Enclosure 3. Combined RAI Responses Part 2 of 2

Table 3: Operational CCNPP Unit 3 Radiological Environmental Monitoring Program Locations

(Page 1 of 2)

Sample Site/Type	Sector	Distance[a] km	Distance[a] mi	Description
DR1	NW	0.6	0.4	Onsite, Along Cliffs
DR2	WNW	2.7	1.7	Rt. 765, Auto Dump
DR3	W	2.3	1.4	Rt. 765, Giovanni's Tavern (Knotty Pine)
DR4	WSW	2.0	1.2	Rt. 765, Across from White Sand Drive
DR5	SW	2.4	1.5	Rt. 765 at Johns Creek
DR6, A4	SSW	2.9	1.8	Rt. 765 at Lusby, Frank's Garage
DR7*, A1*, Ib4*, Ib5*, Ib6*	S	2.9	1.8	Relocated from footprint of Unit 3 to near site boundary
DR8, A2	SSE	2.5	1.5	Camp Conoy Road at Emergency Siren
DR9, A3	SE	2.6	1.6	Bay Breeze Road
DR10	NW	6.4	4.0	Calvert Beach Rd & Decatur St.
DR11	WNW	6.6	4.1	Dirt Road off Mackall Rd & Parran Rd
DR12	W	6.7	4.2	Bowen Rd & Mackall Rd
DR13	WSW	6.1	3.8	Mackall Rd near Wallville
DR14	SW	6.4	4.0	Rodney Point
DR15	SSW	6.2	3.9	Mill Bridge Rd & Turner Rd
DR16	S	6.5	4.1	Across from Appeal School
DR17	SSE	5.9	3.7	Cove Point Rd & Little Cove Point Rd
DR18	SE	7.1	4.5	Cove Point
DR19	NW	4.4	2.8	Long Beach
DR20	NNW	0.4	0.3	Onsite, near shore
DR21, A5, Ib7, Ib8, Ib9	WNW	19.3	12.1	Emergency Operations Facility
DR22	S	12.5	7.8	Solomons Island
DR23	ENE	12.6	7.9	Taylors Island, Carpenter's Property
DR24*, A6*	SSW	2.9	1.8	New Air sampler (TLD) specific Unit 3
Wa1	NNE	0.2	0.1	Intake Area
Wa2, Ia1, Ia2	N	0.3	0.2	Discharge Area (Unit 1 and 2)
Wa3*	E	1.0	0.6	Near Discharge area of Unit 3

[a] Distance and direction are from the central point between the CCNPP Unit 1 and 2 containment buildings.

Key:
- # — The sequential number of the sampling station. An asterisk (*) following a station number indicates location changes due to the Unit 3 operational REMP.
- DR# — Direct Radiation, TLD Station
- A# — Airborne Sampling Station
- Wa# — Waterborne Sampling Station at Intake and Discharges
- Wb# — Waterborne Sediment Sampling Station
- Ia# — Fish and Invertebrates Sampling Station)
- Ib# — Broad Leaf Sampling Station)
- Wg# — Ground water Sampling Station

Table 3: Operational CCNPP Unit 3 Radiological Environmental Monitoring Program Locations
(Page 2 of 2)

Sample Site/Type	Sector	Distance[a] km	Distance[a] mi	Description
Wb1	ESE	0.6	0.4	Shoreline at Barge Road
Wg1*	Protected Area[b]			Near Nuclear Island (see Figure 6.2-5)
Wg2*	Protected Area[b]			Near Nuclear Island (see Figure 6.2-5)
Wg3*	Protected Area[b]			Near Nuclear Island (see Figure 6.2-5)
Wg4*	Protected Area[b]			Near Nuclear Island (see Figure 6.2-5)
Wg5*	Protected Area[b]			Near Nuclear Island (see Figure 6.2-5)
Wg6*	Protected Area[b]			Near Nuclear Island (see Figure 6.2-5)
Wg7*	Protected Area[b]			Near Nuclear Island (see Figure 6.2-1)
Wg8*	Protected Area[b]			Near Retention Basin (see Figure 6.2-1)
Ib1, Ib2, Ib3,	SSE	2.6	1.6	Garden Plot off Bay Breeze Rd
Ia4, Ia5	(Area not influenced by Plant Discharge)			Patuxent River
Ia3	E	0.9	0.6	Camp Conoy.
Ia6	NNW	10.7	6.7	Kenwood Beach
Ia10	SSE	15.3	9.5	Hog Island

[a] Distance and direction are from the central point between the CCNPP Unit 1 and 2 containment buildings.
[b] Ground water sampling locations shall be located down gradient (ground water flow) of facilities at a depth sufficient to monitor the aquifer.

Key:
- # The sequential number of the sampling station. An asterisk (*) following a station number indicates location changes due to the Unit 3 operational REMP.
- DR# Direct Radiation, TLD Station
- A# Airborne Sampling Station
- Wa# Waterborne Sampling Station at Intake and Discharges
- Wb# Waterborne Sediment Sampling Station
- Ia# Fish and Invertebrates Sampling Station)
- Ib# Broad Leaf Sampling Station)
- Wg# Ground Water Sampling Station

Table 4: Environmental Monitoring Sites for the Independent Spent Fuel Storage Installation

Station	Description	Distance (kilometers) [Note: a]	Direction (sector) [Note: a]
Air Samplers			
A1	On Site before Entrance to Camp Conoy	0.3	ESE
SFA1	Meteorological Station	0.3	NW
SFA2	CCNPP Visitor's Center	0.8	N
SFA3	NNW of ISFSI	0.1	NNW
SFA4	SSE of ISFSI	0.1	SSE
TLD Locations			
SFDR1	SW of ISFSI	0.2	SW
SFDR2	N of ISFSI	0.2	N
SFDR3	N of ISFSI	0.1	N
SFDR4	NE of ISFSI	<0.1	NE
SFDR5	E of ISFSI	<0.1	E
SFDR6	ESE of ISFSI	0.1	ESE
SFDR7	CCNPP Visitor's Center	0.8	N
SFDR8	NNW of ISFSI	0.1	NNW
SFDR9	SSE of ISFSI	0.1	SSE
SFDR10	NW of ISFSI	0.1	NW
SFDR11	WNW of ISFSI	0.1	WNW
SFDR12	WSW of ISFSI	<0.1	WSW
SFDR13	S of ISFSI	<0.1	S
SFDR14	SE of ISFSI	0.1	SE
SFDR15	ENE of ISFSI	<0.1	ENE
SFDR16	SW of ISFSI	<0.1	SW
DR7 [Note: b]	On Site Before Entrance to Camp Conoy	0.3	ESE
DR30	Meteorological Station	0.3	NW
SFDR17	NNE of ISFSI	0.1	NNE
SFDR18	W of ISFSI	0.04	W
Vegetation			
SFb1	Meteorological Station	0.3	NW
SFb2	CCNPP Visitor's Center	0.8	N
SFb3	NNW of ISFSI	0.1	NNW
SFb4	SSE of ISFSI	0.1	SSE
SFb5	On Site Before Entrance to Camp Conoy	0.3	ESE
Soil			
SFS1	Meteorological Station	0.3	NW
SFS2	CCNPP Visitor's Center	0.8	N
SFS3	NNW of ISFSI	0.1	NNW
SFS4	SSE of ISFSI	0.1	SSE
SFS5	On Site Before Entrance to Camp Conoy	0.3	ESE

Notes:

a. Distance and direction are from the Central Point of the ISFSI.

b. DR7 is common to both the REMP and the ISFSIMP.

Figure 1: CCNPP Sampling Locations 0-2 Miles (0-3.2 km)

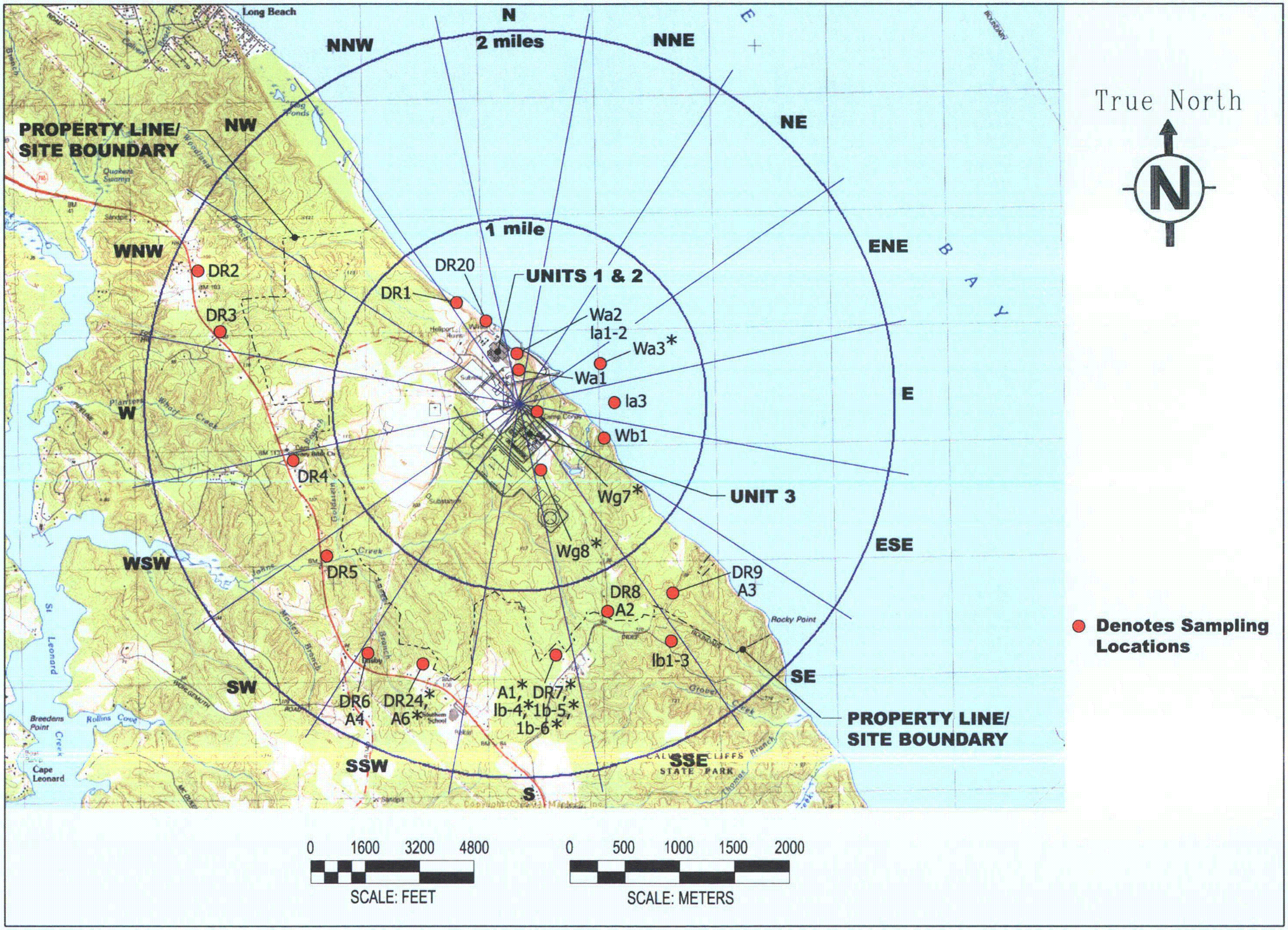
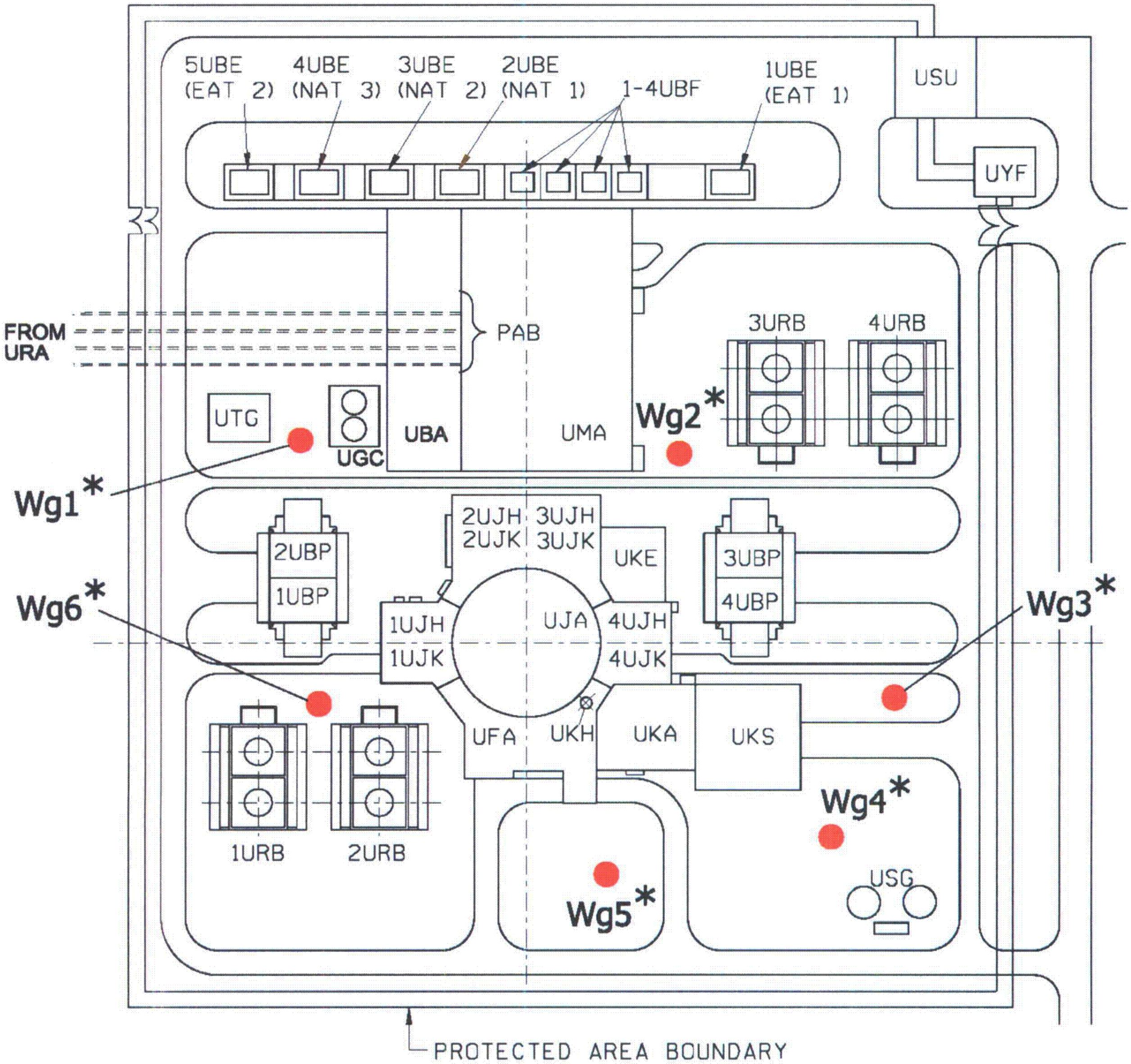


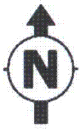
Figure 2: CCNPP Unit 3 Ground Water Sampling Locations Inside the Protected Area Boundary



LEGEND:

	PAB	CIRCULATING WATER PIPES
	UAA	SWITCHYARD
	UBA	SWITCHGEAR BUILDING
1-5	UBE	AUXILIARY POWER TRANSFORMERS
1-4	UBF	GENERATOR TRANSFORMERS
1-4	UBP	EMERGENCY DIESEL GENERATOR BUILDING
	UFA	FUEL POOL BUILDING
	UGC	DEMINERALIZED WATER TANKS
	UJA	REACTOR BUILDING
1-4	UJH	SAFEGUARD BUILDINGS MECHANICAL
1-4	UJK	SAFEGUARD BUILDINGS ELECTRICAL
	UKA	REACTOR AUXILIARY BUILDING
	UKE	ACCESS BUILDING
	UKH	VENT STACK
	UKS	RADIOACTIVE WASTE PROCESSING BUILDING
	UMA	TURBINE BUILDING
	URA	COOLING TOWER STRUCTURE
1-4	URB	ULTIMATE HEAT SINK
	USG	FIRE PROTECTION STORAGE TANKS AND BUILDING
	USU	STORAGE/WAREHOUSE
	UTG	CENTRAL GAS SUPPLY SYSTEMS BUILDING
	UYF	SECURITY GATE HOUSE

REFERENCE PLANT NORTH



● - DENOTES WELL LOCATION

Item Number 134 **ER Section 6.3**

Request:

Section 6.3, page 6.3-1 notes that biological monitoring stations are discussed in Section 6.1, but no discussion is presented. Please provide.

Response:

The reference to biological monitoring stations is a typographical error. The intended reference is to thermal monitoring stations in Section 6.1 and biological monitoring in Section 6.5, not Section 6.6, as noted. ER Section 6.3 will be revised to correct the typographical error as follows: "The existing thermal and biological monitoring stations for surface water are discussed in Sections 6.1 and 6.5, respectively."

ER Impact:

ER Section 6.3 will be revised as follows: "The existing thermal and biological monitoring stations for surface water are discussed in Sections 6.1 and 6.5, respectively." This revision will be incorporated into a future revision to the ER.

Item Number 135 **ER Section 6.3**

Request:

It is stated that on-site construction monitoring will be part of the NPDES permitting process. Also, Chesapeake Bay monitoring will be at the intake and discharge structures and part of the ACOE 401 permit process (Section 1.3) to ensure compliance with applicable water quality and sediment transport requirements. Provide a description of the monitoring stations.

Response:

Specifics as to monitoring programs are the discretion of the respective regulatory agencies, the Maryland Department of the Environment for the NPDES Construction General Permit and the U.S. Corps of Engineers for the 401 Permit. Even so, monitoring stations can be expected at the points of effluent discharge, e.g., at storm water outfalls and in the vicinity of dredging, or potential sensitive receptor locations. Typical parameters monitored would likely include total suspended solids (TSS), pH, and oil and grease

ER Impact:

No changes to the ER are required.

Item Number 136 **ER Section 6.3**

Request:

Although revisions to the observation well network during construction will be implemented to ensure that the resulting changes in the local groundwater regime will be tracked (pg 6.6-3and 5), provide information on the well monitoring network during construction.

Response:

Specifics as to the observation well network during construction will depend on three important factors: (1) the final site utilization plot plan, (2) the project sequencing (i.e., the construction stages and schedule), and (3) the construction methods selected. All are still to be determined. The objective of the program, however, will be as stated, to establish a baseline for evaluating potential hydrologic changes, monitor anticipated impacts from site preparation and construction, and detect unexpected Impacts.

ER Impact:

No changes to the ER are required.

Item Number 137 **ER Section 6.3**

Request:

Hydrological monitoring during operation will be designed, as needed, but a monitoring plan has not been developed (pg 6.3-5). Provide a monitoring plan.

Response:

The hydrological monitoring plan during operation will be established based on the applicable regulatory requirements and responsible agency. For example, the NPDES permit issued by the Maryland Department of the Environment will determine the surface water monitoring program. The groundwater monitoring program will be designed to meet NRC requirements, which have yet to be become final, and described in the CCNPP Unit 3 Offsite Dose Calculation Manual (ODCM) at that time.

ER Impact:

No changes to the ER are required.

Item Number 138 **ER Sections 6.4, 6.4.2.5**

Request:

What is the rationale for not including meteorological and climatological data from Patuxent River Naval Air Station?

Response:

Patuxent River Naval Air Station meteorological and climatological data is discussed in Sections 2.7.4.1 and 2.7.4.3 and listed in tables 2.7-14 through 2.7-16, 2.7-24 through 2.7-26, and 2.7-31.

Other National Weather Service (NWS) sites within 50 miles (80km) of the CCNPP site include the Patuxent River Naval Air Station at 10.6 miles (17.0 km) and Washington Reagan-National Airport at 43.8 miles (70.5 km) from CCNPP site. Other nearby NWS sites include Baltimore-Washington International Airport at 52.8 miles (85.0 km), Richmond International Airport at 79.8 miles (128.4 km), and Norfolk International Airport at 106.6 miles (171.5 km) from CCNPP site.

ER Impact:

No changes to the ER are required.

Item Number 139 **ER Section 6.4.2.3**

Request:

Is the temperature difference measured or calculated from the temperature measurements? If it is calculated, how is the required accuracy achieved?

Response:

The temperature difference is calculated from the temperature measurements. Each temperature sensor meets the accuracy requirement listed in Regulatory Guide 1.23. System calibrations test the sensors and the overall system.

ER Impact:

No changes to the ER are required.

Item Number 140 **ER Section 6.4.2.3**

Request:

Justify not including a humidity measurement in the pre-operational meteorological monitoring program.

Response:

A green field site would have included humidity measurements; since CCNPP is not a green field site and the existing units do not use cooling towers, humidity measurements were not made. Therefore, it was decided to use humidity measurements from an offsite source that is representative of the site (Patuxent River Naval Air Station).

ER Impact:

No changes to the ER are required.

Item Number 141 **ER Section 6.6**

Request:

As noted in Section 6.3, surface water monitoring related to construction activities will be part of the permitting process. Groundwater monitoring will be determined at a later date, but prior to construction activities. Surface water operational monitoring, including intake and outfall structures and discharge locations, will commence from first use of Chesapeake Bay water and first discharge, as covered by the permitting process. Provide information on the chemical monitoring programs. (Cross reference with HP-1[a])

Response:

Chemical monitoring will comply with the NPDES permit and the Maryland Code of Regulation (COMAR) - 26, Subtitle 08 Water Pollution Chapter 4 "Permit".

As stated in ER Section 6.6.2 (Construction and Preoperational Monitoring):

> "chemical monitoring of surface water during construction related activities for CCNPP Unit 3 will be an extension of more than 30 years of pre-application monitoring."
>
> "Construction and preoperational chemical monitoring will be performed during the planned two year and four year periods for site preparation and plant construction, respectively ... and comply with permit modifications."
>
> "Prior to the start of construction, approval of storm water management and erosion/sediment control plans will be obtained in accordance with the NPDES Construction Genera! Permit as discussed in Section 1.3. These controls will be incorporated into a Storm Water Pollution Prevention Plan (SWPPP)." "No chemical monitoring is planned at this time for groundwater."

As stated in Section 6.6.3 (Operational Monitoring):

> "Operational monitoring will commence from the date of the first appropriation and use of Chesapeake Bay water and first discharge and continue as long as required by the NPDES permit applicable for CCNPP Unit 3."
>
> "...chemical monitoring at the CCNPP Unit 3 intake and outfall will be limited by the new NPDES permit"
>
> "There are currently no plans to monitor ground water for chemicals during the operational phase of CCNPP Unit 3."

For clarification purposes, Section 6.6 will be updated to include a statement explaining that chemical monitoring will comply with the NPDES permit and Maryland Code of Regulation (COMAR) for water pollution.

Also, Section 6.6.3 will be updated to state that chemical monitoring during operation will commence from the date of first appropriation ... as required by the NPDES permit applicable for CCNPP Unit 3.

ER Impact:

No changes to the ER are required.

Item Number 142 **ER Section 7.1**

Request:

Are the radionuclide inventories used to generate DBA source terms consistent with the inventories used to estimate consequences of normal operations?

Response:

The core radionuclide Inventory is common to the radiological analyses. The RCS radionuclide concentration used in the radiological analyses depend on the SRP guidance except for the DE I-131 and DE Xe-133 concentrations which are at the technical specification limits. The remaining radionuclides follow the SRP. For example, SRP 11 assumption for failed fuel fraction is 1%. The failed fuel assumption for the SRP 12 is 0.25%. The 0.25% failed fuel assumption is also applied to the DBA initial RCS inventory.

ER Impact:

No changes to the ER are required.

Item Number 143 **ER Section 7.1**

Request:

Are the distances to the EAB and LPZ from the center of containment or the shortest distance from potential release points?

Response:

The CCNPP Unit 3 EAB radius is from the center of the reactor building and encompasses the 0.5 mile distances from each release point on the nuclear island. This radius that encompasses the 0.5 mile distances for the EAB is bounded by 0.62 miles as shown in ER Figure 3.3-1. The site LPZ Is defined by a radius of 2.0 miles to encompass the existing units and the EPR LPZ of 1.5 miles as shown in ER Figure 2.5-3. The radius of 2.0 miles is from the geometric center of CCNPP Units1 and 2.

ER Impact:

No changes to the ER are required.

Item Number 144 **ER Section 7.1**

Request:

(4th paragraph) The EAB boundary of 500 m is not consistent with the EAB boundary shown in Figure 3.1-1. Clarify.

Response:

The fourth paragraph of Section 7.1 does not reference an EAB of 500 m. The fourth paragraph references the 0.5 mile distance as the EAB reflecting the DC X/Q assumption of 0.50 miles from each of the nuclear island release points. The CCNPP Unit 3 EAB is about 0.62 mile radius from the center of the reactor building to enclose the 0.50 mile distance from all release points on the nuclear island. ER Figure 3.3-1 shows the CCNPP Unit 3 EAB of 3,324 feet which is approximately 0.62 miles and bounds the DC X/Q distance.

ER Impact:

No changes to the ER are required.

Item Number 145 **ER Section 7.1**

Request:

The table indicates that a single X/Q value was used for all time periods. Provide a realistic assessment using the appropriate X/Q values for each of the time periods, or provide a justification for departing from long-standing NRC guidance on DBA dose calculations.

Response:

The original ER submittal utilized a conservative single X/Q value. However, the DBA analyses documented in the Design Certification FSAR strictly adhered to NRC guidance from RG 1.145 for off-site dispersion factors and the ARCON96 methodology for the control room X/Q. The ER dose analyses have been updated to apply the same methodology using the 50th percentile X/Q values in Table 7.1-5. Tables7.1-5 and 2.7-115 will be revised, as shown in RAI Item Number 29 response, in a future revision to the ER.

ER Impact:

ER Tables 7.1-5 and 2.7-115 will be revised, as shown in RAI Item Number 29 response, in a future revision to the ER.

Item Number 146 **ER Section 7.1**

Request:

The DBA analysis (and Table 7.1-1) considers DBAs that are listed in NUREGs 0800 and 1555, and Regulatory Guide 1.183. The DBAs considered in these documents are not based on the US EPR design. Are there any potential DBAs that might be specific to the US EPR design that are not listed in the NRC guidance?

Response:

SRP15.0.3 describes the scope and requirements for design basis accident radiological evaluations. RG1.183 describes the Alternative Source Term (AST) for evaluating DBA at nuclear power reactors. The AST is based on NUREG 1465 which presented a representative accident source term for a BWR and PWR. The U.S. EPR is a representative PWR consisting of 4 loops with typical PWR fuel operated at a higher power level. The overall EPR design was evaluated for a range of potential accidents as describe in US EPR FSAR Chapter 15. For example, the FWLB was evaluated and found to be bounded by the MSLB. Table 7.1-1 represents all the DBAs that are applicable to the US EPR Design.

ER Impact:

The FWLB event will be removed from Table 7.1-1 in a future revision of the ER.

Item Number 147 **ER Section 7.1**

Request:

Tables 7.1-2 and 7.1-3 give source coolant source terms in terms of coolant concentrations. Provide the source terms in terms of activity (Ci or Bq) released by isotope. Or, alternatively, provide the mass of coolant released to the environment for each DBA involving coolant releases.

Response:

The ER will be updated to include radionuclides released to the atmosphere from DBAs. Table 7.1-15 through Table 7.1-24 will be included to tabulate the released radionuclides (activity) as a function of time following the X/Q time intervals. The DC FSAR in Chapter 15.0 contains both the RCS concentrations and mass released for applicable events. For example, the small line break total curies released can' be calculated by obtaining the concentration in DC FSAR Table 15.0-15 and the break mass release from DC FSAR Table 15.0-21.

ER Impact:

ER Tables 7.1-15 through 7.1-24 will be added to the ER in a future revision to the ER.

Table 7.1-15: Radionuclide Releases to Atmosphere for Main Steam Line Break with Pre-Accident Iodine Spike

Nuclide	Releases to Atmosphere (Ci) During Specified Time Intervals (hrs)			
	0 to 2	2 to 8	8 to 24	Total
Kr-83m	2.167E-02	2.145E-02	3.182E-04	4.344E-02
Kr-85m	1.115E-01	1.858E-01	4.350E-03	3.016E-01
Kr-85	1.205E+00	3.613E+00	1.505E-01	4.969E+00
Kr-87	4.505E-02	2.194E-02	9.099E-05	6.709E-02
Kr-88	1.849E-01	2.258E-01	3.674E-03	4.144E-01
Kr-89	2.093E-04	8.419E-16	1.370E-50	2.093E-04
Xe-131m	2.446E-01	7.271E-01	3.027E-02	1.002E+00
Xe-133m	3.042E-01	8.850E-01	3.985E-02	1.229E+00
Xe-133	2.140E+01	6.307E+01	2.646E+00	8.711E+01
Xe-135m	3.843E-01	8.821E-01	8.834E-02	1.355E+00
Xe-135	9.137E-01	3.733E+00	4.540E-01	5.100E+00
Xe-137	4.777E-04	1.767E-13	2.237E-42	4.777E-04
Xe-138	6.324E-03	1.790E-05	9.525E-14	6.341E-03
Br-83	2.522E-01	4.130E-03	7.641E-05	2.564E-01
Br-84	4.771E-02	4.524E-05	7.550E-09	4.775E-02
Br-85	6.133E-04	1.092E-18	1.546E-56	6.133E-04
I-129	7.539E-07	3.757E-08	1.301E-09	7.928E-07
I-130	6.787E-01	2.685E-02	8.749E-04	7.064E-01
I-131	1.516E+01	8.621E+00	1.226E+00	2.501E+01
I-132	4.788E+00	1.069E+00	4.889E-02	5.906E+00
I-133	2.350E+01	1.244E+01	1.602E+00	3.754E+01
I-134	1.620E+00	1.135E-01	5.052E-04	1.734E+00
I-135	1.246E+01	5.510E+00	5.515E-01	1.852E+01
Rb-86m	1.353E-09	1.255E-45	0.000E+00	1.353E-09
Rb-86	1.398E-03	7.207E-04	1.024E-04	2.221E-03
Rb-88	1.915E-01	2.517E-01	4.103E-03	4.474E-01
Rb-89	1.838E-03	3.266E-06	1.619E-13	1.841E-03
Cs-134	1.609E-01	8.300E-02	1.185E-02	2.557E-01
Cs-136	3.808E-02	1.963E-02	2.782E-03	6.048E-02
Cs-137	6.160E-02	3.177E-02	4.536E-03	9.791E-02
Cs-138	2.051E-02	1.254E-03	1.886E-07	2.177E-02
Sr-89	7.189E-07	2.557E-06	3.082E-07	3.584E-06
Ba-137m	5.786E-02	3.006E-02	4.291E-03	9.220E-02
Total	8.386E+01	1.016E+02	6.875E+00	1.923E+02

Table 7.1-16: Radionuclide Releases to Atmosphere for Main Steam Line Break with Accident-Induced (Coincident) Iodine Spike

Nuclide	Releases to Atmosphere (Ci) During Specified Time Intervals (hrs)			
	0 to 2	2 to 8	8 to 24	Total
Kr-83m	2.167E-02	2.145E-02	3.182E-04	4.344E-02
Kr-85m	1.115E-01	1.858E-01	4.350E-03	3.016E-01
Kr-85	1.205E+00	3.613E+00	1.505E-01	4.969E+00
Kr-87	4.505E-02	2.194E-02	9.099E-05	6.709E-02
Kr-88	1.849E-01	2.258E-01	3.674E-03	4.144E-01
Kr-89	2.093E-04	8.419E-16	1.370E-50	2.093E-04
Xe-131m	2.446E-01	7.308E-01	3.188E-02	1.007E+00
Xe-133m	3.045E-01	9.837E-01	8.092E-02	1.369E+00
Xe-133	2.140E+01	6.448E+01	3.237E+00	8.912E+01
Xe-135m	7.205E-01	1.136E+01	2.616E+00	1.470E+01
Xe-135	1.023E+00	1.721E+01	5.434E+00	2.367E+01
Xe-137	4.777E-04	1.767E-13	2.237E-42	4.777E-04
Xe-138	6.324E-03	1.790E-05	9.525E-14	6.341E-03
Br-83	2.522E-01	4.130E-03	7.641E-05	2.564E-01
Br-84	4.771E-02	4.524E-05	7.550E-09	4.775E-02
Br-85	6.133E-04	1.092E-18	1.546E-56	6.133E-04
I-129	7.539E-07	3.757E-08	1.301E-09	7.928E-07
I-130	6.787E-01	2.685E-02	8.749E-04	7.064E-01
I-131	1.627E+01	6.254E+01	1.557E+01	9.438E+01
I-132	8.145E+00	3.962E+01	6.683E+00	5.445E+01
I-133	2.653E+01	1.129E+02	2.685E+01	1.663E+02
I-134	5.642E+00	2.468E+01	2.899E+00	3.322E+01
I-135	1.595E+01	7.814E+01	1.675E+01	1.108E+02
Rb-86m	1.353E-09	1.255E-45	0.000E+00	1.353E-09
Rb-86	1.398E-03	7.207E-04	1.024E-04	2.221E-03
Rb-88	1.915E-01	2.517E-01	4.103E-03	4.474E-01
Rb-89	1.838E-03	3.266E-06	1.619E-13	1.841E-03
Cs-134	1.609E-01	8.300E-02	1.185E-02	2.557E-01
Cs-136	3.808E-02	1.963E-02	2.782E-03	6.048E-02
Cs-137	6.160E-02	3.177E-02	4.536E-03	9.791E-02
Cs-138	2.051E-02	1.254E-03	1.886E-07	2.177E-02
Sr-89	7.189E-07	2.557E-06	3.082E-07	3.584E-06
Ba-137m	5.786E-02	3.006E-02	4.291E-03	9.220E-02
Total	9.932E+01	4.172E+02	8.034E+01	5.968E+02

Table 7.1-17: Radionuclide Releases to Atmosphere for Main Steam Line Break with Accident-Induced 1.24% Clad Failure

Nuclide	Releases to Atmosphere (Ci) During Specified Time Intervals (hrs)			
	0 to 2	2 to 8	8 to 24	Total
Kr-83m	1.234E+01	1.339E+01	4.654E-01	2.619E+01
Kr-85m	3.180E+01	5.299E+01	1.250E+00	8.604E+01
Kr-85	4.628E+00	1.388E+01	5.781E-01	1.908E+01
Kr-87	4.483E+01	2.183E+01	9.054E-02	6.675E+01
Kr-88	8.286E+01	1.011E+02	1.647E+00	1.857E+02
Kr-89	5.007E+00	2.014E-11	3.276E-46	5.007E+00
Xe-131m	1.499E+00	4.467E+00	1.887E-01	6.154E+00
Xe-133m	7.499E+00	2.160E+01	9.244E-01	3.002E+01
Xe-133	2.563E+02	7.562E+02	3.187E+01	1.044E+03
Xe-135m	1.561E+01	1.737E+01	1.804E+00	3.479E+01
Xe-135	7.553E+01	2.021E+02	1.331E+01	2.910E+02
Xe-137	9.450E+00	3.495E-09	4.426E-38	9.450E+00
Xe-138	3.388E+01	9.589E-02	5.105E-10	3.398E+01
Br-83	4.268E+00	3.443E+00	1.707E-01	7.881E+00
Br-84	4.045E+00	2.171E-01	5.883E-05	4.262E+00
Br-85	6.252E-01	8.120E-14	1.228E-51	6.252E-01
I-129	2.904E-06	5.616E-06	8.492E-07	9.369E-06
I-130	3.923E+00	6.706E+00	8.338E-01	1.146E+01
I-131	6.926E+01	1.468E+02	2.198E+01	2.380E+02
I-132	4.433E+01	3.363E+01	1.588E+00	7.955E+01
I-133	9.127E+01	1.655E+02	2.231E+01	2.791E+02
I-134	4.733E+01	8.856E+00	4.002E-02	5.623E+01
I-135	7.309E+01	1.083E+02	1.126E+01	1.926E+02
Rb-86m	6.630E-04	1.126E-39	0.000E+00	6.630E-04
Rb-86	3.593E-01	9.232E-01	1.396E-01	1.422E+00
Rb-88	9.053E+01	1.129E+02	1.838E+00	2.052E+02
Rb-89	3.107E+01	9.210E-02	4.812E-09	3.116E+01
Cs-134	4.026E+01	1.041E+02	1.582E+01	1.602E+02
Cs-136	9.981E+00	2.558E+01	3.858E+00	3.942E+01
Cs-137	1.537E+01	3.975E+01	6.041E+00	6.116E+01
Cs-138	1.013E+02	8.553E+00	1.560E-03	1.099E+02
Sr-89	2.066E-02	7.312E-02	9.210E-03	1.030E-01
Ba-137m	1.454E+01	3.760E+01	5.714E+00	5.785E+01
Total	1.223E+03	2.008E+03	1.437E+02	3.375E+03

Table 7.1-18: Radionuclide Releases to Atmosphere for Pump Locked Rotor Accident (LRA) with Accident-Induced 8.0% Clad Failure

Nuclide	Releases to Atmosphere (Ci) During Specified Time Intervals (hrs)		
	0 to 2	2 to 8	Total
Kr-83m	5.781E+01	4.552E+01	1.033E+02
Kr-85m	1.604E+02	2.552E+02	4.156E+02
Kr-85	1.822E+01	5.241E+01	7.063E+01
Kr-87	2.309E+02	1.056E+02	3.365E+02
Kr-88	4.212E+02	4.890E+02	9.102E+02
Kr-89	3.203E+01	9.752E-11	3.203E+01
Xe-131m	6.515E+00	1.857E+01	2.509E+01
Xe-133m	3.645E+01	9.966E+01	1.361E+02
Xe-133	1.201E+03	3.385E+03	4.585E+03
Xe-135m	4.917E+01	9.850E+00	5.902E+01
Xe-135	3.604E+02	7.953E+02	1.156E+03
Xe-137	6.002E+01	1.694E-08	6.002E+01
Xe-138	1.927E+02	4.645E-01	1.931E+02
Br-83	3.612E+00	1.721E+00	5.333E+00
Br-84	5.315E+00	7.391E-02	5.389E+00
Br-85	1.964E+00	2.103E-14	1.964E+00
I-129	1.995E-06	3.356E-06	5.352E-06
I-130	2.843E+00	3.859E+00	6.702E+00
I-131	4.887E+01	8.686E+01	1.357E+02
I-132	3.739E+01	1.672E+01	5.410E+01
I-133	6.484E+01	9.667E+01	1.615E+02
I-134	5.113E+01	3.473E+00	5.460E+01
I-135	5.503E+01	6.044E+01	1.155E+02
Rb-86m	2.139E-03	2.855E-40	2.139E-03
Rb-86	2.655E-01	5.398E-01	8.053E-01
Rb-88	3.718E+02	5.449E+02	9.167E+02
Rb-89	7.557E+01	1.480E-01	7.572E+01
Cs-134	2.971E+01	6.089E+01	9.061E+01
Cs-136	7.377E+00	1.495E+01	2.232E+01
Cs-137	1.134E+01	2.325E+01	3.460E+01
Cs-138	2.418E+02	2.320E+01	2.650E+02
Sr-89	2.770E-02	1.157E-01	1.434E-01
Ba-137m	8.491E+00	2.200E+01	3.049E+01
Total	3.844E+03	6.216E+03	1.006E+04

Table 7.1-19: Radionuclide Releases to Atmosphere for Design-Basis Small Line Break [Rupture of 1/4" NSS Sampling Line Outside Primary Containment]

Nuclide	Total Release to Atmosphere (Ci) [0 - 2 hr]
Kr-83m	1.653E+00
Kr-85m	7.066E+00
Kr-85	6.827E+01
Kr-87	3.672E+00
Kr-88	1.247E+01
Kr-89	4.810E-02
Xe-131m	1.389E+01
Xe-133m	1.750E+01
Xe-133	1.219E+03
Xe-135m	1.652E+02
Xe-135	6.941E+01
Xe-137	1.093E-01
Xe-138	1.111E+00
Br-83	1.514E-01
Br-84	6.319E-02
Br-85	1.447E-03
I-129	2.360E-07
I-130	2.521E-01
I-131	9.400E+01
I-132	1.132E+02
I-133	1.828E+02
I-134	1.347E+02
I-135	1.502E+02
Rb-86	1.881E-02
Rb-88	5.174E+00
Rb-89	1.458E-01
Cs-134	2.150E+00
Cs-136	5.140E-01
Cs-137	8.228E-01
Cs-138	1.032E+00
Sr-89	2.485E-05
Ba-137m	7.775E-01
Total	2.265E+03

Table 7.1-20: Radionuclide Releases to Atmosphere for SGTR with Pre-Accident Iodine Spike

Nuclide	Releases to Atmosphere (Ci) During Specified Time Intervals (hrs)					
	0 to 2	2 to 8	8 to 24	24 to 96	96 to 720	Total
Kr-83m	5.579E+01	5.208E+01	1.113E+01	1.110E-01	1.024E-10	1.191E+02
Kr-85m	2.745E+01	9.737E-02	5.647E-02	5.168E-03	7.391E-08	2.761E+01
Kr-85	2.693E+02	1.875E+00	4.878E+00	2.172E+01	1.734E+02	4.711E+02
Kr-87	1.365E+01	1.170E-02	4.390E-04	7.132E-08	6.326E-25	1.366E+01
Kr-88	4.786E+01	1.186E-01	3.368E-02	6.881E-04	1.565E-11	4.801E+01
Kr-89	1.260E-01	4.744E-16	2.768E-50	0.000E+00	0.000E+00	1.260E-01
Xe-131m	5.483E+01	7.018E-01	1.810E+00	7.458E+00	3.116E+01	9.596E+01
Xe-133m	7.072E+01	7.102E+00	1.379E+01	2.108E+01	4.983E+00	1.177E+02
Xe-133	4.829E+03	1.262E+02	2.600E+02	5.499E+02	6.459E+02	6.411E+03
Xe-135m	1.530E+03	3.263E+03	3.062E+03	7.187E+02	4.064E-01	8.574E+03
Xe-135	4.299E+02	5.069E+02	4.845E+02	1.206E+02	1.232E-01	1.542E+03
Xe-137	2.887E-01	9.932E-14	4.492E-42	0.000E+00	0.000E+00	2.887E-01
Xe-138	3.434E+00	9.959E-06	2.041E-13	8.199E-34	0.000E+00	3.434E+00
Br-83	2.004E+00	2.840E-03	7.849E-04	1.620E-05	4.395E-14	2.008E+00
Br-84	5.904E-01	4.270E-05	1.939E-08	4.027E-17	1.788E-57	5.904E-01
Br-85	6.852E-04	1.190E-18	2.448E-56	0.000E+00	0.000E+00	6.852E-04
I-129	3.454E-06	1.964E-08	8.140E-08	1.077E-06	4.192E-05	4.655E-05
I-130	3.616E+00	1.503E-02	3.374E-02	5.191E-02	2.304E-03	3.719E+00
I-131	5.578E+01	3.103E-01	1.236E+00	1.376E+01	1.542E+02	2.253E+02
I-132	2.339E+01	3.417E-02	8.312E-03	1.407E-04	1.667E-13	2.343E+01
I-133	9.220E+01	4.337E-01	1.242E+00	3.997E+00	9.448E-01	9.882E+01
I-134	1.140E+01	3.079E-03	3.155E-05	2.442E-10	1.584E-34	1.140E+01
I-135	5.584E+01	1.805E-01	2.463E-01	1.167E-01	1.685E-04	5.639E+01
Rb-86	4.589E-03	2.766E-05	1.086E-04	1.305E-03	2.814E-02	3.417E-02
Rb-88	1.105E+00	1.286E-03	6.410E-04	2.976E-05	2.261E-12	1.107E+00
Rb-89	1.257E-02	4.677E-08	4.331E-15	1.140E-33	0.000E+00	1.257E-02
Cs-134	5.246E-01	3.196E-03	1.275E-02	1.648E-01	6.259E+00	6.964E+00
Cs-136	1.253E-01	7.520E-04	2.931E-03	3.415E-02	5.875E-01	7.507E-01
Cs-137	2.008E-01	1.224E-03	4.884E-03	6.322E-02	2.436E+00	2.706E+00
Cs-138	1.397E-01	9.813E-06	5.129E-09	1.405E-17	2.046E-57	1.397E-01
Ba-137m	1.883E-01	1.148E-03	4.579E-03	5.927E-02	2.284E+00	2.537E+00
Total	7.580E+03	3.959E+03	3.841E+03	1.458E+03	1.023E+03	1.786E+04

Table 7.1-21: Radionuclide Releases to Atmosphere for SGTR with Accident-Induced (Coincident) Iodine Spike

Nuclide	Releases to Atmosphere (Ci) During Specified Time Intervals (hrs)					
	0 to 2	2 to 8	8 to 24	24 to 96	96 to 720	Total
Kr-83m	5.286E+01	6.506E+01	2.614E+01	5.395E-01	1.229E-09	1.446E+02
Kr-85m	2.938E+01	2.475E-01	2.560E-01	2.342E-02	3.350E-07	2.990E+01
Kr-85	2.693E+02	1.875E+00	4.878E+00	2.172E+01	1.734E+02	4.711E+02
Kr-87	1.365E+01	1.170E-02	4.390E-04	7.132E-08	6.326E-25	1.366E+01
Kr-88	4.786E+01	1.186E-01	3.368E-02	6.881E-04	1.565E-11	4.801E+01
Kr-89	1.260E-01	4.744E-16	2.768E-50	0.000E+00	0.000E+00	1.260E-01
Xe-131m	5.476E+01	5.269E-01	1.550E+00	9.473E+00	8.667E+01	1.530E+02
Xe-133m	6.924E+01	4.025E+00	1.188E+01	4.107E+01	2.417E+01	1.504E+02
Xe-133	4.808E+03	8.294E+01	2.349E+02	9.134E+02	1.558E+03	7.597E+03
Xe-135m	9.009E+02	2.273E+03	2.859E+03	1.054E+03	1.262E+00	7.088E+03
Xe-135	3.154E+02	3.712E+02	6.204E+02	3.471E+02	1.427E+00	1.655E+03
Xe-137	2.887E-01	9.932E-14	4.492E-42	0.000E+00	0.000E+00	2.887E-01
Xe-138	3.434E+00	9.959E-06	2.041E-13	8.199E-34	0.000E+00	3.434E+00
Br-83	3.105E+00	2.064E-02	3.304E-02	1.187E-03	4.062E-12	3.159E+00
Br-84	3.844E+00	4.306E-03	7.921E-04	7.298E-12	4.404E-52	3.849E+00
Br-85	7.119E-01	4.381E-05	6.904E-07	0.000E+00	0.000E+00	7.120E-01
I-129	1.942E-06	3.838E-08	4.662E-07	9.049E-06	3.973E-04	4.088E-04
I-130	2.679E+00	3.998E-02	3.041E-01	6.765E-01	3.436E-02	3.734E+00
I-131	3.199E+01	6.194E-01	7.305E+00	1.192E+02	1.500E+03	1.659E+03
I-132	3.721E+01	2.421E-01	3.626E-01	1.103E-02	1.671E-11	3.782E+01
I-133	6.155E+01	1.022E+00	9.383E+00	4.389E+01	1.163E+01	1.275E+02
I-134	4.170E+01	9.438E-02	3.336E-02	7.756E-07	6.711E-31	4.183E+01
I-135	5.032E+01	6.126E-01	3.161E+00	2.185E+00	3.747E-03	5.629E+01
Rb-86	4.589E-03	2.766E-05	1.086E-04	1.305E-03	2.814E-02	3.417E-02
Rb-88	1.105E+00	1.286E-03	6.410E-04	2.976E-05	2.261E-12	1.107E+00
Rb-89	1.257E-02	4.677E-08	4.331E-15	1.140E-33	0.000E+00	1.257E-02
Cs-134	5.246E-01	3.196E-03	1.275E-02	1.648E-01	6.259E+00	6.964E+00
Cs-136	1.253E-01	7.520E-04	2.931E-03	3.415E-02	5.875E-01	7.507E-01
Cs-137	2.008E-01	1.224E-03	4.884E-03	6.322E-02	2.436E+00	2.706E+00
Cs-138	1.397E-01	9.813E-06	5.129E-09	1.405E-17	2.046E-57	1.397E-01
Ba-137m	1.883E-01	1.148E-03	4.579E-03	5.927E-02	2.284E+00	2.537E+00
Total	6.801E+03	2.802E+03	3.780E+03	2.554E+03	3.368E+03	1.930E+04

Table 7.1-22: Radionuclide Releases to Atmosphere for Design Basis LOCA

Nuclide	Releases to Atmosphere (Ci) During Specified Time Intervals (hrs)						
	0 to 1.5	1.5 to 3.5	3.5 to 8	8 to 24	24 to 96	96 to 720	Total
Kr-83m	7.297E+02	2.751E+03	4.641E+03	4.187E+03	1.072E+02	3.150E-07	1.242E+04
Kr-85m	1.709E+03	6.303E+03	8.876E+03	8.074E+03	3.703E+02	5.366E-03	2.533E+04
Kr-85	1.126E+02	4.307E+02	9.847E+02	3.497E+03	7.845E+03	6.661E+04	7.948E+04
Kr-87	2.224E+03	4.925E+03	2.337E+03	2.199E+02	1.791E-02	1.613E-19	9.706E+03
Kr-88	4.382E+03	1.434E+04	1.548E+04	7.580E+03	7.766E+01	1.794E-06	4.186E+04
Kr-89	9.523E+00	3.044E-06	1.461E-17	3.346E-43	0.000E+00	0.000E+00	9.523E+00
Xe-131m	7.277E+01	3.151E+02	7.225E+02	2.650E+03	8.448E+03	8.304E+04	9.525E+04
Xe-133m	4.023E+02	1.806E+03	4.148E+03	1.551E+04	3.840E+04	2.689E+04	8.716E+04
Xe-133	1.326E+04	5.898E+04	1.353E+05	4.923E+05	1.172E+06	2.331E+06	4.202E+06
Xe-135m	1.676E+03	1.283E+04	5.187E+04	1.495E+05	6.371E+04	8.257E+01	2.797E+05
Xe-135	4.390E+03	2.130E+04	5.958E+04	2.402E+05	1.708E+05	9.095E+02	4.971E+05
Xe-137	2.238E+01	1.730E-04	7.545E-14	4.529E-35	0.000E+00	0.000E+00	2.238E+01
Xe-138	6.229E+02	9.854E+01	3.005E-01	5.518E-07	1.111E-27	0.000E+00	7.217E+02
Br-83	3.714E+00	7.476E+00	5.922E+00	1.578E+00	9.943E-03	7.939E-12	1.870E+01
Br-84	3.206E+00	1.399E+00	1.010E-01	2.106E-04	1.010E-13	1.200E-54	4.706E+00
Br-85	7.005E-01	3.783E-10	1.011E-22	3.330E-51	0.000E+00	0.000E+00	7.005E-01
I-129	2.143E-06	6.460E-06	1.204E-05	2.778E-05	8.971E-05	6.739E-04	8.120E-04
I-130	3.160E+00	8.910E+00	1.395E+01	1.919E+01	9.181E+00	1.557E-01	5.455E+01
I-131	3.558E+01	1.070E+02	1.971E+02	4.395E+02	1.216E+03	3.310E+03	5.305E+03
I-132	3.928E+01	8.453E+01	8.515E+01	8.672E+01	1.646E+02	1.700E+02	6.303E+02
I-133	7.134E+01	2.071E+02	3.479E+02	5.859E+02	5.389E+02	5.089E+01	1.802E+03
I-134	4.192E+01	4.308E+01	1.043E+01	2.466E-01	4.949E-07	8.736E-32	9.568E+01
I-135	6.120E+01	1.615E+02	2.183E+02	2.005E+02	3.195E+01	1.584E-02	6.735E+02
Rb-86m	2.457E-04	8.331E-31	2.805E-66	0.000E+00	0.000E+00	0.000E+00	2.457E-04
Rb-86	1.268E-01	3.249E-01	5.175E-01	6.158E-01	1.784E-01	3.473E-02	1.798E+00
Rb-88	6.288E+01	1.545E+02	1.636E+02	8.009E+01	8.460E-01	1.980E-08	4.619E+02
Rb-89	1.126E+01	5.235E-01	1.960E-03	4.966E-09	5.198E-29	0.000E+00	1.178E+01
Cs-134	1.418E+01	3.636E+01	5.818E+01	7.012E+01	2.128E+01	5.202E+00	2.053E+02
Cs-136	3.511E+00	9.004E+00	1.431E+01	1.694E+01	4.810E+00	8.548E-01	4.943E+01
Cs-137	5.419E+00	1.389E+01	2.223E+01	2.679E+01	8.142E+00	2.002E+00	7.848E+01
Cs-138	4.511E+01	2.603E+01	1.839E+00	3.106E-03	3.645E-13	3.186E-55	7.298E+01
Sb-125	7.674E-02	3.605E-01	5.787E-01	6.973E-01	2.117E-01	5.185E-02	1.977E+00
Sb-127	3.566E-01	1.658E+00	2.602E+00	2.947E+00	7.152E-01	6.814E-02	8.347E+00
Sb-129	8.062E-01	3.074E+00	3.076E+00	1.172E+00	1.262E-02	9.903E-09	8.142E+00
Te-127m	5.087E-02	2.290E-01	3.677E-01	4.432E-01	1.345E-01	3.221E-02	1.257E+00
Te-127	3.679E-01	1.678E+00	2.678E+00	3.139E+00	8.103E-01	9.679E-02	8.769E+00
Te-129m	1.475E-01	6.643E-01	1.065E+00	1.276E+00	3.779E-01	8.132E-02	3.612E+00
Te-129	9.137E-01	3.758E+00	4.244E+00	2.219E+00	2.610E-01	5.294E-02	1.145E+01
Te-131m	4.117E-01	1.808E+00	2.706E+00	2.700E+00	4.296E-01	9.844E-03	8.066E+00
Te-131	4.731E-01	6.764E-01	6.180E-01	6.079E-01	9.670E-02	2.216E-03	2.474E+00
Te-132	4.076E+00	1.819E+01	2.841E+01	3.181E+01	7.423E+00	6.147E-01	9.053E+01
Te-134	1.637E+00	2.306E+00	2.992E-01	1.926E-03	2.642E-11	1.491E-43	4.244E+00

Table 7.1-22 (Cont.): Radionuclide Releases to Atmosphere for Design Basis LOCA

Nuclide	Releases to Atmosphere (Ci) During Specified Time Intervals (hrs)						
	0 to 1.5	1.5 to 3.5	3.5 to 8	8 to 24	24 to 96	96 to 720	Total
Sr-89	1.295E+00	6.070E+00	9.727E+00	1.167E+01	3.484E+00	7.831E-01	3.303E+01
Sr-90	1.352E-01	6.346E-01	1.019E+00	1.228E+00	3.731E-01	9.176E-02	3.481E+00
Sr-91	1.523E+00	6.489E+00	8.369E+00	5.720E+00	3.029E-01	1.462E-04	2.240E+01
Sr-92	1.273E+00	4.299E+00	3.300E+00	7.207E-01	1.556E-03	1.220E-12	9.594E+00
Ba-137m	4.246E+00	1.310E+01	2.103E+01	2.535E+01	7.702E+00	1.894E+00	7.332E+01
Ba-139	1.252E+00	2.933E+00	1.185E+00	7.377E-02	2.809E-06	3.953E-23	5.444E+00
Ba-140	2.011E+00	9.409E+00	1.500E+01	1.775E+01	5.031E+00	8.876E-01	5.008E+01
Mo-99	6.680E-01	1.185E+00	1.843E+00	2.036E+00	4.535E-01	3.193E-02	6.218E+00
Tc-99m	4.054E-01	1.062E+00	1.685E+00	1.916E+00	4.358E-01	3.075E-02	5.535E+00
Ru-103	2.419E-01	1.134E+00	1.816E+00	2.175E+00	6.463E-01	1.417E-01	6.155E+00
Ru-105	1.639E-01	6.263E-01	6.347E-01	2.485E-01	2.881E-03	3.096E-09	1.676E+00
Ru-106	1.433E-01	6.720E-01	1.079E+00	1.299E+00	3.939E-01	9.568E-02	3.683E+00
Rh-103m	2.180E-01	1.022E+00	1.637E+00	1.961E+00	5.827E-01	1.277E-01	5.549E+00
Rh-105	1.753E-01	8.191E-01	1.284E+00	1.375E+00	2.453E-01	7.574E-03	3.907E+00
Rh-106	1.433E-01	6.720E-01	1.079E+00	1.299E+00	3.939E-01	9.568E-02	3.683E+00
Ce-141	4.504E-02	2.100E-01	3.363E-01	4.027E-01	1.191E-01	2.551E-02	1.139E+00
Ce-143	4.473E-02	2.032E-01	3.060E-01	3.105E-01	5.212E-02	1.426E-03	9.179E-01
Ce-144	3.421E-02	1.595E-01	2.560E-01	3.085E-01	9.342E-02	2.261E-02	8.743E-01
Np-239	7.573E-01	3.479E+00	5.379E+00	5.860E+00	1.242E+00	7.389E-02	1.679E+01
Pu-238	2.937E-04	1.371E-03	2.200E-03	2.652E-03	8.060E-04	1.984E-04	7.522E-03
Pu-239	1.236E-05	5.767E-05	9.263E-05	1.118E-04	3.413E-05	8.458E-06	3.171E-04
Pu-240	2.817E-05	1.315E-04	2.110E-04	2.543E-04	7.729E-05	1.901E-05	7.212E-04
Pu-241	5.110E-03	2.385E-02	3.828E-02	4.613E-02	1.402E-02	3.446E-03	1.308E-01
Y-90	3.140E-03	2.339E-02	6.936E-02	1.818E-01	1.423E-01	7.603E-02	4.961E-01
Y-91m	5.663E-01	3.441E+00	5.191E+00	3.634E+00	1.924E-01	9.288E-05	1.302E+01
Y-91	1.652E-02	8.019E-02	1.426E-01	2.021E-01	7.064E-02	1.656E-02	5.286E-01
Y-92	3.112E-01	2.236E+00	3.968E+00	2.181E+00	2.160E-02	1.599E-09	8.719E+00
Y-93	1.749E-02	7.414E-02	9.685E-02	6.832E-02	3.943E-03	2.631E-06	2.607E-01
Zr-95	1.861E-02	8.589E-02	1.377E-01	1.654E-01	4.955E-02	1.135E-02	4.685E-01
Zr-97	1.877E-02	8.243E-02	1.169E-01	1.014E-01	1.051E-02	5.726E-05	3.300E-01
Nb-95	1.862E-02	8.599E-02	1.380E-01	1.664E-01	5.053E-02	1.232E-02	4.719E-01
La-140	6.044E-02	4.868E-01	1.509E+00	3.941E+00	2.736E+00	9.057E-01	9.639E+00
La-141	1.590E-02	5.866E-02	5.613E-02	1.940E-02	1.590E-04	3.935E-11	1.502E-01
La-142	1.132E-02	2.986E-02	1.382E-02	1.118E-03	1.026E-07	7.220E-23	5.612E-02
Pr-143	1.844E-02	8.551E-02	1.384E-01	1.698E-01	5.241E-02	1.030E-02	4.748E-01
Pr-144	3.272E-02	1.590E-01	2.560E-01	3.085E-01	9.343E-02	2.261E-02	8.722E-01
Nd-147	7.658E-03	3.525E-02	5.615E-02	6.621E-02	1.857E-02	3.127E-03	1.870E-01
Am-241	2.343E-06	1.083E-05	1.740E-05	2.105E-05	6.475E-06	1.695E-06	5.978E-05
Cm-242	1.065E-03	4.917E-03	7.889E-03	9.495E-03	2.870E-03	6.862E-04	2.692E-02
Cm-244	5.651E-04	2.610E-03	4.190E-03	5.049E-03	1.534E-03	3.772E-04	1.432E-02
Total	3.005E+04	1.250E+05	2.852E+05	9.254E+05	1.463E+06	2.512E+06	5.341E+06

Table 7.1-23: Radionuclide Releases to Atmosphere for Fuel Handling Accident

Nuclide	Releases to Atmosphere (Ci) During Specified Time Intervals (hrs)					
	0 to 2	2 to 8	8 to 24	24 to 96	96 to 720	Total
Kr-83m	1.437E+00	2.129E-01	4.404E-02	4.294E-04	3.665E-13	1.694E+00
Kr-85m	7.810E+01	3.881E-01	4.693E-08	1.678E-26	0.000E+00	7.849E+01
Kr-85	1.471E+03	9.977E+00	3.052E-06	1.296E-23	0.000E+00	1.481E+03
Kr-87	2.330E-04	5.290E-07	6.148E-15	4.260E-36	0.000E+00	2.335E-04
Kr-88	1.016E+01	4.220E-02	2.983E-09	2.549E-28	0.000E+00	1.020E+01
Xe-131m	5.637E+02	1.475E+01	2.813E+01	1.084E+02	3.282E+02	1.043E+03
Xe-133m	2.609E+03	8.098E+01	1.193E+02	1.540E+02	1.538E+01	2.979E+03
Xe-133	9.442E+04	1.533E+03	1.684E+03	2.174E+03	2.171E+02	1.000E+05
Xe-135m	1.089E+03	1.975E+03	1.834E+03	4.211E+02	2.219E-01	5.319E+03
Xe-135	1.407E+04	7.705E+02	6.412E+02	1.472E+02	7.759E-02	1.563E+04
Xe-138	1.825E-39	3.471E-44	2.388E-58	4.092E-96	0.000E+00	1.825E-39
Br-83	1.610E-03	6.097E-06	3.273E-13	1.343E-32	0.000E+00	1.616E-03
Br-84	2.046E-18	1.009E-21	1.206E-31	4.188E-58	0.000E+00	2.047E-18
I-129	1.459E-05	9.898E-08	3.028E-14	1.286E-31	0.000E+00	1.469E-05
I-130	3.363E+00	2.038E-02	4.453E-09	7.713E-27	0.000E+00	3.383E+00
I-131	3.443E+02	2.319E+00	6.942E-07	2.784E-24	0.000E+00	3.466E+02
I-132	1.118E-02	4.139E-05	2.076E-12	7.100E-32	0.000E+00	1.122E-02
I-133	1.615E+02	1.025E+00	2.567E-07	6.398E-25	0.000E+00	1.625E+02
I-134	8.997E-10	1.249E-12	3.325E-21	4.528E-44	0.000E+00	9.009E-10
I-135	1.282E+01	7.041E-02	1.148E-08	9.113E-27	0.000E+00	1.289E+01
Rb-88	4.884E+00	4.672E-02	3.332E-09	2.846E-28	0.000E+00	4.931E+00
Cs-138	6.206E-40	1.019E-42	1.379E-52	6.210E-79	0.000E+00	6.216E-40
Total	1.148E+05	4.388E+03	4.307E+03	3.005E+03	5.610E+02	1.271E+05

Table 7.1-24: Radionuclide Releases to Atmosphere for Rod Ejection Accident (REA) with Accident-Induced 26% Clad Failure [Secondary-side releases without SG tube uncovery]

Nuclide	Releases to Atmosphere (Ci) During Specified Time Intervals (hrs)		
	0 to 2	2 to 8	Total
Kr-83m	4.713E+02	3.879E+02	8.592E+02
Kr-85m	1.326E+03	2.209E+03	3.535E+03
Kr-85	7.302E+01	2.188E+02	2.918E+02
Kr-87	1.878E+03	9.137E+02	2.791E+03
Kr-88	3.466E+03	4.228E+03	7.695E+03
Kr-89	2.102E+02	8.446E-10	2.102E+02
Xe-131m	5.278E+01	1.566E+02	2.094E+02
Xe-133m	3.008E+02	8.563E+02	1.157E+03
Xe-133	9.847E+03	2.890E+04	3.875E+04
Xe-135m	3.493E+02	6.359E+01	4.129E+02
Xe-135	2.976E+03	6.805E+03	9.781E+03
Xe-137	3.971E+02	1.468E-07	3.971E+02
Xe-138	1.423E+03	4.026E+00	1.427E+03
Br-83	2.318E+00	1.109E+01	1.341E+01
Br-84	1.340E+00	4.784E-01	1.818E+00
Br-85	1.816E-02	1.358E-13	1.816E-02
I-129	1.451E-06	2.134E-05	2.279E-05
I-130	2.119E+00	2.472E+01	2.684E+01
I-131	2.406E+01	3.485E+02	3.726E+02
I-132	2.343E+01	1.077E+02	1.311E+02
I-133	4.811E+01	6.162E+02	6.643E+02
I-134	2.052E+01	2.249E+01	4.300E+01
I-135	4.045E+01	3.877E+02	4.282E+02
Rb-86m	3.435E-06	9.253E-40	3.435E-06
Rb-86	1.192E-01	1.756E+00	1.876E+00
Rb-88	2.836E+03	4.711E+03	7.548E+03
Rb-89	2.112E+02	1.177E+00	2.124E+02
Cs-134	1.337E+01	1.981E+02	2.114E+02
Cs-136	3.309E+00	4.861E+01	5.192E+01
Cs-137	5.096E+00	7.554E+01	8.064E+01
Cs-138	1.250E+03	1.935E+02	1.443E+03
Sr-89	1.940E-01	8.238E-01	1.018E+00
Ba-137m	4.812E+00	7.146E+01	7.627E+01
Total	2.726E+04	5.156E+04	7.882E+04

Item Number 148 **ER Section 7.1**

Request:

Footnote c of Table 7.1-5 states that the 96 to 720 hr X/Q ratio was used to calculate the dose contribution in each of the 4 periods. Justify the use of this single ratio rather than the appropriate ratio for each time period.

Response:

The ER analyses have been updated to apply the Regulatory Guide 1.183 methodology using the 50^{th} percentile X/Q values In Table 7.1-5. The DBA doses reported in the ER will be updated. Please see responses to RAI Item Numbers 149 through 154.

ER Impact:

ER Table 7.1-5 will be revised to reflect the updated DBA doses in a future revision of the ER.

Item Number 149 **ER Section 7.1**
Request:

Table 7.1-6, Steam System Piping Failure. Justify using the 0 to 9 hr time period for the LPZ dose calculation. What is the justification for using the 8 to 24 hr X/Q ratio for the 0 to 9 hr period? Provide LPZ dose increments for the 0 to 8 and 8 to 24 hr time periods. Provide isotopic source terms for each period. Discuss the relevance of the last 2 sections of this table to the ER. Are they DBAs or severe accidents?

Response:

The ER analyses have been updated to apply the Regulatory Guide 1.183 methodology using the 50^{th} percentile X/Q values in Table 7.1-5. Table 7.1-6 has been updated to present tabulated radionuclide releases as a function of time and dose increments following the X/Q time structure.

The analysis was performed following the regulatory guidance in Regulatory Guide 1.183. The classical cases involving a pre-existing and coincident iodine spike are supplemented by the last section of the updated Table 7.1-6. The last section of Table 7.1-6 provides the dose consequences from the predicted clad failures. Consistent with the regulatory guidance, the clad failure case does not have to include the iodine spiking since the clad failures occur at the start of the accident.

ER Impact:

An update to ER Table 7.1-6 will be provided in a future revision to the ER.

Table 7.1-6: Steam System Piping Failure

Time	Site TEDE Dose (rem)	
	EAB	**LPZ**
Pre-Existing Iodine Spike		
0-2 hr	1.96E-02	3.71E-03
2-8 hr		1.58E-03
8-24 hr		9.10E-05
24-96 hr		0.00E+00
96-720 hr		0.00E+00
Total	1.96E-02	5.38E-03
Limit	25	25
Accident-Initiated Iodine Spike		
0-2 hr	2.17E-02	4.11E-03
2-8 hr		1.25E-02
8-24 hr		1.30E-03
24-96 hr		0.00E+00
96-720 hr		0.00E+00
Total	2.17E-02	1.80E-02
Limit	2.5	2.5
Accident-Induced 1.24% Fuel Rod Clad Failure		
0-2 hr	1.70E-01	3.21E-02
2-8 hr		5.30E-02
8-24 hr		3.24E-03
24-96 hr		0.00E+00
96-720 hr		0.00E+00
Total	1.70E-01	8.83E-02
Limit	25	25

Item Number 150 **ER Section 7.1**

Request:

Table 7.1-7. Feedwater System Line Break. Discuss the relevance of the 1st, 4th, and 5th sections of the table. Justify using the 0 to 2 hr X/Q ratio for the LPZ for the 0 to 8 hr period.

Response:

ER Table 7.1-7, Feedwater System Line Break, will be removed from the ER in a future revision to the ER since the MSLB bounds the FWLB. In addition, the ER analyses have been updated to apply the Regulatory Guide 1.183 methodology using the 50th percentile X/Q values in Table 7.1-5.

ER Impact:

ER Table .7.1-7 will be removed in a future ER revision.

Item Number 151 **ER Section 7.1**

Request:

Tables 7.1-8, 7.1-10, and 7.1-13. Justify using the 0 to 2 hr X/Q ratio for the LPZ for the 0 to 8 hr period.

Response:

The ER analyses have been updated to apply the RG 1.183 methodology using the 50^{th} percentile X/Q values in Table 7.1-5.

ER Impact:

ER Tables 7.1-8, 7.1-10, and 7.1-13 will be updated to include the results from analyses performed using the 50^{th} percentile X/Q values from ER Table 7.1-5 in a future revision to the ER.

Table 7.1-8: Reactor Coolant Pump Locked Rotor Accident / Broken Shaft

Time	Site TEDE Dose (rem)	
	EAB	LPZ
0-2 hr	1.57E-01	2.92E-02
2-8 hr		3.48E-02
8-24 hr		0.00E+00
24-96 hr		0.00E+00
96-720 hr		0.00E+00
Total	1.57E-01	6.39E-02
Limit	2.5	2.5

Table 7.1-10: Steam Generator Tube Rupture

Time	Site TEDE Dose (rem)	
	EAB	LPZ
Pre-Existing Iodine Spike		
0-2 hr	8.93E-02	1.69E-02
2-8 hr		3.24E-03
8-24 hr		2.48E-03
24-96 hr		1.16E-03
96-720 hr		5.07E-03
Total	8.93E-02	2.88E-02
Limit	25	25
Accident-Initiated Iodine Spike		
0-2 hr	5.90E-02	1.11E-02
2-8 hr		2.35E-03
8-24 hr		2.83E-03
24-96 hr		7.13E-03
96-720 hr		4.61E-02
Total	5.90E-02	6.96E-02
Limit	2.5	2.5

Table 7.1-13: Rod Ejection Accident

Time	Site TEDE Dose (rem)	
	EAB	LPZ
0-2 hr	3.24E-01	6.12E-02
2-8 hr		1.55E-01
8-24 hr		0.00E+00
24-96 hr		0.00E+00
96-720 hr		0.00E+00
Total	3.24E-01	2.16E-01
Limit	6.3	6.3

Item Number 152 **ER Section 7.1**

Request:

Table 7.1-9. Failure of Small Lines Carrying Primary Coolant Outside Containment. The doses are for a 2-hr time period because the X/Qs used to calculate the X/Q ratios are for a 2-hr time period. Why wasn't the 0 to 8h period used for the LPZ dose calculation?

Response:

The dose assessment is for the duration of the release. The release duration for the Small Lines Carrying Primary Coolant Outside the Containment analysis is 30 minutes.

ER Impact:

ER Table 7.1-9 will be updated to include the results from analyses performed using the 50th percentile X/Q values from ER Table 7.1-5 in a future revision to the ER.

Table 7.1-9: Failure of Small Lines Carrying Primary Coolant Outside Containment[1]

Time	Site TEDE Dose (rem)	
	EAB	**LPZ**
0-2 hr	1.45E-01	2.75E-02
2-8 hr		0.00E+00
8-24 hr		0.00E+00
24-96 hr		0.00E+00
96-720 hr		0.00E+00
Total	1.45E-01	2.75E-02
Limit	2.5	2.5

1 The Nuclear Sampling System Line Break (1/4" line) bounds the Chemical and Volume Control System Line Break (6" line) for the EAB and LPZ.

Item Number 153 **ER Section 7.1**

Request:

Table 7.1-11. Provide dose increments for each of the 4 standard time periods for LPZ dose calculations. Justify using the 96 to 720 hr X/Q ratio for the LPZ for all time periods.

Response:

The ER analyses have been updated to apply the Regulatory Guide 1.183 methodology using the 50^{th} percentile X/Q values in Table 7.1-5. The doses are reported following the X/Q time periods.

ER Impact:

ER Table 7.1-11 will be updated to include the results from analyses performed using the 50^{th} percentile X/Q values from Table 7.1-5 in a future revision to the ER.

Table 7.1-11: Loss of Coolant Accident

Time	Site TEDE Dose (rem)	
	EAB	LPZ
0-1.5 hr		4.52E-02
1.5-3.5	1.01E+00	1.91E-01
3.5-8 hr		2.39E-01
8-24 hr		3.13E-01
24-96 hr		2.00E-01
96-720 hr		1.57E-01
Total	1.01E+00	1.14E+00
Limit	25	25

Item Number 154 **ER Section 7.1**

Request:

Table 7.1-12. LPZ dose should be calculated for the 0 to 8 hr time period.

Response:

ER analyses have been updated to apply the Regulatory Guide 1.183 methodology using the 50^{th} percentile X/Q values in Table 7.1-5.

ER Impact:

ER Table 7.1-12 will be updated to include the results from analyses performed using the 50^{th} percentile X/Q values from Table 7.1-5 in a future revision to the ER.

Table 7.1-12: Fuel Handling Accident

Time	Site TEDE Dose (rem)	
	EAB	**LPZ**
0-2 hr	4.54E-01	8.58E-02
2-8 hr		2.62E-03
8-24 hr		1.66E-03
24-96 hr		3.42E-04
96-720 hr		7.27E-06
Total	4.54E-01	9.04E-02
Limit	6.3	6.3

Item Number 155 **ER Section 7.1**

Request:

General. Provide isotopic source terms by release period for each accident.

Response:

As provided in the response to RAI Item Number 47, new ER Tables 7.1-15 through 7.1-24 will be included in a future revision to the ER. These tables tabulate the released radionuclldes as a function of time following the X/Q time structure in Table7.1-5.

ER Impact:

ER Tables 7.1-15 through 7.1-24 will be included in a future revision of the ER.

Item Number 156 **ER Section 7.1**

Request:

General. The X/Q ratios used to calculate doses should be based on the site-specific X/Q for the appropriate period (0 to 2 hr for the EAB, and 0 to 8, 8 to 24, 24 to 96, and 96 to 720 hr for the LPZ) and the X/Q used in the DCD dose calculation regardless of period. This may mean the time periods for site-specific X/Q and for DCD X/Q are not the same. The objective is to remove the DCD X/Q, whether correct or not, and replace it with the appropriate site-specific X/Q.

Response:

The ER analyses have been updated to apply the Regulatory Guide 1.183 methodology using the 50th percentile X/Q values in Table 7.1.5. The doses are reported following the X/Q time periods.

ER Impact:

Updated analyses performed using the Regulatory Guide 1.183 methodology and the 50th percentile X/Q values in Table 7.1.5 will be provided in a future revision of the ER.

Item Number 157 **ER Section 7.1**

Request:

General. Please indicate the 2-hr period of maximum release rate for all releases extending beyond 2 hrs

Response:

Table 7.1-5 shows the time period corresponding to 1.5 to 3.5 hours leads to the most adverse release for the LOCA. For all other DBAs, the worst 2-hr release interval for the limiting scenario is from 0 to 2 hrs, as shown in the tabulated doses.

ER Impact:

Updated analyses performed using the Regulatory Guide 1.183 methodology and the 50^{th} percentile X/Q values in Table 7.1.5 will be provided in a future revision of the ER.

Item Number 158 **ER Section 7.2**

Request:

Section 7.2, third paragraph. Provide a reference to the US EPR PRA and indicate where it can be reviewed.

Response:

The US EPR PRA is available as Chapter 19.1 of the U.S. EPR FSAR, available in ADAMS (ML073531789).

ER Impact:

No changes to ER Section 7.2 are required.

Item Number 159 **ER Section 7.2**

Request:

How do the release categories relate to source terms? Are the source terms for release categories within each end state the same, or at least consistent?

Response:

Each release category is associated with a representative MAAP run. This representative MAAP run provides the source term for the release category. Therefore each release category is associated its own source term. The source term for each release category can be found in the U.S. EPR FSAR Chapter 19, Table 19.1-20.

ER Impact:

No changes to the ER are required.

Item Number 160 **ER Section 7.2**

Request:

Provide information on how the site-specific input files to MACCS were created and the sources of information used to create, update, or modify all files used. Provide electronic copies of all input and output files for the MACCS2 runs.

Response:

Inputs for MACCS2 come from a variety of sources, including Level 1 PRA results (e.g., core damage end states and associated CDF), Level 2 PRA results

(e.g., release categories), core inventory, output from the Modular Accident Analysis Program (MAAP) code (used to support the Level 2 PRA) and site specific information (e.g., population data, meteorological data, etc.).

MACCS2 input and output files are being provided in a separate attachment to this submittal. The input and output file information is considered AREVA proprietary material and an affidavit has been prepared and executed to withhold these files from disclosure. Since all of the files are considered proprietary, a redacted data file is not available or provided.

ER Impact:

No changes to the ER are required.

Item Number 161 **ER Section - None**

Request:

No question provided for this Item Number.

Response:

N/A

ER Impact:

No changes to the ER are required.

Item Number 162 **ER Section 7.2**

Request:

Are the meteorological data used in the MACCS2 analysis consistent with the meteorological data used to calculate X/Q values for routine releases and releases for DBAs? If not, why not? Justify using different meteorological data sets for different purposes.

Response:

MACCS2 requires one year of consecutive meteorological data as input. Since multiple years of data were available, the data set with the least number of unusable data points was chosen. For the CCNPP Level 3 PRA, the 2001 meteorological data were used. There are different input requirements for meteorological data to calculate X/Q, particularly the need for five years of meteorological data as input. Since the input needs are different for the two different analyses and since MACCS2 can use any year's meteorological data as representative of the meteorological data for the site, it is justified to use different meteorological data for these different applications.

ER Impact:

The ER will be modified in a future revision to incorporate the following text to Section 7.2.1.1.

> For the Level 3 PRA, meteorological data for the CCNPP site for the years 2000 through 2004 were reviewed to determine the year with the least unusable data points. The year 2001 satisfied this criterion and was used for the base case.

Item Number 163 ER Section 7.2

Request:

Page 7.2-2. Are the population distributions used in the MACCS2 analysis consistent with those used in the socioeconomic sections? If not, why not? Justify using different population distributions for different purposes. Justify using a larger growth rate than one based on observed data. Justify using a larger population growth rate than observed in a severe accident analysis that is to be used in an environmental review under NEPA (realistic, not conservative).

Response:

The population distributions in the MACCS2 analysis (Level 3 PRA) are not consistent with those in the socioeconomic sections. The socioeconomic sections use 2000 census data, and state-specific projections (i.e., Delaware, Maryland, Virginia) to estimate population growth. The Level 3 PRA looked at multiple sources of population data from different points in time and matched them together in various combinations to get different growth rates, each of them realistic. Sensitivity cases were run considering the Level 3 PRA consequences for different growth rates and the Level 3 PRA consequences were found to be sensitive to the population. Therefore, the largest growth rate was used.

Also, the requirements for the organization of population data are different between the needs of the socioeconomic analysis and the input requirements for MACCS2. MACCS2 requires population to be input in sections (bins) that are the intersection of the 16 radial sectors (representing 16 directions) and ten concentric rings defined with the plant at the center. The socioeconomic analysis uses population on a regional basis (state and/or counties). These different forms of data are difficult to reconcile.

If there is reason to believe that one of the smaller growth rates was more realistic than what was used, the Level 3 PRA consequences would be reduced proportionally with the reduction in the growth rate. One of the purposes of estimating the Level 3 PRA consequences in the ER was to determine the maximum benefit for the SAMDA analysis. With the Level 3 PRA consequences provided (with higher growth rate), no SAMDAs were considered cost-beneficial. Therefore, reduced Level 3 PRA consequences would have no impact on these results.

ER Impact:

No changes to the ER are required.

Item Number 164 **ER Section 7.2**

Request:

Page 7.2-3. 1st sentence, 1st paragraph. What release heights were used for the various event sequences? Were these heights included in the MACCS2 analyses? Are the prerequisites for an elevated release met for each event sequence?

Response:

For each release category, the associated release height is obtained from its representative MAAP run. A list of the release heights used for each release category can be found in the table below. No prerequisites for an elevated release were considered - releases are modeled to occur at the break location. No intentional releases were modeled.

Release Category	Release height (meters)
RC101	60.51
RC201	0.839
RC202	0/839
RC203	0.839
RC204	0.839
RC205	0.839
RC206	0.827
RC301	0.839
RC302	0.839
RC303	0.839
RC304	0.839
RC401	35.7
RC402	35.7
RC403	35.7
RC404	35.7
RC501	35.7
RC502	35.7
RC503	35.7
RC504	35.7
RC602	35.7
RC701	24.75
RC702	24.75
RC802	6.525

ER Impact:

No changes to the ER are required.

Item Number 165 **ER Section 7.2**

Request:

Page 7.2-3, 2nd paragraph. Indicate the contributions to CDF from internal and external initiating events in addition to providing the total CDF. How were the CDFs from external initiating events evaluated? What is the likelihood that all significant external initiating events have been identified and evaluated without an examination of the plant as built? For each RC, indicate internal, external event contributors to CDFs vs. total (similar in detail to ESP EISs).

Response:

Page 7.2-3, 2nd paragraph states that the external events reported include only internal fires and internal floods. Total at power CDF from the U. S. EPR FSAR Chapter 19 is 5.3E-07/yr, with the following distribution.

- Internal Initiating Events 55%
- Internal Fire 33%
- Internal Flood 12%

The relative contributions of Internal Initiating Events, Internal Fires, and Internal Floods to each Release Category can be found in the Table 1.

The CDFs from internal fire and flood were evaluated using conservative quantitative analysis, as described in Sections 19.1.5.2 and 19.1.5.3 of the U.S. EPR FSAR.

External events other than internal fires and floods were also analyzed as part of the CCNPP Unit 3 COL application production. This analysis can be found in the CCNPP Unit 3 FSAR Section 19.1.5. All external events from Appendix A of the ANSI/ANS-58.21 External Event PRA standard Appendix A, "List of External Events Requiring Consideration" were evaluated against the U.S. EPR FSR design. A seismic margin assessment was performed, as well as a screening analysis of other external events following NUREG 0800 guidance.

The CCNPP Unit 3 PRA was performed using assumptions of the as-built plant. These assumptions will be verified, in accordance with the CCNPP Unit 3 FSAR COL Item 19.19, with a review of the as-designed and as-built information and by conducting walk-downs.

ER Impact:

No changes to the ER are required.

Table 1 – Internal Initiating Events, Internal Fires, and Internal Floods to Each Release Category

Release Category	Total Frequency [1/yr]	Internal Events		Internal Fires		Internal Floods	
		Frequency [1/yr]	Contribution	Frequency [1/yr]	Contribution	Frequency [1/yr]	Contribution
RC101	3.39E-07	1.90E-07	56%	1.33E-07	39%	1.52E-08	4%
RC201	4.98E-10	4.50E-10	90%	2.87E-11	6%	1.91E-11	4%
RC202	4.00E-14	3.82E-14	96%	1.76E-15	4%	1.66e-17	0%
RC203	8.45E-13	5.94E-13	70%	1.18E-13	14%	1.32E-13	16%
RC204	2.41E-11	2.36e-11	98%	4.11e-13	2%	1.32e-14	0%
RC205	4.10E-10	3.26E-10	80%	4.20E-11	10%	4.10E-11	10%
RC206	1.64E-08	1.31E-08	80%	2.48E-09	15%	8.94E-10	5%
RC301	1.63E-12	1.29E-12	79%	3.43E-13	21%	4.35E-15	0%
RC302	1.51E-11	3.11E-12	21%	9.15E-12	61%	2.81E-12	19%
RC303	2.29R-09	1.67E-09	73%	6.08E-10	27%	1.13E-11	0%
RC304	1.76E-08	1.44E-08	82%	2.29E-09	13%	8.48E-10	5%
RC401	1.38E-11	1.06E-11	77%	3.20E-12	23%	1.21E-17	0%
RC402	2.75E-10	1.87E-11	7%	1.98E-10	72%	5.84E-11	21%
RC403	6,82E-10	5.26E-10	77%	1.56E-10	23%	6.03E-16	0%
RC404	1.35E-08	9.29E-10	7%	9.69E-09	72%	2.83E09	21%
RC501	2.65E-13	1.66E-13	63%	9.79E-14	37%	3.40E-16	0%
RC502	1.11E-10	5.09E-11	46%	2.43E-11	22%	3.63E-11	33%
RC503	3.65E-10	2.21E-10	61%	1.44E-10	39%	4.58E-13	0%
RC504	1.19E-07	5.12E-08	43%	2.69E-08	23%	4.12E-08	35%
RC602	3.61E-10	1.39E-10	39%	2.13E-10	59%	8.06E-12	2%
RC701	1.02E-08	1.02E-08	100%	0.00E+00	0%	0.00E+00	0%
RC702	5.37E-09	4.56E-09	85%	6.23E-10	12%	1.97E-10	4%
RC802	2.64E-10	2.64E-10	100%	0.00E+00	0%	0.00E+00	0%
Total (CDF)	**5. 26E-07**	**2.98E-07**	**55%**	**1.76E-07**	**33%**	**6.14E-08**	**12%**

Item Number 166 **ER Section 7.2**

Request:

Page 7.2-3. Last Sentence, 2nd paragraph. How are person-rem per year and dollars per year combined? Identify method used.

Response:

In ER Section 7.2, severe accident consequences are reported in person-rem and cost separately. Cost indicates, for example, the cost incurred due to land decontamination, lost farm output due to contamination, and interdiction costs. In Section 7.3.2, the cost and non-cost consequences are combined in accordance with NUREG/BR-0184, "Regulatory Analysis Technical Evaluation Handbook."

ER Impact:

No changes to the ER are required.

Item Number 167 **ER Section 7.2**

Request:

Page 7.2-4. Last sentence, 1st paragraph. Provide the basis for the statement that the CDF for the US EPR is less than the CDFs for the current U.S. nuclear fleet. The truth of the statement is not obvious from the information presented.

Response:

Total at-power CDF from the U.S. EPR FSAR PRA (U.S. EPR FSAR Chapter 19) is 5.3E-07/yr, including internal events, internal fires and internal floods. This value is less than typical CDFs for current U.S. nuclear plants, which can be found in the Generic Environmental Impact Statement (NUREG-1437). Examples of current plants for which the CDF can be found in NUREG-1437 include ANO Unit 1 (1E-05/year, internal events only), Oconee Unit 3 (3E-05/year, internal events, internal fires and floods), Ginna (3E-5/year, internal events, internal fires and floods) and CCNPP Unit 1 (3E-04/year, internal events, fires and floods).

ER Impact:

No changes to the ER are required.

Item Number 168 **ER Section 7.2**

Request:

Table 7.2-3. What is the definition of Release Category Frequency? What is the source of the Release Category Frequencies in this table. How do they relate to the CDF. How can a release category that has 0.00 E+00 yr^{-1} frequency result in a non-zero risk, if risk = frequency X consequence? Provide the missing frequencies. Why is the release category frequency for RC101 = 0.0? Shouldn't RC101 be about the same as or larger than any of the other release category frequencies? Provide CDF as well as release category frequency. (Table to be corrected; use corrective action program)

Response:

- The Release Category Frequency is defined as the frequency of an offsite release whose characteristics correspond to those of a pre-defined release category.
- The release category frequencies are obtained from the EPR Level 2 model quantification. Each Containment Event Tree sequence that leads to a release is assigned one of the release categories.
- Each Level 2 sequence initiates with a core damage event and is propagated through the containment event trees to a release category end state. Therefore the sum of all release category frequencies is equal to the CDF. Minor differences are possible due to software cutoff error.

Table 7.2-3 values were typographical errors. The ER will be updated to correct these items, as shown in the attached table.

ER Impact:

The ER will be updated to correct Table 7.2-3 in a future revision of the ER.

Table 7.2.3: U.S. EPR Severe Accidents Analysis Impacts – 50-mile radius and 2050 population

		Number of Fatalities (per year)		Environmental Risk			
Release Category	Release Category Frequency (per year)	Early Fatalities	Late Cancers	Population Dose-Risk (person-rem per year)	Cost (dollars/ year)	Land Requiring Decontamin ation (acres/year)	Water Ingestion Dose (rem within 50 miles)
RC101	3.39E-07	0.00E+00	8.31E-06	1.60E-02	4.64E+00	2.81E-04	6.78E-05
RC201	4.98E-10	9.51E-12	1.09E-06	2.13E-03	4.29E+00	5.41E-05	1.07E-04
RC202	4.00E-14	1.56E-17	1.00E-10	1.91E-07	2.28E-04	5.89E-09	2.93E-09
RC203	8.45E-13	1.61E-16	2.44E-09	4.29E-06	5.29E-03	1.30E-07	6.11E-08
RC204	2.41E-11	1.05E-14	5.54E-08	1.10E-04	1.20E-01	3.52E-06	1.49E-06
RC205	4.10E-10	3.92E-12	1.27E-06	2.46E-03	2.68E+00	6.48E-05	3.33E-05
RC206	1.64E-08	1.32E-08	3.03E-05	5.18E-02	5.46E+01	1.60E-03	1.01E-03
RC301	1.63E-12	6.34E-16	4.08E-09	7.79E-06	9.29E-03	2.40E-07	1.19E-07
RC302	1.51E-11	2.87E-15	4.36E-08	7.67E-05	9.45E-02	2.32E-06	1.09E-06
RC303	2.29E-09	9.96E-13	5.27E-06	1.05E-02	1.14E+01	3.34E-04	1.41E-04
RC304	1.76E-08	1.68E-10	5.46E-05	1.06E-01	1.15E+02	2.78E-03	1.43E-03
RC401	1.38E-11	0.00E+00	1.38E-08	2.84E-05	2.13E-02	1.07E-06	1.99E-07
RC402	2.75E-10	0.00E+00	4.90E-07	1.03E-03	1.16E+00	3.84E-05	1.38E-05
RC403	6.82E-10	0.00E+00	6.82E-07	1.40E-03	1.05E+00	5.29E-05	9.82E-06
RC404	1.35E-08	0.00E+00	2.40E-05	5.04E-02	5.70E+01	1.88E-03	6.76E-04
RC501	2.65E-13	0.00E+00	1.04E-10	2.32E-07	2.78E-05	1.09E-08	1.54E-09
RC502	1.11E-10	0.00E+00	4.37E-08	9.73E-05	1.17E-02	4.55E-06	6.46E-07
RC503	3.65E-10	0.00E+00	7.88E-08	1.75E-04	2.31E-02	2.53E-05	7.26E-07
RC504	1.19E-07	0.00E+00	2.57E-05	5.70E-02	7.53E+00	8.23E-03	2.37E-04
RC602	3.61E-10	0.00E+00	1.42E-07	3.17E-04	3.79E-02	1.48E-05	2.10E-06
RC701	1.02E-08	0.00E+00	1.36E-05	2.37E-02	1.90E+01	7.99E-04	2.27E-04
RC702	5.37E-09	2.74E-08	7.84E-05	8.48E-02	8.86E+01	1.06E-03	2.40E-03
RC802	2.64E-10	1.00E-12	5.04E-07	1.07E-03	1.48E+00	3.67E-05	3.59E-05
Total	**5.26E-07**	**4.08E-08**	**2.45E-04**	**4.09E-01**	**3.69E+02**	**1.73E-02**	**6.39E-03**

Item Number 169 **ER Section 7.2**

Request:

Section 7.2.2.1. Provide estimates of the average individual risk of an early fatality for individuals within 1 mi of the reactor and the average individual risk of latent cancer fatalities for individuals within 10 mi of the reactor. (See Commission's 1986 Policy Statement, 51 FR 28044. These values can be obtained from MACCS2.)

Response:

Based on data from MACCS2, the expected number of early fatalities at 1 mile and the number of expected latent cancer fatalities at 10 miles are shown below.

- Early Fatalities (1) 3.82E-8/yr
- Latent Cancers (10) 3.93E-5/yr

ER Impact:

No changes to the ER are required.

Item Number 170 **ER Section 7.2**

Request:

Section 7.2.2.2. Have surface water sources for public water systems within 50 mi of the reactor been identified? Do the drinking water ingestion doses calculated by the MACCS2 code adequately account for these water sources

Response:

Surface water sources for public water systems within 50 mi of the reactor are identified in the MACCS site input file. The drinking water ingestion doses adequately account for these water sources.

ER Impact:

No changes to the ER are required.

Item Number 171 **ER Section 7.2**

Request:

Justify the assertion that the aquatic food ingestion risk is essentially the same as the air pathway dose, given the estimated uninterdicted aquatic food risk (55 person-Sv Ryr^{-1}) in the GEIS Table 5.16 for the current Calvert Cliffs units. Provide a quantitative estimate of the risk associated with uninterdicted aquatic food ingestion. Consider the relative magnitudes of the source terms, the large release core damage frequencies, and any changes in aquatic food harvest.

Response:

The air pathway dose to the population surrounding the plant, presented in the Table 5.6 of Volume I of the GEIS for CCNPP Units 1 and 2, is 2995 person-rem/reactor-year. If the aquatic food dose of 5500 person-rem/reactor-year is reduced by a factor of two (interdiction has the potential to reduce the dose by factors from 2 to 10 (NUREG 1437), then the interdicted aquatic food dose of 2750 person-rem/reactor-year is essentially the same as the air pathway dose for the existing Calvert Cliffs reactors.

The EPR at the CCNPP site has an air pathway dose of 0.41 person-rem/reactor-year. If an uninterdicted aquatic food dose is to be estimated from the existing site dose, the uninterdicted aquatic food ingestion dose for CCNPP Unit 3 would be approximately 0.75 person-rem/reactor-year as estimated below:

$$\frac{0.41}{2995}=\frac{x}{5500} \quad \Rightarrow \quad x=0.75\ person-rem/yr$$

This dose estimate encompasses the differences in the CDF and release fractions between the EPR and the existing plants. This dose also assumes that there is no change in the aquatic food harvest for the region: however, the aquatic food harvest for the region has decreased in recent years from the 1976 values used to calculate the existing plants uninterdicted food ingestion dose (NMFS, 2007). Therefore the U.S. EPR uninterdicted aquatic food ingestion dose would be lower than 0.75 person-rem/reactor-year and with interdiction would be comparable to air pathway dose.

<u>Reference</u>

NMFS, 2007. Fisheries of the United States, 2006" National Marine Fisheries Service, Office of Science and Technology, Silver Spring, Maryland, July 2007.

ER Impact:

No changes to the ER are required.

Item Number 172 **ER Section 7.2**

Request:

Section 7.2.2.2. Please provide water ingestion doses by release category as part of Table 7.2-3. (new column).

Response:

Water ingestion doses for each release category are as follows:

Release Category	Water Ingestion Dose (50) rem
RC101	6.78E-05
RC201	1.07E-04
RC202	2.93E-09
RC203	6.11E-08
RC204	1.49E-06
RC205	3.33E-05
RC206	1.01E-03
RC301	1.19E-07
RC302	1.09E-06
RC303	1.41E-04
RC304	1.43E-03
RC401	1.99E-07
RC402	1.38E-05
RC403	9.82E-06
RC404	6.76E-04
RC501	1.54E-09
RC502	6.46E-07
RC503	7.26E-07
RC504	2.37E-04
RC602	2.10E-06
RC701	2.27E-04
RC702	2.40E-03
RC802	3.59E-05
Total	**6.39E-03**

ER Impact:

Water ingestion doses will be added to ER Table 7.2-3 in a future revision of the ER.

Item Number 173 **ER Section 7.2**

Request:

Page 7.2-5. Second paragraph, last sentence. The conclusion in this sentence does not follow from information contained in the ER. Doses are not a function of CDF. Provide sufficient information to demonstrate that risks associated for groundwater releases from a US EPR severe accident would be lower than they are for the current CCNPP Units 1 and 2.

Response:

The "doses" presented in the Level 3 PRA are actually a risk metric, and, therefore, the "doses" encompass both the consequences of the release and the frequency of the release. The release frequency is function of the CDF and the containment performance. The consequences of the release are function of the site characteristics. Since:

- the CDF of CCNPP Unit 3 is smaller than the CDF of current CCNPP Units 1 and 2 (see RAI Item Number 167), and
- the containment performance is better for the U.S. EPR than for CCNPP Units 1 and 2 (e.g., 9% of early containment failure and containment bypass from NUREG 1437, as opposed to 5% LRF for the U.S EPR), and
- the site characteristics for CCNPP Unit 3 are similar to current CCNPP Units 1 and 2,

It can be concluded that the risks associated with groundwater release would be lower for CCNPP Unit 3 than for the current CCNPP Units 1 and 2.

ER Impact:

No changes to the ER are required.

Item Number 174 **ER Section 7.2**

Request:

Section 7.2.3. First paragraph. What is the basis for assuming the release fractions listed in Table 7.2-2? Discuss this in detail.

Response:

The release fractions listed in Table 7.2-2 are obtained from the representative MAAP runs used to characterize the release categories. A detailed discussion of the source term calculation is provided in Section 19.1.4.2 of the U.S. EPR FSAR Chapter 19.

ER Impact:

No changes to the ER are required.

Item Number 175 **ER Section 7.2**

Request:

Table 7.2-2. Provide release fractions by isotope or element rather than by chemical compound. The ER does not contain sufficient information to convert the values in Table 7.2-2 to isotopic or element release fractions for Cs and Rb. Are the values from Table 7.2-2 used in MACCS2? If so, how are they entered?

Response:

The MAAP grouping is as follows:

Group	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Description	Nobles & Inerts	CsI, RbI	TeO_2	SrO	MoO_2	CsOH, RbOH	BaO	La_2O_3, Nd_2O_3, Y_2O_3, Pr_2O_3, Sm_2O_3	Ceo_2	Sb	Te	NpO_2, PuO_2

The MACCS2 grouping is as follows:

Group	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Description	Xe, Kr	I	Cs	Te, Sb	Sr	Ru, Co, Mo, Tc, Rh	La, Y, Zr, Nb, Am, Cm, Pr, Nd	Ce, Pu, Np	Ba

Based on these groups, the following mapping was used between the MAAP and MACCS2 radioisotopic groups:

MACCS2	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
MAAP	**1**	**2**	**6**	**3, 10, 11**	**4**	**5**	**8**	**9,12**	**7**

For clarity, the following table gives the processed MAAP source term for input into MACCS2.

Table 7.2-2 Source Term Release Fractions

	XE/KR	I	Cs	Te	Sr	Ru	La	Ce	Ba
RC101	1.9E-3	3.1E-5	2.6E-5	6.7E-5	8.0E-6	5.8E-5	4.1E-7	9.7E-7	2.7E-5
RC201	3.2E-1	8.1E-2	8.4E-2	2.4E-2	6.9E-5	4.4E-3	6.4E-6	1.1E-5	1.0E-3
RC202	8.4E-1	3.1E-2	2.2E-2	5.3E-2	7.6E-4	8.6E-3	1.1E-4	1.7E-4	2.1E-3
RC203	8.8E-1	3.6E-2	2.3E-2	8.3E-2	2.0E-4	1.4E-2	3.0E-5	8.5E-5	4.1E-3
RC204	9.2E-1	3.0E-2	1.9E-2	8.1E-2	5.5E-4	6.1E-3	7.9E-5	1.5E-4	3.3E-3
RC205	9.9E-1	4.1E-2	2.6E-2	2.7E-1	4.8E-4	7.2E-3	7.6E-5	2.2E-4	7.2E-3
RC206	1.8E-1	8.9E-3	8.2E-3	1.0E-2	2.2E-3	9.0E-3	9.7E-5	3.1E-4	5.4E-3
RC301	8.4E-1	3.1E-2	2.2E-2	5.3E-2	7.6E-4	8.6E-3	1.1E-4	1.7E-4	2.1E-3
RC302	8.8E-1	3.6E-2	2.3E-2	8.3E-2	2.0E-4	1.4E-2	3.0E-5	8.5E-5	4.1E-3
RC303	9.2E-1	3.0E-2	1.9E-2	8.1E-2	5.5E-4	6.1E-3	7.9E-5	1.5E-4	3.3E-3
RC304	9.9E-1	4.1E-2	2.6E-2	2.7E-1	4.8E-4	7.2E-3	7.6E-5	2.2E-4	7.2E-3
RC401	8.0E-1	6.8E-3	2.8E-3	4.8E-3	2.9E-3	2.8E-3	1.1E-4	2.6E-4	5.8E-3
RC402	9.7E-1	2.8E-2	1.3E-2	1.1E-2	4.1E-3	4.0E-3	1.6E-4	3.9E-4	8.2E-3
RC403	8.0E-1	6.8E-3	2.8E-3	4.8E-3	2.9E-3	2.8E-3	1.1E-4	2.6E-4	5.8E-3
RC404	9.7E-1	2.8E-2	1.3E-2	1.1E-2	4.1E-3	4.0E-3	1.6E-4	3.9E-4	8.2E-3
RC501	9.8E-1	1.9E-3	1.9E-3	3.8E-3	1.1E-5	5.8E-5	4.9E-7	9.5E-7	6.1E-5
RC502	9.8E-1	1.9E-3	1.9E-3	3.8E-3	1.1E-5	5.8E-5	4.9E-7	9.5E-7	6.1E-5
RC503	1.0E+0	8.5E-3	7.9E-4	4.3E-2	8.0E-6	5.8E-5	4.1E-7	9.7E-7	2.7E-5
RC504	1.0E+0	8.5E-3	7.9E-4	4.3E-2	8.0E-6	5.8E-5	4.1E-7	9.7E-7	2.7E-5
RC602	9.8E-1	1.9E-3	1.9E-3	3.8E-3	1.1E-5	5.8E-5	4.9E-7	9.5E-7	6.1E-5
RC701	1.1E-1	4.1E-3	4.1E-3	6.6E-3	5.1E-4	5.2E-3	4.3E-5	1.6E-4	2.8E-3
RC702	1.1E-1	8.1E-2	8.2E-2	1.3E-1	1.0E-2	1.0E-1	8.6E-4	3.3E-3	5.5E-2
RC802	3.9E-1	2.8E-2	2.8E-2	1.5E-2	2.9E-4	3.2E-3	1.9E-5	6.1E-5	2.1E-3

ER Impact:

ER Section 7.2 will be modified to add the MACCS2 Input Table above to replace Table 7.2-2, in a future revision of the ER.

Item Number 176 **ER Section 7.2**

Request:

Section 7.2.3, third paragraph, second sentence. Information presented in the ER so far is not sufficient to support this conclusion related to risk. If the conclusion is correct, provide sufficient information to support it.

Response:

The third paragraph of Section 7.2.3 will be modified as follows:

> The qualitative analysis indicates that risk from the surface water and groundwater pathways is small. As discussed in Section 2.2.2, risks from surface water contamination from an accident at the CCNPP site are comparable to the risk from atmospheric pathway. The risk from atmospheric pathway from a U.S. EPR severe accident is small compared to currently licensed units, therefore the risk from surface water contamination is small compared with the atmospheric pathway of the current U.S. nuclear fleet. As discussed in Section 2.2.3, the risk of groundwater contamination from an U.S. EPR severe accident is also significantly less than the risk from currently licensed reactors. Additionally, interdiction could substantially reduce the groundwater pathway risks.

ER Impact:

ER Section 7.2.3 will be modified to incorporate the identified changes in a future ER revision.

Item Number 177 **ER Section 7.2**

Request:

Section 7.2.3, third paragraph, second sentence. Information presented in the ER so far is not sufficient to support this conclusion related to risk. If the conclusion is correct, provide sufficient information to support it.

Response:

This item is a repeat of RAI Item Number 176. See response to RAI Item Number 176.

ER Impact:

See response to RAI Item Number 176.

Item Number 178 **ER Section 7.3**

Request:

Section 7.3.1, third paragraph. Why were cutsets that account for approximately 50% of the CDF not evaluated? How was the total CDF determined? How many cutsets were there? What is a cutset?

Response:

For PRA Lever 1 a cutset is defined as a combination of events which leads to core damage. A significant cutset is defined in Regulatory Guide 1.200 and the ASME RA-S-2002 Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications as:

> *one of the set of outsets that, when rank-ordered by decreasing frequency, aggregate to a specified percentage of the core damage frequency (or large early release frequency), or that Individually contribute more than a specified percentage of core damage frequency (or large early release frequency). For this version of the standard, the aggregate percentage is 95% and the individual percentage is 1%.*

As stated In the U.S. EPR FSAR Section 19.1.4.1.2.3 (Significant Outsets and Sequences), ninety-five percent of the total CDF is represented by over 12,000 cutsets for the U.S, EPR; however, the top 100 cutsets include all outsets contributing >1% to the total CDF. This equates to approximately 50 percent of the total CDF for the U.S. EPR. The remaining outsets were not evaluated because their individual contribution to the CDF is small resulting in no risk significant design alternatives.

For more Information on how the U.S. EPR CDF was determined see Chapter 19.1.8 of the U.S. EPR FSAR.

ER Impact:

No changes to the ER are required.

Item Number 179 **ER Section 7.3**

Request:

Section 7.3.1, fourth paragraph. How does looking at cutsets that contribute only about 50% of the CDF establish that all possible design alternatives for the US EPR were addressed?

Response:

Referring to the response to RAI Item Number 178, the AREVA definition of significant cutset is consistent with Regulatory Guide 1.200, and ASME RA-S-2002, Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications. While ninety-five percent of the total CDF is represented by *over* 12,000 cutsets for the U.S. EPR, cutsets outside the top 100 have less than 1% contribution to the total CDF. For the US EPR application, this equates to approximately 50 percent of the total CDF for the U.S. EPR. In fact the selection of the top 100 cutset conservatively includes cutsets of low importance. For example, the percentage of the individual contribution to the total CDF for the 101st cutset was 0.10 percent. Consistent with current regulatory guidance and industry practice, all risk significant design alternatives for the U.S. EPR have been addressed by detailed evaluation of the top 100 cutsets to identify plant specific modifications for inclusion in the comprehensive list of U.S. EPR SAMDA candidates.

ER Impact:

The 3rd paragraph in ER Section 7.3.1 will be replaced with the following text in a future ER revision:

> The U.S. EPR Level 1 PRA cutsets were evaluated to identify plant-specific modification for inclusion in the comprehensive list of SAMDA candidates. As stated in the U.S. EPR FSAR Section 19.1.4.1.2.3 (Significant Cutsets and Sequences), ninety-five percent of the total CDF is represented by over 12,000 cutsets for the U.S. EPR; however, the top 100 cutsets include all cutsets contributing >1% to the total CDF. For the U.S. EPR application, this equates to approximately 50 percent of the total CDF for the U.S. EPR. In fact the selection of the top 100 cutset conservatively includes cutsets of low importance. For example, the percentage of the individual contribution to the total CDF for the 101st cutset was 0.10 percent. Consistent with current regulatory guidance and industry practice, all risk significant design alternatives for the U.S. EPR have been addressed by detailed evaluation of the top 100 cutsets to identify plant specific modifications for inclusion in the comprehensive list of U.S. EPR SAMDA candidates.

Item Number 180 **ER Section 7.3**

Request:

Section 7.3.1, page 7.3-2, 5th bullet. Justify the use of "Not required for design certification" as an appropriate screening category for SAMDAs in the environmental report. Re-evaluate each SAMDA placed in this category for the COL or provide a justification for not doing so? Explain how this category can be appropriate for CCNPP Unit 3.

Response:

The SAMDA candidates categorized as "Not required for design certification" in the AREVA NP Environmental Report Standard Design Certification were re-evaluated for CCNPP Unit 3. These SAMDA candidates were re-evaluated using the screening methodology in AREVA NP Environmental Report Standard Design Certification. An additional screening category called "Not a design alternative" was used to capture any SAMDA candidate not related to the plant design. This category would include SAMDA candidates related to procedure modifications, training, and surveillance.

The 51 SAMDA candidates categorized as "Not required for design certification" in the AREVA NP Environmental Report Standard Design Certification were re-evaluated and placed in the following screening categories:

- Four SAMDA candidates were not applicable to the U.S. EPR design
- Three SAMDA candidates were already implemented
- Forty-four SAMDA candidates were not a design alternative

ER Impact:

The following text will be added to the end of the 6th paragraph of ER Section 7.3.1 in a future ER revision:

> The SAMDA candidates categorized as "Not required for design certification" in the AREVA NP Environmental Report Standard Design Certification were re-evaluated for CCNPP Unit 3. These SAMDA candidates were re-evaluated using the screening methodology in AREVA NP Environmental Report Standard Design Certification. An additional screening category called "Not a design alternative" was used to capture any SAMDA candidate not related to the plant design. This category included SAMDA candidates related to procedure modifications, training, or surveillance. If a SAMDA candidate is related to any of these enhancements, it is not retained for this analysis.

In ER Section 7.3.3, the 1st, 2nd and 4th bullet will be changed to the following in a future ER revision:

- Twenty-five SAMDA candidates were not applicable to the U.S. EPR design.

- Seventy SAMDA candidates were already implemented into the U.S. EPR design either as suggested in the SAMDA or an equivalent replacement that fulfilled the intent of the SAMDA. These SAMDA candidates are summarized in Table 7.3-2.

- Forty-four SAMDA candidates were categorized not a design alternative because they were related to procedure modifications, training, or surveillance.

Item Number 181 **ER Section 7.3**

Request:

Page 7.3-3, second and third lines. What is the basis for the assumption that fire risk is as large as or larger than seismic risk? If this is only an assumption, what is the basis for claiming that the assumption is conservative? Explain how this assumption is true for all locations.

Response:

The total cost impact of a severe accident (maximum benefit) must account for the risk contribution from internal initiating events, internal flooding, fire, and seismic. The total core damage frequency (CDF) at power for the U.S. EPR includes the contribution from internal initiating events (55%), internal flooding (12%), and fire (33%) (U.S. EPR FSAR Figure 19.1-24). A seismic margins assessment instead of a seismic PRA was completed for the U.S. EPR. The seismic margins analysis yields valuable information regarding the ruggedness of the seismic design with respect to the potential severe accident (U.S. EPR FSAR Section 19.1.2.1). However, it does not result in the estimation of seismic CDF which is used to determine the cost impact of a severe accident in the SAMDA analysis. In order to account for the seismic contribution it was assumed that the seismic risk is equivalent to the fire risk since the fire risk in the U.S. EPR PRA analysis was evaluated to be the highest external event risk at 33% the total CDF.

This assumption is dependent on location. As stated in CCNPP Unit 3 FSAR (Section 19.1.5.1.2.4), the seismic demands for CCNPP Unit 3 are much lower than that used for the U.S. EPR FSAR. For that reason the assumption that seismic risk is equivalent to fire risk remains applicable for CCNPP Unit 3.

ER Impact:

The 2nd paragraph in ER Section 7.3.2 will be replaced with the following in a future ER revision:

> The total cost impact of a severe accident (maximum benefit) must account for the risk contribution from internal initiating events, internal flooding, fire, and seismic. The total core damage frequency (CDF) at power for the U.S. EPR includes the contribution from internal initiating events (55%), internal flooding (12%), and fire (33%) (U.S. EPR FSAR Figure 19.1-24). A seismic margins assessment instead of a seismic PRA was completed for the U.S. EPR. The seismic margins analysis yields valuable information regarding the ruggedness of the seismic design with respect to the potential severe accident (FSAR Section 19.1.2.1). However, it does not result in the estimation of seismic CDF which is used to determine the cost impact of a severe accident in the SAMDA analysis. In order to account for the seismic contribution it was assumed that the seismic risk is equivalent to the fire risk since the fire risk in the U.S. EPR PRA analysis was evaluated to be the highest external event risk at 33% the total CDF.

This assumption is dependent on location. As stated in CCNPP COLA FSAR (Section 19.1.5.1.2.4), the seismic demands for CCNPP Unit 3 are much lower than that used for the U.S. EPR FSAR. For that reason the assumption that seismic risk is equivalent to fire risk remains applicable for CCNPP Unit 3.

Item Number 182 **ER Section 7.3**

Request:

Page 7.3-3, second paragraph. Explain how the $150,000 minimum implementation cost was determined. Explain how implementation costs estimated for retrofit SAMDA are appropriate for use in evaluating a similar SAMDA on a design that is not complete and has not been built.

Response:

Several U.S. EPR SAMDA candidates were categorized as excessive implementation cost in the AREVA NP Environmental Report Standard Design Certification. The minimum implementation cost was determined by evaluating these SAMDA candidate cost estimates and selecting the monetary value of the lowest cost estimate. The lowest cost estimate for a U.S. EPR SAMDA candidate was $150,000 based on SAMDA candidate CW-22 (Table 5-1 of AREVA NP Environmental Report Standard Design Certification). This provided the minimum implementation cost for the U.S. EPR SAMDA candidates.

The U.S. EPR has several conservatisms built into the estimated implementation costs used to categorize SAMDA candidates as excessive implementation cost. The first conservatism is the implementation cost estimates for retrofit. SAMDA candidates were not increased to account for inflation. The second conservatism is the estimated implementation cost is compared to the maximum benefit for the U.S. EPR. The maximum benefit is the benefit associated with eliminating all risk while the cost estimate for one SAMDA candidate that if implemented would reduce risk by a fraction of the maximum benefit. Using the maximum benefit with minimum cost is the most conservative approach to a cost benefit analysis. Therefore, the implementation costs estimated for retrofit SAMDA candidates are appropriate to use in evaluating a similar SAMDA candidate for a design that is not complete.

ER Impact:

No changes to the ER are required.

Item Number 183 **ER Section - None**

Request:

No question provided for this Item Number.

Response:

N/A

ER Impact:

N/A

Item Number 184 **ER Section 7.4**

Request:

Provide information about maximum individual dose estimates for transportation workers, public onlookers, and the public along the route. Exposure scenarios (that is, dose rates, distances, and exposure times) or alternative methods and data should be provided so that the results can be reproduced.

Response:

The environmental impact to the maximally exposed individual (MEI) for incident-free transportation of radioactive material is a newly defined evaluation in the Draft ESRP-1555 (Section 5.7.2, "Transportation of Radioactive Materials," July 2007). The dose to the MEI for incident-free transportation for the EPR was analyzed using the scenario based evaluation provided in the U.S. Department of Energy report, Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada" (DOE, 2002). The MEI scenarios analyzed are:

- Truck crewmember,
- Inspectors,
- Resident,
- Individual stuck in traffic, and
- Person at a truck service station.

Although this question was asked related to Section 7.4, the information requested will be included in an update to ER section 5.11 as follows:

The following new section will be added after section 5.11.3.4:

5.11.3.5 Maximally Exposed Individual Impact

The maximally exposed individual impact is the potential dose for individuals exposed to any one shipment given the maximum exposure for all pathways. The shipment dose is independent of source, and is based on the maximum potential package dose rate allowed and postulated exposure scenarios. An analysis of incident-free doses to MEI was performed based on NUREG-1815, Section 6.2.1.1, which in turn references the DOE's Final Environmental Impact Statement (FEIS) for Yucca Mountain (DOE, 2002). An MEI is a person who may receive the highest radiation dose from a shipment to and/or from the reactor site.

The analysis is based on assumptions about exposure times, dose rates, and the number of times an individual maybe exposed to an offsite shipment. It was assumed that the shipment dose rate is 0.1 mSv/hr (10 mrem/hr) at 2m (6.6 ft) from the side of the transport vehicle, the maximum dose rate allowed by DOT regulations (49 CFR 173.441). The average annual shipment frequency is based on the total of irradiated fuel and radioactive waste (assuming the dose rate from unirradiated fuel shipments is negligible respective to MEI). The analysis is described below for several different categories of individuals.

Truck crew member:

Truck crew members are trained radiation workers, and would receive the highest radiation doses during incident-free transport because of their proximity to the loaded shipping container for an extended period of time. Although unlikely, it is assumed that the maximum exposure for a crewmember could occur. For irradiated fuel shipments, the crew member doses are limited to 0.02 Sv (2 rem) per year, which Is the DOE administrative control level (DOE 2005). This limit is anticipated to apply to spent nuclear fuel shipments to a disposal facility, as DOE will take title to the spent fuel at the reactor site. For radwaste shipments, the crew member doses are limited to 0.05 Sv (5 rem) per year, which is the NRC limit for occupational exposures (10 CFR 20). Since the NRC limit is higher, a MEI could receive a potential 0.05 Sv/yr (5 rem/yr).

Non-radiation workers, or the general public would receive much less exposure, as demonstrated below.

Inspectors:

Radioactive shipments are inspected by Federal or state vehicle inspectors, for example, at state ports of entry. NUREG-1815 assumed that inspectors would be exposed for 1 hour at a distance of 1-m (3.3 ft) from the package. The dose rate at 1-m is assumed at 0.14 mSv/hr (14 mrem/hr) (Table 5-4), so the dose per shipment is 0.14 mSv (14 rnrem).

For the EPR, based on 21 annual irradiated fuel shipments (as noted in Section

5.11.3.2) and 15 annual radwaste shipments (as noted In Section 5.11.3.3) (36 total), the annual doses to vehicle inspectors Is calculated to be 5 mSv/yr (500 mrem/yr), assuming the same person inspects all shipments of fuel and waste:

MEI annual dose = (21 Irradiated fuel + 15 radwaste) shipments/yr x 0.14 mSv/shlpment = 5 mSv/yr.

Resident:

NUREG-1815 used the DOE FEIS assumption of a resident living 30-m (100-ft) from shipments that are traveling 24-km/hr (15-mi/hr) for all shipments along a particular route. The FEIS also assumed a resident would be exposed to 5,000 (mostly legal-weight) shipments over 24 years. The dose to the resident over 24years was estimated at 0.06 mSv (6 mrem) (DOE, 2002). Therefore, the dose per shipment is 0.000012 mSv (0.0012 mrem).

For the EPR with an average of 36 annual shipments, the potential dose to the MEI resident is 0.000432 mSv/yr (0.0432 mrem/yr).

MEI annual dose = 0.06mSv / 5000 shipments x 36 shlpments/yr = 0.000432 mSv/yr.

Individual stuck in traffic:

NUREG-1815 used the DOE FEIS assumption that, for one time only, an individual could become stuck in traffic next to a loaded shipment for one hour at a distance of 1.2m (4-ft). Similar to a resident, it assumed the Individual would be exposed to 5,000 (mostly legal-weight) shipments over 24 years. The dose to the resident over 24 years was estimated at 0.16 mSv (16 mrem) (DOE, 2002). Therefore, the dose per shipment Is 0.000032 mSv (0.0032 mrem).

For the EPR with an average of 36 annual shipments, the potential dose to the MEI stuck in traffic is 0.00115 mSv/yr (0.115 mrem/yr).

MEI annual dose = 0.16 mSv*15000*shipments x 36 shipments/yr = 0.00115 mSv/yr.

Person at a truck service station:

NUREG-1815 used the DOE FEIS assumption that an employee at a service station where all truck shipments from the advanced reactors would stop could be exposed for 49 minutes at a distance of 16-m (52-ft) from the loaded shipment. This results in a dose estimate of 0.0007 mSv/shipment (0.07 mrem/shlpment).

For the EPR with an average of 36 annual shipments, the potential dose to the MEI at a truck service station Is 0.0252 mSv/yr (2.52 mrem/yr).

MEI annual dose = 0.0007 mSv/shipment x 36shipments/yr = 0.0252 mSv/yr."

Additionally, the following references will be added to the References Section:

DOE, 2002. U.S. Department of Energy (DOE): Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada, DOE/EIS-0250, Office of Civilian Radioactive Waste Management, DOE, Washington, D.C., February 2002

DOE, 2005. U.S. Department of Energy (DOE), DOE Standard, Radiological Control, DOE-STD-1098-99," March 2005"

ER Impact:

The identified changes in ER Section 5.11 will be made in a future revision to the ER.

Item Number 185 **ER Section 7.4**

Request:

Provide output for TRAGIS code and RADTRAN (input and output).

Response:

The TRAGIS and RADTRAN code case files supporting ER Sections 5.11 and 7.4 for the following cases are provided in a separate attached document:

- Input/Output files for CCNPP Unit 3 ER Section 5.11:
  - TRAGIS Unirradiated Fuel Truck from WA to CCNPP
  - TRAGIS Irradiated Fuel Truck from CCNPP to Yucca Mt
  - TRAGIS Radioactive Waste Truck from CCNPP to Hanford Repository
  - RADTRAN Unirradiated Fuel Truck from WA to CCNPP,
  - RADTRAN Irradiated Fuel Truck from CCNPP to Yucca Mt,
  - RADTRAN Radioactive Waste Truck from CCNPP to Hanford Repository.

- Input/Output files for CCNPP Unit 3 ER Section 7.4:
  - TRAGIS CCNPP CASE: UNIRRADATED FUEL
  - TRAGIS CCNPP CASE: IRRADIATED FUEL
  - TRAGIS CCNPP CASE: RADIOACTIVE WASTE
  - RADTRAN Irradiated Fuel Truck from CCNPP to Yucca Mt.,
  - RADTRAN RadWaste Annual Activity form CCNPP to Hanford, WA.

ER Impact:

No changes to the ER are required.

Item Number 186 **ER Section 8.0**

Request:

Most substantive information was deferred or another "process" was referenced. Provide copies of those plans/processes that say there is a need and show specifically how the proposal addresses it.

Response:

The primary document that justified the need for power was the Maryland Public Service Commission's Ten-Year Plan (2005-2014) of Electric Companies in Maryland which is attached. The application to the State of Maryland for a Certificate of Public Convenience and Necessity (CPCN) will provide, when approved, consent and agreement from the State of Maryland that CCNPP Unit 3 is required. The CPCN application is attached.

ER Impact:

No changes to the ER are required.

Item Number 187 **ER Section 8.0**

Request:

Address current strategies in MD (applicants and others) to establish Demand Side Management strategies to reduce future demand.

Response:

Additional information regarding Demand Site Management has been obtained from recent legislation in the State of Maryland and Demand Side Management efforts initiated by Baltimore Gas & Electric, a Constellation Energy Company. Additional detail will be added as a new ER Section 8.2.3.

ER Impact:

Section 8.2 of the ER will be updated in a future revision to add additional information on Demand Side Management programs in Maryland as shown on the following pages.

Insert Text for ER Section 8.2.3

8.2.3 Energy Efficiency and Substitution

Energy efficiency and demand side management (DSM) programs result in estimated load drops that reduce the demand for energy. There has been a substantial increase in DSM programs in recent years. While beneficial, these programs do not meaningfully affect the supply or demand side of the market and cannot be reasonably expected to substitute for necessary power upgrade projects. The DSM program measures are generally considered the cheapest possible compliance option and are often projected to provide a positive cash flow to the customer or utility implementing those measures. These measures can include rebates or other incentives for residential customers to update inefficient appliances with Energy Star® replacements. Customers can also receive credits on their bills for allowing a utility to control, or intermittently turn off their central air conditioning or heat pumps when wholesale electricity prices are high.

Recent legislation passage positions the State of Maryland as one of the leaders in energy efficiency and climate policy. On the energy efficiency side, the state recently launched the EmPOWER Maryland Initiative, which establishes a state goal of achieving a 15 percent reduction in per capita electricity use and peak demand by the end of 2015. This requires the state's utilities to implement energy efficiency programs and tasks the MDPSC with tracking progress toward that goal. This energy efficiency initiative, unlike energy conservation, which is based on changing behaviors and lifestyles, is technology-based.

Baltimore Gas & Electric Company (BGE), a Constellation Energy Group company, has recently taken steps to initiate DSM efforts through its Smart Energy Savers Program™. BGE recognizes that it relies heavily on electricity generated outside its market area, that there are higher costs resulting from market-based generation, and that customers expect them to promote energy efficiency. As a result, the BGE proposes to develop innovative programs promoting energy efficiency for its customers. These programs include: demand response infrastructure (DRI), energy efficiency/conservation, and advanced metering infrastructure (AMI) (BGE, 2007).

DRI is an effort to achieve customer benefits by reducing customer demand during periods of tight or peak supply. This can be accomplished technology-based measures such as programmable communicating thermostats and advanced air conditioning control switches. These technologies allow the BGE to regulate the demand and operation during periods of very high electricity use (that is, peak demand times). As part of the energy efficiency/conservation efforts, the BGE is proposing to offer rebates or incentives to customers to purchase high efficiency products, such as Energy Star®; expand the current low-income gas Comprehensive Home Improvement Program (CHIP); and encourage homebuilders to build homes that meet Energy Star® standards. Through these efforts, the BGE hopes to reduce gas consumption by about 10 percent over the first 10 years of the program and reduce greenhouse gas emissions by an average of 2 billion pounds of carbon dioxide (CO_2) per year (BGE, 2007).

AMI, also referred to as "smart meters" is a state-of-the-art technology to read gas and electric meters. Simply put, AMI provide a two-way communication between the BGE and a customer's meter. The MDPSC approved the BGE AMI pilot in 2007 and the BGE proposes to provide about 9,000 meters to 5,000 customers in early 2008. BGE anticipates the complete AMI rollout to start in late 2008 and take 3 years to complete (BGE, 2007).

In addition, there are a number of state, regional, and national initiatives that promote both energy efficiency and climate policy. National concern for developing adequate supplies of electric power in an environmentally sound manner has led to state consideration of renewable minimum percentage of their power from renewable energy resources by a certain date. As of June 2007, there were 24 states, plus the District of Columbia, that have RPS policies in place. Together these states account for more than half of the electricity sales in the United States (PJM, 2008).

In Maryland, the Governor recently set new renewable energy requirements for the state. These requirements propose to more than double the state's requirements for renewable energy by 2022. This new law proposes to slow the growth of the RPS over the next several years but then accelerates it starting in 2011. It still maintains a requirement for 2 percent of the state's power to come from solar energy by 2011 (MEA, 2008).

8.2.4 References

MD, 1999. Annotated Code of Maryland Code, Public Utility Companies Article, Section 7-505.

MDPSC, 2007. Electric Supply Adequacy Report of 2007, Maryland Public Service Commission, January 2007.

NRC, 1999. Standard Review Plans for Environmental Reviews of Nuclear Power Plants, NUREG-1555, October 1999, Nuclear Regulatory Commission, 1999.

NRC, 2007. Standard Review Plans for Environmental Reviews of Nuclear Power Plants, NUREG-1555, July 2007, Nuclear Regulatory Commission, 2007.

PJM, 2007. PJM 2007 Strategic Report, PJM Interconnect LLC, January 2007.

PJM, 2008. 2007 Regional Transmission Expansion Plan, PJM Interconnection LLC, February 2008.

PPRP, 2006a. Maryland Power Plants and the Environment: A Review of the Impacts of Power Plants and Transmission Lines on Maryland's Natural Resources, PPRP CEIR-13, MDNR Publication Number 12-9202005-57, Power Plant Research Program, January 2006.

PPRP, 2006b. Electricity in Maryland – Factbook 2006, Power Plant Research Program, September 2006.

BGE, 2007. BGE Demand Side Management Programs, presentation at NAPEE Mid-Atlantic Regional Meeting, April 30, 2007.

MEA, 2008. Maryland Strategic Electricity Plan, January 14, 2008.

Item Number 188 **ER Section 8.0**

Request:

Chapter 8 stresses Maryland's goal to reduce reliance on imported power. This needs to be reconciled with the Chapter 9 decision to establish two of the three alternative sites in Upstate New York.

Response:

The relevant service area evaluated in Chapter 8 is consistent with the wholesale market area of Maryland and New York that Constellation participates in for electricity sales. A merchant plant constructed in New York could still provide electricity to Maryland due to Constellation's established wholesale market area and is not limited to selling electricity within New York.

Although consideration of two alternative sites in New York approximately 350 miles from the CCNPP does not satisfy Maryland's goal to reduce reliance on imported power, a merchant plant constructed at either of these alternative sites in New York is in relatively close proximity to CCNPP and could still provide electricity to Maryland to address the identified power needs in the state.

ER Impact:

No changes to the ER are required.

Item Number 189 **ER Section - None**

Request:

No question provided for this Item Number.

Response:

N/A

ER Impact:

N/A

Item Number 190 **ER Section 8.4**

Request:

Provide any significant new developments since submittal of Rev. 0 of the ER relating to need for power?

Response:

In April 2008, the Maryland legislature passed two energy bills both aimed at reducing Maryland's energy consumption by 15% by 2015 (repeated below). The major portion of this initiative is based on demand side management (DSM). Based on the historical performance of DSM efforts in curtailing energy use, it is not expected that these actions will significantly affect the need for power evaluation or the need for CCNPP Unit 3. A press release describing the passage of this legislation is provided below.

FOR IMMEDIATE RELEASE

April 9, 2008

Washington, D.C.—Maryland's legislators gave final approval this week to two landmark energy bills that together aim to reduce the state's energy consumption by 15% by 2015. The legislation, proposed by Governor Martin O'Malley, sets the stage for Maryland to become a leader in capturing the benefits of energy efficiency.

"These two bills provide a foundation for a clean and sustainable energy future for the state of Maryland," said Steven Nadel, Executive Director of the American Council for an Energy-Efficient Economy (ACEEE). "Maryland's policies now recognize energy efficiency as the 'first fuel' for meeting its future energy needs.

A study released in February by ACEEE evaluated a suite of energy efficiency policies for Maryland and found that more than enough energy efficiency resources exist in the state to meet Governor O'Malley's ambitious 15 by '15 goal, and confirmed that reducing electricity consumption is the quickest, cheapest, and cleanest way for policymakers to bring consumer bills down and keep the lights on in the state.

Two of the bills are key to meeting the Governor's goals. The first codifies the goal of reducing per capita electricity consumption 15 percent by 2015. This target, known as an energy efficiency resource standard, will require the state's electric utilities to achieve 10% savings by 2015 and the Maryland Energy Administration (MEA) to oversee programs to meet the remaining 5%. The second bill establishes a Strategic Energy Investment Fund supported by the proceeds of upcoming auctions of the state's carbon dioxide emission allowances and administered by MEA. About half of this new fund, which is expected to reach $100 million or more per year, is to be expended on programs to reduce energy consumption, including low- and moderate-income electric customers.

In addition, the General Assembly passed a bill that requires energy-efficient and environmentally friendly design and materials for new state buildings and public schools, and a separate bill that boosts the state's renewable portfolio standard (a target for the portion of the state's energy derived from wind, solar, and other renewable sources) to 20 percent by 2022.

“Among all the possible energy resources available to the state, energy efficiency is the least-cost and the quickest to deploy," said Maggie Eldridge, ACEEE's State Team Leader. "By committing to investing in energy efficiency, Maryland can meet its future electricity needs while containing energy costs for the state's consumers. This legislation is an extremely smart investment for all Marylanders."

ACEEE's analysis shows that the benefits of energy efficiency include lower consumer electric bills, improved system reliability, significant job and economic development in the state, and reduced pollution. "Our analysis of policy options available to Maryland identified potential net consumer electric bill savings of about $900 million and over 8,000 new in-state jobs in 2015," said Eldridge. "The provisions included in this year's energy legislation and last year's appliance efficiency standards address about 90% of the efficiency savings that we identified."

"Helping consumers save energy means helping families reduce their electric bills," said Ed Osann, Senior Associate with ACEEE. "We commend the General Assembly for answering the Governor's call to help Marylanders make their energy use more efficient."

"The foundation for a more energy-efficient Maryland is now in place," said Neal Elliott, ACEEE's Associate Director for Research. "ACEEE looks forward to working with the Maryland Energy Administration, the Public Service Commission, utilities, and consumers as new programs are developed that will achieve these ambitious goals. Based on our work with leading energy efficiency programs across the country, we are confident that Maryland can succeed."

Reference

ACEEE, 2008. Maryland Legislation Taps Energy Efficiency As The "First Fuel", ACEEE News Release dated April 9, 2008, American Council for an Energy Efficient Economy, Accessed online http://acee.org/press/0804maryland.htm.

ER Impact:

No changes to the ER are required.

Item Number 191 **ER Section 9.2.2**

Request:

Section 9.2.3.1.1 of the ER states that Maryland is planning to participate in the Regional Greenhouse Gas Initiative, which would cap CO_2 emissions from power plants unless the plants obtain emission offsets from qualified CO_2 emission offset projects. What is the current status of this Initiative?

Response:

The Regional Greenhouse Gas Initiative (RGGI) is a cooperative effort by ten northeastern and Mid-Atlantic states to reduce carbon dioxide (CO_2) emissions from electricity generating plants. RGGI includes Maryland, Connecticut, Delaware, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont.

In the United States, RGGI is the first program of its kind, a multi-state emissions cap and trade program with a market-based emissions trading system. The cap and trade program is designed to reduce CO_2, a greenhouse gas, while maintaining electricity affordability and reliability. Maryland's participation in RGGI will reduce CO_2 emissions from the State's electricity generators by roughly 10 percent from current levels by 2019.

The state of Maryland joined the RGGI on April 20, 2007 when the Governor signed the RGGI Memorandum of Understanding. Key features of the Maryland RGGI efforts are:

- Regional Focus: The program will require electric power generators in participating states to reduce CO_2 emissions.
- Who and what will be affected, when: The RGGI program will start in 2009 and include coal-fired, oil-fired, and gas-fired electric generating units that are located in the RGGI region and have a capacity of at least 25 megawatts. In 2009, emissions in the RGGI region will be capped at 188 million short tons (37.5 million short tons in Maryland.) This cap will remain in place until 2015. Then, from 2015 to 2019, emissions will be reduced a total of 10%, 2.5% per year, from this base cap.
- How does a CO_2 cap and trade program work": A cap and trade program is an approach to reducing emissions of CO_2 in a region. The program establishes: (1) a limit on the total quantity of CO_2 that can be emitted into the atmosphere, and (2) a market-based system for purchasing emissions allowances.
- What electricity generators will need to do: Maryland generators included in the RGGI program will need to purchase enough allowances from auctions or directly from the Maryland Department of the Environment to cover the tons of CO_2 that they emit.
- How many emissions allowances will be auctioned or sold: RGGI requires at least 25% of the allowances to be auctioned and the proceeds to be allocated to a public benefits fund. Maryland will auction 100% of the allowances allocated to its Consumer Energy Efficiency Account. As a safety valve, the Department

created a trigger mechanism in the cap and trade rule. Under the trigger provision, if the auction closing price reaches $7, up to 50% of a year's allowances will be reserved for purchase by the Maryland generators at $7 per allowance. This allows generators an option to purchase allowances from the Department, providing a protection against very high auction prices that could be passed on to ratepayers. The proceeds of the auctions will enhance energy efficiency efforts, including stimulating new technology and alternative fuels.

- What are offsets and how can they be used: The program will allow for offsets, or credits for greenhouse gas source reductions outside the cap, to be applied to an electricity generator's CO_2 emissions. Examples of offset projects include landfill gas capture and destruction, and tree planting. Priority will be given to in-state projects.
- What is leakage and what is RGGI doing about it: RGGI is addressing concerns about "leakage", the shifting of electricity generation from power plants in RGGI states to power plants in areas without caps on CO_2 emissions, such as Pennsylvania and states in the midwest. States within the RGGI program, including Maryland, are analyzing the impacts of leakage and evaluating energy efficiency programs designed to reduce consumer demand for electricity. Also, the three regional independent system operators (ISOs) within the RGGI region will add emissions and leakage tracking measures to their systems by the end of 2008. A federal CO_2 cap and trade program would fully eliminate the problem of leakage.

The Maryland CO_2 Cap and Trade Program was formally proposed on February 1, 2008. A copy of the Technical Document as proposed for this program is available at http://textonly.mde.state.md.us/Air/RGGI.asp

ER Impact:

No changes to the ER are required.

Item Number 192 **ER Section 9.2.2**

Request:

The third bullet on p. 9.2-8 of the ER refers to a 1999 DOE study. The study is not in the reference list in section 9.2.5 of the ER. Are there any conclusions from the study that are relevant to the COLA? If yes, provide appropriate citations to the study.

Response:

Consistent with the other U.S. Department of Energy, Energy Information Administration references, the full citation for the 1999 DOE study, which is available in the public domain via the Internet, is:

Reference:

EIA, 1999. Issues in Midterm Analysis and Forecasting 1999, EIA/DOE-0607(99). U.S. Department of Energy, Energy Information Administration, 1999.

ER Impact:

The cited reference will be added at the end of the third bullet on Page 9.2-8 of the ER, and will be added to the references listed in Section 9.2.5 of the ER in a future revision.

Item Number 193 **ER Section 9.2.2**

Request:

Provide the (CEC, 2003) reference on p. 9.2-11 of the ER, which is not in the reference list in section 9.2.5 of the ER

Response:

The full citation for the California Energy Commission (CEC) reference, which is available in the public domain via the Internet, is:

<u>Reference:</u>

CEC, 2003. Renewable Resources Development Report, Report 500-03-080F, November 2003. California Energy Commission (CEC), 2003, available online at. http://www.energy.ca.gov/reports/2003-11-24_500-03-080F.PDF, accessed June 6, 2008

ER Impact:

The cited reference will be added to the references listed in Section 9.2.5 of the ER in a future revision.

Item Number 194 **ER Section 9.2.2**

Request:

Hypothetically, what would be the best way to transport coal to a new coal generation facility sited at the CCNPP site?

Response:

Section 2.2 of the ER states that there is no operating rail line within the 8-mile vicinity of the CCNPP site, and Section 2.2.2.6 of the FSAR states there are no railroads within 5 miles (8 kilometers) of the CCNPP site. Additionally, as stated in Section 2.5.2.10.4 of the ER, there are no rail depots in Calvert County. There are also no rail depots in St. Mary's County (ORNL, 2003).

The nearest railhead (owned by CSX Transportation [CSXT]) is located at the Benedict/Chalk Point node in adjacent Prince George's County. The CCNPP Unit 1 and 2 License Renewal Application states that coal would be transported to the site by barge (15,300 tons of coal and 840 tons of limestone per day).

Reference

ORNL, 2003. Transportation Routing Analysis Geographic Information System (TRAGIS) User's Manual, Revision 0, National Transportation Research Center (NTRC), managed by UT-Battelle for DOE, ORNL/NTRC-006, Oak Ridge National Laboratory, June 2003.

ER Impact:

The following text will be added to ER Section 9.2.3.1.4 (third paragraph):

> As noted in Section 2.5.2.10.4, there is no direct rail access in Calvert and St. Mary's counties within an 8-mile vicinity of the CCNPP site. The nearest railhead, owned by CSX Transportation (CSXT), is located at the Benedict/Chalk Point node in adjacent Prince George's County (Oak Ridge National Laboratory (ORNL, 2003). Coal would need to be transported overland to the CCNPP site by heavy haul trucks or by barge on the Chesapeake Bay. As a result, the potential impacts from heavy haul traffic or from construction of a coal off-loading facility would be MODERATE to LARGE.

Additionally, the following reference will be added to Section 9.2.5:

ORNL, 2003. Transportation Routing Analysis Geographic Information System (TRAGIS) User's Manual, Revision 0, National Transportation Research Center (NTRC), managed by UT-Battelle for DOE, ORNL/NTRC-006, Oak Ridge National Laboratory, June 2003.

These changes will be made in a future revision to the ER

Item Number 195 **ER Section 9.2.2**

Request:

Where would the nearest source of natural gas be for a hypothetical natural gas-fired power plant located at the CCNPP site?

Response:

The CCNPP Units 1 and 2 License Renewal Application states that a proposed gas-fired unit would connect to an existing gas line adjacent to the site.

FSAR Section 2.2.3.1.2 states, "At its closest distance, this Dominion Cove Point Liquid

Natural Gas (DCPLNG) pipeline passes within approximately 1.54 mi (2.48 km) of CCNPP Unit 3."

ER Impact:

Text will be added to ER Section 9.2.3.2.4 (second paragraph) in a future revision to address the RAI as follows:

> A proposed gas-fired unit would connect to an existing gas line adjacent to the site. The Dominion Cove Point Liquid Natural Gas (DCPLNG) pipeline passes within approximately 1.54 mi (2.48 km) of CCNPP Unit 3. As a result, construction impacts related to connecting to an existing gas line would be SMALL.

Item Number 196 **ER Section 9.3**

Request:

What is the region of interest for the COLA? Clarify the discussion of the region in Section 9.3.1.1 and Section 9.2.1.2 of the ER which states that the region of interest is Maryland.

Response:

A response to this RAI will be provided by August 15, 2008.

ER Impact:

No changes to the ER are required.

Item Number 197 **ER Section 9.3.1**

Request:

Explain how cultural resources were considered in the site selection process. Provide references.

Response:

UniStar is currently in the process of re-evaluating candidate sites for plant siting. A response to this RAI will be provided by August 15, 2008.

ER Impact:

No changes to the ER are required.

Item Number 198 **ER Section 9.3**

Request:

Section 9.3.1.2 of the ER is not clear on what candidate areas were considered. Provide more specific detail of candidate area and potential site selection process.

Response:

UniStar is currently in the process of re-evaluating candidate sites for plant siting. A response to this RAI will be provided by August 15, 2008.

ER Impact:

No changes to the ER are required.

Item Number 199 **ER Section 9.3**

Request:

How was the list of potential sites narrowed down to the four candidate sites? Provide a detailed discussion of the process.

Response:

UniStar is currently in the process of re-evaluating candidate sites for plant siting. A response to this RAI will be provided by August 15, 2008.

ER Impact:

No changes to the ER are required.

Item Number 200 **ER Section 9.3**

Request:

Section 9.3.1.1 of the ER is not clear on what specific potential sites were considered. Provide a list of the potential sites that were considered. Table 9.3-5 in the ER implies that the only potential site considered in addition to the four candidate sites is a generic greenfield site.

Response:

UniStar is currently in the process of re-evaluating candidate sites for plant siting. A response to this RAI will be provided by August 15, 2008.

ER Impact:

No changes to the ER are required.

Item Number 201 **ER Section 9.3.2**

Request:

How much additional land would need to be purchased at the Crane site for siting a new nuclear plant? Would obtaining additional land be a reasonable possibility given that the surrounding land has been designated as a critical area under the Chesapeake Bay Critical Area statute and that the adjacent land is predominantly wetlands and is zoned for resource conservation (Section 9.3.2.1.1 of the ER)?

Response:

UniStar is currently in the process of re-evaluating candidate sites for plant siting. A response to this RAI will be provided by August 15, 2008.

ER Impact:

The ER will be updated in a future revision to reflect the results of the candidate site evaluation.

Item Number 202 **ER Section 9.3.2**

Request:

Does the Crane Generating Station combust oil as well as coal?

Response:

UniStar is currently in the process of re-evaluating candidate sites for plant siting. A response to this RAI will be provided by August 15, 2008.

ER Impact:

The ER will be updated in a future revision to reflect the results of the candidate site evaluation.

Item Number 203 **ER Section 9.3.2**

Request:

Section 9.3.3 of the ER states that the Crane Generating Station would have to be dismantled to allow construction of a new nuclear plant. Is the Crane Generating Station currently scheduled for dismantlement? Section 9.2.1.2 of the ER does not list the Crane Generating Station as slated for retirement.

Response:

UniStar is currently in the process of re-evaluating candidate sites for plant siting. A response to this RAI will be provided by August 15, 2008.

ER Impact:

The ER will be updated in a future revision to reflect the results of the candidate site evaluation.

Item Number 204 **ER Section 9.3.2**

Request:

Page 9.3-2 of the proposed revision of ESRP 9.3 calls for the candidate sites "to be among the best that can be reasonably found for the siting of a nuclear power plant." Explain how the Crane site fit within this criterion given that (1) an existing generating plant would have to be dismantled before a new nuclear plant could be built, and (2) the additional adjacent land that would be needed to site a new nuclear plant at the Crane site has been designated as a critical area under the Chesapeake Bay Critical Area statute, is predominantly wetlands, and is zoned for resource conservation (section 9.3.2.1.1 of the ER). Clarify how this zoning is consistent with the proposed revision to ESRP 9.3, which states that to be a candidate site, there should be no preemption of or adverse impacts on land specially designated for environmental, recreational, or other special purposes.

Response:

UniStar is currently in the process of re-evaluating candidate sites for plant siting. A response to this RAI will be provided by August 15, 2008.

ER Impact:

The ER will be updated in a future revision to reflect the results of the candidate site evaluation.

Item Number 205 **ER Section 9.3.2**

Request:

Section 9.3.2.2 of the ER states that collocating a new reactor with another reactor is advantageous when compared to a greenfield or brownfield site because the new reactor would be able to take advantage of the infrastructure that serves the existing reactor. Would a new reactor at the Crane brownfield site also be able to take advantage of existing infrastructure including transmission lines?

Response:

UniStar is currently in the process of re-evaluating candidate sites for plant siting. A response to this RAI will be provided by August 15, 2008.

ER Impact:

The ER will be updated in a future revision to reflect the results of the candidate site evaluation.

Item Number 206 **ER Section 9.3.2**

Request:

Explain the cultural background and known cultural resources at the alternative site locations at a reconnaissance level. Provide references.

Response:

UniStar is currently in the process of re-evaluating candidate sites for plant siting. A response to this RAI will be provided by August 15, 2008.

ER Impact:

The ER will be updated in a future revision to reflect the results of the candidate site evaluation.

Item Number 207 **ER Section 9.3.2.1.3**

Request:

Provide data on faunal diversity in the tidal creeks at Crane. Is diversity greater there than at Calvert Cliffs?

Provide data to support the contention that aquatic impacts from cooling water intake I&E and thermal effects would be MODERATE or LARGE when the same discharges would have only SMALL effects at Calvert Cliffs.

Response:

UniStar is currently in the process of re-evaluating candidate sites for plant siting. A response to this RAI will be provided by August 15, 2008.

ER Impact:

The ER will be updated in a future revision to reflect the results of the candidate site evaluation.

Item Number 208 **ER Section 9.3.2.1.3**

Request:

Identify construction impacts on aquatic resources—is there dredging required, pipeline installation?

What transmission system effects are likely?

Response:

This question is related to construction impacts at the Crane site. UniStar is currently in the process of re-evaluating candidate sites for plant siting. A response to this RAI will be provided by August 15, 2008.

ER Impact:

The ER will be updated in a future revision to reflect the results of the candidate site evaluation.

Item Number 209 **ER Section 9.3.2.1.3**

Request:

Provide the water impacts section for the Crane Generation Plant. The text provided is a repeat of air quality.

Response:

UniStar is currently in the process of re-evaluating candidate sites for plant siting. A response to this RAI will be provided by August 15, 2008.

ER Impact:

The ER will be updated in a future revision to reflect the results of the candidate site evaluation.

Item Number 210 **ER Section 9.3.2.1.9**

Request:

Provide census block level populations and key economic aspects of the area. This holds for all discussion of EJ at the alternative sites. Provide consistent years and populations for the comparisons of populations at the different sites.

Response:

UniStar is currently in the process of re-evaluating candidate sites for plant siting. A response to this RAI will be provided by August 15, 2008.

ER Impact:

The ER will be updated in a future revision to reflect the results of the candidate site evaluation.

Item Number 211 **ER Section 9.3.2.2.2**

Request:

Verify that the existing Nine Mile Point site is sufficiently large to accommodate a new nuclear unit.

Response:

As stated in Section 9.3.2.2.2, the existing Nine Mile Point site encompasses approximately 900 acres. As further stated in the ER, approximately 188 acres are currently used for power generation and support facilities, with the remainder largely undeveloped. The remaining approximately 712 acres is sufficiently large to accommodate an additional nuclear unit (Alternative Site for CCNPP) in addition to the planned new nuclear unit (Nine Mile Point Unit 3). Two areas in the western portion of the Nine Mile Point site were evaluated for determining the optimum placement of additional nuclear units.

ER Impact:

No changes to the ER are required.

Item Number 212 **ER Section 9.3.2.2.2.3 (NMP)**

Request:

Provide the water impacts section for Nine Mile Point Plant. The text provided is for air quality.

Response:

This section is related to impacts at the Nine Mile Point alternate site. UniStar is currently in the process of re-evaluating candidate sites for plant siting. A response to this RAI will be provided by August 15, 2008.

ER Impact:

The ER will be updated in a future revision to reflect the results of the candidate site evaluation.

Item Number 213 **ER Section 9.3.2.2.2.3**

Request:

Provide information about cooling water intake and discharge parameters including the extent of the thermal plume. Would nuisance species (e.g., zebra mussels) likely be a problem?

Response:

This section is related to construction impacts at the Nine Mile Point alternate site. UniStar is currently in the process of re-evaluating candidate sites for plant siting. A response to this RAI will be provided by August 15, 2008.

ER Impact:

The ER will be updated in a future revision to reflect the results of the candidate site evaluation.

Item Number 214 **ER Section 9.3.2.2.2.3**

Request:

[Not applicable]

Response:

N/A

ER Impact:

N/A

Item Number 215 **ER Section 9.3.2.2.2.3**

Request:

Construction impacts on aquatic resources need to be better identified—would dredging be required, pipeline installation? Also, transmission system effects?

Response:

This section is related to construction impacts at the Nine Mile Point alternate site. UniStar is currently in the process of re-evaluating candidate sites for plant siting. A response to this RAI will be provided by August 15, 2008.

ER Impact:

The ER will be updated in a future revision to reflect the results of the candidate site evaluation.

Item Number 216 **ER Section 9.3.2.2.3**

Request:

Verify that the existing Ginna site is sufficiently large to accommodate a new nuclear unit.

Response:

As stated in Section 9.3.2.2.3 of the ER, the Ginna site encompasses 488 acres, approximately half of which is currently leased for agricultural uses. The power station and accompanying support facilities occupy an additional quarter of the area. The remaining quarter is left largely undisturbed. The approximately 370 acres of leased agricultural and undisturbed land at the Ginna site is sufficiently large to accommodate a new nuclear unit, with the eastern portion of the site tentatively identified for the placement of an additional unit.

ER Impact:

No changes to the ER are required.

Item Number 217 **ER Section 9.3.2.2.3.3 (Ginna)**

Request:

Provide water impacts related to Lake Ontario.

Response:

This section is related to construction impacts at the Ginna alternate site. UniStar is currently in the process of re-evaluating candidate sites for plant siting. A response to this RAI will be provided by August 15, 2008.

ER Impact:

The ER will be updated in a future revision to reflect the results of the candidate site evaluation.

Item Number 218 **ER Section 9.3.2.2.3.3**

Request:

Provide information about cooling water intake and discharge parameters. What is the extent of the thermal plume? Would nuisance species (e.g., zebra mussels) likely be a problem?

Response:

This section is related to construction impacts at the Ginna alternate site. UniStar is currently in the process of re-evaluating candidate sites for plant siting. A response to this RAI will be provided by August 15, 2008.

ER Impact:

The ER will be updated in a future revision to reflect the results of the candidate site evaluation.

Item Number 219 **ER Section 9.3.2.2.3.3**

Request:

Construction impacts on aquatic resources need to be better identified—would dredging be required, pipeline installation? What would the transmission system effects be?

Response:

This section is related to construction impacts at the Ginna alternate site. UniStar is currently in the process of re-evaluating candidate sites for plant siting. A response to this RAI will be provided by August 15, 2008.

ER Impact:

The ER will be updated in a future revision to reflect the results of the candidate site evaluation.

Item Number 220 **ER Section 9.3.2.2.3.3**

Request:

Describe the cumulative effects (of land use, hydrological and ecological resources, radiological releases) of adding a new plant to the existing one.

Response:

This section is related to construction impacts at the Ginna alternate site. UniStar is currently in the process of re-evaluating candidate sites for plant siting. A response to this RAI will be provided by August 15, 2008.

ER Impact:

The ER will be updated in a future revision to reflect the results of the candidate site evaluation.

Item Number 221 **ER Section 9.3.3**

Request:

Section 9.3.3 states that terrestrial impacts at the Calvert site would be no greater than at the alternative sites. Table 9.3-5 shows that potential terrestrial impacts at the Crane site would be less than at Calvert. Explain the difference in terrestrial impacts between the Crane site and the Calvert site.

Response:

UniStar is currently in the process of re-evaluating candidate sites for plant siting. A response to this RAI will be provided by August 15, 2008.

ER Impact:

The ER will be updated in a future revision to reflect the results of the candidate site evaluation.

Item Number 222 **ER Section 9.3.3**

Request:

Table 9.3-5 of the ER states that the greenfield site is a candidate site. Section 9.3.1.2 of the ER states that the use of a greenfield site is not carried forward as an alternative site and that only the three existing nuclear sites plus the Crane site were considered as candidate sites. Clarify the use of a greenfield site as a candidate site.

Response:

UniStar is currently in the process of re-evaluating candidate sites for plant siting. A response to this RAI will be provided by August 15, 2008.

ER Impact:

The ER will be updated in a future revision to reflect the results of the candidate site evaluation.

Item Number 223 **ER Section 10.1**

Request:

Table 10.1-1: Housing is not a mitigation measure for impacts on public services. Provide separate listing of impacts and mitigation measures for housing and public services.

Response:

The Socioeconomic impacts category in Table 10.1-1 has been modified to indicate that there will be small impacts on public services and housing has been set apart as a separate adverse impact line item within this impacts category. The updated table is provided in the response to RAI Item Number 225.

ER Impact:

Table 10.1-1 will be revised in a future revision of the ER.

Item Number 224 ER Section 10.1

Request:

Some impact areas list minor impacts that remain after mitigation; however, the table states that "no unavoidable adverse impacts" occur. (e.g., Socioeconomic, Table 10.1-1, pg. 6) List residual impacts remaining after mitigation measures have been taken as Unavoidable Adverse Impacts or justify an alternate treatment of the residual impacts.

Response:

1) Information on housing has been added to the Socioeconomic impacts category in Table 10.1-1

2) Information on public services has been added to Table 10.1-2 including housing.

3) Information on potential spills has been added to the Land Use impacts category in Table 10.1-2

4) Traffic is addressed in both tables

The updated tables are provided in the response to RAI Item Number 225.

ER Impact:

Tables 10.1-1 and 10.1-2 will be revised in a future revision of the ER.

Item Number 225 **ER Section 10.1**

Request:

Coverage of topics between tables appears unbalanced. Example: worker traffic for operations is listed, but not for construction. Identify, as applicable, the same range of impacts for both the construction and operations phases. Reconcile differences between Chapters 10 and 5 in mitigation for operations effects on public services.

Response:

Following a review of the Tables 10.1-1 and 10.1-2, additional information has been added to each regarding public services.

Additional information will be added to Section 10.5.1 in the paragraph that starts with Socioeconomic Benefits, at the end of the sentence that ends in "public services":

> During construction a total of approximately 410 households would move into Calvert County and 135 into St. Mary's County (ER Section 5.8.2.2). The total number of individuals (CCNPP Unit 3 construction and operations workforce) would increase by about 2,466 in Calvert County and 834 in St. Mary's County. This influx may impact various public service institutions such as fire, EMS, education and recreational facilities. However, as a percentage, the increase in population is small and existing Comprehensive County Plans are in place to address the needs of an expanding population base.

ER Impact:.

Tables 10.1-1 and 10.1-2 will be updated in a future revision of the ER per the attachment. Section 10.5.1 of the ER will be revised as noted above.

Table 10.1-1 Construction-Related Unavoidable Adverse Environmental Impacts (Page 1 of 6)

Impact Category	Adverse Impact	Mitigation Measures	Unavoidable Adverse Environmental Impacts
Land Use	{Approximately 420 acres (170 hectares) of land will be disturbed of which 281 acres (114 hectares) will be permanently committed to power plant structures and roads for CCNPP Unit 3.}	{Comply with applicable federal, state and local construction permits/approvals including Coastal Zone Management guidelines. Clear only areas necessary for installation of power plant infrastructure and implement construction Best Management and Storm Water Protection Plans. Limit activities in the 500 year flood plain to those associated with the intake structures. Implement a Site Resource Management Plan. Acreage will be restored/revegetated following construction to the maximum extent possible. Use of existing transmission corridor right-of-ways. Implement Storm Water Pollution Prevention Plan (SWPPP), including sediment and erosion control. Implement Spill Prevention Control and Countermeasures (SPCC) Plan. Use site Resource Management Plan and Best Management Practices (BMP) to protect resources such as wetlands and streams in vicinity; also, onsite land is not used for farmland nor is it considered prime or unique. Obtain individual U.S. Army Corps of Engineers 404 Permit; comply with BMP requirements. Obtain Maryland Non-Tidal Wetlands Protection Act permit; comply with BMP requirements.}	{281 acres (114 hectares) of land will be permanently occupied by nuclear plant infrastructure.}

Table 10.1-1 Construction-Related Unavoidable Adverse Environmental Impacts (Page 2 of 6)

Impact Category	Adverse Impact	Mitigation Measures	Unavoidable Adverse Environmental Impacts
Land Use (continued)	Potential to disturb archaeological and architectural sites during construction	Undertake extensive archaeological survey of site prior to construction. Review significance of sites with the {Maryland State Historic Preservation Officer (SHPO)} and develop plans to avoid and/or minimize impacts to these sites. Develop procedures compliant with Federal and State laws to protect cultural, historical or paleontological resources or human remains in the event of discovery during construction.	Small potential for destruction of unanticipated historic and/or cultural resources.
Hydrologic and Water Use	Construction has the potential to change drainage characteristics, flood handling, and erosion and sediment transport.	Implement BMP and Storm Water Pollution Prevention (SWPPP) Plans according to applicable Local and State regulations to limit erosion and contamination of surface waters. Comply with the U.S. Army Corps of Engineers 404 Permit.	Potential erosion of sediments into surface waters {and local, temporary depression in the water table due to dewatering activities}.
	Construction will require approximately {250 gpm} of groundwater withdrawal.	{Water use controlled within the existing CCNPP Units 1 and 2 allowable withdrawal appropriations. Monitor perched and groundwater water levels. Use offsite water supply, as needed. Following construction, use of groundwater will be replaced with water provided by a desalinization unit. Dewatering ponds will assist with groundwater recharge and sediment control.}	{Temporary drawdown of the aquifer and redirection of recharge source water during construction.}
	Surface and subsurface water quality could be affected by construction activities.	Implement BMP and SWPPP. Monitor water quality in construction impoundments and compare to applicable criteria and historic data. Comply with the U.S. Army Corps of Engineers 404 Permit requirements. Use site Resource Management Plan to protect resources such as wetlands and streams in vicinity. Implement Spill Prevention, Control, and Countermeasures (SPCC) Plan.	Potential for contamination of subsurface groundwater.

Table 10.1-1 Construction-Related Unavoidable Adverse Environmental Impacts
(Page 3 of 6)

Impact Category	Adverse Impact	Mitigation Measures	Unavoidable Adverse Environmental Impacts
Aquatic Ecology	{Two onsite ponds and a small stream will be permanently affected; others will experience temporary impairment resulting in elimination and/or displacement of aquatic species.}	{Implement BMP and SWPPP to limit erosion and sedimentation. Review CCNPP historic survey database to identify important aquatic species; conduct new surveys, as needed. Use site Resource Management Plan and BMP to protect resources.}	{Aquatic resources in the ponds and stream will be permanently lost.}
	{Chesapeake Bay marine life may be affected due to increased suspended sediment, dredging for the intake, and removal of substrate for the discharge structure.}	{Activities at the intake will occur within a sheet pile barrier. Dredging for the discharge will be confined to a small area and will quickly recolonize based on prior experience. Implement SWPPP, including sediment and erosion control and the construction of new impoundments, as appropriate. Comply with the U.S. Army Corps of Engineers 404 Permit requirements. Implement SPCC Plan. No marine or aquatic endangered species are expected to be impacted.}	{Benthic organisms in the dredged areas will be temporarily removed.}

Table 10.1-1 Construction-Related Unavoidable Adverse Environmental Impacts
(Page 4 of 6)

Impact Category	Adverse Impact	Mitigation Measures	Unavoidable Adverse Environmental Impacts
Terrestrial Ecology	{Vegetation loss will occur in certain construction areas, including mixed forest, old field, and wetlands habitats.}	{Restore available old field not impacted by CCNPP with mixed deciduous forest to provide an overall net gain and provide a suitable location to transplant the showy goldenrod from the Camp Conoy area. Perform activities in wetlands in accordance with permit requirements of Section 404 of the Clean Water Act and the Maryland Non-tidal Wetlands Protection Act including setbacks and erosion controls. Facilities will be sited to limit wetland encroachment. Review CCNPP historic survey database to identify important terrestrial species; conduct new surveys, as needed. Use site Resource Management Plan and BMP to protect resources. Preserve aesthetically outstanding tree clusters, as practical; harvest merchantable timber; use or recycle other woody material, as appropriate; develop reforestation plan. Obtain individual U.S. Army Corps of Engineers 404 Permit; comply with BMP requirements. Obtain Maryland Non-Tidal Wetlands Protection Act Permit; comply with BMP requirements. Acreage will be restored following construction to the maximum extent possible.}	{A limited amount of mixed deciduous forest will be lost. A portion of onsite wetlands will be lost.}

Table 10.1-1 Construction-Related Unavoidable Adverse Environmental Impacts (Page 5 of 6)

Impact Category	Adverse Impact	Mitigation Measures	Unavoidable Adverse Environmental Impacts
Terrestrial Ecology (continued)	{Designated bird species may be displaced or disturbed.}	{Manage forest habitat specific to key bird species to limit habitat fragmentation. Reclamation of old fields will contribute to added forest habitat. Consult with appropriate agencies regarding avoidance and appropriate mitigation measures, if necessary, for bald eagle nests. Design construction footprint to account for Chesapeake Bay Critical Area and other important habitat, including bald eagle nests. Minimize lighting, as practicable and allowed by regulation. No activities will take place in the most favorable habitat area for the two threatened beetles, thereby avoiding impact.	{No unavoidable impacts.}
Socioeconomic	Construction workers, existing employees and local residents could be affected by increased dust, noise, emissions and traffic.	{Onsite noise will be maintained within applicable Maryland limits and OSHA noise-exposure limits. Limit construction activities resulting in non-routine noise levels to day time. Train construction workers and employees in use of appropriate personal protective equipment Develop fugitive dust and vehicle emissions control strategies in conformance with air quality standards and best management practices. Ameliorated traffic congestion with improvements to site access road from Maryland State Route 2/4 and with onsite shift changes. Comply with applicable U.S. EPA and Maryland Department of the Environment (MDE) air quality regulations. Install new site perimeter and access road.	{No unavoidable impacts.}

Table 10.1-1 Construction-Related Unavoidable Adverse Environmental Impacts (Page 6 of 6)

Impact Category	Adverse Impact	Mitigation Measures	Unavoidable Adverse Environmental Impacts
Socioeconomic (continued)	Public services supporting construction activities and expanded work force may be impacted. Influx of workers may impact housing availability.	Minor aggregate socioeconomic impacts anticipated; mitigation not required.} Town Comprehensive Plans address stressors associated with population growth. There are adequate numbers of vacant housing units to accommodate the influx of workers.	{Small increase in emergency calls, number of new students, temporary housing.} No unavoidable adverse impacts.
Radiological	{Construction workers will be exposed to small doses of radiation from existing units.}	{All doses will be within 10 CFR 20.1301 limits. Implement ALARA practices at construction site.}	{Small doses to construction workers.}
Atmospheric and Meteorological	Construction will cause increased air emissions from traffic and construction equipment, and fugitive dust.	Train construction workers and employees on appropriate personal protective equipment. Develop fugitive dust and vehicle emissions control strategies in conformance with air quality standards and best management practices. Equipment maintenance plans. Comply with applicable U.S. EPA {and MDE} air quality regulations.	No unavoidable adverse impacts.
Environmental Justice	{No disproportionate impacts to low income or minority groups were identified.}	{None.}	{No unavoidable adverse impacts.}
Non-radiological Health Impacts	Risk to workers from accidents and occupational illness.	Implement construction site-wide health and safety program.	Industrial worker accidents may occur.

Table 10.1-2 Operations-Related Unavoidable Adverse Environmental Impacts

Impact Category	Adverse Impact	Mitigation Measures	Unavoidable Adverse Environmental Impacts
Land Use	{The CCNPP Unit 3 footprint will permanently occupy a portion of the site.	{Limit area required during design and construction.	{Land use is consistent with current operations at the site.
	Some potential impact on land and water courses from spills and discharges	Maintain Storm Water Pollution Prevention Plan (SWPPP), including sediment and erosion control. Maintain Spill Prevention Control and Countermeasures (SPCC) Plan.	No unavoidable impacts
	Operation of the new unit will increase radioactive and non-radioactive waste disposal in landfills and onsite in long-term storage facilities.}	Implement a waste minimization, pollution prevention program to limit waste generation.}	Some land will be dedicated to offsite and onsite waste storage and will not be available for other uses.}
	Transmission line maintenance may have some impact on vegetation and wildlife.	Best management practices will mitigate potential impacts from vegetation control and other ROW activities.	Unavoidable but small impacts may occur as a result of keeping the ROWs in a safe condition.
Hydrologic and Water Use	{Circulating water supply system makeup water will be withdrawn from Chesapeake Bay potentially affecting near-shore hydrology.	{Implement closed-cycle cooling and reduce water use.	{No unavoidable impact.
	Evaporative loss of water from the cooling tower represents a consumptive use.}	Use desalination to supply makeup water; minimize use of groundwater resources.}	A limited amount of cooling water taken from Chesapeake Bay will be consumed through evaporative loss.}
Aquatic Ecology	{Cooling water withdrawal will result in impingement and entrainment.	{Implement closed-cycle cooling. Limit intake velocity.	{Some limited entrainment and impingement will occur.
	Thermal plume may impact aquatic species abundance and distribution.	Meet all applicable state and federal regulatory requirements regarding the discharge of heat. The diffuser is being designed to rapidly disperse the thermal discharge.	A small thermal plume will be created.}

Table 10.1-2 Operations-Related Unavoidable Adverse Environmental Impacts (Page 2 of 4)

Impact Category	Adverse Impact	Mitigation Measures	Unavoidable Adverse Environmental Impacts
Aquatic Ecology (continued)	Biofouling and other process control chemicals will be discharged.	Meet all applicable state and federal Clean Water Act and NPDES permit regulations and limitations.	Chemicals will be discharged in small quantities.
	Recreational and commercial fishing may be impacted by impingement and entrainment.}	Implement closed-cycle cooling.}	No unavoidable adverse impacts.}
Terrestrial Ecology	{Operation of the cooling tower would result in a visible plume, fogging, icing and salt deposition.	{Use of low-profile cooling tower with drift eliminators to limit evaporative loss and deposition.	{The tower plumes will be visible from beyond the site boundary and from Chesapeake Bay
	Salt deposition from the cooling tower operations will have some impact on terrestrial vegetation.		No unavoidable adverse impacts.
	Bird collisions with the tower may occur.}	Use of low-profile cooling tower and lower lighting.}	{No unavoidable adverse impacts.}
Socioeconomic	{Operating nuclear plants emit low noise.	Studies demonstrate noise levels on and offsite will meet applicable regulations.	No unavoidable adverse impacts.
	The additional transmission line has potential to cause electric shock onsite	Design to NESC code to minimize potential impacts.	No unavoidable adverse impacts.
	Cooling tower and plume may impact existing site aesthetics.	Site contours and the forest canopy limit landward visibility. The new facilities will be consistent with existing uses. The towers will have a low-profile.	The cooling tower plume will be visible from Chesapeake Bay, and inland offsite during winter.

Table 10.1-2 Operations-Related Unavoidable Adverse Environmental Impacts (Page 3 of 4)

Impact Category	Adverse Impact	Mitigation Measures	Unavoidable Adverse Environmental Impacts
Socioeconomic (continued)	An additional 363 permanent staff will increase traffic during shift changes.	A new access road and interconnection with Maryland State Route 2/4 will limit traffic congestion. Heavy plant components will be barged in.	No unavoidable adverse impacts.
	Air quality could potentially be affected due to onsite diesel generators.	Conform to state and federal emission standards and permit requirements.	No unavoidable adverse impacts.
	Population increases due to added staff may affect public services.}	Existing capacity exists to absorb the increased population related services.}	No unavoidable adverse impacts.}
	Public services supporting the increased operations work force may be impacted	County Comprehensive Plans address population growth, housing, land use, recreation and public services	Small increase in emergency calls, students use of recreational facilities.
	Increased direct and indirect work force and increased population may impact housing availability.	The number of vacant housing units will be adequate to accommodate the increased work force.	
Radiological	{Potential doses to members of the public from releases to air and surface water.	All releases will be well below regulatory limits.	{No unavoidable adverse impacts.
	General public and worker exposure to radiation during incident-free transport of fuel and wastes.}	Detailed analysis performed in accordance with 10 CFR 51.52(b), yielding conservative results.}	No unavoidable adverse impacts.}
Atmospheric and Meteorological	{The cooling tower plume will traverse the site.}	{Use of cooling tower drift eliminators to limit drift losses.}	{During certain times of the year, the plume will be visible offsite.}

Table 10.1-2 Operations-Related Unavoidable Adverse Environmental Impacts (Page 4 of 4)

Impact Category	Adverse Impact	Mitigation Measures	Unavoidable Adverse Environmental Impacts
Environmental Justice	{No disproportionately high or adverse impacts on minority or low income populations are predicted}	{None required.}	{No unavoidable adverse impacts.}
Non-radiological Health Impacts	{Potential growth of infectious organisms within the Essential Service Water System cooling towers.	{Apply best management biocide treatment to limit growth and dispersal of harmful organisms.}	{No unavoidable adverse impacts.
	Risk to workers from occupational related accidents and illnesses.}	Implement site-wide Safety and Medical Program.}	Some accidents are likely to occur.}

Item Number 226 **ER Section 10.2**

Request:

Provide a discussion of transmission line impacts discussed in Chapter 5.

Response:

It is assumed that this comment applied to Table 10.1-2. Additional information has been added to the Land Use impacts category to address ROW maintenance.

ER Impact:

A change to the ER is required.

Table 10.1-2 will be revised in the ER. (See response to RAI 225 for revised table)

Item Number 227 **ER Section 10.2**

Request:

Provide data on US reserves of materials used in construction. Include data on major materials not included in the list, such as copper, stainless steel, iron, etc.

Response:

Information regarding the availability and production of construction materials was found in several sources:

- **USCB, 2006a.** U.S. Census Bureau 2006 Annual Trade Wholesale Report. Table 1. Estimated Sales and Inventories of U.S. Merchant Wholesalers 2002 through 2006.
- **USCB, 2008.** US Census Bureau. Statistical Abstract of the United States: 2008, Table 868, Natural Resources. April, 2008
- **USCB, 2006b.** US Census Bureau Survey of Plant Capacity: 2006. U.S. Department of Commerce, Economics and Statistics Administration.

The inventories of construction materials tabulated by the US Census Bureau for 2002, 2005 and 2006 are shown in Table 1. In general, construction supplies increased from 2002 through 2006 suggesting that such commodities will continue to be available for the foreseeable future in response to demand (USCB, 2006a)

Similarly, inventories of minerals and related construction materials have remained relatively stable between 2000 and 2005 (Table 2) (USCB 2008).

Another important measure is industry capacity in those sectors that may affect nuclear power plant construction. In general, the data suggest that most industries have surplus capacity (Table 3). USCB (2006b) found that during the fourth quarter of 2007, U.S. domestic manufacturing plants collectively used only 70% of their full production capacity.

Table 1. Estimated Inventories of Construction Supplies Based on U.S. Merchant Wholesalers Data in 2002, 2005 and 2006 (USCB, 2006a)

Category	Inventories ($\$x10^6$)		
	2002	2005	2006
Metals and Minerals	14,750	23,782	29,567
Electrical Goods	28,188	32,098	35,747
Hardware, Plumbing, Heating equipment and supplies	12,855	15,385	16635
Machinery, Equipment, and Supplies	53,495	65,237	70,866
Lumber & Other Construction Materials	10,300	16,524	17,080

Table 2. U.S. Mineral Production in 2000, 2005 and Estimated for 2006 (USCB 2008)

Category	Inventory		
	2002	2005	2006 est
Inventories Per 1000 metric tons			
Aluminum (Per 1000 metric tons)	3,688	2,481	2,280
Cooper (Per 1000 metric tons)	1,450	1,140	1,200
Iron ore (mil. metric tons)	61	53	53
Lead (Per 1000 metric tons)	449	426	430
Titanium (Per 1000 metric tons)	300	300	300
Zinc (Per 1000 metric tons)	805	748	725
Portland Cement (mil. metric tons)	84	94	94
Masonry Cement (mil metric tons)	4	5	5
Construction Sand and Gravel (mil. metric tons)	1,120	1,270	1,280

Table 3. Percent Capacity Utilization Rates by Industry (USCB 2006b)

Industry	2002	2003	2004	2005	2006
Primary Metal Manufacturing	71	72	74	79	73
Ferrous Metal Foundries	62	63	68	72	72
Nonferrous Metal Foundries	65	63	60	66	64
Fabricated Metal Products	59	61	66	68	70
Electrical Equipment	60	64	69	68	69

ER Impact:

The following text will be included in Section 10.2.2.

> The inventories of construction materials tabulated by the US Census Bureau for 2002, 2005 and 2006 are shown in Table 10.2.2-2. In general, construction supplies increased from 2002 through 2006 suggesting that such commodities will continue to be available for the foreseeable future in response to demand (USCB, 2006a)
>
> Similarly, inventories of minerals and related construction materials have remained relatively stable between 2000 and 2005 (Table 10.2.2-3) (USCB, 2008). Another important measure is industry capacity in those sectors that may affect nuclear power plant construction. In general, the data suggest that most industries have surplus capacity (Table 10.2.2-4). USCB (2006b) found that during the fourth quarter of 2007, U.S. domestic manufacturing plants collectively used only 70% of their full production capacity.

Additionally, the tables provided in response to this RAI Item will be incorporated into ER as Tables 10.2-2 through 10.2-4.

These changes will be incorporated in a future revision of the ER.

Item Number 228 **ER Section 10.4.1.2**

Request:

"The evaluation indicated that neither a coal-fired nor a gas-fired facility would appreciably reduce overall environmental impacts relative to a new nuclear plant." This seems to conflict with the subsequent sentence in the section and with Chapter 9. Explain.

Response:

UniStar is currently in the process of re-evaluating candidate sites for plant siting. A response to this RAI will be provided by August 15, 2008.

ER Impact:

The ER will be updated in a future revision to reflect the results of the candidate site evaluation.

Item Number 229 **ER Section 10.4.1.3**

Request:

Provide the criteria used to conclude that Nine Mile Point (360 miles) and Ginna (345 miles) (a) are in “relatively close proximity to the CCNPP,” or (b) meet Maryland’s goal to reduced reliance on imported electric power stated in Sec. 8.0.

Response:

As stated in response to RAI Item Number 188, the relevant service area evaluated in Chapter 8 is consistent with the wholesale market area of Maryland and New York that Constellation participates in for electricity sales. Both Nine Mile Point and Ginna are located within this area and, therefore, are in relatively close proximity to CCNPP from the perspective of being within the Region of Interest and Candidate Areas. In addition, a new nuclear unit constructed at an existing New York nuclear power plant is able to meet the identified need for power requirements in Maryland because the new nuclear power plant would be a merchant plant and not limited to selling electricity within New York.

Although consideration of two alternative sites in New York approximately 350 miles from the CCNPP does not satisfy Maryland's goal to reduce reliance on imported power, a merchant plant constructed at either of the existing Nine Mile Point or Ginna nuclear plant sites in New York could still provide electricity to Maryland to address the identified power needs in the state.

ER Impact:

No changes to the ER are required.

Item Number 230 **ER Section 10.4**

Request:

Provide additional monetary values for the cost categories (Table 10.4-1). List the benefits separately from the costs. Identify the baseline assumption made to determine the costs and benefits of operating CCNPP Unit 3.

Response:

UniStar is currently in the process of re-evaluating candidate sites for plant siting. A response to this RAI will be provided by August 15, 2008.

ER Impact:

The ER will be updated in a future revision to reflect the results of the candidate site evaluation.

Item Number 231 **ER Section 10.5.1**

Request:

Identify other agency activities in the area and related cumulative impacts of Unit 3 in concert with other stressors in the region.

Response:

Section 10.5.3 provides a discussion of the cumulative impact of other agency activities in the region.

ER Impact:

No changes to the ER are required.

Item Number 232 **ER Section 10.5.1**

Request:

Identify other projects in the region not included in Section 2.8.

Response:

UniStar has not identified any planned projects in Calvert or St. Mary's Counties of a size that would significantly impact the availability of labor, construction materials, housing or public services. The Tri-County Council for Southern Maryland (TCC, 2007) has identified numerous projects in their 2007 inventory but most of these are smaller scale transportation and infrastructure improvements. Of these, the construction of an additional span on the Governor Thomas Johnson Memorial Bridge may compete for resources depending on its timing and duration but should not materially impact resources available to Calvert Cliffs Unit 3. Other transportation projects include improvements to MD State Route 2/4, and possible modifications to the Captain Walter F. Duke Regional Airport.

Reference:

TTC, 2007. Tri-County Council for Southern Maryland. Regional Transportation Needs Inventory (FY, 2007). Hughesville, Maryland.

ER Impact:

No changes to the ER are required.

Item Number 233 **ER Section 10.5**

Request:

Provide the criteria used to calculate the carbon dioxide equivalent emissions avoided by operating CCNPP Unit 3 (page 10.5-6).

Response:

The calculation of Greenhouse Gas Equivalents is explained in Chapter 9.2.3.1.1. Coal was assumed to be 2% by weight and currently available emissions controls were assumed for a 1600 MWe coal plant (Table 9.2-2). The warming effect of CO_2 is assigned a value of 1 compared to other green house cases. The green house gas equivalent is expressed in terms of million metric tons of carbon dioxide equivalents. Calculations for natural gas are also given in Table 9.2-2. The numbers provided in ER Section 10.5 (Page 10.5-6) were based on tons per year, the numbers should be in metric tons. As a result, the amounts of CO_2 equivalents given in Chapter 10 should be 1,731,000 metric tons for coal and 565,000 metric tons for gas.

ER Impact:

A change to the ER is required.

The text in ER Section 10.5 (page 10.5-6) will be updated in a future revision of the ER, as follows:

> By contrast, CCNPP Unit 3 operation would avoid the emission of approximately 1,731,000 CO2e (CO2 equivalent) from coal combustion and 565,000 CO2e from natural gas combustion.

Item Number HP-1

ESRP/ER Sections 2.3.3, 3.3.2, 3.4.2, 3.6.2, 3.6.3 4.2.1, 4.2.2, 5.2.3

Request:

All liquid effluent discharges during plant operation would be monitored and regulated by NPDES permits, issued by the State of Maryland Department of the Environment (MDE). References to these NPDES permits appear in Sections 2.3.3, 2.3.3.1.2, 3.3.2, 3.4.2.2, 3.6.2, 3.6.3.2, 4.2.1.2, 4.2.1.7, 4.2.1.8, 4.2.2.3, 4.2.2.5, 4.2.2.11, 4.2.2.12, 5.2.3.1. How many actual NPDES permits are expected to be associated with Unit 3, and which sections pertain to which permits (e.g., effluent water streams, Waste Water Retention Basin, brine, sewerage treatment and sanitary waste, desalinization plant, cooling tower blowdown, stormwater runoff, submerged diffuser releases, intake screen backwash, free available chlorine, free available oxidants, chromium, zinc, biocides, chemical additives, oil, antifreeze, etc.)? What are the anticipated discharges or discharge limits, concentrations, and constituents covered by the permits?

Response:

There will be a single discharge point for liquid effluents related to CCNPP Unit 3 operations. Liquid effluent streams from the CWS and ESWS cooling tower blowdown, the brine stream from the desalination plant, the sanitary wastewater treatment system, and site waste streams will be collected in a common waste water retention basis and discharged. There will also be a liquid discharge associated with the fish return system for CCNPP Unit 3. In addition, there will be storm water released from the storm water management system for the operating plant.

These discharges will be managed under an NPDES permit for plant operations which will include a Storm Water Pollution Prevention Plan. Based on the NPDES permit for CCNPP Units 1 and 2, discharge parameters that will likely be subject to consideration under the NPDES permit for CCNPP Unit 3 include biological oxygen demand, residual chlorine, residual bromine, cyanuric acid, fecal coliform, oil an grease, pH, temperature, and total suspended solids. As reported in ER Section 6.6 of the ER, monitoring data for CCNPP Units 1 and 2 showed discharge levels for these parameters were in the acceptable range.

The characteristics of the releases that will make up the total discharge to the Chesapeake Bay from CCNPP Unit 3 are provided in the response to RAI Item Number 85. Table 1 in that response shows the relative contributions to the waste water retention basin discharge, which is 19,426 gallons per minute under normal operating conditions. The individual waste stream contributions to the total are as follows:

- CWS cooling tower blowdown 90.3%
- ESWS cooling tower blowdown 0.3%
- Desalination plant waste 8.7%
- Misc. low volume waste 0.2%
- Treated sanitary waste 0.4%

Table 2 in the response to RAI Item Number 85 provides estimates of the chemical constituent concentrations in the each of these discharges and in the combined discharge based on currently-available design data. More precise determinations of the amounts of these constituents will be made as part of the NPDES permitting process. The concentrations of the chemical constituents in the total discharge to the Chesapeake Bay are very low. The constituents of the three main waste streams are driven by their original source of water, the Chesapeake Bay.

While some chemicals are added to the blowdown for biological control, these are added in relatively small amounts. Prior to any mixing in the Chesapeake Bay, the concentrations of chemicals in the discharge that have Aquatic Life chronic salt water limits in COMAR are less than 1/32nd, or less of these limits. The low chemical concentrations in the total discharge will rapidly diminish as the discharge mixes with the water in the Chesapeake Bay.

ER Impact:

No changes to the ER are required.

Item Number HP-2 **ESRP/ER Section 2.3.2.2.7**

Request:

The ER reports that the Maryland Geological Survey (MGS) continues to conduct studies, including modeling efforts, to understand and predict the effects of increasing groundwater demands of the Coastal Plain aquifers within the State of Maryland. New users (or existing users 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. Clarify whether this means that Unit 3 could withdraw and use water from the existing Permit for CCNPP Units 1 and 2.

Response:

ER Table 2.3.2-7 shows that withdrawals from the Aquia aquifer by plant wells under the groundwater withdrawal permit for CCNPP Units 1 and 2 averaged 141E6 gallons per year (534E6 liters per year), which is equivalent to approximately 268 gpm (1,015 lpm). As shown in ER Table 2.3.2-6, the yearly withdrawal limit under this permit [CA69G010 (05)] is 450,000 gallons per day (1,703,435 liters per day), which translates to 312.5 gpm (1,183 lpm). The unused portion of the water allocation for the Aquia aquifer amounts to an average withdrawal rate of 44.5 gpm (168.4 lpm).

The permit for groundwater withdrawal from the Aquia aquifer for CCNPP Units 1 and 2 was issued on the basis that that this allocation would not result in lowering the potentiometric level in the aquifer below the 80 percent management level. As shown on ER Figure 2.3.2-20, over the last three and a half years the potentiometric level has not declined in the onsite Aquia well that serves as a USGS observation well. As a result, it is considered likely that the MDE will agree to the additional average withdrawal of the unused portion of the currently permitted withdrawal authorization (44.5 gpm) to support CCNPP Unit 3, provided the daily average for the month of maximum use does not exceed approximately 85 gpm for this purpose.

ER Table 4.2-1 indicates that the expected freshwater requirements during construction activities for CCNPP Unit 3 would not exceed 39,269,844 gallons (148,650,000 liters), which amounts to approximately 75 gpm (559 lpm) on an average annual basis. Assuming that additional withdrawals from the Aquia wells equivalent to the unused portion of the groundwater withdrawal authorization for CCNPP Units 1 and 2 can be permitted for use at CCNPP Unit 3 at an average of 44.5 gpm for construction activities, an additional 30.5 gpm will need to be obtained by trucking in water from offsite or by constructing a well tapping another (probably deeper) aquifer. Because the peak water use rate for construction is estimated to be as high as 1,200 gpm (4,540 lpm), an onsite water storage facility will be required to meet the water demands during construction. The capacity of the storage tank(s) will depend upon the results of an analysis of the expected hour-by-hour water demands during the period of construction when peak water demands are expected.

Several engineering options are being explored to address the calculated shortfall between expected construction water use and the unused portion of the CCNPP Unit 1 and 2 allocation for the Aquia aquifer, including trucking of water from offsite wells and constructing a well tapping the next lower aquifer below the Aquia. Also, a groundwater flow model is being developed for evaluating the likely impacts of incremental increased pumping from the Aquia aquifer for this purpose.

ER Impact:

No changes to the ER are required.

Item Number HP-3 ESRP/ER Section 3.6.3.5

Request:

Under Solid Effluents, it is stated that operation of an industrial waste facility for private use at the CCNPP site does not require a permit but must comply with the regulations imposed by the State of Maryland for construction, installation and operation of solid waste facilities. It goes on to note that debris (e.g., vegetation) collected on trash racks and screens at the water intake structure are disposed of as solid waste in accordance with the applicable NPDES permit. Solid "effluents" must comply with regulations (which sounds like a permit situation), and solid "waste" requires a permit. Provide a clear explanation associated with the disposal of solid "wastes/effluents" and identify which wastes are associated with which permits.

Response:

Both hazardous and non-hazardous waste streams are considered solid wastes. As described in ER Section 3.6.3.3, the generation, storage, treatment and disposal of hazardous wastes are regulated by EPA and the State of Maryland. The criteria for determining whether a solid waste is hazardous are also described (i.e., ignitability, corrosivity, reactivity or toxicity).

With respect to hazardous wastes, regulations apply to a broad spectrum of activities associated with hazardous waste management. While permits are required for hazardous waste facilities that qualify as treatment, storage, and disposal facilities, they are not required for facilities that are considered generators of hazardous wastes. CCNPP Unit 3 will be considered as a hazardous waste generator, but will not qualify as a treatment, storage, and disposal facility.

ER Table 3.6-6 lists the quantities of specific hazardous waste streams generated by CCNPP Units 1 and 2 for three different years. This information is provided as a representative example of hazardous waste types and volumes that may be generated by CCNPP Unit 3. CCNPP Unit 3, as a generator of hazardous wastes, would not need a permit, as long as it is able to manage hazardous waste onsite while maintaining generator status.

Generators of non-hazardous solid waste in Maryland are not subject to waste management permit requirements, however, most facilities receiving, storing, processing, treating, and disposing of non-hazardous waste must obtain a State permit to operate. The types of non-hazardous solid waste generated by CCNPP are described in Section 3.6.3.5. CCNPP does not require a permit to generate non-hazardous solid waste; however, the offsite facilities receiving this waste will require permits.

ER Impact:

No changes to the ER are required.

Item Number HP-4 **ESRP/ER Section 4.2.1.7**

Request:

On page 4.2-7, a Storm Water Pollution Prevention Plan is mentioned to control runoff from construction areas. Provide the anticipated contents and the effective impact mitigation of the Storm Water Pollution Prevention Plan.

Response:

A storm water management plan for the site has been prepared, which includes details of the planned erosion and sediment control measures and the primary features of the planned storm water management system (Calvert Cliffs Unit 3 Storm Water Management Plan dated April 2008).

As described in the storm water management plan, best management erosion and sediment control measures will be selected and implemented to insure that the water quality downgradient of the power block area and the adjoining construction laydown area will not be noticeably altered. These measures will be implemented by installation of *initial, intermediate,* and *final* erosion and sedimentation controls, which will be designed, constructed and maintained according to the Calvert County Soil Conservation District standards and specifications.

Initial controls will be installed prior to construction commencement and will include perimeter protection fencing and controls and strictly-controlled construction exits. *Intermediate* controls will include silt fencing, sediment ponds, diversion dikes and stone check dams if necessary to control erosion and storm water runoff. During the grading and construction phase; additional intermediate erosion controls will be put in place as land disturbance occurs. Erosion control devices will be implemented or modified as the drainage patterns for storm water are constructed. All disturbed land left exposed for 7 days (steep slopes) to 14 days (gentle slopes) will be mulched or temporary grass cover will be provided.

Final erosion and sediment controls will be integrated with establishment of the permanent storm water management system and will include, among other things, construction of filtration trenches, stream enhancements, stabilization of construction roads, application of rolled erosion control product on steep slopes during final grading, and permanent stabilization by grassing of final grades and open pervious areas.

Implementation of a sequenced, systematic erosion and sedimentation control plan, as summarized above and to be approved by Calvert County Soil Conservation District, will result in small to negligible water-quality impacts due to the planned construction activities.

As described in the Storm Water Management Plan, a detailed stormwater management study will be conducted to evaluate adequate sizes of the several components of the storm water system to maintain both quality and quantity requirements for the downstream area. This will include analyzing the pre-development and post-development site hydrology for the 1-, 2-, 5-, 10- and 100-year 24-hour rainfall events. The planned storm water management system will be sized such that the downstream flow rates, sediment loads and water quality will be similar to the existing conditions and such that the post-development peak discharges will not exceed the pre-development rates. Thus, no significant change in the long- or short-term flow to the streams and wetlands from the power block area is expected.

ER Impact:

No changes to the ER are required.

Item Number HI-1 **ESRP/ER Section 4.2.1.2**

Request:

Modifications are proposed to the Surficial aquifer, which potentially impacts Johns Creek discharge pathways. In addition, storm water management modifications to the land surface could potentially redirect the overland runoff from the site to bio-retention and sedimentation basins. The impacts are associated with pre-construction, construction, and operational periods. Provide any qualitative and/or quantitative analyses and assessments that have been conducted to address the impacts to Johns Creek and the Surficial aquifer.

Response:

At the site and vicinity, the Surficial aquifer is considered a terrace deposit and, as such, is found only in the upland areas and is usually of limited areal extent. Each distinct area where the deposits exist is separated and bounded by the streams and tributaries of the area. In the power block area, ER Figures 2.3.1-38 and 2.3.1-39 illustrate how the aquifer pinches out due to its being dissected by the streams and tributaries of the plant area. Groundwater from the Surficial aquifer deposits discharges through seeps into the bounding tributaries and streams.

Removal of a substantial portion of the Surficial aquifer by construction activities and its replacement with impermeable surfaces will effectively eliminate direct recharge of that aquifer via precipitation. As explained above, the Surficial aquifer in that area is physically and hydraulically isolated from neighboring expressions of the aquifer. Sand-filter trenches will receive and drain off surface runoff from the CCNPP Unit 3 area. On the east side, the trenches draining the power block and the adjacent laydown area will convey runoff to a wetland creation area located east of the power block. On the west side, trenches draining the switch yard area will discharge into an unlined storm water basin located to the west, and runoff from sand filter trenches in the cooling tower area and the parking area will discharge directly into tributaries to Johns Creek. The outflow structure for the storm water basin will be designed to release water at low enough rates so that the receiving stream will not be subject to either erosion or sedimentation, beyond what is naturally occurring now.

The bottom of these trenches will consist of a permeable layer of sand or gravel and this will permit infiltration into the remaining (lower) portion of the Surficial aquifer. These trenches will be designed to accommodate as much as a two-year 24-hour rain event.

Recharge to this local Surficial aquifer will shift in that direct recharge via precipitation will largely cease, while recharge to the aquifer will occur through the bottoms of the sand-filter trenches, and the storm water basin. This infiltration into the remaining portion of the Surficial aquifer will compensate in large part for the elimination of recharge via infiltrating precipitation. Based on observations made at other sites where the land surface has been lowered, it is expected that at the power block the post-construction steady-state water table in the aquifer may be a few feet lower than that indicated in Figures 2.3.1-42 through -45. While such lowering of the water table may reduce the rate of groundwater discharge into the bounding tributaries somewhat, this would be offset by runoff flow contributed from the sand-filter trenches to the wetland creation area on the east side and to the tributaries to Johns Creek on the west side. Thus, no significant change in the long- or short-term flow to Johns Creek and downstream wetlands from the power block area is expected.

A storm water management plan has been prepared (Calvert Cliffs Unit 3 Storm Water Management Plan, dated April 2008). As discussed in the plan, a detailed storm water management study will be conducted to determine adequate sizes of the several components of the storm water system to maintain both quality and quantity requirements for the downstream area. This will include analyzing the pre-development and post-development site hydrology for the 1-, 2-, 5-, 10- and 100-year 24-hour rainfall events. The planned storm water management system will be sized such that the downstream flow rates, sediment loads and water quality will be similar to the existing conditions and such that the post-development peak discharges will not exceed the pre-development rates.

ER Impact:

No changes to the ER are required.

Item Number HI-2 **ESRP/ER Section 4.1.1.1**

Request:

The ER states that the proposed construction activities will result in the permanent loss, through filling, of approximately 18.6 acres (7.5 hectares) of non-tidal wetland habitat and approximately 48 acres (19 hectares) of non-tidal wetland buffer. The land use impacts to the CCNPP site and vicinity of the CCNPP site from construction of the new unit are identified as being MODERATE, primarily due to the loss of wetlands and wetland buffers, and would require mitigation. Mitigation measures associated with the wetlands and wetland buffers are described in Section 4.3.1.4. Provide the qualitative and/or quantitative analyses and assessments that form the basis for this impact level.

Response:

As defined in ER Section 1.2.6, MODERATE environmental effects are those that are sufficient to alter noticeably, but not to destabilize, important attributes of a resource, while SMALL impacts are those in which environmental effects are not detectable or are so minor they will neither destabilize nor noticeably alter any important attribute of a resource.

As indicated on ER page 4-2-6, surface-water use impacts are considered MODERATE primarily due to the loss of wetlands and wetland buffers. As a result, this loss will require mitigation. An analysis of the nine wetland assessment areas identified in the site area is provided in ER Section 4.3.1.3, and the planned mitigation measures are described in Section 4.3.1.6.

Planned construction activities will involve the permanent filling of an estimated 8,350 linear feet (2,545 m) of intermittent and upper perennial stream channels and approximately 11.7 acres (4.7 hectares) of the delineated wetland areas. The project will also disturb approximately 30.9 acres (12.5 hectares) of land defined by Calvert County as non-tidal wetland buffer (lands within 50 feet [15 m] of the landward edge of non-tidal wetlands). Most of the wetland fill would take place in Wetland Assessment Areas I, II, IV VII and IX.

In order to mitigate alteration to the site wetlands, several mitigation measures will be considered based on the results of field surveys to determine the appropriate areas for onsite wetland mitigation (Section 4.3.1.6). A proposed conceptual wetland and stream mitigation has been incorporated into Section 4.6. Final mitigation strategies will include consultation with state and local resource agencies, consideration of (1) the construction of new replacement wetlands in favorable areas of the site and (2) enhancement of existing contiguous wetlands. The soils and surface hydrology of any candidate area for wetland creation will be evaluated in detail to determine that new wetland construction is feasible. Wetland enhancement could include (a) eradication of the invasive grass *Phragmites* and its replacement with regionally indigenous wetland vegetation, and (b) stabilization of any eroding stream channel and stream channel banks in an area potentially impacted by site construction.

ER Impact:

No changes to the ER are required.

Item Number HI-3 **ESRP/ER Section 4.2.1.4**

Request:

Surface water impacts that could receive effluents are summarized as follows: two unnamed streams (Branch 1 and Branch 2); Branch 1; Camp Conoy Fishing Pond and two downstream impoundments; Johns Creek, Branch 3 and Branch 4, and the unnamed headwater tributaries; Goldstein and Laveel Branches of Johns Creek; Lake Davies and two unnamed impoundments within the Lake Davies dredge spoils disposal area; and Chesapeake Bay and Patuxent River. Several impoundments are planned to catch stormwater and sediment runoff from the various construction areas. In Section 4.2.1.5, construction impacts to the existing surface water bodies are summarized as follows: increasing runoff; infilling and eliminating the Camp Conoy Fishing Pond, upper reaches of Branch 2 and Branch 3, and an unnamed tributary to Johns Creek; isolating portions of the upper reach of Branch 1 by construction of the laydown areas; disruption of the drainage in the Lake Davies dredge spoils disposal area with possible impacts on the two downstream impoundments; wetlands removal and disruptions; and possibly increasing the sediment loads into the proposed impoundments and downstream reaches. In Section 4.2.2.2, the hydrologic alterations to groundwater that could result from the project related construction activities are creation of a local and temporary depression in the Surficial aquifer potentiometric surface; disruption of current Surficial aquifer recharge and discharge; hilly, vegetated areas would be cleared and graded potentially increasing runoff; some streams and the Camp Conoy Fishing Pond (impoundment) would be backfilled and construction areas would be covered by less permeable materials and graded to increase runoff into bio-retention ditches; potential changes in locations of or quantity of water produced at springs and seeps could change; stormwater runoff would be directed and concentrated into bio-retention ditches potentially affecting recharge to the Surficial aquifer; additional drawdown in the Aquia aquifer when the water needed for CCNPP Unit 3 construction; potentially shifting of the Surficial aquifer recharge area(s) to the underlying Chesapeake aquifer/confining unit. These impacts to surface water bodies are identified as MODERATE, primarily due to the loss of wetlands and wetland buffers, and require mitigation. Provide the qualitative and/or quantitative analyses and assessments that form the basis for this impact level.

Response:

As defined in ER Section 1.2.6, MODERATE environmental effects are those that are sufficient to alter noticeably, but not to destabilize, important attributes of a resource, while SMALL impacts are those in which environmental effects are not detectable or are so minor they will neither destabilize nor noticeably alter any important attribute of a resource.

As indicated on page 4-2-6 of the ER, surface-water use impacts are considered MODERATE primarily due to the loss of wetlands and wetland buffers. As a result, this loss will require mitigation. An analysis of the nine wetland assessment areas identified in the site area is provided in ER Section 4.3.1.3, and the planned mitigation measures are described in Section 4.3.1.6.

Planned construction activities will involve the permanent filling of an estimated 8,350 linear feet (2,545 m) of intermittent and upper perennial stream channels and approximately 11.7 acres (4.7 hectares) of the delineated wetland areas. The project would also disturb approximately 30.9 acres (12.5 hectares) of land defined by Calvert County as non-tidal wetland buffer (lands within 50 feet [15 m] of the landward edge of non-tidal wetlands). Most of the wetland fill would take place in Wetland Assessment Areas I, II, IV VII and IX.

In order to mitigate the noticeable alteration to the site wetlands, several mitigation measures will be considered based on the results of a planned field survey to be conducted during construction activities to determine the appropriate areas for onsite wetland mitigation (Section 4.3.1.6). This will include, in consultation with state and local resource agencies, consideration of (1) the construction of new replacement wetlands in favorable areas of the site and (2) enhancement of existing contiguous wetlands. The soils and surface hydrology of any candidate area for wetland creation will be evaluated in detail to determine that new wetland construction is feasible. Wetland enhancement could include (a) eradication of the invasive grass *Phragmites* and its replacement with regionally indigenous wetland vegetation, and (b) stabilization of any eroding stream channel and stream channel banks in an area potentially impacted by site construction.

Apart from impacts to wetlands, the impacts associated with shifts in groundwater recharge and in runoff patterns, and with potential erosion and sedimentation are considered low to negligible. This is because of the planned erosion and sediment control measures and the comprehensive storm water management system described in the Calvert Cliffs Unit 3 Storm Water Management Plan, dated April 2008.

Removal of a significant portion of the Surficial aquifer by the construction activities and its replacement with impermeable surfaces will effectively eliminate direct recharge of that aquifer via precipitation. Sand-filter trenches will receive and drain off surface runoff from the CCNPP Unit 3 area. On the east side, the trenches draining the power block and the adjacent laydown area will convey runoff to a wetland creation area located east of the power block. On the west side, trenches draining the switch yard area will discharge into an unlined storm water basin located to the west, and runoff from sand filter trenches in the cooling tower area and the parking area will discharge directly into tributaries to Johns Creek. The outflow structure for the storm water basin will be designed to release water at low enough rates so that the receiving stream will not be subject to either erosion or sedimentation, beyond what is naturally occurring now.

The bottom of these trenches will consist of a permeable layer of sand or gravel and this will permit infiltration into the remaining (lower) portion of the Surficial aquifer. These trenches will be designed to accommodate as much as a two-year 24-hour rain event.

Recharge to the local Surficial aquifer will shift in that direct recharge via precipitation will largely cease, while recharge to the aquifer will occur through the bottoms of the sand-filter trenches, and the storm water basin. This infiltration into the remaining portion of the Surficial aquifer will compensate in large part for the elimination of recharge via infiltrating precipitation. Based on observations made at other sites where the land surface has been lowered, it is expected that at the power block the post-construction steady-state water table in the aquifer may be a few feet lower than that indicated in Figures 2.3.1-42 through -45. While such lowering of the water table may reduce the rate of groundwater discharge into the bounding tributaries somewhat, this would be offset by runoff flow contributed from the sand-filter trenches to the wetland creation area on the east side and to the tributaries to Johns Creek on the west side. Thus, no significant change in the long- or short-term flow to receiving streams and wetlands from the power block area is expected.

As discussed in the referenced storm water management plan, a detailed storm water management study will be conducted to determine adequate sizes of the several components of the storm water system to maintain both quality and quantity requirements for the downstream area. This will include analyzing the pre-development and post-development site hydrology for the 1-, 2-, 5-, 10- and 100-year 24-hour rainfall events. The planned storm water management system will be sized such that the downstream flow rates, sediment loads and water quality will be similar to the existing conditions and such that the post-development peak discharges will not exceed the pre development rates. As a result of these plans and analyses, non-wetland impacts with respect to surface water and groundwater are considered small to negligible.

ER Impact:

No changes to the ER are required.

Item Number HI-4 ESRP/ER Sections 4.2.2.5, 4.2.2.7

Request:

The ER states that if contaminants enter the surface water bodies unchecked, there will be a potential for infiltration and subsequent groundwater contamination. If contaminants do enter groundwater, they may impact the quality of water withdrawn for industrial and commercial applications. It is also possible that this groundwater could discharge locally at seeps or springs. Any possible impacts on deeper aquifers would also depend on the infiltrating volume and the hydrologic connection with the Surficial aquifer. In Section 4.2.2.7, if heavy metals or chemical compounds spill and/or wash into surface waters, there could be a direct toxicity to aquatic organisms. These potential pollutant releases could impact aquatic species and in turn affect the recreational aspects associated with fishing, canoeing, or kayaking. The impacts to surface water quality downstream of the construction site are identified as SMALL due to the use of BMPs to control dust, runoff, and spills. Provide the qualitative and/or quantitative analyses and assessments that form the basis for this impact level.

Response:

As defined in ER Section 1.2.6, SMALL impacts are those in which environmental effects are not detectable or are so minor they will neither destabilize nor noticeably alter any important attribute of a resource, while MODERATE environmental effects are those that are sufficient to alter noticeably, but not to destabilize, important attributes of a resource.

Impacts to surface-water quality downstream of the construction area are considered to be SMALL because of the conservative erosion and sediment controls to be implemented and because of the comprehensive water-management system that will be constructed in and around the CCNPP Unit 3 power block area.

Best management practices will be selected and implemented to insure that the water quality downgradient of the power block area and the adjoining construction laydown area will neither be noticeably altered nor destabilized. The maintenance of acceptable water quality will be largely effected by implementation of the erosion and sediment control measures detailed in the Calvert Cliffs Unit 3 Storm Water Management Plan, dated April 2008. These measures will be implemented by installation of *initial, intermediate,* and *final* erosion and sedimentation controls, which will be planned, conducted and maintained according to the Calvert County Soil Conservation District standards and specifications.

Initial controls will be installed prior to construction commencement and will include perimeter protection fencing and controls and strictly-controlled construction exits. *Intermediate* controls will include silt fencing, sediment ponds, diversion dikes and stone check dams if necessary to control erosion and storm water runoff. During the grading and construction phase, additional intermediate erosion controls will be put in place as land disturbance occurs. Erosion control devices will be implemented or modified as the drainage patterns for storm water are constructed. All disturbed land left exposed for 7 days (steep slopes) to 14 days (gentle slopes) will be mulched or temporary grass cover will be provided.

Final erosion and sediment controls will be integrated with establishment of the permanent storm water management system and will include, among other things, construction of sand filtration trenches, stream enhancements, stabilization of construction roads, application of rolled erosion control product on steep slopes during final grading, and permanent stabilization by grassing of final grades and open pervious areas.

Implementation of a sequenced, systematic erosion and sedimentation control plan, as summarized above and to be approved by Calvert County Soil Conservation District, will result in small water-quality impacts due to the planned construction activities.

ER Impact:

No changes to the ER are required.

Item Number HI-5 **ESRP/ER Section 4.2.2.7**

Request:

Runoff containing saline residue from the spoils could enter the impoundment just southeast of the spoils disposal pile, which is likely in direct hydraulic contact with the Surficial aquifer. Any impact on groundwater quality would probably be minor due to dilution. Little, if any, water quality impacts would be expected if this diluted water were to reach the deeper aquifers. Dewatering for the foundation excavations may increase the oxidation of some sedimentary constituents by placing them in direct contact with the atmosphere. The oxides might have an increased solubility and could migrate down gradient when the potentiometric head is reestablished following construction completion. Possible impacts to the Surficial aquifer water quality are identified as SMALL and decrease with migration and dilution. Provide the qualitative and/or quantitative analyses and assessments that form the basis for this impact level.

Response:

As defined in ER Section 1.2.6, SMALL impacts are those in which environmental effects are not detectable or are so minor they will neither destabilize nor noticeably alter any important attribute of a resource, while MODERATE environmental effects are those that are sufficient to alter noticeably, but not to destabilize, important attributes of a resource. Possible impacts to the water quality of the Surficial aquifer are considered to be SMALL for the reasons described in the following paragraphs.

At the site and vicinity, the Surficial aquifer is considered a terrace deposit and, as such, is found only in the upland areas and is usually of limited areal extent. Each distinct area where the deposits exist is separated and bounded by the streams and tributaries of the area. In the power block area, Figures 2.3.1-38 and 2.3.1-39 illustrate how the aquifer pinches out due to its being dissected by the streams and tributaries of the plant area. Thus, the Surficial aquifer in the power block area is physically and hydraulically isolated from neighboring expressions of the aquifer. Groundwater from the Surficial aquifer deposits discharges through seeps into the bounding tributaries and streams.

Portions of the saline residue in the dredge spoils, which are to be stored in the spoils disposal area near Lake Davies, will likely enter the surficial groundwater by solution into the infiltrating rain water. The salts in the dredge spoils will be diluted by the rainwater, and they will be further attenuated through hydrodynamic dispersion as the water flows in the Surficial aquifer deposits in that area toward the nearby tributary, into which the water will discharge via seeps. Further dilution will occur in the tributary by mixing with groundwater having minimal salinity that discharges into the tributary farther downstream.

The common minerals found naturally in surficial groundwater, such as exists presently at the site, are represented by calcium, magnesium, sodium, potassium, iron and manganese. The oxides of calcium, magnesium, sodium and potassium are unstable and are rarely found in environments having a normal pH range (5.0 to 8.5). The oxides of iron and manganese can appear readily in surficial soils, but their solubility in water is low. They will therefore tend to precipitate out of solution and not migrate with the groundwater.

ER Impact:

No changes to the ER are required.

Item Number HI-6 **ESRP/ER Section 4.2.2.8**

Request:

The ER states that surface water users downstream of the site may experience impacts from potential water quality changes if construction effluent concentrations and volumes are large enough and the release enters directly into a surface water body bypassing the overflow catch basins and retention ponds. The surface water users that could be impacted in the event of a release are those downstream of the CCNPP site along the tributaries flowing to the Patuxent River and Chesapeake Bay. The ER notes that any impacts to the larger surface water bodies receiving the discharge are expected to be minor. Provide the qualitative and/or quantitative analyses and assessments that form the basis for this impact level.

Response:

The water-quality impacts to the larger surface water bodies (Patuxent River and the Chesapeake Bay) during the construction and post-construction stages are expected to be minimal because of the implementation of soil erosion and sediment control measures over the active site area combined with a comprehensive storm water management system.

Sand-filter trenches will receive and drain off surface runoff from the CCNPP Unit 3 area. On the east side, the trenches draining the power block and the adjacent laydown area will convey runoff to a forested wetland creation area located east of the power block. On the west side, trenches draining the switch yard area will discharge into an unlined storm water basin located to the west, and runoff from sand filter trenches in the cooling tower area and the parking area will discharge directly into tributaries to Johns Creek. The outflow structure for the storm water basin will be designed to release water at low enough rates so that the receiving stream will not be subject to either erosion or sedimentation, beyond what is naturally occurring now.

The bottom of these trenches will consist of a permeable layer of sand or gravel and thus will permit infiltration down into the Surficial aquifer. The trenches will be designed to accommodate as much as a two-year 24-hour rain event.

The storm water planned to be released to the wetland creation area will include runoff from the power block, the adjacent laydown area to the south, and from a portion of the proposed haul road and the parking lot north of the haul road that will be conveyed through roadside ditches and culverts. The retention time in the planned storm water basin to be located just west of the Unit 3 switchyard will be sufficient to allow sediment to settle out prior to discharge to the tributaries to Johns Creek.

Best management practices will be selected and implemented to insure that the water quality downgradient of the power block area and the adjoining construction laydown area will not be noticeably altered. The maintenance of acceptable water quality will be largely affected by implementation of the erosion and sediment control measures detailed in the Calvert Cliffs Unit 3 Storm Water Management Plan, dated April 2008.

These measures will be implemented by installation of *initial, intermediate,* and *final* erosion and sedimentation controls, which will be planned, conducted and maintained according to the Calvert County Soil Conservation District standards and specifications.

Initial controls will be installed prior to construction commencement and will include perimeter protection fencing and controls and strictly-controlled construction exits. *Intermediate* controls will include silt fencing, sediment ponds, diversion dikes and stone check dams if necessary to control erosion and storm water runoff. During the grading and construction phase, additional intermediate erosion controls will be put in place as land disturbance occurs. Erosion control devices will be implemented or modified as the drainage patterns for storm water are constructed. All disturbed land left exposed for 7 days (steep slopes) to 14 days (gentle slopes) will be mulched or temporary grass cover will be provided.

Final erosion and sediment controls will be integrated with establishment of the permanent storm water management system and will include, among other things, construction of sand filtration trenches, stream enhancements, stabilization of construction roads, application of rolled erosion control product on steep slopes during final grading, and permanent stabilization by grassing of final grades and open pervious areas.

Implementation of a sequenced, systematic erosion and sedimentation control plan, as summarized above and to be approved by Calvert County Soil Conservation District, will result in minor water-quality impacts of the planned construction and plant operation activities.

A detailed storm water management study will be conducted to evaluate adequate sizes of the several components of the storm water system to maintain both quality and quantity requirements for the downstream area. This will include analyzing the pre-development and post-development site hydrology for the 1-, 2-, 5-, 10- and 100-year 24-hour rainfall events. The planned storm water management system will be sized such that the downstream flow rates, sediment loads and water quality will be similar to the existing conditions and such that the post-development peak discharges will not exceed the pre-development rates. Since small to negligible impacts are expected in Johns Creek, any impact to the Patuxent River would not be measurable or noticeable.

ER Impact:

No changes to the ER are required.

Item Number HI-7 **ESRP/ER Section 4.2.2.9**

Request:

The ER notes that the impact of potential increased sediment loads in site runoff during construction will result in SMALL or no impacts to surface water users and affected areas. Given that a good portion of the Surficial aquifer would be removed, provide the basis for the conclusion that the impact is temporary. Provide the qualitative and/or quantitative analyses and assessments that form the basis for this impact level.

Response:

At the site and vicinity, the Surficial aquifer is considered a terrace deposit and, as such, is found only in the upland areas and is usually of limited areal extent. Each distinct area where the deposits exist is separated and bounded by the streams and tributaries of the area. In the power block area, Figures 2.3.1-38 and 2.3.1-39 illustrate how the aquifer pinches out due to its being dissected by the streams and tributaries of the plant area. Groundwater from the Surficial aquifer deposits discharges through seeps into the bounding tributaries and streams.

Removal of a substantial portion of the Surficial aquifer in the area of the CCNPP Unit 3 and its replacement with buildings, paved areas and other impermeable surfaces will effectively eliminate direct recharge into that aquifer via precipitation. As explained above, the Surficial aquifer in that area is hydraulically isolated from neighboring expressions of the aquifer.

Sand-filter trenches will receive and drain off surface runoff from the CCNPP Unit 3 area. On the east side, the trenches draining the power block and the adjacent laydown area will convey runoff to a forested wetland creation area located east of the power block. On the west side, trenches draining the switch yard area will discharge into an unlined storm-water basin located to the west, and runoff from sand filter trenches in the cooling tower area and the parking area will discharge directly into tributaries to Johns Creek. The outflow structure for the storm-water basin will be designed to release water at low enough rates so that the receiving stream will not be subject to either erosion or sedimentation, beyond what is naturally occurring now.

The bottom of these trenches will consist of a permeable layer of sand or gravel and this will permit infiltration down into the remaining (lower) portion of the Surficial aquifer. The trenches will be designed to accommodate as much as a two-year 24-hour rain event.

The infiltration through the bottom of the sand-filter trenches, and the storm-water basins into the remaining portion of the Surficial aquifer will compensate in large part for the elimination of recharge through infiltrating precipitation. Based on observations made at other sites where the land surface has been lowered, it is expected that at the power block the post-construction steady-state water table in the aquifer may be a few feet lower than that indicated in Figures 2.3.1-42 through -45. While such lowering of the water table may reduce the rate of groundwater discharge into the bounding tributaries somewhat, this would be compensated for by the runoff flow contributed from the sand-filter trenches to the wetland creation area on the east side and to the tributaries to Johns Creek on the west side. Thus, no significant change in the long- or short-term flow to the streams and wetlands from the power block area is expected.

Best management practices will be selected and implemented to insure that the water quality downgradient of the power block area and the adjoining construction laydown area will not be noticeably altered. The maintenance of acceptable water quality will be largely effected by implementation of the erosion and sediment control measures detailed in the Calvert Cliffs Unit 3 Storm Water Management Plan, dated April 2008. These measures will be implemented by installation of *initial, intermediate,* and *final* erosion and sedimentation controls, which will be planned, conducted and maintained according to the Calvert County Soil Conservation District standards and specifications.

Final erosion and sediment controls will be integrated with establishment of the permanent storm-water management system and will include, among other things, construction of filtration trenches, stream enhancements, stabilization of construction roads, application of rolled erosion control product on steep slopes during final grading, and permanent stabilization by grassing of final grades and open pervious areas.

Soils excavated from the dewatered power block excavation will be disposed of in an onsite spoils disposal area. And because of best management practices that will be applied to this and other areas of the active site, transport of this material into nearby tributaries and streams is unlikely.

Implementation of a sequenced, systematic erosion and sedimentation control plan, as summarized above and to be approved by Calvert County Soil Conservation District, will result in small water-quality and sedimentation impacts due to the planned construction activities.

ER Impact:

No changes to the ER are required.

Item Number HI-8 **ESRP/ER Section 4.2.2.9**

Request:

The ER states that because groundwater from CCNPP Units 1 and 2 onsite wells will be used for construction, there might be impacts on local users that also make withdrawals from the Aquia aquifer. Construction activities are only expected to produce limited and temporary impacts in the Surficial aquifer. Given that a good portion of the Surficial aquifer would be removed, provide the basis for the conclusion that the impact is limited and temporary. Provide the qualitative and/or quantitative analyses and assessments that form the basis for this impact level.

Response:

No wells tapping the Surficial aquifer are known to exist in the vicinity of the plant or along Maryland State Route 2/4. This is because the aquifer's saturated thickness is limited and variable, and consequently any shallow wells tapping the unit would tend to dry up during periods of drought. At the site and vicinity, this aquifer is considered a terrace deposit and, as such, is found only in the upland areas and is usually of limited areal extent. Each distinct area where the deposits exist is separated and bounded by the streams and tributaries of the area. Any onsite impact affecting the quantity or quality of water in the local Surficial aquifer will not impact local groundwater users as residents and other local users in the vicinity use deeper aquifers.

The known offsite wells (primarily domestic) within 1.5-mile radius of the site tap the Piney Point-Nanjemoy aquifer, as do seven of the 12 wells on the plant property. The Piney Point-Nanjemoy aquifer at the power block area occurs in the approximate depth range of 300 to 400 feet. The remaining five onsite wells tap the deeper Aquia aquifer, which at the power block area occurs in the approximate depth range of 500 to 650 feet.

Any water-quality degradation in the Surficial aquifer at the power block would be unlikely to impact the underlying Piney Point-Nanjemoy aquifer, and even less likely the deeper Aquia aquifer, This is because beneath the power block area, two aquitards (layers of low permeability) totaling approximately 150 feet in thickness occur between the Surficial aquifer and the Piney Point-Nanjemoy aquifer. Deposits comprising another aquitard between the Piney Point-Nanjemoy aquifer and the underlying Aquia aquifer total approximately 200 feet in thickness. The rate of potential vertical movement of any impacted groundwater from the Surficial aquifer through the aquitards to the deeper aquifers would necessarily be very low because of the low permeability of the aquitards, and in the process of this migration, many or most of any contaminants would tend to be adsorbed onto the clay components of the aquitards. It is therefore unlikely that measurable quantities of degraded water would reach the lower aquifers.

In the response to question HP-2, it was discussed that withdrawals from the Aquia aquifer by plant wells under the groundwater permit for CCNPP Units 1 and 2 has averaged 141E6 gallons per year (534E6 liters per year), which is equivalent to approximately 268 (gpm) [1,015 (lpm)]. The yearly withdrawal limit under this permit

[CA69G010 (05)] is 450,000 gallons per day (1,703,435 liters per day), which translates to 312.5 gpm (1,183 lpm). Therefore, the unused portion of the water allocation for the Aquia aquifer amounts to an average withdrawal rate of 44.5 gpm (168.4 lpm).

The permit for groundwater withdrawal from the Aquia aquifer for CCNPP Units 1 and 2 was issued on the basis that that the total allocation of 450,000 gpd (312.5 gpm) would not result in lowering the potentiometric level in the aquifer below the 80 percent management level. Thus, by withdrawing the remaining amount of the allocation for construction purposes, an average withdrawal of 44.5 gpm (amounting to 14.2 percent of the total allocation), it is unlikely to impact other users of the Aquia aquifer in the area. This conclusion is supported by information presented on Figure 2.3.2-20, showing that over the last three and a half years the potentiometric level has not declined in the onsite Aquia well that has been serving as a USGS observation well.

ER Impact:

No changes to the ER are required.

Item Number HI-9 **ESRP/ER Section 2.3.1**

Request:

The ER states that the Surficial aquifer is not used as a potable water source in the vicinity of the CCNPP site. Therefore, potential groundwater quality changes will not be expected to have any impact on possible users. Potential impacts to the deeper aquifers are dependant on the nature of the hydraulic connection between aquifers described in Section 4.2.1.1. It is noted that groundwater quality impacts on users of the deeper aquifer users are SMALL due to dilution and other contaminant attenuation effects that could occur along any effluent plume migration path. Provide the qualitative and/or quantitative analyses and assessments that form the basis for this impact level.

Response:

While there is a potential for water-quality degradation in the Surficial aquifer or in the thin immediately-underlying Chesapeake aquifers to impact the lower aquifers commonly used for potable water supply, this potential is considered remote. The aquifers used for water supply in this part of Calvert County include the Piney Point-Nanjemoy aquifer, found in the approximate depth range of 300 to 400 feet, and the Aquia aquifer, which is encountered at depths of approximately 500 to 650 feet.

No wells tapping the Surficial aquifer are known to exist in the vicinity of the plant or along Maryland State Route 2/4. This condition results because the saturated thickness of the aquifer is limited and variable, and consequently any shallow wells tapping into it would tend to dry up during periods of drought. Also, each distinct area where the deposits exist is separated and bounded by the streams and tributaries of the area. As a result, any onsite impact affecting the quantity or quality of water in the local Surficial aquifer will be unlikely to impact local groundwater users, as residents and other local users have wells tapping either the Piney Point-Nanjemoy aquifer or the Aquia aquifer.

The known offsite (primarily domestic) wells within 1.5-mile radius of the site tap the Piney Point-Nanjemoy aquifer, as do seven of the 12 wells on the plant property. The remaining five onsite wells tap the deeper Aquia aquifer.

Any water-quality degradation in the Surficial aquifer would be unlikely to impact the underlying Piney Point-Nanjemoy aquifer, and even less likely the deeper Aquia aquifer, This is because beneath the plant site, two aquitards (layers of low permeability) totaling approximately 150 feet in thickness occur between the Surficial aquifer and the Piney Point-Nanjemoy aquifer. Deposits comprising another aquitard between the Piney Point-Nanjemoy aquifer and the underlying Aquia aquifer total approximately 200 feet in thickness. The rate of potential vertical movement of any impacted groundwater from the Surficial aquifer through the aquitards to the deeper aquifers would necessarily be very low because of the low permeability of the aquitards, and in the process of this migration, many or most of any contaminants would tend to be adsorbed onto the clay components of the aquitards. It is therefore unlikely that measurable quantities of degraded water would reach the lower aquifers.

ER Impact:

No changes to the ER are required.

Item Number HI-10 **ESRP/ER Section 5.2.1.2.1**

Request:

The ER states that construction water use is assumed to be entirely consumptive. Groundwater withdrawals required for construction of CCNPP Unit 3 will be SMALL and temporary, and the effect on the groundwater supply will be SMALL. If the water mass balance demonstrates that water withdrawals appear to be significant with impacts lasting at least four years, identify the qualitative and/or quantitative analyses and assessments that form the basis for this impact level?

Response:

ER Table 2.3.2-7 shows that withdrawals from the Aquia aquifer by plant wells under the groundwater withdrawal permit for CCNPP Units 1 and 2 averaged 141E6 gallons per year (534E6 liters per year), which is equivalent to approximately 268 gpm (1,015 lpm). As shown in ER Table 2.3.2-6, the yearly withdrawal limit under this permit [CA69G010 (05)] is 450,000 gallons per day (1,703,435 liters per day), which translates to 312.5 gpm (1,183 lpm). The unused portion of the water allocation for the Aquia aquifer amounts to an average withdrawal rate of 44.5 gpm (168.4 lpm).

The permit for groundwater withdrawal from the Aquia aquifer for CCNPP Units 1 and 2 was issued on the basis that that this allocation would not result in lowering the potentiometric level in the aquifer below the 80 percent management level. As shown on ER Figure 2.3.2-20, over the last three and a half years the potentiometric level has not declined in the onsite Aquia well that serves as a USGS observation well. As a result, it is considered likely that the MDE will agree to the additional average withdrawal of the unused portion of the currently permitted withdrawal authorization (44.5 gpm) to support CCNPP Unit 3, provided the daily average for the month of maximum use does not exceed approximately 85 gpm for this purpose.

ER Table 4.2-1 indicates that the expected freshwater requirements during construction activities for CCNPP Unit 3 would not exceed 39,269,844 gallons (148,650,000 liters), which amounts to approximately 75 gpm (559 lpm) on an average annual basis. Assuming that additional withdrawals from the Aquia wells equivalent to the unused portion of the groundwater withdrawal authorization for CCNPP Units 1 and 2 can be permitted for use at CCNPP Unit 3 at an average of 44.5 gpm for construction activities, an additional 30.5 gpm will need to be obtained by trucking in water from offsite or by constructing a well tapping another (probably deeper) aquifer. Because the peak water use rate for construction is estimated to be as high as 1,200 gpm (4,540 lpm), an onsite water storage facility will be required to meet the water demands during construction. The capacity of the storage tank(s) will depend upon the results of an analysis of the expected hour-by-hour water demands during the period of construction when peak water demands are expected.

Several engineering options are being explored to address the calculated shortfall between expected construction water use and the unused portion of the CCNPP Unit 1 and 2 water allocation for the Aquia aquifer, including trucking of water from offsite wells and constructing a well tapping the next lower aquifer below the Aquia. Also, a groundwater flow model is being developed for evaluating the likely impacts of incremental increased pumping from the Aquia aquifer for this purpose.

Increasing the average withdrawal from the onsite Aquia wells from 268 to 312.5 gpm, an increase of 17 percent, is a small impact on that groundwater resource. The remaining water required for construction needs, 30.5 gpm, will also directly or indirectly have to come from groundwater. Considering this low level of withdrawal and the fact that it will only be required for four to five years, it is believed that the impact on groundwater may be considered SMALL.

ER Impact:

No changes to the ER are required.

Item Number HI-11 **ESRP/ER Section 5.2.1.3**

Request:

The ER states that once construction is completed, and normal operations begin, it is expected that the streams would experience little ongoing impact. Provide the qualitative and/or quantitative analyses and assessments that form the basis for this conclusion.

Response:

No analysis has been performed to date to assess quantitatively the impacts of plant operation on the streams downgradient of the plant. During the permitting and final design process some of these impacts will be quantitatively assessed, while other impacts will be addressed indirectly through conservative design of the components of the storm water management system and sediment and erosion control measures. The following paragraphs convey the basis for the assertion that the impacts to streams are expected to be small.

Surface water use impacts due to plant construction and operation are considered MODERATE primarily due to the loss of wetlands and wetland buffers, which implies that mitigation will be required. However, surface-water impacts with respect to streams are considered SMALL during operations, because site areas disturbed during construction will be subject to restoration and the flow characteristics of the streams are not expected to change significantly from pre-development rates.

As described in Calvert Cliffs Unit 3 Storm Water Management Plan dated April 2008, a detailed storm water management study will be conducted to evaluate adequate sizes of the several components of the storm-water system to maintain both quality and quantity requirements for the streams in the downstream area. This will include analyzing the pre-development and post-development site hydrology for the 1-, 2-, 5-, 10- and 100-year 24-hour rainfall events. The planned storm water management system will be sized such that the downstream flow rates, sediment loads and water quality will be similar to the existing conditions and such that the post-development peak discharges will not exceed the pre-development rates. Thus, no significant change in the long term or short term flow to the streams from the power block area or cooling tower area is expected.

ER Impact:

No changes to the ER are required.

Item Number HI-12 **ESRP/ER Section 5.2.2.1.2**

Request:

The ER states that the primary external impact will be the discharge of cooling tower blowdown water to the Chesapeake Bay. The CCNPP maximum Unit 3 CWS cooling tower discharge is estimated to be 20,200 gpm. Prior to discharge into the Chesapeake Bay, the cooling tower blowdown will be sent to a retention basin, thus reducing thermal impacts to receiving waters. No effect on fisheries, navigation, or recreational use of the Chesapeake Bay is expected. Provide any studies that support the expectation that recreational activity would not be affected.

Response:

The impact on recreational use of the Chesapeake Bay associated with the discharge of plant cooling water with a temperature of about 12°F (6.7°C) above the intake water temperature is expected to be imperceptible, and the impact on recreational activities including boating, fishing, paddling, etc., will be minimal. The basis for this conclusion is that the amount of water discharged from CCNPP Unit 3 will be approximately $1/20^{th}$ of the amount of water discharged from CCNPP Units 1 and 2, and no adverse effects have been observed due to operation. Additionally, the discharge will occur about 30 feet below the water surface and 550 feet from the shore line.

No studies have been completed to determine the impact on recreational activity expected from the installation of CCNPP Unit 3. There are a number of organizations and web sites that describe the key locations of recreational activities on the Chesapeake such as:

http://www.baygateways.net/watertrails.cfm

http://www.ecalvert.com/_media/client/pdf/tourism/visitorsguide/TouristMap.pdf

http://www.co.cal.md.us/ /ParksRec/2008breezybrochure.pdf

http://www.cbf.org/site/PageServer?pagename=exp_sub_recreation

http://www.baydreaming.com/

No recreational preferences are shown on the published web sites for the area adjacent to the existing CCNPP site. The western shore of the Chesapeake, especially along that portion of the Chesapeake Bay near the CCNPP site, consists of cliffs and shallow waters and virtually no beach areas. There is a restricted area on the Chesapeake Bay that is marked with buoys to prevent boaters from approaching the area around CCNPP Units 1 and 2. Any boaters entering this zone are flagged by CCNPP Security personnel who may call upon the Calvert County Sherriff, the Maryland Department of Natural Resources Police and the US Coast Guard for assistance. Other portions of the estuary are more preferable for recreational activities.

There is anecdotal evidence indicating that the current discharge from CCNPP Units 1 and 2 is a preferred fishing spot, probably because of the increase in water temperature at that location.

There are six areas designated for swimming in Calvert County:

- Chesapeake Beach (swimming, fishing, crabbing, boating)
- Breezy Point Beach (swimming, fishing & crabbing from pier)
- Calvert Cliffs State Park (swimming at own risk)
- Flag Ponds Nature Park (fishing from pier)
- Matoaka Beach – privately owned (swimming, boating, fishing)
- North Beach (swimming, fishing from pier, boating)

Flags Ponds Nature Park is the closest to the water discharge point for CCNPP Unit 3 and is located about 3.5 miles (6 km) northwest of the plant.

Operation of CCNPP Unit 3 would not be expected to adversely affect fishing or recreation on the Chesapeake Bay. In fact, it is possible that operation of CCNPP Unit 3 could result in creation of a new preferred fishing location at the location of the CCNPP Unit 3 discharge pipe exit, about 550 feet offshore. However, considering the relatively small amount of water discharged from CCNPP Unit 3 compared to the discharge from CCNPP Units 1 and 2, the current fishing location is likely to remain the preferred location near the site after CCNPP Unit 3 begins operation.

ER Impact:

No changes to the ER are required.

Item Number HI-13 **ESRP/ER Section 5.2.3.1**

Request:

The ER states that impacts of chemicals in the permitted blowdown discharge wastewater to the water quality of Chesapeake Bay will be negligible and are not expected to warrant mitigation. Provide qualitative and/or quantitative analyses and assessments that form the basis for this impact level.

Response:

Estimates of the chemical constituent concentrations in the blowdown discharges based on currently available design data are included in the response to RAI Item Number 85 (Table 2). That response provides an analysis of the anticipated constituents in and impact of the total discharge from CCNPP Unit 3 to the Chesapeake Bay.

Under normal operations, the combined CWS and ESWS cooling tower blowdown contributes over 90% of the total discharge to the Chesapeake Bay (90.3% and 0.3%, respectively), thus dominating all other discharges. The only other significant contributor is the desalination plant, which releases about 8.7% of the total discharge from CCNPP Unit 3.

As shown in Table 2 of the response to RAI Item Number 85, the concentrations of the chemical constituents in the blowdown and in the total discharge to the Chesapeake Bay are very low. The constituents of the blowdown and desalination plant discharges are driven by their original source of water, the Chesapeake Bay. While some chemicals are added to the blowdown for biological control, these are added in relatively small amounts. The low chemical concentrations in the total discharge, which are primarily a function of the concentrations in the blowdown, will rapidly diminish as the discharge mixes with the water in the Chesapeake Bay. It is concluded that any impacts to biota will be SMALL and will not warrant mitigation.

ER Impact:

No changes to the ER are required.

Item Number HI-14 **ESRP/ER Section 5.2.3.7**

Request:

The ER states that a common retention basin would collect cooling tower blowdown and effluent from the proposed desalinization plant. Effluent from the retention basin, which will contain dilute quantities of chemicals and dissolved solids, and be slightly elevated in temperature, will be discharged to Chesapeake Bay within the limits of the site NPDES permit. It is also noted that environmental impacts on water quality during construction and operations for CCNPP Unit 3 would be minimal. When discharged and diluted, this small amount of slightly contaminated water, approximately 0.001% of low flow conditions in Chesapeake Bay, would be expected to have small impacts. Provide the characteristics (discharge, concentrations, constituents, etc.) of the releases and the qualitative and/or quantitative analyses and assessments that form the basis for this impact level.

Response:

The characteristics of the releases that make up the discharge from the waste water retention basin and an analysis of the resulting impact are provided in the response to RAI Item Number 85. Table 1 in that response shows the relative contributions to the waste water retention basin discharge, which is 20,914 gpm (79,168 lpm) under normal operating conditions. The individual waste stream contributions to the total are as follows:

- CWS cooling tower blowdown 90.3%
- ESWS cooling tower blowdown 0.3%
- Desalination plant waste 8.7%
- Misc. low volume waste 0.2%
- Treated sanitary waste 0.4%

Table 2 in the response to RAI Item Number 85 provides estimates of the chemical constituent concentrations in the each of these discharges and in the combined discharge based on currently-available design data. More precise determinations of the amounts of these constituents will be made as part of the NPDES permitting process. The concentrations of the chemical constituents in the total discharge to the Chesapeake Bay are very low. The constituents of the three main waste streams are driven by their original source of water, the Chesapeake Bay.

While some chemicals are added to the blowdown for biological control, these are added in relatively small amounts. Prior to any mixing in the Chesapeake Bay, the concentrations of chemicals that have Aquatic Life chronic salt water limits in COMAR are less than 1/32nd of those limits. The low chemical concentrations in the total discharge will rapidly diminish as the discharge mixes with the water in the Chesapeake Bay. It is concluded that any impacts to biota will be SMALL and will not warrant mitigation.

ER Impact:

No changes to the ER are required.

Item Number HI-15 **ESRP/ER Section 5.3.1.1**

Request:

The ER states that based on the facts that (1) the amount of additional cooling water withdrawn for CCNPP Unit 3 is small compared to that of CCNPP Units 1 and 2, (2) CCNPP Unit 3 intakes for the CWS and the UHS are to be located within the existing intake embayment, and (3) intake velocities will be less than 0.5 ft/sec, it is concluded that the physical impacts of the intakes for the CCNPP Unit 3 CWS and UHS will be SMALL and will not warrant mitigation measures beyond the design features previously discussed. Provide the qualitative and/or quantitative analyses and assessments that form the basis for this impact level.

Response:

Item (1) – CCNPP Units 1 and 2 utilize a once-through cooling water design to reject heat from the main condenser. A significant amount of water is needed to provide the required heat rejection for this design (i.e., about 2 million gallons per minute). With the hybrid cooling tower planned for CCNPP Unit 3, the amount of water needed to reject heat (approximately 40,000 gallons per minute) will be approximately 1/50th the amount required for CCNPP Units 1 and 2, which have about the same combined generating capacity as new CCNPP Unit 3.

Item (2) – Because no additional forebay or intake embayment will have to be constructed for CCNPP Unit 3, no additional baffle walls or other structures will be needed to protect the CWS and UHS intake.

The Chesapeake Bay water intake system design would consist of a wedge-shaped expansion of the CCNPP Units 1 and 2 intake channel forebay, the CCNPP Unit 3 forebay and related piping; the CCNPP Unit 3 non-safety-related CWS makeup water intake structure and associated equipment, including the non-safety-related CWS makeup pump; the safety-related UHS makeup water intake structure and associated equipment, including the safety-related UHS makeup water pumps; and the makeup water chemical treatment system.

The CCNPP Unit 3 intake water forebay will be 100 feet by 120 feet by 30 feet deep and will be located between the Units 1 and 2 intake and the barge slip. It will draw water from the extended Units 1 and 2 intake forebay through new intake water piping.

Item (3) – The CCNPP Unit 3 intake water velocity meets the Section 316(6) design requirement of 0.5 fps. The CCNPP Unit 3 CWS makeup water intake structure will be an approximately 78 feet long, 55 feet wide and 30 feet deep concrete structure with individual pump bays. The UHS water intake structure will be an approximately 75 feet long, 60 feet wide and 30 feet deep concrete structure with individual pump bays. Flow velocities at the intake channel will depend on the Chesapeake Bay water level. Even at the minimum recorded Chesapeake Bay water level of – 4.0 feet below msl, the flow velocity along the new intake channel will be less than 0.5 feet per second (fps), based on the maximum makeup demand of 43,480 gpm.

One makeup pump is located in each pump bay and one dedicated traveling band screen and trash rack is located in the CWS and UHS makeup intake structures. Debris collected by the trash racks and the traveling water screens will be collected in a debris basin for cleanout and disposal as solid waste.

In sum, these facts justify a finding of a SMALL impact.

ER Impact:

No changes to the ER are required.

Item Number HI-16 ESRP/ER Section 5.5.1.2

Request:

The ER states that impacts from increases in volume or pollutants in the storm water discharge will be minimized by implementation of best management practices (BMPs). As such, impacts are expected to be SMALL. Provide the qualitative and/or quantitative analyses and assessments that form the basis for this impact level.

Response:

As defined in ER Section 1.2.6, SMALL impacts are those in which environmental effects are not detectable or are so minor they will neither destabilize nor noticeably alter any important attribute of a resource, while MODERATE environmental effects are those that are sufficient to alter noticeably, but not to destabilize, important attributes of a resource.

Removal of the upper portion of the Surficial aquifer in the area of the CCNPP Unit 3 and its replacement with impermeable surfaces will effectively eliminate direct recharge into that aquifer via precipitation. Sand-filter trenches will receive and drain off surface runoff from the CCNPP Unit 3 area. On the east side, the trenches draining the power block and the adjacent laydown area will convey runoff to a wetland creation area located east of the power block. On the west side, trenches draining the switch yard area will discharge into an unlined storm-water basin located to the west, and runoff from sand filter trenches in the cooling tower area and the parking area will discharge directly into tributaries to Johns Creek. The outflow structure for the storm-water basin will be designed to release water at low enough rates so that the receiving stream will not be subject to either erosion or sedimentation, beyond what is naturally occurring now.

The bottom of these trenches will consist of a permeable layer of sand or gravel and this will permit infiltration down into the remaining (lower) portion of the Surficial aquifer, which will compensate in large part for the elimination of recharge through infiltrating precipitation. Based on observations made at other sites where the land surface has been lowered, it is expected that at the power block the post-construction steady-state water table in the aquifer may be a few feet lower than that indicated in Figures 2.3.1-42 through -45. While such lowering of the water table may reduce the rate of groundwater discharge into the bounding tributaries somewhat, this would be compensated for by the runoff flow contributed from the sand-filter trenches to the wetland creation area on the east side and to the tributaries to Johns Creek on the west side.

Best management practices will be selected and implemented to insure that the water quality downgradient of the power block area and the adjoining construction laydown area will neither be noticeably altered nor destabilized. The maintenance of acceptable water quality will be largely effected by implementation of the erosion and sediment control measures detailed in the Calvert Cliffs Unit 3 Storm Water Management Plan, dated April 2008. These measures will be implemented by installation of *initial,* *intermediate,* and *final* erosion and sedimentation controls, which will be planned, conducted and maintained according to the Calvert County Soil Conservation District standards and specifications.

Initial controls will be installed prior to construction commencement and will include perimeter protection fencing and controls and strictly-controlled construction exits. *Intermediate* controls will include silt fencing, sediment ponds, diversion dikes and stone check dams if necessary to control erosion and storm-water runoff. During the grading and construction phase, additional intermediate erosion controls will be put in place as land disturbance occurs. Erosion control devices will be implemented or modified as the drainage patterns for storm water are constructed. All disturbed land left exposed for 7 days (steep slopes) to 14 days (gentle slopes) will be mulched or temporary grass cover will be provided.

Final erosion and sediment controls will be integrated with establishment of the permanent storm-water management system and will include, among other things, construction of filtration trenches, stream enhancements, stabilization of construction roads, application of rolled erosion control product on steep slopes during final grading, and permanent stabilization by grassing of final grades and open pervious areas.

Implementation of a sequenced, systematic erosion and sedimentation control plan, as summarized above and to be approved by Calvert County Soil Conservation District, will limit the water-quality impacts of the planned construction activities to SMALL.

As described in Calvert Cliffs Unit 3 Storm Water Management Plan, a detailed storm water management study will be conducted to evaluate adequate sizes of the several components of the storm-water system to maintain both quality and quantity requirements for the downstream area. This will include analyzing the pre-development and post-development site hydrology for the 1-, 2-, 5-, 10- and 100-year 24-hour rainfall events. The planned storm-water management system will be sized such that the downstream flow rates, sediment loads and water quality will be similar to the existing conditions and such that the post-development peak discharges will not exceed the pre-development rates. Thus, no significant change in the long term or short term flow to the streams and wetlands from the power block area is expected.

ER Impact:

No changes to the ER are required.

Item Number HI-17 **ESRP/ER Section 5.5.1.3**

Request:

The ER states that potential impacts from land disposal on nonradioactive solid waste will be SMALL. Provide the qualitative and/or quantitative analyses and assessments that form the basis for this impact level.

Response:

During the construction of CCNPP Unit 3, nonradioactive solid wastes will be generated in relatively small quantities. Those that are not recycled or recovered will be disposed in permitted landfills. Maryland regulations do not allow solid waste to be managed in a manner that will create a nuisance, cause insect and rodent infestation or harboring of animals, pollute the air, cause a discharge of pollutants to State waters, impair the quality of the environment or create other hazards to the public health, safety, or comfort. A permit is required to construct or operate a system of refuse disposal for public use or a sanitary landfill. Such permits specify operating procedures that must be followed in order to ensure that any impacts are minimized. Because these wastes will be recycled, recovered, or disposed in permitted landfills designed to minimize impacts and will be generated in relatively small quantities, environmental effects are expected to be very minor in nature.

ER Impact:

No changes to the ER are required.

Item Number HM-1 **ESRP/ER Section 4.2.1.4**

Request:

The ER states that the maximum high water level elevation in Johns Creek is 65 ft, which is below the approximate 84.6 ft elevation of the final site grade in the power block, switchyard, and cooling tower area. Provide the calculations and the quantitative analysis to support this statement.

Response:

Hydrologic analyses were performed to evaluate the flooding potential in the vicinity of the CCNPP Unit 3 power block area as a part of the CCNPP Unit 3 Final Safety Analysis Report. Using the model HEC-RAS, water-surface profiles resulting from the Probable Maximum Flood (PMF) in the Johns Creek catchment were developed. Figure 2.4.3-10 of the FSAR shows plots of these profiles. According to the analysis, the highest computed water-level elevation in Johns Creek resulting from the projected flood was approximately 65 feet at a location (Section 17) on the creek approximately 3,300 feet south of the CCNPP Unit 3 power block area (Figure 2.4.3-9 of the FSAR).

ER Impact:

No changes to the ER are required.

Item Number HM-2 **ESRP/ER Section 5.2.3.5**

Request:

The ER states that the descriptions of the discharge location for CCNPP Units 1 and 2 and the discharge location for CCNPP Unit 3 are provided in Section 5.3.2. The discharge for CCNPP Units 1 and 2 influences the discharge location for CCNPP Unit 3 due to its discharge mixing zone. The two discharge locations must meet environmental regulations in order to be permitted. Based on a field trip to the Chesapeake Bay, where real-time temperature readings were observed, it appeared that the thermal discharge from Units 1 and 2 would not influence Units 3's thermal discharge. This conclusion appears to be borne out in Figure 5.3-1. Provide the scientific and quantitative bases that support the discharge for CCNPP Units 1 and 2 influencing the discharge location for CCNPP Unit 3.

Response:

Selection of the discharge location for CCNPP Unit 3 was not based on any possible mutual thermal impact of the CCNPP Unit 3 discharge relative to that from CCNPP Units 1 and 2. The selection was based on the fact that adequate spacing was required for trenching to accommodate the piping for CCNPP Unit 3, and also based on the need to place the discharge location within the Intensely Developed Area (IDA).

ER Impact:

No changes to the ER are required.

Item Number HM-3 **ESRP/ER Section 5.2.3.7**

Request:

The ER states that groundwater would not be used for CCNPP Unit 3 operation, and will only be used during construction within the withdrawal limits of the existing groundwater permit for CCNPP Units 1 and 2. Surface water runoff and sedimentation effects will be minimized by implementation of a site safety and spill prevention plan and a stormwater pollution prevention plan. Effluent from the planned wastewater treatment plant will meet all applicable health standards, regulations, and total maximum daily loads (TMDLs) as set by the Maryland Department of the Environment (MDE) and the U.S. EPA. It is noted that environmental impacts on water quality during construction and operations for CCNPP Unit 3 would be minimal. Provide the qualitative and/or quantitative analyses and assessments that form the basis for this conclusion.

Response:

Best management practices will be selected and implemented to insure that the water quality downgradient of the power block area and the adjoining construction laydown area will not be noticeably altered. The maintenance of acceptable water quality will be largely effected by implementation of the erosion and sediment control measures detailed in the Calvert Cliffs Unit 3 Storm Water Management Plan dated, April 2008. These measures will be implemented by installation of *initial, intermediate,* and *final* erosion and sedimentation controls, which will be planned, conducted and maintained according to the Calvert County Soil Conservation District standards and specifications.

Initial controls will be installed prior to construction commencement and will include perimeter protection fencing and controls and strictly-controlled construction exits. *Intermediate* controls will include silt fencing, sediment ponds, diversion dikes and stone check dams if necessary to control erosion and storm-water runoff. During the grading and construction phase, additional intermediate erosion controls will be put in place as land disturbance occurs. Erosion control devices will be implemented or modified as the drainage patterns for storm water are constructed. All disturbed land left exposed for 7 days (steep slopes) to 14 days (gentle slopes) will be mulched or temporary grass cover will be provided.

Final erosion and sediment controls will be integrated with establishment of the permanent storm-water management system and will include, among other things, construction of filtration trenches, stream enhancements, stabilization of construction roads, application of rolled erosion control product on steep slopes during final grading, and permanent stabilization by grassing of final grades and open pervious areas.

Implementation of a sequenced, systematic erosion and sedimentation control plan, as summarized above and to be approved by Calvert County Soil Conservation District, will result in minimal water-quality impacts due the planned Unit 3 construction and operation activities.

Sand-filter trenches will receive and drain off surface runoff from the CCNPP Unit 3 area. On the east side, the trenches draining the power block and the adjacent laydown area will convey runoff to a forested wetland creation area located east of the power block. On the west side, trenches draining the switch yard area will discharge into an unlined storm-water basin located to the west, and runoff from sand filter trenches in the cooling tower area and the parking area will discharge directly into tributaries to Johns Creek. The outflow structure for the storm-water basin will be designed to release water at low enough rates so that the receiving stream will not be subject to either erosion or sedimentation, beyond what is naturally occurring now.

The bottom of these trenches will consist of a permeable layer of sand or gravel and thus will permit infiltration into the remaining (lower) portion of the Surficial aquifer. These trenches will be designed to accommodate as much as a two-year 24-hour rain event.

As described in the CCNPP Unit 3 Storm Water Management Plan, a detailed storm water management study will be conducted to evaluate adequate sizes of the several components of the storm-water system to maintain both quality and quantity requirements for the downstream area. This will include analyzing the pre-development and post-development site hydrology for the 1-, 2-, 5-, 10- and 100-year 24-hour rainfall events. The planned storm-water management system will be sized such that the downstream flow rates, sediment loads and water quality will be similar to the existing conditions and such that the post-development peak discharges will not exceed the pre-development rates. Thus, no significant change in the water quality or in the long- or short-term flow to the streams and wetlands from the power block area is expected.

Groundwater utilization during construction is discussed in the response to RAI Item Number HP-2.

ER Impact:

No changes to the ER are required.

Item Number HM-4 **ESRP/ER Section 5.3.2.2.3**

Request:

The ER states that physical and related ecological impacts of the CCNPP Units 1 and 2 thermal discharges have been limited to sediment scour in the vicinity of the high velocity discharge ports. It is expected that the physical impacts associated with CCNPP Unit 3 will also be limited to sediment scour of a small area. Explain how the scour area was bounded. Provide the qualitative and/or quantitative analyses and assessments that form the basis for this conclusion.

Response:

Evaluating the potential physical effects of scour resulting from CCNPP Unit 3 operations on a qualitative basis, scour action will be minimized for CCNPP Unit 3 because the port diffusers will be directed upwards toward the water surface rather than laterally or down into the bed. Additionally, the expected average discharge from CCNPP Unit 3 into the Chesapeake Bay is 21,019 gpm (79,566 lpm). This amounts to 0.9 percent of the current discharge from CCNPP Units 1 and 2, which is approximately 2,300,000 gpm. Following operation of CCNPP Units 1 and 2, an area of approximately 42 acres (17 hectares) was noted to be scoured by the discharge. Surficial sands were also noted to have been transported to deeper waters (MMC 1980). There have been no identified issues related to scour or sedimentation at the CCNPP Units 1 and 2 discharge outfall location.

The potential physical effects of scour resulting from CCNPP Unit 3 operations is discussed on a quantitative basis in the response to RAI Item Number 95. In summary, this response concluded that based on an analysis performed using a computational fluid dynamics approach, a predicted area of scour of approximately 10,500 ft^2 ($975m^2$) would result.

<u>Reference</u>

MMC, 1980. Summary of Findings: Calvert Cliffs Nuclear Power Plant Aquatic Monitoring Program, Volume 1, Report. PPSP-CC-80-2, Martin Marietta Corporation, 1980.

ER Impact:

No changes to the ER are required.

Item Number HS-1 **ESRP/ER Sections 2.3, 4.1**

Request:

The sum of construction parking areas in Figure 2.3.1-4 equals 46 acres, but Table 4.1-1 notes 17.7 acres. The concrete batch plant in Figure 2.3.1-4 equals 22 acres, but Table 4.1-1 notes 26.2 acres. Explain or correct the apparent inconsistencies between Table 4.1-1 and Figure 2.3.1-4.

Response:

ER Figure 2.3.1-4 shows four areas totaling 46 acres for construction parking. Of this total, 28.3 acres will be utilized as temporary parking during construction, and the remaining 17.7 acres will continue to be used as a parking area after the construction period. ER Table 4.1-1 shows the 17.7 acres as construction parking area which is considered a permanent construction feature. As a result, Figure 2.3.1-4 and Table 4.1-1 are consistent with one another. As shown on the updated Table 4.1-1, which is attached, the estimated acreage requirement for the construction concrete batch plant should be 22 acres.

ER Impact:

ER Table 4.1-1 will be updated to reflect the correct concrete batch plant acreage and include a new entry for temporary construction parking in a future ER revision.

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

Construction Area	Construction Acreage (hectares)	Current Land Use	Current Zoning
Unit 3 Power Block	45.8 (18.5)	Forest and Urban or Built Up	I-1 and FFD
Unit 3 Switchyard	59.3 (24)	Forest	I-1 and FFD
Unit 3 Cooling Tower Area	18.1 (7.3)	Forest	FFD
Permanent Laydown Area	59 (23.9)	Urban or Built Up	I-1
Parking Area	17.7 (7.2)	Urban or Built Up	I-1
Connector Transmission Lines (Onsite)	11.7 (4.7)	Forest and Urban or Built Up	I-1
Desalinization Plant	0.46 (0.18)	Forest	FFD
Waste Water Treatment Facility	0.29 (0.12)	Forest	FFD
Heavy Haul Road	15.7 (6.4)	Urban or Built Up	I-1
Construction Access Road	42.8 (17.3)	Urban or Built Up	I-1 and FFD
Borrow Area	4.8 (1.9)	Urban or Built Up	I-1
Stormwater Retention Basins Adjacent to the Permanent Construction Features	5.3 (2.2)	Forest and Urban or Built Up	FFD and I-1
Total Acreage of Disturbed Area for Permanent Construction Features	**280.95 (113.7)**	--	--
Temporary Laydown Areas	106.7 (43.2)	Urban or Built Up and Forest	I-1 and FFD
Concrete Batch Plant, Material Storage	22 (8.9)	Urban or Built Up	I-1
Retention Basins Adjoining Temporary Features	6.2 (2.5)	Urban or Built Up and Forest	I-1 and FFD
Temporary Construction Parking	28.3 (11.5)	Urban or Built Up	I-1
Total Acreage of Disturbed Area for Temporary Construction Features	**139.1 (56.3)**	--	--

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

Item Number HS-2 ESRP/ER Sections 2.3.1, 2.3.2

Request:

Figures 2.3.1-(38-39) appears to be a duplicate of Figures 2.3.2-(5-6)? Explain the difference between Figures 2.3.1-(38-39) and Figures 2.3.2-(5-6).

Response:

ER Figures 2.3.1-38 and 2.3.1-39 are duplicates of Figures 2.3.2-5 and 2.3.2-6.

ER Impact:

No changes to the ER are required.

Item Number HS-3 **ESRP/ER Section 2.3.2**

Request:

On page 2.3-38, the ER reports that the Aquia formation is a productive aquifer with a reported yield at the CCNPP site of up to 432,000 gpd (300 gpm). The productive yield of the Aquia aquifer is identified as being up to 432,000 gpd, and the current withdrawal is stated as 450,000 gpd (Table 2.3.2-6) with a permitted limit of 865,000 gpd (Table 2.3.2-6 and Section 4.2.1.3). Clarify the difference in numbers and whether they relate to differences between productive aquifer and productive yield.

Response:

The value of 300 gallons per minute (gpm) [432,000 gpd] is an average that refers to the expected yield of a given well tapping the Aquia aquifer in the vicinity of the CCNPP site. The yield values provided in ER Table 2.3.2-6 do not relate directly to the yield of the aquifer at the site, but to the permitted water allocation – 450,000 gpd averaged over the entire year, and 865,000 gpd averaged over the month having the maximum amount withdrawn. These limits relate to the 80 percent management level imposed by the Maryland Department of the Environment.

The actual quantities withdrawn from the Aquia aquifer for CCNPP Units 1 and 2 from 2001 to 2006 are given in ER Table 2.3.2-7. During the period from July 2001 through June 2006, the average rate of water withdrawal from the Aquia wells onsite was approximately 386,300 gpd. The peak withdrawal occurred in June 2004 when 15,858,200 gallons were withdrawn, equivalent to 528,607 gpd or 367 gpm. This amount represents the sum of withdrawals from the five onsite Aquia wells.

ER Impact:

No changes to the ER are required.

Item Number HS-4 **ESRP/ER Section 2.3.2.2.7**

Request:

Groundwater level declines have been especially large in Southern Maryland and parts of the eastern shore where groundwater pumpage is projected to increase by more than 20% between 2000 and 2030 as population within the region is expected to grow by 37% (USGS 2006, as reported by Section 2.3.2.2.7 page 1.3-42). Two areas in Calvert County show cones of depression in the Aquia aquifer. A small depression north of the site is present in the North Beach and Chesapeake Beach area and a large depression south of the site in the Solomons area appears to be having a significant regional effect on the Aquia aquifer. This larger cone of depression is influencing regional groundwater flow out to a radius of at least 15 mi (24 km) from the pumping centers in the Solomons area as shown in Figure 2.3.2-7. This area of influence includes the CCNPP site (Section 2.3.2.2.7 Page 1.3-(42-43)). Because of these considerations, water supply managers in these counties are seeking to shift some groundwater usage from the Aquia aquifer to deeper aquifers (MGS 2005, as reported by Section 2.3.2.2.2.2 page 2.3-38).

UniStar reports submitting a permit request to the State of Maryland to utilize any excess water not being used under the existing Units 1 and 2 permit. Provide an analysis of the impacts to the aquifer and surrounding users of the aquifer in the event that any excess from the Units 1 and 2 permit would be used for Unit 3.

Response:

ER Table 2.3.2-7 shows that withdrawals from the Aquia aquifer by plant wells under the groundwater withdrawal permit for CCNPP Units 1 and 2 averaged 141E6 gallons per year (534E6 liters per year), which is equivalent to approximately 268 gpm (1,015 lpm). As shown in ER Table 2.3.2-6, the yearly withdrawal limit under this permit [CA69G010 (05)] is 450,000 gallons per day (1,703,435 liters per day), which translates to 312.5 gpm (1,183 lpm). The unused portion of the water allocation for the Aquia aquifer amounts to an average withdrawal rate of 44.5 gpm (168.4 lpm).

The permit for groundwater withdrawal from the Aquia aquifer for CCNPP Units 1 and 2 was issued on the basis that that this allocation would not result in lowering the potentiometric level in the aquifer below the 80 percent management level. As shown on ER Figure 2.3.2-20, over the last three and a half years the potentiometric level has not declined in the onsite Aquia well that serves as a USGS observation well. As a result, it is considered likely that the MDE will agree to the additional average withdrawal of the unused portion of the currently permitted withdrawal authorization (44.5 gpm) to support CCNPP Unit 3, provided the daily average for the month of maximum use does not exceed approximately 85 gpm for this purpose.

ER Table 4.2-1 indicates that the expected freshwater requirements during construction activities for CCNPP Unit 3 would not exceed 39,269,844 gallons (148,650,000 liters), which amounts to approximately 75 gpm (559 lpm) on an average annual basis.

Assuming that additional withdrawals from the Aquia wells equivalent to the unused portion of the groundwater withdrawal authorization for CCNPP Units 1 and 2 can be permitted for use at CCNPP Unit 3 at an average of 44.5 gpm for construction activities, an additional 30.5 gpm will need to be obtained by trucking in water from offsite or by constructing a well tapping another (probably deeper) aquifer. Because the peak water use rate for construction is estimated to be as high as 1,200 gpm (4,540 lpm), an onsite water storage facility will be required to meet the water demands during construction. The capacity of the storage tank(s) will depend upon the results of an analysis of the expected hour-by-hour water demands during the period of construction when peak water demands are expected.

Several engineering options are being explored to address the calculated shortfall between expected construction water use and the unused portion of the CCNPP Unit 1 and 2 water allocation for the Aquia aquifer, including trucking of water from offsite wells and constructing a well tapping the next lower aquifer below the Aquia. Also, a groundwater flow model is being developed for evaluating the likely impacts of incremental increased pumping from the Aquia aquifer for this purpose. The results of the modeling will be reported to the NRC by November 30, 2008.

ER Impact:

No changes to the ER are required.

Item Number HS-5 **ESRP/ER Section 2.3.2**

Request:

Table 2.3.2-8 appears to essentially be a duplicate of Table 2.3.2-6. Check, resolve, and provide any corrections.

Response:

ER Table 2.3.2-6 and Table 2.3.2-8 provide similar information and are consistent with one another. However, Table 2.3.2-8 provides additional information regarding well depth that is not provided on Table 2.3.2-6.

ER Impact:

No changes to the ER are required.

Item Number HS-6 **ESRP/ER Section 2.3.2**

Request:

Confirm that the entry in Table 2.3.2-7 for August 2005 should be 8,786,380 rather than 87,86,380.

Response:

The correct value in Table 2.3.2-7 for August 2005 should be 8,786,380.

ER Impact:

ER Table 2.3.2-7 will be updated in a future revision of the ER revision.

Item Number HS-7 ESRP/ER Section 2.3.2.2.9

Request:

There is potentially a large gap that exists between the available permitted groundwater appropriations within the Aquia aquifer and short-term demands associated with construction activities for CCNPP Unit 3. The CCNPP Unit 3 is considering meeting any future groundwater shortfalls by tapping the Coastal Plain aquifers within the State of Maryland through consultations with the MGS and the MDE (Section 2.3.2.2.9 page 2.3-45). Explain how these offsite-potable-water demands, supplying onsite-fresh-water needs, could realistically meet the construction needs for water by providing a regional water mass balance during construction and identifying the specific sources of potable water. Explain how potable water needs would be met, including any use of storage tanks, trucking in water, pumpage rates and times for pumpage (e.g., day, night), etc. Provide storage tank sizes and possible tank locations if storage tanks are used.

Response:

ER Table 2.3.2-7 shows that withdrawal from the Aquia aquifer by plant wells under the groundwater permit for CCNPP Units 1 and 2 has averaged 141E6 gallons per year (534E6 liters per year), which is equivalent to approximately 268 gpm [1,015 lpm]. As shown in Table 2.3.2-6, the yearly withdrawal limit under this permit [CA69G010 (05)] is 450,000 gallons per day (1,703,435 liters per day), which translates to 312.5 gpm (1,183 lpm). As a result, the unused portion of the water allocation for the Aquia aquifer amounts to an average withdrawal rate of 44.5 gpm (168.4 lpm).

The permit for groundwater withdrawal from the Aquia aquifer for CCNPP Units 1 and 2 was issued on the basis that that the allocation would not result in lowering the potentiometric level in the aquifer below the 80 percent management level. As shown on ER Figure 2.3.2-20, over the last three and a half years the potentiometric level has not declined in the onsite Aquia well that has been serving as a USGS observation Consequently, it is likely that authorization can be obtained to utilize an average withdrawal of 44.5 gpm, provided the daily average for the month of maximum use does not exceed approximately 85 gpm, to support CCNPP Unit 3 construction activities.

ER Table 4.2-1 indicates that the expected freshwater requirements during the construction activities would not exceed 39,269,844 gallons (148,650,000 liters) per year, which amounts to approximately 75 gpm (559 lpm) on an average annual basis. Increased stress on local deep aquifers would result from withdrawing an additional year-around flow of 75 gpm for a construction period of five years. However, this stress would be temporary, as sometime in the sixth year the planned desalinization plant would be placed online, and well water supply would no longer be required.

Additionally, the required withdrawal rate during the first five years would amount to only 28 percent of the amount currently being withdrawn from onsite Aquia wells. Because of the temporary nature of the withdrawal and the fact that the withdrawal rate would amount to a relatively small fraction of what is already being withdrawn from onsite

Aquia wells, UniStar Nuclear does not believe that the requested regional water balance would not be useful at this stage.

Assuming that the Maryland Department of the Environment (MDE) permits the additional withdrawal from the Aquia wells of an average of 44.5 gpm for construction activities under the existing groundwater permit, an additional 30.5 gpm will need to be obtained by trucking in water from off site or by constructing a well tapping another (probably deeper) aquifer. Because the peak water use rate for construction is estimated to be as high as 1,200 gpm (4,540 lpm), an onsite water storage facility will be required to meet the water demands during construction. The capacity of the storage tank(s) will depend upon the results of an analysis of the expected hour-by-hour water demands during the period of construction when peak water demands are expected.

Several engineering options are being explored to address the discrepancy between the expected construction water use and the unused portion of the site water allocation for the Aquia aquifer, including trucking of water from offsite wells and constructing a well tapping the next lower aquifer below the Aquia aquifer. Also, a groundwater flow model is being developed for evaluating the likely impacts of incremental increased pumping from the Aquia aquifer for this purpose.

ER Impact:

No changes to the ER are required.

Item Number HS-8 **ESRP/ER Section 4.2.2.3**

Request:

Increasing groundwater withdrawals for construction needs from the onsite Aquia aquifer production wells, could produce a local depression of the potentiometric surface in that aquifer. These increased withdrawals could potentially induce salt water intrusion or produce land subsidence, but neither had been reported as a significant problem in Calvert County or St. Mary's County (Section 4.2.2.3 page 4.2-11). Provide the basis for suggesting that there may be the potential for induced salt water intrusion to an aquifer 600 ft below msl being supplied by salt water from the Chesapeake Bay with a bottom elevation from 30 to 100 ft below msl.

Response:

While there is a potential for salt water intrusion into the Aquia aquifer, it is considered remote. The only sources for salt water intrusion are the Chesapeake Bay and the Atlantic Ocean, the latter located some 70 miles downdip (southeast) of the site.

As noted in the report, the natural discharge of the Aquia Aquifer is to the southeast, primarily from subaqueous exposures of the aquifer presumed to occur along the Continental Shelf. The aquifer thins progressively southeast of the site and grades from sandy material to predominantly fine-grained sediments. Because of the low permeability of the unit downdip of the site, the natural rate of discharge into the Atlantic Ocean is correspondingly low. However, if the cone of depression in the aquifer becomes sufficiently deep over a sufficiently long period of time, the natural gradient could be reversed and salt water could be drawn inland toward the deep pumping center. Regarding possible salt water encroachment from the Chesapeake Bay, Figure 2.3.1-33 of the ER indicates the potentiometric level in the aquifer at or near the site in September 2003 was approximately 100 feet below mean sea level. Thus, a vertically downward hydraulic gradient of about 100/400, or 0.25, already exists between the Chesapeake Bay water and the Aquia aquifer at the site.

What makes salt water intrusion or encroachment into the Aquia aquifer at the site rather remote is the fact that extensive low-permeability deposits occur between the source of the salt water and the aquifer beneath the site. Salt water from the Atlantic Ocean would have to travel northwestward through the aquifer a distance of 70 miles or more to reach the site area. Most of this would involve flow through sediments comprised largely of silt and clay. Similarly, there is a significant thickness of aquitards (layers of low permeability) between the bottom of the Chesapeake Bay and the top of the Aquia aquifer at the site. All this indicates that any movement of salt water toward the Aquia aquifer at the site would be extremely slow, and therefore must be considered unlikely unless the cone of depression in the Aquia aquifer beneath Calvert County deepens substantially over a long period of time.

ER Impact:

No changes to the ER are required.

Item Number HS-9 ESRP/ER Section 4.2.2.3

Request:

If properly managed, construction activities at CCNPP and any additional groundwater withdrawals for construction of CCNPP Unit 3 should not adversely affect the local or regional groundwater systems. There are currently no known or projected site discharges that are or could affect the local groundwater system. Construction activities will affect the shallower, non-utilized water-bearing units beneath the site (the Surficial aquifer and upper water bearing units within the Chesapeake Group) (SAR Section 2.4.12.1.4 page 2.4.12-12). A potential stormwater management plan calls for a series of bio-retention basins and sedimentation basins to divert, collect, and promote infiltration to the Surficial aquifer which feeds Johns Creek. Provide the basis for stating that groundwater withdrawals would not adversely impact the local or regional groundwater systems. Include the impact to the Surficial aquifer, Aquia aquifer, connected aquifers, and water availability to other users. Identify the impact to the Surficial aquifer and Johns Creek due to a potential stormwater management plan, which calls for a series of bio-retention basins and sedimentation basins to divert, collect, and promote infiltration. (See Item HS-8, which is related.)

Response:

At the site and vicinity, the Surficial aquifer is considered a terrace deposit, and is consequently found only in the upland areas and is usually of limited areal extent. Each distinct area where the deposits exist is separated and bounded by the streams and tributaries of the area. In the power block area, Figures 2.3.1-38 and 2.3.1-39 illustrate how the aquifer pinches out due to its being dissected by the streams and tributaries of the plant area. Groundwater from the Surficial aquifer deposits discharges through seeps into the bounding tributaries and streams.

Removal of a significant portion of the Surficial aquifer by the construction activities and its replacement with impermeable surfaces will effectively eliminate direct recharge of the Surficial aquifer via precipitation in that area. As explained above, the Surficial aquifer in the area impacted by construction is physically and hydraulically isolated from neighboring expressions of the aquifer.

Sand-filter trenches will receive and drain off surface runoff from the CCNPP Unit 3 area. On the east side, the trenches draining the power block and the adjacent laydown area will convey runoff to a wetland creation area located east of the power block. On the west side, trenches draining the switch yard area will discharge into an unlined storm-water basin located to the west, and runoff from sand filter trenches in the cooling tower area and the parking area will discharge directly into tributaries to Johns Creek. The outflow structure for the storm-water basin will be designed to release water at low enough rates so that the receiving stream will not be subject to either erosion or sedimentation, beyond what is naturally occurring now.

The bottom of these trenches will consist of a permeable layer of sand or gravel and this will permit infiltration into the remaining (lower) portion of the Surficial aquifer. These trenches will be designed to accommodate as much as a two-year, 24-hour rain event.

Recharge to this local Surficial aquifer will shift in that direct recharge via precipitation will largely cease, while recharge to the aquifer will occur through the bottoms of the sand-filter trenches, and the storm-water basin. This infiltration into the remaining portion of the Surficial aquifer will compensate in large part for the elimination of recharge via infiltrating precipitation. Based on observations made at other sites where the land surface has been lowered, it is expected that at the power block the post-construction steady-state water table in the aquifer may be a few feet lower than that indicated in Figures 2.3.1-42 through -45. While such lowering of the water table may reduce the rate of groundwater discharge into the bounding tributaries somewhat, this would be offset by runoff flow contributed from the sand-filter trenches to the wetland creation area on the east side and to the tributaries to Johns Creek on the west side. Thus, no significant change in the long- or short-term flow to Johns Creek and downstream wetlands from the power block area is expected.

A storm water management plan has been prepared (Calvert Cliffs Unit 3 Storm Water Management Plan, dated April 2008). As discussed in the plan, a detailed storm water management study will be conducted to determine adequate sizes of the several components of the storm-water system to maintain both quality and quantity requirements for the downstream area. This will include analyzing the pre-development and post-development site hydrology for the 1-, 2-, 5-, 10- and 100-year 24-hour rainfall events. The planned storm-water management system will be sized such that the downstream flow rates, sediment loads and water quality will be similar to the existing conditions and such that the post-development peak discharges will not exceed the pre-development rates.

While there is a potential for water-quality degradation in the Surficial aquifer or in the thin immediately-underlying Chesapeake aquifers to impact the lower aquifers commonly used for potable water supply, we believe this potential is remote. The aquifers used for water supply in this part of Calvert County include the Piney Point-Nanjemoy aquifer, found in the approximate depth range of 300 to 400 feet, and the Aquia aquifer, which is encountered at depths of approximately 500 to 650 feet.

No wells tapping the Surficial aquifer are known to exist in the vicinity of the plant or along Maryland State Route 2/4. This is because, as described above, the saturated thickness of the aquifer is limited and variable, and consequently any shallow wells tapping the unit would tend to dry up during periods of drought. Each distinct area where the deposits exist is separated and bounded by the streams and tributaries of the area. Any onsite impact affecting the quantity or quality of water in the local Surficial aquifer will be unlikely to impact local groundwater users, as residents and other local users have wells tapping either the Piney Point-Nanjemoy aquifer or the Aquia aquifer.

The known offsite (primarily domestic) wells within 1.5-mile radius of the site tap the Piney Point-Nanjemoy aquifer, as do seven of the 12 wells on the plant property. The remaining five onsite wells tap the deeper Aquia aquifer.

Any water-quality degradation in the Surficial aquifer would be unlikely to impact the underlying Piney Point-Nanjemoy aquifer, and even less likely the deeper Aquia aquifer, This is because beneath the plant site, two aquitards (layers of low permeability) totaling approximately 150 feet in thickness occur between the Surficial aquifer and the Piney Point-Nanjemoy aquifer. Deposits comprising another aquitard between the Piney Point-Nanjemoy aquifer and the underlying Aquia aquifer total approximately 200 feet in thickness. The rate of potential vertical movement of any impacted groundwater from the Surficial aquifer through the aquitards to the deeper aquifers would necessarily be very low because of the low permeability of the aquitards, and in the process of this migration, many or most of any contaminants would tend to be adsorbed onto the clay components of the aquitards. It is therefore unlikely that measurable quantities of degraded water would reach the lower aquifers.

As shown in ER Table 2.3.2-7, withdrawals from the Aquia aquifer by plant wells under the permit for CCNPP Units 1 and 2 have averaged 141E6 gallons per year (534E6 liters per year), which is equivalent to approximately 268 gpm [1,015 lpm]. The yearly withdrawal limit under the CCNPP Unit 1 and 2 groundwater withdrawal permit [CA69G010 (05)] is 450,000 gallons per day (1,703,435 liters per day), which translates to 312.5 gpm (1,183 lpm), as shown in ER Table 2.3.2-6. This results in an average 44.5 gpm (168.4 lpm) from the CCNPP groundwater withdrawal permit for the Aquia aquifer that is currently not being used.

The permit for groundwater withdrawal from the Aquia aquifer for CCNPP Units 1 and 2 was issued on the basis that that this allocation would not result in lowering the potentiometric level in the aquifer below the 80 percent management level. As shown on ER Figure 2.3.2-20, over the last three and a half years the potentiometric level has not declined in the onsite Aquia well that serves as a USGS observation well. As a result, it is considered likely that the MDE will agree to the additional average withdrawal of the unused portion of the currently permitted withdrawal authorization (44.5 gpm) to support CCNPP Unit 3, provided the daily average for the month of maximum use does not exceed approximately 85 gpm for this purpose.

ER Table 4.2-1 indicates that the expected freshwater requirements during construction activities for CCNPP Unit 3 would not exceed 39,269,844 gallons (148,650,000 liters), which amounts to approximately 75 gpm (559 lpm) on an average annual basis. Assuming that additional withdrawals from the Aquia wells equivalent to the unused portion of the groundwater withdrawal authorization for CCNPP Units 1 and 2 can be permitted for use at CCNPP Unit 3 at an average of 44.5 gpm for construction activities, an additional 30.5 gpm will need to be obtained by trucking in water from offsite or by constructing a well tapping another (probably deeper) aquifer. Because the peak water use rate for construction is estimated to be as high as 1,200 gpm (4,540 lpm), an onsite water storage facility will be required to meet the water demands during construction. The capacity of the storage tank(s) will depend upon the results of an analysis of the expected hour-by-hour water demands during the period of construction when peak water demands are expected.

Several engineering options are being explored to address the calculated shortfall between expected construction water use and the unused portion of the CCNPP Unit 1 and 2 water allocation for the Aquia aquifer, including trucking of water from offsite wells and constructing a well tapping the next lower aquifer below the Aquia. Also, a groundwater flow model is being developed for evaluating the likely impacts of incremental increased pumping from the Aquia aquifer for this purpose.

ER Impact:

No changes to the ER are required.

Item Number HS-10 **ESRP/ER Section 2.3.1.2.3.4**

Request:

In the vicinity of the CCNPP site, the Surficial aquifer is capable of transmitting groundwater but is of limited areal and vertical extent. The Surficial aquifer is not a reliable source of groundwater because of its relative thinness, limited saturated thickness, and dissected topography that causes local groundwater to discharge as small seeps and springs (Section 2.3.1.2.3.4 page 2.3-27). The Surficial aquifer is present above elevation 65 to 70 ft msl at the CCNPP site as shown in Figures 2.3.1-38 and 2.3.1-39. Groundwater surface contour maps, as detailed in Figures 2.3.1-(41-45) and reported in Table 2.3.1-17, indicate groundwater elevations between 68.0 to 83.5 ft msl (Section 2.3.2.2.2.1 page 2.3-36). For each quarter, the spatial trend of the water table surface and horizontal gradients are similar, with elevations ranging from a high of approximately 84.8 ft msl at well OW-423 to a low of approximately 68.1 ft msl at well OW-743 (Section 2.3.1.2.3.2 page 2.3-22, Figure 2.3.1-41). Clarify whether the 83.5 number is in error as the maximum reported number appears to be 84.78 in Table 2.3.1-17. Also, provide the correct low elevation, as neither the 68.0 nor the 68.1 is reported in Table 2.3.1-17, and Table 2.3.1-17 indicates a minimum elevation of 68.37.

Response:

The maximum Surficial aquifer elevation observed during the reported period was 84.78 ft msl. The correct observed low is 68.12 ft msl.

ER Impact:

Values for maximum Surficial aquifer elevation and observed Surficial aquifer low level will be incorporated into a future revision of the ER.

Item Number HS-11 **ESRP/ER Sections 2.3.1, 3.1**
Request:

Figures 2.3.1-38 and 2.3.1-39 suggest a maximum ground surface elevation at around 125 ft msl. The plant grade for CCNPP Unit 3 will be at an elevation of approximately 85 ft msl with the bottom of the Reactor Building foundation 40-ft below grade at an elevation of 45 ft msl (Section 3.1 page 3.1-2). The deepest base of the excavation for construction of the reactor building is an elevation of approximately 44 ft msl (Section 2.3.2.2.11 page 2.3-46). Clarify whether the base of the reactor building is at 45 ft or 44 ft msl.

Response:

The bottom of the foundation for the Reactor Building Complex (i.e. Nuclear Island Common Base Mat Structure) is located at approximate elevation 44 ft msl for the general area (i.e. approximately 41 ft below finish grade at approximate elevation 85 ft msl). Excavation for the Reactor Building Complex will extend down to the competent cemented sand soil layer, which varies in elevation, but is located at approximate elevation 40 ft msl. Local areas of the excavation will extend below elevation 40 ft msl to follow the cemented sand contour and to facilitate installation of tendon gallery structures for the Reactor Building. Structural backfill will be placed on top of the cemented sand layer to achieve the required bottom of foundation elevation for the Reactor Building Complex general area.

ER Impact:

ER Section 3.1 will be updated to reflect the bottom elevation of the reactor building as being approximately 44 ft msl in a future revision of the ER.

Item Number HS-12 **ESRP/ER Sections 2.3.1, 4.2.2.5**

Request:

With the plant grade for CCNPP Unit 3 being lowered to an elevation of approximately 85 ft msl, there is the potential to remove up to 40 ft of soil and remove a potential vadose zone volume that helps recharge the Surficial aquifer, as illustrated by Figures 2.3.1-37 through 2.3.1-39. Section 4.2.2.5 page 4.2-13, it states that the final site grade elevation will be 84.6 ft. Clarify whether the final site grade elevation is 84.6 or 85.0 ft msl.

Response:

Plant grade is nominally 85 ft, since the grade varies across the power block location due to slope for drainage.

ER Impact:

No changes to the ER are required.

Item Number HS-13 **ESRP/ER Section 2.3.1**

Request:

A permanent groundwater dewatering system is not anticipated to be a design feature for the CCNPP Unit 3 facilities. Removal of a portion of the Surficial aquifer during construction may eventually lower the expected depth to groundwater. 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 groundwater system beneath the site. Groundwater elevations will continue to be monitored, and any observed deviations in groundwater elevations potentially impacting the current design basis will be accounted for to design a construction dewatering system, as appropriate (Section 2.3.2.2.11 page 2.3-47). Provide if possible a topographic map with an overlay of the construction foot print and with contours that can be easily read. Describe how the recharge to the Surficial aquifer would be impacted in the short term. Long term is presented in Figures 2.3.2-(24-25). Identify how the seeps and streams would be impacted and how this would impact local wells.

Response:

A figure depicting the construction footprint and post-construction topography will be provided in a future revision of the ER. Also, the existing Surficial aquifer groundwater model will be updated to include an evaluation of offsite impacts due to changes in recharge as well as impacts to local seeps and springs. From a qualitative perspective, since the Surficial aquifer is laterally discontinuous due to local stream dissection, the short term impact to recharge is expected to be minimal. However, the existing Surficial aquifer groundwater model is being updated/revised to include an evaluation of any off-site impacts. The results of this modeling will be reported to the NRC by November 30, 2008.

ER Impact:

A figure depicting the construction footprint and post-construction topography will be provided in a future revision of the ER.

Item Number HS-14 **ESRP/ER Section 2.3.1**

Request:

Table 2.3.1-1 appears to be mislabeled. Please check, resolve, and correct.

Response:

The correct title for Table 2.3.1-1 is “Chesapeake Bay Sub-Watersheds and CCNPP Unit 3 Site Locations”

ER Impact:

The title for ER Table 2.3.1-1 will be updated in a future revision of the ER.

Item Number HS-15 **ESRP/ER Sections 3.4, 4.3.2.2**

Request:

It appears that there is an error in the text, as it refers to Figure 3.4-8 instead of Figure 3.4-3 (Section 4.3.2.2 page 4.3-19). Please verify.

Response:

The cited text in ER Section 4.3.2.2 on page 4.3-19 should refer to Figure 3.4-3 instead of Figure 3.4-8.

ER Impact:

The table reference in ER Section 4.3.2.2 will be updated in a future ER revision.

Item Number HS-16

ESRP/ER Sections 4.2.1.2, 4.3.2.1, 4.2.2.7

Request:

Excavated and dredged material will be transported to an onsite spoils area located outside the boundaries of designated wetlands (Section 4.2.1.2 page 4.2-3). Dredged material will be disposed of in the previously used disposal area known as Lake Davies (Section 4.3.2.1 page 4.3-15). The location of Lake Davies is shown in Figure 2.3.1-2. Lake Davies previously received spoils for CCNPP Units 1 and 2. As such, dredge spoils generated during the dredging of the barge slip area and construction of the intake/discharge structures may contain elevated levels of metals and salts. Runoff containing saline residue from the spoils could enter the impoundment just southeast of the spoils disposal pile, which is likely in direct hydraulic contact with the Surficial aquifer. The Environmental Report notes that any impact on groundwater quality would probably be minor due to dilution (Section 4.2.2.7 pg 4.2-14). Lake Davies appears to be below the elevation associated with the Surficial aquifer; describe how Lake Davies' runoff and seepage could impact the Surficial aquifer. Provide the basis for the conclusion that the impacts to groundwater quality would be minor.

Response:

At the site and vicinity, the Surficial aquifer is considered a terrace deposit and, as such, is found only in the upland areas and is usually of limited areal extent. Each area where these deposits exist is separated and bounded by the streams and tributaries of the area. In the power block area, for example, Figures 2.3.1-38 and 2.3.1-39 illustrate how the aquifer pinches out due to its being dissected by the streams and tributaries of the plant area. As shown on these figures, the bottom of the Surficial aquifer ranges between 65 and 75 feet msl. Groundwater from the Surficial aquifer deposits discharges through seeps into the bounding tributaries and streams.

The term 'Lake Davies' is subject to misinterpretation as it has in the past referred to a large field where dredge material was disposed during the construction of CCNPP Units 1 and 2. Water was decanted from this disposal area into a series of settling ponds (two ponds in the southern portion and one in the southwest portion of the disposal area) that drained ultimately into Johns Creek. This disposal area as it exists today is a large flat field that is used for storage. In this report, the term Lake Davies is applied to the larger of the ponds, as shown on Figure 2.3.1-2; it is the one immediately south of the large dredge spoil area. The pond currently functions as a storm water retention pond and the depth fluctuates widely depending on precipitation. The pond bottom and banks are vegetated by *Phragmites sp.*

Most of the dredged material will be placed in the large former dredge spoil area adjoining Lake Davies on the north. Brackish or saline water can slowly leach through the older dredge material and into the underlying deposits of the Surficial aquifer. The saline water from the new dredge spoils can also drain laterally into the draw adjoining the spoil area to the east, which in turn would drain directly into Lake Davies. According to the most recent USGS topographic map of the site area, the bottom surface elevation of Lake Davies is between 75 to 80 feet above msl. Based on the information from the power block area, the bottom of the Surficial aquifer ranges between 65 to 75 feet above msl. Hence, we can expect that the Surficial aquifer beneath Lake Davies might range in thickness from 0 to 15 feet.

It is to be expected that portions of the saline residue in the dredge spoils will be mobilized by solution into infiltrating rain water. The salts in the dredge spoils will be diluted by the rainwater, and they will be further attenuated through hydrodynamic dispersion as the water seeps through the older dredge spoils and into the underlying Surficial aquifer deposits to flow either toward Lake Davies or the tributary to the southwest of the dredge spoils area. Some of the water in Lake Davies will infiltrate through the bottom of the lake resulting in further dilution through dispersion.

The impact on the water quality of the Surficial aquifer in this local area will not be of major consequence because the impact will be very localized as the water will discharge to a nearby surface-water body and because the aquifer is so thin and is not utilized for any purpose in the site and vicinity. Further dilution will occur in the tributary downstream of Lake Davies by mixing with groundwater of low salinity that discharges into the tributary farther downstream.

ER Impact:

No changes to the ER are required.

Item Number HS-17 **ESRP/ER Section 4.2.2.7**

Request:

Little, if any, water quality impacts would be expected if this diluted water were to reach the deeper aquifers. Dewatering for the foundation excavations may increase the oxidation of some sedimentary constituents by placing them in direct contact with the atmosphere. The oxides might have an increased solubility and could migrate down gradient when the potentiometric head is reestablished following construction completion. The ER notes that possible impacts to the Surficial aquifer water quality would be small and decrease with migration and dilution (Section 4.2.2.7 page 4.2-14). Provide the basis for the conclusion that water quality impacts would be small and decrease with migration and dilution.

Response:

Possible impacts to the water quality of the Surficial aquifer are considered to be SMALL for the following reasons:

At the site and vicinity, the Surficial aquifer is considered a terrace deposit and, as such, is found only in the upland areas and is usually of limited areal extent. Each distinct area where the deposits exist is separated and bounded by the streams and tributaries of the area. In the power block area, Figures 2.3.1-38 and 2.3.1-39 illustrate how the aquifer pinches out due to its being dissected by the streams and tributaries of the plant area. Thus, the Surficial aquifer in the power block area is physically and hydraulically isolated from neighboring expressions of the aquifer. Groundwater from the Surficial aquifer deposits discharges through seeps into the bounding tributaries and streams.

Portions of the saline residue in the dredge spoils, which are to be stored in the spoils disposal area near Lake Davies, will likely enter the surficial groundwater by solution into the infiltrating rain water. The salts in the dredge spoils will be diluted by the rainwater, and they will be further attenuated through hydrodynamic dispersion as the water flows in the Surficial aquifer deposits in that area toward the nearby tributary, into which the water will discharge via seeps. Further dilution will occur in the tributary by mixing with groundwater having minimal salinity that discharges into the tributary farther downstream.

The common minerals found naturally in surficial groundwater, such as exists presently at the site, are represented by calcium, magnesium, sodium, potassium, iron and manganese. The oxides of calcium, magnesium, sodium and potassium are unstable and are rarely found in environments having a normal pH range (5.5 to 8.5). The oxides of iron and manganese can appear readily in surficial soils; however, their solubility in water is low. They will therefore tend to precipitate out of solution and not migrate with the groundwater.

ER Impact:

No changes to the ER are required.

Item Number HS-18

ESRP/ER Sections 4.2.2.2, 4.2.2.7, 4.3.2.2

Request:

The proposed removal of onsite wetlands could reduce the ability of microbiotic organisms and fauna to naturally attenuate contaminants and pollutants produced onsite (Section 4.2.2.7 page 4.2-14). No significant effects of overland sedimentation or runoff into the Chesapeake Bay are expected (Section 4.3.2.2 page 4.3-(18-19)). A quantitative calculation and evaluation of the construction effluents and runoff will be done as part of the state construction permit process (Section 4.2.2.2 page 4.2-(9-11)). Provide quantitative calculations and an evaluation.

Response:

Based on the site development plan and the boundaries of the wetlands and surface water areas on the CCNPP Unit 3 project site, a total of 11.71 areas of wetlands and surface waters and 8,350 linear feet of intermittent and upper perennial stream channels will be permanently impacted during the construction of the proposed facility. The project will also disturb approximately 30.85 acres of land defined as non-tidal wetland buffer (50 foot) by Calvert County. There have not been any studies to determine baseline levels of contaminants or pollutants on site in these areas, nor is there an ability to determine the percent efficiency for sequestering or attenuating these materials by the wetlands and surface water areas that will be impacted. The need to mitigate for the lost resources and to maintain or improve water quality from the developed site is recognized.

Compensatory mitigation for unavoidable impacts will be required the US Army Corps of Engineers and the Maryland Department of Environment. The primary goal of the mitigation plan is to establish viable bottomland hardwood forest habitat and emergent wetland habitat within a historically-altered upland area (Lake Davies Disposal Area), enhancement of existing poorly drained bottomland hardwood forest habitat within Johns Creek, creation of a forested wetland habitat within the Camp Conoy area, stream restoration to 6,283 linear feet of stream channel to reestablish physical, biological, and riparian function, and stream enhancement of 4,146 linear feet of stream channel through bank stabilization, native riparian planting, and other improvements to the aquatic habitat. The proposed mitigation is intended to replace the lost resource as well as the function of the resource, which is improving water quality, providing habitat, and attenuating contaminants.

A comprehensive water management plan will be designed for the proposed facility and will begin prior to the first day of ground clearing. Water quality will be planned for from the time that precipitation deposits on the site until it leaves the property.

Best management practices will be selected and implemented to insure that the water quality downgradient of construction will not be noticeably altered. The maintenance of acceptable water quality will be largely affected by implementation of the erosion and sediment control measures described in the CCNPP Unit 3 Storm Water Management Plan, dated April 2008. These measures will be implemented by installation of *initial, intermediate,* and *final* erosion and sedimentation controls, which will be planned, conducted and maintained according to the Calvert County Soil Conservation District standards and specifications. The specific features to be implemented for erosion and sediment control will be detailed in the Grading Permit Application, which planned to be submitted to Calvert County in July 2008.

Initial controls will be installed prior to construction commencement and will include perimeter protection fencing and controls and strictly-controlled construction exits. *Intermediate* controls will include silt fencing, sediment ponds, diversion dikes and stone check dams if necessary to control erosion and storm-water runoff. The site will be designed so that all disturbed areas flow to sediment retention ponds as much as possible. The ponds will be designed to maximize trapping efficiency and reduce turbidity. This will reduce impacts and provide protection to the receiving water bodies. During the grading and construction phase, additional intermediate erosion controls will be put in place as land disturbance occurs. Erosion control devices will be implemented or modified as the drainage patterns for storm water are constructed. All disturbed land left exposed for 7 days (steep slopes) to 14 days (gentle slopes) will be mulched or temporary grass cover will be provided.

Final erosion and sediment controls will be integrated with establishment of the permanent storm-water management system and will include, among other things, construction of filtration trenches, stream enhancements, stabilization of construction roads, application of rolled erosion control product on steep slopes during final grading, and permanent stabilization by grassing of final grades and open pervious areas.

Monitoring will be an integral part of the Storm Water Management Plan and will include the inspection of BMPs weekly, prior to storms, and immediately following storm events. If there are any concerns about the quality of the water leaving BMPs, turbidity measurements could be incorporated into the management plan.

Implementation of a sequenced, systematic erosion and sedimentation control plan, as summarized above and to be approved by Calvert County Soil Conservation District will result in minimal water-quality impacts due the planned CCNPP Unit 3 construction and operation activities.

Post construction measures will include sand-filter trenches which will receive and drain off surface runoff from the CCNPP Unit 3 area. On the east side, the trenches draining the power block and the adjacent laydown area will convey runoff to a forested wetland creation area located east of the power block. The sand filter trenches are intended to filter particulates from the water and to act as a media for metal and petroleum digesting bacteria. The wetlands that the water will then flow to will sequester nutrients and polish the water prior to discharge into the stream. On the west side, trenches draining the switch yard area will discharge into an unlined storm-water basin located to the west, and runoff from sand filter trenches in the cooling tower area and the parking area will discharge directly into tributaries to Johns Creek. The outflow structure for the storm water basin will be designed to release water at low enough rates so that the receiving stream will not be subject to either erosion or sedimentation, beyond what is naturally occurring now.

The bottom of these trenches will consist of a permeable layer of sand or gravel and thus will permit infiltration into the remaining (lower) portion of the Surficial aquifer. These trenches will be designed to accommodate as much as a two-year 24-hour rain event.

As described in the CCNPP Unit 3 Storm Water Management Plan, a detailed storm-water management study will be conducted to evaluate adequate sizes of the several components of the storm-water system to maintain both quality and quantity requirements for the downstream area. This will include analyzing the pre-development and post-development site hydrology for the 1-, 2-, 5-, 10- and 100-year 24-hour rainfall events. The planned storm-water management system will be sized such that the downstream flow rates, sediment loads and water quality will be similar to the existing conditions and such that the post-development peak discharges will not exceed the pre-development rates. Thus, no significant change in the water quality or in the long term or short term flow to the streams and wetlands from the power block area is expected.

In summary, the goal of the design team is plan and design to maintain water quality and to discharge water at a preconstruction rate. Wetland resources and function will be replaced through a mitigation plan. The design of the permanent stormwater management system will reduce the quantity and improve water quality of runoff from impervious surfaces even before it reaches a water body. While there is no reliable method to quantify construction runoff or water quality, there is a strong commitment to ensure that it meets stringent standards.

ER Impact:

No changes to the ER are required.

Item Number HS-19   ESRP/ER Sections 4.2.1.5, 4.2.2.10

Request:

Heavy rainfall events could impact local streams and watersheds. Provide expected impacts during heavy rainfall events to local streams and watersheds and include catchment area size associated with Johns Creek and contaminant loadings.

Response:

As a part of the CCNPP Unit 3 Final Safety Analysis Report (FSAR), hydrologic analyses were performed to evaluate the flooding potential in the vicinity of the CCNPP Unit 3 power block area. Using the model HEC-RAS, water-surface profiles resulting from the Probable Maximum Flood (PMF) in the Johns Creek catchment were developed. The size of the Johns Creek catchment area at the intersection of the creek and Maryland State Route 2/4 is approximately 1,500 acres. FSAR Figure 2.4.3-10 shows plots of these profiles. According to this analysis, the highest computed water-level elevation in Johns Creek resulting from the projected flood was approximately 65 feet at a location (Section 17) on the creek approximately 3,300 feet south of the CCNPP Unit 3 power block area (Figure 2.4.3-9 of the FSAR). At the culvert at Maryland State Route 2/4 the predicted flood height ranged from 51 to 53 feet in elevation.

Contaminant loadings were not included in the analysis. The contaminant loading at the time of a PMF would depend upon whether the plant is in the construction phase or the post-construction phase, and if in the construction phase, the status of the ground surface conditions in the construction area and laydown areas.

During the construction phase, major storms could wash contaminants such as concrete slurry, concrete sealants, acidic byproducts, solvents, and hydrocarbons (fuels, oils, and greases) into the temporary impoundments. If the capacity of these impoundments and other storm water BMPs was to be exceeded, then these contaminants could then enter into Johns Creek or its tributaries where it would have a temporary impact on downstream aquatic organisms. Similarly, if the capacity of impoundments and other storm water BMPs was exceeded, construction debris residing on the pads and temporary staging areas could mix with the stormwater, exit the site and produce chemical reactions that could have a temporary impact on downstream aquatic organisms.

The addition of sediment and organic debris to local streams resulting from the clearing, grubbing, and grading performed during the initial stage of construction could also temporarily impair water quality if impoundments and other storm water BMPs were to be exceeded. Organic debris would tend to clog existing streams, increase sediment deposition, and increase the potential for future flooding. Organic debris decomposing in streams can cause dissolved oxygen and pH imbalances and sediment-laden waters are prone to reduced oxygen levels and algal growth. Such impacts from a major storm would be expected to be temporary.

In the event of major storms during the plant operational phase, contaminants that could reach area streams would be limited to organic debris and sediment, and because of the permanent stormwater management system the quantity of these contaminants would be significantly less than what could occur during the construction phase.

ER Impact:

No changes to the ER are required.

Item Number HS-20 **ESRP/ER Section 1.3**

Request:

Clean Water Act Section 316(a). This section regulates the cooling water discharges to protect the health of the aquatic environment. Add this permit to the list in Table 1.3-1.

Response:

ER Table 1.3-1 will be updated to include the addition of a listing for the applicable requirement of Section 316(a) under the Clean Water Act.

ER Impact:

ER Table 1.3-1 will be updated to include a listing for Section 316(a) under the Clean Water Act in a future ER revision.

Item Number HS-21 **ESRP/ER Section 1.3**

Request:

Clean Water Act Section 316(b). This section regulates cooling water intake structures to minimize environmental impacts associated with location, design, construction, and capacity of those structures. Add this permit to the list in Table 1.3-1.

Response:

ER Table 1.3-1 will be updated to include the addition of a listing for the applicable requirement of Section 316(b) under the Clean Water Act.

ER Impact:

ER Table 1.3-1 will be updated to include a listing for Section 316(b) under the Clean Water Act in a future ER revision.

Item Number HS-22 **ESRP/ER Section 3.3**

Request:

Questions HS-25 through -27 below are directly related to Table 3.3-1 and Figure 3.3-1. Because UniStar has modified its design to go with a hybrid cooling tower, the intake and discharge rates provided in Table 3.3-1 and Figure 3.3-1 will need to be updated and be consistent with the information provided in the text.

Response:

Addition of the hybrid section to the CWS cooling tower does not significantly impact the water demand and effluent discharge rates specified in Table 3.3-1 and Figure 3.3-1. However, the use of higher efficiency drift eliminators reduces the drift rate to 3.9 gallons per minute (0.0005%) from 39 gallons per minute. This reduction in drift rate will have a slight impact on the cooling tower supply and blowdown amounts shown.

ER Impact:

Applicable portions of the ER related to water intake and discharge flow rates (ER Sections 3.3 and 3.4), salt drift (ER Section 5.3), and the use of higher efficiency drift eliminators will be updated in a future revision of the ER.

Item Number HS-23 **ESRP/ER Sections 3.3, 3.4.2.2**

Request:

Maximum effluent discharge to Chesapeake Bay is 23,228 gpm (Figure 3.3-1). Reconcile the volume stated in Section 3.4.2.2 page 3.4-6, with the volumes in Fig 3.3-1 and Table 3.3-1.

Response:

As described in the response to RAI Item Number 42, the flow values in ER Table 3.3-1 and Figure 3.3-1 have been updated since submittal of the ER. The updated value for maximum effluent discharge to the Chesapeake Bay is 24,363 gpm.

ER Impact:

Values for maximum effluent discharge to the Chesapeake Bay in ER Sections 3.3 and 3.4 will be corrected in a future ER revision.

Item Number HS-24 **ESRP/ER Section 3.3**

Request:

All water demands by the CCNPP are supplied by water withdrawn from the Chesapeake Bay. It is anticipated that the average withdrawal rate is 37,788 gpm (Table 3.3-1). Is there an error in Fig 3.3-1, which reports 37,778 gpm?

Response:

As described in the response to RAI Item Number 42, the flow values in ER Table 3.3-1 and Figure 3.3-1 have been updated since submittal of the ER. The updated value for anticipated average withdrawal rate is 41,095 gpm.

ER Impact:

Table 3.3-1 and Figure 3.3-1 will be reconciled in a future revision to the ER.

Item Number HS-25 ESRP/ER Section 3.3.1

Request:

3040 gpm represents the desalinated water consumption during normal operations (Section 3.3.1 page 3.3-1 and Table 3.3-1). Is there an error, as page 3.3-1 notes 4.1E7 gal/mo, which equals 935 gpm, not 3040 gpm?

Response:

As described in the response to RAI Item Number 42, the flow values in ER Table 3.3-1 and Figure 3.3-1 have been updated since submittal of the ER. The updated value for desalination plant influent flow is now 3063 gpm, and the updated desalination plant output flow is 1225 gpm. A copy of ER Table 3.3-1 that reflects updated desalination plant output and demand is provided in the response to RAI Item Number 42.

As stated in Note e. of updated ER Table 3.3-1, "a production rate of 1,225 gpm (4,637 lpm) would be less than the makeup demand for the UHS cooling towers. However, the makeup and evaporation demands for the UHS cooling towers in the above table are bounding values that occur under design ambient conditions; actual demands are anticipated to be significantly less. Therefore, the flows will likely change during the detailed design phase." The 4.1E7 gal/mo flow rate shown in the submitted ER equates to consumption of 935 gpm of desalinated water. However, based on the demand and output conditions described above, the appropriate monthly consumption value should be equivalent to the output capacity of the desalination plant (1225 gpm), and the value on ER page 3.3-1 should therefore be 5.29E7 gal/mo.

ER Impact:

The values for desalination plant influent and output flowrate presented in ER Section 3.3.1, and the monthly consumption value for desalinated water presented on ER page 3.3-1 will be updated in a future ER revision.

Item Number HS-26 ESRP/ER Sections 2.3.2.2, 4.2.1.1

Request:

Some irrigation, old farm, and domestic wells withdraw water from the Surficial aquifer, but the aquifer is not widely used as a potable water supply, and yields are generally less than 50 gpm (Section 4.2.1.1 page 4.2-2; Section 2.3.2.2.2.1 page 2.3-36 (ER references MGS 2005). There are four bio-retention basins that drain the power block and turbine building areas. These ditches are constructed with material that promotes infiltration and runoff from low-intensity rainfall events (FSAR Section 2.4.2.3 page 2.4.2-23). No other information is presented that substantiates that the Surficial aquifer will be able to maintain the ability of local wells to withdraw at these low rates. Identify the wells locations. Assuming major portions of the Surficial aquifer are removed, explain whether the Surficial aquifer would still be able to maintain the ability of local wells to withdraw at these low rates.

Response:

The statement "The Surficial aquifer is primarily tapped by irrigation wells, and some old farm and domestic wells..." was taken from a Maryland Geological Survey report dated June 2005 ("Water Supply Potential of the Coastal Plain Aquifers in Calvert, Charles and St. Mary's Counties, Maryland, with Emphasis on the Upper Patapsco and Lower Patapsco Aquifers"), which related to groundwater conditions in the three counties—Calvert, Charles and St. Mary's. Hence, the statement is a generalization about the Surficial aquifer for the entire three-county region.

No irrigation wells are known to exist in the vicinity of the plant, and no nearby offsite wells are known to tap the Surficial aquifer. This is because the saturated thickness of the aquifer is limited and variable, and consequently any shallow wells tapping the unit would tend to dry up during periods of drought. The known offsite wells (primarily domestic) within 1.5-mile radius of the site tap the Piney Point-Nanjemoy aquifer, as do seven of the 12 wells on the plant property. (The remaining five onsite wells tap the deeper Aquia Aquifer.) The Piney Point-Nanjemoy aquifer in the plant vicinity occurs in the approximate depth range of 300 to 400 feet.

At the site and vicinity, the Surficial aquifer is considered a terrace deposit and, as such, is found only in the upland areas and is usually of limited areal extent. Each distinct area where the deposits exist is separated and bounded by the streams and tributaries of the area. In the power block area, Figures 2.3.1-38 and 2.3.1-39 illustrate how the aquifer pinches out due to its being dissected by the streams and tributaries of the plant area. Groundwater from the Surficial aquifer deposits discharges through seeps into the bounding tributaries and streams.

Removal of a significant portion of the Surficial aquifer in the area of the CCNPP Unit 3 and its replacement with buildings, paved areas and other impermeable surfaces will effectively eliminate direct recharge into that aquifer via precipitation. As explained above, the Surficial aquifer in that area is physically and hydraulically isolated from neighboring expressions of the aquifer.

Sand-filter trenches will receive and drain off surface runoff from the CCNPP Unit 3 area. On the east side, the trenches draining the power block and the adjacent laydown area will convey runoff to a forested wetland creation area located east of the power block. On the west side, trenches draining the switch yard area will discharge into an unlined storm-water basin located to the west, and runoff from sand filter trenches in the cooling tower area and the parking area will discharge directly into tributaries to Johns Creek. The outflow structure for the storm-water basin will be designed to release water at low enough rates so that the receiving stream will not be subject to either erosion or sedimentation, beyond what is naturally occurring now.

This infiltration into the remaining portion of the Surficial Aquifer will compensate in large part for the elimination of recharge through infiltrating precipitation. Based on observations made at other sites where the land surface has been lowered, it is expected that at the power block the post-construction steady-state water table in the aquifer may be a few feet lower than that under current conditions. While such lowering of the water table may reduce the rate of groundwater discharge into the bounding tributaries somewhat, this would be compensated for by the runoff flow contributed from the sand-filter trenches to the wetland creation area on the east side and to the tributaries to Johns Creek on the west side.

Because there are no local wells tapping the Surficial aquifer in the local area, the expected reduction in recharge to the portion of the aquifer underlying the power block and associated laydown area will not represent a negative impact.

ER Impact:

No changes to the ER are required.

Item Number HS-27 **ESRP/ER Section 2.3.2**

Request:

Figures 2.3.2-24 and 2.3.2-25 and their explanations are very confusing.

Although these figures only present the modeling domain, the figures are difficult to read because the dark background (green and purple) suggests the Chesapeake Bay, when in fact they do not represent the Chesapeake Bay. Please update the figures to more clearly articulate locations of figure features.

Response:

The dark blue-green and aqua color in the upper part of Figure 2.3.2-24, and the purple color in the upper part of Figure 2.3.2-25, both represent inactive cells in the model. These are cells essentially outside the boundary of the aquifers, and do not represent the Chesapeake Bay. The groundwater model for the Surficial aquifer is scheduled to be updated and rerun. A legend will be provided for the resulting figures, replacing Figures 2.3.2-24 and 2.3.2-25.

ER Impact:

Figures 2.3.2-24 and 2.3.2-25 will be updated to include a legend in a future ER revision.

Item Number HS-28 **ESRP/ER Section 2.3.2**

Request:

Figures 2.3.2-24 and 2.3.2-25 and their explanation are very confusing.

It appears from Figure 2.3.2-(24-25) and Section 2.3.2.2.11 (page 2.3-(46-47), with the exception of the Essential Service Water System (ESWS) Cooling Tower 1 and Emergency Power Generating Building 1/2, that water table elevations range approximately 4 to 10 ft below the proposed grade at all safety-related facilities. Also, the water table averages approximately 4 ft below grade at the Service Water System Cooling Tower 1 and approximately 3 ft below grade at the Emergency Power Generating Building 1/2. Identifiy in these figures the exact locations of the 1) Service Water System Cooling Tower 1 where the water table is 4 ft below grade, and 2) Emergency Power Generating Building 1/2 where the water table is 3 ft below grade." (Figure 2.3.2-25; Section 2.3.2.2.11 page 2.3-(46-47)).

Response:

The Essential Service Water System (ESWS) Cooling Tower 1 is located on the southernmost side of the power block, and Emergency Power Generating Building 1/2 is located just to the west of that cooling tower. The groundwater model for the Surficial aquifer is scheduled to be updated and rerun. Appropriate labels will be provided on the resulting figures, replacing Figures 2.3.2-24 and 2.3.2-25.

ER Impact:

Figures 2.3.2-24 and 2.3.2-25 will be updated to include appropriate legends in a future ER revision.

Item Number HS-29 **ESRP/ER Section 2.3.2**

Request:

Figures 2.3.2-24 and 2.3.2-25 and their explanation are very confusing.

Groundwater mounding in the Surficial aquifer will no longer be present below the CCNPP Unit 3 power block area (which includes the nuclear island). Horizontal flow will be predominantly to the north and east and controlled by discharge to the bio-retention ditches on the northwest, northeast, and southeast sides of the CCNPP Unit 3 power block area. From Section 2.3.2.2.11 page 2.3-(46-47), is it noted that modeled post-construction water table elevations will average approximately 73.0 ft msl at the nuclear island (Figure 2.3.2-25). A maximum of approximately 29.0 ft of groundwater induced hydrostatic head loadings should be used as the design basis for the subsurface portions of all safety-related structures. Groundwater within the Surficial aquifer beneath the CCNPP Unit 3 facility area ranges from approximately elevation 68 to 85 ft msl.

Provide responses for the following questions to clarify the figures:

a) If the ground surface elevation in this entire area will be around 85 ft msl, then why does Figure 2.3.2-24 present a two-foot mound of water above grade to the south-southeast of the power block (denoted by -2.0-ft contour)? If this two-ft pond of water above grade in Figure 2.3.2-24 represents one of the bio-retention basins, then why are the other bio-retention basins also not represented by mounding?

b) If the contours suggest a hydrologic divide to the southwest, south, and southeast of the power block, why would the simulations indicate that any deep drainage percolation will flow into the power block area? Also, if precipitation is diverted away from this area to the bio-retention basins, then why would the infiltration not just flow back into the power block area?

c) Explain the mound of water to the northwest of the proposed ESWS cooling tower in Figure 2.3.2-24.

d) The results in Figure 2.3.2-24 appear to be in conflict with the results presented in Figure 2.3.2-25. Why does Figure 2.3.2-25 indicate that with movement downgradient toward Johns Creek to the southwest, the water table elevation increases to at least 86.3623 ft msl (as shown in figure key), which is higher than the ground surface elevation in the power block area? Why does all of the groundwater flow appear to be into the power block area from the south and the south west (i.e., to the north and northeast, as indicated in the ER), if the surface water flow should be directed to the bio-retention basins upgradient of the power block area? Why are the water surface elevations toward Johns Creek higher than those at the power block area (e.g., 86 ft msl versus 71 ft msl)? If the water table surface in the power block area is at 71 ft msl and the ground surface is at 85 ft msl, then why is the water table surface 14 ft (i.e., 85 – 71) not below the ground surface, which does not appear to match Figure 2.3.2-24?

e) Explain the following statement: "Therefore a maximum of approximately 29.0 ft of groundwater induced hydrostatic head loadings should be used as the design basis for the subsurface portions of all safety-related structures."

f) Which vadose and saturated zone models were used? What is the conceptual site model? What are the input boundary conditions to the model simulation?

Response:

The following responses are provided:

a) Further investigation is in progress regarding the two-foot 'mound' of groundwater shown on Figure 2.3.2-24 near the southern (southwestern) corner of the power block, which appears to be anomalous. The groundwater model for the Surficial aquifer is scheduled to be updated and rerun. Based on the results of the rerun, a revised Figure 2.3.2-24 will be included in a future revision of the Environmental Report. It should be pointed out that bio-retention ditches were simulated in the model and are represented by the light gray square cells shown in the figure.

b) The model simulated bio-retention ditches, as noted above. A portion of the runoff water captured by the bio-retention ditches in the power block area was simulated to recharge the underlying Surficial aquifer.

c) Similar to what was noted under item (a) above, the mounding indicated near the northwest corner of the power block also appears to be anomalous. This will be addressed in the planned rerun of the model and in the results to be included in the revised Environmental Report.

d) The boundary condition imposed by the model on the west side appears to have resulted in groundwater flowing toward the northeast, as shown on Figure 2.3.2-25. This boundary condition will be reviewed and adjusted prior to rerunning the model, so that more realistic static groundwater elevations at or near Johns Creek will be the outcome of the simulation.

e) As stated in Section 2.3.2.2.11, the maximum post-construction water-table elevation at the nuclear island is expected to be 73 feet above msl, and the lowest design elevation for a building foundation there is 44 feet above msl. Therefore, the maximum groundwater-induced hydrostatic head loading in the nuclear island would be 29 feet (73 – 44 = 29).

f) No vadose-zone model was used. The saturated-flow model used was MODFLOW applied within the graphical user interface Visual Modflow Pro. The conceptual model involved recharge via the bio-retention ditches and a flow source on the western side of the model. As stated above, the boundary conditions will be reviewed and adjusted prior to rerunning the model, so that more realistic static groundwater elevations can be simulated.

ER Impact:

ER Section 2.3.2 will be revised, as necessary, to reflect the results of updated groundwater modeling of the Surficial aquifer in a future ER revision.

Item Number HS-30

ESRP/ER Sections 2.3.3, 5.2.3, 5.2.3.1

Request:

Section 2.3.3 (page 2.3-49) notes that salinity, dissolved oxygen, temperature, sediments, chemical contaminants, and nutrients are the most important water quality parameters with nutrient loading (e.g., phosphorus and nitrogen) being regarded as the most critical water quality problem. Sections 5.2.3 and 5.2.3.1 (page 5.2-6) note that in 1998 the Chesapeake Bay was declared an impaired water body by the U.S. Environmental Protection Agency (EPA) because of excess sediments and nutrients and appears on the Maryland Clean Water Act 303(d) impaired surface water list. Supply reference material to support these statements.

Response:

The EPA Chesapeake Bay Program, Maryland Department of the Environment and Maryland Department of Natural Resources have identified nutrient loading as the most significant factor causing the decline in water quality in the Chesapeake Bay. Algal blooms are fed by nutrient pollution, blocking sunlight from reaching underwater bay grasses, leading to low oxygen levels in the water and causing fish kills. Suspended sediment from urban development and agricultural lands, as well as some natural sources, is carried into the Bay and clouds its waters. Portions of the Bay and its tidal tributaries are contaminated with chemical pollutants found in fish tissue.

http://www.chesapeakebay.net/
http://www.mde.state.md.us/Water/bayrestoration.asp
http://www.baystat.maryland.gov/current_health.html

The "Other West Chesapeake Bay Drainage Basin" or "Lower Western Shore" of the Chesapeake Bay was first identified on the 1996 Clean Water Act Section 303(d) list submitted to EPA by Maryland as impaired by nutrients and sediments in the tidal portion, with listings of fecal coliform impairments added in 1998, and evidence of biological impacts in the non-tidal areas added in 2002. The drainage are includes portions of Anne Arundel and Calvert County.

http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/ApprovedFinalTMDL/TMDL_final_westchesapeake_fc.asp

ER Impact:

No changes to the ER are required.

Item Number HS-31 **ESRP/ER Section 3.3**

Request:

The arithmetic difference (18,386 gpm) between Chesapeake Bay withdrawals (37,778 gpm Table 3.3-1) and the effluent discharge to the Chesapeake Bay (19,426 gpm Table 3.3-1) does not appear to be equivalent to the CWS & ESWS Evap and drift (17,354 gpm, 940 gpm, 39 gpm, and 2 gpm), and Fire, portable, sanitary (20 gpm, 3 gpm), which totals 18,358 gpm. Verify these numbers and correct if needed.

Response:

As reflected in the current revision of the ER, the difference between Chesapeake Bay withdrawal of 37,788 gpm listed in Table 3.3-1, and the effluent discharge to the Chesapeake Bay of 19,426 gpm, equates to 18,362 gpm. Referring to Figure 3.3-1, the amount of water consumed is the sum of the following: [940 gpm + 2 gpm (ESWS cooling tower evaporation and drift)] + [17,354 gpm + 39 gpm (CWS cooling tower and drift)] + [103 gpm – (1 gpm + 20 gpm + 55 gpm) (power plant usage)] which also equates to 18,362 gpm.

The values for Chesapeake Bay withdrawal and discharge flow have been updated since the ER was last submitted. The updated value for withdrawal from the Chesapeake Bay is 41,095 gpm, and the updated effluent discharge to the Chesapeake Bay is 21,019 gpm, resulting in a difference between the two of 20,076 gpm. Subsequent revisions in water consumption flows which will be listed in Table 3.3-1, and shown on Figure 3.3-1, are as follows: (566 gpm + 2 gpm) ESWS cooling tower evaporation and drift + (19,016 gpm + 39 gpm) CWS cooling tower evaporation and drift + (413 gpm) additional capacity + (40 gpm) power plant consumption = 20,076 gpm.

A water use diagram with updated flow values is provided in the response to RAI 42. Figure 3.3-1 and Table 3.3-1 will be updated to indicate the updated flow values and modified flow arrangement shown in a future ER revision.

ER Impact:

Figure 3.3-1 and Table 3.3-1 will be revised in a future ER revision to reflect the anticipated water use flows. The updated figure and table are shown in the response to RAI Item Number 7.

Item Number HS-32 **ESRP/ER Section 3.6.3.2**

Request:

The desalination plant water output is 1.75E6 gpd or 1215 gpm (Section 3.6.3.2 page 3.6-3). Provide the source of these numbers and explain why they do not seem to match the 1055 gpm Table 3.3-1 or Figure 3.3-1.

Response:

The updated desalinization plant water output is 1225 gpm. The desalinization plant water input from Chesapeake Bay is 3063 gpm. The requirement for membrane filtration is 306 gpm and reverse osmosis reject is 1532 gpm. Hence, the desalinization plant output is 1225 gpm. The relevant desalination plant values are provided in the table below.

Chesapeake Bay Water demand for Desalinization	***3063 (11,595)***
Membrane Filtration (Back wash)	*306 (1158)*
Reverse Osmosis	*2757 (10,436)*
Reverse Osmosis Reject	*1,532 (5,799)*
Essential Service Water System (ESWS)/Ultimate Heat Sink (UHS) Makeup	*629 (2,381)*
ESWS Cooling Tower Evaporation	*566 (2,142)*
ESWS Cooling Tower Drift	2 (8)
ESWS Cooling Tower Blowdown	*61 (231)*
Power Plant Makeup	*183 (693)*
Demineralized Water Distribution System	80 (303)
Potable and Sanitary Water Distribution System	*93 (352)*
Plant Users	*93 (352)*
Non-Plant Users	0 (0)
Fire Water Distribution System	*5 (19)*
Floor Wash Drains	*5 (19)*
Additional Capacity	*413 (1563)*

ER Impact:

The desalination plant output values in ER Sections 3.3 and 3.6.will be updated in a future ER revision.

Item Number HS-33 **ESRP/ER Section 5.2.3.1**

Request:

"Based on the ESWS makeup and blowdown rate, it will circulate fresh water concentrated two times compared to brackish water assumed to have total dissolved solids of 20,000 milligram per liter concentrated two times" (Section 5.2.3.1 (page 5.2-7)). Clarify statement. Does this mean that the TDS in the blowdown would be 40,000 mg/L?

Response:

The influent to the CWS cooling tower will be the brackish water from the Chesapeake Bay. The total dissolved solids (TDS) in the Chesapeake Bay water is closely associated with the salinity of the Chesapeake Bay. Based on one year of salinity measurements taken at the intake to the cooling system for CCNPP Units 1 and 2, the monthly average salinity levels varied from 9,700 mg/l to 16,700 mg/l, with an annual average of 13,600 mg/liter. The CWS cooling tower will operate with an average cycles of concentration of 2 (i.e., the concentration in the CWS tower and in the blowdown will be twice the concentration in the influent). As a worst case, if the influent salinity concentration in the Chesapeake Bay water was as high as 20,000 mg/liter, the blowdown concentration would be twice that, or 40,000 mg/liter.

The ESWS tower will use desalinated water from the desalination plant. The desalination plant is expected to produce a water quality with an estimated TDS level of 372 mg/l. The ESWS cooling tower design has been updated to operate with an average cycles of concentration of 10. Therefore, the blowdown from the ESWS cooling tower is expected to contain a TDS level of 3720 mg/liter.

ER Impact:

The ER will be revised to reflect the updated operational value for ESWS cooling tower cycles of concentration in a future ER revision.

Item Number HS-34

ESRP/ER Sections 2.3.3, 3.3, 3.6, 5.2.3.1

Request:

During the operation of the plant, Table 3.6-3 indicates that the Waste Water Treatment Plant (WWTP) would be operational and would discharge 19,500 gpd (13.5 gpm) of effluents. Figure 3.3-1 reports that the Waste Water Treatment Plant would only discharge a maximum of 20 gpm of effluents, and this would be discharged only to the Waste Water Retention Basin (WWRB). Table 3.6-7 reports that the WWTP design flow for normal operations is 52,500 gpd (36.5 gpm) with a peak flow of 183,000 gpd (127 gpm). Section 5.2.3.1 (page 5.2-8) notes that all WWTP effluents would be directly discharged to the Chesapeake Bay. In addition, Section 2.3.3.1.3 (page 2.3-(60-61)) notes that "treated effluent will be combined with the discharge stream from the onsite waste water retention basin and discharged to Chesapeake Bay. The discharge will be in accordance with local and state safety codes. The dewatered sludge will be hauled offsite for disposal at municipal facilities...discharge could be directly into the effluent stream from the retention basin." There appears to be inconsistencies between the various sections. Please correct and clarify.

Response:

As described in the response to RAI Item Number 42, the table entry for treated waste water flow of will be removed from Table 3.6-3 and a pointer will be provided to Table 3.3-1 as the data source for anticipated sanitary waste flow during normal operation. Table 3.3-1 will also be updated to reflect a maximum treated sanitary waste flow of 216 gpm [818 lpm], and average flow of 93 gpm [352 lpm]), instead of 20 gpm and 36 gpm, respectively.

As discussed in Section 2.3.3.1.3, the treated effluent will be combined with the discharge stream from the WWRB and discharged to the Chesapeake Bay. The combining of the WWRB and WWTP effluent flow streams occurs in the Seal Well. The combined flow is directed to the Chesapeake Bay. Figure 3.3-1 in the submitted revision of the ER indicates that this flow is discharged to the WWRB. This aspect of the CCNPP Unit 3 design has been modified such that the combined flow from the WWTP, WWRB, and treated liquid radwaste is collected in a seal well prior to to discharge to the Chesapeake Bay. This flow arrangement is illustrated in the water use diagram provided in the response to RAI 42. Figure 3.3-1 and Table 3.3-1 will be updated to indicate the updated flow values and modified flow arrangement shown in a future ER revision.

Under the modified liquid effluent system design, WWTP effluents will not be discharged directly to the Chesapeake Bay. ER Section 5.2.3.1 will be revised to indicate the flow arrangement shown in the sketch below.

ER Impact:

Table 3.3-1, Figure 3.3-1, Table 3.6-7, and Section 5.2.3.1 will be updated in a future ER revision.

Item Number HS-35 ESRP/ER Sections 3.3.3, 5.2.3.1

Request:

The average discharge from the Waste Water Retention Basin into the Chesapeake Bay is 19,425 gpm with a maximum flow rate of 23,227 gpm (Section 5.2.3.1 page 5.2-7; Table 3.3-1 and Figure 3.3-1). An NPDES discharge permit will regulate all liquid effluents discharges from the CCNPP site during plant operations (Section 3.3.3 page 2.3-49). Identify the constituents that would be discharged to the Chesapeake Bay from the Waste Water Retention Basin, and at what levels. Discuss the potential impacts.

Response:

Estimates of the constituents and their levels in the discharge from the waste water retention basin based on currently-available design data are provided in the response to RAI Item Number 85. Table 2 in that response provides estimates of the chemical constituent concentrations in the discharge from the waste water retention basin. More precise determinations of the amounts of these constituents will be made as part of the NPDES permitting process.

The concentrations of the chemical constituents in the discharge from the waste water retention basin to the Chesapeake Bay are very low. The constituents and concentrations are driven by the Chesapeake Bay because it is the source of water for the components releasing essentially the entire discharge from the basin (cooling towers and desalination plant). While some chemicals are added to the blowdown for biological control, these are added in relatively small amounts. Prior to any mixing in the Chesapeake Bay, the concentrations of chemicals that have Aquatic Life chronic salt water limits in COMAR are less than one-hundredth of those limits. The low chemical concentrations in the discharge from the basin will rapidly diminish as the discharge mixes with the water in the Chesapeake Bay. It is concluded that any impacts to biota will be SMALL and will not warrant mitigation.

ER Impact:

No changes to the ER are required.

Item Number HS-36 **ESRP/ER Section 3.4.2.2**

Request:

The maximum discharge will be approximately 23,228 gpm (3.344E7 gpd) (Section 3.4.2.2 page 3.4-6). Reconcile the value with HS-22.

Response:

The updated maximum discharge will be approximately 24,363 gpm (3.504E7 gpd).

ER Impact:

Applicable portions of the ER related to water intake and discharge flow rates (ER Sections 3.3 and 3.4) will be updated in a future ER revision.

Item Number HS-37 ESRP/ER Sections 2.3.3, 5.3.2.1.1

Request:

Table 2.3.3-9 summarizes the analytical results of sediment samples collected in the Chesapeake Bay near the CCNPP Barge Slip Unit 3 in September 2006. The samples indicate a size distribution of 1.5% gravel, 96% sand, and 0.2 silt with a specific gravity of 2.679. Section 5.3.2.1.1 (page 5.3-8) notes that sands predominate in waters less than 13.1 ft in depth, mud predominates in waters with a depth greater than 26 ft, and both mud and sand appear at intermediate depths. Section 2.3.3.1.2, on the other hand, contradicts the size distribution reported in Table 2.3.3-9 by noting that in "the vicinity of the CCNPP site, silt and clay sediments predominate with moderate sedimentation and resuspension rates (Section 2.3.3.1.2, page 2.3-51). Clarify whether sand, silt, or clay predominate.

Response:

The samples reported in ER Table 2.3.3-9 were collected in September 2006 in the vicinity of the CCNPP Unit 3 planned discharge point (shown as point CCNPP-1 on Figure 2.3.3-4) and at two other sampling points within 500 feet of CCNPP-1 as shown on the figure. As shown in the table, the sample close to the CCNPP Unit 3 discharge point indicated a size distribution of 1.5% gravel, 96% sand, 0.2% silt and 2.3% clay.

In Section 5.3.2.1.1, it was stated: "Sands predominate in waters less than 13.1 ft (4.0 m), mud predominates in water greater than 26 ft (8.0 m), and a mixture of each appears in the intermediate depths." However, on page 2.3-51 in Section 2.3.3, the statement is made that in the area of the CCNPP site, the predominant physical characteristics of the Chesapeake Bay include: "silt and clay sediments, mesohaline salt concentrations..."

It is likely that the samples collected in September 2006 were taken from shallow waters (less than 13 feet deep), which would be consistent with the statement, quoted above, in Section 5.3.2.1.1. The statement made on page 2.3-51 was a very general statement that applied to the deeper portions of the Chesapeake Bay opposite the site, where finer-grained sediment would be expected to predominate.

ER Impact:

No changes to the ER are required.

Item Number HS-38 **ESRP/ER Section 2.3.3.1.2**

Request:

"Based upon the localized flow rates and pycnocline data, presented in this section, resuspended bottom sediments are likely to settle rapidly within area of the CCNPP site" (Section 2.3.3.1.2 page 2.3-59). When the water is denser, the sediments tend to stay suspended for longer periods of time. What is the evidence that denser water will result in more rapid settling of suspended sediment particles in a flowing estuary?

Response:

The water layer below the pycnocline layer will have a higher salinity level and higher density. The pycnocline layer will limit the vertical mixing between layers, thus limiting transport of sediment. The pycnocline layer also isolates the lower layer from activities at the surface, such as the wind and water flow from the tributaries that cause mixing above the pycnocline and promote transport of suspended material. The isolation of the lower layer contributes to more rapid settling; there is no indication that more rapid settling occurs because of the denser water.

ER Impact:

No changes to the ER are required.

Item Number HS-39 **ESRP/ER Section 2.3.2**

Request:

On page 2.3.2-59, the ER refers to Figure 2.3.1-12 but should refer to Figure 2.3.1-26. Verify the appropriate reference for the figure.

Response:

The appropriate reference is Figure 2.3.1-26.

ER Impact:

The figure reference in ER Section 2.3.2 will be updated to in a future ER revision.

Item Number HS-40 **ESRP/ER Section 3.4.2.1**

Request:

Section 3.4.2.1 page 3.4-4 reports 13,80. Correct the value if necessary.

Response:

The cited value in ER Section 3.4.2.1 should be 1,380.

ER Impact:

ER Section 3.4.2.1 will be updated in a future ER revision.

Item Number HS-41 **ESRP/ER Section 5.3.1.1**

Request:

In NRC's license renewal determination of existing impacts associated with Units 1 and 2 were small. A case is being made that the impacts of the additional water withdrawal by Unit 3 should also be relatively SMALL, given that 1) Unit 3's intake structure will be associated with the existing intake embayment, 2) the relatively small amount of water removed as compared to Units 1 and 2, and 3) intake velocities below 0.5 ft/s. It is stated that no mitigation measures beyond the design features are warranted (Section 5.3.1.1 page 5.3-(2-3)). Provide qualitative and/or quantitative analyses that support the conclusions, if available, and identify the anticipated impacts of periodic dredging.

Response:

The response provided here is very similar to that for RAI Item Number HI-15. Additionally, there are no planned periodic dredging activities anticipated for the maintenance of the cooling water intake structures for the facility.

1) CCNPP Units 1 and 2 utilize a once-through cooling water system to reject heat from the main condenser. A significant amount of water is needed for this design (i.e., approximatley 2 million gpm). By using a hybrid cooling tower, the amount of water needed to reject heat for CCNPP Unit 3 (approximately 41,000 gallons per minute) will be about 1/50th the amount needed for CCNPP Units 1 and 2. CCNPP Units 1 and 2 have about the same combined generating capacity as the proposed CCNPP Unit 3.

2) Because no additional forebay or intake embayment will have to be constructed for CCNPPUnit 3, no additional baffle walls or other structures will be needed to protect the CWS and UHS intake.

   The Chesapeake Bay water intake system design would consist of a wedge-shaped expansion of the CCNPP Units 1 and 2 intake channel forebay, the CCNPP Unit 3 forebay and related piping; the CCNPP Unit 3 non-safety-related CWS makeup water intake structure and associated equipment, including the non-safety-related CWS makeup pump; the safety-related UHS makeup water intake structure and associated equipment, including the safety-related UHS makeup water pumps; and the makeup water chemical treatment system.

   The CCNPP Unit 3 intake water forebay will be 100 feet by 120 feet by 30 feet deep and will be located between the Units 1 and 2 intake and the barge slip. It will draw water from the extended Units 1 and 2 intake forebay through new intake water piping.

3) The water intake velocity meets the Section 316(6) design requirement of 0.5 fps.

   The CCNPP Unit 3 CWS makeup water intake structure will be an approximately 78 feet long, 55 feet wide, and 30 feet deep concrete structure with individual pump bays. The UHS water intake structure will be an approximately 75 feet long, 60 feet wide, and 30 feet deep concrete structure with individual pump bays. Flow velocities at the intake channel will depend on the Chesapeake Bay water level. Even at the minimum recorded Chesapeake Bay water level of – 4.0 feet below msl, the flow velocity along the new intake channel will be less than 0.5 feet per second (fps), based on the annual average makeup demand of 41,096 gpm.

One makeup pump is located in each pump bay and one dedicated traveling band screen and trash rack is located in the CWS and UHS makeup intake structures. Debris collected by the trash racks and the traveling water screens will be collected in a debris basin for cleanout and disposal as solid waste.

In sum, these facts justify a finding of a SMALL impact.

ER Impact:

No changes to the ER are required.

Item Number HS-42 **ESRP/ER Section 5.3.2.2.3**

Request:

Using CCNPP Units 1 and 2 thermal discharge structure as an example, Units 1 and 2 currently have limited sediment scour in the vicinity of their high velocity discharge ports, and therefore, UniStar expects similar limited scouring in the vicinity of the Unit 3 discharge diffuser (Section 5.3.2.2.3 page 5.3-10). Provide a qualitative and/or quantitative analysis that justifies and substantiates the conclusions that are being drawn.

Response:

Evaluating the potential physical effects of scour resulting from CCNPP Unit 3 operations on a qualitative basis, scour action will be minimized for CCNPP Unit 3 because the port diffusers will be directed upwards toward the water surface rather than laterally or down into the bed. Additionally, the expected average discharge from CCNPP Unit 3 into the Chesapeake Bay is 21,019 gpm (79,566 lpm). This amounts to 0.9 percent of the current discharge from CCNPP Units 1 and 2, which is approximately 2,300,000 gpm. Following operation of CCNPP Units 1 and 2, an area of approximately 42 acres (17 hectares) was noted to be scoured by the discharge. Surficial sands were also noted to have been transported to deeper waters (MMC 1980). There have been no identified issues related to scour or sedimentation at the CCNPP Units 1 and 2 discharge outfall location.

The potential physical effects of scour resulting from CCNPP Unit 3 operations is discussed on a quantitative basis in the response to RAI Item Number 95. In summary, this response concluded that based on an analysis performed using a computational fluid dynamics approach, a predicted area of scour of approximately 10,500 ft^2 ($975m^2$) would result.

Given the relatively small amount of discharge expected from CCNPP Unit 3 relative to the discharge from CCNPP Units 1 and 2, the potential for scour and sedimentation impacts due to the discharge at the CCNPPUnit 3 outfall is correspondingly small, and the impact is correspondingly SMALL.

Reference

MMC, 1980. Summary of Findings: Calvert Cliffs Nuclear Power Plant Aquatic Monitoring Program, Volume 1, Report. PPSP-CC-80-2, Martin Marietta Corporation, 1980.

ER Impact:

No changes to the ER are required.

Item Number HS-43 **ESRP/ER Section 2.3.2**

Request:

Units 1 and 2 1) are discharging a monthly annual average of 4965 cfs (3.209E9 gpd or 2.228E+6 gpm) with a maximum monthly discharge of 5354 cfs (3.46E9 gpd or 2.40E6 gpm), based on data from January 2002 through December 2006 (Table 2.3.2-2). Provide the basis and preferably a reference to conclude that there are no significant issues with major sedimentation or scouring.

Response:

According to the water balance diagram prepared for CCNPP Unit 3, the expected average discharge from CCNPP Unit 3 into the Chesapeake Bay is 21,019 gpm (79,566 lpm). This amounts to 0.9 percent of the current discharge from CCNPP Units 1 and 2 of approximately 2,300,000 gpm. Following operation of CCNPP Units 1 and 2, an area of approximately 42 acres (17 hectares) was noted to be scoured by the discharge. Surficial sands were also noted to have been transported to deeper waters (MMC 1980).

Given the relatively small amount of discharge expected from CCNPP Unit 3 relative to the discharge from CCNPP Units 1 and 2 the potential for scour and sedimentation impacts due to the discharge at the CCNPPUnit 3 outfall is correspondingly small, and the impact is correspondingly SMALL.

References

MMC, 1980. Summary of Findings: Calvert Cliffs Nuclear Power Plant Aquatic Monitoring Program, Volume 1, Report. PPSP-CC-80-2, Martin Marietta Corporation, 1980.

ER Impact:

No changes to the ER are required.

Item Number HS-44 **ESRP/ER Section 5.3.2**

Request:

The CORMIX model was used to simulate the extent of the thermal plume under the conditions identified in Tables 5.3.2.-(1-2). Provide all CORMIX input parameters and their values.

Response:

The specific parameters used in the CORMIX simulation are shown in ER Tables 5.3.2-1 and 5.3.2-2. However, the model has been reperformed to reflect a change in the predicted discharge volumes. The information provided in the ER is based on a discharge flow of 17,633 gpm (1.1125 m^3/s). Additional simulations have been undertaken with a flow of 21,019 gpm (1.326 m^3/s). This revised flow rate encompasses the condenser cooling water and service water discharge.

ER Impact:

The following updates will be provided in a future revision of the ER:

1) First Paragraph of Section 5.3.2.1 – text related to the average discharge flow is changed from 19,400 gpm (73,500 lpm) to 21,019 gpm (79,566 lpm).

2) Section 5.3.2.1.3 – text related to the extend of the 3.6°F (2°C) isotherm is changed from 207 ft. (63 m) to 148 ft (45 m)

3) Section 5.3.2.1.3 – text related to the full capacity of the 3.6°F (2°C) isotherm is changed from less than 0.3% to less than 0.4% for the Chesapeake Bay cross section, and text related to the the bottom area affected by the plume is changed from about 0.01% to about 0.02% of the average ebb tidal excursion.

4) Section 5.3.2.2.1 – text related to the benthic area is potentially exposed to the entire 3.6°F (2°C) isotherm, is changed from than 0.7 acres (0.3 hectares) to less than 0.4 acres (0.2 hectares).

Table 5.3.2-2 Baseline Discharge Structure Input Data CORMIX Thermal Plume Prediction

(Page 1 of 1)

Input Quantity/Data	Parameter Value
Location	1,200 ft (366 m) south of the CCNPP Unit 3 intake structure
Discharge Water Temperature ΔT	12°F (6.67°C)
Discharge Water Density (69.5°F, 13.0‰)	62.919 lbm/ft^3 (1007.87 kg/m^3)
Discharge Flow Rate	21,019 gpm (1.3261 m^3/s)
Diffuser Type	Multi-port
Number of Discharge Ports	3
Distance of Shore	550 ft (167.6 m)
Orientation	Parallel to Shoreline
Height of Discharge Ports above Bottom	3 ft (0.91 m)
Angle of Inclination	22.5 degrees
Nozzle Diameters	16 in (0.406 m)
Active Diffuser Length	18.75 ft (5.715 m)

Table 5.3.2-3 CORMIX Thermal Plume Predictions for the 3.6°F (2°C) Isotherm (Page 1 of 1)

Plume No.	Description	Length	Width
1	Max. Ebb	148 ft (45 m)	46 ft (14 m)
2	Max. Flood	148 ft (45 m)	46 ft (14 m)
3	Slack	19 ft (6 m)	6 ft (2 m)
4	Mid. Ebb (before and after slack)	72 ft (22 m)	30 ft (9 m)
5	Mid. Flood (before and after slack)	79 ft (24 m)	33 ft (10 m)
Overall	Thermal Plume Envelope	296 ft (126 m)	56 ft (17 m)

Table 5.3.2-4 Comparison of the Predicted Thermal Plume to the Maryland Power Plant Thermal Plume Compliance Criteria (Page 1 of 1)

Water Quality Standard	Permissible Limit	Calculated
The 24 hour average of the maximum radial dimension measured from the point of discharge to the boundary of the full capacity 3.6°F (2°C) above ambient isotherm (measured during the critical periods) may not exceed one-half of the average ebb tidal excursion.	4,101 ft (1250 m)	< 148 ft (45 m)
The 24 hour average full capacity 3.6°F (2°C) above ambient thermal barrier (measured during the critical periods) may not exceed 50% of the accessible cross section of the receiving water body. Both cross sections shall be taken in the same plane.	16,000 ft (4,800 m)	56 ft (17 m)
The 24 hour average area of the bottom touched by waters heated 3.6°F (2°C) or more above ambient at full capacity (measured during the critical periods) may not exceed 5% of the bottom beneath the average ebb tidal excursion multiplied by the width of the receiving water body.	1.3E07 ft^2 (1.2E06 m^2)	1.7E04 ft^2 (1.5E03 m^2)

Item Number HS-45 **ESRP/ER Section 5.3.2.1.3**

Request:

Section 5.3.2.1.3 (page 5.3-9) states that the "area occupied by the plume is compared to the State of Maryland water quality criteria in Table 5.3.2-4. This comparison demonstrates that the CCNPP Unit 3 thermal plume conforms to each of the criteria. The radial dimension of the 3.6°F (2°C) isotherm is less than 3% (reviewer computes 207/4101 = 5%) of the ebb tide excursion, compared to the one-half specified by the State of Maryland regulation. The full capacity of the 3.6°F (2°C) isotherm is less than 0.3% (reviewer computes 69/16000 = 0.4%) of the Chesapeake Bay cross section, and the bottom area affected by the plume is about 0.01% (reviewer computes 2.9E4/1.3E7 = 0.2%) of the average ebb tidal excursion multiplied by the width of the Chesapeake Bay." Provide an explanation of the correct values and justify the numbers.

Response:

The reviewer calculated percentages above (i.e., 5%, 0.4%, and 0.2%) are correct. The percentages were calculated from computed values. The computed values listed are correct, however, the percentages arere not.

ER Impact:

The percentages in Section 5.3.2.1.2 of the ER will be updated in a future revision.

Item Number HS-46 **ESRP/ER Section 5.3.2**

Request:

Table 5.3.2-4 provides three permissible limits. Provide calculations or specific references to document the three permissible limits in Table 5.3.2-4.

Response:

The regulatory reference is cited in the references of ER section 5.3.2 as follows:

<u>Reference:</u>

COMAR, 2007. Code of Maryland Regulations, COMAR 26.08.03.03. Impact Assessment for Thermal Discharges, 2007.

The specific section of the regulations is D. Thermal Mixing Zone Criteria.

ER Impact:

No changes to the ER are required

Item Number HS-47 ESRP/ER Sections 5.5.1.2, 5.6.2.3

Request:

Increased "runoff from 20 acres of impervious surfaces from the switchyard could cause a modification to the hydrograph and increases in temperature, sediment, and nutrients in receiving water bodies, and corresponding impacts to aquatic invertebrates, plants, and fish. Impacts from these affects would be mitigated by the provision of storm water retention facilities downstream. There is also the potential to increase stream temperatures from the removal of shade from ground and water bodies in the transmission corridor, but this is anticipated to be of minor significance" (Section 5.6.2.3 page 5.6-70 "The NPDES permit will also require a Storm Water Pollution Prevention Plan (SWPPP), which prevents or minimizes the discharge of potential pollutants with the storm water discharge, to reflect the addition of new paved areas and facilities and changes in drainage patterns. Impacts from increases in volume or pollutants in the storm water discharge will be minimized by implementation of best management practices (BMPs). As such, impacts are expected to be SMALL" (Section 5.5.1.2, page 5.5-2). Provide qualitative and/or quantitative calculations to clearly show that the impacts to the watershed from major storm events would not impact the water amounts, use, or quality of the surrounding streams and watershed.

Response:

A sand-filter trench and an unlined storm-water basin are planned for the western (downslope) side of the switchyard. The filter trench will receive runoff from the switchyard, which will drain into the storm-water basin located just to the west. The basin will in turn discharge water into Johns Creek. The outflow structure for the storm-water basin will be designed to release water at low enough rates so that the receiving stream will not be subject to either erosion or sedimentation, beyond what is naturally occurring now.

The bottom of this trench will consist of a permeable layer of sand or gravel and this, together with the permeable nature of the bottom of the unlined filter trench, will permit infiltration into the unsaturated deposits overlying the Surficial aquifer. The trench will be designed to accommodate as much as a two-year 24-hour rain event.

A storm-water management plan for the site has been prepared, which includes details of the planned erosion and sediment control measures and the primary features of the planned storm-water management system (Calvert Cliffs Unit 3 Storm Water Management Plan, dated April 2008).

As described in the storm-water management plan, best management erosion and sediment control measures will be selected and implemented to insure that the water quality downgradient of the switchyard, as well as the power block, and the adjoining construction laydown area will not be noticeably altered. These measures will be implemented by installation of *initial, intermediate,* and *final* erosion and sedimentation controls, which will be designed, constructed and maintained according to the Calvert County Soil Conservation District standards and specifications.

Initial controls will be installed prior to construction commencement and will include perimeter protection fencing and controls and strictly-controlled construction exits. *Intermediate* controls will include silt fencing, sediment ponds, diversion dikes and stone check dams if necessary to control erosion and storm-water runoff. During the grading and construction phase, additional intermediate erosion controls will be put in place as land disturbance occurs. Erosion control devices will be implemented or modified as the drainage patterns for storm water are constructed. All disturbed land left exposed for 7 days (steep slopes) to 14 days (gentle slopes) will be mulched or temporary grass cover will be provided.

Final erosion and sediment controls will be integrated with establishment of the permanent storm-water management system. These controls will include, among other things, construction of filtration trenches (for the power block area as well as for the switchyard), stream enhancements, stabilization of construction roads, application of rolled erosion control product on steep slopes during final grading, and permanent stabilization by grassing of final grades and open pervious areas.

Implementation of a sequenced, systematic erosion and sedimentation control plan, as summarized above and to be approved by Calvert County Soil Conservation District, will result in small to negligible water-quality impacts due to the planned construction activities or subsequent plan operation.

As described in the Storm Water Management Plan, a detailed storm-water management study will be conducted to evaluate adequate sizes of the several components of the storm-water system to maintain both quality and quantity requirements for the downstream area. This will include analyzing the pre-development and post-development site hydrology for the 1-, 2-, 5-, 10- and 100-year 24-hour rainfall events. The planned storm-water management system will be sized such that the downstream flow rates, sediment loads and water quality will be similar to the existing conditions and such that the post-development peak discharges will not exceed the pre-development rates. Thus, no significant change in the water-quality characteristics or in the long term or short term flow to the streams and wetlands from the switchyard or from power block area is expected.

ER Impact:

No changes to the ER are required.

Item Number GC-1 ESRP/ER Section: 10 CFR 51.50(c)

Request:

Provide an environmental protection plan (EPP) as required by 10 CFR 51.50(c) or identify where in the application it currently resides.

Response:

The Environmental Protection Plan was provided in the March 14, 2008, Combined Operating License Application submittal for the CCNPP Unit 3. It is located in Appendix A – Proposed Combined License Conditions of Part 10 of the application.

ER Impact:

No changes to the COL application documents are required.

Item Number GC-2

ESRP/ER Sections 3.4.1, 3.4.2, 5.3.3, 5.8.1

Request:

Provide a statement describing the cooling system/tower change to a hybrid design and identify the impacts of the new aspects of the design and construction and operation.

Response:

The selected cooling tower design has been modified a full hybrid design by installing the dry cooling sections to restore plume abatement capability. This change, when engaged, will eliminate any visible plume from the cooling tower. This will station in-house electric loads, cooling tower blowdown, and cooling tower drift. These changes and impacts will be provided in a future revision to the ER.

ER Impact:

Changes will be made to the ER to fully reflect the effects of this change in a future revision.

Item Number GC-3 **ESRP/ER Section 4.1.2**

Request:

The ER indicated that new offsite transmission lines were not planned to support Unit 3. However, the PJM Interconnection regional transmission operator has identified three options for upgrading or adding transmission lines from Calvert Cliffs. The first requires no new offsite transmission lines, but some upgrades on-site. The second option adds two new transmission lines from Calvert Cliffs to substations about 20 to 30 miles away to the north and west. The third adds one new transmission line and upgrades circuit breakers. The new lines would be needed to avoid reducing power from the proposed Unit 3 when the existing lines are out of service for maintenance. Provide a description of the environmental impacts (land use, ecology, hydrology, socioeconomic, cultural resources) of options two and three if either appears likely.

Response:

Section 8.2.2.7 of the CCNPP Unit 3 Final Safety Analysis Report entitled "Compliance With GDC 17" discusses the PJM System Impact Study and details the changes to be made to the system to accommodate CCNPP Unit 3. As stated in FSAR Section 8.2.2.7, "

> The study determined that modifications to the existing substations will be required. Thirteen breakers at the Oak Grove substation and twenty three breakers at the Chalk Point substation will need to be replaced with 63 kA and 80 kA breakers, respectively. Six breakers at the existing Calvert Cliff[s] substation will need to be upgraded. At the Waugh Chapel substation, a transmission line will have to be relocated to a bay with two new breakers.

The changes described above are the only transmission changes planned for CCNPP Unit 3 and no further evaluations are anticipated.

ER Impact:

No changes to the ER are required.

Item Number GC-4 **ESRP/ER Section: 10 CFR 52.79**

Request:

Provide corrections and changes to the ER since its release in July 2007.

Response:

Corrections and changes to the ER since its release will be provided in a future ER revision.

ER Impact:

An update to the ER will be submitted in a future ER revision.

Item Number GC-5 ESRP/ER Section: 10 CFR 51.45(c)

Request:

Provide a description the environmental impacts of pre-construction activities at the site and an analysis of the cumulative impacts of the activities to be authorized by the COL in light of the preconstruction impacts, as explained in COL/ESP-ISG-4, available at http://www.nrc.gov/reading-rm/doc-collections/isg/col-esp-isg-4.pdf on the NRC's public Web site.

Response:

Pre-construction activities at the CCNPP Unit 3 site will primarily entail clearing and grading of the site, construction of roads and infrastructure, and construction of support structures. A comparative evaluation of the relative impacts of these pre-construction activities to those identified for construction activities in ER Section 10.1 and ER Table 10.1-1 did not identify any new impact categories, adverse impacts, or mitigation measures during pre-construction that were not already identified for construction, and there were no identified impact categories, adverse impacts, or mitigation measures for construction that were not also relevant to pre-construction. Areas considered in the evaluation of pre-construction impacts included: land use, hydrologic and water use, aquatic ecology, terrestrial ecology, socioeconomics, radiological, atmospheric and meteorological, environmental justice, and non-radiological health impacts.

Although the scope of impact categories, adverse impacts, and mitigation measures for pre-construction activties is the same as those identified for construction, some of the impacts identified for construction will be reduced during pre-construction due to the comparatively smaller level of effort and smaller workforce that will be in place during pre-construction. For example, because of the limited scope of work that is authorized during pre-construction, the quantity of concrete that can be poured during pre-construction is only a small portion of what will be poured during construction. As a result, hydrologic and water use impacts will be less during pre-construction. Similarly, the limited scope of pre-construction work authorized will result in substantially fewer personnel being on-site during pre-construction, resulting in reduced socioeconomic imnpacts related to housing and traffic. Depending on the level of pre-construction effort, it is likely that traffic congestion mitigation will not be required for portions of the pre-construction phase.

The irretrievable commitment of resources is discussed in ER Section 10.2. With respect to irretrievable commitment of resources during pre-construction, these impacts will significantly less than during construction. This conclusion is based on the fact that almost all of the irretrievably commited resources are associated with the fabrication and construction of equipment and structures that are not within the limited scope of authorized pre-construction activities.

In general, the completion of pre-construction activities will result in a corresponding reduction in the cumulative impact of construction activities that is commensurate with the amount of pre-construction work that is completed and therefore removed from the scope of construction activities.

ER Impact:

A discussion of pre-construction activities will be incorporated into ER Chapter 10 in a future ER revision.

Item Number TL-1 **ESRP/ER Section 5.6**

Request:

The PJM Generator Interconnection Q48 Calvert Cliffs 1640MW Impact Study, dated September 2007, available at http://www.pjm.com/planning/project-queues/impact_studies/q48_imp.pdf, last visited April 2, 2008, states that options are under consideration to add circuits to the existing transmission corridors from Calvert Cliffs to Chalk Point and Waugh Chapel to Brighton to support the operation of Calvert Cliffs Unit 3. However, Sec. 5.6.3.1 of the Environmental Report limits consideration of impacts to the CCNPP site. Describe the circuit additions that are under consideration and discuss the environmental impacts.

Response:

As stated in response to GC-3, Section 8.2.2.7 of the CCNPP Unit 3 Final Safety Analysis Report entitled, "Compliance with GDC 17," discusses the PJM System Impact Study and details the changes to be made to the system to accommodate the proposed CCNPP Unit 3. As stated in FSAR Section 8.2.2.7,

> The study determined that modifications to the existing substations will be required. Thirteen breakers at the Oak Grove substation and twenty three breakers at the Chalk Point substation will need to be replaced with 63 kA and 80 kA breakers, respectively. Six breakers at the existing Calvert Cliff[s] substation will need to be upgraded. At the Waugh Chapel substation, a transmission line will have to be relocated to a bay with two new breakers.

The changes described above are the only transmission changes planned for CCNPP Unit 3. Onsite impacts as discussed in Section 5.6.3.1 are the only impacts that will be experienced.

ER Impact:

No changes to the ER are required.

Item Number TE-1 **ESRP/ER Section 2.4.1**

Request:

Provide the basis for stating that none of the six State of Maryland noxious weeds are present on the CCNPP site.

Response:

There are six Federally listed noxious weeds for the State of Maryland: *Carduus acanthoides* (plumeless thistle), *Carduus nutans* (musk thistle, nodding thistle), *Cirsium arvense* (Canada thistle), *Cirsium vulgare* (bull thistle), *Sorghum bicolor* (shatter cane, wild cane), and *Sorghum halepense* (johnsongrass).

Flora surveys were conducted to describe and map plant populations in the CCNPP Unit 3 project area between early May and early October 2006, and for the remainder of the CCNPP site in early January 2007. Additional observations within the CCNPP Unit 3 project area were made for early spring flowering plants in mid-April 2007. These surveys and observations did not identify any of the six Maryland noxious weeds within the CCNPP site during the floral surveys they conducted.

While none of the six identified noxious weeds were observed and reported in the recent floral surveys (TTNUS, 2007), it would not be unusual to overlook these species because they occur in such marginal or disturbed habitats. Most of these species are widespread, and if not already present, are likely to appear at some time in the future. In particular, Canada thistle and Johnsongrass would be expected in old field, edge or recently disturbed areas.

The Final Flora Survey Report does identify six plants on site that are listed as invasive exotic plants by the State of Maryland. This includes phragmites (Phragmites australis), Japanese stiltgrass (Microstegium vimineum), tall fescue (Lespedeza cuneata), bush honeysuckle (Lonicera sp.), tree of heaven (Ailanthus altissima), and paulownia (Paulownia tomentosa). The Forest Stand Delineation Report (TTNUS, 2008) also lists these species as being non-native invasive plants on site. Additionally, ER Section 2.4.1 lists phragmites and Japanese stiltgrass as being widespread over the CCNPP.

<u>References</u>

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

TTNUS, 2008. Forest Stand Delineation Report for Proposed Calvert Cliffs Nuclear Power Plant Unit 3 Project Area, Calvert Cliffs Nuclear Power Plant Site, Calvert County, Maryland, Tetra Tech NUS, May 2008.

ER Impact:

No changes to the ER are required.

Item Number TE-2 **ESRP/ER Section 2.4.1**

Request:

Provide consultation correspondence with USFWS to determine which federally listed species may occur on the CCNPP site.

Response:

Attached are copies of the correspondence with the USFWS concerning federally listed species. This includes:

- April 10, 2007 Letter: RM Krich (UniStar) to John Wolflin (US Fish and Wildlife Service) , Information Request, Threatened and Endangered Species
- May 22, 2007 Letter: Mary J. Ratnaswamy, PhD (US Fish and Wildlife Service) to RM Krich (UniStar), Federal Threatened and Endangered Species

ER Impact:

No changes to the ER are required.

Item Number TE-3 **ESRP/ER Section 2.4.1**

Request:

Describe bald eagle nest activity within the last 5 years on the Calvert Cliffs site and describe methods used to acquire this information.

Response:

The history of monitoring the bald eagle habitat at the Calvert Cliffs site is as a follows.

- Prior to 9/11/2001, the Maryland Department of Natural Resources conducted aerial surveys of the site. Since then, all monitoring of eagle nest habitat activity has been by annual visual observations from the ground below the nest conducted by Constellation employees.
- One active nest was observed to be occupied for the time period covering 2001 through 2005. This nest is located south of the site of the proposed new unit.
- In April of 2006 three active nests were observed. This includes the nest on the south side, a new nest on the north side, and a new nest west of the plant. These three nests are outside of the footprint of the new plant.
- In April of 2007, a fourth nest was identified, in the Camp Canoy area, where the power block for the new unit will be located. The nest on the south side and the nest on the west side were active. The nest on the north side was inactive and deteriorating.
- In April 2008 an aerial survey was conducted. The south, west and Camp Canoy nests continue to be active. The north nest no longer exists. The survey identified two eaglets in each of the south and west nests, and eaglet in the Camp Canoy nest.

ER Impact:

No changes to the ER are required.

Item Number TE-4 **ESRP/ER Section 2.4.1**

Request:

What is the current distribution and abundance of the eastern narrowmouth toad within the construction footprint and within any wetland or stream that would be influenced by the proposed actions, including wetlands that may potentially be affected by changes in surface and groundwater flow alterations? How were these data derived?

Response:

Based on consultation with the Associate Director, Natural Heritage Program of the Maryland Department of Natural Resources, it is not believed that the Eastern Narrow-mouth Toad exists in Calvert County. However, UniStar has initiated a survey to determine whether such toads inhabit the CCNPP site. The survey will be conducted between mid-May and the end of July 2008, which is the primary breeding season.

The survey will be made along creeks, wetlands, wetlands restoration areas and other waterways that could be affected by the installation of Unit 3. UniStar will follow a protocol provided by the Associate Director, Natural Heritage Program of the Maryland Department of Natural Resources, and the work effort is being contracted a local marine biologist who is associated with the University of Maryland Center for Environmental Sciences at Solomons Island, MD. This individual possesses a PhD, has previously completed a study for EPA on the Eastern Narrow-mouth Toad in South Carolina, and is familiar with the toad's call.

ER Impact:

No changes to the ER are required.

Item Number TE-5 **ESRP/ER Section 2.4.1**

Request:

What were the criteria used to determine whether or not beach/cliff habitats are considered unique or rare and identify any state/federal agency consulted to make this determination.

Response:

Beach/cliff habitat along the Chesapeake Bay shoreline, as primarily related to habitat suitability and the potential for the occurrence of the puritan tiger beetle (*Cicindela puritana*) and the northeastern beach tiger beetle (*C. dorsalis dorsalis*) on the CCNPP Unit 3 project site, was evaluated by Tetra Tech NUS during site reconnaissance conducted in 2006-2007. Additional site reconnaissance of habitat conditions on the CCNPP Unit 3 site was conducted in 2007-2008.

These field efforts included a determination of suitability of beach/cliff habitat for tiger beetles based on available literature of the specific habitat requirements of the two species. A recent report prepared by C. Barry Knisley (Knisley, 2006) was reviewed for the site reconnaissance effort and the preparation of the Environmental Report. The author of this study conducted an evaluation of the quality of the tiger beetle habitat at CCNPP in 2006, which included a visual examination of the beach width and surface character (adult tiger beetle habitat) along with the presence and amount of suitable cliff strata (tiger beetle oviposition sites and larval habitat).

The author used a letter grading system to provide a qualitative indication of habitat quality for the CCNPP survey area; i.e., "A" through "E," with "A" representing the best habitat and "E" being non-habitat. The beach/cliff habitat from the northern end of the CCNPP property to the southern end of the property was graded in this manner, as using Global Positioning System waypoints to demarcate changes in habitat quality along the shoreline of the bay. The results of the investigation provided a valuable source of information on the quality of beach/cliff habitat on the CCNPP property, as well as the extent or location of the areas of high quality habitat, low quality habitat, non-habitat, etc.

Additionally, UniStar requested any information on the occurrence of protected species on the CCNPP site, or any concerns that the two agencies might have relative to threatened and endangered species in the CCNPP site from the Maryland Department of Natural Resources (MDNR) and the Chesapeake Bay Field Office of the U.S. Fish and Wildlife Service (USFWS). These inquiries were provided in a Request for Environmental Review (letter) that was submitted by UniStar Nuclear on June 30, 2006 to Ms. Lori Byrne of the MDNR and a Threatened and Endangered Species – Information Request (letter) that was submitted by UniStar on April 10, 2007 to Mr. John Wolflin of the Chesapeake Bay Field Office of the USFWS.

The MDNR responded on July 31, 2006. Their response included information on population records of the puritan tiger beetle and the northeastern beach tiger beetle in the vicinity of the existing CCNPP power plant. The USFWS responded on May 22, 2007, stating that, "except for occasional transient individuals, no federally proposed or listed endangered or threatened species are known to exist within the project impact area."

In their assessment of the on-site habitat, including the beach/cliff habitat, a specialized knowledge would exist of what constitutes good habitat and non-habitat, or unique or rare habitat. The determination of unique or rare habitat may include other factors of recognition, however, such as recreational amenity, geologic importance, archaeological importance, etc.

Reference

Knisley, 2006. Knisley, C.B, "Current Status of Two Federally Threatened Tiger Beetles at the Calvert Cliffs Nuclear Power Plant." 2006

ER Impact:

No changes to the ER are required.

Item Number TE-6 **ESRP/ER Section 4.3.1**

Request:

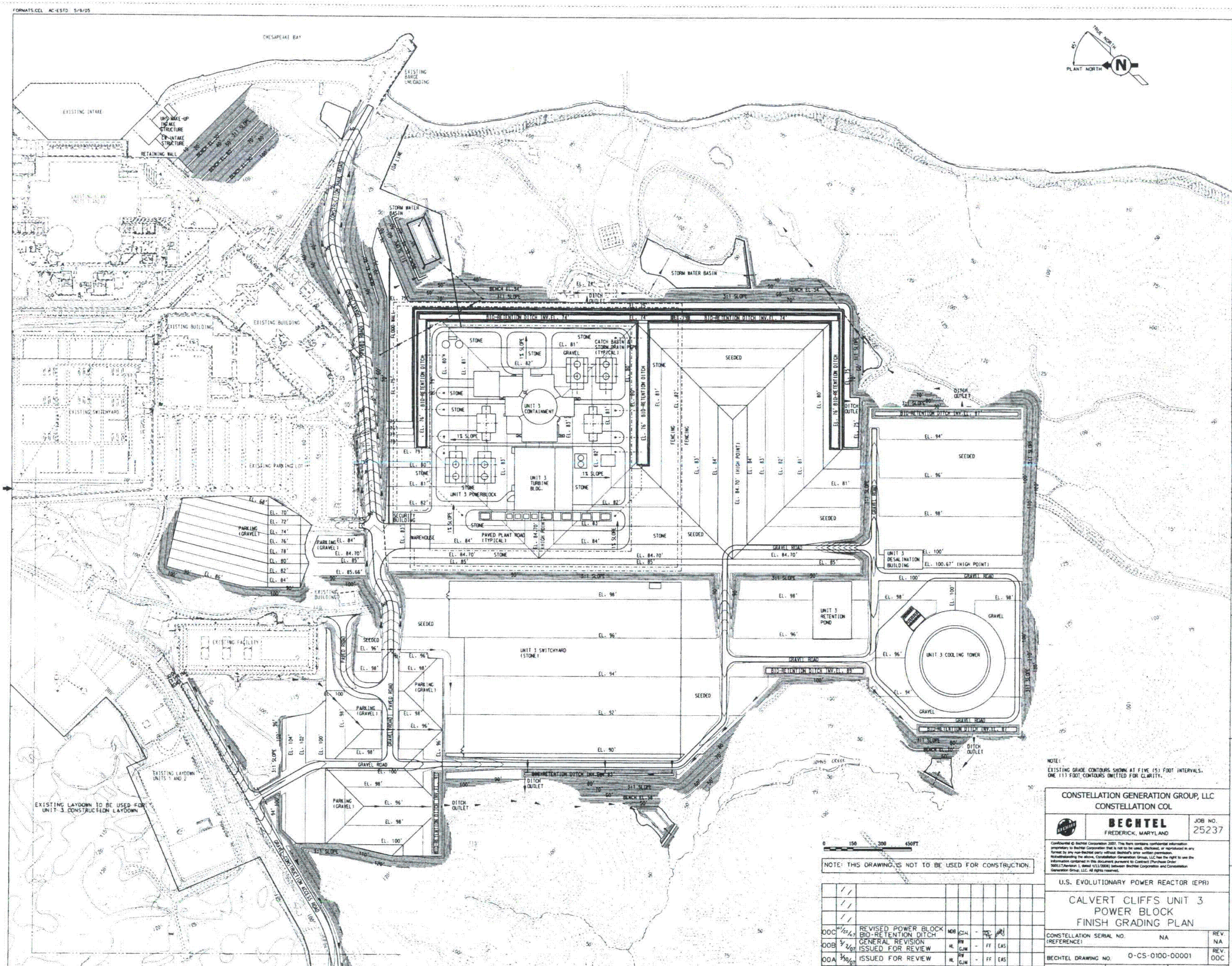
Define specific management actions to the laydown areas with respect to reclamation and/or restoration.

Response:

The attached drawing shows the areas that are to be reseeded at the end of construction. Areas not seeded will be left as gravel areas. Additionally, plans may be made to restore/reclaim those areas that are not reseeded or left as gravel.

ER Impact:

No changes to the ER are required.



NOTE:
EXISTING GRADE CONTOURS SHOWN AT FIVE (5) FOOT INTERVALS. ONE (1) FOOT CONTOURS OMITTED FOR CLARITY.

NOTE: THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION.

REV. NO.	DATE	REVISIONS	BY	CHK	SCS SUPV.	CHKR	PROJ ENGR	APPR	ACCEPT
	/ /								
	/ /								
	/ /								
00C	6/22/07	REVISED POWER BLOCK BIO-RETENTION DITCH	MDB	GJM	-				
00B	5/2/07	GENERAL REVISION ISSUED FOR REVIEW	HL	RW GJM	-	FF	EAS		
00A	3/30/07	ISSUED FOR REVIEW	HL	RW GJM	-	FF	EAS		

CONSTELLATION GENERATION GROUP, LLC
CONSTELLATION COL

BECHTEL
FREDERICK, MARYLAND
JOB NO. 25237

U.S. EVOLUTIONARY POWER REACTOR (EPR)

CALVERT CLIFFS UNIT 3 POWER BLOCK FINISH GRADING PLAN

CONSTELLATION SERIAL NO. (REFERENCE) NA — REV. NA
BECHTEL DRAWING NO. 0-CS-0100-00001 — REV. 00C
SCALE 1"=150' SIZE E DOC. TYPE

34"X44"E SIZE

Item Number TE-7 **ESRP/ER Section 5.6.1**

Request:

How would the proposed actions contribute to the regional ecology with respect to the new Mid-Atlantic 500kV line and the expansion of the Cove Point L&G power facility?

Response:

Construction and operation of CCNPP Unit 3 is not expected to have a significant impact on the regional ecology, by itself, or collectively with respect to the proposed Mid-Atlantic Power Pathway (MAPP) and the approved expansion of the Cove Point Liquid Natural Gas (LNG) power facility actions.

CCNPP Unit 3 impacts to surface water aquatic resources, especially species of concern (Federal and state-listed species, commercially and recreationally important species, etc.) are expected to be SMALL due to the:

- use of existing CCNPP Units 1 and 2 intake area to supply required cooling water;
- lack of suitable aquatic habitat (such as submerged aquatic vegetation) in the areas impacted for some of the species of concern;
- very small areas impacted relative to the large expanse of available habitat;
- temporary nature of most impacts;
- incorporation of design features to collect, store and control stormwater in order to minimize impacts to wetlands and streams; and
- use of recirculating, closed cooling system to minimize intake water requirements, provide for small discharge plume areas, and low flow velocities through traveling screens.

CCNPP Unit 3 impacts to terrestrial and wetland resources, especially species of concern, are expected to be SMALL to MODERATE (mitigated wetland losses and loss of nesting tree for a pair of bald eagles) due to the;

- location of new unit on the existing CCNPP Units 1 and 2 site in order to avoid impacting new and potentially lesser disturbed habitats;
- extensive site selection analysis to minimize impacts on higher quality wetland and forest resources and bald eagle territories;
- development of conservation measures to offset the loss of a bald eagle pair's nesting territory while protecting three other known territories in accordance with the National Eagle Management Guidelines, thus insuring minimal impact on future productivity of species;

- utilization of existing disturbed onsite open/old-field areas to minimize fractionation of forest habitat;
- use of the existing 500 kV transmission line right-of-way to carry additional electricity to existing substations;
- mitigation and restoration of impacted wetland resources at other suitable onsite locations;
- relocation of species of concern (state-listed showy goldenrod) to other suitable onsite locations; and
- incorporation of design features to collect, store and control stormwater in order to minimize erosion impacts.

Details on the Mid-Atlantic Power Pathway (MAPP) are preliminary at this stage and an impact statement has not been completed for this project. However, it appears that existing transmission right-of-ways will be utilized in most of the region, thereby minimizing impacts. A portion of the 500 kV transmission line will be submerged from the western shore (near the CCNPP site) to the eastern shore of the Chesapeake Bay. Considerable environmental studies will be done to select the appropriate route and technology for this submerged cable in order to minimize impacts to aquatic resources. The project will have to be coordinated with, and appropriate permits obtained from, various Federal and state agencies. It is likely that any significant impacts will have to be mitigated and any losses of wetlands or other important habitat will have to be restored. Therefore, it is likely that any impacts to regional ecological resources will be minimal.

A final Environmental Impact Statement has been issued and the expansion of the Cove Point LNG facility has been approved by the Federal Energy Regulation Commission. Various mitigation methods have been proposed by the applicant (Dominion) and additional requirements have been imposed by FERC as a condition to expansion of the facility. The applicant has had an ongoing Natural Heritage Trust agreement with the Sierra Club and the Maryland Conservation Council to maintain a conservation area of about 800 acres on their site. The applicant has also entered into Conservation Easement agreements with the Nature Conservancy and Maryland Environmental Trust to preserve an additional 200 acres of forests. Most of the new pipeline required for delivery of the gas to the region will utilize existing rights-of-way in order to minimize impacts. Where critical habitats or resources were identified, routes were altered to avoid these areas to the extent possible. Significant adverse impacts to the regional ecological resources from this expansion are not expected

All three actions have considered and factored in impacts to regional ecological resources and have committed to minimizing and mitigating impacts to these resources. Therefore, the cumulative impacts from the three actions are not expected to have a significant adverse impact on regional ecological resources.

ER Impact:

No changes to the ER are required.

Item Number TE-8 **ESRP/ER Section 2.4.1**

Request:

How might the proposed actions affect certification of the Calvert Cliffs' site as wildlife habitat by the Wildlife Habitat Institute?

Response:

The Constellation Energy wildlife management program at the CCNPP site has been certified by the Wildlife Habitat Council since 1993. CCNPP is not certified by the Wildlife Habitat Institute, as that company does not have a history of providing habitat certifications. CCNPP also has a Wildlife Protection Agreement with the Nature Conservancy that is certified by the Wildlife Habitat Council. A wildlife habitat team comprised of employee volunteers monitors the sites floral and faunal resources as part to the Wildlife Habitat Council's certification program.

The CCNPP site consists of 2,070 acres, of which an estimated 220 acres are occupied by CCNPP Units 1 and 2. The proposed construction of the CCNPP Unit 3 will require use of 420 acres, of which an estimated 281 acres will permanently be used by CCNPP Unit 3 and its supporting facilities. The location of CCNPP Unit 3 will be in the southern portion of the CCNPP property. The large majority of the site area will continue to be forested and undeveloped property outside the development envelope of the three units. These forested areas will continue to provide wildlife habitat and serve as a wildlife corridor between thr Flag Ponds Nature Park and Calvert Cliffs State Park in Calvert County. A wildlife team will continue to monitor the site and conduct surveys of the floral and faunal resources. The proposed CCNPP Unit 3 construction and operation should not eliminate the status of the CCNPP campus as a certified wetland habitat site due to the existing wildlife monitoring team and the continuation of the existing wildlife protection agreement.

ER Impact:

No changes to the ER are required.

Item Number TE-9 **ESRP/ER Section 4.3.1**

Request:

How much of the historic bluff would be impacted by the construction of the new make-up and emergency water intake structures, as well as the new fish return facility? How much forested area would be removed for stabilization?

Response:

The location of the Intake Structure as described in the ER requires approximately 3 acres of the existing bluff to be re-graded representing a cut of approximately 170,000 cubic yards along with the construction of a retaining wall to satisfy slope stability concerns associated with a postulated seismic event. An alternate location for the Intake Structure has been considered. This alternate location is approximately 400 feet south of the CCNPP Unit 1 and 2 intake area. This alternate location requires approximately 5 acres of the existing bluff to be re-graded representing a cut of approximately 210,000 cubic yards to satisfy concerns associated with a postulated seismic event. Therefore, in the context of the existing terrain, and specifically with regard to the bluff, the current location of the CCNPP Unit 3 intake structure currently shown in the ER would result in less impact than other scenarios that were considered.

ER Impact:

No changes to the ER are required.

Item Number TE-10 ESRP/ER Section 4.3.1

Request:

What wetland mitigation would occur to offset impacts of Unit 3 construction? Where would this occur and what is the expected impact of mitigation actions (quality/quantity)?

Response:

Compensatory mitigation will occur to offset unavoidable impacts to approximately 11.71 acres of jurisdictional wetlands (forested wetlands, emergent/herbaceous wetlands, and surface waters) and approximately 8,350 linear feet (lf) of intermittent and upper perennial jurisdictional stream channels. Figure 7.2-1 (attached) depicts the location and types of proposed compensatory mitigation, in addition to the quantities of proposed stream mitigation for construction of the CCNPP Unit 3 facility. Performance standards of proposed mitigation areas will be conducted in accordance with the MDE guidelines and with consideration of other permitting agencies as mandated by the state of Maryland. These standards include yearly monitoring of primary success criteria, contingencies for unmet success criteria, and legal protection of mitigation areas in perpetuity. A more detailed decription of proposed mitigation activities is provided in the Section 4.6-2 of the attached Wetland/Stream Compensatory Mitigation Plan (draft).

Wetland Mitigation Plan

Compensatory wetland mitigation will consist of will include: (1) enhancement of one manmade, abandoned, sediment basin within the Lake Davies Disposal Area; (2) enhancement of a portion of Johns Creek; (3) creation of forested and herbaceous wetland habitat within the largest manmade, abandoned, sediment basin of the Lake Davies Disposal Area; and (4) creation of forested wetland habitat within the Camp Conoy area which lies within the CBCA.

(1) The enhancement of approximately 2.4 acres of the central, manmade sediment basin within the Lake Davies Disposal Area will occur by the eradication of phragmites, the application of chemical herbicide, and the planting of woody bottomland hardwood species.

(2) The enhancement of approximately 15.7 acres of a significant portion of the Johns Creek system and an adjoining remnant stream system that extends northward into the Lake Davies Disposal Area will occur by the eradication of phragmites, the application of chemical herbicide, and the planting of woody bottomland hardwood species.

(3) The creation of a total of approximately 9.4 acres of forested and herbaceous wetland habitat within the northern, manmade sediment basin within the Lake Davies Disposal Area will occur by the establishment of the following vegetative zones: (1) approximately 0.9 acres of interior open water (pond) area will be planted with floating aquatic species; (2) approximately 1.3 acres

of surrounding freshwater marsh habitat will be planted with herbaceous plant species; and (3) approximately 7.2 acres of an outer zone will be planted with woody bottomland hardwood species. Fill material will be deposited within the sediment basin to raise the ground elevation across the entire basin. Phragmites, which is currently infesting the sediment basin, will be eradicated through the application of chemical herbicide prior to the aforementioned filling and planting activities. The hydroperiod of this created wetland area will be manipulated through the establishment of a water control structure.

(4) The creation of approximately 4.6 acres of forested wetland habitat within the Camp Conoy area will occur by the capture of stormwater runoff from the power block to achieve the necessary wetland hydroperiod, and by the planting of hydrophytic tree and shrub species.

Mitigation actions associated with the eradication of *phragmites* within the proposed wetland areas is anticipated to replace a degraded environment with a more diverse natural community and improve hydrology among phragmites-infested wetlands. The planting of desirable woody species is anticipated to provide suitable habitat and food sources for wildlife. These individual wetland mitigation actions are anticipated to have a beneficial cumulative effect on the ecological integrity of the surrounding areas as well.

The Calvert County Soil and Water Conservation District (CCSWCD) has been contacted and this agency can assist the Applicant with wetland creation needs; i.e., potential offsite mitigation areas that could be acquired to meet any deficit in wetland creation for the project.

Stream Mitigation Plan

Compensatory stream mitigation will consist of stream restoration and stream enhancement activities that are intended to compensate for the direct loss of physical, biological and, or riparian function of impacted streams. Stream restoration activities are intended to re-establish physical, biological and riparian function and will include the adjustment of horizontal/vertical channel alignment and channel cross section performed on approximately 6,283 lf as follows: Lone Creek ~1,237 lf; Johns Creek (mainstem) ~ 951 lf; Johns Creek (unnamed tributary) ~ 447 lf; and Woodland Branch upstream and downstream (mainstem, two locations) ~ 2,114 lf and 1,534 lf, respectively. Additional restoration treatments include: instream habitat structures (cover logs, lateral/longitudinal diversity, root wads), bank stabilization (vegetative and bioengineering treatments) and riparian wetland enhancements (hydraulic and vegetative).

Stream enhancement activities are intended to increase existing channel functions and include less intense grading operations, and minor adjustments such as horizontal alignment and channel cross section at isolated features throughout. Additional proposed stream enhancements include: improvements to aquatic habitat, bank stabilization and native riparian planting. Enhancement activities will be performed on approximately 4,146 lf as follows: Conoy Creek ~920 lf; Johns Creek (unnamed tributary) ~ 904 lf; Woodland Branch (mainstem) ~ 655 lf; and Woodland Branch (unnamed tributaries, two total) ~ 507 lf and 1,160 lf.

Table 4.6-2 below provides a summary of the proposed stream mitigation segments, specific type of mitigation proposed, and approximations of the amounts of mitigation proposed. A discussion of each proposed reach of stream mitigation stream follows the table.

Table 4.6-2 Stream Mitigation Summary, CCNPP Unit 3 Site, Calvert County, Maryland.

Stream Segment	Segment Length (lf)	Width (ft) of Up-lift	Area (ac)
SR-1 (Lower Woodland Branch)	2,114	varies*	6.78
SR-2 (Upper Woodland Branch)	1,534	varies*	2.90
SR-3 (Lone Creek)	1,237	varies*	0.77
SR-4 (Johns Creek mainstem)	951	varies*	2.76
SR-5 (Unnamed trib. Johns Creek)	447	varies*	1.15
Stream Restoration Total	6,283		14.36
SE-1 (Unnamed trib. L.W. Branch)	1,160	30	0.80
SE-2 (Middle Woodland Branch)	655	30	0.45
SE-3 (Unnamed trib. U.W. Branch)	507	30	0.35
SE-4 (Conoy Creek)	920	30	0.63
SE-5 (Unnamed trib. Johns Creek)	904	30	0.62
Stream Enhancement Total	4,146		2.86

*Varies per measurement of valley width.

SR-1 (Lower Woodland Branch) – Located near the northern boundary on the CCNPP property, this site begins below a significant head-cut. Because of the extreme degree of entrenchment, practical improvements to the channel would include Priority I restoration. Priority 1 restoration would include relocating the main channel alignment away from the existing “F” type channel, beginning at a severe headcut and continuing downstream to an area where floodplain access is more available. As is typical for proposed relocation, the abandoned reach of channel will be plugged throughout to prevent bypass, however it will still retain depressional qualities allowing it to serve as an ephemeral pond.

SR-2 (Upper Woodland Branch) - Located in the northeast section of the CCNPP property, this site begins at an identified intermittent/perennial (I/P) transition of flow, and continues down valley until bank height ratios provide the opportunity to reconnect with the existing, semi-active floodplain. Similar to SR-1, practical improvements to Upper Woodland Branch would require Priority I restoration inclusive of relocating the main channel alignment away from the existing “G” type channel, or gully, beginning at a severe headcut upstream of the I/P point and continuing downstream to an area where floodplain access is more available.

SR-3 (Lone Creek) – This channel, which is adjacent to the proposed power plant improvements, provides a unique opportunity to offset stream impacts by providing mitigation within the CBCA. Because of the extreme nature of the over widening and incision, this stream allows for Priority II restoration in the form of establishing a “new” active floodplain within the existing “F” type channel. However, this can only be accomplished through bank (future valley wall) grading and substantial adjustment of the existing alignment and profile. This restoration activity will begin immediately below the proposed fill zone, and continue downstream until reconnection with the adjacent floodplain becomes practical, near an existing culvert. From that point downstream to the confluence with the bay adjacent to a barge facilities active pier access road, Priority I restoration will be applied.

SR-4 (Johns Creek mainstem) – Located along Johns Creek between the proposed wetland enhancement zone (phragmites eradication) downstream and the reference reach site upstream, SR-4 has been affected by a series of headcut activities resulting in this section of stream channel being over widened and incised. To remediate this, Priority I restoration is proposed whereby the existing channel will be abandoned and relocated toward the center of the valley, allowing for restored stream function. This treatment will continue for over 950 lf until acceptable access to the active floodplain is achieved.

SR-5 (Unnamed Tributary to Johns Creek) – Located southeast of John Creek in the southwest portion of the CCNPP property, this unnamed tributary to John's Creek is located upstream and adjacent to a proposed wetland enhancement zone. An entrenched, G type channel exhibits a series of medium size headcuts. Priority I restoration is proposed whereby the existing channel will be abandoned and relocated toward the center of the valley, allowing for restored stream function. This treatment will continue for nearly 450 lf until acceptable access to the active floodplain is achieved.

SE-1 (Unnamed Tributary to Lower Woodland Branch) - This unnamed tributary is located in the northern portion of the site. The confluence of this tributary with Lower Woodland Branch is approximately 100 lf upstream from the terminus of the mainstem restoration. The existing channel shows signs of degradation occurring from various head cut activities suspected to be caused from down-cut and entrenched condition of Lower Woodland Branch at the confluence. Similar to other stream segments found in the Woodland Branch watershed, woody debris has softened the impacts of the downstream confluence. Enhancement in the form of adjustment of channel dimension along with re-vegetation would decrease the average channel shear stress and increase the resistance.

SE-2 (Middle Woodland Branch) - This site begins below an existing stream crossing/culvert (12" CMP). The culvert has acted to protect the upstream from further degradation by: (1) arresting upstream migration of headcuts; (2) providing flood storage upstream of the roadway embankment, suppressing modified peak discharge and timing; and (3) capturing excess sediment from downstream transport. The entrenchment of this stream reach has not escalated to unmanageable proportions, thereby allowing corrective measures to be addressed through minor changes to existing channel dimension. Maintaining the existing channel alignment, slight adjustments to the profile and channel cross section will allow the stream to transform from an existing "F" type channel toward a more stable "C" or "E" type channel.

SE-3 (Unnamed Tributary to Upper Woodland Branch) - This tributary is located in the northeastern portion of the CCNPP and forms part of the headwater of Woodland Branch. The existing channel shows signs of degradation occurring from various headcuts. The existence of in stream woody debris has softened the impacts of the headcuts. However, the current condition exhibits vulnerability to repeat occurrences and combined with restoration of the main channel, enhancement in the form of adjustment of channel dimension and assertive revegetation would decrease the average channel shear stress and increase the resistance.

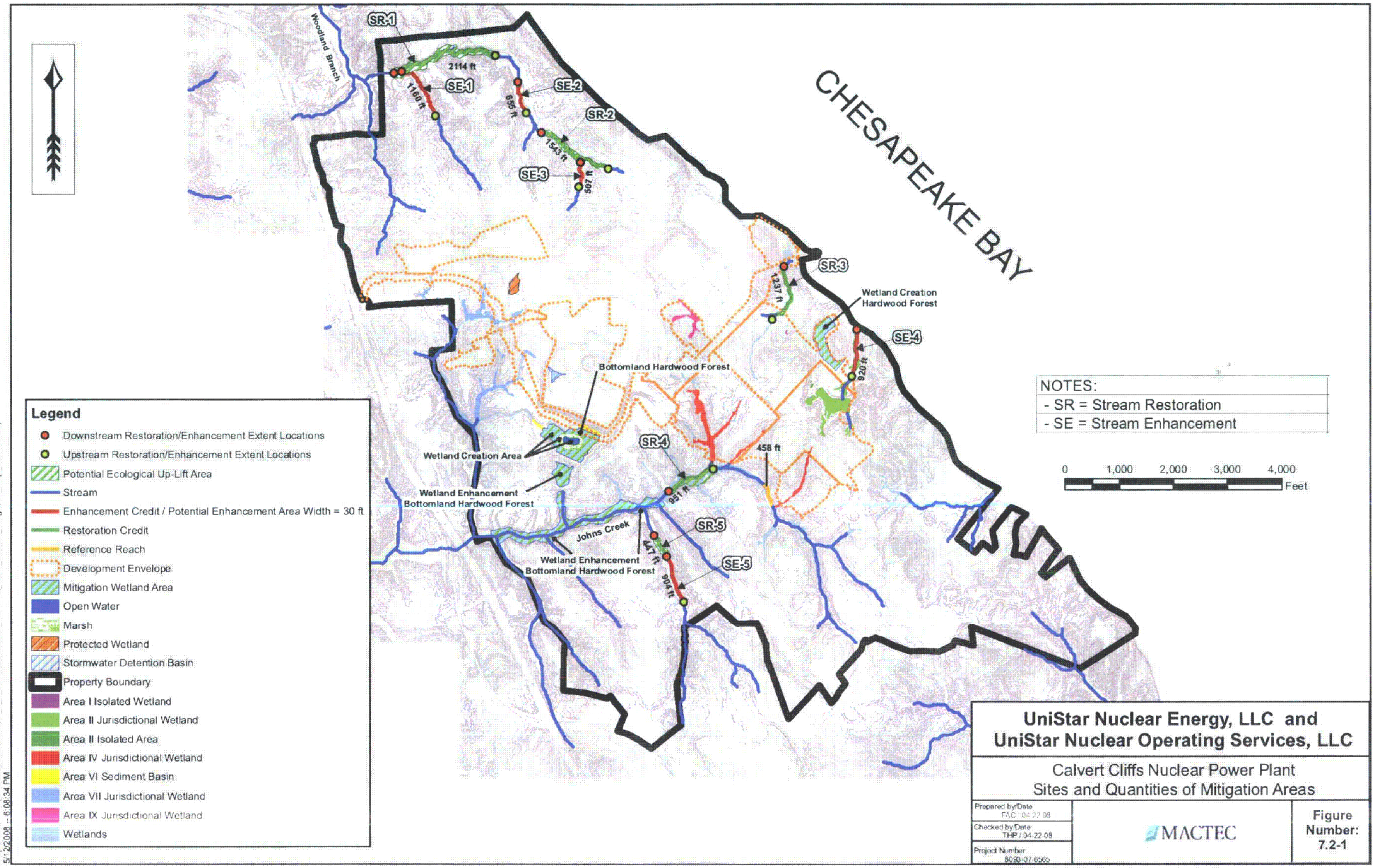
SE-4 (Conoy Creek) – This stream orginates in Camp Conoy flowing from Lake Conoy toward the Chesapeake Bay and does not suffer from excessive degradation. This stream includes a sequence of impoundments built decades ago, which have since naturalized and function as wetlands. The primary element of enhancement at this site involves providing a major channel stabilization grade control feature at the confluence with the Chesapeake Bay. By preventing upstream migration of a single 15-foot headcut, this feature will preserve the upstream sequence of wetlands and stream channels. Additional enhancement throughout this reach includes riparian revegetation and minor bank grading where knickpoints have initiated.

SE-5 (Unnamed Tributary to Johns Creek) – This stream mitigation reach is located in the southwest portion of the CCNPP near the southern property boundary. This unnamed stream channel is a tributary to John's Creek and is located upstream of SR-5. The degradation seen in this stream segment is likely due to a combination of the downstream degraded SR-5 and that of historical land use in the valley. This segment appears to be in a state of transition from a slightly entrenched Bc to a highly entrenched G. Enhancement activity in the stream segment would include the grading of streambanks back to an angle more representative of natural stream slopes. The reduced streambank slope angle would allow the stream to better access its floodplain and improve ecological connectivity. Success of this enhancement reach could be contingent, in part, to effective re-establishment of grade control in the downstream, SR-5.

Stream mitigation activities, combined with a proposed stormwater management plan, will offset losses to watershed functions by increasing the ability of onsite streams to provide flood storage, naturally recharge local aquifers, perform water quality improvement, and maintain stream and riparian functions that support the ecological integrity of the site.

ER Impact:

No changes to the ER are required.



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Item Number TE-11 **ESRP/ER Section 5.3**

Request:

Does the characterization of salt deposition from the cooling tower in the ER adequately describe what is expected with a hybrid system? If not, provide an updated description.

Response:

The salt deposition analysis contained in the ER reflects a drift eliminator with an efficiency of 0.005%. The current design has been updated to include drift eliminators with an efficiency of 0.0005% (i.e., 1/10th the drift loss rate of the initial drift eliminator design). This degree of control represents best available control technology for large cooling towers.

Because of the higher efficiency of the drift eliminator, particulate (salt) emissions will be 1/10th of those stated in the ER for the earlier design. Furthermore, the particles leaving the updated chevron-design eliminator will be smaller and will remain suspended in the air for a longer period. Salt deposition in the vicinity of the plant will be reduced because the lighter particles will be carried farther downwind before being deposited.

The EPA's AERMOD Model was used to predict salt deposition rates for the cooling tower with the 0.0005% efficient drift eliminator. The maximum predicted deposition rates are:

- 0.90 lb/ac/month – Maximum on-site,
- 0.70 lb/ac/month – Maximum off-site (on the south-side boundary), and
- 0.45 lb/ac/month – Maximum on the Switchyard.

Isopleths of deposition rate in the area around the CCNPP site are shown in the attached figure.

ER Impact:

An updated description of cooling tower salt deposition and the attached figure will be provided in ER Section 5.3 in a future ER revision.

Highest Cooling Tower Salt Deposition Rate (lb/ac/mo) CCNPP Unit 3

Item Number TE-12 **ESRP/ER Section 4.3.1**

Request:

How would the alteration of surface and subsurface water flow impact the quality and quantity of water flowing into wetlands during construction?

Response:

The alteration of surface and subsurface water flow during construction is expected to have a minor and temporary impact on the quality and quantity of water flowing into wetlands. The rationale for this statement is provided in the following paragraphs.

Removal of the upper portion of the Surficial aquifer in the area of the CCNPP Unit 3 and its replacement with impermeable surfaces will effectively eliminate direct recharge into that aquifer via precipitation. Lowering of the land surface in this way will likely result in the lowering of the static water table, which in turn will probably reduce the rate of groundwater discharge into the bounding tributaries. However, this potential reduction in stream flow would be compensated for by the runoff flow contributed from sand-filter trenches to the wetland creation area on the east side and to the tributaries to Johns Creek on the west side. These trenches will receive and drain off surface runoff from the Unit 3 area, and since the bottom of the trenches will consist of a permeable layer of sand or gravel, infiltration down into the remaining (lower) portion of the Surficial aquifer will occur to some extent. This will compensate in large part for the elimination of recharge by precipitation infiltrating directly into the Surficial aquifer. Thus, no significant alteration of groundwater or surface runoff flow from the construction area is expected.

Best management practices will be selected and implemented to insure that neither the water flow nor the water quality downgradient of the power block area and the adjoining construction laydown area will be noticeably altered during the construction phase. The maintenance of acceptable water quality as impacting downstream wetlands will be largely affected by implementation of the erosion and sediment control measures detailed in the Calvert Cliffs Unit 3 Storm Water Management Plan dated April 2008. These measures will be implemented by installation of *initial, intermediate,* and *final* erosion and sedimentation controls, which will be planned, conducted and maintained according to the Calvert County Soil Conservation District standards and specifications.

Initial controls will be installed prior to construction commencement and will include perimeter protection fencing and controls and strictly-controlled construction exits. *Intermediate* controls will include silt fencing, sediment ponds, diversion dikes and stone check dams if necessary to control erosion and storm-water runoff. During the grading and construction phase, additional intermediate erosion controls will be put in place as land disturbance occurs. Erosion control devices will be implemented or modified as the drainage patterns for storm water are constructed. All disturbed land left exposed for 7 days (steep slopes) to 14 days (gentle slopes) will be mulched or temporary grass cover will be provided. The *intermediate* controls will ensure that the quantity and quality of water flowing into the downstream wetlands will not be significantly altered from pre-construction conditions.

Final erosion and sediment controls will be integrated with establishment of the permanent storm-water management system and will include, among other things, construction of filtration ditches, stream enhancements, stabilization of construction roads, application of rolled erosion control product on steep slopes during final grading, and permanent stabilization by grassing of final grades and open pervious areas.

Implementation of a sequenced, systematic erosion and sedimentation control plan, as summarized above and to be approved by Calvert County Soil Conservation District, will limit the water-flow and water-quality impacts on wetlands due to the planned construction activities to be temporary and minor.

ER Impact:

No changes to the ER are required.

Item Number TE-13 **ESRP/ER Section 5.1**

Request:

How would the alteration of surface and subsurface water flow impact the long-term quality and quantity of water flowing into area wetlands after construction?

Response:

The alteration of surface and subsurface waters is not expected to have a negative impact on the long-term quality and quantity of water flowing into area wetlands after construction. The rationale for this statement is provided in the following paragraphs.

Removal of the upper portion of the Surficial aquifer in the area of the CCNPP Unit 3 and its replacement with impermeable surfaces will effectively eliminate direct recharge into that aquifer via precipitation. Sand-filter ditches will receive and drain off surface runoff from the CCNPP Unit 3 area. On the east side, the ditches draining the power block and the adjacent laydown area will convey runoff to a wetland creation area located east of the power block. On the west side, ditches draining the switch yard area will discharge into an unlined storm-water basin located to the west, and runoff from sand filter ditches in the cooling tower area and the parking area will discharge directly into tributaries to Johns Creek. The outflow structure for the storm-water basin will be designed to release water at low enough rates so that the receiving stream will not be subject to either erosion or sedimentation, beyond what is naturally occurring now. At the same time, wetlands will be receiving replenishment from upstream tributaries at approximately the same rate as occurs under pre-construction conditions.

The bottom of these ditches will consist of a permeable layer of sand or gravel and this will permit infiltration down into the remaining (lower) portion of the Surficial aquifer, which will compensate in large part for the elimination of recharge through infiltrating precipitation. The ditches will be designed to accommodate as much as a two-year 24-hour rain event.

Based on observations made at other sites where the land surface has been lowered, it is expected that at the power block the post-construction steady-state water table in the aquifer may be a few feet lower than that indicated in Figures 2.3.1-42 through -45. While such lowering of the water table may reduce the rate of groundwater discharge into the bounding tributaries somewhat, this would be compensated for by the runoff flow contributed from the sand-filter ditches to the wetland creation area on the east side and to the tributaries to Johns Creek on the west side.

Best management practices will be selected and implemented to insure that the water quality downgradient of the power block area and the adjoining construction laydown area will not be noticeably altered. The maintenance of acceptable water quality will be largely effected by implementation of the erosion and sediment control measures detailed in the Calvert Cliffs Unit 3 Storm Water Management Plan dated April 2008. These measures will be implemented by installation of *initial, intermediate,* and *final* erosion and sedimentation controls, which will be planned, conducted and maintained according to the Calvert County Soil Conservation District standards and specifications. The *final* erosion and sediment controls will be integrated with establishment of the permanent storm-water management system and will include, among other things, construction of the filtration ditches, stream enhancements, stabilization of construction roads, application of rolled erosion control product on steep slopes during final grading, and permanent stabilization by grassing of final grades and open pervious areas.

Surface-water use impacts are considered moderate primarily due to the loss of wetlands and wetland buffers, which implies that mitigation will be required. An analysis of the nine wetland assessment areas identified in the site area is provided in Section 4.3.1.3 of the report, and the planned mitigation measures are described in Section 4.3.1.6. The planned construction will involve the permanent filling of an estimated 8,350 linear feet (2,545 m) of intermittent and upper perennial stream channels and approximately 11.7 acres (4.7 hectares) of the delineated wetland areas. The project would also disturb approximately 30.9 acres (12.5 hectares) of land defined by Calvert County as non-tidal wetland buffer (lands within 50 feet [15 m] of the landward edge of non-tidal wetlands). Most of the wetland fill would take place in Wetland Assessment Areas I, II, IV VII and IX. In order to mitigate this noticeable alteration to the site wetlands, several mitigation measures will be considered based on the results of a planned field survey to be conducted during construction activities to determine the appropriate areas for onsite wetland mitigation.

As described in Calvert Cliffs Unit 3 Storm Water Management Plan dated April 2008, a detailed storm-water management study will be conducted to evaluate adequate sizes of the several components of the storm-water system to maintain both quality and quantity requirements for the downstream area. This will include analyzing the pre-development and post-development site hydrology for the 1-, 2-, 5-, 10- and 100-year 24-hour rainfall events. The planned storm-water management system will be sized such that the downstream flow rates, sediment loads and water quality will be similar to the existing conditions and such that the post-development peak discharges will not exceed the pre-development rates. Thus, no significant change in the long- or short-term flow to the streams and wetlands from the power block area and the adjoining construction laydown area is expected.

ER Impact:

No changes to the ER are required.

Item Number TE-14 **ESRP/ER Section 2.4.1**

Request:

Provide the State of Maryland environmental review report when received (June/July timeframe) as discussed at the site audit in March.

Response:

The State of Maryland Environmental Review Review Report will be provided when it becomes available.

ER Impact:

No changes to the ER are required.

Item Number TE-15 **ESRP/ER Section 4.6**

Request:

Provide Wetland Mitigation Plan as discussed at the site audit in March.

Response:

A copy of the Wetland/Stream Compensatory Mitigation Plan (draft) is attached.

ER Impact:

No changes to the ER are required.

Item Number TE-16 **ESRP/ER Section 4.6**

Request:

Provide the Forest Conservation Plan as discussed at the site audit in March.

Response:

The Forest Conservation Plan is provided as an attachment to this submittal.

ER Impact:

No changes to the ER are required.

Item Number AE-1 **ER Section 2.4.2**

Request:

Clarify the characterization of Lake Davies and Lake Conoy. The Surface Waters section of the ER (2.3.1.1) does not include adequate descriptions of either impoundment. The aquatic ecology section (2.2.4.1.1.3) provides some information about the fauna present in each, but does not describe physical features. Provide information about the history, size, physical features, and current status of both. Describe what actions, if any, are taken to maintain or adjust the water level in each water body.

Response:

Lake Davies is a misnomer as it refers to a field where dredge material was disposed during the initial construction of the facility. As material was dredged from the Chesapeake Bay, it was pumped to a large shallow impoundment for disposal. Water was decanted from this disposal area into a series of settling ponds (two ponds in the southern portion and one in the southwest portion of the disposal area) then drained back into Johns Creek. Lake Davies as it exists today is a large flat field that is used for storage. The settling ponds still exist and often the name Lake Davies is improperly applied to these features. The southwestern settling pond is a triangular shaped water feature that is approximately 300 feet long on each side and is 0.53 acres in size. The pond currently functions as a stormwater retention pond and the depth fluctuates widely depending on precipitation. The pond bottom and banks are vegetated by *Phragmites sp.*

As an aquatic habitat, these ponds are not maintained or adjusted. The vegetation is predominantly *Phragmites sp.* The ponds offer low quality habitat to amphibians, birds, and mammals on a seasonal basis.

Proposed plans call for the enhancement of the two southern ponds by raising the ponds' bottoms, installing appropriate water control structures, removing the *Phragmites sp.*, and planting the ponds with native hardwood wetland species. The ponds would then be maintained as forested wetlands.

Lake Conoy is an impoundment created when this parcel was a YMCA camp and appears to have been used for fishing and boating. The lake is a little over 400 feet long and a little wider than 200 feet and is 2.6 acres in size. The depth is unknown, but estimated at 5 feet at its deepest point due to terrain and dam size. One side of the lake is comprised of the dam with a paved access road traversing it. The opposite bank is a bedrock outcrop. The banks of the lake are forested and grass. The is emergent vegetation in the littoral zone including cattails and *Phragmites sp.* Water levels appeared to fluctuate 2 to 3 feet on an annual basis and the maximum water elevation is maintained by a corrugated pipe. Aquatic macroinvertbrates, fish, amphibians, and waterfowl were all observed.

There are currently no management practices that are employed for Lake Conoy. Lake Conoy is proposed for filling. Mitigation will be employed at other locations including an area along Johns Creek, two new wetlands creation areas and a wetland enhancement area. All of these wetland mitigation areas are on the CCNPP site property and have been submitted to the Army Corps of Engineers as part of the Section 404 Permit Application.

ER Impact:

No changes to the ER are required.

Item Number AE-2 **ER Section 2.4.2**

Request:

Clarify that the "blue dots" shown in Figure 2 of the Aquatic Surveys Report (EA 2007) are freshwater sampling stations. Some appear to be "on land" (e.g., LC-02, LD-01, LD-03).

Response:

The "blue dots" shown on Figure 2 of the report "Aquatic Field Studies for UniStar Calvert Cliffs Expansion Project" (EA 2007) are intended to represent the location of the stream and pond sampling sites. In some instances on the figure they are adjacent to the water body where the samples were taken and appear to be on land. The sampling sites are described in Table 1 of the report. The LC designation is for Lake Canoy. The LD designation is for Lake Davies.

ER Impact:

No changes to the ER are required.

Item Number AE-3 **ER Section 2.4.2**

Request:

The Faunal Survey Report (Tetra Tech 2007) lists a crayfish burrow as being seen in Goldstein Branch. Are there any records indicating the species of crayfish present on the CCNPP site? Is there any information to indicate that crayfish on the site do not include the invasive Rusty Crayfish (*Orconectes rusticus*)?

Response:

There are no records for the *Orconectes rusticus* species of crayfish present on the CCNPP site. No individuals were collected during either the aquatic and faunal survey. Additionally, there are no known occurrences of *Orconectes rusticus* on the CCNPP site. However, it is cannot be said with certainty that this species is not present on site. This species has been found in Maryland at several locations and is listed as an Invasive Species of Concern in Maryland, and there is little that can be done to prevent the spread of this species once it has been introduced into a region.

ER Impact:

No changes to the ER are required.

Item Number AE-4 **ER Section 2.4.2**

Request:

What are the units for the depth contours shown in Figure 3 of the Aquatic Survey Report (EA 2007)?

Response:

The depth contours shown in Figure 3 of the Aquatic Field Studies for UniStar Calvert Cliffs Project (EA 2007) are in feet. The depth contours are consistent with ER Figure 2.3.1-27 that shows bathymetry contours near existing CCNPP Units 1 and 2 structure and existing intake channel. These contours are at 2-foot intervals from 4 to 40 feet. In addition, nautical chart 12263 (Cove Point to Sandy Point) from the National Oceanic and Atmospheric Administration shows soundings in feet for the Chesapeake Bay that correlate well with those in ER Figure 2.3.1-27.

ER Impact:

No changes to the ER are required.

Item Number AE-5 **ER Section 2.4.2**

Request:

The Aquatic Survey Report (EA 2007) shows that there appears to be a deep "channel" perpendicular to the intake area. Was this channel dredged? If so, are there any plans to dredge the channel for the installation of Unit 3? Does the channel require maintenance dredging?

Response:

The channel was dredged during the construction of CCNPP Units 1 and 2, which was approximately 40 years ago. The intended purpose of the channel was to provide colder water to the water intake to the facility. It was presumed that cooler water existed at lower depths in the Chesapeake, and the channel along with the baffle wall was intended to provide the coldest possible water source to the plant.

The channel has not been dredged or maintained since its construction. The channel has been determined to not necessary to the operation of CCNPP Units 1 and 2, and no dredging or maintenance of this channel will be needed for the installation and/or operation of CCNPP Unit 3.

The channel still exists according to the underwater survey that was competed for the area, albeit not at the same depths as the original design.

ER Impact:

No changes to the ER are required.

Item Number AE-6 **ER Section 2.4.2**

Request:

Discussions during the site tour (March 2008) indicated that the location and design of the cooling intake and discharge systems, including the fish return system for the new unit, had not been finalized. Also, there was some expectation that the fish return system for Unit 3 would be combined with that for Units 1 and 2 at a new location. Describe the impacts of closing the fish return system for Units 1 and 2 while it is being relocated to the site of the return system for Unit 3. Provide the final location and design of the cooling intake and discharge systems, including the fish return system for the new unit.

Response:

Although there may have been some discussion of combining the Fish Return System for CCNPP Unit 3 with that of CCNPP Units 1 and 2, the present design is for a dedicated Fish Return System for CCNPP Unit 3. To that effect, the recent final design that was submitted as part of the Army Corps or Engineers Section 404 Permit Application provides for a separate intake structure for the CCNPP Unit 3 Fish Return System.

The existing CCNPP Units 1 and 2 Fish Return Facility is located to the southeast side of the CCNPP Units 1 and 2 intake forebay. Currently, water from CCNPP Units 1 and 2 flows through the Fish Return Facility where environmental aquatic studies can be performed. Traveling screen wash water leaving the facility then enters the Chesapeake Bay directly through a buried conduit to the shoreline outfall. The Fish Return Facility contains a holding pit, two isolation gates and a flow trough. The main isolation gate is normally open, allowing discharge of screen wash water (containing fish) to the Chesapeake Bay. If needed, the main gate can be closed, and the side isolation gate opened, allowing diversion of screen wash water to the holding pit to allow environmental studies. Water overflowing the holding pit would lead to the buried conduit and exit to the Chesapeake Bay.

For CCNPP Unit 3, a fish collection/holding facility similar to the one provided for CCNPP Units 1 and 2, will be constructed at the CCNPP Unit 3 Intake Structure. This facility will be located on the east side (bay side) of the CCNPP Unit 3 Intake Forebay. Screen wash water and fish collected from the traveling screens of the CCNPP Unit 3 Circulating Water Makeup Intake Structure will be diverted to the new Fish Return Facility and will be released to the Chesapeake Bay via a buried pipe to a new shoreline outfall. The outfall will be submerged below tide level to minimize any drop at the exit to facilitate the returning of the fish to the Chesapeake Bay water. No modification to the existing fish return and holding facility for CCNPP Units 1 and 2 is necessary.

ER Impact:

No changes to the ER are required.

Item Number AE-7 **ER Section 2.4.2**

Request:

During the site tour, it was mentioned that stream modification is being considered as a possible mitigation for impacts. Describe the specific modifications that would be made and how the success of this mitigation would be evaluated.

Response:

A complete walkthrough and inventory of plausible stream resources on the CNPP Unit 3 site was conducted on February 21 and 22, 2008. Following this walkthrough, field notes and photographic logs were compiled and the opportunity for physical, biological and, or riparian "lift" and corresponding compensatory mitigation activity was realized at various locations throughout CCNPP. CCNPP stream restoration and enhancement (SR-X and SE-X) sites selected as candidates for compensatory mitigation are shown in Table 1 and Figure 1 (attached).

**Table 1. Stream Mitigation Summary,
CCNPP Unit 3 Site, Calvert County, Maryland.**

Stream Segment	Segment Length (lf)	Width (ft) of Up-lift	Area (ac)
SR-1 (Lower Woodland Branch)	2,114	varies*	6.78
SR-2 (Upper Woodland Branch)	1,534	varies*	2.90
SR-3 (Lone Creek)	1,237	varies*	0.77
SR-4 (Johns Creek mainstem)	951	varies*	2.76
SR-5 (Unnamed trib. Johns Creek)	447	varies*	1.15
Stream Restoration Total	6,283		14.36
SE-1 (Unnamed trib. L.W. Branch)	1,160	30	0.80
SE-2 (Middle Woodland Branch)	655	30	0.45
SE-3 (Unnamed trib. U.W. Branch)	507	30	0.35
SE-4 (Conoy Creek)	920	30	0.63
SE-5 (Unnamed trib. Johns Creek)	904	30	0.62
Stream Enhancement Total	4,146		2.86

*Varies per measurement of valley width.

Stream restoration activities are intended to re-establish physical, biological and riparian function and includes the adjustment of horizontal/vertical channel alignment and channel cross section performed on approximately 6,283 lf, as follows:

- Lone Creek ~1,237 lf;
- Johns Creek (mainstem) ~ 951 lf;
- Johns Creek (unnamed tributary) ~ 447 lf; and

- Woodland Branch upstream and downstream (mainstem, two locations) ~ 2,114 lf and 1,534 lf, respectively.
- Additional restoration treatments include: instream habitat structures (cover logs, lateral/longitudinal diversity, root wads), bank stabilization (vegetative and bioengineering treatments) and riparian wetland enhancements (hydraulic and vegetative).

Stream enhancement activities are intended to increase existing functions, and include less intense grading operations and minor adjustments such as horizontal alignment and channel cross section. Additional proposed stream enhancements include: improvements to aquatic habitat, bank stabilization, and native riparian planting. Enhancement activities will be performed on approximately 4,146 lf, as follows:

- Conoy Creek ~920 lf;
- Johns Creek (unnamed tributary) ~ 904 lf;
- Woodland Branch (mainstem) ~ 655 lf; and
- Woodland Branch (unnamed tributaries, two total) ~ 507 lf and 1,160 lf.

The following section describes the existing stream conditions and generalizes the proposed mitigation.

SR-1 (Lower Woodland Branch) – Located near the northern boundary on the CCNPP property, this site begins below a significant head-cut. Because of the extreme degree of entrenchment, practical improvements to the channel would include Priority I restoration. Priority 1 restoration would include relocating the main channel alignment away from the existing "F" type channel, beginning at a severe headcut and continuing downstream to an area where floodplain access is more available. As is typical for proposed relocation, the abandoned reach of channel will be plugged throughout to prevent bypass, however it will still retain depressional qualities allowing it to serve as an ephemeral pond.

SR-2 (Upper Woodland Branch) - Located in the northeast section of the CCNPP property, this site begins at an identified intermittent/perennial (I/P) transition of flow, and continues down valley until bank height ratios provide the opportunity to reconnect with the existing, semi-active floodplain. Similar to SR-1, practical improvements to Upper Woodland Branch would require Priority I restoration inclusive of relocating the main channel alignment away from the existing "G" type channel, or gully, beginning at a severe headcut upstream of the I/P point and continuing downstream to an area where floodplain access is more available.

SR-3 (Lone Creek) – This channel, which is adjacent to the proposed power plant improvements, provides a unique opportunity to offset stream impacts by providing mitigation within the CBCA. Because of the extreme nature of the over widening and incision, this stream allows for Priority II restoration in the form of establishing a "new" active floodplain within the existing "F" type channel. However, this can only be accomplished through bank (future valley wall) grading and substantial adjustment of the existing alignment and profile. This restoration activity will begin immediately below the proposed fill zone, and continue downstream until reconnection with the adjacent floodplain becomes practical, near an existing culvert. From that point downstream to the confluence with the bay adjacent to a barge facilities active pier access road, Priority I restoration will be applied.

SR-4 (Johns Creek mainstem) – Located along Johns Creek between the proposed wetland enhancement zone (phragmites eradication) downstream and the reference reach site upstream, *SR-4* has been affected by a series of headcut activities resulting in this section of stream channel being over widened and incised. To remediate this, Priority I restoration is proposed whereby the existing channel will be abandoned and relocated toward the center of the valley, allowing for restored stream function. This treatment will continue for over 950 lf until acceptable access to the active floodplain is achieved.

SR-5 (Unnamed Tributary to Johns Creek) – Located southeast of John Creek in the southwest portion of the CCNPP property, this unnamed tributary to John's Creek is located upstream and adjacent to a proposed wetland enhancement zone. An entrenched, G type channel exhibits a series of medium size headcuts. Priority I restoration is proposed whereby the existing channel will be abandoned and relocated toward the center of the valley, allowing for restored stream function. This treatment will continue nearly 450 lf until acceptable access to the active floodplain is achieved.

SE-1 (Unnamed Tributary to Lower Woodland Branch) - This unnamed tributary is located in the northern portion of the site. The confluence of this tributary with Lower Woodland Branch is approximately 100 lf upstream from the terminus of the mainstem restoration. The existing channel shows signs of degradation occurring from various head cut activities suspected to be caused from down-cut and entrenched condition of Lower Woodland Branch at the confluence. Similar to other stream segments found in the Woodland Branch watershed, woody debris has softened the impacts of the downstream confluence. Enhancement in the form of adjustment of channel dimension along with re-vegetation would decrease the average channel shear stress and increase the resistance.

SE-2 (Middle Woodland Branch) - This site begins below an existing stream crossing/culvert (12" CMP). The culvert has acted to protect the upstream from further degradation by: (1) arresting upstream migration of headcuts; (2) providing flood storage upstream of the roadway embankment, suppressing modified peak discharge and timing; and (3) capturing excess sediment from downstream transport. The entrenchment of this stream reach has not escalated to unmanageable proportions, thereby allowing corrective measures to be addressed through minor changes to existing channel dimension. Maintaining the existing channel alignment, slight adjustments to the profile and channel cross section will allow the stream to transform from an existing "F" type channel toward a more stable "C" or "E" type channel.

SE-3 (Unnamed Tributary to Upper Woodland Branch) - This tributary is located in the northeastern portion of the CCNPP and forms part of the headwater of Woodland Branch. The existing channel shows signs of degradation occurring from various headcuts. The existence of in stream woody debris has softened the impacts of the headcuts. However, the current condition exhibits vulnerability to repeat occurrences and combined with restoration of the main channel, enhancement in the form of adjustment of channel dimension and assertive revegetation would decrease the average channel shear stress and increase the resistance.

SE-4 (Conoy Creek) – This stream orginates in Camp Conoy flowing from Lake Conoy toward the Chesapeake Bay and does not suffer from excessive degradation. This stream includes a sequence of impoundments built decades ago, which have since naturalized and function as wetlands. The primary element of enhancement at this site involves providing a major channel stabilization grade control feature at the confluence with the Chesapeake Bay. By preventing upstream migration of a single 15-foot headcut, this feature will preserve the upstream sequence of wetlands and stream channels. Additional enhancement throughout this reach includes riparian revegetation and minor bank grading where knickpoints have initiated.

SE-5 (Unnamed Tributary to Johns Creek) – This stream mitigation reach is located in the southwest portion of the CCNPP near the southern property boundary. This unnamed stream channel is a tributary to John's Creek and is located upstream of SR-5. The degradation seen in this stream segment is likely due to a combination of the downstream degraded SR-5 and that of historical land use in the valley. This segment appears to be in a state of transition from a slightly entrenched Bc to a highly entrenched G. Enhancement activity in the stream segment would include the grading of streambanks back to an angle more representative of natural stream slopes. The reduced streambank slope angle would allow the stream to better access its floodplain and improve ecological connectivity. Success of this enhancement reach could be contingent, in part, to effective re-establishment of grade control in the downstream, SR-5.

The success of this stream mitigation will be determined based on specific Performance Standards that will be evaluated in accordance with the MDE guidelines, and with consideration of other permitting agencies as mandated by the state of Maryland. In addition, the success of stream mitigation efforts located, on-site, at CCNPP will include channel stability and riparian survivability. Specifically, substantial determination of success or failure of stream restoration project will encompasses measure of channel modification, erosion control, seeding, and woody vegetation plantings. This will be accomplished through evaluating channel stability (cross-sections, longitudinal profile, pebble counts), photo reference sites (longitudinal, lateral), plant survival (plots, stake/tree counts), and via biological indicators (benthic macro-invertebrates, fish populations).

The specific success criteria for the vegetation-habitat restoration/enhancement is presented below:

- Mean density of approximately 435 stems per acre (planted and naturally regenerated/recruited stems), which match the dominant species of the reference areas, or
- A minimum of 320 stem survival of all planted species (as determined through vegetation monitoring), and
- Positive growth indicators on planted species (as determined through vegetation monitoring).

If success criteria are not met within the proposed mitigation area by the fifth (or otherwise determined final) year of the monitoring program, some additional replanting, re-grading, or hydrologic modification may be necessary at the mitigation site. Sufficient funding for this potential activity will be provided in the form of a Performance Bond or Letter of Credit. The amount of the Performance Bond or Letter of Credit will be determined and justified based on the required land management strategies and activities required to achieve ecological success.

The protection of the environment through the mitigation process cannot be denied. However, if the mitigation area(s) were to fail (i.e., not provide adequate compensatory mitigation for authorized impacts causing a net loss in wetland function), some form of contingency would need to be in place to assure that remedial activities can be funded to bring the site into compliance. Financial guarantees provide assurances to the permitting agencies that monies will be available to perform remedial activities should they be required. The financial assurances for the proposed mitigation plan for the CCNPP Unit 3 site will be established in accordance with the USACE RGL No. 05-1 (February 14, 2005) Guidance on the Use of Financial Assurances and may be provided in the form of a Performance Bond or Letter of Credit.

The stream mitigation areas shall be protected into perpetuity through establishment of a legally-binding deed restriction. These deed restrictions generally will follow the standard USACE Baltimore District model for such instruments. However, the deed restrictions will allow the removal of dead and/or diseased trees, management of wildlife, and other conservation management strategies. In addition, easements will accommodate possible future utility crossings. The following items shall be provided with the deed restriction:

- A title insurance policy updated to the date of conveyance, after the recording of the protective mechanism for the mitigation area;
- A survey (or plat) and legal description of the mitigation area, showing all existing easements and encumbrances (if any), as identified in the title document submitted in recordable form; and
- A publicly recorded, certified copy of the protective mechanism.

The protection mechanism that is ultimately chosen for the stream mitigation areas on CCNPP Unit 3 will include the following provisions (COMAR 26.23.04.03):

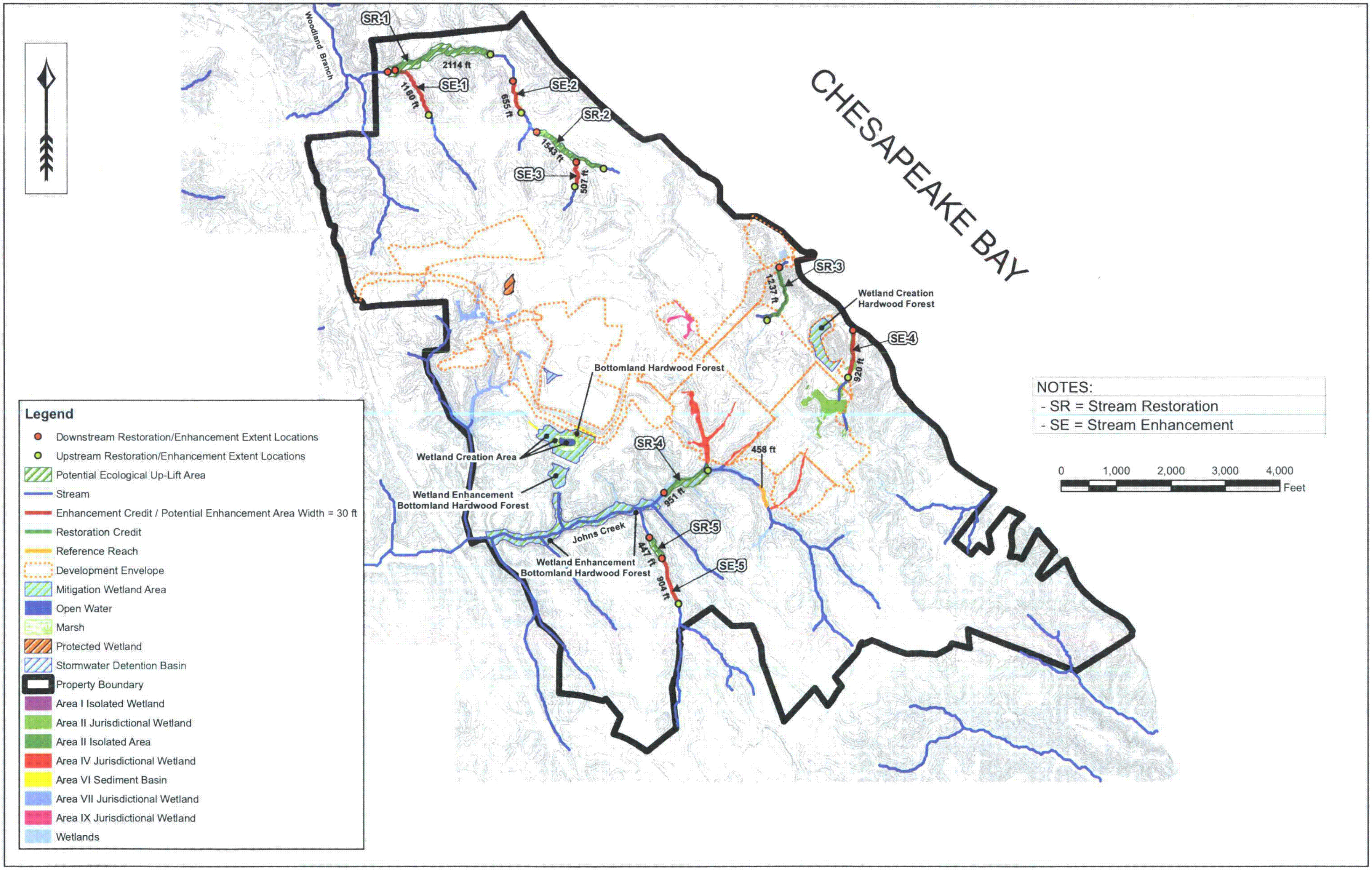
- Language granting the recipient agency, or any successor agency, access to the mitigation sites for inspections during the monitoring period and for construction of the mitigation project, if the permittee or person conducting the proposed activity forfeits a bond and the recipient agency decides to complete construction of the mitigation project;
- In the case of an easement agreement, language allowing assignment of a permittee's, or person conducting the proposed activity's, interest under the easement agreement to the recipient agency, if the bond is forfeited and the recipient agency decides to complete construction of the mitigation project;
- An absolute prohibition on the draining, dredging, removal, or filling of the restored or enhanced stream channels; and
- Language that the restriction is perpetual, binding on the grantor's personal representatives, heirs, successors, and assigns and runs with the land.

Long-term management and maintenance of the stream and wetland restoration sites will be assured through the placement of deed restrictions on the mitigation areas. Formal management/maintenance of the mitigation site beyond the monitoring period will be the responsibility of the site owner. Ownership of the mitigation area will likely reside with CCNP or its assigns, until such a time when CCNP decides to sell the property or donate it to a public agency or private conservation organization. If the mitigation area should ever be sold, all appropriate protective mechanisms (which will have been recorded) will remain in effect and will remain with the site into perpetuity. CCNP proposes that a Performance Bond be provided for the mitigation effort (COMAR 26.23.04.03).

Following mitigation activities, a minimum five-year annual monitoring plan will be implemented per the Interagency Mitigation Task Force's, *Maryland Compensatory Mitigation Guidance*, (August, 1994) and the USACE Baltimore District's, *Mitigation and Monitoring Guidelines,* (November, 2004). Multiple monitoring plots will be established and monitored for vegetative survivorship, vegetative growth indicators, and habitat attributes. At least one additional reference wetland plot will also be established for data comparison to the mitigation monitoring plots. The annual monitoring events will be conducted during September and October of each year.

ER Impact:

Table 1 will be added to ER Section 4.6, and Figure 1 will be added to ER Section 7.2 in a future ER revision.



CHESAPEAKE BAY
Woodland Branch
SR-1
2114 ft
SE-1
1160 ft
SE-2
655 ft
SR-2
1543 ft
SE-3
507 ft
SR-3
1237 ft
Wetland Creation
Hardwood Forest
SE-4
920 ft
Bottomland Hardwood Forest
Wetland Creation Area
SR-4
951 ft
458 ft
Wetland Enhancement
Bottomland Hardwood Forest
Johns Creek
SR-5
447 ft
Wetland Enhancement
Bottomland Hardwood Forest
SE-5
904 ft
Legend
Downstream Restoration/Enhancement Extent Locations
Upstream Restoration/Enhancement Extent Locations
Potential Ecological Up-Lift Area
Stream
Enhancement Credit / Potential Enhancement Area Width = 30 ft
Restoration Credit
Reference Reach
Development Envelope
Mitigation Wetland Area
Open Water
Marsh
Protected Wetland
Stormwater Detention Basin
Property Boundary
Area I Isolated Wetland
Area II Jurisdictional Wetland
Area II Isolated Area
Area IV Jurisdictional Wetland
Area VI Sediment Basin
Area VII Jurisdictional Wetland
Area IX Jurisdictional Wetland
Wetlands
NOTES:
- SR = Stream Restoration
- SE = Stream Enhancement
0
1,000
2,000
3,000
4,000
Feet

Item Number AE-8 **ER Section 2.4.2**

Request:

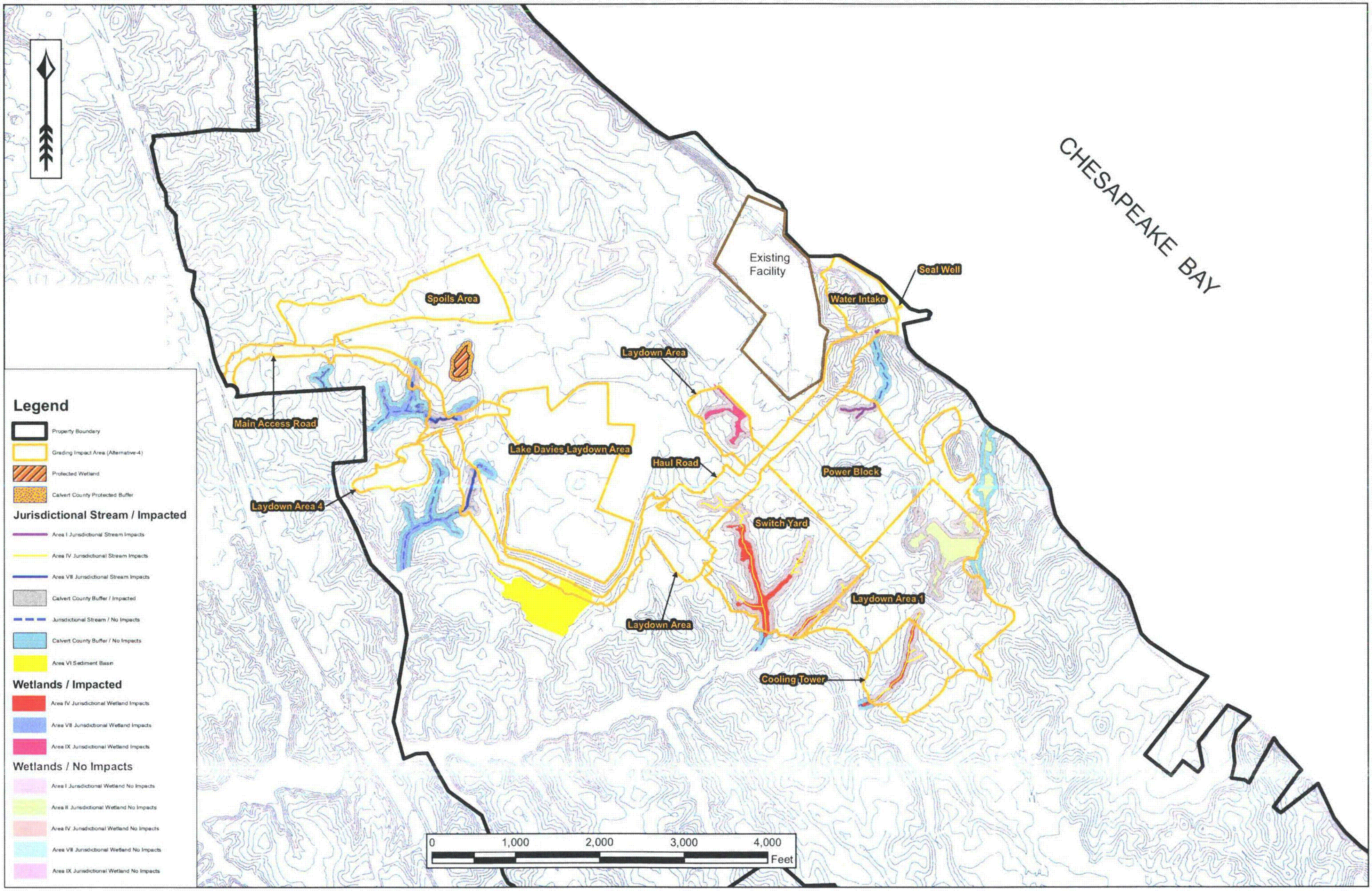
Provide one clear, readable map that shows the complete footprint of the new plant in relation to all of the freshwater bodies that would be impacted.

Response:

A figure showing the complete footprint of the new plant in relation to freshwater bodies that could be impacted is attached.

ER Impact:

The attached figure will be incorporated into the ER in a future ER revision.



CHESAPEAKE BAY
Existing Facility
Seal Well
Water Intake
Spoils Area
Laydown Area
Main Access Road
Lake Davies Laydown Area
Haul Road
Power Block
Laydown Area 4
Switch Yard
Laydown Area 1
Laydown Area
Cooling Tower
0
1,000
2,000
3,000
4,000
Feet
Legend
Property Boundary
Grading Impact Area (Alternative-4)
Protected Wetland
Calvert County Protected Buffer
Jurisdictional Stream / Impacted
Area I Jurisdictional Stream Impacts
Area IV Jurisdictional Stream Impacts
Area VII Jurisdictional Stream Impacts
Calvert County Buffer / Impacted
Jurisdictional Stream / No Impacts
Calvert County Buffer / No Impacts
Area VI Sediment Basin
Wetlands / Impacted
Area IV Jurisdictional Wetland Impacts
Area VII Jurisdictional Wetland Impacts
Area IX Jurisdictional Wetland Impacts
Wetlands / No Impacts
Area I Jurisdictional Wetland No Impacts
Area II Jurisdictional Wetland No Impacts
Area IV Jurisdictional Wetland No Impacts
Area VII Jurisdictional Wetland No Impacts
Area IX Jurisdictional Wetland No Impacts

Item Number AE-9 **ER Section 2.4.2**

Request:

The lower part of Johns Creek is shown as potential flood area (ER Figure 2.3.1-7). How would the stormwater discharge system affect the ecology of downstream Johns Creek and St. Leonard Creek?

Response:

The planned storm water management system is not expected to have any significant impact on the ecology of St. Leonard Creek or the downstream portion of Johns Creek.

The CCNPP Unit 3 Storm Water Management Plan, dated April 2008, details planned soil erosion and sedimentation control measures. Implementation of a sequenced, systematic erosion and sedimentation control plan, which will be approved by the Calvert County Soil Conservation District, will limit the water-quality impacts of the planned construction and plant operation activities to small to negligible.

As described in CCNPP Unit 3 Storm Water Management Plan, a detailed storm water management study will be conducted to determine requisite sizes of the several components of the storm water system to maintain both quality and quantity requirements for the downstream area. This will include analyzing the pre-development and post-development site hydrology for the 1-, 2-, 5-, 10- and 100-year 24-hour rainfall events.

The storm water management system will be sized such that the downstream flow rates, sediment loads and water quality will be similar to the existing conditions and such that the post-development peak discharges will not exceed the pre-development rates. Thus, no significant change in the long- or short-term flow to the receiving streams from the CCNPP Unit 3 power block and the adjoining construction laydown area is expected.

ER Impact:

No changes to the ER are required.

Item Number SE-1 **ER Section 2.5.1**

Request:

Population numbers within 10 and 50 miles are different in Tables 2.5-2 and 2.5-6. Numbers in Table 2.5-6 are consistent with FSAR Tables 2.1.3-1 and 2.1.3-2. Verify numbers in these ER tables.

Response:

A response to this RAI will be provided by August 15, 2008.

ER Impact:

No changes to the ER are required.

Item Number SE-2 **ER Section 2.5.1**

Request:

Clarify how the exponential growth rate for each county was determined, covering the 0-50 miles from the center of the site. Identify the number of years of population data considered in growth rate determination.

Response:

A response to this RAI will be provided by August 15, 2008.

ER Impact:

No changes to the ER are required.

Item Number SE-3 **ER Section 2.5.1**

Request:

Clarify the process used to project populations into the future (2010 through 2060) by decade using the above determined growth rate. Was growth rate by county determined above used to project population into future as exponential basis or linear basis?

Response:

A response to this RAI will be provided by August 15, 2008.

ER Impact:

No changes to the ER are required.

Item Number SE-4 **ER Sections 2.6.2, 10.3**

Request:

Provide Phase 2 Traffic Impact Study when completed.

Response:

A copy of the Phase 2 Traffic Impact Study dated May 22, 2008, is attached to this submittal.

ER Impact:

No changes to the ER are required.

Item Number SE-5 **ER Section 9.3**

Request:

Regarding the Crane alternative site, provide present population, projections, and density determinations. If this exceeds 500 persons/mi^2, provide a justification for considering this site as an alternative and present rationale for selecting this as more advantageous than others considered.

Response:

UniStar is currently in the process of re-evaluating candidate sites for plant siting. A response to this RAI will be provided by August 15, 2008.

ER Impact:

The ER will be updated in a future revision to reflect the results of the candidate site evaluation.

Item Number SE-6 **ER Section 9.3.2**

Request:

On page 9.3-10, the second line in this discussion of CCNPP refers to Baltimore County. Verify that the correct county is Calvert County.

Response:

UniStar is currently in the process of re-evaluating candidate sites for plant siting. A response to this RAI will be provided by August 15, 2008.

ER Impact:

The ER will be updated in a future revision to reflect the results of the candidate site evaluation.

Item Number SE-7 **ER Section 9.3.2**

Request:

The discussions in the Environmental Justice sections (9.3.2.1.9, 9.3.2.2.1.9, 9.3.2.2.2.9, 9.3.2.2.3.9) for Baltimore County, Calvert County, Oswego County, and Wayne County state that "These data demonstrate that the population of this area is similar in composition to the State of Maryland [New York for Ginna and NMP sites] and to the U.S. as a whole." Resolve these statements with the data presented in Tables 9.3-1 through 9.3-4 or revise the tables appropriately.

Response:

UniStar is currently in the process of re-evaluating candidate sites for plant siting. A response to this RAI will be provided by August 15, 2008.

ER Impact:

The ER will be updated in a future revision to reflect the results of the candidate site evaluation.

Item Number CR-1 **ER Sections 2.5.3, 4.1.3, 5.1.3**

Request:

Based on conversations during the site audit 3/17/08 specifically tours of the cultural resources – the proposed area of potential effect (APE) may be altered and expanded due to the change in lay down areas. Describe the expanded APE, the cultural resources within the expanded APE, and the impacts to the cultural resources from construction and operation of the proposed action.

Response:

The proposed Area of Potential Effect (APE) for cultural resources has been expanded to encompass an additional approximately 83 acres. These expanded project localities are situated adjacent to the Old Bay Farm and Camp Conoy sections of the project area and in the Johns Creek and Woodland Branch drainages to the north and south of the initial project APE. Proposed project impacts will include lay down easements, heavy haul road construction, stream enhancement/stream restoration, wetland creation/wetland enhancement, and critical area mitigation.

A Phase IA cultural resources reconnaissance of supplemental project areas was performed, followed by Phase IB shovel testing in portions determined to have a moderate to high archaeological potential (i.e. relatively undisturbed, relatively level to gently sloping, well-drained localities). As part of the Phase 1B shovel testing, 646 shovel test pits were excavated in seven localities of moderate to high archaeological potential (totaling approximately 25 acres), resulting in the identification of two archaeological sites (Sites 15 and 16).

Sites 15 and 16 both represent small, low-density 20th century artifact scatters. Site 15 is located in a field in proposed Lay Down Area #4 (Old Bay Farm Section) in the northwest portion of the project area. Proposed impacts will result from use of the field as a lay down area during project construction. Site 16 is situated adjacent to the Eagle's Den, a circa 1930 structure located in Camp Conoy, overlooking the Chesapeake Bay at the project's eastern edge. Site 16 will be impacted by proposed demolition of the Eagle's Den and tree planting associated with proposed critical area mitigation. Sites 15 and 16 are both recommended as Not Eligible to the National Register of Historic Places and no further investigations of these sites is recommended

ER Impact:

No changes to the ER are required.

Item Number MET-1 ER Sections 2.7, 5.4, 7.1

Request:

Provide the input and output for X/Q calculation codes.

Response:

The X/Q Calculation Code used is the AEOLUS3 Code. Since the NRC does not have the AEOLUS3 computer code, the input file would not be useable or useful for NRC calculational purposes. A table of input for AEOLUS3, the atmospheric dispersion code used by AREVA NP, is provided in response to RAI 33 as an update to ER Section 2.7. The hourly meteorological data used as input to the code are provided in electronic ASCII files as an attachment to this submittal:

File Name	File Description
cc2000.ref	CCNPP 2000 met data in RG 1.23 format
cc2001.ref	CCNPP 2001 met data in RG 1.23 format
cc2002.ref	CCNPP 2002 met data in RG 1.23 format
cc2003.ref	CCNPP 2003 met data in RG 1.23 format
cc2004.ref	CCNPP 2004 met data in RG 1.23 format
cc2005.ref	CCNPP 2005 met data in RG 1.23 format

The output is the X/Q data provided in ER Section 2.7.

ER Impact:

As described in the response to RAI Item Number 33, ER Section 2.7 will be updated to include the AEOLUS3 input table in a future ER revision.

Item Number AC-1 **ER Section 2.7**

Request:

Provide the input and output for the Aeolus code (Areva's X/Q calculation code).

Response:

The X/Q Calculation Code used is the AEOLUS3 Code. Since the NRC does not have the AEOLUS3 computer code, the input file would not be useable or useful for NRC calculational purposes. A table of input for AEOLUS3, the atmospheric dispersion code used by AREVA NP, is provided in response to RAI Item Number 33 as an update to ER Section 2.7. The hourly meteorological data used as input to the code are provided in electronic ASCII files as an attachment to this submittal:

File Name	File Description
cc2000.ref	CCNPP 2000 met data in RG 1.23 format
cc2001.ref	CCNPP 2001 met data in RG 1.23 format
cc2002.ref	CCNPP 2002 met data in RG 1.23 format
cc2003.ref	CCNPP 2003 met data in RG 1.23 format
cc2004.ref	CCNPP 2004 met data in RG 1.23 format
cc2005.ref	CCNPP 2005 met data in RG 1.23 format

The output is the X/Q data provided in ER Section 2.7.

ER Impact:

As described in the response to RAI Item Number 33, ER Section 2.7 will be updated to include the AEOLUS3 input table in a future ER revision.

Item Number AC-2 **ER Section 7.2**

Request:

Please clarify whether distance to nearest residence 2700 ft or 4000 ft.

Response:

The reference to a nearest residence was not found in Section 7.2 of the ER. However, the below listing identifies the locations in the ER where a distance to the closest reference is given:

ER Location	Distance to nearest resident/residence
Section 2.7.6.1	1770 m (5,807 ft) - stack to nearest resident
Table 2.7-101	1770 m (5,807 ft)
Table 2.7-105	1770 m (5,807 ft)
Table 2.7-109	1770 m (5,807 ft)
Table 2.7-113	1770 m (5,807 ft)
Section 3.1	CCNPP Unit 3 will be located 3000-4000 ft (914.4 m to 1,219.2 m) from residential properties
Section 4.4.1.4	Nearest residence is approximately 3000 ft (900 m) from construction site footprint
Table 9.4-2	The plant's location 3000 to 4000 ft (914.4 m to 1,219.2 m) from nearest residential properties

The difference in the distance to the nearest resident is dependent on the originating reference point for the distance.

ER Impact:

No changes to the ER are required.

Item Number AC-3 **ER Section 7.2.1.1**

Request:

For the offsite consequences evaluation, provide descriptions of the scenarios representing the following release categories in the U.S. EPR PR (same as release categories listed in Table 7.2-1): RC101, RC201, RC205, RC206, RC303, RC304, RC404, RC504, RC701, and RC702.

Response:

The different release categories are described in Table 7.2-1. The source term for each release category is calculated based on a representative MAAP run. The output from this representative run provides a representative scenario for the associated release category.

The initiating event chosen to initiate the core damage sequence is a station blackout (LOOP, no diesel) with or without RCP seal LOCA.

The scenarios representing each of the requested release categories, as provided by the MAAP case outputs, are outlined below.

<u>RC 101</u>

The main characteristic of RC 101 is the absence of containment failure.

The case analyzed is a station blackout (LOOP, no diesel) with no injection. Hot leg rupture is assumed to occur at the time predicted by the MAAP code analysis.

The sequence of events timeline is presented in Table 1.

Table 1: Sequence of Events for RC 101

Event	Time (approximate)
Core Uncovery	2 hrs 25 min
Core Melt Onset	3 hrs 25 min
Hot Leg Failure	3 hrs 50 min
Vessel Failure	8 hrs 55 min
Corium enters spreading area	12 hrs 35 min
Containment Failure	No failure

<u>RC 201</u>

The main characteristics of RC201 are:

- core *recovered* in-vessel using safety injection
- containment isolation failure

The case analyzed is a station blackout (LOOP, no diesel) with a seal LOCA (flow rate equivalent to a 0.6 inch diameter break), and no injection prior to core damage. The containment is assumed open at t=0 (no isolation). Hot leg rupture occurs, resulting in RCS depressurization and enabling safety injection.

The sequence of events timeline is presented in Table 2.

Table 2: Sequence of Events for RC 201

Event	Time (approximate)
Containment Failure	0 hr (pre-existing opening)
Core Uncovery	2 hrs 20 min
Core Melt Onset	3 hrs 15 min
Hot Leg Rupture	3 hrs 25 min
LHSI Injection Onset	3 hrs 25 min
Vessel Failure	No vessel failure

RC 205

The main characteristics of RC205 are:

- vessel failure
- successful melt flooding
- no molten core-concrete interaction (MCCI)
- containment isolation failure
- SAHRS spray unavailable

The case analyzed is a station blackout (LOOP, no diesel) with a seal LOCA (flow rate equivalent to a 0.6 inch diameter break), and no injection prior to core damage. The containment is assumed open at t=0 (no isolation).

The sequence of events timeline is presented in Table 3.

Table 3: Sequence of Events for RC 205

Event	Time (approximate)
Containment Failure	0 hr (pre-existing opening)
Core Uncovery	2 hrs 20 min
Core Melt Onset	3 hrs 15 min
Vessel Failure	6 hrs 35 min

RC 206

The main characteristics of RC 206 are the same that RC 205, with the following difference: the pre-existing containment opening is restricted to a 2" diameter line instead of the default "large" opening (modeled as 1 square meter).

The case analyzed is a station blackout (LOOP, no diesel) with a seal LOCA (flow rate equivalent to a 0.6 inch diameter break), and no injection prior to core damage. Hot leg rupture is assumed to occur at the time predicted by phenomenological evaluation.

The sequence of events timeline is presented in Table 4.

Table 4: Sequence of Events for RC 206

Event	Time (approximate)
Containment Failure	0 hr (pre-existing opening), 2" diameter
Core Uncovery	2 hrs 20 min
Core Melt Onset	3 hrs 15 min
Hot Leg Rupture	3 hrs 25 min
Vessel Failure	8 hrs 35 min

RC303

The main characteristics of RC303 are:

- early containment rupture
- successful melt flooding
- no MCCI
- SAHRS spraying successful

Release categories 301 to 304 are not evaluated separately for source term. Instead, the runs used for RC 202 to 205 are used to represent RC 301 to 304. This is possible because the phenomenology that influences the source term is the same in both cases, the only difference is the mechanism of containment breach (isolation failure vs. early rupture). It is conservative to use the RC 200s source term, because the containment is assumed open at t=0, while for RC 300s containment failure would occur early but not necessarily at t=0.

Therefore the sequence of events for RC 303 is similar to RC 204, and is shown in Table 5.

Table 5: Sequence of Events for RC 303

Event	Time (approximate)
Containment Failure	0 hr
Core Uncovery	2 hrs 20 min
SAHRS spray on	3 hrs 10 min
Core Melt Onset	3 hrs 15 min
Vessel Failure	7 hrs 20 min

RC304

The characteristics of RC 304 are the same as RC 303, only without SAHRS sprays. As explained above, the sequence of events is derived from RC 205, and is shown in Table 6.

Table 6: Sequence of Events for RC 304

Event	Time (approximate)
Containment Failure	0 hr
Core Uncovery	2 hrs 20 min
Core Melt Onset	3 hrs 15 min
Vessel Failure	6 hrs 35 min

RC 404

The characteristics of RC 404 are

- containment failure at time of vessel failure
- successful melt flooding
- no MCCI
- no sprays

The case analyzed is a station blackout with no injection. Hot leg rupture is assumed to occur at the time predicted by the MAAP code analysis.

The sequence of events for RC 404 is presented in Table 7.

Table 7: Sequence of Events for RC 404

Event	Time (approximate)
Core Uncovery	2 hrs 25 min
Core Melt Onset	3 hrs 25 min
Hot Leg Failure	3 hrs 50 min
Vessel Failure	8 hrs 45 min
Containment Failure	8 hrs 45 min

RC 504

The main characteristics of RC 504 are

- late containment failure on overpressure (P=170 psia)
- successful melt flooding
- no MCCI
- no sprays

The case analyzed is a station blackout with no injection. Hot leg rupture is assumed to occur at the time predicted by the phenomenological evaluation.

The sequence of events for RC 504 is presented in Table 8.

Table 8: Sequence of Events for RC 504

Event	Time (approximate)
Core Uncovery	2 hrs 25 min
Core Melt Onset	3 hrs 25 min
Hot Leg Failure	3 hrs 50 min
Vessel Failure	8 hrs 55 min
Corium enters spreading area	12 hrs 35 min
Containment Failure	72 hrs on overpressure (170 psia)

RC 701 and 702

The main characteristic of RC 701/702 is

- containment bypassed due to steam generator tube rupture

In RC 701, feedwater is available to the broken SG and therefore releases occur under water (scrubbed release). In RC 702, the broken SG is dry (unscrubbed release).

The source term for RC 702 is evaluated by analyzing the case of a creep induced SGTR following a station blackout with at 2"-equivalent seal LOCA. The source term for RC 701 is evaluated by applying a decontamination factor (DF) to the releases predicted for RC 702, to model the scrubbing of releases. The calculation of the DF is subject to a separate calculation.

The sequence of events for RC 702 (also applies to RC 701) is shown in Table 9.

Table 9: Sequence of Events for RC 701/702

Event	Time (approximate)
Core Uncovery	1 hr 10 min
Broken SG dry (RC 702 only)	1 hr 35 min
Core Melt Onset	3 hrs 10 min
Containment Failure	3 hr 20 min (creep induced SGTR)
Vessel Failure	9 hr 20 min

ER Impact:

No changes to the ER are required.

Item Number AC-4 **ER Section 7.2**
Request:

Supply MAAP input/output files that characterize the RCs (plus calculations or access to calculations) to examine the time sequence of events and timing of key events.

Response:

The release categories (RCs) are characterized by the MAAP cases run to evaluate the U.S. EPR PRA source term. A list of the source term runs for each RC is shown in Table 1. The associated calculation documents are available for review upon request. MAAP input and output files are being provided on a computer disk. The input and output file information is considered AREVA proprietary material and an affidavit has been prepared and executed to withhold these files from disclosure. Since all of the files are considered proprietary, a redacted data file is not available or provided

ER Impact:

No changes to the ER are required.

Table 1. Mapping of MAAP4.0.7 Sequences to Release Categories

Release Category	MAAP Run
RC101	ST1.10#
RC201	ST1.11
RC202	ST1.8c
RC203	ST1.8b
RC204	ST1.8a
RC205	ST1.8
RC206	ST1.8f
RC301	ST1.8c
RC302	ST1.8b
RC303	ST1.8a
RC304	ST1.8
RC401	ST1.10c
Rc402	ST1.10b
RC403	ST1.10c
RC404	ST1.10b
RC501	ST1.10a+
RC502	ST1.10a
RC503	ST1.10+
RC504	ST1.10
RC602	ST1.10a++
RC701	ST2.3##
RC702	ST2.3
RC802	ST3,2a

Notes:

Used ST1.10 to a shorter time than RC504 since there is no containment damage in RC101.

Used ST2.3, but applied a decontamination factor (of 20) to the release fractions; thus the release fractions are the only difference between the MAAP4.0.7 characterization of RC701 and RC702.

+ Used MAAP4.0.7 runs without sprays as a bounding approximation, since there were no MAAP4.0.7 runs available with sprays functional.

++ Used ST1.10a as a surrogate for RC602, since there were no MAAP4.0.7 runs available that modeled basemat melt-through.