Applicant's

Environmental Report

Combined License Stage

Calvert Cliffs Nuclear Power Plant Unit 3

Constellation Generation Group
UniStar Nuclear Operating Services

Volume 5

4.0 Environmental Impacts of Construction

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4.1 LAND USE IMPACTS

This section describes the impacts of site preparation and construction to the {CCNPP} site and the surrounding area. Section 4.1.1 describes impacts to the site and vicinity. Section 4.1.2 describes impacts that could occur along transmission lines. Section 4.1.3 describes impacts to historic and cultural resources at the site.

4.1.1 THE SITE AND VICINITY

The {CCNPP} site land use is presented in Table 2.2.1-1 and shown on Figure 2.2.1-1. The land use categories are consistent with USGS land use/cover categories. Land use/cover within the 8 mi (13 km) site vicinity is presented in Table 2.2.1-2 and shown on Figure 2.2.1-2. Highways and utility right-of-ways that cross the site and vicinity are shown on Figure 2.2.1-4 and Figure 2.2.2-2.

4.1.1.1 The Site

{CCNPP Unit 3 and supporting facilities would be located on the 2,057 acre (832 hectares) CCNPP site, to the southeast of and adjacent to CCNPP Units 1 and 2. The CCNPP site use activities will not change as the result of the proposed action. The CCNPP site acreage were purchased for and used by Constellation Energy for the purpose of generating electricity. The proposed action of the construction and operation of an additional power unit does not alter the site's current use. The CCNPP site will conform to all applicable local, state, and Federal land use requirements and restrictions as they pertain to the proposed action. Figure 4.1-1 shows the current Calvert County zoning categories for the CCNPP site.

The State of Maryland and Calvert County have land use plans that attempt to limit sprawl and encourage smart growth primarily through zoning ordinances. Through regulation, the Federal, State, and County governments attempt to limit potential environmental impacts to coastal areas including the Chesapeake Bay. The CCNPP site would follow all local, state, and federal requirements that pertain to the Coastal Zone Management Program (MDE, 2004) regulations and those regulations pertaining to the Chesapeake Bay Critical Area (CALCO, 2006) (CAC, 2006). During construction, site activities are required to be authorized by the agencies and programs listed in Table 1.3-1. There are no recognized Native American Tribal Land use plan that would have jurisdiction over the CCNPP site or within the vicinity of the CCNPP site that could impact the CCNPP site.

Table 4.1-1 provides an estimate of the land areas that would be disturbed during construction of CCNPP Unit 3 and supporting facilities, including temporary features such as laydown areas, stormwater retention ponds, and borrow areas. Approximately 420 acres (170 hectares) of the CCNPP site would be disturbed by site preparation and construction. Approximately 281 acres (114 hectares) would be permanently dedicated to CCNPP Unit 3 and its supporting facilities, and lost to other uses until after decommissioning. Approximately 140 acres (56 hectares) would be temporarily impacted. Acreage not containing permanent structures would be reclaimed to the maximum extent possible.

From Figure 4.1-1, an estimate was made regarding the amount of land currently zoned as Forest and Farm District within the CCNPP site boundary that would be affected by the proposed construction activities. Approximately 147 acres (59 hectares) of land currently zoned Forest and Farm District will be permanently (134 acres (54 hectares)) or temporarily (13 acres (5.2 hectares)) impacted by the construction activities.

As discussed in Section 4.3.1.1, an estimated 191 acres (77 hectares) of mixed deciduous forest would be lost during construction activities, approximately 28 acres (11 hectares) of which would be temporary. Additional information is provided on Table 4.3.1-1.

Section 2.2.1 describes the land areas that are devoted to major uses within the CCNPP site boundary and the CCNPP site vicinity. These areas are depicted on Figures 2.2-1 and 2.2-2, respectively. In addition, Section 2.2.1 describes the highways and utility right-of-way that cross the CCNPP site and vicinity. The footprint for the proposed unit and supporting facilities will be partially located on land and facilities associated with Camp Conoy, a recreational facility formerly used by CCNPP employees. This area is not open to the public; thus, there would be no impact to public recreation areas as the result of the proposed action. Constellation Generation Group and UniStar Nuclear Operating Services are not aware of any Federal action in the area that would have cumulatively significant land use impacts.

Heavy equipment and reactor components would be barged up the Chesapeake Bay to the existing barge slip. The slip area would be dredged and the existing heavy haul road from the barge slip would be modified and extended to the new construction site and lay down areas. A new access road, approximately 2.5 mi (4 km) long, would be constructed from Maryland State Road 2/4 to the construction site providing access to the construction areas without impeding traffic to the existing units. A site perimeter road system and access road around the cooling tower area to the power block would be built. Another road would be constructed to the proposed water intake structure.

The new intake, discharge, and barge facilities would be located in the 100 year coastal floodplain. With those exceptions, construction activities would be outside the 500 year floodplain in areas designated as areas of minimal flooding (FEMA, 1977).

The proposed location of CCNPP Unit 3 and supporting facilities is not farmland, and does not possess any prime farmland soils. The CCNPP site itself is predominantly forested with areas categorized as "Urban" or "Built-up" in the vicinity of the areas of current CCNPP operational facilities. In addition, the only known mineral deposits currently being extracted in Calvert Country are sand and gravel as described in Section 2.2.1.2. There are no known economic mineral deposits on the CCNPP site.

The proposed construction activities would result in the permanent loss, through filling, of approximately 18.6 acres (7.5 hectares) of non-tidal wetland habitat and approximately 48 acres (19 hectares) of non-tidal wetland buffer. Section 4.3.1.3 provides a detailed discussion of construction impacts to wetlands.

Construction would also impact 30.3 acres (12.3 hectares) within the Chesapeake Bay Critical Area including approximately 0.4 acres (0.16 hectares) within the Chesapeake Bay Critical Area Buffer zone that extends 100 ft (30.5 m) landward of mean high tide. This occurs in the vicinity of the proposed intake and discharge pipelines, the heavy haul road, stormwater retention basins, and security fencing. Section 4.3.1 provides a detailed discussion of construction impacts within the Chesapeake Bay Critical Area.

In the event the construction of CCNPP Unit 3 is not completed, a Site Redress Plan describing the return of the site to preconstruction conditions is provided in Part 6 of the COL application.

It is concluded that the land use impacts to the CCNPP site and vicinity of the CCNPP site from construction of the new unit would be MODERATE, primarily due to the loss of wetlands and wetland buffers, and would require mitigation. The mitigation measures associated with the wetlands and wetland buffers are described in Section 4.3.1.4.}

4.1.1.2 The Vicinity

{Land in the vicinity of the CCNPP site is rural with development generally occurring in town centers per current Calvert County zoning and planning requirements. Land use within 8 miles (13 km) of the site is predominantly forest as described in Figure 2.2.1-2.

The construction activities that would degrade the visual aesthetics of the land would be limited to those activities potentially seen from the new construction access road. Because of the forested nature of the area surrounding the proposed site, it is unlikely that construction activities for the proposed facilities could be seen directly from the adjacent highway, with the exception of the activities to build or upgrade the CCNPP site access road. Once the proposed facility construction extends above the tree line, some construction could be seen from roadways or other areas in the vicinity of the site depending on the area's topography and the immediate land cover. However, because a portion of the CCNPP site is currently zoned as industrial and already contains CCNPP Units 1 and 2, visual impacts from the proposed project would be similar to existing site conditions.

Section 4.4.2.4 provides the details on potential population impacts due to construction activities. The majority of the temporary construction workforce would probably live outside of Calvert County and St. Mary's County. These workers would commute or find temporary housing in Calvert County or St. Mary's County. No other land use changes in the vicinity would likely occur as a result of construction workforce related population changes.

Thus, it is concluded that impacts to land use in the vicinity of CCNPP Unit 3 would be SMALL, and not require mitigation.}

4.1.2 TRANSMISSION CORRIDORS AND OFFSITE AREAS

{The additional electricity generated from CCNPP Unit 3 will not require the addition of new offsite right-of-way. As discussed in Section 2.2.2.2, the proposed CCNPP Unit 3 construction activities on the CCNPP site would include the following transmission system changes:

- One new 500 kV substation to transmit power from CCNPP Unit 3
- Two new 500 kV, 3,500 MVA circuits connecting the new CCNPP Unit 3 substation to the existing CCNPP Units 1 and 2 substation

Numerous breaker upgrades and associated modifications would also be required at Waugh Chapel substation, Chalk Point Generating Station, and other existing substations.

The North and South Circuits of the CCNPP power transmission system are located in corridors totaling approximately 65 miles (105 km) of 350 to 400 ft (100 to 125 m) wide corridors owned by Baltimore Gas and Electric. The lines cross mostly secondary-growth hardwood and pine forests, pasture, and farmland. The existing CCNPP Units 1 and 2 are also connected to the Southern Maryland Electric Cooperative's Bertha substation via a 69 kV underground transmission line.

The transmission line work being considered to support this project would require new towers and transmission lines to connect the CCNPP Unit 3 switchyard to the existing switchyard for CCNPP Units 1 and 2. Line routing would be conducted to avoid or minimize impact on the existing Independent Spent Fuel Storage Installation (ISFSI), wetlands, and threatened and endangered species identified in the local area. No new offsite corridors or widening of existing corridors are required. The proposed onsite connector corridor would be located on land already in use to generate electric power. Some of the proposed facility locations associated with the project are located on land currently zoned and used as light industrial. The remainder is zoned as Farm and Forest District. CCNPP Unit 3 will be exempt from the Calvert County

Zoning Ordinance once the CPCN for CCNPP Unit 3 is issued. However, all federal, state, and local regulations and requirements including those that deal with construction impacts, and those regulations pertaining to the Coastal Zone Management Program, the Chesapeake Bay Critical Area, and the Maryland Public Service Commission would be complied with.

There are no Federal actions that would have cumulatively significant land use impacts within the vicinity and region of the CCNPP site activity and offsite areas as described in Section 2.8.

Because there are no new offsite transmission corridors, it is concluded that there will be no additional impacts to the offsite transmission corridor lands associated with the proposed construction of CCNPP Unit 3. The proposed onsite transmission line connector corridor would be located on land already in use to generate electric power. No new access roads of modifications to existing roads are currently anticipated.}

4.1.3 HISTORIC PROPERTIES

{Tables 2.5.3-4 and 2.5.3-5 list resources within the proposed project's Area of Potential Effect (APE) that are potentially eligible or eligible for listing on the National Register of Historic Places (NRHP). These tables reflect the comments received from the Maryland State Historic Preservation Office (SHPO) (MHT, 2007). As described in Section 2.5.3, the cultural resource survey of the CCNPP site identified fourteen archaeological sites, four of which are considered potentially eligible for inclusion on the NRHP. The survey also identified five architectural resources, four of which are considered eligible for the NRHP.

The preliminary assessment of adverse effects to the eight NRHP resources from project construction activities is as follows. It is likely that the four identified archaeological sites would be heavily damaged by construction activities and use, thereby resulting in an adverse effect to those resources. Of the four architectural resources, two would be adversely affected. These two architectural resources are the Baltimore and Drum Point Railroad roadbed and Camp Conoy. These architectural resources are located within the 600 acre (243 hectares) APE and would be heavily damaged by construction activities and use, resulting in an adverse effect to these resources. The Preston Cliffs property is located approximately 1,500 ft (457 m) away from the outer boundary of the APE and would not be damaged by construction activities and use. There would also be no adverse effect to the setting of this property, as CCNPP Units 1 and 2 are adjacent to this property and would be located between the property and CCNPP Unit 3 and its cooling tower facility. The Parran's Park property is within the 600 acre (243 hectares) APE. However, it is located in a portion of the project site that would only include development of a construction access road and would not be damaged by construction activities and use. There would also be no effect to the setting of this property, as the access road is already in existence and facilities associated with CCNPP Units 1 and 2 are adjacent to this property.

Consultation on the Phase I cultural resources survey with Native American tribes is pending. This consultation could result in changes to the recommended National Register of Historical Places eligibility of the 19 identified resources. Phase II archaeological investigations and subsequent SHPO consultation would be conducted on potentially eligible archaeological resources that are located within the proposed project area and cannot be avoided, to determine their eligibility. Upon completion of Phase II investigations and SHPO consultations, assessments of effect on the National Register of Historical Places eligible resources on the project site would be determined and consultation conducted with the SHPO to identify measures to avoid, minimize, or mitigate any adverse effects, per Section 106 of the National Historic Preservation Act (USC, 2007).

Extensive areas in the Chesapeake Bay have been previously dredged for the existing discharge conduit and channel, cooling water intake channel, the barge dock and channel, and the shore protection revetment. Construction of the new intake channel and discharge conduit would occur within areas previously dredged or disturbed by construction. Thus, there would be no impacts to historic properties from construction of these facilities.

With construction activities, there is always the possibility for inadvertent discovery of previously unknown cultural resources or human remains. Prior to initiation of land disturbing activities, procedures will be developed which include actions to protect cultural, historic, or paleontological resources or human remains in the event of discovery. These procedures will comply with applicable Federal and State laws. These laws include the National Historic Preservation Act (USC, 2007), and Code of Maryland, Criminal Law, Title 10, Subtitle 4, Sections 10-401 through 10-404 (MD, 2004a) and the Code of Maryland, Title 4, Subtitle 2, Section 4-215 (MD, 2004b).

It is concluded that there will be adverse inputs impacts to historic or cultural resources from construction. Upon completion of the Phase II investigations and SHPO consultation, assessments of effect on the National Register-eligible resources located in the APEs would be determined and consultation conducted with the SHPO to identify measures for avoidance, minimization, or mitigation of any adverse effects, per Section 106 of the National Historic Preservation Act. Any identified measures would be delineated in a Memorandum of Agreement between NRC, the SHPO, Constellation Generation Group, UniStar Nuclear Operating Services, and Advisory Council on Historic Preservation.

The magnitude of the impacts and requirements for mitigation are determined to be moderate.

4.1.4 REFERENCES

{**CAC, 2006.** Critical Area Commission for the Chesapeake and Atlantic Coastal Bays, Critical Area Commission, Website: www.dnr.state.md.us/criticalarea/, Date accessed: May 7, 2006.

CALCO, 2006. Calvert County Zoning Ordinances, Calvert County, Website: Date accessed: May 16, 2006.

FEMA, 1997. Flood Hazard Boundary Map, Calvert County, Maryland, Federal Emergency Management Agency, July 15, 1997, Website: www.fema.gov/hazard/flood/index.shtm, Date accessed: December 21, 2006.

MD, 2004a. Code of Maryland, Criminal Law, Title 10, Subtitle 4, Sections 10-401 through 10-404, January 2004.

MD, 2004b. Code of Maryland, Criminal Law, Title 4, Subtitle 2, Section 4-215, January 2004.

MDE, 2004. A Guide to Maryland's Coastal Zone Management Program Federal Consistency Process, Maryland Department of the Environment, February 2004.

MHT, 2007. Letter from J. Rodney Little, Director/State Historic Preservation Officer, Maryland Historic Trust to R. M. Krich, June 7, 2007.

USC, 2007. Title 16, United States Code, Part 470, National Historic Preservation Act of 1966, as amended, 2007.}

Table 4.1-1 {Construction Areas Acreage and Operations Acreage, Land Use and Zoning}
(Page 1 of 1)

Construction Area	Construction Acreage (hectares)	Current Land Use	Current Zoning
Unit 3 Power Block	45.8 (18.5)	Forest and Urban or Built Up	I-1 and FFD
Unit 3 Switchyard	59.3 (24)	Forest	I-1 and FFD
Unit 3 Cooling Tower Area	18.1 (7.3)	Forest	FFD
Permanent Laydown Area	59 (23.9)	Urban or Built Up	I-1
Parking Area	17.7 (7.2)	Urban or Built Up	I-1
Connector Transmission Lines (Onsite)	11.7 (4.7)	Forest and Urban or Built Up	I-1
Desalinization Plant	0.46 (0.18)	Forest	FFD
Waste Water Treatment Facility	0.29 (0.12)	Forest	FFD
Heavy Haul Road	15.7 (6.4)	Urban or Built Up	I-1
Construction Access Road	42.8 (17.3)	Urban or Built Up	I-1 and FFD
Borrow Area	4.8 (1.9)	Urban or Built Up	I-1
Stormwater Retention Basins Adjacent to the Permanent Construction Features	5.3 (2.2)	Forest and Urban or Built Up	FFD and I-1
Total Acreage of Disturbed Area for Permanent Construction Features	**280.95 (113.7)**	--	--
Temporary Laydown Areas	106.7 (43.2)	Urban or Built Up and Forest	I-1 and FFD
Concrete Batch Plant, Material Storage	26.2 (10.6)	Urban or Built Up	I-1
Retention Basins Adjoining Temporary Features	6.2 (2.5)	Urban or Built Up and Forest	I-1 and FFD
Total Acreage of Disturbed Area for Temporary Construction Features	**139.1 (56.3)**	--	--

Notes:
I-1 = Light industrial
FFD = Farm and Forest District

FIGURE 4.1-1 **Rev. 0**

{CCNPP SITE}

ZONING AND GRADING LAYOUT

CCNPP UNIT 3 ER

4.2 Water-Related Impacts

4.2 WATER-RELATED IMPACTS

The following sections describe the hydrologic alterations and water use impacts that result from the construction of the {Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3}. Section 4.2.1 describes the hydrologic alterations resulting from construction activities including the physical effects of these alterations on other users, the best management practices to minimize any adverse impacts and how the project will comply with the applicable Federal, State and local standards and regulations. Section 4.2.2 describes the potential changes in water quality and an evaluation of the impacts resulting from construction activities on water quality, availability and use.

4.2.1 HYDROLOGIC ALTERATIONS

This section discusses the proposed construction activities including site preparation, the resulting hydrologic alterations and physical effects of these activities on other water users, best management practices to minimize adverse impacts, and compliance with applicable Federal, State and local environmental regulations.

4.2.1.1 Description of Surface Water Bodies and Groundwater Aquifers

{The CCNPP site covers an area of approximately 2,057 acres (832 hectares) and is located on the western shore of Chesapeake Bay in Calvert County, Maryland near Maryland State Highway 2/4 as shown in Figure 2.1-2. Additional details on the CCNPP site location and surrounding area are provided in Section 2.1.

The topography at the CCNPP site is gently rolling with steeper slopes along stream courses. Local relief ranges from sea level up to an elevation of 130 ft (40 m) with an average relief of approximately 100 ft (30 m). The CCNPP site is well drained by short, intermittent, and perennial streams. Six existing surface water impoundments are present on the site. A drainage divide (ridge) runs approximately from southeast to northwest across the CCNPP site as shown in Figure 2.3.1-4. Approximately 20% of the existing CCNPP site surface runoff is directed to drainages discharging into Chesapeake Bay. The remaining 80% of the runoff flows into tributaries of Johns Creek.

Surface Water Bodies

The surface water bodies (Fig 2.3.1-4) within the hydrologic system at CCNPP that may be affected by the construction and operation of Unit 3 are:

- Two unnamed streams designated (Branch 1 and 2) on the eastern side of the drainage divide, Branch 1 being downstream of the Camp Conoy Fishing Pond;
- Johns Creek, Branch 3 and Branch 4, and the unnamed headwater tributaries;
- Goldstein Branch;
- Laveel Branch;
- Camp Conoy Fishing Pond and two downstream impoundments;
- Lake Davies and two unnamed impoundments within the Lake Davies dredge spoils disposal area; and
- Chesapeake Bay and Patuxent River.

The streams listed above are perennial and are typically fed by springs and seeps.

The Camp Conoy fishing pond is a man-made impoundment with an earthen dam on the northeast side. Water depth increases slowly away from the shoreline, with a depth of less than 1 ft (0.3 m) over most of the lake and may exceed 3 ft (1 m) near the center. An outlet pipe conveys water from the fishing pond to a single stream channel which continues northeast toward Chesapeake Bay. Two smaller impoundments were created along this channel, and water depth in these two impoundments does not appear to exceed 1 to 2 ft (0.3 to 0.6 m) in most locations. These two impoundments are within the Chesapeake Bay Critical Area boundary.

A series of three man-made impoundments are present south of the existing dredge spoils disposal area near the center of the CCNPP site. These sequentially connected basins convey stormwater runoff from the dredge spoils disposal area to Johns Creek. Water levels in Johns Creek appear to be heavily influenced by surface runoff from the dredge spoils disposal area. The upper, pond closest to the spoils pile (Lake Davies) appears to extend to a depth below the water table and has open water of unmeasured depth at its center. The downstream impoundments do not typically contain surface water but persist as wetlands.

USGS gauging stations exist for downstream areas of the Patuxent River and these records are presented in Section 2.3.1. Additional details on the surface water drainage and hydrology are also presented in Section 2.3.1 and the Final Wetland Delineation Report (TTNUS, 2007).

Groundwater Aquifers

The local aquifer systems that could be impacted by project construction activities at the CCNPP site are, from shallow to deep, the: Surficial aquifer, Piney Point - Nanjemoy aquifer, and the Aquia aquifer. The hydrostratigraphic column for the CCNPP site and surrounding area, identifying geologic units, confining units, and aquifers is shown in Figure 2.3.1-31. A schematic cross-section of the southern Maryland hydrostratigraphic units is shown in Figure 2.3.1-32. The physical characteristics of the groundwater aquifers are provided in Sections 2.3.1 and 2.3.2.

The Surficial aquifer is primarily tapped by irrigation wells, and some old farm and domestic wells. It is not widely used as a potable water supply because of its vulnerability to contamination and unreliability during droughts. The Piney Point - Nanjemoy aquifer and underlying Aquia aquifer are the chief sources of groundwater in Calvert County and St. Mary's County. The Piney Point - Nanjemoy aquifer is primarily used for domestic water supply. The Aquia aquifer is the primary source of groundwater for major groundwater appropriation in southern Maryland.}

4.2.1.2 Construction Activities

The following construction activities will take place that may alter site hydrology:

Clearing, Grubbing, and Grading

{Spoils, backfill borrow, and topsoil storage areas will be established on parts of the CCNPP property. Clearing and grubbing of the site begins with harvesting trees, vegetation removal, and disposal of tree stumps. Topsoil will be moved to a storage area (for later use) in preparation for excavation. The general plant area including the switchyard and cooling tower area will be brought to plant grade in preparation for foundation excavation and installation. As described in Section 4.1, approximately 420 acres (170 hectares) of land will be cleared for road, facility construction, laydown and parking uses.

Road Construction

A new and upgraded intersection at Nursery Road on Maryland State Highway (MD) 2/4, south of the existing Calvert Cliffs Parkway to CCNPP Units 1 and 2, will be built and utilized as a construction access route into the CCNPP Unit 3 construction area. Approximately 2 mi (3 km) of road will be upgraded and built to accommodate the traffic into the construction area. The existing barge slip heavy haul road will also be upgraded and extended to the Unit 3 site area and construction laydown areas. The maximum slope for the existing and extended haul road is 4% grade. A CCNPP Unit 3 site perimeter road system will be installed including an access road from the cooling tower area to the power block area.

Temporary Utilities

Temporary utilities include above-ground and underground infrastructure for power, communications, potable water, wastewater and waste treatment facilities, fire protection, and for construction gas and air systems.

Temporary Construction Facilities

Temporary construction facilities include offices, warehouses, sanitary toilets, a changing area, a training area, and personnel access facilities. The site of the concrete batch plant includes the cement storage silos, the batch plant and areas for aggregate unloading and storage.

Parking, Laydown, Fabrication, and Shop Preparation Areas

The parking, laydown, fabrication and shop areas include preparation of the parking and laydown areas by grading and stabilizing the surface with gravel. The shop and fabrication areas include the concrete slabs for formwork, laydown, module assembly, equipment parking and maintenance, and fuel and lubricant storage. Concrete pads for cranes and crane assembly will be installed.

Underground Installations

Concurrent with the power block earthworks, the initial non-safety-related underground fire protection, water supply, sanitary and hydrogen gas piping, and electrical power and lighting duct banks will be installed and backfilled. These installations will continue as construction progresses.

Unloading Facilities Installation

The existing barge slip will be upgraded. New sheet pile will be installed and the existing crane foundations removed from the water. The slip will be widened by dredging to receive larger barge shipments that have roll-on, roll-off capability. Concurrently, crane foundations will be placed to erect a heavy lift crane.

Intake/Pumphouse Cofferdams

A sheet pile cofferdam and dewatering system will be installed on the south side of the CCNPP Units 1 and 2 intake structure to facilitate the construction of the CCNPP Unit 3 makeup water intake structures and pump houses. Pilings may also be driven to facilitate construction of new discharge system piping.

Excavation and dredging of the intake structures, erection of pump houses, and installation of mechanical, piping, and electrical systems follow the piling operations and continue through site preparation into plant construction. Excavated and dredged material will be transported to an onsite spoils area located outside the boundaries of designated wetlands.

Power Block Earthwork (Excavation)

The deepest excavations in the power block area are for the CCNPP Unit 3 reactor and auxiliary building foundations that extend to approximately 40 ft (12 m) below plant grade. The next deepest excavations are for the turbine building foundation area which will be excavated approximately 21 ft (6.4 m) below plant grade with the circulating water piping excavation areas extending down to 33 ft (10 m) below plant grade.

The excavations will take place concurrent with the installation of any required dewatering systems, slope protection and retaining wall systems. At a minimum, drainage sumps will be installed at the bottom of the excavations from which surface drainage and groundwater infiltration will be pumped to a stormwater discharge point. Monitoring of construction effluents and stormwater runoff would be performed as required in the stormwater pollution prevention plan, the National Pollutant Discharge Elimination System (NPDES) permit, and other applicable permits obtained for construction. Excavated material will be transferred to the spoils and backfill borrow storage areas. Acceptable material from the excavations will be stored and reused as structural backfill.

Power Block Earthwork (Backfill)

The installation of suitable backfill to support structures or systems occurs as part of the site preparation activities. Backfill material will come from the concrete batch plant, onsite borrow pit and storage areas, or offsite sources. Excavated areas will be backfilled to reach the initial level of the building foundation grade. Backfill will continue to be placed around the foundation as the building rises from the excavation until final plant grade is reached.

Nuclear Island Base Mat Foundations

The deepest foundations in the power block are installed early in the construction sequence. Detailed steps include: installation of the grounding grid, mud-mat concrete work surface, reinforcing steel and civil, electrical, mechanical/piping embedded items, forming, and concrete placement and curing.

Transmission Corridors

A new transmission substation/switchyard will be installed adjacent to the power block area for CCNPP Unit 3. A new onsite transmission corridor will be installed from the CCNPP Unit 3 switchyard to the existing CCNPP Units 1 and 2 switchyard. Tower foundations will be installed as well as an access road running along the corridor.

Offsite Areas

No offsite areas will be impacted by the construction activities for CCNPP Unit 3. The existing offsite transmission corridor and towers will be utilized for the high voltage lines for CCNPP Unit 3.}

4.2.1.3 Water Sources and Amounts Needed for Construction

{Construction of CCNPP Unit 3 will require an estimated 250 gpm (946 lpm) or 360,000 gpd (1,363,000 lpd) of water during the 68 month construction phase. The current CCNPP Units 1 and 2 groundwater usage varies markedly but averaged 387,000 gpd (1,465,000 lpd) from July 2001 through June 2006 as shown in Table 2.3.2-7. The current groundwater appropriations allow for a daily average of 450,000 gpd (1,700,000 lpd) with a limit of 865,000 gpd (3,270,000 lpd) daily average for the month of maximum use as shown in Table 2.3.2-6.

Initially, water for construction will be supplied from the existing CCNPP Units 1 and 2 groundwater production wells and from offsite sources as required. These water sources will eventually be replaced when the onsite desalinization plant is completed and is able to supply the necessary water from the Chesapeake Bay for the remaining construction activities. It is currently estimated that a peak water demand of up to approximately 1,200 gpm (4,500 lpm) will be required for CCNPP Unit 3 construction activities (demands include those for construction personnel, concrete manufacturing, dust control, hydro testing and flushing, and filling tanks and piping). Average construction demand would be less and is estimated at 250 gpm (950 lpm). The potential sources of water for construction include onsite groundwater from CCNP Units 1 and 2, Chesapeake Bay water (to supply the desalinization plant in construction years five and six), and offsite water trucked to the construction site. Table 4.2-1 shows the estimated amounts of fresh water needed by construction year.

The proposed desalinization plant will treat Chesapeake Bay brackish water to produce up to 1,750,000 gpd (6.62E+6 lpd) of desalinated water. The plant will use the seawater reverse osmosis desalinization process to treat Chesapeake Bay water to provide water to the CCNPP Unit 3 process users. The plant will have three portions consisting of a centralized pump center, an energy recovery center, and a reverse osmosis center. The plant will contain a pretreatment filtration system and chemical conditioning equipment to prevent fouling and mitigate corrosion in pipes and equipment. The desalinization plant is expected to reduce the salinity of the water to a level of approximately 1.67E-3 lbs/gal (200 to 300 mg/l), with the general characteristics of softened well water.}

4.2.1.4 Surface Water Bodies Receiving Construction Effluents that Could Affect Water Quality

{The surface water bodies as shown in Figure 2.3.1-4 within the hydrologic system at the CCNPP site that could receive effluents during CCNPP Unit 3 construction include:

- Two unnamed streams (Branch 1 and Branch 2) on the eastern side of the drainage divide, Branch 1 being downstream of the Camp Conoy Fishing Pond;
- Camp Conoy Fishing Pond and two downstream impoundments;
- Johns Creek, Branch 3 and Branch 4, and the unnamed headwater tributaries;
- Goldstein and Laveel Branches of Johns Creek;
- Lake Davies and two unnamed impoundments within the Lake Davies dredge spoils disposal area; and
- Chesapeake Bay and Patuxent River.

Several impoundments are planned to catch stormwater and sediment runoff from the various construction areas. Modeling of the runoff from the probable maximum flood (PMF) during plant operation bounds the possible runoff amounts, characteristics, and impacts that might occur during construction due to unpaved surfaces allowing for greater stormwater infiltration into the ground. The impoundments will be sized so as to prevent fast flowing, sediment laden stormwater from reaching the creeks or Chesapeake Bay prior to allowing the sediments to settle out. The flow velocities will be minimized to prevent erosion of creek and stream banks. The allowable flow rates and physical characteristics of stormwater runoff will be specified in the State discharge permits.

Maximum runoff for the entire western basin during the PMF is estimated at 21,790 cfs. The maximum high water level elevation in Johns Creek is 65 ft (19.8 m) NGVD 29, which is below the approximate 84.6 ft (25.8 m) NGVD 29 elevation of the final site grade in the power block, switchyard, and cooling tower area.}

4.2.1.5 Construction Impacts

{Construction of CCNPP Unit 3 with its associated cooling tower will impact several of the current drainages and impoundments at the CCNPP site. Runoff from the finished grade of the CCNPP Unit 3 power block, switchyard, cooling tower, parking areas and permanent laydown areas will be directed by sloping towards a series of bio-retention ditches around most of the periphery of these permanent features. Any excess runoff from the bio-retention ditches will in turn flow into stormwater impoundments. The bio-retention ditches will be constructed of base materials that promote infiltration of runoff from low intensity rainfall events. However, for large storms the infiltration capacity of the base materials will be exceeded and overflow pipes will direct the excess runoff to the stormwater impoundments. The final site grading plan is shown in Figure 4.2-1.

The four planned stormwater impoundments will be unlined basins with a simple earth-fill closure on the downstream end and will include a piping system that will direct any discharge to the adjacent watercourses. One impoundment is northeast of the power block and will discharge into the Branch 2 channel that flows into Chesapeake Bay. The Camp Conoy Fishing Pond will be filled in by the construction of the CCNPP Unit 3 power block and adjacent permanent laydown area. An impoundment east of this laydown area will in turn discharge into the Branch 1 channel, the two impoundments downstream of the former fishing pond, and ultimately, Chesapeake Bay. Branch 3 will be filled in by the construction, and excess runoff from the switchyard and adjacent parking areas to the north will flow into an impoundment in the Branch 3 channel and in turn discharge to Johns Creek. Runoff from the impoundment adjacent to the cooling tower will also discharge into Johns Creek.

Grading of the dredge spoils pile for a temporary laydown area, concrete batch plant, access road, and construction parking areas could increase runoff into the existing impoundments downstream of the dredge spoils pile and into temporary impoundments along the southern edge of the new access road as shown in Figure 4.2-1.

Construction impacts to the existing surface water bodies are summarized as follows:

- Increasing runoff from the approximately 333 acres (135 hectares) of impervious and relatively impervious surfaces for the CCNPP Unit 3 power block pad, cooling tower pad, switchyard, laydown, and parking areas;
- Infilling and eliminating the Camp Conoy Fishing Pond under the southeast portion of the laydown area south of the CCNPP Unit 3 power block foundation;
- Infilling and eliminating the upper reaches of Branch 2 and Branch 3, and an unnamed tributary to Johns Creek;
- Isolating portions of the upper reach of Branch 1 by construction of the laydown areas south of the CCNPP Unit 3 power block foundation;
- Disruption of the drainage in the Lake Davies dredge spoils disposal area with possible impacts on the two downstream impoundments;
- Wetlands removal and disruptions; and
- Possibly increasing the sediment loads into the proposed impoundments and downstream reaches.

The overall site drainage basin areas are not directly affected by the proposed site grading plan. The 80% / 20% drainage proportion to the west and east respectively, will stay the same during and after construction. Approximately 15 to 20 acres (6 to 8 hectares) will be added to the east drainage basin and removed from the west drainage basin.}

These impacts to surface water bodies are MODERATE, primarily due to the loss of wetlands and wetland buffers, and require mitigation. The mitigation measures associated with the wetlands and wetland buffers are described in Section 4.3.1.4.

4.2.1.6 Identification of Surface Water and Groundwater Users

{There are no users of onsite surface water. Johns Creek flows into the Patuxent River where there is recreational boating and fishing. Branch 1 and Branch 2 flow into Chesapeake Bay where there are also recreational boaters in addition to public beaches to the north and south of the CCNPP site. Commercial fisheries and recreational fishing also exist in Chesapeake Bay as discussed in Section 2.3.2.

Groundwater users in the vicinity of the CCNPP site are identified in Section 2.3.2. As described in Section 2.3.2, the nearest permitted Maryland Department of the Environment (MDE) groundwater well (beyond the boundary of the CCNPP property boundary and downgradient from the site), is conservatively presumed to lie adjacent to the southeastern boundary of the CCNPP site. At this location, the distance between the boundary and the center of CCNPP Unit 3 is approximately 1.1 mi (1.8 km) as shown in Figure 2.3.2-12. The flow direction was based on the regional direction of flow within the Aquia aquifer as shown in Figure 2.3.2-7.}

4.2.1.7 Proposed Practices to Limit or Minimize Hydrologic Alterations

{The following actions will be used to limit or minimize expected hydrologic alterations:

- Implementation of best management practices (BMPs) such as;
  - Maintaining clean working areas;
  - Removing excess debris and trash from construction areas;
  - Properly containing and cleaning up all fuel and chemical spills;
  - Installing erosion prevention devices in areas with exposed soils;
  - Installing sediment control devices at the edges of construction areas; and
  - Retaining and controlling stormwater and wash-down water onsite.
- Implementation of a Storm Water Pollution Prevention Plan (SWPPP)

The bio-retention ditches are designed to allow runoff to infiltrate. They will shift, slightly, the recharge areas for the Surficial aquifer. The amount of recharge may increase since there is less opportunity for evaporation and evapotranspiration. Monitoring of construction effluents and stormwater runoff will be performed as required in the stormwater pollution prevention plan, NPDES permit, and other applicable permits obtained for the construction.}

4.2.1.8 Compliance with Applicable Hydrological Standards and Regulations

{The regulations guiding the implementation of Best Management Practices (BMPs) are provided by the Maryland Department of the Environment (MDE, 1994). These regulations contain BMP installation instructions and typical construction activities which require BMPs. Monitoring of construction effluents and stormwater runoff will be performed as required in the stormwater pollution prevention plan, NPDES permit, and other applicable permits obtained for the construction.}

4.2.1.9 Best Management Practices

{The following BMPs will be implemented:

- Implementation of a SWPPP;
- Controlling site runoff;
- Monitoring runoff, groundwater, and surface water bodies for contaminants;

- Implementing controls, such as a spill prevention program, to protect against accidental discharge of contaminants (fuel spills, other fluids and solids that could degrade groundwater.

The bio-retention ditches are designed to allow runoff to infiltrate. They will shift, slightly, the recharge areas for the Surficial aquifer. The amount of recharge may increase since there is less opportunity for evaporation and evapotranspiration. Monitoring of construction effluents and stormwater runoff would be performed as required in the stormwater management plan, NPDES permit, and other applicable permits obtained for the construction.

In addition, CCNPP Unit 3 will comply with the requirements and conditions of the various permits issued to support construction. Environmental compliance personnel will monitor construction activities and provide direction to add, modify or replace site practices to ensure compliance with hydrological standards and regulations.}

In summary, the impact to hydrology is SMALL due to design of the surface water retention systems and use of best management practices to control surface water runoff.

4.2.2 WATER USE IMPACTS

This section discusses the proposed construction activities and resulting hydrologic alterations that could impact water use, an evaluation of potential changes in water quality resulting from construction activities and hydrologic changes, an evaluation of proposed practices to minimize adverse impacts, and compliance with applicable Federal, State and local environmental regulations.

4.2.2.1 Description of the Site and Vicinity Water Bodies

{The CCNPP site covers an area of approximately 2,057 acres (832 hectares) and is located on the western shore of Chesapeake Bay in Calvert County, Maryland near (MD) 2/4 as shown in Figure 2.1-2. Additional details on the CCNPP site location and surrounding area are provided in Section 2.1.

The surface water bodies, as shown in Figure 2.3.1-4, within the hydrologic system at the CCNPP site that may be affected by the construction and operation of CCNPP Unit 3 are discussed in Section 4.2.1.1.

Additional details on the surface water drainage and hydrology are presented in Section 2.3.1 and the Final Wetland Delineation Report (TTNUS, 2007).

The aquifers that could be impacted by project construction activities at the CCNPP site are the Surficial aquifer, the Chesapeake aquifer/confining unit, and the Castle Hayne-Aquia aquifer. These, and the other aquifers in the regional groundwater system, are described in Section 2.3.1 and Section 2.3.2. Site-specific hydrogeologic cross-sections are provided in Figure 2.3.2-5 and Figure 2.3.2-6.}

4.2.2.2 Hydrologic Alterations and Related Construction Activities

{Construction impacts to the existing surface water bodies are summarized as follows:

- Increasing runoff from the approximately 333 acres (135 hectares) of impervious and relatively impervious surfaces for the CCNPP Unit 3 power block pad, cooling tower pad, switchyard, permanent laydown, and parking areas;
- Infilling and eliminating the Camp Conoy Fishing Pond under the southeast portion of the laydown area south of the CCNPP Unit 3 power block foundation;

- Infilling and eliminating the upper reaches of Branch 2 and Branch 3, and an unnamed tributary to Johns Creek;
- Isolating portions of the upper reach of Branch 1 by construction of the laydown areas south of the CCNPP Unit 3 power block foundation;
- Disruption of the drainage in the Lake Davies dredge spoils disposal area with possible impacts on the two downstream impoundments;
- Wetlands removal and disruptions; and
- Possibly increasing the sediment loads into the proposed impoundments and downstream reaches.

The hydrologic alterations to groundwater that could result from the project related construction activities are:

- Creation of a local and temporary depression in the Surficial aquifer potentiometric surface due to dewatering for foundation excavations;
- Disruption of current Surficial aquifer recharge and discharge areas by plant construction. Hilly, vegetated areas would be cleared and graded; some streams and the Camp Conoy Fishing Pond (impoundment) would be backfilled and construction areas would be covered by less permeable materials and graded to increase runoff into bio-retention ditches. The locations of, or quantity of, water produced at springs and seeps could change downgradient of the construction areas;
- Stormwater runoff from the flat, non-vegetated foundation pads, switchyard and laydown areas would be directed and concentrated into bio-retention ditches and new impoundments that could affect recharge to the Surficial aquifer. Since the ditches and impoundments are unlined, they could act as smaller, focused recharge areas and might increase the amount of water recharging the surficial aquifer;
- Additional drawdown in the Aquia aquifer when the water needed for CCNPP Unit 3 construction is supplied by the CCNPP Units 1 and 2 onsite wells; and
- Minor shifting of the Surficial aquifer recharge area(s) to the underlying Chesapeake aquifer/confining unit.

A further discussion of related construction activities is provided in Section 4.2.1.2.}

4.2.2.3 Physical Effects of Hydrologic Alterations

{Impacts from the construction of CCNPP Unit 3 are similar to those associated with any large construction project. The construction activities that could produce hydrologic alterations to surface water bodies and groundwater aquifers are presented in Section 4.2.1.2. The potentially affected surface water bodies and groundwater aquifers are described in Section 4.2.1.4. The potential construction effects on surface water bodies and groundwater aquifers are presented in Section 4.2.1.5.

Surface Water Impacts

Because of the potential for impacting surface water resources, a number of environmental permits are needed prior to initiating construction. Table 1.3-1 in Chapter 1 provides a list of construction-related consultations and permits that have to be obtained prior to initiating construction activities.

The construction activities expected to produce the greatest impacts on the surface water bodies occur from:

- Reducing the available infiltration area;
- Grading and the subsequent covering of the 46 acre (19 hectare) CCNPP Unit 3 power block foundation;
- Grading and covering of the 18 acre (7 hectare) CCNPP Unit 3 cooling tower pad;
- Grading and covering of the 59 acre (24 hectare) CCNPP Unit 3 switchyard/substation;
- Vegetation removal and grading of 151 acres (61 hectares) for temporary construction laydown areas, concrete batch plant, offices, parking, warehouses, and shop preparation areas;
- Creation of impoundments;
- Elimination of an existing impoundment (i.e., Camp Conoy Fishing Pond); and
- Elimination of existing branches of Johns Creek.

Site grading and new building foundations will cover and reduce existing infiltration and recharge areas. Runoff will be directed into bio-retention ditches that could discharge to new impoundments, altering the Surficial aquifer recharge areas. Possible increases in runoff volume and velocity in the downstream creeks may cause erosion and adversely affect riparian habitat if not controlled.

Dewatering for the proposed foundation excavations could also impact surface water bodies. Effluent from the dewatering system, and any stormwater accumulating during the excavation, would be pumped to a stormwater discharge point or into onsite impoundments. If pollutants (e.g., oil, hydraulic fluid, concrete slurry) exist in these effluents from construction activities, they could enter the impoundments, downstream channel sections, or other surface water bodies. Monitoring of construction effluents and stormwater runoff would be performed as required in the stormwater management plan, NPDES permit, and other applicable permits obtained for the construction. Depending on the design of the stormwater impoundments and discharge systems, outflow rates into the surface streams could be altered.

All water bodies within the CCNPP site boundary could have the potential to indirectly receive untreated construction effluents. The water bodies listed in Section 4.2.1.1 are potentially subject to receiving untreated construction effluents directly. It will be necessary to implement proper BMPs under state regulations such as a: General NPDES Permit for Stormwater associated with Construction Activity, Erosion and Sediment Control Plan, and a stormwater pollution prevention plan. Table 1.3-1 lists and presents additional information on the Federal, State and Local Authorizations associated with this project.

If proper BMPs are implemented under these permits, treated construction effluents could be released to the site water bodies without adverse impacts. Flow rates for untreated construction effluents will depend upon the usage of water during site construction activities and the amount of precipitation contacting construction debris during construction activities. Flow rates and physical characteristics of the construction effluents are discussed in Section 4.2.1.4. A quantitative calculation and evaluation of the construction effluents and runoff will be done as part of the state construction permit process. BMPs would be implemented to control runoff, soil erosion, and sediment transport. Good housekeeping practices and engineering controls will be implemented to prevent and contain accidental spills of fuels, lubricants, oily wastes, sanitary wastes, etc.

BMPs are implemented under a Spill Prevention Plan, a SWPPP, and an Erosion Control Plan, as described in Section 4.2.1.7 and Section 4.2.2.10. Environmental control systems installed to minimize impacts related to construction activities will comply with all Federal, state and local environmental regulations and requirements. Once the initial controls are in place, they are maintained through the completion of construction and during plant operation, as needed.

Surface water use impacts are MODERATE, primarily due to the loss of wetlands and wetland buffers, and will require mitigation. The mitigation measures associated with the wetlands and wetland buffers are described in Section 4.3.1.4.

Groundwater Impacts

Depending on the design of the stormwater impoundments and discharge systems, outflow velocity and volume in the surface streams could change, and change the volume of water available to infiltrate and recharge the Surficial aquifer.

Increasing groundwater withdrawals for construction needs from the onsite Aquia aquifer production wells, could produce a local depression of the potentiometric surface in that aquifer. These increased withdrawals could potentially induce salt water intrusion or produce land subsidence, but as discussed earlier, neither had been reported as a significant problem in Calvert County or St. Mary's County.

The hydrologic alterations that could be produced in the groundwater aquifers are expected to be localized and possibly temporary. Most of the effects are expected to occur in the uppermost or Surficial aquifer. Any effects in the deeper aquifers are expected to be minor, due to remaining within the existing permit withdrawal limits, and dependent to a large extent on groundwater travel time, thickness and physical properties of the intervening stratigraphic units, and the nature of the hydraulic connection between aquifers.

The construction activities listed in Section 4.2.1.2 that are expected to produce the greatest impacts on the Surficial aquifer are related to:

- Changing the existing recharge and discharge areas;
- Possibly changing the amount of runoff available for infiltration; and
- Dewatering of foundation excavations during construction.

Site grading and leveling for the building foundations and laydown areas will cover and possibly eliminate existing recharge areas. Runoff from the graded areas will be directed into bio-retention ditches and several proposed impoundments, possibly creating new "focused" recharge areas. Runoff velocity may be increased in the channels downstream of the impoundments, which could decrease the amount of runoff available for infiltration and recharge. Fine-grained sediments could settle out in the impoundments and channels and create less-permeable areas for infiltration and recharge. These changes affect local recharge to the Surficial aquifer. Impacts on the deeper Aquia aquifer are likely to be SMALL.

Dewatering foundation excavations also produce localized impacts on the Surficial aquifer. The deepest excavations anticipated are for the proposed reactor and auxiliary building foundations, and extend approximately 40 ft (12 m) below plant grade. The dewatering system and activities are not expected to have any significant impact on the deeper Aquia aquifer due to the main recharge area of the Aquia aquifier is to the north. Hence, it is insensitive to perturbances of the Surficial aquifer. Effluent from the dewatering system will be pumped to a stormwater discharge point. Monitoring of construction effluents and stormwater runoff will be performed as required in the stormwater pollution prevention plan, NPDES permit, and other applicable permits obtained for the construction.

The locally lowered Surficial aquifer water level would be expected to eventually recover after the dewatering and other subsurface construction activities are complete.} Although it would be altered by buildings and paved areas, rainwater is still allowed to infiltrate in other plant areas to recharge the aquifer.

The impact to groundwater is SMALL and localized, changes to the surficial aquifer water level are expected to eventual recover once construction is complete.

4.2.2.4 Water Quantities Available to Other Users

{As described in Section 2.3.2.1.2, at present no surface water withdrawals are made in Calvert County for public potable water supply. Water use projection in Maryland for 2030 does not include surface water as a source for public water supply in southern Maryland counties including Calvert Country.

Groundwater use and trends in southern Maryland and at the CCNPP site are presented in Section 2.3.2.2 and in Section 2.4.12 of the Final Safety Analysis Report.

Water required for CCNPP Unit 3 construction is estimated at 250 gpm (946 lpm). This water is expected to come from the existing onsite wells into the Aquia aquifer at the CCNPP site. Any additional water needed is expected to come from offsite sources until the desalination plant begins operational and can supply the necessary water.

The Surficial aquifer is not used as a potable water source in the vicinity of the CCNPP site. The impacts expected from foundation dewatering or other construction activities will not impact any local users. The razing of the Camp Conoy facilities that are under the construction footprint may require abandonment of the four wells that supply those facilities. These wells draw from the Piney Point aquifer and have an appropriation limit of 500 gpd (1,900 lpd). The impact on the local area water supply resulting from the abandonment of these wells will be minor.}

4.2.2.5 Water Bodies Receiving Construction Effluents

{The surface water bodies directly downstream of the proposed construction activities could be impacted during clearing, grubbing, and grading. Locations of surface water and its users that could be impacted by construction activities are provided in Section 4.2.1.4.

Since most of the water for construction would be used for consumptive uses such as grading, soil compaction, dust control, and concrete mixing, little infiltration would be expected. Any effluents that might infiltrate would recharge the Surficial aquifer, and, potentially, the underlying Chesapeake aquifer/ confining unit, and the Castle Hayne-Aquia aquifer.

If contaminants enter the surface water bodies unchecked, there would be a potential for infiltration and subsequent groundwater contamination. If contaminants do enter groundwater, they may impact the quality of water withdrawn for industrial and commercial applications.

Any construction effluents infiltrating into the subsurface could potentially reach the Surficial aquifer if they are of sufficient volume and concentration. The plume migration would be downgradient and, depending on location, flow either eastward toward Chesapeake Bay or westward toward the Patuxent River. As described in Section 2.3.2, the horizontal groundwater flow in the Surficial aquifer is generally bi-directional. A northwest trending groundwater divide roughly follows a line extending through the southwestern boundary of the proposed power block area. Northeast of this divide, horizontal groundwater flow is northeast toward the Chesapeake Bay to small seeps and springs or onsite streams. Groundwater southwest of this divide flows to the southwest.

It is also possible that this groundwater could discharge locally at seeps or springs. Any possible impacts on deeper aquifers would also depend on the infiltrating volume and the hydrologic connection with the Surficial aquifer.

The composition of possible construction effluents that could infiltrate into the Surficial aquifer would depend on several factors related to the physical nature of the effluent material, i.e., solids versus liquids, solubility, vapor pressure, mobility, compound stability, reactivity in the surface and subsurface environments, dilution, and migration distance to groundwater. It is expected that proper housekeeping and spill management practices would minimize potential releases and volumes and physically contain any releases. Pesticides and herbicides are expected to be applied in limited site areas for insect and weed/brush control.

Several impoundments are planned to catch stormwater and sediment runoff from the various construction areas. Bio-retention ditches are planned to drain the proposed CCNPP Unit 3 power block, cooling tower pad, switchyard, and laydown areas. Modeling of the runoff from the probable maximum flood (PMF) during plant operation bounds the possible runoff amounts, characteristics, and impacts that might occur during construction due to unpaved surfaces during construction allowing for greater stormwater infiltration to ground. The retention ditches will discharge excess runoff into impoundments. The impoundments will be sized so as to prevent fast flowing, sediment laden stormwater from reaching the creeks or Chesapeake Bay prior to allowing the sediments to settle out. The flow velocities will be minimized to prevent erosion of creek and stream banks. The allowable flow rates and physical characteristics of stormwater runoff will be specified in State discharge permits.

Maximum runoff for the entire basin during the PMF is estimated at 21,790 cfs (617 cms). The maximum high water level elevation in Johns Creek is 65 ft (19.8 m) NGVD 29, which is below the approximate 84.6 ft (25.8 m) NGVD 29 elevation of the final site grade in the power block, switchyard, and cooling tower area.}

4.2.2.6 Baseline Water Quality Data

{Baseline water quality data for surface water bodies is provided and discussed in Section 2.3.3. A summary of the water quality data for the onsite surface water bodies is presented in Table 2.3.3-1. Baseline water quality data for groundwater is provided in Section 2.3.3.}

4.2.2.7 Potential Changes to Surface Water and Groundwater Quality

{The following section describes the potential water quality impacts resulting from the construction of CCNPP Unit 3.

The CCNPP site is a private facility and does not have any municipal water supplies. All water currently used onsite is drawn from Chesapeake Bay or subsurface aquifers. There are 13 groundwater supply wells onsite. The wells are listed in Table 2.3.2-6. Figure 2.3.2-13 shows the locations of the onsite supply wells. Four wells supply fresh water for CCNPP Units 1 and 2 operations; eight wells supply ancillary site facilities such as the rifle range and Camp Conoy. The Old Bay Farm well, identified in Table 2.3.2-6, is no longer in use.

Potential Changes to Surface Water Quality

Any potential surface water quality impacts are associated with the site clearing and grading activities.

The addition of sediment and organic debris to the local streams resulting from clearing, grubbing, and grading could decrease water quality. Organic debris could dam or clog existing streams, increase sediment deposition, and increase potential for future flooding. Organic debris decomposing in streams can cause dissolved oxygen and pH imbalances and subsequent releases of other organic and inorganic compounds from the stream sediments. Sediment laden waters are prone to reduced oxygen levels, algal growth, and increases in pathogens. If heavy metals or chemical compounds spill and/or wash into surface waters, there could be a direct toxicity to aquatic organisms. These potential pollutant releases could impact aquatic species and in turn affect the recreational aspects associated with fishing, canoeing, or kayaking.

The water bodies downstream of the proposed construction areas could be directly and indirectly affected by construction activities onsite. Construction debris residing on the pads and temporary staging areas could mix with construction wash-down water or stormwater, exit the site via untreated runoff and produce chemical reactions adverse to downstream ecology. Possible contaminants include: sediment, alkaline byproducts from concrete production, concrete sealants, acidic byproducts, heavy metals, nutrients, solvents, and hydrocarbons (fuels, oils, and greases). There could be a high potential for contaminants to mix with site wash-down water or rainwater/precipitation runoff and be washed downstream into surface water bodies existing on the CCNPP site due to the persistent nature of local precipitation. There could also be the potential for spills within the construction areas consisting of fuels, solvents, sealants, paints, or glues. Construction dusts not suppressed could drift outside of the construction zones and contaminate nearby water supplies. If these contaminants enter the surface water bodies unchecked there could be a potential for infiltration and subsequent groundwater contamination.

The proposed removal of onsite wetlands could reduce the ability of microbiotic organisms and fauna to naturally attenuate contaminants and pollutants produced onsite.

The impacts to surface water quality downstream of the construction site are SMALL due to the use of BMPs to control dust, runoff, and spills.

Potential Changes to Groundwater Quality

The spoils for CCNPP Units 1 and 2 were deposited in the dredge spoils disposal area of the site known as the Lake Davies area. Dredge spoils generated during the dredging of the barge slip area and construction of the intake/discharge structures may contain elevated levels of metals and salts. Runoff containing saline residue from the spoils could enter the impoundment just southeast of the spoils disposal pile, which is likely in direct hydraulic contact with the Surficial aquifer. Any impact on groundwater quality would probably be minor due to dilution. Little, if any, water quality impacts would be expected if this diluted water were to reach the deeper aquifers.

Dewatering for the foundation excavations may increase the oxidation of some sedimentary constituents by placing them in direct contact with the atmosphere. The oxides might have an increased solubility and could migrate down gradient when the potentiometric head is reestablished following construction completion. Possible impacts to the Surficial aquifer water quality would be SMALL and decrease with migration and dilution.}

4.2.2.8 Surface Water and Groundwater Users

{Surface water users downstream of the site may experience impacts from potential water quality changes if construction effluent concentrations and volumes are large enough and the release enters directly into a surface water body bypassing the overflow catch basins and retention ponds. The surface water users that could be impacted in the event of a release are those downstream of the CCNPP site along the tributaries flowing to the Patuxent River and

Chesapeake Bay. Any impacts to the larger surface water bodies receiving the discharge are expected to be minor.}

Groundwater users in vicinity of the CCNPP site are identified in Section 2.3.2.

4.2.2.9 Predicted Impacts on Water Users

{The impact of potential increased sediment loads in site runoff during construction would result in SMALL or no impacts to surface water users and affected areas.

Because groundwater from CCNPP Units 1 and 2 onsite wells will be used for construction, there might be impacts on local users that also make withdrawals from the Aquia aquifer.

Potential construction effluent impacts on aquifer groundwater quality would first be manifested in the Surficial aquifer. Construction activities are only expected to produce limited and temporary impacts in the Surficial aquifer. As described in Section 2.3.1, the Surficial aquifer is not used as a potable water source in the vicinity of the CCNPP site. Therefore, potential groundwater quality changes would not be expected to have any impact on possible users. Potential impacts to the deeper aquifers are dependant on the nature of the hydraulic connection between aquifers described in Section 4.2.1.1. Groundwater quality impacts on users of the deeper aquifer users are SMALL due to dilution and other contaminant attenuation effects that could occur along any effluent plume migration path.

The CCNPP site is located in U.S. EPA Region 3 (the District of Columbia, Delaware, Maryland, Pennsylvania, Virginia, and West Virginia). Six sole-source aquifers are identified in U.S. EPA Region 3 as shown in Figure 2.3.2-11. These are not located in southern Maryland. Thus, the addition of CCNPP Unit 3 is a SMALL impact to any sole source aquifer.}

4.2.2.10 Measures to Control Construction Related Impacts

The following measures will be taken to avoid runoff from the construction areas entering and potentially impacting downstream surface water bodies and groundwater, as applicable:

- Implementation of a SWPPP;
- Controlling runoff and potential spills using dikes, earthen berms, seeded ditches, and impoundments;
- Monitoring for contaminants within construction area impoundments and impoundments downstream of disturbed areas;
- Implementation of BMPs to protect against accidental discharge of contaminants (fuel spills, other fluids and solids that could degrade groundwater and surface water resources);
- Performing additional onsite surface and groundwater monitoring compared to established water quality benchmarks and historical site data; and

Bio-retention ditches are planned for the periphery of the power block, laydown, cooling tower and switchyard areas. The ditches are constructed of base materials that promote infiltration of runoff from low intensity rainfall events. However, for large storms the infiltration capacity of the base materials would be exceeded and the overflow pipes are provided to direct the runoff to the stormwater basins. The stormwater basins are unlined impoundments with simple earth-fill closure on the down stream end and include discharge piping to the adjacent watercourses.

Following the acquisition of the required permits and authorizations, site preparation activities include the installation or establishment of environmental controls to assist in controlling construction impacts to groundwater. These environmental controls include:

- Coffer Dams;

- Stormwater management systems;
- Spill containment controls;
- Silt screens;
- Settling basins; and
- Dust suppression systems.

These controls assist in protecting the {Surficial aquifer} by minimizing the potential for construction effluents to infiltrate directly into the subsurface or to carry possible contaminants to aquifer recharge areas.

Mitigation measures for barge slip dredging and construction activities in the area of the new intake structure and discharge outfall include:

- Restricting dredging only during certain times of the year to minimize impacts to aquatic species;
- Restricting dredging to only the areas identified for dredging;
- Installing a silt curtain around each dredge or active dredge area to minimize sediment release, as far as practicable, at the seabed/silt curtain interface and at the surface water level/silt curtain interface;
- Ensuring clam-shell dredges are fully closed and hoisted slowly to limit the amount of spillage;
- Not filling spoils barges to levels which will cause overflowing of materials during loading and moving;
- Not allowing vessel decks to be washed in such a way that allows material to be released overboard;
- Installing a sheet pile cofferdam and dewatering system to facilitate construction of the Unit 3 intake structure; and
- Carrying out water-quality monitoring in accordance with any permit requirements.

Additional measures to minimize or contain accidental releases of contaminants will be the establishment, maintenance, and monitoring of:

- Solid waste storage areas;
- Backfill borrow, spoils, and topsoil storage areas; and
- Site drainage patterns.

Groundwater monitor wells will be installed to assess gradient changes toward the excavation dewatering areas and potential groundwater quantity and quality changes.

Construction groundwater use impacts might be expected in the {Aquia aquifer and the groundwater withdrawals and potentiometric surface depression will be monitored. As mentioned in Section 4.2.1.1, salt water intrusion has not been identified as a problem in this area of Maryland.

As explained in Section 4.2.2.7, any contamination that might be introduced into the Surficial aquifer would be attenuated by the time it might reach deeper aquifers.}

4.2.2.11 Consultation with Federal, State and Local Environmental Organizations

The regulations guiding the implementation of Best Management Practices (BMPs) are provided by the {Maryland Department of the Environment (MDE, 1994)}. These regulations contain BMP installation instructions and typical construction activities which require BMPs. Monitoring of construction effluents and stormwater runoff would be performed as required in the stormwater management plan, NPDES permit, and other applicable permits obtained for the construction. The integrated permitting process for the applicable environmental permits will proceed concurrently with NRC review of the combined license application.

4.2.2.12 Compliance with Water Quality and Water Use Standards and Regulations

The regulations guiding the implementation of water quality and water use standards and regulations are provided by the {Maryland Department of the Environment (MDE, 1994)}. These regulations contain water quality and water use standards that must be adhered to during construction. In addition, site specific permits for various construction activities will contain conditions that must be complied with for the duration of the permitted activity.

4.2.2.13 Water Quality Requirements for Aquatic Ecosystems and Domestic Users

Section 4.3.2 discusses information pertaining to water quality requirements for aquatic ecosystems. {The USEPA declared Chesapeake Bay an impaired water body in 1998 based on the Federal Water Pollution Control Act (USC, 2007) due to excess nutrients and sediments. The Chesapeake Bay water is required to meet federal regulatory water quality standards by 2010 (USC, 2007).}

Domestic users of groundwater need to meet the State water quality standards for potable water systems.

4.2.2.14 References

{MDE, 1994. 1994 Standards and Specifications for Soil Erosion and Sediment Control, Website: http://www.mde.state.md.us/Programs/WaterPrograms/SedimentandStormwater/erosionsedimentcontrol/standards.asp, Date accessed: March 14, 2007.

TTNUS, 2007. Final Wetland Delineation Report, for Proposed UniStar Nuclear Project Area, Calvert Cliffs Nuclear Power Plant Site, Calvert County, Maryland, TetraTech NUS, May 2007

USC, 2007. Title 33, United States Code, Part 1251, Federal Water Pollution Control Act, 2007.

USGS, 2007. Hydrogeology of the Piney Point-Nanjemoy, Aquia, and Upper Patapsco aquifers, Naval Air Station Patuxent River and Webster Outlying Field, St. Mary's County, Maryland, 2000-06, USGS Scientific Investigations Report 2006-5266, 26p, U.S. Geological Survey, C. Klohe and R. Kay, 2007.}

Table 4.2-1 Estimated Amounts of Fresh Water by Construction Year Needed for CCNPP Unit 3[f] (Page 1 of 1)

Construction Year	1	2	3	4	5	6
People	8,550,000[a] gal (32,365,000 L)	25,650,000[b] gal (97,096,000 L)	25,650,000[b] gal (97,096,000 L)	25,650,000[b] gal (97,096,000 L)	25,650,000[b] gal (97,096,000 L)	
Concrete Mixing and Curing[c]	2,219,844 gal (8,403,000 L)	2,219,844 gal (8,403,000 L)	2,219,844 gal (8,403,000 L)	2,219,844 gal (8,403,000 L)	2,219,844 gal (8,403,000 L)	
Dust Control[d]	11,400,000 gal (43,154,000 L)	11,400,000 gal (43,154,000 L)	11,400,000 gal (43,154,000 L)	11,400,000 gal (43,154,000 L)	11,400,000 gal (43,154,000 L)	
Subtotal	22,169,844 gal (83,922,000 L)	39,269,844 gal (148,650,000 L)	39,269,844 gal (148,650,000 L)	39,269,844 gal (148,650,000 L)	39,269,844 gal (148,650,000 L)	26,179,896[e] gal (99,102,000 L)

Notes:

(a) Estimated at 1,000 persons using 30 gal (113.6 L) per day for 285 days per year.

(b) Estimated at 3,000 persons using 30 gal (113.6 L) per day for 285 days per year.

(c) Estimated at 6,700 cubic yards (5,122.5 m^3) per month using 27.61 gal (104.5 L) per cubic yard and 12 months per year.

(d) Estimated at 40,000 gal (151,400 L) per day for 285 days per year.

(e) Estimated at two-thirds of the amount used in any year 2 through 5.

(f) Water for construction would largely come from the existing onsite groundwater production wells. For construction years 1-4, the construction water would be supplied by a combination of onsite well water, trucked in supply, and storage tanks. The desalinization plant would be operational to meet freshwater supply needs during construction years five and six.

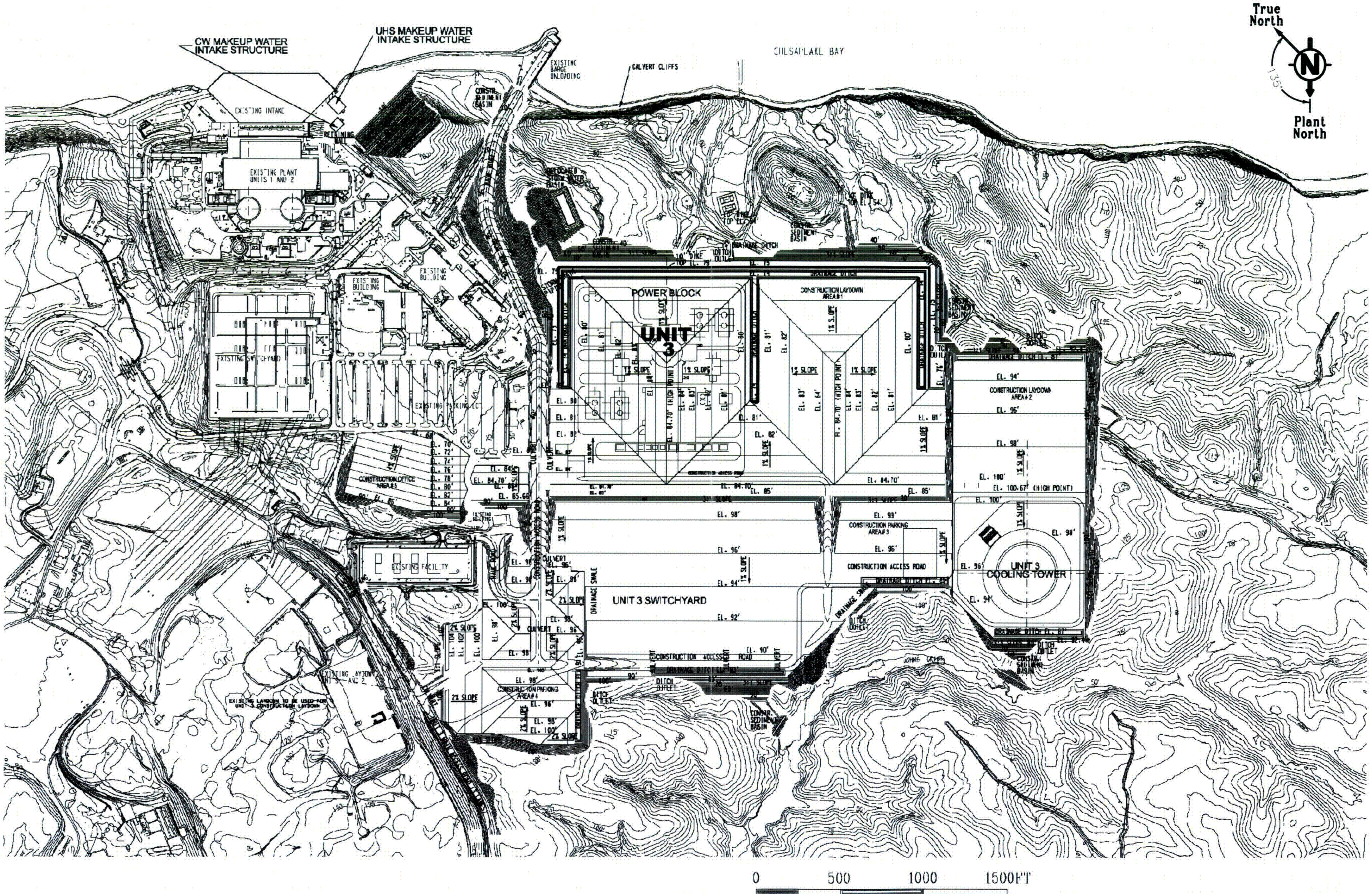

FIGURE 4.2-1 **Rev. 0**

FINAL SITE GRADING PLAN

{CCNPP UNIT 3}

CCNPP UNIT 3 ER

4.3 Ecological Impacts

4.3 <u>ECOLOGICAL IMPACT</u>

4.3.1 TERRESTRIAL ECOSYSTEMS

{This section describes the impacts of construction on the terrestrial ecosystem. Construction would require the permanent or temporary disturbance of approximately 435 acres (176 hectares) of terrestrial habitat on the CCNPP site as shown in Figure 4.3-1. This area is assumed to be the maximum area of soil to be exposed at any time. Approximately 264 acres (107 hectares) of the affected terrestrial habitat would be permanently converted to structures, pavement, or other intensively-maintained exterior grounds to accommodate the proposed power block, cooling tower, switchyard, roadways, permanent construction laydown area, borrow area, retention basins, and permanent parking lots. The remaining disturbed area of approximately 171 acres (69 hectares) would be only temporarily disturbed to accommodate the batch plant, temporary construction laydown areas, temporary construction offices and warehouses, and temporary construction parking. The temporarily disturbed habitats would be restored to a naturally vegetated condition once construction activities are complete. The permanent loss of affected terrestrial habitat of 264 acres (107 hectares) is small compared to the 1,796,718 acres (724,242 hectares) in the region as shown in Table 2.2.3-1. Approximately 11 acres (4.5 hectares) of the lost terrestrial habitat is wetlands compared to 240,288 acres (97,245 hectares) of wetlands in the region as shown in Table 2.2.3-1. Figure 2.2.1-1 shows the CCNPP site boundary and the major buildings to be constructed. Figure 4.3-2 shows the land to be cleared, the waste disposal area and the construction zone.

Dredging will take place at the barge area to accommodate delivery of large components. Dredging will also be performed to allow for construction of the discharge line from the circulating water system. Dredged material will be disposed of in the previously used disposal area know as Lake Davies.

The construction footprint was designed to minimize impacts to terrestrial ecosystems, specifically lands within the Chesapeake Bay Critical Area (CBCA), which encompasses lands within 1,000 ft (305 m) of the mean high tide level on the shoreline; locations of federally-designated or state-designated threatened or endangered species; wetlands; wetland buffers designated by Calvert County; and forest cover, especially riparian forests, forested slopes, and large blocks of contiguous forest that provide habitat for forest dwelling species forest interior dwelling species (FIDS).

The proposed footprint of construction within the CBCA would be limited to approximately 30.3 acres (12.3 hectares), including approximately 0.4 acres (0.16 hectares) in the CBCA Buffer (extending 100 ft [30.5 m] landward of mean high tide) and approximately 29.9 acres (12.1 hectares) in the remainder of the CBCA. The CBCA encroachment is due to the water intake structures and pipelines, the discharge pipelines, the heavy haul road from the barge dock, stormwater retention basins, and security fencing. The affected land within the CBCA has already been designated by Calvert County as an intensively developed area (IDA) due to the presence of a barge dock serving the existing CCNPP Units 1 and 2.

None of the sandy cliff or beach areas on the CCNPP site that provide suitable habitat for the puritan tiger beetle or northeastern beach tiger beetle will be disturbed because their habitat is north of the construction footprint. No construction will take place within 1,500 ft of three bald eagle nests known to occur on the CCNPP site. However, a new bald eagle nest first observed within the construction footprint in 2007 may have to be mitigated after consultations and in agreement with the appropriate agencies.

It is not possible to construct the proposed facilities without adversely impacting terrestrial ecosystems, including wetlands, wetland buffers designated by Calvert County, and FIDS habitat. Construction activities will start after the State of Maryland issues the appropriate permits to start clearing and grading of the site. Activities to construct nonsafety-related systems and structures are expected to begin December 2009. Construction is expected to be complete by July 2015.}

4.3.1.1 Vegetation

{Plant Communities and Habitats: Clearing and grubbing would result in the vegetation losses shown in Figure 4.3-1 and summarized in Table 4.3.1-1. The losses would include approximately 191 acres (77 hectares) of mature forest cover consisting of well developed tree canopy and understory strata and dominant trees over 12 in (30 cm) in diameter at breast height (DBH), including:

- Approximately 179 acres (72 hectares) of mixed deciduous forest,
- Approximately 1.4 acres (0.6 hectares) of well-drained bottomland deciduous forest, and
- Approximately 11 acres (4.5 hectares) of poorly drained bottomland deciduous forest.

The losses would also include approximately 61 acres (25 hectares) of younger, fast growing forest cover, including:

- Approximately 48 acres (19 hectares) of mixed deciduous regeneration forest, and
- Approximately 13 acres (5 hectares) of successional hardwood forest.

Other vegetation losses would include:

- Approximately 125 acres (51 hectares) of old field vegetation,
- Approximately 3.3 acres (1.3 hectares) of herbaceous marsh vegetation,
- Approximately 51 acres (21 hectares) of lawns, and
- Approximately 3 acres (1.2 hectares) of shallow water with submerged vegetation (Camp Conoy Fishing Pond).

As indicated in Table 4.3.1-1, each of the affected types of vegetation is common throughout the CCNPP Site.

The boundaries of vegetated areas subject to clearing and grubbing will be prominently marked prior to site preparation. Merchantable timber within marked areas may be harvested prior to site preparation. Merchantable timber occurs only in areas of mixed deciduous forest, well-drained bottomland deciduous forest, and poorly drained bottomland deciduous forest. Remaining trees will then be felled. Stumps, shrubs, and saplings will be grubbed, and groundcover and leaf litter will be cleared to prepare the land surface for grading. Felled trees, stumps, and other woody material would be disposed of by burning, chipping and spreading the wood chips, and/or sent to an offsite landfill. Opportunities to recycle woody material for use elsewhere on the CCNPP site or for sale to the public may be considered. Recycling opportunities could include cutting logs into firewood, using wood chips to mulch landscaped areas, using logs to line pathways, piling logs and brush in open fields to improve terrestrial wildlife habitat, and placing stumps (root wads) in stream channels to prevent bank erosion and enhance aquatic habitat.

Because of the need for grading broad contiguous areas of land to construct the power block, switchyard, and cooling tower, there will be no practicable opportunities to preserve individual trees within those areas. However, a biologist would examine forested areas subject to clearing for the temporary construction parking areas, construction office and warehouse area, and construction laydown areas for aesthetically outstanding trees or clusters of trees that might be capable of preservation without interfering with construction activities. Only trees where a minimum of 70% of the critical root zone can be left ungraded without interfering with construction activities would be identified for preservation. The critical root zone is defined by the Maryland Department of Natural Resources (MDNR) as a circular zone surrounding a tree trunk with a radius of 1 ft (0.3 meter) for each inch DBH (and a minimum radius of 8 ft (2.4 m) (MDNR, 1997). The critical root zone would be marked consistent with the State Forest Conservation Technical Manual (MDNR, 1997).

Silt fences will be erected around the perimeter of the construction footprint to reduce the potential for sedimentation of adjoining vegetated areas. Detailed specifications for the silt fences and vegetative stabilization will be presented in a soil erosion and sediment control plan approved by the MDE prior to site disturbance. Soil piles will be covered with plastic or bermed until removed during backfill and final grading activities. Monitoring of construction effluents and storm water runoff will be performed as required by the Storm Water Management Plan, the NPDES permit, and other applicable permits obtained for construction.

<u>Important Habitats</u>: The construction footprint was designed to minimize encroachment into habitats identified in Section 2.4.1 as important. Three habitats on the CCNPP Site were identified as important. Poorly drained bottomland deciduous forest and herbaceous marsh vegetation meet the definition of wetlands protected under federal and state regulations. Well-drained bottomland deciduous forest is important because of its occurrence in riparian settings. Site preparation will result in the permanent loss (filling) of approximately 17 acres (6.9 hectares) of wetland habitats, including approximately 11 acres (4.5 hectares) of poorly drained bottomland deciduous forest, approximately 3 acres (1.2 hectares) of herbaceous marsh vegetation, and approximately 3 acres (1.2 hectares) of shallow open water in the Camp Conoy fishing pond supporting submerged vegetation. Site preparation also results in the permanent loss of approximately 1.4 acres (0.6 hectares) of well-drained bottomland deciduous forest. Wetland impacts are discussed in more detail in Section 4.3.1.3.

<u>Important Plant Species</u>: The chestnut oak, tulip poplar, mountain laurel, and New York fern were identified in Section 2.4.1 as important because they are key contributors to the overall structure and ecological function of forested plant communities on the CCNPP site. Chestnut oak, which is dominant or codominant in the canopy throughout most of the mixed deciduous forest on the CCNPP site, is a slow growing tree species that is difficult to grow and transplant (Hightshoe, 1988). Similarly hard to grow species common in the mixed deciduous forest on the CCNPP site includes white oak, bitternut hickory, and pignut hickory (TTNUS, 2007a). Mountain laurel, which forms a dense understory over much of the mixed deciduous forest (TTNUS, 2007b), is also a slow growing species and is difficult to transplant (Hightshoe, 1988). Even though mixed deciduous forest can be replanted, several hundred years could be necessary to restore the oaks, hickories, and mountain laurel to their present sizes in the restored forest cover. Any losses of cover by these species, even in areas of only temporary disturbance where forest vegetation can be replanted, must therefore be considered effectively permanent.

The showy goldenrod, Shumard's oak, and spurred butterfly pea were identified in Section 2.4.1 as important because they are listed by the State of Maryland as threatened or rare. Spurred butterfly pea was observed during a rare plant survey conducted in 2006 only in areas outside of the proposed construction footprint (TTNUS, 2007b) and therefore will not be adversely affected. Shumard's oak was observed outside of but very close to within 50 ft (15 m) the western edge of the proposed construction area for the cooling tower. The observed specimens of Shumard's oak do not have to be cut down to allow site preparation, but portions of their root systems could experience compaction or other physical disturbances. Careful protection of trees at the edge of the cooling tower construction area will be necessary to prevent mortality of the observed Shumard's oak specimens. Clusters of showy goldenrod (listed as threatened by Maryland) were observed in the 2006 surveys within the proposed construction footprint for the power block, at the edges of forested areas within Camp Conoy (TTNUS, 2007d). The clusters of showy goldenrod will be transplanted to open field areas outside of the construction footprint.

4.3.1.2 Fauna

{The vegetation losses summarized in Table 4.3.1-1 will reduce the habitat available to mammals, birds, and other fauna that inhabit the CCNPP Site and surrounding region. Some smaller, less mobile fauna such as mice, shrews, and voles could be killed by heavy equipment used in clearing, grubbing, and grading. Larger, more mobile fauna will be displaced to adjoining terrestrial habitats, which could experience temporary increases in population density of certain species. If the increases exceed the carrying capacity of those habitats, the habitats could experience degradation and the displaced fauna could compete with other fauna for food and cover, resulting in a die-off of individuals until populations decline to below the carrying capacity. Potential impacts to specific fauna species identified in Section 2.4.1 as important are discussed below.

<u>White-tail Deer</u>: White-tail deer, which are identified in Section 2.4.1 as important because of their recreational value to hunters, are abundant throughout the CCNPP site (TTNUS, 2007c) and throughout Maryland. Deer populations have generally increased rather than decreased as Maryland and Virginia have become more densely developed (Fergus, 2003). When deer populations exceed the carrying capacity of forested habitats, as is common in Maryland and Virginia, shrubs and saplings can be killed or stunted by over-browsing (Fergus, 2003). Although some CCNPP personnel have noticed browse damage to understory forest vegetation on the CCNPP site, the damage is not yet severe (TTNUS, 2007c). Displaced deer can be expected to cause greater browsing and trampling of the understory of forested areas surrounding the proposed construction. The effects from increased browsing by displaced deer could be at least partially offset by increased hunting in public lands to the north and south.

<u>Scarlet Tanager and Other Forest Interior Dwelling Species (FIDS)</u>: The scarlet tanager was identified as important because it represents one of several MDNR-designated FIDS (listed in "A Guide to the Conservation of Forest Interior Dwelling Birds in the Chesapeake Bay Critical Area" (CAC, 2000)) observed on the CCNPP Site in 2006 (TTNUS, 2007c). The construction footprint was designed to minimize fragmentation of forest cover to the extent possible. The proposed power block will be situated in an area where the forest cover has already been fragmented by the lawns and playing fields of Camp Conoy. The proposed batch plant, construction laydown areas, construction office and warehouse area, and construction parking area will be situated in areas where the forest cover has already been fragmented by former agricultural fields, dredge spoil disposal, and existing roadways. Construction of CCNPP facilities will not substantially contribute to increased fragmentation of forest cover or loss of habitat for the scarlet tanager or other FIDS.

Construction of the proposed switchyard, cooling tower, and construction offices and warehouses would encroach into areas of unfragmented forest north and east of the headwaters to Johns Creek and south of Camp Conoy. The only alternative to siting the facilities in the forested areas west and south of the proposed power block location would be to site them to the east, which would encroach into the CBCA. Construction of the facilities would therefore reduce the availability of suitable habitat in the region to the scarlet tanager and other FIDS. However, the reduction would be minimized because the forest clearing would take place in blocks beginning at the edge of the forested landscapes rather than as clearings or strips that encroach deeper into the forest interior.

Bald Eagle: The bald eagle was identified as important because of its status as a federal and state listed threatened species. Three known bald eagle nesting sites were present on the CCNPP site in 2006, although one nest was determined in 2007 to no longer be active (TTNUS, 2007c). The proposed construction footprint does not encroach within a 1,500 ft (457 meter) circular setback surrounding each of the three nesting sites. However, bald eagles established a new nest after the 2006 breeding season in a tree adjoining a ball field in Camp Conoy (Figure 2.4-2). The new nest was first observed in April 2007. Two adult bald eagles were observed circling the nest, suggesting that it was active. Because the nest is located within an area that will be impacted by construction, the Maryland Department of Natural Resources and U.S. Fish and Wildlife Service will be consulted regarding avoidance and appropriate mitigation measures.

Puritan Tiger Beetle and Northeastern Beach Tiger Beetle: The proposed construction activities would have no potential to affect the puritan tiger beetle or northeastern beach tiger beetle, which were identified as important because of their federal threatened status. Both species have highly specific habitat requirements that limit their potential occurrence on the CCNPP site to the sandy cliffs adjoining undeveloped shoreline stretches of the Chesapeake Bay (USFWS, 1993; USFWS, 1994). No construction activities would take place on or within 500 ft (152 m) of any cliff or beach habitats which are all located further south of CCNPP Units 1 and 2. The proposed intake and discharge pipelines and heavy haul road have been routed to impact the Chesapeake Bay shoreline at either the existing CCNPP Units 1 and 2 intake structure or just to the south near the barge slip where the shoreline consists of armored fill soil, a habitat unsuitable for either tiger beetle species.

The results of the 2006 survey (Knisley, 2006) indicated that the work proposed at the CCNPP site will not have any effect on the puritan or northeastern beach tiger beetles or their habitats. However, since the beach south of the barge slip is favorable habitat for the puritan tiger beetle, mitigation measures will consist of administrative controls such as posting signage or fencing off the beach south of the barge slip area, to restrict personnel access.

Bird Collisions: The tallest structure constructed as part of CCNPP Unit 3 is the cooling tower, with a height of 164 ft (50 m). The tower will be the tallest structure in the vicinity, which is predominantly rural. Assuming a tree canopy height of approximately 80 ft (24 m), the tower would protrude 84 ft (36 m) over the surrounding tree canopy. Because the tower would be constructed at a location with a ground surface elevation of 120 ft (37 m) above mean sea level (USGS, 1987), its top would be approximately 284 ft (86 m) above mean sea level, and hence 284 ft (86 m) above the water surface of the Chesapeake Bay.

Some bird mortality would likely result from collisions with the cooling tower, but the expected mortality would be low and unlikely to significantly affect populations of migratory bird species. There are few published data regarding bird collision mortality with cooling towers. However, research was conducted in the early 1970s on the potential for bird collisions with cooling towers at the Davis-Besse Nuclear Power Station. Over 80 bird mortalities were reported in 1973 due to collisions with a 495 ft tall cooling tower constructed on the southeast shore of Lake Erie as part of the Davis-Besse Nuclear Power Station (Rybak, 1973). However, the Davis-Besse tower is 495 ft in height, more than 350 ft taller than the proposed CCNPP cooling tower.

Monitoring conducted at the Davis-Besse Nuclear Power Station between Fall 1972 and Fall 1979 revealed a total of 1,561 bird carcasses, of which 78.7% (approximately 1,229 carcasses) were attributed to collisions with the cooling tower. Most of the carcasses were species that migrate at night such as warblers (Family *Parulidae*), vireos (Family *Vironidae*), and kinglets (Family *Sylvidae*) (Temme, 1979). Many warbler and vireo species are suffering substantial population declines due at least in part to forest fragmentation (Askins, 2000) and have been identified as FIDS by the MDNR (CAC, 2000). Substantial numbers of warblers, vireos, and kinglets likely migrate through the extensive forested lands on and around the CCNPP site, and warblers of multiple species as well as the red-eyed vireo (*Vireo olivaceus*) were observed on the CCNPP site in 2006 (TTNUS, 2007c). Some individual warbler and vireo mortality events due to collisions with the cooling tower must therefore be expected. Due to the low height of the proposed cooling tower, the mortality should not have an adverse effect on populations of any bird species. Measures such as reducing the lighting on the cooling tower to the minimum required by the Federal Aviation Administration and using flashing lights instead of floodlights have been shown to be effective in reducing the incidence of bird collisions (Ogden, 1996).

The construction of the onsite transmission lines could injure birds if they collide with the new conductors or towers or by electrocution if birds with large wingspans contact more than one conductor (i.e., cross phases). However, the transmission line connections will be constructed in, and adjoining other developed areas, and would not fragment natural bird habitats. Regularly occurring noise from human activity will also discourage frequent visitation by birds. The new towers would not be higher that the existing towers on the CCNPP site, and thus would be no more likely to increase bird collisions than the existing towers.

No new offsite transmission corridors and no offsite areas are impacted since no changes are required to the existing transmission lines or towers.}

4.3.1.3 Wetlands

{The construction footprint for the proposed facilities has been designed to minimize encroachment into areas delineated as wetlands or other waters of the U.S. However, construction of the proposed facilities would not be possible without permanently filling approximately 12,590 linear feet (3,837 m) of intermittent and upper perennial stream channels and approximately 18.6 acres (7.5 hectares) of the delineated areas (Table 4.3.1-2). The project would therefore require an individual permit under Section 404 of the Federal Water Pollution Act (USC, 2007) from the Baltimore District of the U.S. Army Corps of Engineers (USACE). The project does not qualify for approval under the Maryland Programmatic General Permit because of the extent of the affected regulated areas and because constructing the intake and discharge pipelines and dredging to allow larger vessels to access the existing CCNPP barge slip requires work within the traditionally navigable waters of the Chesapeake Bay.

Because all of the affected wetlands are non-tidal, the project would also require a permit from the Maryland Department of the Environment (MDE) under the Maryland Non-tidal Wetlands Protection Act (COMAR, 2005). The project would also disturb approximately 48 acres (19.4 hectares) of land defined as non-tidal wetland buffer by Calvert County under the Maryland Non-tidal Wetlands Protection Act (COMAR, 2005). Non-tidal wetland buffer is defined by Calvert County as lands within 50 ft (15 m) of the landward (up-gradient) edge of non-tidal wetlands, as delineated using the federal methodology. The act also regulates expanded non-tidal wetland buffers extending as far as 100 ft (30.5 m) from the landward edge of Wetlands of Special State Concern. However, no Wetlands of Special State Concern have been identified for the CCNPP site. The permits and authorizations required for the project are presented in Section 1.3.

Most of the wetland fill would take place in Wetland Assessment Areas I, II, IV and VII described in the wetland delineation report (TTNUS, 2007d). Only small areas of wetlands would be filled in Wetland Assessment Areas V or VI. None of the wetlands directly adjacent to Johns Creek (in Wetland Assessment Area V) or Goldstein Branch (in Wetland Assessment Area VII) would be filled, although some wetlands adjacent to headwaters to those streams would be filled. No wetlands or non-tidal wetland buffers would be disturbed in Wetland Assessment Area III, which is located more than 500 ft (152 m) south of where the permanent laydown area south of the power block would be constructed, or Wetland Assessment Area VIII, which is located more than 500 ft (152 m) north of where the construction access road would be constructed.

Wetland Assessment Area I: Grading to construct the power block and heavy haul road will fill 0.92 acres (0.37 hectares) of Wetland Assessment Area I. Most of the fill would encompass approximately 2,160 linear feet (658 m) of intermittent and upper perennial stream channels and adjacent forested wetlands, totaling 0.90 acre (0.36 hectares). The affected stream channels have been deeply scoured by surface runoff and are adjoined by very narrow strips of forested wetlands that are less than 5 ft (1.5 m) in width and bounded by steep, eroding banks (TTNUS, 2007d). Grading to build the heavy haul road would also require filling approximately 0.02 acres (0.01 hectares) of open water at the southern edge of an existing stormwater retention basin near the barge dock. Construction activities will also disturb 6.45 acres (2.61 hectares) of uplands within 50 ft (15 m) of Wetland Assessment Area I designated as non-tidal wetland buffer by Calvert County. The affected buffer consists mostly of undeveloped forested land. Because the structural components of the power block must be closely spaced over an evenly graded surface for effective operation, it is not possible to fragment the pad to allow preservation of the stream or wetlands.

Approximately 0.40 acres (0.16 hectares) of the affected portions of Wetland Assessment Area I are located in the CBCA. However, none lie within 100 ft (30.5 m) of mean high tide on the Chesapeake Bay shoreline (the CBCA Buffer). Construction within the CBCA, including the eastern (down-gradient) portions of Wetland Assessment Area I, is necessary to connect the proposed power block to an existing barge dock that presently serves CCNPP Units 1 and 2.

The losses of the wetland features in Wetland Assessment Area I would not represent a substantial loss in terms of wetland functions or values. Wetland functions are physical, chemical, and biological processes or attributes of wetlands that are vital to the integrity of a wetland system, independent of how those benefits are perceived by society. Wetland values are attributes that are not necessarily important to the integrity of a wetland system but which are perceived as valuable to society (Adamus, 1991). A functional assessment included in the wetland delineation report (TTNUS, 2007d) identified only two functions (and no values) present in Wetland Assessment Area I: groundwater recharge/discharge and wildlife habitat. Neither was identified as principal, i.e., of high importance to regional ecosystems or society at a local, regional, or national level. The low number of functions and values identified for Wetland Assessment Area I generally reflects the severely eroded and scoured condition of the stream channels and banks, the narrowness of the adjacent vegetated wetlands, and proximity to existing developed areas associated with CCNPP Units 1 and 2 (TTNUS, 2007d).

Wetland Assessment Area II: Preparation of the proposed permanent construction laydown area south of the power block will fill 4.95 acres (2.0 hectares) of Wetland Assessment Area II. Filled areas will include 2.66 acres (1.08 hectares) of open water comprising the Camp Conoy Fishing Pond as well as approximately 0.78 acres (0.32 hectares) of emergent wetlands and 1.50 acres

(0.6 hectares) of forested wetlands fringing the pond and the adjoining 1,150 linear feet (351 m) of intermittent and upper perennial stream channels flowing into or out of the pond. Construction would also disturb 7.18 acres (2.91 hectares) of uplands within 50 ft (15 m) of Wetland Assessment Area II designated as non-tidal wetland buffer by Calvert County. The affected buffer consists mostly of undeveloped forested land.

Impacts to Wetland Assessment Area II would be within the CBCA, but will be 0.35 acres (0.14 hectares) limited to the most landward (westernmost) 200 ft (61 m) of the CBCA. Approximately 0.85 acre (0.34 hectares) of uplands, all undeveloped forest land, in the CBCA designated by Calvert County as non-tidal wetland buffer would be impacted. No areas of Wetland Assessment Area II within 800 ft (244 m) of the Chesapeake Bay will be impacted, including the two small impoundments on the stream flowing northeast from the Camp Conoy Fishing Pond to the Bay.

Although the power block could be constructed without disturbing Wetland Assessment Area II or its associated non-tidal wetland buffer, relocating the proposed construction laydown area to a more distant upland location will require transporting workers and equipment over distances greater than one mile (1.6 km) on a regular basis. The laydown area will be graded to a size, shape, and grade suitable for use for a laydown area during construction and as needed for operation. It may be possible to reconfigure the proposed permanent laydown area to avoid some of the affected wetlands or buffer. However, the area would then not be suitable for future use as a laydown area during plant operation.

The evaluation of wetland functions and values included in the wetland delineation report (TTNUS, 2007d) identified seven functions (groundwater recharge/discharge, fish and shellfish habitat, sediment/toxicant retention, nutrient removal, production export, sediment/shoreline stabilization and wildlife habitat) and three values (recreation, educational/scientific value, and uniqueness/heritage) present in Wetland Assessment Area II. Of these, wildlife habitat and recreation have been identified as principal. Wildlife habitat was identified as a principal function because of the diversity of vegetative cover in the wetlands and adjoining uplands. Recreation was identified as a principal value because of the trails, dock, and other facilities at the Camp Conoy fishing pond. The loss of the wetlands and wetland buffer in Wetland Assessment Area II therefore represents a substantial reduction in the local availability of quality wildlife habitat. The loss of the Camp Conoy Fishing Pond constitutes the loss of an outdoor recreational facility that previously provided picnicking, fishing, and canoeing opportunities for Constellation employees and their guests.

<u>Wetland Assessment Area III</u>: No part of Wetland Assessment Area III or its associated on-tidal wetland buffer designated by Calvert County would be filled.

<u>Wetland Assessment Area IV</u>: Construction of the proposed switchyard will require filling 5.3 acres (2.1 hectares) of wetlands and other waters of the U.S. in Wetland Assessment Area IV, including approximately 4,870 linear feet (1,484 m) of intermittent and perennial wetland to Johns Creek and adjacent forested wetlands. The affected area includes intermittent and perennial stream channels, forested wetlands, and forested springs associated with a generally southwest-flowing headwater of Johns Creek. Construction will also disturb 15.3 acres (6.2 hectares) of uplands within 50 ft (15 m) of Wetland Assessment Area IV designated as non-tidal wetland buffer by Calvert County. The affected buffer consists mostly of undeveloped forest land. The wetland and wetland buffer impacts are unavoidable because the switchyard must be constructed adjacent to the power block.

Lands east of the power block are in the CBCA, lands south are needed for the cooling tower and laydown area, and lands north contain existing facilities. Hence, the only practicable location for the switchyard is west of the power block. The need for closely clustering the switchyard facilities over a contiguous, evenly graded area would prevent preserving the subject stream channels, springs, and wetlands. Construction of a 500 kV transmission line from the proposed switchyard to the existing 500 kV transmission line on the CCNPP site will require clearing trees in 0.31 acres (0.13 hectares) of additional forested wetlands in Wetland Assessment Area IV (adjoining approximately 520 linear feet (158 m) of intermittent stream channel), as well as in 1.85 acres (0.75 hectares) of additional forested uplands designated as non-tidal wetland buffer by Calvert County. No grading would be constructed in the subject wetlands or wetland buffer; disturbance would be limited to tree and shrub removal only. Surface soils within the affected wetlands and buffer will remain undisturbed, as would the pattern of surface runoff. The vegetation impacts to the affected wetlands and buffer are necessary because trees growing close to a 500 kV electric conductor must be removed to prevent possible outages. The transmission line is needed to convey electric power generated by the proposed power block to existing transmission lines that connect to the regional power grid.

The evaluation of wetland functions and values included in the wetland delineation report (TTNUS, 2007d) identified five functions (groundwater recharge/discharge, sediment/toxicant retention, nutrient removal, production export, and wildlife habitat) and three values (recreation, educational/scientific value, and uniqueness/heritage) present in Wetland Assessment Area IV. Of these, wildlife habitat and uniqueness/heritage were identified as principal. Wildlife habitat was identified as principal because of the presence of the wetlands within a large block of contiguous forest that provides habitat for FIDS. Uniqueness/heritage was identified as principal because of the fact that Johns Creek and its headwaters east of (MD) 2/4 represent one of the few stream systems in southern Calvert County that still remains largely free of development. The loss of the wetlands and wetland buffer in Assessment Area IV therefore represents a reduction in the local availability of quality wildlife habitat, including FIDS habitat, and a reduction in the availability of outdoor passive recreation facilities in the region.

Wetland Assessment Area V: No part of Wetland Assessment Area V or its associated non-tidal wetland buffer will be filled. The functional assessment included in the wetland delineation report (TTNUS, 2007d) identified more principal functions and values for Wetland Assessment Area V than for any other Wetland Assessment Area. The principal functions included wildlife habitat, fish and shellfish habitat, sediment/toxicant retention, nutrient removal, and production export. Uniqueness/heritage was identified as a principal value. Some key properties of Wetland Assessment Area V contributing to its functional superiority include the juxtaposition of forest and emergent wetland vegetation, the meandering and braided course of Johns Creek through the wetlands, and the extensive coverage by mature forest cover in the adjoining uplands. Avoiding encroachment into Wetland Assessment Area V and its associated non-tidal wetland buffers was therefore a key objective when selecting a route for the construction access road.

Wetland Assessment Area VI: Construction of a construction access road linking the power block to (MD) 2/4 will require filling 0.86 acre (0.35 hectares) of wetlands and other waters of the U.S. in Wetland Assessment Area VI. The affected area consists of 0.50 acre (0.20 hectares) of emergent wetland and 0.36 acre (0.15 hectares) of forested wetland comprising part of a former sediment basin associated with the Lake Davies dredged material disposal area. Construction will also disturb 1.12 acre (0.45 hectares) of uplands within 50 ft (15 m) of Wetland Assessment Area VI designated as non-tidal wetland buffer by Calvert County. The affected buffer consists mostly of undeveloped land supporting forest and old field vegetation. The access road was routed across the up-gradient (eastern) part of Wetland Assessment Area VI to avoid disturbing wetlands closer to Johns Creek and to avoid encroaching into the uplands to the east needed for temporary construction laydown.

Construction impacts to Wetland Assessment Area VI will not result in a substantial loss of wetland values or functions. The evaluation of wetland functions and values included in the wetland delineation report (TTNUS, 2007d) identified five functions (sediment/toxicant retention, nutrient removal, production export, sediment/shoreline stabilization, and wildlife habitat) but no values for Wetland Assessment Area VI. None of the identified functions were reported to be principal. The former Lake Davies sediment basins are man-made features rather than natural wetlands and are infested throughout by dense growth of the non-native invasive grass phragmites (*Phragmites australis*), which is of low value as food or cover by wildlife. The phragmites cover extends over most of the emergent wetlands and under the tree canopy in most of the forested wetlands, as well as most of the 50 ft (15 m) wetland buffer.

Wetland Assessment Area VII: Construction of the construction access road, batch plant, and temporary construction laydown areas will require filling 5.16 acres (2.09 hectares) of wetlands and other waters of the U.S. in Wetland Assessment Area IV, including 3,200 linear feet (975 m) of headwaters to Goldstein Branch and adjacent forested wetlands. The affected area includes intermittent and perennial stream channels, forested wetlands, and forested springs associated with headwaters to Goldstein Branch, but construction will not involve disturbing the main channel of Goldstein Branch or its directly adjoining wetlands. Construction will also disturb 12.76 acres (5.16 hectares) of uplands within 50 ft (15 m) of Wetland Assessment Area VII designated as non-tidal wetland buffer by Calvert County. The affected buffer consists mostly of undeveloped forested land.

The evaluation of wetland functions and values included in the wetland delineation report (TTNUS, 2007d) identified five functions (groundwater recharge/discharge, sediment/toxicant retention, nutrient removal, production export, and wildlife habitat) and three values (recreation, educational/scientific value, and uniqueness/heritage) present in Wetland Assessment Area IV. Of these, wildlife habitat and uniqueness/heritage have been identified as principal. Wildlife habitat was identified as principal because of the presence of the wetlands within a large block of contiguous forest that provides habitat for FIDS. Uniqueness/heritage was identified as principal because of the fact that Johns Creek and its headwaters east of (MD) 2/4 represent one of the few stream systems in southern Calvert County that still remains largely free of development. The loss of the wetlands and wetland buffer in Assessment Area IV therefore represents a reduction in the local availability of quality wildlife habitat and a reduction in the availability of outdoor passive recreation facilities in the local region.

Wetland Assessment Area IX: Construction of the parking lot will require filling the entirety of Wetland Assessment Area IX (1.12 acres (0.45 hectares)), including 0.64 acres (0.26 hectares) of emergent wetlands and 0.48 acres (0.19 hectares) of forested wetlands. Wetland Assessment Area IX consists of 1,200 linear feet (366 m) of multiple springs and small fragments of intermittent stream channels and ditches within a small remnant area of forest land surrounded by existing roadways and parking lots. Construction will also disturb 3.34 acres (1.35 hectares) of uplands within 50 ft (15 m) of Wetland Assessment Area IX designated as non-tidal wetland buffer by Calvert County. The affected buffer consists of undeveloped forested land and mowed grassland adjoining existing roadways.

The affected wetlands and associated buffers are of low functional quality. The evaluation of wetland functions and values included in the wetland delineation report (TTNUS, 2007d) identified only one function (wildlife habitat) and one value (visual quality/aesthetics). Neither was identified as principal. While the isolated forest area, including its wetlands, might have some value as an "oasis" for wildlife traversing the existing developed areas west of CCNPP Units 1 and 2, its small size and proximity to areas of heavy human and vehicular use make it generally unattractive to most terrestrial wildlife. Surface flow in the wetlands is all directed into existing storm sewers rather than into natural streams, hence the opportunity for the wetlands to perform water quality functions or production export to aquatic food chains is minimal. The loss of Wetland Assessment Area IX therefore represents a minimal loss of wetland functions and values.

4.3.1.4 Other Projects Within the Area with Potential Impacts

Although not a project, Calvert County is redirecting future residential and commercial development into existing clusters of urban development termed "town centers" away from the CBCA, including the cliffs and beaches that provide potential habitat for the two tiger beetle species and bald eagles (CCPC, 2004).

The EIS for the other large energy facility development project planned for Calvert County, the Cove Point Liquefied Natural Gas (LNG) expansion project indicates that no cliff or other naturally vegetated Chesapeake Bay habitat would be impacted by the project (FERC, 2005). The EIS also indicates that the one bald eagle nest near a proposed pipeline crossing of the Patuxent River in western Calvert County could be impacted by the construction. The developer of the project, Dominion Cove Point LNG, LP, has committed to the U.S. Fish and Wildlife Service (USFWS) to implement appropriate mitigation measures.

Calvert County has experienced extensive fragmentation of forest cover and loss of FIDS habitat due to agricultural and suburban development. The Cove Point LNG expansion project would limit forest clearing in the county to lands directly adjacent to the LNG and ancillary facilities and areas to the side of existing pipeline right-of-way (FERC 2005) and is unlikely to diminish FIDS habitat.

4.3.1.5 Consultation

Affected Federal, State and Regional agencies will be contacted regarding the potential impacts to the terrestrial ecosystem resulting from plant construction. {The Maryland Natural Heritage Program, operated by the Maryland Department of Natural Resources, was consulted for information on known occurrences of Federally-listed and State-listed threatened, endangered, or special status species and critical habitats (Byrne, 2006). Identification of the important species discussed above was based in part on information provided by that consultation. The U.S Fish and Wildlife Service was consulted via letter dated April 12, 2007 and responded on May 22, 2007 stating that no federally protected, threatened, or endangered species are known to exist with the proposed project area except for the occasional transient species, but qualified the response by stating that "if additional information on the distribution of listed or proposed species becomes available, this determination maybe reconsidered (Ratnaswamy, 2007), The consultation occurred prior identification of the eagle in the project vicinity (Section 4.3.1.2) and additional consultation is planned as stated in Section 4.3.1.2. USFWS and the Maryland Department of Natural Resources will be provided an opportunity to review the Environmental Report.}

4.3.1.6 Mitigation Measures

Opportunities for mitigating unavoidable impacts to terrestrial ecosystems involve restoration of natural habitats temporarily disturbed by construction creation of new habitat types in formerly disturbed areas, as well as enhancement of undisturbed natural habitats. Mitigation plans will be developed in consultation with the applicable State and local resource agencies and will be implemented on the CCNPP site to the extent practicable. The description of mitigation measures is addressed below for upland areas (flora and fauna) and wetland areas.

{Flora and Fauna: Mitigation to replace temporary and permanent impacts to upland areas (Table 4.3.1-1) will consist of reforestation as well as development of other appropriate naturally vegetated areas (e.g., meadows, shrub/scrub communities). Some areas on the CCNPP site may be available for mitigation, including lawns and old agricultural fields. Consideration will be given to mitigation within the CBCA as well as areas further inland. Because the areas of projected forest losses in the CBCA are already fragmented by roads and lawns in Camp Conoy and the roadways and open areas adjoining the barge dock, reforestation within the CBCA will contribute to the State of Maryland's goal of increased FIDS habitat in the CBCA (CAC, 2000). In addition, UniStar will keep the remaining unforested upland, not impacted by the construction of Unit 3, as old field habitat to maintain site biodiversity and provide a suitable location to transplant the showy goldenrod for the Camp Conoy area.

The reforestation process is designed to ultimately generate a mixed deciduous forest. Mixed deciduous forest is the climax vegetation, i.e., the permanently-sustaining vegetation that would result following an extended period without disturbance, for uplands in central Maryland, including Calvert County. The process by which unvegetated land reverts to climax vegetation is termed natural succession. Left undisturbed, abandoned agricultural land in central Maryland typically passes through a series of intermediate forest stages termed seres. The initial series consist of vegetation dominated by grasses and other herbaceous plants; then vegetation dominated by shrubs and tree saplings; then forest vegetation dominated by Virginia pines and hardwoods such as black locust and black cherry that grow rapidly in conditions of full sunlight; and finally forest dominated by oaks, tulip poplars, and other hardwoods that can regenerate under their own shade. The initial two series correspond to the old field vegetation on the CCNPP site, the intermediate series corresponds to the successional hardwood forest, and the final (climax) series corresponds to the mixed deciduous forest. The mixed deciduous regeneration forest is the result of logging mixed deciduous forest without killing the stumps and associated root systems; it therefore consists of a mixture of stump sprouts of climax tree species and fast-growing successional tree species and is intermediate in character between mixed deciduous forest and successional hardwood forest.

An optimal mix of tree species for planting includes tulip poplar, sweet gum, green ash, black locust, Virginia pine, and loblolly pine. All are relatively fast growing when properly planted, are easily transplanted and widely available as nursery stock (Hightshoe, 1988), and are components of the existing successional hardwood forest and/or mixed deciduous forest on the CCNPP site (TTNUS, 2007b). Based on reported growth rates (Hightshoe, 1988), a stand planted with bare-root or 1-gallon container-grown nursery stock of the above species would form a closed canopy forest resembling the existing successional hardwood forest or mixed deciduous regeneration forest within 20 to 30 years. At that point, the stand will provide habitat for FIDS. The Matapeake soils mapped in the subject area have a reported site index of 75 to 85 for loblolly pine (USSCS, 1971).The site index indicates the expected height for planted loblolly pine after 50 years. Site index data are not available for the other species, but the data for loblolly pine provides a general idea of growth rate for relatively fast growing tree species.

Oaks, beeches, and other shade-tolerant climax species would be expected to voluntarily establish in the shade of the stand as their nuts are dispersed naturally by squirrels and other wildlife. Mountain laurel and other understory and groundcover vegetation typical of mixed deciduous forests would also be expected to gradually become established under the shade of the closed canopy. The floristic composition of the stand will gradually approach that of the existing mixed deciduous forest on the CCNPP site, a process that could require more than 100 years.

A field survey will be needed during construction activities to determine the appropriate areas for onsite mitigation as forested and other naturally vegetated areas (meadows, shrub/scrub) and the best old field habitats to replant with the showy goldenrod. Therefore the exact locations and habitat type will be determined at a later date. As stated previously, mitigation plans will be developed in consultation with the State and local resource agencies.

Wetlands: Wetland mitigation in Maryland is driven primarily by conditions established by the USACE and MDE in permits issued under Section 404 of the Federal Water Pollution Control Act (USC, 2007) and the Maryland Nontidal Wetlands Protection Act (COMAR, 2005). Wetland mitigation follows a sequencing process beginning with avoidance of wetland impacts, then minimization of wetland impacts, and lastly compensatory mitigation to offset impacts. The proposed facilities have been sited, and the proposed construction has been configured, to avoid encroaching into wetlands (and a surrounding 50 ft (15 meter) wide buffer) to the extent possible. Other factors such as minimizing encroachment into the CBCA, keeping NRC-required buffers within the CCNPP site boundaries, and situating the power block close to the existing CCNPP units were considered; hence the wetland impacts detailed above must be considered unavoidable.

Several measures will be taken to minimize the unavoidable adverse effects to wetlands. The use of silt fences, temporary and permanent vegetative stabilization, and other soil erosion and sediment control practices would reduce the risk of sediment runoff into intact wetlands adjoining the areas of fill. Bio-retention ditches will be constructed around the periphery of the power block, construction laydown area, cooling tower and switchyard areas to help catch surface runoff and prevent degradation of adjoining terrestrial and aquatic habitats. The ditches would be constructed of base materials that promote infiltration of runoff from low intensity rainfall events. However, for large storms the infiltration capacity of the base materials would be exceeded and the overflow pipes would direct the runoff to the stormwater retention basins. The stormwater retention basins would be unlined impoundments, vegetated with regionally indigenous wetland grasses and herbs, with simple earth-fill closure on the down stream end and could include discharge piping to the adjacent watercourses.

Commonly used forms of compensatory wetland mitigation include restoration or enhancement of degraded wetlands, creating (constructing) wetlands in areas that are not wetland, and preserving areas of intact wetlands,. The proposed wetland impacts would be permanent; hence, restoring the filled wetlands after completion of construction activities would not be possible.

Several opportunities exist to enhance existing wetlands on the CCNPP site. Several of the wetlands in peripheral areas of the CCNPP site will not be filled during construction have become infested with near-monocultures of the invasive grass *Phragmites*. Eradicating *Phragmites* from those wetlands and restoring regionally indigenous wetland vegetation in its place is an applicable form of wetland mitigation. Several stream channels in some peripheral parts of the CCNPP site have become scoured by runoff. Efforts to stabilize eroding channel banks and divert runoff from streams would be another possible form of wetland mitigation. Opportunities may exist to construct new wetlands on the CCNPP site. The soils and surface hydrology of any candidate area for wetland creation would have to be evaluated in detail to quantitatively determine that wetland construction is feasible.

In summary, the following mitigation measures will be implemented for wetlands:

- The use of silt fences, temporary and permanent vegetative stabilization, and other soil erosion and sediment control practices will be implemented to reduce the risk of sediment runoff into intact wetlands adjoining the areas of fill;
- Dust suppression methods will be implemented such as using bag houses on the concrete batch plant, watering unpaved roads throughout the construction site and watering during backfill operations;
- Bio-retention ditches will be constructed around the periphery of the power block, construction laydown area, cooling tower and switchyard areas to help catch surface runoff and prevent degradation of adjoining terrestrial and aquatic habitats;
- *Phragmites* Eradication from infested onsite wetlands and restoration of regionally indigenous wetland vegetation in its place;
- Stabilization of eroding channel banks near the areas impacted by the construction of CCNPP Unit 3;
- Restoration of wetland and wetland buffer temporarily disturbed during construction; and
- If practicable, construction of new wetlands in favorable areas of the CCNPP site.

A field survey will be needed during construction activities to determine appropriate areas for onsite wetland mitigation. Therefore, the exact location and size of areas to be constructed for wetlands would be determined at a later date. As stated previously, mitigation plans will be developed in consultation with the state and local resource agencies.}

4.3.2 AQUATIC ECOSYSTEMS

{This section provides an assessment of the potential impact construction activities will have on aquatic ecosystems to impoundments and streams onsite and to the Chesapeake Bay offsite. New transmission lines and access corridors are limited to the CCNPP site. The existing transmission corridor will be used offsite.

As shown in Table 4.3-2, 2.69 acres (1.09 hectares), of the affected aquatic habitat, will be permanently converted to structures, pavement, or other intensively-maintained exterior grounds to accommodate the proposed power block, cooling tower, switchyard, roadways, permanent construction laydown area, borrow area, retention basins, and permanent parking lots. The permanent loss of affected aquatic habitat of 2.69 acres (1.09 hectares) is small compared to the 1,548,769 acres (626,787 hectares) in the region as shown in Table 2.2.3-1. Figure 2.2.1-1 shows the CCNPP site boundary and the major buildings to be constructed. Figure 4.3-2 shows the land to be cleared, the waste disposal area and the construction zone. A topographic map is provided as Figure 2.3.1-2, showing the important aquatic habitats. A similar analysis is discussed for wetlands in Section 4.3.1.

Section 4.2 includes a footprint of the construction area and a description of construction methods. Construction activities will start after the State of Maryland issues the appropriate permits to start clearing and grading of the CCNPP site. Activities to construct non-safety-related systems and structures will begin after that. The NRC combined license is expected by March 2011 which will allow construction of safety-related systems and structures. Construction is expected to be complete by July 2015 as discussed in Section 1.2.7.}

4.3.2.1 Impacts to Impoundments and Streams

{The construction footprint of CCNPP Unit 3 covers 420 acres (170 hectares) including many separate wetland and surface water areas. Construction effects to aquatic habitats in the immediate area range from temporary disturbance to complete destruction. The following surface water bodies are potentially affected by construction activities:

- Two unnamed streams (Branch 1 and Branch 2) on the eastern side of the drainage divide, Branch 1 being downstream of the Camp Conoy Fishing Pond;
- Johns Creek, Branch 3 and Branch 4, and the unnamed headwater tributaries;
- Goldstein Branch;
- Laveel Branch;
- Camp Conoy Fishing Pond and two downstream impoundments;
- Lake Davies and two unnamed impoundments within the Lake Davies dredge spoils disposal area; and
- Chesapeake Bay and Patuxent River.

As described in Section 4.2.2.2, construction of CCNPP Unit 3 will permanently destroy some of the existing surface water bodies. Construction impacts to the existing surface water bodies are summarized as follows:

- Increasing runoff from the approximately 333 acres (135 hectares) of impervious and relatively impervious surfaces for the CCNPP Unit 3 power block pad, cooling tower pad, switchyard, laydown, and parking areas;
- Infilling and eliminating the Camp Conoy Fishing Pond under the southeast portion of the laydown area south of the CCNPP Unit 3 power block foundation;
- Infilling and eliminating the upper reaches of Branch 2 and Branch 3, and an unnamed tributary to Johns Creek;
- Isolating portions of the upper reach of Branch 1 by construction of the laydown areas south of the CCNPP Unit 3 power block foundation;
- Disruption of the drainage in the Lake Davies dredge spoils disposal area with possible impacts on the two downstream impoundments;
- Wetlands removal and disruptions; and
- Possibly increasing the sediment loads into the proposed impoundments and downstream reaches.

The overall site drainage basin areas are not directly affected by the site grading plan. The 80%/20% drainage proportion to the west and east respectively, would stay the same during and after construction. Approximately 15 to 20 acres (6 to 8 hectares) would be added to the east drainage basin and removed from the west drainage basin.

Dredging will take place at the barge slip area to accommodate delivery of large components. Dredging will also be performed for construction of the discharge line from the circulating water system. Dredged material will be disposed of in the previously used disposal area known as Lake Davies.

When a surface water body is filled by construction activities, impacts to aquatic life are expected. If the water body has an outlet, and the disturbance is gradual rather than abrupt, some fish may relocate. Oftentimes, however, construction impacts to small impoundments or stream reaches result in loss of the fish and invertebrates.

As discussed in Section 2.4.2 extensive surveys of the onsite streams and impoundments documented that no rare or unique aquatic species occur in the construction zone. The aquatic species that occur onsite are ubiquitous, common, and easily located in nearby waters. Typical fish species include the eastern mosquito fish and the bluegill. The most important aquatic invertebrate species in the impoundments and streams are the juvenile stages of flying insects; these species readily recolonize available surface waters, and so would not be lost to the area. No important aquatic habitats were identified in the freshwater systems in the project vicinity. The fish in the Camp Conoy pond are most likely to perish during construction activities as the overflow from the pond flows down to the Chesapeake Bay via two small impoundments. The fish in the tributaries of John's Creek would most likely swim away from the affected areas to other parts of the creek outside the construction footprint.

Table 2.4.2-5 provides a list of important species and habitats found in the Chesapeake Bay. Figure 2.4.2-1 is a map of important species and habitats. One important species, because it is commercially harvested, is the American eel (*Anguilla rostrata*). It is found in most of the water bodies onsite and in the Chesapeake Bay. As discussed in Section 2.4.2, the American eel is abundant year round in all tributaries to the Chesapeake Bay.

Onsite streams and ponds were described in terms of the typical surface water habitats in the area. Headwater streams in general are considered important; however, there is nothing of regional significance about these particular streams. All of the onsite aquatic species mentioned in this section are common in the area. No loss of critical habitat is anticipated.

Although the wetland areas themselves are considered a sensitive and valuable resource, the particular wetlands that will be impacted onsite are not substantively distinguishable from other wetland acreage in the vicinity. Additional details of the specific plants that will be lost in each area are presented in the final Wetland Delineation Report (TTNUS, 2007e).

Several other drainages and impoundments at the CCNPP site will be moderately to severely impacted. It is possible, and even likely, that some sediment will be deposited in wetlands, including impoundments and stream channels, with rainfall runoff during and immediately following construction. Best construction management practices will reduce the amount of erosion and sedimentation associated with construction, however, and would limit impacts to aquatic communities in down-gradient water bodies. Although unlikely, it is also possible that excavated soil placed in the proposed spoils and overflow storage area will be disturbed and move with runoff into streams onsite. Details are summarized herein:

- Increased runoff from 133 acres (53 hectares) of impervious surfaces for the power block pad, the cooling tower pad, and the switchyard;
- Creation of a large impoundment east of the power block pad by construction of a dam, discharge structure and piping that will discharge to the impoundment down stream of the Camp Conoy fishing pond;
- Creation of bio-retention ditches on the periphery of the power block, laydown, cooling tower and switchyard areas. The ditches are constructed of base materials that promote infiltration of runoff from low intensity rainfall events. However, for large storms the infiltration capacity of the base materials will be exceeded and the overflow pipes are provided to direct the runoff to the stormwater basins. The stormwater basins are unlined impoundments with simple earth-fill closure on the down stream end and may include discharge piping to the adjacent watercourses.
- Creation of new impoundments southwest of the proposed switchyard and cooling tower pads for stormwater detention with associated discharge structures and outlet piping to the unnamed tributary of Johns Creek;
- Disruption of the drainage in the Lake Davies dredge spoils disposal area with possible impacts on the two downstream impoundments;

- Wetlands removal and associated impacts; and
- Increased sediment loads into the proposed impoundments and downstream reaches of Johns Creek and its associated tributaries, Branch 1 and Branch 2.

Proposed construction activities that will potentially affect onsite water bodies are described in Section 4.2. During construction, effects to aquatic ecosystems may result from sedimentation (due to erosion of surface soil) and, to a lesser extent, spills of petroleum products. A report on human impacts to stream water quality listed siltation as the primary cause of stream degradation by a wide margin (Waters, 1995). In a 1982 nationwide survey by the U.S. Fish and Wildlife Service on impacts to stream fisheries, sedimentation was named the most important factor (Waters, 1995).

Three major groups of aquatic organisms are typically affected by the deposition of sediment in streams: (1) aquatic plants, (2) benthic macro invertebrates, and (3) fish. The effects of excess sediment in streams, including sediment generated by construction activities, are influenced by particle size. Finer particles may remain suspended, blocking the light needed for primary producers photosynthesis, and initiating a cascade of subsequent effects (Waters, 1995) (MDE, 2007a). Turbidity associated with suspended sediments may reduce photosynthetic activity in both periphyton and rooted aquatic plants. Suspended particles may also interfere with respiration in invertebrates and newly hatched fish, or reduce their feeding efficiency by lowering visibility. Slightly larger particles fall out of suspension to the stream bed, where they can smother eggs and developing fry, fill interstitial gaps, or degrade the quality of spawning grounds. As the gaps in the substrate are filled, habitat quality is decreased for desirable invertebrates such as Ephemeroptera, Plecoptera, and Trichoptera, and less desirable oligochaetes and chironomids become dominant (Waters, 1995). Such changes in the benthic community assemblage result in a loss of fish forage, and a subsequent reduction in fish populations.

Construction sites contribute to erosion, which can lead to sedimentation in streams. Construction-related activities such as excavation, grading for drainage during and after construction, temporary storage of soil piles, and use of heavy machinery all disturb vegetation and expose soil to erosive forces. Reducing the length of time that disturbed soil is exposed to the weather is an effective way of controlling excess erosion and sedimentation.

Preventing onsite erosion by covering disturbed areas with straw or matting is also a preferred method of controlling sedimentation. When erosion cannot be prevented entirely, intercepting and retaining sediment before it reaches a stream is a high priority.

Several measures will be taken to minimize the unavoidable adverse effects to the aquatic ecology. The use of silt fences, temporary and permanent vegetative stabilization, and other soil erosion and sediment control practices will reduce the risk of sediment runoff into intact wetlands adjoining the areas of fill. Bio-retention ditches will be constructed around the periphery of the power block, construction laydown area, cooling tower and switchyard areas to help catch surface runoff and prevent degradation of adjoining terrestrial and aquatic habitats. The ditches will be constructed of base materials that promote infiltration of runoff from low intensity rainfall events. However, for large storms the infiltration capacity of the base materials will be exceeded and the overflow pipes will direct the runoff to the stormwater retention basins. The stormwater retention basins will be unlined impoundments, vegetated with regionally indigenous wetland grasses and herbs, with simple earth-fill closure on the down stream end and will include discharge piping to the adjacent watercourses.

Construction impacts to water resources will be avoided or minimized through best management practices and good construction engineering practices such as stormwater retention basins and silt screens (MDE, 2007b). The Stormwater Pollution Prevention Plan, which provides explicit specifications to control soil erosion and sediment intrusion into wetlands, streams and waterways will be followed. The Spill Prevention, Control and Countermeasure Program will also be used to clean up and contain oil spills from construction equipment to avoid or minimize the impact to wetlands and waterways.}

4.3.2.2 Impacts to Chesapeake Bay

{As discussed in Section 2.4.2, the Chesapeake Bay is considered important estuarine habitat to most, if not all, of the estuarine species identified in the area. However, none of the important species in the vicinity of the CCNPP site are endemic to Chesapeake Bay. All of them range widely throughout the mid-Atlantic coast, and most occur in the Gulf of Mexico, as well.

The portion of the Chesapeake Bay nearest the CCNPP site is of lower relative importance compared to other areas of the Chesapeake Bay. Estuarine species that use the Chesapeake Bay as nursery grounds need the submerged aquatic vegetation (SAV) and tidal marshes for nutrient-rich forage for the larvae and young-of-the-year, as well as for protective cover from predators. The area near the CCNPP site has no SAV, and does not provide critical habitat for any species.

The National Marine Fisheries Service designated Essential Fish Habitat (EFH) for each life stage of federally managed marine fish species in the Chesapeake Bay area; the bluefish is the only important species in the CCNPP site area that is federally managed, and for which EFH has been designated. Bluefish eggs and larvae are found only offshore, so no EFH occurs in Chesapeake Bay. For juvenile bluefish, all major estuaries between Penobscot Bay (Maine) and St. Johns River (Florida) are EFH. Generally juvenile bluefish occur in North Atlantic estuaries from June through October, Mid-Atlantic estuaries from May through October, and South Atlantic estuaries March through December, within the "mixing" and "seawater" zones. Adult bluefish are found in North Atlantic estuaries from June through October, Mid-Atlantic estuaries from April through October, and in South Atlantic estuaries from May through January in the "mixing" and "seawater" zones. Bluefish adults are highly migratory and distribution varies seasonally and according to the size of the individuals comprising the schools. Bluefish are generally found in waters with normal shelf salinities (greater than 25 parts-per-thousand).

The threatened and endangered species known to occur in the area are two species of sturgeon and two of sea turtles. No sturgeon is known to have spawned in the Chesapeake in decades. The sea turtles that occasionally use the Chesapeake Bay spawn much further south, outside the Chesapeake Bay watershed.

No effects of sedimentation or runoff into the Chesapeake Bay are expected. However, construction of the intake structure and discharge pipeline, and enlargement of the barge slip, will cause some disturbance in the Chesapeake Bay. As described in Section 4.2.1, a sheet pile cofferdam and dewatering system will be installed on the south side of the CCNPP Units 1 and 2 intake structure to facilitate the construction of the CCNPP Unit 3 circulating and service water intake structure and pump house. Pilings may also be driven into the seabed to facilitate construction of new discharge system piping. Enlargement of the barge slip is estimated to require removal of about 15,000 cubic yards (11,500 cubic meters) of sediment. Dredging of the barge slip would result in increased suspended sediment in the immediate area for approximately two weeks. Excavation and dredging of the intake structure would have similar effects. All dredging will conform to guidance provided by the Maryland Port Authority and dredging permit conditions including mitigation measures to minimize suspended sediment and other impacts.

Dredging inevitably causes an increase in suspended sediment in the immediate area, and may result in a plume of suspended sediment some distance from the site. In a study of the effects of hopper dredging in Chesapeake Bay, near-field concentrations of suspended sediment, < 980 ft (< 300 m) from the dredge, reached 840 to 7,200 mg/L or 50 to 400 times the normal background level. Far-field concentrations (> 980 ft (> 300 m)) were enriched 5 to 8 times background concentrations and persisted 34% to 50% of the time during a dredging cycle (1.5 to 2.0 hr) (Nichols, 1990).

The ecological effect of the suspended sediment depends on a variety of factors, including the type of dredge used, the timing and duration of the dredging, the particle size of the suspended sediment, the presence of toxins in the sediment, the success of environmental controls to contain suspended sediment, and the life stage of the species present. Both short term direct behavioral effects (such as entrainment, turbidity, fish injury, and noise) and long term cumulative effects (such as possible contaminant release and habitat alteration) on marine organisms can result from dredging (Nightingale, 2001). Although effects may be similar, concern is often greater at the disposal site than at the dredge site; controversy over the effects of disposal of dredge spoils in the Chesapeake Bay has been ongoing since the 1970s (MSG, 2000). A thorough independent scientific investigation of the effects of disposing of large volumes of sediment in a deep channel of the Chesapeake Bay concluded that, apart from possibly affecting migrating sturgeon, no significant biological effects resulted from the deposition of sediment in the channel. Although this study is not directly applicable to the small-scale dredging proposed for CCNPP Unit 3, it serves as reassurance that the Chesapeake Bay is so large, and has such an enormous volume of water flowing through it, that even extremely large disturbances, such as the deposition of dredged material from Baltimore Harbor, have a negligible long term effect on the Chesapeake Bay ecosystem (MSG, 2000).

Small-scale dredging like that required to construct CCNPP Unit 3 is not considered a significant impact to the Chesapeake Bay. A report by the NOAA Chesapeake Bay Office, developed by a Technical Advisory Panel comprised of top fisheries scientists from area universities and senior government fisheries scientists, presented a Fisheries Ecosystem Plan for the Chesapeake Bay; it is notable that the only mention of the effects of dredging in the 450 page report were the following two general statements: "Dredging and the displacement of dredge spoil to other parts of the Chesapeake Bay can affect fish and shellfish by removing or inundating slow-moving or sessile species and their prey. Dredge spoil can also reintroduce sedimentary inventories of nutrients and contaminants into the water" (Chesapeake Bay Fisheries Ecosystem Advisory Panel (NOAA, 2006)). The report also acknowledged that the effects of even widely-used methods of harvest that disturb bottom sediments, such as trawling and crab dredging, remain unknown.

Excavation and dredging of the intake structure, discharge pipe, and barge slip will continue through CCNPP site preparation into plant construction. Excavated and dredged material will be transported to the onsite Lake Davies dredge spoils area as shown in Figure 4.3-1. Figure 3.4-8 show the show location of the intake and outfall structures areas and the barge slip.

Important species in the project area that may be temporarily affected by dredging include eggs, larvae, and adults of invertebrates and fishes. Based on the monitoring of the baffle wall and intake screens for CCNPP Units 1 and 2, Bay anchovy and Atlantic menhaden are the most common mid-water fish species in the immediate area (EA, 2006). These species may be temporarily affected by high levels of suspended sediment, which can interfere with foraging and respiration, as well as cause dermal abrasion to delicate fishes. No invertebrate sampling data are available in the intake area. In a study of dredging in Chesapeake Bay, benthic communities survived the deposition of suspended sediment despite the exceedance of certain water quality standards (Nichols, 1990).

No threatened or endangered species are expected to be affected by the proposed dredging. During the license renewal review process in 1999 for CCNPP Units 1 and 2, the National Marine Fisheries Service concluded that CCNPP license renewal would not adversely affect either the shortnose sturgeon or the loggerhead turtles because the CCNPP Units 1 and 2 discharge/intake do not lie within the areas normally used by either species (NRC, 1999). Neither the shortnose sturgeon nor the loggerhead turtle has been found impinged on the CCNPP Unit 1 and 2 intake screens during the 21 years of monitoring data (NRC, 1999).

The assemblage of aquatic species present near the CCNPP site varies throughout the year, due to spawning and migration patterns of individual fish and invertebrate species, as described in Section 2.4.2. The season of the year in which dredging and construction occur would determine to a large extent the impact on specific aquatic resources within the Chesapeake Bay. However, because the area to be dredged is small and in a protected near shore area that is already dedicated to intake functions, the overall impact on eggs and larvae is expected to be SMALL and TEMPORARY.}

4.3.2.3 Impacts on the Transmission Corridor and Offsite Areas

{The new transmission lines do not cross over any onsite water bodies. At one point, the transmission corridor right-of-way is near Johns Creek. No important aquatic species and their habitat will be impacted by the transmission corridor.

Transmission line construction will be limited to onsite construction of short connections from the new switchyard to the existing 500 kV transmission line that runs from near the center of the CCNPP site northward. Construction of a 500 kV transmission line from the CCNPP Unit 3 switchyard to the existing 500 kV transmission line on the CCNPP site will require clearing trees in 0.31 acres (0.13 hectares) of additional forested wetlands in Wetland Assessment Area IV (adjoining 520 linear feet (158 m) of intermittent stream channel), as well as in 1.85 acres (0.75 hectares) of additional forested uplands designated as non-tidal wetland buffer by Calvert County. No grading will be conducted in the subject wetlands or wetland buffer; disturbance will be limited to tree and shrub removal only. Surface soils within the affected wetlands and buffer will remain undisturbed, as will the pattern of surface runoff. The vegetation impacts to the affected wetlands and buffer are necessary because trees growing close to a 500 kV electric conductor must be removed to prevent possible outages. The transmission line is needed to convey electric power generated by the CCNPP Unit 3 power block to existing transmission lines that connect to the regional power grid.

The onsite transmission corridor for CCNPP Unit 3 is within the construction area. The information provided above pertaining to control of erosion and sedimentation applies to streams and wetlands within the transmission corridor.

No incremental effect on aquatic resources beyond what currently occurs within the transmission corridor is expected for the construction of CCNPP Unit 3.

The existing offsite transmission corridor will be used for CCNPP Unit 3. No new transmission corridors and no offsite areas are impacted since no changes are required.}

4.3.2.4 Summary

{Construction activities that may cause erosion that could lead to harmful deposition in aquatic water bodies would be (1) of relatively short duration, (2) permitted and overseen by state and federal regulators, and (3) guided by an approved Stormwater Pollution Prevention Plan. Any small spills of construction-related hazardous fluids, such as petroleum products, would be mitigated according to a Spill Prevention, Control, and Countermeasure Plan. Some sensitive habitats occur within the area expected to be affected by construction activities; however, no important aquatic species are expected to be affected. Impacts to aquatic communities from construction would be SMALL and temporary, and would not warrant mitigation.

No incremental effect on aquatic resources beyond what currently occurs within the transmission corridor is expected.}

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Table 4.3.1-1 Vegetation (Plant Community) Impacts in Acres (Hectares) Construction of Proposed CCNPP Unit 3 (Page 1 of 1)

Habitat (Plant Community Type)	Forest (MDNR Definition)	Wetland (Federal and MDE Definition)	Permanent Losses					Temporary Losses					Total
			CBCA IDA 0-100' (0-30 meters)	CBCA IDA 100-1,000' (30 - 305 meters)	CBCA RCA 0-100' (0-30 meters)	CBCA RCA 100-1,000' (30 -305 meters)	Rest of Site	CBCA IDA 0-100' (0-30 meters)	CBCA IDA 100-1,000' (30 - 305 meters)	CBCA RCA 0-100' (0-30 meters)	CBCA RCA 100-1,000' (30 -305 meters)	Rest of Site	
Lawns/Developed Areas	No	No	0.25 (0.10)	1.76 (0.71)	-	5.21 (2.11)	19.33 (7.82)	-	-	-	-	24.30 (9.80)	50.85 (20.58)
Old Field Vegetation	No	No	0.09 (0.04)	1.13 (0.46)	-	0.23 (0.09)	27.35 (11.07)	-	-	-	-	96.00 (38.80)	124.80 (50.50)
Mixed Deciduous Forest	Yes	No	0.01 (0.004)	13.96 (5.65)	-	5.20 (2.10)	133.81 (54.15)	-	-	-	-	26.44 (10.70)	179.42 (72.61)
Mixed Deciduous Regeneration Forest	Yes	No	-	-	-	-	36.28 (14.68)	-	-	-	-	12.00 (4.90)	48.28 (19.54)
Well-Drained Bottomland Deciduous Forest	Yes	No	-	-	-	-	1.37 (0.55)	-	-	-	-	0.05 (0.02)	1.42 (0.57)
Poorly Drained Bottomland Deciduous Forest	Yes	Yes	-	0.15 (0.06)	-	0.49 (0.20)	7.84 (3.17)	-	-	-	-	2.53 (1.02)	11.01 (4.46)
Herbaceous Marsh Vegetation	No	Yes	-	0.05 (0.02)	-	0.02 (0.01)	1.56 (0.63)	-	-	-	-	1.63 (0.66)	3.26 (1.32)
Successional Hardwood Forest	Yes	No	-	-	-	1.71 (0.69)	3.50 (1.40)	-	-	-	-	7.82 (3.16)	13.03 (5.27)
Open Water	No	Yes	-	0.02 (0.01)	-	-	2.54 (1.03)	-	-	-	-	-	2.56 (1.04)
Total			0.35 (0.14)	17.07 (6.91)	-	12.86 (5.20)	233.58 (94.53)	-	-	-	-	170.77 (69.11)	434.63 (175.89)
			Total Permanent: 263.86 (106.78)					Total Temporary: 170.77 (69.11)					

Notes:

MDNR: Maryland Department of Natural Resources
MDE: Maryland Department of the Environment
CBCA: Chesapeake Bay Critical Area
IDA: Intensive Developed Area (within CBCA)
RCA: Resource Conservation Area (within CBCA)

Table 4.3.1-2 Non-Tidal Wetland and Non-Tidal Wetland Buffer Losses in Acres (Hectares)
Construction of Proposed CCNPP Unit 3
(Page 1 of 1)

Wetland Assessment Area	Permanent Grading Losses				Temporary Grading Losses				Permanent Non-Grading Losses (Forest Clearing for Transmission Line)				Total Losses	
	PFO	PEM	Open Water	Buffer	PFO	PEM	Open Water	Buffer	PFO	PEM	Open Water	Buffer	Wetland	Buffer
I- Total	**0.85 (0.34)**	**0.05 (0.02)**	**0.02 (0.01)**	**6.45 (2.61)**	-	-	-	-	-	-	-	-	**0.92 (0.37)**	**6.45 (2.61)**
I-Outside CBCA	0.52 (0.21)	-	-	3.79 (1.53)	-	-	-	-	-	-	-	-	0.52 (0.21)	3.79 (1.53)
I-Inside CBCA-IDA	0.15 (0.06)	0.05 (0.02)	0.02 (0.01)	1.42 (0.57)	-	-	-	-	-	-	-	-	0.22 (0.09)	1.42 (0.57)
I-Inside CBCA-RCA	0.18 (0.07)	-	-	1.24 (0.50)	-	-	-	-	-	-	-	-	0.18 (0.07)	1.24 (0.50)
II- Total	**1.50 (0.6)**	**0.78 (0.32)**	**2.67 (1.08)**	**7.18 (2.91)**	-	-	-	-	-	-	-	-	**4.95** (2.00)	**7.18** (2.91)
II-Outside CBCA	1.18 (0.48)	0.76 (0.31)	2.66 (1.08)	6.33 (2.56)	-	-	-	-	-	-	-	-	4.60 (1.90)	6.33 (2.56)
II-Inside CBCA-RCA	0.32 (0.13)	0.02 (0.01)	0.01 (0.004)	0.85 (0.34)	-	-	-	-	-	-	-	-	0.35 (0.14)	0.85 (0.34)
III-Total	No Impacts to Wetland Assessment Area III													
IV-Total	**5.29 (2.14)**	-	-	**15.34 (6.21)**	-	-	-	-	**0.31 (0.13)**	-	-	**1.85 (0.75)**	**5.60 (2.30)**	**17.19 (6.96)**
V-Total	No Impacts to Wetland Assessment Area V													
VI-Total	**0.36 (0.15)**	**0.50 (0.20)**	-	**1.12 (0.45)**	-	-	-	-	-	-	-	-	**0.86 (0.35)**	**1.12 (0.45)**
VII-Total	**0.88 (0.36)**	-	-	**3.44 (1.39)**	**2.63 (1.06)**	**1.65 (0.67)**	-	**9.32 (3.77)**	-	-	-	-	**5.16 (2.09)**	**12.76 (5.16)**
VIII-Total	No Impacts to Wetland Assessment Area VIII													
IX-Total	**0.64 (0.26)**	**0.48 (0.19)**	-	**3.34 (1.35)**	-	-	-	-	-	-	-	-	**1.12 (0.45)**	**3.34 (1.35)**
Total	9.52 (3.85)	1.81 (0.73)	2.69 (1.09)	36.87 (14.92)	2.63 (1.06)	1.65 (0.67)	-	9.32 (3.77)	0.31 (0.13)	-	-	1.85 (0.75)	18.61 (7.53)	48.04 (19.44)

Notes:
PFO: Palustrine Forested
PEM: Palustrine Emergent
CBCA: Chesapeake Bay Critical Area
IDA: Intensively Developed Area
RCA: Resource Conservation Area

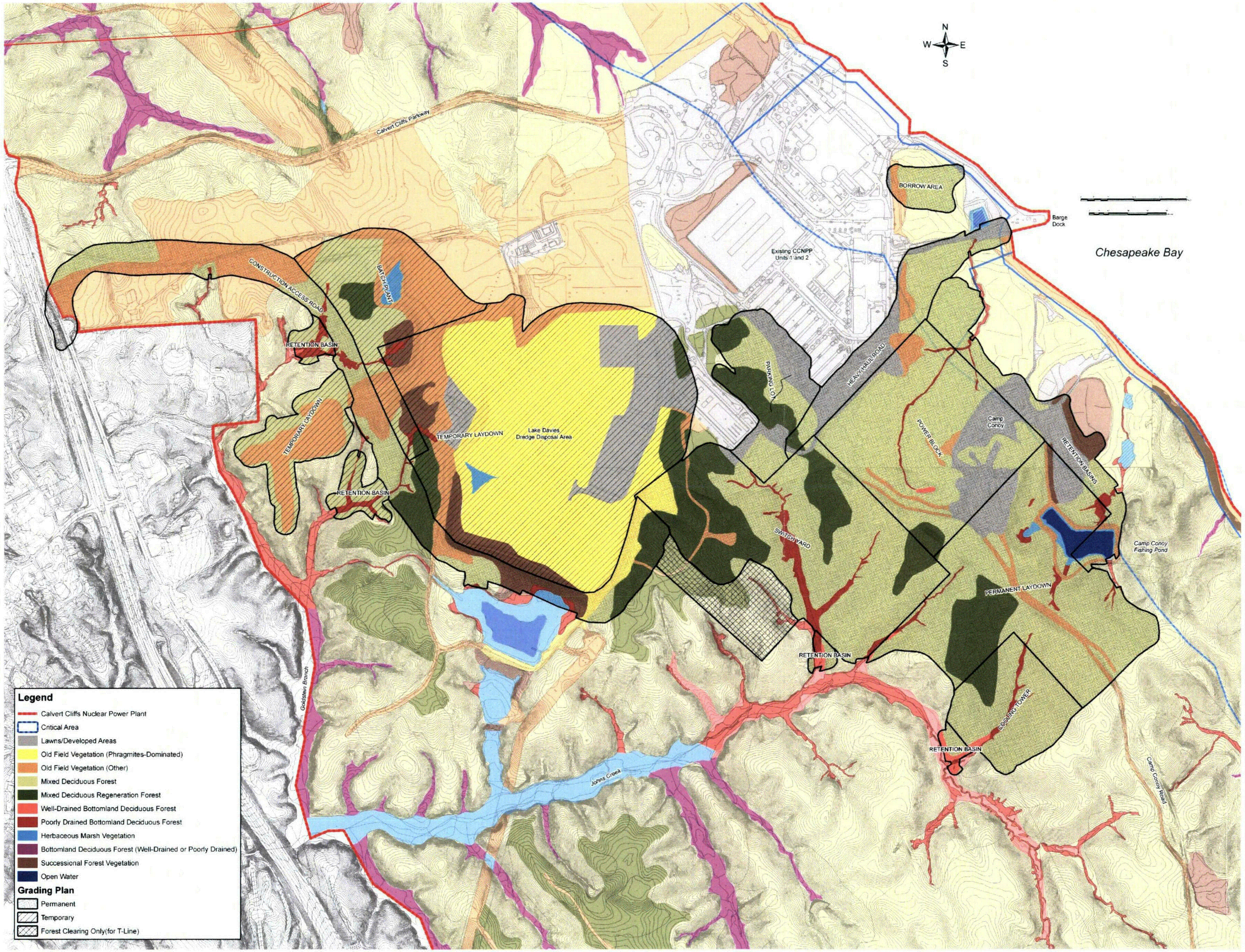

FIGURE 4.3-1 **Rev. 0**

{CCNPP} VEGETATION IMPACTS

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CCNPP UNIT 3 ER

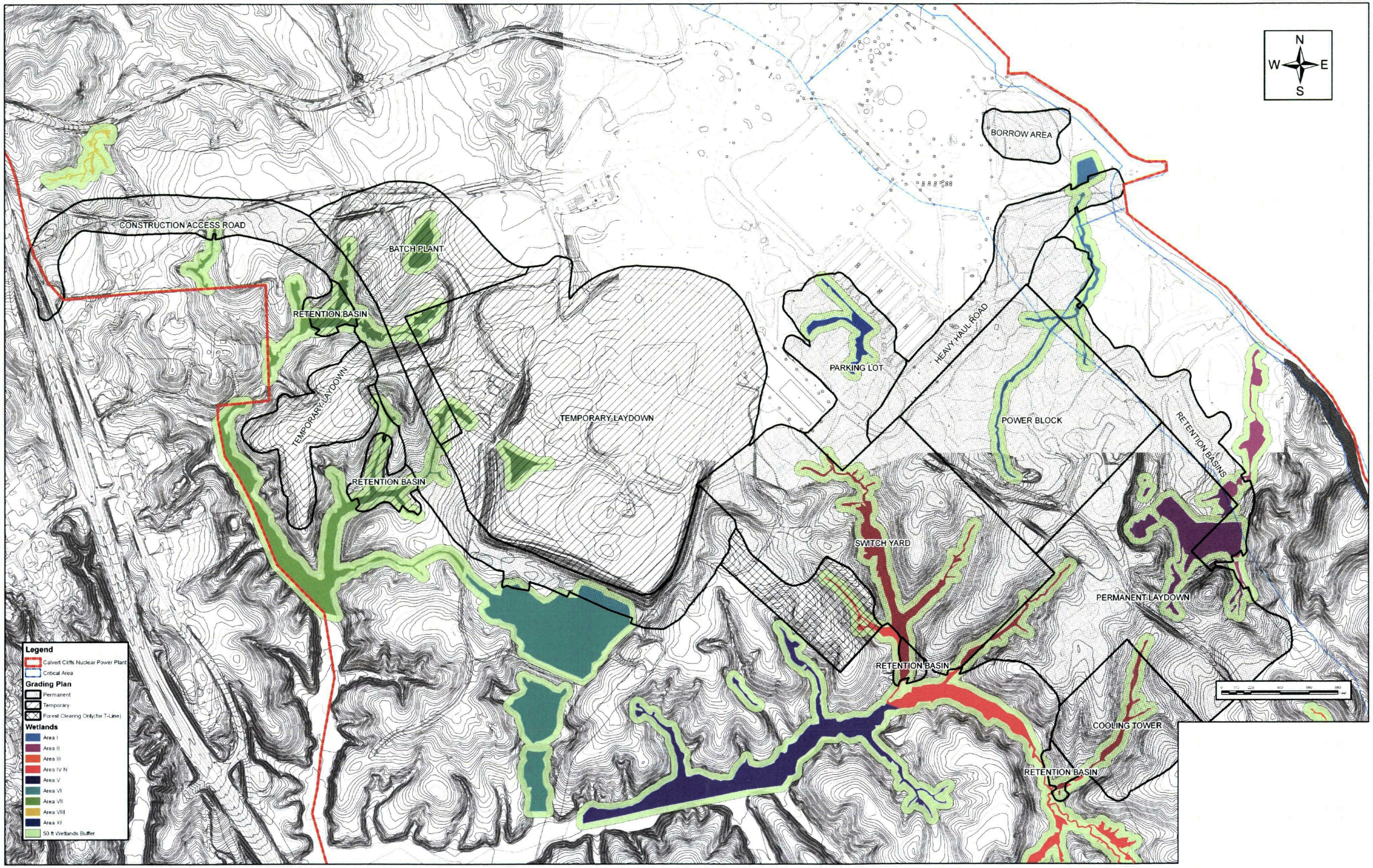

FIGURE 4.3-2	**Rev. 0**
{CCNPP} WETLAND IMPACTS	
CCNPP UNIT 3 ER	

4.4 SOCIOECONOMIC IMPACTS

4.4.1 PHYSICAL IMPACTS

Construction activities at the {CCNPP} site will cause temporary and generally localized physical impacts such as increased noise, vehicle exhaust, and dust. This section addresses these potential impacts as they might affect people (the local public and workers), buildings, transportation routes, and the aesthetics of areas located near the plant site.

A description of the {CCNPP} site, location and surrounding community characteristics is provided in Sections 2.1, 2.2, and 2.5. Chapter 3 describes the proposed facility including its external appearance.

{As discussed below, the potential for direct physical impacts to the surrounding communities from plant construction is expected to be SMALL.}

4.4.1.1 The Public and Workers

People who work at or live near the {CCNPP} site will be subject to physical impacts resulting from construction activities. Onsite construction workers will be impacted the most, with workers at the existing adjacent operating units subject to slightly reduced, similar impacts. People living or working adjacent to the site will be impacted significantly less due to site access controls and distance from the construction site where most activities will occur. Transient populations and recreational visitors will be impacted the least for similar reasons and the limited exposure to any impacts of construction.

4.4.1.2 Noise

Section 2.7 provides information and data related to the background noise levels that exist at the construction site.

Noise levels in the site area will increase during construction primarily due to the operation of vehicles; earth moving, materials-handling, and impact equipment; and other tools.

Typical noise levels from equipment that is likely to be used during construction are provided in Table 4.4.1-1 (Beranek, 1971). Onsite noise levels that workers will be exposed to are controlled through appropriate training, personnel protective equipment, periodic health and safety monitoring, and industry good practices. Good practices such as maintenance of noise limiting devices on vehicles and equipment, and controlling access to high noise areas, duration of emission, or shielding high noise sources near their origin will limit the adverse effects of noise on workers. Non-routine activities with potential to adversely impact noise levels such as blasting will be conducted during weekday business hours and utilize good industry practices that further limit adverse effects.

The exposure of the public to adverse effects of noise from construction activities will be reduced at the source by many of the same measures described above and the additional distance, interposing terrain, and vegetation which provide noise attenuation. {The noise levels at the nearest residential and other surrounding property boundary areas will be controlled to remain at or below state limits.} Pile driving will occur during some construction activities. {State regulations define those periods during which these activities may occur to minimize the impact of the associated noise (COMAR, 2007). The state regulations also set standards that limit the intensity of vibration that may be transmitted beyond the construction site property boundaries and that will be complied with during construction.}

Traffic noise in the local area will increase as additional workers commute, and materials and waste are transported to and from the construction site. Noise impacts will occur primarily during shift changes and will not be extraordinary given the source and nature of vehicle noise and the normally varying nature of transient vehicle noise levels. Additionally, localized impacts will be reduced as distance from the construction site increases and traffic diverges outward.

In summary, good noise control practices on the construction site, and the additional attenuation provided by the distance between the public and the site, will limit noise effects to the public and workers during construction so that its impact will be small and temporary. Construction noise generation is directly linked with the conduct of construction activities which will be end as the facility enters operation.

4.4.1.3 Dust and Other Air Emissions

Construction activities will result in increased air emissions. Fugitive dust and fine particulate matter will be generated during earth moving and material handling activities. Vehicles and engine-driven equipment (e.g., generators and compressors) will generate combustion product emissions such as carbon monoxide, oxides of nitrogen, and to a lesser extent, sulfur dioxides. Painting, coating and similar operations will also generate emissions from the use of volatile organic compounds (VOCs).

To limit and mitigate releases, emission-specific strategies, plans and measures will be developed and implemented to ensure compliance within the applicable regulatory limits defined by the primary and secondary National Ambient Air Quality Standards in 40 CFR 50 (CFR, 2007c) and the National Emission Standards for Hazardous Air Pollutants in 40 CFR 61 (CFR, 2007d). Air quality and release permits and operating certificates will be secured where required.

For example, a dust control program will be incorporated into the Storm Water Pollution Prevention Plan. A routine vehicle and equipment inspection and maintenance program will be established to minimize air pollution emissions. Emissions will be monitored in locations where air emissions could exceed limits (e.g. the concrete batch plant).

{The State of Maryland, Department of Labor, Licensing and Regulation, implements occupational health and safety regulations that set limits to protect workers from adverse conditions including air emissions. If localized emissions result in limits being exceeded, corrective and protective measures will be implemented to reduce emissions (or otherwise protect workers in some cases) in accordance with the applicable regulations.}

Implementation of controls and limits at the source of emissions on the construction site will result in reduction of impacts offsite. For example, the dust control program will limit dust due to construction activities to the extent that it is not expected to reach site boundaries.

Transportation and other offsite activities will result in emissions due largely to use of vehicles. Activities will generally be conducted on improved surfaces and any related fugitive dust emissions will be minimized. As with noise, impacts will be reduced as distance from the site increases.

In summary, air emission impacts from construction are expected to be small because emissions will be controlled at the sources where practicable, maintained within established regulatory limits that were designed to minimize impacts, and distance between the construction site and the public will limit offsite exposures. Construction air emissions impacts are temporary because they will only occur during the actual use of the specific construction equipment or conduct of specific construction activities, and surfaces will be stabilized upon completion of construction activities.

4.4.1.4 Buildings

{The primary buildings in the immediate area with potential for impact from construction are those associated with CCNPP Units 1 and 2. Some peripheral onsite buildings will be removed during construction. Related information about historic properties and the impacts of construction on them is provided in Sections 2.5.3 and 4.1.3.}

Many existing onsite buildings related to safety of the existing facility were constructed to meet seismic qualification criteria which make them resistant to the effects of vibration and shock similar to that which could occur during construction. Other onsite facilities were constructed to the appropriate building codes and standards which include consideration of seismic loads. Regardless of the applicable design standard, construction activities will be planned, reviewed, and conducted in a manner that ensures no adverse effect on the operating nuclear units and that buildings are adequately protected from adverse impact.

{Construction activities are not expected to affect offsite buildings due to their distance from the construction site. For example, the nearest residence is located approximately 3,000 ft (900 m) from the construction site footprint. As described above in 4.4.1.1, offsite vibrations are limited by state regulations and compliance with those regulations will further prevent mechanical interaction with offsite facilities.}

The impact of construction activities on nearby buildings will be small and temporary because of the design of onsite building and the administrative programs that will ensure no adverse interaction with the operating units, while offsite buildings are located at greater distances that isolate them from potential interaction.

4.4.1.5 Transportation Routes

The major transportation routes in the area are described in Section 2.5.1.

{Traffic will increase substantially on Maryland State Highway (MD) 2/4 during peak construction periods and will be at its highest during shift changes. Construction workers will use the public highways in the area around the site to commute to work. Additionally, public roadways will be used to transport most construction materials and equipment to the site. Impact on area transportation resources will generally decrease with increased distance from the site as varied routes are taken by individual vehicles.

As a result of the expected increase in traffic around the site, Constellation conducted a Traffic Impact Analysis (TIA) of the area during construction and operation of the additional unit planned at the CCNPP (KLD, 2007). The TIA study area was based on input from the state of Maryland and Calvert County. The area extended 4 miles (6.4 km) from the site access road in the north and south direction (Figure 4.4-1) and included the following intersections along MD 2/4:

- Calvert Beach Road (intersection with signal control)
- Calvert Cliffs Parkway (intersection with signal control)
- Pardoe Road (intersection without signal control)
- Cove Point Road (intersection without signal control)

The TIA based its conclusions on the ability of the MD 2/4 roadway network to accommodate projected construction traffic volumes generated utilizing techniques to measure capacity in the form of Critical Lane Volume (CLV) at intersections with signals (e.g., stop lights) and level of service (LOS) at intersections without signals (e.g., use of signage only such as stop or yield signs). Any signal-controlled intersection with a CLV of 1450 vehicles/hour (vph) or less was considered acceptable, based on the state and county guidelines. LOS, on the other hand, is an ordinal scale that is defined from A to F, with "A" being the best level of service. Typically, the LOS is determined for the peak hour during the identified periods as it represents "worst case" conditions. A LOS with scale of "E" or better (delays of less than 50 seconds) at an intersection without signal control was considered acceptable.

As expected, the major concern identified in the TIA was the traffic related to the construction staff and the daily peak travel period and patterns in and around the start and end of the day shift. Since there are no major highway development or improvement projects planned within the area to influence the capacity of the roadway system (KLD, 2007), a new site access road connecting directly to MD 2/4 at Nursery Road south of the plant will be built to reduce traffic impacts related to construction activities.

Nonetheless, the TIA concluded that the existing roadway system has insufficient capacity to handle this peak demand. Refer to Table 4.4.1-2. The intersections of Calvert Beach Road and Nursery Road are the most affected during the morning and afternoon peak traffic hour. The critical element in the increased traffic levels is the construction crew and not traffic delivering materials arriving to the site.

As a result, additional mitigation during the construction period is needed. For example, the TIA noted that the anticipated area future growth rate of 2.5% per year will require that signals be placed at Pardoe Road and Cove Point Road, the two intersections along MD 2/4 without signals. Additionally, a Phase 2 TIA will be performed to determine the mitigation necessary to achieve the target value CLV of 1450 vph at intersections with signals. Examples of the type of mitigation that will be considered include both physical improvements such as traffic control signals, turning and merging lanes. Additionally, management measures, such as staggered shift changes and increasing average vehicle capacity will be considered. Thus, the potential impacts to the surrounding communities from construction traffic, although expected to be moderate, will be temporary and manageable.

Large components / equipment will be transported by barge to the site and delivered to the existing site barge unloading facility. The barge unloading facility will be refurbished and upgraded to meet the equipment delivery needs as well as to comply applicable regulatory requirements. The refurbishment will include new sheet pile, widening of the slip to receive large barge shipments, upgrading the existing onsite, heavy-haul road, and extending it to the construction area. Neither the unloading facility refurbishment nor the heavy-haul road extension is expected to have an impact to the public as each activity is confined to an access-restricted area.}

4.4.1.6 Aesthetics

{Construction activities generally will not be visible from points outside the CCNPP site boundary due to the heavily wooded area surrounding the site. Section 3.1 provides a detailed description of the site and figures that illustrate the appearance of the facility after completion. Construction activities will be visible on those portions of the facility visible in the illustrations, for example construction equipment such as cranes will be visible during use. Federal regulations require that any temporary or permanent structure, including all appurtenances, that exceeds an overall height of 200 ft (61 m) above ground level be appropriately marked with lighting. The tallest new structures on the site will be below this height; however temporary cranes used to construct these structures that are likely to require lighting during their use.

Recreational users of Chesapeake Bay to the north and east will generally be unable to view the construction site due to its elevation above the water and setback distance from the shoreline.

Portions of the construction may be visible from certain locations on the Bay (see Section 3.1), including elevated activities and those conducted along the shoreline such as the barge unloading facility, and installation of intake and discharge equipment.

The existing transmission line corridor will be used to provide power to the grid. No new transmission line towers are needed offsite.

Water turbidity may be present during construction and dredging activities. Measures to control water turbidity or other related activity impacts include implementation of the Storm Water Pollution Prevention Plan (SWPPP), transportation of excavated and dredged material to an onsite spoils area, and compliance with the required federal and state regulations and permit conditions (see Section 1.3).

Aesthetic impacts are expected to be small and temporary because the CCNPP Unit 3 site is set back from, and only limited portions of the construction will be visible from, publicly accessible areas. Most construction activities will be shielded from public view and construction activities are by nature temporary.}

4.4.1.7 References

{**Beranek, 1971.** Noise and Vibration Control, Leo L. Beranek, ed., 1971.

CFR, 2007a. Title 29, Code of Federal Regulations, Part 1910.95, Occupational Noise Exposure, 2007.

CFR, 2007b. Title 29, Code of Federal Regulations, Part 1926.52, Occupational Noise Exposure, 2007.

CFR, 2007c. Title 40, Code of Federal Regulations, Part 50, National Primary and Secondary Ambient Air Quality Standards, 2007.

CFR, 2007d. Title 40, Code of Federal Regulations, Part 60, Standards for Performance for New Stationary Sources, 2007.

COMAR, 2007. Code of Maryland Regulations, COMAR 26.02.03, Control of Noise Pollution, 2007.

KLD, 2007. KLD Associates, Inc., Traffic Impact Study at the Calvert Cliffs Nuclear Power Plant – Phase 1, TR-405, May 30, 2007.}

4.4.2 SOCIAL AND ECONOMIC IMPACTS

{This analysis presents information about the potential impacts to key social and economic characteristics that could arise from the construction of the power plant at the CCNPP site. The analysis was conducted for the 50 mi (80 km) comparative geographic area and for the region of influence (ROI, Calvert County and St. Mary's County, Maryland), where appropriate and as described in Section 2.5.2.} The discussion focuses on potential impacts to population settlement patterns, housing, employment and income, tax revenue generation, and public services and facilities.

4.4.2.1 Study Methods

{Changes in regional employment can result in impacts to the region's social and economic systems. An estimate of direct full-time equivalent (FTE) personnel that would be needed to construct the new unit was determined and is provided in Table 4.4.2-1. "Direct" jobs are those new construction employment positions that would be located on the CCNPP site. "Indirect jobs" are positions created off of the CCNPP site as a result of the purchases of construction materials and equipment, and the new direct workers' spending patterns in the ROI. Examples of indirect jobs that could be generated include carpenters and other construction jobs, barbers, restaurant personnel, gas station and auto repairs jobs, convenience store cashiers, drying cleaning and laundry jobs, and so forth.

To estimate indirect employment that would be generated by construction of the power plant, a regional multiplier was generated by the RIMS II software provided by the Regional Economic Analysis Division of the U. S. Bureau of Economic Analysis (BEA, 1997). This model, based upon the construction industry in the ROI, generated a multiplier of 0.6855 indirect jobs created for each direct job. This multiplier was then applied to the estimated peak number of new direct FTE workers to estimate the peak number of indirect jobs that will be created in the ROI.

This analysis evaluates two potential in-migration impact scenarios for the construction workforce, an assumed 20% of the peak construction workforce moving into the ROI with their families for the duration of construction and a second scenario with 35% moving into the ROI. These scenarios were selected because they are representative of the range of in-migration levels that the NRC found in studies they conducted in 1981 of nuclear power plant construction workforces. The NRC (NRC, 1981b) conducted a study of 28 surveys of construction workforce characteristics for 13 nuclear power plants. They found that 17% to 34% of the total construction workforces at most of these nuclear power plants (the 75th percentile) had moved their families into the study areas for each power plant.

They then conducted a more detailed analysis of in-migrants and found that the most common in-migration levels (again for the 75th percentile) for the construction/labor portion of the workforce ranged from 11% to 29%. Additionally, an analysis of the craft labor portion of the workforce showed that pipefitters, electricians, iron workers, boilermakers, and operating engineers were most likely non-managerial staff to in-migrate into an area, and general laborers, carpenters, and other types of construction workers were the least likely to in-migrate (NRC, 1981b).

For managerial and clerical staff the in-migration levels ranged from 40% to 58%. Of the managerial staff alone (i.e., excluding clerical staff), most sites had in-migration rates of 58% to 76% (NRC, 1981b).

The potential demographic, housing, and public services and facilities impacts are only discussed for the two-county region of influence because those impacts are an integral part of and derive from the impacts of the in-migrating construction workforce. Impacts to employment and tax revenues are discussed for the 50 mi (80 km) comparative geographic area and the ROI because of the construction labor pool that would be drawn from and the collection and distribution of income and sales tax revenues throughout the state.}

4.4.2.2 Construction Labor Force Needs, Composition and Estimates

4.4.2.2.1 Labor Force Availability and Potential Composition

{There will be an estimated maximum 3,950 FTE person workforce constructing the CCNPP Unit 3 power plant between 2011 and 2015, representing a significant increase in the overall employment opportunities for construction workers. In comparison, Calvert County had 2,231 construction jobs in 2006 and St. Mary's County had 1,716 construction jobs (MDDLLR, 2007). As shown in Table 4.4.2-1, this peak is estimated to last for about 12 months, from about the third quarter of the fourth year of construction through about the second quarter of the fifth year. Over the course of the entire construction period, staffing needs are estimated to increase relatively steadily from the third quarter of the first year until the peak is reached. Once the peak has passed, the staff levels again will drop steadily, until the last 5 months of construction when employment levels will drop significantly.

Relatively recent studies have shown that the availability of qualified workers to construct the power plant might be an issue, particularly if several nuclear power plants are built concurrently nationwide. Competition for this labor could increase the size of the geographic area, beyond the middle eastern seaboard, from which the direct construction labor force would have to be drawn for CCNPP Unit 3. In its study of the construction labor pool for nuclear power plants, the U.S. Department of Energy (DOE, 2004) stated that, "A shortage of qualified labor appears to be a looming problem...The availability of labor for new nuclear power plant construction in the U.S. is a significant concern."

These workforce restrictions are most likely to occur with "managers, who tend to be older and close to retirement, and skilled workers in high-demand, high-tech jobs." The DOE (2005) anticipates that qualified boilermakers, pipefitters, electricians, and ironworkers might be in short supply in some local labor markets. Labor force restrictions can be exacerbated by the fact that portions of the labor force might have to have special certifications for the type of work that they are doing, and because they might have to pass NRC background checks. (DOE, 2004) DOE also found that, "recruiting for some nuclear specialists (e.g., health physicists, radiation protection technicians, nuclear QA engineers/technicians, welders with nuclear certification, etc.) may be more difficult due to the limited number of qualified people within these fields" (DOE, 2004b). However, meeting these needs can be accomplished by hiring traveling crafts workers from other jurisdictions or regions of the country, which is a typical practice in the construction industry.

Estimates about the composition of the CCNPP Unit 3 construction workforce (i.e., types of personnel needed) have not been developed for the power plant. However, existing studies of other nuclear power plant construction sites provide an indication about the potential composition of the CCNPP Unit 3 construction workforce. As shown in Table 4.4.2-2 (DOE, 2005), during the peak construction period an estimated 67% (2,635) of the construction workforce could be craft labor. Other less prevalent construction personnel could include about 8% (330) of UniStar's operation and maintenance staff, 7% (265) site indirect labor, and 6% (230) Nuclear Steam Supply System vendor and subcontractor personnel.

In more specifically reviewing only the potential craft labor force component of the entire construction workforce (see Table 4.4.2-3, DOE, 2005), the greatest levels of employment during the peak of construction could be about 18% (475) electricians and instrument fitters, 18% (475) iron workers, 17% (450) pipefitters, 10% (265) carpenters, and 10% (265) of general laborers. Table 4.4.2-4 shows the percentage of each of these craft labor categories that would be needed during seven phases of construction. Carpenters, general laborers, and iron workers would comprise the greatest proportions of the workforce during the concrete formwork, rebar installation, and concrete pouring phase of construction. Iron workers would continue to be the greatest portion of the workforce during the installation of structural steel and miscellaneous iron work. General laborers and operating engineers would be most needed during the earthwork and clearing of the site, including excavation and backfilling. The installation of mechanical equipment would primarily require pipefitters and millwrights. Pipefitters would also be the primary craft labor category working during installation of piping. Electricians would be the most prevalent during installation of the power plant instrumentation and the electrical systems (GIF, 2005).}

4.4.2.3 Demography

{As stated above, it is estimated that a peak of 3,950 FTE employees would be required to construct CCNPP Unit 3. As shown in Tables 4.4.2-5 and 4.4.2-6, under the 20% in-migration scenario an estimated peak of 720 construction workers would migrate into the ROI along with about 1,160 family members, for a total of 1,880. Of these, the total estimated direct in-migration would be about 1,400 people (68%) into Calvert County and 475 people (23%) into St. Mary's County. Under the 35% in-migration scenario an estimated peak of 1,260 direct workers would migrate into the ROI along with about 2,025 family members, for a total of 3,285 people. Of these, the total estimated peak in-migration would be about 2,455 people (68%) into Calvert County and 830 people (23%) into St. Mary's County.

In addition, it is estimated that a maximum of 493 indirect jobs would be created within the ROI under the 20% scenario and 860 indirect workforce jobs would be created under the 35% scenario (multiplying 3,595 ROI peak direct workers by the BEA indirect employment/economic multiplier of 0.6855 (BEA, 1997)). Under both scenarios, all of these indirect jobs located within the ROI could be filled by the spouses of the direct workforce, because the number of in-migrating family members would exceed the number of indirect jobs created by the in-migrating direct workforce.

An in-migration of up to 1,880 people into the ROI under the 20% scenario or up to 3,285 people under the 35% scenario would only represent a 1.2% to 2.0% increase in the total ROI population of 160,774 people. Because these percentage changes are small, it is concluded that the impacts to population levels in the ROI would be small, and would not require mitigation.

Figure 4.4.2-1, shows the overlapping 50 mile (80 km) zones for four nuclear power plant sites surrounding the CCNPP site. The other power plants include Salem Units 1 & 2 and Hope Creek Unit 1 to the northeast, Peach Bottom Units 2 and 3 to the north, North Anna Units 1 and 2 to the southwest, and Surry Units 1 and 2 to the south/southwest. As can be seen in the figure, the CCNPP site's 50 mi (80 km) radius overlaps slightly with the 50 mi (80 km) zones of each of these facilities. The cumulative effect of a portion of the construction workforce originating from within 50 mi (80 km) of Calvert Cliffs and potentially drawing employees from these other four power plants, or significantly adding to the total employment levels for these types of facilities in these areas, would be small because of the distances and intervening political and geographical features, and would not require mitigation.}

4.4.2.4 Housing

{The in-migrating construction workforce would likely either rent or purchase existing homes, or would rent apartments and townhouses. Non-migrating (i.e., weekly or monthly) workers would likely stay in area hotels, motels, bed and breakfasts (B&Bs), or at area campgrounds and recreational vehicle (RV) parks. Of the estimated 720 households migrating into the ROI to construct CCNPP Unit 3 under the 20% scenario and the 1,260 households in the 35% scenario, it is estimated that 535 to 940 households (75 percent) would reside in Calvert County and 180 to 320 (25 percent) would reside in St. Mary's County. This would represent a maximum of 12.9% to 22.6% of the 5,568 total housing units vacant in the ROI in 2000 (see Section 2.5.2). Thus, the ROI and each county within it have enough housing units available to meet the needs of the workforce, based upon 2000 housing information.

However, since 2000, discussions with the Calvert County Department of Economic Development indicated that the housing market in Calvert County might be tight. Despite this indication, as shown in Section 2.5.2 the county issued a low of 488 authorizations for construction of single family and multifamily units in 2005 to a high of 928 permits in 2002 (MDDP, 2006). Unlike Calvert County, discussions with the St. Mary's County Government indicated that the housing market might still remain open in St. Mary's County (see Section 2.5.2 for more details). Thus, the housing market is not likely to be quite as open as indicated by the 2000 data, but there still appears to be adequate housing available based upon the fact that less than 25% of the 2000 levels of vacant units would be used.

Also, the Calvert County Department of Economic development has indicated that because housing prices have increased significantly in Calvert County over the past few years, particularly in the northern part of the county, some of the units that might be available for purchase or rent in that location might be outside of the construction workers' budget. This might result in a greater percentage of the in-migrating construction workforce seeking housing in St. Mary's County than is estimated in these projections.

In addition to the above housing units, there are a total of 33 apartments and townhouse complexes providing one to three bedroom rental units in the ROI. Most of these facilities are located in St. Mary's County, including 28 apartment and townhouse complexes. These rental complexes could be used to house part of the in-migrating workforce and might be a viable option to purchasing more costly single-family homes. In addition, the St. Mary's County Government has indicated that some apartment units currently used by a major employer in the county to house staff in training, might become available in the future because of potential relocation of training activities to areas outside of Maryland. These units could provide an additional housing option for the in-migrating construction workforce.

Weekly or monthly commuters might elect to stay at one of the 28 hotels/motels/B&Bs facilities, providing about 1,950 rooms for rent, in the ROI. Most of the 28 hotels/motels/B&Bs facilities are located in St. Mary's County, with 16 hotel/motel facilities having 737 rooms. Because the hotels and motels are operating at or near capacity during the summer vacation season, from about April through August (see Section .2.5.2), the portions of the workforce that might want to stay on a weekly or monthly basis and then commute home might compete with existing users. During the remainder of the year, enough units would likely be available to meet the needs of the weekly or monthly commuters.

Because significantly more housing units are available than would be needed, the in-migrating workforce alone should not result in an increase in the demand for housing, or in increases in housing prices or rental rates. Also, construction is not scheduled to begin until 2011, providing adequate time for private developers to construct additional new homes and apartment complexes if the economy in the ROI expands, in general, and demand warrants it. In addition, for about seven months out of the year there are noticeable quantities of vacant motel and hotel units that could be used by weekly and monthly commuters. Thus, because of the available housing, it is concluded that the impacts to area housing would be SMALL, and would not require mitigation.}

4.4.2.5 Employment and Income

4.4.2.5.1 50 mi (80 km) Comparative Geographic Area

{As stated above, it is estimated that a peak of 3,950 direct construction employees would build CCNPP Unit 3. Under the 20% peak in-migration scenario described above, it is implicit that the remaining 80% (3,160) either would be commuting from a reasonable distance on a daily basis or would stay at area hotels/motels and would be weekly/monthly commuters to the job site. Under the 35% in-migration scenario, an estimated 65% (2,570) of the peak direct construction workers would be daily or weekly/monthly commuters. The greatest proportion of these workers would likely commute from within or near the Washington DC; Alexandria, Virginia; Annapolis, Maryland; and the Baltimore, Maryland, metropolitan areas. However, a portion of these workers also would likely originate from outside of this 50 mi (80 km) radius, from throughout the middle eastern seaboard and the remainder of the U.S. The greater the distance that they would commute and the longer that they are employed on the construction site, the more likely they would be to commute from home on a weekly or monthly basis and stay in area motels, or to become in-migrants into the ROI, as described in the housing section above. Because the employment opportunities and income would be spread over the 50 mi (80 km) radius, and an even larger geographic area and basis of comparison outside of the region, the beneficial impacts would be small and would not require mitigation.

4.4.2.5.2 Two-County Region of Influence

Direct construction workforce employment is already discussed in the demography section above. In addition to the 3,950 direct workforce, a peak of 495 indirect workforce jobs would be created in the ROI under the 20% scenario and 860 indirect jobs would be created under the 35% scenario (see Tables 4.4.2-5 and 4.4.2-6). This would result in a peak increase of 1,212 to 2,120 employed people in the ROI, depending upon the scenario selected. The peak increase in employment would range from 905 to 1,585 people in Calvert County and 310 to 535 people in St. Mary's County. Unemployed or underemployed members of the labor force could benefit from these increased employment opportunities, to the extent that they have the craft skills required (e.g., laborers, carpenters, electricians, plumbers, welders) and are hired as part of the construction workforce. These increases would result in a noticeable but small impact to the area economy, representing a maximum 4.0% increase in the 39,341 total labor force in Calvert County in 2000 and 1.2% in the 46,032 total labor force in St. Mary's County (USCB, 2000).

It is estimated that the direct construction workforce will receive average salaries of $34.00/hour/worker (two-thirds of the estimated $50 per hour, including benefits), or about $70,720 annually. This would result in an annual salary expenditure, for the peak construction workforce of 3,950 people, of $279.3 million. The average annual salary for the direct workforce would be moderately less than the $84,388 median income for an entire household in Calvert County in 2005, but larger than $62,939 median household income in St. Mary's County. Based upon the peak 35% scenario in-migration levels, Calvert County would experience an estimated $66.5 million increase in annual income during peak construction and St. Mary's County would receive an estimated $22.5 million annually. In addition, the working spouses of the direct construction workers, who filled indirect jobs created by the power plant, would contribute substantially to individual household incomes. The additional direct and indirect workforce income would result in additional expenditures and economic activity in the ROI. However, it would represent a small percentage of overall total income and economic activity in the ROI. It is concluded that the beneficial impacts to employment and income would be SMALL, relative to the overall labor force and ROI-wide income, and would not require mitigation.}

4.4.2.6 Tax Revenue Generation

4.4.2.6.1 50 mi (80 km) Comparative Geographic Area

{State income taxes would be generated by the in-migrating residents, although the amount cannot be estimated because of the variability of investment income, retirement contributions, tax deductions taken, applicable tax brackets, and other factors. It is estimated that the 50 mi (80 km) radius and the state, excluding the two-county ROI, would experience a $223.5 million increase in annual wages from the direct workforce under the 20% scenario (i.e., 80% of the construction workforce in the 50 mi (80 km) area) and $181.6 million under the 35% scenario (i.e., 65% of the construction workforce in the 50 mi (80 km) area). Relative to the existing total wages for the region and the 50 mi (80 km) radius, it is concluded that the potential increase in state income taxes represent a small economic benefit.

Additional sales taxes also would be generated by the power plant and the in-migrating residents. Constellation Generation Group and UniStar Nuclear Operating Services would directly purchase materials, equipment, and outside services, which would generate additional state sales taxes. Also, in-migrating residents would generate additional sales tax revenues form their daily purchases. The amount of increased sales tax revenues generated by the in-migrating residents would depend upon their retail purchasing patterns, but would only represent a small benefit to this revenue stream for the region and the 50 mi (80 km) radius.

Overall, although all tax revenues generated by the CCNPP Unit 3 and the related workforce would be substantial in absolute dollars, as described above, they would be relatively small compared to the overall tax base in the region and the state of Maryland. Thus, it is concluded that the overall beneficial impacts to state tax revenues would be SMALL.}

4.4.2.6.2 Two-County Region of Influence

{In 2006, Constellation Energy paid about $15.8 million in Calvert County property taxes (including $10.3 million in personal property and $5.5 million in operating real property taxes) for Units 1 and 2, and in 2007 it paid about $16.2 million in property taxes (including $10.6 million in personal property and $5.6 million in operating real property taxes),

The total project capital cost estimated for CCNPP Unit 3 is [ ] billion (in 2007 dollars). In 2007, the CCNPP Unit 3 site is estimated to generate [ ] million in total property taxes in its current, substantially undeveloped state. Investments in planning, engineering, and an assumed limited work authorization from 2008 through 2010 would result in UniStar paying increased county total property taxes, from about [ ] million in 2008, to [ ] million in 2009, to [ ] million in 2010. Even more substantial increases in total property tax payments would occur in subsequent years once major construction activities commence, including [ ] million in 2011, [ ] million in 2012, [ ] million in 2013, [ ] million in 2014, and [ ] million in 2015. The maximum of [ ] million would represent a significant [ ] percent increase in Calvert County's $78.8 million in annual property (real and personal) tax revenues for fiscal year 2005, and a [ ] percent increase in total county revenues of $174.1 million (see Section 2.5.2).

These increased property tax revenues would either provide additional revenues for existing public facility and service needs or for new needs generated by the power plant and associated workforce. The increased revenues could also help to maintain or reduce future taxes paid by existing non-project related businesses and residents, to the extent that project-related payments provide tax revenues that exceed the public facility and service needs created by CCNPP Unit 3. However, the payment of those taxes often lags behind the actual impacts to public facilities and services, or the time needed to plan for and provide the additional facilities or services. Thus, it is concluded that these increased power plant property tax revenues would be a LARGE economic benefit to Calvert County.

Additional county income taxes would be generated by the in-migrating residents, although the amount cannot be estimated because of the variability of investment income, retirement contributions, tax deductions taken, applicable tax brackets, and other factors. It is estimated that Calvert County would experience a $66.5 million increase in annual wages from the direct workforce. St. Mary's County would experience an estimated annual increase of $22.5 million from the direct workforce. Relative to the existing total wages for the ROI, it is concluded that the potential increase in county income taxes represent a small economic benefit to the jurisdictions.

As with the 50 mi (80 km) comparative geographic area, additional sales taxes also would be generated within the ROI by the power plant and the in-migrating residents. However, these purchases would be much smaller within the ROI. The amount of increased sales tax revenues generated by the in-migrating residents would depend upon their retail purchasing patterns, but would only represent a small benefit to this revenue stream for Calvert and St. Mary's Counties.

Overall, although all tax revenues generated by the CCNPP Unit 3 and the related workforce would be substantial, as described above, they would be relatively small compared to the overall tax base in the ROI. Thus, it is concluded that the overall beneficial impacts to tax revenues would be SMALL.}

4.4.2.7 Land Values

{The Maryland Department of Natural Resources evaluated three industrial facilities to determine how their presence might affect area property values. The three industrial facilities included CCNPP Units 1 and 2, the Alcoa Eastalco Works in Frederick County, and the Dickerson Generating Plant in Montgomery County. The study showed that residential property values were not adversely affected by their proximity to the CCNPP site. Overall, Maryland power plants have not been observed to have negative impacts on surrounding property values. This lack of impact is partially attributed to impact mitigation fees imposed in Maryland Power Plant Research Program (PPRP) conditions stipulated in Certificates of Public Convenience and Necessity (CPCNs). It is concluded that the impacts to land values would be SMALL, and would not require mitigation.}

4.4.2.8 Public Services

{Although an increase in population levels from the CCNPP operational workforces would likely place additional demands on area doctors and hospitals, as indicated in Section 2.5.2 discussions with Calvert Memorial Hospital have indicated that these services have enough capacity to accommodate the increased demand and impacts would likely be small. However, the increased population levels could place some additional daily demands on constrained police services, fire suppression and EMS services, and schools. Impacts to these services are provided below.

<u>Police</u>

The Calvert County Sheriffs Department previously has expressed concern about whether they have sufficient staff levels to simultaneously respond to a potential emergency and offsite evacuation in the event of an emergency. The department has identified ongoing current needs for additional funding, staff, facilities, and equipment. However, the department does not feel that construction of CCNPP Unit 3 and the potential additional in-migrating construction workforce, daily commuters, and weekly/monthly commuters would not create additional needs beyond the existing ones.

Similarly, representatives from St. Mary's County Government have stated that the Sheriff's Department currently has the typical ongoing need for additional staff. They felt that the peak in-migrating workforce and their families into the county would minimally increase their needs from their current levels, but not enough to warrant taking action.

<u>EMS and Fire Suppression Services</u>

The Calvert County and St. Mary's County have large volunteer fire departments that appear to be doing an excellent job of meeting the needs of their residents. The Calvert County Public Safety office has indicated that they have ongoing needs for some staff, renovation or construction of facilities for three departments, new vehicles, and new equipment. However, representatives of both departments felt that construction of the power plant generally would not create additional needs beyond those that already exist. Calvert County did state that the Emergency Management office staff would be affected by having to conduct emergency planning activities for the new power plant.

These fire and emergency response departments are supplemented by the CCNPP's onsite emergency response team, which includes a fire brigade. The CCNPP Unit 3 staff will include an onsite emergency response team staff, a fire brigade and emergency medical technician (EMT) responders. A new emergency management plan will be developed for CCNPP Unit 3, similar to that already existing for CCNPP Units 1 and 2, that would address Constellation Generation Group and UniStar Nuclear Operating Services and agency responsibilities, reporting procedures, actions to be taken, and other items should an emergency occur at CCNPP Unit 3.

Existing fire and law enforcement services in Calvert County and St. Mary's County appear to be adequate to meet current daily needs within their jurisdictions. As described in Section 4.4.2.6 above, the significant new tax revenues generated in Calvert County by operation of CCNPP Unit 3 would provide additional funding to expand or improve services and equipment to meet the additional daily demands created by the plant. St. Mary's County would also experience increased revenues from operation of the power plant, but to a much lesser extent. However, some departments still might not have enough staff and equipment to respond to an emergency situation, including offsite evacuation. Because the relevant departments did not feel that the new power plant would increase the needs on their services to the point of having to take action, it is concluded that there would be a SMALL impact on the fire and law enforcement departments and no mitigation would be required.}

Educational System

As described above, an estimated 535 to 940 new households would in-migrate into Calvert County for construction of CCNPP Unit 3. The estimated $29.0 to $71.2 million in increased annual property taxes that would be paid to Calvert County by UniStar during construction of CCNPP Unit 3, which include levies for the Calvert County Public School System, would provide additional funds to meet the educational needs of children for the in-migrating operational workforce. Calvert County Public Schools indicated that some of these current needs include providing additional special services (i.e., special education) for its students. If enrollment levels were to increase as a result of constructing the power plant, the district might seek assistance in recruiting additional teachers and would install modular classrooms. However, in general, the district did not feel that the in-migrating workforce would have an impact on the system. Thus, it is concluded that the impacts to the Calvert County Public School System would be SMALL, and would not require mitigation.

The St. Mary's County Government stated that the educational facilities in St. Mary's County Public School System already are operating about at capacity. However, representatives of the county stated that school enrollment has been relatively stable for the last few years, they are completing construction of a new elementary school, and don't anticipate building a new high school until about 2012. Because they are generally able to meet existing needs, they are now focused more on improving students' performance. The in-migration of an estimated 182 to 318 new households into the county from construction of the CCNPP Unit 3 could place greater demands on the system. Although the school district could receive some additional funding from property taxes generated by these new households (likely to be minimal because adequate housing units are already available in the county and those units are already being taxed), it would not receive additional funding directly from the power plant because CCNPP Unit 3 does not pay property taxes to St. Mary's County. Because the St. Mary's County Public School System is at capacity and would not receive additional funding, the impacts of the power plant would be SMALL and no mitigation would be required.}

4.4.2.9 Public Facilities

{As discussed above, there is a sufficient quantity of vacant housing units in Calvert and St. Mary's Counties to meet the housing needs of the in-migrating direct construction workforce for CCNPP Unit 3, so no new housing units would likely be required. The excess capacity in the water and sewage services and the lack of new construction resulting from the power plant would result in no effects to those services. Although an increase in the population would likely place additional demands on area transportation and recreational facilities, the facilities appear to have enough capacity to accommodate the increased demand and impacts would likely be small. Area highways and roads would have increased traffic levels, particularly during shift changes at the CCNPP, resulting in a small traffic impact. These impacts are described in Section 4.4.1.}

4.4.2.10 References

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4.4.3 ENVIRONMENTAL JUSTICE IMPACTS

This section describes the potential disproportionate adverse socioeconomic, cultural, environmental, and other impacts that construction of {CCNPP Unit 3} could have on low income and minority populations within two geographic areas. The first geographic areas is a 50 mi (80 km) radius of the {CCNPP Unit 3} power plant, where there is a potential for disproportionate employment, income, and radiological impacts, compared to the general population (NRC, 1999). This analysis also evaluates potential impacts within the region of influence (ROI), most of which is encompassed within a 20 mi (32 km) radius of the power plant site, where more localized potential additional impacts could occur to transportation/traffic, aesthetics, recreation, and other resources, compared to the general population. It also highlights the degree to which each of these populations would disproportionately benefit from construction of the proposed power plant, again compared to the entire population is also discussed.

Section 2.5.1 provides details about the general population characteristics of the study area. Section 2.5.4 provides details about the number and locations of minority and low income populations within a 50 mi (80 km) radius of the {CCNPP} site, and subsistence uses.

4.4.3.1 Minority and Low Income Populations and Activities

{As discussed in Section 2.5, about 90% of the residential population that lives within a 50 mi (80 km) radius lives farther than 30 mi (48 km) from the site. Calvert County and St. Mary's County have been defined as the ROI because 91% of the current CCNPP Units 1 and 2 operational workforce resides there, and it is assumed that the in-migrating construction workforce for CCNPP Unit 3 would also primarily reside in and impact this geographic area.

Because the power plant site is already developed and access is restricted, no minority or low income residences would be removed or relocated within the ROI. Additionally, the distance of the plant from area residents, in general, is great enough that none of these populations would be directly affected by construction of the power plant (i.e., noise, air quality, and other disturbances from the footprint of the facility).}

4.4.3.1.1 50 Mile (80 km) Comparative Geographic Area

Employment and Income

{There would be an estimated maximum 3,950-person workforce constructing the CCNPP Unit 3 power plant from 2011 to 2015, representing a significant increase in the overall employment opportunities for construction workers. Unemployed or underemployed members of minority and low income groups could benefit from increased employment opportunities, to the extent that they have the craft skills required (e.g., laborers, carpenters, electricians, plumbers, welders), are hired as part of the construction workforce, and have adequate transportation to access the construction site. These low income and minority populations primarily reside in the Washington/Arlington/Alexandria Metropolitan Statistical Area (MSA) and Prince Georges County, Maryland, and in Fairfax County, Virginia. The beneficial impacts of these potential new employment opportunities likely would be SMALL.

In addition, because of the demand for such skills, the proportion of low income and minority construction workers from the comparative geographic area that are currently employed could realize increased income levels, to the extent that they leave lower paying jobs to work on CCNPP Unit 3. The beneficial impacts of these increased income levels for low income and minority populations likely would be SMALL.

There are no unique minority or low income populations within the comparative geographic area that would likely be disproportionately adversely impacted by construction of the proposed power plant because they are located more than 30 mi (48 km, or outside of the ROI) from the CCNPP Unit 3 site where no environmental impacts (e.g., noise, air quality, water quality, changes in habitat, aesthetic, etc.) would likely occur.}

4.4.3.1.2 {Two-County} Region of Influence

Employment and Income

{Unemployed or underemployed members of minority and low income groups within the ROI also could benefit from increased employment opportunities, to the extent that they have the craft skills required (e.g., laborers, carpenters, electricians, plumbers, welders) and are hired as part of the construction workforce. The beneficial impacts of increased employment opportunities are likely to be more noticeable for minority and low-income populations within the 20 mi (32 km) radius that includes most of the ROI because of the potential hiring levels relative to the smaller existing workforce base. As shown in Table 4.4.3-1, minority and low income populations within a 20 mi (32 km) radius that comprises the ROI are located at least 11 mi (18 km) to the south in St. Mary's County and over 19 mi (30.6 km) away in Dorchester County. Because of their limited geographic extent and the level of impacts, the beneficial impacts of these potential new employment opportunities likely would be SMALL.

In addition, impacts on area businesses, and potentially related increased opportunities to obtain higher paying indirect jobs, could be realized from increased economic activity resulting from CCNPPs purchase of materials from businesses within the ROI. The beneficial impacts of these potential new employment opportunities likely would be SMALL.

In addition, because of the demand for such skills, the proportion of low income and minority construction workers from the ROI that are currently employed could realize increased income levels, to the extent that they leave lower paying jobs to work on CCNPP Unit 3. These benefits might be even greater for the low income populations within the 20 mi (32 km) radius of the ROI, relative to the benefits realized in the 50 mi (80 km) comparative geographic area, if construction related income currently is lower within the ROI. The beneficial impacts of these increased income levels for low income and minority populations likely would be SMALL.}

4.4.3.2 Subsistence Activities

{The types and levels of subsistence activities occurring in the two-county region of influence (i.e., Calvert and St. Mary's Counties) are described in Section 2.5.4. As discussed there, fish and shellfish harvesting are important parts of the food gathering activities for minority and low income residents. Chesapeake Bay sediments would be disturbed and turbidity would likely increase during construction of the water intakes and outfall for the CCNPP Unit 3. These activities could disturb current subsistence catch rates of shellfish and finfish, to the extent that they are occurring near the CCNPP site. Construction of the CCNPP Unit 3 intakes within the existing intake embayment should limit siltation effects outside of the curtain wall and are not likely to alter fishing habits or harvest. Construction of the discharge multi-port diffuser would result in temporary disturbance of the substrate and a localized increase in turbidity during the work activities, thus resulting in a small impact. Although these activities could disturb traditional subsistence catch rates of shellfish and finfish, to the extent that they are occurring near the CCNPP site, the impacts likely be SMALL for all members of the general public and, thus, would not represent a disproportionate impact to minority or low income populations.

As stated in ER Section 2.4.1, white-tail deer and waterfowl populations are abundant throughout Maryland and on or near the CCNPP site. These populations represent a valuable resource for hunters.

In addition, it is assumed that collection of plants for ceremonial purposes and as a food source (i.e., culturally significant plants, berries, or other vegetation) could be occurring in the two-county region of influence. Again, minority and low-income populations might be conducting these collection activities, off of the CCNPP site, more often than the general population. In addition, when conducting their collection activities, they also could be harvesting greater quantities of plants, than the general population. For safety and security reasons the general public is not allowed uncontrolled access to the CCNPP site. Thus, no ceremonial or subsistence gathering of culturally significant plants, berries, or other vegetation occurs on the site and no impacts will occur.}

Table 4.4.1-1 Typical Noise Levels of Construction Equipment
(Page 1 of 1)

Equipment Type	Noise Level, db(A)		
	Peak	at 50 ft (15.2 m)	at 3000 ft (914.4 m)
Earthmoving			
Loaders	104	73-86	38-51
Dozer	107	87-102	52-67
Scraper	93	80-89	45-54
Graders	108	88-91	53-56
Dump trucks	108	88	53
Heavy trucks	95	84-89	49-54
Materials Handling			
Concrete mixer	105	85	50
Crane	104	75-88	40-53
Forklift	100	95	60
Stationary			
Generator	96	76	41
Impact			
Pile driver	105	95	60
Jack hammer	108	88	53

Table 4.4.1-2 Projected Traffic Conditions During Construction (Page 1 of 1)

Intersection at MD 2/4	Morning Peak 6:30-7:30 AM		Afternoon Peak 4:00-5:00 PM	
	LOS	CLV (vph)	LOS	CLV (vph)
Calvert Beach Road	F	1796	F	1986
Calvert Cliffs Parkway	B	1005	E	1558
Pardoe Road	C	1293	E	1471
Cove Point Road	D	1371	E	1577
Nursery Road	F	2303	F	2525

LOS: Level of Service
CLV: Critical Lane Volume

Table 4.4.2-1 Estimated Average FTE Construction Workers, by Construction Year/Quarter at the CCNPP (Page 1 of 1)

Year / Quarter of Construction	Average FTE Construction Workforce
Year 1:	
1	350
2	800
3	1,250
4	1,600
Year 2:	
1	1,900
2	2,200
3	2,500
4	2,800
Year 3:	
1	3,050
2	3,200
3	3,350
4	3,500
Year 4:	
1	3,683
2	3,867
3	3,950
4	3,950
Year 5:	
1	3,950
2	3,917
3	3,700
4	3,400
Year 6:	
1	3,050
2	1,967
3*	768*

Note: The third "quarter" of construction year 6 has only two months; the length of the total construction period is estimated to be 68 months.

Table 4.4.2-2 Total Peak On-Site Nuclear Power Plant Construction Labor Force Requirements (based on an average of single power plants) (Page 1 of 1)

Personnel Description	DOE Percent of Total Peak Personnel, Average Single Unit	DOE Peak Total Personnel, Average Single Unit	Estimated CCNPP Unit 3 Total Peak Workforce Composition
Craft Labor	66.7%	1,600	2,635
Craft Supervision	3.3	80	130
Site Indirect Labor	6.7	160	265
Quality Control Inspectors	1.7	40	67
NSSS Vendor and Subcontractor Staffs	5.8	140	229
EPC Contractor's Managers, Engineers, and Schedulers	4.2	100	166
Owner's O&M Staff	8.3	200	328
Start-Up Personnel	2.5	60	99
NRC Inspectors	0.8	20	32
Total Peak Construction Labor Force	100.0 %	2,400	3,950

Notes:

EPC = Engineering, Procurement, and Construction
O&M = operation and maintenance
NRC = Nuclear Regulatory Commission
NSSS = Nuclear Steam Supply System
Percentages and numbers may total slightly more or less than the total due to rounding.

Table 4.4.2-3 Peak On-Site Nuclear Power Plant Construction Craft Labor Force Requirements (based on an average of single power plants)
(Page 1 of 1)

Craft Personnel Description	DOE Percent of Peak Craft Labor Personnel, Average Single Unit	DOE Peak Craft Labor Personnel, Average Single Unit	Estimated CCNPP Unit 3 Peak Craft Workforce Composition
Boilermakers	4.0 %	60	105
Carpenters	10.0	160	264
Electricians/Instrument Fitters	18.0	290	474
Iron Workers	18.0	290	474
Insulators	2.0	30	53
Laborers	10.0	160	264
Masons	2.0	30	53
Millwrights	3.0	50	79
Operating Engineers	8.0	130	211
Painters	2.0	30	53
Pipefitters	17.0	270	448
Sheetmetal Workers	3.0	50	79
Teamsters	3.0	50	79
Total Craft Labor Force	100.0 %	1,600	2,635

Notes: Percentages and numbers may total slightly more or less than the total due to rounding.

Table 4.4.2-4 Nuclear Power Plant Craft Labor Force Composition by Phases of Construction (in percent)
(Page 1 of 1)

Craft Labor	Percentage of Craft Labor Force by Construction Phase						
	Concrete Formwork, Rebar, Embeds, Concrete	Structural Strength Steel, Misc. Iron & Architectural	Earthwork Clearing, Excavation, Backfill	Mechanical Equipment Installation	Piping Installation	Instrument Installation	Electrical Installation
Boilermakers				15			
Carpenters	40	5					2
Electricians/Instrument Fitters						70	96
Iron Workers	20	75		10			
Laborers	30	5	60				1
Millwrights				25			
Operating Engineers	5	15	35	12	15	2	1
Pipefitters				35	80	28	
Teamsters			5	3	5		
Others	5						
Total Percentage of Craft Labor Force	100	100	100	100	100	100	100

Table 4.4.2-5 Estimates of In-Migrating Construction Workforce in Calvert County and *St. Mary's County, 20% In-Migration Scenario, 2011-2015*
(Page 1 of 1)

In-migration Characteristics	Calvert County	St. Mary's County	Total ROI
Direct Workforce:			
Maximum Direct Workforce			3,950
Percent of Current CCNPP Units 1 & 2 Workforce Distribution	68%	23%	
Estimated In-migrating Direct Workforce (@20% assumption)	537	182	719
In-migrating Direct Workforce Population (@2.61 people/household)	1,402	474	1,876
Indirect Workforce:			
Estimated Distribution of Peak Direct Workforce	2,686	909	3,595
Peak Indirect Workforce (@0.6855, BEA multiplier)	368	125	493
Indirect Workforce Needs That Could Met by Direct Workforce Spouses (@59.5% working spouses)	515	175	689
Remaining, Unmet Indirect Workforce Need*	-148	-50	-196

Notes:

It is assumed that 100% of the construction workforce in-migrating into the ROI will move their families with them.

U.S. Census Bureau 2000 census data indicates that the state of Maryland had 2.61 people per household.

U.S. Census Bureau 2000 census data indicates that, within the state of Maryland, 59.5% of households had a working spouse.

* - A negative value for the remaining, unmet indirect workforce needs means that working spouses of the in-migrating direct workforce will exceed the estimated number of indirect workforce jobs generated by the power plant.

Table 4.4.2-6 Estimates of In-Migrating Construction Workforce in Calvert County and St. Mary's County, 35% In-Migration Scenario, 2011-2015
(Page 1 of 1)

In-migration Characteristics	Calvert County	St. Mary's County	Total ROI
Direct Workforce:			
Maximum Direct Workforce			3,950
Percent of Current CCNPP Units 1 & 2 Workforce Distribution	68%	23%	
Estimated In-migrating Direct Workforce (@35% assumption)	940	318	1,258
In-migrating Direct Workforce Population (@2.61 people/household)	2,454	830	3,284
Indirect Workforce:			
Estimated Distribution of Peak Direct Workforce	2,686	909	3,595
Peak Indirect Workforce (@0.6855, BEA multiplier)	644	218	862
Indirect Workforce Needs Met by Direct Workforce Spouses (@59.5% working spouses)	901	305	1.205
Remaining, Unmet Indirect Workforce Need*	-256	-87	-434

Notes:

It is assumed that 100% of the construction workforce in-migrating into the ROI will move their families with them.

U.S. Census Bureau 2000 census data indicates that the state of Maryland had 2.61 people per household.

U.S. Census Bureau 2000 census data indicates that, within the state of Maryland, 59.5% of households had a working spouse..

* - A negative value for the remaining, unmet indirect workforce needs means that working spouses of the in-migrating direct workforce will exceed the estimated number of indirect workforce jobs generated by the power plant.

Table 4.4.3-1 Minority and Low Income Populations Within About 20 Linear Miles (32 km) of the CCNPP Site (Page 1 of 1)

County	Type of Population	Number of Census Block Groups	Estimated Linear Distance from CCNPP mi (km)	Direction from CCNPP
Region of Influence:				
Calvert	Minority	0	n/a	n/a
	Low Income	0	n/a	n/a
St. Mary's	Minority	2	11 (17.7)	South
	Low Income	1	11 (17.7)	South
Other Counties:				
Dorchester	Minority	4	>19 (30.6)	northeast
	Low Income	2	21 (33.8)	northeast
Charles	Minority	0	n/a	n/a
	Low Income	0	n/a	n/a
Prince George's	Minority	0	n/a	n/a
	Low Income	0	n/a	n/a
TOTAL	Minority	6		
	Low Income	3		

Notes:

n/a = not applicable

A 20-mi (32 km) radius was selected because it includes most of Calvert County and St. Mary's County, the ROI, but also includes portions of other counties.

FIGURE 4.4-1 **Rev. 0**

{CCNPP} TRAFFIC IMPACT ASSESSMENT STUDY AREA

CCNPP UNIT 3 ER

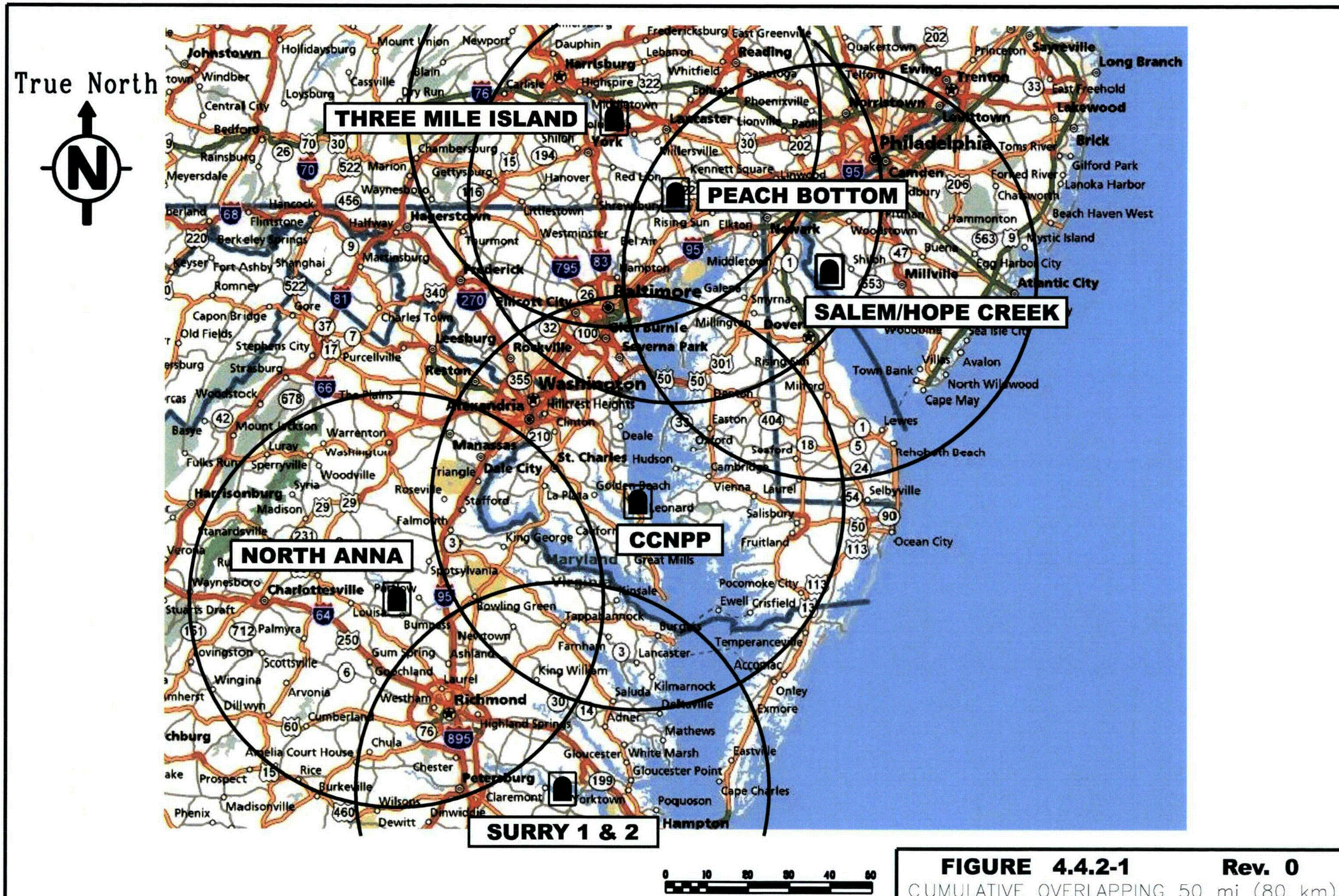

FIGURE 4.4.2-1 **Rev. 0**

CUMULATIVE OVERLAPPING 50 mi (80 km) ZONES FOR NUCLEAR POWER PLANTS SURROUNDING {CCNPP UNIT 3}

CCNPP UNIT 3 ER

4.5 Radiation Exposure to Construction Workers

4.5 RADIATION EXPOSURE TO CONSTRUCTION WORKERS

{This section discusses the exposure of construction workers building Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3 to radiation from the normal operation of CCNPP Units 1 and 2.}

4.5.1 SITE LAYOUT

{The physical location of CCNPP Unit 3 relative to the existing CCNPP Units 1 and 2 on the CCNPP site is presented on Figure 4.5-1. As shown, except for the CCNPP Unit 3 Intake Structure, CCNPP Unit 3 would be located southeast of the protected area from CCNPP Units 1 and 2. Hence, the majority of construction activity would take place outside the protected area for the existing units, but inside the Owner Controlled Area for the CCNPP site.}

4.5.2 RADIATION SOURCES AT CCNPP UNITS

{During the construction of CCNPP Unit 3, the construction workers will be exposed to radiation sources from the routine operation of CCNPP Units 1 and 2. Sources that have the potential to expose CCNPP Unit 3 workers are listed in Table 4.5-1. They are characterized as to location, inventory, shielding, and typical local dose rates. Interior, shielded sources are not included. Figure 4.5-2 and Figure 4.5-3 show the locations of these sources. These sources are discussed in the Offsite Dose Calculation Manual (ODCM) (CCNPP, 2005), the annual Radiological Effluent Release Report (CCNPP, 2006a), and the Radiological Environmental Operating Report (CCNPP, 2006b) for CCNPP Units 1 and 2. The four main sources of radiation to CCNPP Unit 3 workers are gaseous effluents, liquid effluents, the Independent Spent Fuel Storage Installation (ISFSI) and the Interim Resin Storage Area. These are discussed below.

All gaseous effluents flow out the CCNPP Units 1 and 2 plant stacks. The releases are reported annually to the NRC. For example, the annual gaseous releases from CCNPP Units 1 and 2 for 2005 were reported as 191 Ci (7.07E+12 Bq) of fission and activation gases, 1.36E-3 Ci (5.03E+07 Bq) of I-131, 1.35E-5 Ci (5.00E+05 Bq) of particulates with half-lives greater than eight days, and 6.48 Ci (2.40E+11 Bq) of tritium. Doses to the general population are also reported annually.

Effluents from the liquid waste disposal system produce small amounts of radioactivity in the discharge to the Chesapeake Bay. The annual liquid radioactivity releases for 2005 were reported as 0.11 Ci (4.07E+09 Bq) of fission and activation products, 991 Ci (3.67E+13 Bq) of tritium, and 0.141 Ci (5.22E+09 Bq) of dissolved and entrained gases (CCNPP, 2006a).

There are two main direct radiation sources, the ISFSI and the Interim Resin Storage Area. This is because they are closer to CCNPP Unit 3 than all the other direct sources. There are radiation monitors at the perimeter of each. Radiation from minor direct sources from CCNPP Units 1 and 2 would be picked up by the ISFSI and Resin Storage Area monitoring programs, and thus, would be included in the dose estimates below.}

4.5.3 HISTORICAL DOSE RATES

The historical measured and calculated dose rates that were used to estimate worker dose are presented below.

4.5.3.1 Gaseous and Liquid Effluent Historical Measurements

{The doses listed in Table 4.5-2 are to the maximally exposed member of the public due to the release of gaseous and liquid effluents from CCNPP Units 1 and 2 and are calculated in accordance with the existing units' ODCM (CCNPP, 2005). The maximum individual doses are from historical CCNPP Units 1 and 2 Annual Radiological Environmental Operating Reports and, prior to that, the Radiological Environmental Monitoring Program Annual Reports. The Annual Radioactive Effluent Release Report for 2005 provides a whole body dose of 0.005 mrem (0.05 μSv) and a critical organ dose of 0.095 mrem (0.95 μSv) to the maximally exposed member of the public due to the release of gaseous effluents from the existing units. The Annual Radioactive Effluent Release Report for 2005 provides a whole body dose of 0.004 mrem (0.04 μSv) and a critical organ dose of 0.017 mrem (0.17 μSv) to the maximally exposed member of the public due to the release of liquid effluents from the existing units. The controlling pathway was the fish and shellfish pathway. Construction workers will not ingest food (edible plants or fish) grown in effluent streams as part of their work activity, therefore, only external pathways will be considered.

4.5.3.2 ISFSI Historical Measurements

Figure 4.5-4 provides thermoluminescent dosimeter (TLD) measurements made adjacent to the ISFSI in 2005 as well as a conservative extrapolation of dose over distance. Table 4.5-3 contains the average monthly ISFSI TLD dose and the average monthly control location dose from 1990 to 2005. The locations used to determine the background are locations DR 1, 7, 8, 20, 21, 22, and 23 as described in the 2005 Radiological Environmental Monitoring Program (REMP) report (CCNPP, 2006b). Table 4.5-4 provides the time trend for the ISFSI net annual dose since spent fuel was initially placed into storage at the ISFSI in 1993.

4.5.3.3 Resin Storage Area Historical Measurements

Table 4.5-5 provides historical Resin Storage Area TLD readings from 2001 through 2005.

Figure 4.5-5 provides the ISFSI and Resin Storage Area TLD readings, averaged over all detectors and over each year of data. Figure 4.5-6 extrapolates the 2005 dose rate over distance from the center of the Resin Area.}

4.5.4 {PROJECTED DOSE RATES AT CCNPP UNIT 3

Dose rates from all sources combined were calculated for each 100 x 100 foot square on the plant grid. These dose rates were in terms of mrem/year. For purposes of dose rate calculations a 100% occupancy is assumed. (For purposes of collective dose calculations the occupancy for construction workers is 2,200 hours per year.) The dose rates were the sum of the dose rate from the four main sources; gases, liquids (only on the shoreline), ISFSI, and Resin Storage Area. They are shown in Figure 4.5-7 for the year 2015, the last year of construction. It is this year that the dose rate will be greatest, primarily because the ISFSI will have the largest number of spent fuel storage casks. No credit is taken for any additional shielding other than that present in measured doses is taken in the calculations.

4.5.4.1 Gaseous Dose Rates

The annual dose rate from gaseous effluents to construction workers on the CCNPP Unit 3 site is bounded by the following equation:

$$D(r) = 98020\, r^{-1.8342} \text{ (mrem/year)}$$

where r = distance from stack to worker location in feet

This parametric equation is based on annual average, undepleted, ground level X/Qs that are based on CCNPP site specific meteorology for the years 2000 to 2004. Note that only those wind directions which could carry gaseous effluents from the stacks to the CCNPP Unit 3 workers were included in the present analysis. Thus, the directions from ENE through the S, through SSW are included. The χ/Q data used are provided in Table 4.5-6. A bounding curve was then fitted to a power equation as shown in Figure 4.5-8.

The equation is:

$$\frac{X}{Q}(r) = 60.205r^{-1.8342}$$

Where *r* is the stack to target distance in feet.

The dose rates were calculated for an onsite location with a known χ/Q for the years 2001 through 2005 according to the Regulatory Guide 1.109 (NRC, 1977) method with Total Effective Dose Equivalent (TEDE) calculations according to Federal Guidance Reports 11 (EPA, 1988) and 12 (EPA, 1993). The gaseous releases are shown in Table 4.5-7. The 2005 releases gave the highest dose rates. This data was then used to establish the dose rate to χ/Q ratio which was used to derive a parametric equation to bound the dose rate from the 2005 releases.

4.5.4.2 Liquid Dose Rates

The dose from liquid effluents is conservatively calculated assuming all the exposure is from deposition on the shoreline. The historical liquid effluents and dilution rates for the years 2001 through 2005 are given in Table 4.5-8, the dose at the shoreline is 0.32 mrem/yr (3.2 μSv/yr).

The actual discharge from CCNPP Units 1 and 2 is 850 ft (259 m) away from shore. The dilution factor at the shore would provide a significant reduction but is conservatively ignored. The LADTAPII computer code (NRC, 1986) was used to make these calculations. LADTAPII assumes a 12 hours/year occupancy rate which had to be scaled up to by the factor 8766/12 for annual dose rate calculations.

4.5.4.3 ISFSI Dose Rates

The dose rate had to be calculated at various distances and directions from the ISFSI. The dose rate also had to be projected into the future as more spent fuel was loaded into storage canisters and stored at the ISFSI from CCNPP Units 1 and 2. TLD readings around the ISFSI as shown in Figure 4.5-9 were used to develop the following equation for 2005 dose rate as a function of location:

$$DR_{N,2005} = 76\,\omega\,e^{-0.00195x} \quad (mrem/year)$$

Where x = source surface to target distance (ft)

ω = solid angle of the ISFSI bunkers and an equivalent air scattering source above it.

This is a reasonable approximation for the North end, i.e., ISFSI-N, which was about 72% loaded with spent fuel at the end of 2005. The exterior perimeter distance, x, to ISFSI-N is calculated assuming a source center at N9703, E7936. Then, it was assumed that all post-2005 spent fuel loading went into ISFSI-S whose source center was N9403, E7936. The source term for ISFSI-S was an extrapolation of the historic dose rate increase from ISFSI-N as shown in Figure 4.5-10. The dose rate from ISFSI-S as a function of calendar year after 2005 is:

DR_S(t) = $DR_{N,2005}$ F_S(t) (mrem/year)

where, F_S(t) = -170.8456 + 0.08521 t

and where t is in absolute year (such as 2015).

Note that these provide annual average dose rates. There are significant temporal variations, for example, during ISFSI loading operations the dose rate will go up. These variations are included in the annual average. The short term affect of ISFSI spent fuel loading is important for consideration in the CCNPP Unit 3 ALARA program.

4.5.4.4 Resin Area Dose Rates

The resin dose rate equation is given below where, r, the distance in feet from the effective center of the Resin Area, i.e., N 10100 E 7600 on the plant grid in feet.

$$D = 2.23E6\ e^{-0.000951r} / r^2 \quad \text{(mrem/year)}$$

This is independent of direction. The Cobalt-60 photon energy spectrum is assumed because it typically dominates or bounds the exterior distance dose rate from resin beds. In reality there is expected to be significant variation in the sources and their strengths from quarter to quarter. There is also expected to be some azimuthal variation in dose rate. However, this is a best estimate, which is suitable for the purpose of ALARA calculations.

This equation was fitted to TLDs located as shown in Figure 4.5-11. The data for 2005 was used. All the data for the years 2001 through 2005 are in Table 4.5-5. There has been one year in which the dose rate was higher than is predicted by this equation. For this reason, future TLD dose rates will be monitored to assure that this equation and associated results remain valid.}

4.5.5 COMPLIANCE WITH DOSE RATE REGULATIONS

CCNPP Unit 3 construction workers are, for the purposes of radiation protection, members of the general public. This means that the dose rate limits are considerably lower than the 100 mrem/year limit to be considered a radiation worker. The construction workers (with the exception of certain specialty contractors loading fuel or using industrial radiation sources for radiography) do not deal with radiation sources.

There are three regulations that govern dose rates to members of the general public. Dose rate limits to the public are provided in 10 CFR 20.1301 (CFR, 2007a) and 10 CFR 20.1302 (CFR, 2007b). Compliance with 10 CFR 20.1302 is discussed in Section 4.5.7. The design objectives of 10 CFR 50, Appendix I (CFR, 2007c) apply relative to maintaining dose as low as reasonably achievable (ALARA) for construction workers. Also, 40 CFR 190 (CFR, 2007d) applies as it is referred to in 10 CFR 20.1301. Note that 10 CFR 20.1201 through 20.1204 do not apply to the construction workers as they are considered members of the public and not radiation workers.

4.5.5.1 10 CFR 20.1301

{The 10 CFR 20.1301 (CFR, 2007a) limits annual doses from licensed operations to individual members of the public to 0.1 rem (1 mSv) TEDE (total effective dose equivalent.) In addition, the dose from external sources to unrestricted areas must be less than 0.002 rem (0.02 mSv) in any one hour. This applies to the public both outside of and within controlled areas. Given that the relevant sources are relatively constant in time, the hourly limit is met if the annual limit is met. The maximum dose rates by zone are given in Table 4.5-9. For an occupational year, i.e., 2,200 hours onsite, the maximum dose would be on the road by the ISFSI or the Resin Storage Area where the dose would be 0.0388 rem (388 mSv) and less than .002 rem (0.02 mSV) in any one hour. This assumes the worker stood on the road for all working hours in one year. This value is less than the limits specified above for members of the public. Therefore, construction workers can be considered to be members of the general public for the purpose of not requiring radiation protection or monitoring.

4.5.5.2 10 CFR 50, Appendix I

The 10 CFR 50, Appendix I criteria (CFR, 2007c) apply only to effluents. The purpose of the criteria are to assure adequate design of effluent controls. The annual limits for liquid effluents are 3 mrems (30 μSv) to the total body and 10 mrems (100 μSv) to any organ. For gaseous effluents, the pertinent limits are 5 mrems (50 μSv) to the total body and 15 mrems (150 μSv) to organs including skin. Table 4.5-10 shows that there is no dose rate to workers in a construction zone from effluents that exceeds 1 mrem/year (10 μSv/year). Therefore, the criteria have been met. Note that CCNPP Unit 3 occupational zones, during construction, are treated, for purposes of these criteria, as unrestricted areas.

4.5.5.3 40 CFR 190

The 40 CFR 190 (CFR, 2007d) criteria apply to annual doses, here called dose rates because the units are in mrem per year, received by members of the general public exposed to nuclear fuel cycle operations, i.e., nuclear power plants. Therefore, these regulations apply to CCNPP Unit 3 construction workers on the plant site, just as they apply to members of the general public who live offsite. The most limiting part of the regulation states "The annual dose equivalent (shall) not exceed 25 millirems (per year) to the whole body." In the case of CCNPP Units 1 and 2 effluent releases, if this regulation is met for the whole body, then the thyroid and organ components will also be met.

Table 4.5-9 shows that the maximum dose rate in any of the construction zones is 38.83 mrem/2,200 hours (388 mSv/2,200 hours). The units are expressed to be clear that an occupancy of 2200 hours is assumed. The use of 2,200 hours assumes the worker takes 2 weeks vacation or sick time per year, works 40 hours per week for 50 weeks per year, and works 10% overtime per year. Note, that this dose rate is for the maximum dose rate locations adjacent to the ISFSI and Resin Storage Areas. The ALARA program described below will not allow workers to linger or work full shifts at these locations. The maximum dose rates for all other Construction Zones are less than 25 mrem/year (0.25 msievert/year). Therefore, the requirements of 40 CFR 190 will be met for all construction workers.}

4.5.6 {COLLECTIVE DOSES TO CCNPP UNIT 3 WORKERS

The collective dose is the sum of all doses received by all workers. It is a measure of population risk. The total worker collective dose for the combined years of construction is 15.4 person-rem (0.154 person-Sieverts). This is a best estimate and is based upon the worker census and occupancy projections shown in Table 4.5-11 and Table 4.5-12. The breakdown of collective dose by construction year and occupancy zone is given in Table 4.5-13. This assumes 2,200 hours per year occupancy for each worker.}

4.5.7 RADIATION PROTECTION AND ALARA PROGRAM

{Due to the exposures from CCNPP Units 1 and 2 normal operations, there will be a radiation protection and ALARA program for CCNPP Unit 3 construction workers. This program will meet the guidance of Regulatory Guide 8.8 (NRC, 1978) to maintain individual and collective radiation exposures ALARA. This program will also meet the requirements of 10 CFR 20.1302.

Because the construction workers are not radiation workers, but are, for the purposes of radiation protection, members of the general public, individual monitoring and training of construction workers on CCNPP Unit 3 is not required. Construction workers will be treated, for purposes of radiation protection, as if they are members of the general public in unrestricted areas.

However, they are exposed to effluent radioactivity and direct radiation sources from CCNPP Units 1 and 2. The most important reason for the ALARA program is that these source levels may vary over time from the projections made here. There may also be additional sources, unaccounted for by the above projections.

Some features of the CCNPP Unit 3 Construction ALARA Program will be:

- The CCNPP Unit 3 ALARA Committee will operate in parallel with the CCNPP Units 1 and 2 ALARA Committee. The Committee will meet quarterly, will review monitoring, and review worker dose rate and dose projections. The Committee will be empowered to stop work if the "general public" status of any construction worker(s) is jeopardized. The Committee will publish a dose and dose rate report for construction workers.
- Unit 3 radiation protection personnel will report to the Committee. The Radiation Protection Department will be in charge of radiation monitoring, worker census, source census and use this data to project worker doses and dose rates on a monthly basis into the next quarter and will report to the Committee.
- The CCNPP Units 1 and 2 ODCM and other CCNPP Unit 1 and 2 processes such as the ISFSI projected loading process, will be updated to link dose important CCNPP Unit 1 and 2 activities to projected CCNPP Unit 3 construction worker ALARA dose.
- The Committee will periodically identify and direct construction management to control the occupancy of areas, such as the road between the ISFSI and the Resin Storage Area, where dose rates can be high enough that workers might exceed 40 CFR 190 limitations for example, when spent fuel casks are being transported to the ISFSI.
- The Committee will establish a radiation monitoring program to assure 40 CFR 190 regulations are met for CCNPP Unit 3 Construction workers. It is expected that monitoring will require either special instruments and/or measurements closer to sources and projected by calculation further out to where workers will be.
- The Committee will require, before any high dose rate evolutions, such as the transport of fuel to the ISFSI, or transport of resins to the Resin Storage Area, or transport on site of large, radioactive components, that the CCNPP Unit 3 ALARA evaluation be revised.
- Consumption of edible plants growing onsite or fishing onsite will not be allowed.
- The program will survey the radiation levels in construction areas and will survey radioactive materials in effluents released to construction areas to demonstrate compliance with dose limits for CCNPP Unit 3 workers.
- The program will comply with the annual dose limit in 10 CFR 20.1301 by measurement or calculation to verify the total effective dose equivalent to the individual worker likely to receive the highest dose from any onsite operation does not exceed the annual dose limit.**}**

4.5.8 REFERENCES

CFR, 2007a. Title 10, Code of Federal Regulations, Part 20.1301, Dose Limits for Individual Members of the Public, 2007.

CFR, 2007b. Title 10, Code of Federal Regulations, Part 20.1302, Compliance with Dose Limits for Individual Members of the Public, 2007.

CFR, 2007c. Code of Federal Regulations, Title 10 CFR 50, Appendix I, Numerical Guides for Design Objectives and Limiting Condition for Operation to Meet the Criterion 'As Low as is Reasonably Achievable' for Radioactive Material in Light Water Cooled Nuclear Power Reactor Effluents, 2007.

CFR, 2007d. Title 40, Code of Federal Regulations, Part 190, Environmental Radiation Protection Standards for Nuclear Power Operations, 2007.

{CCNPP, 2005. Offsite Dose Calculation Manual for Calvert Cliffs Nuclear Power Plant, Revision 8, Calvert Cliff Nuclear Power Plant, July 14, 2005.

CCNPP, 2006a. 2005 Radioactive Effluent Release Report, for the year 2005, Calvert Cliffs Nuclear Power Plant, July 13, 2006.

CCNPP, 2006b. Annual Radiological Environmental Operating Report for the Calvert Cliffs Nuclear Power Plant Units 1 and 2 and the Independent Spent Fuel Storage Installation for the year 2005, Calvert Cliff Nuclear Power Plant, April 2006.}

EPA, 1988. Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion, Federal Guidance Report No. 11, Document Number EPA-52011-88-020, U.S. Environmental Protection Agency, September 1988.

EPA, 1993. External Exposure to Radionuclides in Air, Water, and Soil, Federal Guidance Report No. 12, Document Number EPA-402-R-93-08 1, U.S. Environmental Protection Agency, September 1993.

NRC, 1978. Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations will be as Low As is Reasonably Achievable, Regulatory Guide 8.8, Revision 3, Nuclear Regulatory Commission, June 1978.

NRC, 1977. Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10CFR Part 50, Appendix I, Regulatory Guide 1.109, Revision 1, Nuclear Regulatory Commission, October 1977.

NRC, 1986. LADTAP II – Technical Reference and User Guide, NUREG/CR-4013, Nuclear Regulatory Commission, April 1986.

Table 4.5-1 Source List for CCNPP Units 1 and 2
(Page 1 of 2)

Source	Location	Radioactive Inventory	Shielding	Typical Dose Rates
CCNPP Unit 1 Stack	Side of CCNPP Unit 1 containment	There are two elevated vents, one for each of CCNPP Units 1 and 2. Their joint effluents are characterized in the annual RETS/REMP reports(a)	N.A., airborne effluent	Offsite doses generally less than few mrem/year (msievert/year)
CCNPP Unit 2 Stack	Side of CCNPP Unit 2 containment		N.A., airborne effluent	Offsite doses generally less than few mrem/year (msievert/year)
Circulating Water System Discharge	850 ft (259.1 m) from shore	Liquid effluents discharged to bay are characterized in annual RETS/REMP reports(b)	N.A., waterborne effluent	Offsite doses generally less than few mrem/year (msievert/year)
ISFSI	ISFSI Pad	Spent fuel characterized by TLD measurements listed in annual ISFSI REMP report	Vented concrete bunkers	Contact dose rates <20 mrem/hr (<0.2 msievert/hr)
Auxiliary Building	West of Turbine Building	Radwaste tanks and storage	Shielded building walls	Exterior contact <2.5 mrem/hr (<0.025 msievert/hr)
Refueling Water Tanks (RWT)	Adjacent to Auxiliary Building on 45 ft (13.7 m) elevation	Maximum inventory occurs when tanks have reactor water	None	<5.0 mrem/hr (<0.05 msievert/hr) at 15 ft (4.6 m) distance
Interim Resin Storage Area, Lake Davies	300 ft (91.4 m) west of ISFSI	Interim storage of spent resin and filters	None	<0.5 mrem/hr (<0.005 msievert/hr) at the storage area fence
Materials Processing Facility (MPF)	South of Turbine Building	Interim storage of dry active waste, and liquids being processed for shipment	Variety of shields built into structure	Exterior contact <0.5 mrem/hr (<0.005 msievert/hr)
Original Steam Generator Storage Facility	100 ft (30.5 m) north of north end of ISFSI	Lower assemblies of four original steam generators	Heavily shielded building	Exterior contact <0.5 mrem/hr (<0.005 msievert/hr)

Table 4.5-1 Source List for CCNPP Units 1 and 2 (Page 2 of 2)

Source	Location	Radioactive Inventory	Shielding	Typical Dose Rates
West Road Cage	On 45 ft (13.7 m) Elevation ~120 ft (~36.6 m) Auxiliary Building rollup doors	Interim storage of spent resins and filters	None	< 5.0 mrem/hr (<0.05 msievert/hr) at the cage fence

Notes:

(a) The gaseous releases reported for 2005 were 191 Ci (7.07E+12 Bq) of fission and activation gases, 1.36E-3 Ci (5.03E+07 Bq) of I-131, 1.35E-5 Ci (5.00E+05 Bq) of particulates with half-lives greater than eight days, and 6.48 Ci (2.40E+11 Bq) of tritium. These are typical compared to recent years.

(b) Liquid effluents from the liquid waste disposal produce small amounts of radioactivity in the discharge to the Chesapeake Bay. The annual liquid radioactivity releases for 2005 were reported as 0.11 Ci (4.07E+09 Bq) of fission and activation products, 991 Ci (3.67E+13 Bq) of tritium, and 0.141 Ci (5.22E+09 Bq) of dissolved and entrained gases. These are typical compared to recent years.

Table 4.5-2 Historical All-Source Compliance for Offsite General Public (Page 1 of 1)

(Historically the receptors have been offsite;
therefore the dose is dominated by gaseous and liquid effluents.)

	Historical Site Boundary Doses Reported to NRC (mrem/year)/(msievert/year)			Percent of 40 CFR 190 Limit by Year of Operation		
Limits	75	25	25	Percent of Limit		
Year	Thyroid	WB	Other Organs	Thyroid	WB	Other Organs
2005	0.006/0.00006	0.005/0.00005	0.095/0.00095	0.01	0.02	0.38
2004	0.007/0.00007	0.002/0.00002	0.006/0.00006	0.01	0.01	0.02
2003	0.006/0.00006	0.004/0.00004	0.023/0.00023	0.01	0.02	0.09
2002	0.003/0.00003	0.007/0.00007	0.174/0.00174	0.00	0.03	0.70
2001	0.005/0.0005	0.010/0.0001	0.351/0.00351	0.01	0.04	1.40
2000	0.018/0.00018	0.018/0.00018	0.211/0.00211	0.02	0.07	0.84
1999	0.011/0.00011	0.013/0.00013	0.686/0.00686	0.01	0.05	2.74
1998	0.005/0.00005	0.005/0.00005	0.302/0.00302	0.01	0.02	1.21
1997	0.005/0.00005	0.009/0.00009	0.235/0.00235	0.01	0.04	0.94
1996	0.005/0.00005	0.012/0.00012	0.245/0.00245	0.01	0.05	0.98
1995	0.007/0.00007	0.017/0.00017	0.132/0.00132	0.01	0.07	0.53
1994	0.024/0.00024	0.039/0.00039	0.473/0.00473	0.03	0.15	1.89
1993	0.099/0.00099	0.125/0.00125	0.466/0.00466	0.13	0.50	1.86
1992	0.125/0.00125	0.114/0.00114	0.420/0.0042	0.17	0.46	1.68
1991	0.167/0.00167	0.045/0.00045	0.292/0.00292	0.22	0.18	1.17
1990	0.070/0.0007	0.070/0.0007	0.370/0.0037	0.09	0.28	1.48
1989	0.526/0.00526	0.113/0.00113	0.674/0.00674	0.70	0.45	2.70
1988	1.130/0.00113	0.120/0.0012	0.500/0.005	1.51	0.48	2.00
1987	0.381/0.00381	0.250/0.0025	1.360/0.00136	0.51	1.00	5.44
1986	0.685/0.00685	0.093/0.00093	0.643/0.00643	0.91	0.37	2.57
1985	0.800/0.008	0.010/0.0001	0.030/0.0003	1.07	0.04	0.12
1984	0.710/0.0071	0.110/0.0011	0.020/0.0002	0.95	0.44	0.08
1983	0.150/0.0015	0.060/0.0006	0.030/0.0003	0.20	0.24	0.12
1982	0.220/0.0022	0.034/0.00034	0.080/0.0008	0.29	0.14	0.32
1981	0.100/0.001	0.002/0.00002	0.080/0.0008	0.13	0.01	0.32
1980	0.170/0.0017	0.009/0.00009	N/A/N/A	0.23	0.04	N/A

Table 4.5-3 Historical ISFSI Exposures by Year
(Page 1 of 1)

Average TLD Exposures by Year Digitized from Figure 4.5-5 of 2005 REMP Report (mRoentgen/30 days) (These are historical values and are listed as reported, in English units)		
Year	ISFSI	Control
1990	3.96	N/A
1991	3.95	4.11
1992	4.28	4.40
1993	3.99	4.19
1994	4.73	4.63
1995	5.14	4.69
1996	5.01	4.20
1997	5.56	4.31
1998	6.20	4.56
1999	6.07	4.47
2000	5.72	3.88
2001	6.88	4.15
2002	7.23	4.48
2003	8.46	4.60
2004	8.27	4.51
2005	8.14	4.02

Note:

1990 through 1992 provide baseline data before spent fuel stored at ISFSI in 1993.

Table 4.5-4 Historical ISFSI Net Trend
(Page 1 of 1)

Annual Gamma Dose Rate based on ISFSI TLDs						
Year	ISFSI	Control[(a)]	Net ISFSI	ISFSI	Control adjusted	Net ISFSI
	mrem/y	mrem/y	mrem/y	uSv/y	uSv/y	uSv/y
1991	48.06	47.54	(b)	480.6	475.4	(b)
1992	52.10	51.11	(b)	521.0	511.1	(b)
1993	48.53	48.54	0.00	485.3	485.4	0.0
1994	57.55	53.93	3.62	575.5	539.3	36.2
1995	62.59	54.67	7.92	625.9	546.7	79.2
1996	61.00	48.61	12.39	610.0	486.1	123.9
1997	67.69	50.02	17.68	676.9	500.2	176.8
1998	75.38	53.08	22.30	753.8	530.8	223.0
1999	73.80	52.00	21.79	738.0	520.0	217.9
2000	69.56	44.78	24.77	695.6	447.8	247.7
2001	83.71	48.02	35.69	837.1	480.2	356.9
2002	87.92	52.08	35.84	879.2	520.8	358.4
2003	102.90	53.49	49.41	1029.0	534.9	494.1
2004	100.65	52.41	48.24	1006.5	524.1	482.4
2005	99.07	46.52	52.55	990.7	465.2	525.5

Notes:

(a) Slightly adjusted such that 1993 net TLD dose is zero.

(b) 1991 and 1992 provide baseline before first spent fuel stored at ISFSI in 1993.

(c) SI Units assume 1Roentgen = 1rem = 0.01 Sv which is correct to +/- 10%.

Table 4.5-5 Historical Resin Area TLD Readings for 2001 through 2005
(Page 1 of 1)

Quarter	RPDR05	RPDR06	RPDR07	RPDR08	RPDR09	RPDR10	RPDR11	RPDR12
1st Qtr 2001	16.07	16.88	27.94	16.66	32.02	29.56	11.82	21.36
2nd Qtr 2001	51.86	129.45	166.45	124.63	113.28	48.70	17.39	29.98
3rd Qtr 2001	38.54	50.32	154.74	146.91	122.34	52.91	16.91	32.08
4th Qtr 2001	17.54	20.19	23.16	19.72	19.62	21.49	12.68	21.98
1st Qtr 2002	20.91	23.04	38.04	37.08	28.29	28.45	13.96	24.30
2nd Qtr 2002	19.07	18.71	15.78	17.54	19.28	20.96	13.43	21.78
3rd Qtr 2002	15.83	16.20	19.20	18.68	21.08	23.75	16.27	27.98
4th Qtr 2002	16.87	17.04	23.38	18.94	18.91	21.48	17.89	29.63
1st Qtr 2003	16.48	17.21	23.87	18.31	18.11	22.52	18.06	19.73
2nd Qtr 2003	17.75	17.74	31.33	18.73	16.34	25.52	21.06	21.49
3rd Qtr 2003	15.44	15.87	20.96	20.52	16.98	19.31	17.58	24.81
4th Qtr 2003	18.01	16.93	18.63	17.39	19.97	21.78	17.29	26.26
1st Qtr 2004	16.32	16.75	17.88	17.64	18.75	20.89	17.38	25.82
2nd Qtr 2004	36.25	33.89	18.85	36.51	24.17	22.40	16.14	23.34
3rd Qtr 2004	30.26	30.32	24.27	50.34	28.67	30.49	14.84	32.10
4th Qtr 2004	59.47	72.37	74.41	77.07	43.09	46.48	21.50	48.46
1st Qtr 2005	33.37	42.40	34.46	37.28	31.26	33.52	17.03	52.83
2nd Qtr 2005	57.76	53.64	35.03	44.53	45.42	33.16	18.67	60.40
3rd Qtr 2005	30.16	33.09	23.84	42.11	25.38	24.47	15.03	46.03
4th Qtr 2005	17.97	16.71	20.91	38.71	20.81	18.56	14.62	39.27

Note:

(Exposure Rates to TLDs are expressed in mRoentgen/90 days. Note that for photons, a Roentgen is approximately equal to a rem.)

Table 4.5-6 Historical Annual Average χ/Q (sec/m^3) In CCNPP Unit 3 Directions (Page 1 of 1)

Normal Effluent Annual Average, Undecayed, Undepleted χ/Q Values for Ground Level Release Without Building Wake Using CCNPP Meteorological Data for Directions that Could Affect CCNPP Unit 3 Workers				
Downwind Direction	Distance from Stacks to CCNPP Unit 3 Location			
	0.5 mi (0.8 km)	0.62 mi (1.0 km)	1.5 mi (2.4 km)	2.5 mi (4.0 km)
ENE	3.19E-05	2.15E-05	2.74E-06	8.81E-07
E	2.35E-05	1.59E-05	2.02E-06	6.49E-07
ESE	2.22E-05	1.50E-05	1.90E-06	6.10E-07
SE	1.64E-05	1.12E-05	1.41E-06	4.43E-07
SSE	1.20E-05	7.51E-06	9.39E-07	2.94E-07
S	1.13E-05	7.70E-06	9.54E-07	2.96E-07
SSW	1.05E-05	7.17E-06	8.87E-07	2.74E-07

Table 4.5-7 Historical Gaseous Releases for 2002 through 2005
(Page 1 of 1)

Nuclide	2002 Release Ci (Bq)	2003 Release Ci (Bq)	2004 Release Ci (Bq)	2005 Release Ci (Bq)
1 H-3	7.33E+00 (2.71E+11)	1.20E+01 (4.44E+11)	5.86E+00 (2.17E+11)	6.48E+00 (2.40E+11)
18 Ar-41	1.06E-02 (3.92E+08)	1.68E-02 (6.21E+08)	4.32E-01 (1.60E+10)	2.87E-03 (1.06E+08)
26 Fe-55	None Detected	None Detected	2.52E-04 (9.33E+06)	None Detected
27 Co-58	None Detected	None Detected	1.24E-05 (4.59E+05)	7.09E-06 (2.62E+05)
35 Br-82	None Detected	None Detected	1.10E-05 (4.07E+05)	None Detected
36 Kr-85 m	1.78E-02 (6.60E+08)	6.67E-02 (2.47E+09)	5.48E-02 (2.03E+09)	2.18E-02 (8.06E+08)
36 Kr-85	3.33E+01 (1.23E+12)	2.99E+01 (1.11E+12)	2.31E+01 (8.54E+11)	2.22E+01 (8.23E+11)
36 Kr-87	3.09E-04 (1.14E+07)	2.87E-03 (1.06E+08)	7.08E-05 (2.62E+06)	
36 Kr-88	6.65E-04 (2.46E+07)	9.07E-03 (3.36E+08)	4.90E-03 (1.81E+08)	9.06E-03 (3.35E+08)
38 Sr-89	None Detected	None Detected	None Detected	1.24E-07 (4.59E+03)
38 Sr-90	None Detected	None Detected	4.48E-10 (1.66E+01)	9.43E-07 (3.49E+04)
53 I-131	5.75E-04 (2.13E+07)	1.82E-03 (6.72E+07)	1.54E-03 (5.71E+07)	1.36E-03 (5.03E+07)
53 I-133	2.96E-03 (1.10E+08)	3.80E-03 (1.41E+08)	1.42E-03 (5.25E+07)	3.06E-03 (1.13E+08)
54 Xe-131 m	1.00E-01 (3.71E+09)	9.53E-01 (3.53E+10)	8.35E-01 (3.09E+10)	6.57E-01 (2.43E+10)
54 Xe-133 m	2.84E-01 (1.05E+10)	1.83E+00 (6.78E+10)	1.75E+00 (6.49E+10)	6.11E-01 (2.26E+10)
54 Xe-133	6.03E+01 (2.23E+12)	1.12E+02 (4.15E+12)	1.22E+02 (4.52E+12)	1.55E+02 (5.72E+12)
54 Xe-135 m	6.12E-04 (2.26E+07)	5.29E-03 (1.96E+08)	1.29E-04 (4.77E+06)	None Detected
54 Xe-135	2.75E+00 (1.02E+11)	5.77E+00 (2.13E+11)	9.23E+00 (3.41E+11)	1.29E+01 (4.77E+11)
54 Xe-138	1.34E-04 (4.96E+06)	3.71E-04 (1.37E+07)	7.15E-09 (2.64E+02)	None Detected

Table 4.5-8 Historical Liquid Releases 2001 through 2005
(Page 1 of 2)

Isotope	2001 Release Ci (Bq)	2002 Release Ci (Bq)	2003 Release Ci (Bq)	2004 Release Ci (Bq)	2005 Release Ci (Bq)
Ag-110M	3.45E-02 (1.28E+09)	2.03E-02 (7.49E+08)	2.22E-03 (8.22E+07)	2.65E-04 (9.81E+06)	9.78E-06 (3.62E+05)
Ba-140	None Detected	2.88E-05 (1.07E+06)	None Detected	None Detected	None Detected
Ba-24	4.66E-03 (1.72E+08)	None Detected	None Detected	None Detected	None Detected
Be-7	None Detected	3.94E-04 (1.46E+07)	None Detected	None Detected	None Detected
Ce-144	1.19E-03 (4.40E+07)	None Detected	2.25E-04 (8.33E+06)	None Detected	None Detected
Co-57	1.19E-03 (4.39E+07)	3.50E-04 (1.30E+07)	7.61E-05 (2.82E+06)	1.62E-05 (5.99E+05)	1.39E-06 (5.14E+04)
Co-58	3.04E-01 (1.13E+10)	4.29E-02 (1.59E+09)	1.44E-02 (5.33E+08)	5.90E-03 (2.18E+08)	2.39E-03 (8.85E+07)
Co-60	1.95E-02 (7.22E+08)	1.94E-02 (7.19E+08)	3.64E-03 (1.34E+08)	1.77E-03 (6.53E+07)	5.94E-04 (2.20E+07)
Cr-51	5.64E-02 (2.09E+09)	1.09E-02 (4.03E+08)	1.54E-03 (5.71E+07)	6.88E-04 (2.55E+07)	3.89E-04 (1.44E+07)
Cs-134	3.30E-03 (1.22E+08)	2.35E-04 (8.68E+06)	7.95E-05 (2.94E+06)	2.78E-04 (1.03E+07)	7.55E-05 (2.79E+06)
Cs-137	9.39E-03 (3.48E+08)	4.44E-04 (1.64E+07)	3.17E-04 (1.17E+07)	7.34E-04 (2.71E+07)	1.32E-04 (4.89E+06)
Eu-154	6.99E-04 (2.59E+07)	3.32E-04 (1.23E+07)	2.03E-04 (7.51E+06)	None Detected	None Detected
Eu-155	2.23E-04 (8.25E+06)	3.63E-04 (1.34E+07)	1.47E-04 (5.44E+06)	None Detected	None Detected
Fe-55	1.07E-01 (3.96E+09)	1.19E-01 (4.41E+09)	2.71E-02 (1.00E+09)	1.51E-02 (5.59E+08)	8.67E-02 (3.21E+09)
Fe-59	5.02E-03 (1.86E+08)	2.25E-03 (8.33E+07)	5.80E-05 (2.14E+06)	5.35E-06 (1.98E+05)	1.66E-05 (6.13E+05)
I -131	1.42E-03 (5.26E+07)	3.51E-04 (1.30E+07)	6.04E-04 (2.24E+07)	2.93E-04 (1.08E+07)	1.58E-04 (5.86E+06)
I -132	None Detected	2.40E-04 (8.88E+06)	None Detected	None Detected	None Detected
I -133	8.97E-05 (3.32E+06)	4.95E-05 (1.83E+06)	1.57E-05 (5.80E+05)	3.55E-05 (1.31E+06)	1.59E-05 (5.86E+05)
La-140	None Detected	9.69E-05 (3.59E+06)	None Detected	None Detected	None Detected
Mn-54	5.75E-03 (2.13E+08)	4.66E-03 (1.72E+08)	7.45E-04 (2.76E+07)	1.81E-04 (6.68E+06)	4.11E-05 (1.52E+06)

Table 4.5-8 Historical Liquid Releases 2001 through 2005 (Page 2 of 2)

Isotope	2001 Release Ci (Bq)	2002 Release Ci (Bq)	2003 Release Ci (Bq)	2004 Release Ci (Bq)	2005 Release Ci (Bq)
Na-24	None Detected	None Detected	2.49E-06 (9.21E+04)	None Detected	None Detected
Nb-95	5.96E-02 (2.20E+09)	2.16E-02 (7.98E+08)	2.65E-03 (9.82E+07)	3.06E-04 (1.13E+07)	1.60E-04 (5.93E+06)
Nb-97	3.54E-05 (1.31E+06)	None Detected	None Detected	None Detected	None Detected
Ni-63	None Detected	None Detected	None Detected	2.17E-03 (8.03E+07)	6.16E-03 (2.28E+08)
Ru-103	5.42E-04 (2.01E+07)	7.10E-05 (2.63E+06)	None Detected	None Detected	None Detected
Sb-124	3.42E-03 (1.26E+08)	6.43E-05 (2.38E+06)	5.50E-04 (2.04E+07)	None Detected	None Detected
Sb-125	2.15E-02 (7.96E+08)	1.70E-02 (6.30E+08)	8.85E-03 (3.27E+08)	1.44E-04 (5.33E+06)	8.57E-06 (3.17E+05)
Sn-113	5.45E-03 (2.02E+08)	2.18E-03 (8.06E+07)	5.27E-05 (1.95E+06)	None Detected	None Detected
Sn-117M	3.77E-04 (1.40E+07)	3.86E-04 (1.43E+07)	1.08E-03 (3.98E+07)	3.20E-05 (1.18E+06)	1.28E-04 (4.74E+06)
Sr-89	7.63E-04 (2.82E+07)	9.51E-06 (3.52E+05)	4.84E-04 (1.79E+07)	None Detected	3.83E-04 (1.42E+07)
Sr-90	2.12E-05 (7.84E+05)	None Detected	1.89E-06 (7.00E+04)	None Detected	None Detected
Te-125M	None Detected	None Detected	None Detected	None Detected	1.27E-02 (4.70E+08)
Te-132	None Detected	1.44E-04 (5.33E+06)	None Detected	None Detected	None Detected
W -187	None Detected	7.15E-06 (2.65E+05)	None Detected	None Detected	None Detected
Zn-65	1.54E-06 (5.70E+04)	None Detected	None Detected	None Detected	None Detected
Zr-95	3.59E-02 (1.33E+09)	1.12E-02 (4.15E+08)	1.46E-03 (5.41E+07)	1.59E-04 (5.88E+06)	1.17E-04 (4.34E+06)
Zr-97	5.61E-05 (2.08E+06)	None Detected	None Detected	None Detected	None Detected
Total	6.82E-01 (2.52E+10)	2.75E-01 (1.02E+10)	6.65E-02 (2.46E+09)	2.81E-02 (1.04E+09)	1.10E-01 (4.08E+09)
Dilution Flow ft^3/sec (L/sec)	3705.3 (130.85)	2738.4 (96.71)	4924.0 (173.89)	5147.8 (181.79)	5147.8 (181.79)

Table 4.5-9 Projected Dose Rates from all Sources by Construction Zone (Page 1 of 1)

Maximum Construction Zone Dose Rates (mrem/year) Assuming 2,200 Hours per Year Occupancy		
Zone	Zone Description	Dose Rate mrem/2,200 hours (msieverts/2,200 hours)
B	Batch Plant	0.05 (0.0005)
C	Construction on main structures	1.32 (0.0132)
L	Laydown	21.46 (0.2146)
O	Office/Trailer	0.02 (0.0002)
P	Parking	20.27 (0.2027)
R	Roads	38.83 (0.3883)
S	Shoreline, tunnel, barge, in/out flow	0.23 (0.0023)
T	Tower/Basin/Desalinization	0.01 (0.0001)
W	Warehouse	0.02 (0.002)

Table 4.5-10 Projected Dose Rates from Effluents by Construction Zone
(Page 1 of 1)

Maximum Dose Rate mrem/year (msievert/year) Assuming Full Time Occupancy			
Zone	**Zone Description**	**Gaseous Effluents**	**Liquid Effluents**
B	Batch Plant	0.03 (0.0003)	0.00 (0.0000)
C	Construction on main structures	0.11 (0.0011)	0.00 (0.0000)
L	Laydown	0.07 (0.0007)	0.00 (0.0000)
O	Office/Trailer	0.04 (0.0004)	0.00 (0.0000)
P	Parking	0.15 (0.0015)	0.00 (0.0000)
R	Roads	0.18 (0.0018)	0.00 (0.0000)
S	Shoreline, tunnel, barge, in/out flow	0.55 (0.0055)	0.32 (0.0032)
T	Tower/Basin/Desalinization	0.02 (0.0002)	0.00 (0.0000)
W	Warehouse	0.03 (0.0003)	0.00 (0.0000)

Table 4.5-11 Projected Construction Worker Census 2010 to 2015 (Page 1 of 1)

Year	Construction Workers on Site
2010	531
2011	2,281
2012	4,000
2013	4,000
2014	4,000
2015	3,215

Table 4.5-12 Projected Construction Worker Occupancy by Zone
(Page 1 of 1)

Zone Description	Zone Code	Occupancy Fraction
Batch Plant	B	0.001
Construction on Main Structures	C	0.665
Laydown	L	0.020
Office/Trailer	O	0.160
Parking	P	0.020
Roads	R	0.020
Shoreline, Tunnel, Barge, In/Out Flow	S	0.066
Tower/Basin/Desalinization	T	0.066
Warehouse	W	0.003
	Total	1.021

Note: Total of occupancy fractions is greater than 1 because the "Laydown" zone fraction was conservatively increased to match the occupancy fraction for parking and roads.

Table 4.5-13 Unit 3 Collective Dose to Construction Workers
(Page 1 of 1)

		Collective Dose (person-rem) (person-sievert) by Zone						
Zone	Zone Description	2010	2011	2012	2013	2014	2015	By Zone
B	Batch Plant	0.000/ 0.00000	0.000/ 0.00000	0.000/ 0.00000	0.000/ 0.00000	0.000/ 0.00000	0.000/ 0.00000	**0.001/ 0.00001**
C	Construction on Main Structures	0.127/ 0.00127	0.587/ 0.00587	1.098/ 0.01098	1.168/ 0.011680	1.238/ 0.01051	1.051/ 0.01051	**5.270/ 0.0527**
L	Laydown	0.023/ 0.00023	0.100/ 0.00100	0.179/ 0.00179	0.183/ 0.00183	0.186/ 0.00186	0.152/ 0.00152	**0.823/ 0.00823**
O	Office/Trailer	0.003/ 0.00003	0.015/ 0.00015	0.027/ 0.00027	0.027/ 0.00027	0.028/ 0.00028	0.022/ 0.00022	**0.122/ 0.00122**
P	Parking	0.082/ 0.00082	0.380/ 0.0038	0.716/ 0.00716	0.765/ 0.00765	0.815/ 0.0815	0.694/ 0.00694	**3.453/ 0.03453**
R	Roads	0.132/ 0.00132	0.597/ 0.00597	1.097/ 0.01097	1.148/ 0.01148	1.199/ 0.01199	1.004/ 0.01004	**5.178/ 0.05178**
S	Shoreline, Tunnel, barge, In/Out Flow	0.015/ 0.00015	0.065/ 0.00065	0.114/ 0.00114	0.114/ 0.00114	0.114/ 0.00114	0.091/ 0.00091	**0.512/ 0.00512**
T	Tower/Basin/ Desalinization	0.001/ 0.00001	0.003/ 0.00003	0.005/ 0.00005	0.005/ 0.00005	0.005/ 0.0005	0.004/ 0.00004	**0.024/ 0.00024**
W	Warehouse	0.000/ 0.00000	0.000/ 0.00000	0.001/ 0.00001	0.001/ 0.00001	0.001/ 0.00001	0.000/ 0.00001	**0.003/** 0.00003
	By Year	**0.384/ 0.00384**	**1.747/ 0.01747**	**3.238/ 0.03238**	**3.411/ 0.03411**	**3.585/ 0.03585**	**3.021/ 0.03021**	**15.386/ 0.15386**

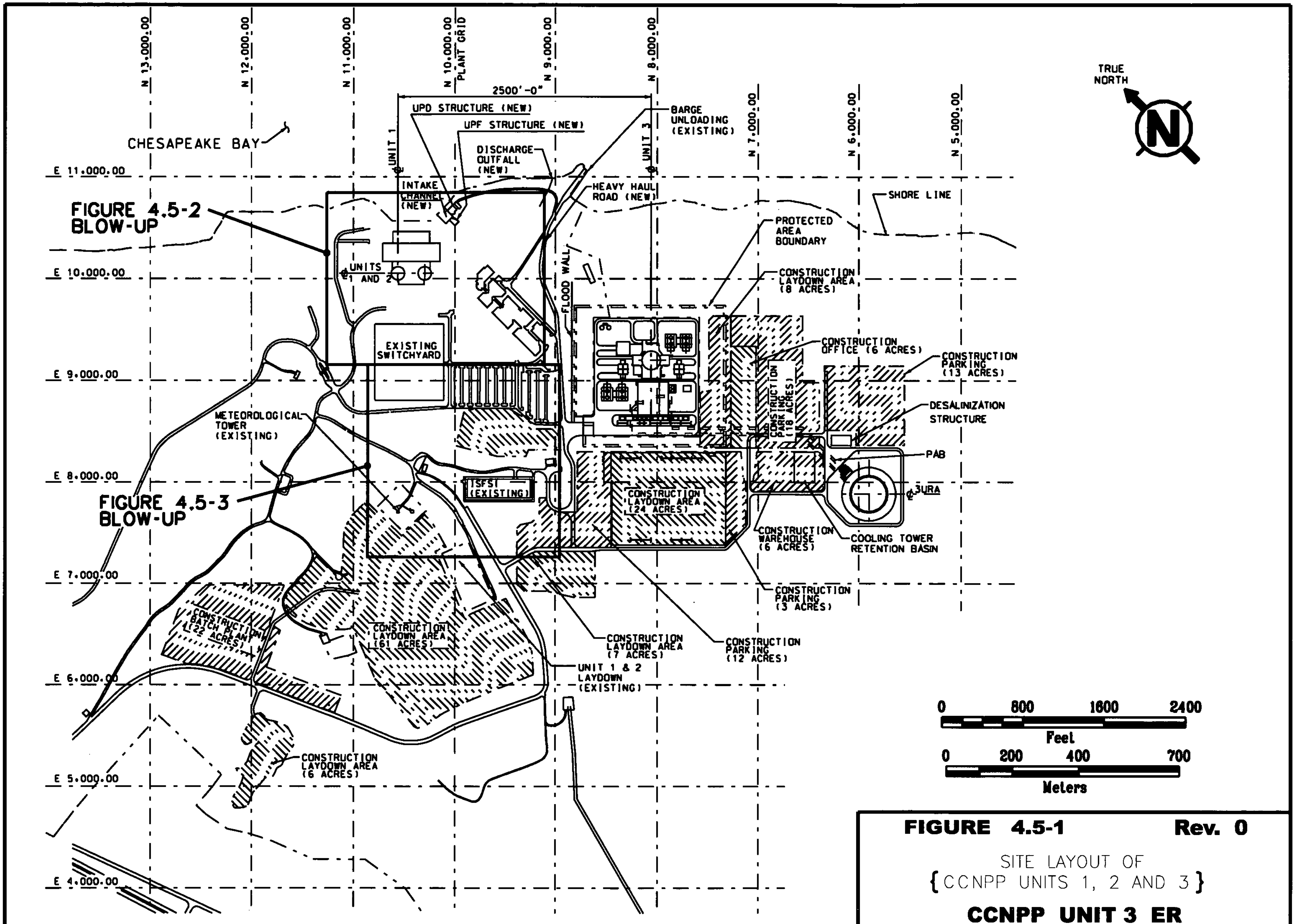

FIGURE 4.5-1 **Rev. 0**

SITE LAYOUT OF {CCNPP UNITS 1, 2 AND 3}

CCNPP UNIT 3 ER

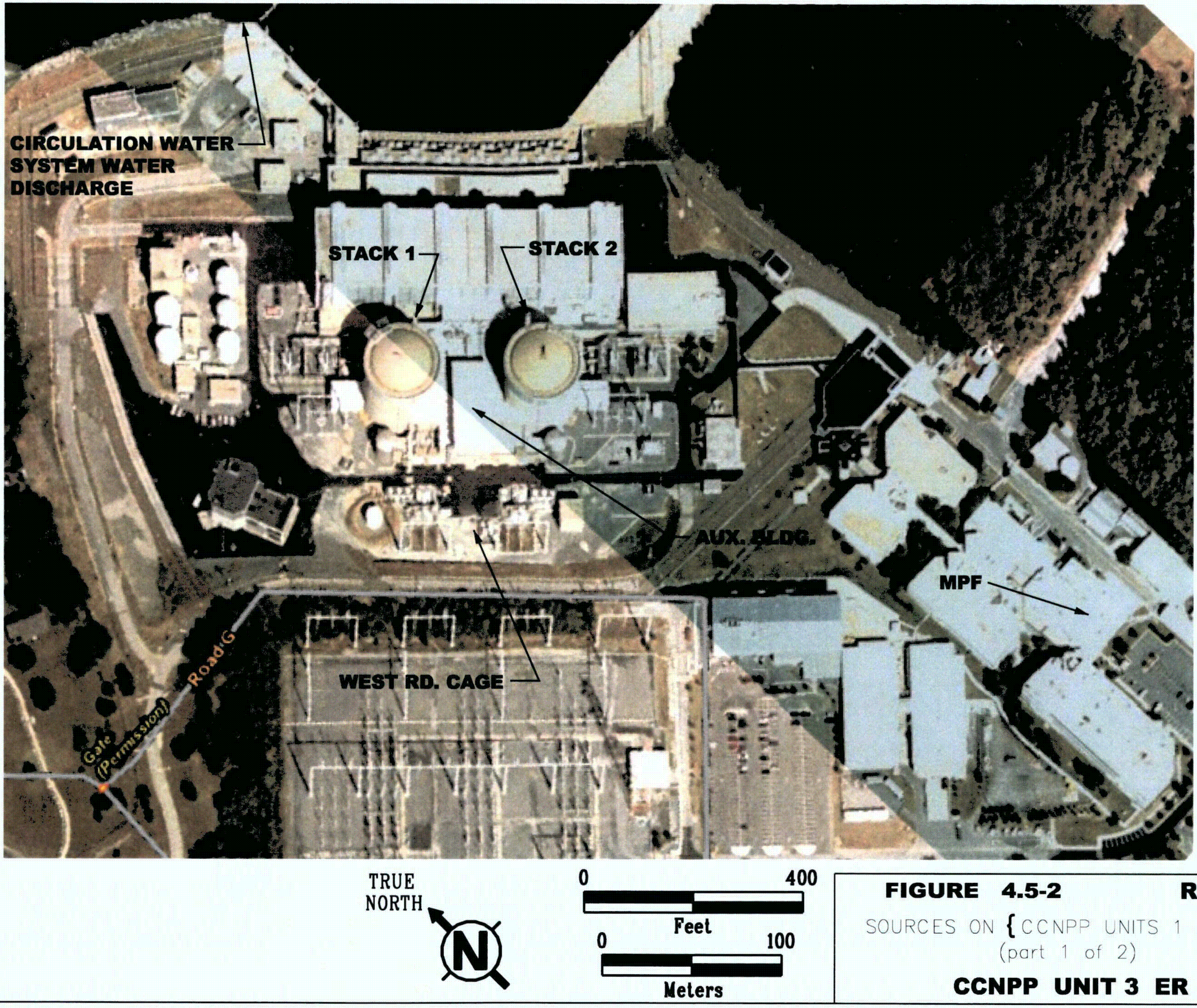

FIGURE 4.5-2 **Rev. 0**

SOURCES ON {CCNPP UNITS 1 AND 2}
(part 1 of 2)

CCNPP UNIT 3 ER

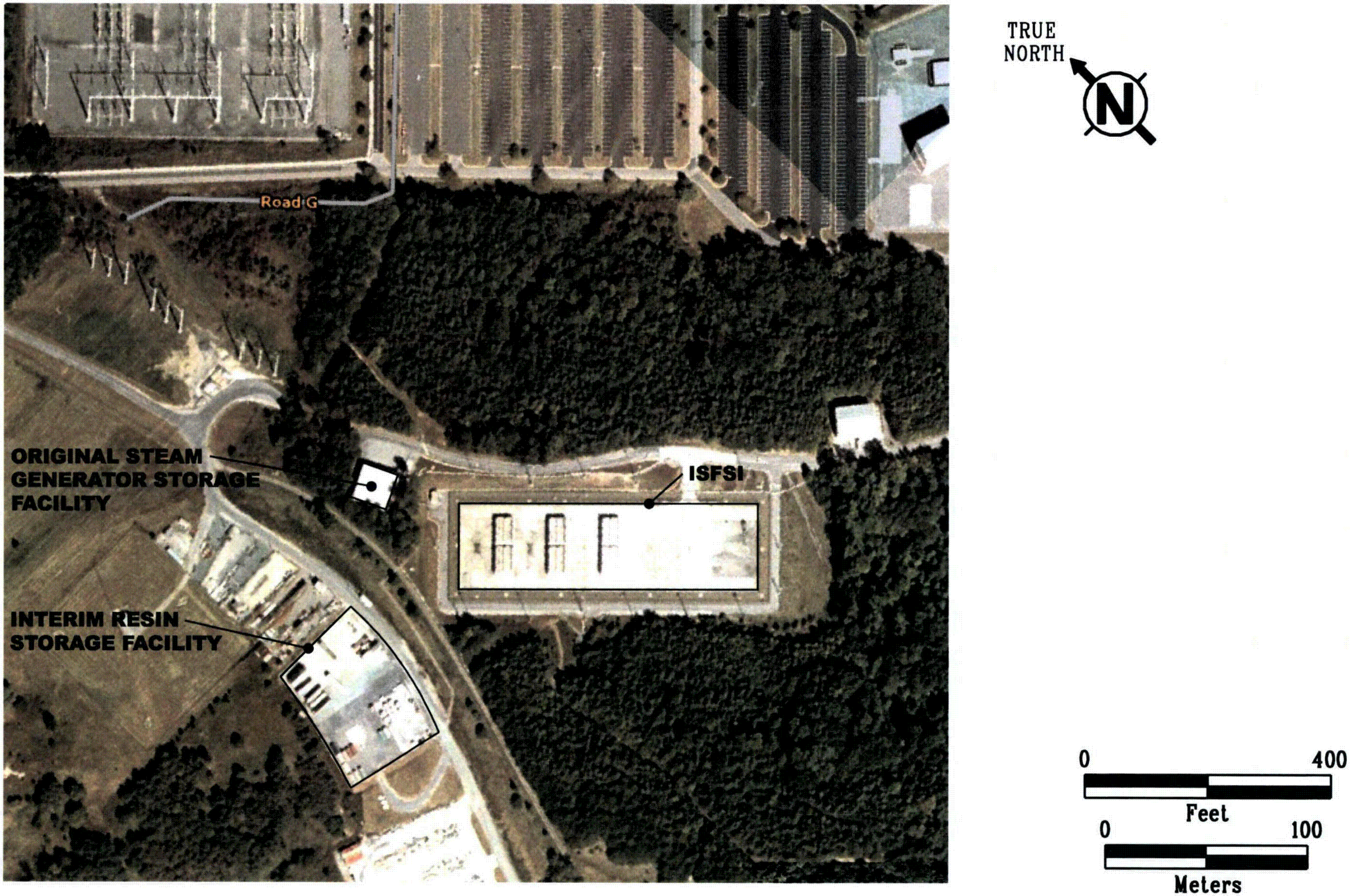

FIGURE 4.5-3 **Rev. 0**

SOURCES ON {CCNPP UNITS 1 AND 2}
(part 2 of 2)

CCNPP UNIT 3 ER

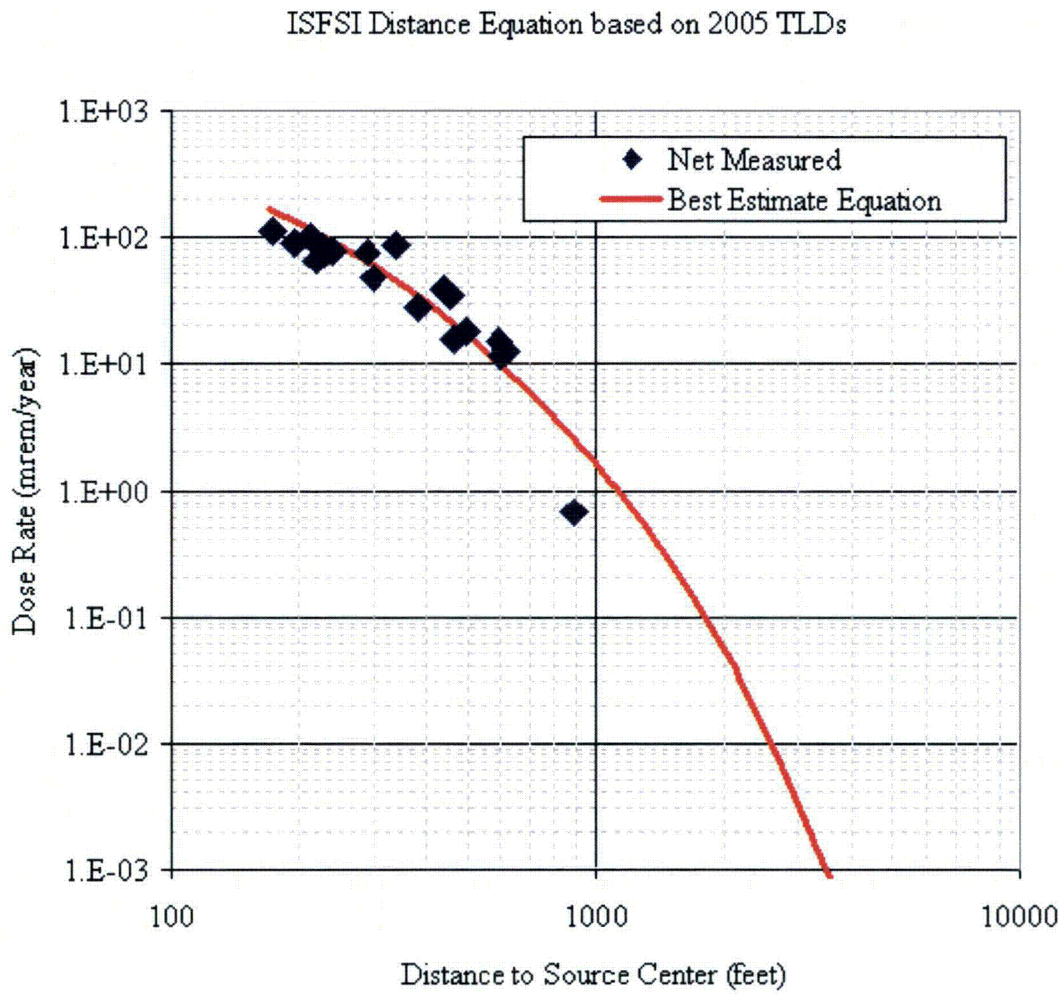

FIGURE 4.5-4 **Rev. 0**

{HISTORICAL ISFSI 2005 TLD DOSES VERSUS DISTANCE}

CCNPP UNIT 3 ER

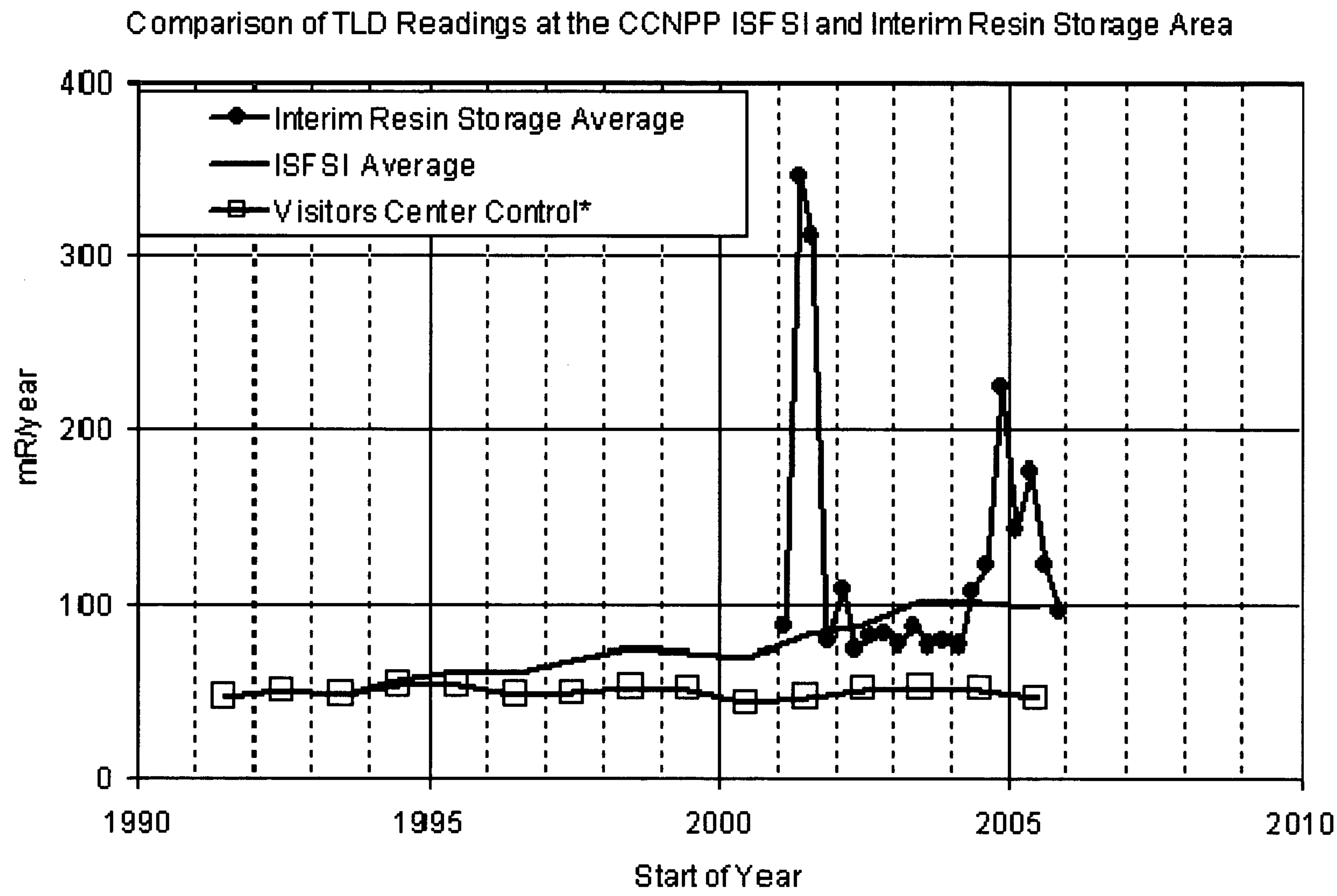

FIGURE 4.5-5 Rev. 0

{RESIN AREA AND ISFSI}
HISTORICAL TLD READINGS

CCNPP UNIT 3 ER

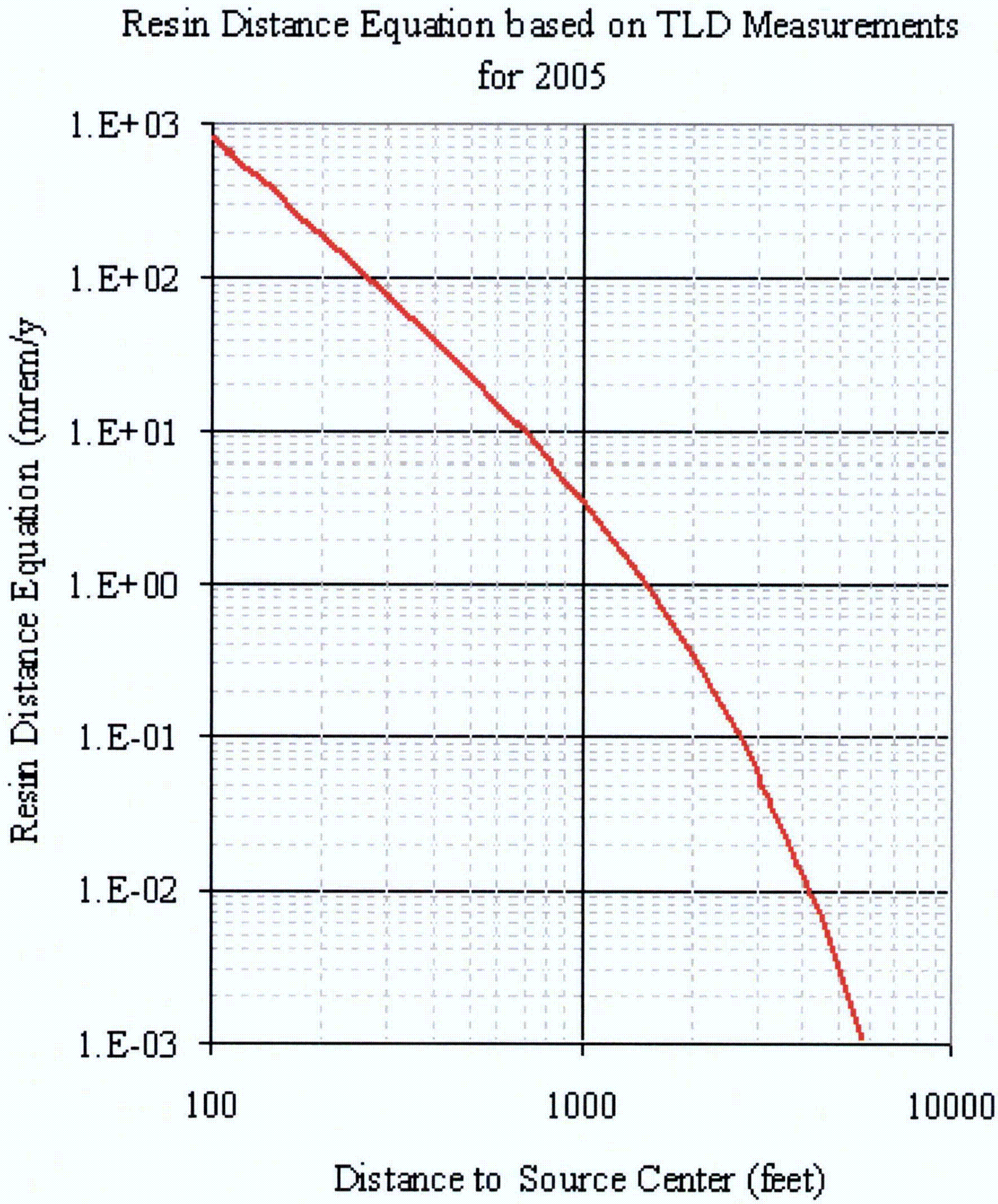

FIGURE 4.5-6 **Rev. 0**

{RESIN AREA DOSE RATE FOR 2005}

CCNPP UNIT 3 ER

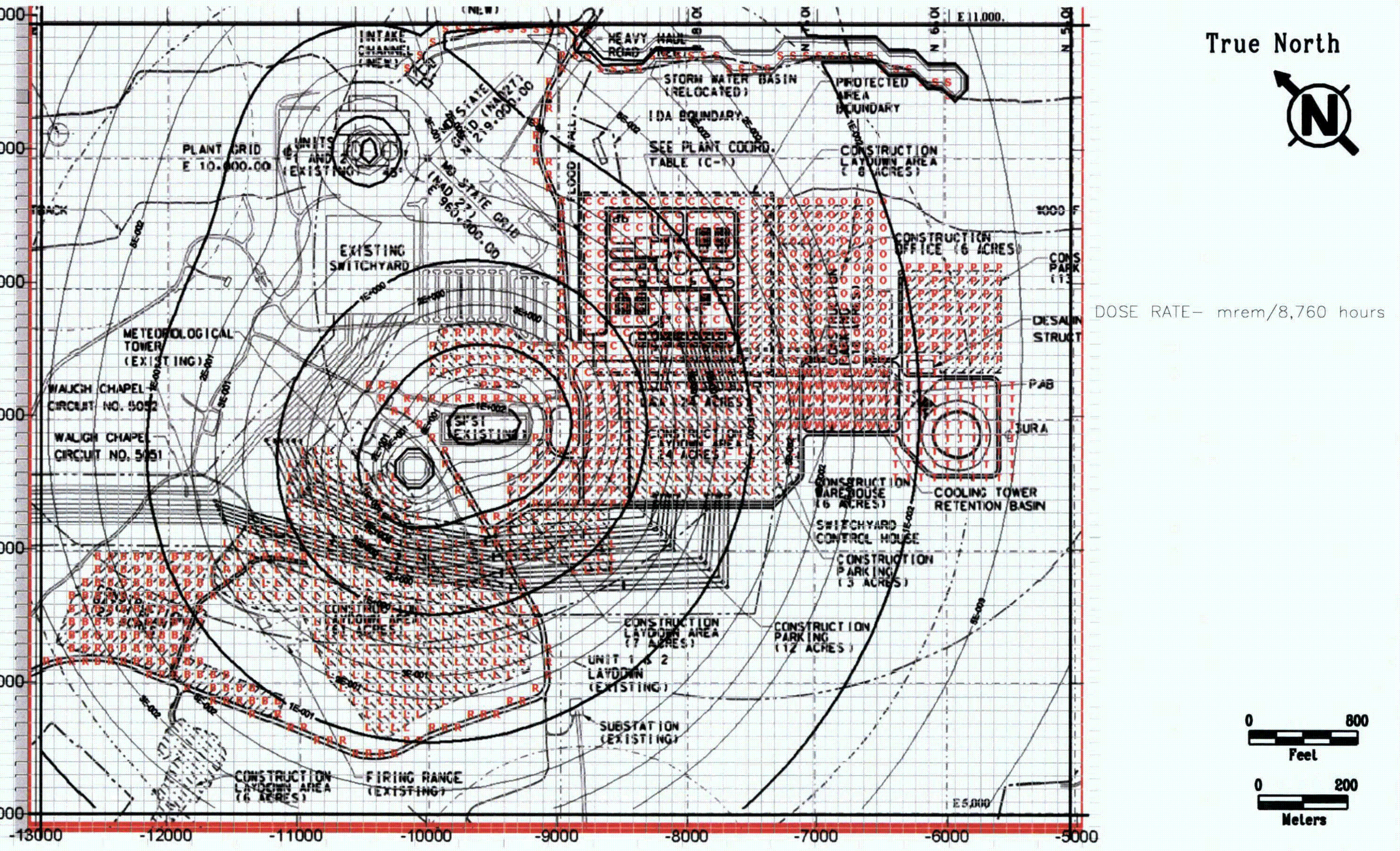

FIGURE 4.5-7 **Rev. 0**

DOSE RATE ESTIMATED IN 2015

CCNPP UNIT 3 ER

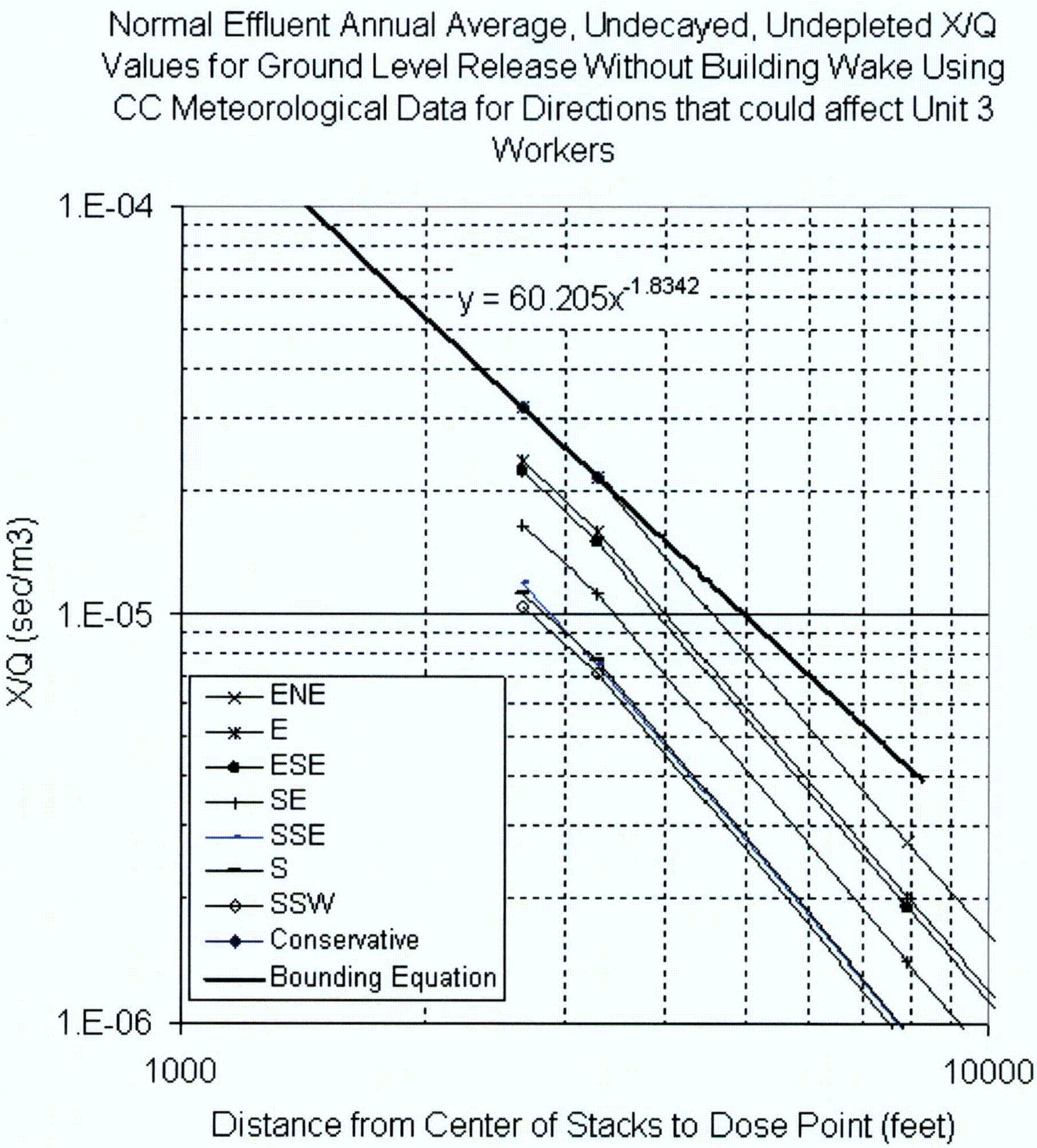

FIGURE 4.5-8 **Rev. 0**

BOUNDING ANNUAL AVERAGE X/Q IN {CCNPP UNIT 3} DIRECTION

CCNPP UNIT 3 ER

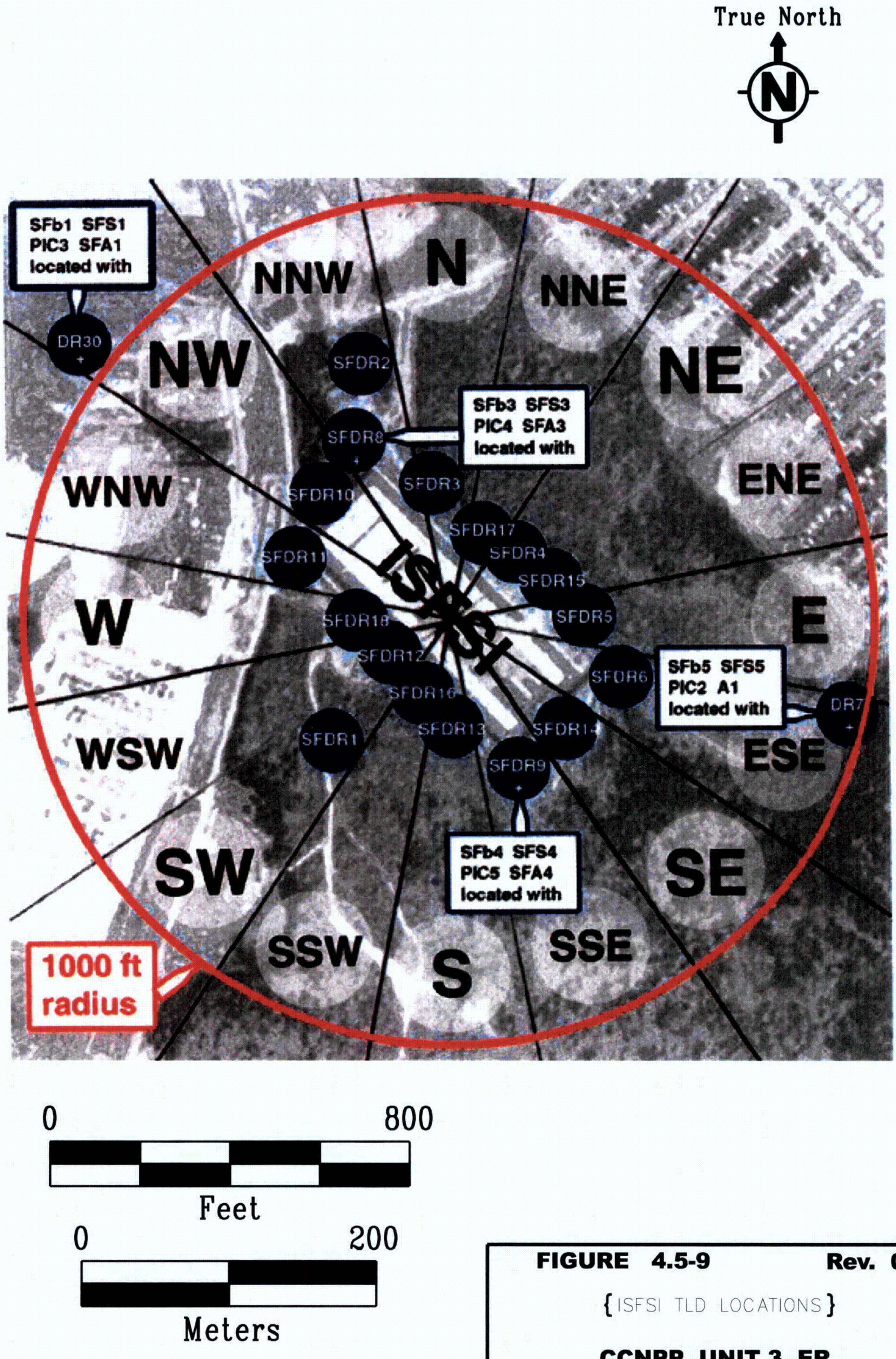

FIGURE 4.5-9 **Rev. 0**

{ISFSI TLD LOCATIONS}

CCNPP UNIT 3 ER

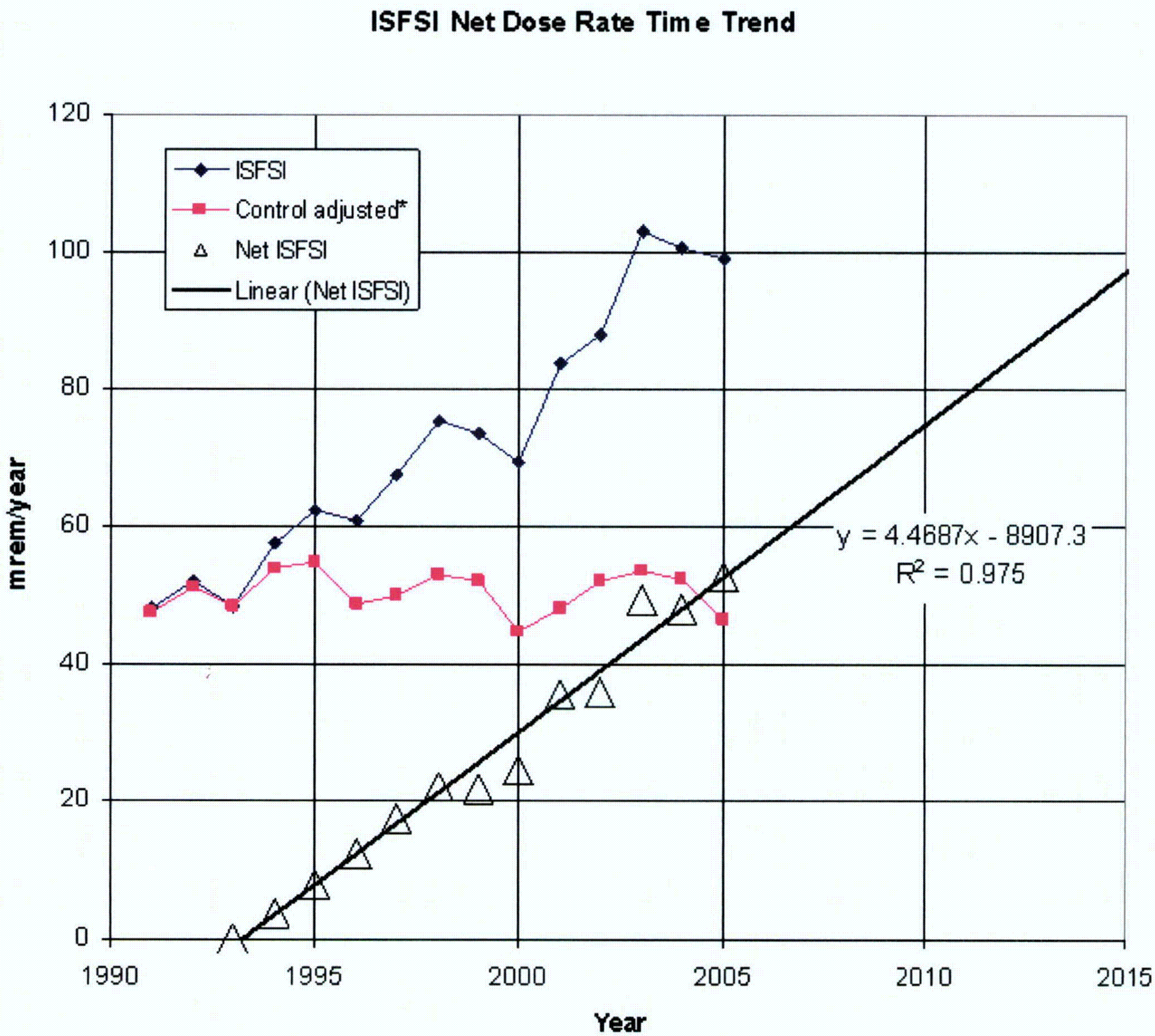

FIGURE 4.5-10 **Rev. 0**

{ANNUAL GAMMA NET ISFSI DOSE RATE}

CCNPP UNIT 3 ER

CCNPP Interim Resin Storage Area showing Site Grid overlaid on an Aerial Photograph. The locations of TLDs RPDR05 thru 12 shown in red.

FIGURE 4.5-11 Rev. 0

{RESIN AREA TLD LOCATIONS}

CCNPP UNIT 3 ER

4.6 Measures and Controls to Limit Adverse Impacts During Construction

4.6 MEASURES AND CONTROLS TO LIMIT ADVERSE IMPACTS DURING CONSTRUCTION

In general, potential impacts will be minimized through compliance with applicable Federal, {Maryland}, and local laws and regulations enacted to prevent or minimize adverse environmental impacts that may be encountered such as air emissions, noise, storm water pollutants, and spills. Principal among these will be the National Pollutant Discharge Elimination System (NPDES) Construction General Permit and the Corps of Engineers 404 Permit to minimize sediment erosion and protect water quality. The Site Resource Management Plan will address affected site lands and waters. Also included will be required plans such as a Storm Water Pollution Prevention Plan (SWPPP) and associated Best Management Practices (BMPs) as well as administrative actions {such as a Traffic Management Plan.}

Table 4.6-1 lists the potential impacts associated with the construction activities described in Sections 4.1 through 4.5 and 4.7. The table identifies, from the categories listed below, which adverse impact may occur as a result of construction activities and its relative significance rating (i.e., [S]mall, [M]oderate, or [L]arge) following implementation of associated measures and controls. Table 4.6-1 also includes a brief description, by ER Section, of each potential impact and the measures and controls to minimize the impact, if needed.

- Erosion and Sedimentation
- Air Quality (dust, air pollutants)
- Wastes (effluents, spills, material handling)
- Surface Water
- Groundwater
- Land Use
- Water Use and Quality
- Terrestrial Ecosystems
- Aquatic Ecosystems
- Socioeconomic
- Aesthetics
- Noise
- Traffic
- Radiation Exposure
- Other (site specific (i.e., non-radiological health impacts))

Based on existing site conditions, {in-place CCNPP Units 1 and 2 programs and procedures}, as well as the measures and controls proposed, the potential adverse impacts identified from the construction of {CCNPP Unit 3} are anticipated to be SMALL, if any, {for all categories evaluated except: (1) surface waters, which is expected to be MODERATE and require mitigation due to the impact of wetlands and wetland buffers; (2) traffic, which is expected to be MODERATE but manageable with the implementation of a Traffic Management Plan.}

{Table 4.6 - 1 Summary of Measures and Controls to Limit Adverse Impacts During Construction
(Page 1 of 10)

ER Reference Section	Erosion/Sediment (ES)	Air Quality (AQ)	Wastes (WS)	Surface Water (SW)	Groundwater (GW)	Land Use (L)	Water Use & Quality (W)	Terrestrial Ecosystems (TE)	Aquatic Ecosystems (AE)	Socioeconomic (S)	Aesthetics (A)	Noise (N)	Traffic (T)	Radiation Exposure (R)	Other (site specific) (O)
4.1 Land Use Impacts	S	S	S	M	-	S	-	S	S	-	-	-	-	-	-

ER Reference Section	Potential Impact Category and Description	Proposed Measures and Controls or Mitigating Circumstances
4.1.1 The Site and Vicinity	Clearing, grading, excavation, and re-contouring. (ES)(AQ)(L)(TE)	Comply with NPDES Construction General Permit, including EPA effluent limitations.
	Disturbance (temporary and permanent) of wetlands and streams in vicinity. (SW)(AE)	Use site Resource Management Plan and BMPs to protect resources such as wetlands and streams in vicinity.
		Comply with individual Corps of Engineers 404 Permit.
		Comply with Maryland Non-Tidal Wetlands Protection Act permit.
		Restore wetlands and wetland buffers temporarily disturbed during construction.
		Construct new wetlands.
	Soil stockpiling and disturbance to natural drainage channels. (L)(ES)	Implement Storm Water Pollution Prevention Plan (SWPPP), including sediment and erosion control.

Table 4.6 - 1 Summary of Measures and Controls to Limit Adverse Impacts During Construction (Page 2 of 10)

ER Reference Section	Potential Impact Category and Description	Proposed Measures and Controls or Mitigating Circumstances
4.1.1 The Site and Vicinity (Cont.)	Removal of existing trees and vegetation. (WS)(TE)	Use site Resource Management Plan and comply with BMP requirements; on-site land is not used for farmland nor is it considered prime or unique.
		Unmerchantable trees and slash will be chipped and spread as wood chips, or disposed of at an offsite landfill.
		Acreage will be restored following construction to the extent possible.
	Construction of temporary and permanent structures. (AQ)(L)(TE)	Construction footprint would be wholly contained on an existing dedicated nuclear power plant site.
	Release of fuels, oils, or other chemicals. (WS)(TE)(AE)	Implement Spill Prevention Control and Countermeasures (SPCC) Plan.
4.1.2 Transmission Corridors and Off-site Areas	The existing transmission lines have sufficient capacity to carry the total output of existing CCNPP Units 1 and 2, as well as CCNPP Unit 3; as a result, there will be no new off-site transmission lines or rights-of-way disturbance. (L)(TE)	Use existing transmission corridor maintenance policies and practices to protect terrestrial and aquatic ecosystems.
4.1.3 Historic Properties (and Cultural Resources)	Disturbance of archaeological resources. (L)	Perform Phase II Cultural Resource Survey.
		In consultation with the SHPO, develop plan and procedures to manage identified/unidentified historic/cultural resource.
		Take appropriate actions (e.g., stop work) following discovery of potential historic/cultural resource.

Table 4.6 - 1 Summary of Measures and Controls to Limit Adverse Impacts During Construction
(Page 3 of 10)

ER Reference Section	Potential Impact Category and Description	Proposed Measures and Controls or Mitigating Circumstances
4.2 Water-Related Impacts	Erosion/Sediment (ES): S Air Quality (AQ): - Wastes (WS): S Surface Water (SW): M Groundwater (GW): S Land Use (L): S Water Use & Quality (W): S Terrestrial Ecosystems (TE): - Aquatic Ecosystems (AE): S Socioeconomic (S): - Aesthetics (A): - Noise (N): - Traffic (T): - Radiation Exposure (R): - Other (site specific) (O): -	
4.2.1 Hydrologic Alterations	Erosion, sediment, and storm water runoff (from on-site building, utilities, and road construction activities). (ES)(SW)(GW)(W)	Implement Storm Water Pollution Prevention Plan (SWPPP), including sediment and erosion control, as part of the NPDES Construction General Permit requirements.
	Chesapeake Bay turbidity/sediment effects (from dredging, refurbishment of the shoreline unloading facility, and installation of the Intake and Discharge Structures). (WS)(SW)(W)(AE)	Comply with Corps of Engineers 404 Permit requirements.
	Temporary increase in groundwater withdrawal. (GW)(W)	Comply with existing Groundwater Water Appropriations and Use Permit Withdrawal Limit.
		Use off-site water supply.
		Install Desalinization Plant.

Table 4.6 - 1 Summary of Measures and Controls to Limit Adverse Impacts During Construction (Page 4 of 10)

ER Reference Section	Potential Impact Category and Description	Proposed Measures and Controls or Mitigating Circumstances
4.2.1 Hydrologic Alterations (Cont.)	Temporary dewatering activities. (GW)(W)	Comply with COMAR 26.17.06 for dewatering activities or obtain Water Appropriation and Use Permit, as needed.
		Comply with individual Corps of Engineers 404 Permit.
		Comply with BMP requirements.
		Monitor perched water levels.
	Disturbance of wetlands and streams in vicinity. (SW)(AE)	Use site Resource Management Plan and BMPs to protect resources such as wetlands and streams in vicinity.
		Comply with Maryland Non-Tidal Wetlands Protection Act permit.
		Comply with individual Corps of Engineers 404 Permit.
		Restore wetlands and wetland buffers temporarily disturbed during construction.
		Construct new wetlands.
	Shift of the Surficial aquifer recharge area(s). (GW)	Monitor perched water levels.
4.2.2 Water Use Impacts	Temporary increase in groundwater withdrawal. (GW)(W)	Comply with existing Groundwater Water Appropriations and Use Permit Withdrawal Limit.
		Use off-site water supply.
		Install Desalinization Plant.
	Reduction in available pervious (infiltration) areas. (GW)(W)	Install bio-retention ditches to allow runoff to infiltrate.

Table 4.6 - 1 Summary of Measures and Controls to Limit Adverse Impacts During Construction
(Page 5 of 10)

ER Reference Section	Potential Impact Category and Description	Proposed Measures and Controls or Mitigating Circumstances
4.2.2 Water Use Impacts (Cont.)	Temporary dewatering activities. (GW)	Comply with COMAR 26.17.06 for dewatering activities or obtain Water Appropriation and Use Permit, as needed.
		Comply with individual Corps of Engineers 404 Permit.
		Comply with BMP requirements.
	Disturbance of wetlands and streams in vicinity. (SW)(AE)	Use site Resource Management Plan and BMPs to protect resources such as wetlands and streams in vicinity.
		Comply with Maryland Non-Tidal Wetlands Protection Act permit.
		Comply with individual Corps of Engineers 404 Permit.
		Comply with BMP requirements
		Restore wetlands and wetland buffers temporarily disturbed during construction.
		Construct new wetlands.
	Construction of new impoundments and modification of existing impoundments. (L)(AE)	Use site Resource Management Plan and BMPs to protect resources such as wetlands and streams in vicinity.
	Release of fuel, oils, or other chemicals. (WS)(AE)	Implement Spill Prevention, Control, and Countermeasures (SPCC) Plan.
	Temporary increase in sediment and silt. (ES)(W)	Implement Storm Water Pollution Prevention Plan (SWPPP), including sediment and erosion control, as part of the NPDES Construction General Permit requirements.
	Temporary increase in turbidity. (ES)(W)	Comply with Corps of Engineers 404 Permit requirements.

Table 4.6 - 1 Summary of Measures and Controls to Limit Adverse Impacts During Construction (Page 6 of 10)

ER Reference Section	Potential Impact Category and Description															Proposed Measures and Controls or Mitigating Circumstances
4.3 Ecological Impacts	Erosion/Sediment (ES)	Air Quality (AQ)	Wastes (WS)	Surface Water (SW)	Groundwater (GW)	Land Use (L)	Water Use & Quality (W)	Terrestrial Ecosystems (TE)	Aquatic Ecosystems (AE)	Socioeconomic (S)	Aesthetics (A)	Noise (N)	Traffic (T)	Radiation Exposure (R)	Other (site specific) (O)	
	S	-	-	-	-	-	S	S	S	-	S	-	-	-	-	
4.3.1 Terrestrial Ecosystems	Loss of vegetation (i.e., oaks, hickories, mountain laurel and showy goldenrod) and existing habitat for important fauna (i.e., white-tailed deer and scarlet tanager and other forest-interior dwelling species (FIDS)), as well as forest cover. (TE)															Use site Resource Management Plan and BMPs to protect resources.
																To the extent practicable, design construction footprint to account for CBCA and other important habitat, including bald eagles nests.
																If any bald eagles' nest is located within the construction area, the Maryland Department of Natural Resources and U.S. Fish and Wildlife service will be contacted to determine the required mitigating actions.
																Minimize cooling tower lighting, as practicable and allowed by regulation.
																Create new habitats (i.e., unforested uplands to ultimately generate a mixed deciduous forest).
																Maintain remaining unforested upland as old field habitat.
																Acreage will be restored following construction to the maximum extent possible.

Table 4.6 - 1 Summary of Measures and Controls to Limit Adverse Impacts During Construction (Page 7 of 10)

ER Reference Section	Potential Impact Category and Description	Proposed Measures and Controls or Mitigating Circumstances
4.3.1 Terrestrial Ecosystems (Cont.)	Disturbance (temporary and permanent) of wetlands and streams in vicinity. (ES)(AE)(A)	Use site Resource Management Plan and BMPs to protect resources such as wetlands and streams in vicinity.
		Comply with Maryland Non-Tidal Wetlands Protection Act Permit.
		Comply with BMP requirements.
		Comply with individual Corps of Engineers 404 Permit.
	Temporary disturbance of Chesapeake Bay Critical Area (CBCA). (AE)(A)	Preserve aesthetically outstanding tree clusters, as practical; harvest merchantable timber; use or recycle other woody material, as appropriate; develop reforestation plan.
	Limited mortality of wildlife (e.g., avian collisions with man-made structures.) (TE)(AE)	Use site Resource Management Plan and BMPs to protect resources.
4.3.2 Aquatic Ecosystems	Disturbance (temporary and permanent) of wetlands and streams in vicinity; however, on-site wetlands are not substantively distinguishable from other wetlands in the site vicinity and streams within the construction zone contain no rare or unique aquatic species. (SW)(ES)(AE)(A)	Use site Resource Management Plan and BMPs to protect resources.
		Implement Spill Prevention, Control, and Countermeasures (SPCC) Plan.
		Comply with Maryland Non-Tidal Wetlands Protection Act Permit.
		Comply with individual Corps of Engineers 404 Permit.
		Comply with BMP requirements.
		Restore wetlands and wetland buffers temporarily disturbed during construction.
		Construct new wetlands.

Table 4.6 - 1 Summary of Measures and Controls to Limit Adverse Impacts During Construction (Page 8 of 10)

ER Reference Section	Potential Impact Category and Description	Proposed Measures and Controls or Mitigating Circumstances
	Temporary sediment and silt buildup. (ES)(AE)	Implement Storm Water Pollution Prevention Plan (SWPPP), including sediment and erosion control and the construction of new impoundments, as appropriate.
	Temporary turbidity increase. (ES)(AE)(W)	Comply with Corps of Engineers 404 Permit requirements.
	Limited mortality of fish (i.e., resulting from sedimentation). (AE)	Comply with BMPs, including intercepting and retaining sediment before it reaches streams.
4.4 Socioeconomic Impacts	Erosion/Sediment (ES): - Air Quality (AQ): S Wastes (WS): S Surface Water (SW): - Groundwater (GW): - Land Use (L): - Water Use & Quality (W): - Terrestrial Ecosystems (TE): - Aquatic Ecosystems (AE): - Socioeconomic (S): S Aesthetics (A): S Noise (N): S Traffic (T): M Radiation Exposure (R): - Other (site specific) (O): -	
4.4.1 Physical Impacts	Equipment and non-routine noise. (N)	Comply with applicable MDE noise limits.
		Comply with applicable OSHA noise-exposure limits.
	Air emissions (fugitive emissions and exhaust emissions) increase. (AQ)(WS)	Comply with applicable EPA and MDE air quality regulations.
		Implement routine vehicle/equipment inspection and maintenance program.
	Local and regional traffic increase. (AQ)(T)	Install new site perimeter and access road.
		Conduct Phase 2 Traffic Impact Analysis (TIA).
		Develop Traffic Management Plan using Phase 2 TIA results.

Table 4.6 - 1 Summary of Measures and Controls to Limit Adverse Impacts During Construction
(Page 9 of 10)

ER Reference Section	Potential Impact Category and Description	Proposed Measures and Controls or Mitigating Circumstances
	The site is aesthetically altered due to CCNPP Units 1 and 2. Additional temporary impacts due to the visibility of construction activities. (A)	No mitigating measures required, because local residences and road traffic have limited visibility of site due to heavily wooded area.
4.4.2 Social and Economic Impacts	Influx of large construction work force. (S)	Small aggregate socioeconomic impacts anticipated, mitigation not required.
	Public services need (housing, schools, land use) increase. (S)	Small aggregate socioeconomic impacts anticipated; mitigation not required.
	Spending and tax revenue increase. (S)	Large beneficial impact to county property tax revenues; small beneficial impact for other types of tax revenues. No mitigating measures or controls required.
4.4.3 Environmental Justice Impacts	No disproportionate adverse impacts to minority or low-income populations. (S)	No mitigating measures or controls required
4.5 Radiation Exposure to Construction Workers	Erosion/Sediment (ES): - Air Quality (AQ): - Wastes (WS): - Surface Water (SW): - Groundwater (GW): - Land Use (L): - Water Use & Quality (W): - Terrestrial Ecosystems (TE): - Aquatic Ecosystems (AE): - Socioeconomic (S): - Aesthetics (A): - Noise (N): - Traffic (T): - Radiation Exposure (R): S Other (site specific) (O): -	
	ISFSI and Interim Resin Storage Area direct radiation exposure. (R)	Total Effective Dose Equivalent (TEDE) from all exposures has been determined to be below limits set in 10 CFR 20.1301.
		Implement ALARA practices at construction site.

Table 4.6 - 1 Summary of Measures and Controls to Limit Adverse Impacts During Construction
(Page 10 of 10)

ER Reference Section	Potential Impact Category and Description	Proposed Measures and Controls or Mitigating Circumstances
	CCNPP Units 1 and 2 gaseous effluents exposure. (R)	Implement ALARA practices at construction site.
	CCNPP Units 1 and 2 liquid effluents exposure. (R)	Implement ALARA practices at construction site.
4.7 Non-Radiological Health Impacts	Erosion/Sediment (ES): - Air Quality (AQ): - Wastes (WS): - Surface Water (SW): - Groundwater (GW): - Land Use (L): - Water Use & Quality (W): - Terrestrial Ecosystems (TE): - Aquatic Ecosystems (AE): - Socioeconomic (S): - Aesthetics (A): - Noise (N): - Traffic (T): - Radiation Exposure (R): - Other (site specific) (O): S	
	Risk to workers from accidents and occupational illnesses. (O)	Implement site-wide Safety and Medical Program, including safety policies, safe work practices, as well as general and topic-specific training.

4.7 NONRADIOLOGICAL HEALTH IMPACTS

4.7.1 PUBLIC HEALTH

Members of the public can potentially be put at risk by construction of a new power generation unit and associated new transmission lines. Nonradiological air emissions and dust can migrate offsite through the atmosphere to nearby residences or businesses. Noise can also propagate offsite. The increase in traffic from commuting construction workers and deliveries can result in additional air emissions and traffic accidents. Section 4.4.1, "Physical Impacts, addresses these potential impacts to the public from construction activities.

4.7.2 OCCUPATIONAL HEALTH

Construction of a new power generation unit and associated transmission lines would involve risk to workers from accidents or occupational illnesses. These risks could result from construction accidents (e.g., falls and burns), exposure to toxic or oxygen-replacing gases, and other causes.

During construction of {CCNPP Unit 3}, {Constellation Generation Group and UniStar Nuclear Operating Services} will provide a safety and medical program with associated personnel to promote safe work practices and respond to occupational injuries and illnesses. The safety and medical program will utilize an industrial safety manual providing a set of work practices with the objective of preventing accidents due to unsafe conditions and unsafe acts. These safe work practices address hearing protection, confined space entry, personal protective equipment, respiratory protection, heat stress, electrical safety, excavation and trenching, scaffolds and ladders, fall protection, chemical handling, storage, and use, and other industrial hazards. The safety and medical program provides for employee training on safety procedures. Site safety and medical personnel are provided to handle construction accidents and occupational illnesses.

Contractors, including construction contractors, will be required to review all safety policies/safe work practices applicable to their work with site personnel. The contractors will be required to comply with site safety, fire, radiation, security polices, procedures, safe work practices, and federal and state regulations.

The Bureau of Labor Statistics maintains records of a statistic known as total recordable cases (TRC), which are a measure of annual work-related injuries or illnesses that include death, days away from work, restricted work activity, medical treatment beyond first aid, and other criteria. The {2005} nationwide TRC rate published by the Bureau of Labor Statistics for utility system construction is {5.6} per 100 workers {(BLS, 2005a)}. The same statistic for the {State of Maryland is 6.3} per 100 workers {(BLS, 2005b)}. {Constellation Generation Group and UniStar Nuclear Operating Services} have calculated the TRC incidence for the proposed construction site. Using the monthly employment numbers and the national and {Maryland} TRC rates, monthly TRCs were estimated from which an average monthly rate was developed. The average monthly rate was then used to calculate the annual average TRCs over the 68 months of pre-construction and construction activities, the estimates are as follows:

	TRC Incidence	TRC Incidence
	Based on US Rate	**Based on {MD} Rate**
Average Annual	{154}	{174}

The Bureau of Labor Statistics published {2005} statistics for fatal occupational injuries {(BLS, 2005c)} and average employment {(BLS, 2005a)} that were used to calculate the nationwide annual rate of fatal occupational injuries for utility system construction. Using monthly construction employment predictions and the calculated rate {0.027%}, it is estimated that {4} construction deaths could occur over the pre-construction and construction period of 68 months. {Constellation Generation Group and UniStar Nuclear Operating Services} will require all construction contractors and subcontractors working at the construction site to comply with all safety procedures in order to prevent and/or minimize the number of deaths, injuries, and illness during the construction of {CCNPP Unit 3}. Even with effective safety procedures, construction work carries the risk or injury, illness, and death. However, it is not expected that the construction of a new nuclear power generation facility will result in more construction deaths than other similarly sized non-nuclear heavy construction projects.

4.7.3 REFERENCES

BLS, 2005a. Table 1, Incidence rates of nonfatal occupational injuries and illnesses by industry and case types, 2005, Bureau of Labor Statistics, Website: http://www.bls.gov.iif/oshwc/osh/os/ostb1619.pdf, Date accessed: February 27, 2007.

BLS, 2005b. Table 6, Incidence rates of nonfatal occupational injuries and illnesses by industry and case types, 2005, Maryland, Bureau of Labor Statistics, Website: http://www.bls.gov.iif/oshwc/osh/os/pr056md.pdf, Date accessed: February 27, 2007.

BLS, 2005c. Table A-1, Fatal occupational injuries and even or exposure, All United States, 2005, Bureau of Labor Statistics, Website: http://www.bls.gov.iif/oshwc/cfoi/cftb0205.pdf, Date accessed: March 5, 2007.

5.0 Environmental Impacts of Station Operation

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5.1 Land-Use Impacts

5.1 LAND USE IMPACTS

The following sections describe the impacts of {Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3} operations on land use at the {CCNPP} site, the 8 mi (13 km) vicinity, and associated transmission line corridors, including impacts to historic and cultural resources. The operation of {CCNPP Unit 3} is not anticipated to affect any current or planned land uses.

5.1.1 THE SITE AND VICINITY

Land use impacts from construction are described in Section 4.1.1. {The only additional impacts to land use from operations will be the impacts of solids deposition from cooling tower drift. The cooling system for CCNPP Unit 3 will be a closed-cycle, wet cooling system, consisting of a single mechanical draft cooling tower for heat dissipation. The cooling water system will have the same basic structure and profile as a combination dry and wet (hybrid) cooling tower, but it will operate year-round as a wet cooling tower. The tower will be approximately 164 ft (50 m) high with an overall diameter of 528 ft (161 m). Makeup water for the proposed unit will be taken from the Chesapeake Bay at a rate of 37,748 gpm (131,535 lpm), assuming two cycles of concentration.

The cooling tower system will occupy an area of approximately 5 acres (2 hectares). Details of cooling tower design are discussed in Section 3.4.2 and impacts of the heat dissipation system, including salt deposition, are discussed further in Sections 5.3.3.1 and 5.3.3.2. The cooling tower for CCNPP Unit 3 will be located south-southeast of the CCNPP Unit 3 power block. The cooling tower will be approximately 3,200 ft (970 m) from the center of the tower to the nearest site boundary to the south-southeast and approximately 1,545 ft (471 m) to the closest portion of the 1,000 ft (305 m) Chesapeake Bay Critical Area (CBCA) zone located to the northeast along the Chesapeake Bay. The cooling tower plume could occur in all compass directions.

The maximum salt deposition rate from the cooling tower is provided in Table 5.3.3.1-3. The maximum predicted salt deposition rate is below the NUREG-1555 (NRC, 1999) significance level for possible vegetation damage of 8.9 lbs per acre per month (10 kg per hectare per month) in all directions from the cooling tower, during each season and annually. Therefore, impacts to vegetation from the salt deposition are not expected for both onsite and offsite locations.

The average plume length and height was calculated from the frequency of occurrence for each plume by distance from the tower. The average plume length will range from 2.1 mi (3.3 km) to the northeast in the summer, to 3.5 mi (5.6 km) to the southeast in the winter. The annual average plume length will be 2.6 mi (4.2 km) to the northeast. The average plume height in the winter will range from 1,500 ft (470 m) to 2,500 ft (770 m). The annual average plume height will be 1,900 ft (590 m). Due to the varying directions and short average plume length, impacts from the larger plumes would be SMALL and not warrant mitigation.

The electrical switchyard for {CCNPP Unit 3 will be located approximately 1,600 ft (500 m) to the northwest of the proposed location for the Circulating water supply system (CWS) cooling tower. A maximum predicted solids deposition rate of {0.87 pounds per acre per month (0.098 kg per hectare per month) is expected at the CCNPP Unit 3 switchyard during the fall season. Additionally, the electrical switchyard for CCNPP Units 1 and 2 is located approximately 4,600 ft (1,400 m) to the north-northwest, from the proposed location of the CCNPP Unit 3 CWS cooling tower. The maximum predicted solids deposition expected at the CCNPP Units 1 and 2 electrical switchyard due to operation of the CCNPP Unit 3 CWS cooling tower will be 0.95 pounds per acre per month (0.85 kg per hectare per month) during the summer season.}

Based on industry experience, adjustments to maintenance frequencies (e.g., insulator washing) may be necessary due to solids deposition; however, the expected deposition rates will not affect switchyard component reliability or increase the probability of a transmission line outage at CCNPP Units 1 and 2, or CCNPP Unit 3. Figure 5.3-2 shows the extent of solids deposition during the summer months.

Impacts from salt deposition from the CCNPP Unit 3 cooling tower would be SMALL. The modeling predicts salt deposition at rates below the NUREG-1555 significance level of 8.9 lbs per acre per month (10.0 kgs per hectare per month), Section 5.3.3.2, Terrestrial Ecosystems, presents information on the sensitivity of specific species to salts.

Land use at the CCNPP site is indicated in Table 5.1-1. Forest is the most common land use at the CCNPP site. The forested area represents 78.7% of the CCNPP site acreage. Urban/built-up is the next highest land use area classification at the CCNPP site. The urban/built-up area represents 16.1% of the CCNPP site acreage.}

{Land use data for the 8.0 mi (13 km) site vicinity is presented in Table 5.1-2. Water is the largest land use category and represents 59.7% of the area in the 8.0 mi (13 km) site vicinity radius. Forest is the next largest land use and represents approximately 22% of the land area, with the Urban/Built-up category representing 10.3% of the land area. Section 2.2.1 presents land use on the CCNPP site and its vicinity extending 8 mi (13 km) beyond the site boundary and includes maps showing land use and transportation routes.}

{As described in Section 2.5, the impact evaluation assumes that the residences of CCNPP Unit 3 employees will be distributed across the region in the same proportion as those of the CCNPP Units 1 and 2 employees.} It is estimated that an additional operational work force of {363} onsite employees will be needed for {CCNPP Unit 3}. Section 5.8.2 describes the impact of {363} new employees on the region's housing market and the increases in tax revenues.

{Approximately 91% (330) of the new employees are expected to settle in Calvert and St. Mary's Counties. Sixty-seven percent (562) of current CCNPP Units 1 and 2 employees live in Calvert County. The area is rural, with utilities and amenities generally supplied by the townships in the county. It is likely that the new employees who choose to settle near the CCNPP site will purchase homes or acreage in the Calvert County and St. Mary's County area. Based on the 20 years of experience of the existing units, increased tax revenues will not spur development in the vicinity of the CCNPP site. There is some land within the vicinity in Calvert County and St. Mary's County owned by the Federal government and unavailable for development.}

It is therefore concluded that impacts to land use in the vicinity will be SMALL and not warrant mitigation.

5.1.2 TRANSMISSION CORRIDORS AND OUTSIDE AREAS

As discussed in Section 2.2.2, {the additional electricity generated from CCNPP Unit 3 will not require the addition of new offsite transmission lines. As discussed in Section 2.2.2.2, CCNPP Unit 3 construction activities will include the following onsite changes at the CCNPP site (PJM, 2006):

- One new 500 kV substation to transmit power from CCNPP Unit 3.
- Two new 500 kV, 3500 MVA circuits connecting CCNPP Unit 3 substation to the existing CCNPP Units 1 and 2 substation.

Numerous breaker upgrades and associated modifications will also be required at Waugh

Chapel, Chalk Point, and other substations, but all of the changes will be implemented within the boundaries of the existing substations. There will be no operational impact to land use along the corridors as the result of the proposed action.

The onsite transmission line work necessary to support CCNPP Unit 3 will require new towers and a transmission line to connect a new switchyard for CCNPP Unit 3 to the existing CCNPP Units 1 and 2 switchyard. Line routing will be conducted to avoid or minimize impact on the existing Independent Spent Fuel Storage Installation, wetlands, and threatened and endangered species identified in the local area. No new operational land use impacts will occur as the result of the operation of the new connector transmission lines or the CCNPP Unit 3 substation.

In general, the transmission line owner (Baltimore Gas and Electric (BGE)) ensures that land use in the corridors and underneath the high voltage lines is compatible with the reliable transmission of electricity. Vegetation communities in these corridors are kept at an early successional stage by mowing and application of herbicides and growth-regulating chemicals. In some instances, BGE could allow agricultural activities in these rights-of-way. BGE could also allow hunt clubs and individuals to plant wildlife foods for quail, dove, wild turkey, and white-tailed deer. However, BGE's control and management of these rights-of-way precludes virtually all residential and industrial uses of the transmission corridors. As described in Section 3.7, BGE has established corridor vegetation management and line maintenance procedures that will continue to be used to maintain the corridor and transmission lines.

There will be no need for additional access roads along the existing offsite transmission corridors. Offsite corridor maintenance activities will be in accordance with existing right-of-way agreements between BGE and current landowners, where applicable. Should additional access be warranted, BGE will negotiate/renegotiate access agreements with the appropriate landowner. Therefore, it is concluded that land use impacts to offsite transmission corridors from operation of CCNPP Unit 3 will be identical to impacts from the existing CCNPP Units 1 and 2.}

{Onsite transmission corridor activities are limited to tying about 1 mi (1.6 km) of onsite transmission line from a new CCNPP Unit 3 switchyard to the existing CCNPP Units 1 and 2 switchyard. The basic transmission system electrical and structural design parameters for this new onsite transmission corridor are addressed in Section 3.7. Land use impacts from construction of the new onsite transmission corridor and new CCNPP Unit 3 switchyard are described in Section 4.1.}

{It is therefore concluded that impacts to land use in the existing transmission corridors or offsite areas would be SMALL and not require mitigation.}

5.1.3 HISTORIC PROPERTIES AND CULTURAL RESOURCES

Tables 2.5.3-4 and 2.5.3-5 list historic properties within the project Areas of Potential Effect that are potentially eligible or eligible for listing on the National Register of Historic Places. These tables reflect the comments received from the Maryland SHPO (MHT, 2007). As described in Section 2.5.3, the cultural resource survey of the CCNPP site identified fourteen archaeological sites, four of which are considered eligible for inclusion on the National Register of Historical Places. The survey also identified five architectural resources, four of which are considered eligible for the National Register of Historical Places.

Five of the eight historic properties would not be affected by operation of CCNPP Unit 3 due to the mitigation actions that will be taken during construction activities. All four of the potentially eligible archaeological sites will be addressed during construction as described in Section 4.1.3, thus operation of CCNPP Unit 3 would have no effect on these resources. Although the Eagle's

Den building at Camp Conoy would remain, because the rest of the property would be affected during construction, this building would not retain National Register of Historic Places eligibility. Thus there would be no effect to this property from operation of the plant.

Portions of the roadbed for the former Baltimore and Drum Point Railroad will be affected during construction of CCNPP Unit 3, resulting in a a potentially adverse effect to this property. However, other portions both on and off the CCNPP site property will remain intact and remain eligible to the National Register of Historic Places. The Preston's Cliff property and the Parran's Park property will also remain intact and eligible to the National Register of Historic Places post-construction of CCNPP Unit 3. Potential sources of effects to these three properties would be maintenance activities and operation of the cooling tower which are addressed below.

Maintenance activities will occur in areas previously disturbed during CCNPP Unit 3 construction. Thus, effects to the three properties from maintenance activities are expected to be SMALL and not warrant mitigation. As discussed in Section 5.3.3.1, operation of the cooling tower would produce a visible plume, occasional fog and ice, and salt deposition which could effect the settings or materials of historic properties. Due to the nature of the Baltimore and Drum Point Railroad property, the effects of these products of cooling tower operation on the railroad are expected to be SMALL and not warrant mitigation. Effects to the Preston's Cliff property's setting from the visible plume and fog are expected to be SMALL and not warrant mitigation due to the property's location near CCNPP Units 1 and 2. Effects to the property from ice are expected to be SMALL and not warrant mitigation due to the short duration and intermittent basis of ice formation. Effects to the property from salt deposition could occur but are expected to be SMALL and not warrant mitigation due to the small amount that would be deposited in the area (7.6 kg per hectare per month) and the location of the property adjacent to salt water. The same levels of effect are expected for the Parran's Park property, for the same reasons.

Previously recorded historic or archaeological resources located within 10 mi (16 km) of the CCNPP site were also identified through research of existing records. Research identified 1,029 previously inventoried cultural resources. These resources are provided in Appendix A of Section 2.5. Potential sources of effects to these resources would be operation of the cooling tower and the resulting fog, ice, and the visible plume.

Fogging and icing would occur mostly onsite. Fogging is predicted to reach site boundaries less than 13 hours per year, and icing is expected to occur offsite for less than 7 hours per year as discussed in Section 5.3.3.1. Because of the short duration and intermittent basis of fogging and icing, any adverse effect to offsite historic properties and their settings or materials would be SMALL and not warrant mitigation. The plume above the cooling tower would be visible from archaeological and historic resources in the region surrounding the CCNPP site and would introduce a modern feature into their viewsheds. However, due to the presence of numerous modern features in the region already, the effect to these properties would be anticipated to be SMALL and not warrant mitigation.

Consultation on the Phase I cultural resources survey with Native American tribes is pending. This consultation could result in changes to the recommended National Register of Historical Places eligibility of the 19 identified resources. Phase II archaeological investigations and subsequent SHPO consultation will be conducted on potentially eligible archaeological resources that are located within the proposed project area and cannot be avoided, to determine their eligibility. Upon completion of Phase II investigations and SHPO consultations, assessments of effect on the National Register of Historical Places eligible resources on the project site will be determined and consultation conducted with the SHPO to identify measures to avoid, minimize, or mitigate any adverse effects, per Section 106 of the National Historic Preservation Act (USC, 2007).

With maintenance and operations activities, there is always the possibility for inadvertent discovery of previously unknown cultural resources or human remains. Prior to initiating land disturbing activities, procedures will be developed which include actions to protect cultural, historic, or paleontological resources or human remains in the event of discovery. These procedures would comply with applicable Federal and State laws. Section 106 of the National Historic Preservation Act (USC, 2007) and Article 83B Section 5-617 and 5-618 of the Maryland Code, respectively, require any project requiring licenses, permits, or that are funded by State and Federal agencies to examine the impact of their undertaking on significant cultural resources and to take steps to avoid, reduce or mitigate any adverse effects. The Code of Maryland, Criminal Law Title 10, Subtitle 4, Sections 10-401 through 10-404 (MD, 2007a) requires consultation with the State of Maryland for removal and reburial of human remains. The Code of Maryland, Health – General, Title 4, Subtitle 2, Section 4-215 (MD, 2007b) requires a permit to disinter a burial.

{The continued use of the existing transmission corridors by the proposed project would not result in new impacts to cultural and historical resources. There would be no new offsite transmission corridors or offsite transmission lines for the proposed project. Because there will be no new corridors or construction of new transmission lines within the existing corridors required for this project, there will be no new impacts as the result of this project. However, should new and significant cultural and historic resources be encountered during maintenance operations along the existing corridors, Constellation Generation Group and UniStar Nuclear Operating Services would contact the Maryland Historic Trust to consult on the discovery.}

It is therefore concluded that {CCNPP Unit 3} operations would have a SMALL impact on historic or cultural resources and would not require mitigation.

5.1.4 REFERENCES

{**MD, 2007a.** Code of Maryland, Criminal Law, Title 10, Subtitle 4, Sections 10-401 through 10-404, 2007.

MD, 2007b. Code of Maryland, Health – General, Title 4, Subtitle 2, Section 4-215, 2007.

MHT, 2007. Letter from J. Rodney Little, Director/State Historic Preservation Officer, Maryland Historic Trust to R. M. Krich, dated June 7, 2007.

PJM, 2006. Feasibility Study for Calvert Cliffs Nuclear Power Plant Unit 3 (Draft), PJM Designation Q48, PJM Interconnection, LLC, November, 2006.

NRC, 1999. Environmental Standard Review Plan, NUREG-1555, Nuclear Regulatory Commission, October 1999.

USC, 2007. Title 16, United States Code, Part 470, National Historic Preservation Act of 1966, as amended, 2007.}

Table 5.1-1 Land Use at the CCNPP Site
(Page 1 of 1)

Land Use Category	Acres (Hectares)	Percent of Site
Forest	1,618.6 (655)	78.7
Urban or Built-up	330.7 (133.8)	16.1
Agriculture	106 (43)	5.1
Water	1.6 (0.7)	0.1
Total	**2,057 (832.5)**	**100**

Table 5.1-2 Land Use Within the 8 mi (13 km) Radius of the CCNPP Site
(Page 1 of 1)

Land Use Category	Acres (Hectares)	Percent of Area
Open Water	78,237.7 (31,661.8)	59.7
Forest	28,827.5 (11,666.1)	22
Urban or Built-up	13,483.8 (5,456.7)	10.3
Agriculture	9,843 (3,983.4)	7.5
Barren	56.1 (22.7)	0.04
Wetland	690.7 (279.5)	0.53
Not Defined	20.5 (8.3)	0.02
Total	**131,159.3 (53,078.5)**	**100**

5.2 Water-Related Impacts

5.2 WATER RELATED IMPACTS

This section identifies impacts to surface water and groundwater resources associated with operation of the {CCNPP Unit 3} site and transmission corridors. {As described in Section 3.3, CCNPP Unit 3 will require water for cooling and operational purposes. The source of this water will be the Chesapeake Bay. Normal plant operations will require an estimated 34,748 gpm (131,535 lpm) of surface water for turbine condenser cooling. Approximately half of this water will be lost to the atmosphere as evaporation and cooling tower drift, and the remainder (17,355 gpm, or 65,695 lpm) will be released as blowdown to the Chesapeake Bay.

A desalinization plant will be provided to treat Chesapeake Bay water and will have sufficient capacity to supply the fresh water makeup of the Essential Service Water System (ESWS) cooling towers and Ultimate Heat Sink (UHS), as well as other non-plant uses, such as potable and sanitary needs. It is estimated that 3,040 gpm (11,508 lpm) of Chesapeake Bay water will be processed by the desalinization plant, with approximately 940 gpm (3,558 lpm) returned to the Chesapeake Bay as blowdown from the ESWS cooling towers.}

5.2.1 HYDROLOGIC ALTERATIONS AND PLANT WATER SUPPLY

Section 2.3.1 provides a description of surface water bodies and the groundwater aquifers, including their physical characteristics.

5.2.1.1 Regional Water Use

Section 2.3.2 describes surface water and groundwater uses that could affect or be affected by the construction or operation of {CCNPP Unit 3}. Section 2.3.2.1 describes the potential sources of surface water, the current and future consumptive surface water uses in {Calvert County}, and the non-consumptive surface water uses. Section 2.3.2.2 describes the sources of groundwater available to the {CCNPP site} and the current and future trends in groundwater use in the {southern Maryland region, Calvert County, and by CCNPP Units 1 and 2}.

The standards and regulations applicable to the use of surface water are presented in Section 2.3.2.1.4. The groundwater demands, regulations governing groundwater withdrawal permits, and the ongoing comprehensive assessment of groundwater resources {in the Maryland Coastal Plain} are described and discussed in Section 2.3.2.2.7.

5.2.1.2 Plant Water Use

The following sections describe sources and uses of water associated with {CCNPP Unit 3}. Additional detail on water sources, rates of consumption and return, and amounts used by various plant operating systems during normal operations and outages is presented in Section 3.3.

{The average water demand from the Chesapeake Bay for plant operation is estimated at 37,788 gpm (143,043 lpm) from which 3,040 gpm (11,508 lpm) is processed through the desalinization plant to supply fresh water. During refueling outages, which occur approximately every two years and last approximately 1 month, the maximum water demand will rise to 43,480 gpm (164,590 lpm) for the initial period of plant cool down and then decrease to include essentially only the fresh water demand for the onsite workforce.

During outages, the permanent onsite workforce of approximately 633 would increase by an estimated 750 additional workers. For the purpose of estimate, a fresh water demand value of 30 gpd (114 lpd) per person is assumed. Using this value, fresh water demand would increase from 13.2 gpm (50 lpm) during normal operations, to 28.8 gpm (109.0 lpm) during major outages. This increase in fresh water demand correlates to an increase in makeup water demand for the desalinization plant of approximately 39 gpm (148 lpm) at a 40% recovery rate.

Sanitary effluents are estimated at 20 gpm (76 lpm), during normal operations, and would increase to 45 gpm (170 lpm) during major outages. These increases represent relatively small fractions of the Chesapeake Bay demand and plant effluent.}

5.2.1.2.1 Surface Water

{CCNPP Unit 3} is designed to use the minimum amount of water necessary to ensure safe, long-term operation of the plant. {The intake for CCNPP Unit 3 will be located inside the existing intake structure for CCNPP Units 1 and 2. The discharge outfall piping will enter the bay near the existing barge slip and extend approximately 550 ft (170 m) offshore through a 30 in (80 cm) diameter buried pipe to a multi-port diffuser system. Additional details on the intake and discharge systems are presented in Section 3.4. Water withdrawals for the operation of CCNPP Unit 3 are described in detail in Section 3.3.1.}

5.2.1.2.1.1 Plant Construction

The primary water demands during construction are concrete mixing and curing, dust control, and potable water. Water for construction will come from {the existing CCNPP Units 1 and 2 onsite groundwater production wells, trucked in supply, desalinization plant, and storage tanks. Estimated average construction water demand is 250 gpm (946 lpm) during working hours (i.e. 8 hours per day, 265 days per year), and the peak water use is estimated at 1,200 gpm (4,542 lpm). Construction uses of water are described in more detail in Table 5.2 2.

Any groundwater withdrawals made to support CCNPP Unit 3 construction will be performed within the limits of existing groundwater permit for CCNPP Units 1 and 2. It is anticipated that groundwater needs will be reduced during the final construction years when the desalinization plant becomes operational to meet freshwater supply needs. Groundwater withdrawals will not be made to support operation of CCNPP Unit 3.

Construction water use is assumed to be entirely consumptive. Groundwater withdrawals required for construction of CCNPP Unit 3 will be small and temporary, and the effect on the groundwater supply will be small. Section 4.2 further addresses water-related impacts of plant construction.}

5.2.1.2.1.2 Circulating Water Supply System

{CCNPP Unit 3 will utilize a closed-loop Circulating Water Supply System (CWS). The system will use a single mechanical draft cooling tower for heat dissipation. The CWS cooling tower will have the same basic structure and profile as a combination dry and wet (hybrid) cooling tower, but it will operate year round as a wet cooling tower. The cooling tower system requires makeup water to replace that lost to evaporation, drift (entrained in water vapor), and blowdown (water released to purge solids).

Makeup water for the hybrid mechanical draft CWS cooling tower system will be withdrawn from the Chesapeake Bay. As indicated in Section 3.4, makeup water for the CWS will be pumped at a maximum rate of 40,440 gpm (153,082 lpm). At the maximum makeup rate, water lost by evaporation and blowdown returned to Chesapeake Bay will each be approximately equal at 20,200 gpm (76,465 lpm). Average makeup water flow to the Circulating Water Supply System is expected to be approximately 34,748 gpm (131,535 lpm), with water lost by evaporation and blowdown returned to Chesapeake Bay each being approximately equal at 17,355 gpm (65,695 lpm).

The water balance is affected minimally by drift. Maximum drift losses will be less than 0.005% of the circulating water flow (785,800 gpm (3.0 million lpm)). This results in a maximum drift of 39 gpm (148 lpm).

The cooling tower will operate at 2 cycles of concentration. Minimum makeup and blowdown values occur at this value. If evaporation and drift are not changed, makeup is reduced to approximately two thirds of its maximum value and blowdown is reduced to approximately one third of its maximum value.

The Essential Service Water System (ESWS), under normal plant operations with two trains operating, will operate at a nominal recirculated flow rate of approximately 19,075 gpm (72,207 lpm). The maximum fresh water makeup rate from the desalinization plant required under normal operations is estimated to be 1,882 gpm (7,124 lpm) to offset maximum evaporation rate (approximately 940 gpm (3,560 lpm)), maximum blowdown rate (approximately 940 gpm (3,560 lpm)), and drift loss (approximately 2 gpm (8 lpm).

Water released to the Chesapeake Bay as blowdown is not lost to downstream users or downstream aquatic communities. Evaporative losses and drift losses are not replaced and are considered "consumptive" losses.}

5.2.1.2.1.3 {Desalinization Plant

During operations, CNPP Unit 3 will not withdraw groundwater for use at the site. Consequently, operation of CCNPP Unit 3 will require a consistent source of fresh water makeup for cooling purposes. A reverse-osmosis (RO) desalinization plant will be used to provide fresh water for the plant demineralized water system, potable and sanitary water systems, and UHS makeup water system. The desalinization plant will use stage media filtration, with a one pass seawater reverse osmosis (SWRO) at 40% recovery. The system will also include seawater feed pumps, multimedia filters, chemical injection system, and an RO permeate tank. The Chesapeake Bay will be the source of water for the desalinization plant.

The desalinization plant will remove the high concentration of salts and minerals from the Chesapeake Bay source water. During the production of desalinated water, a percentage of the source water is concentrated and is unusable. The product water recovery relative to input water flow is 15% to 50% for most seawater desalinization plants. That is, for every 100 gal (379 L) of seawater, 15 to 50 gal (57 to 189 L) of pure water is produced along with brine wastewater containing a higher concentration of dissolved solids. A desalinization plant's recovery rate varies, mainly because plant operations and efficiencies depend on site-specific conditions. Depending on the efficiency of the desalinization plant, briny wastewater could represent as much as 85% of the intake water (CCC, 2004).

The general process of reverse osmosis is described as follows. High pressure makeup water enters the RO trains, where the water passes through the membranes, and the dissolved salts are rejected. Permeate, or product water, is collected from the end of each membrane element, and becomes the product of the purification process. As the raw water flows along the "brine channel", or coarse medium, it becomes increasingly more concentrated.

This concentrated raw water is called the reject stream, or concentrate stream. Operation at 50% recovery would result in a reject stream that is twice as concentrated as the feed, which is essentially the same concentration as the blowdown from the CWS cooling tower. The desalinization plant is expected to operate at a 40% recovery rate that will result in a less concentrated reject stream. The reject stream carries the concentrate from the RO trains to the waste water retention basin prior to being released to the Chesapeake Bay along with the cooling tower blowdown.

Preliminary studies indicate that desalinization plant water capacity will be 1,750,000 gpd (1,215 gpm, or 4,599 lpm). Desalinization plant demand for CCNPP Unit 3 will be approximately 1,250,000 gpd (4,731,000 lpd), with an additional capacity of 500,000 gpd (1,893,000 lpd) available. The conceptual water requirements for the systems that will be served by the desalinization are shown in Table 5.2 1.

Makeup water for the desalinization plant will be taken from the makeup line for the CWS, which utilizes the Chesapeake Bay as its source. The desalinization plant will have a membrane filtration pretreatment followed by the reverse osmosis process. Therefore, assuming 10% filtration waste and operation at 40% recovery, 3.89 million gpd (14.7 million lpd) of water will be

The desalinization plant reject stream would be directed to a retention pond where it will mix with, and be diluted by, circulating water blowdown from CCNPP Unit 3 prior to discharge to the Chesapeake Bay.}

5.2.1.2.2 Groundwater Use

Groundwater monitoring wells are installed on the site to study and model the groundwater in the CCNPP site vicinity as described in Section 2.3. {Groundwater withdrawals will not be used to support operation of CCNPP Unit 3. Groundwater withdrawals during construction are discussed in Section 4.2. As discussed in Section 2.3.2, temporary groundwater dewatering controls are expected during construction activities; however, a permanent groundwater dewatering system is not anticipated to be a design feature for the CCNPP Unit 3 facility.}

5.2.1.3 Hydrological Alterations

Operational activities that could result in hydrological alterations within the site and vicinity and at offsite areas are described in Sections 3.3, 3.4, and 3.7.

{The principal hydrological alteration onsite associated with CCNPP Unit 3 will occur during construction, when at least one impoundment and several tributaries to Johns Creek will be filled. Some onsite streams may be impacted by either sedimentation or reduced water flow due to measures taken to reduce sedimentation, as described in Section 4.3.2. Once construction is completed, and normal operations begin, it is expected that the streams will experience little ongoing impact.

There have been no clearly discernible onsite or offsite effects of hydrologic alterations for operation of CCNPP Units 1 and 2, and the supply of surface water and groundwater has been sufficient. Operation of CCNPP Unit 3 with a closed loop cooling system will result in much smaller effects on withdrawals and discharges and correspondingly reduced operational effects than would be expected for an open loop cooling system. The provision of a desalinization plant will provide adequate fresh water for operation of CCNPP Unit 3 systems, and will have some additional capacity.

{The CCNPP Unit 3 intake structure will be located within the existing intake area for CCNPP Units 1 and 2. A sheet pile cofferdam and dewatering system will be installed on the south side of the CCNPP Unit 1 and 2 intake structure to facilitate construction of the CCNPP Unit 3 circulating and service makeup water intake structure and pump house. Pilings may also be driven to facilitate construction of new discharge system piping.

Excavation and dredging of the intake structure, pump house erection and the installation of mechanical, piping, and electrical systems follow the piling operations and continue through site preparation into plant construction. Excavated and dredged material will be transported to an onsite spoils area located outside the boundaries of designated wetlands.

The barge slip will be dredged to accommodate the construction shipments. New sheet pile will be installed and 15,000 yds^3 (11,500 m^3) of spoils are estimated to be generated from this activity. No maintenance dredging had been performed to keep the slip open and none is anticipated after the construction shipments are received. Placement of the discharge pipeline will require excavating and backfilling a trench on the Chesapeake Bay floor. No additional spoils are expected to be generated.

Dredging of the barge slip, intake, and pipeline areas are expected to be one time event and are not expected to require maintenance dredging. Consequently, any hydrologic alterations, such as disruption of the longshore current and drift mechanism, are expected to be local, transitory, reversible, and small. Additionally, based on operational experience at CCNPP Units 1 and 2, it is expected that no maintenance dredging will be needed to keep the intake area clear.}

5.2.2 WATER USE IMPACTS

5.2.2.1 Surface Waters

5.2.2.1.1 Consumptive Use

{The maximum evaporation loss for the Unit 3 CWS cooling tower system is estimated to be approximately 20,200 gpm (76,500 lpm). Additionally, makeup water for the ESWS cooling towers is normally supplied from the plant potable water system (e.g., desalinization plant). Evaporation from the circulated ESWS flow will occur at the cooling towers, and will be approximately 940 gpm (3,558 lpm).

Consumptive uses of water during construction of CCNPP Unit 3 include concrete mixing and curing, dust control, and potable and sanitary water. Peak consumptive water use will occur for several years during construction, and will be 39.3 million gpy (148 million lpy). A breakdown of construction water use by year is provided in Table 5.2-2.

The Chesapeake Bay contains nearly 18 trillion gallons (68 trillion liters) of water and is refreshed by rivers at an annual average rate of 77,500 ft^3/s (2,190 m^3/s), and a flowrate of 30,800 ft^3/s (872 m^3/s) during periods of low freshwater input to the Chesapeake Bay. The volume of water that will be lost to evaporation from the CCNPP Unit 3 cooling towers and ESWS cooling towers is negligible compared with the amount of water in the Chesapeake Bay, and consumptive losses of this magnitude will not be discernible. No measurable impact of consumptive water use on the Chesapeake Bay water level is expected, and operation of CCNPP Unit 3 will therefore have a SMALL impact on the availability of water from the Chesapeake Bay.}

5.2.2.1.2 Non-Consumptive Use

{Non-consumptive uses of water downstream from the plant are described in Section 2.3.2.1.3. The major non-consumptive surface water use categories in the vicinity of the site are recreation, fisheries, marinas, parks, and transportation. The recreational activities include swimming, fishing and boating along the Patuxent River and in the Chesapeake Bay. Fisheries in the Chesapeake Bay are described in Section 2.4.2. Transportation on the Chesapeake Bay will not be affected by the construction or operation of CCNPP Unit 3.

The existing intake system for CCNPP Units 1 and 2 includes an intake channel, and an embayment established by a curtain wall. The CCNPP Unit 3 intake for the CWS will be located on the southern edge of the intake embayment, while the intake for the UHS makeup system will be located to the east immediately adjacent to the CWS intake. The CCNPP Unit 3 intakes will be set back from the intake embayment and situated at the end of a 123 ft (37 m) long, 100 ft (30 m) wide channel.

The CCNPP Unit 3 CWS and UHS makeup intakes will meet the U.S. Environmental Protection Agency (EPA) Phase 1 design criteria, as described in Section 5.3.1.1. The overall percentage of Chesapeake Bay water entrained will remain less than 1%, with the maximum additional makeup required to meet the CCNPP Unit 3 cooling water requirement of 40,440 gpm (153,082 lpm).

While fish impingement and entrainment will occur, CCNPP Unit 3 will employ the impingement/entrainment mitigation techniques (low velocity approach, screens, etc.) currently utilized by CCNPP Units 1 and 2 to minimize the impact on aquatic resources. The fish loss associated with impingement/entrainment will be negligible.

Design approach velocities for both CCNPP Unit 3 intake structures will be less than 0.5 ft/s (0.15 m/s). The intake structures will incorporate fish and invertebrate protection measures that maximize impingement survival. The through trash rack and through screen mesh flow velocities will be less than 0.5 ft/s (0.15 m/s). The screen wash system will provides a pressurized spray to remove debris from the water screens. In both intake structures, there is no need for a fish return system, because the flow velocities through the screens are less than 0.5 ft/s (0.15 m/s) in the worst case scenario (minimum Chesapeake Bay level with highest makeup demand flow).

The primary external impact will be the discharge of cooling tower blowdown water to the Chesapeake Bay. The CCNPP maximum Unit 3 CWS cooling tower discharge is estimated to be 20,200 gpm (76,500 lpm). Prior to discharge into the Chesapeake Bay, the cooling tower blowdown will be sent to a retention basin, thus reducing thermal impacts to receiving waters.

No effect on fisheries, navigation, or recreational use of the Chesapeake Bay is expected.}

5.2.2.2 Groundwater

{Groundwater withdrawals will not be used to support operation of CCNPP Unit 3. Limited groundwater withdrawals are anticipated to support CCNPP Unit 3 construction and will be performed within the limits of existing groundwater permit for CCNPP Units 1 and 2. It is anticipated that groundwater needs will be reduced during the final construction years when the desalinization plant becomes operational to meet freshwater supply needs for the operation of CCNPP Unit 3. Thus, the operation of CCNPP Unit 3 will have no impact on the inventory of local groundwater systems.}

5.2.3 WATER QUALITY IMPACTS

{Water quality data for the Chesapeake Bay are presented in Section 2.3.3. The U.S. EPA declared the Chesapeake Bay as an impaired water body in 1998 based on the Federal Water Pollution Control Act (USC, 2007) because of excess nutrients and sediments. The Chesapeake Bay water is required to meet Federal regulatory water quality standards by 2010.}

5.2.3.1 Chemical Impacts

{The area of the Chesapeake Bay near the CCNPP site is included on the Maryland Clean Water Act Section 303(d) list. The effects of the discharge from all CCNPP units will be considered in developing the National Pollutant Discharge Elimination System (NPDES) Permit for CCNPP Unit 3.

CCNPP Unit 3 will utilize cooling tower based heat dissipation systems that remove waste heat by allowing water to evaporate to the atmosphere. The water lost to evaporation must be continuously replaced with makeup water. To prevent build up of solids, a small portion of the circulating water stream with elevated levels of solids is drained or blown down.

Because cooling towers concentrate solids (minerals and salts) and organics that enter the system in makeup water, cooling tower water chemistry must be maintained with anti-scaling compounds and corrosion inhibitors. Similarly, because conditions in cooling towers are conducive to the growth of fouling bacteria and algae, biocides must be added to the system. This is normally a chlorine or bromine-based compound, but occasionally hydrogen peroxide or ozone is used. Table 3.3-2 lists water treatment chemicals used for CCNPP Units 1 and 2. It is anticipated that CCNPP Unit 3 will also utilize these water treatment chemicals.} Section 5.3 specifically deals with the impacts of the cooling system.

As opposed to the CWS cooling tower, which uses brackish Chesapeake Bay water as its makeup water source, the ESWS cooling towers will be typically be supplied with fresh water makeup from the desalinization plant, and will only use Chesapeake Bay water as an emergency backup source when freshwater makeup from storage tanks or the desalinization plant is not available. The build up of solids and solid scale formation in the ESWS cooling towers will therefore be substantially less than for the CWS cooling tower. The ESWS cooling towers will use the water treatment chemicals described above, as required, but to a lesser degree than the Circulating Water Supply System cooling tower. Based on the ESWS makeup and blowdown rate, it will circulate fresh water concentrated two times compared to brackish water assumed to have total dissolved solids of 20,000 milligram per liter concentrated two times.

Limited treatment of raw water to prevent biofouling in the intake structures and makeup water piping may be required. Additional water treatment will take place in the cooling tower basin, and will include the addition of biocides, anti-scaling compounds, and foam dispersants. Sodium hypochlorite and sodium bromide are expected to be used to control biological growth in the existing Circulating Water Supply System and will likely be used in the system as well.

The NPDES permit will be acquired prior to the startup of CCNPP Unit 3. This permit will specify threshold concentrations of Free Available Chlorine (when chlorine is used) and Free Available Oxidants (when bromine or a combination of bromine and chlorine is used) in cooling tower blowdown when the dechlorination system is not in use.

Dechlorination is a component of the planned Unit 3 project site wastewater treatment plant, which is discussed below. Lower discharge limits would apply to effluent from the dechlorination system (which is released into Chesapeake Bay) when it is in use. The CCNPP Unit 3 NPDES permit will contain discharge limits for discharges from the cooling towers for two priority pollutants, chromium and zinc, which are widely used in the U.S. as corrosion inhibitors in cooling towers.

Operation of the CCNPP Unit 3 cooling tower systems will be based on 2 cycles of concentration. As a result, levels of solids and organics in cooling tower blowdown will be approximately twice as high as ambient concentrations in Chesapeake Bay. Blowdown wastewater from the cooling tower and similar waste from the saltwater desalinization plant (membrane filtration pretreatment and saltwater reverse osmosis) will discharge to a retention basin to allow time for settling of suspended solids and to allow additional chemical treatment of the wastewater, if required, prior to discharge to Chesapeake Bay. The final discharge will consist of cooling tower blowdown from the CWS cooling tower, the ESWS cooling towers, the desalinization plant, and site waste streams, including the domestic water treatment and circulating water treatment systems.

Under normal conditions, 19,425 gpm (73,531 lpm) will be discharged by pipe from the retention basin into Chesapeake Bay; a maximum discharge of 23,227 gpm (87,923 lpm) is anticipated. Because the discharge stream volume will be small relative to the volume of the Chesapeake Bay, concentrations of solids and chemicals used in cooling tower water treatment will rapidly dilute and approach ambient concentrations in Chesapeake Bay after exiting the discharge pipe.

The cooling tower blowdown and desalinization plant wastewater effluent volume entering Chesapeake Bay from the common CCNPP Unit 3 retention basin will be small and any chemicals it contains low in concentration. The operation of CCNPP Unit 3 will comply with a Maryland Department of Environment issued NPDES permit, and the applicable state water quality standards. All biocides or chemical additives in the discharge will be among those approved by the U.S. EPA and the State of Maryland as safe for humans and the environment.

The area of Chesapeake Bay near CCNPP Unit 3 is included on the Maryland Clean Water Act, Section 303(d) List because of high nutrient levels and low dissolved oxygen (DO) concentration (i.e., <5 mg/L) (MDE, 2004). Section 303(d) of the Federal Water Pollution Control Act (USC, 2007) requires States to identify waters that are impaired by pollution, even after application of pollution controls (USEPA, 2007). For those waters, States must establish a total maximum daily load (TMDL) of pollutants to ensure that water quality standards can be attained.

A State of Maryland regulatory deadline of 2011 exists to establish TMDLs for Chesapeake Bay. Because of this mandate and the State enforcement of environmental design of discharge stuctures, the effluent from CCNPP Unit 3 will be monitored, and any necessary measures will be taken to mitigate negative impacts from possible pollutants and low dissolved oxygen content in the effluent. As a result, it is not expected that there will be any negative effect on the DO concentration in the Chesapeake Bay due to the CCNPP Unit 3 discharge plume.

Based on the above, impacts of chemicals in the permitted blowdown discharge wastewater to the water quality of Chesapeake Bay will be negligible and are not expected to warrant mitigation.

The CCNPP Unit 3 Wastewater Treatment Plant (WWTP) will also discharge chemically treated water to Chesapeake Bay. Wastewater generated onsite during operation of CCNPP Unit 3 will be treated using standard wastewater treatment plant processes. The treated wastewater will meet all applicable health standards, regulations, and total maximum daily loads (TMDLs) as set by the Maryland Department of the Environment (MDE) and the U.S. EPA.

The CCNPP Unit 3 WWTP will be similar to the existing onsite WWTP that is currently being used for CCNPP Units 1 and 2. It will be designed with a typical two-stage clarifier type treatment system which incorporates a lift station, an anoxic mixing chamber, an oxidation ditch, a series of clarifiers, media filtration, a chlorination system, and a dechlorination system. The treatment process is described below.

Raw sewage generated during the operation of CCNPP Unit 3 will flow into a wet well and then be pumped to the anoxic mixing chamber. The collection of sewage and the subsequent pumping help to grind waste materials to a uniform size and add oxygen to the liquid waste stream. In the anoxic mixing chamber incoming sewage is mixed with activated sludge from the clarifiers. This begins the aerobic digestion process. The activated sludge adds the necessary microorganisms to the incoming sewage and the microorganisms digest the organic constituents in the incoming wastewater. Aerobic microorganisms use the incoming wastes for food, a source of energy, and reproduction. The products of aerobic digestion are water, carbon dioxide, and more microorganisms.

Microorganisms and oxygen must be present in sufficient numbers to consume the incoming organic material and oxidize ammonia and nitrogen. Optimum conditions for the microorganisms are maintained by controlling the pH, oxygen concentration, and biomass in the system.

Sewage then flows into the oxidation ditch and then into the primary clarifier. The primary clarifier separates the solids (sludge) from the clear liquid. The sludge is then pumped back into the anoxic mixing chamber, or collected and sent to the sludge holding tank. The waste sludge is then removed and transported to a waste processing plant. All sludges are tested for radiological contaminants prior to shipping. If any radionuclides are detected, the waste is deemed radioactive and disposed of as low level radioactive waste.

The liquid portion of the waste stream flows into a secondary clarifier which further settles out the remaining suspended particles. The effluent of the secondary chamber then flows into a chlorine contact chamber where any remaining microorganisms are dosed with specified concentration of chlorine. The effluent is allowed to remain in the chlorine contact chamber for a set period which allows time for the chlorine to effectively kill any pathogenic organisms. The effluent flows into a dechlorination chamber. This step removes any residual chlorine which would be toxic to organisms in downstream environments. From the dechlorination chamber, the final effluent, which at this stage is basically water, is gravity fed to the main discharge pipe and released to the Chesapeake Bay.

Based on the above, impacts of chemicals in thoroughly treated, permitted WWTP effluents to the water quality of Chesapeake Bay will be negligible and are not expected to warrant mitigation.}

5.2.3.2 {Desalinization Impacts

Briny wastewater from the desalinization plant will be treated prior to release to Chesapeake Bay by mixing with site process waters to reduce the salt and metal concentration to ambient Chesapeake Bay water conditions. Briny process wastewater may contain all or some of the following constituents: high salt concentrations, chemicals used during defouling of plant equipment and pretreatment, and toxic metals (which are most likely to be present if the discharge water was in contact with metallic materials used in construction of the plant facilities). Liquid desalinization plant wastes will be discharged to a retention basin before being returned to the Chesapeake Bay.

An RO desalinization system will be utilized. In an RO plant, water is pumped at high pressures through membranes to filter out dissolved particles. The desalinization plant will be located adjacent to the cooling towers for the Circulating Water Supply System. The desalinization plant will withdraw Chesapeake Bay water from the Circulating Water Supply System makeup line. The desalinization plant feed water will be pretreated to protect the membranes of the RO process.

Pretreatment equipment includes holding tanks, strainers, a series of sand filters, coagulation tanks, and an ultraviolet sanitation system. The pretreatment system is periodically backwashed, and the small amount of backwash is combined with a large dilution volume of cooling tower blowdown before it is discharged into Chesapeake Bay through a series of diffusers.

Under normal operation, the product water requirement for the desalinization plant is 3,040 gpm (11,508 lpm). The desalinization plant will be able to recover up to 50% of the input bay water as fresh water, and will produce a wastewater stream with a salt concentration that is up to twice the ambient Chesapeake Bay concentration. This is similar to the concentration of the cooling tower blowdown. During plant shutdown conditions, salt concentration will be administratively controlled within discharge limits.

Desalinization plant effluent will be only a small fraction of the total blowdown flow. Approximately 18,295 gpm (69,254 lpm) of blowdown will be returned to the Chesapeake Bay from the CWS and ESWS cooling towers, which is equivalent to 40.8 ft^3/s (1.2 m^3/s). Inclusion of the desalinization plant wastewater and waste treatment system effluent results in a slightly higher total discharge flow of approximately 19,425 gpm (73,531 lpm) or 43.2 ft^3/s (1.2 m^3/s). The amount of blowdown associated with the desalinization plant is insignificant, even when compared to low flow conditions (30,800 ft^3/s (872 m^3/s)) in the Chesapeake Bay.}

5.2.3.3 Thermal Impacts

As noted in Section 5.2.3.1, discharges from {CCNPP Unit 3} will be permitted under the NPDES program, which regulates the discharge of pollutants into waters of the state. In this context, waste heat is regarded as a thermal pollutant and is regulated in much the same way as chemical pollutants. Thermal discharges are also regulated under the {Code of Maryland Regulations (COMAR, 2007a)}. Further information describing thermal discharge and the physical impacts associated with operation of {CCNPP Unit 3} is presented in Section 5.3.2.1.1.

{The CCNPP Unit 3 discharge multi-port diffuser system is designed to minimize the potential impact of the thermal plume as it enters the Chesapeake Bay. The subsurface diffusers create rapid mixing of the thermal effluent with ambient tidal flows. Strong tidal currents driven by the rise and fall of tides in the Chesapeake Bay largely determine plume size and shape. The area occupied by the plume is compared to the Maryland water quality criteria in Table 5.3.2.1-4 (COMAR, 2007a). This comparison demonstrates that the CCNPP Unit 3 thermal plume conforms to each of the criteria.

The radial dimension of the 3.6°F (2°C) isotherm is less than 3% of the ebb tide excursion, as compared to the less than one-half (50%) ebb tide excursion specified by Maryland regulation. The full capacity of the 3.6°F (2°C) isotherm is less than 0.3% of the Chesapeake Bay cross section, and the bottom area affected by the plume is about 0.01% of the average ebb tidal excursion multiplied by the width of the Chesapeake Bay. The temperature plume in the Chesapeake Bay resulting from discharge of blowdown wastewater was modeled, as described in Section 5.3.2.1.}

5.2.3.4 Maryland Mixing Zone Regulations

{The State of Maryland has established surface water mixing regulations (COMAR, 2007a) and specific thermal mixing zone criteria (COMAR, 2007b). Power plant thermal discharges into tidal waters must meet the following (simplified) criteria:

- The plume boundary is defined by the temperature isotherm which is 2 °C hotter than ambient temperature,
- The maximum radial plume dimension must not exceed one-half of the average ebb tidal excursion,
- The plume width may not exceed 50% of the cross-section of the receiving water body,
- The area of the channel bottom contacted by a bottom-attached plume my not exceed 5% of the channel bottom below the level of average ebb tidal excursion.

The Cornell Mixing Zone Expert System (CORMIX) model (Jirka, 1996) was used to model the predicted steady state mixing behavior and plume geometry. As discussed in Section 5.3.2, the results of the modeling, as shown in Table 5.3.2.1-3, indicate that the plume will be well below the Maryland Power Plant Thermal Plume compliance criteria. Thermal impacts to the aquatic communities are therefore expected to be small.

Concentrations of water treatment chemicals, such as chlorine and anti-foulants that are added to the cooling system and subsequently discharged in the cooling tower blowdown are also expected to meet mixing zone requirements (COMAR, 2007a). Because of the treatment planned for some of the effluent streams and the large dilution factor expected in the CCNPP

Unit 3 retention basin prior to discharge, possible impacts on the aquatic communities are also expected to be small.

CCNPP Unit 3 will comply with applicable State of Maryland regulations requiring the design of the cooling water intake and discharge structures to incorporate the Best Technology Available to minimize adverse environmental impacts (COMAR, 2007b).}

5.2.3.5 {CCNPP Units 1 and 2 Discharge

Descriptions of the discharge location for CCNPP Units 1 and 2 and the discharge location for CCNPP Unit 3 are provided in Section 5.3.2. The discharge for CCNPP Units 1 and 2 influences the discharge location for CCNPP Unit 3 due to its discharge mixing zone. The two discharge locations must meet environmental regulations in order to be permitted.}

5.2.3.6 Discharge Mixing Zone

{The discharge outfall for CCNPP Unit 3 will be located on the shoreline of the Chesapeake Bay, approximately approximately 1,200 ft (366 m) southeast of the CCNPP Unit 3 intake structures. The discharge piping will extend approximately 550 ft (168 m) east from the outfall into the Chesapeake Bay. The discharge structure will utilize a single 30 in (76 cm) diameter pipe having three final outlet nozzles. The preliminary centerline elevation of the discharge nozzles are 3 ft (0.9 m) above the bay bottom. Riprap will be placed around the discharge point to resist potential scour due to the discharge jet from the nozzles.}

5.2.3.7 Site Surface Water Impacts

{The existing and proposed surface water bodies within the CCNPP site are described in Sections 2.3.1 and 4.2.1. The potential for these bodies to be impacted by site operations are dependent upon operational conditions related to: site safety and spill containment training, a spill pollution prevention plan (SPPP), and a stormwater pollution prevention plan (SWPPP). These plans are addressed in Section 1.3.

Spills or operational debris potentially occurring on outdoor facilities could mix with site precipitation or washing wastewater and be conveyed to downstream impoundments, creeks, rivers, and eventually the Chesapeake Bay. If proper spill and stormwater pollution prevention plans are implemented and practiced, the majority of polluted runoff can be controlled and prevented from escaping the CCNPP site. A monitoring plan implemented under the regulatory guidance for surface and groundwater monitoring could identify future sources of pollution which are above established TMDLs. Those areas could be addressed and point-sources of pollution removed before the area water bodies are impacted further.

Environmental impacts on water quality during construction and operations for CCNPP Unit 3 would be minimal. Groundwater would not be used for CCNPP Unit 3 operation, and will only be used during construction within the withdrawal limits of the existing groundwater permit for CCNPP Units 1 and 2. Surface water runoff and sedimentation effects will be minimized by implementation of a site safety and spill prevention plan and a stormwater pollution prevention plan. Effluent from the planned wastewater treatment plant will meet all applicable health standards, regulations, and total maximum daily loads (TMDLs) as set by the Maryland Department of the Environment (MDE) and the U.S. EPA.

A common retention basin would collect cooling tower blowdown and effluent from the proposed desalinization plant. Effluent from the retention basin, which will contain dilute quantities of chemicals and dissolved solids, and be slightly elevated in temperature, will be discharged to Chesapeake Bay within the limits of the site NPDES permit. When discharged and diluted, this small amount of slightly contaminated water, approximately 0.001% of low flow conditions in Chesapeake Bay, would be expected to have small impacts.}

5.2.4 REFERENCES

{**CCC, 2004.** Seawater Desalinization in California, California Coastal Commission, 2004, Website: http://www.coastal.ca.gov/desalrpt/dchap1.html, Date accessed: March 5, 2007.

Jirka, 1996. User's Manual for CORMIX: A Hydro-Dynamic Mixing Zone Model and Decision Support System for Pollutant Discharges into Surface Waters, G. Jirka, R. Doneker, and S. Hinton, EPA#: 823/B-97-006, U.S. Environmental Protection Agency, Website: http://www.epa.gov/waterscience/models/cormix/users.pdf, Date accessed: June 02, 2007.

COMAR, 2007a. Code of Maryland Regulations, COMAR 26.08.03.03 Water Quality Impact Assessment for Thermal Discharges, Website: http://www.dsd.state.md.us/comar/26/26.08.03.03.htm, Date accessed: March 5, 2007.

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MDE, 2004. Final 303(d) List and Integrated Assessment of Water Quality in Maryland, Maryland Department of Environment, 2004.

USC, 2007. Title 33, United States Code, Part 1251, Federal Water Pollution Control Act, 2007.

USEPA, 2007. Federal Water Pollution Control Act, U.S. Environmental Protection Agency, Website: http://www.epa.gov/region5/water/pdf/ecwa.pdf, Date accessed: June 3, 2007.}

Table 5.2-1 Desalinization Plant Demand
(Page 1 of 1)

System	Demand	
	gpm	lpm
Essential Service Water System Cooling Towers	1882	7,124
Potable Water System	20	76
Makeup to Demineralizer	80	303
Fire Protection	3	11
Additional Capacity	350	1,325
Total	2,335	8,839

Table 5.2-2 Estimated Fresh Water Demand During CCNPP Unit 3 Construction (Page 1 of 1)

Construction Year	Year 1 gal (L)	Year 2 gal (L)	Year 3 gal (L)	Year 4 gal (L)	Year 5 gal (L)	Year 6 gal (L)
Potable and Sanitary	8,550,000[(a)] (32,361,750)	25,650,000[(b)] (97,085,250)	25,650,000[(b)] (97,085,250)	25,650,000[(b)] (97,085,250)	25,650,000[(b)] (97,085,250)	--
Concrete Mixing and Curing[(c)]	2,219,844 (8,402,110)	2,219,844 (8,402,110)	2,219,844 (8,402,110)	2,219,844 (8,402,110)	2,219,844 (8,402,110)	--
Dust Control[(d)]	11,400,000 (43,149,000)	11,400,000 (43,149,000)	11,400,000 (43,149,000)	11,400,000 (43,149,000)	11,400,000 (43,149,000)	--
Total	**22,169,844 (83,912,860)**	**39,269,844 (148,636,360)**	**39,269,844 (148,636,360)**	**39,269,844 (148,636,360)**	**39,269,844 (148,636,360)**	**26,179,896[(e)] (99,090,906)**

Notes:

(a) Estimated at 1,000 persons using 30 gallons per day for 285 days per year.

(b) Estimated at 3,000 persons using 30 gallons per day for 285 days per year.

(c) Estimated at 6,700 cubic yards per month using 27.61 gallons per cubic yard and 12 months per year.

(d) Estimated at 40,000 gallons per day for 285 days per year.

(e) Estimated at two-thirds of the amount used in years 2 through 5.