Duke Energy®

BRYAN J. DOLAN
VP, Nuclear Plant Development

Duke Energy
EC09D / 526 South Church Street
Charlotte, NC 28201-1006

Mailing Address:
P.O. Box 1006 – EC09D
Charlotte, NC 28201-1006

704 382 0605

Bryan.Dolan@duke-energy.com

September 30, 2010

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: Duke Energy Carolinas, LLC (Duke)
William States Lee III Nuclear Station - Docket Nos. 52-018 and 52-019
AP1000 Combined License Application for the
William States Lee III Nuclear Station Units 1 and 2
Response to Request for Additional Information (RAI No. 4870)
Ltr # WLG2010.09-09

Reference: Letter from Brian Hughes (NRC) to Peter Hastings (Duke Energy), Request for Additional Information Letter No. 091 Related to SRP Section 02.04.12 Groundwater for the William States Lee III Units 1 and 2 Combined License Application, dated August 25, 2010

This letter provides the Duke Energy Response to the Nuclear Regulatory Commission's request for additional information (RAI) included in the referenced letter.

The response to the NRC information request described in the referenced letter is addressed in a separate enclosure, which also identifies associated changes, when appropriate, that will be made in a future revision of the Final Safety Analysis Report for the Lee Nuclear Station.

If you have any questions or need any additional information, please contact Peter Hastings, Nuclear Plant Development Licensing Manager, at (980) 373-7820.

Bryan J. Dolan
Vice President
Nuclear Plant Development

D093
NRO

Enclosure:

1) Duke Energy Response to Request for Additional Information Letter 091, RAI 02.04.12-19

AFFIDAVIT OF BRYAN J. DOLAN

Bryan J. Dolan, being duly sworn, states that he is Vice President, Nuclear Plant Development, Duke Energy Carolinas, LLC, that he is authorized on the part of said Company to sign and file with the U. S. Nuclear Regulatory Commission this supplement to the combined license application for the William States Lee III Nuclear Station and that all the matter and facts set forth herein are true and correct to the best of his knowledge.

Bryan J. Dolan
Bryan J. Dolan

Subscribed and sworn to me on September 30, 2010
Date

Vickie M Prenatt
Notary Public

My Commission Expires: May 11, 2011

VICKIE M PRENATT
NOTARY PUBLIC
Mecklenburg County
North Carolina
My Commission Expires May 11, 2011

SEAL

xc (w/o enclosure):

Loren Plisco, Deputy Regional Administrator, Region II

xc (w/ enclosure):

Brian Hughes, Senior Project Manager, DNRL

Lee Nuclear Station Response to Request for Additional Information (RAI)

RAI Letter No. 091

NRC Technical Review Branch: Hydrologic Engineering Branch (RHEB)

Reference NRC RAI Number(s): 02.04.12-019

NRC RAI:

Additional information regarding maximum post-construction groundwater elevations in the area near the SSCs is required to meet the requirements of 10 CFR 52.79(a) (1) (iii), 10 CFR 100.20(c), 10 CFR 100.21(d), and GDC 2. The key area of interest is bounded approximately by the 588-ft contour just north and south of Units 1 and 2, as shown in COLA Rev. 2, FSAR Fig. 2.4.2 202, and is bounded east and west by the cooling towers.

Within this area, the staff needs an estimate of the maximum post-construction groundwater level that is based on anticipated post-construction surface and subsurface conditions. Although the limited preconstruction information that is available will be of use in estimating groundwater levels, the estimation process must also explicitly consider anticipated post-construction conditions. To facilitate the staff's review of these estimated groundwater elevations, the estimated elevations should be supported by new information used in preparing the estimates, or by references to information that has already been presented elsewhere, or else by an explanation of why such information is not relevant to the estimate. Types of information that the staff believes will likely be relevant includes:

1) A conceptual description of the post-construction groundwater flow system,
2) Figures or GIS coverage showing the major surface features that may affect recharge within the key area, such as areas of different kinds of soil, vegetation, graveled surfaces, buildings, and paved areas, including percentages and locations,
3) Estimates of post-construction recharge rates for the major surface features identified, taking into account changes in topography, soil, and vegetation,
4) Comparisons of estimated post-construction recharge rates with estimated pre-construction recharge rates,
5) An explanation of the fate of precipitation that falls on buildings,
6) A site grading plan of the key area with sufficiently-detailed elevation contours to show planned drainage features (e.g., swales; sub basins; drains).
7) Properties and geometry of subsurface materials, including artificial fills,
8) The role of non-groundwater hydrologic features in controlling groundwater levels, such as surface water bodies that are connected with groundwater, subsurface drains, or artificial surface features that act as discharge locations for groundwater,
9) Descriptions of subsurface features, such as building foundations, that may alter or block groundwater flow,
10) An explanation of how post-construction recharge conditions will affect post-construction groundwater levels.

Duke Energy Response:

The following list provides a summary of relevant topics and location(s) of related discussion within this response. The discussion of historical data is intended to present the most severe of historically recorded natural phenomena and also considers post-construction conditions where applicable.

1) A conceptual description of the post-construction groundwater flow system (Sections 1.0, 2.0, 3.0, and 7.0),
2) Figures or GIS coverage showing the major surface features that may affect recharge within the key area, such as areas of different kinds of soil, vegetation, graveled surfaces, buildings, and paved areas, including percentages and locations (Attachments 2 and 3, Figures 1 and 2),
3) Estimates of post-construction recharge rates for the major surface features identified, taking into account changes in topography, soil, and vegetation (Sections 3.0 and 6.0),
4) Comparisons of estimated post-construction recharge rates with estimated pre-construction recharge rates (Sections 3.0 and 6.0),
5) An explanation of the fate of precipitation that falls on buildings (Section 6.0),
6) A site grading plan of the key area with sufficiently-detailed elevation contours to show planned drainage features (e.g., swales; sub basins; drains) (Attachments 2 and 3, Figures 1 and 2, and Section 5.0),
7) Properties and geometry of subsurface materials, including artificial fills (Section 4.0),
8) The role of non-groundwater hydrologic features in controlling groundwater levels, such as surface water bodies that are connected with groundwater, subsurface drains, or artificial surface features that act as discharge locations for groundwater (Sections 5.0 and 7.0),
9) Descriptions of subsurface features, such as building foundations, that may alter or block groundwater flow (Section 7.0), and
10) An explanation of how post-construction recharge conditions will affect post-construction groundwater levels (Sections 6.0, 7.0, and 8.0).

1.0 The Groundwater Conceptual Model

Duke Energy developed a groundwater conceptual site model at Lee Nuclear Site that considered the hydrogeologic setting, historical and current groundwater conditions, and anticipated and potential post-construction groundwater conditions as part of the implementation of a Radiological Groundwater Protection (RGP) Initiative (Reference 1).

The factors that influence the post-construction Lee Nuclear groundwater configuration are the two-media, surface drainage basin and slope-aquifer systems that govern groundwater occurrence and movement in the Piedmont Geologic Province, as described in LeGrand's Master Conceptual Model (Piedmont MCM) (References 1 and 2). As stated in FSAR Subsection 2.4.12.1.1, the Piedmont aquifer system basically consists of two layers, a shallow water table aquifer composed of saprolite and residual soil and an underlying bedrock aquifer composed of weathered and unweathered igneous and metamorphic bedrock. The interpretation of the effects of these systems on post-construction Lee Nuclear groundwater is based in part on available groundwater levels, in part on available surface water levels, and in part on hydrogeologic experience in the Piedmont Geologic Province. Confirmation of post-construction Lee Nuclear groundwater conditions will be accomplished through Duke Energy's voluntary RGP Initiative (Reference 1).

2.0 Pre-Cherokee Topography vs. Post-Construction Topography

LeGrand states, "Under natural conditions, the topography of the water table is crudely similar to that of the land surface, but has less relief" (Reference 2). The projected post-construction Lee Nuclear Site topography differs from the pre-Cherokee natural topography due to significant construction-related changes to the site. During the partial Cherokee-era development of the site, areas upgradient relative to the plant location were cut, while areas downgradient were filled (FSAR Figure 2.5.4-202). The ridges were graded, valleys were filled, and surface waters were altered and/or created (Reference 1).

Post-dewatering, post-construction water table elevations are expected to mimic post-construction topography, consistent with Piedmont slope-aquifer conditions. Comparisons of pre-Cherokee water levels to post-Cherokee / pre-Lee water levels and the response of groundwater levels to construction-related changes in topography are discussed in FSAR Subsection 2.4.12.2.3:

> Under natural conditions the topography of the water table within the Piedmont mimics the topography of the land surface, but has less relief. Cross-sections of the Lee Nuclear Site are presented in Figure 2.4.12-205, Sheets 1 - 4. These figures depict the relationship between groundwater beneath the site and the surface water bodies surrounding the site. Groundwater flow in the Piedmont province is typically restricted to the topographic area underlying the slope that extends from a divide to an adjacent stream.
>
> Both regionally and locally, surface topography plays a dominant role in groundwater occurrence. Post-construction topography was observed to affect groundwater conditions such that cuts in topography induce a lowered water table and fill induces a raised water table. Field evidence for this is based on comparison between the Cherokee water table map (Figure 2.4.12-201) and the maps developed from the Lee Nuclear Site investigation (Figure 2.4.12-204, Sheets 1-7). For example, MW-1204, located on the Unit 2 Cooling Tower Pad, is where construction fill was placed during Cherokee construction, resulting in a significantly higher land surface elevation (approximately 610 ft. msl compared to its pre-grading elevation of around 560 ft. msl). Consequently, the water table elevation is higher in MW-1204: groundwater elevation of approximately 570 ft. msl compared with the former groundwater elevation of less than 550 ft. msl. Another example includes MW-1200, located west-northwest of Unit 1, where construction cuts resulted in a significantly lower land surface elevation (approximately 590 ft. msl compared to its pre-grading elevation of approximately 670 ft. msl). Consequently, the water table elevation has lowered (groundwater elevation of 565 ft. msl compared with the former groundwater elevation of more than 585 ft. msl).

The Cherokee site remained relatively inactive following the termination of construction activities in 1984, until the Lee Nuclear Site activities began in 2005. Over this approximately twenty-year period, the Cherokee-era open excavation filled with water. Even though the Cherokee site grading was such that runoff from the surrounding site was generally directed away from the excavation, the excavation received water from inflow of natural groundwater and precipitation falling within the excavation footprint. Analysis of a series of post-Cherokee aerial photographs indicates that the water level within the excavation approached equilibrium with groundwater levels. Based on measurement of elevations of water-stained concrete within the Cherokee-era open excavation, water levels appeared to range between 574 and 579 ft. msl in this area of the site.

3.0 Groundwater Recharge and Compartmentalization

Site conditions observed prior to the Lee site investigation allowed 100% of local precipitation less evaporation to recharge the exposed water table within the Cherokee-era open excavation. A conservative estimate of recharge for the region was derived to be 18 inches per year for use in the analysis of accidental release of radioactive effluent (FSAR Subsection 2.4.13). This recharge value assumed no water losses due to surface runoff and, therefore, was quite conservative and appropriate for the accidental release analysis. Thus, prior to the Lee Nuclear Site investigation, and in the absence of surface runoff, an estimated recharge up to 18 inches per year occurred directly to the exposed water table within the Cherokee-era open excavation. This estimate represents a conservative estimate of pre-construction groundwater recharge rate. FSAR Subsection 2.4.12.1.1 discusses recharge conditions and compartmentalization of local aquifers within the Piedmont province:

> Groundwater occurs in various local aquifer systems and compartments that have similar characteristics and are hydraulically connected. Groundwater recharge in this area is derived from infiltration by local precipitation or infiltration from nearby surface water.

In the area of the proposed AP1000 nuclear islands, groundwater movement is generally to the north, toward the Broad River. In this area groundwater flow is contained between the groundwater divides located east and west of the nuclear islands (FSAR Figure 2.4.12-204, Sheet 8).

Post-construction recharge is affected by the manner in which the open excavation is filled, the characteristics of ground cover to promote runoff, and stormwater management systems employed at the site. These issues are discussed in the following sections.

4.0 Placement and Characteristics of Backfill Materials

Earthwork during the Lee Nuclear Site construction activities will continue within the area bounded approximately by the post-construction 588-ft. contour, as shown in FSAR Figure 2.4.2-202. The yard grade elevation at Lee Nuclear Station is built up to 589.5 ft. msl. The excavation is the only area at the Lee Nuclear Site that requires significant placement of backfill material during plant construction, since the bulk of the site is at elevations generally consistent with the Lee Nuclear Site grading and drainage plan (FSAR Figure 2.4.2-202). As part of the Lee Nuclear Station power block construction, the excavation will be filled with 1) engineered granular fill (classified as SW, GW, or GP) around each of the two nuclear islands and extending outward to form the foundation support of the adjacent buildings (radwaste, annex, and turbine buildings), and 2) compacted fill comprised of residual soil and saprolite cut from various areas of the site. FSAR Figures 2.5.4-245, -246, and 2.5.4-260 through -265 provide cross-sections of the proposed backfill material and placement in relation to Units 1 and 2. Placement of the backfill is described in FSAR Subsection 2.5.4.5, as follows:

> The seismic Category I structures consist of the Unit 1 and Unit 2 nuclear islands. Other structures within the power block are not seismic Category I structures and are not safety related. The location of the nuclear island structures is shown on Figures 2.5.4-201 and 2.5.4-208. The Lee Nuclear Station nuclear island is constructed with a building floor slab elevation of approximately 590 feet. Below grade portions of the nuclear island extend approximately 39.5 feet below building slab elevation, to Elevation 550.5 feet. Foundation materials, consisting of continuous rock or concrete, are located at this elevation or below for support of the nuclear island. Fill concrete is used in areas where continuous rock or Cherokee Nuclear Station concrete is below Elevation 550.5 feet to bring that surface up to the Lee Nuclear Station base of foundation elevation.

Placement of engineered granular backfill and soil backfill is further discussed in FSAR Subsection 2.5.4.5.3.5, as follows:

> Outside the below grade nuclear island walls (Units 1 and 2), a granular backfill will be placed up to approximately the yard elevation or to the underside of the adjacent buildings. The backfill adjacent to the nuclear island walls and extending outward to form the foundation support of the adjacent buildings (radwaste, annex, and turbine buildings) will be an engineered granular backfill. Outside the limits of the granular fill, soil backfill will be used. This subsection describes the specifications and controls of granular fill materials. The soil backfill placed beyond the granular fill limits is non safety-related and the placement specifications will be developed as part of construction.

As shown in FSAR Figures 2.5.4-245, -246, and 2.5.4-260 through -265, granular backfill placement within the power block area is of a symmetric nature and relatively limited horizontal extent beyond the planned building footprints. Based on the undifferentiated nature of the shallow Piedmont aquifer flow system and the limited extent of the backfill placement, the fill is not expected to significantly impact the predicted groundwater pathways. FSAR Subsection 2.4.12.2.4.2 describes the hydraulic conductivity of soil/saprolite backfill materials now occupying former site valleys based on slug tests performed in 2006-2007. Although the hydraulic conductivity of the engineered granular backfill has not been tested, based on physical properties the engineered granular backfill is anticipated to have a hydraulic conductivity approximately one or two orders of magnitude higher than that of native in-situ residual soil and saprolite. The remaining backfill that surrounds the engineered granular backfill, being comprised of reworked residual soil and saprolite and compacted in-place as soil/saprolite backfill, is anticipated to have a hydraulic conductivity slightly lower than that of the undisturbed residual soil and saprolite. Hydraulic conductivity (permeability) of the materials is presented in FSAR Subsection 2.4.12.2.4.2. Properties of the materials other than hydraulic conductivity are summarized in FSAR Table 2.5.4-211.

5.0 Post-Construction Grading and Drainage

In Piedmont aquifer systems groundwater recharge is directly related to the ability of precipitation to permeate surface and subsurface soil materials to the aquifer zone. Compared with the pre-Cherokee naturally occurring topography (FSAR Figure 2.4.12-201), the final yard grade at Lee Nuclear Station is relatively flat and gently slopes away from the plant (FSAR Figure 2.4.2-202). Surface topography has been graded to facilitate storm water runoff away from safety-related structures, and drainage flow directions can be directly inferred from the topographic contours provided on FSAR Figure 2.4.12-202.

Within the post-construction 588-ft contour, storm water is generally conveyed radially from high elevations at the cooling tower pads towards topographic lows and then on to Make-Up Pond A to the east, Make-Up Pond B to the west and the Broad River and Hold-Up Pond A to the north, as shown on FSAR Figure 2.4.2-202. As shown on the table below (excerpted from FSAR Table 2.4.1-201), the highest anticipated surface water elevation in any of the above-mentioned surface water bodies is 570 ft msl (in Make-Up Pond B), which is well below the plant yard grade elevation of 589.5 ft msl.

Surface Water	Same Compartment as Plant?	Full Pond Elev.
Broad River (Ninety-Nine Islands Reservoir)	YES	511
Make-Up Pond A	NO	547
Make-Up Pond B	NO	570
Hold-Up Pond A	YES	536
Make-Up Pond C	NO	650

Elevation units in ft. msl

Both Hold-Up Pond A and the Broad River are located north and downslope relative to the Lee Nuclear Station, and appear to be within the same groundwater compartment as Lee Nuclear Station. Make-Up Ponds A and B are outside the apparent groundwater divides located east and west of the plant site (FSAR Figure 2.4.12-204, Sheet 8). Make-Up Pond C is located within a watershed (London Creek) approximately 2 miles west of the plant and, consequently, does not affect the groundwater flow regime at the Lee Nuclear Site. Thus, the local surface water bodies listed above within the same compartment as the Lee Nuclear Station are topographically downgradient such that runoff will drain away from the Lee Nuclear Station. Additionally, any interaction between groundwater and these surface water bodies would be well below the Lee Nuclear Station yard grade elevation.

Subsection 2.4.12.2.3 of the FSAR will be revised to include information regarding post-construction drainage.

6.0 Post-Construction Ground Cover and Storm Water Management

In addition to site grading to facilitate storm water runoff away from the plant, the Lee Nuclear Station will be constructed with a ground cover that is less pervious than the pre-Cherokee, natural surface cover and significantly less pervious than the post-Cherokee open-excavation setting. Within the post-construction 588 ft. contour, the immediate station area contains approximately 65.4 acres, including 17.8 acres (27 %) of impervious surfaces (consisting of 10.1 acres of roadways, parking lots and other impervious areas and 7.7 acres of building footprints), and 12.9 acres (20 %) of semi-impervious compacted gravel (graded road base material consisting of gravel, sand, and silt) or otherwise hardscaped areas to promote runoff. Approximately 34.7 acres (53 %) of the 65.4-acre station will be grass surface cover (Attachment 2, Figure 1). Runoff coefficients for compacted gravel and hardscape surfaces (approximately 0.76 - 0.91) are much higher than those of a typical grass surface (approximately 0.15 - 0.35); therefore, the surface cover using compacted gravel will be expected to be much more conducive to run-off in comparison to grass surfaced areas.

Impervious areas and hardscape surfaces are generally located in the immediate vicinity of the power block, overlying the granular fill that will be placed around the exterior subgrade walls of the nuclear islands and under and around the adjacent buildings (radwaste, annex and turbine buildings). Grassy areas surround the impervious and hardscaped areas beyond the power block areas. As shown in Figure 1 and described above, approximately 20% of the post-construction plant surface area within the 588 ft. msl contour lines will have compacted gravel or otherwise hardscaped surfaces. With relatively high run-off coefficients associated with these types of cover, this surface area will promote runoff and reduce infiltration. In that this surface cover applies to the larger portion of the immediate areas around the power block, this surface area will cover the granular backfill placement (Attachment 3, Figure 2). By this approach, infiltration into granular backfill will be reduced. Thus, this route of recharge is consequently limited. Note that the large portion of post-construction grass cover is in the outermost border of the area within the 588 ft. msl contour and, as such, will not overlay granular backfill and will not contribute significantly to recharge in the area of the power block structures.

The ground cover will shed much of the stormwater runoff to the Storm Drain System (DRS) for discharge away from the power block area. Furthermore, roof drainage will be collected through a roof drain collection system, channeled through drainage downspouts, and directed to the DRS piping network. In general, the surface above granular backfill will be either impervious ground cover or semi-impervious compacted gravel / hardscaped cover, as discussed above. By this approach, runoff will be promoted, limiting recharge into granular backfill materials in the power block area.

The cumulative effect of 1) completing the plant with less pervious ground surfaces, 2) grading the ground surface to slope away from the plant, and 3) capturing roof drainage and directing it into the DRS and away from the plant results in significantly less infiltration and less groundwater recharge to the Piedmont aquifer within the NRC's key area of interest inside the post-construction 588 ft. msl contour. The post-construction recharge is expected to be significantly less than either natural Piedmont conditions (pre-Cherokee) or the post-Cherokee conservative estimate of recharge of 18 inches (described in Section 3.0 above).

Subsection 2.4.12.2.3 of the FSAR will be revised to include information regarding post-construction ground cover and storm water management.

7.0 Post-Construction Groundwater Flow Characteristics

The post-construction Lee Nuclear Site groundwater table is anticipated to return to elevations that mimic the post-construction surface topography. Groundwater movement surrounding the backfilled excavation is still governed by the two-media, surface drainage basin, and slope-aquifer systems of the Piedmont province. Review of historical construction features was conducted to identify existing subsurface features that may alter groundwater flow. Cherokee-era subsurface utility corridors were identified that may intercept the post-construction water table, thus creating a potential preferential flow pathway. As discussed in FSAR Subsection 2.4.12.2.3 below, Duke Energy has committed to completing mitigating actions to remove the potential preferential pathway during Lee Nuclear Site construction activities:

> The existing storm drain and bedding materials will be removed by overexcavation. The remaining void will then be plugged with low-permeability backfill material, and compacted to density sufficient to assure no short-circuiting can occur.

Review of construction plans was also performed to identify potential flow barriers. The foundations and basemats of the nuclear islands extend to depths that reach the underlying continuous rock or to fill concrete. These structures that extend the complete depth of the shallow soil and saprolite aquifer are expected to create a local groundwater flow barrier forcing shallow groundwater to flow horizontally around the structures. Although there will be localized "stagnation" zones upgradient and downgradient of those structures constructed on competent bedrock or fill concrete, the properties of the surrounding granular backfill (well graded, coarse grain size, and higher hydraulic conductivity than materials beyond the areas containing granular backfill) will facilitate groundwater equilibration. All other structures adjacent to the nuclear islands are founded on various depths of granular backfill, and are expected to not impact groundwater flows. Thus, groundwater flow is not significantly constrained, and no significant groundwater mounding occurs as a result of the nuclear islands or other structures of the Lee Nuclear Station.

Furthermore, because the prevalent aquifer media at the Lee Nuclear Site are the naturally occurring Piedmont aquifer materials that surround the plant construction fill, once construction is completed and groundwater has reached equilibrium, lateral flow beneath the plant will resume in a manner consistent with the Piedmont MCM. The above is substantiated by not only general Piedmont experience and literature, but also by Duke Energy's voluntary Radiological Groundwater Protection (RGP) Initiative implemented at Duke Energy's operating nuclear stations (Catawba Nuclear, McGuire Nuclear, and Oconee Nuclear). At all three stations, site characterization reports document that post-development groundwater conditions are consistent with the Piedmont MCM (Reference 1).

Relative to the power block, post-construction groundwater is expected to flow primarily northward, toward Hold-Up Pond A and the Broad River floodplain (FSAR Figure 2.4.12-205, Sheet 8). No significant component of groundwater flow occurs toward the south in the direction of McKowns Mountain Road, as ground surface elevations and groundwater potentiometric levels generally rise to the south.

8.0 Post-Construction Maximum Groundwater Level

The potentiometric surface beneath Lee Nuclear Station Units 1 and 2 is expected to rebound to an elevation near the apparent hydrostatic equilibrium for this location based on field measurements and observations at the site. An understanding of groundwater fluctuation at Lee Nuclear Site was developed based on assessment of evidence including the range of apparent water levels observed in historical aerial photographs and the range of water stains observed on the Cherokee concrete structures. These observations suggest that the range of groundwater fluctuation in the open excavation (approximately between the years 1984 and 2005) was from 574 ft. to 579 ft. msl, with a mid-range point of 576.5 ft. msl. Groundwater level measurements from onsite observation wells obtained in 2006 – 2007 indicate that seasonal groundwater fluctuations do not exceed 5 – 10 ft. Review of regional groundwater levels indicate that groundwater levels will not fluctuate more than 15 ft. total. Using the 15 ft. water level fluctuation as a bounding condition at Lee Nuclear Station (+ 7.5 ft. from the mid-range point, the assumed hydrostatic equilibrium), and assuming the 576.5 ft. msl elevation to be representative of the hydrostatic equilibrium, a conservative high post-construction water level range of 576.5 – 584 ft. msl is determined. Therefore, a conservative estimate of the post-construction maximum groundwater level in the area of Units 1 and 2 is 584 ft. msl, well below the AP1000 DCD maximum groundwater design elevation of 588 ft. msl. The value of 584 ft. msl is believed to be conservative considering that it was derived based on the most severe of historically recorded natural phenomena at the site and the surrounding area (10CFR 52.79 (a)(1)(iii)). The conservative nature of this estimated maximum post-construction groundwater level is further supported by the anticipated decrease in recharge in the area of the plant after construction, installation of stormwater controls and roof drains to limit infiltration, and the addition of impervious surfaces and other hardscape, to further promote runoff away from the power block area. Confirmation of post-construction Lee Nuclear Site groundwater conditions will be accomplished through Duke Energy's voluntary RGP Initiative (Reference 1).

Subsection 2.4.12.2.3 of the FSAR will be revised to include information regarding post-construction maximum groundwater level.

References:

1) Letter from Bryan J. Dolan (Duke Energy) to Document Control Desk, U.S. Nuclear Regulatory Commission, Supplemental Response to Request for Additional Information (RAI No. 826), Ltr# WLG2009.05-07, dated May 12, 2009 (ML091340410).
2) LeGrand Sr., Harry E., 2004. A Master Conceptual Model for the Hydrogeological Site Characterization in the Piedmont and Mountain Region of North Carolina, A Guidance Manual. North Carolina Department of Environmental and Natural Resources, Division of Water Quality, Groundwater Section.

Associated Revision to the Lee Nuclear Station Final Safety Analysis Report:

FSAR Subsection 2.4.12.2.3

Attachments:

1) Revision to FSAR Subsection 2.4.12.2.3
2) RAI 2.4.12-019, Figure 1
3) RAI 2.4.12-019, Figure 2

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 1 of RAI 02.04.12-019

Revision to FSAR Subsection 2.4.12.2.3

COLA Part 2, FSAR Chapter 2, Subsection 2.4.12.2.3, beginning at the seventh paragraph is revised as follows:

Upon returning to post-dewatering conditions, the post-construction water table is expected to mimic land surface, consistent with slope-aquifer conditions of the Piedmont physiographic province. The potentiometric surface beneath Lee Units 1 and 2 is expected to rebound to an elevation near the apparent hydrostatic equilibrium (576.5 ft. msl). This apparent hydrostatic equilibrium is considered conservative since it represents the directly exposed water table in the post-Cherokee open excavation, allowing for recharge of all local precipitation less evaporation. In contrast, post-construction groundwater recharge would be significantly reduced due to impervious and semi-impervious areas (buildings, pavement, compacted road base material, and hardscape), site grading to effect drainage away from the nuclear islands, and installation of stormwater controls and roof drainage systems to further limit infiltration near Lee Units 1 and 2. Placement of impervious/semi-impervious surfaces is also expected to overlie the granular fill surrounding Units 1 and 2 such that infiltration in this area will be limited. Granular fill placement and characteristics are described in Subsection 2.5.4.5.

Seasonal water table fluctuations, as observed at the site, do not exceed 5 to 10 ft. Review of regional groundwater levels indicate that groundwater levels at Lee Nuclear Site are unlikely to fluctuate more than 15 ft. total. Using the more conservative regional seasonal water level fluctuation (±7.5 ft.) as a bounding condition to fluctuate around the apparent hydrostatic equilibrium (576.5 ft. msl), a~~A~~ conservative estimate of the post-construction maximum ~~high~~ groundwater elevation in the area of the excavation was established at 584 ft. msl.

The projected post-dewatering water table conditions are illustrated in Figure 2.4.12-204, Sheet 8. The potentiometric conditions shown in Figure 2.4.12-204, Sheet 8 affect the directions of groundwater flow surrounding the Lee Nuclear Station. Each of the ponds serves as a constant head flow boundary. The crests of the water table indicate groundwater divides within the slope-aquifer system. These features indicate distinct compartments of groundwater flow at the site, with the nuclear site area flowing to the north toward the Broad River, the area west of the north divide flowing toward Make-Up Pond B, and the area east of the south divide flowing toward Make-Up Pond A. Surface water bodies located within the same hydrologic compartment as the Lee Nuclear Station are topographically downgradient such that surface runoff will drain away from the power block area and any interaction between groundwater and surface water would be well below the Lee Nuclear Station plant grade elevation. Ultimately, all groundwater flow discharges to the Broad River, the groundwater sink for the site and the surrounding area.

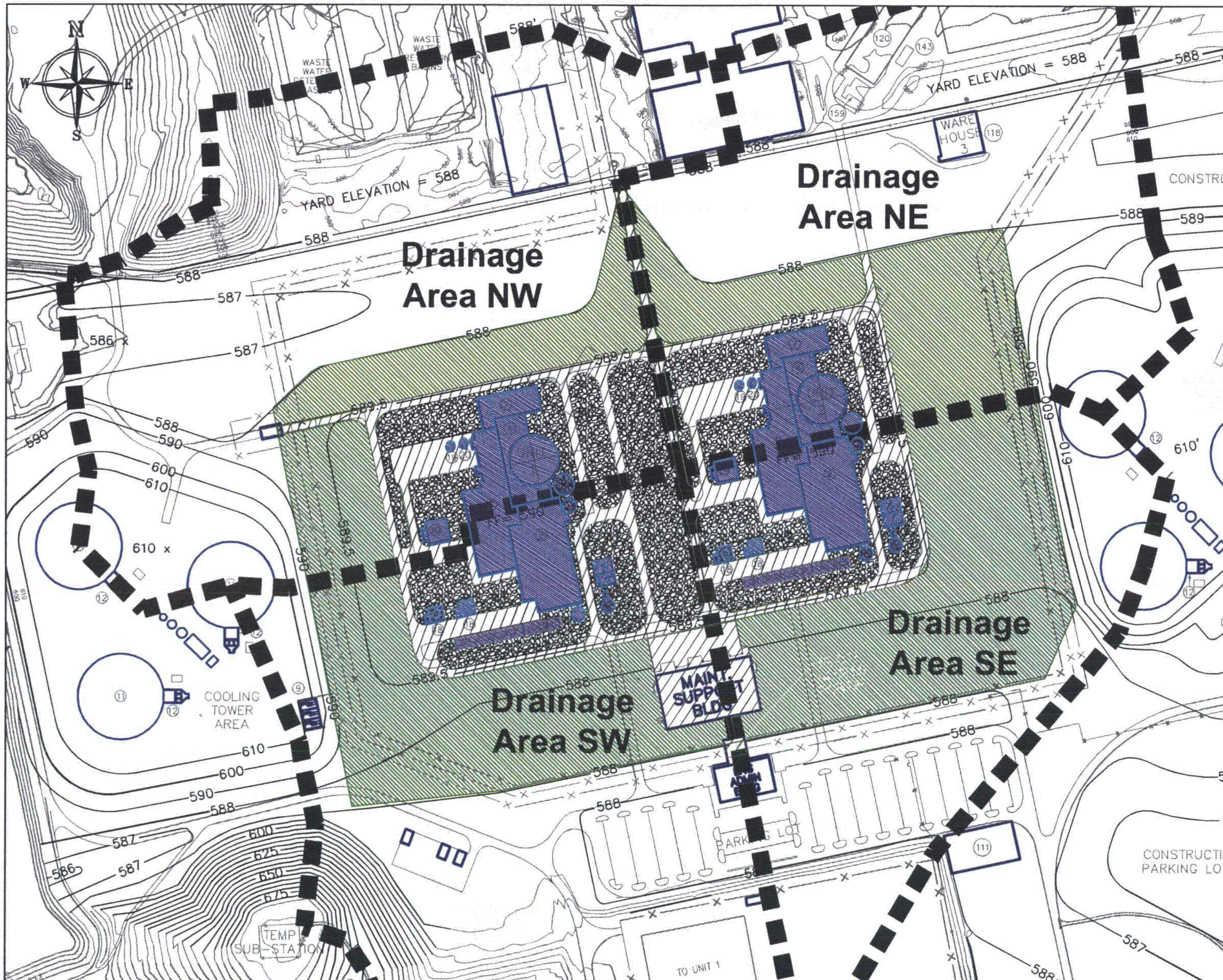
Based on site observations, a network of storm drains and buried piping was partially installed during the Cherokee project to manage surface water runoff. While no as-built drawings for the existing storm drain system for the former Cherokee Nuclear Station exist, a review of stormwater plans was conducted to assess the drain system's potential effect on groundwater movement. Storm drains located more than 500 ft. upgradient (south) of the power block could potentially intercept the water table and allow shallow groundwater movement towards Make-Up Pond A; these drains do not affect groundwater movement in the power block area. Other storm drains appear to be above the water table and would not affect the movement of groundwater. One exception is a storm drain originally designed to transfer stormwater from the Cherokee power block area to Hold-Up Pond A. The depth of this storm drain pipe appears to be below the projected water table. Therefore, if left in place, this conduit could potentially cause a preferential groundwater pathway from the power block area downgradient to Hold-Up Pond A once groundwater recovers from the construction dewatering activities. The existing storm drain and bedding materials will be removed by overexcavation. The remaining void will then be plugged with low-permeability backfill material, and compacted to density sufficient to assure no short-circuiting can occur.

Stormwater controls at the Lee Nuclear Station include a combination of surface grading to facilitate surface water flow, construction of a stormwater drainage system (DRS), and construction of a roof drain and collection system. The Lee Nuclear Station ~~stormwater drainage system (~~DRS~~)~~ is designed to facilitate and control the runoff of precipitation along surface water flow paths, diverting surface runoff away from the power block area and reducing the potential for flooding. The site grading and drainage plan is shown in Figure 2.4.2-202. The site is relatively flat; however, the site is graded such that overall runoff will drain away from safety-related structures to Make-Up Pond B, Make-Up Pond A, or directly to the Broad River. Precipitation falling on buildings is captured by a roof drain and collection system, channeled through drainage downspouts, and directed to the DRS. The DRS is not expected to directly affect groundwater flow system of the limiting groundwater flow pathway.

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 2 of RAI 02.04.12-019

Figure 1



WILLIAM STATES LEE III NUCLEAR STATION UNITS 1 & 2

Figure 1
Ground Cover Within the Power Block and Surrounding Area

Source: This is an illustrative adaptation of the figure "Ground Cover Within the Power Block and Surrounding Area" from the letter dated September 2, 2010, from Sylvester Yongho (Shaw Nuclear) to John Thrasher (Duke Energy).

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 3 of RAI 02.04.12-019

Figure 2

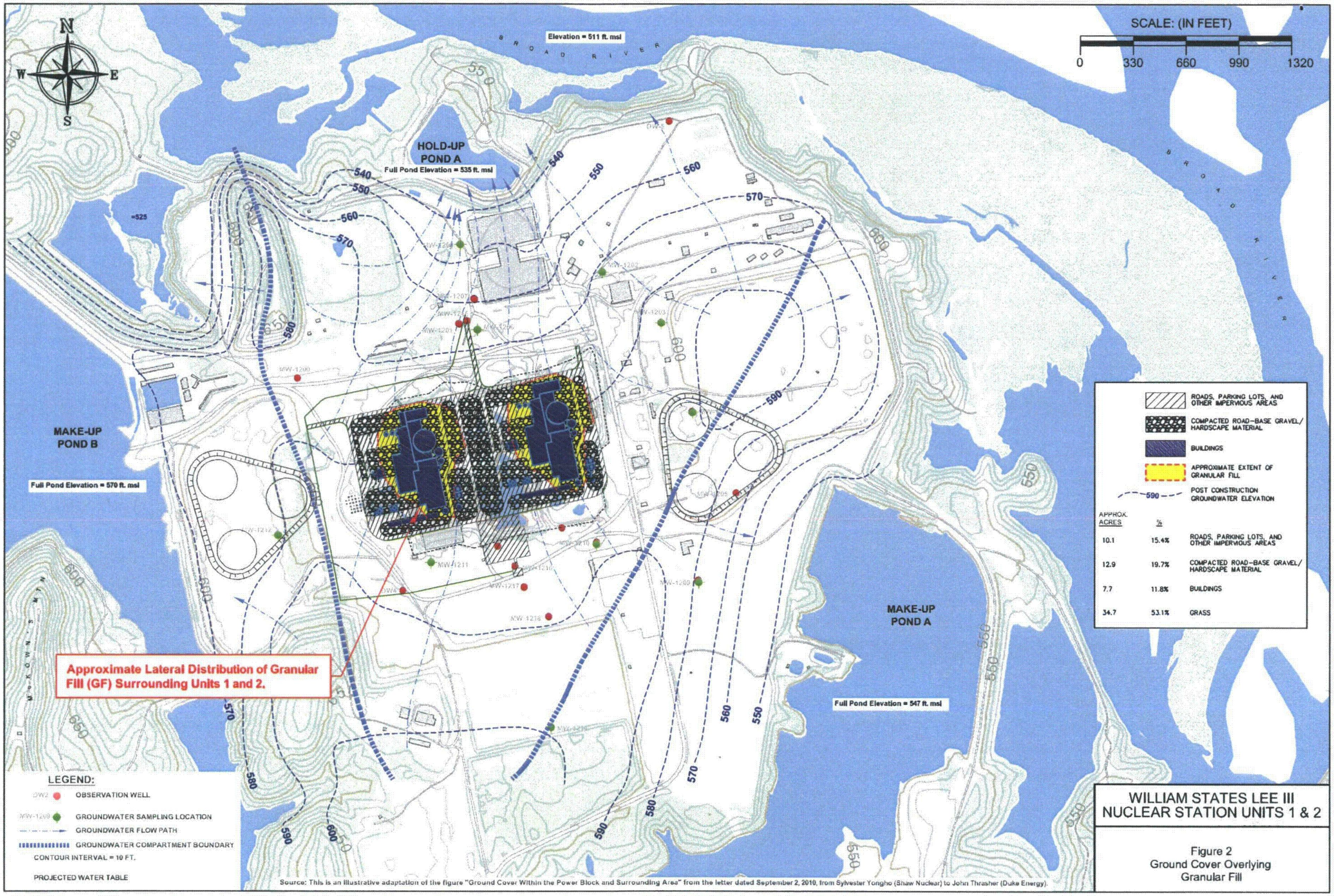


Figure 2
Ground Cover Overlying Granular Fill