

## ENGINEERING DESIGN FILE (EDF)

EDF Number: 338884-EDF-011

Revision: C

Project: PEC COLA

Engineering Discipline: Geotechnical

Date: 7/20/2007

### EDF Title & Description

**Title:** Geomatrix Field Documentation.

**Description:** This EDF contains documentation of Geomatrix field visits on May 17-19, June 26-30, and December 4-8, 2006. Formal reports were prepared for the visits May and December visits. No formal report was prepared for the June visit. These site visits were to gather preliminary information to support later analysis and reports. The following are attached to this EDF:

Attachment A-1: Memoranda from Geomatrix to CH2M HILL, dated June 2, 2006 documenting site visit May 17-19 2006. (9 Pages)

Attachment A-2: Memoranda from Geomatrix to CH2M HILL, dated December 19, 2006 documenting site visit December 5-8 2006. (27 Pages)

Attachment B-1: Copies of field notes from site visit May 17-19, 2006 (7 Pages)

Attachment B-2: Copies of field notes from site visit June 26-30, 2006 (17 Pages)

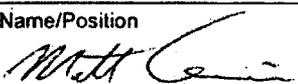
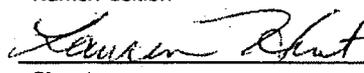
Attachment B-3: Copies of field notes from site visit December 4-8, 2006 (8 Pages)

See Page 2 for assessment of input acceptance.

### Revision History

Revision Number	Description	Date	Affected Pages
A	Initial Submittal	4/25/2007	All
B	Revised to address Squad Check Comments	4/29/2007	All
C	Revised to add Attachment B-2 to file	7/20/2007	All

### Document Review & Approval

Originator:	Matt Gavin / Geotechnical Task Lead	7/20/2007
	Name/Position	Date
		
	Signature	
Checked:	Lauren Hunt / Hydrogeologist	7-20-07
	Name/Position	Date
		
	Signature	
Approved:	Tim Young / Tech PM	7/20/07
	Name/Position	Date

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**Assessment of Design Input Acceptance (338884-EDF-011):**

The purpose and objectives for this deliverable are to document field notes that support future Geomatrix analysis and support. These notes are general in nature and do not constitute design inputs or analysis. The bases for acceptability are clarity and legibility of the records. The documents included in 338884-EDF-011 are determined to be acceptable for addition to the project records. Information in these files has been incorporated in other Geomatrix deliverables.



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Memorandum  
June 2, 2006  
Page 2

Waste Disposal site, Southwestern Wake County, North Carolina. The NCGS provided technical review of the work conducted at the site. All of the core and records from these studies are housed at the North Carolina Geological Survey. Mr. Clark provided us with a copy (on loan) of the Executive Summary of the initial Law Engineering studies and a copy of the Harding Lawson Associates (1997) reports to review and copy.

Mr. Clark provided us with copies of the 2001 Southeastern GSA Fieldtrip Guidebook that includes two summary papers that provide an overview of the depositional and structural setting of the Deep River Basin (Clark et al., 2001) and the stratigraphy and faulting observed at the proposed Low-Level Radioactive Waste Disposal Site, southwestern Wake County, North Carolina (Wooten et al., 2001).

Age of faulting-No capable faults are known in the site vicinity. The most recent movement on the Jonesboro and secondary faults in the basin occurred prior to 150 Ma. There are no good exposures of the Jonesboro fault in the site area. The fault is overlain by unfaulted Cretaceous sediments. Mr. Clark has observed the fault in construction excavations that were subsequently obscured by construction.

Geotechnical characteristics of the Triassic sediments- Poor infiltration, nonexistent in the B/C horizon (average ~ 4% infiltration); high shrink-swell clays in the upper weathered horizon; poor compressibility. The Triassic sediments are not good aquifers; water only present in highly fractured rock adjacent to dikes. Fracture density varies with lithology: coarse units- fractures are very rough, large, irregular apertures, spacing on the order of feet: fine sand -apertures decrease: siltstone- no apertures.

**Friday 19 May 2006 (S. Shannon and K. Hanson)**

7 am to ~ 4 pm. Fieldtrip with Tyler Clark to review exposures of Triassic stratigraphy in the site area.

**Stop 1:** Boat Ramp exposure-Good exposure of Lithofacies 3-conglomerate. Jonesboro fault is located within ~1/4 to 1/2 mile of this locality. Exposures of numerous slickensided fault surfaces, randomly oriented. Photos: 11-12.

9:25 am -10:30 am- Meeting at the Visitor Center with Lynn Yuhr and Matt Gavin to discuss results of the geophysical studies. Tyler Clark noted that magnetometer results in Area E were consistent with the braided, bifurcating dike system that would be expected in that region. Based on the preliminary results of the magnetometer data, it was decided to extend the magnetometer survey in Area C further to the west along the road and to run another resistivity line in Area E to see if the possible anomaly that was coincident with the fault could be reproduced along another line.

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Memorandum  
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Note: Deeper P-wave velocity data may be available for the Sears #1 well, which is the closest (~ 4.5 mi NNE of the SHNPP) deep (~3,000 to 4,000 feet) well near the site. Additional oil and gas wells are present in the Sanford basin at distances of ~20 mi. Cuttings, compressed lithologic log, gamma logs, etc. may be available thru the NCGS.

10:30am- Continued fieldtrip.

**Stop 2:** Exposures along the right bank just below Auxiliary Dam Spillway. Lithofacies 2/3- transitional. Soil (good B horizon with ped structure and carbonate nodules)/siltstone (contained fossil bones)/interbedded siltstone and sandstone. The siltstone at this location is heavily bioturbated. Photos: 13-15. Note: Structures and fractures at this stop are described as Stop 2 in Wooten et al. (2001).

**Stop 3:** Martha's Chapel Outcrop, Jordon Lake shoreline outcrops, Farrington 7.5-minute quadrangle. Lithofacies 2- Well exposed sequence along the lake shoreline. This is probably fairly typical of what will be present at the Harris site (except that the exposures at this locality may be slightly more arkosic). Sequence includes several fining-upward sequences of basal gravel/coarse sand into silt and locally purplish paleosol. A dike is exposed at the western end of the exposure on the peninsula. The effect of contact metamorphism on the adjacent Triassic rocks is well preserved and exposed. Small offset faults and brecciated zones immediately adjacent the dike are also present. Conjugate sets of joints are present along the eastern margin of the dike which is relatively hard. Further to the west the dike is heavily weathered to saprolite. Photos: 16 -35. Note: This is Stop 3 in Clark et al. (2001).

**Stop 4:** Road cut along main road (between upper Beaver Creek and Reedy Branch approximately 4 mi west of the town of Apex. Lithofacies 2: good exposure of sandy end member. Photos: 36-42.

**Stop 5:** Exposure along railroad cut south of Morrisville. Lithofacies 1: good exposure of coarse gravel facies. This site is near the depositional center of the basin. Individual clasts or cobbles up to 6 or 8 inches across are present and often lie in bands with imbricate structure.

**Action Items:**

1. Make copy of the Harding-Lawson Associates (1997) report for the Low Level Radioactive Waste Site study & return original to Tyler Clark.
2. Contact John Nickerson, NCGS, IT person to obtain digital 1:24,000 geologic map of quadrangle containing site and information regarding oil and gas wells in the vicinity of the site.

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**NRC Site Visit to Progress Energy - Harris Nuclear Plant (HNP) COLA Site  
Meeting Attendee List  
May 17-18, 2006**

Last	First	Org.	Title	Phone
Julian	Caudle	NRC	Team Leader	(404) 562-4603
Miller	Garry	PGN	Mgr - Nuclear Plant Engineering	(919) 546-6107
Gavin	Matt	CH2M HILL	Geotechnical Task Lead	(847) 525-4770
Munson	Cliff	NRC	Geophysicist	(301) 415-2529
Carrion	Robert	NRC	Project Engineer	(404) 562-4522
Hanson	Kathryn	Geomatrix	Geomatrix Consultants	(510) 663-4146
Garner	Larry	PGN	Facilities Supr.	(619) 362-2255
Shannon	Sam	CH2M HILL	Sr. Geologist	(334) 271-1444
Nazario	Tomy	NRC	Reactor Inspector	(404) 562-?
Starefos	Joelle	NRC	Sr. Project Mgr.	(301) 415-8488
Nevill	James	PGN	Lead Engineer	(919) 546-7855
Anderson	Don	CH2M HILL	Sr. Geotechnical Engineer	(425) 453-5000
Schaeffer	Jen	CH2M HILL	Field Team Leader	(540) 558-8786

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[11151\\_PGN\\_COL\\_17-19\\_May\\_2006\\_001\\_Unit\\_2\\_site.jpg](#)



[11151\\_PGN\\_COL\\_17-19\\_May\\_2006\\_002\\_BGA-9\\_Drill\\_hole.jpg](#)



[11151\\_PGN\\_COL\\_17-19\\_May\\_2006\\_003\\_BGA-9\\_core\\_box.jpg](#)



[11151\\_PGN\\_COL\\_17-19\\_May\\_2006\\_004\\_BGA-7drill\\_site.jpg](#)



[11151\\_PGN\\_COL\\_17-19\\_May\\_2006\\_004\\_BGA-7drill\\_site\\_close\\_up.jpg](#)



[11151\\_PGN\\_COL\\_17-19\\_May\\_2006\\_006\\_Unit\\_3\\_site\\_view\\_S.jpg](#)



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[11151\\_PGN\\_COL\\_17-19\\_May\\_2006\\_008\\_NRC\\_Staff\\_visit.jpg](#)



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[11151\\_PGN\\_COL\\_17-19\\_May\\_2006\\_012\\_Stop\\_1\\_View\\_SE\\_towards\\_Jonesboro\\_fault.jpg](#)



[11151\\_PGN\\_COL\\_17-19\\_May\\_2006\\_013\\_Stop\\_2\\_Auxilliary\\_Dam.jpg](#)



[11151\\_PGN\\_COL\\_17-19\\_May\\_2006\\_014\\_Stop\\_2\\_relict\\_soil\\_upper\\_part.jpg](#)



[11151\\_PGN\\_COL\\_17-19\\_May\\_2006\\_015\\_Stop\\_2\\_relict\\_soil.jpg](#)

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[11151\\_PGN\\_COL\\_17-19\\_May\\_2006\\_016\\_Stop\\_3\\_Martha's\\_Chapel\\_Outcrop.jpg](#)



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[11151\\_PGN\\_COL\\_17-19\\_May\\_2006\\_024\\_Stop\\_3\\_dike\\_and\\_saprolite.jpg](#)



[11151\\_PGN\\_COL\\_17-19\\_May\\_2006\\_026\\_Stop\\_3\\_dike\\_end.jpg](#)



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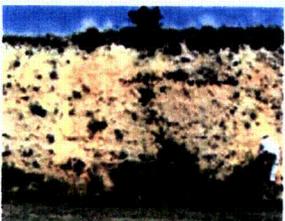
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[11151\\_PGN\\_COL\\_17-19\\_May\\_2006\\_035\\_Stop\\_3\\_conjugate\\_fractures.jpg](#)



[11151\\_PGN\\_COL\\_17-19\\_May\\_2006\\_036\\_Stop\\_4\\_Lithofacies\\_2.jpg](#)



[11151\\_PGN\\_COL\\_17-19\\_May\\_2006\\_037\\_Stop\\_4.jpg](#)



[11151\\_PGN\\_COL\\_17-19\\_May\\_2006\\_038\\_Stop\\_4.jpg](#)



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[11151\\_PGN\\_COL\\_17-19\\_May\\_2006\\_040\\_Stop\\_4\\_full\\_profile.jpg](#)



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[11151\\_PGN\\_COL\\_17-19\\_May\\_2006\\_042\\_Stop\\_4\\_close\\_up.jpg](#)

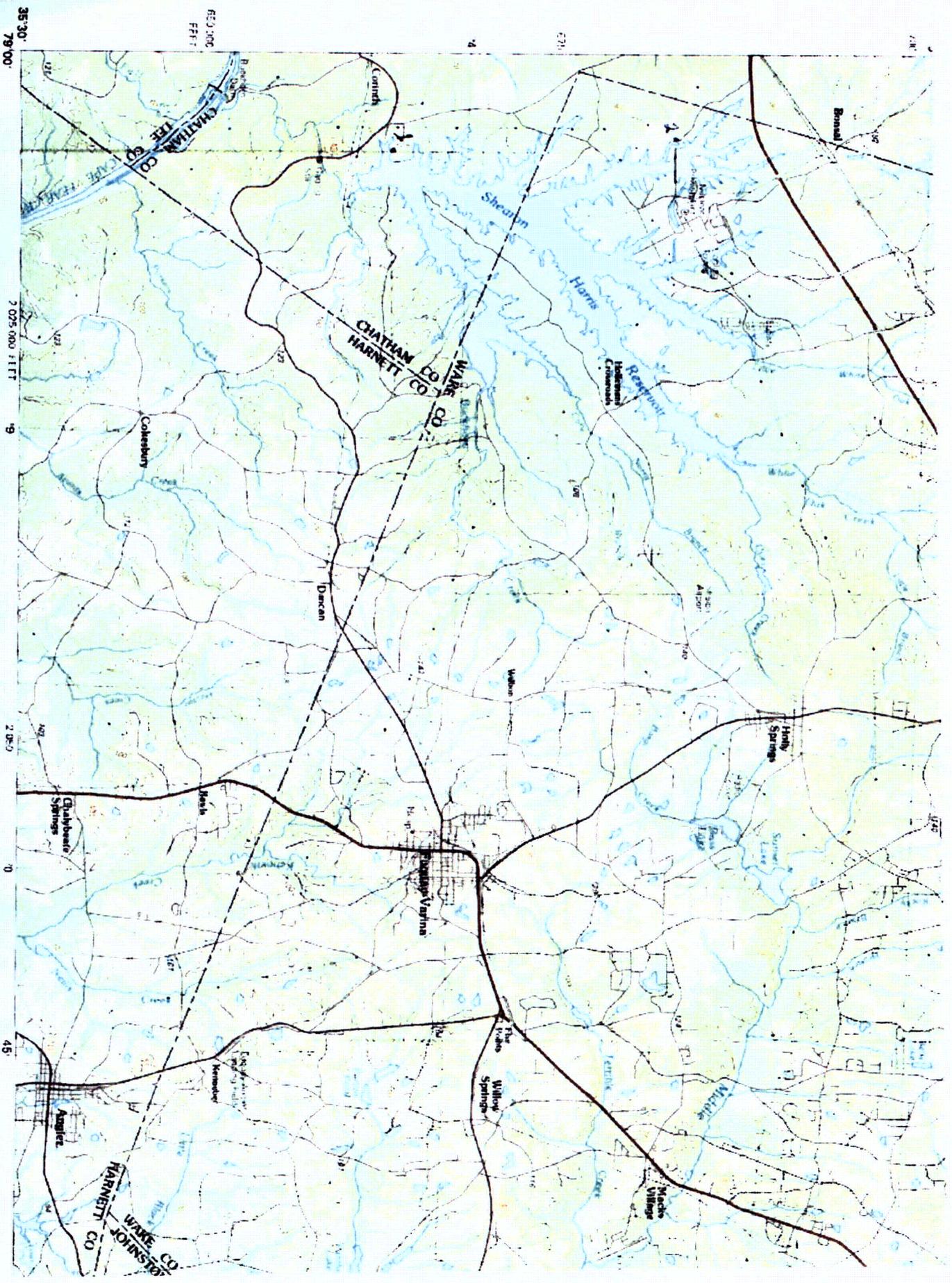


[11151\\_PGN\\_COL\\_17-19\\_May\\_2006\\_043\\_Stop\\_5\\_Lithofacies\\_1.jpg](#)



[11151\\_PGN\\_COL\\_17-19\\_May\\_2006\\_044\\_Stop\\_5\\_Lithofacies\\_1.jpg](#)

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Attachment A2  
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## Memorandum

TO: Matt Gavin (CH2M Hill)      DATE: December 19, 2006  
 FROM: Kathryn Hanson (Geomatrix)      PROJ. NO.: 11151.000  
 Alexis Lavine (Geomatrix)  
 CC: File      PROJ. NAME: Progress Energy Harris COL Site  
 SUBJECT: December 5-8, 2006 Field and Aerial Reconnaissance

A brief summary of activities conducted during the week of December 4-8, 2006 to evaluate possible neotectonic features in the HAR site area and vicinity is provided in this memo. The reconnaissance was conducted by Kathryn Hanson (Principal Geologist) and Alexis Lavine (Project Geologist), Geomatrix Consultants. Tyler Clark (Chief Geologist, North Carolina Geological Survey) participated in field and aerial reconnaissance activities on December 5-6, 2006.

Field reconnaissance maps at varying scales and on different bases were prepared in advance of the field reconnaissance to show the locations of the key structures and possible neotectonic features in the site vicinity and adjoining region. These maps are provided in Attachment 1 (Maps 1 and 2). Way points (WP) (red dots) for locations along previously mapped faults or other proposed neotectonic features [i.e., fall lines (Weems, 1998) and East Coast fault system-central segment] are shown on these field maps. Many of these points were selected to indicate points where mapped faults intersected roads or streams. The helicopter reconnaissance route flown on December 6, routes for the ground reconnaissance, and additional WPs entered during the flight or during subsequent ground reconnaissance (blue dots) also are indicated on the maps. Field notes are provided in Attachment 2. Photographs (thumbnail views) and a photo log are provided in Attachment 3.

### Tuesday - December 5, 2006

- 9:00 am – noon: Meeting at the North Carolina Geological Survey (NCGS) with Tyler Clark to discuss neotectonic features in the site vicinity and region that had been identified from literature review and ongoing NCGS field studies. The overall objectives of the aerial and field reconnaissance activities for the week were also discussed.

The North Carolina Geological Survey is currently mapping the Farrington quadrangle northwest of the site. Structures along the western margin of the Deep River basin, including the Bush Creek fault (informal name assigned by the NCGS to fault in the northwestern part of the site vicinity) are the focus of the ongoing mapping program. Localities of high gravels (Tertiary-Pliocene?) are noted at a point between WP 139 and 140 at an elevation of 216 feet

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as well as the higher gravels noted by Parker (1979) in the vicinity of Apex (~ 500 feet above MSL) and near Wake Forest at an elevation of 550 feet. T. Clark noted that these gravels were probably deposited on a previously dissected terrain and therefore, the present differences in the elevations of the terrace remnants do not necessarily imply different ages. The gravels are generally significantly weathered and datable material is not present to provide definitive age control.

A fault mapped in the eastern part of the site vicinity as a curvilinear fault around the margins of the pluton (approximately 5-10 miles west from Smithfield, see note on Attachment 1, Map 1) appears to represent variations in metamorphic grade proximal to the pluton rather than a fault contact.

- 1:30 pm -5:00 pm: Conducted field reconnaissance with Tyler Clark- Parker (1979) fault locality (WP 123).

KH 44 (WP 145) - intersection of SR 2724 and railroad track, recently excavated gully exposure along the eastern side of the track south of the road. Coastal Plain sediment (fluvial deposits) overlying felsic gneiss is well exposed in this approximately 2.5 m high cut that extends for approximately 200 to 300 feet. Interfingering gravel and sand units within the Coastal Plain terrace unit onlap the contact. This cut was revisited on December 8 and the basement rock was cleaned off to better expose the bedrock structure at the margin of the channel incised into the gneiss. Foliation within the basement rock was relatively uniform beneath the channel margin. The fabric (foliation) within the gneiss strikes north and is steeply dipping. The basal contact and overlying Tertiary Coastal Plain sediments are not tectonically deformed.

KH 45 (WP 147 - ~ location of WP 123 (fault number 150). A previous fault exposure along the railroad cut where Parker (1979) observed 8 ft of displacement of terrace gravels (Pliocene or Pleistocene?) on a reverse fault dipping to the south is now obscured by pine duff and vegetation. No geomorphic expression of active faulting was observed, but there has been development of the surfaces to the west and east of the railroad tracks in this area and it is not clear how much excavation and grading of these surfaces has occurred.

#### Wednesday - December 6, 2006

- 8:30 am: Picked up T. Clark in Raleigh and drove to Lee County airport, Sanford, North Carolina to meet helicopter (Jet Ranger, Aircraft Tail No. 86AF, 4-seater) chartered through Southeast Air Charter (contact person: Karen Robinson, 910-692-2095).
- 9:45 am: Helicopter (Rodney Swanson, pilot) arrives. Some time was spent on the ground while security clearance was obtained from PE-HNP to fly within 5 mile radius of HNP.

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- ~11:00 am: Start aerial reconnaissance.

Main dam area - flew over the main dam and north along the Jonesboro fault to the HNP

HNP (HAR site) area - reconnaissance along 'fire pond lineament', Harris fault, Borrow pit and LLRW site areas.

Western margin of Deep River basin - reconnaissance along NE-trending structures that extend into the basin (fault adjacent to Jordan Lake dam and Bush Creek fault to the north). The faults are topographically expressed at the basin margin where the more easily eroded Triassic sediment is juxtaposed against crystalline basement. The faults are much less well expressed topographically in the basin where they are primarily defined by aligned drainages and gullies.

Cary and Apex area - flew over the Jonesboro fault (no topographic expression of the fault in this area) and remnants of high older terrace gravel remnants.

Garner and Banks area - reconnaissance in the vicinity of previously mapped Cretaceous and Cenozoic faults (Parker, 1979; Prowell, 1983) and point fault localities within the 25-mile radius region. We observed no geomorphic evidence of neotectonic deformation in the vicinity of WP123 (Parker, 1979 locality) or where the two Cretaceous-Cenozoic faults (Prowell, 1983, faults 49 and 41) intersect the Coastal Plain sediments (WP 125-122-fault number 49; WP115 -fault number 41). There is no obvious change in the gradient or morphology of stream and drainage channel (WP 122) across the trace of the N30W-trending fault 49. Likewise, there is no obvious geomorphic expression of fault 41 in the Coastal Plain sediments. Given the small Tertiary-Quaternary displacement reported for fault 41 (3 feet in Upper Cretaceous-Miocene? Sediments), the lack of strong geomorphic expression is not unexpected.

East Coast Fault System-Central Segment - reconnaissance along the ECFS-C fault and subparallel Cretaceous and Cenozoic? faults north from Smithfield to WP 101-102. The ECFS-C does not appear to be expressed geomorphically. Coastal Plain sediments are not apparently disrupted along the trace of the fault. No obvious knickpoints, rapids, or other noticeable anomalies in the gradients of rivers or drainages across the ECFS-C trace were observed during the aerial reconnaissance.

Reconnaissance of Cretaceous and Cenozoic faults mapped between Buckhorn Reservoir (drainage between WP 102 and 103) west towards 25-mile radius circle (near WP 116). Mapped faults are not expressed geomorphically. Faults 42 and 43, which are reported to have displaced Upper Cretaceous-Miocene? sediment 4 feet and >10 feet, respectively, were not readily discerned from the helicopter.

Jonesboro fault - Deep River south to Sanford. Reconnaissance of WP 134 (point fault locality) in Sanford along the Jonesboro fault. Gravel pits or excavations (one old and a

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shallow more recent one) are present near the mapped location of WP 134 locality. No obvious good exposures were apparent, however. No evidence of reactivation of the fault where it is overlain by Coastal Plain sediment.

- 2:50 pm - Landed at the Lee County airport.
- 3:30 pm - KH 46 (WP163) Harris Lake exposure of Lithofacies III (Trcc) conglomerates and overlying siltstone north of Jonesboro fault (photos 107-112).

**Thursday - December 7, 2006**

Field Reconnaissance (K. Hanson and A. Lavine) - Northern part of the site vicinity (Bush Creek fault, Bonsal-Morrisville fault, Garner fault locality (WP 120), and revisit to the Banks exposure of fluvial deposits (Tt, Pliocene or Pleistocene?) over gneiss (KH 44, WP 145). See notes above.

**Friday - December 8, 2006**

Field Reconnaissance - Sanford area - Attempted to visit WP 134 locality in Sanford. We were not successful in gaining access to the old gravel pits. Good exposure of Coastal Plain sediment is present along a roadcut adjacent to the Sanford water tower ~ 500 feet from the WP 134 location. There was no evidence of tectonic deformation observed in this outcrop, which extended 200-300 feet. Marine gravel and a shell (float) indicate a marine origin for the deposits.

Reconnaissance by vehicle was completed across the buried trace of the Jonesboro fault and the Durham fall line as mapped by Weems (1998). Locally in the vicinity of WP 135, the upper surface that is mapped as being underlain by Cretaceous Middendorf formation (Km) appears to drop off across both the Jonesboro and fall line, but in both cases it appears to be due to erosion. No exposures or outcrops of strata were observed along the route covered. The Durham fall line in the vicinity of WP 135 is close to a bedrock contact between Triassic rock and felsic gneiss and the apparent topographic drop across this feature is associated with the drop into the stream valley.

HNP-HAR site area - Revisited the exposure of bedrock at the outlet to the fire pond. The presence of a copperhead snake at this location earlier in the summer precluded us from collecting structural measurements of bedding and joint attitudes during previous field investigations.

We stopped by the drilling operation at the HAR 2 site. Jen Schaeffer was logging core from borehole BPA-47.

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We also hiked out to the location where the Harris fault projects into Harris reservoir. The approximate location of infilled trenches excavated across the fault is indicated by residual spoils piles and surface disruption.

- Attachment 1 - Map 1. Field Reconnaissance (December 4-9, 2006)  
Map 2. Field Reconnaissance (December 4-9, 2006)
- Attachment 2 - Field Notes
- Attachment 3 - Photograph Log and Photographs (thumbnail view)

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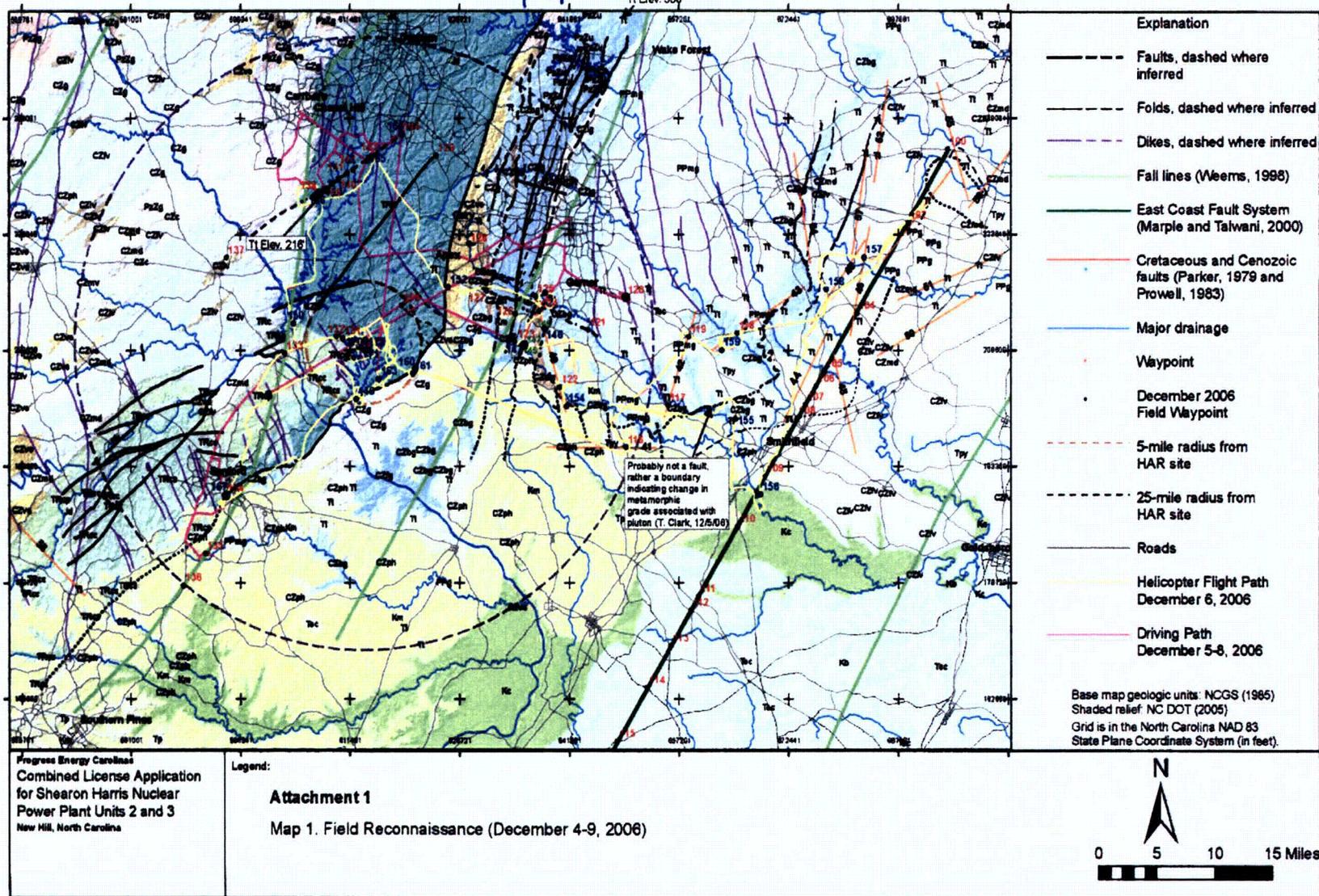
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**ATTACHMENT 1**

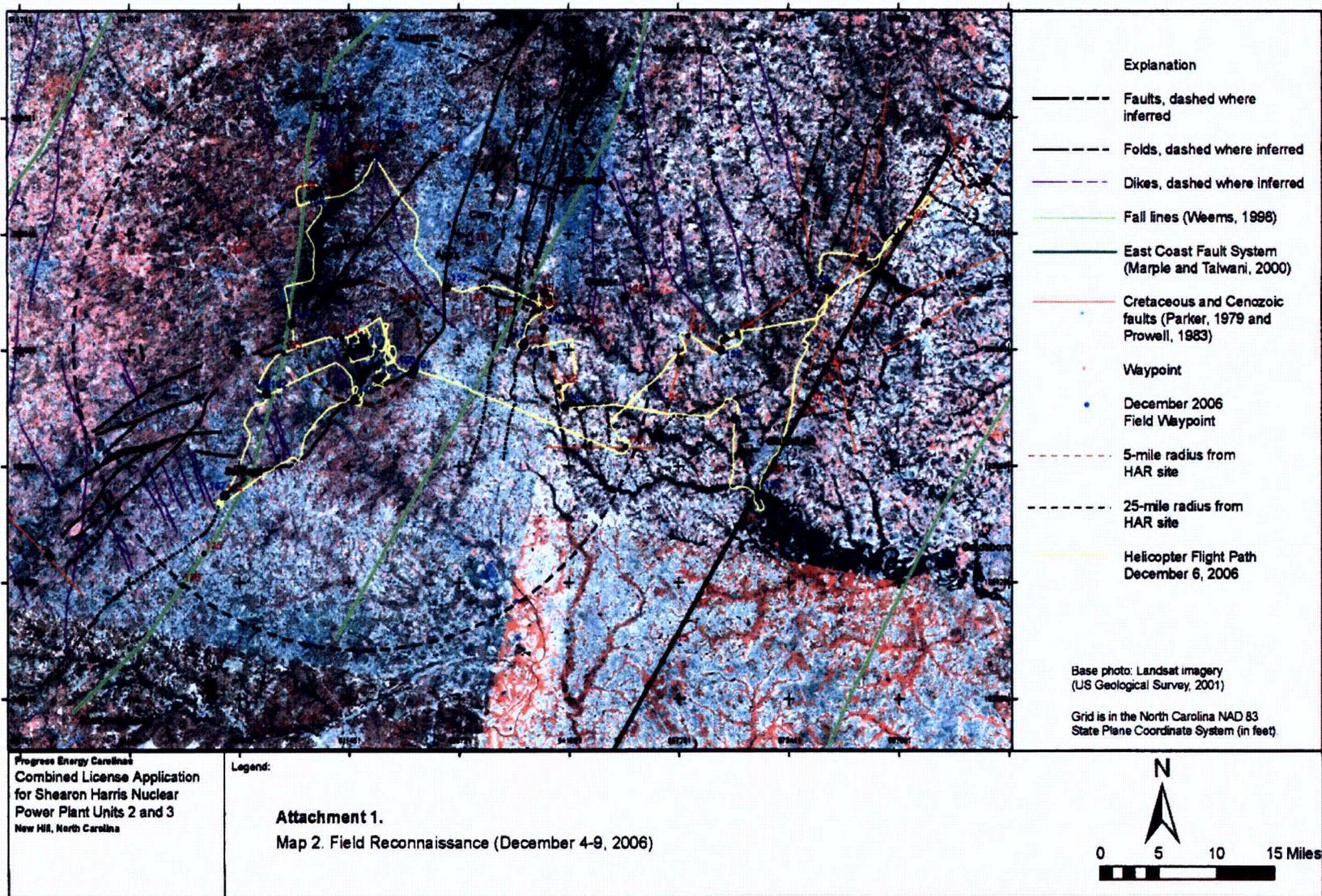
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**Maps 1 and 2  
Field Reconnaissance  
(December 4-9, 2006)**

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## **ATTACHMENT 2**

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### **Field Notes**

48

11151  
7 Dec 2006

K. HANSON  
A. LAUVINE

0684850  
Stop KH 48 WIP 105 3969764

Approximate location of  
projected trail of Bush Cr. F  
and Hwy 75L

Based on seismic line data the  
zone of faulting should  
be located within the drainage  
northwest of road.

No roadcuts along Hwy 75L  
across projected fault.

Kathryn L. Hanson 7 Dec 2006

11151  
7 Dec 2006

K. HANSON  
A. LAUVINE 49

0678227  
Stop KH 49 WIP 146  
3965540

~ coincident with WIP 138

along Bush Cr. lineament  
limited exposure of Tertiary  
basin material (sandstone)  
on eastern bank of  
inlet

No evidence of previously  
mapped fault (NGAS #9)  
in geologic map. This  
fault may have been  
identified in exposures  
at lower water level.

Kathryn L. Hanson 7 Dec 2006

46 11151  
7 DEC 2006  
K. HANSON  
A. LAUVINE

8:30 - 10:00 AM - download photos -  
map reviewed, 10/15/06

11:00 AM weather: sunny 50's

Stop #47 Bush Creek fault  
projected eastern limit  
near WP 164 intersection  
of Sedwick Road and  
drainage

no geomorphic evidence  
of tectonic activity  
stream channel ~ 20-30'  
wide low gradient. young  
fluvial terrace ~ 6'  
continuous along stream  
south of bridge

WP 164 869 9619  
397 3330

Kristin L. Hanson 7 DEC 2006

11151  
7 DEC 2006  
K. HANSON  
A. LAUVINE 47

Photo 11151 PAN COL 39 DEC 2006  
#013

VIEW N/W OF TERRACE  
STRUCT.

11151 - PAN COL - 39 DEC 2006 - 0134  
+ south toward exposure in  
right stream bank.

exposure appears to be  
without terrace cut  
suggesting that terrace  
is a stable terrace cut  
into bedrock.

Note: location may be at  
northern limit of  
broad zone of Paulding  
Basal. with Bush Cr. F.  
(Lithology data shows broad  
zone of differentiation) - subparallel  
drainage to south, may also  
be along fault zone.

Kristin L. Hanson 7 DEC 2006

44 11151  
6 Dec 2006

K. Hanson  
A. LAMIRE

Field Recon with Taylor Clark  
KH-46 WP 163 0617039  
3941037

Wabamonas III - east of Trec  
Hallowans Crossing road

contact between empl. and  
overlying siltstone

Photos:  
11151 P&N COL - 58 DEC 2006 - 107 Trec  
108 contact

empl. matrix - matrix supported  
blocks up to 15-20 cm  
org, suborg, & subvd. blocks  
v. coarse sd. matrix

Photos  
11151 P&N COL 58 DEC 2006 - 109  
photo showing bedding normal  
component along Walker  
siltstone

11151 P&N COL - 6 Dec 2006 - 110-112  
Katherine L. Hanson 6 Dec 2006

11151  
6 Dec 2006

K. Hanson  
A. LAMIRE 45

Paraceras - south to north  
Donchore fault along siltstone  
thin peninsular

Katherine L. Hanson 6 Dec 2006

42 11151  
5 Dec 2006  
1:30pm Sunday, 100' (40°)  
FIELD NOTES  
with Tyler Clark (MCGS)  
K. Hanson  
A. Lavigne

KH-44 WP 145  
N 0107149  
3945864

SR 2784 and railroad crossing  
recent exposure out along  
drainage ditch  
~300 feet long

Photos:  
11151 PAN 201 5 Dec 2006  
001 to 005

Harrison L. Hanson 5 Dec 2006

43 11151  
5 Dec 2006  
H. Hanson  
A. Lavigne

depositional contact between  
Coastal Plain gravel and  
basement rock

WP 147 0909989 6907282  
WP 146 3945133 3946134  
KH-45 (WP 123 location)

western bank along entire  
railroad is obscured by  
pine duff and vegetation

Exposure of fault is not  
apparent at this time

Note: WP 123 coordinates  
differ by coordinates for  
WP 146 incorrect  
WP deleted

12 Dec 2006 Helicopter Pilot  
K. Hanson, A. Lavigne, T. Clark  
8:30 am Arrive Lee County airport  
8:45 am Rodney Swanson, helicopter pilot  
~11 am Flight start - approval to fly  
over HWP railroad.

2:30 pm Back to Lee Co. airport.  
Harrison L. Hanson 5 Dec 2006

11151  
7 DECEMBER 2006

K. HANSON  
A. LAVINE

NH 44 (cont.)

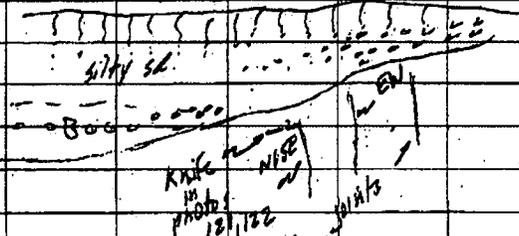
Returned to exposure to  
reexamine <sup>base</sup> / gravel  
contact.

Agreed that  
apparent slip in basal  
gravel is not tectonic

Underlying schist (highly  
weathered to clay)  
is not faulted.

Joints N15E (knife)  
EW, vertical

11151 PHO COL 7 DEC 2006  
115 to 122

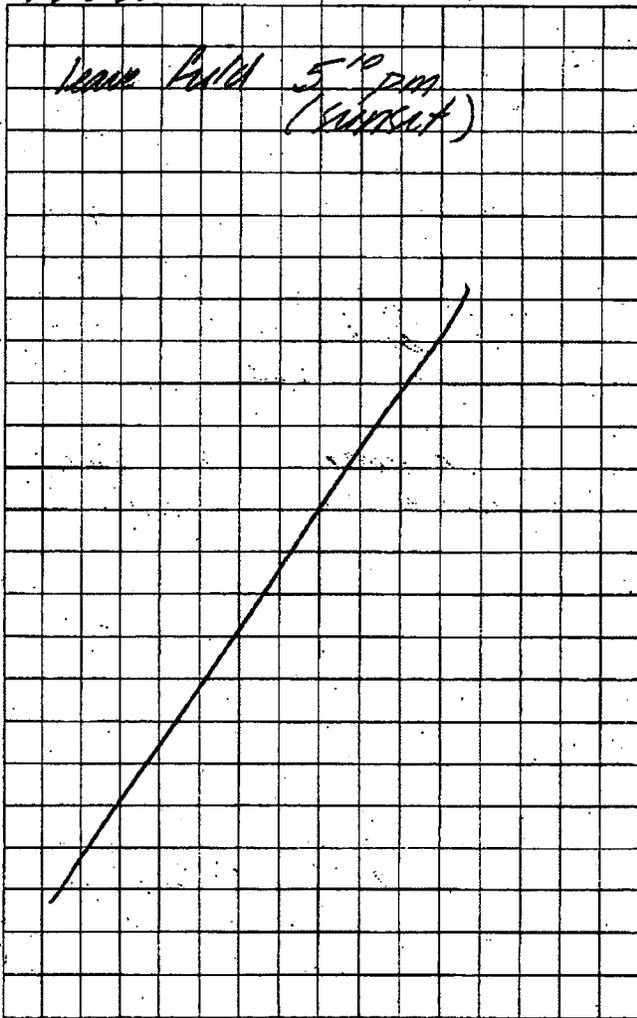


Hanson & Lavine 7 Dec 2006

11151  
7 DEC 2006

K. HANSON  
A. LAVINE

Leave Field 5:10 pm  
(Sunset)



Hanson & Lavine 7 Dec 2006

52

11151  
8 DEC 2006K. HAMMON  
A. LAVINE

Geologic Recon.

Weather: sunny, cold -30°

Stanford

Stop Kit 50 WP 167  
0606280  
3925499

Roadcut - west side of road  
adjacent to Stanford water  
tower.

~240m N to Point 06174  
~100m SW

Good exposure of coastal plain  
sediment.

~2 m high with (soil)  
developed on sand. basal  
gravel (rounded) and coarse  
sand at southern end of

Katherine L. Hammon 8 DEC 2006

11151

8 DEC 2006

K. Hammon  
A. Lavine

53

exposure.

No evidence of faulting or  
extensional joints is present

Shell observed in float.

Photographs

11151-PLA COL-5-8 DEC 2006  
123 to 129

See transect across buried trace  
of Jansford and Williams  
Dunham Fall line (WP 135)

The coastal plain surface  
did dip (erosional) across  
both features. No exposures  
observed. Fall line is close  
to base contact T<sub>1</sub>/F<sub>1</sub>mg.

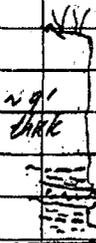
Katherine L. Hammon 8 DEC 2006

11151  
8 Dec 2006K. HANSON  
A. LAUVIEPhotographs 11151 P6N COL - 5-8 DEC 2006  
Panorama of HARC 1 site. 131-135  
KH 51 WIP 168 0085021  
3946182Copperhead exposure along mill  
spillway to Fire Pond.

Photographs

11151 P6N COL - 5-8 DEC 2006 136 to 146

P N50E, vertical P6W  
 P N35E, ~80W  
 P N40W, vertical  
 P N5E, vertical  
 P N55W, 82N  
 P N5E, bedding  
 P N50W N30E, 29SE  
 N15E; 27SE (bed)



weathering profile

yellowish brown

reddish br. siltstone

~ 1 foot thick at st.

gray claystone

Katherine L. Hanson 8 Dec 2006

11151  
8 Dec 2006K. HANSON  
A. LAUVIE~5m downstream  
conglomerate exposed at base  
of left bank rounded  
gravel up to ~3 cm.

STCA-5 Rock hole

WIP 168 - void

WIP 170 0084986  
3946169at Fire pond about north end  
upstream of WIP 168 locality

Photograph of fire pond

11151 P6N COL - 5-8 DEC 2006-147

KH 52 WIP 171 0084431  
3945061northern end of access road into  
Compensated Area EFollowed fence to south to  
place where tree fallen  
across fence provided access  
to peninsula where Harris  
fault was viewed in a valley

Katherine L. Hanson 8 Dec 2006

56

1151  
8 DEC 2006K. Kasper  
A. Lavigne

1E trenches

FEI SW-74 trench accumulation  
site apparent. No exposures  
along shorelinePhotographs 1151. P&N COL - 5-8 DEC 2006 158-  
162K153 DR 122 0685251  
3944799

Initial structure

Photo parameters

1151. P&amp;N COL - 8 DEC 2006

163-171

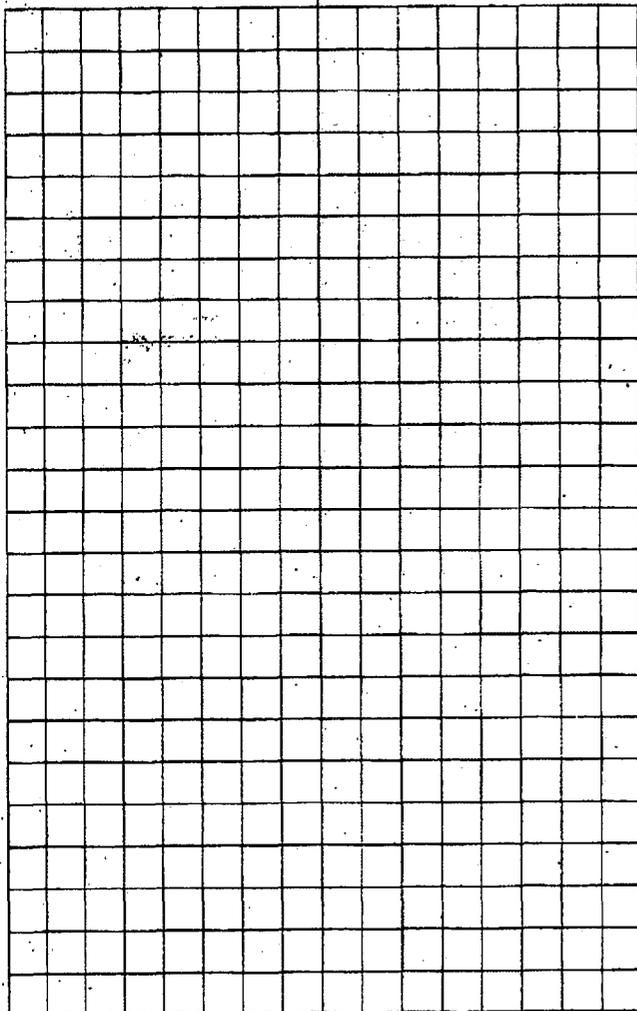
172-173 cooling tower  
reactor

3:10 pm - leave site

Note: Photos 1151. P&N COL 5-8 Dec  
2006 158-155 were taken  
at BPA-47 drill hole site  
156-157 Newham site north  
towards HAR-7-3

Kasper &amp; Lavigne 8 DEC 2006

57



Attachment 4-2  
Page 18 of 27

**ATTACHMENT 3**

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**Photograph Log and  
Photographs (thumbnail view)**

Attachment A-2  
Page 19 of 27

## ATTACHMENT 3

## Photograph Log

Project No.: 11151.000  
Project Name: Progress Energy COLA Study- HAR site

File: I:\Project\11000\11151.000\Photographs\11151\_PGN COL\_5-8 Dec 2006

Photographer: Kathryn Hanson  
Field Notes: Kathryn Hanson

Date Taken	Photo No.	Description (* indicates best images)
12-5-2006	001	Field Stop KH-44 - WP145 Contact Upland gravel (Tt)/felsic gneiss
	002	Field Stop KH-44 same
	003	Field Stop KH-44 Contact Upland gravel (Tt)/felsic gneiss-close up
	004	Field Stop KH-44 basal gravel
	005	Field Stop KH-44 Tyler Clark and Alexis Lavine
12-6-2006		Aerial Reconnaissance-from Lee County Airport, Sanford (recon route shown on Attachment 1, Maps 1 and 2)
	006	view E toward HNP from near LLWR site
	007	view NE of HNP
	008	Harris Reservoir- poor quality
	009	view NE along Jonesboro fault-crosses peninsula in the distance
	010	view SE Harris Reservoir Dam
	011	Harris Reservoir Dam
	012	Harris Reservoir Dam
	013	W -Harris Reservoir Dam
	014	SW -Harris Reservoir Dam
	015	view SSE- Harris Reservoir Dam
	016	view NE along Jonesboro fault-crosses peninsula in the distance
	017	view NE along Jonesboro fault-crosses peninsula in the distance *
	018	view NW towards HNP
	019	View NNW towards HNP
	020	View WNW towards HNP and HAR sites *
	021	View WNW towards HNP and HAR sites
	022	View W of HNP
	023	View W along 'fire pond ' lineament
	024	View ESE toward HAR sites
	025	View E across the auxiliary dam; enlarge to see HAR 2 site and exposures along emergency discharge channel *
	026	View E towards HNP
	027	View E of South Borrow Pit area
	028	View N of Borrow Pit area

Attachment A-2  
Page 20 of 27

029	View NE across powerline and intake channel towards HNP and HAR sites
030	View N of HAR sites *
031	View N of HNP and HAR*
032	View W along 'fire pond 'lineament showing HAR sites*
033	View SE across fire pond towards site
034	View S-poor image
035	View S-poor image
036	View E along fire pond lineament
037	View ESE towards HAR sites
038	View E of HAR 2 site-fuzzy image
039	View ESE of HAR 2 site and emergency discharge channel
040	Triangle brick plant west of HNP
041	View WSW along fault at Jordan Reservoir dam
042	View NNE -Jordan reservoir
043	View W-Bush Creek fault-
044	View SW along Bush Creek fault
045	View E -Bush Creek fault
046	View NE along Bush Creek fault
047	Eagle Point ? ; close to WP 140
048	Same as above; close up
049	Highway 64 bridge crossing over B Everet Jordan Lake
050	View SE across Hwy 64 bridge
051	WP 152- View N along Jonesboro fault showing lack of topographic expression along this segment of the fault
052	WP 152- View NW across Jonesboro fault
053	View south along WP 125 fault
054	-----
055	WP 123 locality; intersection of railroad and SR 2724 ; Parker (1979) fault exposure is located ~500 north of intersection.
056	View East of exposure along the ditch south of intersection-close up
057	View west towards Parker (1979) railroad cut exposure (now obscured by vegetation)
058	View SE towards SR 2724/railroad intersection
059	Alexis at Johnson Co. airport
060	Rodney, pilot,
061	Tyler Clark--in helicopter
062	Same
063	Same
064	Same
065	-----
066	Alexis in helicopter
067	View SW? : Neuse River at ECFS-C crossing
068	Location uncertain
069	View SSW; at WP 102 along strike of ECFS-C which crosses the photo at the road intersection
070	WP 157; View S; NNE-trending fault crosses upper reach of Buckhorn Reservoir at and parallels road before bend in road to SW..
071	View E or NE from WP 158
072	View NE along WP 118 fault
073	---
074	View SW along fault at WP 118
075	View S at WP 118; fault cuts across the river just E of the major bend
076	View NE along WP 118 fault

Attachment A-2  
Page 21 of 27

	077	View SW along WP 118 fault
	078	View SW WP 118
	079	View NW towards WP 118 Neusse River fault intersection
	080	View NE towards WP 118
	081	View W - WP 116 fault to south of highway
	082	Same as above
	083	View W towards Deep River basin and HNP
	084	Same as above
	085	Same as above
	086	View W; Quarry WP 160 and 161; CZg just to east of Jonesboro fault
	087	View E of eastern wall of quarry
	088	View E of wall of quarry* good view of fabric in basement rock
	089	View NE of wall of quarry
	090	View N of quarry
	091	View NW of western wall of exposure; basement fabric *
	092	Same as above; close up
	093	-----
	094	View NE along Jonesboro fault
	095	View NE along Jonesboro fault
	096	View W of HNP
	097	-----
	098	View W along Harris fault*
	099	-----
	100	Similar view as 101
	101	View NE towards WP 161 quarry along Jonesboro fault*
	102	Similar view as 101
	103	View S-Jonesboro fault
	104	View S -along Jonesboro fault (eastern margin of reservoir)
	105	View ESE of Coastal Plain sediment (Km)green fields) that are mapped across the Jonesboro fault (~6 miles NE from Sanford)
	106	Same location as above; buried Jonesboro fault is located just west of road*; End- Aerial reconnaissance
12/6/06	107	Field Stop KH 46 (WP 163); Lithofacies III; conglomerate matrix supported
	108	Same location; contact between conglomerate and overlying siltstone
	109	Same location; A. Lavine and T. Clark : lineament along contact;
	110	WP 163; panorama N to S across reservoir to Jonesboro fault
	111	WP 163; panorama N to S across reservoir to Jonesboro fault
	112	WP 163; panorama N to S across reservoir to Jonesboro fault
12/7/06	113	Field Stop KH 47 (WP 164) along projected trend of Bush Creek fault; view of terrace surface that appears to cross projected trend; view NW
	114	Same as above; view W
	115	Field Stop KH-44. Channel margin (Tt) over gneiss. Contact between Tt basal gravel and gneiss is cleaned off. Basal gravel unit to south (right) grades into finer deposits overlying basal gravel to north (left).
	116	same as above
	117	Panorama of channel margin * Fabric in gneiss is consistent across channel margin contact
	118	Same as above*
	119	Panorama of northern part of exposure N to S.
	120	Same as above
	121	Same as above: knife is subparallel to N15E-trending fracture; vertical fractures to the right are E-W-trending
	122	Same as above; close up view
12-8-06	123	Field Stop KH 50 (WP 167) - Sanford road cut adjacent to Sanford water tower.

Attachment A-2  
Page 22 of 27

		Coastal Plain sediment ( Middendorf formation) well exposed.
	124	Same as above
	125	Same as above
	126	Same as above
	127	Same as above: close up of marine gravel
	128	Same as above--obscured by truck
	129	Same as above: marine gravel at base of exposure left of bush right end of photo
	130	Panorama of HAR -2 site area, E to W
	131	Panorama of HAR -2 site area, E to W
	132	Panorama of HAR -2 site area, E to W
	133	Panorama of HAR -2 site area, E to W
	134	Panorama of HAR -2 site area, E to W
	135	Panorama of HAR -2 site area, E to W
	136	Field Stop KH 51 (WP 168); Bedrock exposure along outlet spillway to fire pond; panorama from 136 to 142.
	137	Same as above; View towards north (left) bank at upper knickpoint
	138	Same as above; continued downstream view
	139	Same as above; continued downstream view
	140	Same as above; continued downstream view
	141	Same as above; continued downstream view
	142	Same as above; view NE; A. Lavine for scale;
	143	Same as above; close up of strata in north (left) bank; attitude N15E; 27SE
	144	Same as above; view of south (right) bank just downstream of 145
	145	Same as above; E-W-trending fracture; view of north (left) bank*
	146	Same as above; E-W-trending fracture; view of north (left) bank*
	147	WP 170 ; view W of fire pond towards HAR-3
	148	Same as above;
	149	Same as above;
	150	Drilling at HAR-2; BPA-47
	151	Same as above: Jen Schaffer
	152	Same as above
	153	Same as above
	154	Same as above
	155	Drill rig
	156	View N towards HAR-3 site
	157	Continuation from 156
	158	View W; location where Harris fault intersects Shearon-Harris Reservoir
	159	Same as above
	160	View E along Harris fault; towards FET 5W-74 trench location
	161	Same as above
	162	View W along projected trace of Harris fault
	163	Field Stop KH-53 (WP 172) panorama SE to NW
	164	Same as above
	165	Same as above
	166	Same as above
	167	Same as above
	168	Same as above
	169	Same as above
	170	Same as above
	171	Same as above
	172	HNP Cooling tower and intake structure

Attachment A-2  
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ATTACHMENT 3



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Dec2006 154



11151\_PGN COL\_5-8  
Dec2006 155



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Dec2006 153



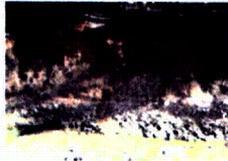
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Attachment A-2  
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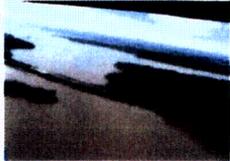
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Attachment A-2  
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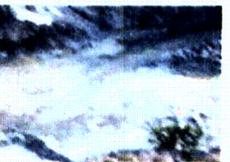
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Dec2006 102

Attachment 4-2  
Page 26 of 27



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Dec2006 103



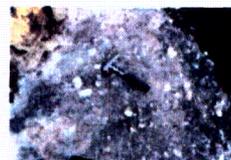
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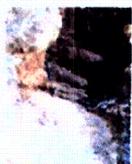
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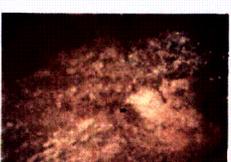
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Dec2006 122



11151\_PGN COL\_5-8  
Dec2006 123



11151\_PGN COL\_5-8  
Dec2006 124



11151\_PGN COL\_5-8  
Dec2006 125



11151\_PGN COL\_5-8  
Dec2006 126



11151\_PGN COL\_5-8  
Dec2006 127



11151\_PGN COL\_5-8  
Dec2006 128



11151\_PGN COL\_5-8  
Dec2006 129



11151\_PGN COL\_5-8  
Dec2006 130



11151\_PGN COL\_5-8  
Dec2006 131



11151\_PGN COL\_5-8  
Dec2006 132



11151\_PGN COL\_5-8  
Dec2006 133



11151\_PGN COL\_5-8  
Dec2006 134



11151\_PGN COL\_5-8  
Dec2006 135



11151\_PGN COL\_5-8  
Dec2006 136



11151\_PGN COL\_5-8  
Dec2006 137

Attachment A-2  
Page 27 of 27



11151\_PGN COL\_5-8  
Dec2006 138



11151\_PGN COL\_5-8  
Dec2006 139



11151\_PGN COL\_5-8  
Dec2006 140



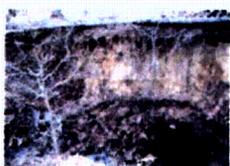
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11151\_PGN COL\_5-8  
Dec2006 142



11151\_PGN COL\_5-8  
Dec2006 143



11151\_PGN COL\_5-8  
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11151\_PGN COL\_5-8  
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11151\_PGN COL\_5-8  
Dec2006 146



11151\_PGN COL\_5-8  
Dec2006 147



11151\_PGN COL\_5-8  
Dec2006 148



11151\_PGN COL\_5-8  
Dec2006 149



11151\_PGN COL\_5-8  
Dec2006 150



11151\_PGN COL\_5-8  
Dec2006 151



11151\_PGN COL\_5-8  
Dec2006 152



11151\_PGN COL\_5-8  
Dec2006 156



11151\_PGN COL\_5-8  
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11151\_PGN COL\_5-8  
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11151\_PGN COL\_5-8  
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11151\_PGN COL\_5-8  
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11151\_PGN COL\_5-8  
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11151\_PGN COL\_5-8  
Dec2006 163



11151\_PGN COL\_5-8  
Dec2006 164



11151\_PGN COL\_5-8  
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11151\_PGN COL\_5-8  
Dec2006 166



11151\_PGN COL\_5-8  
Dec2006 167



11151\_PGN COL\_5-8  
Dec2006 168



11151\_PGN COL\_5-8  
Dec2006 169



11151\_PGN COL\_5-8  
Dec2006 170



11151\_PGN COL\_5-8  
Dec2006 171



11151\_PGN COL\_5-8  
Dec2006 172

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RH/ste/06

17  
5/18/06 8:30 am SHUAPP Project Trailer  
Wednesday met with Mark Gaurin; Jim Schaffer

~12:00 met with Dan Carmite at BCA-9  
photos - test run 5381 - 6311

voice mail message

(404) 516 0135

for Kiosk @ PH1 ...

1:30 pm Briefing with NRC Staff at  
Project trailer on site  
site tour to observe ongoing  
work down of site activities

~5pm complete tour and leave site

Matthew A. Hansen 5/20/06

Attachment B-1  
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5/18/06

7<sup>30</sup> AM ARRIVE at SHNPP - with SEM SHANNON  
8<sup>00</sup> - 10<sup>00</sup> AM REVIEWED CORE (BPA-30)10<sup>00</sup> AM - 12<sup>00</sup> Review of drilling with SEM12<sup>00</sup> PM -- Meeting with Tyler Clark (US NCGS)  
Assistant State Geologist

Low Level Waste Site -

NE- Tech. Advisors to State

Finding - upward sequences with paleosols  
overlain by sand units

basement upward -

2 basins. W-mingled

Durham basin - a lot younger (fossil  
assemblage) younger

- Forushoro -

3 divisions (S → N oldest → north)

South intruded diabase dikes

Mid diabase plus intrusives

Canada - post-Jurassic diabase

Katherine L. Hamm 5/18/06

Attachment B-1  
Page 3 of 7

15

5/18/06

oldest exposed basalt

Bridgeway - adjacent to site ~~is~~ fossil  
localityClark et al., 2001, Fieldtrip SE CSA  
Depositional and Structural

braided dike at Harris site

LW site - magnetometer surveys - detailed  
enough to determine dip etc.

Cook - Tertiary basins

not aquifer - no water

very discrete fracture

coarse fractures fit to

very rough

large, irregular apertures

fine sd

aperture decreases

siltstone - no aperture

poor poor compressible sands

high shrink swell clays

infiltration nonexistent in BC horizon

(avg. ~4% infiltration)

thick BC horizon -

Hanson L Hanson 5/18/06

Attachment B-1  
Page 4 of 7

16

5/18/06  1:24,000 scale - digitized map available  
# NCGS will provide

NORTH CAROLINA DEPARTMENT OF  
ENVIRONMENT AND NATURAL RESOURCES

TIMOTHY W. (TYLER) CLARK  
CHIEF GEOLOGIST



NORTH CAROLINA GEOLOGICAL SURVEY

1612 M&E Service Center, Raleigh, NC 27659-1612  
512 N. Salisbury Street, Raleigh, NC 27604  
Phone: 919-733-2423 Fax: 919-733-0900  
tyler.clark@ncdenr.com

*Matthew L. Hanson 5/19/06*

Attachment B-1  
Page 5 of 7

17

5/19/06 7:15 am Field reconnaissance with Tyler Clark  
(NCCS) and Sam Shannon.

Step 1: Boat Ramp exposure: good exposures  
of conglomeratic unit. Jonesboro  
fault borders the lake on opposite side  
exposures of strike-slip fault surfaces  
randomly oriented, <sup>faults</sup> within 1/4 to 1/2 mi.  
of Jonesboro f. zone

large dike offset by Jonesboro  
last movement post - 201 Ma (late Jur.)  
late Cretaceous deposits overlie fault  
~ 20 miles

photos:

9:25 am Met with Lynn York (Tectonics) <sup>and Matt Goffin</sup> to review  
geophysical results.

Braided swarm, bifurcating system of  
dikes

composite dikes - multiple intrusions  
chilled zone around hot zone  
(margins)

Katherine L. Hanson 5/19/06

Attachment B-1  
Page 6 of 7

18

5/19/06

Bears #1 cuttings oil & gas well  
compacted little log  
gamma logs.

10:30 am resumed N. con.

Stop 2: Exposures along the right bank  
just below Emergency Dam  
Spillway.

Good exposure of soil/paleosol (with  
red structure + carbonate nodules)  
siltstone (with fossils) sandstone / siltstone / sandstone  
fossils

siltstone heavily bioturbated  
Litholacis 2/3 transitional

Stop 3 ~~At~~ Martha's Chapel Outcrop.

Well exposed sequence - Litholacis 2.  
probably fairly typical of what will  
be exposed at site (slightly more  
arkose sand here than at SH)  
good examples of fining-upward  
sequences.

Dike with associated brecciation and  
saprolite development at west end  
Hammur Hammur 5/19/06.

Attachment B-1  
Page 7 of 7

19

5/19/06 of exposure on peninsula.

John Knickerson ET PERSON NC 65

from completion of site reconnaissance

Raymond L. Hanson 5/19/06

8 11151

K. Hanson  
A. Lavigne

Attachment B-2  
Page 1 of 17

26 June 06

9:30 am - Badging office  
Call to Jim Neville

Weather: 80°F, humid, scattered cumulus  
cloud cover

10:00 am Field Broom Site Area

Locations marked on Base Map (5 mi radius)

Stop KH-1 WP 002

0687173 E 3948271 N

residential road - very limited  
exposure in ditches

Stop KH-2 WP 002

Older road L Old Hwy 1

068709

0680941 E 3946424 N

±17'

~ location of fire pond linearment  
No exposures along Chlared.  
within ~ 0.2 mi from  
intersection

Kathryn L. Hanson 26 June 06

11151

K. Hanson  
A. Lavigne

26 JUNE 06

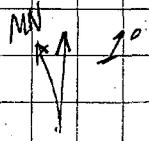
Stop KH-3 Borsal Cemetery  
WP 003

068744 E 3947421 N  
±18'

No exposures. Fault as  
mapped by NCGS (1985)  
projects ~ 0.1 mi east  
of cemetery.

Old pump handle adjacent  
to road suggests there  
maybe a nearby ditch

85°  
191 mts.



Kathryn L. Hanson 26 June 06

10 11151  
27 JUN 06

K. HANSON  
A. LAVINE

8<sup>00</sup> am Meet with Jim Neville  
at Project Trailer on site.

Discussion of trenching  
option

9<sup>30</sup> am Reconnaissance within  
site area.

Checked access downroad in  
upper Thomas Creek. Should  
be no problem to walk  
around road blockade.

Start recon of northern site  
area starting at railroad track/  
road intersection

WP 004 0684790E 3945787N  $\pm 14'$

Checked Brunton compasses. Set  
declination to 9.5°W.

Kenneth J. Hanson 27 JUN 06

11151 Attachment B-2  
Page 2 of 17  
27 JUN 06

KH

11

Stop KH-4 WP 005

0684297E 3946245N  
 $\pm 16'$

Exposure of siltstone  
~1.7 m of soil over  
reddish brown siltstone.  
no bedding apparent

Exposure starts bend in track  
~200 ft of upper weathered  
soil on siltstone

Stop KH-5 WP 006

0684197E 3946426N  
5

$\pm 20'$

adjacent to bay arm of  
Harris reservoir

Kenneth J. Hanson 27 JUN 06

12 11151  
27 JUN 06

K. HANSON  
A. LAVINE

Stop KH-6 WP 008

0683986 E 3946742 N  
± 18'

Southern end of higher cut (2.5m)  
with limited exposure of  
weathering profile in middle  
part of cut. No bedding  
or structure is visible.

~ 0684250 mapped intersection  
of dike and powerline road.

No apparent color change or  
evidence of diabase rubble  
observed. Some areas of  
grassy, wet-poor exposure

Kenneth L. Hanson 27 Jun 06

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27 JUN 06 Page 3 of 17

K. HANSON  
A. LAVINE 13

Stop KH-7 WP 009

0684324 E 3947128 N  
± 18'

Limited exposure of <sup>coarse</sup> sandy  
siltstone, (plan view) in  
road to silty sandstone

Stop KH-8 WP 000

0684352 E 3947144 N  
± 16'

Dark yellowish brown (moist)  
10 yr 5/6 <sup>medium</sup> sandstone  
foliated structure, platy,  
stick-sided surfaces.  
Plats up to a few mm;  
Subrounded. Thick clay  
films on surfaces.

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A. LAVINE

Stop KH-8 (cont.) the exposure  
is not sufficient to determine  
if anastomosing, strike-slip  
clay-lined surfaces are  
pedogenic or bedrock structure  
modified by soil & weathering  
processes.

Yellowish brown exposure  
is ~ 100 ft wide. To the  
east the color becomes  
redder.

Stop KH-9 WP 00 011

0684635E 3947323 N  
± 15'

Diabase boulder, <sup>and pebbles</sup> chists  
abundant in road

Kathryn L. Hanson 27 Jun 06

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27 JUN 06

Attachment B-2  
Page 4 of 17

K. HANSON  
A. LAVINE 15

Stop KH-10 WP 012

0684694E 3947355 N  
± 15'

Weak red to dusty red  
(2.5 VR 3.5/2, moist)  
sandstone; ? baked

Stop KH-11 WP 013

0684237E 3946790 N  
± 17'

Conglomerate unit; first  
strata clear appearance;  
extent to north masked  
by imported gravel.  
and subrounded  
rounded pebbles; 0.5 to 2 cm  
common

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27 JUN 06

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A. LAVINE

16

Stop KH-12 WP 014

0684425E 3946567N  
±18'

end of widespread gravel  
in road. Gravel continuous  
between KH-11 & KH-12.  
Exposures in side banks at  
KH-11 indicate gravel was  
probably in-situ. It is  
not as certain if the gravel  
between KH-11 & KH-12  
was all in-situ or if  
some had been moved  
when the road was graded.

Kenneth L. Hanson 27 Jun 06

11151  
27 JUN 06

Attachment B-2  
Page 5 of 17

K. HANSON  
A. LAVINE 17

STOP KH-13 WP 015

0684433E 3946512N  
±15'

weathered profile (yellowish brown)  
on sandstone; discontinuous  
exposure in east road cut  
(~1 to 1.5 high ~50 ft long).

Stop KH-14 WP-016

0684556E 3946392N  
±14'

Reddish brown (2.5 yr 1/4 semi-  
moist)  
? baked siltstone

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18 11151  
27 JUN 06K. HANSON  
A. LAUVINEStop KH-14 WP 016 017

0684681

0684618 E 3946401 N  
±17

Gully eroded into road.  
Exposure of reddish brown  
and gray baked? sediments  
between 3rd + 4th trunk  
survey flags - from west  
end of magnetometer  
survey line

Photographs

11151-P&N COL - 27 JUNE 2006  
001 to 003Stop KH-15 WP 018 019

BGA-7 Elev. 263.5'

for calibration

084657 E 3945965 N

±16' GPS 292.0°

Katherine L. Hanson 27 JUN 06

11151 Attachment B-2  
28 JUN 06 Page 6 of 17K. HANSON  
A. LAUVINE<sup>19</sup>

8:30 am

Weather: warm (80's), sunny  
with scattered morning  
clouds.Stop KH-16 WP 019 019

Photographs

11151-P&amp;N COL - 28 JUNE 06

001-002-003

View WNW of Five Pond  
upper part of reservoir  
Thomas Creek 3km.0685460 E 3946093 N  
±19'Stop KH-17 WP 020

0685467 E 3946186 N

±20' (vicinity of Five Pond  
Adjacent to reservoir (upstream))low terrace at water level  
no exposures along reservoir  
margin.

Katherine L. Hanson 28 JUN 06

20 11151  
28 JUN 06

K. HANSON  
A. LAVINE

Stop KH-18 WP 021

0685527E 3946167N  
±16'

Western end of probable  
fluvial terrace remnant  
~ 2 m high vegetated  
(pine covered) bank  
on road cut.

Stop KH-19 WP 022

0685548E 3946207N  
±16'

Top of fluvial terrace?  
cleared area along power  
line; ? possible modification  
due to power line.

Kenneth L. Hanson 28 JUN 06

11151 Attachment B-2  
28 JUN 06 Page 7 of 17

K. HANSON  
A. LAVINE 21

Stop KH-20 WP 023

Broad flat terrace surface  
(higher surf. above WP 022 surf.)

0685582E 3946181N  
±16'

Stop KH-21 WP 024

0685610E 3946261N  
±16'

Exposure of sandy mudstone  
numerous worked clasts  
and arrowhead fragments.

Stop KH-22 WP 025

0685601E 3946297N  
±15'

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22 11151  
28 JUN 06

K. HANSON  
A. LAVINE

Stop KH-22 (cont.)

Exposure of dark reddish  
brown (2.5 yr 2.5-3/4, dm)  
sandstone. (north side of  
road).

glayed zones along curved  
roots (? fractures); generally  
massive, no apparent  
bedding

10<sup>30</sup> am reached locked gate  
on intersection with  
SR 1134

Stop KH-23 WP 026

0684936E 3945921N  
±18

Boulders of dolomite in road  
Not certain if they are  
in situ. They are close to

Kathryn L. Hanson 28 JUN 06

11151 Attachment B-2  
28 JUN 06 Page 8 of 17

K. HANSON  
A. LAVINE 23

mapped diked as shown by  
NC Geol Survey New Hill  
7.5' grid digital map.

Close examination shows  
the clasts to be sandstone

Stop KH-24 WP 027 / WP 028

0684936E 3945941N  
±20 16'

sandy  
Outcrop of pebbly conglomerate.  
pebbles reach up to 1 cm  
N10W, 30 NE ~ bedding  
apparent bedding

joints N67W 80SW  
N35W "  
NA  
N44W 85SW

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11151  
28 JUN 06

K. HANSON  
A. LAVINE

Stop KH-25 WP 029

0684898E 3946094N  
±17'

Pump house levee

Photographs

11151 PEN COL - 28 JUN 06  
006

View W along front of  
liniment (+ seismic  
shots of tree reflections)

Stop KH-26 WP 030

0684975E 3946060N  
±21'

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Stop KH-26 (cont.)

reddish brown siltstone

joint - N21E, ~vertical

joint ~25' north of  
N32E

Stop KH-27 WP 030

685006E 3946079N  
±13'

Outcrop of coarser sandstone  
not as red

limited to no exposure  
between this outcrop  
and see stop KH-28

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26 11151  
28 JUN 06

K. HANSON  
A. LAVINE

Stop KH-28 WP 032

0684989 E 3946073 N  
± 22'

Contact between fine reddish  
brown siltstone unit and  
coarser gray sandstone

Contact not well exposed  
could be bedding  
contact.

Exposure in deep gully,  
shallow N10W-trending  
gully to east of exposure

Kenneth L. Hanson 28 JUN 06

11151 Attachment B-2  
28 JUN 06 Page 10 of 17

K HANSON  
A. LAVINE 27

Stop KH-29 WP 033

0685010 E 3946170 N  
± 17'

Knick point in main  
channel drainage below  
fire pond dam.

Siltstone exposed upstream

Photographs of bedrock  
~ 35 ft upstream

11151 - P6N COL - 28 JUN<sup>20</sup> 06 012  
013

11151 - P6N COL - 28 JUNE 2006 014  
snake photo

Kenneth L. Hanson 28 JUN 06

11157  
28 JUN 06K. HANSON  
A. LAVINEKH-29-30 WP 034 (see also  
p 30)0684989 E 3946176 N  
± 20'

zone of filled fractures  
and major color change  
from reddish brown siltstone  
downstream to pale tan  
unit.

Photographs11151 - PEN COL - 28 JUN<sup>20</sup> 06 015 to  
019

joints N21W  
prominent pair of joints

course sandstone -  
bleached light gray (1042 71.5,  
m)

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Attachment B-2  
Page 11 of 17

28 JUN 06

K. HANSON  
A. LAVINE

KH-31 WP 035

0684810 E 3946168 N  
± 15'

stream cut exposure  
west bank

2 m high cut generally  
covered; very limited  
exposure of fine sandy  
siltstone (weathered).

KH-32 WP 036

0684752 E 3946179  
± 14'

no exposure

Kathleen L. Hanson 28 JUN 06

30 11151  
28 JUN 06

K. HANSON  
A. LAURINE

KH-30 W2034 (additional  
information)

revisited site coming in from  
the west

Contact between sandstone  
and underlying claystone

N34°W; 17°NE

Claystone unit is ~2 ft  
thick overlying red siltstone

Photographs of fractures in  
sandstone.

11151-PAN COL-28 JUN 2006 001  
to 024

Kathryn L. Hanson 28 Jun 06

11151 Attachment B-2  
29 JUN 06 Page 12 of 17

K. HANSON  
A. LAURINE 31

9<sup>00</sup> am Arrive at site  
Start field work.

Weather: clear, sunny, warm  
(80°s)

Eastern end of Emergency  
Discharge Channel

Photographs

11151-PAN COL-29 JUNE 2006  
001 to 007

photos of south wall of  
channel.

11151-PAN COL-29 JUNE 2006 008-010  
photos of north wall  
siltstone / sandstone  
contact.

Kathryn L. Hanson 29 Jun 06

32 11151  
29 JUN 06

K HANSON  
A. LAVINE

33 037  
KH-31 WP 035

0684764E 3945447N  
± 20'

Bedding contact  
pb. coarse sand / sand.  
N45W, 17° SW

? channel margin

Photograph  
11151-P6N10L-29 JUNE<sup>20</sup> 011  
view of opposite wall (N wall  
of channel).

On opposite wall - base of  
channel appears to dip  
into wall (towards N)

To east siltst / sandstone  
dip towards E.

Kenneth L. Hanson 29 Jun 06

11151  
29 JUN 06

Attachment B-2  
Page 13 of 17

K. HANSON  
A. LAVINE 33

KH-34 WP 038

0684708E 3945446N  
± 18

siltstone - no good bedding  
photographs:  
series of photos of  
north channel wall

W → E

11151-P6N10L-29 JUN<sup>20</sup> 012  
012 to 021

Kenneth L. Hanson 29 Jun 06

34 11151  
29 JUN 06

K. HANSON  
A. LAVINE

KH 35 WP 039

0684625 E 3945456 N  
±16'

Western end of good bedrock  
exposure near ~~bank~~ bend  
in channel.

sandstone overlain by  
probable fill

Joints: N54E 62°NW  
N5-8W vertical  
N47E vertical

? bedding top of sandstone  
~ siltstone

N85E, 15°SW

Kenneth L. Hanson 29 Jun 06

11151  
29 JUN 06

Attachment B-2  
Page 14 of 17

K. HANSON  
A. LAVINE 35

KH 36 WP 040

0684824 E 3945463 N  
±19'

Top of sandstone / base siltst.  
N channel margin west  
of ~~the~~ discharge structure.

N6W, 7°NE

Joints N30°E 74°NW  
305 ~ vertical  
N5°E 81°NW

Bedding N20W, 13E (15' west)  
N20W, 15E (30' west  
of KH 36)

Kenneth L. Hanson 29 Jun 06

36 11151  
29 JUN 06

K HANSON  
A LAVINE

KH-37 WP 041

0684721 E, 3945463 N  
±15'

Joints

N67°E vertical  
N58°E vertical  
N51°E vertical

N5°W  
N24°W, near vertical to  
vertical steep dipping SW

KH-38 WP 042

0684754 E 3945466 N  
±16'

massive sandstone  
no bedding attitude measured  
based on view from across  
the channel, the beds may

Kristin L Hanson 29 Jun 06

11151  
29 JUN 06

Attachment B-2  
Page 15 of 17

K HANSON  
A. LAVINE 37

KH-38 (cont.)

and gently northward into  
the wall of the cut.

KH-39 WP 043

0684715 E 3945467 N  
±14'

bedding N20°E, 21°SE  
on ~~laminar~~ mudstone

KH-40 WP 044

0684866 E 3945752 N  
±14'

upper soil weathering on  
sandy siltstone  
poorly exposed.

Kristin L Hanson 29 Jun 06

11151  
29 JUN 06K. HANSON  
A. LAVINEKH-41 WDP 045684197E 3946125N  
±19'

Lunch break on Fire Pond

limbament - shoreline of

S.H. Reservoir: 11151-P6N COL-29 JUNE 2006

Photograph: view W along limbament 022  
023

Walked north to Railroad

tracks, back on road

past storage area to

car parked at Emergency

Discharge channel.

Photographs: 11151-P6N COL-29 JUNE 2006 024-028

- 1:50 pm left HNP site. (scenic  
shots)

Recon along Road SR 1127

south of Harris Visitor Center

across projected trend of

'Fire Pond limbament'

Kathryn L. Hanson 29 June 06

11151  
29 JUN 06K. HANSON  
A. LAVINE 39KH-42 WDP 0460689108E 3946354N  
±20'

Roadcut along eastern

side of SR 1127 just

south of White Oak Cr.

Along projection of 'Fire  
Pond' limbamentVery limited exposure of and  
reddish siltstone <sup>at and</sup> south  
of curve in road.KH-43 WDP 0470689061E 3946405N  
±20'Coarser sandstone - shallow  
gully  
adjacent to curve in road.

Kathryn L. Hanson 29 June 06

11151  
30 JUN 06

K. HANSON  
A. LAVINE

9<sup>30</sup>am Meeting with Tyler Clark  
(North Carolina Geological  
Survey)

Reviewed seismic data  
(Texas) for Durham  
basin.

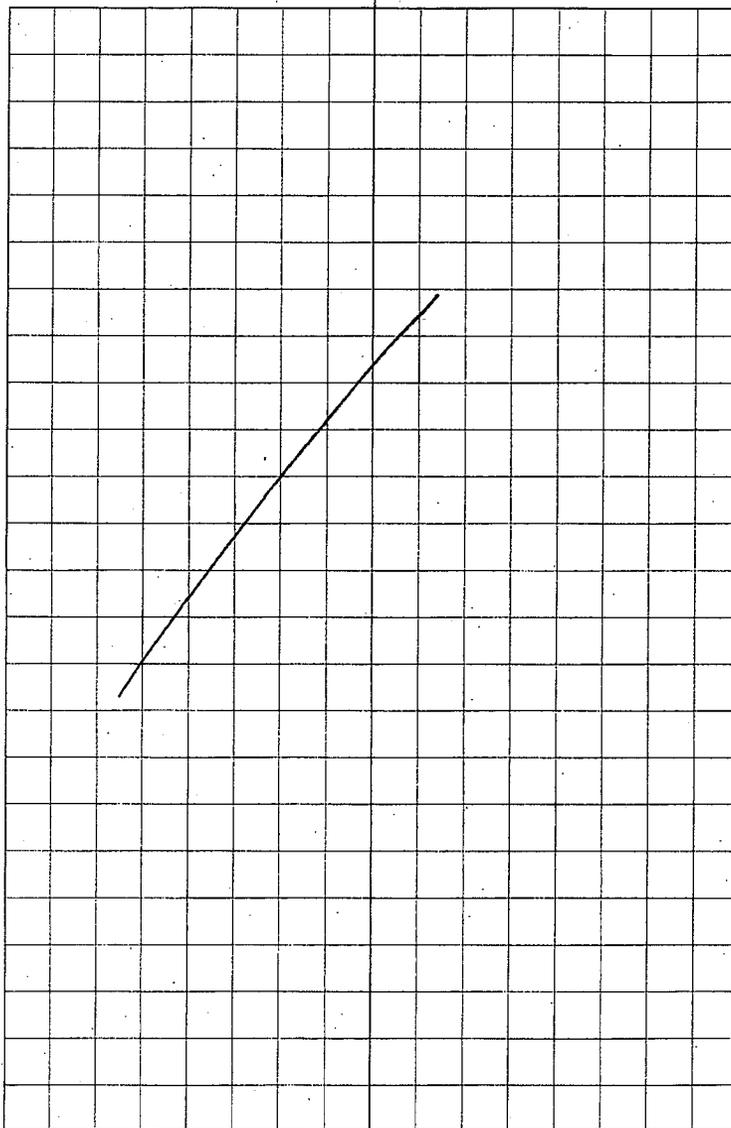
The NCGS will scan these  
profiles and post them  
to the Biomatrix PDP site.

11<sup>00</sup>am Dropped A. Lavine off  
at the RDU airport.

11<sup>30</sup>am Visit to Wake County  
Soil & Conservation Service  
office.

Picked up soil survey for  
Wake County.

Kathryn L. Hanson 30 JUN 06



42

11151  
5 Dec 2006

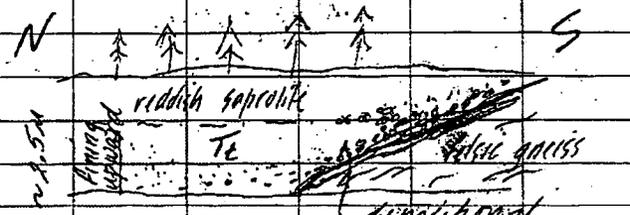
K. Hanson  
A. Lavigne

1:30 pm Sunny, cool (40°)  
Field Recon:  
with Tyler Clark (NCCGS)

KH-44 WP 145  
N 0707149  
3945864

SR 2724 and railroad crossing  
recent exposure out along  
drainage ditch  
~ 300 feet long

Photos.  
11151 PGM COL 5 Dec 2006  
001 to 005



depositional contact  
felsic gneiss N-S relationship  
steeply dipping  
no evidence of deformation of Tertiary gr.  
(see add. notes p. 50)

Katherine L. Hanson 5 Dec 2006

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11151  
5 Dec 2006

K. Hanson  
A. Lavigne

depositional contact between  
coastal plain gravel and  
basement rock

WP 147 8709462 0707282  
WP 146 3945133 3946134  
KH-45 (WP 123 location)

western bank along entire  
railroad is obscured by  
pine duff and vegetation

Exposure of fault is not  
apparent at this time

Note: WP 123 coordinates  
KH-44 coordinates for  
WP 146 incorrect  
WP deleted

Helicopter Return  
12 Dec 2006 K. Hanson, A. Lavigne, T. Clark  
8:30 am Arrive Lee County airport  
9:45 am Rodney Swanson, helicopter pilot  
11:30 am Flight start - approval to fly  
over HNF authorized.

2:30 pm Back to Lee Co. airport.  
Katherine L. Hanson 5 Dec 2006

EFFECTIVE DATE: 07/20/2007

44 11151  
6 Dec 2006

K. HANSON  
A. LUMPE

Field Recon with Tyler Clark  
KH-46 WP 163 0687038  
3941037

Lithologies III - Marxist Trcc  
Halloway Crossing Engrl

contact between Engrl. and  
overlying siltstone

Photos:  
11151. P6N COL - 58 Dec 2006 - 107 Trcc  
108 contact

conglomerate - matrix supported  
blocks up to 15-20cm  
agg. subangular, & subround. blocks  
v. coarse sd. matrix

Photos  
11151 P6N COL - 58 Dec 2006 - 109  
photo showing bedding exposed  
embayment along W. side of  
siltstone

11151 P6N COL - 6 Dec 2006 - 110-112

Kathryn L. Hanson 6 Dec 2006

11151  
6 Dec 2006

K. HANSON  
A. LUMPE 45

Paracana - south to north  
Shoshone fault along Shoshone  
then permissite

Kathryn L. Hanson 6 Dec 2006

46 11151  
7 DEC 2006  
K. HANSON  
A. LAVINE

8:30 - 10:00 AM - download photos -  
map review, 10154715

11:00 AM weather: sunny 50's

Stop KH 47 Bush Creek fault  
projected eastern limit  
near WP 144. intersection  
of Sedwick Road and  
drainage

no geomorphic evidence  
of tectonic activity  
stream channel ~ 20-30'  
wide low gradient. young  
fluvial terrace ~ 6'  
continuous along stream  
south of bridge

WP 144 2689619  
3973330

Kathryn L. Hanson 7 DEC 2006

11151  
7 DEC 2006  
K. HANSON  
A. LAVINE

Photo 11151-PAN COL 38 DEC 2006  
0113

VIEW N.W. OF TERRACE  
SURFACE.

11151-PAN COL 38 DEC 2006 0114  
+ south toward exposure in  
right stream bank.

exposure appears to be  
within Tertiary rock  
suggesting that terrace  
is a shallow terrace cut  
into bedrock.

Note: location may be at  
northern limit of  
broad zone of Paulding  
Assoc. with Bush Cr. F.  
(Lithologic data shows broad  
zone of deformation); subparallel  
drainage to south may also  
be along fault zone.

Kathryn L. Hanson 7 DEC 2006

48 11151  
7 DEC 2006  
K. HANSON  
A. LAUVINE

0684850  
3969764

Stop KH 48 WP 165

Approximate location of  
projected trace of Bush Cr. F  
and Hwy 75L

Based on seismic line data the  
zone of faulting should  
be located within the drainage  
northwest of road.

No roadcuts along Hwy 75L  
across projected trace.

Katherine L. Hanson 7 DEC 2006

11151  
7 DEC 2006  
K. HANSON  
A. LAUVINE 49

0678227  
3965540

Stop KH 49 WP 166

recombinant with WP 13F

along Bush Cr. faultament  
limited exposure of Tertiary  
basin fillrock (sandstone)  
on eastern bank of  
inlet.

No evidence of previously  
mapped fault (NGES pt.)  
in speculate that this  
fault may have been  
identified in exposures  
at lower water level.

Katherine L. Hanson 7 DEC 2006

50 11151  
7 December 2006  
K. Hanson  
A. Lavigne

NH 44 (cont.)

Returned to exposure to reevaluate bed / gravel contact.

confirmed that apparent slip in basal gravel is not tectonic

underlying schist (highly unaltered to clay) is not faulted.

Joints N15E (knife)  
EW, vertical

11151 PEN COL 7 DEC 2006  
115 to 122

Katman & Hanson 7 Dec 2006

11151  
7 Dec 2006  
K. Hanson  
A. Lavigne

leave field 5:10 pm (sunset)

Katman & Hanson 7 Dec 2006

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11151  
8 DEC 2006K. HANSON  
A. LAVINE

Geologic Recon.

Weather: sunny, cold - 30°F

Sanford

Stop KH 50 WP 167

0606280

3925499

Roadcut - west side of road  
adjacent to Sanford water  
tower.~240m N - to Point WP 134  
~100m SW -Good exposure of coastal plain  
sediment.~2 m high with (soil)  
developed on sand. basal  
gravel (rounded) and coarse  
sand at southern end of

Kathryn L. Hanson 8 DEC 2006

11151  
8 DEC 2006K. Hanson  
A. Lavine

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deposits.

No evidence of faulting or  
extensive joints is present

Shell observed in float.

Photographs:

11151-T6N COL-5-8 DEC 2006  
123 to 129Car basket across buried trace  
of Danvers and Wilkes  
Barren Fall line (WP 135)The coastal plain surface  
did not (expose) across  
both features. No exposures  
observed. Fall line is close  
to water contact to / from.

Kathryn L. Hanson 8 DEC 2006

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8 DEC 2006

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A. LAVINE

Photographs 11/51 P6N COL 5-8 DEC 2006  
Panorama of HARC 1 site. 131-135  
KH 51 WP 168 0085021  
3946182

Copperhead exposure along mill  
spillway to Fire Pond.

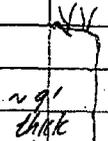
Photographs

11/51 P6N COL 5-8 DEC 2006 136 to 146

- P N5E, vertical P6W
- P N35E, ~90 W
- P N40W, vertical
- P N5E, vertical
- P N55W, 82N
- P N5E,
- P N50W

bedding

N30E, 29SE  
N15E, 27SE (incl)



weathering profile  
yellowish brown  
reddish br. siltstone  
~1 foot thick at st.  
gray claystone

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11/51  
8 DEC 2006

K. HANSON  
A. LAVINE

~5m downstream  
conglomerate exposed at base  
of left bank. rounded  
gravel up to ~3 cm.

BTLA-5 rock hole

WP 168 - void  
WP 170 0084986  
3946169

at Fire pond from north end  
upstream of WP 168 locality

Photograph of Fire pond  
11/51 P6N COL 5-8 DEC 2006 147  
KH 52 WP 171 0084431  
3945061

northern end of access road into  
Geophysical Area E

Followed road to south to  
place where tree fallen  
across fence provided access  
to peninsula where Harris  
well was viewed in a circle

Kathryn L. Hanson 8 DEC 2006

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11151  
8 DEC 2006

K. Thompson  
A. Lavine

at trenches.

BPA-5W-74 trench excavation  
site apparent. No exposures  
along shoreline

Photographs 11151 P&N COL - 5-8 DEC 2006 158-  
162

11153 OR 172 0685251  
3944795

INTAKE structure

Photo parameters

11151 P&N COL - 8 DEC 2006

163-171

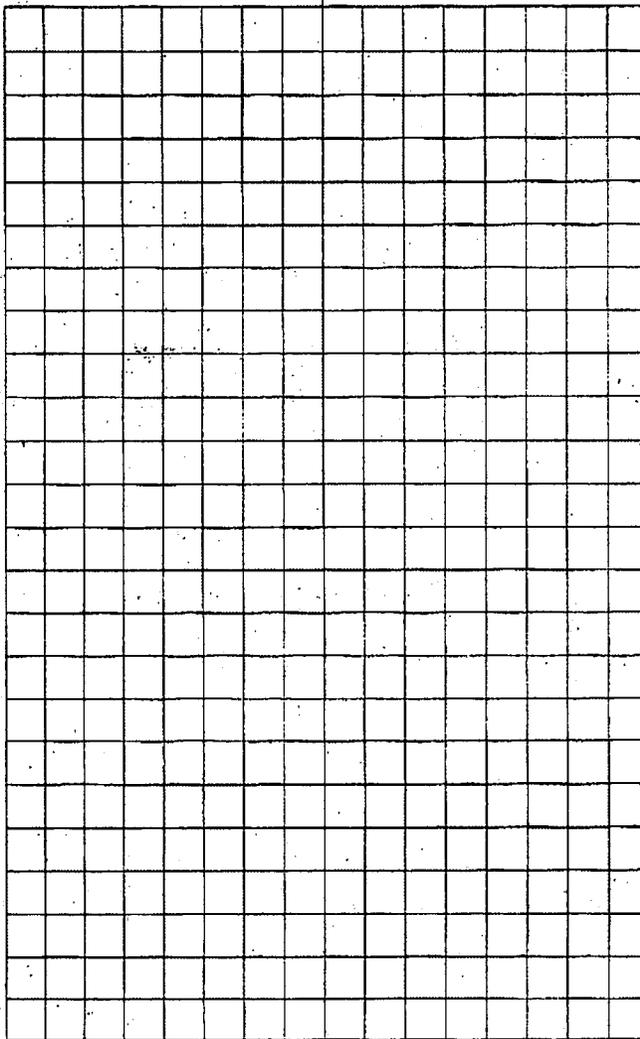
172-173 looking toward  
KUALTOR

3:40 pm - leave site

Note: Photos 11151 P&N COL - 5-8 Dec  
2006 150-155 were taken  
at BPA-47 drill hole site  
156-157 New from site north  
towards HAR-7-3

K. Thompson & A. Lavine 8 DEC 2006

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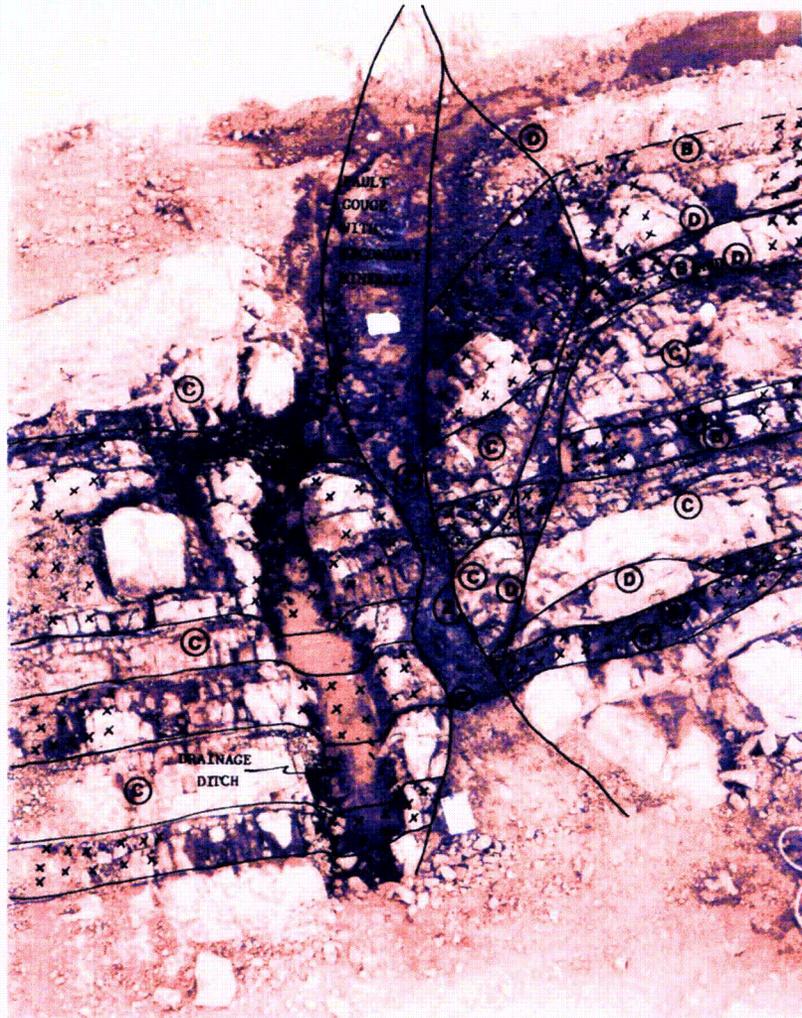
Source: Ebasco (1975)

View north along East Dike 2 at intersection with the fault at elevation 2.2 feet below beginning elevation 247. Line segments (A) represent limits of segments of diabase. Line segments (B) represent shearing along the trace of the fault. Note that the horizontal component of displacement is greatest in the eastern diabase segment and least in the western segment. This is consistent in photos taken at greater depth and forms part of the basis for our interpretation that the dikes were intruded during movement on the fault, since the westernmost diabase segment is paleomagnetically the youngest.

Progress Energy Carolinas

**Shearon Harris Nuclear Power Plant  
Units 2 and 3  
Part 2, Final Safety Analysis Report**  
New Hill, North Carolina

Photograph of Ebasco (1975)  
Harris Fault Excavation Along East Dike 2  
RAI 2.5.1-25 FIGURE 1



Source: Ebasco (1975)

View eastward along fault at the intersection with East Dike 2 at reference elevation 210. The primary trace of the fault is enclosed between the line segments outside of the small areas identified as "Z". The "Z" locations are those from which zeolite mineral samples were taken from the fault gouge. Line segments (B) represent the limits of the three diabase segments making up this composite dike. Areas around the letter (C) are hornfels. Line segments (D) represent secondary fractures associated with the commonly observed drag folding in material immediately south of the fault. This view represents the deepest excavation at the fault intersection with East Dike 2. Samples of coal and pyrite were taken in the fault gouge at the extreme top of the photo. Barite was sampled at approximate elevation 214, above the level of this photo at approximately the location of the sheet and arrow in the upper center of this photo. Paleomagnetic dating indicates that the thinner diabase segment nearest the viewer in the lower part of the photo is the youngest and that the other two are of about the same age and are older. Photo (H) following is another view at this location.

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 New Hill, North Carolina

Photograph of Ebasco (1975) Harris Fault  
 Excavation Along Fault at  
 Intersection of East Dike 2  
 RAI 2.5.1-25 FIGURE 2

**THIS PAGE IS AN  
OVERSIZED DRAWING OR  
FIGURE,  
THAT CAN BE VIEWED AT THE RECORD  
TITLED:**

**“RAI 2.5. 1-25 FIGURE 3  
Trench Logs from Excavations Across  
The Harris Fault (Ebasco, 1975, Plate 9).”**

**WITHIN THIS PACKAGE... OR  
BY SEARCHING USING THE**

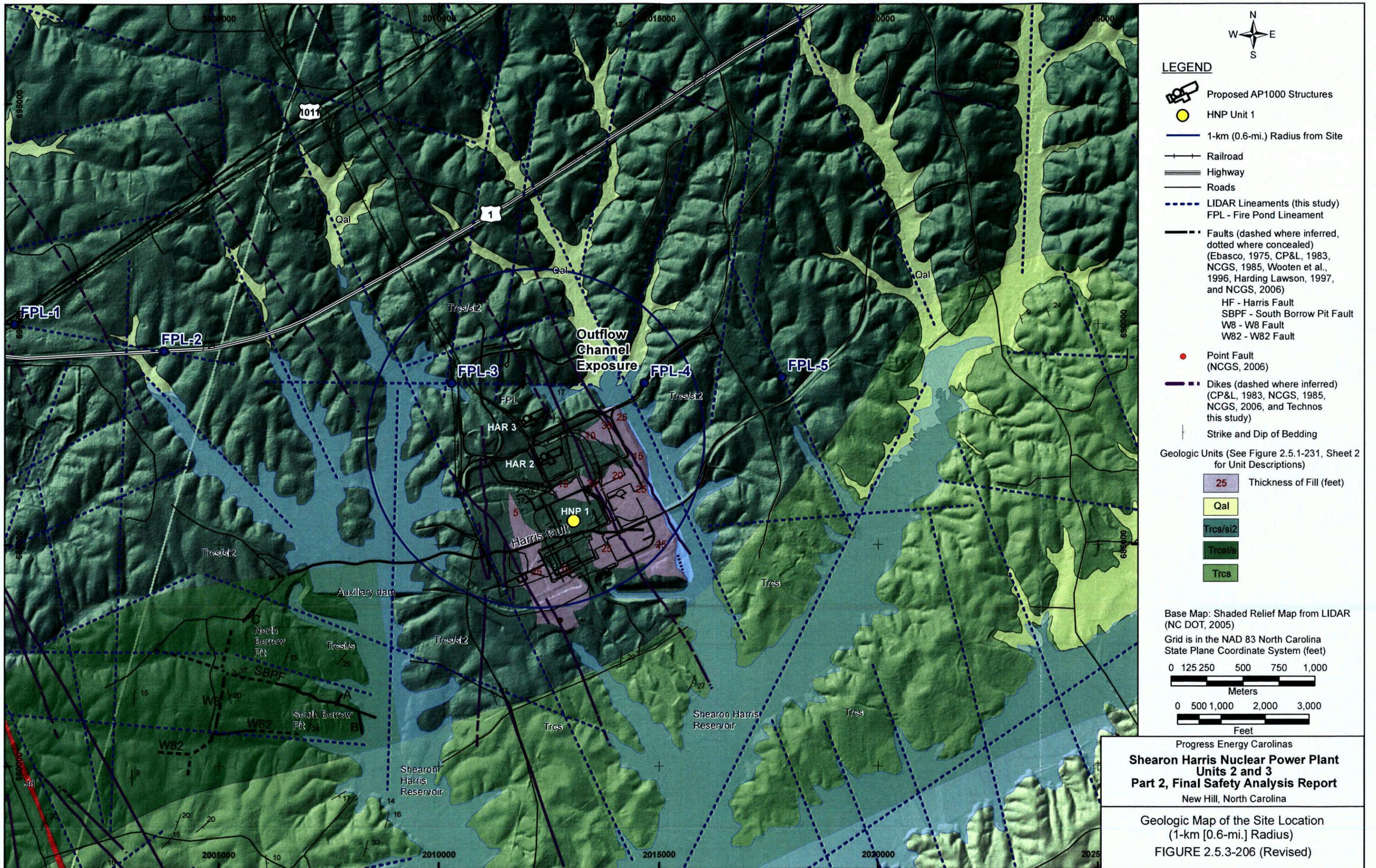
**D-03**

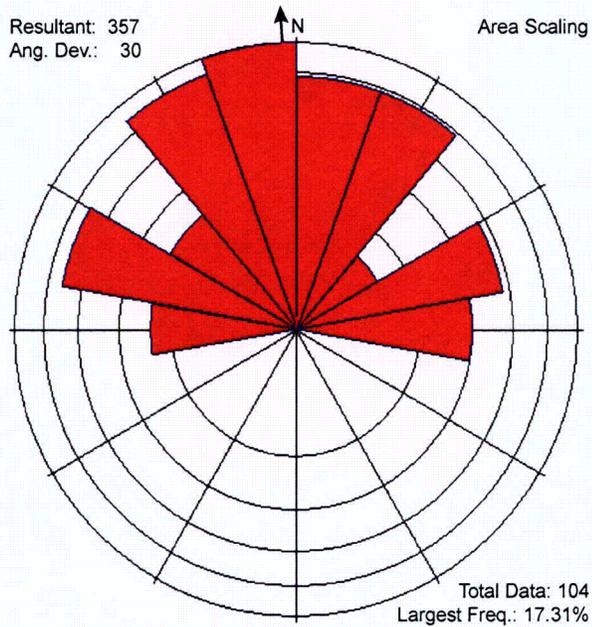
**THIS PAGE IS AN  
OVERSIZED DRAWING OR  
FIGURE,  
THAT CAN BE VIEWED AT THE RECORD  
TITLED:**

**“RAI 2.5. 1-25 FIGURE 4  
Correlations Across The Harris Fault  
Based on Borehole Data (Ebasco, 1975, Plate 8).”**

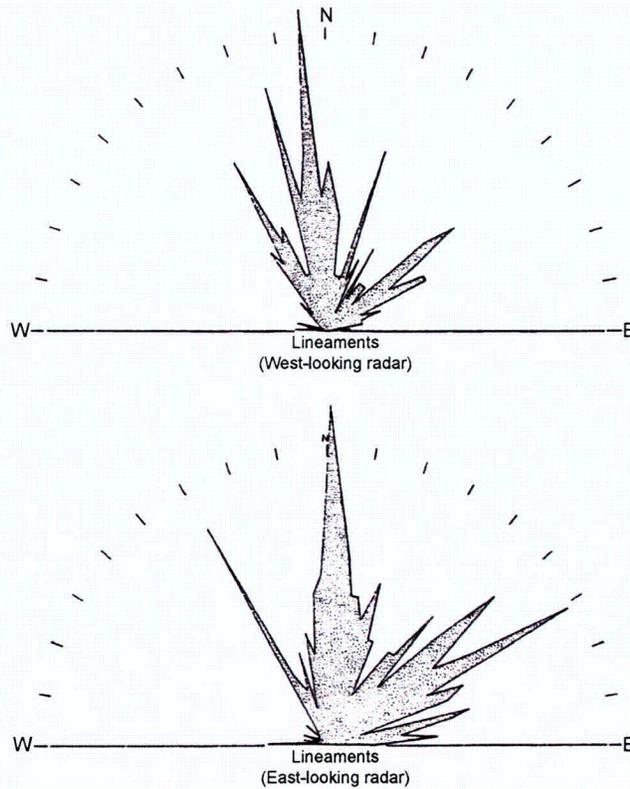
**WITHIN THIS PACKAGE... OR  
BY SEARCHING USING THE**

**D-04X**





(a)  
Lineaments interpreted from  
2005 LIDAR data (lineaments  
shown in Figure 2.5.3-203)



(b)  
Lineaments interpreted from  
SLAR imagery (Bain and Brown, 1981)

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Rose Diagrams Showing  
Orientations of Lineaments  
FIGURE 2.5.3-207 (Revised)

**Brenda Watson**

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**From:** Tyler Clark [the4clarks@mac.com]  
**Sent:** Wednesday, October 08, 2008 9:12 AM  
**To:** Alexis Lavine  
**Cc:** john.nickerson@ncmail.net; Michael.Medina@ncmail.net; Kathryn Hanson; Geraldine Moore-Butler  
**Subject:** Re: geologic map questions

Hi all!

Sorry for the delayed response, but we were out of town for an extra-long weekend to Heidelberg.

I cannot speak to the "published" status of the maps. Mike and John would know.

As for the specifics on the faults, I can help here. Believe it or not, when I moved to Germany I brought along all my old field books for some strange reason, rather than pack them up in storage. Here's what I have on the two faults in question:

**Unnamed northern-most fault:** This unnamed fault was pulled directly off the state Geologic map (1985). I looked intently for it during my mapping, but only found some strange, hi-angle bedding measurements and "different"-looking strata than the rest of the basin (possibly Lithofacies Assoc. I). Also lots of fractures in that area, so I made the decision to leave the fault on the map, even though I never saw it. Bain and Harvey (1977) saw some strange seismic reflectors in that area, and Bain was on the Geologic Map Committee, so he probably felt pretty good that it should be included on the State Map.

**Unnamed US 1 fault:** This fault I know more about. I observed this fault during the widening of US 1 in May 1997. The exposure was in a storm water drain excavation that is now under the highway. The excavation contained a fault zone consisting of at least 4 curvi-planar fault surfaces in a zone of disrupted lithology. The fault surfaces themselves were extremely slickensided, giving the rock the appearance of a dark grey and polished talc.

There were four main fault surfaces measured, all striking NE-SW, dipping moderately-high to the NW:

Fault plane 1: 041 60 NW

Fault plane 2: 057 74 NW

Fault plane 3: 042 54 NW

Fault plane 4: 062 54 NW

Due to the heavily slickensided surfaces, it was difficult to determine a sense of slip, but in almost all cases, it is normal movement (assumed).

I also measured one antithetic fault in the footwall that was truncated against Fault plane 1, but cut across Fault plane 2:

Antithetic fault plane 5: 052 20 SE

Similar antithetic faults were observed on normal faults at the LLRW site to the south.

On either side of the fault zone, I found typical Triassic lithologies. The hanging wall consisted of two units: 1) a reddish-brown, fine-grained, muscovite sandstone with occasional green mottling, and 2) a whitish-pink, moderately-sorted, coarse-grained lithic arkose-sandstone. The footwall consisted of olive-green to grey, very fine-grained, laminated sandstone.

I was not able to trace the fault zone beyond the extent of the excavation. However, based on similar observations at the LLRW site to the south, my Survey colleagues and I felt the fault zone could be significant. We even waved our hands a lot in the air and suggested that it could be a northward extension of the W8 fault, but that's just pure speculation.

Can't think of anything else right now. Let me know if you have any questions. My brain is starting to clear up now that Oktoberfest is finally over!

Tyler

On Oct 3, 2008, at 8:20 PM, Alexis Lavine wrote:

John, Michael, and Tyler,

Last year you sent us shapefiles for the Cokesbury, New Hill, and Raleigh 100k quads that were unpublished at the time. Could you tell me if these maps are published yet, or if not have they been internally or externally peer reviewed?

Tyler,

We are looking for information about a few unnamed faults within 5 miles of the Harris site that are circled in yellow on the attached figure. There are two small faults that cross highway 1- we could use a little more detail (if it exists) about the fault northwest of the site observed during construction excavation. You've already given us information about the one to the northeast of the site. Also, there is an unnamed fault from the NC State Geologic Map approximately 5 miles north of the site. Do you have any information about this fault?

Thank you,  
Alexis

**Alexis Lavine**

Project Geologist

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Oakland, CA 94612

T: (510) 663-4270 cell (510) 367-7676

[www.geomatrix.com](http://www.geomatrix.com)

***P.S. As you may have heard, AMEC has acquired Geomatrix. While our physical address and phone numbers will remain the same, I have a new email address. Emails sent to [alavine@geomatrix.com](mailto:alavine@geomatrix.com) will be active until the end of the year. Therefore, you may still reply to this email address or use my new email address ([alexis.lavine@amec.com](mailto:alexis.lavine@amec.com)). Please update my contact information with the new email address. Thanks.***

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<Fig 2.5.1-231\_forNCGS.pdf>

