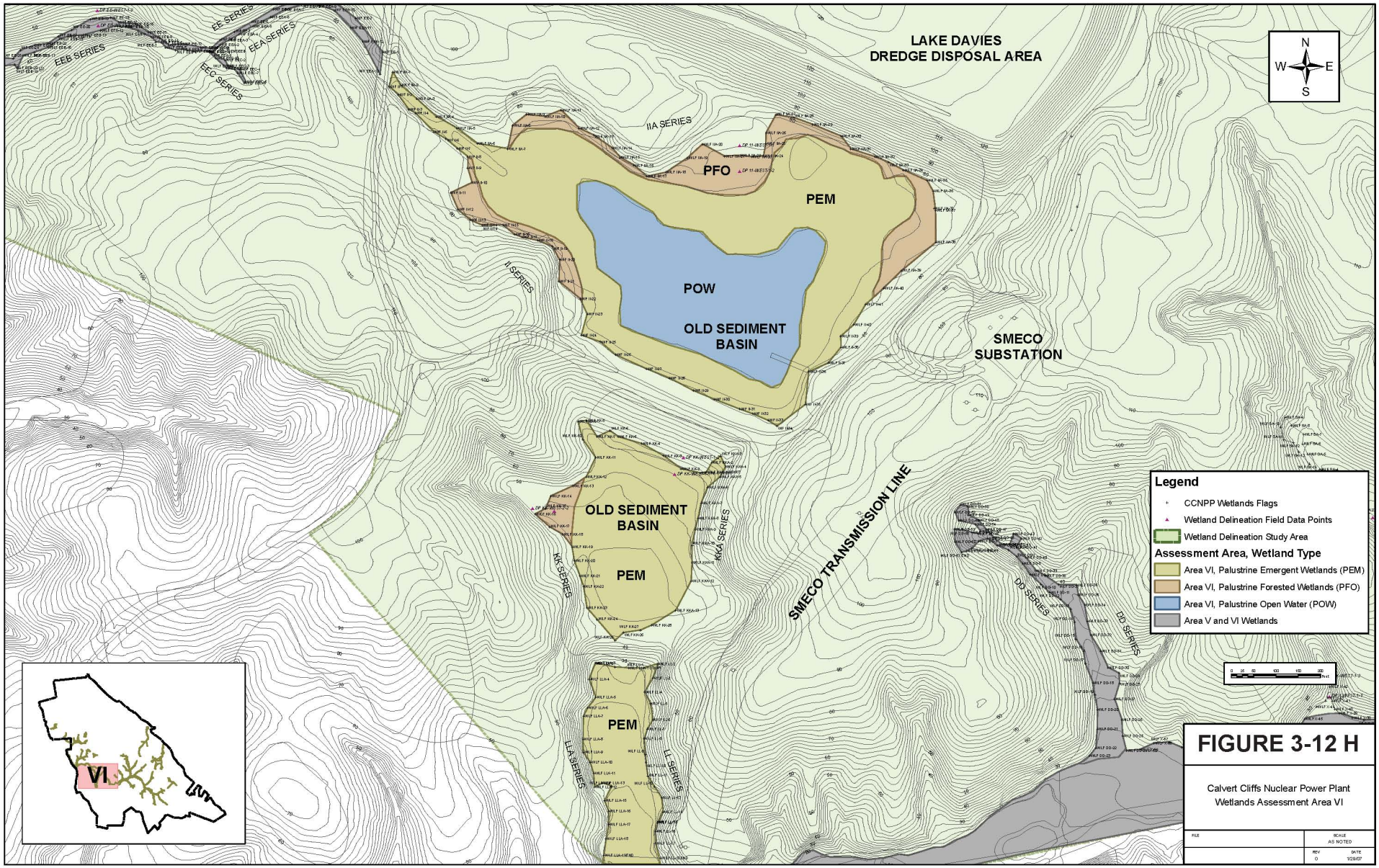

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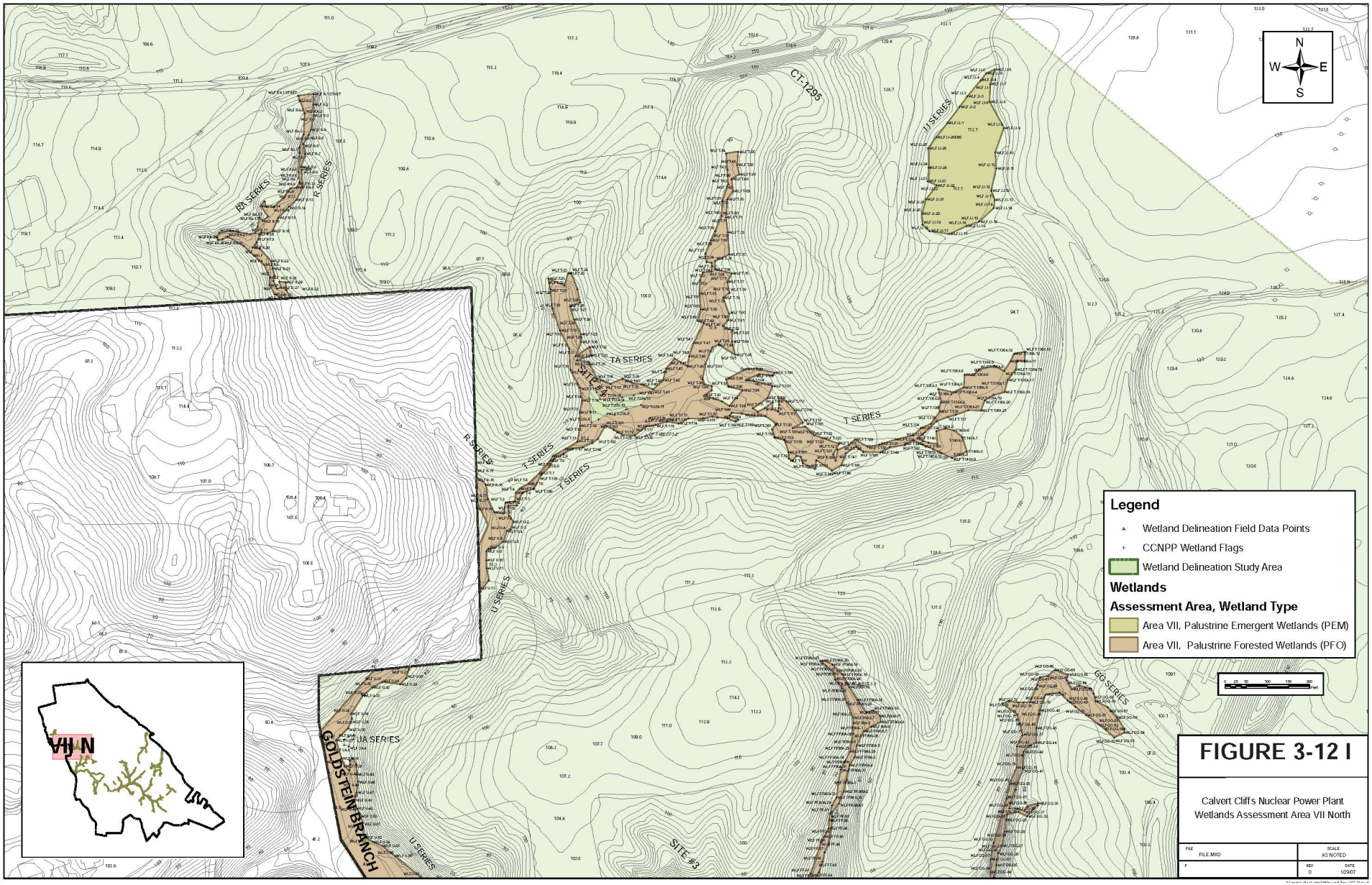

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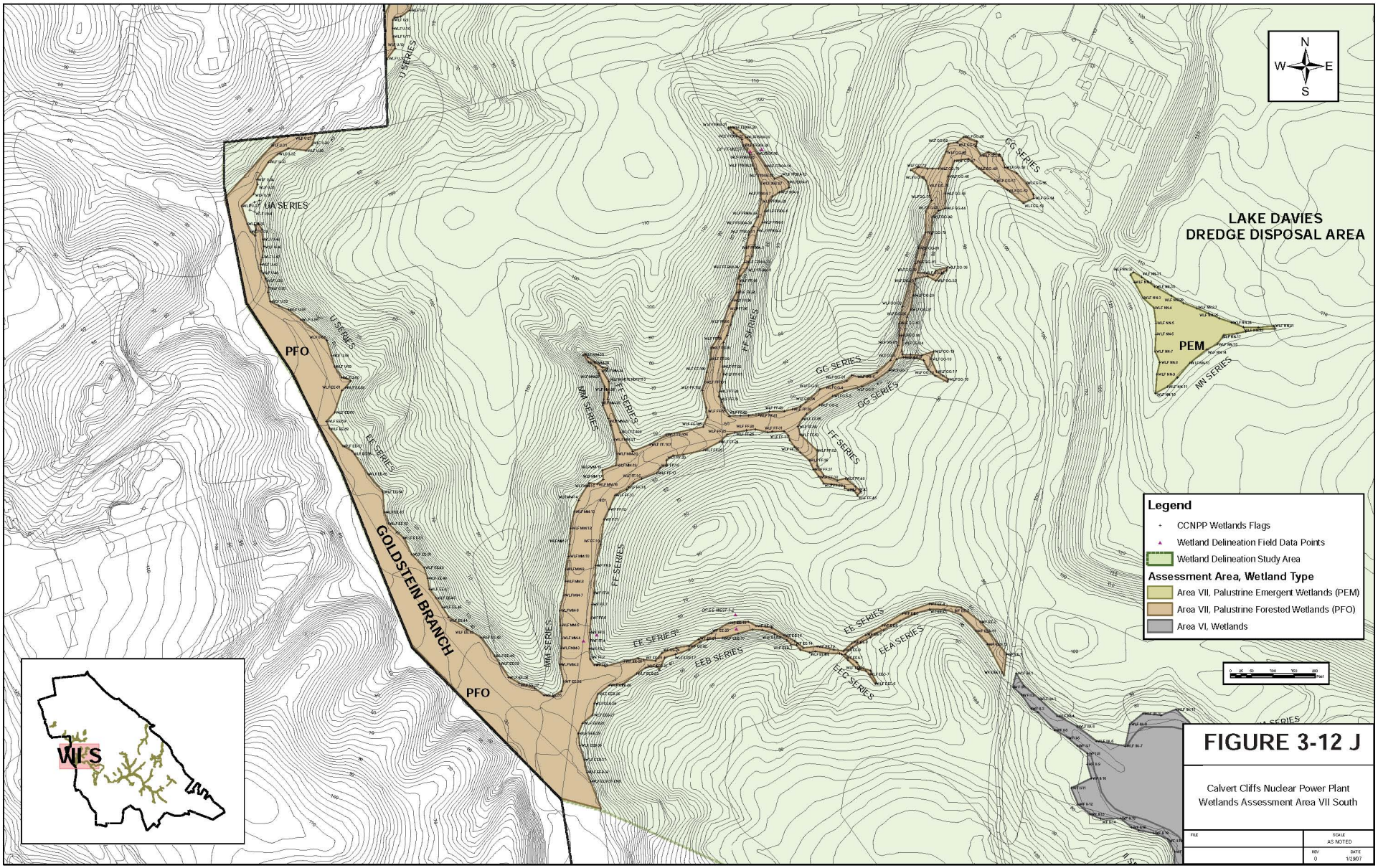

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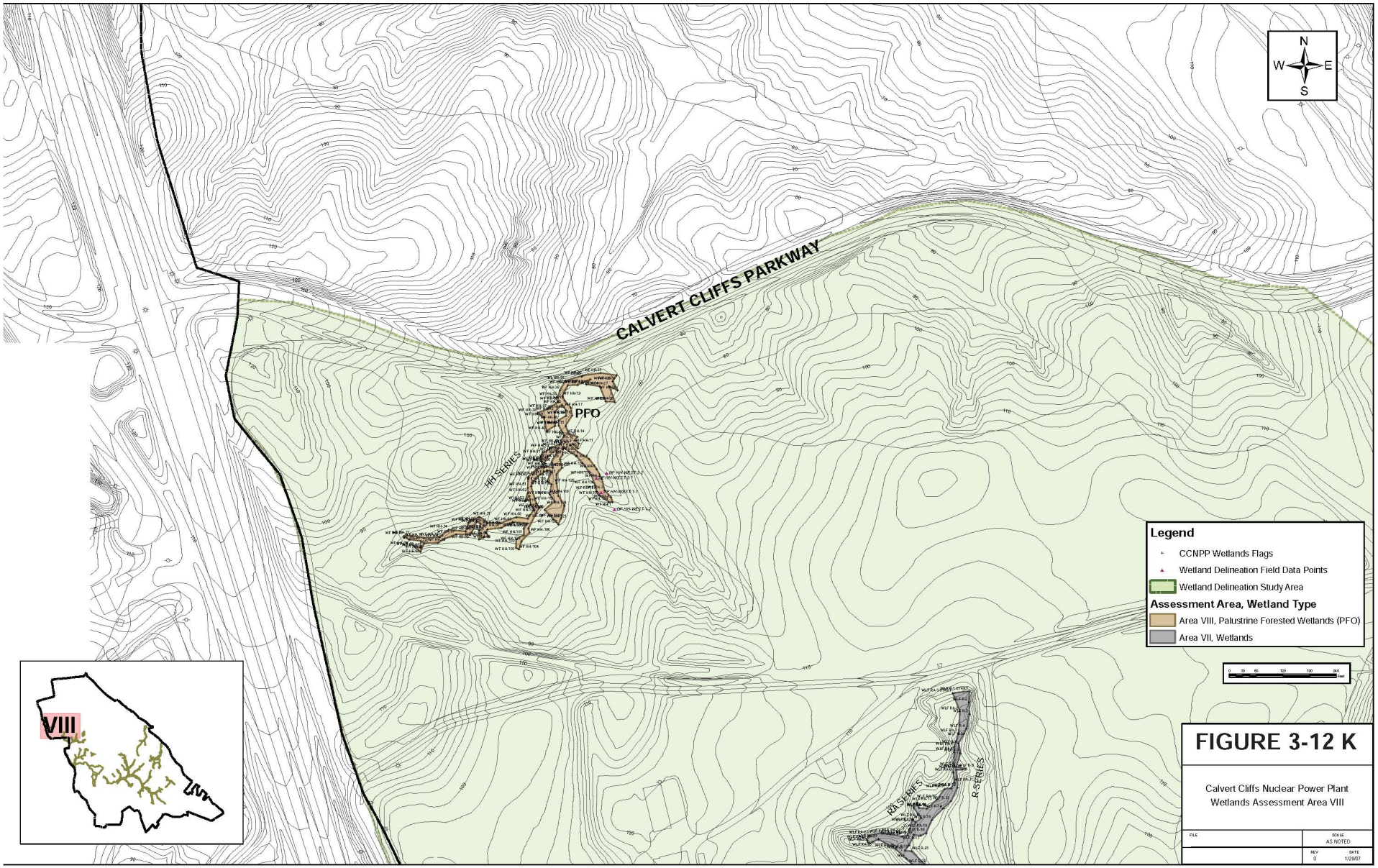

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existing developed portion of the Calvert Cliffs site. It should be noted that dividing wetlands for purposes of characterization and impact assessment can be arbitrary especially when wetlands are connected and one flows into the other.

Assessment Area I (2.2 acres of wetlands, including stream channels)

Assessment Area I consists of a system of streams and narrow strips of adjoining wetlands draining lands north of Camp Conoy and south of the existing reactors. One stream originates in a swale close to the northwest corner of Camp Conoy and flows to the north and east. A second stream originates as the outflow from an existing stormwater basin south of the existing reactors. The two streams join in a forested valley north of Camp Conoy and flow east into the Chesapeake Bay just south of the existing Calvert Cliffs barge dock.

The streams appear to carry perennial flow. A third stream originates at a small seepage north of the central part of Camp Conoy and flows north to the main stream. It appears to be an intermittent stream. Most jurisdictional wetlands in Assessment Area I are limited to the stream channels, which are defined by steep embankments. The stream channels are deeply incised and lack adjacent vegetated wetlands at most points. Where they occur, strips of adjoining emergent vegetation are generally under 2 or 3 feet wide.

Assessment Area I also includes another man-made stormwater basin close to the Calvert Cliffs barge dock. Unlike the dry basin southwest of Calvert Cliffs Units 1 and 2, the basin near the barge dock appears to consist of permanent open water surrounded by a narrow fringe of emergent wetland vegetation. No other wetlands are present in the vicinity of the barge dock. The Chesapeake Bay shoreline consists of riprap in this area.

Most of the delineated wetland boundaries in Assessment Area I correspond to the ordinary high water elevation of perennial and intermittent streams. The boundary of the forested wetlands at the head of the intermittent stream correspond to a transition from forest vegetation dominated by sweet gum with a groundcover of sedges, rushes, and deertongue grass (poorly drained bottomland deciduous forest) to vegetation dominated by tulip poplar with a dense understory of pawpaw and only sparse groundcover (mixed deciduous forest).

***Assessment Area II** (6.2 acres of wetlands, including stream channels and Camp Conoy fishing pond)*

Assessment Area II consists of the Camp Conoy Fishing Pond, constructed by excavation and stream channel impoundment, and associated wetlands and stream channels. It includes 1) three stream channels, seepages, and bordering wetlands that originate up-gradient (west and southwest) of the pond; 2) three small, isolated wetlands on forested slopes up-gradient (west and southwest) of the pond; 3) the pond basin and wetland fringe; and 4) the outlet stream channel (with two small impoundments termed Pond 1 and Pond 2 in an aquatic field study completed for the Calvert Cliffs site in 2006), and bordering wetlands that carry the outflow from the pond northeast to the Chesapeake Bay.

The stream channels up-gradient of the Camp Conoy Fishing Pond begin at distinct seepages and become adjoined by narrow strips of forested wetlands as they flow downhill. These strips vary in width from a few feet to more than 100 feet. The two isolated wetlands on the slopes up-gradient of the pond consist of groundwater seepages that percolate back underground. The USACE will not exert jurisdiction over these two seep areas, as the wetlands have been determined to be isolated from waters of the U.S. by the USACE. However, the MDE may exert regulatory jurisdiction over the two seep areas. Most of the pond consists of open water no greater than 3 or 4 feet in depth. The pond is fringed by a zone of emergent wetlands generally between 10 and 30 feet in width.

The stream channel carrying the outflow from the pond is fringed by forested wetlands, except where two small impoundments (Pond 1 and Pond 2) occur. Water depth is shallow (generally less than 2 feet) throughout both impoundments, thus both consist primarily of emergent wetlands rather than open waters. The first (Pond 1) contains approximately 0.75 acre of emergent wetlands. The second (Pond 2), contains approximately 0.25 acre of emergent wetlands. Just down-gradient (northeast) of the eastern of the two impoundments (Pond 2), flow from the stream channel falls over a low cliff onto a narrow sandy beach at the Chesapeake Bay. The cliffs block tidal influence from Assessment Area II.

Most of the delineated wetland boundaries in Assessment Area II correspond to the transition between forest vegetation dominated by sweet gum and red maple (poorly drained bottomland deciduous forest) and forest vegetation dominated by tulip poplar and oaks (mixed deciduous forest). The groundcover consists of dense fern cover, especially New York fern and cinnamon fern, at most locations inside the

delineated wetland boundaries and sparse cover by deciduous tree seedlings outside the delineated wetland boundaries.

Assessment Area III (0.8 acres of wetlands, including stream channels)

Assessment Area III consists of a stream and bordering wetlands near the southeastern corner of the Wetland Delineation Project Area. The stream originates at four separate seepage points that merge and then flow southeast to the Wetland Delineation Project Area southern boundary, and then to the Chesapeake Bay. These channels are generally not sharply defined by distinct banks. An intermittent stream originates near Camp Conoy Road and flows east into the main stream system. This intermittent stream channel, which carries surface runoff from land near Camp Conoy Road, is deeply incised and lacks adjoining wetlands.

The delineated wetland boundaries in Assessment Area III generally correspond to the transition between forest vegetation dominated by sweet gum and red maple (poorly drained bottomland deciduous forest) and forest vegetation dominated by tulip poplar and oaks (mixed deciduous forest). The groundcover consists of dense fern cover, especially New York fern and cinnamon fern, at most locations inside the delineated wetland boundaries and sparse cover by deciduous tree seedlings outside the delineated wetland boundaries. The landward boundary for the intermittent stream corresponds to the ordinary high water elevation on the toe of the steep slopes adjoining the deeply incised channel.

Assessment Area IV (12.8 acres of wetlands, including stream channels)

Assessment Area IV consists of a system of headwater streams and bordering wetlands forming the upper part of Johns Creek. One headwater stream subsystem and associated wetlands originates at a cluster of seepages to the north, near existing Calvert Cliffs facilities. It flows generally to the southwest. The other headwater stream subsystem and associated wetlands originates at seepages south on privately owned forested land south of the Calvert Cliffs site. It flows generally to the northwest. The two stream subsystems merge at a point approximately 1,800 feet west of Camp Conoy. The ridge separating lands that flow west to Assessment Area IV and east to Assessment Areas I, II, and III roughly corresponds to Camp Conoy Road.

Most of the delineated wetland boundaries in Assessment Area IV correspond to the transition between forest vegetation dominated by sweet gum and red maple (poorly drained bottomland deciduous forest) and forest vegetation dominated by tulip poplar and oaks (mixed

deciduous forest). The groundcover consists of dense fern cover, especially New York fern and cinnamon fern, at most locations inside the delineated wetland boundaries and sparse cover by deciduous tree seedlings outside the delineated wetland boundaries.

Assessment Area V (9.1 acres of wetlands, including stream channels)

Assessment Area V consists of the main channel of Johns Creek and bordering wetlands. Johns Creek flows west, exiting the western perimeter of the Wetland Delineation Project Area near the confluence with Goldstein Branch and exiting the Calvert Cliffs site just east of Maryland Route 2-4. The upstream limit of tidal influence on Johns Creek lies substantially west of Maryland Route 2-4, close to St. Leonard Creek. Hence, none of the wetlands in Assessment Area V are under tidal influence.

Assessment Areas IV and V are hydrologically connected, and their division is arbitrary. As a general distinction, Assessment Area IV comprises the headwaters of Johns Creek, while Assessment Area V comprises the main channel. The width of the stream channel and associated floodplain ranges from 100 to more than 200 feet in Assessment Area V, wider than anywhere in Assessment Area IV. A few seepages that form intermittent tributaries on the slope north of the Johns Creek main channel are included in Assessment Area V, even though they are headwaters.

Most of the delineated outer boundaries for wetlands adjoining the main channel of Johns Creek correspond to the toe of the steep slopes to the north and south. The bottomland deciduous forest and herbaceous marsh vegetation in the level floodplain abruptly shifts to mixed deciduous forest vegetation on the sloping uplands. A small amount of well-drained bottomland deciduous forest (nonwetland) is present in the Johns Creek floodplain in the eastern (up-gradient) part of Assessment Area V. Farther west (down-gradient), the wetland vegetation (poorly drained bottomland deciduous forest and common reed-dominated herbaceous marsh vegetation) extends throughout the floodplain.

Assessment Area VI (14.0 acres of wetlands, including stream channels and open water area)

Assessment Area VI consists of the old Lake Davies sediment basins, a series of man-made basins south of the existing Lake Davies dredged spoils disposal area in the central part of the Wetland Delineation Project Area. These sequentially connected basins carry storm water runoff from the dredged materials area to Johns Creek and Goldstein Branch.

Assessment Area VI is hydrologically connected to Johns Creek. Unlike the natural tributaries contributing flow to Johns Creek in Assessment Areas IV and V, however, Assessment Area VI consists of wetlands within man-made basins that are the result of extensive grading and dredged materials placement.

The landward boundary of the common reed-dominated wetlands surrounding the upper basin generally corresponded to the outer extent of saturated surface soils at the time of the wetland delineation field work in this area. For most of the boundary, dense stands of common reed were prevalent in both wetlands and uplands. Occasional wetland plants such as sedges and rushes occur amid the common reed on the wetland side, while occasional upland plants such as tall fescue, eastern red cedar (*Juniperus virginiana*), black locust (*Robinia pseudoacacia*), and Allegheny blackberry (*Rubus allegheniensis*) occur amid the common reed on the upland side.

Assessment Area VII (11.6 acres of wetlands, including stream channels)

Assessment Area VII consists of Goldstein Branch, its headwaters, associated headwater stream channels and seepages, and narrow strips of adjacent wetlands. Several seepage areas and associated headwaters contribute flow to Goldstein Branch. The northernmost reach of a headwater to Goldstein Branch is located in a forested swale near the northwestern corner of the Wetland Delineation Project Area. Another headwater originates from multiple seepages in sloping forest land south of an open field and wooden barn in the northwestern quadrant of the Wetland Delineation Project Area. The landward edge of wetlands west of this reach of Goldstein Branch are located off of the Calvert Cliffs site.

Several other unnamed headwaters to Goldstein Branch and narrow strips of adjoining wetlands are included in Assessment Area VII. Goldstein Branch is a tributary to Johns Creek. Assessment Area VII is therefore hydrologically connected to other Assessment Areas associated with Johns Creek (Assessment Areas IV, V and V). Most surface runoff entering Johns Creek up-gradient (east) of Goldstein Branch originates in a predominantly forested landscape, and most surface runoff entering Assessment Area VI originates on dredged materials. In contrast, most surface runoff entering Goldstein Branch originates in a mixed landscape of forest, crop, and offsite rural residential land uses. Goldstein Branch can therefore be characterized as a distinct stream system from the upper reaches of Johns Creek.

Close to the seepages, the stream channels forming Assessment Area VII are shaded by deciduous trees, primarily tulip poplar and upland oaks,

growing on the tops of the banks and in adjoining uplands. A level floodplain area adjoining the channel becomes progressively wider, reaching a width of approximately 150-ft at some points. Most lands in the floodplain support poorly drained bottomland deciduous forest dominated by red maple, black gum, and sweet gum. Dense patches of New York fern occur in both the well-drained and poorly drained forests. Patches of other ferns such as sensitive fern, cinnamon fern, and royal fern occur only in the poorly drained forest.

Assessment Area VIII (0.4 acres of wetlands, including stream channels)

Assessment Area VIII consists of headwaters and adjoining wetlands that originate at seepages on a forested slope immediately south of Calvert Cliffs Parkway in the northern part of the Wetland Delineation Project Area. Separate seepages form narrow headwaters. The headwaters merge to form a single main stream channel, adjoined by forested wetlands, at a point approximately 150 feet south of Calvert Cliffs Parkway. Another broad seepage area contributes flow from the east. The stream flows north under Calvert Cliffs Parkway and ultimately to Woodland Branch, which flows north and west into St. Leonard Creek.

Up-gradient stream channel reaches immediately downstream from the seepages are bounded directly by uplands, and the delineated wetland boundary corresponds to the ordinary high water mark. Closer to Calvert Cliffs Parkway, the delineated wetland boundary generally corresponds to an abrupt transition from forest vegetation dominated by sweet gum and red maple (poorly drained bottomland deciduous forest) to forest vegetation dominated by tulip poplar and oaks (mixed deciduous forest).

Assessment Area IX (1.1 acres of wetlands, including stream channels)

Assessment Area IX consists of seepages, headwaters, and adjoining wetlands within a patch of undeveloped forest land directly west of an existing Calvert Cliffs parking lot. The forest land slopes generally east. The headwaters originate at seepages low on the slope and flow generally eastward. Separate headwaters originate at seepages. Storm drains collecting runoff from around the existing transmission switchyard feed a ditch that contributes additional flow to the wetlands.

Assessment Area IX is the only remnant of a stream system that formerly flowed east to the Chesapeake Bay. Most of that stream system was filled to construct the existing power generation units and associated developed areas. Flow from Assessment Area IX enters a storm drain and is piped under the developed area to the east. Flow from the storm drain system is

ultimately discharged at a stormwater basin feeding into Assessment Area I.

Wetland Functional Assessment

Functional assessments of wetlands were conducted by UniStar using two methodologies. The USACE New England Highway Method (USACE Method) characterizes wetlands by determining whether wetland functions consisting of physical, chemical, and biological processes and wetland values consisting of attributes perceived to be important to society are present; this method was applied to all wetlands on the Calvert Cliffs site. The Ohio Rapid Assessment Method (ORAM) quantifies the functions and quality of wetland communities in order to determine the appropriate level of mitigation that should be required to permit the destruction, alteration, or degradation of a wetland community; this method was applied only to wetlands in Assessment Areas subject to impacts from the proposed project. It should be noted that neither functional assessment method is required by MDE or USACE when applying for a Section 404 wetlands permit.

- *USACE Method.* Functions and values present in each of the nine Assessment Areas delineated on the Wetland Delineation Project Area are summarized in Table 3-15 and discussed below. Functions and values that are "Principal" are those considered an important physical component of an ecosystem or of special value to society from a local, regional, or national perspective. In general, Assessment Areas IV and V display the most principal wetland functions and values (DeSanto and Flieger, 1995).
- The functions and values present in each of the nine Assessment Areas delineated on the Wetland Delineation Project Area are summarized in Table 3-15. Considered holistically, the greatest overall functions and values are provided by Assessment Area V, which consists of the main channel of Johns Creek and its adjoining wetlands. Within the Calvert Cliffs site, Johns Creek remains largely free of human disturbance. It flows through a stream valley bounded throughout on both sides by mature deciduous forest cover free of agricultural or urban development. The channel is generally diffuse and poorly defined, spreading its flow through dense wetland vegetation that is more than 100 ft in width at many locations. The vegetation is capable of attenuating flow velocity, filtering out dissolved nutrients or contaminants in the water, and causing suspended sediment to settle out before flowing downstream to the tidal waters of St. Leonard Creek. Many of the same functions and values are provided by Assessment Area IV which consists of the seepages, springs, and headwaters that flow into the upper end of Johns Creek. The reach of

Table 3-15 Summary of Functions and Values for UniStar Calvert Cliffs Unit 3 Assessment Areas

Function or Value	Wetland Assessment Area								
	I	II	III	IV	V	VI	VII	VIII	IX
Functions									
Groundwater Recharge/ Discharge	X	X	X	X	X		X	X	
Floodflow Alteration									
Fish and Shellfish Habitat		X			X		X		
Sediment/ Toxicant Retention		X	X	X	X	X	X	X	
Nutrient Removal		X	X	X	X	X	X	X	
Production Export		X	X	X	X	X	X	X	
Sediment/ Shoreline Stabilization		X			X	X			
Wildlife Habitat	X	X	X	X	X	X	X	X	X
Values									
Recreation		X	X	X	X		X	X	
Educational/ Scientific Value			X	X	X			X	
Uniqueness/ Heritage		X	X	X	X		X	X	
Visual Quality/ Aesthetics		X						X	X

Legend:
X: Function or Value Present
X: Function or Value Principal

Johns Creek east of MD 2/4 constitutes one of the largest remaining systems of headwaters and stream whose watershed is still largely forested. The Assessment Areas with the least overall apparent function and value are Assessment Areas I, VI, and IX. Assessment Area I consists mostly of deeply incised stream channels that have been scoured by runoff from areas of existing development. There is very little vegetated wetland adjoining the channels. The channel is therefore not capable of substantially attenuating flow and thereby

Source: UniStar Joint Application, CPCN Application Supplement filed 20 May 2008, Figure 5.5-1. Used by permission.

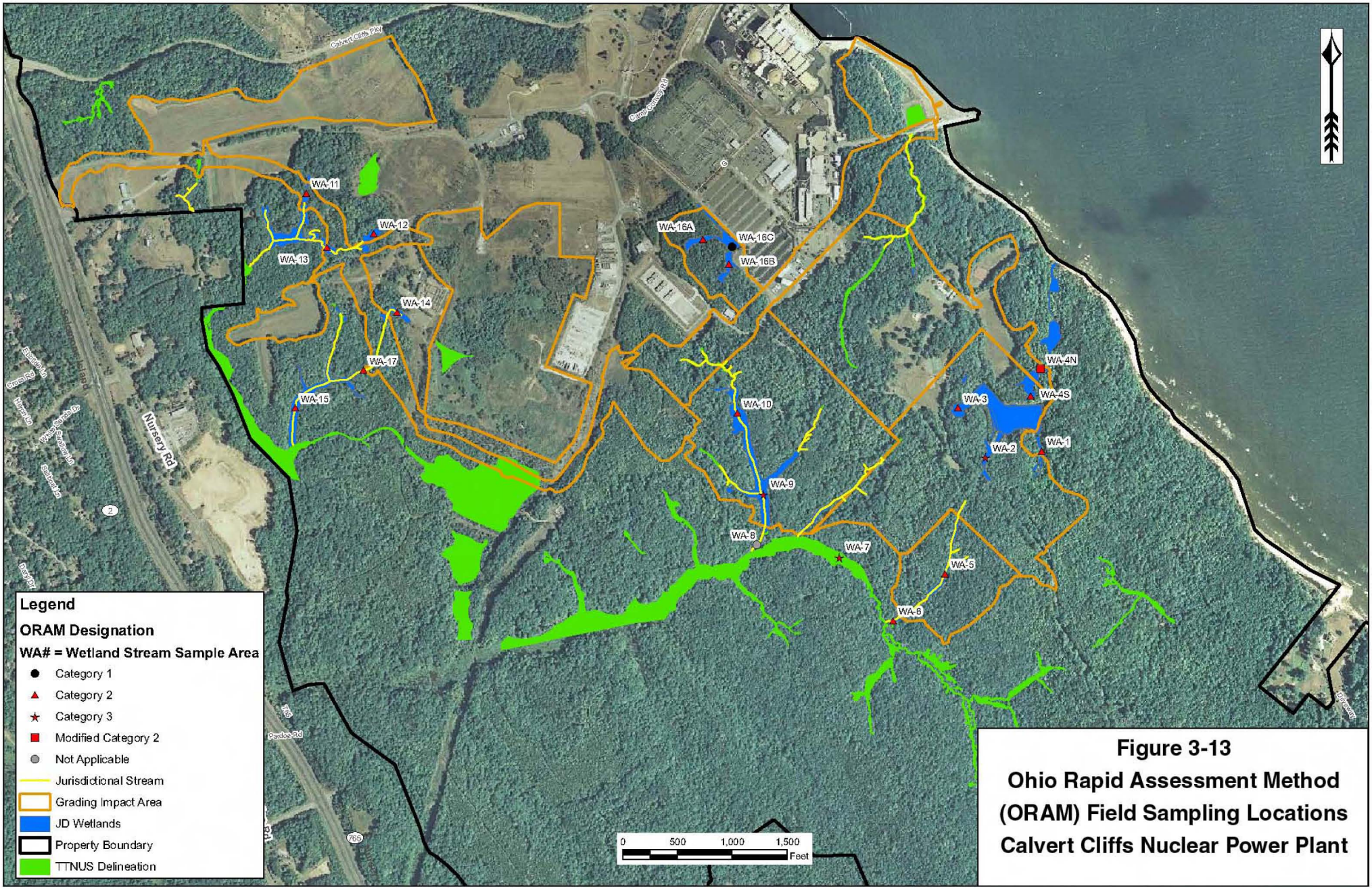


Figure 3-13
Ohio Rapid Assessment Method (ORAM) Field Sampling Locations
Calvert Cliffs Nuclear Power Plant

helping to reduce downstream movement of sediment, nutrients, and toxicants. Assessment Area VI consists of man-made basins overrun by phragmites, an invasive grass that is of poor or minimal value as food or cover for wildlife. Assessment Area IX consists of wetlands in a small fragment of forest surrounded by existing development. The wetlands flow into a storm drain system under the existing Calvert Cliffs facilities.

- *ORAM.* As part of its application for a wetlands permit, UniStar applied the Ohio Rapid Assessment Method (ORAM) to wetland areas that would be affected by project construction. ORAM is a methodology used to quantify the functions and quality of on-site wetland communities in order to determine the appropriate level of mitigation that should be required to permit the destruction, alteration, or degradation of a particular wetland community. ORAM scores wetland areas based on six major variables: wetland size, upland buffers/surrounding land use, hydrology, habitat alteration and development, special wetland communities, and plant communities/interspersion/microtopography. A final quantitative score ranging from 0 to 100 is used to categorize wetland quality as 1-low, 2-medium, or 3-high. Category 1 wetlands are defined as "limited quality waters" and therefore should be given the least consideration for protection; Category 2 wetlands "support moderate wildlife habitat, or hydrological or recreational functions," while those with relatively higher scores can be regarded as Modified 2 and "have reasonable potential for restoration." Category 3 wetlands have "superior habitat, or superior hydrological or recreational functions," and can support the presence of listed species; impacts to Category 3 wetlands should be minimized to the greatest extent practicable.
- The results of the ORAM analysis based on 20 sampling locations indicate that most of the streams on the project site are Category 2 indicating moderate quality. Two wetlands (WA-2 and WA-9) scoring in Category 3 would be affected by project construction, as would the only wetland scoring as Modified 2 (WA-4N) (Figure 3-13). However, the largest wetland area (WA-7) scoring as Category 3 would not be affected by the project. Only one wetland area (WA-16C) was determined to be Category 1 and would be affected by project construction.

3.4.1.3 *Chesapeake Bay Critical Area*

The Critical Area Act was enacted to minimize adverse impacts to water quality from runoff; conserve fish, wildlife, and plant habitat; and accommodate growth but address the fact that activities of people can have adverse environmental impacts. On land, the Chesapeake Bay

Critical Area (CBCA) consists of all land within 1,000 feet of the landward edge of tidal waters and tidal wetlands as mapped on the 1972 State Wetlands Maps. Within the CBCA, development is restricted based on area designations, proportionally: Resource Conservation Area (RCA) is approximately 80 percent of the CBCA; Limited Development Area is approximately 15 percent of the CBCA; and Intensely Developed Area is approximately 5 percent of the CBCA. Within each CBCA designation specific requirements regulate development for a number of factors such as zoning use, amount forest coverage, construction on slopes, and the amount of impervious surfaces allowed. Forest protection is of primary importance in the CBCA and the level of impact typically dictates how much forest will need to be replaced.

The 2,070 acre Calvert Cliffs property lies adjacent to the Chesapeake Bay's western shore, where the area along its approximately 10,000 feet shoreline is included in the CBCA. Calvert Cliffs Units 1 and 2 are located within the CBCA along with many supporting facilities including a barge slip and a haul road for access. Much of the remaining area that comprises the CBCA on the property is densely forested both to the north and south of the existing units. Several elements of Camp Conoy to the south of the existing units are within the CBCA including tennis courts and a swimming pool. Several wetlands areas exist within the CBCA including those associated with streams that drain to the Chesapeake Bay (see description of Wetland Assessment Area I in *Section 3.4.1.2*).

3.4.1.4 *Wildlife*

UniStar and its consultants made late spring, summer, and fall observations of fauna at the site between May and October 2006. Observations were made concurrently with other natural resource investigations, including vegetation community mapping and characterization efforts, wetland delineation, and rare plant surveys. UniStar returned in January 2007 to make winter season observations, and in April 2007 to make early spring observations. Faunal observations included direct sightings of fauna and noting of sign indicative of fauna such as sounds, tracks, burrows, chewed vegetation, and scat. The dense distribution of wetlands that were delineated and the need to traverse a diversity of vegetated areas to characterize vegetation ensured that each major habitat was visited multiple times over the course of the investigation.

Mammals

White-tailed deer (*Odocoileus virginianus*) and their sign were observed throughout the Calvert Cliffs area. The mixture of forest, oldfield,

wetland, and open water vegetation at Calvert Cliffs provides ideal deer habitat. White-tailed deer have become a pest species over most rural and suburban areas of Maryland, including Calvert County, and over-browsing has substantially damaged forest understory and suburban landscape vegetation in many parts of the state (Fergus, 2003). Although large groups of deer were observed throughout Calvert Cliffs, there was little visible over-browsing of forest understory vegetation. The Calvert Cliffs environmental staff, however, has observed heavy browse damage on vegetation on forest edges around the existing developed areas of the site. No hunting of deer or other game is currently permitted on the Calvert Cliffs site.

Beavers (*Castor canadensis*) have reportedly been observed often by Calvert Cliffs environmental staff, and were directly observed by UniStar at dusk on April 18, 2007 in the Camp Conoy Fishing Pond. The large number of freshly gnawed trees in the wetlands adjoining Johns Creek and Goldstein Branch and numerous beaver dams indicate the presence of a beaver population. Many of the gnawed trees are dead or declining, and water backed up behind beaver dams has caused additional trees in those wetlands to decline or die. Open areas within the dead and declining trees have become dominated by sedges, rushes, bulrushes, and other herbaceous vegetation typical of freshwater marshes. Beaver activity in the last several years has apparently converted sizeable areas of forested wetland vegetation along Johns Creek and Goldstein Branch to freshwater marsh vegetation. Increased levels of flooding of riparian lands in recent years caused by increased beaver activity has lead to trapping programs by wildlife agencies in Maryland and Virginia (Fergus 2003).

Other mammals observed by UniStar during the faunal surveys include gray squirrel (*Scuirus carolinensis*), eastern cottontail rabbit (*Sylvilagus floridanus*), eastern chipmunk (*Tamias striatus*), raccoon (*Procyon lotor*), and coyote (*Canis latrans*). The squirrels and rabbits are regionally common and were observed by UniStar on multiple occasions in the Camp Conoy Area, and both likely occur frequently throughout the Calvert Cliffs site. Raccoons are also locally common but were observed only by tracks in 2006; a specimen was sighted in April 2007 along Camp Conoy Road. The coyote was observed on a dirt road that circles the Camp Conoy Fishing Pond. The Calvert Cliffs environmental staff report that the species has been recently sighted in other locations of Calvert County. Drillers performing geotechnical investigations reported seeing a fox den, most likely a gray fox (*Urocyon cinereoargenteus*), and east of the pond. Additionally, what appeared to be a bobcat (*Lynx rufus*) was briefly observed by UniStar in a forested area north of Camp Conoy. This sighting was uncertain, but is consistent with anecdotal observations made by Calvert Cliffs personnel. Bobcats are reclusive and favor large

areas of forest vegetation without human disturbance (Fergus 2003). The environmental review conducted by DNR in 2006 at the Calvert Cliffs site did not identify the potential for presence of any endangered, threatened, or other special status mammal species (DNR 2006).

Birds

A total of 49 bird species were documented by UniStar's faunal survey conducted at the Calvert Cliffs Unit 3 site. Most bird species were characteristic of forests, wetlands, and inland aquatic habitats; a few species were noted that are more commonly associated with the Chesapeake Bay, e.g., bald eagle and osprey. Table 3-16 provides a list of bird species that are likely to breed on the Calvert Cliffs Unit 3 site based on a local breeding bird survey (Island Creek) in Calvert County. As indicated in Table 3-16, most bird species observed during the faunal survey appear on the list, as well as a number of Forest Interior Dwelling species (FIDS). Along with FIDS, the only other bird species identified by the DNR in their 2006 environmental review of the site was the bald eagle, which was identified on the site at several nesting locations.

The bald eagle is listed both federally and in Maryland as Threatened. Bald eagles were the only listed bird species recorded from the UniStar surveys. By the end of 2006, three bald eagle nests were known to exist on the Calvert Cliffs site. All were outside of the proposed Calvert Cliffs Unit 3 area. In April 2007, a new active bald eagle nest was observed in a Virginia pine tree close to Camp Conoy Road, near the southwestern corner of a baseball field. Adult bald eagles were observed circling the nest, suggesting that it was active and contained eggs or recently hatched chicks. This nest appeared inactive during another visit to the site with PPRP in March 2008. One of the other previously recognized nests, in the northern part of the Calvert Cliffs site, was also reported by Calvert Cliffs environmental staff to be inactive in April 2007. Bald eagles prefer to nest in tall trees within sight of lakes, rivers, and other open waters (Fergus 2003). Following this, the optimal bald eagle nesting habitat on the Calvert Cliffs site is apparently the forested areas at the top of the cliffs overlooking the Chesapeake Bay. Two of the known nesting locations are in such areas, to the north and south of the proposed Calvert Cliffs Unit 3 area. The Camp Conoy nest is more than 1,500 feet inland from the Chesapeake Bay but is within sight of the Camp Conoy fishing pond. The western nest is situated even farther inland but directly adjoins a large marshy area with pools of open water formed by beaver dams on Johns Creek. The mixture of forest cover and open water present throughout the Calvert Cliffs site and surrounding region therefore appears to provide suitable bald eagle nesting habitat.

Nine FIDS were observed by UniStar in the large tracts of forest in the eastern and southern parts of the proposed Calvert Cliffs Unit 3 area. These included red-shouldered hawk, hairy woodpecker and pileated woodpecker, as well as neotropical migrant species, scarlet tanager, red-eyed vireo, wood thrush, worm-eating warbler, hooded warbler, prothonotary warbler. FIDS are an assemblage of bird species that require (or strongly prefer) large unbroken tracts of forest cover to forage and breed. It is known that FIDS are detrimentally affected by competition with more aggressive bird species in open and forest edge settings (Askins, 2000; Ehrlich *et al.*, 1988). Further, many FIDS nesting near forest edges in the eastern United States have been observed to contain eggs of the brown cowbird (*Molothrus ater*), a prolific bird that lays its eggs in the nests of other species (nest parasite). Parents of parasitized nests expend resources to nurture the cowbird eggs and nestlings instead of their own. As noted, many FIDS are neotropical migrants that spend the spring and summer breeding season in North America and winter in the tropics of Central and South America. Many FIDS have experienced substantial population declines over the past 30-40 years that are thought to be attributable both to increased fragmentation of forest due to urban sprawl in North America and the clearing of forest for timber and agriculture in the tropics (Askins 2000; Ehrlich *et al.* 1988). The State of Maryland has designated FIDS protection as a key goal in the management of lands around the Chesapeake Bay (Jones et al. 2000). The best FIDS habitat on the Calvert Cliffs site occurs mostly in the southern, southwestern, and northern parts of the site where adjoining forested habitats form a large contiguous forest.

Several other birds of prey were observed by UniStar in and near the proposed Calvert Cliffs Unit 3 area. Red-shouldered hawks (*Buteo lineatus*) were observed either directly or by call (sound) in all areas of the proposed Calvert Cliffs Unit 3 area, and a red-tailed hawk (*Buteo jamaicensis*) was also heard calling while flying near the dredged materials area. A great horned owl (*Bubo virginianus*) was heard calling in the upland forest cover along Johns Creek and in the upland forest just south of the Camp Conoy Fishing Pond. Turkey vultures (*Cathartes aura*) were observed flying high over the dredged materials area. Turkey vultures are carrion feeders that typically fly high over the landscape and do not land until a carcass is discovered. A black vulture (*Coragyps atratus*), also a carrion feeder, was observed on the side of Camp Conoy Road south of the Calvert Cliffs site, about one mile south of the gate to Camp Conoy.

Canada geese (*Branta canadensis*) were observed by UniStar on the Camp Conoy Fishing Pond. It is not known whether the observed geese were part of a migratory or resident population. Canada geese do not appear to have reached pest status anywhere at the Calvert Cliffs site, including the

Camp Conoy Fishing Pond. Great blue herons (*Ardea herodias*) were observed on and close to the Camp Conoy Fishing Pond by UniStar on several occasions.

Other passerine species observed by UniStar in and around the Calvert Cliffs site include American robin (*Turdus migratorius*), northern cardinal (*Cardinalis cardinalis*), northern mockingbird (*Mimus polyglottos*), gray catbird (*Dumetella carolinensis*), blue jay (*Cyanocitta cristata*), and American goldfinch (*Carduelis tristis*). Unlike FID birds, these species are habitat generalists that can be found in most rural and suburban landscapes in eastern North America.

Table 3-16 Breeding Bird Survey Near Calvert Cliffs – Recorded Species

Common Name	Scientific Name
Double-crested cormorant	*Phalacrocorax auritus*
Great blue heron	***Ardea herodias***
Green heron	*Butorides virescens*
Black vulture	***Coragyps atratus***
Turkey vulture	***Cathartes aura***
Canada goose	***Branta canadensis***
Mallard	*Anas platyrhynchos*
Osprey	***Pandion haliaetus***
Cooper's hawk	*Accipiter cooperii*
Red-shouldered hawk*	***Buteo lineatus***
Broad-winged hawk*	*Buteo platypterus*
Red-tailed hawk	***Buteo jamaicensis***
Ring-necked pheasant	*Phasianus colchicus*
Wild turkey	*Meleagris gallopavo*
Northern bobwhite	*Colinus virginianus*
Killdeer	***Charadrius vociferus***
Laughing gull	*Larus atricilla*
Rock dove	*Columba livia*
Mourning dove	***Zenaida macroura***
Yellow-billed cuckoo	***Coccyzus americanus***
Great horned owl	***Bubo virginianus***
Chimney swift	*Chaetura pelagica*

Common Name	Scientific Name
Ruby-throated hummingbird	***Archilochus colubris***
Red-bellied woodpecker	***Melanerpes carolinus***
Downy woodpecker	***Picoides pubescens***
Hairy woodpecker*	***Picoides villosus***
Northern flicker	*Colaptes auratus*
Pileated woodpecker*	***Dryocopus pileatus***
Eastern wood-Pewee	***Contopus virens***
Acadian flycatcher*	*Empidonax virescens*
Eastern phoebe	*Sayornis phoebe*
Great crested flycatcher	*Myiarchus crinitus*
Eastern kingbird	*Tyrannus tyrannus*
White-eyed vireo	*Vireo griseus*
Yellow-throated vireo*	*Vireo flavifrons*
Red-eyed vireo*	***Vireo olivaceus***
Blue jay	***Cyanocitta cristata***
American crow	***Corvus brachyrhynchos***
Fish crow	***Corvus ossifragus***
Purple martin	*Progne subis*
N. Rough-winged swallow	*Stelgidopteryx*
Barn swallow	*Hirundo rustica*
Carolina chickadee	***Poecile carolinensis***
Tufted titmouse	***Baeolophus bicolor***
White-breasted nuthatch	***Sitta carolinensis***
Carolina wren	***Thryothorus ludovicianus***
House wren	*Troglodytes aedon*
Blue-gray gnatcatcher	*Polioptila caerulea*
Eastern bluebird	***Sialia sialis***
Wood thrush*	***Hylocichla mustelina***
American robin	***Turdus migratorius***
Gray catbird	***Dumetella carolinensis***
Northern mockingbird	***Mimus polyglottos***
Brown thrasher	*Toxostoma rufum*
European starling	*Sturnus vulgaris*
Cedar waxwing	*Bombycilla cedrorum*

Common Name	Scientific Name
Northern parula*	*Parula americana*
Yellow warbler	***Dendroica petechia***
Yellow-throated warbler	*Dendroica dominica*
Pine warbler	*Dendroica pinus*
Prairie warbler	*Dendroica discolor*
Black-and-white warbler*	*Mniotilta varia*
American redstart*	*Setophaga ruticilla*
Prothonotary warbler*	***Protonotaria citrea***
Worm-eating warbler*	***Helmitheros vermivorus***
Ovenbird*	*Seiurus aurocapillus*
Louisiana waterthrush*	*Seiurus motacilla*
Kentucky warbler*	*Oporornis formosus*
Common yellowthroat	*Geothlypis trichas*
Hooded warbler*	***Wilsonia citrina***
Yellow-breasted chat	*Icteria virens*
Summer tanager	*Piranga rubra*
Scarlet tanager*	***Piranga olivacea***
Eastern towhee	***Pipilo erythrophthalmus***
Chipping sparrow	***Spizella passerina***
Field sparrow	*Spizella pusilla*
Grasshopper sparrow	*Ammodramus savannarum*
Song sparrow	***Melospiza melodia***
Northern cardinal	***Cardinalis cardinalis***
Blue grosbeak	*Guiraca caerulea*
Indigo bunting	*Passerina cyanea*
Red-winged blackbird	***Agelaius phoeniceus***
Eastern meadowlark	*Sturnella magna*
Common grackle	***Quiscalus quiscula***
Brown-headed cowbird	*Molothrus ater*
Orchard oriole	*Icterus spurius*
House finch	*Carpodacus mexicanus*
American goldfinch	***Carduelis tristis***
House sparrow	*Passer domesticus*

* Indicates species listed as Forest Interior Dwelling species (FIDS) that potentially breed in the Critical Area.

Bold indicates species identified during faunal site surveys. Six additional species were identified by the faunal survey of which only the bald eagle is a breeding bird at the site.

Reptiles

Several snakes and turtles were observed by UniStar at various locations at the Calvert Cliffs site. An eastern diamondback terrapin (*Malaclemys terrapin*) was observed in an upper reach of the channel of Johns Creek, in the south-central part of the Project Area. Once common in brackish and fresh water bodies close to the Chesapeake Bay, the eastern diamondback terrapin has suffered population declines caused by hunting and habitat loss (PWRC 2003). Eastern box turtles (*Terrapene carolina carolina*), were noted in several forested areas throughout the Calvert Cliffs site. A copperhead snake (*Agkistrodon contortrix*) was observed on the shore of one of the old Lake Davies sediment basins. Northern black racers (*Coluber constrictor constrictor*) were observed in upland forest locations along Johns Creek and Goldstein Branch, and a northern water snake (*Nerodia sipedon*) was observed in a headwater channel to Johns Creek. A dead eastern worm snake (*Carphophis amoenus*) was apparently observed at the Calvert Cliffs site by Calvert Cliffs environmental staff in 2006.

Amphibians

The abundant wetlands situated throughout the Calvert Cliffs site provide substantial habitat for amphibians. Large numbers of spring peepers (*Pseudacris crucifer*) were heard by UniStar around the Camp Conoy Fishing Pond and Johns Creek headwaters in April 2007. Large numbers of northern cricket frogs (*Acris crepitans*) were heard in the forested wetlands along streams in the Johns Creek, Camp Conoy, and Goldstein Branch Areas throughout the summer. Calling from southeastern chorus frogs (*Pseudacris feriarum*) and green frogs (*Rana clamitans*) were heard around Lake Conoy and Johns Creek during May and June. These frogs also likely occur in wetlands around Goldstein Branch and its headwaters and old Lake Davies sediment basins, which were not visited until later in the summer and fall when frog calling is infrequent.

Invertebrates

The northeastern beach tiger beetle (*Cicindela dorsalis*) and Puritan tiger beetle (*Cicindela puritana*) are the only invertebrate species noted in the wildlife surveys, and are discussed in the threatened and endangered species section that follows.

3.4.2 *Freshwater Aquatic Ecology*

Freshwater aquatic surveys were conducted by UniStar during fall 2006 and spring 2007, in the streams and ponds at Calvert Cliffs. Fish and benthic macroinvertebrate fauna were sampled at two locations on Johns Creek and one location on Goldstein Branch. Lake Davies and Camp Conoy Fishing Pond were sampled at three locations each and the two unnamed ponds north of the Camp Conoy Fishing Pond were each sampled at one location.

The fall survey resulted in the collection of 532 fish distributed among 15 species within nine families (Table 3-17). The three stream sites produced 174 individuals among 10 species and the eight pond sites produced 358 individuals among 6 species and 1 hybrid sunfish. Eastern mosquitofish (*Gambusia affinis*) dominated the ponds with bluegill (*Lepomis macrochirus*) being co-dominant at Lake Conoy. Eastern mosquitofish (*Gambusia affinis*) was the only species collected at Lake Davies. The station on the downstream section of John's Creek had the most diverse and productive fish community which consisted of 105 individuals representing eight species. The sampling location on Goldstein Branch exhibited the second most diverse site in relation to numbers of species consisting of 65 individuals representing seven species. Station LC-02 on Lake Conoy had the second highest number of individuals (84) but only representing two species and dominated by bluegill. Generally, pond locations typically have less species represented than stream locations. The upstream station on John's Creek produced only 4 fish of the same species, eastern mudminnow (*Umbra pygmaea*). The lack of species richness and diversity as well as the limited number of individuals may very well be due to the headwater nature of this stream location, where species numbers are typically limited. Other factors which may contribute to the condition of the fish community at this site are the lack of a defined channel downstream of the site (as described in the reason for not sampling the mid-zone of John's Creek) which can limit fish immigration and emigration from this site and the possible intermittent character of this location, where the stream may be dry or nearly dry at certain times of the year.

Table 3-17 Fish Sampled from Streams and Ponds of Calvert Cliffs Nuclear Power Plant during Fall 2006 and Spring 2007 Surveys

Species	Fall Streams	Fall Ponds	Spring Streams	Spring Ponds
Lampreys				
Least Brook lamprey	1		14	
Freshwater eels				
American eel	24	8	72	33
Suckers				
Creek chubsucker	32		18	
Bullhead catfishes				
Brown bullhead			2	
Carps and Minnows				
Blacknose dace	8		25	
Golden shiner	13		1	
Pikes				
Redfin pickerel	4		2	
Mudminnows				
Eastern mudminnow	13		11	
Livebearers				
Eastern mosquitofish	5	148	1	4
Darters				
Tessellated darter	44		60	
Sunfishes				
White crappie		2		
Black crappie				1
Green sunfish		24		41
Pumpkinseed	30		14	
Bluegill		173		71
Largemouth bass		2		3
Lepomis hybrid		1		
Totals	**174**	**358**	**220**	**153**

The spring survey resulted in the collection of 373 fish also distributed among 15 species within ten families (Table 3-17). The three stream sites produced 220 individuals among 11 species and the eight pond sites produced 153 individuals among 6 species. Pond sites during the spring sampling were dominated by bluegill although this species was only collected at the three stations located in Lake Conoy. Green sunfish (*Lepomis cyanellus*) were co-dominant during the spring survey and were distributed among Ponds #1 and #2 as well as Lake Conoy. Electrofishing efforts at the three locations in Lake Davies resulted in no fish collected during the spring survey. The reduction of total numbers of individuals collected during the spring survey at the pond locations may be due to

cooler water temperatures resulting in the total fish community of a given impoundment being less dispersed. Whereas during the fall survey, populations of fish within a given impoundment may have been more widely distributed.

Stream stations sampled during the spring survey produced similar abundance and distribution of fish as the fall survey, with a few variations. Goldstein Branch exhibited the largest number of individuals collected during the Spring sampling, 107 individuals among 8 species. Tesselated darter (*Etheostoma olmstedi*) was the most abundant species (45 individuals), followed by American eel (27 individuals) collected in Goldstein Branch in the spring. The downstream location on Johns Creek had the second most abundant fish community with 98 individuals collected during the spring survey distributed among 8 species.

The single most abundant species collected at all stream stations during the spring survey was American eel at 72 individuals which accounted for a third of the stream station fish community. Increased numbers of eels in the streams is typical for the spring time as these fish are migrating back into their freshwater habitat. Pond locations were dominated by bluegill which represented 71 individuals and accounted for 46 percent of all fish collected in the ponds. While total numbers of fish collected varied between the two surveys (532 in the fall survey and 373 in the spring), species numbers largely remained the same. All of the fishes identified at Calvert Cliffs are commonly occurring species in coastal plain stream and pond habitats (Rohde *et al.*, 1994).

None of the fish species collected in Calvert Cliff's streams and ponds are protected by federal or state law as rare, threatened or endangered. However, American eels (*Anguilla rostrata*) were regularly collected in both stream and pond habitats, and appeared to be relatively abundant in some (45 eels were collected from one 75-m stream length sampled). There is growing concern worldwide regarding the status of American eel populations. American eels begin their lives as eggs hatching in the Sargasso Sea, a 2-million-square-mile warm-water lens in the North Atlantic between the West Indies and the Azores. They take years to reach freshwater streams where they mature, and then they return to their Sargasso Sea birth waters to spawn and die. They are the only species of freshwater eels in the Western Hemisphere. It is not known how or why American eels go to certain streams for their long maturing period. Over 20 percent of female spawning eels come from Canadian waters, and those waters are now experiencing a serious crash in numbers of yellow eels. A decline in one area such as this affects the entire population. American eel populations are already in decline and the eels could become scarce and could even disappear if current trends continue (USFWS, 2008).

The U.S. Fish and Wildlife Service and the National Marine Fisheries Service agreed in September 2004 to review the status of the American eel at the request of the Atlantic States Marine Fisheries Commission in light of an apparent decline in the commercial eel harvest. In December 2004, the two Services announced their intention to consider extending Endangered Species Act protection to the American eel. The U.S. Fish and Wildlife Service announced in 2007 the completion of the extensive status review of the American eel, concluding that protecting the eel as an endangered or threatened species under the Endangered Species Act is not warranted (USFWS, 2008).

To complete its review, USFWS examined all available information about the American eel population from Greenland south along the North American coast to Brazil in South America and as far inland as the Great Lakes and the Mississippi River drainage. They concluded that while the eel population has declined in some areas, the overall population is not in danger of extinction or likely to become so in the foreseeable future. Several actions have been taken in an effort to conserve eel populations including installation of eel ladders for upstream passage at hydropower projects, implementation of state harvest restrictions, and dam removals that open historic eel habitat (USFWS, 2008). In Maryland, an eel restoration plan is being developed for the Susquehanna River.

Lake Davies exhibited the least productive fish population as far as number of species and quantity of individuals. Only one species of fish eastern mosquitofish (*Gambusia affinis*) was collected in Lake Davies and only during the fall sampling season. No fish were collected in Lake Davies during the spring survey. Habitat at this site appeared to be ideal for a pond system which included adequate cover, depth and forage. Depressed oxygen levels due to algae and duckweed degeneration as observed during the fall survey may be the reason for the depauperate fish fauna at this site. Water quality conditions, as described previously, are dissimilar from the other freshwater ponds on the site.

More than 100 benthic macroinvertebrate taxa were collected from streams and ponds at Calvert Cliffs during both fall and spring surveys (UniStar, 2007). The number of taxa in streams was relatively consistent ranging from 23 to 34 during both seasons. Similarly, the Camp Conoy Fishing Pond had 24 to 34 taxa among the three locations sampled in each season. The two unnamed ponds had similar diversities, 20 and 21 taxa in fall and 17 and 18 taxa in spring, but shared only about half of the taxa in each season. Lake Davies consistently had the lowest diversity with 10 to 16 taxa among the three location sampled for the two seasons.

For the most part, Chironomids dominated the stream and pond communities, and particularly so at Lake Davies, which had fewer taxa overall. Only the two unnamed ponds were dominated by Oligochaetes, but this members of this taxa were also abundant in other streams and ponds. An Index of Bioitic Integrity (IBI) based on the benthic macroinvertebrate taxa present was calculated for the streams surveyed. During the fall survey, Johns Creek was rated as *fair* at both survey locations and Goldstein Branch as *poor*, while during the spring survey, all locations were rated as *fair*.

3.4.3 *Chesapeake Bay*

In addition to its role as a center of commerce and shipping, the Bay is home to dozens of species of wildlife and produces millions of pounds of seafood for domestic and international markets. In recent years, government, industry, and the public have focused efforts on reversing the processes that have led to a decline in the quality of the Bay for both natural resources and the human population. Pollution, nutrient enrichment, and over-harvesting of estuarine species are among the key threats to the health of the Bay. Reports on the status of the Bay reach the same conclusion: the overall health of the ecosystem remains degraded. Much of the extensive restoration effort expended during the last 20 years has merely kept the Bay from becoming even more severely impacted by the growing human population in the area. The Chesapeake Bay Foundation assigned the Bay an overall score of 28 (out of a possible 100) based on measures of pollution, habitat, and fisheries for 2007. The failing grade score was 1 point lower than the previous year, indicating no improvement.

The Integration and Application Network, University of Maryland Center for Environmental Science and EcoCheck (NOAA-UMCES Partnership) provided an overall grade for the Chesapeake Bay of C- for 2007 (http://www.eco-check.org/reportcard/chesapeake/2007/). A summary of their findings is listed below.

- There was a slight improvement compared to 2006 (from 39 percent to 42 percent); health remained in moderate-poor condition.

- Overall bay health has increased slightly since a record low in 2003, largely driven by improvements in phytoplankton community and chlorophyll a scores.

- Bay health remained in poor condition in most regions. The health scores were generally poor in 2007, but did vary from region to

region. With some exceptions, the regions in the middle of the Bay scored worse than the upper and lower regions.

- An overall improvement compared to 2006. Bay health in many regions improved in 2007 compared to 2006. The most improved regions were the Upper Western Shore and Choptank River. Improved health may be due in part to the summer drought conditions.

- Summer drought: Record low rainfall occurred in many regions of the Chesapeake Bay watershed this past summer. The summer drought led to lower–than–average levels of sediment and nutrients flowing into the Bay from June to September. However, annual nitrogen loads were similar to the long–term (1990–2007) average due to slightly higher winter and spring flow conditions.

- Slight improvement in aquatic grasses: The area covered by aquatic grasses increased in many regions of the Bay in 2007. The largest percent increase occurred in the Upper Bay and Upper Western Shore regions. Decreases did occur in some regions, including the Patuxent River, Lower Western Shore, and Upper Eastern Shore regions.

- Continued poor water clarity: Overall, water clarity improved slightly in 2007, with the highest score since 2002. However, the slight improvement did not reverse the downward trajectory of baywide water clarity. The reasons for the baywide water clarity decline are under investigation.

- Harmful algal blooms and fish kills: Numerous harmful algal blooms were recorded around the Bay in 2007, mostly in the Potomac River, Lower Western Shore, and Patapsco and Back Rivers regions. Many of the blooms led to fish kills due to algal toxins and/or depleted dissolved oxygen levels caused by the decaying algal blooms.

3.4.3.1 *Important Estuarine Species*

UniStar compiled a list of estuarine species considered important in the project area, based on the criteria of NRC NUREG-1555 and summarized in Table 3-18. NUREG-1555 defines important species as: 1) species listed or proposed for listing as threatened, endangered, candidate, or of concern in 50 CFR 17.11 and 50 CFR 17.12, by the U.S. FWS, or the state in which the project is located; 2) commercially or recreationally valuable species; 3) species essential to the maintenance and survival of rare or

Table 3-18 Important Species in the Chesapeake Bay Near the Calvert Cliffs Site

Species (Scientific Name)	Commercially Harvested	Recreational Target	Keystone Species	Indicator Species
Threatened and Endangered Species				
Shortnose Sturgeon *Acipenser brevirostrum*				
Atlantic Sturgeon *Acipenser oxyrhynchus*	X (Moratorium since 1997)			
Atlantic Loggerhead Turtle *Caretta caretta*				
Kemps Ridley Turtle *Lepidochelys kempii*				
Harvested Fish				
American Shad *Alosa sapidissima*	X			
Bay Anchovy *Anchoa mitchilli*	X		X	
Atlantic Menhaden *Brevoortia tyrannus*	X		X	X
Atlantic Croaker *Micropogonias undulatus*	X	X		
Striped Bass *Morone saxitilis*	X	X		
Spot *Leiostomus xanthurus*	X	X		
White Perch *Morone americana*	X	X		
Bluefish *Pomatomus saltatrix*	X	X		
American Eel *Anguilla rostrata*	X	X		
Harvested Invertebrates				
Blue Crab *Callinectes sapidus*	X	X		
American Oyster *Crassostrea virginica*	X			X
Other Important Resources				
Submerged Aquatic Vegetation (SAV)			X	X
Plankton			X	X

commercially or recreationally valuable species; 4) species critical to the structure and function of local terrestrial ecosystems; or 5) species that could serve as biological indicators of effects on local terrestrial ecosystems. A single species may meet more than one of the five criteria. For this analysis, these criteria are further defined as:

- **Species Under Special Protection**: Threatened, Endangered, or Candidate Species: Any species that is known to occur or could occur in the Bay or near the CCNPP site that is afforded special protection under the federal Endangered Species Act, or under the equivalent State of Maryland law, is defined as an important species.
- **Commercially Harvested Species**: Finfish and shellfish that rely on habitat in the vicinity of the CCNPP site during any life stage, and are commercially harvested to a substantial degree, are considered important resources.
- **Recreational Target Species**: Finfish and shellfish that rely on habitat in the vicinity of the CCNPP site during any life stage, and are preferentially taken by recreational anglers or trappers to a substantial degree are considered important resources.
- **Keystone Species**: Any species that is essential to maintaining the structure and function of the estuarine ecosystem in the vicinity of the CCNPP site will be identified as important.
- **Indicator Species**: A species whose abundance, distribution, or condition is known or believed to be a reliable predictor of the status of another species of interest is considered an important species.
- A sixth criterion was also evaluated by UniStar (2007) - status as a potential nuisance to plant operation. However, no nuisance aquatic species is expected to occur in the vicinity of the Project Area. Each important species is described in the following subsections.

Threatened or Endangered Species

Two fish and two sea turtle species in the project area are afforded special protection under the Endangered Species Act: the Shortnose and Atlantic Sturgeon, and the Loggerhead and Kemp's Ridley Turtle.

- The **Shortnose Sturgeon** (*Acipenser brevirostrum)* is an anadromous bony fish that has historically inhabited sluggish tidal rivers and nearshore marine waters of the western Atlantic coast, including the Chesapeake Bay. The ancestral range of this species is believed to extend from the St. John River in New Brunswick, Canada, to the St. Johns River in Florida. It moves up river channels to spawn in fresh water. Although this fish once supported an enormous international export business, the stock plummeted during the 1900s due to

overharvesting. The shortnose sturgeon was listed as federally endangered in 1967 and is an endangered species under Maryland law. Deteriorating water quality (especially low dissolved oxygen) and placement of dams that restrict its access to historical spawning grounds have likely inhibited the strong comeback that could have been expected once legal protections were put in place. In 1979, BGE researchers captured a shortnose sturgeon during trawl studies in the vicinity of the Calvert Cliffs site. Other isolated individuals may use the area intermittently; however, no shortnose sturgeon is known to have spawned in the Chesapeake Bay in decades. In August, 2006, a female with eggs was captured as she swam up the Potomac, presumably to spawn. It is not known whether she spawned, but biologists consider it doubtful, since males are exceedingly rare in the area. Intensive efforts by biologists to document the presence of this species in the Chesapeake are ongoing. Another female was captured near the Choptank River entrance in 2007. One shortnose sturgeon was captured during trawl studies in 1979. No shortnose sturgeon has been captured in impingement samples at Calvert Cliffs Units l and 2. The NMFS initiated a status review to compile information on the species status and threats and to consider whether to identify and assess distinct population segments (FR Vol. 72, No. 230 / November 30, 2007). The review is expected to be completed in 2009 (NOAA 2008 Status Review of Shortnose Sturgeon Populations Questions and Answers).

- The **Atlantic Sturgeon** (*Acipenser oxyrhynchus*) is a larger, longer-lived relative of the shortnose Sturgeon and once supported a robust fishery in the Chesapeake Bay. It is currently on the candidate species list maintained by the National Oceanic and Atmospheric Administration (NOAA) Fisheries, because it is undergoing a status review under the Endangered Species Act. The decline of the Atlantic sturgeon was not as sudden or steep as that of the shortnose sturgeon, but its populations are currently depleted. The Maryland Department of Natural Resources (DNR) conducted a trial stocking experiment in 1996 to investigate the viability of juvenile hatchery fish that were released on the Eastern Shore. In late 1997, a moratorium on the harvest of wild Atlantic sturgeon was implemented and remains in effect. The Atlantic Sturgeon Status Review Team (2007) concluded that the Chesapeake Bay, New York Bight, and Carolina Distinct Population Segments have a moderately high risk of becoming extinct in the foreseeable future (20 years) and should be considered threatened under the ESA.

- **Atlantic Loggerhead Turtles** (*Caretta caretta*) occur throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. The Loggerhead is the most abundant species of sea turtle

found in U.S. coastal waters, including the Bay. Approximately 2,000 to 10,000 young Loggerheads forage in the bay each summer for horseshoe crabs, jellyfish, and mollusks. They are most often seen near the mouths of rivers, in water greater than 13 ft (4 m) deep. Most sightings are in the Virginia portion of the bay, where salinity is higher.

- The **Kemp's Ridley Turtle** (*Lepidochelys kempii*) has been on the endangered species list since 1970. Nesting occurs in spring on Mexican beaches. A sizeable group of the Kemp's Ridley Turtle spends summers in the Bay, although most remain in the higher salinity waters of the Virginia portion of the bay.

Harvested Fish

Nine species of fish that are harvested commercially or recreationally in the Bay are considered important in the project area:

- • The **American Shad** (*Alosa sapidissima*) is one of six shad and herring species to occur in the Bay. From January to June, shad older than about four years old enter the Bay to spawn in fresh or near-fresh tributaries as far north as the Susquehanna River.
- The **Bay Anchovy** (*Anchoa mitchilli*) is the most abundant fish in the Bay. Through predator-prey relationships, the bay anchovy forms a link between zooplankton and top game fish.
- The **Atlantic Menhaden** (*Brevoortia tyrannus*) is a key component of the estuarine food web, consuming plankton and small fish while being consumed by larger predatory fish. Adults are present in near proximity to the Calvert Cliffs site year round.
- The **Atlantic Croaker** (*Micropogonias undulates*) is one of the top ten recreational finfish in the Bay. Adults are abundant in the Bay from March to October. All of the major predatory fish in the Bay, including striped bass, flounder, shark, spotted seatrout, other croaker, bluefish, and weakfish include croaker in their diet.
- The **Striped Bass** (*Morone saxatilis*) (also known as rockfish) is the dominant predator in the Bay. Juveniles and adults occur in the Bay year round. According to DNR, 602,506 lb (273,292 kg) of striped bass were harvested from the south central area of the Bay near the Calvert Cliffs site in 2004.
- The **Spot** (*Leiostomus xanthurus*), like the Atlantic croaker, occupies a middle position in the Bay food web, as a consumer of benthic invertebrates and as prey for striped bass, bluefish, weakfish, shark, and flounder.

- **White Perch** (*Morone americana*) migrate from the open Bay into the tidal-fresh portions to spawn from April to June over the sandy bottoms of brackish or tidal-fresh rivers. White perch are heavy consumers of fish eggs, including those of the striped bass.
- The **Migratory Bluefish** (*Pomatomus saltatrix*) visits the Bay area from spring to fall; it spawns offshore in the Chesapeake region in July. Its diet is varied, consisting of fish species at all depths, including Atlantic menhaden, weakfish, and croaker.
- The **American Eel** (*Anguilla rostrata*) is a widely distributed catadromous species, which lives predominately in rivers, lakes, and estuaries, but spawns in the Atlantic Ocean. The American eel is currently being considered for special protection under the Endangered Species Act, which may affect the way the species is managed by the Atlantic States Marine Fisheries Commission.

Harvested Invertebrates

Two species of invertebrates have been historically important to commercial and recreational harvesters near the Calvert Cliffs site, and throughout the Bay: the blue crab and the American Oyster. Both species are now severely depleted, and under strict management provisions.

- The **Blue Crab** (*Callinectes sapidus*) plays a vital role in the Bay region as both predator and prey. The Bay is the largest producer of crabs in the country, supporting major commercial and recreational fisheries. Although mating occurs in the areas near the Calvert Cliffs site, the females typically migrate down-bay to a spawning and hatching area approximately 70 mi (110 km) south of the Calvert Cliffs site.
- The **American Oyster** (*Crassostrea virginica*) is highly valued in the Bay but has been declining since the late 1800s due to over-harvesting, parasites, disease, and poor water quality. Oyster breeding and nursery areas occurred near the Calvert Cliffs site and were relocated to the Patuxent River during Calvert Cliffs Units 1 and 2 construction as a mitigation measure. Oysters have not occurred in sufficient number for commercial fishery near the Calvert Cliffs site since at least 1971. The lack of harvestable numbers was confirmed during an oyster survey conducted in fall 2006.

Other Important Resources

In addition to the fish and invertebrates already mentioned, submerged aquatic vegetation and plankton are considered important resources in the project area:

- **Submerged aquatic vegetation** (SAV) includes a group of about 16 rooted plant species that live within the shallows of the Bay and its tributaries. This vital resource provides refuge and nursery habitat for numerous organisms, increases the structural complexity of the bottom, adds oxygen to the water, and prevents erosion and sedimentation. In addition, microscopic algae and protozoa use the leaves of SAV as attachment locations. Small fish are attracted to these areas for feeding. Decaying leaves are consumed by zooplankton, which are then eaten by larval fish. SAV is considered an indicator group because the plants respond quickly and dramatically to degradation of water quality. At one time, SAV covered about 200,000 shallow and shoreline acres (81,000 hectares) of the Bay. Acreage has fluctuated widely over the past few decades. In 2006, bay grasses covered 59,159 acres (23,941 hectares). This value represented a decrease over previous years and is now only about 31 percent of what experts believe to be necessary for complete restoration of function. Acreage of SAV in the middle and lower Bay has diminished even more significantly over the past decade. In addition, late in 2005 much of the SAV in the lower Bay died, possibly due to high temperatures. In 2006 and 2007, the Chesapeake Bay Foundation issued a Chesapeake Bay score of 18 percent (failing grade) in the SAV category. No SAV was observed during the September 2006 and March 2007 surveys in the immediate vicinity of the Calvert Cliffs site. In addition, a review of SAV data available from the Virginia Institute of Marine Science (VIMS) indicates that SAV has not been observed along the shoreline in the vicinity of the study area during the period 1994 to 2004.

- **Plankton** (Phytoplankton and Zooplankton) are organisms of the open water that drift on currents and tides. Phytoplankton are plants or algae that manufacture their own food using nutrients in the water. Zooplankton are animals that generally consume phytoplankton. A small but significant component of the plankton consists of bacterial cells. Although most plankton are tiny, they range in size from microscopic bacteria and plants to larger animals, such as jellyfish. In the Bay, plankton provides the nutritional support for the entire fisheries industry. Plankton are short-lived and highly responsive to both positive and negative environmental changes. As such, plankton are useful indicators of overall environmental quality. Phytoplankton abundance is a readily visible measure of invisible nutrient loads in the Bay. The composition and abundance of zooplankton are predictors of near term fisheries abundance, as most larval fish rely on zooplankton to grow to a size large enough to compete as a predator. Some species, such as blueback herring, alewife, and shad, rely on the larger mesozooplankton food their entire lives. The influence of zooplankton on striped bass and white perch in the Bay is well documented.

Striped bass, white perch, and yellow perch depend on mesozooplankton and microzooplankton as larvae, and shift to larger prey as they grow. The role of zooplankton in the Bay is an area of active research. The overall health of the zooplankton in the Bay is suboptimal, and worsening in most reaches. Despite universal improving trends, zooplankton food levels for migratory fish larvae are currently inadequate in most major spawning/nursery areas. Sharp declines in mesozooplankton abundance were noted in almost all of the middle and lower Bay mainstem and lower tributary reaches. At the station nearest to the Calvert Cliffs site (just north of the Calvert Cliffs site), a 32 percent drop in abundance from 1984 to 2002 was reported. In contrast, abundances of the smaller microzooplankton increased in the mid-Bay. The overall zooplankton food base for important forage fish such as bay anchovy, menhaden, and immature stages of other resident species is declining and shifting to smaller sizes. However, some positive trends have been documented, likely in response to improvements in water quality. Significant increases in mesozooplankton abundance indicate an improving trend in the overall food base for fish in some areas, especially where water quality significantly improved, as in the Patuxent River. Monitoring of phytoplankton using a Phytoplankton Index of Biotic Integrity showed scores increased in 8 regions in 2007 compared to 2006 and decreased in 3 (no monitoring in 4 regions in 2006). In 2007, the majority of sampling stations had average Phytoplankton IBI scores between 1and 3 out of a possible 5, indicating that the phytoplankton communities were in degraded conditions relative to reference communities (Ecocheck, 2007).

- **Benthos** refers to the benthic invertebrate community, which is a group of animals that live on or in the bottom sediments of the Chesapeake Bay. The benthic community includes a wide variety of organisms including clams, oysters, small shrimp-like crustaceans, as well as blood and clam worms often used as bait. UniStar conducted benthic sampling at 3 locations around the proposed discharge point (within 500 feet). The total number of benthic taxa collected among all samples was similar ranging from 9 to 13, however, the kinds of benthic macroinvertebrates present varied among 28 taxa. Commonly collected species included gem clams (*Gemma gemma*) and annelid worms (*Neanthes succinea* and *Streblospio benedicti*). The Chesapeake Bay benthic index of biotic integrity (B-IBI) is an index that measures the "health" of benthic communities in Chesapeake Bay. The B-IBI provides a means for comparing the relative condition of benthic invertebrate assemblages across habitat types. It also combines several benthic community measures indicative of habitat "health" into a single number that measures overall benthic community condition. The B-IBI was calculated with the benthic data for High Mesohaline

Sand habitat. B-IBI scores among the three sites indicated the area is severely degraded to degraded. These results were in agreement with those of the Chesapeake Bay Water Quality Monitoring Program's Long-term Benthic Monitoring and Assessment Component, which indicated that the area off Calvert Cliffs was severely degraded during September 2006 monitoring (Versar, Inc 2007).

3.4.3.2 *Aquatic Habitat*

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 project 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 Bay nearest the Calvert Cliffs site is of lower relative importance in terms of productivity than other areas of the Bay. Estuarine species that use the Bay as nursery grounds need SAV and tidal marshes for nutrient-rich forage for larvae, as well as for protective cover from predators. The area near the Calvert Cliffs site has no SAV and does not provide critical habitat for any species.

The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), 1996 revision, defines essential fish habitat (EFH) as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity." Under the MSFCMA, fishery management plans must identify and describe EFH for the fishery and minimize adverse effects on the fishery to the extent practical. The MSFCMA also defines associated habitat areas of particular concern (HAPC). This designation denotes EFH that is particularly important to the long-term productivity of the species, and/or is particularly vulnerable to degradation. The intent of the designation is to focus greater attention on conservation efforts. The six summary EFH designations specific to major portions of the Chesapeake Bay in Maryland are as follows: Chesapeake Bay Mainstem; Chester River; Choptank River; Patuxent River; Potomac River; and, Tangier/Pocomoke Sound. Twenty-one Federally managed species have designated EFH within Chesapeake Bay.

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

3.4.3.3 *Other Preexisting Environmental Stresses*

Pollution, nutrient enrichment, and over-harvesting of estuarine species are among the key threats to the health of the Bay. Based on conditions throughout 2006, the Patuxent River Watershed portion of the Bay received a grade of D- (23 percent) from the Chesapeake Bay Foundation based on very poor water clarity and chlorophyll a, moderate dissolved oxygen conditions, poor benthic and phytoplankton scores, and loss in bay grasses.

Impingement and Entrainment Impacts of Calvert Cliffs Units 1 and 2

Biological monitoring for impingement and entrainment was conducted at Calvert Cliffs Units 1 and 2 during the mid 1970s through 1995 (the most recent data available). HDR/LMS (2005) reviewed these studies of cooling water withdrawal from an aquatic community characteristic of mid-Atlantic estuaries. The impingement and entrainment collections were dominated by blue crab and bay anchovy comprising 86 percent of all organisms collected.

Impingement Studies

Extensive impingement data were collected each year from 1974 through 1995 (the most recent data available) (Hixon and Breitburg 1996; Ringger 2000). During 1995, the last year sampled, an adjusted total of 8,177 fish and blue crab was collected. The collections included 28 species representing 21 families. Blue crab (53 percent) and bay anchovy (33 percent) were the dominant species of all organisms collected. Menidia sp. and hogchoker each accounted for 4 percent of all organisms collected. The highest impingement period was July through September, with 79 percent of all organisms collected during this time. The highest impingement period varied across species, with bay anchovy most abundant in July and August, silverside during the winter months, and hogchoker most abundant from June through August. Impingement sampling results from 1993 and 1994 indicate that blue crab are consistently among the most frequently impinged species (45 and 79 percent of total catch, respectively) (Hixson and Breitburg, 1994, 1995). The percent composition of other commonly impinged species varied among years. These species include bay anchovy (3-25 percent), Atlantic silverside (2-3 percent), hogchoker (4-15 percent), Atlantic croaker (<1-8 percent), and northern pipefish (1 percent).

The use of large volumes of cooling water on one of the nation's most productive estuaries prompted extensive impingement studies that continued from 1975 to 1995 (Ringger, 2000). Based on the collections and

plant operating times, the estimated annual impingement averaged 1.3 million fish. Episodic impingement events caused by high temperature and low dissolved oxygen were responsible for many of the high numbers. When the numbers are adjusted to account for the percentage of each species that is killed, the total mortality due to impingement is reduced by 73 percent. Based on the last 6 years of data collected (1989-1995) and the expected survival rate, the annual mortality rate was about 68,600 fish. With blue crab survival determined to be 99.5 percent, the impingement impact for this important commercial species is not significant.

Entrainment/Ichthyoplankton Studies

The most recent entrainment data available for Calvert Cliffs were collected from April 1978 through September 1980 (EA 1981). As summarized in HDR/LMS (2005), a total of 22 species of fish representing 14 families were collected in abundance samples. Hogchoker were the dominant species, accounting for almost 75 percent of all organisms and life stages collected. Bay anchovy eggs and post larvae accounted for 19 percent of all organisms collected and naked goby larvae for another 3 percent. Mean densities, of the four most common species/life stages were hogchoker eggs (200.9 / 100 m3), bay anchovy eggs (13.2 / 100 m3) bay anchovy post larvae (37.4 / 100 m3), and naked goby post larvae (8.8 / 100 m3). No other species and life stage occurred in densities higher than 1.4 / 100m3. Hogchoker eggs were collected at their highest density in June and July while most anchovy were collected in June for two years and July of the third year of the study. Naked goby larvae were most common in late May and early June.

Recent Regulations and Studies

Constellation Generation Group (CGG) submitted a Proposal for Information Collection (PIC) on behalf of Calvert Cliffs Units 1 and 2 as required by the U.S. Environmental Protection Agency's (USEPA) Clean Water Act (CWA) Section 316(b) Phase II Rule, 40 CFR 125 (HDR/LMS, 2005). The Phase II Rule covers existing sources of cooling water intake structures (CWIS) at steam electric plants. In accordance with 40 CFR Section 125.95(b)(1) of the Phase II Rule, the PIC set forth CGG's plan to address the information requirements of the Comprehensive Demonstration Study (CDS), 40 CFR 125.95(a)(2). The Phase II Rule established regulatory requirements for CWIS at power plants that withdraw 50 million gallons per day (MGD) or more of cooling water from the waters of the United States. The rules performance standards required reductions in entrainment (60 to 90 percent) and/or impingement mortality (80 to 95 percent) caused by the location and

operation of the CWIS. Specific performance standards depend on the source of the cooling water waterbody type and intake flows in relation to the source water flow and plant operating capacity.

The PIC summarized the rule, outlined the requirement for the PIC, described the facility, cooling water intakes, the source waterbody, and reviewed historical studies. The PIC also screened proposed compliance measures to meet the rule and presented a sampling plan to collect additional information as required under the rule to develop the CDS. Because impingement data had been collected through 1995, those data were recent enough that additional sampling was not needed. However, because entrainment data had not been collected since 1980, additional data collection was warranted. Collection and analysis of this data is currently underway.

Potential compliance measures were evaluated and the following were determined to be feasible for further study:

1. Addition of variable speed drives on circulating water pumps to reduce entrainment at certain times of year

2. Use of a coarse mesh barrier net to reduce impingement

3. Use of coarse mesh Ristroph-type traveling screens to reduce impingement mortality and entrainment

4. Habitat restoration to mitigate losses

5. Stocking program to mitigate losses

The last two options are restoration measures and were disallowed under a court ruling on the Phase II rule. That court ruling also resulted in suspension of the Phase II rule, because the court ruling remanded several of its provisions. EPA subsequently issued a Federal Register notice formally suspending the rule until it could be revised to comply with the court ruling. In the interim, all NPDES permits for Phase II facilities (including Calvert Cliffs) must include conditions under CWA 316(b) developed on a "best professional judgment" (BPJ) basis, as required under 40 CFR 125.90(b). The current NPDES permit for Calvert Cliffs Units 1 and 2 expires on May 31, 2009 and is expected to be renewed according to this requirement. The State will evaluate the existing plant's CWA 316(b) compliance assessment and determine, on the basis of BPJ, whether the currently implemented technologies and operational measures reflect BTA, as required by CWA 316(b) and implemented under COMAR 26.08.03.05. Pursuant to 40 CFR 122.62, if the State

determines that the currently implemented technologies and other measures do not reflect BTA, MDE may reopen and modify the permit to include a CWA 316(b) compliance schedule sufficient to allow the facility to design and construct or otherwise implement any additional technologies or operational measures that MDE determines are necessary to satisfy CWA 316(b). Pursuant to 40 CFR 122.62, EPA may also reopen and modify the permit to comply with requirements of new regulations, standards, or judicial decisions relating to CWA 316(b).

3.4.4 *Threatened and Endangered Species*

UniStar requested environmental review of the project site for threatened and endangered species from both USFWS and DNR, Wildlife & Heritage Service. The USFWS response, in a letter dated 22 May 2007, indicated that no federally proposed or listed endangered or threatened species are known to exist within the project impact area (except for occasional transient individuals), therefore no Biological Assessment would be required. DNR responded in a letter dated 31 July 2006, which identified several plant and animal species of concern including the state-Threatened bald eagle. Since then, additional information about bald eagles on the project site has been disclosed, and a change in the status of bald eagles as a protected Maryland species appears imminent; therefore, following a request made by UniStar, DNR Wildlife & Heritage Service updated its environmental review of the project site in a letter dated 23 June 2008. The NRC's NUREG-1555 definition of important species includes, among other categories, "species under special protection;" several additional federal and state-listed Threatened and Endangered species that occur in the Chesapeake Bay were identified and addressed by UniStar under this regulation. These species are discussed in *Section 3.4.3.1 Important Estuarine Species*. Finally, as part of its Joint Application for wetlands permit, UniStar completed additional reconnaissance surveys during November 2007 through February 2008 for protected species including all those state-listed endangered or threatened for Calvert County.

Terrestrial Species

Plants

In its initial environmental review, DNR Heritage indicated that only one plant of special concern, the spurred butterfly-pea (*Centrosema virginianum*), was known from an area along a fire road in the western part of the Calvert Cliffs site, south of Johns Creek. Although Heritage did not provide a map of the record, the description of the location indicated that it was south and west of Johns Creek, in the southwestern part of the Calvert Cliffs site and southwest of the Project Area. During field

surveys, spurred butterfly-pea was tentatively identified on the northern edge of an emergent wetland (herbaceous marsh vegetation) adjoining Johns Creek in the central part of the Calvert Cliffs site in August 2006. According to UniStar, the plant was in flower and displayed other characteristics expected for spurred butterfly pea, but the observation is noted as "possible" because the species is more typical of dry, open forest habitats than wetland habitats. According to UniStar, the ideal habitat for this species is open upland forest, which does not occur within the area of the Calvert Cliffs site proposed for Unit 3. The upland forest plant communities in this area consist of closed canopy cover with dense understory wherever the canopy is broken. For this reason, UniStar stated that no further effort would be undertaken to confirm the status of this species.

Field surveys for rare plants conducted by UniStar positively identified showy goldenrod (*Solidago speciosa*), a state-Threatened plant species, within the area that would be affected by the development of Calvert Cliffs Unit 3. According to UniStar, several large patches of showy goldenrod were observed in lawn, old field, and mixed deciduous forest in and around the edge of Camp Conoy.

Another plant species of concern observed by UniStar in the vicinity of the site, but outside of the project impact area, is Shumard's oak (*Quercus shumardii*), a state-Threatened species. Several specimens were observed in well-drained bottomland deciduous forest in the floodplain adjoining the southern of the two main headwaters to Johns Creek. No Shumard's oaks were observed more than 50 feet landward (roughly east) of the stream channel and adjoining wetlands.

Several large patches of Carolina elephant's foot (*Elephantopus carolinianus*) were observed by UniStar in multiple forested areas at the Calvert Cliffs site, including an area directly west of Lake Conoy, an area east of Camp Conoy Road, and on a slope south of a barn in the northwestern part of the Calvert Cliffs site. This species has no federal or state protected status, but it was highlighted in UniStar's Rare Species report because it is morphologically similar to tobacco weed (*Elephantopus tomentosa*), listed as Endangered in Maryland. The *Elephantopus* plants at the Calvert Cliffs site, however, displayed cauline leaves (leaves growing from a stem) as well as basal leaves (leaves growing very close to the ground surface). Possessing cauline as well as basal leaves is indicative of Carolina elephant's foot. Tobacco weed typically displays only basal leaves.

Animals

Mammals

UniStar reported that what appeared to be a bobcat (*Lynx rufus*) was briefly observed in a forested area north of Camp Conoy during the 2006 faunal studies. In Maryland, bobcat currently possesses a State Rank of S3, which designates it as a Watch List species, and is state-listed as In Need of Conservation. Watch List species are rare to uncommon, with the number of occurrences typically in the range of 21 to 100 in the state. The sighting was judged to be uncertain, but is consistent with anecdotal observations made by Calvert Cliffs personnel. Bobcats are reclusive and favor large areas of forest vegetation without human disturbance.

Birds

Bald eagle (*Haliaeetus leucocephalus*), is a state-listed Threatened species. By the end of 2006, three bald eagle nests were known to exist on the Calvert Cliffs site, however all were outside of the Project Area. In April 2007, a new active bald eagle nest was discovered in the Camp Conoy area and directly within the area proposed to be cleared for project development. This new nest was observed in a Virginia pine tree close to Camp Conoy Road near the southwestern corner of the baseball field. An aerial reconnaissance survey conducted during April 2008 revealed that the new nest and two of the original three nests were active with chicks. The new nest had a single chick, whereas the nests located south and west on the property each had two chicks. The third original nest located north on the property was reported to have blown down prior to 2007. The nest territory located south on the property in the vicinity of Rocky Point has been active since at least 2000 and is the longest active bald eagle nesting territory on the Calvert Cliffs property.

Bald eagles prefer to nest in tall trees within sight of lakes, rivers, and other open waters (Fergus, 2003). The optimal bald eagle nesting habitat on the Calvert Cliffs site is therefore the forested areas at the top of the cliffs overlooking the Chesapeake Bay. Two of the known nesting locations are in such areas (although one has since blown down), to the north and south of the Project Area. The Camp Conoy nest is more than 1,500 feet inland from the Chesapeake Bay but is within sight of the Camp Conoy fishing pond. The western nest is situated even farther inland but directly adjoins a large marshy area with pools of open water formed by beaver dams on Johns Creek. The mixture of forest cover and open water present throughout the Calvert Cliffs site and surrounding region therefore provides potentially suitable bald eagle habitat.

UniStar reported sightings of red-breasted nuthatch (*Sitta canadensis*) and yellow-bellied sapsucker (*Sphyrapicus varius*) at the proposed Calvert Cliffs Unit 3 site during their 2006 faunal surveys, but did not indicate the time of year of the sightings. The State Rank of red-breasted nuthatch is

currently S1B, indicating that breeding populations of the species are considered highly rare in Maryland. The State Rank of yellow-bellied sapsucker is currently SHB, indicating that breeding populations of the species are historically known from Maryland, but have not been verified for an extended period (usually greater than 20 years), with the expectation that could be rediscovered. Neither of these species likely breeds in the Project Area.

As part of their Joint Application for wetlands permit, UniStar addressed the likelihood of impacts to three other bird species that are listed in Maryland and are known from Calvert County. It was determined that the state-Endangered sedge wren (*Cistothorus platensis*) and black rail (*Laterallus jamaicensis*), and state-Threatened least tern (*Sternula antillarum*) would not be affected by the construction of the proposed project.

Reptiles and Amphibians

At present, there are no federal or state-listed Threatened, Endangered, or Rare reptile or amphibian species known to occur at the Calvert Cliffs site. The narrow-mouthed toad (*Gastrophryne carolinensis*), a state-listed Endangered amphibian, is known historically in Calvert County from a record approximately one mile from the project site. As part of their Joint Application for wetlands permit, UniStar indicated that additional surveys would be conducted for this species during the spring and summer of 2008. Although suitable habitat for this species is present on the project site, UniStar determined that the construction of the proposed facility would "not likely to effect" the species or its habitat.

Invertebrates

The northeastern beach tiger beetle (*Cicindela dorsalis*) and Puritan tiger beetle (*Cicindela puritana*), both federally-threatened and state-endangered species, are the only invertebrate species noted by the DNR in their 2006 environmental review for the project as having occurrence records on the Calvert Cliffs site that are designated threatened or endangered on the federal or state level, or candidates for such listing. Neither species was observed during the UniStar surveys. However, specific surveys for these species conducted by Knisely (2006) indicate that *C. dorsalis*, which inhabits shoreline beach areas, occurs on the Calvert Cliffs site only occasionally at the northern site border, and *C puritana*, which inhabits shoreline beach areas and adjacent cliffs, occurs on the Calvert Cliffs site only in suitable shoreline/beach/cliff habitat south of the Calvert Cliffs barge dock, from the middle of the Camp Conoy area southward (Knisely, 2006).

Aquatic Species

Two fish and two sea turtle species in the project area are afforded special protection under the Endangered Species Act: the shortnose and Atlantic Sturgeon, and the loggerhead and Kemp's Ridley turtle. These species are discussed in *Section 3.4.3.1 Important Estuarine Species*.

3.5 *REGIONAL SOCIOECONOMIC SETTING*

The proposed project would be located in Calvert County near Lusby on a site occupying 2,070 acres of prime wooded and agricultural lands in a rural part of southern Maryland on the Chesapeake Bay. The property consists of rolling hills, part of it forested primarily with deciduous trees. About 220 acres of the site have been altered for plant and auxiliary structures associated with Calvert Cliffs Units 1 and 2, and between 75 and 100 acres of the property borders the Chesapeake Bay.

Calvert County is Maryland's smallest county in land area with 213 square miles. A 35-mile long peninsula, bounded by the Chesapeake Bay on the east and the Patuxent River on the west, the county is nine miles wide at its widest point. No part of the county is more than five miles from navigable water. The county seat is Prince Frederick, located near the mid-point of the county. Prince Frederick is about 35 miles southeast of Washington, D.C., and 55 miles south of Baltimore.

Maryland State Highway 2/4 (MD 2/4) is the main north-south transportation artery in the county, linking it to Anne Arundel County and points north. At Solomons, MD 4 crosses the Patuxent River over the Governor Thomas Johnson Memorial Bridge into St. Mary's County. The only other highway link to Maryland is MD 231 which crosses the Patuxent River into Charles County at Hallowing Point.

There are only two incorporated towns in Calvert County: North Beach and Chesapeake Beach. Both are located in the northeast corner of the county. There are several small communities within a 10 mile radius of Calvert Cliffs, including Lusby, White Sands, Cove Point, Long Beach, Calvert Beach, Dowell and Solomons. Two of these – Lusby and Solomons – are identified as town centers in the county's Comprehensive Plan.

Tourism is one of the leading components of Calvert County's economy, and summer residents and tourists increase the population of the county. Although Lusby is emerging as a center for high technology development, the area around Calvert Cliffs remains predominantly rural in character.

3.5.1 *Population Trends*

Calvert County is Maryland's 16th most populous county and the least populous county in Southern Maryland. In 2005 the population of Calvert County was 87,250, an increase of more than 17 percent from 2000 (MDP, 2007a). There were 30,175 households in the county in 2005. Population is projected to grow at a rate of less than one percent per year through 2030, to 105,850 while the number of households is projected to increase to 38,575.

Population is relatively evenly distributed throughout the county. 29,552 persons lived in the Solomons Island minor civil division (MCD) in 2000, compared to 22,769 and 22,242 in the Prince Frederick MCD and Sunderland MCD (Census 2000). The most populous area of the county is Solomons (Census Tract 8610.02) and North Beach/Chesapeake Beach (8604.01).

Since the late 1960s, the county's population growth has been shaped by the suburbanization of the Washington, DC metropolitan area, changing commuting patterns and the construction of major industrial facilities in the county, including the Calvert Cliffs Nuclear Power Plant and Dominion Cove Point LNG terminal. Significantly, Calvert County became more accessible to commuters with the widening of MD 2/4 to four lanes, completed in 1987, and construction of the Governor Thomas Johnson Memorial Bridge, officially opened in 1978. From a 1970 population of 20,682, Calvert County's population has increased by more than four percent annually through 2005.

3.5.2 *Employment and Income Trends*

Calvert County has the smallest labor force in Southern Maryland. In 2006, the county's labor force totaled 47,336 with an unemployment rate of 3.2 percent (BLS, 2008). Nearby St. Mary's County, an employment center for Southern Maryland, had a labor force of 50,459 and unemployment rate of 3.4 percent. Maryland's unemployment rate was nearly 3.9 percent in the same period. The unemployment rate for Calvert County was 3.1 percent in February 2008.

Most employed persons living in Calvert County commute to jobs outside the county. In 2000, more than 22,700 commuted to jobs outside Calvert County, primarily to Prince George's County, St. Mary's County and Washington, DC (MDP, 2003). In contrast, about 4,900 commuted into Calvert County, primarily from Anne Arundel and St. Mary's counties, and 14,975 were intra-county commuters.

By 2005, there were 32,245 full and part-time jobs in Calvert County, an increase of nearly 6,200 from 2000 (MDP, 2007b). Most jobs were in construction (3,779), retail trade (3,721), health care and social assistance (3,707) and local government (3,679). The job base in St. Mary's County was 57,102 in 2005, with most jobs in professional and technical services (9,297), retail trade (6,054), health care and social services (4,730), construction (3,494) and local government (3,477). Major employers in Calvert County (March 2007) include Constellation Energy (Calvert Cliffs NPP), Calvert Memorial Hospital, Wal-Mart/Sam's Club, Dyncorp International, ARC of Southern Maryland, Giant Food, Safeway and Recorded Books (DBED, 2008).

Per capita personal income in Calvert County rose to $37,323 in 2005 (in 2005 dollars), up from $32,383 in 2001 (MDP, 2007c). Major components of earnings in 2005 were associated with local government, utilities, construction, ambulatory health care services and food services and drinking places. Per capita personal income in St. Mary's County was $34,004 in 2005.

Tourism is an important part of the Calvert County economy. The county has 143 miles of Chesapeake Bay and Patuxent River shoreline and offers many recreational opportunities on land and water. Tourism-oriented industries (arts, entertainment and recreation; accommodation and food services) accounted for about 12.5 percent of private, non-farm jobs in the county in 2005 (MDP, 2007b). In 2006, tourism expenditures exceeded $79 million, and accounted for more than $17.6 million in payrolls and 790 jobs in Calvert County, and contributed more than $5.2 million to local tax revenues (Maryland Office of Tourism, 2007). More than 424,800 visitors were logged at 15 key visitor sites throughout Calvert County in FY 2007, up 18.6 percent from FY 2006 (CCDED, 2008). Major attractions in the county include Annmarie Gardens and the Calvert Marine Museum in Solomons; Breezy Point Park, Chesapeake Railway Museum, and Chesapeake Beach Water Park in Chesapeake Beach; Flags Pond Nature Park and Calvert Cliffs State Park in Lusby; and Cypress Swamp Sanctuary in Prince Frederick (SMHA, 2003). Portions of the area of Solomons and of North Beach and Chesapeake Beach are two of eight proposed Target Investment Zones (TIZ) in the SMHA Heritage Management Plan. A TIZ is a specific area eligible for incentives available through the Maryland Heritage Preservation and Tourism Areas Program for attracting private investment (SMHA, 2003).

Like many Maryland counties, the traditional industries of farming, forestry and fishing are declining in Calvert County. In 2005, only 360 farm proprietors remained in the county (MDP, 2007b). In the same year, earnings in forestry and fishing amounted to only $443,000 out of nearly

$888 million in total private earnings in the county (MDP, 2007c). 30,032 acres on 321 farms were cultivated in 2002, down from more than 41,000 in 1987 (MDP, 2004). Major crops are corn (441,000 bushels in 2006), soybeans (93,200 bushels), wheat (90,700 bushels), and hay (7,900 tons) (USDA, 2007). Southern Maryland is in the eighth year of a 10-year Tobacco Buyout Program. Prior to this, Calvert County was the second largest tobacco producer in Maryland (BCC, 2004). By 2005, 877 growers representing 86 percent of producers in Southern Maryland had opted for Maryland's tobacco buyout (Bergmark, 2005).

3.5.3 *Land Use and Zoning*

Relentless suburbanization, farm economics and the increasing attractiveness of Calvert County as a tourism destination have challenged the county to manage land use more effectively. The county has attempted to shape its land use through growth management since its 1974 Comprehensive Plan when it adopted policies that constrained housing densities in rural areas, developed a transfer of development rights (TDR) program and encouraged voluntary clustering. Concern about residential sprawl and commercial strip development during the formulation of the 1983 Comprehensive Plan led to town center concept and adoption of the State Land Preservation Program. In the 1980's the county also enacted an Adequate Public Facilities ordinance, required mandatory clustering and impact fees, created protection areas and began purchasing and retiring development rights. The 1997 Comprehensive Plan sought to reduce the rate of population growth by reducing the residential build-out cap to 37,000 households, to preserve prime farms, historic and natural resources and direct growth away from protected areas (DPZ, 2006).

Land use in Calvert County is currently guided by the 2004 Comprehensive Plan (BCC, 2004). The plan promotes Calvert County for high-technology industries, tourism, farming, resource conservation and as a retirement destination. Land use is also an integral component of the county's Land Preservation, Parks and Recreation Plan (BCC 2006), the Comprehensive Water and Sewage Plan (DPZ, 2007c), and is influenced by the Southern Maryland Heritage Tourism Management Plan (SMHA, 2003) and others.

The 2004 Comprehensive Plan sets a number of land use and growth management objectives, among them to:

- Manage the amount and rate of residential growth.
- Preserve the county's rural character.
- Develop town centers.

- Direct residential, commercial and industrial growth to appropriate areas.

Of the total land area in the county, more than 32,000 acres (24 percent) were in residential land uses in 2002, an increase of 363 percent from 1973 (Table 3-19). Industrial and institutional land acreage has also increased significantly, primarily at the expense of agricultural and forested lands.

Table 3-19 ***Calvert County Generalized Land Use/Land Cover (in acres)***

Description	1973	2002	Change
Low Density Residential	5,624	26,060	20,435
Medium Density Residential	1,092	6,126	5,034
High Density Residential	116	121	5
Commercial	785	1,423	637
Industrial	185	882	697
Institutional	509	1,520	1,011
Other Developed Land	581	686	105
Agriculture	35,483	27,721	-7,762
Forest	88,471	69,500	-18,971
Wetlands	4,384	3,013	-1,371
Barren Land	193	55	-138
Total	137,423	137,106	

Source: Maryland Department of Planning, Land Use Land Cover.

Land use planning is regulated by the Calvert County Zoning Ordinance (DPZ, 2008) and Town Center Master Plans (DPZ, 2008). Residential areas are zoned Rural Community District (RCD), Residential District (RD) or are in Town Centers (TC). Much of the county is zoned Farm and Forest District (FFD). (Calvert County seeks to preserve 40,000 acres of prime farms, forests, historic resources and sensitive areas by 2020.) Land zoned RCD is primarily in the north of the county, with RD zones in the two incorporated towns and at Solomons. Land north and south of Calvert Cliffs is zoned FFD. Land to the west of MD 2/4 is zoned RCD or RD (White Sands). The Calvert Cliffs site, itself, is zoned Light Industrial (I-1) or FFD. There are small RD and Rural Commercial (RC) districts adjacent to the site between MD 2/4 and Nursery Road.

Surrounded on three sides by the Chesapeake Bay and its tributaries, much of Calvert County lies within the Critical Area. Comprising all lands within 1000 feet of tidal waters, tidal wetlands, or tributaries to tidal waters, land use activities within the Critical Area are governed by the

county's Critical Area Program, as approved by the State's Chesapeake Bay Critical Area Commission, and are regulated by the county's Zoning Ordinance. Within the Critical Area, the Critical Area Buffer is a naturally vegetated area extending 100 feet landward from tidal waters, wetlands or tributaries. The Buffer may be expanded for adjacent steep slopes (>15 percent) and erodible soils to further protect non-tidal wetlands and environmentally sensitive areas. Activity within the buffer is further restricted by regulation.

In terms of land use, the Critical Area is classified into Resource Conservation Areas (RCAs), Limited Development Areas (LDAs), and Intensely Developed Areas (IDAs). The regulations associated with each classification are applied in addition to those for the local jurisdiction's zoning districts. The Critical Area borders the entire Calvert Cliffs site along the Chesapeake Bay. Land comprising the footprints of Units 1 and 2 and ancillary facilities is designated IDA, with the remaining Critical Area classified as RCA.

One of the four goals of the 2004 Comprehensive Plan is to preserve the natural, cultural and historic assets of Calvert County (BCC, 2004). Coincident with that is a vision of preserving 40,000 acres of farm and forest land by 2020. The county's Land Preservation, Parks and Recreation Plan (BCC, 2006) promotes three strategies for building on this vision.

- Implement zoning changes to allow farmers to have additional uses for agri-tourism, eco-tourism, and heritage tourism uses.
- Continue to work with the Economic Development Department and the Tri-County Agriculture Commission to develop and implement marketing programs.
- Continue to fund County Purchase of Development Rights and urge the state to do the same.

The Rural Area of Calvert County comprises about 76 percent (107,000 acres) of the county's total land area. Within this, 34 percent is low density residential, 28 percent is neither developed nor preserved, and 38 percent is permanently protected or preserved as parks and open space, wetlands, cluster open space or in land preservation programs (DPZ, 2007a). State programs available to land owners are administered by the Maryland Agricultural Land Preservation Program (MALPP), the Rural Legacy Program, and the Maryland Environmental Trust (MET). The county's primary land preservation program is transferable development rights for residential density or forest conservation. By 2007, nearly 29,000 acres had been preserved through State, county and private land

preservation efforts (Table 3-20). At the current rate, the county's goal of 40,000 acres could be achieved by 2020 (BCC, 2006).

Table 3-20 Protective Easements in Calvert County

	Total Land (Acres)	2002 Agricultural Use	MALPP Easements 2007	MET Easements 2007	County Easements & TDRs 2007	Private Cons. Easements	Green Print	Rural Legacy
Calvert	137,730	30,032	4,754	1,801	18,136	2,555	0	1,660
Percent		21.8	3.45	1.31	13.17	1.86	0	1.21
Maryland	6,212,804	2,077,630	265,690	87,137	154,310	37,399	22,464	57,786
Percent		33.4	4.3	1.4	2.5	0.6	0.4	0.9

Source: Dan Rosen, Manager, Conservation Program Development and Implementation, Maryland Department of Planning, 2008

Efforts to preserve historic structures and landscapes have been less successful. Suburban sprawl, commercial strip development and changing farm economics have contributed to this trend, threatening both the county's cultural heritage and its developing heritage tourism industry. Programs such as the State's Tobacco Buyout Program have had unintended consequences in Calvert County (Wilson, 2004). In 2004, the National Trust for Historic Preservation identified Southern Maryland tobacco barns as one of America's most endangered places (BCC, 2004).

There are more than 1,300 properties in Calvert County listed on the Maryland Inventory of Historic Properties (MIHP). In addition more than 80 properties ranging from structures to farms that are designated "historic districts", governed by the county's Historic District ordinance (BCC, 1984). Historic Districts can take advantage of tax credits to assist in restoration. With the goal of protecting both historic and archeological resources, the Historic District Commission reviews all development projects in the county. In addition to the Historic District ordinance, two town-center zoning ordinances and the multi-family and townhouse ordinance may require archeological reconnaissance if the site is determined to have high potential (DPZ, 2007b). All projects undertaken by the County are subject to archeological requirements. Calvert County subdivision regulations allow for the evaluation of cultural resources but do not guarantee that sites will be protected, preserved or mitigated. Article 7-1.05 of the Calvert County Zoning Ordinance provides an incentive for residential subdivisions to retain historic structures by allowing the lot on which the Historic District to be recorded regardless of whether the APF requirements are met.

One archeological site that is routinely protected through the subdivision regulations is the Baltimore-Drum Point Railroad right of way (MIHP inventory number 18CV172). The abandoned railroad bed, large sections

of which are still intact, runs the length of the county and transects the Calvert Cliffs property. The right of way is subject to a County easement for a trail on all development projects (DPZ, 2007b).

3.5.4 *Transportation*

The primary transportation link throughout Calvert County is MD 2/4, which extends almost its entire length. From the north MD 2/4 is formed at the junction of MD 2 (from Annapolis) and MD 4 (from Upper Marlboro) at Sunderland. MD 2 terminates at Solomons, while MD 4 continues across the Governor Thomas Johnson Memorial Bridge into St. Mary's County. MD 231 is an east-west state highway that intersects MD 2/4 in Prince Frederick and connects the county with Charles County over the Patuxent River Bridge at Benedict. The incorporated towns of North Beach and Chesapeake Beach are accessed from MD 261 from the north, MD 260 from the east and MD 263 from the south. There are various other minor state highways that branch off MD 2/4, primarily to waterfront communities within the county (Figure 3-14). There are no active railroads or ferries serving Calvert County and no direct linkages to the Eastern Shore although a southern crossing between Calvert and Dorchester counties was an option considered by a Maryland Transportation Authority task force to relieve congestion on the Bay Bridge (MdTA 2006).

Traffic volumes on state highways in the county have increased with population growth. Between 2000 and 2006 the average annual daily traffic (AADT) on MD 2/4 near Dowell Road increased 21 percent to 25,800. Near Calvert Cliffs, the growth in AADT was six percent to 24,030 vehicles. Traffic volumes on major state highways exiting the county are shown in Table 3-21.

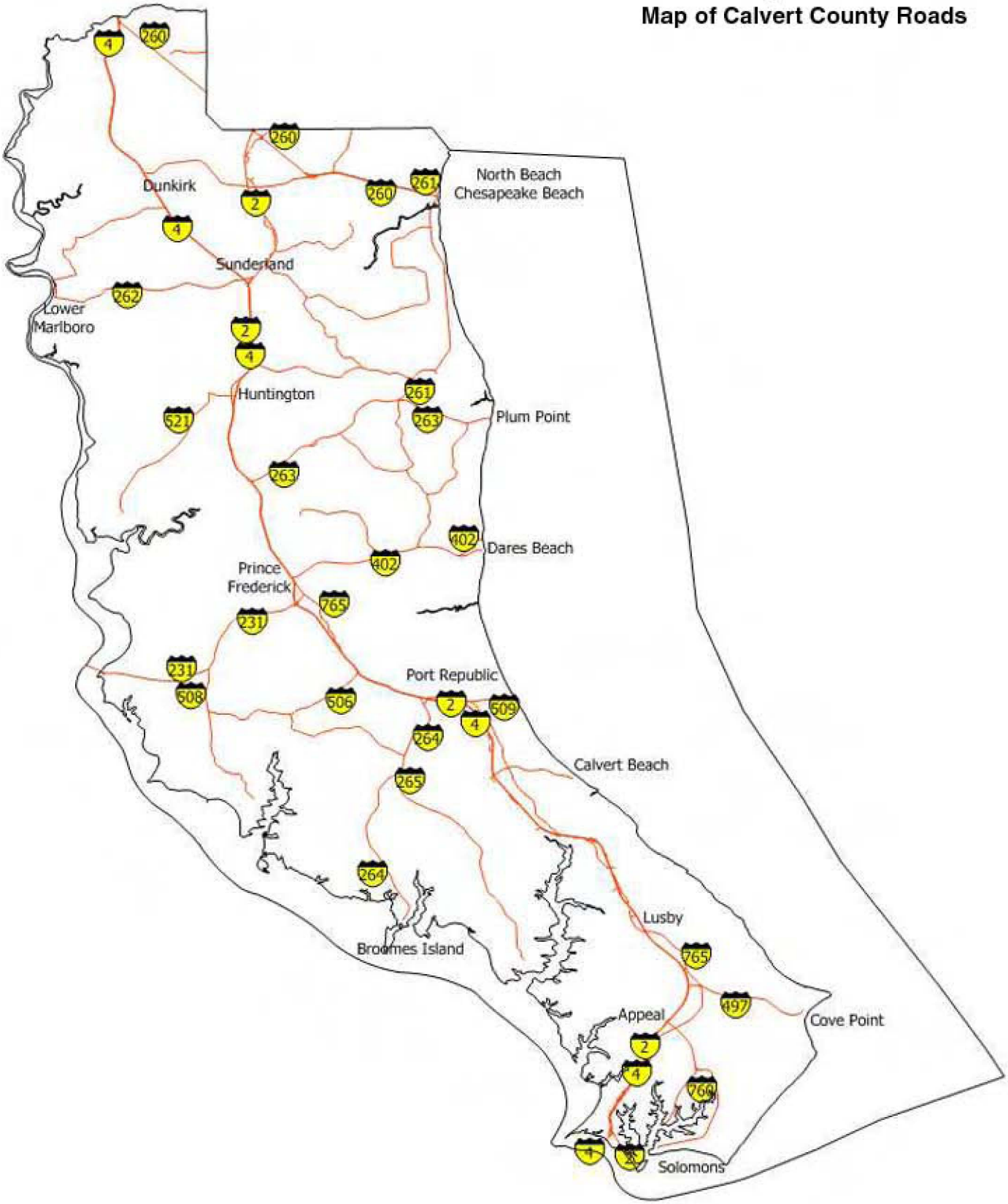
Table 3-21 Calvert County Traffic Volumes

Highway	To	AADT 2000*	AADT 2006*
MD 2/4	St. Mary's County	21,375	25,800
MD 231	Charles County	10,150	10,961
MD 2	Anne Arundel County	8,650	10,871
MD 4	Anne Arundel County	36,350	46,111

*AADT- Average number of vehicles per day

The county expects to need to make major transportation investments even if residential build-out is limited to 37,000 households, including (DPZ, 2006):

Figure 3-14
Map of Calvert County Roads



- Constructing the Prince Frederick Loop Road, including three overpasses.
- Widening MD 4 from MD 264 (Broomes Island Road) to MD 263 (Plum Point Road)

In addition, there are concerns about safety of the Governor Thomas Johnson Memorial Bridge and its ability to meet current and future traffic needs.

Several road improvements are on the books for Calvert County that are designed to relieve congestion. Construction is currently underway to reconstruct the intersection of MD 231 and MD 2/4 to provide additional capacity and improve safety. Also, the SHA is currently in the engineering phase of a project to upgrade MD 2/4 to a six-lane divided highway with auxiliary lanes from south of MD 765 to north of Stoakley Road. Finally, the SHA is undertaking a planning study to upgrade MD 4 between MD 2 and MD 235 (in St. Mary's County) including the Governor Thomas Johnson Memorial Bridge (MDOT, 2008). In January, Governor O'Malley announced a $4 million allocation to complete the planning study this project. However, construction funds have been allocated for intersection improvements at MD 231 and MD 2/4 only.

3.5.5 *Public Services and Safety*

Ground water is Calvert County's primary water source. Except for industrial demand from the Calvert Cliffs Nuclear Power Plan and the Dominion Cove Point LNG plant, ground water usage is primarily from residential and small commercial users. Recent aquifer studies indicate that sufficient ground water is available to supply the county's current private and commercial requirements through 2030 (DPZ, 2007c). There are 19 privately owned residential community water systems, 22 municipally (public) owned water systems, and 24 water systems owned by corporations or institutions. The major municipal systems are operated by the Calvert County Department of Public Works, Water and Sewerage Division in the Prince Frederick and Solomons Island Sanitary districts. The water system in Chesapeake Beach is owned and operated by the town of Chesapeake Beach, and there is a community water system in the municipality of North Beach. Constellation Energy owns a water treatment facility at the Calvert Cliffs Nuclear Power Plant.

Most residents are not serviced by community sewage systems, relying instead on septic systems. Calvert County has the highest percentage of septic sewage disposal in Maryland (BCC, 2004). There are eight community sewage systems and one shared septic system in the county: Chesapeake Beach, Prince Frederick, Solomons Island, Calvert Cliffs

Nuclear Power Plant, Calvert County Industrial Park, Northern High School, Randal Cliffs, Marley Run and Tapestry North Condominium Association. The Tapestry North Condominium Association system is a shared septic system. The future design capacities in the eight community sewage service areas are projected to be adequate to accommodate the residential build-out limit of 37,000 households called for in the county's Comprehensive plan (DPZ, 2007c).

The developed part of the Calvert Cliffs site is categorized W-1 and S-1, indicating the site is served by existing water and sewer systems.

Calvert County opened a new landfill in Appeal in 1993. Although open, most solid waste is collected at a transfer station in Lusby, operated by a private contractor, which is trucked to King George, Virginia for disposal. Of 148,219 tons of solid waste disposed in Calvert County in 2007, 147,753 were transferred out of the county. The Appeal Landfill is projected to have capacity until 2031, or 2041 if the county continues to export its solid waste (Thomas, 2008). Calvert County closed and capped a landfill in Barstow in 1997 (BCC, 2004).

There are 12 elementary schools, six middle schools and four high schools in Calvert County. Public school enrollment was 17,030 in September 2007, comprising 7,026 elementary, 4,059 middle and 5,875 high school students. Another 62 students are enrolled in Calvert Country School, which teaches children with disabilities. Approximately 22 percent of residents in Calvert County attend public schools, higher than any other school district in the state (CCPS, 2007). At present, three elementary, one middle school and two high schools are over Adequate Public Facilities (APF) capacities (Humphreys, 2007). In addition, one elementary school (Huntingtown) is only slightly under capacity and another three are over 90 percent of capacity. Three middle schools – Calvert Middle, Plum Point Middle and Windy Hill Middle – are over 90 percent capacity and the remaining two high schools are just short of capacity.

That several public schools are above capacity has important implications since the number of new residential lots that may be recorded is limited by the county's zoning ordinance, based on pupil yield and housing type. Since 2000, the pupil growth rate has slowed significantly, reflecting the county's strategy to manage population growth. This has given the county some breathing room in terms of facilities and infrastructure (CCPS, 2007), but near-capacity conditions at some schools is a limit to residential development in parts of the county.

Public safety is under the management of the Department of Public Safety, which includes the Calvert Control Center, Emergency Management,

Fire/Rescue/EMS, and the False Alarm Reduction Unit. The department coordinates its activities with the Calvert County Sheriff's Office and Maryland State Police to prepare for and respond to emergency needs in the county. The control center operates Calvert County's 911 system, including the maintenance of primary and backup communications centers. The Emergency Management Division is responsible for disaster planning and coordinating response agencies in the event of an emergency. Fire/Rescue/EMS units provide emergency response assistance in the event of fire, rescue, and/or medical emergencies. There are two volunteer fire departments, four combined volunteer fire department/rescue squads, and one volunteer rescue squad in Calvert County. In addition, there is an advanced life support team (Co. 10) and a rescue dive team (Co. 12), both based in Prince Frederick. Finally, the False Alarm Reduction Unit administers the county's False Alarm Ordinance to improve the effectiveness of emergency response personnel.

The Calvert County Sheriff's Office (CCSO) is the primary law enforcement agency for Calvert County. Established in 1654, the office is organized into four major groups: Administrative Services, Criminal Investigations, Patrol Division and Detention Center. There are offices in Chanyville, North Beach, Prince Frederick and Solomons. The Calvert County Detention Center, with a rated capacity of 172 inmates, is located in Prince Frederick. Within the Patrol Division, the CCSO maintains a Special Operations Team which is trained and equipped to respond to all high risk operations within the county, including anti-terrorism operations. Maryland State Police enforce criminal laws and traffic laws on Calvert County roads out of Barrack U in Prince Frederick.

Emergency management is important in Calvert County because the county is a peninsula with many waterfront communities. With 143 miles of shoreline and an average elevation of 120 feet above mean sea level, the county is susceptible to hurricanes and floods. Furthermore, the county hosts the Calvert Cliffs Nuclear Power Plant, the Dominion Cove Point LNG terminal and is near the Patuxent River Naval Air Station, which are facilities associated with elevated risk and are potential terrorist targets. Emergency planning is complicated by the county's geography which constrains evacuations to four major roads, two of which cross the Patuxent River over two-lane bridges.

Emergency management is under the direction of the Emergency Management Division of the Calvert County Department of Public Safety. The division's mission is to minimize the effects of future disasters through mitigation, planning, training and response efforts. It is also responsible for developing and maintaining the Emergency Operations Plan.

Calvert County has utilized a comprehensive Emergency Operations Plan (EOP) for the last twenty years. The EOP is a comprehensive plan of preparedness for response and recovery from emergencies ranging from natural hazards to terrorist attacks within Calvert County. The plan addresses direction and control, communications, evacuation, damage assessment, sheltering and mass care for residents and domestic pets, law enforcement, public information, health services, transportation, emergency warning, radiological emergencies, hazardous material incidents, Fire/Rescue/EMS, mass casualty, hurricanes and terrorism. The plan is reviewed annually, with changes incorporated by resolution from the Board of County Commissioners. The plan is implemented through the Division of Emergency Management. Local emergency operations are under the overall direction and control of the President of the Board of County Commissioners. In 2004, the County completed and received FEMA approval for a Hazard Mitigation Plan utilized to prepare for natural hazards such as drought, flooding and hurricanes (Fenwick, 2008). Background information specific to radiological emergency planning is provided in Appendix C to this Environmental Review document.

Calvert Health System serves the residents of Calvert County. It consists of three medical centers in Dunkirk, Solomons and Prince Frederick. There is also a community health center in North Beach. Calvert Memorial Hospital is the only hospital in the system. The hospital has 157 total beds including 28 psychiatric unit beds. The hospital has affiliations with regional care providers such as the Washington Hospital Center, Children's National Medical Center, Johns Hopkins and University of Maryland medical facilities.

3.5.6 *Cultural Setting*

The pre-history of Southern Maryland dates back 9,000 years. The earliest inhabitants of Calvert County were probably members of the Conoy or Piscataway, a sub-group of the Algonquians. The Algonquian family in the Chesapeake Region was peaceful and loosely governed, living relatively settled lives in villages on the Patuxent River (Brugger, 1988). Although some believe that the Spanish made exploratory voyages into Chesapeake Bay, Captain John Smith was the first documented European to see the Calvert County peninsula during his exploration of the Chesapeake Bay in 1608. It is known that Smith explored part of the Patuxent River and set foot on Calvert County in July of that year, where contact with the Indians was peaceful. Smith indicated four Indian villages on the Patuxent River in his classic map of the Chesapeake Bay. John Pory and Estinien Moll from the Virginia colony landed in Calvert County in 1621 and found the Indians to be friendly and cooperative, a

marked contrast to Powhatan, chief of the Virginia Algonquians. Smith was the first to note Calvert Cliffs, which he named "Riccards Cliftes," after his mother's maiden name (Mansuetti, 1954).

Maryland's history began in St. Mary's County on March 27, 1634 with the arrival of 140 English colonists on the Ark and the Dove, intent on settling a colony based on religious freedom (Brugger, 1988). Established as a new English colony on a charter from King Charles to George Calvert, it was planned and organized by Calvert's oldest son and heir, Cecil (Lord Baltimore). The expedition was led by Cecil's brother, Leonard, who became the first Governor of Maryland. By 1642, the settlement on the lower Potomac had survived a minor rebellion by William Claiborne and his followers, made peace with the Patuxents, and had grown into St. Mary's County. Colonists had settled up-river as far as St. Clements on the Wicomico River and along the north shore of the Patuxent River. The oldest house in Calvert County, Cross Manor, is thought to have been built in 1643 (Mansuetti, 1954). An early settler of Calvert County was Richard Preston, who in 1649 moved to a bluff overlooking the Patuxent River between Mears Creek and Helen Creek. Known both as Charles Gift and Preston-on-the-Patuxent, it was capital of the Maryland colony for a short time during Cromwell's regime.

Calvert County was officially established in July 1654. The county seat was at Battletown (also know as Calvertown or Calverton) on land lying between the mouth of Battle Creek and the Patuxent River. It remained so until 1725. In October of 1654, as a result of the Protestant revolution in England, the county was renamed Patuxent County only to be changed back to Calvert County in 1658 after control of the colony was wrested back from the Puritans. Settlement of Calvert County was a progressive advance from south to north on lands convenient to navigable waters for the shipment of tobacco. Most travel within the county was over water from landing to landing. As settlement moved inland, roads evolved slowly from trails cut from plantations to nearby landings (Mansuetti, 1954).

At the beginning of the 18th century a mail route traversed Calvert County from Hallowing Point through Prince Frederick, then north to Annapolis and Philadelphia. Prince Frederick became the county seat in 1725 by an Act of the Assembly. Prior to then the locale was known as "Williams Old Field". There was little in the way of population growth and no large towns in the county before the Revolutionary War. Upon the Declaration of Independence, Maryland entered statehood. Thomas Johnson, born in Calvert County in 1732, was the first governor of Maryland (1777 – 1789) and an associate justice of the Supreme Court. British troops invaded Calvert County in November 1780, destroying Rousby Hall and the

mansion of John Parran, the latter an archeological resource (Parran's Park) within the Calvert Cliffs property. The last act of war in Calvert County was probably in February 1783 shortly before the Articles of Peace were ratified, when the British plundered some properties on the Patuxent River near Benedict.

The British returned again during the War of 1812. The Battles of St. Leonard's Creek were fought in June 1814. On June 10, Commodore Joshua Barney and his flotilla of gunboats and barges were blockaded by a British fleet under the command of Admiral Cockburn. With Barney's flotilla pinned down, the British laid much of Calvert County to ruin. On June 26, American land forces and the flotilla launched a combined attack that removed the blockage and allowed Barney's flotilla to escape up the Patuxent River. Battletown was destroyed and Prince Frederick was burned by the British during the summer of 1814 (Mansuetti, 1954).

Slavery was an integral part of the Calvert County economy from the earliest days of settlement. In the Census of 1790, out of a population of 8,652, almost half were slaves. Most were involved in the growing of tobacco and corn. Before and during the Civil War, the people of Calvert County were divided. Most opposed secession, but many prominent citizens supported the Confederacy. Many from the county enlisted in the Confederate Army. Others were drafted into the Union Army. In April 1864, Calvert County citizens voted against a convention to abolish slavery and against Lincoln in the presidential election. Although the smuggling of contraband to Confederate lines was an ongoing activity on the Chesapeake during the war, Calvert County was not a strategic location and saw no hostilities.

The abolition of slavery and end of the war brought economic decline to Calvert County as large plantations were mortgaged heavily to keep them in production or allowed to go fallow (Mansuetti, 1954). The Village of Solomons was settled in 1867 and became a center for oystering and shipbuilding. The County's economy was largely dependent on agriculture, primarily tobacco, and fisheries production.

At the beginning of the 20th century, there were only 265 miles of roads in Calvert County. The main roads were north-south connecting Smithville (Dunkirk), Chaneyville, Huntington, Prince Frederick, Port Republic and Drum Point. The Baltimore and Drum Point Railroad was conceived in 1868 to run the length of county connecting the Baltimore and Annapolis Railroad to Drum Point. Construction began in 1888 and, by 1890 a 20-foot wide rail bed had been graded. But financing for the remainder of the work never materialized and the company was bankrupt by 1891. Large sections of the abandoned railroad bed are still intact. The

Washington and Chesapeake Railroad opened in June 1900 connecting Seat Pleasant in Prince George's County to Owings Station in Chesapeake Beach. The project created Chesapeake Beach as a resort destination for the railroad through the purchase of 3,000 acres. The line was rarely profitable, however, and was discontinued in 1937, survived only by the Chesapeake Beach Railroad Museum (Gibb, 1994).

Prior to the Second World War, the highway and secondary road system in Calvert County was still underdeveloped. In 1936, less than 300 miles of roads existed and only 15 miles of road were paved. But WW II brought significant changes to the county. Shortly after war was declared, Navy and Marine detachments used the Calvert Cliffs in amphibious landing training exercises. In 1942, the Navy established an Amphibious Training Base (ATB) in Dowell and a Navy mine test station on Point Patience. The Patuxent Naval Air Station was constructed in St. Mary's County opposite Drum Point in 1941 (Mansuetti, 1954).

Even though the ATB was closed in 1945, a large military presence and improvements in the county's highway system brought significant and lasting change to the county. Although Calvert was targeted as a vacation destination with the founding of Chesapeake Beach in the late 1800's, improved highway access opened the rest of the county to tourism and seasonal residents. Calvert and Charles counties were connected by the Benedict Bridge across the Patuxent River at Hallowing Point in 1950 and the Thomas Johnson Memorial Bridge replaced ferry service between Calvert and St. Mary's counties in 1978. A 38-mile four-lane segment of MD 4 running the length of the county was constructed between 1964 and 1987 (Calvert County, 2008).

Prosperity has been the hallmark of Calvert County since the 1970's, with an influx of population, both permanent and seasonal, and industry, most notably the Calvert Cliffs Nuclear Power Plant and the Dominion Cove Point LNG terminal. With prosperity, however, have come threats to its cultural heritage. The county has acted aggressively through its comprehensive planning process and in its participation with regional, State and federal programs to preserve its heritage. Its Historic Preservation Commission has undertaken a cultural conservation study of the county's tobacco culture, for example (SMHA, 2003) and has developed an interpretive guide to historic road markers, county historic sites and National Register sites (Calvert County undated). The Comprehensive Plan identifies open spaces and greenways, primarily along the county's 101 miles of shoreline on the Patuxent River and Chesapeake Bay. Eco-tourism and resource-based recreation have become the basis for its tourism program (BCC, 2006).

The Southern Maryland Heritage Area Tourism Management Plan is a major blueprint for highlighting the region's cultural heritage (SMHA, 2003). It defines five key resources – archeological, architectural, cultural, historic, area natural and environmental – that puts Southern Maryland's history and character into context. It proposes a Certified Heritage Area (CHA) of eleven distinct clusters containing a concentration of heritage resources, existing or proposed interpretive facilities, and significant lands protected by federal, state and county ownership or easements. These clusters are connected by corridors comprising scenic byways, trials and waterways. The plan identifies key themes to guide visitors through Southern Maryland's history and identity and, importantly, stewardship principles for sustaining and enhancing the region's heritage tourism initiative. Following the recommendations of the Southern Maryland Heritage Area Tourism Management Plan, the Maryland Heritage Areas Authority (MHAA) certified the Southern Maryland Heritage Area in 2004. All or parts of four heritage clusters are in Calvert County, one of which (Cluster 10) encompasses the Calvert Cliffs site.

Maryland's Greenways and Water Trails Program works with public and private sector partners to preserve a network of natural corridors that connect areas of open space. To be considered part of the statewide greenway network, land must be under some form of permanent protection, have a management plan, and serve at least one of several greenway functions. The program identifies eight greenways in Calvert County including the Baltimore-Drum Point Rail Trail and Flag Ponds to Solomons Trail, both of which are adjacent to Calvert Cliffs.

The Maryland Historical Trust's Maritime Archeology Program actively documents Maryland's maritime and submerged historic resources and has sponsored several cultural resources surveys of the remains of the Chesapeake Flotilla, associated with the first and second Battle of St. Leonard's Creek in 1814. Several artifacts have been recovered and conserved.

Two of the many other heritage activities in the Southern Maryland involve transportation. Southern Maryland Heritage Driving Tours meander through Charles, St. Mary's and Calvert counties using the themes Religious Heritage, Agricultural and Maritime Heritage, and Wars and Conflicts to direct tourists to interpretive sites, museums and festivals (CCOT undated). The Agricultural and Maritime Heritage tour enters Calvert County at Hallowing Point and follows MD 231 and MD 2/4 to Solomons. The tour includes interpretive stops at the Hallowing Point Park Tobacco Barn, Flag Ponds Nature Park, Lore & Sons Oyster House and Drum Point Lighthouse. The Religious Heritage Tour extends the length of Calvert County from St. Peter's Chapel in Solomons to St.

Edmonds United Methodist Church in Chesapeake Beach. The Wars & Conflicts Tour highlights Lower Marlboro, one of the oldest towns in Maryland, the Jefferson Patterson Park & Museum, site of the First and Second Battles of St. Leonard's Creek, amphibious warfare sites in Solomons and the Calvert Marine Museum. Some of these sites are also elements of the Star-Spangled Banner National Historic Trail (NPS 2004). The Star Spangled Banner Tour is one of 19 in the Maryland Scenic Byways program. The tour originates in Solomons and traces British hostilities in Calvert County and Joshua Barney's defenses of the Chesapeake during the war of 1812, exiting the county at Hallowing Point (SHA, 2008).

There are four Southern Maryland bicycle routes in Calvert County that have been developed by the Southern Maryland Travel and Tourism Committee. The Savor Solomons Route is a seven-mile route that circles Solomons Island before heading north along MD 2/4 to Annmarie Garden and then turning south to the former U.S. Navy ATB site. The 29-mile Broomes Island/St. Leonard Route starts at Broomes Island and discovers historic sites in St. Leonards, terminating at the Jefferson Patterson Park and Museum. The Prince Frederick Town and County Route passes the Calvert County Courthouse and other cultural sites in Prince Frederick and surrounding areas. The Bay to the River Historic River is a 41-mile circular route in the north of the county that visits Chesapeake Beach, North Beach, Lower Marlboro and Huntingtown. Many of the county's historic and religious sites can be visited on this tour (SMTTC, undated).

At the federal level, Congress established the Captain John Smith Chesapeake National Historic Trail, the first water trail in the United States. Signed into law by President George W. Bush in December 2006, the trail commemorates the voyages of Captain John Smith on the Chesapeake Bay and its tributaries during 1607-1609. Administered in coordination with the National Park Service and Chesapeake Bay Gateways Network, the trail encompasses the routes of John Smith's two voyages around Chesapeake Bay in 1608, and includes gateways and public access sites in Calvert County near the Calvert Cliffs Nuclear Power Plant. A trail management plan, due in 2007, is expected to guide interpretive and restoration efforts throughout the Chesapeake region.

Created by the Chesapeake Bay Initiative Act of 1998, the Chesapeake Bay Gateways Network (CBGN) is a system of parks, refuges, museums, historic sites and water trails within the Chesapeake watershed region. More than 140 sites across 64,000 square miles are linked in a joint strategy to coordinate visitor experiences and impart the values of the Chesapeake Bay. There are gateways north and south of Calvert Cliffs at Flag Ponds Nature Park and Calvert Cliffs State Park.

Calvert County is also a stop on the National Underground Railroad Network to Freedom (MOTD, undated) and is on the Maryland Women's Heritage Trail (MWHC, 2003). Other federal, State, county, local and private cultural resources in the county are too numerous to mention.

3.6 *NOISE*

3.6.1 *Definition of Noise*

Noise generally consists of many frequency constituents of varying loudness. Three decibels (dB) is approximately the smallest change in sound intensity that can be detected by the human ear. A tenfold increase in the intensity of sound is expressed by an additional 10 units on the dB scale, a 100-fold increase by an additional 20 dB. Because the sensitivity of the human ear varies according to the frequency of sound, a weighted noise scale is used to determine impacts of noise on humans. This A-weighted decibel (dBA) scale weights the various components of noise based on the response of the human ear. For example, the ear perceives middle frequencies better than low or very high frequencies; therefore, noise composed predominantly of the middle frequencies is assigned a higher loudness value on the dBA scale. Typical A-weighted sound levels for various noise sources are shown in Table 3-22.

Because sound levels are expressed as relative intensities, multiple sound sources are not directly additive. Rather, the total noise is primarily a result of the source of highest intensity. For example, two sources, each having a noise rating of 50 dBA, will together be heard as 53 dBA; a source of 65 dBA combined with a source of 85 dBA will result in a noise level of 85.1 dBA. As the intensity difference between the two sources increases, the effects of the lower sound sources become negligible.

Table 3-22 Typical Sound Levels for Common Sources

Noise Source	Typical Sound Pressure Level (dBA)
Lowest sound audible to human ear	10
Soft whisper in a quiet library	30-40
Light traffic, refrigerator motor, gentle breeze	50
Air conditioner at 6 meters, conversation	60
Busy traffic, noisy restaurant, freight train moving 30 mph at 30 meters	70
Subway, heavy city traffic, factory noise	80
Truck traffic, boiler room, lawnmower	90
Chain saw, pneumatic drill	100
Rock concert in front of speakers, sand blasting, thunder clap	120
Gunshot, jet plane	140

3.6.2 *Existing Noise Levels*

UniStar conducted ambient noise surveys in November 2006 and August 2007 to characterize the existing acoustic environment in the area. Environmental sound levels were measured continuously at eight locations over a two-day period during both leaf-on and leaf-off seasonal conditions. A wintertime (leaf-off) survey was completed because any noise emissions in the community from the existing Calvert Cliffs site would be highest due to the lack of tree leaf noise reduction over the buffer distance between plant and residences. A leaf-on survey was recommended to collect additional data and observations during a warmer season when potentially sensitive receptors might be outdoors. The combined results are provided in Table 3-23; monitoring locations are illustrated in Figure 3-15.

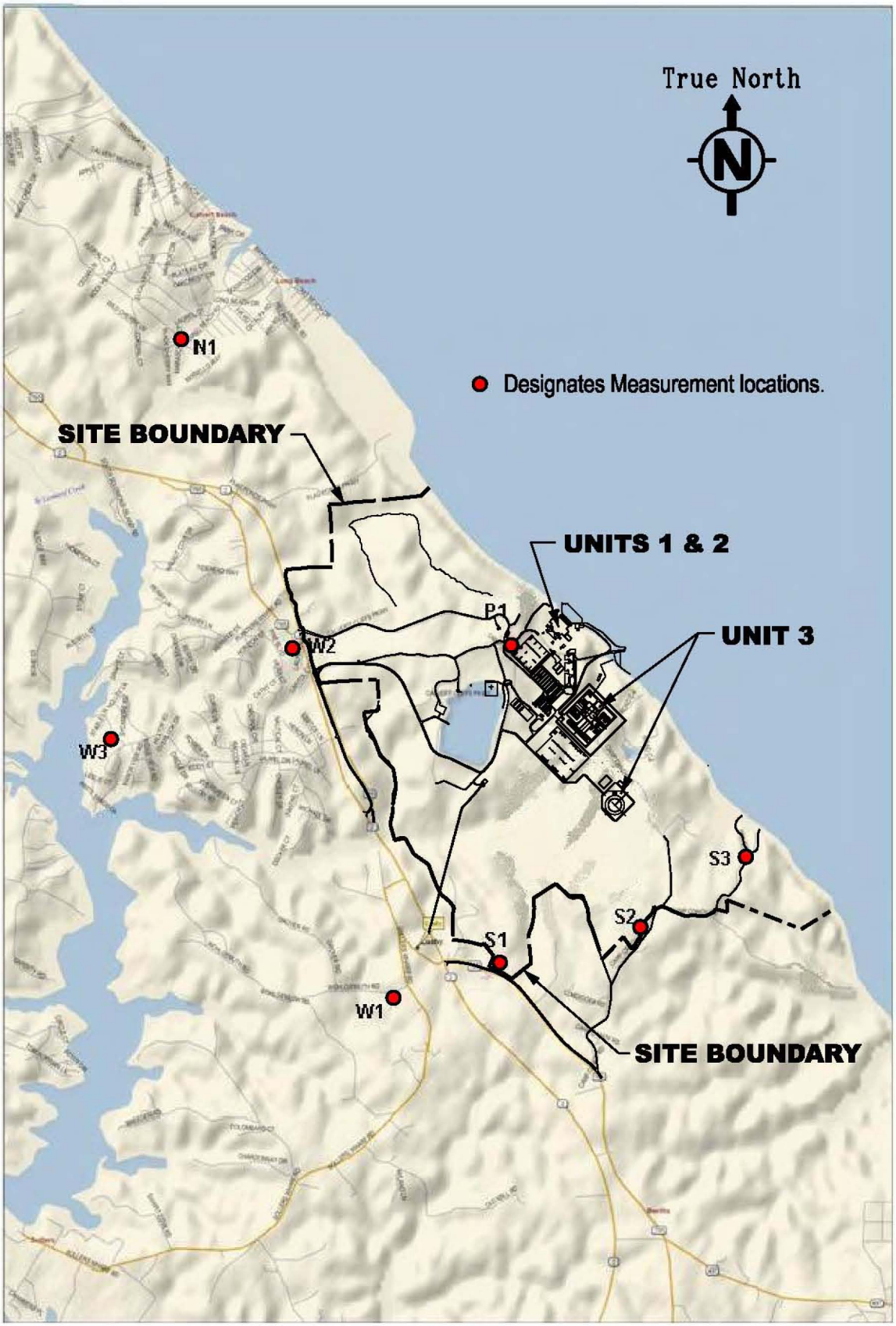
L90 is defined as the "residual" sound level, which is the quasi-steady level that occurs in the absence of all identifiable sporadic sound levels occurring over the interval. The vast majority of all residual sound levels found in communities come from far-away unidentifiable steady levels from traffic and/or industrial sources. They are the levels exceeded 90 percent of the sampling time.

P1 was placed near where Calvert Cliffs Units 1 and 2 are audible and dominant. There are single family residences at locations N1 through S3. The closest receptor locations for proposed Unit 3 would be S1, S2, and S3. The noise survey results indicate that existing sound levels near Calvert Cliffs are typical of quiet, rural areas, and are strongly influenced by traffic on MD 2/4.

Table 3-23 Baseline Noise Monitoring Survey Results (in dBA)

Location	Minimum L90	Average Daytime L90
P1	N/A	N/A
N1	34	44
W1	30	40
W2	37	56
W3	33	46
S1	31	42
S2	30	36
S3	30	35

Minimum L90 refers to the minimum measured hourly L90 over the survey period.
Average Daytime L90 refers to the arithmetic average of all hourly L90s measured at each location over the survey period (daytime hours only)



1600 3200
0 800 2400 4000
SCALE: Feet

500 1000
0 250 750 1250
SCALE: Meters

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Figure 3-15
Baseline Sound Measurement Locations