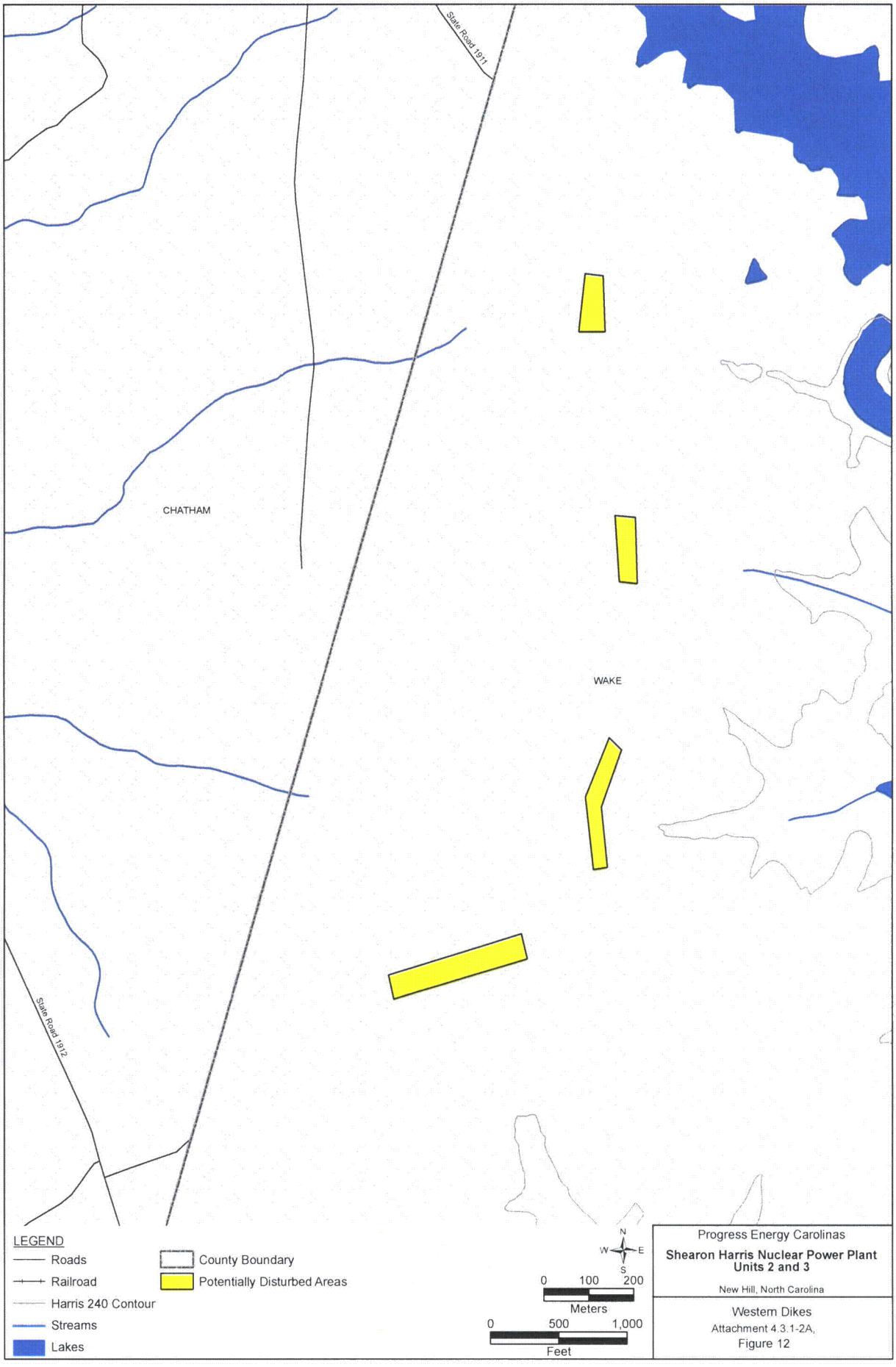
Feet
Progress Energy Carolinas
Shearon Harris Nuclear Power Plant Units 2 and 3
New Hill, North Carolina
NC Highway 42
Attachment 4.3.1-2A,
Figure 11


State Road 1911
CHATHAM
WAKE
State Road 1912
LEGEND
Roads
Railroad
Harris 240 Contour
Streams
Lakes
County Boundary
Potentially Disturbed Areas
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Progress Energy Carolinas
Shearon Harris Nuclear Power Plant Units 2 and 3
New Hill, North Carolina
Western Dikes
Attachment 4.3.1-2A,
Figure 12

HAR ER RAI 4.3.1-2 Attachment B

Summary of Wetlands Delineation (Preliminary Results)

Project Overview

Wetlands delineation and stream characterization activities were conducted from November 2008 through February 2009 to support the preparation of Progress Energy Carolinas, Inc.'s (PEC's) Combined License Application (COLA) for two Westinghouse Electric Company, LLC AP1000 generating units at the Shearon Harris Nuclear Power Plant Units 2 and 3 (HAR) site in Wake County, North Carolina. The delineation effort included an evaluation of areas that would be impacted by the HAR project. The final U.S. Army Corps of Engineers (USACE) verification visit has not been completed and these results should be considered preliminary until the USACE has approved the jurisdictional delineation.

As part of the HAR project, the current surface water elevation of Harris Lake would be raised from 220 feet above mean sea level (msl) to a future elevation of 240 feet above msl, inundating areas adjacent to the lake. These areas were evaluated during a wetland reconnaissance effort in 2006, with more detailed delineation and mapping of the delineation from November 2008 through February 2009. The 2008/2009 delineation included areas of ground-disturbing activities that were not part of the 2006 evaluation, such as laydown yards, roadways, parking lots, fire pond, cooling towers, a new wastewater treatment plant (WWTP) site, the makeup water line from Cape Fear River to Harris Lake, new dikes, and transportation improvement projects. The areas of ground-disturbing activities were identified in RFI 158 Construction Input for Makeup Water Line and HAR Units 2 and 3, the Transportation Impact Analysis (TIA), and RFI 346 Documents on Disturbed Areas. Areas that were delineated in 2008/2009 as part of this effort are identified on the figure included at the end of the text (delineated areas related to the HAR project).

Methodology

Stream and Wetland Delineation

Wetlands are defined jointly by the USACE and the U.S. Environmental Protection Agency (EPA) as:

> *...those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. (USACE, 1987)*

Wetlands include swamps, marshes, bogs, and similar areas. In the North Carolina piedmont region, the USACE uses the *Corps of Engineers Wetlands Delineation Manual* (USACE, 1987) to establish the process for identifying wetlands and uses the *U.S. Army Corps of Engineers Jurisdictional Determination Form Instructional Guidebook* (USACE, 2008a) to determine whether identified wetlands and other waters are subject to jurisdiction under

Section 404 of the Clean Water Act (CWA). In North Carolina, USACE accepts the classification of streams as perennial or intermittent based on the *Identification Methods for the Origins of Intermittent and Perennial Streams* (North Carolina Division of Water Quality, 2005).

Environmental biologists and licensed surveyors from CH2M HILL visited the probable impact areas, as outlined above, to delineate and map wetlands and other waters of the United States. The environmental biologists engaged in this effort have received specific training on wetlands delineation and have completed numerous wetlands delineations across the Southeast. Additionally task-specific training was conducted prior to commencement of field activities to explain the area to be delineated, as well as the specific field protocols described in this summary. Biologists evaluated soil, vegetation, and hydrologic conditions to identify wetlands and other waters in accordance with the procedures established in the previously referenced sources. When wetlands and streams were delineated, they were mapped using survey grade global positioning system (GPS) equipment with sub-meter (less than 3 feet) accuracy. Specific delineation methods, as agreed with the USACE in advance of the field effort, are described in the following sections.

Wetlands

Three types of wetlands were found surrounding Harris Lake: emergent wetlands, lacustrine fringe wetlands, and terrestrial forested and herbaceous wetlands. Emergent wetlands were defined by the presence of emergent wetland vegetation in the littoral zone. Lacustrine fringe wetlands were defined by their location on the landward edge of the lake with hydrology directly attributed to the water surface elevation of the lake. Terrestrial forested and herbaceous wetlands were located inland from the shoreline. A field team delineated the emergent wetlands in the littoral zone using a boat to access these areas. To locate the inland wetlands, multiple delineation teams walked the perimeter of the lake and delineated wetlands in the area that would be inundated by raising the elevation of the lake. The delineation teams also identified wetlands within the areas of probable ground disturbance. These are areas that would be impacted by construction activities at the HAR site; transportation corridors altered due to the increase in lake level or the need for increased vehicle capacity; or areas associated with the Cape Fear River water makeup line and pumphouse. Once the teams delineated wetland areas, surveyors recorded the wetland boundaries using survey grade, sub-meter accurate GPS.

The wetland delineation teams worked in separate, pre-determined areas to avoid confusion with naming conventions or duplication of effort. Each team was designated with a unique letter: A, B, C, or D. Identified wetlands were abbreviated by a "W-[team letter]-[unique numerical identifier]," such as WA-001. The field teams completed a 1987 USACE manual jurisdictional determination form for each wetland that was identified. Representative upland data points were also collected to characterize the upland areas adjacent to the delineated wetlands; upland data were not collected for every individual wetland area. Representative forms were used based on the relatively homogenous nature of the upland areas for each major region of the project area (for example, each of the named arms/drainages of Harris Lake). This methodology was confirmed to be sufficient for the USACE during the initial USACE field verification visit in December 2008. Additionally, a

limited number of USACE 1987 forms were completed for upland data points in representative areas throughout the study area.

The USACE 1987 Wetlands Delineation Manual was used as guidance for delineating the boundary of all wetlands areas for this effort. Several wetland areas that had hydrophytic vegetation and wetland hydrology did not meet the hydric soils criteria within the 1987 manual due to the presence of red parent material for soils. These wetland area soils were identified as hydric using the United States Department of Agriculture, Natural Resource Conservation Services (NRCS) publication "Field Indicators of Hydric Soils in the United States," Version 6.0 (2006). The two primary field indicators that were used for this effort included the following:

1. TF2 field indicator, Loamy and Clayey Soils - Red Parent Material: Used for soil samples with red parent material because the hue of the parent in some cases obscures the reduced soil matrix. This test indicator was designed to be used for soils that have parent material that has a hue of 7.5 YR or brighter and the soil sampled has a matrix value and chroma of 4 or less and 2 percent or more of redoximorphic (redox) concentrations.

2. F3 field indicator, Loamy and Clayey Soils - Depleted Matrix: Used for soil samples with a chroma of 2 but lacked any mottles (a hydric soil classification requirement in the 1987 manual). This test indicator was designed to be used for soils that have a depleted matrix with 60 percent or more chroma of 2 or less that has a minimum thickness of either:

   a. 5 centimeters (cm) (2 inches), if that 5 cm (2 inches) is entirely within the upper 15 cm (6 inches) of the soil, or

   b. 15 cm (6 inches), starting within 25 cm (10 inches) of the soil surface

   NOTE: Redox concentrations are required for soils with matrix colors of 4/1, 4/2, and 5/2.

Use of these indicators for wetland delineation is consistent with the methodology currently under development in the *Draft Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region* (USACE, 2008b).

Once the required forms and notes were completed, the team delineated the wetland with survey flagging that included the specific wetland identifier where individual flags were numbered sequentially (for example, W-A-001-001, W-A-001-002, etc.). The total number of flags and the sequential numbering were noted (for example, W-A-001-001 to W-A-001-012). The surveyors followed behind the wetland teams within 2 to 3 weeks of delineation and mapped wetland boundaries using survey grade GPS.

The USACE indicated that wetlands upstream of beaver dams could be identified by establishing the elevation at the top of beaver dams and then defining the wetland area by extending the corresponding contour rather than walking the perimeter of the impoundment. The delineation team marked the beaver dam with one (or more) survey flags labeled "B-[team letter]-[unique numerical identifier]," such as B-A-001. The surveyors followed behind and mapped the contour elevation that corresponded with the height of the beaver dam. It is important to note that some of the wetland features upstream of beaver

dams were delineated by flagging the entire boundary, so the prefix identifier of "B" does not include all of the beaver-influenced wetland areas. These areas are jurisdictional wetlands and the prefix "B" merely indicates a different method of delineation was used during the field work.

The delineation teams also identified ponds or ox-bow features within the defined survey areas. The team marked these feature with one or two survey flags labeled "P-[team letter]-[unique numerical identifier]," such as P-A-001. The pond and ox-bow features were large and easily recognizable, and the edge of the water of each feature was mapped by surveyors using survey grade GPS.

Emergent wetlands within the littoral zone of the reservoir were delineated and mapped by a delineation team deployed in a boat. The boat crew had a pole calibrated with marks set to a depth of 2 meters (6.6 feet). The 2-meter depth determined the point of change from emergent to submerged aquatic vegetation beds, as defined in the 1987 manual (USACE, 1987). The delineation team used survey grade GPS to locate and map the outer edge of emergent wetland areas at the time of delineation, as determined by depth or the limits of emergent vegetation. The inner boundary of the emergent wetland areas was established by the innermost 220-foot contour line. Fringe wetland areas that bordered individual emergent wetland areas were identified by field crews and mapped by using the areas between the 220-foot contour interval and the 221-foot contour interval. Surveyors used elevation checks in several areas around the lake to verify the location of the 220-foot and 221-foot contour lines adjacent to the lake margin. The boat crew labeled emergent wetlands as "ED-[unique numerical identifier]," such as ED-001, and fringe wetlands as "FD-[unique numerical identifier]," such as FD-001. The unique numerical identifier for the fringe wetland areas matched that of the paired emergent wetland areas.

Feature type Abbreviation	Description
ED	Emergent wetland feature delineated by Field Team D
FD	Fringe wetland feature delineated by Field Team D
PA	Pond feature delineated by Field Team A
PB	Pond feature delineated by Field Team B
PC	Pond feature delineated by Field Team C
WA	Wetland feature delineated by Field Team A
WB	Wetland feature delineated by Field Team B
WC	Wetland feature delineated by Field Team C
WD	Wetland feature delineated by Field Team D
BB	Wetland feature delineated by Field Team B using beaver dam as reference elevation
BC	Wetland feature delineated by Field Team C sing beaver dam as reference elevation

Isolated wetland areas were delineated in the same manner as jurisdictional wetlands. These wetlands will be excluded from the USACE jurisdiction using the Rapanos forms and subsequently will fall under the State Isolated Wetland permit program.

Streams

Teams A, B, C and D also delineated streams in their assigned survey areas. Streams were identified with "S-[team letter]-[unique numerical identifier]," such as SA-001. A North Carolina Division of Water Quality (NCDWQ) Stream Identification Form Version 3.1 was completed to determine if the streams were intermittent or perennial. The team also completed a USACE Stream Quality Assessment Worksheet for all intermittent and perennial streams. No forms were required for ephemeral streams, but teams completed a NCDWQ form for any stream that was borderline between ephemeral and intermittent, as well as representative ephemeral streams throughout the project area. After the forms were completed in the field, all stream score totals were checked to verify the correct total. Forms that had incorrect totals were corrected by use of a single strikethrough of the incorrect total and the correct total and reviewer initials were added to the data forms.

The score of a NCDWQ Stream Identification Form Version 3.1 classifies a stream as perennial, intermittent, or ephemeral. The form is separated into three sections: Geomorphology, Hydrology, and Biology. Each section is scored separately and then the three scores are added together to obtain a final score. A final score of less than 19 indicates an ephemeral stream; a score between 19 and 29 indicates an intermittent stream; and a score of 30 or more indicates a perennial stream. The stream form is used to evaluate the entire reach of a stream. If a stream changed classifications, a separate stream form was completed and a new unique name was used.

A stream scoring 29.5 on the NCDWQ form was classified as perennial if the stream supported biology typical of a perennial stream as specified in *Identification Methods for the Origins of Intermittent and Perennial Streams* (NCDWQ, 2005). Streams that scored between 17.25 and 19 were classified as intermittent, due to the following factors:

a. Presence of an ordinary high water mark (OHWM), per RGL 05-05: Ordinary High Water Mark (OHWM) Identification (USACE, 2005),

b. Presence of flow in stream channels greater than 48 hours after a rain event, and

c. Previous experience with stream calls with the USACE Wilmington District.

Many streams that scored under 19 on the NCDWQ form and that were identified as intermittent were streams that occurred high up in a drainage area that had been logged at some point in recent history (10 to 15 years). These streams were "cut" by accelerated runoff from these cleared watersheds down to the seasonal high water table for that drainage area. Similar drainages that had not been logged showed no channel cutting or development. Once these logged areas revegetated, the erosional forces on the stream were reduced and further channel development was limited, thus resulting in a stream that likely would flow for up to 3 months of the year but would not typically exceed base flow. Final determination as to whether or not these borderline streams will be jurisdictional will be made by the USACE as part of the field verification visit.

Additional field notes were recorded that included observations not captured by the standard forms. The notes usually included weather information, unusual field conditions, or notations on similar stream groupings. The additional field notes were labeled in the field book with "S-[group letter]-[unique numerical identifier]-[date of collection]," such as SA-001-11112008. The team photographed representative stream features and used the same naming convention as the additional field notes, for example, SA-001-11112008.

Once the required forms and notes were completed, the team marked the stream with survey flagging. The flags included the specific stream name and were numbered sequentially (for example, SA-001-001, SA-001-002, etc.). The total number of flags and the sequential numbering were noted (for example, SA-001-001 to SA-001-012). The surveyors followed behind the wetland teams and mapped stream locations using survey grade GPS.

Feature Type Abbreviation	Description
SA	Stream feature delineated by Field Team A
SB	Stream feature delineated by Field Team B
SC	Stream feature delineated by Field Team C
SD	Stream feature delineated by Field Team D

As part of the delineation effort, Rapanos forms were completed to establish whether a significant nexus to Traditionally Navigable Waters existed for streams and wetlands. Only those streams and wetlands with a significant nexus to Traditionally Navigable Waters are subject to USACE jurisdiction. The USACE indicated that they would accept and prefer that streams associated with specifically named drainages and smaller streams flowing directly into Harris Lake be grouped into distinct sets to minimize the number of Rapanos forms. A single Rapanos form would be completed for each distinct group of streams. This method of grouping resulted in six Rapanos forms for all streams and wetlands in the delineated area (forms will be finalized as part of the final USACE approval process). Additionally, all wetlands that are isolated or require an individual significant nexus determination to confirm USACE jurisdiction require their own Rapanos form, adding four additional forms. The USACE approval process may require additional Rapanos forms for these areas.

Results

Wetlands

Once the mapped stream and wetland areas are verified, a Jurisdictional Delineation map will be prepared from the surveyed locations. This map will show the boundaries of the areas that were delineated, as well as identified stream and wetland features. The map will contain tables of stream type and length as well as wetland type and area. Wetlands occurring in the littoral area of Harris Lake were classified as emergent wetlands. Lacustrine fringe wetlands are those wetlands that occur in areas adjacent to the lake with hydrology directly attributed to the water surface elevation of the lake. All other wetlands identified in the HAR project area were classified as forested or herbaceous. The figure included at the end of the text shows the approximate location and size of mapped wetlands and emergent

areas. Fringe areas are not shown on the map but generally are associated with emergent areas.

Feature Type	Approximate Number	Approximate Area (ac.)
Wetlands (Forested/Herbaceous)	58	180
Emergent Wetlands	280	340
Fringe Wetlands	250	60
Open Water (ponds)	16	15

Streams

Streams surrounding the Harris Lake were defined as ephemeral, intermittent, or perennial based on specific channel morphology and flow characteristics. Perennial streams have well-defined channels and flow most of the year under normal climatic conditions. Intermittent streams also have well-defined channels but flow only during wet seasons of the year. Ephemeral streams typically lack well-defined channels and flow only in direct response to precipitation with runoff.

The table below lists the summary of the results for streams identified by the delineation effort. Ephemeral streams were not mapped since they are not considered USACE jurisdictional waters under the CWA 404. The figure included at the end of the text shows the approximate location and length of mapped streams.

Stream Type	Approximate Count	Approximate Length (Total LF)	USACE Score Range	DWQ Score Range	Notes
Intermittent	120	65,600	21-35	14-29	Some steams that fell below the threshold for intermittent classification were classified as intermittent due to the rationale presented above
Perennial	30	70,200	32-80	29.5-50	

References

North Carolina Division of Water Quality. 2005. *Identification Methods for the Origins of Intermittent and Perennial Streams*, Version 3.1. North Carolina Department of Environment and Natural Resources, Division of Water Quality. Raleigh, NC.

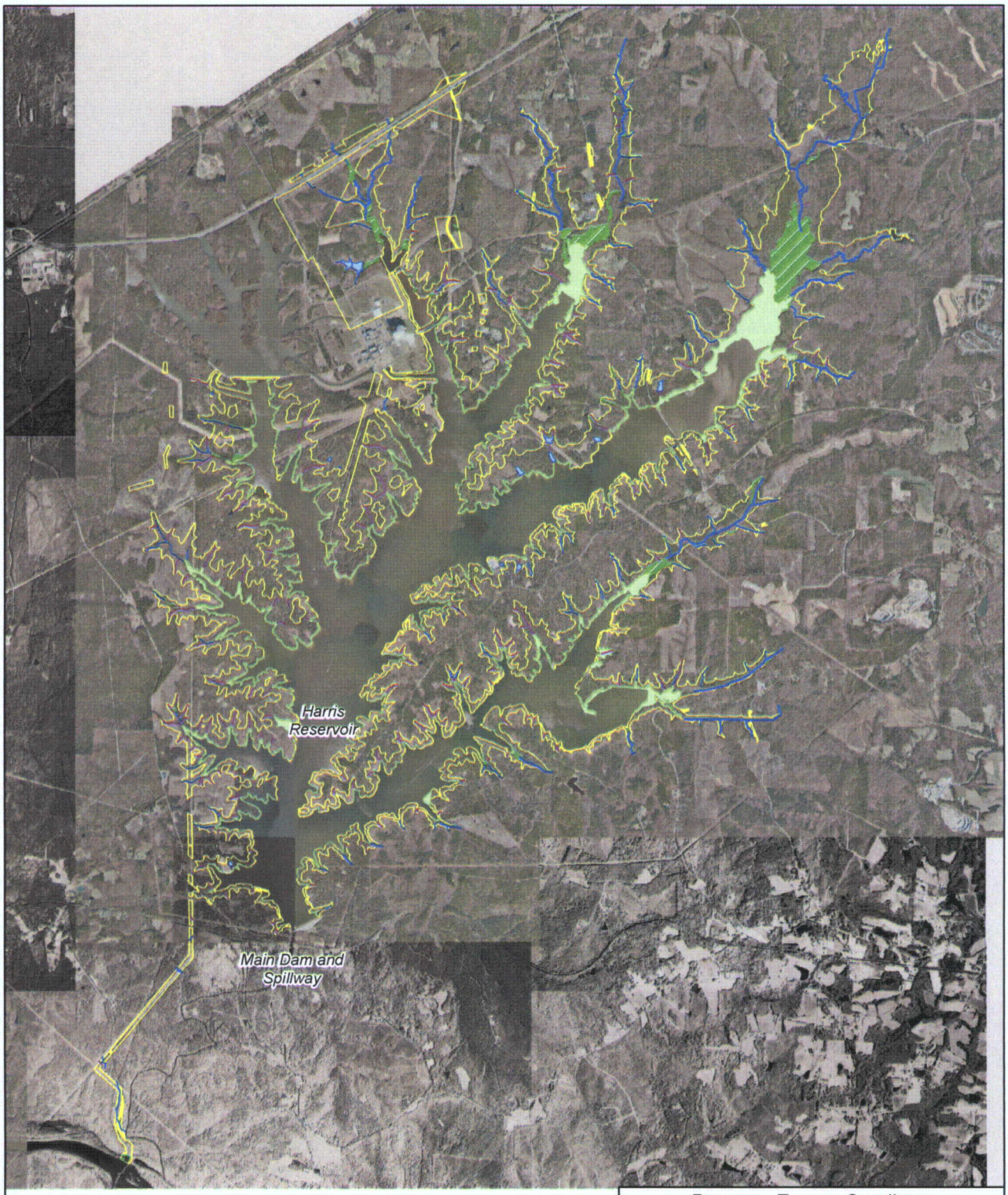
U.S. Army Corps of Engineers (USACE) Waterways Experiment Station. 1987. *Corps of Engineers Wetlands Delineation Manual.*

U.S. Army Corps of Engineers (USACE). 2005. Regulatory Guidance Letter, No. 05-05. *Ordinary High Water Mark (OHHM) Identification.*

U.S. Army Corps of Engineers (USACE). 2008a. *U.S. Army Corps of Engineers Jurisdictional Determination form Instructional Guidebook.*

U.S. Army Corps of Engineers (USACE). 2008b. *Draft Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region.* Wetlands Regulatory Assistance Program. Draft Initial Template.

United State Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS). 2006. *Field Indicators of Hydric Soils in the United States: A Guide to Identifying and Delineating Hydric Soils.* Version 6.0.



LEGEND

- Ephemeral Stream
- Intermittent Stream
- Perennial Stream
- Delineated HAR Project Boundary
- Ponds
- Emergent Wetland
- Forested / Herbaceous Wetland

N
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S

0 0.5 1
Kilometers

0 0.5 1
Miles

Progress Energy Carolinas

Shearon Harris Nuclear Power Plant Units 2 and 3

New Hill, North Carolina

Delineated Areas Related to HAR Project

Attachment 4.3.1-2B

Harris Nuclear Plant
Fire Pond Fish Survey
22 May 2009

Environmental Services Section personnel conducted an informal aquatic survey of the Harris Fire Pond on May 22, 2009. Organisms were collected using a ten meter flat seine along shallow shoreline habitat in two areas. *Lepomis macrochirus* (bluegill) were collected and *Micropterus salmoides* (largemouth bass) were observed in both seining areas. No amphibians were captured in either seine haul or observed while sampling.

Sample site one was located along the southern end of the pond by a drainage culvert. Sample site two was located along the northern end of the pond at the corner of the dam. Prior to sampling, fish were observed moving throughout the sampling areas. Captured fish were measured to the nearest millimeter, categorized into groups, and weighted to the nearest gram. Bluegills were divided into three length classes (1) 0-50mm, (2) 51-100mm and (3) 101+mm. All fish were released alive after weighing.

Bluegill was the only species captured at both sample sites. Three largemouth bass were noted at both sample locations but could not be captured. The largemouth bass ranged in size from 100-250mm. A total of forty-four bluegill was captured weighing 242g. Class 2 bluegills made up over 72% of the bluegill observed and over 74% of the biomass. Dragonfly larvae were also collected in both seine hauls (Pic 4).

The Harris Fire pond resembles a typical North Carolina bass-bluegill pond. The pond seemed to have a healthy stock of fish having both juvenile and adults present.

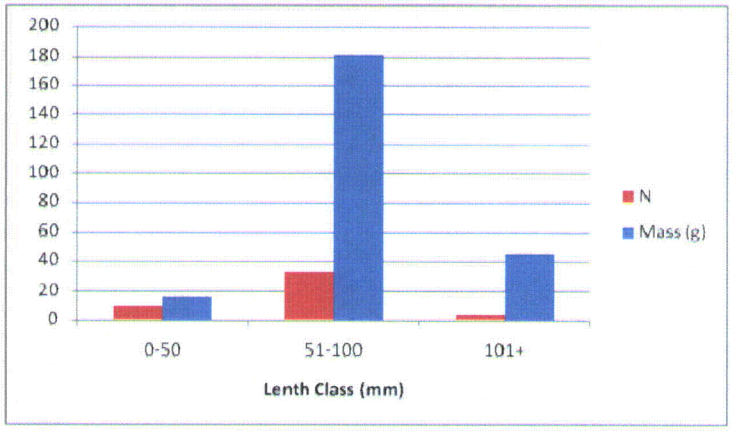
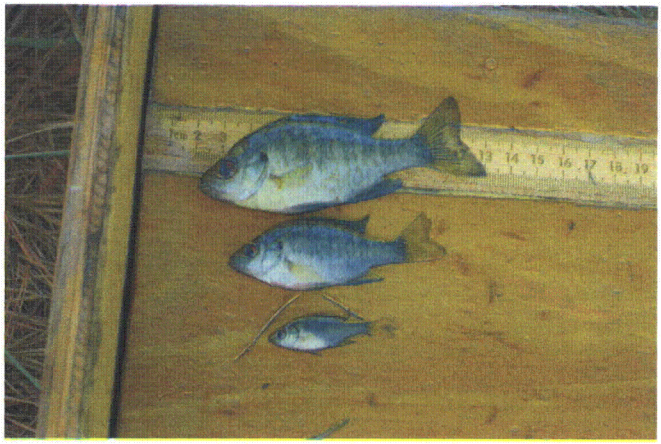


Fig.1 Summary of bluegill captured at both seining locations.



Pic 1. Three size classes of bluegill

Pic 2. Sample location 1

Pic 3. Sample location 3

Pic 4. Dragonfly Larvae

HAR ER RAI 9.4-1 Attachment A

Alternative Site Selection Process

Introduction

As a nuclear power plant applicant, Progress Energy Carolinas, Inc. (PEC) is required to obtain site permits and approval for construction and operation from the U.S. Nuclear Regulatory Commission (NRC). Prior to preparing the NRC application, PEC was required to select a suitable site location that incorporated the range of specific plant design parameters to be certified by the NRC. PEC chose the Harris Nuclear Site as the preferred site from a selection of alternatives that were identified as a result of a site selection process performed based, in part, on the Electric Power Research Institute (EPRI) Siting Guide, ESRP 9.3, and Regulatory Guide 4.7, Rev. 2.

The EPRI Siting Guide, as adopted for the Progress Energy siting study, provides four steps in the site selection process whereby the "**regions of interest**" are initially subjected to exclusionary considerations to develop a list of "**candidate areas.**" The candidate areas are further reduced using more refined discretionary criteria. The resulting "**potential sites**" are further analyzed against avoidance considerations reducing to a small number of "**candidate sites.**" A suitability evaluation of specific criteria then determines the highest ranked "**alternative sites**" best suited for a nuclear plant. These sites are finally subjected to business strategy considerations to determine the "**preferred site.**"

Potential site locations included greenfield sites, previously considered nuclear facility locations, and existing nuclear plant sites. They were subjected to exclusionary and avoidance criteria such as identification of inadequate water supply, adverse environmental impacts, insufficient land area, or unavailable transmission. The potential site locations were thereby reduced to four "alternative sites" and subjected to a detailed suitability evaluation. These locations included one greenfield site previously considered for a merchant fossil plant (Marion site), and three locations with existing operating nuclear plants (Brunswick Steam Electric Plant, Shearon Harris Nuclear Plant, and H. B. Robinson Nuclear Plant).

Executive Summary

The economically and environmentally preferable alternative for the PEC COL is co-location with an existing nuclear facility owned by PEC As summarized in PEC's site selection report and summarized in the Combined License Application (COLA) Environmental Report, the process to select the proposed site considered PEC's business objectives and addressed the elements described in NUREG-1555, Section 9.3, "Site Selection Process," and the EPRI Siting Guide. PEC located and evaluated both greenfield sites and locations with operating nuclear plants. Sites previously considered for a nuclear facility and fossil facilities were also included. Sites outside the ROI were considered only in specific instances. For

example, the Savannah River site (which is outside the PEC service territory and the ROI) was considered as a potential site because the site aggressively pursued a new nuclear plant with PEC, Duke, and SCANA. Based on this review and consideration of PEC's business objectives, Harris was selected as the proposed site.

To determine alternate sites for the Environmental Report analysis, consistent with NRC guidance, PEC included the other two sites it owns in the Region of Interest with nuclear power plants; Robinson and Brunswick. A greenfield site is unlikely to be environmentally preferable to co-location. To validate this conclusion, PEC selected a greenfield site (Marion Site) that was one of the most appropriate for location of a nuclear power plant for further analysis to compare with the proposed site.

The four candidate sites, Harris and the three alternate sites, are among the best sites that could reasonably be found for the siting of a nuclear power station. The selected candidate sites chosen had the least environmental impacts while satisfying the requirements of an AP1000 nuclear plant site. The three nuclear sites are owned by PEC (with ready access to the site and other information), are located within the Region of Interest, and are within the applicant's candidate areas. Finally, all candidate sites are expected to be licensable (that is, able to obtain applicable NRC licenses and state and local permits).

The comparison of alternate sites to the proposed sites concluded that none of the sites was environmentally preferred to Harris. This analysis also confirmed, based on review of the representative greenfield site (Marion), that no greenfield sites would be expected to be environmentally preferable to Harris.

Key Assumptions

Certain key assumptions and criteria were used as "bounding conditions" to aid in the site selection process. The key assumptions are as follows:

- The location must be compatible with system operation and transmission delivery capabilities.
- The expected licensing path and regulatory outlook for the identified proposed site must reduce PEC's schedule and financial risk for establishing additional nuclear baseload generation.
- The cost of the proposed nuclear generation as affected by the location must be reasonable and fair, and methods to ensure greater certainty of the cost and schedule during the licensing, design engineering, and construction phases of the proposed project must be included.
- The selection and evaluation process included a generic "greenfield" site, existing nuclear power station locations in the ROI, other power generating stations (coal, hydroelectric), and other previously developed sites (brownfield sites).
- The sites were evaluated based on the assumption that an AP1000-designed nuclear station will be built and operated. This assumption provides a realistic, consistent basis

for evaluating site conditions against site requirements for a nuclear power station design.

The following sections provide an overview of the site selection process. The objectives of the site selection process were to: (1) position the proposed nuclear power station within a defined ROI at a geographic location that was determined based on the outcome of the site selection process; (2) support the company's business objectives; (3) satisfy applicable NRC site suitability requirements; and (4) comply with NEPA requirements regarding the consideration of alternative sites.

Federal Law, Regulation, and Guidance

In order to select the best location for the proposed nuclear power station, PEC conducted a site selection process, as required by the National Environmental Policy Act of 1969 (NEPA) and Code of Federal Regulations (CFR), Title 10, Part 51.45 (10 CFR 51.45). The site selection process considered relevant federal, state, local, and other requirements, as well as business, engineering, and socioeconomic factors, which demonstrated that the selected site met these requirements.

The following general guidelines were used to develop and document the site selection process. Any deviations from the regulatory guidelines are noted in the text below.

- NRC guidance: NUREG-1555, Environmental Standard Review Plan (ESRP), Section 9.3: Site Selection Process (NRC, 2007). This document formed the basis of the site selection process.
- Regulatory Guide 4.2, Rev. 2, "Preparation of Environmental Reports for Nuclear Power Stations" (NRC, 1976). This guide was used in comparing the alternative sites to the proposed site. According to the guide, a cost-effectiveness analysis of realistic alternatives in terms of both economic and environmental costs can be conducted, if needed, to show why the proposed site is preferred over the alternative sites. In order to determine a suitable site, expected environmental impacts are appraised for each site. Quantifying impacts, while desirable, may not be possible for most factors because of a lack of adequate data. Under such circumstances, qualitative and general comparative statements supported by documentation may be used. The guide suggests various criteria that may be used for comparing the alternatives and the proposed nuclear power station, including the following:
  - Engineering and environmental factors: meteorology; geology; seismology; hydrology; population density in site environments; access to road, rail, and water transportation; fuel supply and waste disposal routes; cooling water supply; water quality; sensitivity of aquatic and terrestrial habitats affected; commitment of resources; and dedicated areas
  - Transmission hookup factors: access to transmission system in place, problems of routing new transmission lines, problems of transmission reliability, and minimization of transmission losses

- Construction factors: access for equipment and materials; housing for construction workers
- Land use factors: land use types, including compatibility with zoning or use changes
- Cost factors: construction costs, including transmission, fuel (annual), and operating and maintenance (annual) costs
- Operating factors: load-following capability
- Alternative site cost factors: land and water rights; base station facilities; main condenser cooling system; main condenser cooling intake structures and discharge system; transmission and substation facilities; access roads and railroads; and site preparation including technical investigations

- Regulatory Guide 4.7, Rev. 2, "General Site Suitability for Nuclear Power Stations" (NRC, 1998). This guide discusses the major site characteristics related to public health and safety and environmental issues that the NRC staff considers in determining the suitability of candidate sites for nuclear power stations. The safety issues that the NRC considers in its evaluation include geologic/seismic, hydrologic, and meteorological characteristics of proposed sites; exclusion areas and low population zones; population considerations as they relate to protecting the general public from the potential hazards of serious accidents; potential effects on a station from accidents associated with nearby industrial, transportation, and military facilities; emergency planning; and security plans. The environmental issues that the NRC considers in its evaluation include potential impacts on ecological systems, water use, land use, the atmosphere, aesthetics, and socioeconomics (social, cultural, and economic features, including environmental justice).
- 10 CFR 100, "Reactor Site Criteria," (NRC, 1996). This document requires that criteria, such as population density, use of site environments (including proximity to man-made hazards), and physical characteristics of the site be used as exclusionary criteria at a higher level to determine the acceptability of a site for a nuclear power reactor.
- Electric Power Research Institute (EPRI), *Siting Guide: Site Selection and Evaluation Criteria for an Early Site Permit Application*, Final Report (EPRI, 2002). The siting guide serves as a roadmap and tool and provides the methodology and framework for developing a detailed and specific process to meet the needs of early site permit (ESP) applicants for site selection. The siting guide is the industry standard for site selection and ESP preparation, and it is also appropriate to use with the COLAs. The siting guide describes a four-step site selection process involving sequential application of exclusionary, avoidance, and suitability criteria, as well as incorporation of preferences (or weighting factors) that are applied to the suitability criteria. Steps 1 and 2 of the siting process are areal in nature; screening of a relatively large region of interest (ROI) is performed to identify a number of discrete "site-sized" parcels for evaluation as a potential nuclear power station site. These steps are accomplished using mappable information. Steps 3 and 4 compare individual sites based on their relative suitability.

This portion of the process begins with the use of mapped and other published information and concludes with detailed information collected through onsite investigations, as necessary. Step 4 culminates in selecting a proposed site.

Region of Interest

The first step in the site selection process was to define and identify the ROI. As defined in ESRP 9.3 (NRC, 2007), the ROI is the geographic area within which sites suitable for the size and type of nuclear power generating facility proposed by the applicant are evaluated. The basis for an ROI can be the state in which the proposed site is located or the relevant service area for the proposed facility. PEC's service territory is the relevant service area that will be served by the Shearon Harris Nuclear Power Plant Units 2 and 3 (HAR). Therefore, the ROI used in the HAR COLA for the proposed Environmental Report (ER) has been defined as PEC's service territory in both North Carolina and South Carolina.

PEC's service territory consists of an area approximately 34,000 square miles (mi.2) (88,060 square kilometers [km2]) and includes northeastern South Carolina, portions of the coastal plain, a lower piedmont section, and a portion of western North Carolina as depicted on Figure 1.

The ROI encompasses the major towns/cities of Asheville, Durham, Cary, Raleigh, Greenville, Jacksonville, Fayetteville, and Wilmington in North Carolina, as well as Florence, Georgetown, Myrtle Beach, and Sumter in South Carolina. Water bodies within the ROI that are available as a source of cooling water for the proposed nuclear station include the Cape Fear River, Haw River, Pee Dee River, Tar River, Neuse River, Santee River, Wateree River, and the Atlantic Ocean. Major highways within the ROI include Interstate 20 (I-20), I-40, I-85, I-95, and I-240. Railroads that operate within the ROI include Amtrak, CSX Transportation, Inc. (CSXT), and the Norfolk Southern Railway. Major airports within the ROI include Raleigh-Durham International Airport, Wilmington International Airport, and Myrtle Beach International Airport. Major land use designations can be found throughout the ROI and include residential, rural, agricultural, industrial, commercial, public facilities, parks, open space, preserves, reserves, natural areas, transportation, communications, utilities, government special designation, and education. Topographic features in the ROI range from flat floodplains along the rivers and coastal plains along the bays to steep hills, deep ravines, and mountain ranges.

Identification of Candidate Areas

After the ROI was identified, the next step in the site selection process was to identify suitable candidate areas by screening the ROI using exclusionary criteria. Candidate Areas are a subset of the ROI and refer to one or more areas within the ROI that remain after unsuitable areas have been removed from consideration. ROI screening was performed at a high level with the purpose of quickly identifying areas with the ROI that would not be suitable for the siting of a new nuclear power plant. Per ESRP 9.3 (NRC, 2007), probable reasons that areas may be unsuitable could include:

- Proximity to major centers of population density
- Lack of existing infrastructure (e.g. roads and railroads)
- Lack of suitable cooling water sources
- Distance to transmission lines, substations, or load centers
- Unsuitable topographic features (mountains, marshes, fault lines)
- Potential to impact valuable agriculture, residential, or industrial areas
- Potential to impact dedicated land-use area (e.g. parks, historic sites, wilderness areas, testing grounds)
- Conflict with land-use planning programs or other restrictions established by state, county, or local governments

The criteria used by PEC in the screening of the HAR COLA ROI in order to identify the candidate areas are consistent with those identified in ESRP 9.3 (NRC, 2007) and the EPRI siting guide (EPRI, 2002). No ratings by criteria were used to screen for the candidate areas—areas either passed or failed the exclusionary criteria. The criteria used in the screening of the ROI to identify the candidate areas are identified below:

- Proximity to major population centers
- Distance to transmission lines, substations, or load centers
- Lack of a suitable cooling water source.
- Potential to impact dedicated lands

Figure 1 identifies the criteria used to screen the ROI (some of the identified excluded areas overlap).

Screening information was obtained from publically accessible geographic information system (GIS) database websites.. Information gathered from the initial screening was used to identify areas not affected by the exclusionary screening criteria. The GIS information was layered to produce a figure that represented the suitable candidate areas for the potential placement of a nuclear power facility (see Figure 2).

It is noted that the exclusionary criteria pertaining to population density used in this siting evaluation is more specific and more conservative than what is required under Nuclear Regulatory Commission regulation 10 CFR § 100. The information presented in 10 CFR § 100 does not specify a permissible population density or total population within this zone because the situation may vary from case to case. NRC Regulatory Guide 4.7, Rev. 2 (NRC, 1998), however, contains the same information as presented in 10 CFR § 100, but adds the following specific criteria:

> Preferably a reactor would be located so that, at the time of initial site approval and within about 5 years thereafter, the population density,

> including weighted transient population, averaged over any radial distance out to 20 miles (cumulative population at a distance divided by the circular area at that distance), does not exceed 500 persons per square mile [ppsm]. A reactor should not be located at a site whose population density is well in excess of the above value.

The EPRI siting guide provides guidance on determining total population density within the candidate areas and on developing a utility function that assigns a scale of value to sites with the lowest, intermediate, and highest population densities. The EPRI siting guide identifies the 500 ppsm or 500 persons per 2.6 km^2) criterion as well as the more conservative criterion with regard to population density and proximity to major population centers (that is, not located in an area with greater than or equal to 300 ppsm or 300 persons per 2.6 km^2) (EPRI, 2002). As indicated in the EPRI siting guide, sites with a lower population density [300 ppsm or 300 persons per 2.6 km^2] received a higher score than sites with higher population densities. This siting evaluation used the conservative population criterion (300 ppsm) as an exclusionary criterion in the identification of candidate areas since this criterion is commonly used as an industry standard.

Identification of Potential Sites

The next step in the site selection process was to screen the candidate areas in order to identify potential geographic locations for the placement of the proposed nuclear power station. The screening process considered discretionary criteria similar to those used to identify the candidate areas. However, identifying potential sites required a more detailed review of available information (NRC, 2007).

The goal of screening the candidate areas was to use a logical process that identified locations within the candidate areas that had ample water, were in close proximity to transmission facilities and load centers, and have infrastructure in place (NRC, 2007).

PEC choose locations within the candidate areas that contained operating nuclear plants as potential sites since the economically and environmentally preferable alternative for the PEC COL is co-locating the new reactor with an existing nuclear power facility. In addition, greenfield sites previously considered for a nuclear facility were also identified as potential sites. Potential sites outside the ROI were considered only in specific instances. For example, the Savannah River site (which is outside the PEC service territory and the ROI) was considered as a potential site because the site aggressively pursued a new nuclear plant with PEC, Duke, and SCANA.

The following preference factors influenced the decision to choose existing nuclear sites within the ROI as potential sites for further evaluation:

- There are benefits offered by existing nuclear sites. For example, co-located sites offer existing infrastructure and support facilities.
- The environmental impacts of an existing plant are known and the impacts of a new facility should be comparable to those of the operating nuclear plant.

- Site physical criteria, primarily geological/seismic suitability, have been characterized at existing sites; these criteria are important in determining site suitability.
- Transmission is available and the existing sites have nearby markets.
- Existing nuclear plants have local support and the availability of experience personnel.

Once existing nuclear sites within the ROI were identified as potential sites, PEC focused next on screening the candidate areas in order to identify other potential sites by applying the criteria listed below in an iterative process until a limited number of potential sites were identified.

- Distances from major centers of population were maximized. Developed areas (greater than or equal to 300 persons per square mile [ppsm] or 300 persons per 2.6 km^2) were identified from aerial photographs and topographic maps. The potential sites were not located in developed areas.
- Distance to existing transmission lines, substations, or load centers were minimized. Potential sites located in close proximity (that is, within a 30 mile [mi.] or 48.3 kilometers (km) radius of 230-kilovolt [kV] (or higher) transmission line) were identified using aerial photographs, topographic maps, and maps of the transmission network within the ROI. Potential sites were located in proximity to existing transmission lines, substations, or load centers.
- Land near existing water supply sources (rivers, lakes and coastal areas) was identified. Aerial photographs and topographic maps were used to locate potential sites in close proximity to (within 15 mi [24.1 km]) an adequate cooling water source (water source to support the consumptive water use requirements of an AP1000 which is approximately 42,000 gpm).
- Sites located in proximity to existing power generating facility infrastructure were identified by screening the candidate areas using aerial photographs and topographic maps.
- Avoidance of areas that contain land use restrictions
- Ownership of availability of adequate land area

Information used in the screening and evaluaton of the candidate areas was obtained from PEC personnel, GoogleEarth™ images, publicly held information on GIS database websites that generally included electric power-producing plants, and/or topographic maps showing roads, urban areas, wetlands, parks, and other dedicated lands.

The screening and evaluation of the candidate areas in order to identify suitable potential sites was performed by a team of Progress Energy Carolina personnel by visually applying the criteria identified above. The process involved examining topographic maps and aerial imagery in order to identify discrete parcels of land [approximating the size needed for an AP1000 nuclear station plus additional land for the ancillary structures and areas such as construction laydown area and parking area] in proximity to a suitable cooling water source, transmission lines, substations, and load centers, and existing power generating facility infrastructure.

The screening process also included consideration of existing site conditions, including whether the site was improved or potentially contained wetlands or floodplains. Potential sites were identified that avoided areas that contained land use restrictions. Also, ownership of availability of adequate land area was considered in identifying potential sites. Finally, potential sites needed to satisfy PEC's overall business objectives, and offer the ability of constructing and operating future nuclear units to provide PEC customers with reliable, cost-effective electric service.

Compiling the information above resulted in the identification of the following 11 potential sites:

1. Harris nuclear site,
2. Brunswick nuclear site,
3. Robinson nuclear site,
4. Three greenfield sites in South Carolina, including Marion County, and
5. Five greenfield sites in North Carolina.

Candidate Sites

Candidate sites were identified in a two-step technical evaluation of the potential sites. The first step involved identifying criterion ratings for each site and developing composite site suitability ratings. The criteria used to evaluate the potential sites were selected to be appropriate to: (1) the ROI; (2) the status of the proposed applicant's nuclear power generating facility being a merchant nuclear power generating facility; and (3) the technology involved with constructing and operating the proposed AP1000 nuclear facility. The second step of the potential site evaluation involved evaluating each potential site to determine if it was acceptable or should be excluded from further evaluation.

NUREG-1555, ESRP 9.3 (NRC, 2007) identifies site qualification criteria that may be used in the screening of the potential sites in order to identify the candidate sites, as identified below:

- Consumptive use of water should not cause significant adverse effects on other users.
- The proposed action should not jeopardize federal, state, and affected Native American tribal listed threatened, endangered, or candidates species or result in the destruction or adverse modification of critical habitat.
- There should not be any potential significant impacts to spawning grounds or nursery areas of populations of important aquatic species on federal, state, and affected Native American tribal lists.
- Discharges of effluents into waterways should be in accordance with federal, state, regional, local, and affected Native American tribal regulations and would not adversely affect efforts to meet water quality objectives.

- There should be no preemption of or adverse impacts on land specially designated for environmental, recreational, or other special purposes.
- There would not be any potential significant impact on terrestrial and aquatic ecosystems, including wetlands, which are unique to the resource area.
- There are no other significant issues that preclude the use of the site.

The potential sites were evaluated and scored using the following discretionary criteria (as identified on Table 1):

- Seismic considerations: Sites needed to meet seismic requirements for existing and planned certified reactor designs.
- Available Land/Land Acquisition, of approximately 400 acres (ac.) (162 hectares [ha]): This is an exclusionary criterion based on the availability of the identified site and adjoining available area to support an AP1000 footprint approximately (240 ac. [97 ha]) plus approximately 180 ac. (73 ha) of additional land needed for ancillary structures, construction buildings, construction laydown areas, and parking areas rounded to 400 ac.
- Cooling Water: Sites needed to be in proximity to adequate cooling water source that contained sufficient quantity of water and the water was available.
- Geotechnical Considerations: Sites needed to meet geologic requirements for existing and planned certified reactor designs.
- Environmental Considerations: proximity of a site to floodplains, proximity of a site to low population areas; and sites were evaluated based on the presence or absence of wetlands at or surrounding the site.
- Transmission: Sites were evaluated based on the need for transmission system upgrades.
- Power: Sites needed to have access to sufficient off-site power voltage to support a nuclear unit.
- An ownership criterion was based on the site's ownership status.

For the second step of the potential site evaluation readily available reconnaissance-level information sources were used, which included publicly available data, information available from PEC files and personnel, and GoogleEarth™ images. .

During the two step evaluation of the eleven potential sites to determine candidate sites, PEC determined that the advantages of co-locating the new facility with an existing nuclear power facility often outweighed the advantages of any other probably siting alternative. Some potential environmental and market advantages included:

- The total number of required generating sites is reduced.

- Construction of new transmission corridors may not be required due to potential use of existing corridors.
- No additional land acquisitions would be necessary, and PEC can readily obtain control of the property.
- The site has already gone through the alternatives review process mandated by NEPA, and was the subject of extensive environmental screening during the original selection process.
- The site development costs and environmental impact of any preconstruction activities are reduced.
- Construction, installation and operation and maintenance costs are reduced because of existing site infrastructure.

Existing facilities where PEC could obtain access and control were preferred over the other potential sites within the region of interest. Sites that were originally designed for more generation than actually constructed also received preference.

Based on the above two-step evaluation process and PEC's preference for co-location, of the eleven potential sites, PEC selected four candidate sites. The four candidate sites that were carried forward for further analysis included three nuclear power generating stations and a greenfield site, as identified in Table 2.

Potential sites were excluded and not carried forward as candidate sites because of the following reasons: a South Carolina site was eliminated because seismic criteria could not be met; a North Carolina site was eliminated because the tract of land was not of suitable size; a North Carolina site was eliminated due to soil liquefaction issues; three sites located near the North and South Carolina border (on or near the Pee Dee River) were eliminated because a new cooling water reservoir would have been required, as well as significant transmission line upgrades; a South Carolina site was eliminated because it lies outside the PEC service territory and the ROI; and two sites in eastern North Carolina were eliminated because they are being actively considered for new fossil plants and the location lacked sufficient off-site power voltage to support a nuclear plant (Table 2).

The potential sites that PEC chose as candidate sites for further evaluation included:

- Harris nuclear site
- Brunswick nuclear site
- Robinson nuclear site
- Marion County greenfield site

No additional potential sites were selected as candidate sites, because according to NUREG-1555, ESRP, Section 9.3, three to five alternative sites in addition to the proposed site are considered to be an adequate number of candidate sites (NRC, 2007).

The four candidate sites were the best sites that could reasonably be found for the siting of a nuclear power station. The selected candidate sites chosen had the least environmental

impacts while satisfying the requirements of an AP1000 nuclear plant site. The three nuclear sites are owned by PEC (with ready access to the site and other information), are located relatively near the Harris Nuclear Plant site, and are within the applicant's candidate areas. Finally, all candidate sites are expected to be licensable (that is, able to obtain applicable NRC licenses and state and local permits).

The scoring associated with the identification of candidate sites from the pool of potential sites did not indicate whether or not one site is environmentally preferable to the other. That determination was accomplished during the next phase of the site evaluation process (that is, evaluation of the candidate sites), when the alternative sites were compared with the proposed site.

Table 1

Evaluation of North and South Carolina Potential Sites

	Exclusionary Criteria							
Site	Seismic	Land Acquisition	Cooling Water	Geotech	Environmental	Transmission	Power	Outcome
1 (NC)	A	A	A	A	A	A	A	Candidate site
2 (NC)	A	A	A	A	A	A	A	Candidate site
3 (SC)	A	A	A	A	A	A	A	Candidate site
4 (SC)	A	A	A	A	A	A	A	Candidate site
5 (SC)	X	A	A	A	A	A	A	Excluded
6 (NC)	A	X	X	A	A	A	A	Excluded
7 (NC)	A	A	X	X	X	A	A	Excluded
8 (NC/SC)	A	A	X	A	A	X	A	Excluded
9 (SC)	A	A	X	A	A	X	A	Excluded
10 (NC)	A	A	A	A	A	A	X	Excluded
11 (NC)	A	A	A	A	A	A	X	Excluded

Notes:
X = Excluded
A = Acceptable
NC = North Carolina
SC = South Carolina

Table 2 (Sheet 1 of 2)

North and South Carolina Potential Site Evaluation and Identification of Candidate Sites

Site #	Site Description and Location	Evaluation	Status
Carolinas locations identified as candidate sites for further consideration:			
1	Harris Nuclear site	Existing nuclear power plant site; no issues to preclude consideration for COL site. This site was originally developed to accommodate much more electrical capacity and has much of the infrastructure to support units already in place.	Carried forward as candidate site.
2	Brunswick Nuclear site	Existing nuclear power plant site; no issues to preclude consideration for COL site.	Carried forward as candidate site.
3	Robinson Nuclear site	Existing nuclear power plant site; no issues to preclude consideration for COL site. This site is challenged from thermal limits on the lake, based on existing operating experience.	Carried forward as candidate site.
4	Marion County, SC Site	Site identified as being available for acquisition, with adequate land area and water supply from the Pee Dee River.	Carried forward as candidate site.
Carolina Potential Sites eliminated from further consideration:			
5	SC site	Site identified as being available for acquisition, with adequate land and water. Initial evaluation of the site indicated a high likelihood that it would not meet seismic requirements for existing and planned certified reactor designs.	Eliminated from further consideration.
6	NC site	Preliminary analysis indicates that there is no block of suitable land of sufficient size in a low population zone without wetlands. The area is also generally too flat for development of the large lake that would be required for a cooling water reservoir, and the site would require considerable expense to make it viable from an engineering perspective.	Eliminated from further consideration.

Table 2 (Sheet 2 of 2)

Carolinas Potential Site Evaluation and Identification of Candidate Sites

Site #	Site Description and Location	Evaluation	Status
7	NC site	This site was previously considered by PEC for a potential nuclear plant. Soil liquefaction issues have been identified that could make the site unsuitable for a certified plant design, and cooling tower makeup water sources are not adequate. The site also appears to be environmentally sensitive.	Eliminated from further consideration.
8	Three sites near the NC/SC border	This site grouping was identified based on current ownership of the hydro plant and previous Progress Energy site selection studies. The site would require major transmission upgrades and a new cooling water reservoir would likely be needed to deal with periodic low river flows on the Pee Dee River at this location.	Eliminated from further consideration.
9	SC site	This site (which is outside the PEC service territory) was identified because the SRS has aggressively pursued a new nuclear plant on the reservation with PGN, Duke, and SCANA. The site is not close to the PEC service territory and therefore would have high transmission costs. In addition, SRS controls the on-site cooling water loop from which cooling water would be drawn; the need for operational water arrangements with SRS to obtain cooling water was not desirable.	Eliminated from further consideration.
10	NC site	The site is available, has been identified in previous PEC siting studies, and is actively being considered for a future approximately 800-MW fossil plant. This location also did not have sufficient off-site power voltage to support a nuclear unit.	Eliminated from further consideration.
11	NC site	The site is available, has been identified in previous PEC siting studies, and is actively being considered for a future approximately 800 MW fossil plant. This location also did not have sufficient off-site power voltage to support a nuclear unit.	Eliminated from further consideration.

Source: PEC, 2006

Evaluation of the Candidate Sites (Proposed Site and Alternative Sites)

This section discusses how PEC evaluated the candidate sites in order to determine the highest ranked alternative sites, i.e., how PEC selected the one proposed site and how PEC determined there was no obviously superior environmental alternative to the proposed site. The four candidate sites are evaluated against suitability criteria, resulting in a transition from the elimination approach to an evaluation approach of the candidate sites. The objective of evaluation against suitability criteria is to rank the small number of alternative sites for determination of the proposed site. PEC performed three evaluations for each site in order to determine the overall ranking of the candidate sites: (1) Technical Evaluation, (2) Strategic Considerations, and (3) a Transmission Study.

The suitability criteria for the technical evaluation were grouped into four categories listed below with features in each category relevant to the specific aspects of facility development that are weighted and scored to provide a relative comparison of the candidate sites. The multiple features of the suitability criteria are combined into one composite value for each of the alternative sites.

- Health and Safety
- Environmental
- Land Use and Socioeconomics
- Engineering and Cost-related

The components of PEC's business strategic considerations include the following (PEC, 2006):

- Existing nuclear site advantages: Sharing of existing resources and facilities associated with security, maintenance, training, warehousing, and emergency planning.
- Proximity to load: Location to load center to ensure transmission delivery capabilities and system operations.
- NRC considerations: Preference of existing nuclear facility sites facilitating the COLA review process.
- Local and state government support: Incentives and support associated with infrastructure improvements, rate base impact, emergency planning and employment training.
- Business planning: The selected site must promote assurance of satisfying schedule and budget for COL approval.
- Public support: General public desire for safe and efficient nuclear power generation and avoidance of nonproductive intervention.

- Land utilization: Leverage of PEC land for potential applications of public benefit.

The Transmission Study provides input for each site regarding direct connection costs and system upgrade costs.

The results of the technical evaluation and verification process are summarized as follows and presented on Figure 3. The HAR site was considered the best with regard to technical evaluation criteria that address licensing and design technical requirements to construct and operate a new nuclear plant. The HAR site is superior to Robinson with regard to the lake cooling water and availability of PEC-owned property. While Brunswick had access to more than adequate river water for cooling, the transmission system upgrades required are significant. The Marion County site had the largest land area but also the largest percentage of wetland acreage and less than desirable geotechnical features. The HAR site has the least wetland acreage and the benefit of being a solid rock site, compared with deep soil of the alternative locations (PEC, 2006).

In regards to PEC's strategic considerations, the HAR site also ranks the highest. The NRC indicates a preference for existing nuclear plant sites based on licensing reviews and detailed site characterization already completed to support the existing nuclear plant, which places the Marion County site at a disadvantage. The existing nuclear plant locations further provide an advantage due to the ability to leverage existing site facilities and resources, such as warehousing, security, and operator training. The HAR site demonstrated an advantage over Brunswick and Robinson due to larger acreage of PEC-owned property and the clear ability to accommodate additional future generation capacity (PEC, 2006).

Transmission deliverability analysis has further concluded the HAR site is best suited to the existing transmission system requirements. The HAR site has minimal transmission impact costs for the installation of a nuclear unit. All other sites evaluated had considerable overloads identified with the addition of a nuclear unit (during various contingency scenarios), and required significant transmission system upgrades compared with the HAR site. Brunswick required the most extensive transmission system upgrades to remedy current overloads (PEC, 2006).

In summary, PEC chose HAR as the proposed site. The site selection process addresses the elements described in NUREG-1555, Section 9.3, "Site Selection Process," and the EPRI Siting Guide. The evaluation of the four candidate sites determined that all three of the nuclear sites were suitable for a new nuclear power plant; the Marion County site (greenfield site) ranked significantly lower than the existing sites as a result of high transmission costs and seismic, land acquisition, and wetlands issues. Of the existing nuclear sites, the HAR site rated highest, followed by Robinson and Brunswick. Robinson rated somewhat lower, primarily due to potential cooling water supply operational limitations and a lower rating in the geology/seismic category. Brunswick rated lower primarily due to transmission challenges and was slightly less favorable with respect to ecology and nearby hazardous land uses.

Once the candidate sites, including the proposed site, were identified, the next step was to screen and evaluate the sites in a two-part sequential test to determine whether any of the remaining three alternative sites were environmentally preferable, and thus potentially obviously superior, to the proposed site.

The first stage of the test determined whether there were environmentally preferred sites among the alternative sites. For this step, the alternative sites were those candidate sites that remained after the proposed site was selected (that is, candidate sites - proposed site = alternative sites). This identification matches the guidance provided in ESRP 9.3 (NRC, 2007).

If an alternative site was found to be environmentally preferable to the proposed site, then the second stage of the alternative site review process would have been implemented. If that stage had been needed, the economics, technology, and institutional factors among the environmentally preferred site(s) and the proposed site would have been considered to determine if any of the environmentally preferred sites were obviously superior to the proposed site. As indicated in ESRP 9.3 (NRC, 2007):

> The criterion for making this determination is that one or more important aspects, either singly or in combination, of a reasonably available alternative site are obviously superior to the corresponding aspects of the applicant's proposed site, and the alternative site does not have offsetting deficiencies.

Because there was no alternative site that was environmentally preferable to the proposed site, then the proposed site prevailed and became the candidate site submitted to the NRC by the applicant as the proposed location for a nuclear power station (NRC, 2007).

The basic constraints and limitations of the site selection process are the currently implemented rules, regulations, and laws within the federal, state, and local agency levels. These provide a comprehensive basis and an objective rationale under which this selection process is performed. (NRC, 2007)

In the first stage of the screening and evaluation of the candidate sites, the standard was one of "reasonableness," considering whether the applicant has performed the following:

- Identified reasonable alternative sites
- Evaluated the likely environmental impacts of construction and operation at these sites
- Used a logical means of comparing sites that led to the applicant's selection of the proposed site

The evaluation of the candidate sites was done using readily available reconnaissance-level information per Regulatory Guide 4.2, Rev. 2 (NRC, 1976), which states:

> The applicant is not expected to conduct detailed environmental studies at alternative sites; only preliminary reconnaissance-type investigations need be conducted.

The reconnaissance-level information sources included publicly available data, information available from PEC files and personnel, and GoogleEarth™ images in order to evaluate, score, and rank the candidate sites. Additional information and clarification of map and literature data were supplemented with site investigations as needed.

In order to begin the first stage, suitability criteria were identified to help facilitate the evaluation of the alternative sites. The criteria used in comparing the proposed site with the alternative sites to determine if there are environmentally preferred sites among the alternative sites were consistent with those presented in ESRP 9.3 (NRC, 2007) and include the following:

- Environmental
- Aesthetics
- Demography
- Ecology
- Geology, hydrology
- Socioeconomics
- Archaeological and historic preservation
- Environmental justice
- Transportation access
- Land use
- Water use
- Workforce availability, accessibility, and housing
- Access roads and railways
- Cooling system
- Intakes and discharges
- Transmission System

The suitability criteria were grouped into four categories: Health and Safety, Environmental, Land Use/Socioeconomics, and Engineering/Cost-related. Features in each category relevant to the specific aspects of facility development were weighted and scored to provide a relative comparison of the candidate sites (PEC, 2006).

Each site was assigned a rating of 1 to 5 (1 = least suitable, 5 = most suitable) for each of the evaluation criteria. Weight factors reflecting the relative importance of these criteria were synthesized from those developed for previous nuclear power plant siting studies. Weight factors used factors of 1 through 5, with 1 being least important and 5 being most important. Each criterion was assigned a weighted score by multiplying the primary weight and the score. Finally, the scores for each criterion were totaled into one composite value for each of the alternative sites, as depicted in Tables 3 and 4 (PEC, 2006).

A review of the scoring results indicated that none of the alternative sites were deemed to be environmental preferable to the proposed HAR site. Therefore, the second step, that is, a determination of whether the environmentally preferable alternative site was obviously superior to the proposed site, was not required.

Table 3

Technical Evaluation of the Candidate Sites

Criteria		Weight Factor	Brunswick		Harris		Marion		Robinson	
			Rating	Score	Rating	Score	Rating	Score	Rating	Score
	Geology/Seismology	**3.77**	3	11.31	4	15.08	2	7.54	2	7.54
	Cooling System Requirements	**3.27**	5	16.35	4	13.08	4	13.08	3	9.81
	Flooding	**2.4**	1	2.4	1	2.4	1	2.4	3	7.2
	Nearby Hazardous Land Uses	**3.35**	1	3.35	2	6.7	2	6.7	2	6.7
	Extreme Weather Conditions	**2.36**	1	2.36	3	7.08	3	7.08	3	7.08
	Accident Effect Related	**4.09**	3	12.27	3	12.27	4	16.36	4	16.36
	Surface Water – Radionuclide Pathway	**2.5**	5	12.5	4	10	4	10	4	10
	Groundwater Radionuclide Pathway	**2.55**	3	7.65	5	12.75	3.5*	8.925	3	7.65
	Air Radionuclide Pathway	**2.5**	5	12.5	5	12.5	5	12.5	5	12.5
	Air-Food Ingestion Pathway	**2.5**	5	12.5	4	10	3	7.5	2	5
	Surface Water-Food Radionuclide Pathway	**2.41**	5	12.05	3	7.23	5	12.05	5	12.05
	Transportation Safety	**2.14**	5	10.7	5	10.7	5	10.7	5	10.7
	Disruption of Important Species/Habitats	**2.64**	3	7.92	4	10.56	4	10.56	4	10.56

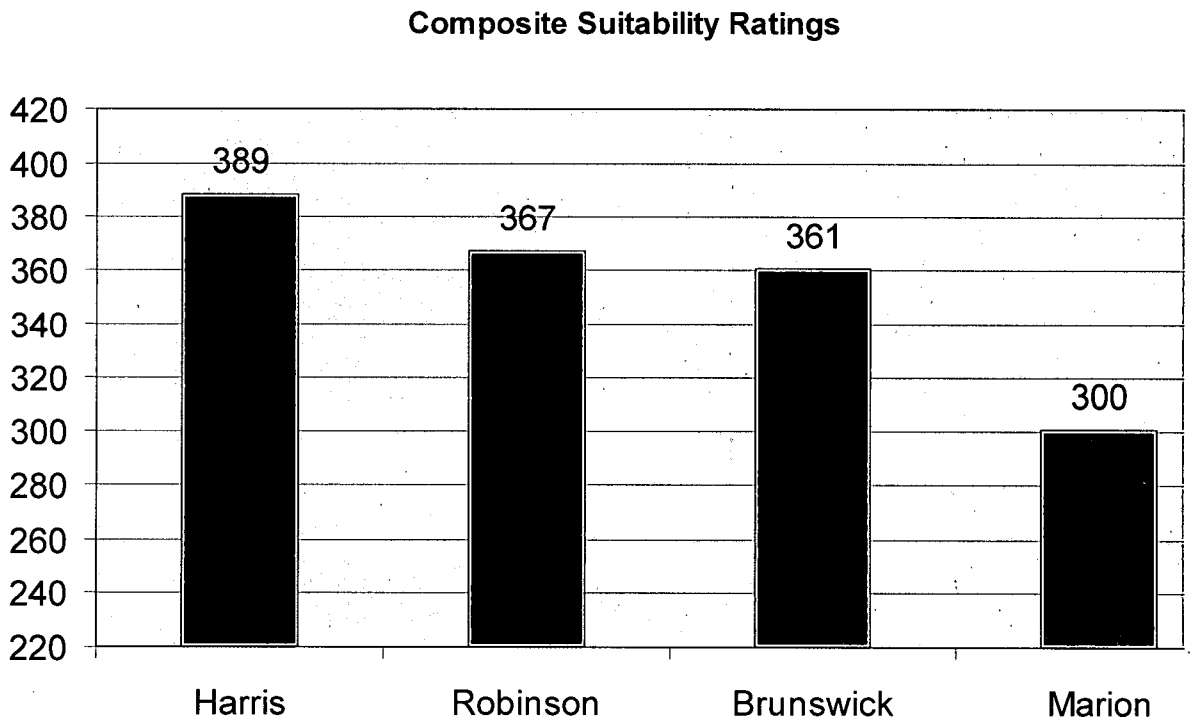
Criteria		Weight Factor	Brunswick		Harris		Marion		Robinson	
			Rating	Score	Rating	Score	Rating	Score	Rating	Score
	Bottom Sediment Disruption Effects	**2.14**	4	8.56	4	8.56	2	4.28	2	4.28
	Disruption of Important Species/Habitats and Wetlands	**3.18**	3	9.54	4	12.72	2	6.36	4	12.72
	Dewatering Effects on Adjacent Wetlands	**2.77**	3	8.31	5	13.85	1	2.77	5	13.85
	Thermal Discharge Effects	**3.64**	4	14.56	4	14.56	4	14.56	3	10.92
	Entrainment/Impingement Effects	**3.23**	3	9.69	3	9.69	3	9.69	3	9.69
	Dredging/Disposal Effects	**2.36**	3	7.08	4	9.44	3	7.08	3	7.08
	Drift Effects on Surrounding Areas	**2.36**	3	7.08	4	9.44	4	9.44	4	9.44
	Socioeconomics – Construction – Related Effects	**2**	5	10	5	10	5	10	5	10
	Environmental Justice	**1.95**	5	9.75	5	9.75	5	9.75	5	9.75
	Land Use	**3.8**	5	19	5	19	2	7.6	5	19
	Water Supply	**3.7**	5	18.5	5	18.5	3	11.1	5	18.5
	Pumping Distance	**3.05**	5	15.25	5	15.25	3	9.15	5	15.25
	Flooding	**2.9**	1	2.9	1	2.9	1	2.9	3	8.7
	Civil Works	**3.4**	3	10.2	3	10.2	2	6.8	3	10.2
	Railroad Access	**2.6**	5	13	5	13	3	7.8	5	13
	Highway Access	**2.8**	5	14	5	14	3	8.4	5	14

Criteria		Weight Factor	Brunswick		Harris		Marion		Robinson	
			Rating	Score	Rating	Score	Rating	Score	Rating	Score
	Barge Access	**2.85**	5	14.25	1	2.85	1	2.85	1	2.85
	Transmission Access	**4.8**	1	4.8	5	24	2	9.6	3	14.4
	Topography	**2.55**	4	10.2	4	10.2	4	10.2	4	10.2
	Land Rights	**2.75**	5	13.75	5	13.75	3	8.25	5	13.75
	Labor Rates	**3.3**	5	16.5	5	16.5	5	16.5	5	16.5
	Composite Site Rating		**361**		**389**		**300**		**367**	

Source: PEC, 2006

Table 4

Composite Suitability Ratings for the Technical Evaluation of the Candidate Sites



Source: PEC, 2006

Results of the Evaluation of the Candidate Sites

Based on these rating results and other applicable considerations related to PEC's business plans, the HAR site was selected as the proposed site for the PEC COL and there is no alternate site that is environmentally preferable to the proposed site.

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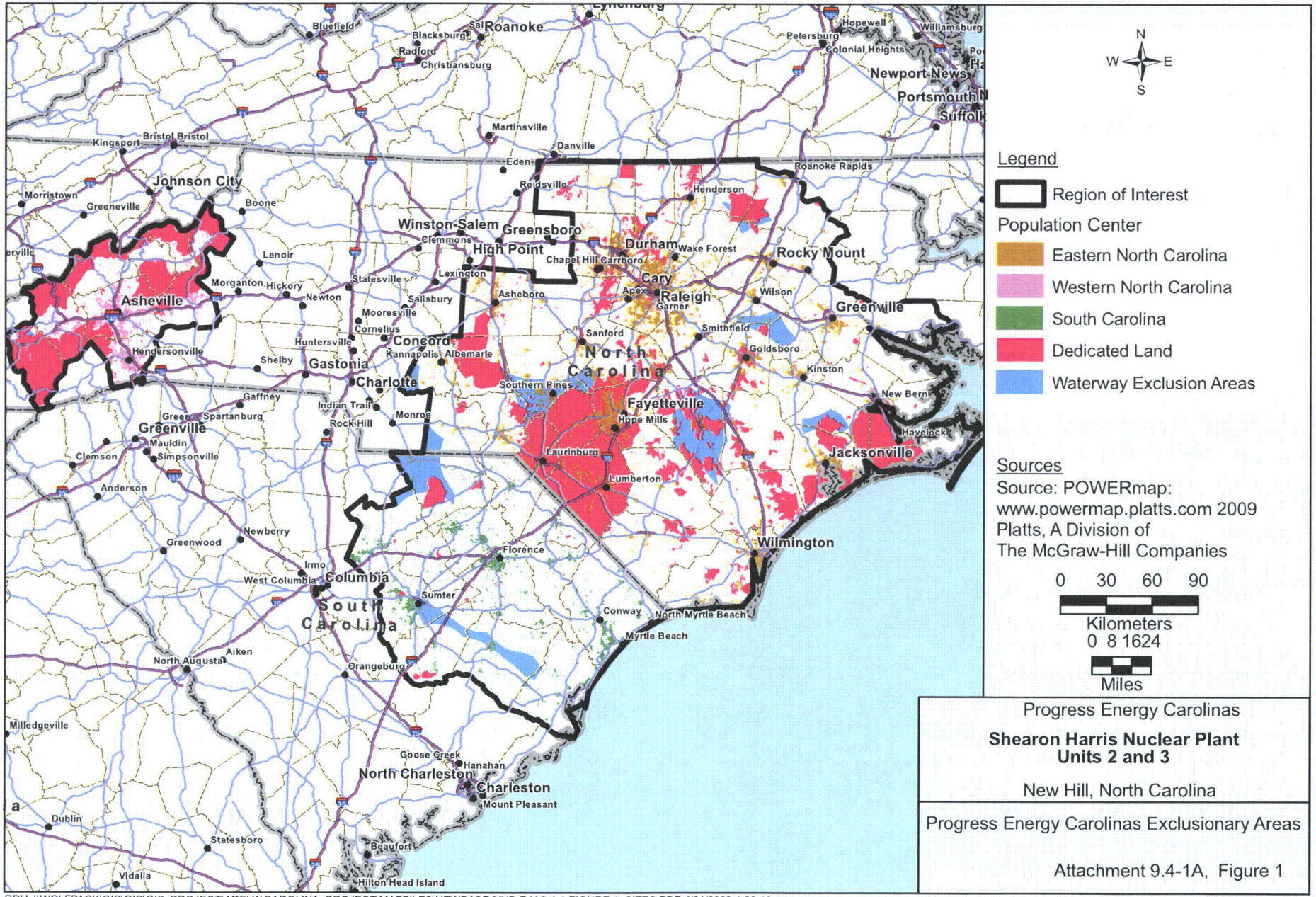

Progress Energy Carolinas

Shearon Harris Nuclear Plant
Units 2 and 3

New Hill, North Carolina

Progress Energy Carolinas Exclusionary Areas

Attachment 9.4-1A, Figure 1

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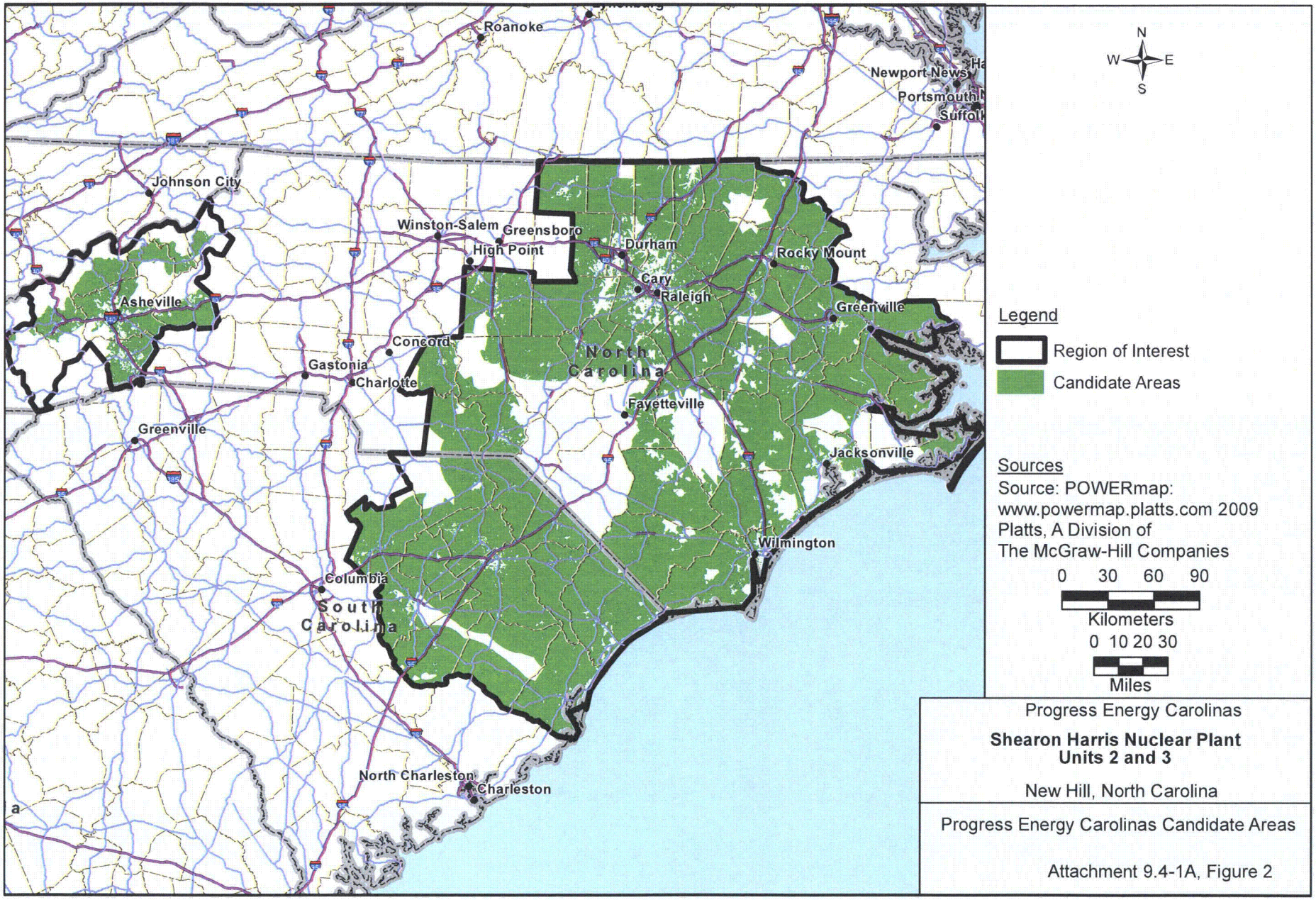

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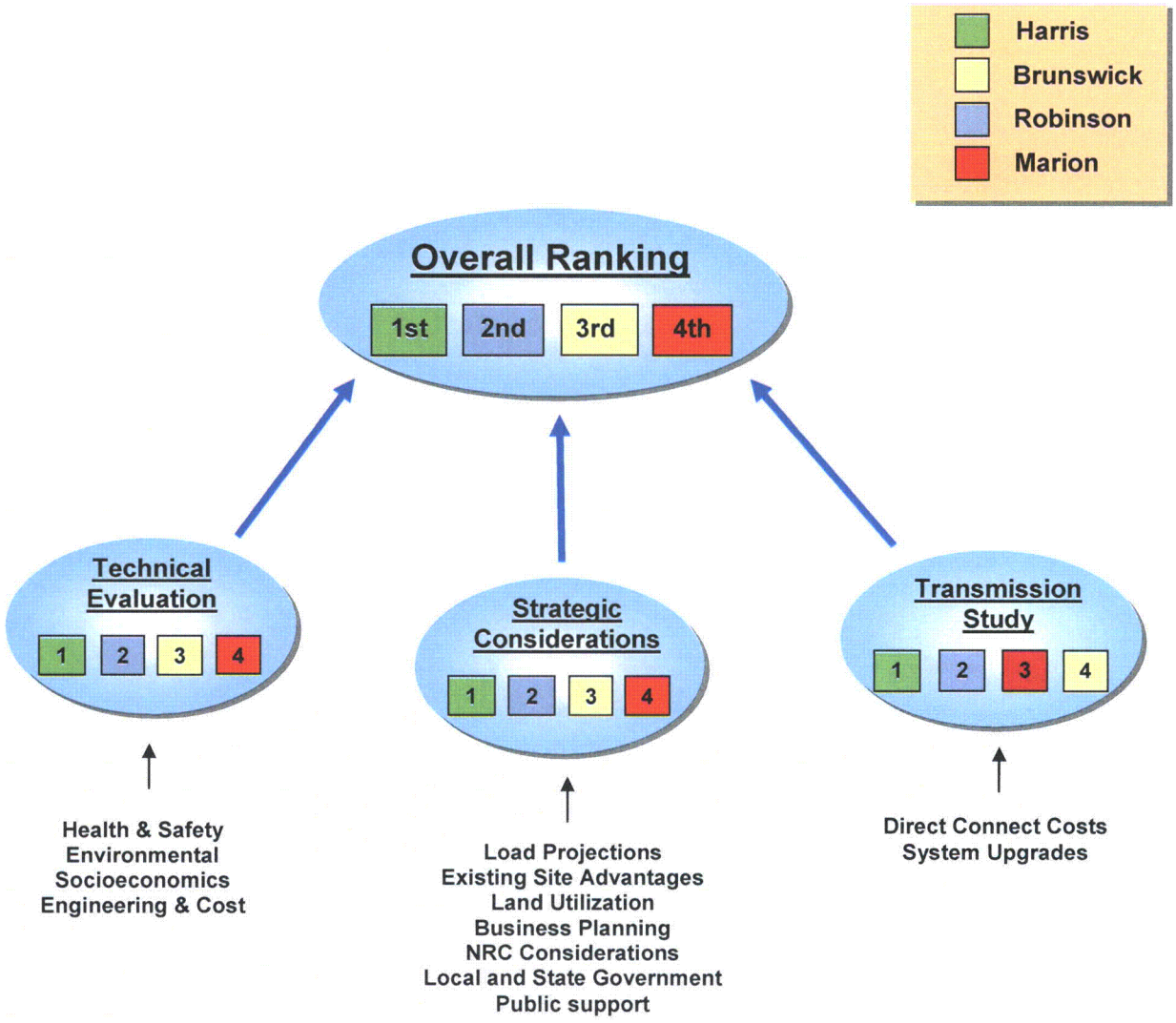
Figure 3

Overall Ranking of the Candidate Sites Based on the Results of the Technical Evaluation, Strategic Considerations, and Transmission Study



Source: PEC, 2006