CCNPP3COLA PEmails

From: Parkhurst, Mary Ann [maryann.parkhurst@pnl.gov]
Sent: Tuesday, October 06, 2009 6:15 PM
To: Quinn, Laura; Nash, Harriet; Anderson, Kathy NAB02
Cc: Kropp, Roy K; Chapman, Elaine G; Duberstein, Corey A; Hickey, Eva E; Keller, Tonya K
Subject: Draft Essential Fish Habitat -- Calvert Cliffs
Attachments: CCNPP_Draft_EFH_Assessment_10-06-09.doc

Laura,

Attached is the draft Essential Fish Habitat Assessment for Calvert Cliffs for review during a Live Meeting the week of October 12. (On EARRTH at https://earrth.pnl.gov/Site%20Documents/COL%20Sites/Calvert%20Cliffs/26%20BAs%20and%20EFH/October%2009%20Aquatic%20Drafts/CCNPP_Draft_EFH_Assessment_10-06-09.doc.)

<<CCNPP_Draft_EFH_Assessment_10-06-09.doc>>

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Essential Fish Habitat Assessment

National Marine Fisheries Service

Calvert Cliffs Nuclear Power Plant
U.S. Nuclear Regulatory Commission Combined License Application
Docket No. 52-016

U.S. Army Corps of Engineers Permit Application
Permit Application No. NAB-2007-08123-M05(Calvert Cliffs 3 Nuclear Project, LLC/UniStar Nuclear Operating Services, LLC)

Calvert County, Maryland

October 2009

U.S. Nuclear Regulatory Commission
Rockville, Maryland

U.S. Army Corps of Engineers
Baltimore District

1.0 Introduction

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) and amendments of the Sustainable Fisheries Act of 1996 (Public Law 04-267)recognized that habitat is important for the protection of healthy fisheries and established procedures to identify, conserve, and enhance Essential Fish Habitat (EFH) for Federally managed species (NEFMC 1998). Essential fish habitat (EFH) is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (MSA § 3(10); NMFS 2004). Federal agencies must consult with the Secretary of Commerce on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (NMFS 2004).

The U.S. Nuclear Regulatory Commission (NRC) is reviewing an application from Calvert Cliffs 3 Nuclear Project, LLC and UniStar Nuclear Operating Services, LLC (Applicant or UniStar) for a combined license (COL) to construct and operate a new nuclear reactor on the site of the Calvert Cliffs nuclear Power Plant (CCNPP). The US Army Corps of Engineers (Corps) is reviewing an application from UniStar for a Department of the Army Permit pursuant to Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act (33 U.S.C. 1344) to perform site preparation activities and construct supporting facilities at the site of a proposed nominal 1,710 MW nuclear power generation station (Unit 3). The Corps will be cooperating with NRC to ensure that the information presented in the National Environmental Policy Act (NEPA) document is adequate to fulfill the requirements of Corps regulations, the Clean Water Act Section 404(b)(1) Guidelines which contains the substantive environmental criteria used by the Corps in evaluating discharges of dredged or fill material into waters of the U.S., and the Corps public interest review process. The Corps permit decision will be made following issuance of the final EIS.

Currently, there are two operating nuclear reactors on the Calvert Cliffs site, Units 1 and 2. The proposed Unit 3 would be located adjacent to existing Units 1 and 2. The site is located about 60 mi south of Baltimore and 40 mi southeast of Washington, D.C. (Figure 1). It is about 10.5 mi southeast of Prince Frederick, Maryland and 7.5 mi north of Solomons, Maryland.

This EFH assessment examines the potential impacts of the proposed actions on nine species that have EFH established within Chesapeake Bay, black sea bass (*Centropristis striata*), bluefish (*Pomatomus saltatrix*), butterfish (*Peprilus triacanthus*), clearnose skate (*Raja eglanteria*), little skate (*Leucoraja erinacea*), red drum (*Sciaenops ocellatus*), summer flounder (*Paralichthys dentatus*), windowpane flounder (*Scophthalmus aquosus*), and winter skate (*Leucoraja ocellata*). These species are discussed further in Section 6.

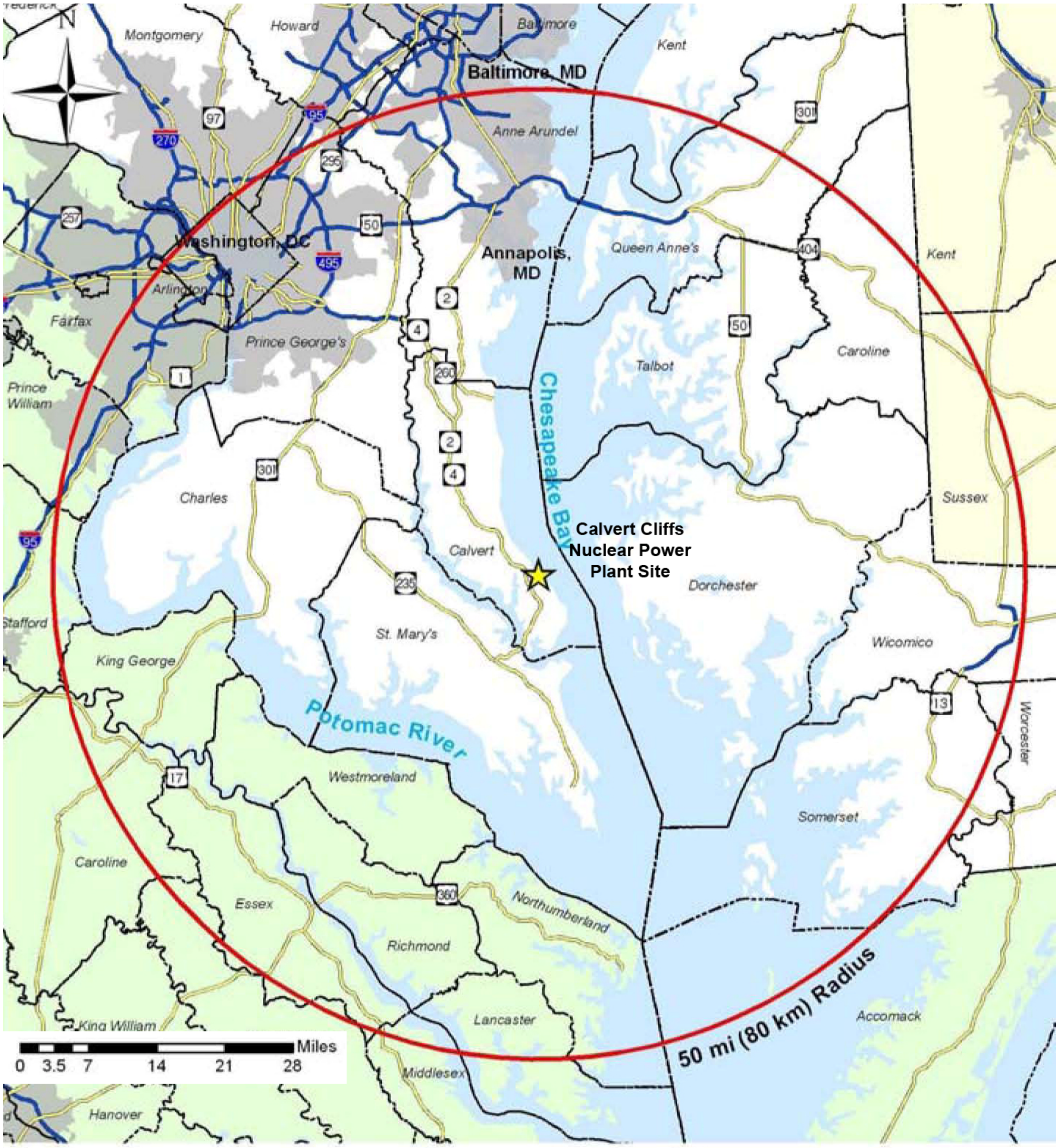

Figure 1. Location of the Calvert Cliffs Site , 80-km (50-mi) Region

2.0 Proposed Federal Actions

The proposed Federal actions are the issuance of a COL for the construction and operation of a new nuclear reactor at the Calvert Cliffs site pursuant to 10 CFR 50.52 and 10 CFR 50.23, and a Department of the Army permit pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899.

Prerequisites to construction activities include, but are not limited to, documentation of existing site conditions within the Calvert Cliffs site and acquisition of the necessary permits (e.g., COL, local building permits, a National Pollutant Discharge Elimination System permit |40 CFR Part 122|, a Clean Water Act (CWA) Section 404 permit, and a General Stormwater Permit). After these prerequisites are completed, planned construction activities could proceed and would include all or some of the activities pursuant to 10 CFR 50.10(e)(1). Following construction, planned operation of the new reactor(s) would proceed according to 10 CFR 50.57 (although no separate operating license would be required).

Briefly, the construction and operation activities that could affect Federally managed estuarine and marine species based on habitat affinities and life-history characteristics, and the nature and spatial and temporal considerations of the activity are:

Construction

- New and maintenance dredging and modification of the existing barge slip, including a sheet pile wall and a stone apron, on the Chesapeake Bay shoreline
- Installation of the cooling water intake system including new sheet pile, armor removal, armor installation, and dredging
- Installation of the cooling water discharge system including the fish return system
- Increased vessel traffic associated with the construction activities

Operation

- Impingement, entrainment, and entrapment associated with the cooling water intake system
- Discharge plume from the cooling water system (thermal, chemical, and physical effects)
- Maintenance of the fish-return system
- Maintenance dredging of barge slip

3.0 Environmental Setting

The Calvert Cliffs site is located on the Chesapeake Bay about 60 mi south of Baltimore, 40 mi southeast of Washington, D.C., 10.5 mi southeast of Prince Frederick, Maryland, and 7.5 mi north of Solomons, Maryland (Figure 1). The site comprises about 2070 acres adjacent to Chesapeake Bay in an unincorporated area of Calvert County, Maryland. The NRC has licensed two existing nuclear generating units at the Calvert Cliffs site, CCNPP Units 1 and 2, that have a combined net electric generating capacity of approximately 1685 megawatts-electric (MW[e]). Units 1 and 2 use once-through cooling systems and obtain water from the Chesapeake Bay. The combined flow of CCNPP Units 1 and 2 intakes is about 5332 cubic feet per second (cfs). There are two water intake structures for the existing units that share a common forebay, and each unit has its own fish return system. The two existing units also share a discharge pipe that enters the Chesapeake Bay north of the intake structure. South of the intake structure is a barge slip for offloading heavy replacement components. The barge slip has been used several times since 2001 to receive replacement steam generators, transformers, and vessel reactor heads, and it is likely that there would be occasional use of the facility in the future (UniStar 2009b). Both existing units would remain and continue to operate and are not affected by the proposed action. The project would impact about 5.7 ac of tidal open waters.

3.1 Chesapeake Bay Conditions

The Chesapeake Bay is one of the largest estuary systems in the world and currently supplies cooling water for CCNPP Units 1 and 2. The Bay is very productive and is an important part of the cultural and economic fabric of the area. Much of the Chesapeake Bay, including the reach that encompasses Calvert County, is considered impaired, primarily because of low dissolved oxygen (DO) and increased nutrients and sedimentation from human activities. The Chesapeake Bay Program (CBP) oversees monitoring at selected locations throughout the Bay and has developed average seasonal conditions from 1985 to 2008. One station, known as CB4.4, is in the middle of the Bay east of the Calvert Cliffs site. The average monthly surface water temperature at this location has ranged from about 38°F (February) to about 81°F (July, August; MDNR 2009a) |CC Website Record CB4.4 temperature record.pdf|. The average monthly surface water salinity at station CB4.4 is typically lowest in late spring, ranging from about 10 to 11 ppt (April through June), and highest in late fall, ranging from about 15 to 16 ppt (September through November; MDNR 2009b) |CC Website Record CB4.4 salinity record.pdf|. Average monthly DO concentrations at station CB4.4 have ranged from about 0.3–0.4 mg/L (July, August) to 9.0–10.0 mg/L (January through March; MDNR 2009c) |CC Website Record CB4.4 DO record.pdf|. Average June through September DO concentrations have been hypoxic (less than 2.0 mg/L; Wicks et al. 2007) Wicks 2007 |Wicks 2007 EcoCheck DO_newsletter.pdf|. The minimum DO concentrations during those months occasionally may be anoxic (less than 0.2 mg/L).

Sediments near the CCNPP barge dock area are comprised primarily of sand (94 to 96 percent) and gravel (2 to 5 percent) with a small percentage of clay (EA Engineering 2007) |24_Aquatic_Field_Studies_for_UniStar_Calvert_Cliffs_Expansio.pdf|. Total organic carbon (TOC) in the sediments ranged from about 2.4 to 3.1 percent. The sediment type sampled near the barge area was typical for the general region. The two stations located just north of the CCNPP site that have been sampled under the Maryland Department of Natural Resources (MDNR) water quality monitoring program are also very sandy with a very small silt/clay fraction (Llansó et al. 2007) |Llanso 07 CB benthos LTM report Vol 2.pdf|. However, the TOC content of the CCNPP sediments was much higher than that of the two MDNR stations (<1 percent each). Most metals, polynuclear aromatic hydrocarbon compounds, polychlorinated biphenyl congeners, pesticides, semi-volatile organic compounds and volatile organic compounds analyzed in the CCNPP sediments were reported as not detected (EA Engineering 2007). The few organic compounds that were detected in the sediments occurred at concentrations less than the respective method detection limits. Of the seven metal compounds analyzed, six occurred at levels greater than the method detection limits, but all were substantially less than their respective threshold effects levels (the concentration below which effects are expected to be rare) (Buchman 2008) |Buchman 2008 122_NEW-SQuiRTs.pdf|.

The benthic infaunal community found near the barge dock was generally sparse and comprised of relatively few taxa. Infaunal abundance varied from 32 to 85 individuals per 0.05 m^2 samples (about 640 to 1700 individuals per m^2) (EA Engineering 2007). These samples contained from 9 to 13 species. The abundances of infauna inhabiting the CCNPP sediments were generally similar to those reported for the two MDNR stations sampled in the summer 2006 (Llansó et al. 2007). However, species numbers at the CCNPP stations were slightly greater than those for the MDNR stations. The infaunal community at the two CCNPP stations near the site of the proposed cooling water discharge pipe primarily was comprised of the small clam *Gemma gemma* and polychaete worms, such as *Streblospio benedicti* and *Glycinde solitaria*. The small clam was not found at the station south of the barge dock near the area proposed to be dredged. The infaunal community there consisted predominantly of polychaete worms, such as *S. benedicti*. The general infaunal community composition at the Calvert Cliffs site was similar to those at the two MDNR stations. *Gemma gemma* was predominant at both MDNR stations in summer 2006. Polychaete worms, such as *S. benedicti*, were common. Another small clam, *Mulinia lateralis*, was common at the MDNR stations.

4.0 Plant and Cooling Water Systems Description

4.1 CCNPP Unit 3

The construction footprint for the Unit 3 would cover about 460 ac, including about 175 ac of previously disturbed ground (Figure 2). UniStar has proposed to build and operate an AREVA U.S. EPR design PWR steam electric system. This four-loop PWR is rated at 4590 MW(t) with a net of 1562 MW(e). Unit 3 would have separate facilities, including the protected area and plant access road. The proposed circulating water supply system (CWS) would be closed-cycle using a hybrid cooling tower with plume abatement (UniStar 2008a) |ER Rev. 5, p. 3.0-25|.

The existing transmission system for CCNPP Units 1 and 2, which consists of two circuits, would also be used to service Unit 3. No new transmission corridors will be constructed outside the construction footprint. Operation of the transmission system is not expected to affect Federally managed estuarine or marine species in the Chesapeake Bay.

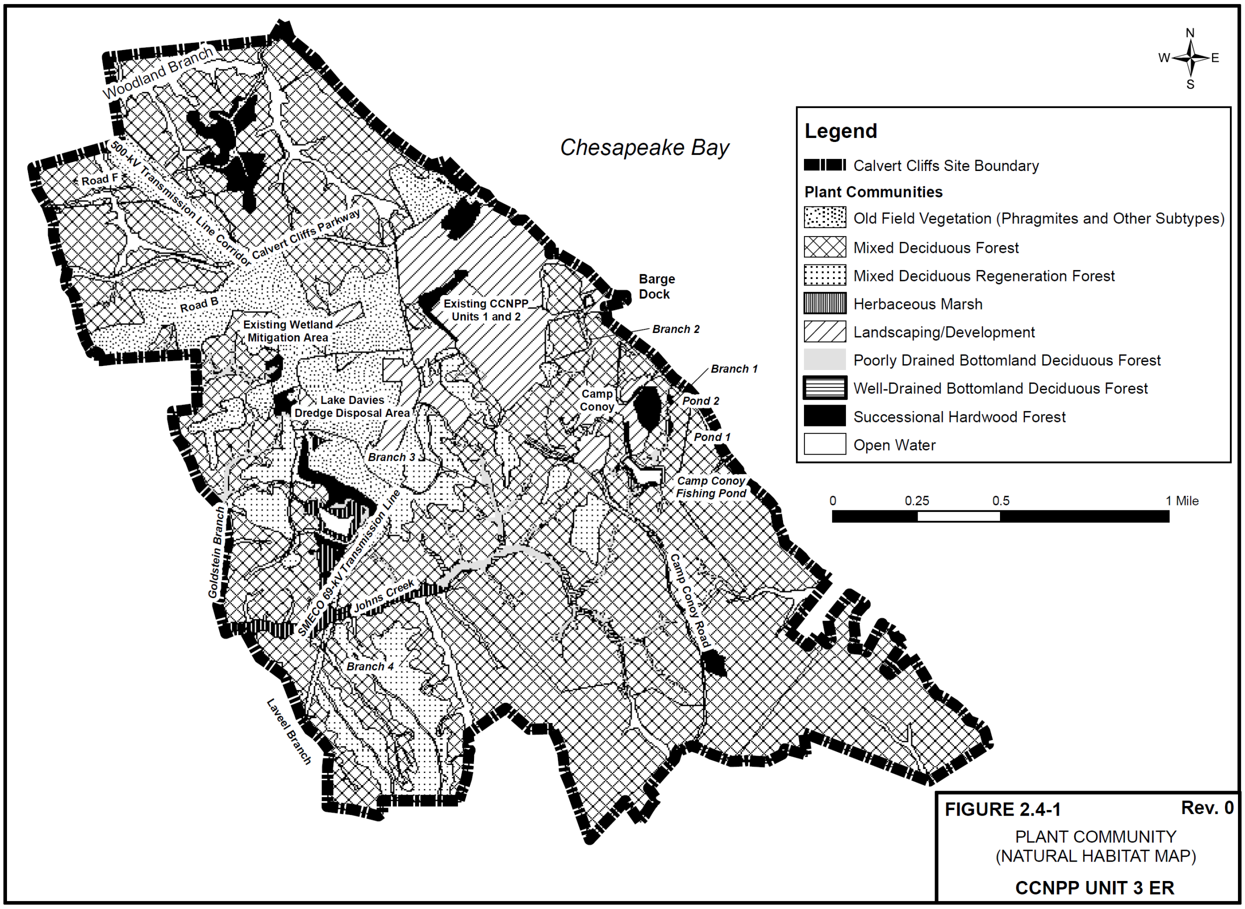

Figure 2. Watersheds and Unit 3 Location at the Calvert Cliffs Site (UniStar 2009b, Fig 2.4-1)

4.2 Cooling Water Intake System

A 180-ft-long sheet-pile wall, embedded 15 ft into the bay bottom, would be built to extend from the existing baffle wall for CCNPP Units 1 and 2 to the shoreline south of the present intake forebay to create a 9000-ft^2 (0.21-ac) wedge-shaped area that would be the intake embayment for the new unit (Figure 3) (UniStar 2008c) |Sep_29_Response_Aquatic_ML082760508.pdf|. The wall would be built of steel sheet piling supported by 30-in.-diameter soldier piles placed on 10-ft centers. The new baffle wall would not have an opening that would allow the new embayment to communicate directly with the bay. A 50-ft section of shoreline armoring would be removed prior to the wall installation. The construction of the sheet-pile wall would take about two months. Once the wall is in place, about 60 ft of shoreline armor within the wedge-shape embayment would be removed and a temporary sheet-pile wall would be installed upland along the intake water pipe route. The upland sheet-pile wall would extend about 30 ft into the wedge-shaped embayment to create a small area that would be dewatered to facilitate dredging of a 30 ft × 30 ft area to a depth of 25 ft. This excavation would house two 60-in.-diameter intake pipes with trash racks at their openings. The trash bar spacing would be 3.5 in. from center to center. Debris collected by the trash racks would be collected in a debris basin for cleanout and disposal as solid waste. The intake piping would be oriented perpendicular to the tidal flow of the bay to minimize the component of the tidal flow parallel to the intake-area flow, reducing the potential of fish entering the common CWS/ultimate heat sink (UHS) forebay for Unit 3. The flow velocity into the existing intake area from the bay is less than 0.5 fps. About 80 ft of the shoreline within the pool would be armored, with the armoring extending about 10 ft from shore. The new sheet-pile wall would be armored by placing riprap on the bay bottom extending about 75 ft from the shoreline and about 25 to 95 ft toward the channel (UniStar 2009d) |Intake_Structure_with_Figs_ML0921200610.pdf|. The armoring would be added to the bay bottom as a series of four overlying layers ranging from washed gravel on the bottom to large quarry rock (average about 2 tons each rock) on the top (UniStar 2009d) |Intake_Structure_with_Figs_ML0921200610.pdf|. The overall thickness of the armoring would vary according to the water depth. About 4652 ft^2 (0.11 ac) of the bay bottom would be armored (Figure 3). The temporary sheet-pile wall within the wedge-shaped embayment would be removed. The construction of the intake system would take about four months.

The two intake pipes would placed in trenches dug on land and would extend about 500 ft south to the location of common forebay for the Unit 3 CWS and UHS makeup water intake structures (UniStar 2009a) |2009.01.14_Intake_Relocation_ML090220368.pdf|. The common CWS/UHS forebay would be 100 ft long and 80 ft wide and would be about 12 ft deep (UniStar 2009a) |2009.01.14_Intake_Relocation_ML090220368.pdf, Page 18 of 71|. The Unit 3 CWS makeup water intake structure would be a concrete structure about 78 ft long and 55 ft wide with individual pump bays. Three 50% capacity, vertical, wet-pit CWS makeup pumps would provide up to 44,000 gpm of makeup water. The Unit 3 UHS makeup water intake structure would be a concrete structure about 75 ft long and 60 ft wide with individual pump bays. Four 100% capacity, vertical, wet-pit UHS water makeup pumps would provide up to 3,000 gpm of makeup water. Flow velocities at the CWS and UHS makeup structures would be less than 0.3 fps and less than 0.1 fps, respectively.

For the CWS makeup water intake structure, water would flow from the large common CWS/UHS forebay through two traveling screens and trash racks into a smaller forebay that feeds the three CWS makeup pumps. The traveling screens for each system would be dual-flow screens with a double entry-center exit flow pattern. The screen panels would be metallic or plastic mesh with a mesh size of 3/8 in. or smaller (UniStar 2009b) |2009.03.06_RAI_Response_writing_session_holes_ML0907101463.pdf|. The screens would be mechanically rotated above the water for cleaning with a pressurized water spray. Screen wash water would be supplied by two screen wash pumps. Through-screen flow velocities would be less than 0.5 fps. For the UHS makeup intake structure, water flows from the large common CWS/UHS forebay directly to each makeup pump after passing through a dual flow screen. The screens for the UHS pumps would not be equipped with a fish-return system (UniStar 2009c) |NRC_Letter_RE_Calvert_Cliffs ML092150721.pdf|.

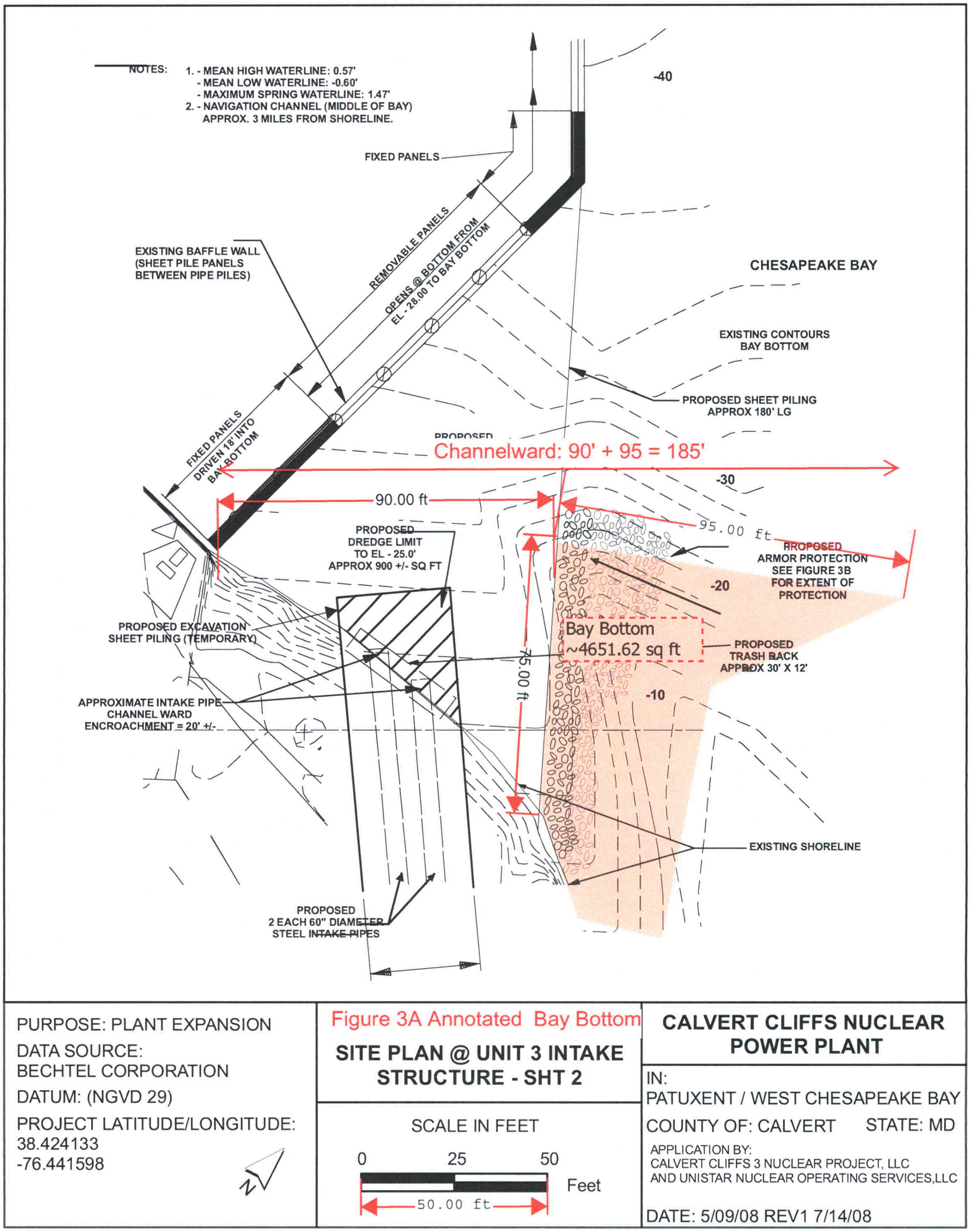

Figure 3. Site Plan at the Unit 3 Intake Structure (Source: UniStar 2009d)

4.3 Fish-Return System

A fish-return system that is similar to those for CCNPP Units 1 and 2 would be built (UniStar 2008c) |Sep_29_Response_Aquatic_ML082760508.pdf| for the CWS pumps. The final design details have not been determined. Organisms would enter the return system at the intake screens for the CWS intake structure located at the large common CWS/UHS forebay after the organisms traveled through the pipe originating at the shoreline intake about 500 ft north of the forebay. The UHS pumps would not be connected to the fish-return system because the UHS make-up system only operates periodically or in the case of a design-based accident (UniStar 2009c) |NRC_Letter_RE_Calvert_Cliffs ML092150721.pdf|. The return system would be located on the east (Bay) side of the Unit 3 intake forebay about midway between the CCNPP Units 1 and 2 intake forebay and the existing barge dock. The proposed 18-in.-diameter high density polyethylene fish-return outfall pipe would extend about 40 ft into the bay with end of the pipe emerging from the bay floor, but remaining below mean lower low tide level (UniStar 2008a) |ER Rev 5 p. 5.0-28|. This design was chosen to minimize any drop at the exit point to facilitate the returning of the fish to the Chesapeake Bay (UniStar 2008a) |ER Rev 5 p. 5.0-28|. Any bends in the pipes would be >90° to facilitate fish passage. The pipes would be smooth walled and smooth jointed to reduce potential fish abrasion (UniStar 2009b) |2009.03.06_RAI_Response_writing_session_holes_ML0907101463.pdf|. About 40 linear feet of shoreline armoring would be removed to allow installation of the return pipe. A 6-ft-deep trench extending 40 ft from shore would be dredged to house the return pipe. The trench would be about 5 ft wide at the bottom and about 65 ft wide at the level of the bay floor (UniStar 2008c) |Sep_29_Response_Aquatic_ML082760508.pdf| (Figure 4). An area of about 2600 ft^2 would be directly disturbed by the dredging. After the return pipe is placed in the trench, the trench would be back filled with the dredged sand and stone material. A 10-ft × 10-ft section of the bay bottom would be covered to a depth of 2 ft by a riprap apron. The shoreline armoring would be replaced. The existing fish return system for CCNPP Units 1 and 2 would not be modified.

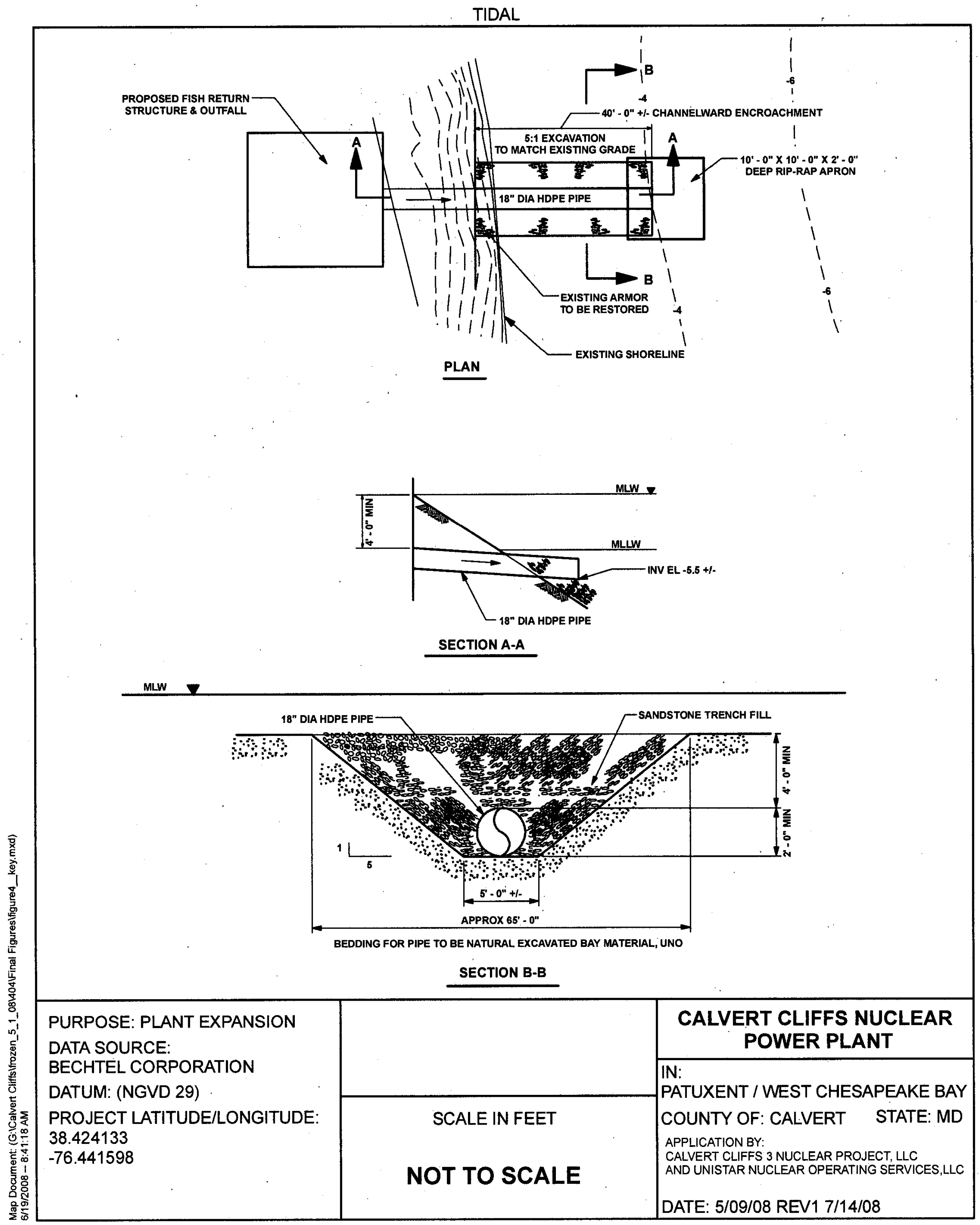

Figure 4. Fish-return System for the Unit 3 Intake Structure (Source: UniStar 2008c ML082760508)

4.4 Cooling Water Discharge Structure

The 30-in.-diameter high-density polyethylene cooling water discharge pipe would be placed in a 550-ft-long trench dredged in a trapezoidal form at a 5:1 side slope to prevent sloughing of the trench sides (UniStar 2008c) |Sep_29_Response_Aquatic_ML082760508.pdf|. The trench bottom would range from 3 to 6 ft wide and the maximum width of the trench at the level of the bay bottom would be about 70 ft. The discharge point would be elevated 3 ft above the bay bottom (Figure 5). A minimum area of about 38,500 ft^2 (0.88 ac) of bay bottom would be directly disturbed by the pipeline installation. About 7,000 yd^3 of material would be dredged for the pipe installation. About 5,800 yd^3 of this material would be reused as trench fill with the remainder (about 1,200 yd^3) being deposited at an existing upland (non-wetland), environmentally controlled disposal area at the Lake Davies laydown area on the site. Riprap with a median diameter of 12 in. and filter fabric would be placed on top of the back-filled material to provide a minimum 4 ft cover over the pipe. The riprap would be placed within discharge pipe trench to the top of the trench at the original grade of the bay bottom, but would not extend above the existing bay bottom. A 2-ft-deep riprap area would be placed to extend approximately 10 ft on each side of the 40-ft-long multiport diffuser. The area of bay bottom covered by this riprap is about 800 ft^2.

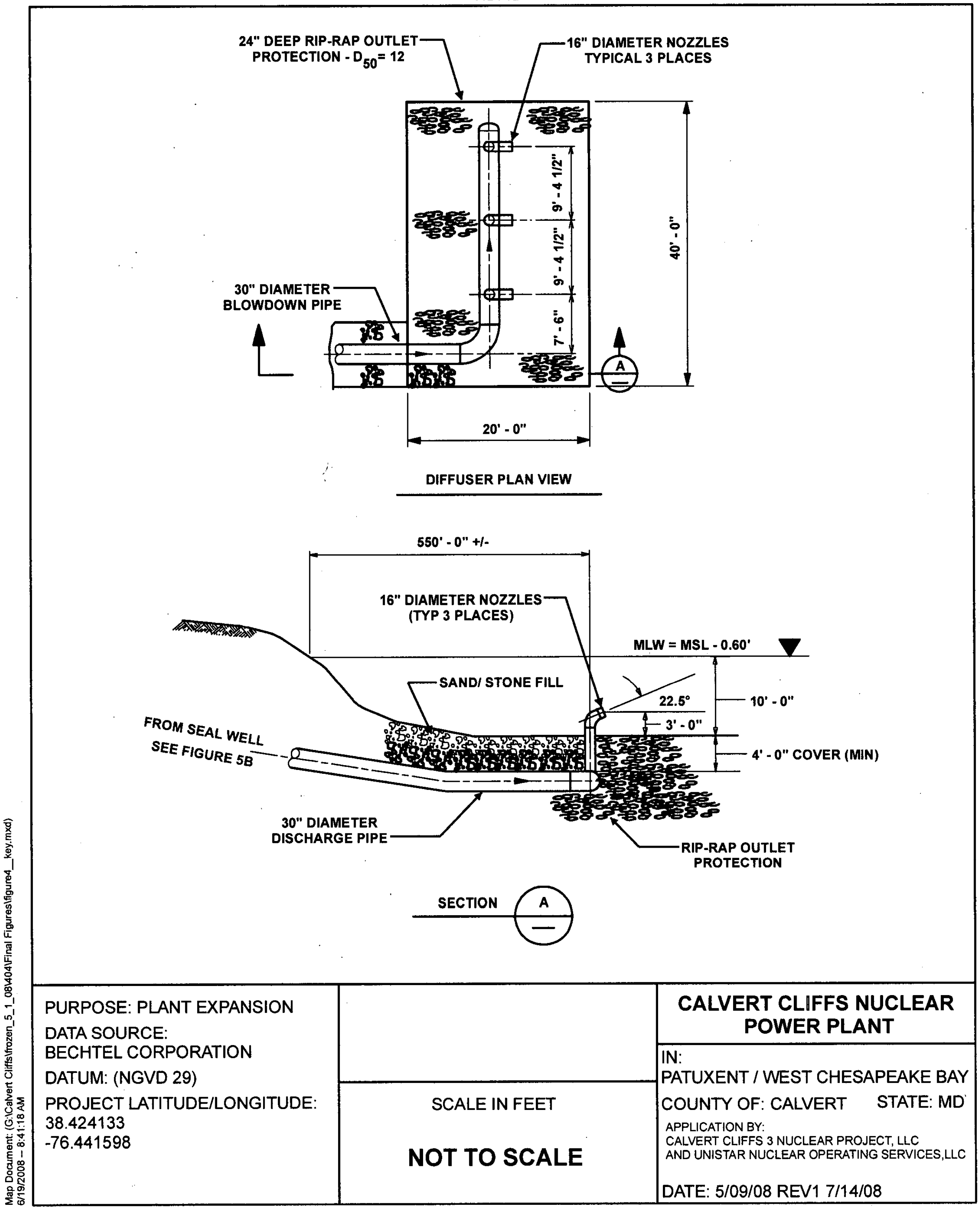

Figure 5. Details of the Unit 3 Cooling Water Discharge Outfall (Source: UniStar 2008c ML082760508)

4.5 Barge Dock Improvements

The existing barge slip for CCNPP Units 1 and 2 would be restored and extended to re-establish use during the construction of Unit 3. An area about 1500 ft long by 130 ft wide (average width), covering about 195,000 ft^2 (4.5 ac) of bay bottom would be dredged to a bottom depth of −16 ft mean low water (UniStar 2008c)|Sep_29_Response_Aquatic_ML082760508.pdf|. This would require the mechanical dredging of about 50,000 yd^3 of bottom substrates. UniStar considers the removal of sediment from about 1065 ft of the total length, about 45,000 yd^3, as maintenance dredging, with the removal of material from the remaining 435 ft, about 5000 yd^3, as new dredging beyond the original dredging limits of −16 ft mean low water. This extension is necessary to extend the proposed channel to tie into the same depth as the existing natural depth contour. Prior to dredging, two existing crane piles and one mooring bollard may be removed from the channel area (UniStar 2008c) |Sep_29_Response_Aquatic_ML082760508.pdf, Figure 6A| (Figures 6 and 7). Additional maintenance dredging would remove silt that has accumulated in the shoreward portion of the barge dock area during the past 30 years altering the normal flow pattern from an existing culvert outfall. The area would be restored by installing a 12 ft × 90 ft concrete apron and a 90-ft-wide sheet-pile wall at the beach end of the area, and building a 40-ft long × 40-ft wide × 2-ft deep riprap apron that would extend about 40 ft into the bay covering about 1600 ft^2 (0.04 ac). The sheet-pile wall would be constructed of steel sheet piling supported by 30-in.-diameter soldier piles. The restoration would allow the discharge from the culvert outfall to flow directly in the bay. The restoration is expected to take about two weeks.

Once the barge dock area has been refurbished, it would be used by barges that may be as large as 200 ft long and 50 ft wide. More typically the barges used are about 35 ft wide. Barge drafts range from 2 ft to 11 ft, depending on the load. UniStar expects that the barge dock would be in use for about five years during the construction, but stated that although there are no specific plans for maintenance dredging, eventual replacement of major components could require dredging in the future. UniStar has requested permission from the Corps to conduct maintenance dredging for 10 years (USACE 2008) |2008.09.03_USACE CCNPP3 Notice_ML082550288.pdf|. The dredged material removed from the barge slip would be used during the plant construction as sand bedding for underground pipe installation or deposited at Lake Davies, an existing upland (non-wetland) environmentally controlled disposal area on site that was also used for previous dredge disposal. The dredged material would be characterized prior to use or disposal.

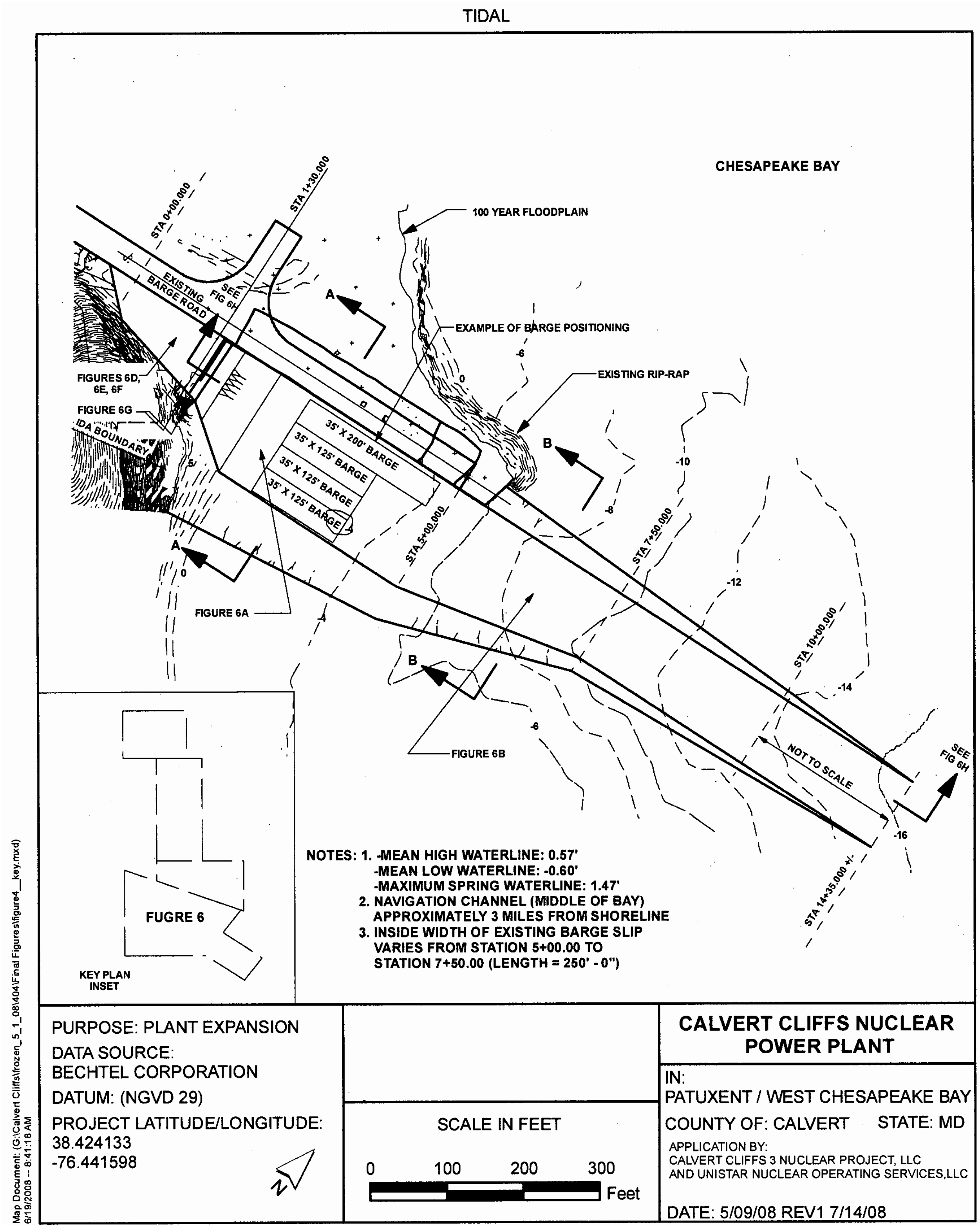

Figure 6. Proposed Restoration of Barge Slip (with existing contours) for the Construction of Unit 3 (Source: UniStar 2008c ML082760508)

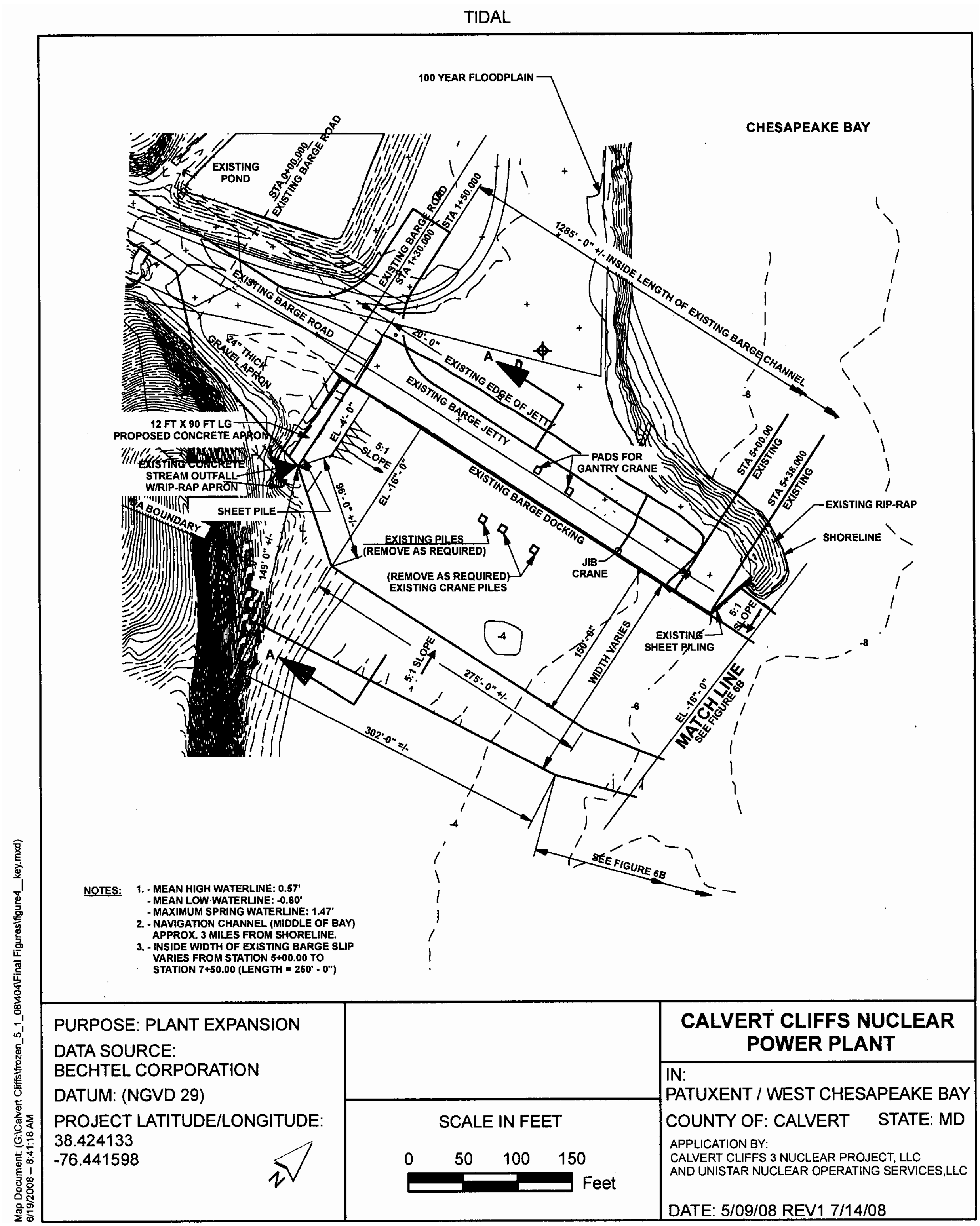

Figure 7. Proposed Modifications at the Existing Barge Unloading Facility for the Construction of Unit 3 (Source: UniStar 2008c ML082760508)

5.0 Potential Impact of Plant Construction and Operation on Biota and Habitat

This section describes the potential impacts from the construction and operation of the Unit 3 to Federally managed estuarine and marine species and their habitats in Chesapeake Bay.

5.1 Construction

Impacts to the EFH in Chesapeake Bay from construction of Unit 3 would be associated mainly with the construction of new water intake and discharge systems, construction of a new fish-return system, and the refurbishing of the existing barge dock area including dredging in Chesapeake Bay. These activities would result in temporary and permanent loss or conversion of aquatic habitat in the Chesapeake Bay.

The major construction events associated with building Unit 3 that would affect EFH in the Chesapeake Bay share certain construction activities, such as dredging, pile driving, and armoring. All work would be conducted in accordance with Federal, State, and local permits that would be obtained by the applicant. EFH in Chesapeake Bay likely would not be adversely affected by the installation of new transmission facilities for the Unit 3 because the facilities would be built on the uplands part of the Calvert Cliffs site.

The total proposed project would permanently impact about 248,000 ft^2 (5.7 ac) of tidal open waters. About 138,500 ft^2 (3.2 ac) of the tidal open water impacts would be from maintenance dredging and about 109,000 ft^2 (2.5 ac) would be new dredging. About 52,500 ft^2 (1.2 ac) of the new dredging would be backfilled).

5.1.1 Dredging and Pipeline Trenching

Dredging of the bay bottom would be done on the south side of the existing CCNPP Units 1 and 2 barge dock by using a shore-based clamshell dredge. Dredging or pipeline trenching constitutes a major, localized impact to the benthos. An area of at least 195,000 ft^2 (4.5 ac) of bay bottom would be affected during the barge dock channel dredging. In addition to the physical removal of bay bottom, dredging increases the suspended sediment load in the water column. The surficial sediments in the area that would be dredged are primarily sandy (Section 3.0) and likely would settle out of the water column relatively quickly. However, the nature of the deeper sediment layers is not known but may consist of hard-packed clay such as that uncovered by the scouring of the bottom near the cooling water discharge for CCNPP Units 1 and 2 (UniStar 2008a) |ER Rev 5, p. 5.0-38|. Suspended sediment may affect fish by clogging the gills and altering the feeding behavior of visual predators, and may affect filter-feeding invertebrates and fish. The resuspension of contaminants would not be a concern for the proposed dredging or trenching because the contaminant loads in the sediments in the barge dock area recently were shown to be very low (EA Engineering 2007) |24_Aquatic_Field_Studies_for_UniStar_Calvert_Cliffs_Expansio.pdf|.

The trench for the cooling water discharge pipeline would be dug by using a barge-mounted clamshell dredge. The minimum area of bay bottom that would be disturbed by this dredging is at least 38,500 ft^2 (0.88 ac). Additional bay bottom next to the trench is likely to be disturbed by the placement of the dredged material for later use in the backfilling of the trench. The backfilling method was not specified, but presuming that the barge-mounted clam dredge would be used, it is likely that some of the native bay-bottom sediment would be removed during the process. Thus, the area of disturbance to the benthos would likely be larger than the specified dimensions of the trench, although the extent is not known. The trenching and backfilling would also cause some sediment to become suspended in the water column. Other potential impacts associated with the discharge pipeline are from armoring that would be placed near the diffuser and the use of vessels to move the dredge barge.

Installation of the Unit 3 intake pipes would involve dredging about 900 ft^2 (0.02 ac) of bottom within the new wedge-shaped intake embayment. Effects of this dredging on water column EFH would be minimized by construction of a sheet-pile cofferdam and dewatering system.

The benthic infauna community in the areas proposed for dredging or trenching for the construction of Unit 3 is very similar to the community elsewhere in the region and also to the community type that has been in the area for many years. The community is moderately degraded to degraded (EA Engineering 2007). Although this community probably provides some forage for fish, the area is not one of high benthic productivity.

5.1.2 Pile Driving

Pile driving would be used in three project areas, all involving the installation of the sheet-pile walls. A vibratory hammer would be used to install the sheet piling and a conventional pile-driving hammer to install the 30-in. soldier piles that would be placed on 10-ft centers to support the sheet piling. The principal impact would be the generation of noise at levels that may be harmful to fish.

Pile driving noise may affect fish and turtles by causing temporary hearing loss, auditory tissue damage (generally sensory hair cells of the ear), and non-auditory tissue damage (UniStar 2008c) |Sep_29_Response_Aquatic_ML082760508.pdf|. Two criteria, both measured at a standard distance of 10 m (32.8 ft) from the pile-driving activity, are used to estimate the sound and vibration levels from pile driving that would injure fish. The peak sound-pressure level (peak pressure or peak), measured as decibels (dB) relative to reference level of one micro Pascal (dB re 1 μPa_{peak}), is maximum excursion of pressure associated with the sound (Popper et al. 2006) |Popper 2006 BA_PileDrivingInterimCriteria.pdf|. Peak pressure determines the likelihood that the swim bladder and ear would be exposed to extreme mechanical stress (Popper et al. 2006). The sound exposure level (SEL), measured as dB re 1 μPa2•s, is the constant sound level of one-second duration that would contain the same acoustic energy as the original sound.

The interim criteria (Popper et al. 2006) specified a peak level of 206 dB and a cumulative SEL level of 187 dB for fish weighing 2 gm and heavier, or a cumulative SEL of 183 dB for fish lighter than 2 gm. The noise levels for the pile driving conducted during the Unit 3 construction were estimated by applying compilations of measurements of noise and vibration impacts associated with various methods of pile driving, types of materials, and water depth. The estimated peak and cumulative SEL values for driving 24- to 36-in. steel piles with a conventional pile-driving hammer in about 5-m water depth are about 203 to 208 dB and 177 to 180 dB, respectively. These values suggest that driving 30-in. steel piles with conventional hammers at the Calvert Cliffs site may produce sound impacts that approach or exceed the peak pressure guidance criterion of 206 dB but would not likely exceed the minimum SEL criterion of 183 dB for fish lighter than 2 gm. Sheet-pile driving produces peak pressures ranging from 175 dB to 180 dB and cumulative SEL values ranging from 160 dB to 165 dB, which are below the respective interim criteria values (UniStar 2008c) |Sep_29_Response_Aquatic_ML082760508.pdf|. Noise from pile driving would most likely affect small EFH species or those with small lifestages (e.g., butterfish, black sea bass) in the area. Prey of some species also could be affected (e.g., bluefish, red drum).

5.1.3 Armoring

The benthic substrate near key underwater structures in the project area would be armored by importing rocks. The largest area, about 4652 ft^2 (0.11 ac), that would receive rock armor is next to the new sheet pile wall that would be installed to create the intake embayment for Unit 3. The armoring in the area next to the baffle wall would be added to the bay bottom as a series of four overlying layers ranging from washed gravel on the bottom to large quarry rock (average about 2 tons each rock) on the top (UniStar 2009d) |Intake_Structure_with_Figs_ML0921200610.pdf|. The overall thickness of the armoring would vary according to the water depth. Armor would also be added to the bay bottom at the end of the fish-return system, the cooling water discharge diffuser, and the nearshore are of the barge dock. Although some sediment suspension would occur during installation of the rock armor, the major effect would be the conversion of the benthic habitat from a soft-bottom infaunal community to a hard-bottom epifaunal community, which eventually should colonize the rocks. The epifaunal community that eventually colonizes the rock armor probably would include oysters, barnacles, mussels, and sea anemones, all of which colonized new hard-bottom habitat near the CCNPP Units 1 and 2 discharge diffuser (Abbe 1987) |Note: the Abbe article is in this pdf file—Sellner Olson 1987 Plankton Entrainment Abbe thermal discharge from Heck 1987.pdf; the Abbe article is Chapter 9 *in*: Heck 1987 title page and intro of CCNPP book.pdf|. The loss of soft-bottom habitat would likely reduce the potential forage area for some benthic-feeding EFH fish species (e.g., summer flounder, winter flounder, skates). However, the area is not one of high benthic productivity and the area that would be lost is relatively small.

5.1.4 Vessel Movements

Vessel use during the dredging or the installation of the in-water structures for Unit 3 would affect the aquatic resources of the area, particularly the benthos. The main effects from using vessels would include turbulence from propellers (prop wash), anchor cable scraping across the bay bottom, and accidental spill of materials overboard. Vessels would be used during the installation of the cooling water discharge pipeline, during the offloading of materials from barges, and probably during the installation of the sheet pile wall at the new intake area. The primary occurrence of vessels would be during the operation of the barge dock, which is expected to last about five years. The proposed barge docking procedures would minimize the potential impacts from prop wash (UniStar 2008c) |Sep_29_Response_Aquatic_ML082760508.pdf|. Vessel operation during construction would cause short-term, localized impacts to EFH at the Calvert Cliffs site. These impacts should not affect the general resources in the area of the site or the region along this coast of the Chesapeake Bay.

5.2 Operation

For EFH in Chesapeake Bay, the primary concerns related to water intake and consumption are those related to the relative amount of water drawn from the cooling water source, the Chesapeake Bay, and the potential for organisms to be entrained into the cooling water system or impinged on the intake screens. Entrainment and impingement have the potential to affect EFH species indirectly by reducing key food-chain organisms or directly by entrainment or impingement of the EFH species themselves.

The intake system design for the Unit 3 includes a fish-return system located at the screens in the proposed large common CWS/UHS forebay, not at the intake pipe openings in the expanded embayment. The fish-return system may help increase survival following impingement by returning fish and crabs beneath the surface of the bay.

UniStar stated that a closed-cycle, recirculating, wet cooling system with a cooling tower would be used for the Unit 3 (UniStar 2008a) |ER Rev 5, p. 3.0-25|. The intake system for Unit 3 would incorporate fish and invertebrate protection measures that may reduce entrainment and impingement. The estimated maximum intake volume of 47,383 gpm for the Unit 3 would not exceed the EPA one-percent water column criterion (UniStar 2008a) |ER Rev 5, p. 5.0-31|. Unit 3 would have a fish-return system similar to that used at existing CCNPP Units 1 and 2. Moreover, the through-screen flow velocity would be less than 0.5 ft/sec (0.15 m/sec) under the worst case scenario of minimum Chesapeake Bay level with highest makeup demand flow (UniStar 2008a) |ER Rev 5, p. 5.0-31|. The projected intake flow for Unit 3 is about 96.8 cfs, which is considerably less than the combined flow of CCNPP Units 1 and 2 of 5332 cfs. Because the projected intake flow volume for the Unit 3 is about 1.82 percent of that at CCNPP Units 1 and 2, and assuming that the relationship between flows is linear, the projected entrainment and impingement rates at Unit 3 are projected to be correspondingly small.

5.2.1 Entrainment

The EFH species listed do not feed directly on plankton, but some are predators that consume planktivorous fish. The potential impact of Unit 3 from the entrainment of organisms within the cooling water system was evaluated by using historical (1974–1980) data collected at CCNPP Units 1 and 2. Sellner and Kachur (1987) |Sellner Olson 1987 Plankton Entrainment Abbe thermal discharge from Heck 1987.pdf| determined that entrainment within the cooling water system of CCNPP Units 1 and 2 significantly reduced phytoplankton density in the discharge stream and changed phytoplankton metabolism such that carbon fixation was reduced. Importantly, however, they determined that these changes had no discernable effect on the phytoplankton densities or metabolism in the Chesapeake Bay waters near the Calvert Cliffs site. Olson (1987) |Sellner Olson 1987 Plankton Entrainment Abbe thermal discharge from Heck 1987.pdf| found that zooplankton densities were less at the discharge point than they were at the intake point, which suggests that entrainment causes some zooplankton cropping. Olson also indicated that survival after entrainment is typically very high and that no important changes in the zooplankton community could be detected.

The potential for direct effects on EFH species can be evaluated by considering information from the ichthyoplankton entrainment sampling that was conducted at the intake system of CCNPP Units 1 and 2 from March 2006 through September 2007 (UniStar 2008d) |Attachment 2 *in* RAI Responses 11_07_08 ML0831106780 Attachment 2.pdf|. Additional ichthyoplankton samples were collected just outside the existing baffle wall separating the intake area from the open waters of the bay from April to December 2006, which allowed comparison of entrained organisms with natural populations in the bay.

The total ichthyoplankton entrainment from March 2006 to September 2007, estimated at the maximum design flow for the intake systems of CCNPP Units 1 and 2, was at least 11.9 billion organisms, including fish fertilized eggs, larvae, juveniles, and adults (UniStar 2008d) |RAI Responses 11_07_08 ML0831106780 Attachment 2.pdf|. This value is a minimum estimate of the total potential entrainment because daytime samples were not collected in March 2006, October through December 2006, and January through March 2007.

Most of the entrainment during the study occurred from May to September. The bay anchovy (*Anchoa mitchilli*), a key prey item for some EFH species, was the predominant taxon entrained, accounting for about 75 percent and 69 percent of the total organisms estimated as entrained during 2006 and 2007, respectively. About 5.7 million adult bay anchovies were estimated to be entrained at the maximum design flow rate for CCNPP Units 1 and 2. Sciaenid eggs, Atlantic menhaden (*Brevoortia tyrannus*), and naked gobies (*Gobiosoma bosc*) accounted for about 18.5, 3.3, and 1.5 percent of the entrained organisms, respectively. Hogchoker eggs (*Trinectes maculatus*), sciaenid eggs, and Atlantic menhaden (another prey species for some EFH taxa) accounted for about 14.1, 6.0, and 4.9 percent of the organisms estimated entrained in 2007, respectively. Bay anchovy, sciaenid eggs, Atlantic menhaden, and naked gobies were the predominant fish collected just outside the intake system baffle wall, although the proportional contribution of each varied somewhat (UniStar 2008d). Comparisons of the intake and baffle-wall samples showed that most taxa entrained at rates relative to their occurrence in the bay waters. However, juvenile bay anchovies, American eel juveniles, Atlantic menhaden, and sciaenid eggs were more abundant at the intake than they were at the baffle wall.

The April through September data for each year were used to estimate the potential entrainment by the Unit 3 intake system because only those months had samples collected during the day and night. The estimate also considered that the projected intake flow volume for the Unit 3 would be about 1.82 percent of that at CCNPP Units 1 and 2 and assumed that the relationship between flows is linear. The projected April through September ichthyoplankton entrainment by the intake system for the Unit 3 would range from about 83 million to about 132 million organisms. The projected combined April through September ichthyoplankton entrainment for all three units during those months would range from about 4.6 billion to 7.4 billion organisms. The projected annual entrainment would not be much greater than these estimates because entrainment from April through September is much greater than it is during the rest of the year.

5.2.2 Impingement and Entrapment

Impingement sampling was conducted at CCNPP Units 1 and 2 from 1975 through 1995 (Ringger 2000) |Ringer 00 impingement at CCNPP 1975-1995.pdf|. Peak fish impingement occurred during the spring and summer. Blue crab (*Callinectes sapidus*), a potential prey for some EFH species, impingement was greatest in spring, summer, or fall. There did not to appear to be annual trends, except that impingement generally appeared to be less after 1986 than it was before. The most commonly impinged fish during the 21-year period were bay anchovy, hogchoker, spot (*Leiostomus xanthurus*), and Atlantic menhaden. Blue crab impingement, as that for fish, generally was lower after the mid 1980s than before. The apparent difference in impingement rates before and after the mid-1980s may be related to several operational and structural modifications to the intake and fish-return systems that were made from about 1984 to 1986, partly in response to severe impingement events that occurred in 1983 (Ringger 2000).

The average annual fish and blue crab impingement rates predicted for Unit 3 are 23,683 fish and 11,403 crabs. These resulted in estimated average annual impingement mortality rates at Unit 3 of 6327 fish and 62 crabs. The impingement mortality estimate for fish and crabs probably is somewhat conservative because the entire 21-yr data set was used for the calculations regardless of apparently reduced impingement after modifications made in the mid 1980s. Also, the Unit 3 intake approach velocities within the forebay would be less than 0.5 ft/sec (0.15 m/sec), which would allow more crabs to avoid impingement.

Special Condition N of the NPDES permit for CCNPP Units 1 and 2 requires notification within 24 hours of any impingement on the water intake apparatus of aquatic organisms substantial enough to cause modification to plant operations (UniStar 2008a) |ER Rev 5. P. 6-53|. Significant fish kills involving cownose rays (*Rhinoptera bonasus*) that were impinged on the trash racks of Units 1 and 2 were reported in the summer 2005 (80 to 100 rays) and 2006 (50 to 200 rays) (NRC 2008) |Calvert Cliff Impingement incidents.doc|. Low dissolved oxygen levels in the bay water might have contributed to the impingement mortality.

Water from the wedge-shaped intake embayment would enter a large common CWS/UHS forebay that would supply water to the CWS and UHS (Section 4.2). Because traveling screens and the fish-return system would be located off the common CWS/UHS forebay, organisms able to pass through the 3.5-in. spacing between the bars comprising the trash racks covering the intake pipe openings would enter the common CWS/UHS forebay and could become trapped there. Organisms that would be pulled from the common CWS/UHS forebay into the CWS pumps would enter the fish return system for passage to the Bay. Those entering the UHS pumps during its periodic operation would be lost because that system would not be connected to a fish-return system. The common CWS/UHS forebay would hold a large volume of water and it is likely that some organisms entering the forebay could become trapped within it. Through-pump velocities would be small and all organisms would not be pulled into the pump system. There would be no mechanism to remove entrapped organisms from the common CWS/UHS forebay other than the fish-return system associated with the CWS pumps (UniStar 2009c) |NRC_Letter_RE_Calvert_Cliffs July 24 2009 ML092150721.pdf|. It is not possible to accurately estimate the numbers of the individuals that would be entrapped. The species most likely to become entrapped would be those that were impinged by the traveling screens at

CCNPP Units 1 and 2 and those whose early life stages were among the more commonly entrained organisms during the studies conducted at Units 1 and 2 (Section 5.2.1).

5.2.3 Aquatic Thermal Impacts

The effluent discharge from Unit 3 would be directly into the Chesapeake Bay. CORMIX modeling showed that the expected discharge plume from Unit 3 would be small and would not interact with the plume from Units 1 and 2. Abbe (1987) evaluated the potential effects of the thermal discharge from CCNPP Units 1 and 2, which is almost one mile north of the Unit 3 discharge location, and concluded that the thermal discharge from CCNPP Units 1 and 2 had no important adverse impacts on fish or key invertebrate species, such as eastern oysters (*Crassostrea virginica*) and blue crabs. The Maryland Power Plant Research Program (PPRP) concluded that the effects of thermal discharges from the power plants into Chesapeake Bay habitats were localized and not considered significant (MDNR 2008a) |Power Plant EIR|. The waste heat from the Unit 3 discharge would dissipate quickly because of the small size of the thermal plume and would not likely affect EFH taxa significantly.

Cold shock occurs when aquatic organisms that have been acclimated to warm water, such as fish in a power plant's discharge canal, are exposed to a sudden temperature decrease. This sometimes occurs when power plants shut down suddenly in winter. Cold shock mortalities at U.S. nuclear power plants are "relatively rare" and typically involve few fish (NRC 1996) |GEIS|. Abbe (1987)|Chapter 9 *in*:| concluded that the potential for cold shock associated with the discharge plume from CCNPP Units 1 and 2 probably was not significant because the relatively small area of warmer water did not attract many fish during the winter. Cold shock is also unlikely to be a factor for EFH species at the Unit 3 site because the discharge is into a large bay where the volume of the discharge is very small in comparison to the volume of the bay (UniStar 2008a) |ER Rev 5, p. 5.0-37|.

5.2.4 Chemical Impacts

The ER indicates that chemicals, such as anti-scaling compounds, corrosion inhibitors, and biocides, would be added to the CWS and the essential service water system (UniStar 2008a) |ER Rev 5 p. 5.0-17|. Biofouling normally would be controlled by injecting chlorine or bromine into the Chesapeake Bay influent water during the spring through fall (UniStar 2008a) |ER Rev 5 p. 5.0-17|. The CWS would provide about 90 percent of the effluent discharged into the Chesapeake Bay, with the desalinization plant contributing another 9 percent (UniStar 2008b) |Combined RAI Response June 12 2008 ML081850081.pdf, Item 85|. UniStar provided estimated concentrations of various constituents in the waste stream based on design data. To illustrate the expected low concentrations of these constituents, UniStar compared expected concentrations of five metal contaminants (arsenic, chromium, copper, nickel, zinc) to aquatic life chronic salt water limits specified by the State of Maryland (COMAR 2008). Predicted concentrations within the discharge from Unit 3 would be substantially less than the State aquatic life limits (UniStar 2008b) |Combined RAI Response June 12 2008 ML081850081.pdf|. UniStar would calculate more precise estimates of constituent concentrations in the effluent as part of the permitting process for Unit 3.

UniStar expects that the NPDES permit for Unit 3 would require bioassay testing as does the permit for Units 1 and 2 to assess the potential toxicity of the discharge and provide for corrective action if necessary. To date, the bioassay testing performed for CCNPP Units 1 and 2 has not indicated any toxicity to test organisms (UniStar 2008a) |ER Rev 5 p. 5.0-38|.

5.2.5 Physical Impacts from Discharge

The primary physical and ecological impacts from the CCNPP Units 1 and 2 cooling water discharge are sediment scour near the high-velocity discharge ports. The bottom scour associated with the discharge from CCNPP Units 1 and 2 was about 42 ac (UniStar 2008b) |Combined RAI Response June 12 2008 ML081850081.pdf|. The sand substrate present prior to the operation of CCNPP Units 1 and 2 was scoured by the discharge, leaving a hard clay substrate. The benthic community changed from one characterized by burrowing soft-bottom organisms to one dominated by fouling organisms (UniStar 2008b) |Combined RAI Response June 12 2008 ML081850081.pdf|.

It is expected that the physical impacts associated with Unit 3 cooling water discharge would be limited to sediment scour of a small area. The area of bay bottom that may be scoured would be minimized by the placement of riprap for about ten feet on either side of the diffuser (UniStar 2008c) |Sep_29_Response_Aquatic_ML082760508.pdf|. The potential scour area was estimated by comparing the sediment type to expected discharge flow velocities. Sediments in the area are primarily sandy (Section 3.0), and UniStar calculated that a water velocity of about one ft/sec would be required to move sand particles of a size between 0.210 mm and 0.177 mm (0.008 and 0.007 in.) (UniStar 2008b) |Combined RAI Response June 12 2008 ML081850081.pdf|. The distance beyond which water velocities are expected to drop below the one ft/sec threshold was estimated to be about 92 ft, which resulted in an estimated potential scour area of 13,256 ft^2 (0.3 ac).

The infaunal community inhabiting the area near the discharge point, which was characterized during 2006 and 2007 (EA Engineering 2007) |24_Aquatic_Field_Studies_for_UniStar_Calvert_Cliffs_Expansio.pdf|, was moderately degraded to degraded (Section 3.0). The community had low organism abundance and few species. The predominant taxa were polychaete worms (*Streblospio benedicti*, *Glycinde solitaria*) and a small clam species (*Gemma gemma*). A historical study of benthic fish feeding at a location north of the Calvert Cliffs site (Kenwood Beach) found that nematode worms and polychaetes were among the predominant prey (UniStar 2008b) |Combined RAI Response June 12 2008 ML081850081.pdf|.

The bottom scouring near the discharge from CCNPP Units 1 and 2 caused the habitat to change from sandy sediment to hard clay and also caused a change from a sand-inhabiting infaunal community to an epifaunal community comprised of oysters, mussels, barnacles, and sea anemones (Abbe 1987). A similar, but much less extensive, change is likely if the sediment becomes scoured near the discharge for Unit 3. The small predicted size of the potential scour area and relative impoverishment of the infaunal community that would be replaced would not have much effect on the regional infaunal populations or their predators.

6.0 Potential Effects of Proposed Federal Actions on EFH and Federally Managed Species

The proposed new unit at the CCNPP site is located in an area that provides EFH for species managed by the Mid-Atlantic Fishery Management Council. The NRC staff has conducted an evaluation by considering all designated EFH that could occur near the CCNPP site. The Maryland portion of the Chesapeake Bay was selected as the primary basis for the evaluation. The area of evaluation was further narrowed to the Chesapeake mainstem, the area most likely applicable to the CCNPP site of the Calvert Cliffs (NMFS 2008a) |CC Website Record Template CB Mainstem EFH Table.doc|. The Patuxent River section of the Chesapeake Bay was also checked but did not add species to the list of those to be evaluated (NMFS 2008b) |CC Website Record Template Patuxent R EFH Table.doc|. A separate list of skate habitats was checked for species with EFH in the Chesapeake Bay (NMFS 2009a) |CC Website Record Skate EFH.doc|.

The original list of candidates for EFH evaluation included 12 species (Table 1). However, the NMFS informed UniStar that the EFH designations for cobia, king mackerel, and Spanish mackerel were very broad and that those species did not need to be considered further (UniStar 2008c) |Attachment 2 *in* Sep_29_Response_Aquatic_ML082760508.pdf|. The final EFH evaluation list included nine species.

Table 1. Species List of EFH Designations by lifestage near CCNPP Unit 3.

Species	Eggs	Larvae	Juveniles	Adults
black sea bass (*Centropristis striata*)			X	X
bluefish (*Pomatomus saltatrix*)			X	X
butterfish (*Peprilus triacanthus*)	X	X	X	X
clearnose skate (*Raja eglanteria*)			X	X
little skate (*Leucoraja erinacea*)			X	X
red drum (*Sciaenops ocellatus*)	X	X	X	X
summer flounder (*Paralichthys dentatus*)		X	X	X
windowpane flounder (*Scophthalmus aquosus*)			X	X
winter skate (*Leucoraja ocellata*)			X	X
cobia (*Rachycentron canadum*) [1]	X	X	X	X
king mackerel (*Scomberomorus cavalla*) [1]	X	X	X	X
Spanish mackerel (*Scomberomorus maculatus*) [1]	X	X	X	X

[1] Not considered further because of very broad EFH designations.

6.1 Black Sea Bass (*Centropristis striata*)

The black sea bass range along the east coast of North America from Nova Scotia to Florida (Drohan et al. 2007) |Drohan 2007 tm200 black sea bass.pdf|. The species occurs in the Chesapeake Bay from spring to late fall and is common in the mid and lower bay (Murdy et al. 1997). Black sea bass migrate offshore in winter. Adults are typically found near structured habitats, such as shipwrecks, pilings, rocky areas and jetties, and shellfish beds (Murdy et al. 1997; Drohan et al. 2007). Some juveniles may overwinter in deeper waters in the bay during mild years (Drohan et al. 2007). Juveniles in the Chesapeake Bay are closely associated with vegetated areas. Black sea bass are visual predators that feed during the day. Juveniles feed primarily on shrimp and small crustaceans, whereas adults eat mainly crabs, clams, and fish. Black sea bass are hermaphroditic with individuals maturing first as females. Most fish smaller than 7.5 in. long are females; larger fish are males (Drohan et al. 2007). Black sea bass may live as long as 20 years and reach a length of about 24 in. (Murdy et al. 1997). Spawning occurs in late spring to early fall over nearshore continental shelf habitats near large estuaries (Drohan et al. 2007). Development from egg through larval stages occurs in offshore water with juveniles migrating into estuaries during summer. There is a small commercial fishery for black sea bass in the Chesapeake Bay, and there is a popular sport fishery for the species (Murdy et al. 2007). Three stocks of black sea bass are used to manage the fishery. The mid-Atlantic stock includes the Chesapeake Bay. Recent year classes within this stock have shown strong growth in contrast to that for the south Atlantic stock (Drohan et al. 2007). The black sea bass recreational fishery has declined recently, although this may have resulted from increased minimum size limits (Kerns 2006) |Kerns 2006 BlackSeaBassFMPReview.pdf|.

EFH that includes Chesapeake Bay has been designated for black sea bass juveniles and adults. Inshore EFH for juveniles includes estuaries where black sea bass are identified as being common, abundant, or highly abundant for the mixing (0.5 to 25.0 ppt) and seawater (greater than 25 ppt) salinity zones. Generally, juvenile black sea bass are found in waters warmer than 43 °F with salinities greater than 18 ppt. Inshore EFH for adult black sea bass is very similar to that designated for juveniles (NMFS 2009b) |CC Website Record black sea bass EFH.doc|.

The construction activities with the greatest potential to affect black sea bass EFH would be the pile driving associated with the installation of the sheet-pile wall at the new intake location and the dredging for the refurbishment of the barge dock and installation of the cooling water discharge pipeline. The noises from pile driving likely would be loud enough to affect small black sea bass juveniles. Increased water column sediment loads from dredging could affect juveniles and adults, which are visual predators. The overall effects of these would be reduced by the relatively short time over which pile driving would occur and the use of turbidity curtains during dredging and pipeline installation. Armoring near the new baffle wall, the fish return discharge point, and the cooling water diffuser could provide habitat for black sea bass.

Operational impacts would most likely be from impingement and possibly entrapment. Black sea bass occurred in 6 of the 21 yearly impingement samples collected from CCNPP Units 1 and 2 between 1975 and 1995 (Ringger 2000). However, the species only occurred in one year from 1984 to 1995, which could indicate a reduced likelihood of impingement and entrapment. Black sea bass eggs and larvae do not occur near Calvert Cliffs (Drohan et al. 2007); therefore entrainment or entrapment of early life stages is unlikely. Juvenile black sea bass were not caught in entrainment samples collected from the intake for Units 1 and 2 in 2006 and 2007, nor were they found in samples collected outside the baffle wall (UniStar 2008d) |RAI Responses 11_07_08 ML0831106780 Attachment 2.pdf|. Some juvenile and adult black sea bass prey, such as bay anchovy and scup, likely would be entrained, impinged, and/or entrapped by the cooling water system for the Unit 3, however, black sea bass diets are very diverse (Drohan et al. 2007) and the overall effects likely would not be important. The construction and operation of the proposed new Unit 3 at the CCNPP site are likely to have a minimal adverse effect on EFH for the black sea bass.

6.2 Bluefish (Pomatomus saltatrix)

Bluefish are found on the western Atlantic coast from Nova Scotia to Brazil but are rare in the Caribbean (Murdy et al. 1997). Bluefish of similar sizes form schools and migrate along the Atlantic coast moving up the Middle Atlantic Bight in spring from wintering grounds off Florida, then returning south in fall (Shepherd and Packer 2006) |Shepard and Packer 2006 tm198 bluefish.pdf|. Schools can be very large, often covering tens of square miles (Murdy et al. 1997). Bluefish visit the Chesapeake Bay from spring to autumn (Murdy et al. 1997). Spawning occurs in offshore waters during the northward migration, with peak spawning off Chesapeake Bay occurring in July (Murdy et al. 1997; ASMFC 2006a) |ASMFC 2006 bluefishProfile.pdf|. After spawning, smaller fish enter nearshore bays, such as Chesapeake Bay and Delaware Bay, while larger fish swim northward. Juveniles move into estuaries and nearshore environments that serve as nursery grounds in late summer, and eventually migrate out of the Bay in the autumn (Murdy et al. 1997; Harding and Mann 2001) |Harding 01 bluefish diet habitat CB.pdf|. In Chesapeake Bay, bluefish are abundant near the mouth of the Bay and common in the upper bay in some years, but rarely occur north of Baltimore (Murdy et al. 1997). Bluefish reach a maximum length of about 45 in. and a weight of about 15 lbs (Shepherd and Packer 2006). Bluefish are voracious top-level predators. Bluefish larvae feed on planktonic copepods and transition to a fish diet at length of about 1.1 in., after which juveniles move into estuaries (Shepherd and Packer 2006). Bluefish feed opportunistically on whatever fish species are abundant (Shepherd and Packer 2006) and also eat invertebrates, such as blue crabs (Buckel et al. 1999) |Buckel 99 bluefish foraging.pdf|. In Chesapeake Bay, bluefish diet varies with location as fish feeding near oyster reefs eat more invertebrates than fish in the middle Chesapeake Bay (Harding and Mann 2001). This species is one of the most important recreational and commercial species in Chesapeake Bay with the recreational catch exceeding the commercial catch by an estimated five to six times (Murdy et al. 1997; ASMFC 2006a; Harding and Mann 2001). Bluefish is managed as a single stock and the most recent review concluded that the species was not being overfished (Nygard 2005) |Nygard05BluefishFMPReview.pdf|. Recreational and commercial catches in Maryland have decreased substantially since peak values in the late 1980s but have remained relatively stable since the mid 1990s (MDNR 2008b) |MDNR 08 FMPBluefish04.pdf|. Despite reduced catches, the bluefish population estimates reflect a substantial increase in biomass from 1997 to 2004 (NOAA 2005) |Bluefish 05 stock assessment41stSAWSARCSummaryReport.pdf, p. 19|.

EFH that includes Chesapeake Bay has been designated for bluefish juveniles and adults. Inshore EFH for juvenile and adult bluefish includes all major estuaries between Penobscot Bay, Maine and the St. Johns River, Florida (NMFS 2009c) |CC Website Record bluefish EFH.doc|. Bluefish adults are highly migratory and distribution varies seasonally and according to the size of the individuals comprising the schools. Bluefish generally found where salinities exceed 25 ppt.

The construction activities with the greatest potential to affect bluefish EFH would be the pile driving associated with the installation of the sheet-pile wall at the new intake location and the dredging for the refurbishment of the barge dock and installation of the cooling water discharge pipeline. The noises from pile driving likely would be loud enough to affect small bluefish juveniles. Increased water column sediment loads from dredging could affect juveniles and adults, which are visual predators. The overall effects of these would be reduced by the relatively short time over which pile driving would occur and the use of turbidity curtains during dredging and pipeline installation.

Direct operational impacts to bluefish EFH would most likely be from impingement. Bluefish occurred in the impingement samples collected from the CCNPP Units 1 and 2 intake system in 9 of the 21 years from 1975 to 1995 (Ringger 2000), although they occurred in only one year after 1984, which could indicate a reduced likelihood of impingement and entrapment. Bluefish were not found in the entrainment samples collected in the CCNPP Units 1 and 2 intake system or baffle wall in 2006 and 2007 (UniStar 2008d) |RAI Responses 10_31_08 ML0831106780 Attachment 2.pdf|. Impingement, entrainment, and entrapment could indirectly affect bluefish EFH because some of the key bluefish prey species in the Chesapeake Bay, Atlantic menhaden and bay anchovy (Hartman and Brandt 1995) |Hartman 95 CB predatory fish.pdf|, are captured by the intake system for CCNPP Units 1 and 2. However, bluefish feed opportunistically on abundant species and likely would feed on prey other than menhaden and bay anchovy if necessary (Shepherd and Packer 2006). Also, the intake system for Unit 3 will draw much less water and would not be expected to add significantly to the numbers of these prey species impinged, entrained, or entrapped. The construction and operation of the proposed new Unit 3 at the CCNPP site are likely to have a minimal adverse effect on EFH for the bluefish.

6.3 Butterfish (*Peprilus triacanthus*)

Butterfish range from Nova Scotia to Florida into the Gulf of Mexico (Murdy et al. 1997), but are most abundant between Cape Hatteras and the Gulf of Maine (Cross et al. 1999) |Cross 1999 tm145 butterfish.pdf|. Butterfish move into Chesapeake Bay about March and remain until about November. They are most abundant in the lower bay but occasionally may be common in the upper bay as far north as the Patapsco River (Murdy et al. 1997), and overwinter in deep offshore waters. Butterfish are pelagic and form large, loosely structured schools. The short-lived species spawns offshore from May to July in the mid-Atlantic area with eggs remaining offshore during the 48-h incubation period (Cross et al. 1999). Larvae eventually congregate around floating items, such as jellyfish, seaweed, and other debris. Juveniles move into nearshore waters, including estuaries (Murdy et al. 1997), and still may be associated with jellyfish. Adults may reach a length of about 12 in. and, in the Chesapeake Bay, mature by their third summer (Cross et al. 1999). Juvenile butterfish feed on smaller plankton, whereas adults feed more broadly on pelagic tunicates, jellyfish, crustaceans, and small fish. Many predatory fish, including weakfish and bluefish, feed on butterfish. Commercial catches of butterfish peaked about 1973 along the Atlantic coast and have declined fairly steadily since, with the lowest landings occurring in 2005 (Overholtz 2006) |Overholtz 2006 24_Butterfish_stock status.pdf|. Butterfish were of minor commercial importance in the Chesapeake Bay in the late 1990s, with most of the catch coming from Virginia waters (Murdy et al. 1997). There is little recreational fishing for butterfish.

EFH that includes Chesapeake Bay has been designated for butterfish eggs, larvae, juveniles, and adults. Inshore EFH for all butterfish life stages includes the mixing and/or seawater portions of all the estuaries where butterfish eggs are common, abundant, or highly abundant on the Atlantic coast, from Passamaquoddy Bay, Maine to James River, Virginia (NMFS 2009d) |CC Website Record butterfish EFH.doc|. Butterfish eggs usually are collected from shore to 6000 ft. Butterfish larvae typically are collected at water depths between 33 ft and 6000 ft. Juveniles and adults usually are collected in depths between 33 ft and 1200 ft. The only portion of the CCNPP site deeper than 33 ft is in the channel that was dredged for the intake system of Units 1 and 2 (EA Engineering 2007) |24_Aquatic_Field_Studies_for_UniStar_Calvert_Cliffs_Expansio.pdf|.

The construction activities with the greatest potential to affect butterfish EFH would be the pile driving associated with the installation of the sheet-pile wall at the new intake location and the dredging for the refurbishment of the barge dock and installation of the cooling water discharge pipeline. The noises from pile driving likely would be loud enough to affect butterfish larvae and juveniles. Increased water column sediment loads from dredging could affect larvae, juveniles and adults. However, these life stages typically occur in waters deeper than where pile driving or dredging will occur. The overall effects of these would be reduced further by the relatively short time over which pile driving would occur and the use of turbidity curtains during dredging and pipeline installation.

Direct operational impacts to butterfish EFH would most likely be from impingement. Butterfish occurred in 15 of the 21 yearly impingement samples collected from CCNPP Units 1 and 2 between 1975 and 1995 (Ringger 2000). However, the species only occurred in five years from 1984 to 1995, which could indicate a reduced likelihood of impingement and entrapment. The intake system for Unit 3 will draw much less water and would not be expected to add significantly to the numbers of butterfish impinged and entrapped. Butterfish were not caught in entrainment samples collected from the intake for Units 1 and 2 in 2006 and 2007, nor were they found in samples collected outside the baffle wall (UniStar 2008d) |RAI Responses 11_07_08 ML0831106780 Attachment 2.pdf|. The planktonic prey of butterfish may be entrained or entrapped by the cooling water system of the Unit 3. Entrainment studies conducted at CCNPP Units 1 and 2 showed no significant effects on plankton communities in the area (Section 5.2 above). The small water volume withdrawn by the Unit 3 intake system reduces the potential for important effects on butterfish prey. The construction and operation of the proposed new Unit 3 at the CCNPP site are likely to have a minimal adverse effect on EFH for the butterfish.

6.4 Clearnose Skate (*Raja eglanteria*)

Clearnose skates are broadly distributed in coastal waters from Massachusetts to Texas, although they are rare in the northern parts of the range (Murdy et al. 1997; Packer et al. 2003a) |Packer 2003 tm174 clearnose skate.pdf|. Clearnose skates are primarily summer to fall residents of the Chesapeake Bay and are most abundant in the lower bay (Murdy et al. 1997). These skates move out of the Bay to shallow offshore waters in the fall. Clearnose skates generally occur in waters with salinities greater than 22 ppt, particularly in the Chesapeake Bay (Packer et al. 2003a). Reproduction in waters north of Cape Hatteras occurs in spring and summer with each fertilized egg being deposited in a rectangular egg case that is deposited on the bottom (Packer et al. 2003a). Juveniles hatch from the egg cases after about three months and may eventually reach a length of about 30 in. at an age of more than six years. Clearnose skates are nocturnal feeders on many types of benthic invertebrates and small fish. Sharks are the main predators of clearnose skates. Clearnose skate eggs may be attacked by snails capable of boring into the capsules (Cox and Koob 1993) |Cox 1993 predation on elasmobranch eggs.pdf|. A relatively small fishery exists for skates (seven species are usually considered and managed together in the fishery) with smaller skates primarily caught for lobster bait (Packer et al. 2003a, Sosebee 2006) |Sosebee 2006 27_Skates_stock status.pdf|. Clearnose skates do not contribute much to the total skate catch and are not being overfished (Sosebee 2006). In the Chesapeake Bay, clearnose skates are considered a nuisance catch (Murdy et al. 1997).

EFH that includes Chesapeake Bay has been designated for clearnose skate juveniles and adults. EFH for juveniles includes soft-bottom substrates along the continental shelf and rocky or gravelly bottom, ranging from the Gulf of Maine south along the continental shelf to Cape Hatteras, North Carolina (NMFS 2009a) |CC Website Record Skate EFH.doc|. Clearnose skate juveniles and adults are most abundant from nearshore to waters less than 360 ft deep.

The construction activities with the greatest potential to affect clearnose skate EFH would be the dredging for the refurbishment of the barge dock and installation of the cooling water discharge pipeline. Increased water column sediment loads from dredging could affect larvae, juveniles and adults. The overall effects of dredging would be reduced by the use of turbidity curtains during dredging and pipeline installation. Noise from pile-driving activities should not adversely affect clearnose skates because the individuals most likely in the area would be relatively large and not as susceptible as smaller fish. Armoring near the new baffle wall, the fish return discharge point, and the cooling water diffuser would make the habitat less suitable for clearnose skates. Disturbances to the benthos, including armoring, could affect benthic prey resources for clearnose skates. However, the benthic habitat near the CCNPP site is not very productive and constitutes only a relatively small portion of the available benthic habitat in the Bay.

Direct operational impacts to clearnose skate EFH would most likely be from impingement on the trash racks. Clearnose skates were not listed in the yearly impingement samples collected from the CCNPP Units 1 and 2 traveling screens between 1975 and 1995 (Ringger 2000). However, other large elasmobranchs (cownose ray, *Rhinoptera bonasus*) occasionally have impinged in large numbers on the trash racks at the existing CCNPP units, probably as a result of low oxygen levels during summer (NRC 2008) |Calvert Cliff Impingement incidents.doc|. Clearnose skates were not caught in entrainment samples collected from the intake for Units 1 and 2 in 2006 and 2007, nor were they found in samples collected outside the baffle wall (UniStar 2008d) |RAI Responses 11_07_08 ML0831106780 Attachment 2.pdf|. Clearnose skates are benthic feeders whose diets would not be adversely affected by the potential entrainment, impingement, and entrapment of prey by the cooling water intake system of Unit 3. The construction and operation of the proposed new Unit 3 at the CCNPP site are likely to have a minimal adverse effect on EFH for the clearnose skate.

6.5 Little Skate (*Leucoraja erinacea*)

Little skates occur from Nova Scotia to Cape Hatteras and are most abundant between Georges Back and Delaware Bay (Murdy et al. 1997; Packer et al. 2003b) |Packer 2003 tm175 little skate.pdf|. Little skates occasionally occur in the lower Chesapeake Bay in the winter and spring (Murdy et al. 1997). Although little skates tolerate relatively low salinities (about 20 ppt), they are most commonly found where salinities are about 30 ppt (Packer et al. 2003b). As for clearnose skates, little skates enclose a single fertilized egg within a capsule that is deposited on the sea floor. Reproduction may occur throughout the year. Development time varies depending on the season in which the capsule is deposited but typically extends at least six months (Packer et al. 2003b). Juveniles are about four inches long at hatching. Adults may reach a total length of about 24 in. Little skates feed primarily on benthic invertebrates, particularly crabs and polychaete worms, but also may feed on fish. Little skates are eaten by sharks, other skates, and several boney fish species (Packer et al. 2003b). Little skate eggs may be attacked by snails capable of boring into the capsules (Cox and Koob 1993). Little skates are fished primarily for use as lobster bait and account for most of the bait fishery. They are not presently being overfished (Sosebee 2006) |Sosebee 2006 27_Skates_stock status.pdf|. In the Chesapeake Bay, little skates are occasionally caught in trawls and by hook and line (Murdy et al. 1997).

EFH that includes Chesapeake Bay has been designated for little skate juveniles and adults. EFH for juvenile and adult little skates includes muddy, sandy, or gravelly bottom habitats from Georges Bank to Cape Hatteras, North Carolina (NMFS 2009a) |CC Website Record Skate EFH.doc|. Both life stages are found in shallow nearshore waters but generally most abundant in waters that are from 240 to 299 ft deep.

The construction activities with the greatest potential to affect little skate EFH would be the dredging for the refurbishment of the barge dock and installation of the cooling water discharge pipeline. Increased water column sediment loads from dredging could affect larvae, juveniles and adults. The overall effects of dredging would be reduced by the use of turbidity curtains during dredging and pipeline installation. Noise from pile-driving activities should not adversely affect little skates because the individuals most likely in the area would be relatively large and not as susceptible as smaller fish. Armoring near the new baffle wall, the fish return discharge point, and the cooling water diffuser would make the habitat less suitable for little skates. Disturbances to the benthos, including armoring, could affect benthic prey resources for little skates. However, the benthic habitat near the CCNPP site is not very productive and constitutes only a relatively small portion of the available benthic habitat in the Bay.

Direct operational impacts to little skate EFH would most likely be from impingement on the trash racks. Little skates were not listed in the yearly impingement samples collected from the CCNPP Units 1 and 2 traveling screens between 1975 and 1995 (Ringger 2000). However, other large elasmobranchs (cownose ray) occasionally have impinged in large numbers on the trash racks at the existing CCNPP units, probably as a result of low oxygen levels during summer (NRC 2008) |Calvert Cliff Impingement incidents.doc|. Little skates were not caught in entrainment samples collected from the intake for Units 1 and 2 in 2006 and 2007, nor were they found in samples collected outside the baffle wall (UniStar 2008d) |RAI Responses

11_07_08 ML0831106780 Attachment 2.pdf|. Little skates are benthic feeders whose diets would not be adversely affected by the potential entrainment, impingement, and entrapment of prey by the cooling water intake system of Unit 3. The construction and operation of the proposed new Unit 3 at the CCNPP site are likely to have a minimal adverse effect on EFH for the little skate.

6.6 Red Drum (*Sciaenops ocellatus*)

Although red drum are found from the Gulf of Maine to the northern coast of Mexico, they are less abundant along the Atlantic coast than they are in the Gulf of Mexico (Murdy et al. 1997). Adults occur in Chesapeake Bay from May to November, with highest numbers near the mouth in spring and fall with salinities at greater than 15 ppt (Murdy et al. 1997). Red drum may occur as far up the Bay as the Patuxent River. Spawning occurs at night in nearshore coastal waters from late summer through autumn, and tidal currents carry larvae to nursery habitats in estuaries where they stay through the juvenile stage (Murdy et al. 1997; ASMFC 2006b; Rooker et al. 1999) |ASMFC 2006 red drum profile.pdf; rooker 99 red drum recruitment.pdf|. Adult red drum may reach a maximum size of 5 feet and weigh up to 92 lb. Red drum are predators feeding primarily on crustaceans, such as blue crabs, and fish, such as bay anchovy and menhaden (Scharf and Schlicht 2000) |Scharf 00 red drum feeding Galvestion.pdf|. There is a small red drum fishery in Chesapeake Bay with a very small catch in Maryland waters in 2006 and an important red drum fishery throughout the Gulf of Mexico and to some extent on the south Atlantic coast (Murdy et al. 1997).

EFH has been designated for red drum eggs, larvae, juveniles, and adults and includes tidal freshwater, emergent vegetated wetlands in estuaries, mangrove fringe in estuaries, submerged rooted vascular plants; oyster reefs and shell banks; soft-bottom sediments, ocean surf zones, and artificial reefs (NMFS 2009e) |CC Website Record red drum EFH.doc|. Many of these habitats, especially submerged vegetation and oyster reefs, occur in Chesapeake Bay. EFH for red drum is also included within the Patuxent River (NMFS 2008b) |CC Website Record Template Patuxent R EFH Table.doc|.

The construction activities with the greatest potential to affect red drum EFH would be the pile driving associated with the installation of the sheet-pile wall at the new intake location and the dredging for the refurbishment of the barge dock and installation of the cooling water discharge pipeline. The noises from pile driving likely would be loud enough to affect red drum larvae and juveniles. Increased water column sediment loads from dredging could affect larvae, juveniles and adults. The overall effects of these would be reduced further by the relatively short time over which pile driving would occur and the use of turbidity curtains during dredging and pipeline installation. Armoring near the new baffle wall, the fish return discharge point, and the cooling water diffuser would make the habitat less suitable for red drum.

Direct operational impacts to red drum EFH would most likely be from impingement and entrapment. Red drum occurred in the impingement samples collected from CCNPP Units 1 and 2 only in 1983 (Ringger 2000), which could indicate a low likelihood of impingement and entrapment. Red drum were not specifically identified in the entrainment samples collected in the CCNPP Units 1 and 2 intake system or from the baffle wall in 2006 and 2007 (UniStar 2008d) |RAI Responses 11_07_08 ML0831106780 Attachment 2.pdf|. However, sciaenid eggs, which were not identified further, were the second most common organism entrained. These were not likely red drum eggs because red drum spawn primarily in nearshore coastal waters. Impingement, entrainment, and entrapment could indirectly affect red drum EFH because some of the potential prey species in the Chesapeake Bay, such as Atlantic menhaden and bay anchovy, are captured by the intake system for CCNPP Units 1 and 2. However, the intake system for Unit 3 will draw much less water and would not be expected to add significantly to the numbers of these prey species impinged, entrained, or entrapped. The construction and operation of the proposed new Unit 3 at the CCNPP site are likely to have a minimal adverse effect on EFH for the red drum.

6.7 Summer Flounder (*Paralichthys dentatus*)

Summer flounder range from Nova Scotia to South Florida and most only visit Chesapeake Bay from spring to autumn, although some have been known to overwinter in the Bay (Murdy et al. 1997). Summer flounder migrate out of estuaries in late summer to early fall, but some may leave as late as early winter (Sackett et al. 2007) |Sackett 07 summer flounder seasonal migrations.pdf|. Tagging studies showed that many individuals return to the same estuary from which they emigrated (Sackett et al. 2007). Summer flounder are more common in the lower Chesapeake Bay than in the upper bay. Spawning occurs during the migration offshore in the autumn with larvae typically most abundant about 15 to 50 miles from shore (NMFS 2009f) |CC Website Record summer flounder EFH HCP.doc|. Recently settled juveniles enter Virginia waters in the lower bay between October and May (Norcross and Wyanski 1994) |Norcross 94 summer flounder recruitment.pdf|. They remain in inshore areas for the first year of life (Murdy et al. 1997; ASMFC 2007) |ASFMC 07 summer flounder profile.pdf|. The maximum adult size is about 37 in. Young-of-the-year (about 1 in. long) may reach the CCNPP site area sometime in spring (Nichols 2008) |FW Summer flounder size range.txt|. Summer flounder are ambush predators that feed on many fish and invertebrate species, although bay anchovy and mysid shrimp (*Neomysis* spp.) comprise about half their diet (Latour et al. 2008) |Latour 08 summer flounder trophic dynamics CB.pdf|.

The summer flounder constitutes a major commercial and recreational fishery and is a highly sought-after food fish (Murdy et al. 1997; ASMFC 2007). The commercial fishery is primarily offshore, whereas the recreational fishery is in estuaries and bays (Latour et al. 2008). Though the summer flounder recreational catch has varied over the years, it approaches the commercial catch because of its popularity with anglers (Murdy et al. 1997; ASMFC 2007). Summer flounder are not yet overfished, but overfishing is occurring (Terceiro 2006) |Terceiro 2006 UpdatedStockAssmt Summ Flndr.pdf|. The estimated stock biomass increased substantially during the 1990s and through 2005 but decreased slightly in 2006.

EFH that includes Chesapeake Bay has been designated for summer flounder larvae, juveniles, and adults (NMFS 2009f) |CC Website Record summer flounder EFH HCP.doc|. Inshore EFH for summer flounder larvae, juveniles, and adults includes all the estuaries where summer flounder were identified as being present in the mixing and seawater salinity zones. Habitat Areas of Particular Concern that includes all native species of macroalgae, seagrasses, and freshwater and tidal macrophytes, whether in beds of any size bed or in loose aggregations, within juvenile and adult summer flounder EFH have been designated (NMFS 2009f) |CC Website Record summer flounder EFH HCP.doc|.

The construction activities with the greatest potential to affect summer flounder EFH would be the pile driving associated with the installation of the sheet-pile wall at the new intake location and the dredging for the refurbishment of the barge dock and installation of the cooling water discharge pipeline. The noises from pile driving likely would be loud enough to affect summer flounder juveniles of the size potentially found off the site. Increased water column sediment loads from dredging could affect larvae, juveniles and adults. The overall effects of these would be reduced further by the relatively short time over which pile driving would occur and the use of turbidity curtains during dredging and pipeline installation. Armoring near the new baffle wall, the fish return discharge point, and the cooling water diffuser would make the habitat less suitable for summer flounder. Disturbances to the benthos, including armoring, could affect benthic prey resources for summer flounder. However, the benthic habitat near the CCNPP site is not very productive and constitutes only a relatively small portion of the available benthic habitat in the Bay.

Direct operational impacts to summer flounder EFH would most likely be from impingement and entrapment. Summer flounder occurred in impingement samples collected from the CCNPP Units 1 and 2 intake system in 18 of the 21 years from 1975 to 1995 and was the fifth most-impinged species in 1984 (Ringger 2000). About 90 percent of impinged summer flounder survive. Despite the possible occurrence of smaller individuals at the CCNPP site, summer flounder were not found in the entrainment samples collected in the CCNPP Units 1 and 2 intake system or baffle wall in 2006 and 2007 (UniStar 2008d) |RAI Responses 11_07_08 ML0831106780 Attachment 2.pdf|. Impingement, entrainment, and entrapment could indirectly affect summer flounder EFH because one of the key prey species in the Chesapeake Bay, bay anchovy (Latour et al. 2008), is captured by the intake system for CCNPP Units 1 and 2. However, the intake system for Unit 3 will draw much less water and would not be expected to add significantly to the numbers of these prey species impinged, entrained, or entrapped. The construction and operation of the proposed new Unit 3 at the CCNPP site are likely to have a minimal adverse effect on EFH for the summer flounder.

6.8 Windowpane Flounder (*Scophthalmus aquosus*)

Windowpane flounder (or windowpane) range from the Gulf of St. Lawrence to Florida (Murdy et al. 1997), and is most common around Georges Bank (Chang et al. 1999) |Chang 1999 tm137 windowpane.pdf|. Windowpane live year round in Chesapeake Bay and may be common as far north as the Choptank River (Murdy et al. 1997). It can be abundant in the lower bay. Windowpane spawn from spring to autumn but may not spawn during the middle of summer (Murdy et al. 1997, Chang et al. 1999). Adult windowpane can reach a total length of about 18 in. and are very thin, which gives rise to the common name. Juveniles and adults have broad diets but feed primarily on small crustaceans and worms, with small fish secondarily important (Chang et al. 1999; Link et al. 2002) |Link 02 NW Atl flatfish feeding ecology.pdf|. The main predators of windowpane are spiny dogfish (*Squalus acanthias*), thorny skates (*Amblyraja radiata*), and other fish species (Chang et al. 1999). Windowpane in the mid-Atlantic region are managed as the Southern New England/Middle Atlantic (SNE-MA) stock (Hendrickson 2006)

|Hendrickson 2006 12_WindowpaneFlounder_status.pdf|. Windowpane catches are not typically targeted but are primarily by-catch for other fisheries, probably because of the thinness of the fish. Landings of the SNE-MA increased from the 1970s through 1985 but have since declined to a record low value in 2005 (Hendrickson 2006). Because there is no targeted fishery, the main cause of fishery mortality is probably as discarded by-catch from other targeted fishing. The most recent evaluation showed that the stock was overfished although overfishing was not occurring (Hendrickson 2006). There is no commercial or recreational windowpane fishery in Chesapeake Bay (Murdy et al. 1997).

EFH that includes Chesapeake Bay has been designated for windowpane juveniles and adults. EFH for juveniles and adults includes muddy or fine-grained sandy bottom habitats (NEFMC 1998) |NEFMC 98 windowpane EFH description.pdf|. Both life stages typically occur where waters are cooler than about 84 °F and salinities range between 5.5 and 36 ppt (NMFS 1998).

The construction activities with the greatest potential to affect windowpane flounder EFH would be the pile driving associated with the installation of the sheet-pile wall at the new intake location and the dredging for the refurbishment of the barge dock and installation of the cooling water discharge pipeline. The noises from pile driving likely would be loud enough to affect windowpane flounder juveniles. Increased water column sediment loads from dredging could affect juveniles and adults. The overall effects of these would be reduced further by the relatively short time over which pile driving would occur and the use of turbidity curtains during dredging and pipeline installation. Armoring near the new baffle wall, the fish return discharge point, and the cooling water diffuser would make the habitat less suitable for windowpane flounder. Disturbances to the benthos, including armoring, could affect benthic prey resources for windowpane flounder. However, the benthic habitat near the CCNPP site is not very productive and constitutes only a relatively small portion of the available benthic habitat in the Bay.

Direct operational impacts to windowpane flounder EFH would most likely be from impingement and entrapment. Windowpane flounder occurred in 5 of the 21 yearly impingement samples collected from CCNPP Units 1 and 2 between 1975 and 1995 (Ringger 2000). However, the species only occurred in one year from 1981 to 1995, which could indicate a reduced likelihood of impingement and entrapment. Windowpane flounder were not caught in entrainment samples collected from the intake for Units 1 and 2 in 2006 and 2007, nor were they found in samples collected outside the baffle wall (UniStar 2008d) |RAI Responses 11_07_08 ML0831106780 Attachment 2.pdf|. Windowpane flounder are benthic feeders whose diets would not be adversely affected by the potential entrainment, impingement, or entrapment of prey by the cooling water intake system of Unit 3. The construction and operation of the proposed new Unit 3 at the CCNPP site are likely to have a minimal adverse effect on EFH for the windowpane flounder.

6.9 Winter Skate (*Leucoraja ocellata*)

Winter skates range from the Gulf of St. Lawrence to Cape Hatteras and are most abundant on Georges Bank and in the northern mid-Atlantic Bight (Packer et al. 2003c) |Packer 2003 tm179 winter skate.pdf|. In the lower Chesapeake Bay, winter skates are occasional residents from winter to spring (Murdy et al. 1997). Winter skate may reproduce all year although there seems to be peak reproductive activity in summer and fall (Packer et al. 2003c). Fully developed juveniles hatch from egg capsules at about four to five inches in total length. Adults are relatively large, reaching lengths of about three to four feet. Winter skates have a very diverse diet of invertebrates and fish, the latter being particularly important food for larger skates (Packer et al. 2003c). Sharks, other skates, and gray seals are the main predators of winter skates. Winter skates are fished as part of the export market for skate wings. The biomass of large skates, including winter skates, has decreased since the 1980s, and at present winter skates are considered as being overfished (Sosebee 2006). There are no commercial or recreational winter skate fisheries in the Chesapeake Bay (Murdy et al. 1997).

EFH that includes Chesapeake Bay has been designated for winter skate juveniles and adults. EFH for juvenile and adult winter skates includes muddy, sandy, or gravelly bottom habitats in Cape Cod Bay, on Georges Bank, the southern New England shelf, and through the Mid-Atlantic Bight to North Carolina (NMFS 2009a) |CC Website Record Skate EFH.doc|. Winter skate juveniles and adults frequent nearshore waters and are most abundant at depths less than 364 ft.

The construction activities with the greatest potential to affect winter skate EFH would be the dredging for the refurbishment of the barge dock and installation of the cooling water discharge pipeline. Increased water column sediment loads from dredging could affect larvae, juveniles and adults. The overall effects of dredging would be reduced by the use of turbidity curtains during dredging and pipeline installation. Noise from pile-driving activities should not adversely affect winter skates because the individuals most likely in the area would be relatively large and not as susceptible as smaller fish. Armoring near the new baffle wall, the fish return discharge point, and the cooling water diffuser would make the habitat less suitable for winter skates. Disturbances to the benthos, including armoring, could affect benthic prey resources for winter skates. However, the benthic habitat near the CCNPP site is not very productive and constitutes only a relatively small portion of the available benthic habitat in the Bay.

Direct operational impacts to winter skate EFH would most likely be from impingement on the trash racks. Winter skates were not listed in the yearly impingement samples collected from the CCNPP Units 1 and 2 traveling screens between 1975 and 1995 (Ringger 2000). However, other large elasmobranchs (cownose ray, *Rhinoptera bonasus*) occasionally have been impinged in large numbers on the trash racks at the existing CCNPP units, probably as a result of low oxygen levels during summer (NRC 2008) |Calvert Cliff Impingement incidents.doc|. Winter skates were not caught in entrainment samples collected from the intake for Units 1 and 2 in 2006 and 2007, nor were they found in samples collected outside the baffle wall (UniStar 2008d) |RAI Responses 11_07_08 ML0831106780 Attachment 2.pdf|. Winter skates are benthic feeders whose diets would not be adversely affected by the potential entrainment and impingement of prey by the cooling water intake system of Unit 3. The construction and operation of the proposed new Unit 3 at the CCNPP site are likely to have a minimal adverse effect on EFH for the winter skates.

7.0 Mitigation Measures

The primary factors that could affect EFH in the CCNPP Unit 3 project area would be construction activities, such as dredging for the barge dock restoration or pipeline installation, pile driving of the sheet pile walls for the intake embayment and barge dock renovation, and prop wash from vessel movements in the area. Increased water column turbidity is a primary effect from dredging. UniStar proposes to use Best Management Practices and Best Available Technologies to reduce the potential turbidity impacts to aquatic resources in Chesapeake Bay (UniStar 2008e) |November 11 2009 UniStar Response to Corps RAIs ML091530687.pdf|. This would include the use of turbidity curtains around dredges or active dredge areas. The State of Maryland, as a condition on granting a Certificate of Public Convenience and Necessity, stipulated that UniStar conduct dredging at times of the year that are appropriate to avoid impacts to Natural Oyster Bar (NOB) 19-2, part of which is within the dredging area (MDNR 2008c) |SignedAgencyLtrRevisedConditionsCase9127-24Oct2008.pdf|. UniStar also agreed to contribute $5000 towards the mapping of NOB 19-2 and up to a maximum of $45,000 per acre for the moving, restoring, or creating oyster habitat equal to the area of NOB 19-2 that would be directly impacted by dredging or filling of tidal wetlands.

Pile driving would be a relatively short-term activity that probably would not require mitigation for potential adverse effects from noise. UniStar has acknowledged that, if necessary, the effects of noise and vibrations could be reduced by various means (UniStar 2008e) |November 11 2009 UniStar Response to Corps RAIs ML091530687.pdf|. These could include placing bubble curtains around large piles and switching to hammers that produce less sound. Turbidity curtains would be used around pile driving areas to reduce the potential for increased water column sediment (UniStar 2008e) |November 11 2009 UniStar Response to Corps RAIs ML091530687.pdf|

The barge docking procedures would minimize the potential impacts from prop wash (UniStar 2008c). Docked barges would not be maneuvered within the barge facility. Tow tugs would push barges toward the dock and remove unloaded barges by slowly pulling them away from the dock. The water depth (16 ft) at the barge dock relative to the draft of the tugs maneuvering the barges should also reduce the potential for prop wash disturbance.

Potential impacts to EFH from the operation of CCNPP Unit 3 CWS would be mitigated by the relatively small volume of water withdrawn from the Bay and the low intake velocities. Also, the proposed new unit would include a fish-return system designed to return fish and crabs to the Bay with minimal impact. Potential impact to EFH from the cooling water discharge would be limited to a relatively small area.

8.0 Conclusion

The potential impacts of the construction and operation of the proposed Unit 3 at the CCNPP site on Federally managed species and their EFH near the site have been evaluated. The known distributions and records of those species, the potential ecological impacts of the construction and operation to the species, their habitat, and their prey have been considered in this EFH assessment.

The NRC has determined that the construction and operation of the proposed Unit 3 at the CCNPP site would have a minimal adverse effect on EFH within the Chesapeake Bay by loss of spawning, nursery, forage, and/or shelter habitat for all nine species considered. The project area is not a Habitat Area of Particular Concern.

The Baltimore District Corps of Engineers has determined that the adverse effects of this project would be more than minimal, although not substantial, and an abbreviated consultation will be conducted with NMFS. The Corps does not recommend any mitigative measures to minimize adverse effects on EFH at this time. This determination may be modified if additional information indicates otherwise and would change the preliminary determination.

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