NRC GEOTECHNICAL VISIT

VIRGIL C. SUMMER NUCLEAR STATION (VCSNS)

[Old] Nuclear Training Center (NTC) – SC Hwy 213

JUNE 22, 2006

TIME	AGENDA ITEM	LEAD
8:00	Welcome & Introductions • Nuclear Training Center (NTC) Logistics • Safety Issues	SCE&G
8:15	NRC Entrance – Comments • NRR • Region II	NRC
8:30	Site Orientation Presentation • Project Schedule • Project Organization • Site Location / Facility Layout • Initial Project Evaluations	SCE&G (Whorton)
8:45	Local and Regional Geology / Seismic Sources • General Overview • Geology Maps • Seismic Sources (Faults)	WLA (Lindvall)
9:15	Geotechnical Investigation Program • Geotechnical Investigation Plan / Layout • Results to Date (Soils, Rock, Groundwater) • Rock & Soil Sample Identification	Bechtel (Davie) [MACTEC]
9:45	Inspection of Rock Cores & Soil Samples • NTC Library Display	All
10:00	BREAK	
10:15	Site Field Visit • Power Block Area (Drill Rigs, Wells, CPTs, Downhole Geophysic Tests) • Site Area Rock Outcrop	All
12:00	LUNCH at NTC	
1:00	NRC Break-Out Sessions: • Technical Discussions and/or Additional Field Visits • QA Programs / Procedures / Data Collection, etc. • Response to Questions	All
3:00	NRC Caucus	NRC
4:00	NRC Exit – Comments • NRR • Region II	NRC
4:30	ADJOURN	

SCE&G VC Summer COL

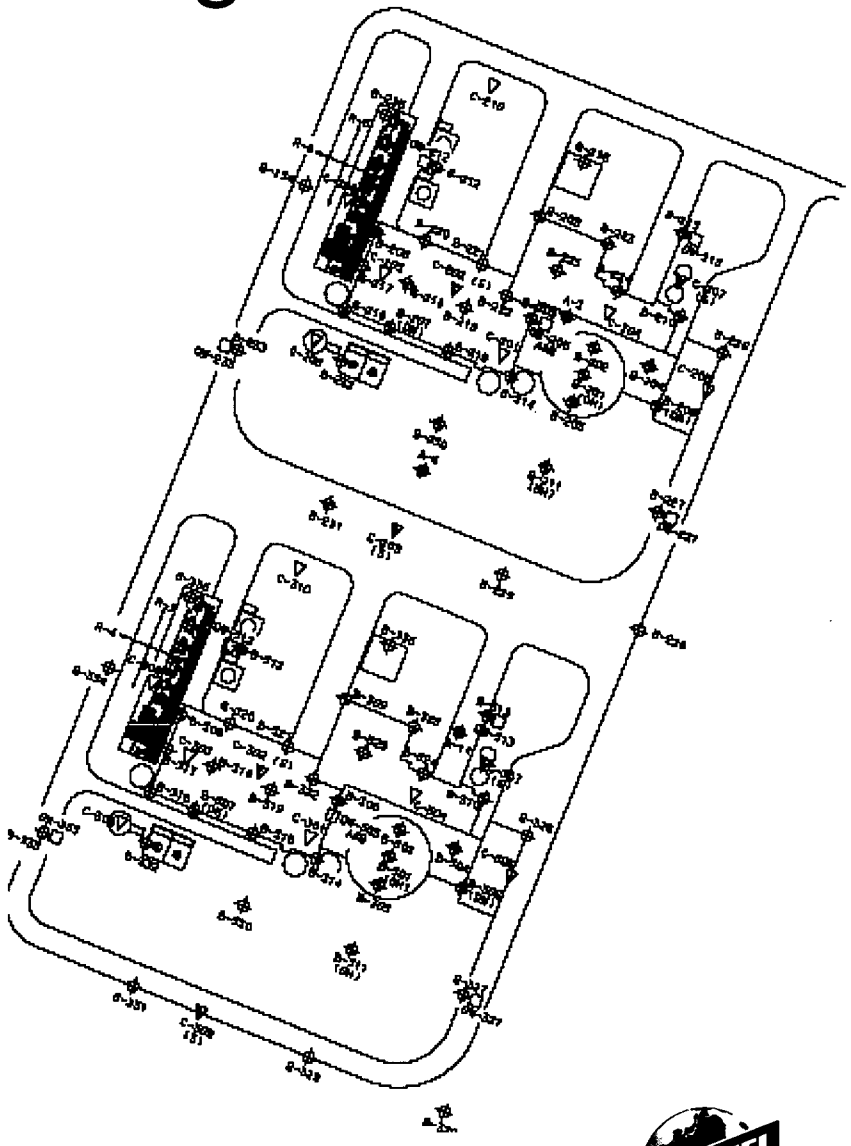
Subsurface Investigation

Bechtel Corporation

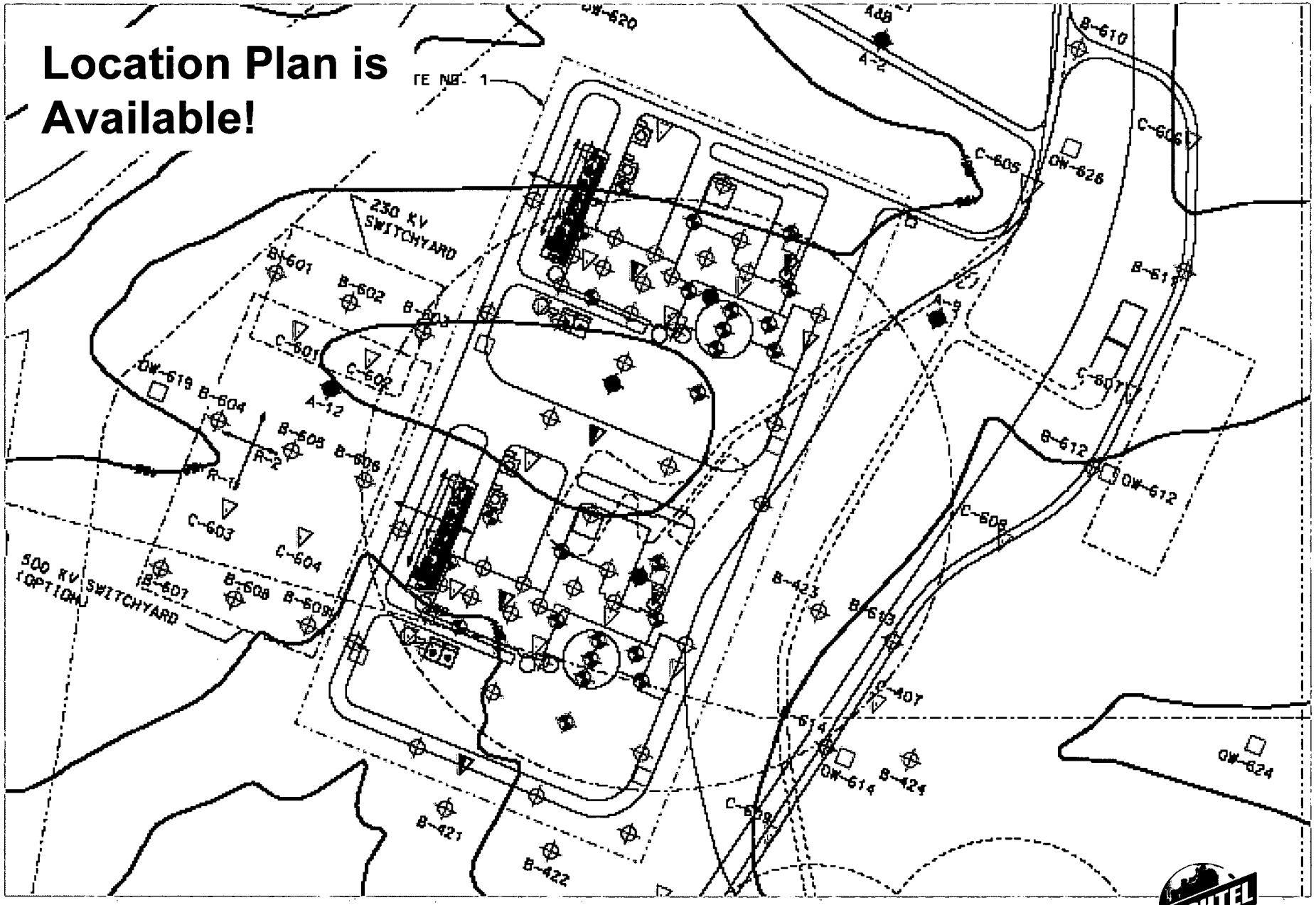
NRC Site Visit
June 22, 2006

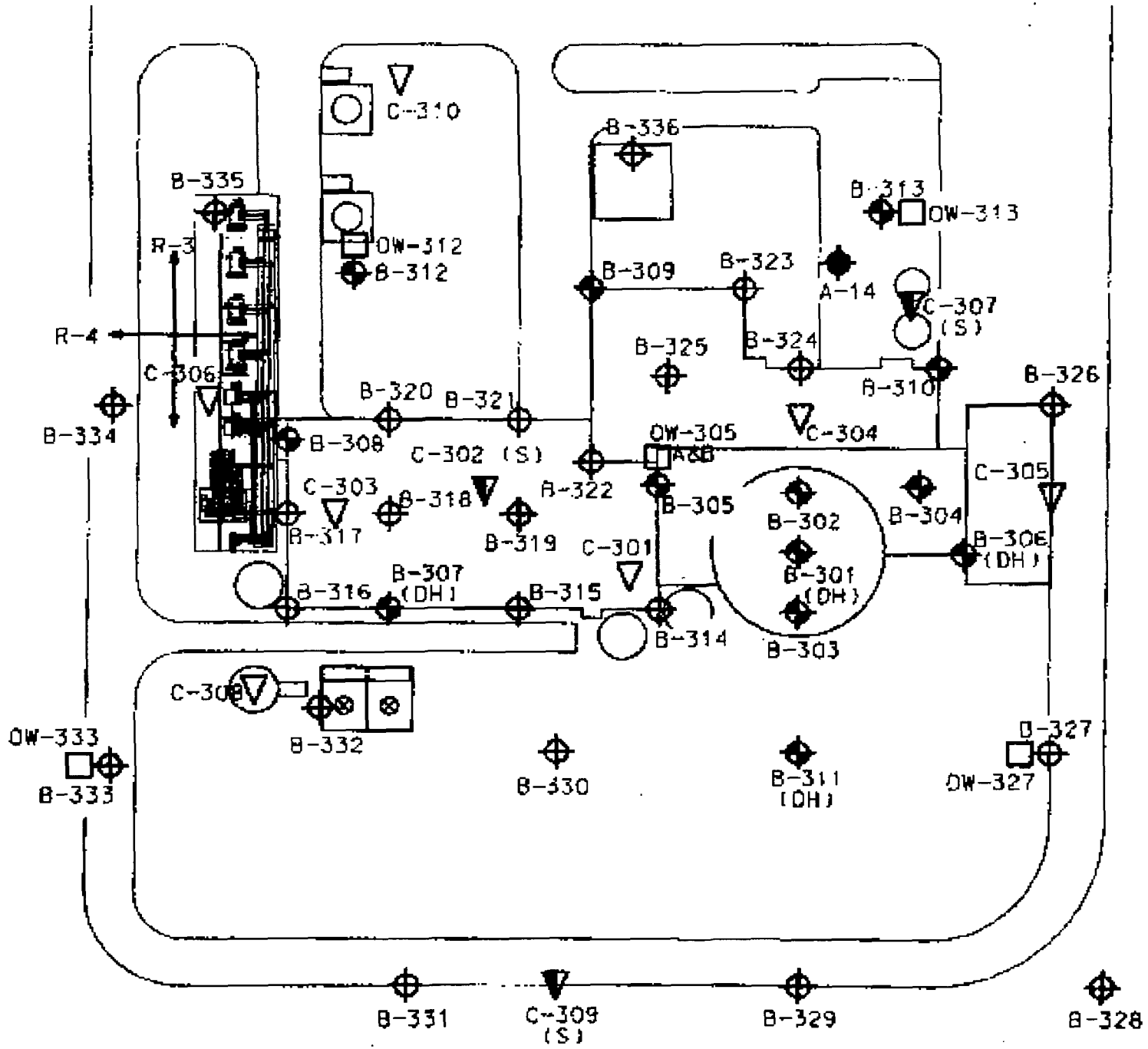
Subsurface Investigation

- Boreholes
  - Soil and Rock Drilling (111 Total)
- Observation Wells (31 Total)
  - Slug and Packer Tests
- Cone Penetrometer Tests (36 Total)
- Test Pits (20 Total)
- Geophysical Testing
  - Downhole Testing (8 Total):
    - (P-S Suspension Logging, Gamma, Resistivity, Televiewer, Caliper, and Deviation)
  - Seismic CPTs (7 Total)
  - Electrical Resistivity (6 Total)



Location Plan is Available!




C-310
B-336
B-335
B-313
OW-313
R-3
OW-312
B-312
B-309
B-323
A-14
C-307
(S)
R-4
B-325
B-324
C-306
B-320
B-321
B-310
B-326
B-334
OW-305
A&B
C-304
B-308
C-302 (S)
B-322
C-305
C-303
B-318
B-305
B-302
B-304
B-317
B-319
C-301
B-306
(DH)
B-307
(DH)
B-316
B-315
B-301
(DH)
B-314
B-303
C-308
B-332
OW-333
B-333
B-330
B-311
(DH)
B-327
OW-327
B-331
C-309
(S)
B-329
B-328

Borings: HQ Size (26 total)

- 2 to 350 ft depth (1 completed)
- 2 to 215 ft depth (1 completed)
- 8 to 175 ft depth (3 completed)
- 8 to 150 ft depth (2 completed)
- 6 to 115 ft depth (2 completed)

Borings: NQ Size (85 total)

- 4 to 175 ft depth (1 completed)
- 27 to 115 ft depth (10 completed)
- 2 to 100 ft depth (2 completed)
- 24 to 85 ft depth (11 completed)
- 2 to 80 ft depth (0 completed)
- 10 to 70 ft depth (10 completed)
- 1 to 60 ft depth (1 completed)
- 10 to 55 ft depth (4 completed)
- 5 to 40 ft depth (0 completed)

Observation Wells (31 total)

- 1 to 115 ft depth (1 completed)
- 4 to 100 ft depth (4 completed)
- 1 to 80 ft depth (0 completed)
- 12 to 70 ft depth (12 completed)
- 9 to 60 ft depth (9 completed)
- 1 to 55 ft depth (1 completed)
- 3 to 50 ft depth (3 completed)

CPTs (36 total)

- 1 to 80 ft depth
- 29 to 50 ft depth
- 6 to 40 ft depth

7 of the 50 ft CPTs include seismic tests

For 80 and 50 ft tests, advance to refusal even if deeper than specified depth.

Laboratory Testing: Soil

- Moisture content (500)
- Unit weight (30)
- Specific gravity (30)
- Sieve and hydrometer analysis (100)
- Grain size analysis w/no. 200 wash (100)
- Atterberg limits (80)
- Chemical analyses (pH, chloride, sulfate) (30)
- Moisture density (20)
- California bearing ratio (10)
- Unconfined compression (20)
- Unconsolidated undrained triaxial compression (40)
- Consolidated undrained triaxial compression (15)
- Direct shear (20)
- Torsional shear and resonant column (16)
- Consolidation (15)

Laboratory Testing: Rock

- Unconfined compression (80)
- Unconfined compression w/ stress-strain (40)
- Slake durability (8)
- Age dating (standard radio carbon) (8)
- X-ray diffraction/mineralogy (8)
- Petrographic analysis (thin section) (20)

Subsurface Investigation: June 11, 2006 Status

- Completed Boreholes: **49** (44%)
- Completed Observation Wells: **30** (97%)
- Boreholes, CPTs, and Downhole Geophysics Estimated Completion Date is Late July

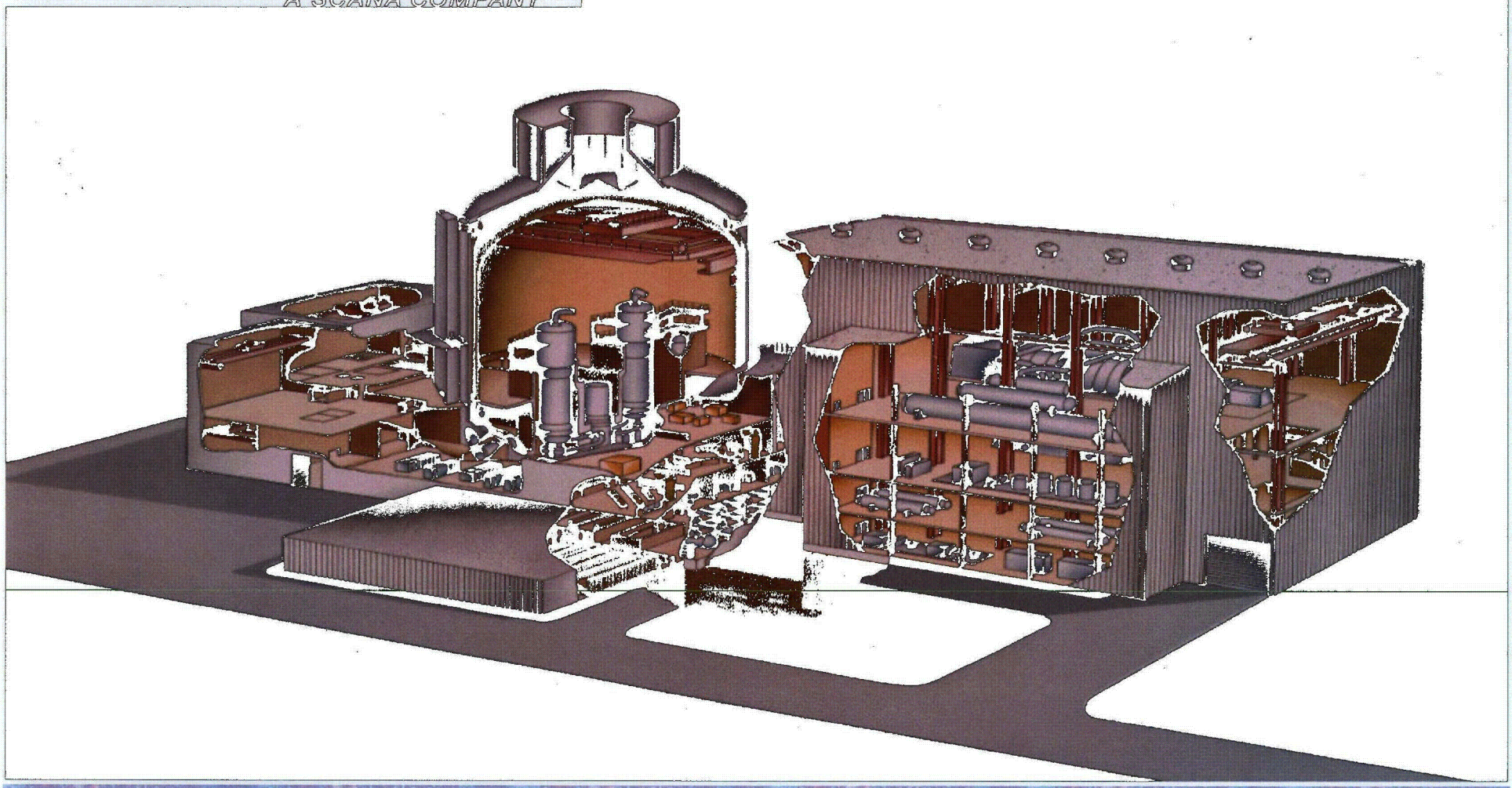
Subsurface Profile

- **Residual Soil** – reddish sandy silts with variable clay content
- **Saprolite** – completely weathered rock but w/preserved relict rock structure
- **Partially Weathered Rock (PWR)** – decomposed rock matrix mixed w/semi-hard rock fragments
- **Moderately Weathered Rock (MWR)** -- >50% by volume of sound rock interspersed w/decomposed zones
- **Sound Rock** – Hard fresh to slightly discolored rock (granodiorite, gneiss, schist)

Subsurface Profile

	B-201	B-305
Residual Soil	0-17 ft	0-33 ft
Saprolite	17-37 ft	37-51 ft
PWR	37-50 ft	51-57 ft
MWR	50-62 ft	57-61 ft
Sound Rock	>62 ft	>61 ft

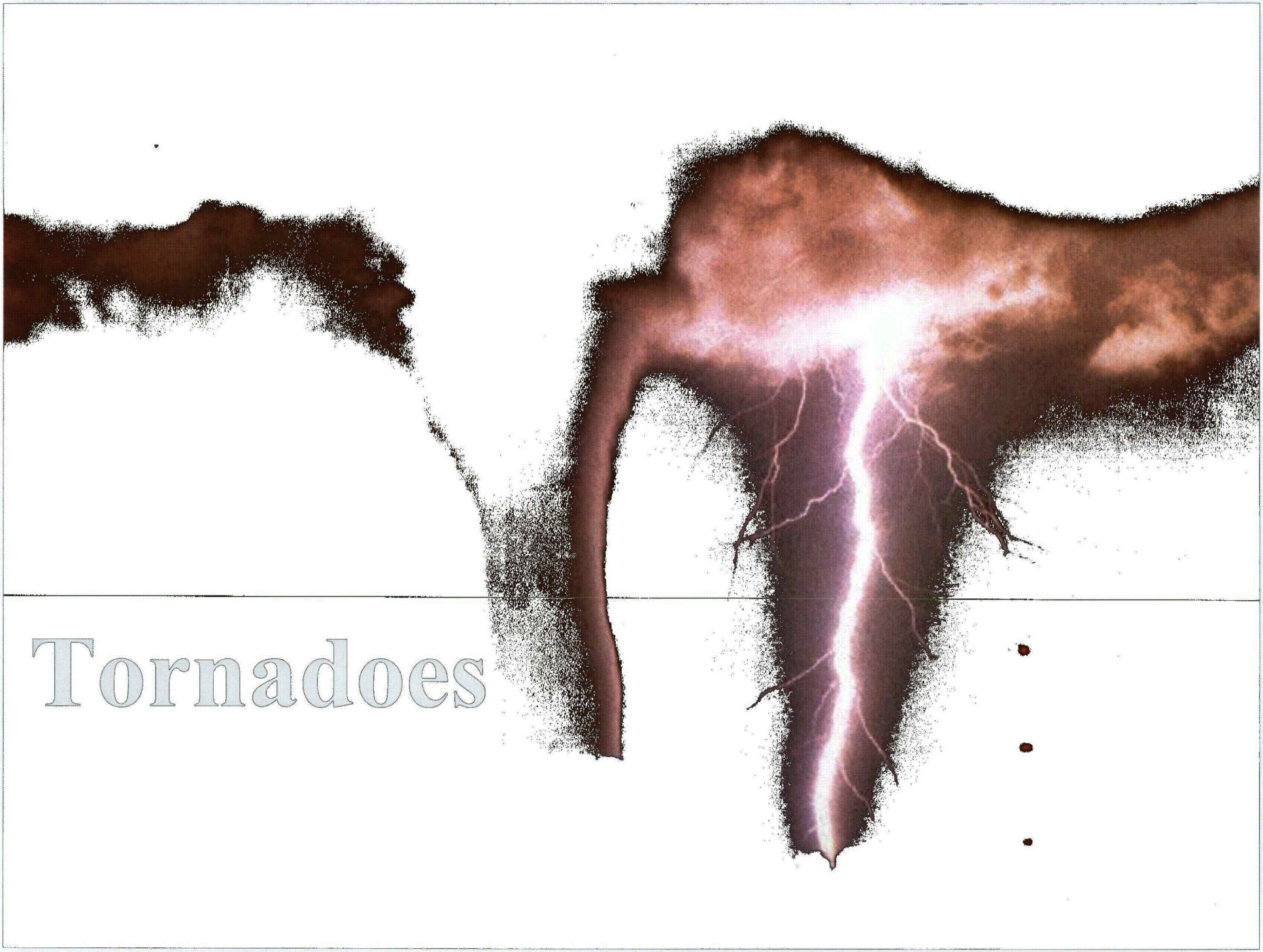
SCE&G®
A SCANA COMPANY



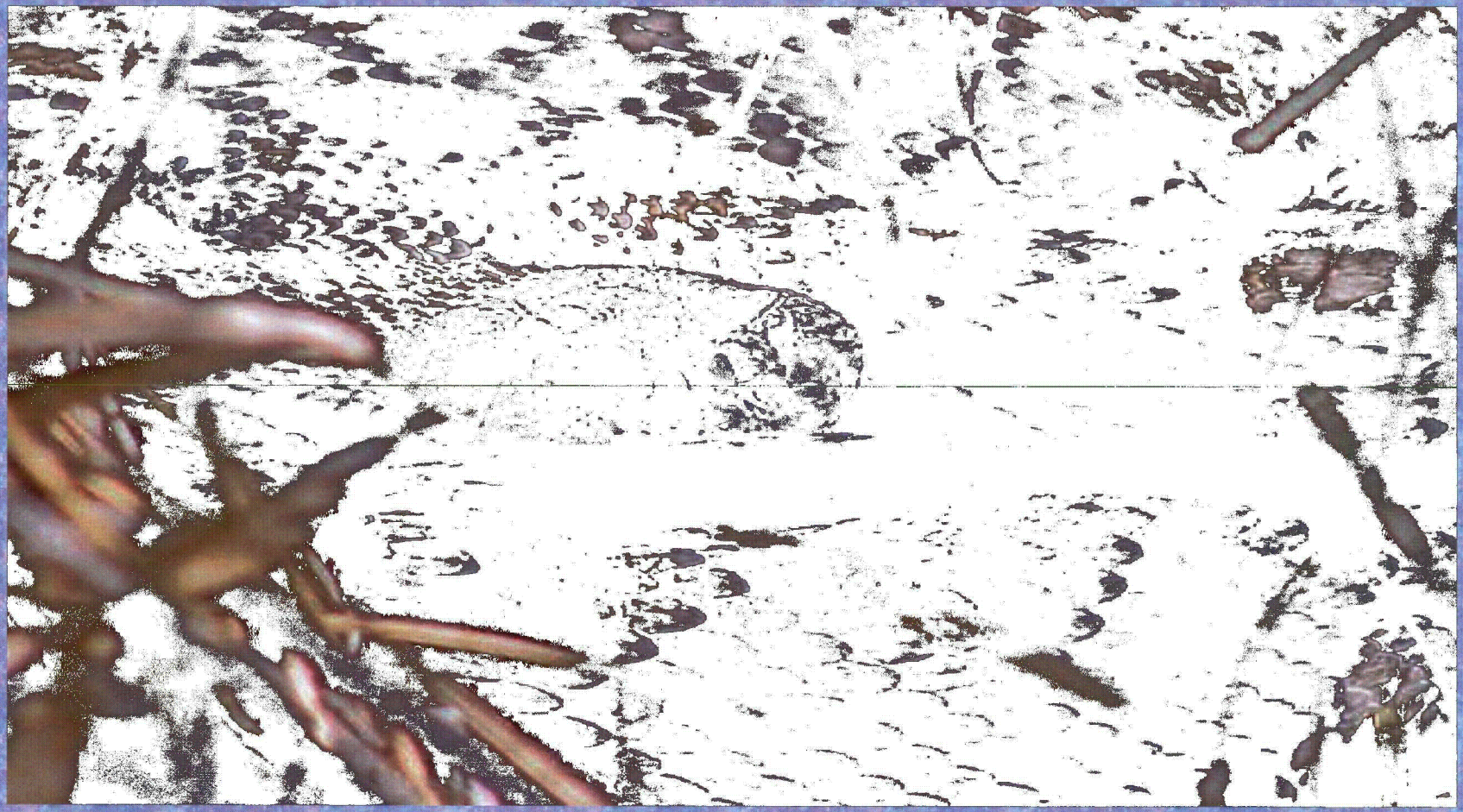
Virgil C. Summer Nuclear Station
NRC Visit – June 22, 2006

INTRODUCTION

- Welcome & Introductions
- Nuclear Training Center (NTC) Logistics
  - Fire Exits
  - Restrooms
  - Refreshments & Lunch
  - Locked Entrances
- Safety Topic(s)


Tornadoes

Pay attention! Watch out for the local wildlife.



Dangerous Insects commonly found in this area:

Fire Ants

Black Widow Spiders

NRC Field Visit

- Orange Vests Shall be Worn
- Safety Protective Devices – Not Required Outside Drill Rig Ribbon Barrier
- Inside Drill Rig Ribbon Barrier:
  - Steel Toe Shoes & Gloves
  - Hard Hat & Eye Protection
  - Ear Protection

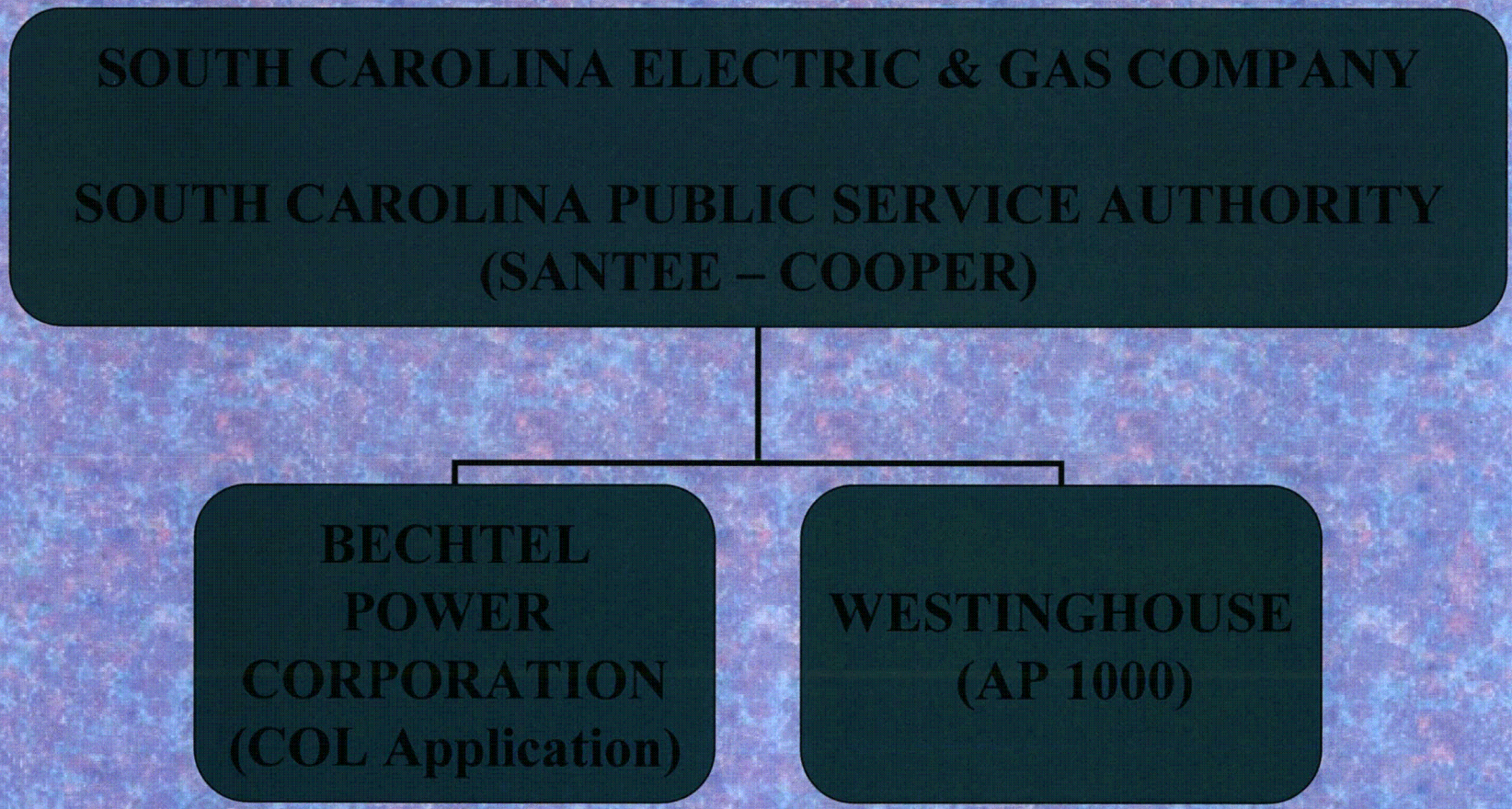
NRC ENTRANCE

- NRC Entrance Comments

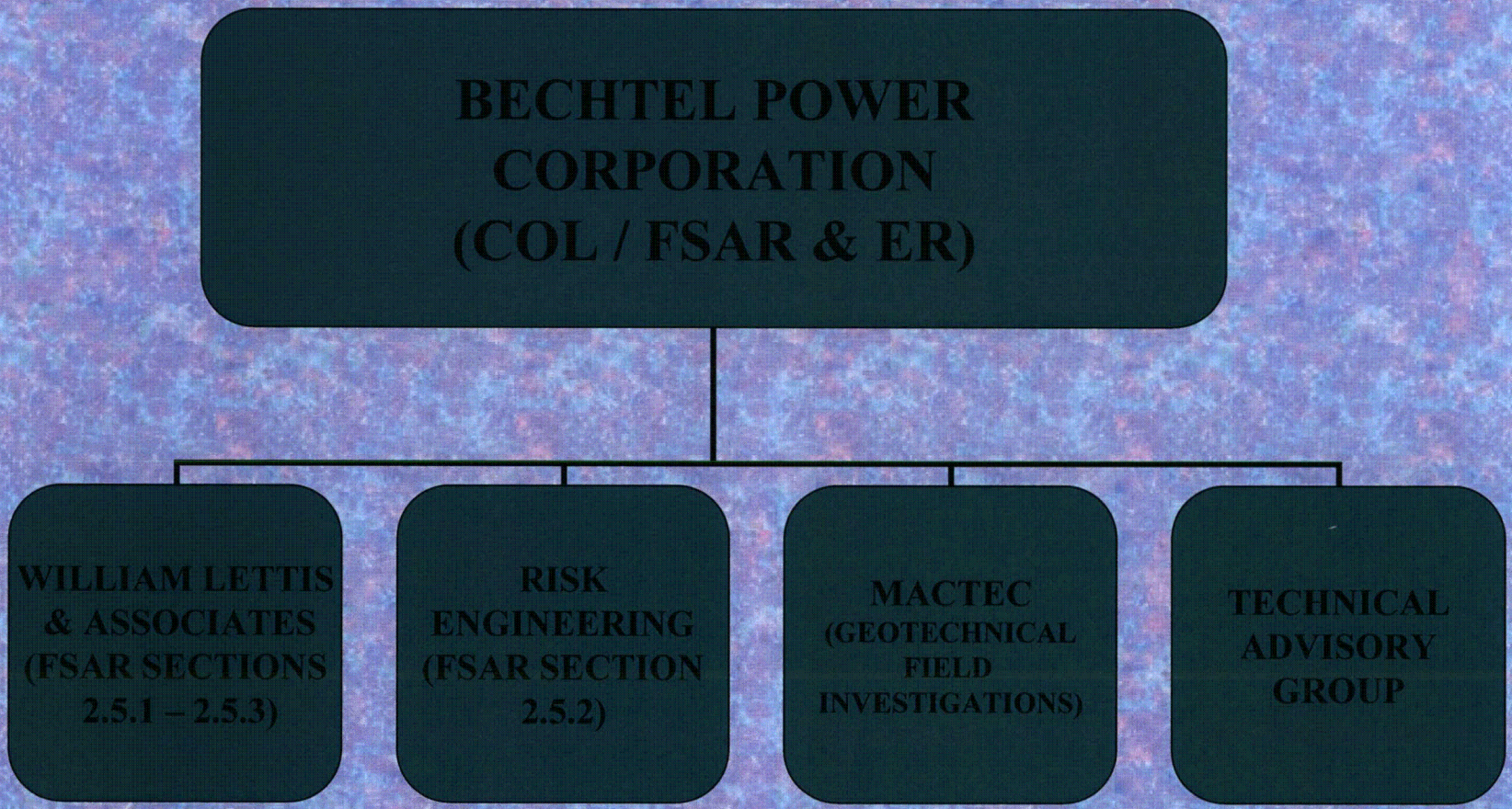
VCSNS COL / Project Schedule

- Fall 2007 – Submit COL Application
- 2011 – COL Approval (42 Months)
- 2011 – Initiate Safety Related Construction
- 2015 – Plant Operation

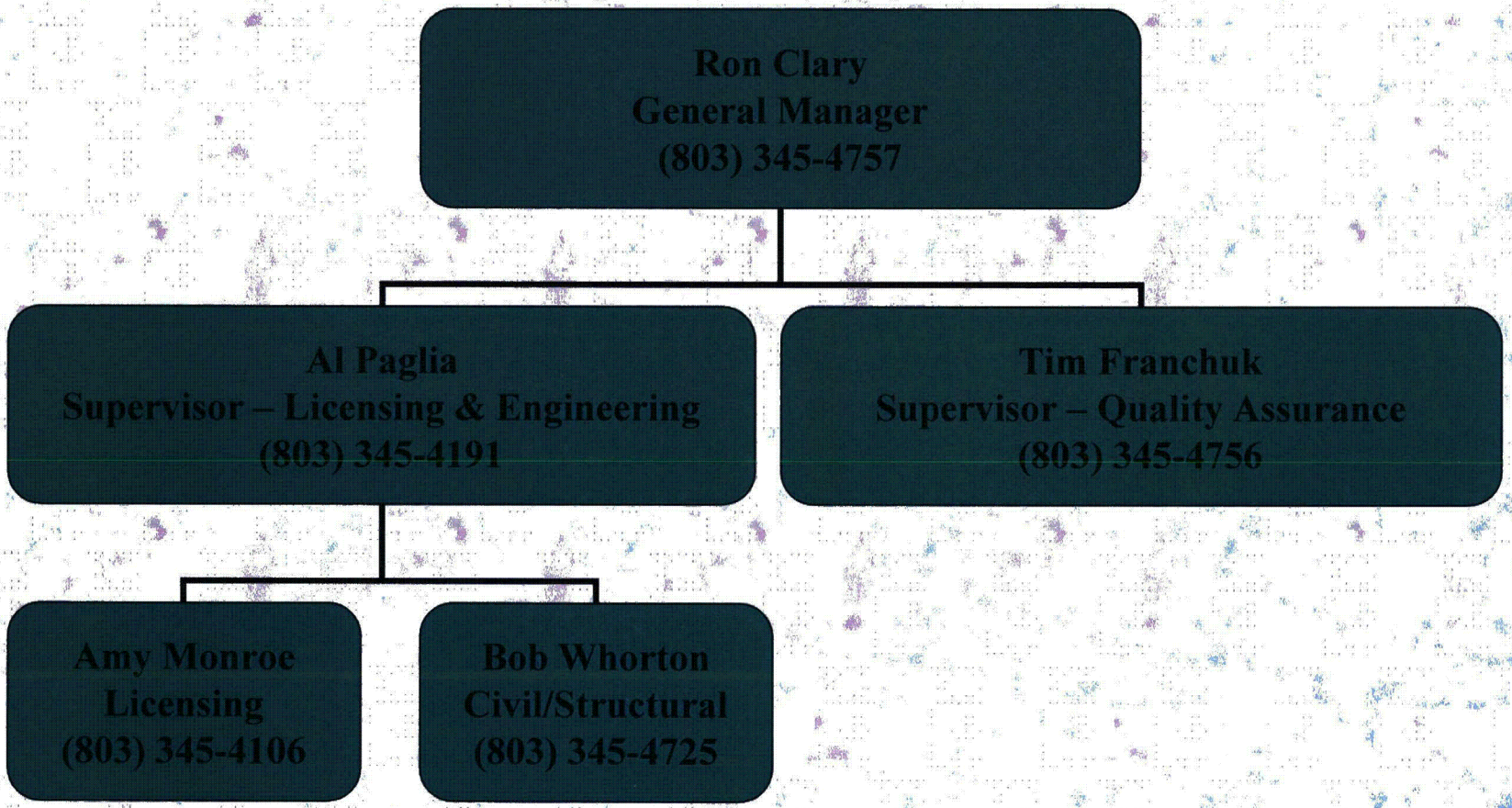
NND Project Organization



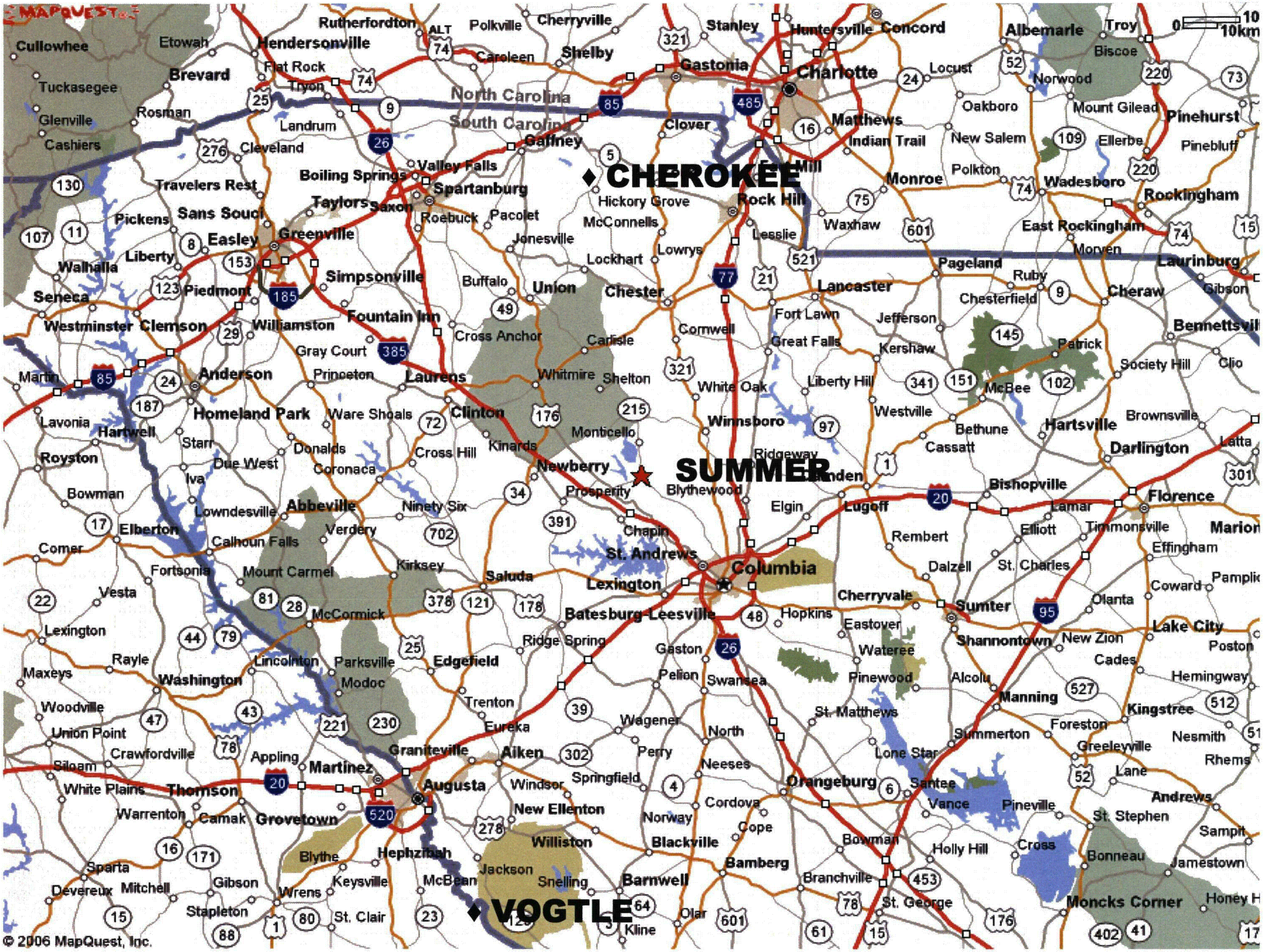
Project Organization



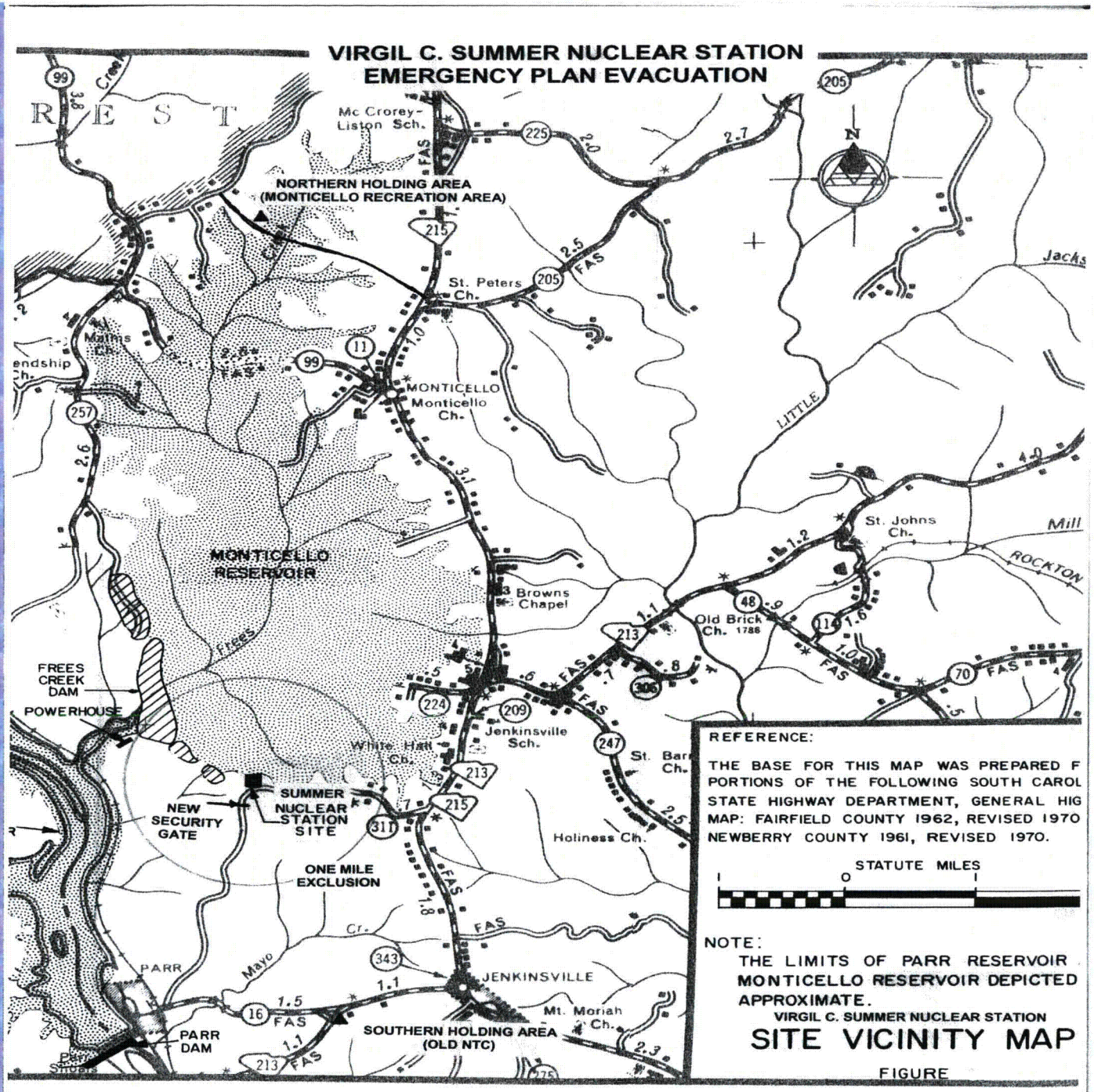
SCE&G NND Project Organization (Geotechnical Contacts)

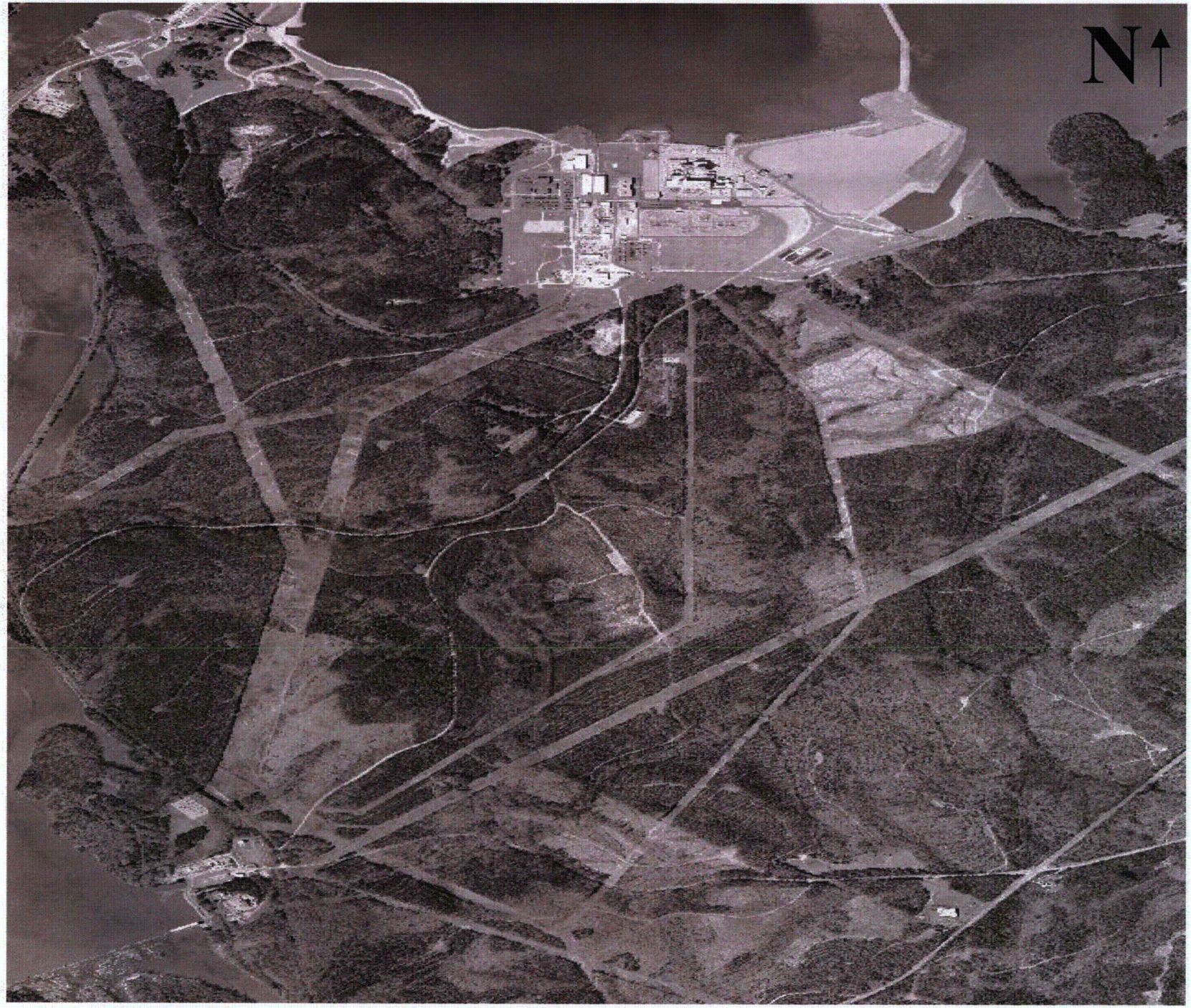



Virgil C. Summer
Nuclear Station
(Unit 1)


MAPQUEST
CHEROKEE
SUMMER
VOGTLE
North Carolina
South Carolina
Cullowhee
Etowah
Brevard
Tuckasegee
Glenville
Cashiers
Rosman
Rutherfordton
Hendersonville
Flat Rock
Tryon
Landrum
Polkville
Cherryville
Caroleen
Shelby
Stanley
Huntersville
Concord
Gastonia
Charlotte
Locust
Albemarle
Troy
Biscoe
Norwood
Oakboro
Mount Gilead
Pinehurst
Pinebluff
Ellerbe
Clover
Matthews
Indian Trail
New Salem
Monroe
Polkton
Wadesboro
Rockingham
East Rockingham
Morven
Laurinburg
Gaffney
Cleveland
Travelers Rest
Boiling Springs
Valley Falls
Spartanburg
Taylors
Saxon
Roebuck
Pacolet
Jonesville
Hickory Grove
McConnells
Rock Hill
Lesslie
Waxhaw
Lowrys
Lockhart
Pickens
Sans Souci
Easley
Greenville
Liberty
Walhalla
Seneca
Piedmont
Simpsonville
Buffalo
Union
Chester
Lancaster
Pageland
Ruby
Chesterfield
Cheraw
Gibson
Bennettsville
Westminster
Clemson
Williamston
Fountain Inn
Cross Anchor
Carlisle
Fort Lawn
Great Falls
Cornwell
Jefferson
Kershaw
Patrick
Society Hill
Clio
Martin
Anderson
Gray Court
Princeton
Laurens
Whitmire
Shelton
White Oak
Liberty Hill
McBee
Lavonia
Hartwell
Homeland Park
Ware Shoals
Clinton
Monticello
Winnsboro
Westville
Bethune
Hartsville
Brownsville
Royston
Starr
Due West
Donalds
Cross Hill
Kinards
Ridgeway
Cassatt
Darlington
Latta
Iva
Coronaca
Newberry
Prosperity
Blythewood
Camden
Bishopville
Florence
Bowman
Lowndesville
Abbeville
Ninety Six
Elgin
Lugoff
Lamar
Elberton
Calhoun Falls
Verdery
Chapin
Rembert
Elliott
Timmonsville
Marion
Effingham
Comer
Fortsonia
Mount Carmel
Kirksey
Saluda
St. Andrews
Columbia
Dalzell
St. Charles
Coward
Vesta
Lexington
Cherryvale
Sumter
Olanta
McCormick
Batesburg-Leesville
Hopkins
Eastover
Lake City
Shannontown
New Zion
Poston
Ridge Spring
Gaston
Wateree
Cades
Lincolnton
Parksville
Edgefield
Maxeys
Rayle
Washington
Modoc
Pelion
Swansea
Pinewood
Alcolu
Manning
Hemingway
Woodville
Trenton
Wagener
St. Matthews
Kingstree
Union Point
Eureka
North
Summerton
Foreston
Nesmith
Crawfordville
Appling
Graniteville
Aiken
Perry
Lone Star
Greeleyville
Siloam
Martinez
Neeses
Lane
Rhems
White Plains
Thomson
Augusta
Windsor
Springfield
Orangeburg
Santee
Andrews
Warrenton
Camak
Grovetown
New Ellenton
Norway
Cordova
Vance
Pineville
St. Stephen
Cope
Sparta
Blythe
Hephzibah
Williston
Blackville
Bowman
Holly Hill
Cross
Bonneau
Jamestown
Devereux
Mitchell
Gibson
Wrens
Keysville
McBean
Jackson
Snelling
Barnwell
Bamberg
Branchville
St. George
Moncks Corner
Stapleton
St. Clair
Kline
Olar
0
10
10km
© 2006 MapQuest, Inc.

Site Vicinity Map




N

VCSNS Units 2 & 3

- **Site Selection Study (Fall 2005)**
  - Virgil C. Summer Nuclear Station (VCSNS)
  - Savannah River Site (SRS)
  - Other Sites (SCE&G Service Territory)

- **Preliminary Geotechnical Investigation (Late 2005)**
  - 10 Boreholes (Laydown Area L-50 & Borrow Area G)
  - L-50: Rock @ 45'-65' depth, Groundwater ~ Rock
  - Borrow Area G: Rock @ 85' depth, Groundwater ~ 50'


Comments

Virgil C. Summer Nuclear Station COL

- Local and Regional Geology / Seismic Sources -

William Lettis & Associates, Inc.
Scott Lindvall

NRC Geotechnical Visit

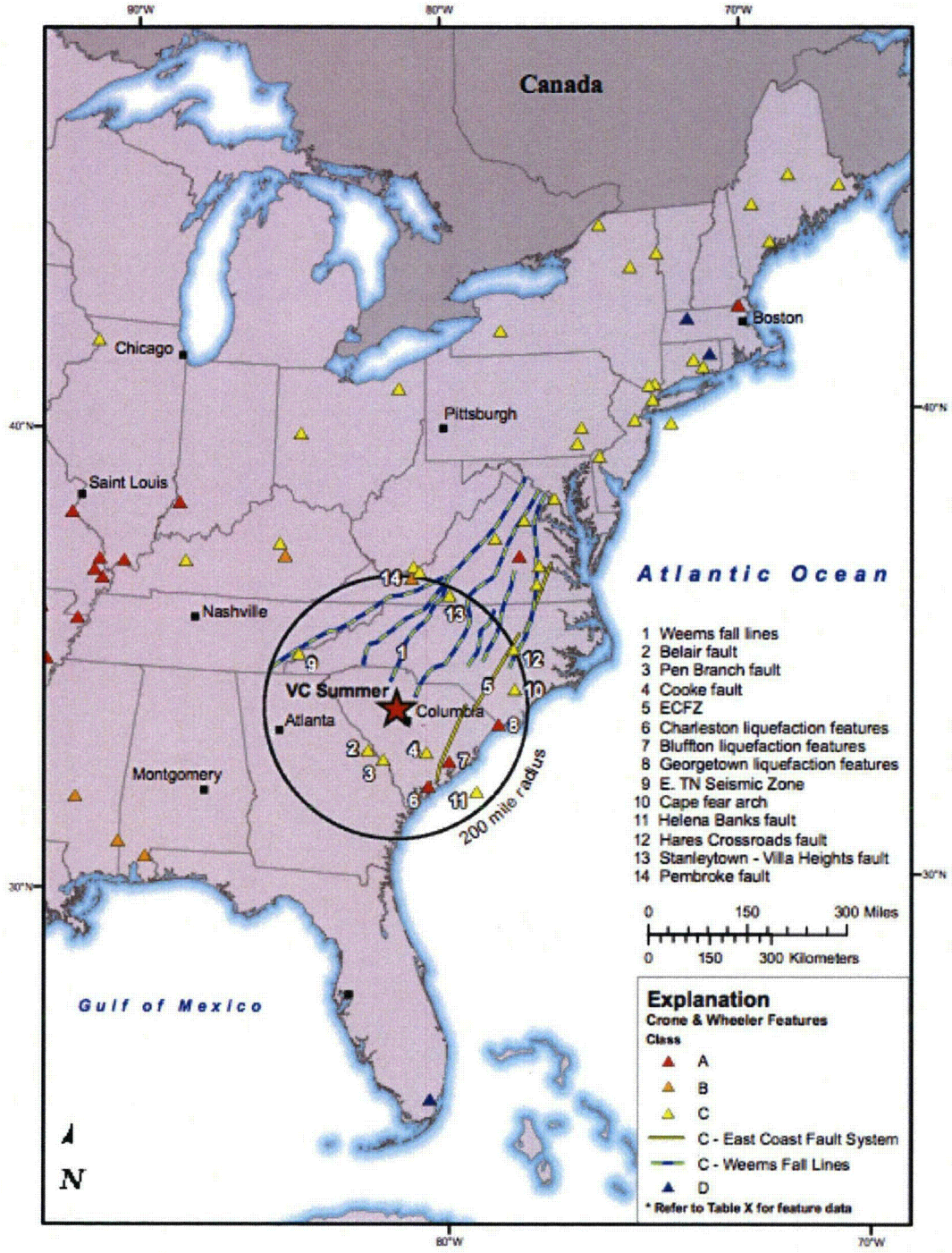
V.C. Summer Nuclear
Station, SC
June 22, 2006

Sections 2.5.1, 2.5.2, and 2.5.3:

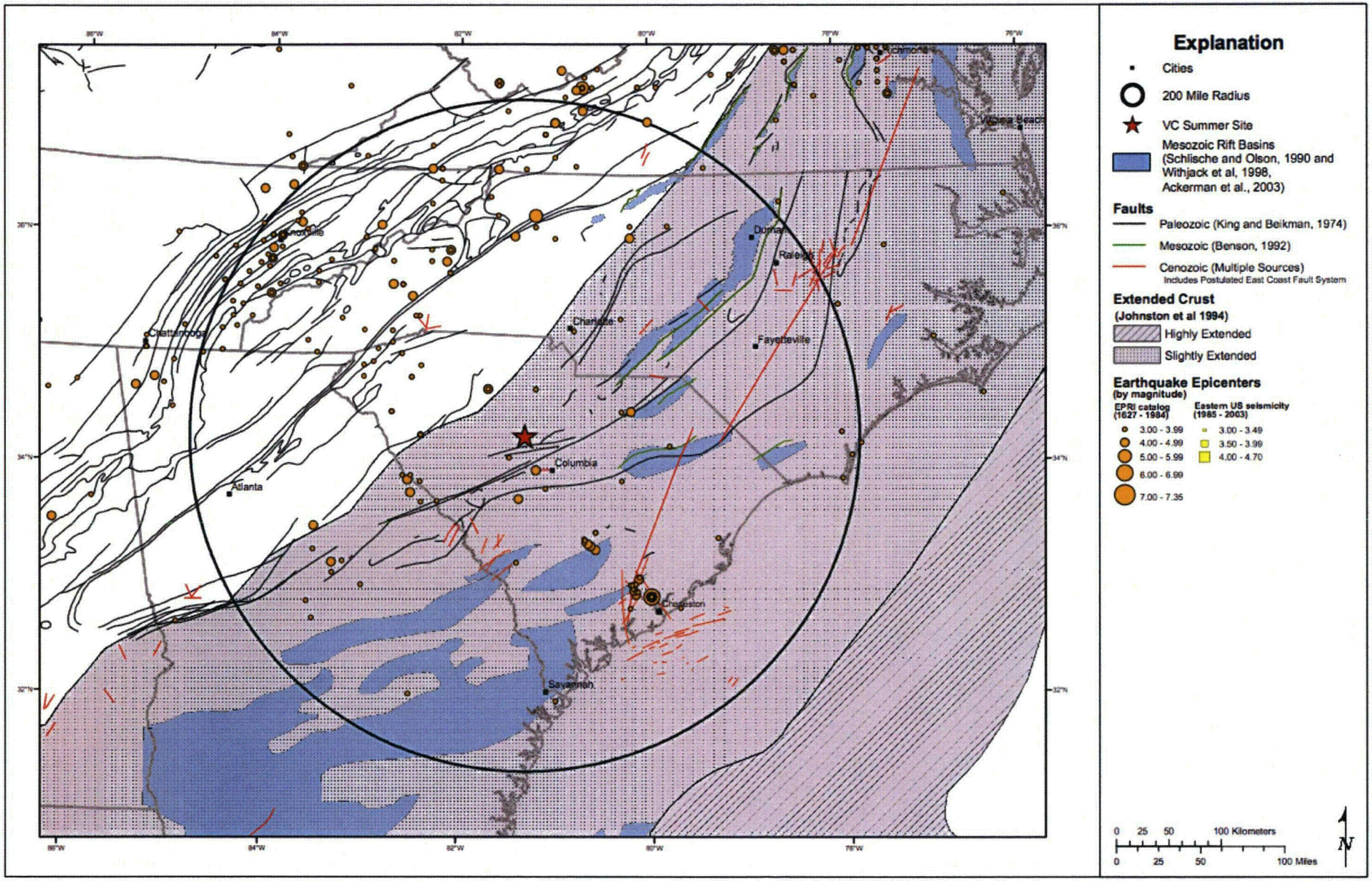
- Currently in the process of:
  - Compilation and review of literature
  - Update geologic, geophysical, and seismic data base
  - Field reconnaissance
  - Preparation of maps (200, 25, 5, and 0.6-mile)
  - Review of EPRI and other seismic source models
  - Any new seismic sources?
  - Update EPRI source model
  - Evaluate potential for surface deformation

Potential Quaternary Tectonic Features

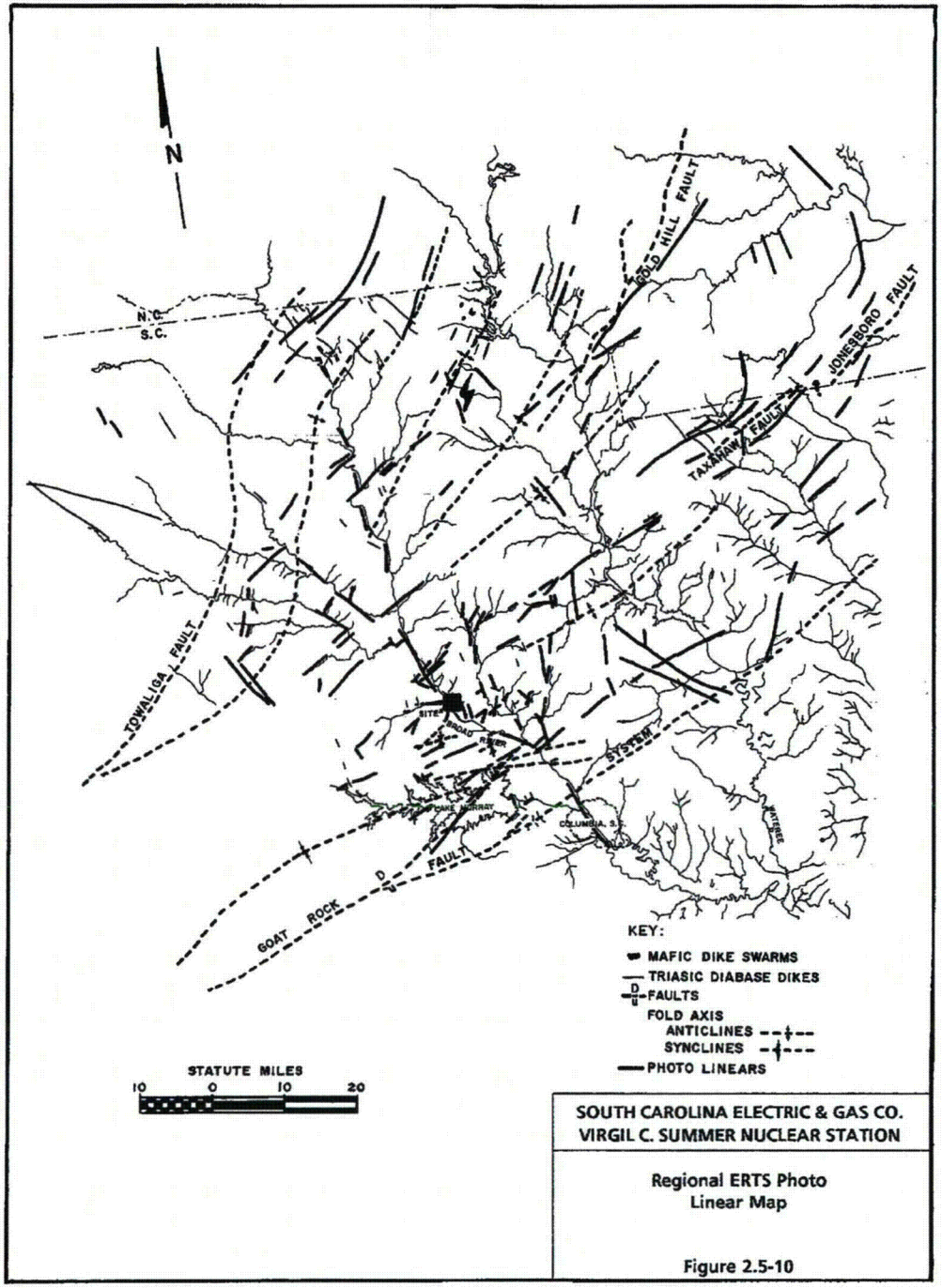
From Crone and Wheeler (2000) and Wheeler (2005)



Regional Tectonic Features



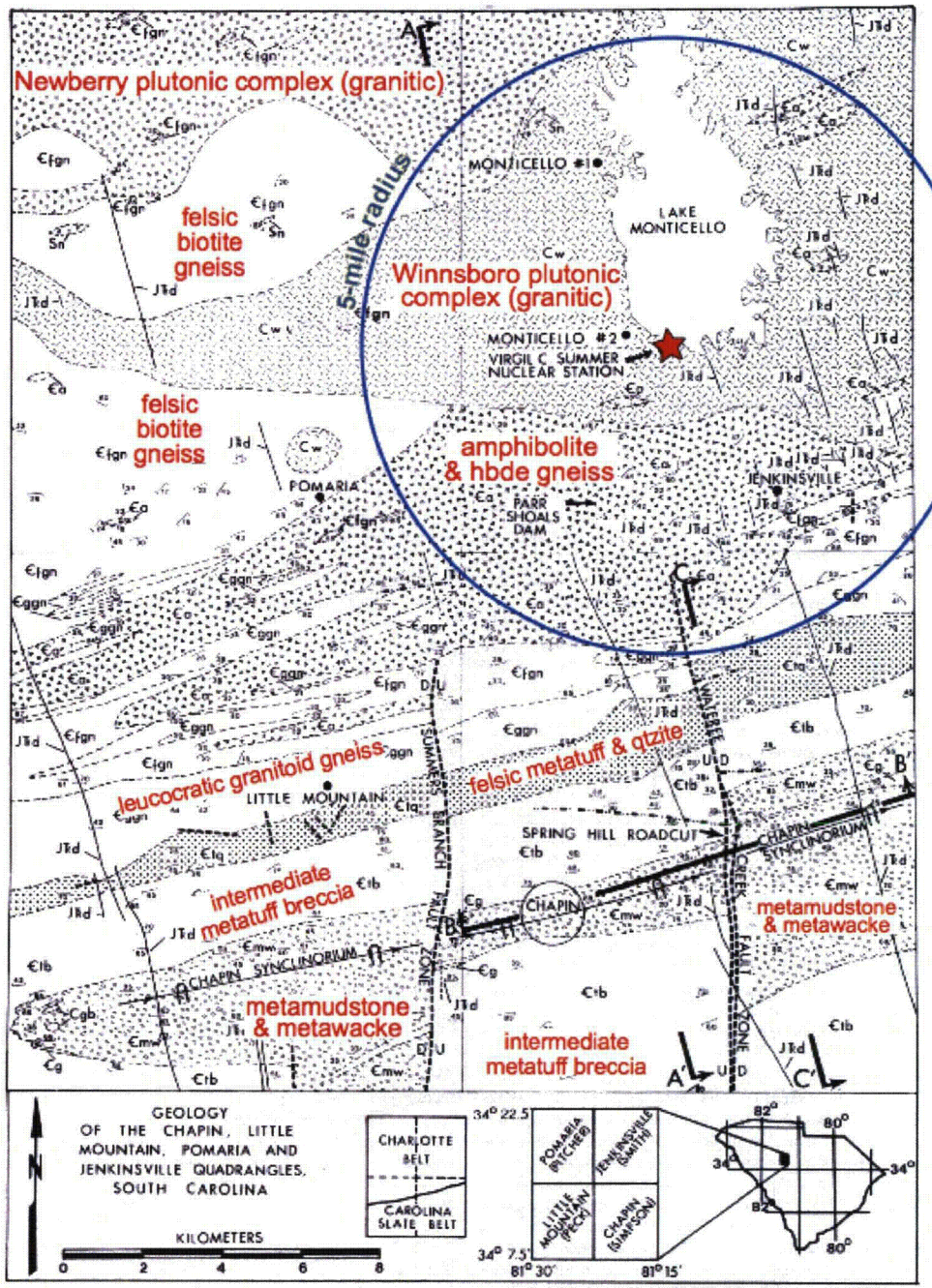
Regional Faults and Lineaments From FSAR



Eastern Piedmont (Goat Rock) Fault System

- EPFS defined as a series of subparallel faults extending from Alabama to Virginia (Hatcher et al, 1977)
- Goat Rock (AL, GA), Towaliga (AL, GA, SC), Modoc (GA, SC), Jonesboro (NC - only fault assoc. with Mesozoic basin), Augusta (GA, SC)
- Early ductile mylonitic phase, later brittle phases of deformation
- Most faults in system do not displace Triassic diabase dikes (pre-Triassic age)

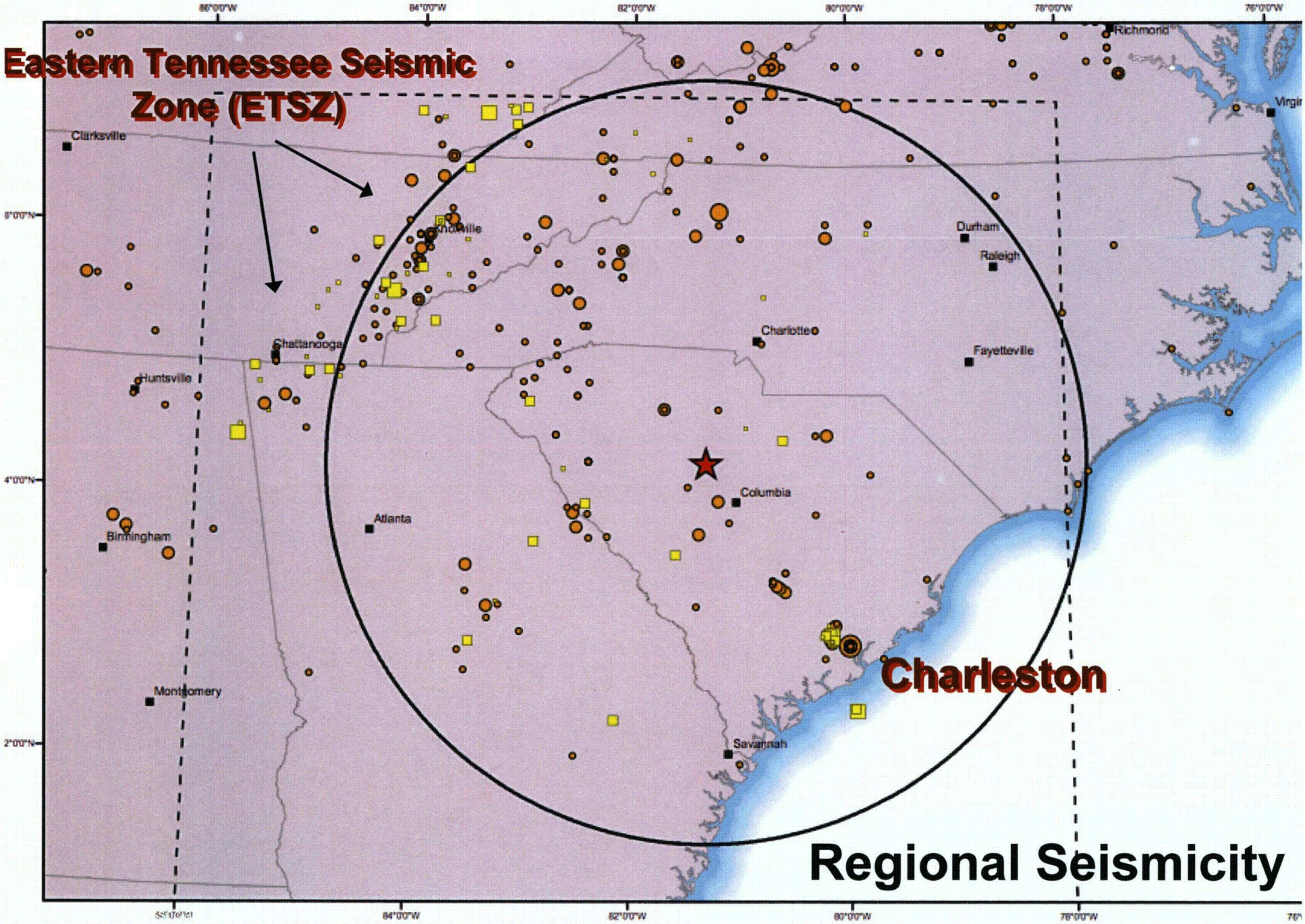
Local Geology



modified after Secor et al. (1982)

Local Faults

- Small faults (~21 mi SE of site) that offset post-Eocene Coastal Plain sediments (Zupan and Abbot, 1975)
- Camden Fault (~40 mi E of site) that offset post-Cretaceous Coastal Plain sediments (Knapp et al, 2001)
- Wateree Creek fault (~3 miles S of site); no evidence for north continuation to site per Don Secor and no slip since Mesozoic dike emplacement
- Ductile shear zone at Charlotte and Carolina terrain boundary (Halpin and Barker, 2004)

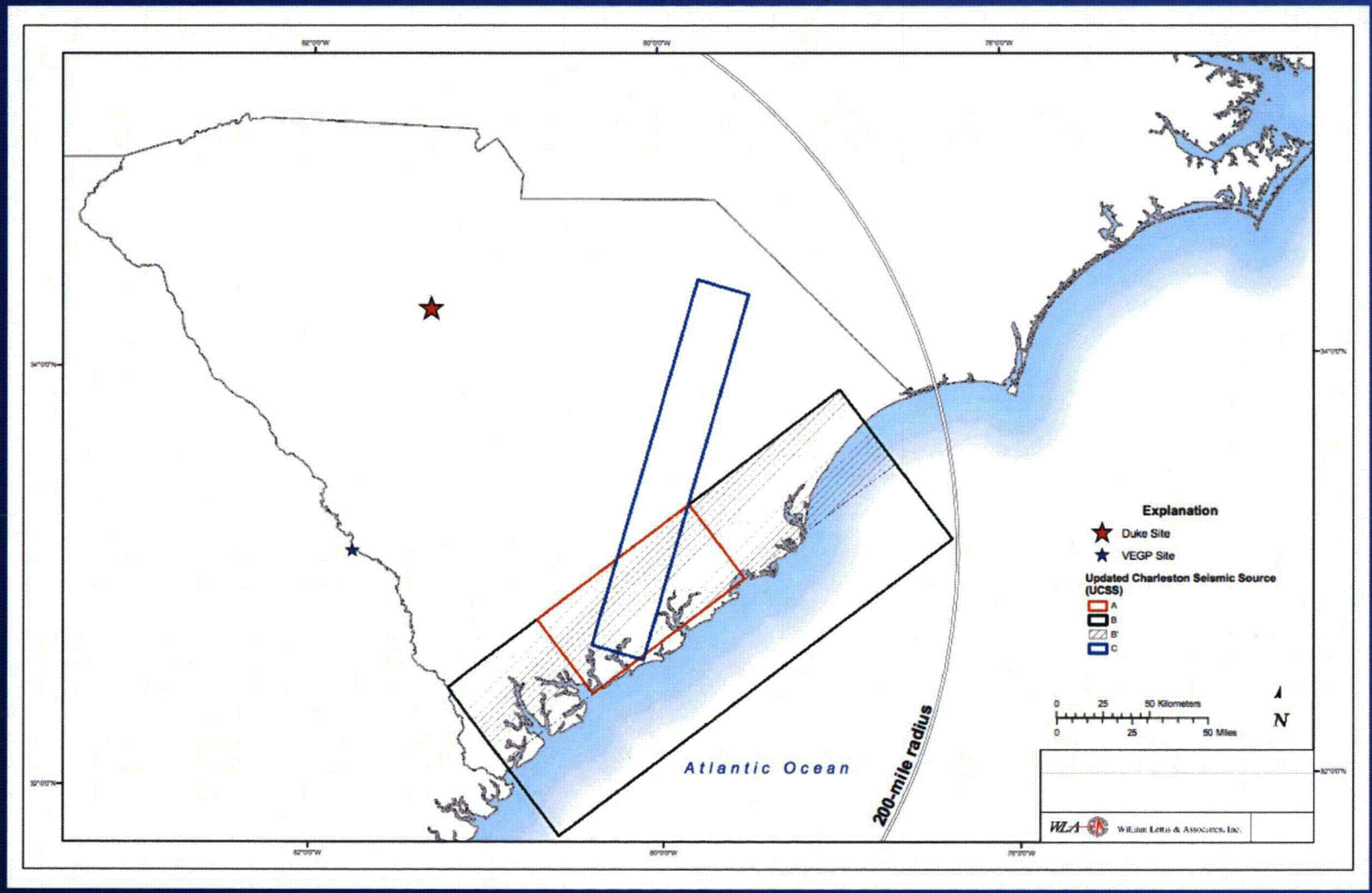

Eastern Tennessee Seismic Zone (ETSZ)
Clarksville
Knoxville
Chattanooga
Huntsville
Birmingham
Atlanta
Montgomery
Columbia
Charlotte
Durham
Raleigh
Fayetteville
Richmond
Savannah
Charleston
Regional Seismicity

Updated Charleston Seismic Source (UCSS) Model

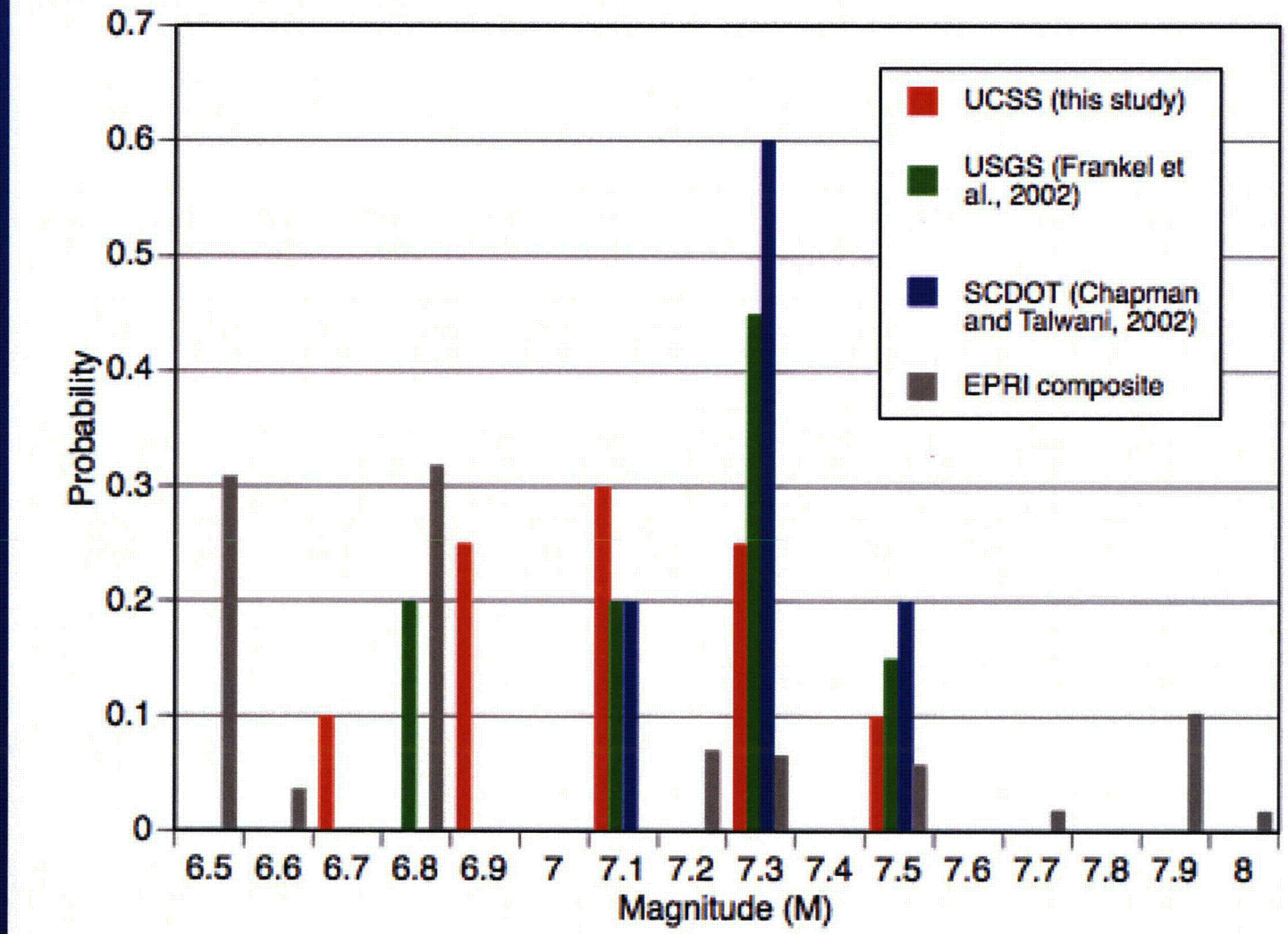
- Updated for Vogtle ESP to incorporate post-EPRI information
- SSHAC Level 2 process
- Replaces EPRI EST representations of the Charleston source zones in source model

Updated Charleston Seismic Source

- Four, mutually exclusive source zone geometries (A, B, B', & C)



Mmax Distributions



Updated Charleston Seismic Source
- Logic Tree -