UN#10-239

Enclosure 1

Updated Markups for Calvert Cliffs Nuclear Power Plant Unit 3
COLA FSAR Section 2.4.12

The refined nomenclature will be used to describe the regional hydrogeologic conditions in the vicinity of CCNPP Unit 3 site. The hydrostratigraphic column for the CCNPP site and surrounding area, identifying geologic units, confining units, and aquifers is illustrated in Figure 2.4-58 (MGS, 1997). A schematic cross-section of the Southern Maryland hydrostratigraphic units is presented in Figure 2.4-59. Geologic and stratigraphic unit descriptions are discussed further in Section 2.5.1.

2.4.12.1.2.1 Surficial Aquifer

In Calvert County, the unconfined Surficial aquifer consists of two informal stratigraphic units, the Lowland Deposits and the Upland Deposits. The units comprising the Lowland Deposits are Holocene to Pleistocene in age. They consist of sands and clays deposited in fluvial and estuarine environments. The Upland Deposits are Pliocene in age and consist primarily of sands and gravels deposited in fluvial environments. In Calvert and St. Mary's counties, the Lowland Deposits outcrop along the Patuxent and Potomac Rivers and the Chesapeake Bay; however, these deposits appear to be absent in the immediate vicinity of the CCNPP site. The Upland Deposits are geographically more extensive in St. Mary's County than in Calvert County, but they are present at the CCNPP site and form the entirety of the Surficial aquifer at the site (MGS, 1996).

Recharge to the Surficial Aquifer is almost exclusively by direct infiltration of precipitation. Flow within the aquifer is localized with water moving from recharge areas (local land surface) along short flow paths to discharge areas (nearby streams or springs). Some of the water may percolate downwards to recharge underlying aquifers. Based on information provided in USGS Ground Water Atlas of the United States, Segment 11 (USGS, 1997a), the average annual precipitation between 1951 and 1980 in the region was estimated at 44 in (112 cm) with an average annual runoff estimated as 15 in (38 cm) (34 percent). The remaining 29 in (74 cm) of precipitation is available as recharge to the aquifer system, with the exception of that removed from the hydrologic cycle by direct evaporation and plant evapotranspiration.

Within the southern Maryland region, the Surficial aquifer is not a reliable source of ground water. This is due to its relative thinness, limited saturated thickness (particularly during prolonged drought), and topographic dissections, which causes local ground water to discharge as small springs (USGS, 1997a). The Surficial aquifer is tapped by irrigation wells and some older farm and domestic wells, but it is not widely used as a potable water supply because of its vulnerability to contamination and reduced dependability during droughts (MGS, ~~1995~~ 2005). Wells completed in this aquifer generally yield less than 50 gpm (189 lpm). The ground water table is usually encountered within a depth of 50 ft (15 m) below ground surface (bgs) (USGS, 1997a).

2.4.12.1.2.2 Chesapeake Confining Unit

From youngest to oldest, the Miocene Chesapeake Group consists of the Saint Mary's, Choptank, and Calvert Formations. The Chesapeake Group is a significant aquifer east of the CCNPP site in the Delmarva Peninsula. However, beneath the western shore of Maryland, in the vicinity of the CCNPP site, the Chesapeake Group is described as a confining unit. With the exception of a relatively thin sandy unit at its base (lower Calvert Formation), the silts and clays of the Chesapeake Group are hydrostratigraphically undifferentiated, and they define the Chesapeake Confining Unit, which separates the overlying Surficial aquifer from the underlying Piney Point - Nanjemoy aquifer (MGS, 1996), although thin and discontinuous sand units capable of producing small quantities of ground water are present locally. These saturated materials beneath the western shore of Maryland may yield water, but not of quantities sufficient for most uses. Within the region, localized sand units are recharged by precipitation

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thickness. Reported transmissivities in northern Calvert County at Randle Cliff Beach are 1330 ft^2/day (123.6 m^2/day) where the Aquia reaches its maximum thickness of approximately 200 ft. Farther south, at Solomons, reported transmissivities are 755 ft^2/day (70.2 m^2/day) where the aquifer thins to approximately 145 ft (44.2 m). A transmissivity of 935 ft^2/day (86.9 m^2/day) is reported at the CCNPP site (MGS, 1997). Storage coefficient values of the Aquia aquifer determined from pumping tests in southern Maryland range from 4×10^{-4} to 1×10^{-4} (MGS, 1997).

The Aquia formation is one of the most productive aquifers on the Northern Atlantic Coastal Plain aquifer system in southern Maryland. Recharge to the Aquia aquifer is from direct infiltration of precipitation in central Anne Arundel and Prince George's counties where these units are exposed at the surface. Natural discharge of the Aquia aquifer is to the southeast, primarily from subaqueous exposures of the aquifer that are presumed to occur along the Continental Shelf. Other discharge occurs at local pumping locations.

The Aquia aquifer is used extensively for domestic and major-user water supplies in southern Maryland. By the 1980s, a deep cone of depression (up to 100 ft (30.5 m)) had developed in the Solomons area of Calvert and St. Mary's county area where it is heavily pumped for public, commercial, and military supplies (USGS, 2005a). This has diverted the ground water flow direction in Calvert County to the south and southeast toward these pumping centers. This is depicted in Figure 2.4-60. A 2003 potentiometric surface map of the Aquia aquifer that indicates the elevation and horizontal direction of ground water flow (USGS, 2005a). Because of these considerations, water supply managers in these counties are seeking to shift some ground water usage from the Aquia aquifer to deeper aquifers (MGS, ~~1995~~). 2005

2.4.12.1.2.6 Brightseat Confining Unit

The confining unit underlying the Aquia aquifer is composed of several geologic units. These include the lower Paleocene Brightseat Formation and several upper Cretaceous units, including the Monmouth, Matawan, and Magothy Formations. The fine-grained sediments of these formations combine to form the hydraulically indistinguishable Brightseat Confining Unit. The Brightseat Confining Unit has a composite thickness ranging from approximately 20 to 105 ft (6.1 to 32 m). A boring log from a production well at the CCNPP site indicates that the base of the Brightseat Confining Unit is at an elevation of approximately -590 ft (-180 m) msl and the Unit attains a thickness of approximately 30 ft (9.1 m) (MGS, 1996).

Most researchers model the Brightseat Confining Unit as a no flow boundary; however, a few vertical hydraulic conductivity and specific storage values have been reported. Samples from Prince George's County yielded vertical hydraulic conductivity and specific storage values of 9.5×10^{-4} ft/day (2.9×10^{-4} m/day) and 7.4×10^{-5} ft^{-1} (24.3×10^{-5} m^{-1}), respectively. Vertical hydraulic conductivities for the Matawan Formation in the Annapolis area range from 5.7×10^{-5} ft/day to 3.1×10^{-4} ft/day (1.7×10^{-5} m/day to 9.4×10^{-5} m/day) (MGS, 1997).

2.4.12.1.2.7 Magothy Aquifer

In central Calvert County, the Magothy aquifer is contained in the Upper Cretaceous Magothy Formation. This unit consists of interbedded red, brown, and gray sands and clays. The Magothy aquifer is present in the northern and central portions of Calvert County where it is used extensively for public and domestic supplies. It thins to the south and pinches out in southern Calvert County where it is not a significant aquifer. The southern extent of the aquifer is estimated to lie somewhere between the CCNPP site and Solomons. A boring log from a production well at the CCNPP site indicates that the base of the Magothy aquifer is at an

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elevation of approximately -610 ft (-186 m) msl and the aquifer appears to attain a thickness of less than 25 ft (7.6 m) (MGS, 1996).

Transmissivities of 450 ft^2/day to 4570 ft^2/day (41.8 m^2/day to 424.6 m^2/day) have been reported for the Magothy aquifer in southern Anne Arundel County (MGS, 2002). Reported transmissivity values for southern Maryland counties range from 1000 ft^2/day to 12,000 ft^2/day (92.9 m^2/day to 1114.8 m^2/day. The primary use of this aquifer occurs in Anne Arundel, Prince George's, and Charles counties (Wolman, 2004).

Recharge to the Magothy aquifer is from direct infiltration of precipitation in northern Anne Arundel County where the Magothy Formation is exposed at the surface. In central Calvert County, flow is east-southeast, towards the Atlantic Coast. Other discharge occurs at local pumping locations (MGS, 1997 and USGS, 2005b).

A 2003 potentiometric surface map of the Magothy aquifer is presented in Figure 2.4-61 (USGS, 2005b) to establish the elevation and horizontal direction of ground water flow.

2.4.12.1.2.8 Potomac Group

The lower Cretaceous Potomac Group consists of the following (in descending order): the Patapsco, Arundel, and Patuxent Formations. These units form a thick (greater than 1500 ft (457 m)) series of unconsolidated sediments, which locally contain three confining units and three aquifers. Because of the significant depth of these formations, and the abundance of exploitable supplies of ground water in shallower aquifers, these units are not currently used as a significant source of ground water in the vicinity of the CCNPP site. Consequently, available hydrogeologic information for the Potomac Group of aquifers and confining units is limited.

The Upper Patapsco aquifer underlies the Magothy aquifer and is separated from it by clayey units in the top of the Patapsco Formation and bottom of the Magothy Formation. These clayey units are collectively referred to as the Upper Patapsco confining unit. The Upper Patapsco aquifer includes sand units in the upper part of the Patapsco Formation. This aquifer is not continuous and comprises complexly stratified sandy units separated locally by silts and clays. Individual sand units in the Upper Patapsco aquifer are difficult to correlate laterally, but they appear to be sufficiently interconnected at the regional scale to form a single aquifer (MGS, 2005 ~~1995~~). The aquifer extends to the northeast through Prince George's and Anne Arundel counties, and beneath Chesapeake Bay to the eastern shore of Maryland. The aquifer is recharged by precipitation at outcrops in western and northern Charles, Prince George's and Anne Arundel counties. It subcrops beneath the tidal part of the Potomac River, where river water intrusion has been documented in the Indian Head area (USGS, 1997b).

The Upper Patapsco aquifer is extensively used for public supply in central Charles County, where a cone of depression has formed as deep as elevation -136 ft (-41.5 m) msl. It is also pumped heavily by major users in Prince George's and Anne Arundel counties (Wolman, 2004). A few major users pump the Upper Patapsco aquifer in northern St. Mary's and Calvert counties (MGS, 2005 ~~1995~~). Pump tests performed in the Upper Patapsco aquifer in east-central Charles County yielded a transmissivity of 1110 ft^2/day (103 m^2/day) (MGS, 2007 ~~7~~). Upper Patapsco transmissivities reported for Charles and Anne Arundel counties range from 1000 ft^2/day to 10,000 ft^2/day (92.9 to 929 m^2/day) (Wolman, 2004). a

The Lower Patapsco aquifer underlies the Upper Patapsco aquifer. The two aquifers are separated by clayey units forming the Middle Patapsco confining unit in the middle part of the Patapsco Formation. The Lower Patapsco aquifer comprises sandy units in the lower part of the Patapsco Formation. The aquifer extends northeast to northern Anne Arundel County, but its

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correlation to the west and southwest is uncertain. It extends across the Chesapeake Bay to the eastern shore of Maryland. The Lower Patapsco aquifer is pumped heavily by users in central and northwestern Charles County, but it is not currently used in St Mary's or Calvert counties (MGS, ~~1995~~ 2005). Pumping tests performed in the Lower Patapsco aquifer in western Charles County yielded a transmissivity of 1130 ft^2/day (105 m^2/day). Specific capacity for wells used in these pump tests ranged from 1.8 gpm/ft to 7.1 gpm/ft (22.4 to 88.2 lpm/m) (Wolman, 2004 and MGS, 2004). Lower Patapsco aquifer transmissivities reported for Charles and Anne Arundel counties range from 1000 ft^2/day to 5000 ft^2/day (92.9 to 464.5 m^2/day) (Wolman, 2004).

Potentiometric surface maps of the Upper and Lower Patapsco aquifers in 2003 are presented in Figure 2.4-62 and Figure 2.4-63 to establish the elevation and horizontal direction of ground water flow (USGS, 2005c and USGS, 2005d).

The Patuxent aquifer lies below the Lower Patapsco aquifer, and it is separated from it by the Arundel confining unit. The Arundel Formation consists of a thick series of dense clays and silts and probably does not allow much leakage. However, the Arundel Formation is not uniformly recognized in southern Maryland (see Section 2.5.1).

The Patuxent Aquifer is the deepest Coastal Plain aquifer in Maryland, and rests on the Piedmont bedrock surface. Patuxent aquifer transmissivities reported for Charles and Anne Arundel counties range from 200 ft^2/day to 8000 ft^2/day (18.6 to 743.2 m^2/day) (Wolman, 2004). Pumping tests performed in the Patuxent aquifer in western Charles County yielded a transmissivity of 937 ft^2/day (87 m^2/day). The specific capacity for the single Patuxent aquifer well used in this pumping test was 2.6 gpm/ft (32.3 lpm/m) (MGS, 2004). Pump tests performed on Patuxent aquifer municipal wells in Bowie, Maryland (northern Prince George's County) yielded an average transmissivity of 1468 ft^2/day (136.4 m^2/day) (Bowie, 2007). Because of its great depth and the known presence of brackish water in coastal areas, its potential for development is thought to be limited (Wolman, 2004).

2.4.12.1.3 Local and Site-Specific Hydrogeology and Sources

The topography at the site (Figure 2.4-64) is gently rolling with steeper slopes along stream courses. Local relief ranges from sea level up to an elevation of approximately 130 ft (39.6 m) msl with an average elevation of approximately 100 ft (30.5 m). The Chesapeake Bay shoreline consists mostly of steep cliffs with narrow beach areas. The site is well drained by short, intermittent streams. A drainage divide, which is generally parallel to the coastline, extends across the site. The area to the east of the divide drains into the Chesapeake Bay. The western area is drained by tributaries of Johns Creek and Goldstein Branch, which flow into St. Leonard Creek, located west of Maryland Highway MD 2/4 and subsequently into the Patuxent River. The Patuxent River empties into the Chesapeake Bay approximately 10 mi (16 km) southeast from the mouth of St. Leonard Creek. The Chesapeake Bay and Patuxent River define the eastern, southern, and western boundaries of Calvert County. The creeks and streams within the area influence the shallow aquifer systems beneath the site. Deeper aquifers are less influenced by incised streams and rivers.

Geotechnical and hydrogeological investigations provided information on the CCNPP Unit 3 site to depths of 400 ft (122 m) below ground surface. Subsurface information was collected from over ~~180~~ 228 borings and cone penetrometer tests (CPTs). A detailed description of the geotechnical subsurface investigation, including the locations of these borings and CPTs is provided in Section 2.5. The location of the soil borings is provided on Figure ~~2.4-65~~ 2.5-103.

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Forty-seven (47)

~~Forty (40)~~ ground water observation wells were installed across the site. They were completed in the Surficial aquifer and water-bearing materials in the Chesapeake Group. The wells were located in order to provide adequate distribution with which to determine site ground water levels, subsurface flow directions, and hydraulic gradients beneath the site. Well pairs were installed at selected locations to determine vertical gradients. Field hydraulic conductivity tests (slug tests) were conducted in each observation well. ~~Monthly water level measurements from the ground water observation wells began in July 2006 and continued through June 2007.~~

Insert 4

Figure 2.4-66 and Figure 2.4-67 contain hydrogeologic cross sections for the strata penetrated by the soil borings at the CCNPP Unit 3 site. These cross sections cover the area in the vicinity of the CCNPP Unit 3 power block area.

2.4.12.1.3.1 Geohydrology

The elevations, thicknesses, and geologic descriptions of the sediments comprising the shallow hydrogeologic units (depths to 400 ft (122 m) below ground surface) were determined from CCNPP Unit 3 geotechnical and hydrogeological borings. Geotechnical and geological descriptions of the material encountered are described in Section 2.5.

The unit thicknesses are interpreted from logs of soil borings drilled in the vicinity of the CCNPP Unit 3 site. The logs describe soil samples collected from the soil borings. The soil samples were generally 18 inches long and were not collected continuously, but approximately at 5-foot intervals. Interpolation between samples varies between different investigators and accounts for minor differences in the interpretation of layer thicknesses between Subsection 2.4.12 and Subsection 2.5.4.

Surficial Aquifer

The elevations, thicknesses, and geologic sediments comprising the Surficial aquifer, as determined from the CCNPP Unit 3 geotechnical and hydrogeological borings, are summarized as follows.

- The unconsolidated sediments comprising the Surficial aquifer consist primarily of fine to medium grained sands and silty or clayey sands. At relatively few locations and intervals, coarse grained sands were observed to comprise the bulk of the interval sampled.

- The Surficial aquifer is present above an elevation of approximately 65 (19.8 m) msl at the CCNPP site (Figure 2.4-66 and Figure 2.4-67). The thickness of the Surficial aquifer ranges from 0 ft (0 m), where local drainages have dissected the unit, to approximately 55 ft (16.8 m) at the site's higher elevations.

Chesapeake Confining Unit

The Chesapeake Confining Unit thickens from northwest to southeast in Calvert County and ranges in thickness from approximately 115 to 300 ft (35 to 91.4 m). A boring log from a production well at the CCNPP site indicates that the base of the Chesapeake Confining Unit is at an elevation of approximately –205 ft (-62.5 m) msl and its total thickness is approximately 250 ft (76.2 m) (MGS, 1996). The CCNPP Unit 3 soil borings advanced to this depth confirm this observation.

The elevations, thicknesses, and geologic descriptions of the sediments comprising the Chesapeake Confining Unit, as determined from the CCNPP Unit 3 geotechnical and hydrogeological borings, are summarized as follows.

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-230 ft (-70.1 m) msl and -234 ft (-71.3 m) msl respectively. Borings B-301 and B-401 extended into the Nanjemoy Formation but did not penetrate through the Nanjemoy Confining Unit.

2.4.12.1.4 CCNPP Unit 3 Ground Water Use Projections

21 months of pre-construction and

The sole source of fresh water for the operation of CCNPP Unit 3 will be a desalinization plant drawing raw water from the Chesapeake Bay. Other sources of fresh water will be required to support construction of CCNPP Unit 3 before the desalinization plant is operational. Construction activities requiring fresh water include concrete mixing and curing, dust suppression, sanitary and potable use by the construction workforce, hydrostatic testing of pipes and tanks, and wash water. The water needed during the projected 68 months (approximately 6 years) of construction of CCNPP Unit 3 will be supplied by new production wells drilled into the Aquia Aquifer, the Upper Patapsco aquifer, or the Lower Patapsco aquifer. Other sources of fresh water that may be used to support construction are the groundwater pumped for construction dewatering and water trucked or barged from off site.

up to two production wells in

The Maryland Public Service Commission has issued a proposed Certificate of Public Convenience and Necessity (CPCN) to UniStar (MPSC, 2009). Condition 17 of the proposed CPCN authorizes UniStar to appropriate and use groundwater from the Aquia aquifer to support the construction of CCNPP Unit 3. The groundwater allocation granted by this appropriation is limited to a daily average of 100,000 gallons on a yearly basis and a daily average of 180,000 gallons for the month of maximum use (MPSC, 2009). Insert 5

If properly managed, construction activities at CCNPP and any additional ground water withdrawals for construction of CCNPP Unit 3 should not adversely affect the local or regional ground water systems. There are currently no known or projected site discharges that do or could affect the local ground water system. Construction activities will affect the shallower, non-utilized water-bearing units beneath the site including the Surficial aquifer and upper water bearing units within the Chesapeake Group. However, these shallow units are not used locally for water supply and their relatively thin, discontinuous layers limit the extent to which construction impacts propagate off site.

2.4.12.2 Sources

2.4.12.2.1 Regional Ground Water Use

Ground water is extensively used as a source of water within the Coastal Plain and is the primary source of water supply in southern Maryland. The area is dependent on ground water for potable supplies because the major surface-water bodies are brackish and the small freshwater streams originating within the area lack adequate dam sites for reservoirs (MGS, 1997). Therefore, an objective of this section is to discuss the U.S. Environmental Protection Agency (U.S. EPA) sole source aquifers within the region, to identify and determine impacts to these aquifers due to the construction and operation of CCNPP Unit 3, and to describe the following: ground water use in southern Maryland, current users in Calvert County, current CCNNP ground water use, expected future ground water demand for southern Maryland and Calvert County.

2.4.12.2.2 Sole Source Aquifers

The Sole Source Aquifer (SSA) Program, which is authorized by the Safe Drinking Water Act, allows for protection when a community is dependent on a single source of drinking water and there is no possibility of a replacement water supply to be found. The U.S. EPA defines a sole or principal source aquifer as one which supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer (USEPA, 2007a).

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198 observations wells. Future domestic pumpage for 1995 to 2025 simulations were based on estimated population increases and evaluated by comparing simulated drawdowns with the permitted 80-percent management levels. Major appropriated pumpage and domestic pumpage for the Piney Point - Nanjemoy and Aquia aquifers were simulated in the calibration and predictive scenarios for Anne Arundel, Charles, and Prince George's counties. Major appropriated pumpage was also taken into account for the Maryland Eastern Shore counties. The Piney Point - Nanjemoy aquifer water levels remained substantially above the Aquia aquifer water levels, but it was suggested that in the future, large appropriators should be restricted from using this aquifer, leaving it to accommodate self-supplied domestic usage. In areas where Aquia domestic wells predominate, water levels could be stabilized by allocating major withdrawals to deeper, more productive aquifers such as the Magothy and Upper Patapsco.

The MGS recently developed a model to simulate and evaluate the potential for increasing ground water withdrawals from the deeper Upper Patapsco and Lower Patapsco aquifers in Southern Maryland (Calvert, Charles, and St. Mary's counties) (MGS, ~~1995~~ 2005). The results of this study projected that water demands within Calvert and St. Mary's counties through 2030 could be met by increasing pumpage in the Aquia aquifer without reducing water levels below the 80% management level. Shifting a portion of the public-supply withdrawals from the Aquia to the Upper Patapsco aquifer would result in an increase in available drawdown in the Aquia aquifer in many areas, with minimal effects on drawdowns near the aquifers outcrop areas in Charles County.

The MGS continues to conduct studies, including modeling efforts to understand and predict the effects of increasing ground water demands of the Coastal Plain aquifers within the state. New users (or existing user applying to increase its withdrawal) would not be granted a permit if the proposed withdrawal rate is predicted to cause the regional head to fall below the management level.

2.4.12.3 Subsurface Pathways

2.4.12.3.1 Observation Well Data

Data collected from ground water observation wells installed for the CCNPP Unit 3 site subsurface investigation were used to develop ground water elevation contour maps and present ground water elevation trends. A total of 40 new observation wells with depths extending to 122 ft (37.2 m) bgs were installed from May to July 2006. Observation wells were installed in three distinct ground water bearing intervals: the Surficial aquifer (17 wells), a deeper sand unit at the top of the Chesapeake Formation, informally referred as the Upper Chesapeake unit (20 wells), and an even deeper sand unit in the Chesapeake, informally called the Lower Chesapeake unit (3 wells). No wells were installed in the deeper Piney Point - Nanjemoy aquifer.

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The base of the well screens in the Surficial aquifer wells were placed at elevations ranging from approximately 81.6 ft (24.9 m) msl to 53.7 ft (16.4 m) msl. Elevations for the base of well screens in the Upper Chesapeake unit range from approximately 27.1 ft (8.3 m) msl to ~~-2.3 ft (-0.7 m)~~ -10.3 ft (-3.1 m) msl, while the corresponding elevations for the Lower Chesapeake unit wells range from approximately -32.4 ft (-9.9 m) msl to -54.3 ft (-16.6 m) msl (Table 2.4-34).

Three well series designations are assigned to the CCNPP Unit 3 observation wells.

- OW-300 Series wells are located in the proposed CCNPP Unit 3 power block area.

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- OW-400 series wells are located adjacent to the CCNPP Unit 3 power block area, generally to the southeast.

- The OW-700 series wells include all of the wells located outside of the power block areas. The OW-700 Series wells are located in the proposed cooling tower, switchyard, and support facility areas.

OW-770, and OW-778

Four

~~Three~~ wells screened in the Surficial aquifer (OW-413A, OW-729, ~~and OW-770~~) are consistently dry, i.e. the depth to water is at or below the bottom of the well screens and exhibit minimal water level fluctuation and, therefore, are not included in the analysis. Additionally, observation well OW-744 appears to have been screened in a discontinuous sand unit between the water bearing sand units of the Surficial aquifer and the Upper Chesapeake unit and could not be grouped into one of the water-bearing units described above. Accordingly, the ground water elevation trends, flow directions, and rates presented below do not consider data from this well. Observation Well Locations are shown in Figure 2.4-68.

Insert 7

To evaluate vertical hydraulic gradients, several observation wells were installed as well clusters. Well clusters are a series of wells placed at the same location, with each well monitoring a distinct water bearing interval. Four well clusters were installed to evaluate the hydraulic gradient between the Surficial aquifer and the Upper Chesapeake unit, and ~~three~~ well clusters were installed to evaluate the gradient between the Upper Chesapeake and Lower Chesapeake units. Table 2.4-34 provides construction details for all observation wells installed onsite. Table 2.4-35 provides the ground water elevation data from these wells over time, listed in numerical order, whereas Table 2.4-36 presents a summary of the observation wells used in the following evaluations, segregated by aquifer.

four

Insert 8

Monthly water levels in the observation wells were measured to characterize seasonal trends in ground water levels and flow directions for the CCNPP Unit 3 site. ~~Monthly monitoring of these wells began in July 2006 and continued through June 2007. A 12-month data set representing July 2006 through June 2007 is utilized for this evaluation. The following ground water potentiometric surface trend discussion is based on this information.~~

2.4.12.3.1.1 Surficial Aquifer

G

~~Recent~~ ground water data for the Surficial aquifer are shown in Figure 2.4-69. These data exhibit seasonal variability in ground water elevations during the observation period (July 2006 to ~~June 2007). A seasonal influence during this monitoring period was indicated by ground water elevation lows in late summer (August and September), followed by gradually increasing levels until spring. For 10 of the 13 wells, maximum observed water levels for the 12 month observation period occurred in April or May 2007. In most cases, these maximums are followed by decreasing water levels through June 2007, with June 2007 levels generally approaching levels observed in July 2006. Three wells (OW-714, OW-743, and OW-759A) exhibited steadily increasing water levels after reaching minimums in autumn 2006 with maximums attained in June 2007 at the end of the observation period. Ground water elevation fluctuations averaged approximately 3.10 ft (0.94 m), and the maximum observed fluctuation of 7.24 ft (2.21 m) was observed in OW-759A.~~

Insert 9

For the first year of monitoring, the

mapping period

~~The~~ ground water elevation data (summarized in Table 2.4-36) were used to develop ground water surface elevation contour maps for the Surficial aquifer on a quarterly basis. These maps are presented in Figure 2.4-70 through Figure 2.4-73 for July, September, December 2006, and March 2007, and Figure 2.4-99 for June 2007. For each ~~quarter,~~ the spatial trend of the water table surface and horizontal gradients are similar. Ground water elevations range from a high

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of approximately ~~84.78 ft (25.8 m)~~ 85.7 ft (26.1 m) msl at well OW-423 to a low of approximately ~~68.1 ft (20.8 m)~~ 65.9 ft (20.1 m) msl at well OW-743.

The ground water surface contour maps indicate that horizontal ground water flow in the Surficial aquifer is generally bi-modal. A northwest trending ground water divide roughly following a line extending through the southwestern boundary of the proposed power block area is present at the CCNPP site. Northeast of this divide, horizontal ground water flow is northeast toward Chesapeake Bay. Because the Surficial aquifer is not present below elevation~~s~~ an of approximately 65 ft (19.8 m) msl ~~to 70 ft (21.3 m) msl~~, ground water flowing in the northeastern direction likely discharges to small seeps and springs before reaching the Chesapeake Bay or CCNPP site streams. Ground water southwest of this divide flows to the southwest. ~~Ground water southwest of this divide flows to the southwest.~~ Ground water flowing from the divide toward the hydraulic boundary created by John's Creek and Branch 3 presumably discharges from seeps and springs above the 65 ~~to 70~~ ft (19.8 ~~to 21.3~~ m) msl elevation level along these stream valleys.

In general, the horizontal hydraulic gradient for the Surficial aquifer decreases from north to south across the CCNPP site. In the northern portion of the CCNPP site, the hydraulic gradients associated with the southwesterly and northeasterly flow components are similar with values ranging from 0.0110 ft/ft and 0.0124 ft/ft, respectively. In the southern portion of the CCNPP site ~~where northeasterly flow predominates~~, the hydraulic gradient is lower (approximately 0.0086 ft/ft). In the northwest portion of the CCNPP site where a small portion of the site's ground water flow emanating from the ground water divide is to the north and west, the hydraulic gradient is approximately 0.0150 ft/ft.

Ground water elevations measured in the four well clusters that monitor head differences between the Surficial aquifer and the Upper Chesapeake unit indicated a downward vertical gradient between the Surficial aquifer and the Upper Chesapeake unit. Water table elevations in the Surficial aquifer range from approximately ~~36.0 to 42.0 ft (11.0 to 12.8 m)~~ 32.8 to 43.0 ft (10.0 to 13.1 m) higher than the potentiometric surface of the Upper Chesapeake unit (Table 2.4-36) indicative of less-permeable material separating the two water-bearing units.

2.4.12.3.1.2 Upper Chesapeake Unit

Ground water elevation data for the Upper Chesapeake unit ~~in 2006 and 2007~~ October 2009 are shown in Figure 2.4-74. These data exhibit slightly more variability in ground water elevations during the observation period (July 2006 to ~~June 2007~~) than those for the Surficial aquifer. Seasonal trends for the Upper Chesapeake are very similar to those in the Surficial aquifer; they are slightly more pronounced. Insert 11 ~~A slight seasonal influence during the monitoring period was indicated by ground water elevation lows in August 2006, followed by gradually increasing levels through March/April 2007, followed by decreasing levels generally approaching water levels observed in July 2006. One well (OW-759B) exhibited steadily increasing water levels throughout most of the 12-month observation period, with a maximum in June 2007. Although they exhibit the same general water level trends during the 12-month observation period, three wells (OW-708A, OW-711, and OW-769) exhibit noticeably higher ranges (amplitude) of elevation changes. On average, ground water elevations fluctuated approximately 4.0 ft (1.2 m), and the maximum observed fluctuation of 8.3 ft (2.5 m) was observed in OW-708A.~~

For the first year of monitoring, the ~~The~~ ground water potentiometric data summarized in Table 2.4-36 were used to develop ground water surface elevation contour maps for the Upper Chesapeake unit on a quarterly basis. These maps are presented in Figure 2.4-75 through Figure 2.4-78 for July 2006, September 2006, December 2006, and March 2007, and Figure 2.4-100 for June 2007. For each mapping period ~~quarter~~, the spatial trends of the potentiometric surface and the horizontal hydraulic gradients Insert 12

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are similar, with elevations ranging from a high of approximately 42.1 ft (12.8 m) msl at observation well OW-401 to a low of approximately ~~17.6 ft (5.4 m) msl at well OW-703A.~~ 1.8 ft (0.5 m) msl at well OW-774A.

The ground water surface contour maps indicate that horizontal ground water flow in the Upper Chesapeake unit ranges from north to east across most of the site. Ground water flowing in this direction likely discharges to the lower reaches of Branch 1 and Branch 2 and to seeps and springs in topographically low areas where the Upper Chesapeake unit is presumably exposed at the surface ~~(below an elevation of approximately 20 ft (6 m) msl)~~, including at the face of the Calvert Cliffs. It is also possible that a component of the Upper Chesapeake unit flow discharges directly to the Chesapeake Bay. The south central portion of the site exhibits a very flat horizontal hydraulic gradient over a large area centered over an area just southeast of the CCNPP Unit 3 power block area. It is possible that a ground water hydraulic divide exists along the southwestern boundary of the power block area, resulting in a flow direction beneath the western switchyard area towards St. John's Creek and Branch 3. A potential exists for localized Upper Chesapeake unit recharge associated with seepage from the small pond southeast of the CCNPP Unit 3 power block area at Camp Canoy (Figure 2.4-75 to Figure 2.4-78 ~~and~~ , and Figures 2.4-114 through 2.4-118 Figure 2.4-100). In this area, the base of the pond is ~~approximately 20 ft (6 m) above~~ close to the top of the water bearing sands of the Upper Chesapeake unit.

In general, three different horizontal hydraulic gradients can be observed from the potentiometric surface data. The highest gradients, at approximately 0.0170 ft/ft are observed to the north and east of the CCNPP Unit 3 power block area. The horizontal hydraulic gradient southeast of the CCNPP Unit 3 power block area is slightly lower at approximately 0.0091 ft/ft. The lowest horizontal hydraulic gradient observed at the CCNPP site was in the southwestern corner of the site where the gradient approaches zero.

2.4.12.3.1.3 Lower Chesapeake Unit

Insert 13

Ground water data for the Lower Chesapeake unit are shown in Figure 2.4-79. The data exhibit similar ground water elevation trends to those observed in the Surficial aquifer and exhibit little variability in ground water elevations during the observation period (July 2006 to ~~June 2007). Two of the three Lower Chesapeake unit observation wells (OW-313B and OW-418B) exhibited slight seasonal influence during this observation period indicated by ground water elevation lows in late summer (August and September), followed by gradually increasing levels until April 2007 and then declining levels for the remainder of the observation period. Observation well OW-703B also exhibited the minimum and maximum in August 2006 and April 2007, respectively, but after decreasing from April 2007 to May 2007, levels began to rise from May 2007 to June 2007. In general ground water elevations fluctuations averaged approximately 3.7 ft (1.1 m), and the maximum observed fluctuation of 5.5 ft (1.7 m) was observed in OW-703B.~~

Insert 14

For the first year of monitoring, the ~~The~~ ground water elevation data summarized in Table 2.4-36 were used to develop ground water surface elevation contour maps for the Lower Chesapeake unit on a quarterly basis. These maps are presented in Figure 2.4-80 through Figure 2.4-83 for July 2006, September 2006, December 2006, and March 2007, and Figure 2.4-101 for June 2007, and near the UHS makeup water intake structure. It should be noted that only ~~three~~ five observation wells penetrate the Lower Chesapeake unit, and the monitoring area is limited to the area within and immediately north of the CCNPP Unit 3 power block area. For each ~~quarter,~~ mapping period the spatial trend in the potentiometric surface shows very little change, with elevations ranging from a high of approximately 35.4 ft (10.8 m) msl in the vicinity of well OW-418B to a low of approximately ~~17.6 ft (5.4 m) msl at well OW-703B.~~ 1.9 ft (0.6 m) msl at well OW-781.

The potentiometric surface contour maps suggest that horizontal ground water flow in the Lower Chesapeake aquifer is to the north-northeast across the coverage area. Ground water

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flowing in this direction likely discharges directly to the Chesapeake Bay because the silty sand unit containing the Lower Chesapeake unit is below sea level. Very little change in horizontal hydraulic gradient was observed during the monitoring period with values averaging approximately 0.0140 ft/ft.

four

-0.6 to 5.4 ft (-0.2 to 1.7 m)

Ground water elevations measured in the ~~three~~ well clusters that monitored head differences between the Upper Chesapeake unit and the Lower Chesapeake unit indicated a slight downward vertical gradient. Potentiometric surface elevations in the Upper Chesapeake unit range approximately ~~3.9 to 4.9 ft (1.2 to 1.5 m)~~ higher than the ranges in the Lower Chesapeake unit ~~at well cluster locations OW-313 and OW-418, respectively~~. Potentiometric surface elevations in the two units are basically identical at the well cluster closest to the Chesapeake Bay, location OW-703.

s s and OW-774

2.4.12.3.2 Hydrogeologic Properties

The 40 ground water observation wells installed in connection with the CCNPP Unit 3 site subsurface evaluation were slug tested to determine in situ hydraulic conductivity values for the Surficial aquifer and Upper and Lower Chesapeake units. Table 2.4-37 summarizes the test results.

Ten of the 17 Surficial aquifer wells tested were used to calculate hydraulic conductivity values. Three wells screened in the Surficial aquifer had measurable water but at or below the bottom of the well screen (OW-413A, OW-729, and OW-770); therefore, the slug test results from these wells are not included in this analysis. The slug test data from three additional Surficial aquifer wells (OW-714, OW-718, and OW-766) were not used in this evaluation because the static water levels were below the top of the solid slugs inserted into the well to displace the water level. Additionally, observation well OW-744 appears to have been screened in a discontinuous sand unit between the water bearing sand units of the Surficial aquifer and the Upper Chesapeake unit. Because the following slug test analyses are categorized by the three distinct water bearing units encountered onsite, the hydraulic conductivity evaluations presented below do not consider slug test data from this well. Slug test data from all the Upper and Lower Chesapeake unit wells were used in the hydraulic conductivity evaluations.

median grain size,

bulk density

Soil samples collected from the Surficial aquifer, Upper Chesapeake, and Lower Chesapeake units during the geotechnical investigation were submitted for laboratory testing to determine moist unit weight, moisture content, and specific gravity. ~~Testing results are included in Table 2.4-38.~~ The results of these laboratory analyses were used to calculate ~~mean void ratio~~ and porosity values for the three water bearing units cited above. The following discussions on hydrogeological properties are derived from the CCNPP Unit 3 data evaluations for the Surficial aquifer, Upper Chesapeake unit, and Lower Chesapeake unit. Hydrogeological property discussions for the Chesapeake Group aquitards comprising the Chesapeake Confining Unit and all deeper units described in Section 2.4.12.1.2 were summarized from the literature, where available. A detailed description of the geotechnical subsurface site investigation, including the hydrogeologic field program is described in Section 2.5.

2.4.12.3.2.1 Surficial Aquifer

Hydraulic conductivity values were determined from slug test results for the Surficial aquifer range from 0.040 ft/day to 17.4 ft/day (0.01 to 5.3 m/day), with a geometric mean of 0.910 ft/day (0.28 m/day) as detailed in Table 2.4-37. The range in values is considered to be indicative of the variability of the subsurface material composition (see Section 2.5). A transmissivity of 10.9 ft^2/day (1.01 m^2/day) for the Surficial aquifer was calculated using the

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mean hydraulic conductivity value cited above and an average saturated thickness of 12 ft (3.7 m).

Insert 15

~~Table 2.4-38 summarizes the laboratory test results for the three geotechnical samples collected from the Surficial aquifer sediments, which were at elevations ranging from 66.3 to 75.3 ft (20.2 m to 23 m) msl. These samples were collected from geotechnical borings B-320, B-722, and B-732. Sand and clayey sand make up the majority of the samples. Measured moist unit weight ranges from 120 to 124 pounds/cubic ft (pcf) (1922 to 1986 kg/m³). Measured moisture contents, by weight, range from 23.1% to 29.4%. Specific gravity values range between 2.63 and 2.76. Using these values, the mean void ratio was estimated to be about 0.75. A mean total porosity of 42.7%t was calculated from this void ratio, and mean effective porosity of about 34.1% (Table 2.4-38) was estimated based on 80 percent of the total porosity (de Marsily, 1986).~~

Information on the vadose zone above the Surficial aquifer is limited. From the geotechnical data listed in Section 2.5.4, measured moisture contents by weight range from approximately 2.5% to 19.1%. The majority of the values ranged between 5% and 15%. Hydraulic conductivity for the Upland Deposits was estimated from grain size analyses as part of the CCNPP Units 1 and 2 FSAR investigation. A maximum hydraulic conductivity of 400 gpd/ft^2 (16,299 lpd/m) (53.6 ft/day (16.3 m/day)) was reported.

2.4.12.3.2.2 Chesapeake Group

The following discussion presents the evaluations of the hydrogeologic properties of the two water bearing units in the upper Chesapeake Group informally named the Upper Chesapeake and Lower Chesapeake units. This is followed by a description of the intervening and underlying Chesapeake Clay and Silt units comprising the remainder of the Chesapeake Group.

Upper Chesapeake Unit

31.8 3.0

The top of the silty sand unit comprising the informally named Upper Chesapeake unit lies approximately 50 ft (15 m) below the base of the Surficial aquifer. Hydraulic conductivities determined from the slug test results for the Upper Chesapeake unit range from 0.12 to 13.7 ft/day (0.04 m/day to 4.2 m/day), with a geometric mean of 0.740 ft/day (0.23 m/day) as detailed in Table 2.4-37. The range in values is indicative of the variability of the grain size and clay content of the material. A transmissivity of ~~15.8~~ ft^2/day (~~1.5~~ m^2/day) for the Upper Chesapeake unit is calculated using the mean hydraulic conductivity value cited above and an average saturated thickness of ~~21.4~~ ft (~~6.5~~ m/day).

43.0 13.1

Insert 16

~~Table 2.4-38 summarizes the laboratory test results for the five geotechnical samples collected from the Upper Chesapeake Unit sediments. Measured moist unit weights range from 116 lbs/ft³ to 121 lbs/ft³ (1859 to 1939 kg/m³). Measured moisture contents, by weight, range from 23.1% to 44.2%. Specific gravity values range between 2.66 and 2.75. Using these values, the mean void ratio is estimated to be about 0.86. A mean total porosity of 46.2% is calculated from this void ratio, and the mean effective porosity of about 37.0% (Table 2.4-38) was estimated based on 80% of the total porosity (de Marsily, 1986).~~

Lower Chesapeake Unit

The top of the informally named Lower Chesapeake unit generally lies approximately 15 ft (4.6 m) below the base of the Upper Chesapeake unit. Hydraulic conductivities determined from the slug test results for the three wells screened in the Lower Chesapeake unit range from 0.019 to 0.093 ft/day (0.006 to 0.028 m/day), with an arithmetic mean of 0.045 ft/day (1.37 cm/day) (Table 2.4-37). The arithmetic mean for the hydraulic conductivity was used

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instead of the geometric mean due to the very small sample size. These values are lower than those observed in the Surficial aquifer and the Upper Chesapeake unit by more than one order of magnitude. A transmissivity of 1.6 ft^2/day (0.15 m^2/day) for the Lower Chesapeake unit is calculated using the mean hydraulic conductivity value cited above and an average saturated thickness of 36.1 ft (11 m).

Insert 17

~~Table 2.4-38 summarizes the laboratory test results for the three geotechnical samples collected from the Lower Chesapeake unit sediments. Measured moist unit weights range from 113 pcf to 117 pcf (1811 to 1875 kg/m^3). Measured moisture contents, by weight, range from 37.3% to 50.5%. Specific gravity values range between 2.64 and 2.70. Using these values, the mean void ratio is estimated to be about 1.06. A mean total porosity of 51.5% is calculated from this void ratio, and mean effective porosity of about 41.2% was estimated based on 80% of the total porosity (de Marsily, 1986).~~

Chesapeake Clay and Silts

Clay and silt comprising the Upper Chesapeakeaquitard separates the Surficial aquifer from the underlying Upper Chesapeake unit. The aquitard immediately underlies the Surficial aquifer below an elevation of approximately 65 ft (19.8 m) msl. Laboratory tests performed on core samples in support of southern Maryland hydrogeologic studies reported vertical hydraulic conductivities ranging between 5.9 x 10^{-5} ft/day to 2.5 x 10^{-2} ft/day (1.8 x 10^{-5} m/day to 7.6 x 10^{-3} m/day (MGS, 1997). Vertical hydraulic conductivities established for ground water model calibrations associated with these studies, range from 8.6 x 10^{-6} ft/day to 8.6 x 10^{-5} ft/day (2.6 x 10^{-6} m/day to 2.6 x 10^{-5} ft/day), except for channeled areas where higher values were assigned to accommodate infilled deposits of sand and gravel (MGS, 1997). These sand units presumably correlate to the Upper and Lower Chesapeake units described herein. Assigned specific storage values ranged between 6.0 x 10^{-6} ft^{-1} and 1 x 10^{-5} ft^{-1} (2.0 x 10^{-5} m^{-1} and 3.3 x 10^{-5} m^{-1} for the Chesapeake Group aquitards in the Chesapeake Confining Unit (MGS, 1996).

2.4.12.3.3 Ground Water Flow and Transport

The following sections present the most probable ground water flow direction and travel time from the CCNPP Unit 3 power block area to nearby surface water features. Based on the evaluation summarized in the above sections, only the shallow water bearing units (Surficial aquifer and the Upper Chesapeake and Lower Chesapeake water-bearing units) would be affected by construction and operation of the CCNPP Unit 3. Ground water use associated with CCNPP Unit 3 operations is discussed in Section 2.4.12.1.4. Accidental release parameters and pathways for liquid effluents in ground water and surface water are presented in Section 2.4.13.

The ground water seepage velocity is defined as distance over time and is calculated as follows:

Velocity = [(hydraulic gradient) x (hydraulic conductivity)] / (effective porosity)

The travel time is defined as rate of ground water movement for a set distance and is calculated as follows:

Travel Time = (distance) / (velocity)

2.4.12.3.3.1 Surficial Aquifer

In the vicinity of the CCNPP site, the Surficial aquifer is capable of transmitting ground water but is of limited areal and vertical extent. The Surficial aquifer (Upland Deposits) is not a reliable source of ground water because of its relative thinness, limited saturated thickness, and dissected topography that causes local ground water to discharge as small seeps and springs.

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The ground water travel time in the Surficial aquifer was calculated from the center of the ground water divide in the CCNPP Unit 3 power block area to the projected discharge point in the headwater area of Branch 3. An average horizontal ground water velocity of ~~0.029~~ 0.022 ft/day (~~0.009~~ 0.072 m/day) was calculated using a mean horizontal hydraulic gradient of 0.0110 ft/ft between the ground water divide and Branch 3 (Figure 2.4-70 through Figure 2.4-73 ~~and~~ , and Figures 2.4-110 through 2.4-113 Figure ~~2.4-99~~), a hydraulic conductivity of 0.910 ft/day (0.28 m/day), and an effective porosity of ~~34.1%~~ 13.9% (Section 2.4.12.3.2.1). Using a mean travel distance of approximately 1315 ft (400.8 m) from the ground water divide in the CCNPP Unit 3 power block to the closest downgradient point above 65 ft (19.8 m) msl in Branch 3, the ground water travel time from the power block area to Branch 3 was estimated to be about ~~124~~ 50 years. East of the CCNPP Unit 3 reactor building, the flow paths to adjacent springs and seeps are presumed to be shorter, with shorter corresponding travel times for spring/seep discharge.

2.4.12.3.3.2 Upper Chesapeake Unit

Direct ground water discharge to surface water from the Upper Chesapeake unit likely occurs along the lower reaches of Branch 1 and Branch 2 at elevations below approximately ~~20 ft (6 m)~~ 45 ft (13.7 m) msl where the Upper Chesapeake unit presumably outcrops. The ground water travel time in the Upper Chesapeake unit was calculated from the center of the CCNPP Unit 3 power block area northward to the projected discharge point at an elevation of ~~20 ft (6 m)~~ 45 ft (13.7 m) msl in Branch 2. An average horizontal ground water velocity of ~~0.034~~ 0.087 ft/day (~~0.010~~ 0.026 m/day) was calculated using a mean horizontal hydraulic gradient of 0.017 ft/ft (Section 2.4.12.3.1.2) along the projected flowpaths between the center of the CCNPP Unit 3 power block and the discharge point in Branch 2 (Figure 2.4-75 through Figure 2.4-78 ~~and~~ , and Figures 2.4-114 through 2.4-118 Figure ~~2.4-100~~), a hydraulic conductivity of 0.740 ft/day (0.226 m/day), and an effective porosity of ~~37.6%~~ 14.5% (Section 2.4.12.3.2.~~2.1~~). Using a mean travel distance of approximately ~~1425 ft (434 m)~~ 470 ft (143.3 m) from the center of the CCNPP Unit 3 power block to the projected downgradient discharge point at ~~20 ft (6 m)~~ 45 ft (13.7 m) msl in Branch 2, the ground water travel time from the power block area to Branch 2 was estimated to be about ~~115~~ 15 years. Similarly, the ground water travel times in the Upper Chesapeake unit were calculated from a point south of the CCNPP Unit 3 power block area northeastward to the projected discharge point at an elevation of ~~20 ft (6 m)~~ 45 ft (13.7 m) msl in Branch 1 and farther downgradient to Chesapeake Bay. Using the same average horizontal ground water velocity of ~~0.034~~ 0.087 ft/day (~~0.010~~ 0.026 m/day) and mean path distances of ~~1415 ft (431.3 m)~~ 1110 ft (338.3 m) and 1685 ft (513.6 m) to Branch 1 and the Chesapeake Bay, respectively, travel times of approximately ~~114~~ 35 years and ~~138~~ 53 years were calculated. It is possible that a ground water hydraulic divide exists along the southwestern boundary of the CCNPP Unit 3 power block area, resulting in a flow direction beneath the western switchyard area towards St. John's Creek and Branch 3.

2.4.12.3.3.3 Lower Chesapeake Unit

The ground water in the Lower Chesapeake unit likely discharges to the Chesapeake Bay, because this unit is entirely below sea level. The ground water travel time in the Lower Chesapeake unit was calculated from the center of the CCNPP Unit 3 power block area northeastward to the downgradient location of the Chesapeake Bay shoreline. An average horizontal ground water velocity of ~~0.0015~~ 0.0040 ft/day (~~0.00046~~ 0.0012 m/day) was calculated using a mean horizontal hydraulic gradient of 0.014 ft/ft (Section 2.4.12.3.1.3) along the projected flowpaths between the center of the CCNPP Unit 3 power block area and the shoreline (Figure 2.4-80 through Figure 2.4-83 ~~and~~ , and Figures 2.4-119 through 2.4-123 Figure ~~2.4-101~~), a hydraulic conductivity of 0.045 ft/day (0.014 m/day), and an effective porosity of ~~41.2%~~ 15.6% (Section 2.4.12.3.2.~~2.2~~). The arithmetic mean for the hydraulic conductivity was used instead of the geometric mean due to the very small sample size. Using a distance of approximately 1540 ft (469 m) from the center of the CCNPP Unit 3 power block area to a downgradient point on the shoreline of Chesapeake Bay, the ground

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water travel time from the CCNPP Unit 3 power block area to the bay is estimated to be about 1054 ~~2810~~ years.

2.4.12.4 Monitoring or Safeguard Requirements

Insert 18

The observation well network in the vicinity of CCNPP Unit 3 currently consists of 40 wells constructed in the summer of 2006~~. Groundwater levels in the observation well network were monitored monthly from July 2006 through October 2008 and have been monitored quarterly thereafter.~~ Quarterly groundwater level monitoring will continue until the onset of CCNPP Unit 3 construction, at which time most of the existing observation wells will be properly sealed and abandoned in accordance with MDE Regulation 26.04.04.11. Most of the wells are within the CCNPP Unit 3 power block area and adjacent areas that will be re-graded during construction. For this reason, all but nine of the existing wells will be properly abandoned to allow for construction and to eliminate the potential for the wells to become damaged during construction and potentially provide a pathway for contaminants to enter the local groundwater system.

Groundwater levels will continue to be monitored quarterly during the construction of CCNPP Unit 3 in the nine observation wells outside of the construction footprint. The following wells will remain: OW-768A, -769, -703A, 703B, -718, -725, -743, -759A and -759B. The objective of continued monitoring of water levels is to determine the long-term range of seasonal water-level fluctuation. The range of fluctuation during the construction period will be compared to that identified during monitoring before construction, to determine if groundwater gradients, flow directions and flow velocities are significantly affected by construction activities.

As soon as practical after construction is complete, and before CCNPP Unit 3 begins operation, approximately 29 new observation wells will be installed in the vicinity of CCNPP Unit 3. The locations of the proposed observation wells are shown on FSAR Figure 2.4-108. These 29 wells, together with the 9 existing wells, are comparable to the number of wells in the original observation network and provide sufficient coverage to monitor groundwater levels in the three aquifers of primary interest beneath the site of CCNPP Unit 3. These are (in increasing depth) the Surficial aquifer, the Upper Chesapeake unit and the Lower Chesapeake unit. Other deeper regional aquifers exist beneath the CCNPP Unit 3 site, but the shallowest of these (the Piney Point-Nanjemoy aquifer) is separated from the overlying Lower Chesapeake unit by an aquitard approximately 170 ft thick and it is unlikely that there is a significant flow path from the Lower Chesapeake unit to the deeper aquifers.

The proposed new wells are arrayed in 13 pairs and one well triplet. Eleven of these new well pairs, plus one well pair from the original nine wells, will monitor the vertical hydraulic gradient between the Surficial aquifer and the underlying Upper Chesapeake unit. Two of the new well pairs, plus one well pair from the original nine wells, will monitor the vertical gradient between the Upper Chesapeake unit and the underlying Lower Chesapeake unit. The well triplet will monitor the vertical hydraulic gradient between all three aquifers. Two of the original nine wells are single wells monitoring the Surficial aquifer and three of the original nine wells are single wells monitoring the Upper Chesapeake unit.

Groundwater levels in each of the 38 observation wells (9 existing and 29 new) in the post-construction network will be measured quarterly. The data will be used to construct water table contour maps for the Surficial aquifer and potentiometric surface contour maps for both the Upper and Lower Chesapeake units. These maps will allow determination of groundwater flow gradients, flow directions and flow velocities after operation of CCNPP Unit 3 begins. In addition, some of these wells may be used during plant operation to monitor groundwater

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quality, including identifying the presence of plant-related radionuclides in the vicinity of CCNPP Unit 3.

Safeguards will be used to minimize the potential of adverse impacts to the ground water by construction and operation of CCNPP Unit 3. These safeguards would include the use of lined containment structures around storage tanks (where appropriate), hazardous materials storage areas, emergency cleanup procedures to capture and remove surface contaminants, and other measures deemed necessary to prevent or minimize adverse impacts to the ground water beneath the CCNPP Unit 3 site. No ground water wells are planned for safety-related purposes.

2.4.12.5 Site Characteristics for Subsurface Hydrostatic Loading and Dewatering

Ground water conditions relative to the foundation stability of safety-related facilities and plans for the analysis of seepage and piping conditions during construction are discussed in Section 2.5.4.6. The completed surface grade for CCNPP Unit 3 is expected to range between elevations of 72 to 85 ft (21.9 to 25.9 m) msl, requiring cut and fill across the site area. The proposed maximum grade elevation of the nuclear island is approximately 83 ft (25.3 m) msl. The design depth for foundations of structures within the nuclear island is estimated to be at an approximate elevation of 40 ft (12.2 m) msl for the reactor containment structure.

Ground water elevations within the Surficial aquifer range from approximately elevation 68 to 85.7 ft (20.7 to 26.1 m) msl with the highest observed elevations occurring in the CCNPP Unit 3 power block area. Since the current maximum observed Surficial aquifer ground water elevation is 85.7 ft (26.1 m) msl in the nuclear island area, the water table currently lies approximately 45.7 ft (13.9 m) above the lowest subsurface portion of safety-related structures.

The U.S. EPR FSAR requires that the maximum ground water elevation be at least 3.3 ft (1.0 m) below grade for safety-related structures. As indicated above, existing data indicates that the maximum pre-construction ground water level is currently at or slightly above the proposed grade level in the nuclear island area, potentially outside of the U.S. EPR FSAR design envelope. Because the CCNPP Unit 3 cut and fill operations, site grading, and construction activities will alter the existing Surficial aquifer ground water system, ground water modeling using a two-dimensional single layer numerical model was employed to evaluate these effects in the power block area and estimate post-construction ground water levels in the Surficial aquifer below the safety-related structures of the power block. The safety-related UHS makeup water intake structure (MWIS), shown in Figure 2.4-64, is located near the Chesapeake Bay at a nominal grade elevation of 10 ft. Because of its remote location, the UHS MWIS is not included in the numerical model. The ground water level at the UHS MWIS is conservatively estimated to be at grade elevation.

Insert 1

At the time of the preparation of the ground water model, Surficial aquifer ground water elevations were not yet available for the period from April to June 2007. Water levels in March 2007 were the highest observed values, and these observations were used to calibrate the model. Surficial aquifer observation wells OW-714, OW-718, OW-743, and OW-759A were not used in the calibration since they were outside of the model domain boundaries. To calibrate the numerical model, hydraulic conductivity values and recharge rates of the native soils were allowed to vary. Hydraulic conductivity values and the effects of anisotropy were evaluated, however, it was determined that the best fit to the observed ground water elevation data was obtained when a uniform hydraulic conductivity value (1.10×10^{-3} cm/s) approximately equal to the arithmetic mean (1.31×10^{-3}) of the slug test data was used. Due to the uncertainty in infiltration values at the site, recharge was varied, with a starting estimate of 10 to 20% of the mean annual rainfall of 44 inches. The best agreement with the observed water levels was obtained with a recharge value of 5 in/yr, or 11.4% of the mean annual rainfall. At the time

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~~modeling was performed, precipitation data was not available for 2007 to compare the value used during calibration to the period used to calibrate the model.~~ The simulated ground water levels were found to agree well with the observed values, and reproduce the salient features of the flow patterns shown in Figures 2.4-70 through 2.4-73 ~~and~~ Figure 2.4-99 based on the interpretation of the measured water levels. Because of inherent spatial variability in aquifer hydraulic conductivity, and potential spatial variability in actual infiltration versus runoff, an exact match between observed and calibrated ground water elevations is not expected.

Insert 2

Insert 3

~~Post-construction modeling accounted for the elevations of areas to be cut, filled and graded. The fill areas effectively extend the boundaries of the pre-construction ground water domain. The hydraulic conductivity of the fill material used in the model was 5.00 x 10^{-3} cm/s. Increasing the hydraulic conductivity of drain cells was explored, but was found to have insignificant effect on the simulated water levels. Model cells in areas where building foundations extend to or near the bottom of the Surficial aquifer were designated as inactive and excluded from the model to indicate that the foundations are barriers to ground water flow. Recharge rates over the area of the proposed buildings in the Unit 3 power block area were reduced to 0, while in all other areas they were kept at 5 in/yr. In addition, the design calls for bio-retention ditches (French drains) to be installed along the perimeter of the power block. Drain cells were located in the model to represent the bio-retention ditches. The drain elevations were set at 76 and 74 ft msl, according to the current design. Post-construction modeling results indicate the following:~~

- ~~Beneath the reactor building, the minimum depth to water will be about 13 ft (4.0 m) below grade. At this location, plant grade elevation is approximately 83 ft (25.3 m). Beneath the entire power block area, the depth to water ranges from approximately 6 ft to 16 ft (1.8 m to 4.9 m) below ground surface (Figure 2.4-97).~~
- ~~The Surficial aquifer water table elevations ranges approximately 8 to 16 ft (2.4 to 4.9 m) below proposed grade at all safety-related structures (Figure 2.4-97).~~
- ~~The depth below grade of the water table at safety-related structures is more than the 3.3 ft (1.0 m) required by the U.S. EPR FSAR.~~
- ~~Horizontal ground water flow below the Unit 3 power block area will be predominantly to the north and east and toward the bio-retention ditches on the northwest, northeast, and southeast sides of the power block area.~~

~~Modeled post-construction water table elevations will average approximately 69 ft (21.0 m) msl at the nuclear island (Figure 2.4-98). The predicted maximum post-construction water table elevation at safety-related structures extending below grade is approximately 72 ft (22.0 m). This occurs in the southern portion of the CCNPP Unit 3 nuclear island at the Safeguards Building2 (Figure 2.4-98). The design depth for foundations of structures within the nuclear island is estimated to be at an elevation of approximately 40 ft (12.2 m) msl. Therefore, a maximum of approximately 32 ft (9.8 m) of hydrostatic head exists at the foundations.~~

~~Based on the results of the ground water model, a permanent ground water dewatering system is not anticipated to be a design feature for the CCNPP Unit 3 facility. Control of surface water (precipitation seepage and runoff) and temporary ground water dewatering are expected during construction activities.~~

~~The numerical model of the Surficial aquifer has been revised to evaluate construction impacts to ground water levels in the vicinity of the power block and stream flow in John's Creek~~

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~~adjacent to the Unit 3 site. Figure 2.5-129 shows the grading plan for the Unit 3 site and Figure 2.4-107 shows the post-construction topography of the model domain. Both stream flow and ground water levels after construction of Unit 3 are dependent upon several factors, including the hydraulic conductivity of the engineered fill material used and the rate of ground water recharge within the graded area of the site.~~

~~The hydraulic conductivity of the engineered fill must be estimated because it has not yet been placed and, therefore, cannot be measured. The rate of ground water recharge within the graded area of the site is difficult to predict because construction of structures, paving with impermeable surfaces, and installation of stormwater drains have the effect of reducing recharge while leveling of the topography, placement of relatively permeable engineered fill, removal of vegetation and its associated evapotranspiration and construction of stormwater retention ditches and basins have the effect of increasing recharge. These activities are undertaken during construction of Unit 3.~~

~~A sensitivity analysis to improve estimates of the hydraulic conductivity of the engineered fill and ground water recharge within the graded area of the site was completed using the numerical model. This analysis determined baseline values of 0.005 cm/sec and 5 in/yr, respectively, for these parameters.~~

~~Baseline values of hydraulic conductivity and ground water recharge for the native soils were determined to be 0.001 cm/sec and 5 in/yr, respectively. Model simulations using these values produce ground water levels that best satisfy the model calibration criteria. Assuming baseline conditions, where the rate of ground water recharge in areas to be graded does not differ significantly from that in undisturbed wooded areas of the site (i.e. 5 in/yr), model simulations show that the estimated average ground water discharge into John's Creek in the reach adjacent to the Unit 3 site is approximately 20 percent lower after construction than before construction.~~

~~The magnitude of this change is primarily dependent upon the rate of ground water recharge that occurs over the graded area of the site. Assuming baseline conditions, cutting, filling and grading of the site cause the position of the existing ground water divide to shift to the west and a greater proportion of ground water recharge from the site to flow toward the Chesapeake Bay rather than John's Creek. However, if the rate of ground water recharge over the graded area is actually twice as high as in the undisturbed wooded areas, the discharge to John's Creek in the reach adjacent to the Unit 3 site will increase after construction by up to about 20 percent.~~

~~On the other hand, the results of modeling show that if the rate of recharge over the graded area is equal to only half the rate over the undisturbed wooded areas, the discharge to John's Creek in the reach adjacent to the Unit 3 site is reduced by about 50 percent. Because only the access road and nuclear island of the Unit 3 site will be paved, evapotranspiration is substantially reduced by clearing approximately 274 acres of woodland across the Unit 3 site and several stormwater retention basins are used to promote infiltration of site drainage, it is likely that the rate of ground water recharge over the graded area of the site will be greater than the rate over the undisturbed wooded areas. Therefore, ground water discharge to John's Creek most likely will not decrease substantially and may slightly increase after construction of Unit 3.~~

~~Cutting, filling and grading will locally affect the location and flow of springs and seeps on the Unit 3 site. These springs and seeps occur where the base of the Surficial aquifer is exposed within erosion channels and at the face of embankments. Downward flow of ground water~~

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~~within the aquifer is restricted by the underlying aquitard and discharge occurs laterally at these locations, forming a spring or seep. Springs and seeps that currently exist in areas to be filled by site grading will be buried. However, they will be buried with fill whose hydraulic conductivity will likely be greater than that of the Surficial aquifer from which the springs and seeps currently flow. (Calibration of the Surficial aquifer numerical model produced an estimate for the hydraulic conductivity of the engineered fill of 0.005 cm/sec and 0.001 cm/sec for that of the native soil). New springs and seeps will likely issue from the toe of the fill, in locations further down-gradient from their former positions.~~

The effect on local users of ground water from cutting, filling and grading the Unit 3 site will be negligible. The upland deposits of southern Calvert County are deeply incised by stream erosion, such that they are laterally discontinuous. This condition causes dissection of the Surficial aquifer into relatively small areas that are effectively isolated and have limited hydraulic connection. Furthermore, because of its thin and variable saturated thickness (typically less than 20 feet at CCNPP) and vulnerability to low yield during droughts, few water wells are completed in the Surficial aquifer in southern Calvert County. Deeper aquifers beneath the Surficial aquifer are effectively segregated from flow in the shallow aquifer. For these reasons, users of ground water near CCNPP are expected to experience no significant impacts to their water supplies due to construction or operation of Unit 3.

Insert 19 → ~~Ground water within the Surficial aquifer beneath the pre-construction CCNPP Unit 3 facility area ranges from approximately elevation 68 to 85.7 ft (20.7 to 26.1 m) msl. Therefore, it is expected that the saturated sands within the Surficial aquifer will be encountered during grading and excavation activities. The saturated sands, where present, rest on at least 10 ft (3 m) of relatively low permeability clays and silts at an approximate elevation of 65 to 75 ft (19.8 to 22.9 m) msl. A temporary ground water management system may need to be employed during excavation to drain and control ground water flow through the Surficial aquifer. The expected lateral ground water flow rate discharging to the excavation during construction is estimated to be 25 gpm (95 lpm) or 4,817 ft³/day (137 m³/day). This is estimated by:~~

$$Q_{gw} = q_R A_R \qquad \text{Eq 2.4.12-1}$$

~~where~~

~~Q_{gw} is the rate of ground water discharge into the excavation area~~
~~q_R is the rate of ground water discharge~~
~~A_R is the source area bounded by the estimated ground water divide and the perimeter of the excavation~~

~~As stated above, q_R = 5 in/yr (0.13 m/yr) for an average year (i.e., 11.4 percent of the mean annual precipitation) based on the results of the ground water model calibration. The source area bounded by the estimated ground water divide and the perimeter of the excavation is A_R = 4,220,000 ft² (392,050 m²).~~

~~Therefore,~~

~~$Q_{gw} = q_R A_R$ = 5 in/yr/(12 in/ft) * 4,220,000 ft² / (365 days/yr) = 4817 ft³/day (137 m³/day) = 25 gpm (95 lpm).~~

~~As a measure of possible fluctuation above the average of steady-state rate of ground water discharge to the excavation, the calculation of discharge was also performed using the largest~~

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~~annual precipitation on record (64.6 inches in 1979) and assuming the same percentage infiltration rate (11.4 percent) which results in q_R, 7.4 inches (0.19 m) of recharge for the year.~~

~~With the same contributing area applied, the calculated lateral ground water flow rate obtained is:~~

~~$Q_{gw} = q_R A_R$ = 7.4 in/yr/(12 in/ft) * 4,220,000 ft^2 / (365 days/yr) = 7,130 ft^3/day (202 m^3/day) = 37 gpm (140 lpm).~~

~~This estimate ignores integration of antecedent conditions, the time delay between infiltration and discharge, and assumes a direct proportion of infiltration to precipitation. For these reasons it is considered a conservatively high estimate of maximum ground water discharge to be expected.~~

~~Based on these evaluations, a permanent ground water dewatering system is not anticipated to be a design feature for the CCNPP Unit 3 facility. Control of precipitation seepage and runoff and passive temporary ground water seepage controls to manage the estimated 25 gpm to 37 gpm (95 lpm to 140 lpm) excavation inflow are expected during construction activities. It is expected that surface swales may be required in areas of higher elevations adjacent to the CCNPP Unit 3 facilities to redirect surface runoff away from the site, and passive ground water drainage systems consisting of ditches, sumps, and pumps will be used to manage the limited amount of projected ground water inflow during construction. Stormwater and Surficial aquifer ground water runoff will be directed to Stormwater Management Basin(s) for settlement prior to discharge to the Chesapeake Bay. If required, this water may also be used for control of construction dust or for other non-potable water use.~~

~~From the period of July 2006 through June 2007, ground water elevations in the Upper Chesapeake unit at the proposed power block area ranged from a high of approximately 42.1 ft (12.7 m) msl in observation well OW-401 to a low of approximately 17.6 ft (5.4 m) msl at well OW-703A. The bottom of the deepest base of the excavation for construction of the reactor building will be at an elevation of approximately 40 ft (12.2 m) msl within the clays and silts separating the overlying Surficial aquifer from the Chesapeake sand units. Therefore, it is anticipated that a ground water management/dewatering system may not be required for the Upper Chesapeake unit. Ground water elevations will continue to be monitored, and any observed deviations in ground water elevations that could impact construction will be evaluated with respect to the need for a temporary construction dewatering system, as appropriate.~~

from grade level

excavation and temporary construction dewatering areas

pre-construction

A permanent ground water dewatering system is not anticipated to be a design feature for the CCNPP Unit 3 facility.

Based on current ground water conditions and the anticipated facility surface grade between elevations of 72 to 85 ft (21.9 to 25.9 m), ground water is expected to be encountered at depths ~~of 6~~ to 16 ft (~~1.8 to~~ 4.9 m) below grade. Surface water controls to minimize precipitation infiltration and the redirection of surface runoff away from the ~~facility area~~ are expected~~, further minimizing water infiltration to the ground water system beneath the site.~~

Electrical manholes within the facility area are expected to be at depths of 10 to 15 ft (3 to 4.6 m) below grade and, therefore, have the potential for encountering ground water that may eventually leak into these structures. Manhole sump pumps may be required to remove the water seeping into these features.

Insert 20

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2.4.12.6 References

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INSERT 1 (FSAR Section 2.4.12.5)

The groundwater model includes five layers, each of which describes one of the hydrostratigraphic units of the shallow groundwater system. Specifically, most of the top layer of the model (layer 1) represents the Surficial aquifer; most of the next lower layer (layer 2) represents the Upper Chesapeake aquitard; layer 3 represents the Upper Chesapeake unit, layer 4 the Middle Chesapeake aquitard, and layer 5, the lowermost layer of the model, describes the Lower Chesapeake unit. The two uppermost hydrostratigraphic units, the Surficial aquifer and the Upper Chesapeake aquitard, do not extend over the entire model domain. Because Visual Modflow requires that all layers extend over the entire model domain, cells within a particular layer where the hydrostratigraphic unit generally corresponding to that layer is absent were assigned the hydraulic properties of the unit that is present at that location.

The Lower Chesapeake aquitard, which separates the Lower Chesapeake unit from the Piney Point/Nanjemoy aquifer, was not included explicitly in the three-dimensional model. The Lower Chesapeake aquitard is below the bottom of the model, which was treated as a no-flow boundary. A sensitivity analysis was conducted to assess the effect of this assumption. The sensitivity analysis indicated that the leakance to the Piney Point Aquifer, which can be estimated by the flux through a general head boundary at the bottom of layer 5, is relatively negligible compared with the horizontal flux towards Chesapeake Bay.

The thickness of each of the five units included in the model was defined from borehole data collected as part of the geotechnical investigation at the site. The model grid was rotated 90 degrees from the plant design grid so that the model north is equivalent to the plant east. All references to the signs of the compass are with respect with the model north, which is at 45-degree angle with the true north, pointing to the true northeast. The total areal extent of the model is about one and a quarter square mile [3.24 km^2], covering an area of 5180 ft [1579 m] by 6790 ft [2070 m]. The model domain extends southward approximately 0.25 mi [0.40 km] beyond the southern side of the Unit 3 switchyard into the Johns Creek watershed. To the model north, the domain extends into Chesapeake Bay about 50 ft [15 m] beyond the tip of the barge dock. In the model east-west direction, the domain extends about 0.35 mi [0.56 km] to the east of the eastern side of the Unit 3 power block and about 0.45 mi [0.72 km] to the west of the western side of the Unit 3 cooling tower.

Because the exact location of groundwater discharge from the Surficial aquifer and the Upper Chesapeake unit into nearby streams and other low-lying areas is not known, a drain condition was applied over the entire top layer of the model, except over the part of the model that is in Chesapeake Bay. The elevation of each drain was set at 0.1 ft [0.03 m] below the ground surface. A high value for the conductance of these drains was used to allow the discharge of groundwater out of the aquifer system when the water table reaches the ground surface.

In the top layer of the model, a constant head boundary condition was used to represent the Chesapeake Bay, and no flow conditions were used along the other three sides of the model. In the layers of the model representing the Upper and the Lower Chesapeake units, a general boundary condition was used on their southern and northern boundaries and a no-flow condition on the eastern and western sides. Layer 2 and layer 4 in the model represent the two aquitards, with the exception of the north side of layer 2 where the Upper Chesapeake unit is present. The northern boundary of layer 2 used a general head boundary while all other boundaries in layers 2 and 4 were treated as no-flow boundaries.

Different zones of groundwater recharge were used in the model simulations. These zones include forested areas, open undeveloped areas (i.e., areas covered with grasses and low shrubs), and paved areas. Also, different recharge zones were defined for forested areas over the Surficial aquifer, over the outcrop of the Upper Chesapeake aquitard and over the outcrop of the Upper Chesapeake unit.

In most simulations, each of the five hydrostratigraphic units was represented with a single value of horizontal hydraulic conductivity and a single value of vertical hydraulic conductivity. One alternative, conceptual geologic scenario and corresponding model employed two zones of horizontal hydraulic conductivity for the Upper Chesapeake unit. The second value represented a zone of low horizontal hydraulic conductivity relative the major portion of the unit. The horizontal to vertical anisotropy of hydraulic conductivity for all aquifer units was assumed to be 10:1.

Calibration parameters included hydraulic conductivity values in all units and the rate of groundwater recharge at the top layer of the model. Piezometric level data from monitoring wells discussed in Section 2.4.12.3.1 were used as calibration targets. The model was calibrated for steady-state conditions. For this purpose, the average value of the monthly or quarterly observations at each well in 2007 was used as a calibration target representing long-term average conditions. The calibrated hydraulic conductivity values were within the range of measured values in the hydraulic tests conducted in each aquifer unit. The calibrated hydraulic conductivity values for the aquitards were within the range of values for the confining layers used by the Maryland Geological Survey in their regional model (MGS, 2007b).

INSERT 2 (FSAR Section 2.4.12.5)

, and Figures 2.4-110 though 2.4-113 for the Surficial aquifer, in Figures 2.4-75 through 2.4-78, Figure 2.4-100, and Figures 2.4-114 though 2.4-118 for the Upper Chesapeake unit, and in Figures 2.4-80 through 2.4-83, Figure 2.4-101, and Figures 2.4-119 through 2.4-123 for the Lower Chesapeake unit

INSERT 3 (FSAR Section 2.4.12.5)

The model was used to predict groundwater levels and flow direction at the site under post-construction conditions. For this purpose, the model was modified by replacing the current topography with the post-construction topography as shown in Figure 2.5-129. The post-construction model accounted for hydraulic properties of backfill and other fill material used to achieve the final grade plan and treated buildings with foundations that extend below elevation 80 ft [24 m] (NGVD 29) as barriers to shallow groundwater flow, incorporated stormwater treatment measures including surface sand filters, and considered changes in groundwater recharge resulting from the construction of Unit 3 and supporting facilities and structures.

Model cells in areas where building foundations extend to or near the bottom of the Surficial aquifer were designated as inactive and excluded from the model to indicate that the foundations are barriers to groundwater flow. Recharge rates over the area of the proposed buildings in the Unit 3 power block area were reduced to zero. The rate of recharge from the surface sand filters surrounding the power block area was estimated based on the amount of flow directed to the surface sand filters and the ability of the subsurface materials in these areas to accommodate these rates.

The post-construction model was used to estimate piezometric levels in the power block area. Modeled post-construction depth to the water table in the power block area is shown on Figure 2.4-97. The elevation of the water table across the power block area is shown on Figure 2.4-98. The model post-construction topography is shown on Figure 2.4-107.

In addition, the post-construction model was used to identify likely and other plausible pathways of postulated accidental effluent releases in the Nuclear Auxiliary Building (NAB), see Section 2.4.13.

The post-construction model was also used to quantify the impact of the construction of Unit 3 on groundwater discharge in Johns Creek. A sensitivity analysis was conducted to assess the impact of different assumptions and input parameter values on the model predictions. The sensitivity analysis included simulations for different values of hydraulic conductivity of the fill material, different assumptions for the performance of the surface sand filters designed to enhance groundwater recharge, an alternative hydraulic conductivity distribution in the Upper Chesapeake unit assumptions, and an assumption of leakage through the bottom of the Lower Chesapeake unit.

The major conclusions from the post construction simulations are:

a) The water table in the power block area will be well below the site grade level. In all simulations, the water table in the power block area was more than 25 ft [7.6 m] below the site grade level of 85 ft [26 m] (NGVD 29).

b) The groundwater pathway for liquid effluent releases from the NAB depends on the hydraulic conductivity of the fill material.

   - If the hydraulic conductivity of the fill is equal to the lower end of the range of expected values (1x10-3 cm/s [2.8 ft/day]), then releases from the bottom of the NAB will move first downwards to the Upper Chesapeake unit and then horizontally through this unit towards Chesapeake Bay where they will eventually discharge. Even with a conservative assumption of 0.145 for the effective porosity for the Upper Chesapeake unit, the estimated travel time from the release point to Chesapeake Bay is over 22 years.

   - If the hydraulic conductivity of the fill is equal to the upper end of the range of expected values (1x10-2 cm/s [28 ft/day]), then releases from the bottom of the NAB will move horizontally through the fill material and discharge into Branch 2. The estimated travel time from the release point to discharge point is less than a year.

c) The impact of the construction of Unit 3 on the volume of groundwater discharge in Johns Creek will be negligible.

Details on the development of the groundwater model, the assumptions and input parameter values used as well as simulation results are presented in the Groundwater Model Report (Bechtel 2010).

INSERT 4 (FSAR Section 2.4.12.1.3)

Groundwater levels in the wells installed in 2006 were monitored monthly from July 2006 through June 2007 and have been monitored quarterly thereafter. Groundwater levels in the

wells installed in 2008 were monitored monthly from September 2008 through October 2009, and will be monitored on a quarterly basis henceforth.

INSERT 5 (FSAR Section 2.4.12.1.4)

Condition 28 of the proposed CPCN limits construction dewatering withdrawals from the Surficial aquifer to a daily average of 75,000 gallons on an average annual basis and a daily average not to exceed 100,000 gallons during the highest w ithdrawal month.

Based on water use estimates for normal conditions during construction, the maximum monthly water use total is calculated to be a daily average of 287,333 gallons. This value exceeds the groundwater allocation allowed by the CPCN. Therefore, other sources of water will be needed during this period, or the CPCN will need to be revised. Utilizing the dewatering effluent as a supplement for construction water use is the most attractive option; but it will require a revision to the dewatering limit in the CPCN.

After Unit 3 construction is complete, the desalination plant may be out of service occasionally for a period estimated to be no more than ten weeks, to permit maintenance and repair. During this period, continued operation of Unit 3 will require a back-up source of approximately 900 gpm of fresh water. The Aquia, Upper Patapsco, and Lower Patapsco aquifers are each capable of producing the fresh water supply required. However, three wells would be needed in the Aquia aquifer (one more than the maximum of two allowed by the CPCN) to reach the required 900 gpm flow, while only two wells would be necessary in either the Upper Patapsco or Lower Patapsco aquifers. In addition, the required 900 gpm of fresh water is substantially more than the 180,000 gpd for the month of maximum use allowed by the CPCN.

INSERT 6 (FSAR Section 2.4.12.3.1)

Seven additional observation wells were installed in 2008 as part of the Supplemental COL Investigation. Five of these wells were installed to provide additional geotechnical information regarding slope stability and soil stresses near the new intake structure. Of these five wells, two were installed in the Surficial aquifer, one was installed in the Upper Chesapeake unit, and two were installed in the Lower Chesapeake unit. In addition, two wells were installed in the Power Block 3 area to provide additional water level information in the Upper Chesapeake Unit. All well screens are 10 feet in length.

INSERT 7 (FSAR Section 2.4.12.3.1)

Observation well OW-779 appears to have been screened in the Chesapeake Confining unit between the Surficial aquifer and the Upper Chesapeake unit. This well is consistently dry and is also not included in the analysis.

INSERT 8 (FSAR Section 2.4.12.3.1)

Upon completion of well installation and development activities, monthly monitoring of the 2006 COL observation wells began in July 2006 and continued through June 2007. Quarterly monitoring of this well series was then initiated, commencing in September 2007 and continuing to the present with the last set of measurements performed in October 2009.

Installation and development activities for the 2008 Supplemental COL Investigation observation well series were completed in September 2008, at which time a monthly water level monitoring

program was initiated for these wells. Monthly water level measurements for the 2008 Supplemental COL Investigation observation well series were taken from September 2008 through October 2009. Henceforth, ground water levels in this series will be monitored on a quarterly basis.

The following ground water potentiometric surface trend discussion is based the observation well data described above.

INSERT 9 (FSAR Section 2.4.12.3.1.1)

October 2009). A seasonal influence during this monitoring period was indicated by ground water elevation lows in the late fall through mid-winter, and ground water elevation highs in the spring and summer. For 12 of the 13 wells, maximum observed water levels for the observation period occurred in late spring to early summer of 2007. Generally, minimum observed water levels for the observation period occurred in the fall to winter of either 2007-2008 or 2008-2009. Ground water elevation fluctuations averaged approximately 4.7 ft (1.4 m), and the maximum observed fluctuation of 9.8 ft (3.0 m) was observed in OW-759A.

INSERT 10 (FSAR Section 2.4.12.3.1.1)

After the first year of monitoring, groundwater surface elevation contour maps were developed semiannually to roughly coincide with observed maximum and minimum groundwater elevations in the Surficial aquifer. These contour maps are presented in Figures 2.4-110 through 2.4-113 for December 2007, July 2008, January 2009, and July 2009.

INSERT 11 (FSAR Section 2.4.12.3.1.2)

A seasonal influence during the monitoring period was indicated by ground water elevation highs in spring and summer, with ground water elevation lows in fall and early winter. Maximum observed water levels for the observation period were recorded in spring to early summer 2007 for the 2006 COL observation wells. Water levels for the 2008 Supplemental COL Investigation wells recorded maximum values in May or June 2009. Minimum observed water levels in 19 of the 23 wells installed in the Upper Chesapeake unit occurred in October 2008. Although they exhibit the same general water level trends during the observation period, two wells (OW-708A and OW-769) exhibit noticeably higher ranges (amplitude) of elevation changes. On average, ground water elevations fluctuated approximately 5.4 ft (1.7 m), and the maximum observed fluctuation of 12.8 ft (3.9 m) was observed in OW-769.

INSERT 12 (FSAR Section 2.4.12.3.1.2)

After the first year of monitoring, groundwater surface elevation contour maps were developed semiannually to roughly coincide with observed maximum and minimum groundwater elevations in the Upper Chesapeake unit. These contour maps are presented in Figures 2.4-114, 2.4-115, 2.4-116 and 2.4-118 for December 2007, July 2008, October 2008, April 2009, and October 2009.

INSERT 13 (FSAR Section 2.4.12.3.1.3)

October 2009). A slight seasonal influence during the monitoring period was indicated by ground water elevation lows in the fall and winter, and ground water elevation highs in the spring and summer. This seasonal variation is not very pronounced in the two wells located

near the Chesapeake Bay shoreline (OW-774B and OW-781). Maximum observed water levels were recorded in April 2007 for the 2006 COL observation wells. Maximum observed water levels for the 2008 Supplemental COL Investigation wells were recorded in June 2009. Minimum observed water levels occurred in fall 2008 and winter 2009. In general, ground water elevation fluctuations averaged approximately 3.6 ft (1.1 m), and the maximum observed fluctuation of 7.0 ft (2.1 m) was observed in OW-703B.

INSERT 14 (FSAR Section 2.4.12.3.1.3)

After the first year of monitoring, groundwater surface elevation contour maps were developed semiannually to roughly coincide with observed maximum and minimum groundwater elevations in the Lower Chesapeake unit. These contour maps are presented in Figures 2.4-119 through 2.4-123 for December 2007, April 2008, October 2008, April 2009, and October 2009.

INSERT 15 (FSAR Section 2.4.12.3.2.1)

An estimate of the effective porosity of the Surficial aquifer was developed based on the grain size distribution of soil samples collected during the geotechnical investigation. Using median grain size and Figure 2.17 in de Marsily (1986), an effective porosity value of 25.2% was estimated for the Surficial aquifer. However, Stephens et al. (1998) indicate that, based on the results of a field tracer test, effective porosities that are estimated from grain size data can over-estimate the actual effective porosities by approximately 45%. Therefore, the estimated effective porosity of the Surficial aquifer was reduced to 13.9% for transport calculations. Bulk density was estimated using moist unit weight and moisture content values from laboratory test results of the geotechnical samples. Bulk density in the Surficial aquifer was estimated to be 100.0 lb/ft^3 (1.60 g/cm^3).

INSERT 16 (FSAR Section 2.4.12.3.2.2)

An estimate of the effective porosity of the Upper Chesapeake unit was developed based on the grain size distribution of soil samples collected during the geotechnical investigation. Using median grain size and Figure 2.17 in de Marsily (1986), an effective porosity value of 26.4% was estimated for the Upper Chesapeake unit. However, Stephens et al. (1998) indicate that, based on the results of a field tracer test, effective porosities that are estimated from grain size data can over-estimate the actual effective porosities by approximately 45%. Therefore, the estimated effective porosity of the Upper Chesapeake unit was reduced to 14.5% for transport calculations. Bulk density was estimated using moist unit weight and moisture content values from laboratory test results of the geotechnical samples. Bulk density in the Upper Chesapeake unit was estimated to be 95.6 lb/ft^3 (1.53 g/cm^3).

INSERT 17 (FSAR Section 2.4.12.3.2.2)

An estimate of the effective porosity of the Lower Chesapeake unit was developed based on the grain size distribution of soil samples collected during the geotechnical investigation. Using median grain size and Figure 2.17 in de Marsily (1986), an effective porosity value of 28.4% was estimated for the Lower Chesapeake unit. However, Stephens et al. (1998) indicate that, based on the results of a field tracer test, effective porosities that are estimated from grain size data can over-estimate the actual effective porosities by approximately 45%. Therefore, the estimated effective porosity of the Lower Chesapeake unit was reduced to 15.6% for transport calculations. Bulk density was estimated using moist unit weight and moisture content values

from laboratory test results of the geotechnical samples. Bulk density in the Lower Chesapeake unit was estimated to be 83.6 lb/ft3 (1.34 g/cm3).

INSERT 18 (FSAR Section 2.4.12.4)

and seven supplemental wells constructed in 2008. Groundwater levels in the 40 wells installed in 2006 were monitored monthly from July 2006 through June 2007 and have been monitored quarterly thereafter. Groundwater levels in the seven wells installed in 2008 were monitored monthly from September 2008 through October 2009 and have been monitored quarterly thereafter.

INSERT 19 (FSAR Section 2.4.12.5)

Construction of Unit 3 includes excavations for the power block and for the Ultimate Heat Sink (UHS) makeup water intake structure. Water within these excavations is typically derived from three sources: surface water from precipitation falling in the excavation, water stored within the materials being excavated, and ground water inflow to the excavation. Ground water inflow in the excavations is analyzed for a Representative case (most likely conditions) and an Upper Bound case (using maximum values). Precipitation into the excavations is estimated using the rational method (a mass balance method which relates discharge to inflow). The volume of water stored within the material to be excavated is estimated by multiplying the area of the excavation by the saturated thickness and the effective porosity of the materials. Ground water flow into the excavation is estimated by treating the excavation as a large diameter well. Variables used for the precipitation Representative case include a 2-year – 1-hour rainfall intensity of 1.75 inches, and a coefficient of runoff of 0.8. For the ground water inflow Representative case, the geometric mean hydraulic conductivity from slug tests of 0.91 ft/day for the Surficial aquifer and 0.74 ft/day for the Upper Chesapeake unit is used for calculations. For the precipitation Upper Bound case, variables used include a 2-year – 1-hour rainfall intensity of 2.5 inches, and a coefficient of runoff of 1.0. The maximum hydraulic conductivity from slug tests is used for the ground water inflow Upper Bound case, corresponding to 17.4 ft/day for the Surficial aquifer and 13.7 ft/day for the Upper Chesapeake unit.

The Power Block excavation is approximately 1,080 ft wide by 1,080 ft long. The bottom of the excavation is at elevation 32 ft msl, with the reactor tendon galleries extending to 30 ft msl. Plant grade is 85 ft msl. For the Surficial aquifer, the saturated thickness is estimated to be 20 ft, with an effective porosity of 25.2%. For the Upper Chesapeake unit, the saturated thickness is estimated to be 13.1 ft, with an effective porosity of 26.4%. The amount of water entering the excavation from precipitation is estimated to be 16,826 gpm for the Representative case, and 30,046 gpm for the Upper Bound case. The ground water stored in the excavation is estimated to be 74,147,852 gallons (43,972,347 gallons in the Surficial aquifer and 30,175,505 gallons in the Upper Chesapeake unit). Assuming a three month period for pumping, the equivalent pumping rate to remove the stored water would be 572 gpm. Ground water flow into the excavation is calculated to be 35 gpm (20 gpm from the Surficial aquifer and 15 gpm from the Upper Chesapeake unit) for the Representative case. The Upper Bound ground water flow into the excavation is calculated to be 250 gpm (140 gpm from the Surficial aquifer and 110 gpm from the Upper Chesapeake unit).

The UHS Makeup Water Structure/Electrical Building excavation is approximately 100 ft wide by 300 ft long by 37 ft deep. The grade in the area is approximately 10 ft msl. In this location, the Surficial aquifer is absent, and the Upper Chesapeake unit is estimated to have a saturated thickness of 30 ft and an effective porosity of 26.4%. Precipitation into the excavation is

estimated to be 433 gpm for the Representative case and 773 gpm for the Upper Bound case. Ground water stored in the excavation is estimated to be 1,777,372 gallons. Assuming a three month period for pumping, the equivalent pumping rate to remove the stored water would be 14 gpm. The ground water flow into the excavation is calculated to be 20 gpm for the Representative case and 110 gpm for the Upper Bound case.

INSERT 20 (FSAR Section 2.4.12.5)

Groundwater sampling and testing at the CCNPP Unit 3 site has been performed in eight separate sampling events. Samples were field tested for pH, and laboratory samples were tested for sulfate and chloride concentrations. Data from these sampling events were analyzed to determine the expected water quality of the groundwater in the excavations. For samples obtained from the Surficial aquifer, the mean pH was found to be 5.2, with a seasonal low mean of 4.9. Test results from the Surficial aquifer gave a pH range of 4.5 to 6.9. Mean sulfate and chloride concentrations in the Surficial aquifer were 14.9 and 13.2 mg/l, respectively. Seasonal high Surficial aquifer mean sulfate and chloride concentrations were 21.8 and 18.9 mg/l, respectively. In the Upper Chesapeake unit, the mean pH was found to be 7.4, with a seasonal low mean of 7.1. Test results from the Upper Chesapeake unit gave a pH range of 6.4 to 8.0. Mean sulfate and chloride concentrations in the Upper Chesapeake were 51.4 and 45.0 mg/l, respectively. In the Upper Chesapeake unit, seasonal high mean sulfate and chloride concentrations were 65.1 and 50.7 mg/l, respectively.

Table 2.4-34
Insert 1

Table 2.4-34—{CCNPP Unit 3 Observation Wells Construction Details}

(Page 1 of 3)

Well ID	Northing[1] (ft)	Easting[1] (ft)	Ground Surface Elevation (ft)	Well Pad Elevation (ft)	Top of Casing[2] Elevation (ft)	Boring Depth (ft)	Well Depth (ft)	Screen Diameter & Slot Size (in)	Screen Interval Depth		Screen Interval Elevation		Filterpack Interval Depth		CCNPP Hydrostratigraphic Unit
									Top (ft)	Bottom (ft)	Top (ft)	Bottom (ft)	Top (ft)	Bottom (ft)	
OW-301	217048.02	960814.47	94.51	94.78	96.27	80.0	77.0	2 / 0.010	65.0	75.0	29.5	19.5	61.0	80.0	Upper Chesapeake Unit
OW-313A	217367.31	960705.30	51.03	51.31	53.20	57.5	52.5	2 / 0.010	40.0	50.0	11.0	1.0	35.0	57.5	Upper Chesapeake Unit
OW-313B	217372.35	960713.67	50.73	51.16	53.54	110.0	107.5	2 / 0.010	95.0	105.0	-44.3	-54.3	91.0	110.0	Lower Chesapeake Unit
OW-319A	216962.56	961116.12	103.13	103.31	104.91	35.0	32.0	2 / 0.010	20.0	30.0	83.1	73.1	15.0	35.0	Surficial Aquifer
OW-319B	216957.32	961125.02	103.53	103.85	105.35	85.0	82.0	2 / 0.010	70.0	80.0	33.5	23.5	65.0	85.0	Upper Chesapeake Unit
OW-323	217034.46	960057.07	106.96	107.55	109.69	43.5	42.0	2 / 0.010	30.0	40.0	77.0	67.0	26.0	43.5	Surficial Aquifer
OW-328	216828.86	960493.21	76.29	76.55	77.85	72.0	72.0	2 / 0.010	60.0	70.0	16.3	6.3	56.5	72.0	Upper Chesapeake Unit
OW-336	216643.18	960746.61	97.11	97.50	99.07	74.0	72.0	2 / 0.010	60.0	70.0	37.1	27.1	53.0	74.0	Upper Chesapeake Unit
OW-401	216348.86	961530.99	71.38	71.91	73.49	77.5	75.3	2 / 0.010	63.0	73.0	8.4	-1.6	57.0	77.5	Upper Chesapeake Unit
OW-413A	216703.14	961418.81	123.15	123.51	125.04	50.0	47.0	2 / 0.010	35.0	45.0	88.2	78.2	30.0	50.0	Surficial Aquifer
OW-413B	216694.88	961413.25	122.90	123.25	124.85	125.0	122.0	2 / 0.010	110.0	120.0	12.9	2.9	105.0	125.0	Upper Chesapeake Unit
OW-418A	216340.41	961966.46	43.66	44.31	45.83	40.0	37.0	2 / 0.010	25.0	35.0	18.7	8.7	21.0	40.0	Upper Chesapeake Unit
0W-418B	216340.25	961976.71	43.67	44.13	45.77	92.0	87.0	2 / 0.010	75.0	85.0	-31.3	-41.3	72.0	92.0	Lower Chesapeake Unit
OW-423	216339.99	960882.24	111.12	111.67	113.16	43.0	40.3	2 / 0.010	28.0	38.0	83.1	73.1	23.0	43.0	Surficial Aquifer
OW-428	216105.21	961212.38	113.92	114.32	115.92	50.0	47.0	2 / 0.010	35.0	45.0	78.9	68.9	30.0	50.0	Surficial Aquifer
OW-436	215922.47	961446.87	108.13	108.53	110.39	50.0	41.0	2 / 0.010	29.0	39.0	79.1	69.1	24.0	50.0	Surficial Aquifer
OW-703A	218171.23	960967.72	44.02	44.44	45.65	49.0	47.0	2 / 0.010	35.0	45.0	9.0	-1.0	32.5	49.0	Upper Chesapeake Unit
OW-703B	218171.67	960958.91	45.57	45.97	47.53	80.0	80.0	2 / 0.010	68.0	78.0	-22.4	-32.4	65.0	80.0	Lower Chesapeake Unit
OW-705	217566.62	960917.18	47.71	47.77	50.22	52.0	52.0	2 / 0.010	40.0	50.0	7.7	-2.3	35.0	52.0	Upper Chesapeake Unit
OW-708A	217586.23	961803.52	37.44	37.82	39.61	34.0	34.0	2 / 0.010	22.0	32.0	15.4	5.4	19.0	34.0	Upper Chesapeake Unit

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Table 2.4-34 Insert 2

Table 2.4-34—{CCNPP Unit 3 Observation Wells Construction Details}

(Page 3 of 3)

Well ID	Northing[1] (ft)	Easting[1] (ft)	Ground Surface Elevation (ft)	Well Pad Elevation (ft)	Top of Casing[2] Elevation (ft)	Boring Depth (ft)	Well Depth (ft)	Screen Diameter & Slot Size (in)	Screen Interval Depth		Screen Interval Elevation		Filterpack Interval Depth		CCNPP Hydrostratigraphic Unit
									Top (ft)	Bottom (ft)	Top (ft)	Bottom (ft)	Top (ft)	Bottom (ft)	
OW-769	216589.75	962559.47	54.23	54.39	56.43	42.0	42.0	2 / 0.010	31.8	41.8	22.4	12.4	18.0	42.0	Upper Chesapeake Unit
OW-770	215466.60	962826.95	121.59	121.79	123.08	42.0	42.0	2 / 0.010	30.0	40.0	91.6	81.6	28.0	42.0	Surficial Aquifer

Notes:

1)Maryland State Plane (NAD 1927). The Maryland State Plane 1927 coordinate system is based on North American Datum of 1927 (NAD27). NAD27 is a surface (or plane) to which horizontal positions in the U.S., Canada and Mexico is surveyed and referenced.

2)Elevation is top of PVC Well Casing. Reference Point for Ground Water Level Monitoring

Well ID	Northing [1] (ft)	Easting [1] (ft)	Ground Surface Elevation (ft)	Well Pad Elevation (ft)	Top of Casing [2] Elevation (ft)	Boring Depth (ft)	Well Depth (ft)	Screen Diameter & Slot Size (in)	Screen Interval Depth		Screen Interval Elevation		Filterpack Interval Depth		CCNPP Hydrostratigraphic Unit
									Top (ft)	Bottom (ft)	Top (ft)	Bottom (ft)	Top (ft)	Bottom (ft)	
Table 2.4-34 Insert 1:															
OW-304	217158.10	960920.80	68.78	69.28	71.01	72.8	72.0	2 / 0.010	60.0	70.0	8.78	-1.22	57.5	72.8	Upper Chesapeake Unit
OW-308	216928.00	960750.00	111.45	111.95	113.62	103.0	102.0	2 / 0.010	90.0	100.0	21.45	11.45	88.0	103.0	Upper Chesapeake Unit
Table 2.4-34 Insert 2:															
OW-774A	219187.30	961030.50	9.7	10.20	12.20	23.0	22.0	2 / 0.010	10.0	20.0	-0.3	-10.3	8.0	23.0	Upper Chesapeake Unit
OW-774B	219176.70	961020.20	10.1	10.50	12.55	52.8	52.0	2 / 0.010	40.0	50.0	-29.9	-39.9	37.5	52.8	Lower Chesapeake Unit
OW-778	219100.60	960728.60	113.3	113.70	115.45	52.0	52.0	2 / 0.010	40.0	50.0	73.3	63.3	38.0	52.0	Surficial Aquifer
OW-779	218958.70	960587.30	100.9	101.30	102.94	52.5	52.0	2 / 0.010	40.0	50.0	60.9	50.9	37.9	52.5	Chesapeake Unit
OW-781	219421.30	960764.40	10.3	10.80	12.87	53.0	52.0	2 / 0.010	40.0	50.0	-29.7	-39.7	37.0	53.0	Lower Chesapeake Unit

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Table 2.4-35—{CCNPP Unit 3 Observation Wells Water Level Elevations}

~~(Page 1 of 2)~~

Well ID	Ground Surface Elevation	Water Level Monitoring Reference Point Elevation	Depth to Water									Water Level Elevation											
			July 2006	August 2006	September 2006	October 2006	November 2006	December 2006	January 2007	February 2007	March 2007	July 2006	August 2006	September 2006	October 2006	November 2006	December 2006	January 2007	February 2007	March 2007	April 2007	May 2007	June 2007
	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
OW-301	94.51	96.27	58.85	59.45	59.37	58.34	58.00	58.04	57.33	57.00	56.78	37.42	36.82	36.90	37.93	38.27	38.23	38.94	39.27	39.49	39.81	38.95	37.60
OW-313A	51.03	53.20	19.80	20.40	20.08	19.57	18.80	18.90	17.93	18.25	17.12	33.40	32.80	33.12	33.63	34.40	34.30	35.27	34.95	36.08	36.43	34.97	33.64
OW-313B	50.73	53.54	23.05	23.65	23.47	23.17	22.76	22.52	21.89	21.80	21.44	30.49	29.89	30.07	30.37	30.78	31.02	31.65	31.74	32.10	32.57	32.07	30.94
OW-319A	103.13	104.91	26.48	26.58	26.25	26.08	26.28	26.22	26.25	26.44	26.25	78.43	78.33	78.66	78.83	78.63	78.69	78.66	78.47	78.66	78.73	78.65	78.34
OW-319B	103.53	105.35	67.49	67.97	67.95	67.53	66.57	66.43	65.74	65.52	65.27	37.86	37.38	37.40	37.82	38.78	38.86	39.61	39.83	40.08	40.51	39.63	38.13
OW-323	106.96	109.69	27.80	28.22	28.37	28.13	27.96	27.26	26.88	26.45	26.52	81.89	81.47	81.32	81.56	81.73	82.43	82.81	83.24	83.17	83.81	83.69	82.92
OW-328	76.29	77.85	40.77	41.40	41.35	40.68	40.33	40.13	39.63	39.42	39.32	37.08	36.45	36.50	37.17	37.52	37.72	38.22	38.43	38.53	39.13	38.52	37.33
OW-336	97.11	99.07	60.99	61.36	61.52	60.45	60.42	60.19	59.65	59.20	59.25	38.06	37.71	37.55	38.62	38.65	38.88	39.42	39.87	39.82	40.31	39.79	38.50
OW-401	71.38	73.49	34.13	34.95	34.73	33.72	32.95	33.37	32.3[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	38.76	39.77	40.54	40.12	41.16	41.04	41.73	42.11	40.83	39.35
OW-413A	123.15	125.04	45.87	45.85	45.87	45.87	45.87	45.86	45.8[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	79.17	79.17	79.17	79.18	79.21	79.27	79.28	79.29	79.36	79.32
OW-413B	122.90	124.85	86.60	87.30	87.13	86.46	85.14	85.56	84.4[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	37.72	38.39	39.71	39.29	40.45	40.10	41.28	41.60	40.01	38.43
OW-418A	43.66	45.83	8.22	9.44	8.60	7.97	6.45	7.60	6.40	[illegible].91	5.68	37.61	36.39	37.23	37.86	39.38	38.23	39.43	38.92	40.15	40.26	38.51	37.18
0W-418B	43.67	45.77	12.52	13.36	12.90	12.47	11.67	12.85	11.[illegible]	11.27	10.74	33.25	32.41	32.87	33.30	34.10	32.92	34.74	34.50	35.03	35.35	34.44	33.22
OW-423	111.12	113.16	29.77	30.04	30.03	29.93	29.78	29.54	29.02	28.76	28.38	83.39	83.12	83.13	83.23	83.38	83.62	84.14	84.40	84.78	85.54	85.74	85.29
OW-428	113.92	115.92	37.82	37.92	37.98	38.07	38.01	37.89	37.69	37.25	37.17	78.10	78.00	77.94	77.85	77.91	78.03	78.23	78.67	78.75	79.45	79.72	79.29
OW-436	108.13	110.39	31.68	32.06	31.85	31.55	31.05	31.40	30.60	31.05	30.28	78.71	78.33	78.54	78.8[illegible]	79.31	78.99	79.79	79.34	80.11	80.20	79.67	79.17
OW-703A	44.02	45.65	27.33	27.84	28.05	27.93	27.60	27.12	25.16	25.60	22.15	18.32	17.81	17.60	17.72	18.05	18.53	20.49	20.05	23.50	23.70	19.97	21.57
OW-703B	45.57	47.53	29.34	29.85	29.95	29.73	29.40	29.10	27.45	27.72	24.74	18.19	17.68	17.58	17.80	18.13	18.43	20.08	19.81	22.79	23.06	19.85	21.06
OW-705	47.71	50.22	20.28	21.10	20.67	20.10	19.02	19.40	17.82	18.60	16.57	29.94	29.12	29.55	30.12	31.20	30.[illegible]	32.40	31.62	33.65	33.87	31.50	30.00
OW-708A	37.44	39.61	13.39	15.01	15.85	12.78	10.46	12.58	8.96	12.20	6.71	26.22	24.60	25.76	26.83	29.15	27.03	30.65	27.41	32.90	32.84	27.91	25.11
OW-711	52.92	55.31	19.26	20.64	19.50	18.43	16.14	18.33	15.94	17.70	14.33	36.05	34.67	35.81	36.88	39.17	36.98	39.37	37.61	40.98	40.95	37.13	35.46
OW-714	116.02	117.98	45.93	46.28	46.33	46.36	46.19	45.87	45.60	45.42	45.21	72.05	71.70	71.65	71.62	71.79	72.11	72.38	72.56	72.77	73.20	73.05	74.73
OW-718	118.53	120.41	40.[illegible]	40.56	40.80	41.07	41.29	41.37	41.18	40.40	40.22	79.94	79.85	79.61	79.34	79.12	79.04	79.23	80.01	80.19	81.13	81.69	81.48
OW-725	58.04	59.94	32.80	33.87	33.92	33.56	32.54	32.30	30.77	30.77	29.77	27.14	26.07	26.02	26.38	27.40	27.64	29.17	29.17	30.[illegible]7	30.99	29.47	25.80
OW-729	118.88	121.11	44.08	41.99	41.96	41.96	41.92	41.99	41.98	41.98	41.98	77.03	79.12	79.15	79.15	79.19	79.12	79.13	79.13	79.13	79.18	79.11	79.11
OW-735	91.20	93.44	54.18	55.17	55.14	54.57	53.31	53.24	52.36	52.13	52.16	39.26	38.27	38.30	38.87	40.13	40.20	41.08	41.31	41.28	42.04	41.07	39.70
OW-743	102.65	105.89	37.22	37.77	37.52	37.35	37.22	36.99	36.61	36.03	35.80	68.67	68.12	68.37	68.54	68.67	68.90	69.28	69.86	70.09	71.11	71.32	71.75
OW-744	97.50	99.81	32.97	33.52	33.15	32.96	32.47	32.52	32.06	31.97	31.73	66.84	66.29	66.66	66.85	67.34	67.29	67.75	67.84	68.08	68.48	68.06	67.34
OW-752A	95.30	97.00	24.76	25.18	25.35	25.36	25.23	24.08	23.34	22.77	22.68	72.24	71.82	71.65	71.64	71.77	72.92	73.66	74.23	74.32	75.43	74.76	73.09

See Replacement for Table 2.4-35

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Table 2.4-35—{CCNPP Unit 3 Observation Wells Water Level Elevations}

~~(Page 2 of 2)~~

Well ID	Ground Surface Elevation	Water Level Monitoring Reference Point Elevation	Depth to Water									Water Level Elevation											
			July 2006	August 2006	September 2006	October 2006	November 2006	December 2006	January 2007	February 2007	March 2007	July 2006	August 2006	September 2006	October 2006	November 2006	December 2006	January 2007	February 2007	March 2007	April 2007	May 2007	June 2007
	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
OW-752B	95.79	97.41	59.55	60.25	60.05	59.75	59.38	59.16	58.77	58.60	58.58	37.86	37.16	37.36	37.66	38.03	38.25	38.64	38.81	38.83	39.40	38.91	38.09
OW-754	67.00	68.85	31.32	32.05	31.80	31.05	30.73	30.93	30.24	30.12	29.67	37.53	36.80	37.05	37.80	38.12	37.92	38.61	38.73	39.18	39.53	38.52	37.52
OW-756	106.56	108.77	29.98	30.17	30.42	30.55	30.59	30.46	30.04	29.42	29.18	78.79	78.60	78.35	78.22	78.18	78.31	78.73	79.35	79.59	81.15	81.72	81.00
OW-759A	97.78	99.69	26.88	27.53	28.00	28.12	28.32	27.41	26.77	25.50	24.41	72.81	72.16	71.69	71.57	71.37	72.28	72.92	74.19	75.28	76.04	75.96	78.61
OW-759B	98.35	100.14	63.09	63.80	63.56	63.31	63.11	62.87	62.54	62.32	62.30	37.05	36.34	36.58	36.83	37.03	37.27	37.60	37.82	37.84	38.29	37.97	38.57
OW-765A	97.37	99.60	21.72	22.02	21.87	21.70	21.20	20.10	18.95	19.25	18.38	77.88	77.58	77.73	77.90	78.40	79.50	80.65	80.35	81.22	81.73	81.32	79.48
OW-765B	96.82	98.47	60.22	60.72	60.55	60.40	59.92	59.77	59.73	59.45	59.37	38.25	37.75	37.92	38.07	38.55	38.70	38.74	39.02	39.10	39.51	39.23	38.55
OW-766	108.89	110.72	28.88	29.36	29.42	29.20	29.20	28.76	28.11	27.60	27.30	81.84	81.36	81.30	81.52	81.52	81.96	82.61	83.12	83.42	83.95	83.87	83.20
OW-768A	48.48	49.84	24.05	24.88	24.04	23.67	23.12	23.65	23					25.80	26.17	26.72	26.19	26.74	26.58	27.31	27.22	26.29	25.69
OW-769	54.23	56.43	26.50	27.96	27.37	26.74	24.13	25.74	23					29.06	29.69	32.30	30.69	32.95	32.00	35.88	35.76	31.75	30.03
OW-770	**121.59**	**123.08**	**dry**	**42.10**	**42.09**	**42.08**	**42.09**	**42.11**	**42**					**80.99**	**81.00**	**80.99**	**80.97**	**80.98**	**80.98**	**80.98**	**80.98**	**80.98**	**80.98**

See Replacement for Table 2.4-35

Notes:

1)Highlighted wells: Questionable water level readings due to proximity of depth of water to bottom of well screen and/or minimal water level fluctuations with time

2) Reading from water level round was 41.90. Review suggested questionable reading. Retaken 5 days later and reading was 30.04 ft

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Well ID	Ground Surface Elevation	Water Level Monitoring Reference Point Elevation	Depth to Water										Water Level Elevation									
			July 2006	August 2006	September 2006	October 2006	November 2006	December 2006	January 2007	February 2007	March 2007	April 2007	July 2006	August 2006	September 2006	October 2006	November 2006	December 2006	January 2007	February 2007	March 2007	April 2007
	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
2006 COLA Observation Wells																						
OW-301	94.51	96.27	58.85	59.45	59.37	58.34	58.00	58.04	57.33	57.00	56.78	56.46	37.42	36.82	36.90	37.93	38.27	38.23	38.94	39.27	39.49	39.81
OW-313A	51.03	53.20	19.80	20.40	20.08	19.57	18.80	18.90	17.93	18.25	17.12	16.77	33.40	32.80	33.12	33.63	34.40	34.30	35.27	34.95	36.08	36.43
OW-313B	50.73	53.54	23.05	23.65	23.47	23.17	22.76	22.52	21.89	21.80	21.44	20.97	30.49	29.89	30.07	30.37	30.78	31.02	31.65	31.74	32.10	32.57
OW-319A	103.13	104.91	26.48	26.58	26.25	26.08	26.28	26.22	26.25	26.44	26.25	26.18	78.43	78.33	78.66	78.83	78.63	78.69	78.66	78.47	78.66	78.73
OW-319B	103.53	105.35	67.49	67.97	67.95	67.53	66.57	66.49	65.74	65.52	65.27	64.84	37.86	37.38	37.40	37.82	38.78	38.86	39.61	39.83	40.08	40.51
OW-323	106.96	109.69	27.80	28.22	28.37	28.13	27.96	27.26	26.88	26.45	26.52	25.88	81.89	81.47	81.32	81.56	81.73	82.43	82.81	83.24	83.17	83.81
OW-328	76.29	77.85	40.77	41.40	41.35	40.68	40.33	40.13	39.63	39.42	39.32	38.72	37.08	36.45	36.50	37.17	37.52	37.72	38.22	38.43	38.53	39.13
OW-336	97.11	99.07	60.99	61.36	61.52	60.45	60.42	60.19	59.65	59.20	59.25	58.76	38.08	37.71	37.55	38.62	38.65	38.88	39.42	39.87	39.82	40.31
OW-401	71.38	73.49	34.13	34.95	34.73	33.72	32.95	33.37	32.33	32.45	31.76	31.38	39.36	38.54	38.76	39.77	40.54	40.12	41.16	41.04	41.73	42.11
OW-413A	123.15	125.04	45.87	45.85	45.87	45.87	45.87	45.86	45.83	45.77	45.76	45.75	79.17	79.19	79.17	79.17	79.17	79.18	79.21	79.27	79.28	79.29
OW-413B	122.90	124.85	86.60	87.30	87.13	86.46	85.14	85.56	84.40	84.75	83.57	83.25	38.25	37.55	37.72	38.39	39.71	39.29	40.45	40.10	41.28	41.60
OW-418A	43.66	45.83	8.22	9.44	8.60	7.97	6.45	7.60	6.40	6.91	5.68	5.57	37.61	36.39	37.23	37.86	39.38	38.23	39.43	38.92	40.15	40.26
OW-418B	43.67	45.77	12.52	13.36	12.90	12.47	11.67	12.85	11.03	11.27	10.74	10.42	33.25	32.41	32.87	33.30	34.10	32.92	34.74	34.50	35.03	35.35
OW-423	111.12	113.16	29.77	30.04	30.03	29.93	29.78	29.54	29.02	28.76	28.38	27.62	83.39	83.12	83.13	83.23	83.38	83.62	84.14	84.40	84.78	85.54
OW-428	113.92	115.92	37.82	37.92	37.98	38.07	38.01	37.89	37.69	37.25	37.17	36.47	78.10	78.00	77.94	77.85	77.91	78.03	78.23	78.67	78.75	79.45
OW-436	108.13	110.39	31.68	32.06	31.85	31.55	31.08	31.40	30.60	31.05	30.28	30.19	78.71	78.33	78.54	78.84	79.31	78.99	79.79	79.34	80.11	80.20
OW-703A	44.02	45.65	27.33	27.84	28.05	27.93	27.60	27.12	25.16	25.60	22.15	21.95	18.32	17.81	17.60	17.72	18.05	18.53	20.49	20.05	23.50	23.70
OW-703B	45.57	47.53	29.34	29.85	29.95	29.73	29.40	29.10	27.45	27.72	24.74	24.47	18.19	17.68	17.58	17.80	18.13	18.43	20.08	19.81	22.79	23.06
OW-705	47.71	50.22	20.28	21.10	20.67	20.10	19.02	19.40	17.82	18.60	16.57	16.35	29.94	29.12	29.55	30.12	31.20	30.82	32.40	31.62	33.65	33.87
OW-708A	37.44	39.61	13.39	15.01	13.85	12.78	10.46	12.58	8.96	12.20	6.71	6.77	26.22	24.60	25.76	26.83	29.15	27.03	30.65	27.41	32.90	32.84
OW-711	52.92	55.31	19.26	20.64	19.50	18.43	16.14	18.33	15.94	17.70	14.33	14.36	36.05	34.67	35.81	36.88	39.17	36.98	39.37	37.61	40.98	40.95
OW-714	116.02	117.98	45.93	46.28	46.33	46.36	46.19	45.87	45.60	45.42	45.21	44.78	72.05	71.70	71.65	71.62	71.79	72.11	72.38	72.56	72.77	73.20
OW-718	118.53	120.41	40.47	40.56	40.80	41.07	41.29	41.37	41.18	40.40	40.22	39.28	79.94	79.85	79.61	79.34	79.12	79.04	79.23	80.01	80.19	81.13
OW-725	58.04	59.94	32.80	33.87	33.92	33.56	32.54	32.30	30.77	30.77	29.77	28.95	27.14	26.07	26.02	26.38	27.40	27.64	29.17	29.17	30.17	30.99
OW-729	118.88	121.11	44.08	41.99	41.96	41.96	41.92	41.99	41.98	41.98	41.98	41.93	77.03	79.12	79.15	79.15	79.19	79.12	79.13	79.13	79.13	79.18

Replacement for Table 2.4-35

Well ID	Ground Surface Elevation	Water Level Monitoring Reference Point Elevation	Depth to Water										Water Level Elevation									
			July 2006	August 2006	September 2006	October 2006	November 2006	December 2006	January 2007	February 2007	March 2007	April 2007	July 2006	August 2006	September 2006	October 2006	November 2006	December 2006	January 2007	February 2007	March 2007	April 2007
	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
OW-735	91.20	93.44	54.18	55.17	55.14	54.57	53.31	53.24	52.36	52.13	52.16	51.40	39.26	38.27	38.30	38.87	40.13	40.20	41.08	41.31	41.28	42.04
OW-743	103.65	105.89	37.22	37.77	37.52	37.35	37.22	36.99	36.61	36.03	35.80	34.78	68.67	68.12	68.37	68.54	68.67	68.90	69.28	69.86	70.09	71.11
OW-744	97.50	99.81	32.97	33.52	33.15	32.96	32.47	32.52	32.06	31.97	31.73	31.33	66.84	66.29	66.66	66.85	67.34	67.29	67.75	67.84	68.08	68.48
OW-752A	95.30	97.00	24.76	25.18	25.35	25.36	25.23	24.08	23.34	22.77	22.68	21.57	72.24	71.82	71.65	71.64	71.77	72.92	73.66	74.23	74.32	75.43
OW-752B	95.79	97.41	59.55	60.25	60.05	59.75	59.38	59.16	58.77	58.60	58.58	58.01	37.86	37.16	37.36	37.66	38.03	38.25	38.64	38.81	38.83	39.40
OW-754	67.00	68.85	31.32	32.05	31.80	31.05	30.73	30.93	30.24	30.12	29.67	29.32	37.53	36.80	37.05	37.80	38.12	37.92	38.61	38.73	39.18	39.53
OW-756	106.56	108.77	29.98	30.17	30.42	30.55	30.59	30.46	30.04	29.42	29.18	27.62	78.79	78.60	78.35	78.22	78.18	78.31	78.73	79.35	79.59	81.15
OW-759A	97.78	99.69	26.88	27.53	28.00	28.12	28.32	27.41	26.77	25.50	24.41	23.65	72.81	72.16	71.69	71.57	71.37	72.28	72.92	74.19	75.28	76.04
OW-759B	98.35	100.14	63.09	63.80	63.56	63.31	63.11	62.87	62.54	62.32	62.30	61.85	37.05	36.34	36.58	36.83	37.03	37.27	37.60	37.82	37.84	38.29
OW-765A	97.37	99.60	21.72	22.02	21.87	21.70	21.20	20.10	18.95	19.25	18.38	17.87	77.88	77.58	77.73	77.90	78.40	79.50	80.65	80.35	81.22	81.73
OW-765B	96.82	98.47	60.22	60.72	60.55	60.40	59.92	59.77	59.73	59.45	59.37	58.96	38.25	37.75	37.92	38.07	38.55	38.70	38.74	39.02	39.10	39.51
OW-766	108.89	110.72	28.88	29.36	29.42	29.20	29.20	28.76	28.11	27.60	27.30	26.77	81.84	81.36	81.30	81.52	81.52	81.96	82.61	83.12	83.42	83.95
OW-768A	48.48	49.84	24.05	24.88	24.04	23.67	23.12	23.65	23.10	23.26	22.53	22.62	25.79	24.96	25.80	26.17	26.72	26.19	26.74	26.58	27.31	27.22
OW-769	54.23	56.43	26.50	27.96	27.37	26.74	24.13	25.74	23.48	24.43	20.55	20.67	29.93	28.47	29.06	29.69	32.30	30.69	32.95	32.00	35.88	35.76
OW-770	121.59	123.08	dry	42.10	42.09	42.08	42.09	42.11	42.10	42.10	42.10	42.10	dry	80.98	80.99	81.00	80.99	80.97	80.98	80.98	80.98	80.98
2008 COLA Supplemental Investigation Observation Wells																						
OW-304	68.78	71.01																				
OW-308	111.45	113.62																				
OW-774A	9.7	12.20																				
OW-774B	10.1	12.55																				
OW-778	113.3	115.45																				
OW-779	100.9	102.94																				
OW-781	10.3	12.87																				

Replacement for Table 2.4-35

Well ID	Ground Surface Elevation	Water Level Monitoring Reference Point Elevation	Depth to Water										Water Level Elevation									
			May 2007	June 2007	September 2007	December 2007	April 2008	July 2008	September 2008	October 2008	November 2008	December 2008	May 2007	June 2007	September 2007	December 2007	April 2008	July 2008	September 2008	October 2008	November 2008	December 2008
	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
2006 COLA Observation Wells																						
OW-301	94.51	96.27	57.32	58.67	59.92	60.75	59.62	59.58	60.57	60.80			38.95	37.60	36.35	35.52	36.65	36.69	35.70	35.47		
OW-313A	51.03	53.20	18.23	19.56	21.05	21.52	20.32	23.80	21.51	21.71			34.97	33.64	32.15	31.68	32.88	29.40	31.69	31.49		
OW-313B	50.73	53.54	21.47	22.60	24.23	24.85	23.98	23.74	24.78	25.08			32.07	30.94	29.31	28.69	29.56	29.80	28.76	28.46		
OW-319A	103.13	104.91	26.26	26.57	26.95	27.25	26.20	26.28	26.68	26.08			78.65	78.34	77.96	77.66	78.71	78.63	78.23	78.83		
OW-319B	103.53	105.35	65.72	67.22	68.45	69.45	68.38	68.18	69.31	69.48			39.63	38.13	36.90	35.90	36.97	37.17	36.04	35.87		
OW-323	106.96	109.69	26.00	26.77	28.48	29.77	29.47	28.22	29.01	29.30			83.69	82.92	81.21	79.92	80.22	81.47	80.68	80.39		
OW-328	76.29	77.85	39.33	40.52	41.90	42.53	41.68	41.60	42.57	42.67			38.52	37.33	35.95	35.32	36.17	36.25	35.28	35.18		
OW-336	97.11	99.07	59.28	60.57	61.80	62.63	61.86	61.67	62.73	62.78			39.79	38.50	37.27	36.44	37.21	37.40	36.34	36.29		
OW-401	71.38	73.49	32.66	34.14	35.80	36.59	35.04	35.07	36.36	36.62			40.83	39.35	37.69	36.90	38.45	38.42	37.13	36.87		
OW-413A	123.15	125.04	45.68	45.72	45.82	45.93	45.97	45.87	45.90	45.92			79.36	79.32	79.22	79.11	79.07	79.17	79.14	79.12		
OW-413B	122.90	124.85	84.84	86.42	88.05	89.02	87.37	87.36	88.65	88.87			40.01	38.43	36.80	35.83	37.48	37.49	36.20	35.98		
OW-418A	43.66	45.83	7.32	8.65	10.67	10.62	8.38	8.95	10.70	11.17			38.51	37.18	35.16	35.21	37.45	36.88	35.13	34.66		
OW-418B	43.67	45.77	11.33	12.55	14.50	14.96	13.02	13.13	14.67	15.16			34.44	33.22	31.27	30.81	32.75	32.64	31.10	30.61		
OW-423	111.12	113.16	27.42	27.87	29.53	31.70	32.02	31.01	31.56	31.87			85.74	85.29	83.63	81.46	81.14	82.15	81.60	81.29		
OW-428	113.92	115.92	36.20	36.63	37.56	38.47	38.82	38.40	38.46	38.57			79.72	79.29	78.36	77.45	77.10	77.52	77.46	77.35		
OW-436	108.13	110.39	30.72	31.22	32.32	33.26	33.12	32.10	32.82	33.06			79.67	79.17	78.07	77.13	77.27	78.29	77.57	77.33		
OW-703A	44.02	45.65	25.68	24.08	28.42	28.83	28.17	28.14	29.15	29.54			19.97	21.57	17.23	16.82	17.48	17.51	16.50	16.11		
OW-703B	45.57	47.53	27.68	26.47	30.38	30.72	30.02	30.80	31.02	31.42			19.85	21.06	17.15	16.81	17.51	16.73	16.51	16.11		
OW-705	47.71	50.22	18.72	20.22	21.80	22.18	20.75	20.90	22.21	22.50			31.50	30.00	28.42	28.04	29.47	29.32	28.01	27.72		
OW-708A	37.44	39.61	11.70	14.50	16.26	17.36	13.46	13.18	15.67	16.28			27.91	25.11	23.35	22.25	26.15	26.43	23.94	23.33		
OW-711	52.92	55.31	18.18	19.85	21.88	19.50	19.42	20.03	14.67	22.37			37.13	35.46	33.43	35.81	35.89	35.28	40.64	32.94		
OW-714	116.02	117.98	44.93	43.25	46.05	47.57	47.32	46.48	48.11	48.53			73.05	74.73	71.93	70.41	70.66	71.50	69.87	69.45		
OW-718	118.53	120.41	38.72	38.93	39.85	41.50	41.70	43.90	41.78	41.82			81.69	81.48	80.56	78.91	78.71	76.51	78.63	78.59		
OW-725	58.04	59.94	30.47	34.14	34.82	35.72	33.83	34.32	35.87	36.27			29.47	25.80	25.12	24.22	26.11	25.62	24.07	23.67		
OW-729	118.88	121.11	42.00	42.00	42.00	41.96	41.98	41.98	42.00	42.00			79.11	79.11	79.11	79.15	79.13	79.13	79.11	79.11		

Replacement for Table 2.4-35

Well ID	Ground Surface Elevation	Water Level Monitoring Reference Point Elevation	Depth to Water										Water Level Elevation									
			May 2007	June 2007	September 2007	December 2007	April 2008	July 2008	September 2008	October 2008	November 2008	December 2008	May 2007	June 2007	September 2007	December 2007	April 2008	July 2008	September 2008	October 2008	November 2008	December 2008
	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
OW-735	91.20	93.44	52.37	53.74	55.98	56.72	55.09	55.32	56.80	57.01			41.07	39.70	37.46	36.72	38.35	38.12	36.64	36.43		
OW-743	103.65	105.89	34.57	34.14	37.17	38.35	38.26	38.65	39.82	39.97			71.32	71.75	68.72	67.54	67.63	67.24	66.07	65.92		
OW-744	97.50	99.81	31.73	32.47	33.70	33.83	33.34	33.47	34.07	34.22			68.08	67.34	66.11	65.98	66.47	66.34	65.74	65.59		
OW-752A	95.30	97.00	22.24	23.91	25.78	27.22	26.73	24.73	25.71	26.11			74.76	73.09	71.22	69.78	70.27	72.27	71.29	70.89		
OW-752B	95.79	97.41	58.50	59.32	60.68	61.05	60.43	60.47	61.46	61.57			38.91	38.09	36.73	36.36	36.98	36.94	35.95	35.84		
OW-754	67.00	68.85	30.33	31.33	32.50	32.98	31.86	32.00	32.87	33.12			38.52	37.52	36.35	35.87	36.99	36.85	35.98	35.73		
OW-756	106.56	108.77	27.05	27.77	29.75	31.44	31.75	31.34	31.60	31.77			81.72	81.00	79.02	77.33	77.02	77.43	77.17	77.00		
OW-759A	97.78	99.69	23.73	21.08	28.27	30.58	29.86	30.92	29.52	29.84			75.96	78.61	71.42	69.11	69.83	68.77	70.17	69.85		
OW-759B	98.35	100.14	62.17	61.57	64.15	64.48	64.00	64.17	65.06	65.23			37.97	38.57	35.99	35.66	36.14	35.97	35.08	34.91		
OW-765A	97.37	99.60	18.28	20.12	22.12	22.57	21.73	21.55	22.25	22.42			81.32	79.48	77.48	77.03	77.87	78.05	77.35	77.18		
OW-765B	96.82	98.47	59.24	59.92	61.07	61.58	61.24	61.27	61.88	62.00			39.23	38.55	37.40	36.89	37.23	37.20	36.59	36.47		
OW-766	108.89	110.72	26.85	27.52	29.47	31.02	30.82	29.80	30.54	30.79			83.87	83.20	81.25	79.70	79.90	80.92	80.18	79.93		
OW-768A	48.48	49.84	23.55	24.15	26.17	26.75	23.84	24.42	26.34	26.81			26.29	25.69	23.67	23.09	26.00	25.42	23.50	23.03		
OW-769	54.23	56.43	24.68	26.40	26.37	30.27	27.70	28.07	29.88	33.33			31.75	30.03	30.06	26.16	28.73	28.36	26.55	23.10		
OW-770	121.59	123.08	42.10	42.10	42.10	42.12	42.08	42.09	42.10	42.10			80.98	80.98	80.98	80.96	81.00	80.99	80.98	80.98		
2008 COLA Supplemental Investigation Observation Wells																						
OW-304	68.78	71.01							37.28	37.43	37.33	36.78							33.73	33.58	33.68	34.23
OW-308	111.45	113.62							78.33	78.41	78.29	78.00							35.29	35.21	35.33	35.62
OW-774A	9.7	12.20							10.13	10.21	10.15	9.98							2.07	1.99	2.05	2.22
OW-774B	10.1	12.55							10.15	10.00	10.15	10.04							2.40	2.55	2.40	2.51
OW-778	113.3	115.45							dry	dry	dry	dry							dry	dry	dry	dry
OW-779	100.9	102.94							dry	dry	dry	dry							dry	dry	dry	dry
OW-781	10.3	12.87							10.36	10.58	10.44	10.45							2.51	2.29	2.43	2.42

Replacement for Table 2.4-35

Well ID	Ground Surface Elevation	Water Level Monitoring Reference Point Elevation	Depth to Water										Water Level Elevation									
			January 2009	February 2009	March 2009	April 2009	May 2009	June 2009	July 2009	August 2009	September 2009	October 2009	January 2009	February 2009	March 2009	April 2009	May 2009	June 2009	July 2009	August 2009	September 2009	October 2009
	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
2006 COLA Observation Wells																						
OW-301	94.51	96.27	59.93			58.65			59.72			60.02	36.34			37.62			36.55			36.25
OW-313A	51.03	53.20	20.60			19.02			20.33			20.87	32.60			34.18			32.87			32.33
OW-313B	50.73	53.54	24.32			23.26			23.47			24.33	29.22			30.28			30.07			29.21
OW-319A	103.13	104.91	26.28			26.38			26.44			26.53	78.63			78.53			78.47			78.38
OW-319B	103.53	105.35	68.72			67.46			68.33			68.78	36.63			37.89			37.02			36.57
OW-323	106.96	109.69	29.57			29.08			27.55			28.72	80.12			80.61			82.14			80.97
OW-328	76.29	77.85	42.07			40.84			41.59			42.19	35.78			37.01			36.26			35.66
OW-336	97.11	99.07	62.24			60.97			61.80			62.28	36.83			38.10			37.27			36.79
OW-401	71.38	73.49	35.67			33.71			35.16			35.47	37.82			39.78			38.33			38.02
OW-413A	123.15	125.04	45.98			45.97			45.77			45.88	79.06			79.07			79.27			79.16
OW-413B	122.90	124.85	87.80			86.07			87.51			87.72	37.05			38.78			37.34			37.13
OW-418A	43.66	45.83	9.00			6.74			9.46			8.66	36.83			39.09			36.37			37.17
OW-418B	43.67	45.77	13.47			12.09			13.28			13.62	32.30			33.68			32.49			32.15
OW-423	111.12	113.16	32.07			31.97			29.77			30.43	81.09			81.19			83.39			82.73
OW-428	113.92	115.92	38.85			38.86			37.68			38.13	77.07			77.06			78.24			77.79
OW-436	108.13	110.39	33.31			33.27			31.66			32.10	77.08			77.12			78.73			78.29
OW-703A	44.02	45.65	28.52			27.68			27.48			28.80	17.13			17.97			18.17			16.85
OW-703B	45.57	47.53	30.30			29.36			29.51			30.56	17.23			18.17			18.02			16.97
OW-705	47.71	50.22	21.02			18.95			20.81			21.42	29.20			31.27			29.41			28.80
OW-708A	37.44	39.61	12.81			9.28			13.64			12.57	26.80			30.33			25.97			27.04
OW-711	52.92	55.31	19.62			16.27			20.45			18.32	35.69			39.04			34.86			36.99
OW-714	116.02	117.98	48.19			47.73			46.04			47.17	69.79			70.25			71.94			70.81
OW-718	118.53	120.41	42.12			42.03			42.08			42.08	78.29			78.38			78.33			78.33
OW-725	58.04	59.94	34.80			32.66			33.97			35.23	25.14			27.28			25.97			24.71
OW-729	118.88	121.11	42.00			42.00			42.00			42.00	79.11			79.11			79.11			79.11

Replacement for Table 2.4-35

Well ID	Ground Surface Elevation	Water Level Monitoring Reference Point Elevation	Depth to Water										Water Level Elevation									
			January 2009	February 2009	March 2009	April 2009	May 2009	June 2009	July 2009	August 2009	September 2009	October 2009	January 2009	February 2009	March 2009	April 2009	May 2009	June 2009	July 2009	August 2009	September 2009	October 2009
	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
OW-735	91.20	93.44	55.77			53.88			55.25			55.80	37.67			39.56			38.19			37.64
OW-743	103.65	105.89	39.58			39.01			37.66			38.48	66.31			66.88			68.23			67.41
OW-744	97.50	99.81	33.47			32.98			33.16			33.37	66.34			66.83			66.65			66.44
OW-752A	95.30	97.00	26.43			26.04			23.72			25.66	70.57			70.96			73.28			71.34
OW-752B	95.79	97.41	60.78			59.89			60.39			60.75	36.63			37.52			37.02			36.66
OW-754	67.00	68.85	32.12			31.10			32.02			32.13	36.73			37.75			36.83			36.72
OW-756	106.56	108.77	31.99			32.04			30.13			30.77	76.78			76.73			78.64			78.00
OW-759A	97.78	99.69	30.23			30.18			27.28			28.76	69.46			69.51			72.41			70.93
OW-759B	98.35	100.14	64.45			63.61			63.95			64.14	35.69			36.53			36.19			36.00
OW-765A	97.37	99.60	22.27			21.05			20.97			22.17	77.33			78.55			78.63			77.43
OW-765B	96.82	98.47	61.50			60.94			60.91			61.33	36.97			37.53			37.56			37.14
OW-766	108.89	110.72	30.70			30.32			28.90			29.86	80.02			80.40			81.82			80.86
OW-768A	48.48	49.84	24.10			23.37			24.91			24.42	25.74			26.47			24.93			25.42
OW-769	54.23	56.43	28.57			24.74			28.03			28.66	27.86			31.69			28.40			27.77
OW-770	121.59	123.08	42.10			42.10			42.11			42.11	80.98			80.98			80.97			80.97
2008 COLA Supplemental Investigation Observation Wells																						
OW-304	68.78	71.01	36.30	36.64	36.40	34.58	33.87	34.18	36.07	36.66	36.85	36.07	34.71	34.37	34.61	36.43	37.14	36.83	34.94	34.35	34.16	34.94
OW-308	111.45	113.62	77.62	77.77	77.71	76.41	75.57	75.43	77.18	77.64	77.73	77.18	36.00	35.85	35.91	37.21	38.05	38.19	36.44	35.98	35.89	36.44
OW-774A	9.7	12.20	10.34	10.45	10.01	9.37	9.53	9.14	9.70	9.82	10.01	9.70	1.86	1.75	2.19	2.83	2.67	3.06	2.50	2.38	2.19	2.50
OW-774B	10.1	12.55	10.52	10.48	10.17	9.78	9.76	9.48	9.92	9.91	10.06	9.92	2.03	2.07	2.38	2.77	2.79	3.07	2.63	2.64	2.49	2.63
OW-778	113.3	115.45	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry
OW-779	100.9	102.94	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry
OW-781	10.3	12.87	10.72	10.95	10.62	10.31	10.17	9.94	10.12	10.21	10.36	10.12	2.15	1.92	2.25	2.56	2.70	2.93	2.75	2.66	2.51	2.75

Notes: 1) Questionable water level readings due to proximity of depth of water to bottom of well screen and/or minimal water level fluctuation with time.
2) Reading from water level round was 41.90. Review suggested questionable reading. Retaken five days later and reading was 30.04 ft.
3) Readings from September 2008 water level for OW-301 (67.2 ft) and OW-754 (21.51 ft) questioned by reviewer. Originator provided corrected readings on 10/8/08.
4) Reported as dry in remarks (water level measurement form).

Replacement for Table 2.4-35

(Page 1 of 6)

Table 2.4-36—{CCNPP Unit 3 Observation Wells Used in Hydrogeologic Evaluation}

~~(Page 1 of 2)~~

See Replacement for Table 2.4-36

Well ID	Aquifer Unit	Ground Surface Elevation	Water Level Monitoring Reference Point Elevation	Depth to Water									Water Level Elevation											
				July 2006	August 2006	September 2006	October 2006	November 2006	December 2006	January 2007	February 2007	March 2007	July 2006	August 2006	September 2006	October 2006	November 2006	December 2006	January 2007	February 2007	March 2007	April 2007	May 2007	June 2007
		(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
Surficial Aquifer (SA)																								
OW-319A	SA	103.13	104.91	26.48	26.58	26.25	26.08	26.28	26.22	26.25	26.44	26.25	78.43	78.33	78.66	78.83	78.63	78.69	78.66	78.47	78.66	78.73	78.65	78.34
OW-323	SA	106.96	109.69	27.80	28.22	28.37	28.13	27.96	27.26	26.88	26.45	26.52	81.89	81.47	81.32	81.56	81.73	82.43	82.81	83.24	83.17	83.81	83.69	82.92
OW-423	SA	111.12	113.16	29.77	30.04	30.03	29.95	29.78	29.54	29.02	28.76	28.38	83.39	83.12	83.13	83.23	83.38	83.62	84.14	84.40	84.78	85.54	85.74	85.29
OW-428	SA	113.92	115.92	37.82	37.92	37.98	38.07	38.01	37.89	37.69	37.25	37.17	78.10	78.00	77.94	77.85	77.91	78.03	78.23	78.67	78.75	79.45	79.72	79.29
OW-436	SA	108.13	110.39	31.68	32.06	31.85	31.55	31.08	31.40	30.60	31.05	30.28	78.71	78.33	78.54	78.84	79.31	78.99	79.79	79.34	80.11	80.20	79.67	79.17
OW-714	SA	116.02	117.98	45.93	46.28	46.33	46.36	46.19	45.87	45.60	45.42	45.21	72.85	71.70	71.65	71.62	71.79	72.11	72.38	72.56	72.77	73.20	73.05	74.73
OW-718	SA	118.53	120.41	40.47	40.56	40.80	41.07	41.29	41.37	41.18	40.40	40.22	79.94	79.85	79.61	79.34	79.12	79.04	79.23	80.01	80.19	81.13	81.69	81.48
OW-743	SA	103.65	105.89	37.22	37.77	37.52	37.35	37.22	36					68.12	68.37	68.54	68.67	68.90	69.28	69.86	70.09	71.11	71.32	71.75
OW-752A	SA	95.30	97.00	24.76	25.18	25.35	25.36	25.23	24					71.82	71.65	71.64	71.77	72.92	73.66	74.23	74.32	75.43	74.76	73.09
OW-756	SA	106.56	108.77	29.98	30.17	30.42	30.55	30.59	30					78.60	78.35	78.22	78.18	78.31	78.73	79.35	79.59	81.15	81.72	81.00
OW-759A	SA	97.78	99.69	26.88	27.53	28.00	28.12	28.32	27.41	26.77	25.50	24.41	72.81	72.16	71.69	71.57	71.37	72.28	72.92	74.19	75.28	76.04	75.96	78.61
OW-765A	SA	97.37	99.60	21.72	22.02	21.87	21.70	21.20	20.16	18.95	19.25	18.38	77.38	77.58	77.73	77.90	78.40	79.50	80.65	80.35	81.22	81.73	81.32	79.48
OW-766	SA	108.89	110.72	28.88	29.36	29.42	29.20	29.20	28.76	28.11	27.60	27.30	81.84	81.36	81.30	81.52	81.52	81.96	82.61	83.12	83.42	83.95	83.87	83.20
Upper Chesapeake Unit (CU)																								
OW-301	CU	94.51	96.27	58.85	59.45	59.37	58.34	58.00	58.04	57.33	57.00	56.78	37.42	36.82	36.90	37.93	38.27	38.23	38.94	39.27	39.49	39.81	38.95	37.60
OW-313A	CU	51.03	53.20	19.80	20.40	20.08	19.57	18.80	18.90	17.93	18.25	17.12	33.40	32.80	33.12	33.63	34.40	34.30	35.27	34.95	36.08	36.43	34.97	33.64
OW-319B	CU	103.53	105.35	67.49	67.97	67.55	67.53	66.57	66.49	65.74	65.52	65.27	37.86	37.38	37.40	37.82	38.78	38.86	39.61	39.83	40.08	40.51	39.63	38.13
OW-328	CU	76.29	77.85	40.77	41.40	41.35	40.68	40.33	40.13	39.63	39.42	39.32	37.08	36.45	36.50	37.17	37.52	37.72	38.22	38.43	38.53	39.13	38.52	37.33
OW-336	CU	97.11	99.07	60.99	61.36	61.52	60.45	60.42	60.19	59.65	59.20	59.25	38.08	37.71	37.55	38.62	38.65	38.88	39.42	39.87	39.82	40.31	39.79	38.50
Surficial Aquifer (SA)																								
OW-401	CU	71.38	73.49	34.13	34.95	34.73	33.72	32.95	33.37	32.33	32.45	31.76	39.36	38.54	38.76	39.77	40.54	40.12	41.16	41.04	41.73	42.11	40.83	39.35
OW-413B	CU	122.90	124.83	86.60	87.30	87.13	86.46	85.14	85.56	84.40	84.75	83.57	38.25	37.55	37.72	38.39	39.71	39.29	40.45	40.10	41.28	41.60	40.01	38.43
OW-418A	CU	43.66	45.83	8.22	9.44	8.60	7.97	6.45	7.60	6.40	6.91	5.68	37.61	36.39	37.23	37.86	39.38	38.23	39.43	38.52	40.15	40.26	38.51	37.18
OW-703A	CU	44.02	45.65	27.33	27.84	28.05	27.93	27.60	27.12	25.16	25.60	22.15	18.32	17.81	17.60	17.72	18.05	18.53	20.49	20.05	23.50	23.70	19.97	21.57
OW-705	CU	47.71	50.22	20.28	21.10	20.67	20.10	19.02	19.40	17.82	18.60	16.57	29.94	29.12	29.55	30.12	31.20	30.82	32.40	31.62	33.65	33.87	31.50	30.00
OW-708A	CU	37.44	39.61	13.39	15.01	13.85	12.78	10.46	12.58	8.96	12.20	6.71	26.22	24.60	25.76	26.83	29.15	27.03	30.65	27.41	32.90	32.04	27.91	25.11
OW-711	CU	52.92	55.31	19.26	20.64	19.50	18.43	16.14	18.33	15.94	17.70	14.33	36.05	34.67	35.81	36.88	39.17	36.98	39.37	37.61	40.98	40.95	37.13	35.46
OW-725	CU	58.04	59.94	32.80	33.87	33.92	33.56	32.54	32.30	30.77	30.77	29.77	27.14	26.07	26.02	26.38	27.40	27.64	29.17	29.17	30.17	30.99	29.47	25.80

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Table 2.4-36—{CCNPP Unit 3 Observation Wells Used in Hydrogeologic Evaluation}

~~(Page 2 of 2)~~

Well ID	Aquifer Unit	Ground Surface Elevation	Water Level Monitoring Reference Point Elevation	Depth to Water									Water Level Elevation											
				July 2006	August 2006	September 2006	October 2006	November 2006	December 2006	January 2007	February 2007	March 2007	July 2006	August 2006	September 2006	October 2006	November 2006	December 2006	January 2007	February 2007	March 2007	April 2007	May 2007	June 2007
		(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
OW-735	CU	91.20	93.44	54.18	55.17	55.14	54.57	53.31	53.24	52.36	52.13	52.16	39.26	38.27	38.30	38.87	40.13	40.20	41.08	41.31	41.28	42.04	41.07	39.70
OW-752B	CU	95.79	97.41	59.55	60.25	60.05	59.75	59.38	59.16	58.77	58.60	58.58	37.86	37.16	37.36	37.66	38.03	38.25	38.64	38.81	38.83	39.40	38.91	38.09
OW-754	CU	67.00	68.85	31.32	32.05	31.80	31.05	30.73	30.93	30.24	30.12	29.67	37.53	36.80	37.05	37.80	38.12	37.92	38.61	38.73	39.18	39.53	38.52	37.52
OW-759B	CU	98.35	100.14	63.09	63.80	63.56	63.31	63.11	62.87	62.54	62.32	62.30	37.05	36.34	36.58	36.83	37.03	37.27	37.60	37.82	37.84	38.29	37.97	38.57
OW-765B	CU	96.82	98.47	60.22	60.72	60.55	60.40	59.92	59.77	59.73	59.45	59.37	38.25	37.75	37.92	38.07	38.55	38.70	38.74	39.02	39.10	39.51	39.23	38.55
OW-768A	CU	48.48	49.84	24.05	24.88	24.04	23.67	23.12	23.65	23.10	23.26	22.53	25.79	24.96	25.80	26.17	26.72	26.19	26.74	26.58	27.31	27.22	26.29	25.69
OW-769	CU	54.23	56.43	26.50	27.96	27.37	26.74	24.13	25.74	23.48	24.43	20.55	29.93	28.47	29.06	29.69	32.30	30.69	32.95	32.00	35.88	35.76	31.75	30.03
Lower Chesapeake Unit (CL)																								
OW-313B	CL	50.73	53.54	23.05	23.65	23.47	23.17	22.76	22.52	21.82	21.80	21.94	30.49	29.89	30.07	30.37	30.78	31.02	31.65	31.74	32.10	32.57	32.07	30.94
0W-418B	CL	43.67	45.77	12.52	13.36	12.90	12.47	11.67	1					32.41	32.87	33.30	34.10	32.92	34.74	34.50	35.03	35.35	34.44	33.22
OW-703B	CL	45.57	47.53	29.34	29.85	29.95	29.73	29.40	2					17.68	17.58	17.80	18.13	18.43	20.08	19.81	22.79	23.06	19.85	21.06

See Replacement for Table 2.4-36

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Well ID	Aquifer Unit	Ground Surface Elevation	Water Level Monitoring Reference Point Elevation	Depth to Water										Water Level Elevation									
				July 2006	August 2006	September 2006	October 2006	November 2006	December 2006	January 2007	February 2007	March 2007	April 2007	July 2006	August 2006	September 2006	October 2006	November 2006	December 2006	January 2007	February 2007	March 2007	April 2007
		(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
Surficial Aquifer																							
OW-319A	SA	103.13	104.91	26.48	26.58	26.25	26.08	26.28	26.22	26.25	26.44	26.25	26.18	78.43	78.33	78.66	78.83	78.63	78.69	78.66	78.47	78.66	78.73
OW-323	SA	106.96	109.69	27.80	28.22	28.37	28.13	27.96	27.26	26.88	26.45	26.52	25.88	81.89	81.47	81.32	81.56	81.73	82.43	82.81	83.24	83.17	83.81
OW-423	SA	111.12	113.16	29.77	30.04	30.03	29.93	29.78	29.54	29.02	28.76	28.38	27.62	83.39	83.12	83.13	83.23	83.38	83.62	84.14	84.40	84.78	85.54
OW-428	SA	113.92	115.92	37.82	37.92	37.98	38.07	38.01	37.89	37.69	37.25	37.17	36.47	78.10	78.00	77.94	77.85	77.91	78.03	78.23	78.67	78.75	79.45
OW-436	SA	108.13	110.39	31.68	32.06	31.85	31.55	31.08	31.40	30.60	31.05	30.28	30.19	78.71	78.33	78.54	78.84	79.31	78.99	79.79	79.34	80.11	80.20
OW-714	SA	116.02	117.98	45.93	46.28	46.33	46.36	46.19	45.87	45.60	45.42	45.21	44.78	72.05	71.70	71.65	71.62	71.79	72.11	72.38	72.56	72.77	73.20
OW-718	SA	118.53	120.41	40.47	40.56	40.80	41.07	41.29	41.37	41.18	40.40	40.22	39.28	79.94	79.85	79.61	79.34	79.12	79.04	79.23	80.01	80.19	81.13
OW-743	SA	103.65	105.89	37.22	37.77	37.52	37.35	37.22	36.99	36.61	36.03	35.80	34.78	68.67	68.12	68.37	68.54	68.67	68.90	69.28	69.86	70.09	71.11
OW-752A	SA	95.30	97.00	24.76	25.18	25.35	25.36	25.23	24.08	23.34	22.77	22.68	21.57	72.24	71.82	71.65	71.64	71.77	72.92	73.66	74.23	74.32	75.43
OW-756	SA	106.56	108.77	29.98	30.17	30.42	30.55	30.59	30.46	30.04	29.42	29.18	27.62	78.79	78.60	78.35	78.22	78.18	78.31	78.73	79.35	79.59	81.15
OW-759A	SA	97.78	99.69	26.88	27.53	28.00	28.12	28.32	27.41	26.77	25.50	24.41	23.65	72.81	72.16	71.69	71.57	71.37	72.28	72.92	74.19	75.28	76.04
OW-765A	SA	97.37	99.60	21.72	22.02	21.87	21.70	21.20	20.10	18.95	19.25	18.38	17.87	77.88	77.58	77.73	77.90	78.40	79.50	80.65	80.35	81.22	81.73
OW-766	SA	108.89	110.72	28.88	29.36	29.42	29.20	29.20	28.76	28.11	27.60	27.30	26.77	81.84	81.36	81.30	81.52	81.52	81.96	82.61	83.12	83.42	83.95
Upper Chesapeake Unit																							
OW-301	CU	94.51	96.27	58.85	59.45	59.37	58.34	58.00	58.04	57.33	57.00	56.78	56.46	37.42	36.82	36.90	37.93	38.27	38.23	38.94	39.27	39.49	39.81
OW-304	CU	68.78	71.01																				
OW-308	CU	111.45	113.62																				
OW-313A	CU	51.03	53.20	19.80	20.40	20.08	19.57	18.80	18.90	17.93	18.25	17.12	16.77	33.40	32.80	33.12	33.63	34.40	34.30	35.27	34.95	36.08	36.43
OW-319B	CU	103.53	105.35	67.49	67.97	67.95	67.53	66.57	66.49	65.74	65.52	65.27	64.84	37.86	37.38	37.40	37.82	38.78	38.86	39.61	39.83	40.08	40.51
OW-328	CU	76.29	77.85	40.77	41.40	41.35	40.68	40.33	40.13	39.63	39.42	39.32	38.72	37.08	36.45	36.50	37.17	37.52	37.72	38.22	38.43	38.53	39.13
OW-336	CU	97.11	99.07	60.99	61.36	61.52	60.45	60.42	60.19	59.65	59.20	59.25	58.76	38.08	37.71	37.55	38.62	38.65	38.88	39.42	39.87	39.82	40.31
OW-401	CU	71.38	73.49	34.13	34.95	34.73	33.72	32.95	33.37	32.33	32.45	31.76	31.38	39.36	38.54	38.76	39.77	40.54	40.12	41.16	41.04	41.73	42.11
OW-413B	CU	122.90	124.85	86.60	87.30	87.13	86.46	85.14	85.56	84.40	84.75	83.57	83.25	38.25	37.55	37.72	38.39	39.71	39.29	40.45	40.10	41.28	41.60

Replacement for Table 2.4-36

Well ID	Aquifer Unit	Ground Surface Elevation	Water Level Monitoring Reference Point Elevation	Depth to Water										Water Level Elevation									
				July 2006	August 2006	September 2006	October 2006	November 2006	December 2006	January 2007	February 2007	March 2007	April 2007	July 2006	August 2006	September 2006	October 2006	November 2006	December 2006	January 2007	February 2007	March 2007	April 2007
		(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
OW-418A	CU	43.66	45.83	8.22	9.44	8.60	7.97	6.45	7.60	6.40	6.91	5.68	5.57	37.61	36.39	37.23	37.86	39.38	38.23	39.43	38.92	40.15	40.26
OW-703A	CU	44.02	45.65	27.33	27.84	28.05	27.93	27.60	27.12	25.16	25.60	22.15	21.95	18.32	17.81	17.60	17.72	18.05	18.53	20.49	20.05	23.50	23.70
OW-705	CU	47.71	50.22	20.28	21.10	20.67	20.10	19.02	19.40	17.82	18.60	16.57	16.35	29.94	29.12	29.55	30.12	31.20	30.82	32.40	31.62	33.65	33.87
OW-708A	CU	37.44	39.61	13.39	15.01	13.85	12.78	10.46	12.58	8.96	12.20	6.71	6.77	26.22	24.60	25.76	26.83	29.15	27.03	30.65	27.41	32.90	32.84
OW-711	CU	52.92	55.31	19.26	20.64	19.50	18.43	16.14	18.33	15.94	17.70	14.33	14.36	36.05	34.67	35.81	36.88	39.17	36.98	39.37	37.61	40.98	40.95
OW-725	CU	58.04	59.94	32.80	33.87	33.92	33.56	32.54	32.30	30.77	30.77	29.77	28.95	27.14	26.07	26.02	26.38	27.40	27.64	29.17	29.17	30.17	30.99
OW-735	CU	91.20	93.44	54.18	55.17	55.14	54.57	53.31	53.24	52.36	52.13	52.16	51.40	39.26	38.27	38.30	38.87	40.13	40.20	41.08	41.31	41.28	42.04
OW-752B	CU	95.79	97.41	59.55	60.25	60.05	59.75	59.38	59.16	58.77	58.60	58.58	58.01	37.86	37.16	37.36	37.66	38.03	38.25	38.64	38.81	38.83	39.40
OW-754	CU	67.00	68.85	31.32	32.05	31.80	31.05	30.73	30.93	30.24	30.12	29.67	29.32	37.53	36.80	37.05	37.80	38.12	37.92	38.61	38.73	39.18	39.53
OW-759B	CU	98.35	100.14	63.09	63.80	63.56	63.31	63.11	62.87	62.54	62.32	62.30	61.85	37.05	36.34	36.58	36.83	37.03	37.27	37.60	37.82	37.84	38.29
OW-765B	CU	96.82	98.47	60.22	60.72	60.55	60.40	59.92	59.77	59.73	59.45	59.37	58.96	38.25	37.75	37.92	38.07	38.55	38.70	38.74	39.02	39.10	39.51
OW-768A	CU	48.48	49.84	24.05	24.88	24.04	23.67	23.12	23.65	23.10	23.26	22.53	22.62	25.79	24.96	25.80	26.17	26.72	26.19	26.74	26.58	27.31	27.22
OW-769	CU	54.23	56.43	26.50	27.96	27.37	26.74	24.13	25.74	23.48	24.43	20.55	20.67	29.93	28.47	29.06	29.69	32.30	30.69	32.95	32.00	35.88	35.76
OW-774A	CU	9.7	12.20																				
Lower Chesapeake Unit																							
OW-313B	CL	50.73	53.54	23.05	23.65	23.47	23.17	22.76	22.52	21.89	21.80	21.44	20.97	30.49	29.89	30.07	30.37	30.78	31.02	31.65	31.74	32.10	32.57
OW-418B	CL	43.67	45.77	12.52	13.36	12.90	12.47	11.67	12.85	11.03	11.27	10.74	10.42	33.25	32.41	32.87	33.30	34.10	32.92	34.74	34.50	35.03	35.35
OW-703B	CL	45.57	47.53	29.34	29.85	29.95	29.73	29.40	29.10	27.45	27.72	24.74	24.47	18.19	17.68	17.58	17.80	18.13	18.43	20.08	19.81	22.79	23.06
OW-774B	CL	10.1	12.55																				
OW-781	CL	10.3	12.87																				

Replacement for Table 2.4-36

Well ID	Aquifer Unit	Ground Surface Elevation (ft)	Water Level Monitoring Reference Point Elevation (ft)	Depth to Water May 2007 (ft)	June 2007 (ft)	September 2007 (ft)	December 2007 (ft)	April 2008 (ft)	July 2008 (ft)	September 2008 (ft)	October 2008 (ft)	November 2008 (ft)	December 2008 (ft)	Water Level Elevation May 2007 (ft)	June 2007 (ft)	September 2007 (ft)	December 2007 (ft)	April 2008 (ft)	July 2008 (ft)	September 2008 (ft)	October 2008 (ft)	November 2008 (ft)	December 2008 (ft)
Surficial Aquifer																							
OW-319A	SA	103.13	104.91	26.26	26.57	26.95	27.25	26.20	26.28	26.68	26.08			78.65	78.34	77.96	77.66	78.71	78.63	78.23	78.83		
OW-323	SA	106.96	109.69	26.00	26.77	28.48	29.77	29.47	28.22	29.01	29.30			83.69	82.92	81.21	79.92	80.22	81.47	80.68	80.39		
OW-423	SA	111.12	113.16	27.42	27.87	29.53	31.70	32.02	31.01	31.56	31.87			85.74	85.29	83.63	81.46	81.14	82.15	81.60	81.29		
OW-428	SA	113.92	115.92	36.20	36.63	37.56	38.47	38.82	38.40	38.46	38.57			79.72	79.29	78.36	77.45	77.10	77.52	77.46	77.35		
OW-436	SA	108.13	110.39	30.72	31.22	32.32	33.26	33.12	32.10	32.82	33.06			79.67	79.17	78.07	77.13	77.27	78.29	77.57	77.33		
OW-714	SA	116.02	117.98	44.93	43.25	46.05	47.57	47.32	46.48	48.11	48.53			73.05	74.73	71.93	70.41	70.66	71.50	69.87	69.45		
OW-718	SA	118.53	120.41	38.72	38.93	39.85	41.50	41.70	43.90	41.78	41.82			81.69	81.48	80.56	78.91	78.71	76.51	78.63	78.59		
OW-743	SA	103.65	105.89	34.57	34.14	37.17	38.35	38.26	38.65	39.82	39.97			71.32	71.75	68.72	67.54	67.63	67.24	66.07	65.92		
OW-752A	SA	95.30	97.00	22.24	23.91	25.78	27.22	26.73	24.73	25.71	26.11			74.76	73.09	71.22	69.78	70.27	72.27	71.29	70.89		
OW-756	SA	106.56	108.77	27.05	27.77	29.75	31.44	31.75	31.34	31.60	31.77			81.72	81.00	79.02	77.33	77.02	77.43	77.17	77.00		
OW-759A	SA	97.78	99.69	23.73	21.08	28.27	30.58	29.86	30.92	29.52	29.84			75.96	78.61	71.42	69.11	69.83	68.77	70.17	69.85		
OW-765A	SA	97.37	99.60	18.28	20.12	22.12	22.57	21.73	21.55	22.25	22.42			81.32	79.48	77.48	77.03	77.87	78.05	77.35	77.18		
OW-766	SA	108.89	110.72	26.85	27.52	29.47	31.02	30.82	29.80	30.54	30.79			83.87	83.20	81.25	79.70	79.90	80.92	80.18	79.93		
Upper Chesapeake Unit																							
OW-301	CU	94.51	96.27	57.32	58.67	59.92	60.75	59.62	59.58	60.57	60.80			38.95	37.60	36.35	35.52	36.65	36.69	35.70	35.47		
OW-304	CU	68.78	71.01							37.28	37.43	37.33	36.78							33.73	33.58	33.68	34.23
OW-308	CU	111.45	113.62							78.33	78.41	78.29	78.00							35.29	35.21	35.33	35.62
OW-313A	CU	51.03	53.20	18.23	19.56	21.05	21.52	20.32	23.80	21.51	21.71			34.97	33.64	32.15	31.68	32.88	29.40	31.69	31.49		
OW-319B	CU	103.53	105.35	65.72	67.22	68.45	69.45	68.38	68.18	69.31	69.48			39.63	38.13	36.90	35.90	36.97	37.17	36.04	35.87		
OW-328	CU	76.29	77.85	39.33	40.52	41.90	42.53	41.68	41.60	42.57	42.67			38.52	37.33	35.95	35.32	36.17	36.25	35.28	35.18		
OW-336	CU	97.11	99.07	59.28	60.57	61.80	62.63	61.86	61.67	62.73	62.78			39.79	38.50	37.27	36.44	37.21	37.40	36.34	36.29		
OW-401	CU	71.38	73.49	32.66	34.14	35.80	36.59	35.04	35.07	36.36	36.62			40.83	39.35	37.69	36.90	38.45	38.42	37.13	36.87		
OW-413B	CU	122.90	124.85	84.84	86.42	88.05	89.02	87.37	87.36	88.65	88.87			40.01	38.43	36.80	35.83	37.48	37.49	36.20	35.98		

Replacement for Table 2.4-36

Well ID	Aquifer Unit	Ground Surface Elevation	Water Level Monitoring Reference Point Elevation	Depth to Water										Water Level Elevation									
				May 2007	June 2007	September 2007	December 2007	April 2008	July 2008	September 2008	October 2008	November 2008	December 2008	May 2007	June 2007	September 2007	December 2007	April 2008	July 2008	September 2008	October 2008	November 2008	December 2008
		(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
OW-418A	CU	43.66	45.83	7.32	8.65	10.67	10.62	8.38	8.95	10.70	11.17			38.51	37.18	35.16	35.21	37.45	36.88	35.13	34.66		
OW-703A	CU	44.02	45.65	25.68	24.08	28.42	28.83	28.17	28.14	29.15	29.54			19.97	21.57	17.23	16.82	17.48	17.51	16.50	16.11		
OW-705	CU	47.71	50.22	18.72	20.22	21.80	22.18	20.75	20.90	22.21	22.50			31.50	30.00	28.42	28.04	29.47	29.32	28.01	27.72		
OW-708A	CU	37.44	39.61	11.70	14.50	16.26	17.36	13.46	13.18	15.67	16.28			27.91	25.11	23.35	22.25	26.15	26.43	23.94	23.33		
OW-711	CU	52.92	55.31	18.18	19.85	21.88	19.50	19.42	20.03	14.67	22.37			37.13	35.46	33.43	35.81	35.89	35.28	40.64	32.94		
OW-725	CU	58.04	59.94	30.47	34.14	34.82	35.72	33.83	34.32	35.87	36.27			29.47	25.80	25.12	24.22	26.11	25.62	24.07	23.67		
OW-735	CU	91.20	93.44	52.37	53.74	55.98	56.72	55.09	55.32	56.80	57.01			41.07	39.70	37.46	36.72	38.35	38.12	36.64	36.43		
OW-752B	CU	95.79	97.41	58.50	59.32	60.68	61.05	60.43	60.47	61.46	61.57			38.91	38.09	36.73	36.36	36.98	36.94	35.95	35.84		
OW-754	CU	67.00	68.85	30.33	31.33	32.50	32.98	31.86	32.00	32.87	33.12			38.52	37.52	36.35	35.87	36.99	36.85	35.98	35.73		
OW-759B	CU	98.35	100.14	62.17	61.57	64.15	64.48	64.00	64.17	65.06	65.23			37.97	38.57	35.99	35.66	36.14	35.97	35.08	34.91		
OW-765B	CU	96.82	98.47	59.24	59.92	61.07	61.58	61.24	61.27	61.88	62.00			39.23	38.55	37.40	36.89	37.23	37.20	36.59	36.47		
OW-768A	CU	48.48	49.84	23.55	24.15	26.17	26.75	23.84	24.42	26.34	26.81			26.29	25.69	23.67	23.09	26.00	25.42	23.50	23.03		
OW-769	CU	54.23	56.43	24.68	26.40	26.37	30.27	27.70	28.07	29.88	33.33			31.75	30.03	30.06	26.16	28.73	28.36	26.55	23.10		
OW-774A	CU	9.7	12.20							10.13	10.21	10.15	9.98							2.07	1.99	2.05	2.22
Lower Chesapeake Unit																							
OW-313B	CL	50.73	53.54	21.47	22.60	24.23	24.85	23.98	23.74	24.78	25.08			32.07	30.94	29.31	28.69	29.56	29.80	28.76	28.46		
OW-418B	CL	43.67	45.77	11.33	12.55	14.50	14.96	13.02	13.13	14.67	15.16			34.44	33.22	31.27	30.81	32.75	32.64	31.10	30.61		
OW-703B	CL	45.57	47.53	27.68	26.47	30.38	30.72	30.02	30.80	31.02	31.42			19.85	21.06	17.15	16.81	17.51	16.73	16.51	16.11		
OW-774B	CL	10.1	12.55							10.15	10.00	10.15	10.04							2.40	2.55	2.40	2.51
OW-781	CL	10.3	12.87							10.36	10.58	10.44	10.45							2.51	2.29	2.43	2.42

Replacement for Table 2.4-36

Well ID	Aquifer Unit	Ground Surface Elevation	Water Level Monitoring Reference Point Elevation	Depth to Water										Water Level Elevation									
				January 2009	February 2009	March 2009	April 2009	May 2009	June 2009	July 2009	August 2009	September 2009	October 2009	January 2009	February 2009	March 2009	April 2009	May 2009	June 2009	July 2009	August 2009	September 2009	October 2009
		(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
Surficial Aquifer																							
OW-319A	SA	103.13	104.91	26.28			26.38			26.44			26.53	78.63			78.53			78.47			78.38
OW-323	SA	106.96	109.69	29.57			29.08			27.55			28.72	80.12			80.61			82.14			80.97
OW-423	SA	111.12	113.16	32.07			31.97			29.77			30.43	81.09			81.19			83.39			82.73
OW-428	SA	113.92	115.92	38.85			38.86			37.68			38.13	77.07			77.06			78.24			77.79
OW-436	SA	108.13	110.39	33.31			33.27			31.66			32.10	77.08			77.12			78.73			78.29
OW-714	SA	116.02	117.98	48.19			47.73			46.04			47.17	69.79			70.25			71.94			70.81
OW-718	SA	118.53	120.41	42.12			42.03			42.08			42.08	78.29			78.38			78.33			78.33
OW-743	SA	103.65	105.89	39.58			39.01			37.66			38.48	66.31			66.88			68.23			67.41
OW-752A	SA	95.30	97.00	26.43			26.04			23.72			25.66	70.57			70.96			73.28			71.34
OW-756	SA	106.56	108.77	31.99			32.04			30.13			30.77	76.78			76.73			78.64			78.00
OW-759A	SA	97.78	99.69	30.23			30.18			27.28			28.76	69.46			69.51			72.41			70.93
OW-765A	SA	97.37	99.60	22.27			21.05			20.97			22.17	77.33			78.55			78.63			77.43
OW-766	SA	108.89	110.72	30.70			30.32			28.90			29.86	80.02			80.40			81.82			80.86
Upper Chesapeake Unit																							
OW-301	CU	94.51	96.27	59.93			58.65			59.72			60.02	36.34			37.62			36.55			36.25
OW-304	CU	68.78	71.01	36.30	36.64	36.40	34.58	33.87	34.18	36.07	36.66	36.85	36.07	34.71	34.37	34.61	36.43	37.14	36.83	34.94	34.35	34.16	34.94
OW-308	CU	111.45	113.62	77.62	77.77	77.71	76.41	75.57	75.43	77.18	77.64	77.73	77.18	36.00	35.85	35.91	37.21	38.05	38.19	36.44	35.98	35.89	36.44
OW-313A	CU	51.03	53.20	20.60			19.02			20.33			20.87	32.60			34.18			32.87			32.33
OW-319B	CU	103.53	105.35	68.72			67.46			68.33			68.78	36.63			37.89			37.02			36.57
OW-328	CU	76.29	77.85	42.07			40.84			41.59			42.19	35.78			37.01			36.26			35.66
OW-336	CU	97.11	99.07	62.24			60.97			61.80			62.28	36.83			38.10			37.27			36.79
OW-401	CU	71.38	73.49	35.67			33.71			35.16			35.47	37.82			39.78			38.33			38.02
OW-413B	CU	122.90	124.85	87.80			86.07			87.51			87.72	37.05			38.78			37.34			37.13

Replacement for Table 2.4-36

Well ID	Aquifer Unit	Ground Surface Elevation	Water Level Monitoring Reference Point Elevation	Depth to Water										Water Level Elevation									
				January 2009	February 2009	March 2009	April 2009	May 2009	June 2009	July 2009	August 2009	September 2009	October 2009	January 2009	February 2009	March 2009	April 2009	May 2009	June 2009	July 2009	August 2009	September 2009	October 2009
		(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
OW-418A	CU	43.66	45.83	9.00			6.74			9.46			8.66	36.83			39.09			36.37			37.17
OW-703A	CU	44.02	45.65	28.52			27.68			27.48			28.80	17.13			17.97			18.17			16.85
OW-705	CU	47.71	50.22	21.02			18.95			20.81			21.42	29.20			31.27			29.41			28.80
OW-708A	CU	37.44	39.61	12.81			9.28			13.64			12.57	26.80			30.33			25.97			27.04
OW-711	CU	52.92	55.31	19.62			16.27			20.45			18.32	35.69			39.04			34.86			36.99
OW-725	CU	58.04	59.94	34.80			32.66			33.97			35.23	25.14			27.28			25.97			24.71
OW-735	CU	91.20	93.44	55.77			53.88			55.25			55.80	37.67			39.56			38.19			37.64
OW-752B	CU	95.79	97.41	60.78			59.89			60.39			60.75	36.63			37.52			37.02			36.66
OW-754	CU	67.00	68.85	32.12			31.10			32.02			32.13	36.73			37.75			36.83			36.72
OW-759B	CU	98.35	100.14	64.45			63.61			63.95			64.14	35.69			36.53			36.19			36.00
OW-765B	CU	96.82	98.47	61.50			60.94			60.91			61.33	36.97			37.53			37.56			37.14
OW-768A	CU	48.48	49.84	24.10			23.37			24.91			24.42	25.74			26.47			24.93			25.42
OW-769	CU	54.23	56.43	28.57			24.74			28.03			28.66	27.86			31.69			28.40			27.77
OW-774A	CU	9.7	12.20	10.34	10.45	10.01	9.37	9.53	9.14	9.70	9.82	10.01	9.70	1.86	1.75	2.19	2.83	2.67	3.06	2.50	2.38	2.19	2.50
Lower Chesapeake Unit																							
OW-313B	CL	50.73	53.54	24.32			23.26			23.47			24.33	29.22			30.28			30.07			29.21
OW-418B	CL	43.67	45.77	13.47			12.09			13.28			13.62	32.30			33.68			32.49			32.15
OW-703B	CL	45.57	47.53	30.30			29.36			29.51			30.56	17.23			18.17			18.02			16.97
OW-774B	CL	10.1	12.55	10.52	10.48	10.17	9.78	9.76	9.48	9.92	9.91	10.06	9.92	2.03	2.07	2.38	2.77	2.79	3.07	2.63	2.64	2.49	2.63
OW-781	CL	10.3	12.87	10.72	10.95	10.62	10.31	10.17	9.94	10.12	10.21	10.36	10.12	2.15	1.92	2.25	2.56	2.70	2.93	2.75	2.66	2.51	2.75

Replacement for Table 2.4-36

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Table 2.4-38—~~{CCNPP Unit 3 Aquifer Unit Geotechnical Parameters}~~

Exploratory Boring	Sample Top Elevation (ft)	Geotechnical Laboratory Test Results			Calculated Values		
		Natural Moisture (%)	Moist Unit Weight (PCF)	Specific Gravity	Void Ratio	Porosity (%)	Effective Porosity (%)
Surficial Aquifer							
B-320	67.9	29.4%	124	2.63	0.713	41.6%	33.3%
B-722	66.3	26.8%	120	2.76	0.820	45.0%	36.0%
B-732	75.3	23.1%	124	2.75	0.704	41.3%	33.0%
				Mean =	0.745	42.7%	34.1%
Upper Chesapeake							
B-328	12.8	44.2%	121	2.65	0.978	49.4%	39.6%
B-321	-2.8	28.5%	120.5	2.67	0.777	43.7%	35.0%
B-423	6.6	23.1%	120	2.74	0.754	43.0%	34.4%
B-420	-0.9	28.3%			0.882	46.9%	37.5%
B-440	5.3	30.0%	118	2.75	0.923	48.0%	38.4%
				Mean =	0.863	46.2%	37.0%
Lower Chesapeake							
B-304	-30.5	42.1%	113.2	2.65	1.076	51.82%	41.5%
B-401	-26.4	59.5%	117	2.70	1.167	53.86%	43.1%
B-701	-38.8	37.3%	116	2.64	0.950	48.71%	39.0%
				Mean =	1.064	51.5%	41.2%

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Calculations:
Void Ratio = (Specific Gravity (x) Unit Weight of Water (x) (1+ Natural Moisture)/(Moist Unit Weight) -1)
Unit Weight Water = 62.4
Porosity = (Void Ratio)/(1+Void Ratio)
Effective Porosity = 80% of Total Porosity)

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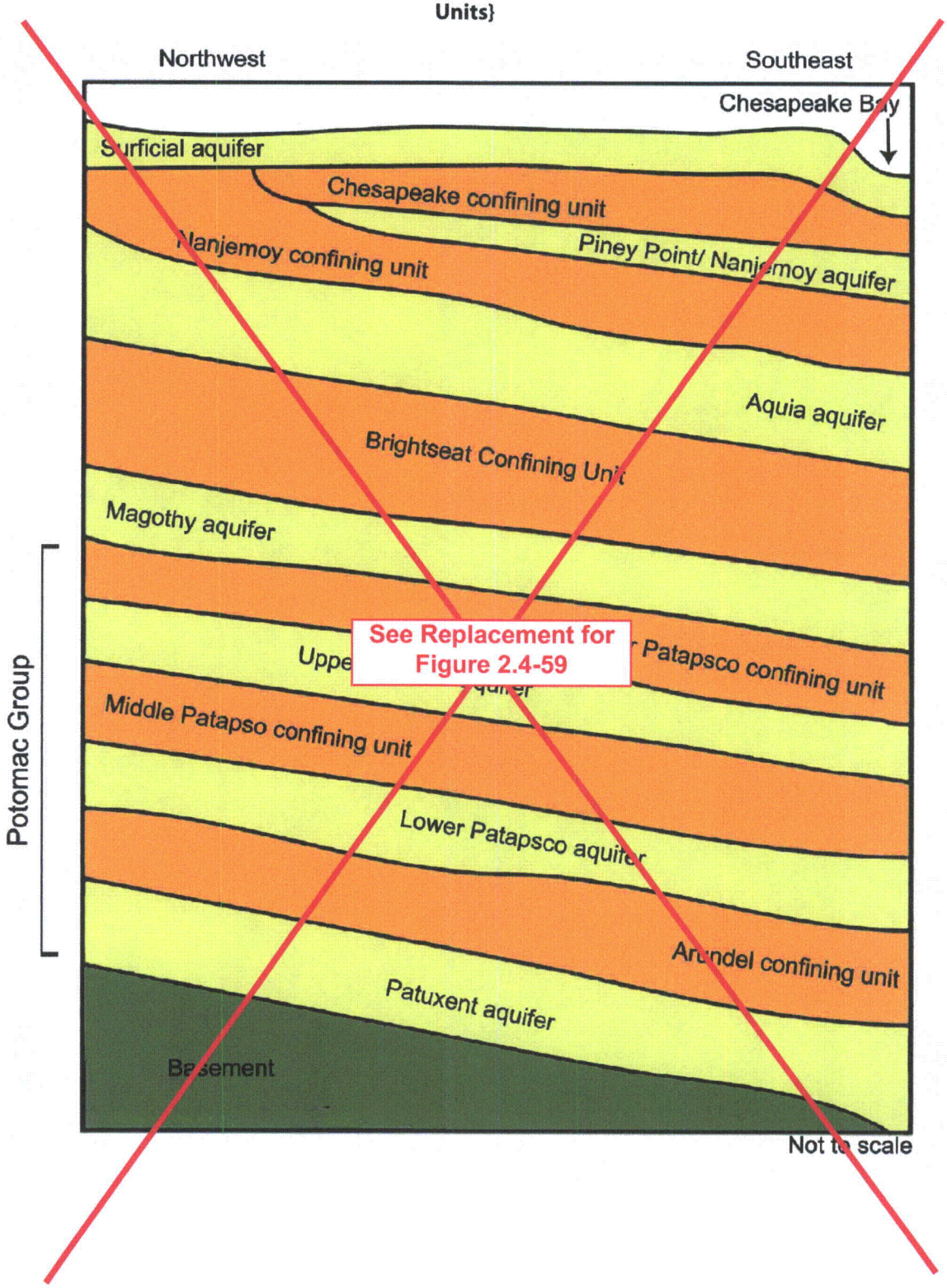
Figure 2.4-59—{Schematic Cross-Section of Southern Maryland Hydrostratigraphic Units}



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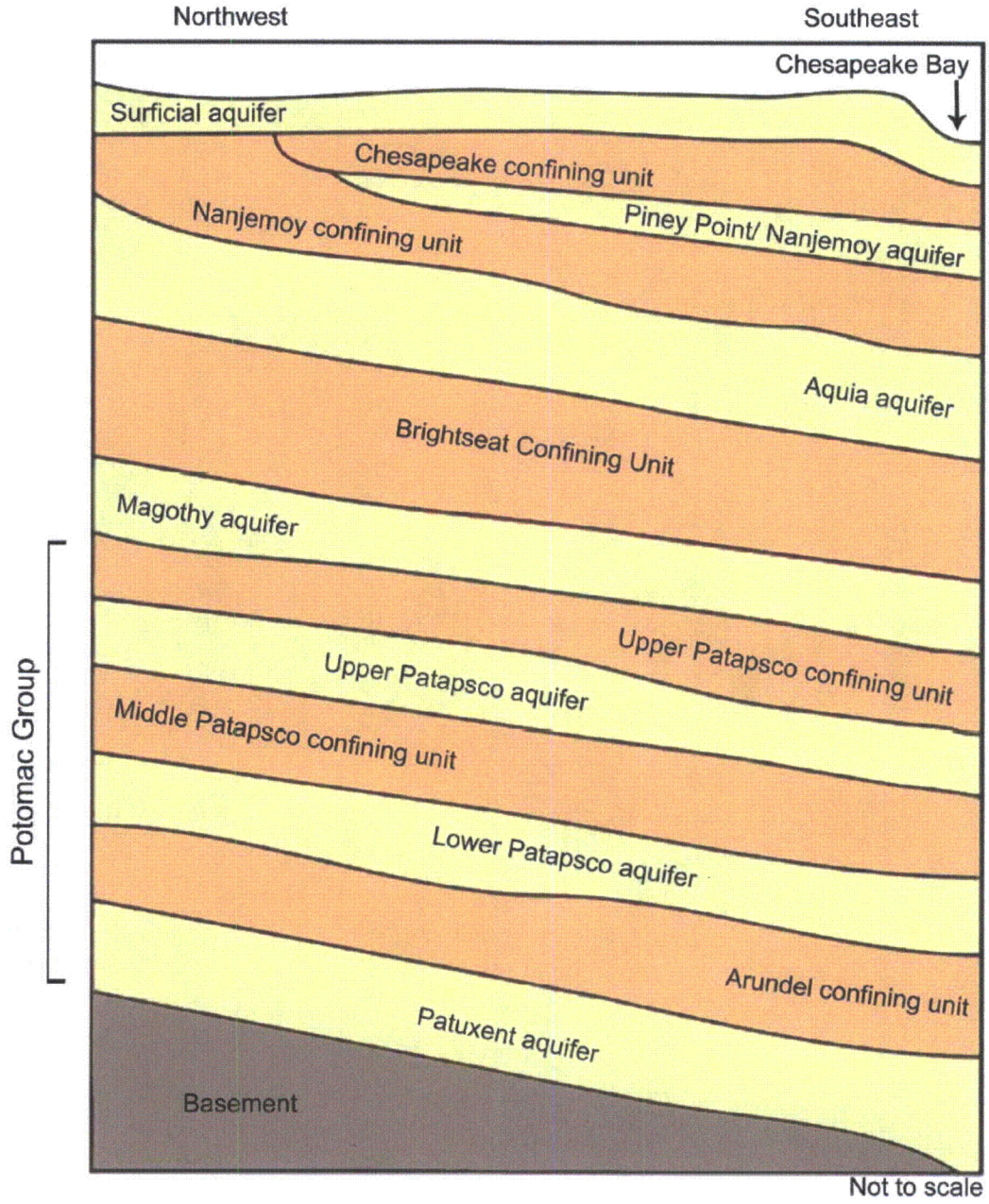
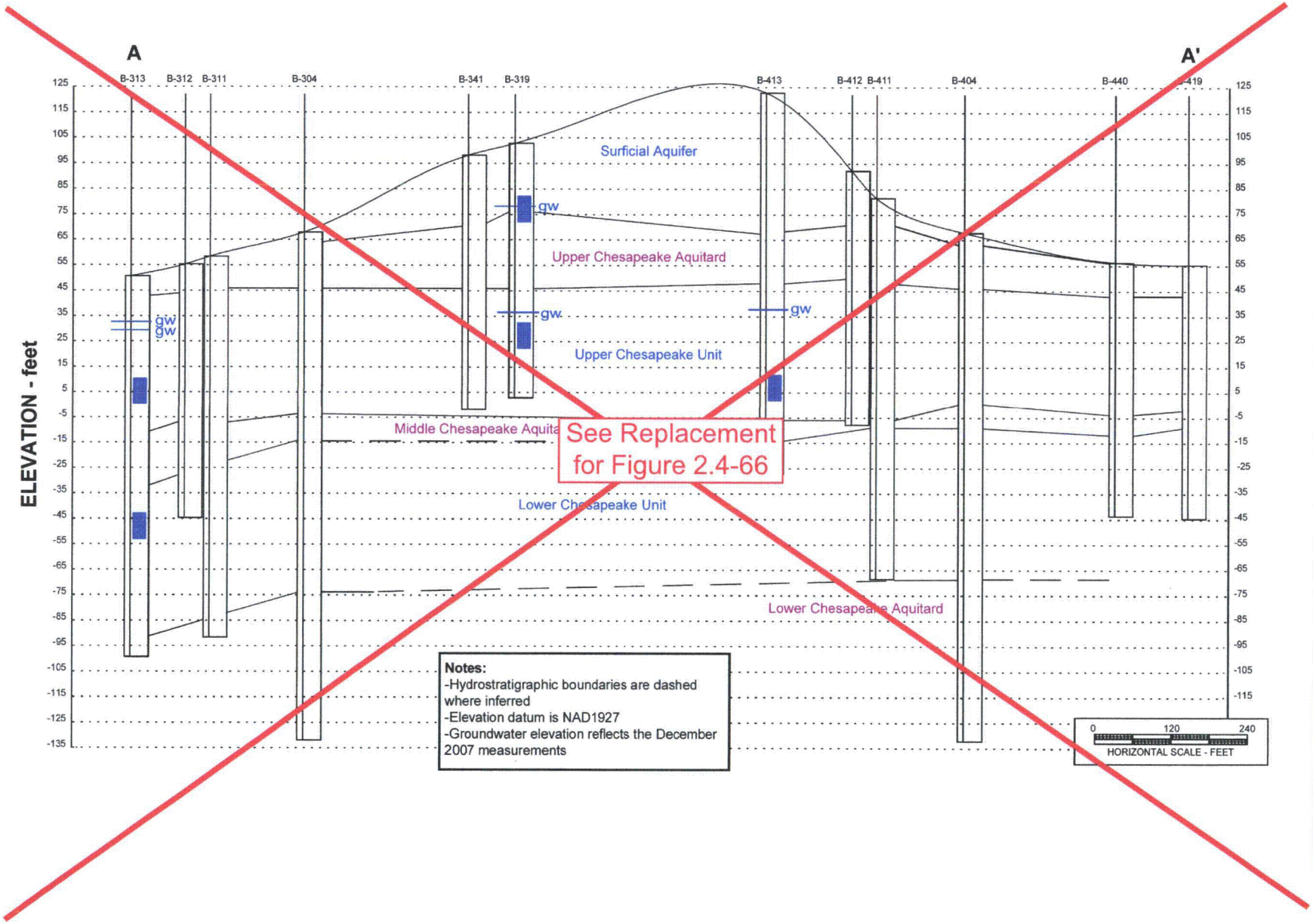


Replacement for Figure 2.4-59

Figure 2.4-66—{Cross-Section A-A' Through Proposed Unit 3 Power Block Area}



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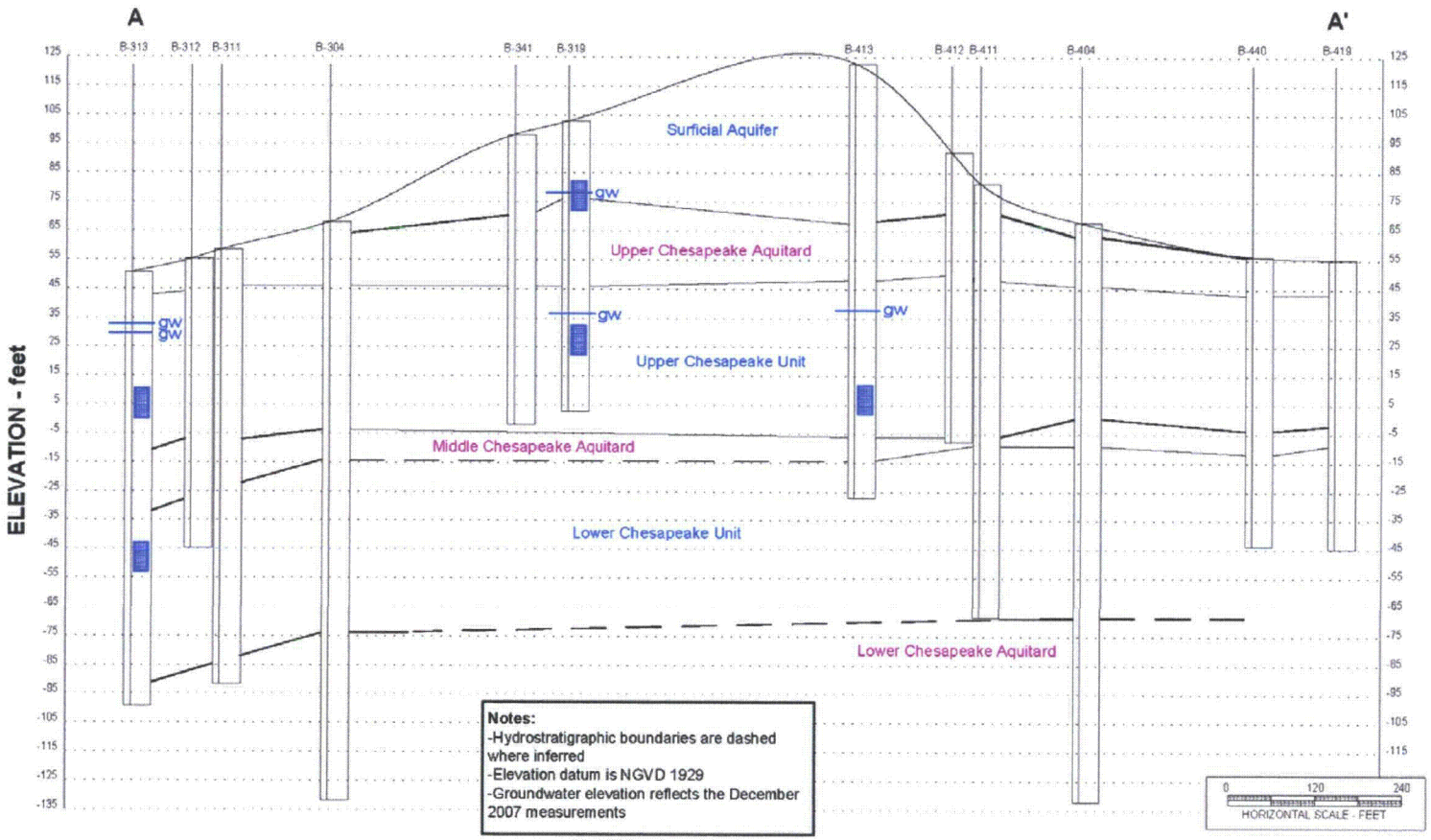
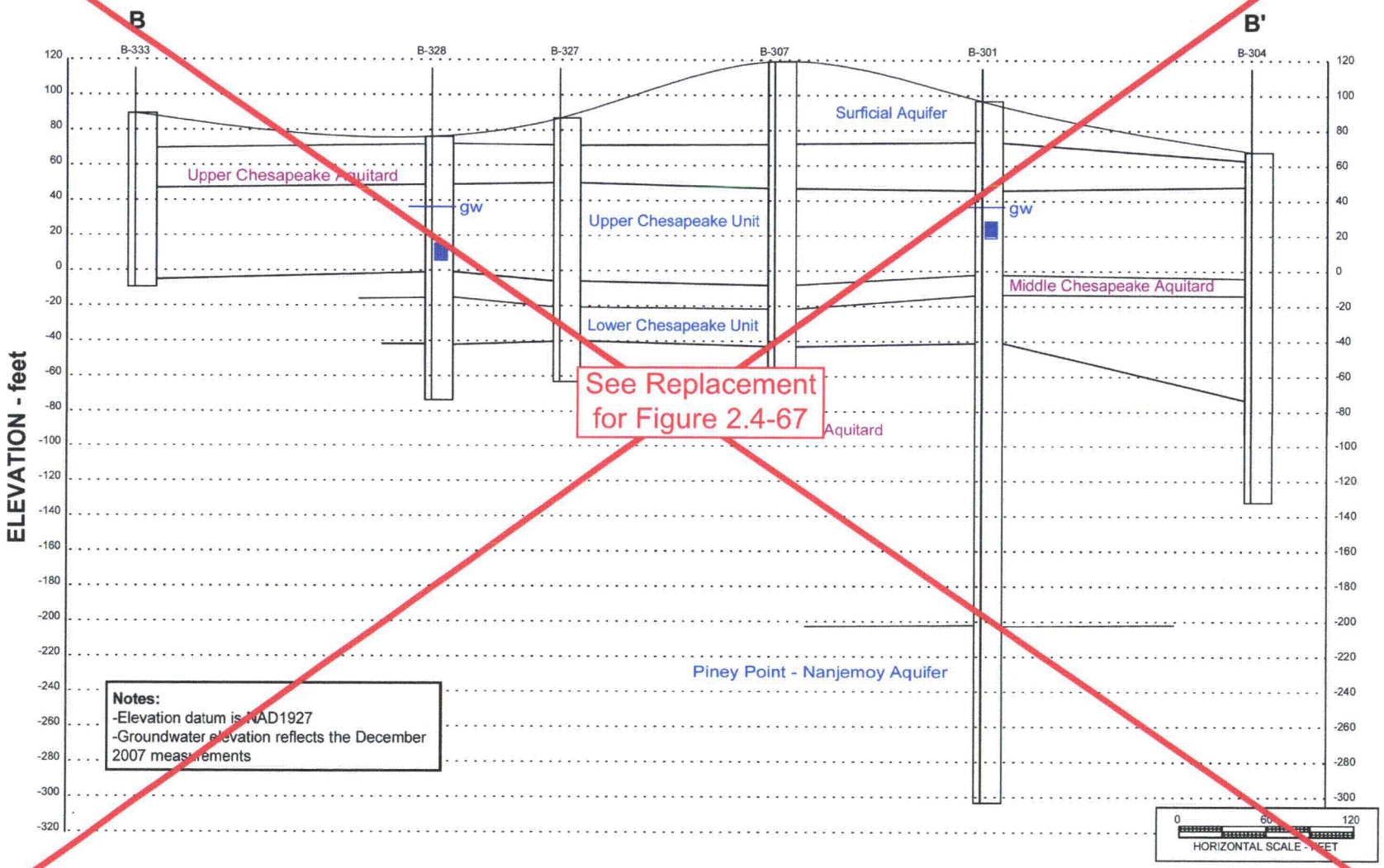


Figure 2.4-67—{Cross-Section B-B' Through Proposed Unit 3 Power Block Area}



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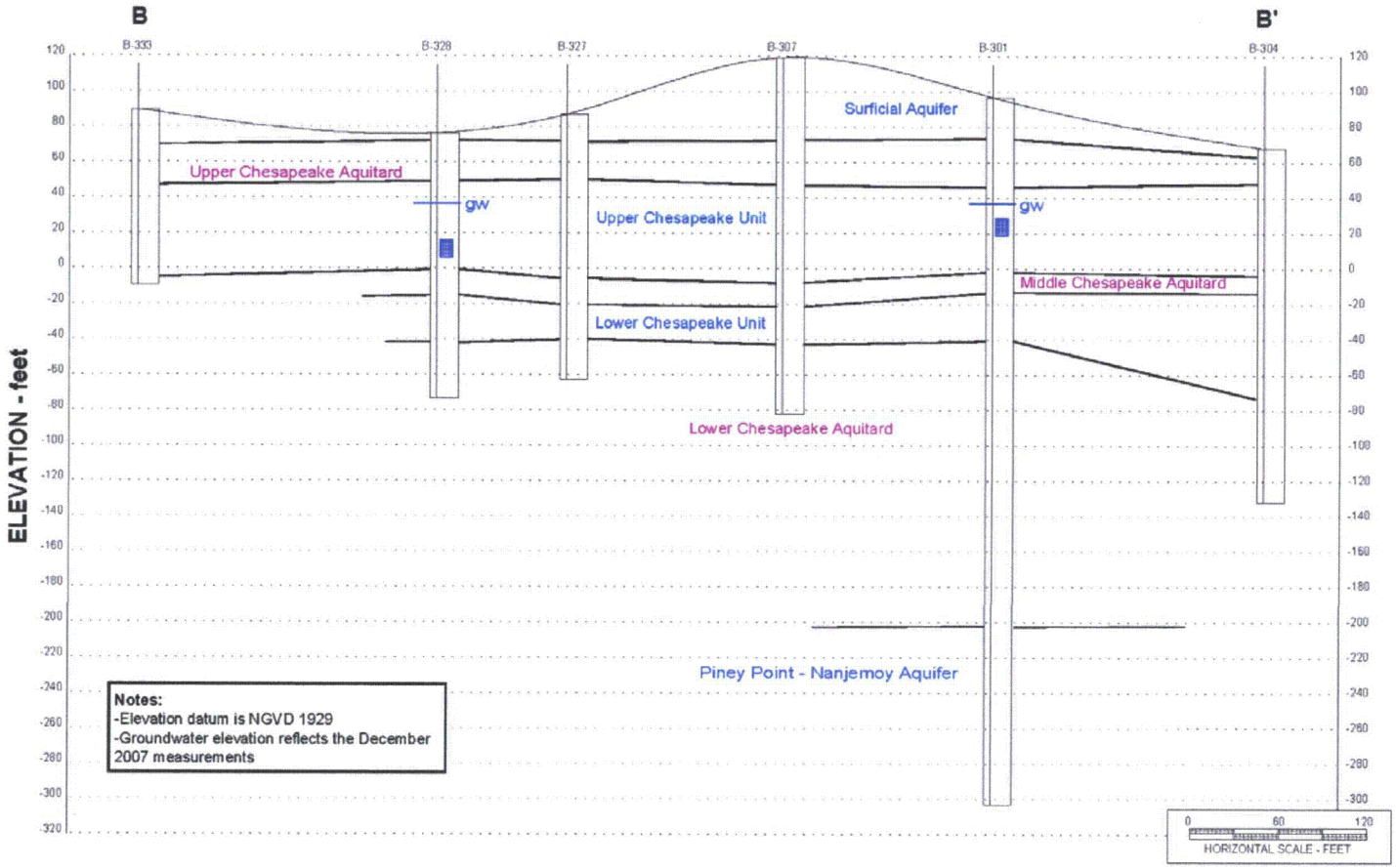
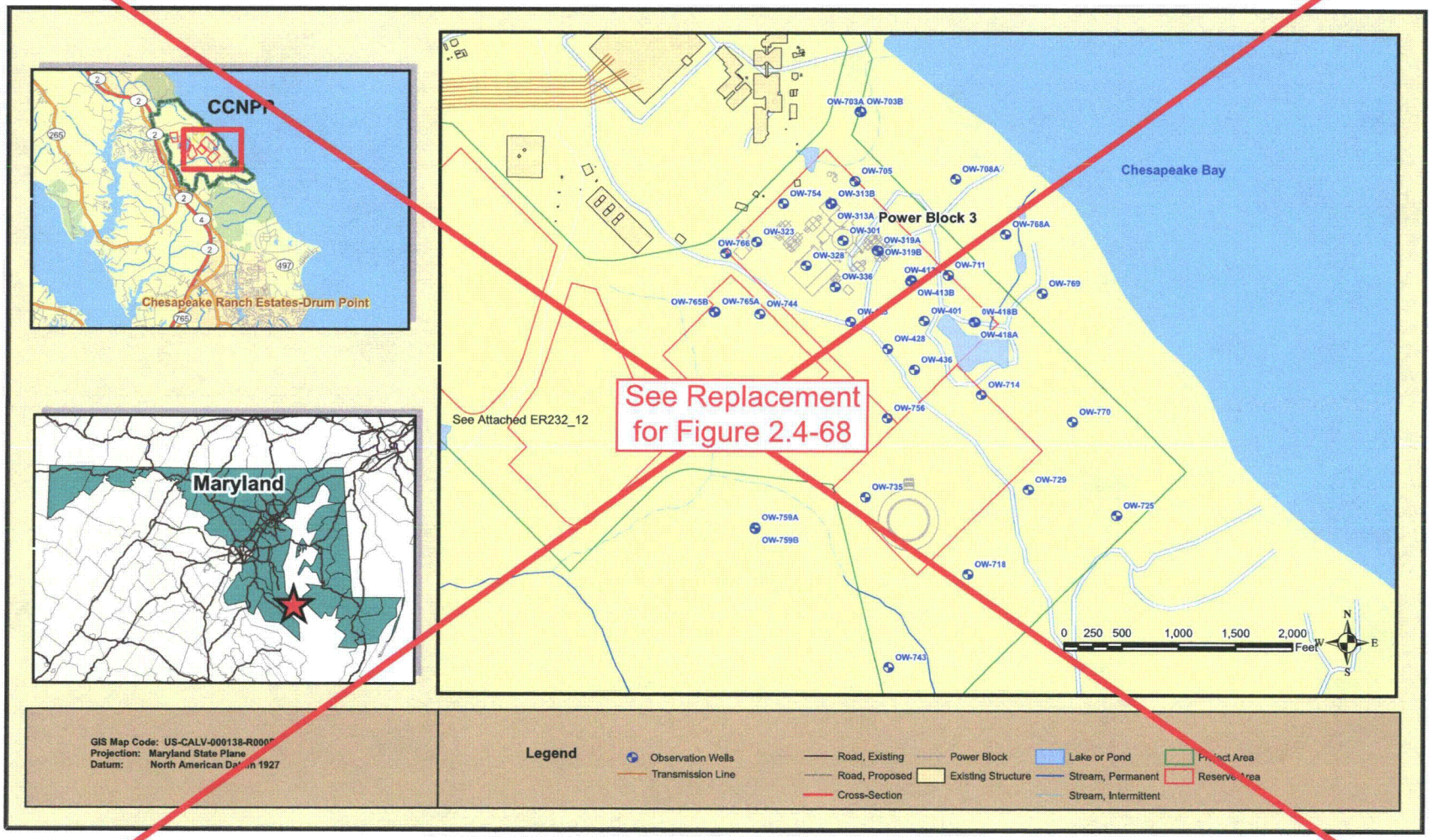


Figure 2.4-68—{Groundwater Observation Wells and Cross-Section Locations in the Vicinity of CCNPP Unit 3}



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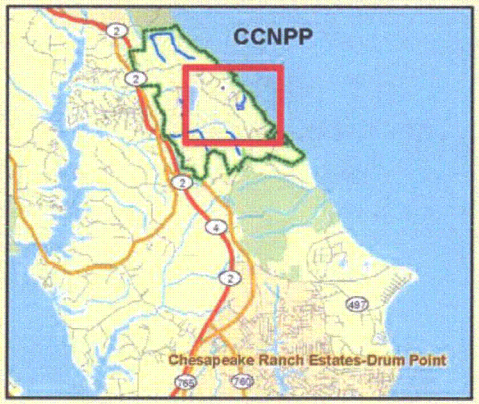
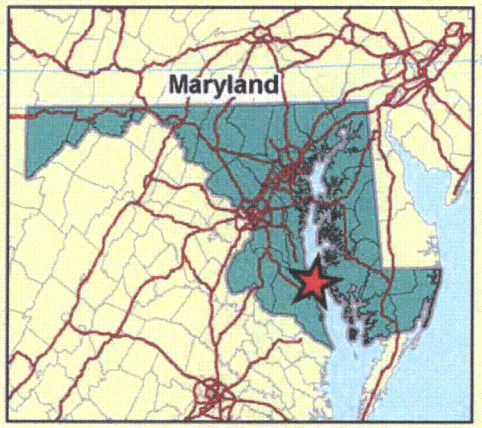
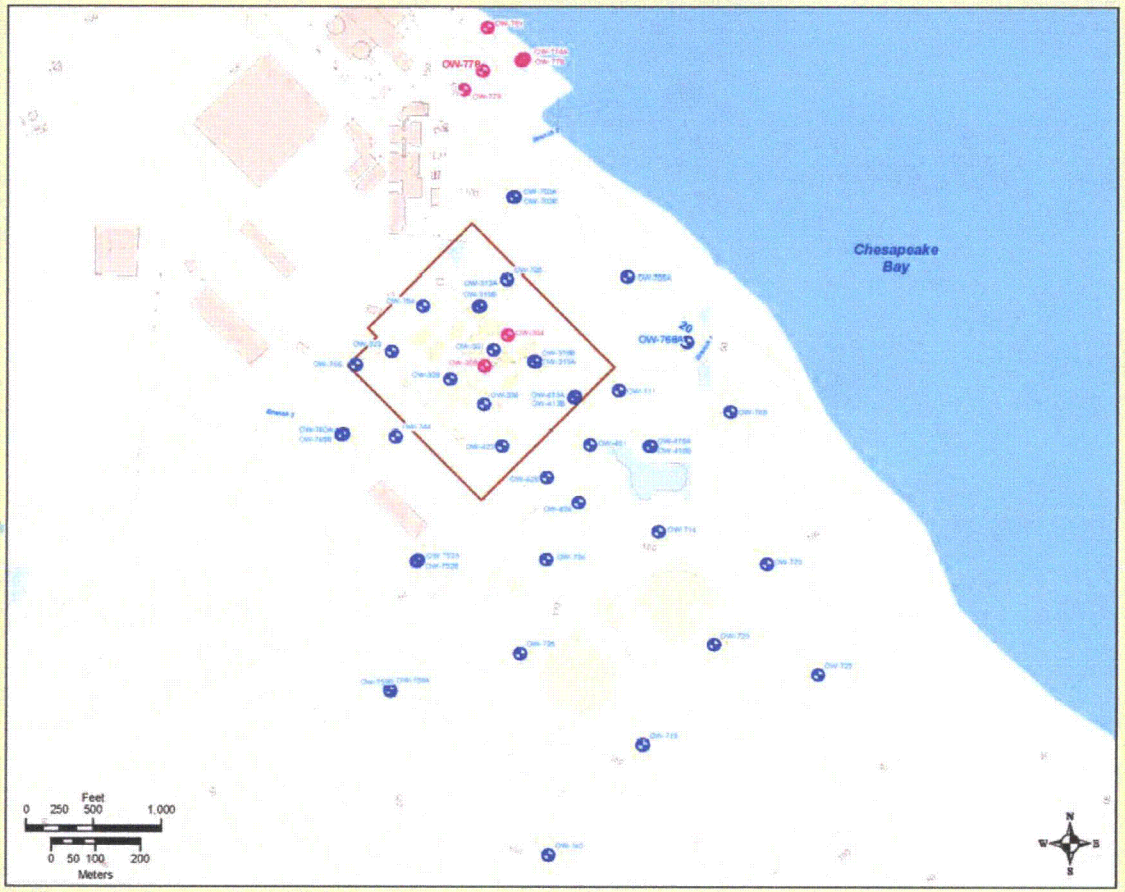






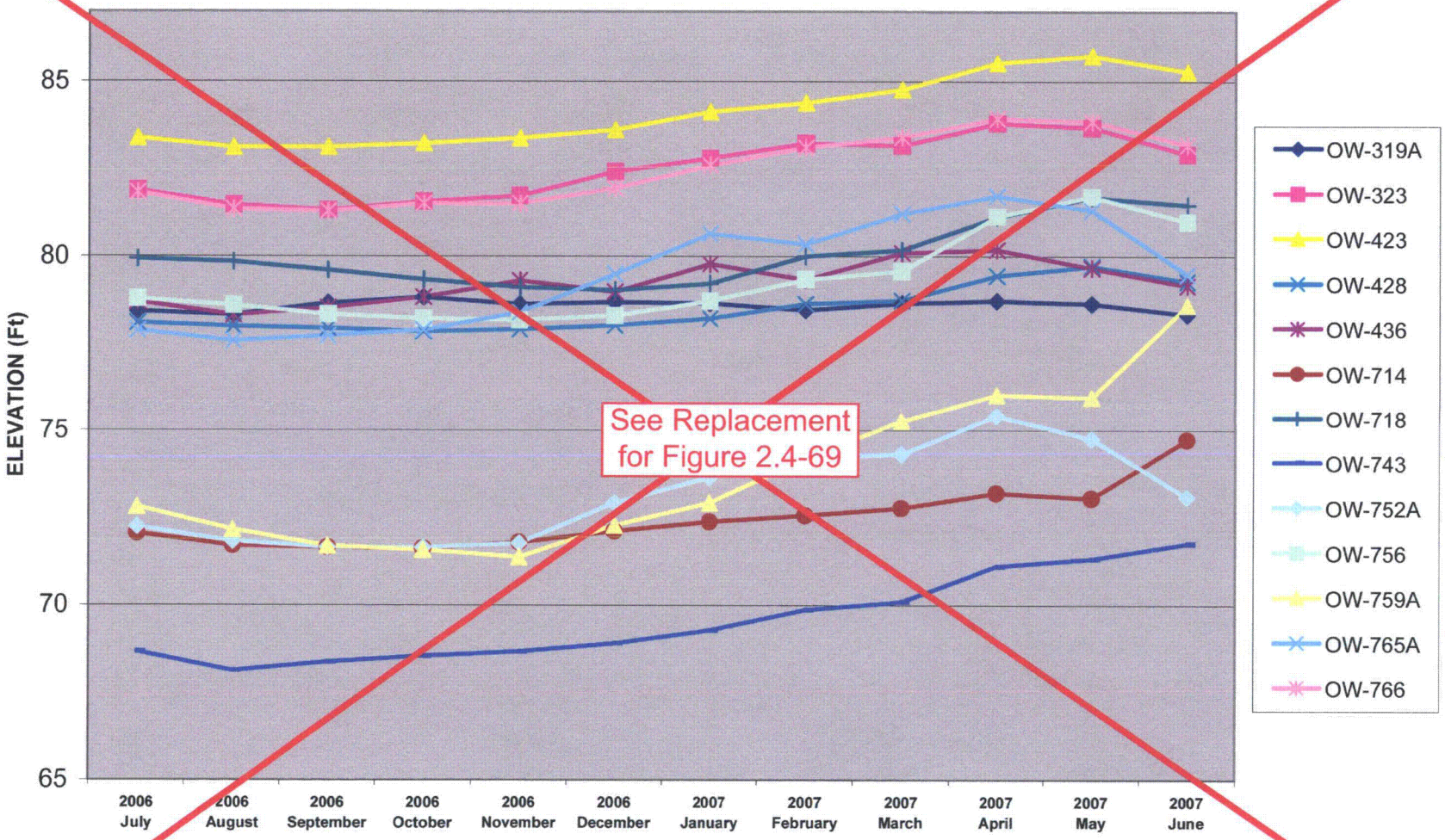
GIS Map Code: US-CALV-000128-R000J
Projection: Maryland State Plane
Horizontal Datum: North American Datum 1927
Vertical Datum: National Geodetic Vertical Datum 1929

Locations of Existing Observation Wells in the Vicinity of CCNPP Unit 3

- 2006 COL Observation Wells
- 2008 Supplemental COL Observation Wells
- Elevation (10-ft Interval)
- Elevation (50-ft Interval)
- Road Edge of Pavement
- Unit 3 Power Block Area
- Aboveground Storage Tank
- Waterbody
- Structures (Units 1 & 2)
- Structures (Unit 3)
- Power Block Structures (Unit 3)

Figure 2.4-69—{Ground Water Elevations for the Surficial Aquifer, July 2006 Through ~~June 2007~~}

October 2009



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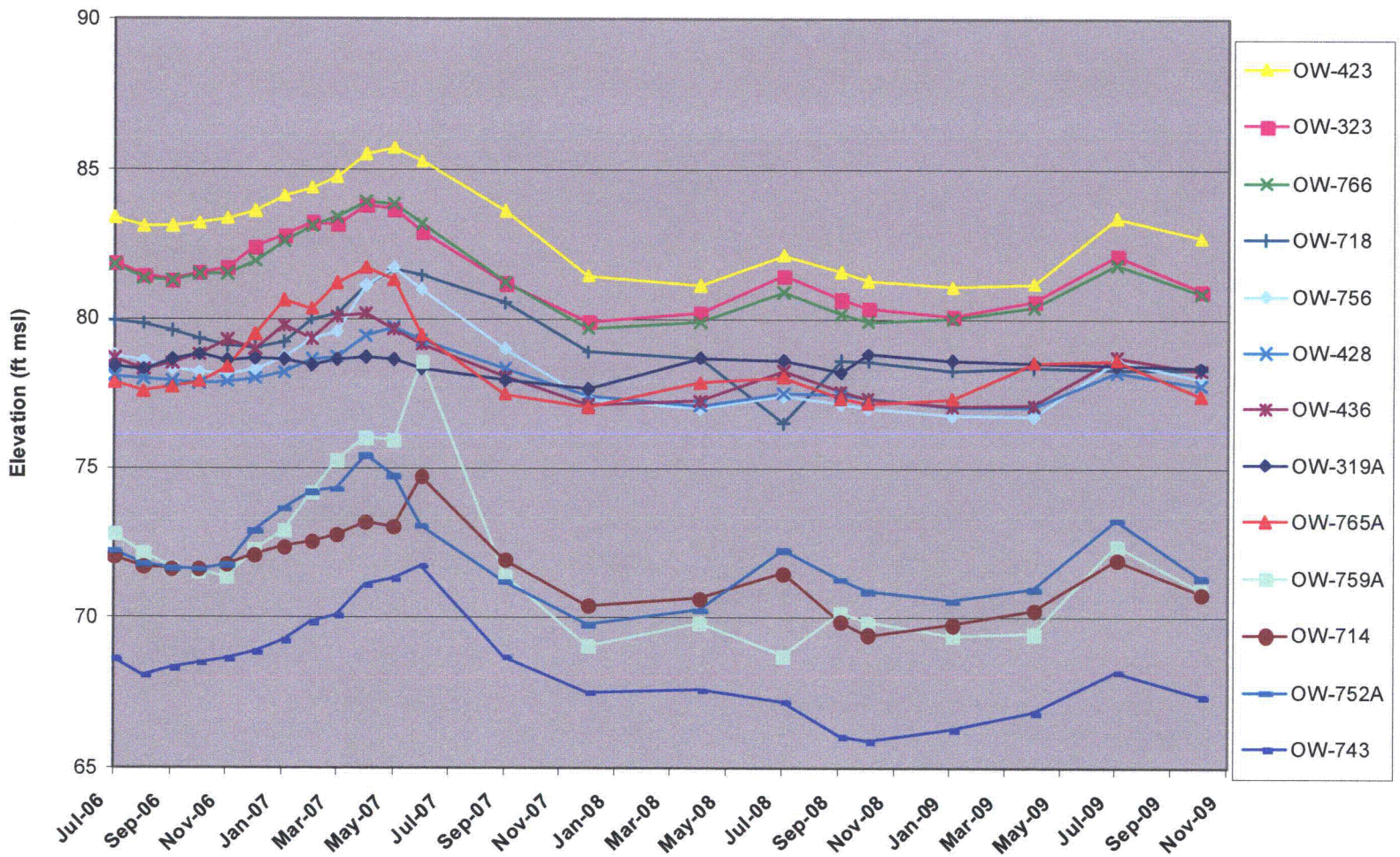
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