RAS 13628

Dominion Exhibit 1-Response to Safety Related Questions

#	Document Page	Document Section	Inquiry	Dominion Response	Author/SME (Note 1)	Title	Organization
			Site Characteristics				
1	SER 1-3	SER Section 1.2	What is the expected high water level of Lake Anna and how does it compare with the lakeside property line elevation of land owned by Lake Anna residents?	Applicant agrees with the NRC staff's response and provides the following additional information: The normal operating water level of Lake Anna on the lake (reservoir) side is 250 feet above mean sea level (ft. MSL). The normal operating water level on the discharge side of the lake [Waste Heat Treatment Facility (WHTF)] is 251.5 ft. MSL, approximately one and one-half feet above the reservoir side. Dominion owns and controls all the land, both above and beneath the water surfaces, that forms Lake Anna and the WHTF. The property line for that land was established by the deeds by which Dominion took ownership of various parcels and in all cases is at or above the high water level of Lake Anna and the WHTF. As stated in those deeds, the water in the reservoir may be raised to a height at the dam not exceeding 255 ft. MSL. This elevation is considered the high water level. The distance between the high water level and the property lines shared by Dominion and adjoining landowners will vary depending on factors such as the location of the property line identified in each deed and the slope of the land abutting the water. References: VEPCO Applicant's Environmental Report, North Anna Power Station Units 1 & 2 Operating License Stage AEC Docket Nos. 50-338 and 50-339, and Units 3 & 4 Construction Permit Stage AEC Docket Nos. 50-404 and 50-405; March 15, 1972; Appendix B.1 - Deed Forms	Tony Banks SME - Jud White	Environmental Lead Environmental Policy Manager	Dominion
2	SER 2-3	SER Section 2.1.1.3	Does the Applicant, Dominion Nuclear North Anna LLC, currently have any right, title, or interest in the proposed ESP site?	With the approval of the Virginia State Corporation Commission (SCC), DNNA has entered into an agreement with Virginia Electric and Power Company (Virginia Power) for access to the North Anna Power Station and site specific information, in order to support DNNA's analysis of whether the site is suitable for additional nuclear generation. DNNA currently has no other right, title or interest in the proposed ESP site.	Marvin Smith	Project Director	Dominion
3	SER 2-4, 2-5, 2-6	SER Section 2.1.2.1	The Applicant appears to have no authority and control over the exclusion area. The Applicant states that it will "purchase or lease the site from Virginia Power and ODEC" and goes on to predict what the terms of the lease will provide. What arrangements or documentation do you have with the current owner of the ESP and NAPS sites that it will agree?	DNNA has not entered into any arrangement with Virginia Power and ODEC and has no documentation that Virginia Power and ODEC will sell or lease the site to DNNA. As explained further in counsel's brief, DNNA cannot enter into such an arrangement with Virginia Power without the SCC's approval, which DNNA expects would be granted if and when the SCC issues a certificate allowing DNNA to construct and operate additional units at North Anna. While Dominion cannot enter into any contract or arrangement with Virginia Power at this time, Dominion has kept both Virginia Power and ODEC informed of its activities, and is confident that both entities are supportive of these activities.	Marvin Smith	Project Director	Dominion
4	SER 2-8	Application Section 2.1.3.1, ACRS March 2005 Transcript	The ACRS has criticized NRC for failing to incorporate changing knowledge into meteorological calculations, such as considering global warming in the projection of severe storms. Is this general criticism not also appropriate for population predictions where an aging population's desire for a rural environment and a desire to be near a lake could be strongly influencing factors that alter population growth?	Applicant agrees with the NRC staff's response.	Dan Patton	Nuc/Mech Engr	Bechtel
5	SER 2-8, Application 2-2-5	Application Section 2.1.3.1	Growth projections 60 years into the future appear primarily based upon year 2000 census numbers and a standard future growth model. It is important to have reasonably accurate numbers for future populations to evaluate population dose calculations and emergency plan evacuation times.				
			A. Given the importance of this information, why were not alternate methods for estimating growth explored? Historical growth could be determined from growth rates in school enrollments, growth rates in automobile registrations, or increases in property registrations. Why has little attention generally been paid to historical growth rates?	Applicant agrees with the NRC staff's response.	Dan Patton	Nuc/Mech Engr	Bechtel
			B. If the proposed modeling method for population growth works, why has the Applicant not demonstrated this by taking census data from around the 1940s and showing that the present population is predicted?	Applicant agrees with the NRC staff's response and provides the following additional information: Lake Anna was created in the 1970's to serve the needs of the power station. Since its creation, the area has become increasingly residential (changing from farmland) as the area is developed and recreational use of the lake has contributed to both permanent and transient population in the area. Growth models which would use data prior to the creation of the lake, or during the early years after its creation, would lead to unsupportable projections of the population growth.	Dan Patton	Nuc/Mech Engr	Bechtel
			C. Given the long period of extrapolation for population growth, shouldn't some effort be made to establish error bars for future growth predictions?	Applicant agrees with the NRC staff's response.	Dan Patton	Nuc/Mech Engr	Bechtel

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SECY-02

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USNRC

May 16, 2007 (4:05pm)

OFFICE OF SECRETARY
RULEMAKINGS AND
ADJUDICATIONS STAFF

U.S. NUCLEAR REGULATORY COMMISSION
In the Matter of Dominion Nuclear North Anna, LLC
Docket No. 52-008-ESP Official Exhibit No. Dominion 1
OFFERED by: (Applicant/Licensee) Intervenor ____
NRC Staff Other ____
IDENTIFIED on 4/24/07 Witness/Panel Safich
Action Taken: (ADMITTED) REJECTED WITHDRAWN
Reporter/Clerk ____

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6		Application Section 2.1.3.4	The growth predictions in this section seem counter-intuitive in that the percentage growth rates decrease with increasing time. The ten-year growth rate averages 3.5%/yr. from 2000 through 2010 but drops to 1.7%/yr. between 2030 and 2040. This trend continues, dropping to about 1.4%/yr. for the period 2040-2065. Has this behavior been exhibited in any past periods? What explanation can be offered for a decreasing future growth rate?	Applicant agrees with the NRC staff's response and provides the following additional information: The observed trend of diminishing rate of growth in certain areas is consistent with the overall societal changes as the US moves away from its agrarian roots. In its press release dated January 22, 2007, the Demographics and Workforce Section of the Weldon Cooper Center for Public Service reported that: "The balance of Virginia's population is pretty much tilting toward metropolitan areas and away from the older central cities and rural areas." Smaller average family size and the tendency for individuals to move from the farm to either high population centers or to residential areas within commuting distance of the centers of business and industry have contributed to changing population growth dynamics. References: Weldon Cooper Center for Public Service, University of Virginia, "State Growth Continues, But At A Slower Pace", January 22, 2007, http://www3.ccps.virginia.edu/demographics/estimates/2006/0-main.html, accessed January 2007	Dan Patton	Nuc/Mech Engr	Bechtel
7	SER 2-17	SER 2.2.3.1	Couldn't the 8,500 gallon gasoline truck or equivalent make delivery closer than 1.5 miles? What about deliveries to the plant?	Applicant agrees with the NRC staff's response and provides the following additional information: The assumption that, given a release, the probability of ignition is "1" is very conservative and may be a factor of 10 higher than the probability used in other comparable studies.	Dan Patton	Nuc/Mech Engr	Bechtel
8	SER 2-14, 2-17	SER Section 2.2.1.1-2.2.3.1	The SER states that there are train tracks 5.5 miles away from the site; a train could create a far larger explosion than a tractor trailer on the interstate. Does the extra half mile beyond the 5-mile radius of interest mean this risk should not be considered at all?	Applicant agrees with the NRC staff's response.	Dan Patton	Nuc/Mech Engr	Bechtel
9	SER 2-19	SER Section 2.2.3.3	The SER states that the Staff "independently reviewed possible hazards posed by the existing NAPS units." Please describe what hazards the Staff reviewed and the results of the Staff's review.	Applicant agrees with the NRC staff's response.	Dan Patton	Nuc/Mech Engr	Bechtel
10	SER 2-26	SER Section 2.3.1.1	The potential for freezing in the UHS water storage facility is apparently measured through the number of degree-days below freezing. Why is this a relevant parameter to establish either rate of freezing or a volume of ice?	Applicant agrees with the NRC staff's response.	Craig Talbot	Senior Hydrologic Eng. Specialist	Bechtel
11	SER 2-27	SER Table 2.3.1-6	Considering flow requirements and the evaporative losses from cooling towers in UHS systems, and the design requirements of providing cooling water for normal operation, anticipated operational occurrences, safe shutdown, cooldown (first 30 days) and long term cooling for periods in excess of 30 days during adverse natural conditions, please explain why this doesn't this rule out the use of wet cooling towers for UHS system. Doesn't this look like a situation for dry cooling or the need to qualify Lake Anna for supplying the necessary water?	Applicant agrees with the NRC staff's response and provides the following additional information: None of the characteristics in NUREG 1835, Table 2.3.1-6 would rule out the use of a wet cooling tower for the UHS system. As stated in NUREG 1835 Section 2.3.1.1 (Page 2-26), a buried water storage basin or other passive water storage facility would provide the required water to the UHS mechanical draft cooling tower to achieve long term (30 days) of cooling. The UHS cooling tower reservoir would be sized based on the maximum expected evaporation for the worst case meteorological conditions defined in SER Table 2.3.1-6 and the UHS waste heat rejection duty. Cooling tower drift (a function of cooling system water flowrate) would also be considered in determining the required storage capacity. Water loss from the UHS reservoir during normal plant operation would be replaced utilizing a makeup water supply to the cooling tower reservoir. This would ensure the required water supply is available for at least 30 days to permit safe shutdown and cooldown in the event of a LOCA or other postulated accident. In accordance with Regulatory Guide 1.27 procedures for ensuring a continued UHS capability after 30 days would be in place. Makeup water from onsite or offsite sources would be considered available at this point in time following an accident. References: Regulatory Guide 1.27, Ultimate Heat Sink for Nuclear Power Plants, Revision 2 (For Comment), U.S. NRC, January 1976	Doug Kemp	Mechanical Engr Group Supervisor	Bechtel

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12		SSER 1 Section A-1, Permit Condition 3.	This permit condition specifies the use of dry cooling during normal operation for a fourth proposed unit. Since the ESP specifies an option of partial evaporative cooling for Unit 3 but only dry cooling for Unit 4, is this Permit Condition really intended for Unit 3? If water flow conditions allow the use of evaporative cooling, why wouldn't this be a preferred mode of operation since plant efficiency is improved?	Applicant agrees with the NRC staff's response and provides the following additional information: As noted in NUREG 1835 Section 2.4.1.1 (page 2-59), in response to RAI 2.4.1-2, the applicant stated that, because of uncertainty concerning the adequacy of makeup water for the proposed Unit 4, it changed the base case for heat dissipation from wet cooling towers to dry cooling towers for that unit.	Doug Kemp	Mechanical Engr Group Supervisor	Bechtel
13	SER 2-27	SER Table 2.3.1-6	Please describe the rationale, criteria, and procedures used in the preparation of Table 2.3.1-6, "Applicant's Proposed Ultimate Heat Sink Meteorological Site Characteristics."	Applicant agrees with the NRC staff's response.	Ping Wan	Senior Environmental Specialist	Bechtel
14	Application 2-2-40	Application Section 2.3.1.3.2	The probability of a tornado strike with rotational wind speeds of 260 mph is cited as only 1 x 10^{-7} but the general probability of a tornado strike is considerably higher: 6 x 10^{-5}. Can these higher probability tornados produce consequential damage at a plant site? Please provide evidence to confirm this response.	Applicant agrees with the NRC staff's response.	Dan Patton	Nuc/Mech Engr	Bechtel
15	SER 2-31	SER Section 2.3.1.3	Data from NSSL on tornado frequencies is quoted in units of "days per year for a tornado threat within 25 miles." This would appear to be a reasonably meaningless parameter. Does a value of .05 mean that there is one chance in 20 per year of a tornado with the reference wind speed being within 25 miles of the plant? If these numbers can be considered to be tornado probabilities, then how do these numbers relate to the much lower tornado frequencies referenced above?	Applicant agrees with the NRC staff's response and provides the following additional information: SER Subsection 2.3.1.3 indicates that the probability of a violent tornado (i.e., F4 or greater, with wind speeds in excess of 207 miles per hour) is less than 0.005 mean number of days per year (or a return period of more than 200 years) based on the statistics as derived by NSSL. Characteristics of tornado events of this magnitude (e.g., wind speed, pressure drop, rate of pressure change) are important in the design basis of structures, systems and components important to safety. The site-specific analysis of tornado strike probability identified in SSAR Subsection 2.3.1.3.2, based on the applicable regulatory guidance, indicates a recurrence interval 16,385 years (or 0.0000594). A separate evaluation of tornado strike probability for the North Anna ESP site, conducted by Pacific Northwest National Laboratories for the NRC Staff, indicated a recurrence interval of 6,250 years (or 0.00016). In both cases, the results are consistent with the NSSL-derived probability for the area that includes the site, albeit the NSSL probabilities are not reported to the same level of precision as the regulatory-based analyses. Reference: National Severe Storms Laboratory, Severe Thunderstorm Climatology, National Oceanic and Atmospheric Administration, http://www.nssl.noaa.gov/hazard/data.html#technical, accessed January 2007.	Mike Mazaika	Senior Environmental Specialist	Bechtel
16	SER 2-34	SER Table 2.3.1-7	What is the effect of including the Staff's proposed regional climatic site characteristics as ESP site characteristics in Appendix A.3? Don't these characteristics simply describe the site climate? What is the effect if the list of climate characteristics is incorrect, or needs to be updated at the time of any COL application? If the COL application occurs 20 years after the ESP is issued, is the intervening 20 years of meteorological data to be ignored?	Applicant agrees with the NRC staff's response.	Ping Wan	Senior Environmental Specialist	Bechtel

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17	SER 2-46, Application 2-2-61	SER Section 2.3.4, Application 2.3.4.2	X/Q values for different accident exposure intervals were calculated by taking a yearly average X/Q and employing a logarithmic interpolation to obtain values for shorter exposure intervals such as 2 hours, 8 hours, 72 hours, etc. See RG 1.111. While this may be a reasonable approach, it does not necessarily represent the highest values of X/Q. Why shouldn't error limits be ascribed to X/Q to confirm that higher values are possible? In lieu of error limits, why not cite probabilities for true values lying below the quoted values?	Applicant agrees with the NRC staff's response and provides the following additional information: Additional Information For licensing and siting of nuclear power plants, Safety Guides 3 and 4 (1970) recommended the use of Pasquill "F" (i.e., moderately stable) stability, a wind speed of 1 meter/sec, and an invariant wind direction to represent atmospheric dispersion conditions for time periods less than 8 hours. This stability and wind speed combination represents an infrequent and conservative atmospheric dispersion situation. The original selection of these atmospheric dispersion conditions was based on examination of available meteorological data from a number of reactor sites representing different topographical and meteorological regimes (i.e., inland, river valley, and coastal). For licensing and siting of nuclear power plants, Safety Guides 3 and 4 (1970) recommended the use of Pasquill "F" (i.e., moderately stable) stability, a wind speed of 1 meter/sec, and an invariant wind direction to represent atmospheric dispersion conditions for time periods less than 8 hours. This stability and wind speed combination represents an infrequent and conservative atmospheric dispersion situation. The original selection of these atmospheric dispersion conditions was based on examination of available meteorological data from a number of reactor sites *representing different topographical and meteorological regimes (i.e., inland, river valley, and coastal).* The examination of that meteorological data indicated that the short-term (0-2 hour) atmospheric dispersion conditions represented by these infrequent conditions were exceeded an average of about 5 percent of the total time on an hourly basis. Subsequently, to acknowledge site-to-site variability in meteorological conditions, NRC selected the "5-percentile criterion" as the probability level of the atmospheric dispersion condition to be considered in a calculation to demonstrate compliance with the dose objectives specified in 10 CFR Part 100. (NUREG/CR-2260) References: NUREG/CR-2260, Technical Basis for Regulatory Guide 1.145,"Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants", USNRC, October 1981.	Ping Wan	Senior Environmental Specialist	Bechtel
18	SER 2-48		Table 2.3.4-1 provides the X/Q values "@ EAB" and "@ LPZ." The former is a specific location - the boundary. The latter is an area - the zone within a 6 mile radius. Please explain whether all LPZ values are the average for the LPZ or are at its outer boundary.	Applicant agrees with the NRC staff's response and provides the following additional information: The LPZ values are calculated at the outer boundary of the Low Population Zone, a 6-mile radius circle centered on the existing Unit 1 containment. According to Regulatory Guide 1.145, the X/Q values "for each significant release point should be calculated at an appropriate exclusion area boundary distance and outer low population zone (LPZ) boundary distance". The accident doses are then calculated using these X/Q values and compared to the regulatory limit which is specified in 10 CFR 50.34. The regulation is explicit that the limit of 25 rem TEDE applies to an individual located at any point on the outer boundary of the low population zone.	Dan Patton	Nuc/Mech Engr	Bechtel
19	Application 2-2-45	Application 2.3.1.3.6	The frequency of lightning strikes at the plant site appears to have been obtained by determining the annual lightning strikes over a larger area and scaling these numbers to a site area of 0.068 square miles. Isn't this overly simplistic? Doesn't lightning occur between points of appropriate electrical potential which can be influenced by building height and conductivity to ground?	Applicant agrees with the NRC staff's response and provides the following additional information: The lightning protection industry recognizes that it is nearly impossible to predict how often lightning strikes to electrical power systems, structures, etc. will occur, as does the nuclear power industry (e.g., IAEA 2003). From a climatological standpoint, typical practice has been to characterize the potential for lightning strikes in an area based on isokeraunic maps which relate the occurrence of such events to thunderstorm-days. This approach was followed in preparing SSAR Subsection 2.3.1.3.6. NUREG/CR-6866 (NRC 2006) supports that basic approach by concluding that "[t]here is a direct correlation between regional lightning strike density and number of events experienced by a nuclear plant". That document goes on to state that the data from the "short period" analyzed in the study of lightning-related events at nuclear power plants (i.e., incorporating the results of an earlier study that covered the period 1980-1991 and supplementing that information by evaluating events from 1992-2003) suggest that the number of lightning-related events is fairly constant. More recent lightning detection measurements of cloud-to-ground strikes, as part of the U.S. National Lightning Detection Network, have been summarized for the National Weather Service (NWS 2002). The flash density map (NWS 2002) reflects cloud-to-ground lightning strikes over open areas as well as locations that may be more susceptible because of structural height, size, or equipment characteristics. For the area that includes the North Anna ESP site, a flash density of 2 to 4 flashes per square kilometer per year is indicated. The upper limit of this range corresponds to about 10 lightning strikes per square mile, which is essentially equivalent to the flash density reported in SSAR Subsection 2.3.1.3.6 (i.e., 11.2 lightning strikes to earth per square mile per year), although it is understood that for any given year the frequency of occurrence may be higher or lower.	Mike Mazaika	Senior Environmental Specialist	Bechtel

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				Therefore, "scaling" the potential frequency of lightning strikes to a smaller area, such as the reactor area, is a reasonable approach in that the reported rate (i.e., 0.76 lightning strike per year at the reactor area) is likewise essentially equivalent to the rates reported for the larger unit areas (i.e., either per square mile or per square kilometer). References: International Atomic Energy Agency, Safety Guide No. NS-G-3.4, Meteorological Events in Site Evaluation for Nuclear Power Plants, IAEA Safety Standards Series, pp. 24-25, Vienna, Austria, May 2003. NUREG/CR-6866, Technical Basis for Regulatory Guidance on Lightning Protection in Nuclear Power Plants, ORNL/TM-2001/140, prepared by Oak Ridge National Laboratory for U.S. Nuclear Regulatory Commission, Division of Engineering Technology, Office of Nuclear Regulatory Research, January 2006. National Weather Service, 5-Year Flash Density Map – U.S. (1996-2000), NOAA, NWS, Office of Climate, Water, and Weather Services, provided by Vaisala-GAI (formerly Global Atmospherics), Tucson, Arizona, February 2002.			
20	Application 2-2-61	Application 2.3.4.2	Measured wind directions and velocities were combined to generate X/Q values at specific locations. The bounding case was apparently a wind direction and velocity with a probability of greater than 0.5% and the highest calculated X/Q. Since the bounding case does not reflect the highest value of X/Q that is possible for a given site, shouldn't the calculated X/Q values in the Application and the SER carry error limits that better reflect the true values that are possible?	Applicant agrees with the NRC staff's response.	Yi Lin	Senior Environmental Specialist	Bechtel
21	Application 2-2-61	Application 2.3.4.3	Bounding X/Q values for different release intervals were apparently obtained by calculating yearly average X/Q values and using a logarithmic extrapolation to obtain values for shorter release times. As cited above, this approach may be reasonable but it does not represent the highest possible X/Q values for a given accident exposure duration. The scientific community deals with this type of problem by including error limits for calculated values when higher values are possible. Why shouldn't this also be done in a regulatory environment?	Applicant agrees with the NRC staff's response.	Yi Lin	Senior Environmental Specialist	Bechtel
22	SER 2-51	SER Section 1.2.5	Why is it acceptable to exclude the known, normal releases from Units 1 and 2 from a calculation of population doses during normal operation? An answer that simply says this is consistent with regulatory policy is not regarded as acceptable.	Applicant agrees with the NRC staff's response and provides the following additional information: In demonstrating compliance with the 40 CFR Part 190 limits on doses to any member of the public, Application ER Table 5.4-11 and SER Section 11.1.3 consider the combined doses from both the existing and new units. Application ER Table 5.4-12 shows the 50-mile population doses from the normal operation of the proposed units. The purpose of this table is to demonstrate that the dose due to the operation of the new units (28 person-rem per year from each unit) is insignificant compared to the background radiation dose received by the same population (9.2×10^5 person-rem per year). Table 11B-8 of the UFSAR for the existing units indicates that the total dose from Units 1 and 2 is 12.7 person-rem per year. Even if the doses from all four units are added together, the total would remain insignificant compared to the background radiation. References: North Anna Power Station Updated Final Safety Analysis Report, Revision 38.	Sharad Jha	Principal Nuclear Engr	Bechtel

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23	Application 2-2-59	Application 2.3.4.1	Why is there no discussion of the effect of possible inversions that could trap radioactive materials near the ground and increase X/Q values?	Applicant agrees with the NRC staff's response and provides the following additional information: In general, there are two types of inversions; (i) surface or radiation inversion which is usually found in open country at night with light winds and clear skies, and (ii) elevated inversion that occurs when the ambient temperature decreases with height and then is capped by an inversion layer. Such inversions may be caused by subsidence of air mass aloft, sea breeze and meteorological frontal. Restrictive dilution conditions are discussed in Subsection 2.3.1.3.7 of the ESP Application. The annual frequency of occurrence of low-level inversions or isothermal layers based at or below 500-foot elevation in the site region as reported in the Application is approximately 30 percent according to Hosler (Hosler, 1961). The SSAR presents atmospheric stability data based on delta-temperature measurements between 159-ft and 33-ft levels on the onsite meteorological tower. Slightly stable (Pasquill type "E"), moderately stable (Pasquill type "F") and extremely stable (Pasquill type "G") conditions occur about 26, 8 and 5 percent of the time, respectively. Although the effects of inversions were not addressed explicitly in Subsection 2.3.4 of the Application, the X/Q values calculated for the North Anna by the Applicant did take the effect of possible inversions into consideration. A brief discussion regarding how the effects of inversions were evaluated by the Applicant and the rationale for the Staff acceptance of the modeling results is provided as follows: • In the X/Q calculations for offsite dose evaluations, all the radiological releases are conservatively modeled as ground-level releases. This treatment is based on the assumption that these releases are released in or around the building complex and they can be caught and brought to ground by the building aerodynamic effects. • Comparatively, the calculated X/Q value for a ground level release under a surface inversion is higher (and results in a higher dose) than that which would be calculated under an elevated inversion. • Although the North Anna ESP site is adjacent to Lake Anna, it is not a coastal site or near a large body of water (e.g., oceans or Great Lakes). The lake breeze effects are expected to be insignificant. • Since there are no elevated releases postulated, no stack fumigation X/Q calculations at the EAB due to inversion breakup are required (R.G. 1.145). • The meteorological conditions, including the ground-based surface inversions, have been measured continuously by the onsite meteorological tower. These measured data (i.e., wind speed, wind direction and temperature difference between the upper- and lower-level of the tower for stability class determination) are input directly into the dispersion models for X/Q calculations. Thus, the meteorological data used (i.e., delta temperature measurements on the tower) and the modeling assumptions (ground level release) ensure that the effects of surface inversions are appropriately reflected in the calculation results. References: • Hosler, C.R., Low-Level Inversion Frequency in the Contiguous United States, Monthly Weather Review, Vol. 89, No. 9, 1961, pp. 319-332. • Regulatory Guide 1.145, Revision 1, November 1982.	Ping Wan	Senior Environmental Specialist	Bechtel
24	SER 2-52	SER Section 2.3.5.1	Please provide a regulatory or other authoritative definition of the following terms: "undepleted no decay," "undepleted/2.26 decay," and "depleted/8:00 decay."	Applicant agrees with the NRC staff's response.	Yi Lin	Senior Environmental Specialist	Bechtel
25	SSER A-18	SSER Appendix A	Why is the D/Q for the nearest vegetable garden on A-18 of the SEP Supplement 6×10^{-9} while the comparable value in Table 1-1 on 1-2 of the Draft EIS appears to be a factor of ten different at 6×10^{-8}?	Applicant agrees with the NRC staff's response.	Dan Patton	Nuc/Mech Engr	Bechtel
26	SER 2-53	SER Table 2.3.5-1	The Applicant states that no milk exposure pathway for isotope ingestion was considered because no cows or goats used for milk consumption were found adjacent to the plant. Given that milk is a high exposure transport path for some isotopes and the fact that the Applicant is trying to look ahead for a period of up to 60 years, shouldn't this exposure pathway be evaluated?	Applicant agrees with the NRC staff's response.	Sharad Jha	Principal Nuclear Engr	Bechtel

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27	SER 2-55		Legal Question: The SER states that any COL or CP applicant referencing the SER dispersion calculations for routine releases "should verify that the specific release point characteristics, specific locations of receptors of interest used to generate the ESP routine release atmospheric dispersion site characteristics bound the actual values provided at the COL or CP stage" and makes this COL Action Item 2.3-3. The SER also states that this will be a site characteristic in any ESP. What happens if, at the COL stage, the release point characteristics or locations of receptors are not as specified in the ESP? Would a contention at the COL stage, alleging that the actual values are different from those used at the ESP stage, be admissible?				
28	SER 2-56	SER Table 2.3.5-2 and Application Table 2.7-14 thru 20	These tables give X/Q and D/Q values for normal and accident conditions for different locations. The table of isotopes upon which these calculations appear to be based contain fission products only. Why weren't Co-58, Co-60, Mn-54 and the other activation products that exist outside the reactor fuel included in these calculations?	Applicant agrees with the NRC staff response and provides the following additional information: SER Table 2.3.5-2 and Application ER Tables 2.7-14 through 2.7-20 present X/Q and D/Q values for routine releases. These dispersion values are calculated independent of isotopes released and are then applied to isotopic activities released in gaseous effluents to estimate the doses at various locations.	Sharad Jha	Principal Nuclear Engr	Bechtel
29	SER 2-56	SER Table 2.3.5-2 and Application Table 2.7-14 thru 20	Tritium is an isotope that is both produced external to the fuel and capable of diffusing through the fuel cladding. Test wells at nuclear plants can show relatively high concentrations of tritium. Why is there no mention of this isotope in either the environmental or dose sections of the SER or Application?	Applicant agrees with the NRC staff's response.	Sharad Jha	Principal Nuclear Engr	Bechtel
30	SER 2-56	SER Table 2.3.5-2	The section on seismic impacts in the Application and SER presents detailed information on calculations, tests, and measurements—even to the extent of including field notes in the Application. In contrast, almost no information is given relative to the assumptions used for calculation of X/Q or dose. For the case of "normal" plant releases: A. What percentage of failed fuel was assumed for the reactor core? B. What coolant leakage through the steam generator was assumed for PWRs and what condenser leakage for BWRs? C. What leakage rates were assumed for pumps and seals? D. What concentrations of activation products were assumed? E. What release rates were assumed from the waste processing facilities at the plant?	Applicant agrees with the NRC staff response and provides the following additional information: SER Table 2.3.5-2 and Application ER Tables 2.7-14 through 2.7-20 present X/Q and D/Q values for routine releases. These dispersion values are calculated independent of the parameters listed in question parts A to E. The methodologies used to calculate X/Q and D/Q values are detailed in Application SSAR Section 2.3. As indicated in Application ER Section 5.4, gaseous effluent doses are calculated using the GASPAR II computer program. The input parameters used in GASPAR II are listed in Application ER Tables 5.4-3, 5.4-4, and 5.4-5. Application ER Table 5.4-7 shows the activities that are released from the plant, based on a PPE approach. As indicated in Application ER Section 5.4.2.2, the activity releases for the new units in the PPE are bounding, composite values obtained by taking the maximum activity for each isotope from multiple reactor designs (AP1000, ABWR, ESBWR, and ACR-700, which are expected to bound the activity releases from the other reactor designs used to establish the PPE). The activity releases from the existing units are obtained from the UFSAR for Units 1 and 2 and added to those from the new units. The details of how the activity releases were calculated (failed fuel fraction, leakage rates, etc.) are not presented in the Application because the activity release values are obtained from reactor designs that are either certified or in the process of being certified. In any COL application referencing this ESP, the applicant will be required to demonstrate that the PPE values, including the postulated activity releases, bound those established for the selected reactor design. References: NUREG/CR-4653, GASPAR II – Technical Reference and User Guide, Prepared for the U. S. Nuclear Regulatory Commission by Pacific Northwest Laboratory, March 1987. AP1000 Document No. APP-GW-GL-700, AP1000 Design Control Document, Tier 2 Material, Westinghouse, Revision 2, 2002. Document 23A6100, ABWR Standard Safety Analysis Report, General Electric, Revision 8. Document 26A6642, ESBWR Design Control Document, Tier 2 Material, General Electric, Revision 1.	Sharad Jha	Principal Nuclear Engr	Bechtel

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31	SER 2-56	SER Table 2.3.5-2	If the Applicant chooses a reactor type different from the AP1000 or ABWR reference designs, will they be held to the X/Q values presented in the Application or will they be allowed to present new values?	Applicant agrees with the NRC staff's response and provides the following additional information: The site-specific X/Q values presented in the ESP Application for offsite doses were conservatively calculated using a minimum distance from the power block envelope to the dose receptor location (EAB and LPZ boundary for accident doses or other sensitive receptors for normal doses). The Applicant has indicated that any point of release of radioactive material, whether a normal release or a release due to an accident, would be within that power block envelope. At the time of the COL, when the specific reactor technology has been selected, the Applicant will confirm that all possible release points remain within that original power block envelope and that the site-specific X/Q values calculated for the ESP therefore remain valid. In the ESP Application, the Applicant calculated site-specific doses for the design basis accidents for the AP1000, the ABWR, and the ESBWR. The design basis accidents for these three types of plants were selected as surrogates for any technology which might subsequently be selected. The site-specific doses for the AP1000 and the ABWR were calculated by multiplying the doses from the design certification documentation for the specific type of plant by the ratio of the site-specific X/Q values to the reactor-specific (i.e. value used for design certification) X/Q values. Site-specific doses for the ESBWR were calculated based on activity releases from the design certification document and site-specific X/Q values. At the time of the COL, the Applicant will demonstrate that this treatment remains bounding (and if it is not, the Applicant would be required to present new dose calculations to show that the doses remain within regulatory limits).	Dan Patton	Nuc/Mech Engr	Bechtel

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32	SER 2-59	SER Section 2.4.1.1	The non-safety related cooling water need for all four units is 121 cubic feet per second. Wouldn't this value vary significantly with time of year?	Applicant agrees with the NRC staff's response with the following additional information: The 121 cubic feet per second flow rate was the estimated non-safety related cooling water need on a time-averaged basis for all four units, prior to changing the proposed cooling system for Unit 3 from once through to cooling towers. The time-averaged value was estimated using meteorological and hydrological conditions representative of those at the site from October 1978 to April 2003. In Revision 9 of the SSAR, the applicant changed the proposed design of the circulating water cooling system for Unit 3 from a once-through cooling system to a closed-cycle, dry and wet hybrid cooling tower system (see Supplemental Safety Evaluation Report (SSER) 2.4.1.1). The estimated time-averaged non-safety related cooling water need for all four units was reduced from 121 cubic feet per second to 112.4 cubic feet per second, as shown in Table 5.2.1 of Revision 9 of applicant's Environment Report. The expected water need at any particular point in time would fluctuate about this average value. The time-averaged value was used to assess the water budget from a long-term perspective. SSER 2.4.1.3 documented a shorter term water budget analysis performed specifically for the critical drought period of 2001-2002 using more conservative values to estimate the minimum water level in Lake Anna.	Kit Ng	Assistant Chief, G&HES	Bechtel
33	SER 2-60	SER Section 2.4.1.1	The SER states that "However, if the dry cooling tower system contains a secondary cooling water loop..." The above sentence seems to imply a make-up water need for the dry cooling tower on Unit 4. Do dry cooling towers require any make up water?	Applicant agrees with the NRC staff's response.	Kit Ng	Assistant Chief, G&HES	Bechtel
34	SSER 2-6	SSER Section 2.4.1.3	A natural evaporation rate from the lake was assumed to be 5.6 in./mo. Wouldn't this value vary significantly with season? Why is 5.6 the selected value?	Applicant agrees with the NRC staff's response.	Kit Ng	Assistant Chief, G&HES	Bechtel
35	SSER 2-6	SER Section 2.4.1.3	The Staff estimates that lake level would drop only 2 feet in 49 days which reflects a balance between evaporative loss and new flow into the lake (not given for the calculation). Wouldn't this conclusion be strongly dependent on the time of year since water influx can vary significantly?	Applicant agrees with the NRC staff's response.	Kit Ng	Assistant Chief, G&HES	Bechtel
36	SSER 2-6	SER Section 2.4.1.3	There does not appear to be any discussion of water leakage from the UHS into groundwater. It would seem possible that this could be a route for some transfer of radioactivity into the environment. (For example, tritium in BWR coolant transferring to the UHS through condenser leakage). Should this release path be considered in the SER?	Applicant agrees with the NRC staff's response.	Stewart Taylor	Manager, G&HES	Bechtel
37	SER 2-71	SER Table 2.4.2-1	Please explain exactly what the entry of the value 18.3 under PMP depth (in.) means?	Applicant agrees with the NRC staff's response.	Craig Talbot	Senior Hydrologic Eng. Specialist	Bechtel

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38	SER 2-77 & 2-78	SER Tables 2.4.3-1	These tables list the PMP values for various size watersheds including North Anna for durations of 6 hour increments. Can the value of 18.2 (no units identified) in Table 2.4.3-2 be interpreted as 18.2 inches water depth accumulation in Lake Anna during the first 6 hours of the storm (an average rate of slightly over 3 inches per hour)? If not, what does it signify?	The applicant agrees with the NRC staff's response and provides the following additional information: For the purposes of the runoff analysis, the 72-hour precipitation depth was distributed as shown in Table 2.4.3-3. From this table, the maximum 6-hour precipitation depth of 18.2 inches occurs during the 7th 6-hour time increment during the 72-hour PMP storm.	Craig Talbot	Senior Hydrologic Eng. Specialist	Bechtel
39	SER 2-74	SER Section 2.4.3.1	Applicant investigated the historical storms used in a 1976 study and three additional storms that occurred in February 1979, March 1996, and June 1995. The additional storms were selected because they produced high water levels in Lake Anna. What were the high water levels in Lake Anna as a result of those storms?	The three storms reported in the FSER occurred in February 1979, March 1994 (1996 is a typographical error), and June 1995. The peak Lake Anna water level for each of these storms was measured at North Anna Dam. The water levels are indicated below: Date Peak Water Elevation (ft, msl) Feb. 26, 1979 252.0 Mar. 28, 1994 251.6 Jun. 27, 1995 252.0	Craig Talbot	Senior Hydrologic Eng. Specialist	Bechtel
40	SER 2-81	SER Figures 2.4.3-2, 2.4.3-3	Comment- The Figures appear to be reversed.	Applicant agrees with the NRC staff's response.	Craig Talbot	Senior Hydrologic Eng. Specialist	Bechtel
41	SER 2-85	SER Section 2.4.1.1	The last paragraph in this section states that the Applicant told the Staff that the UHS would consist of a mechanical draft cooling tower over an underground basin **if the selected plant design includes a UHS** (emphasis added). Is the UHS not confirmed for any of the steam generation plants? Under what conditions would a proposed plant need a UHS?	Applicant agrees with the NRC staff's response and provides the following additional information: Any plant (technology) requiring an independent external ultimate heat sink for removing waste heat from the reactor and/or containment in the event of a postulated accident would need a separate UHS system. For passive design plants, no independent UHS is required, as the plant rejects heat directly to the atmosphere.	Doug Kemp	Mechanical Engr Group Supervisor	Bechtel
42	SER 2-89	SER Section 2.4.5.1	Applicant concluded that given the short fetch length, surges and waves produced from winds or oscillatory waves alone would not produce water heights greater than the still water level resulting from the PMF. Water heights produced by PMFs are considerable and in any event, wouldn't the surges and waves produced by wind action be additive to the flood-caused high water level?	Applicant agrees with the NRC staff's response and provides the following additional information: In accordance with ANSI 2.8-1992, surges and waves produced in association with a probable maximum windstorm are added to 100-year stillwater levels. Wave heights produced from more frequent wind storm events are combined with PMF stillwater levels as discussed in FSER Section 2.4.3.	Craig Talbot	Senior Hydrologic Eng. Specialist	Bechtel
43	SER 2-115	SER Section 2.4.10.3	The Staff estimated local, intense precipitation for the ESP site be 18.3 inches/hr based on Table 2.4.2-1. This seems high. What is the basis for this number?	Applicant agrees with the NRC staff's response.	Craig Talbot	Senior Hydrologic Eng. Specialist	Bechtel
44	SER 2-138	Table 2.4.14-1	Staff's values for local intense precipitation are shown as 18.3 in./hr and 6.1 in. in 5 minutes. Please identify the source of these data.	Applicant agrees with the NRC staff's response.	Craig Talbot	Senior Hydrologic Eng. Specialist	Bechtel
45	SER 2-117	SER Section 2.4.11.1	Staff mentions that the existing units and the proposed units have different lake water levels for shutdown. Hasn't Applicant modified the intake of the existing units to provide for a 242' MSL threshold elevation for shutdown (the same elevation as proposed for the new units)?	Applicant agrees with the NRC Staff's response.	John Waddill	Mechanical Engr	Dominion

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46	SER 2-121	SER Section 2.4.11.3	Staff reports that since the Applicant's minimum water surface elevation site characteristic is lower than the Staff's estimate, the Applicant's value is acceptable. Does this mean that if Applicant had proposed a level below 242', the staff would have accepted that? What criteria did the Staff use in arriving at its decision? Was there any consideration of Lake Anna dockowners?	Applicant agrees with the NRC staff's response.	Kit Ng	Assistant Chief, G&HES	Bechtel
47	SER 2-129	SER Section 2.4.13.1	The SER states that the Applicant provided a conceptual hydrological model of the subsurface environment and pathways for releases of liquid effluent to ground and surface waters from the ESP site. Please provide it.	Applicant agrees with the NRC staff's response.	Stewart Taylor	Manager, G&HES	Bechtel
48	SER 2-130, SER 2-59, SER 2.136	SER Section 2.4.13.1	The SER states that "no site-specific data are available to *determine the chemical characteristics of ground water* at the ESP site. The applicant assumed that the water quality of the crystalline aquifers in the Piedmont Physiographic Province is representative of the water quality at the ESP site." Given that the NAPS industrial facility has been situated on this site for several decades, the assumption that its groundwater is as pure as background seems inappropriate. Please provide the any data on the chemical or radiological characteristics of the soil, vadose zone, and groundwater (not just the aquifer) on and below the ESP site and portions of the NAPS site in the vicinity (within 600' of the boundary) of the ESP site.	Applicant agrees with the NRC staff's response with the following clarification and additional information: There are chemical and radiological groundwater analysis data that have been collected throughout the operation of existing North Anna Units 1&2 and from recent core boring activities in support of the development of a COL application. With respect to the wells within the area described in the Board's question, the following data are being provided: In accordance with Station Administrative Procedure VPAP-2103N, Offsite Dose Calculation Manual (North Anna), Dominion has performed Radiological Environmental Monitoring of water supply well designated 01A. This well is located at the Metrology (formerly Biology) Laboratory, about 0.64 miles southeast of Unit 1 (Figure 1). Results of this radiological monitoring from 2004 through 2006 are provided in Attachment 1. Dominion has also analyzed water samples from two monitoring wells (WP-1 and WP-4) at the ISFSI for radiological constituents. The locations of these wells are shown on Figure 1. Results on these samples from 2005 are provided in Attachment 2. Results provided in Attachments 1 and 2 are characteristic of historical sampling results for the North Anna site and show that there are no elevated radionuclide concentrations indicating site-related contamination of the groundwater. Dominion has had chemical water quality analyses performed for the Virginia Department of Health (VDH), Office of Drinking Water, on samples collected from two onsite water supply wells designated WSW #4 (new) and WSW #6 (Figure 1). Results of this testing in 2004 are provided in Attachment 3. The VDH reports that these results comply "with all current chemical standards for those parameters tested" with the exception of high iron and manganese, and that "the results indicate compliance with all primary maximum contamination levels." Water from a new water supply well installed at the North Anna Security Training facility was tested in 2006 (Figure 1). Results of this testing are provided in Attachment 4. As part of the COL subsurface investigation program completed in 2006 at the North Anna site, groundwater samples were collected from newly installed observation wells (Figure 1). The results of limited chemical analyses performed on these samples are provided in Attachment 5. These results generally fall within the expected ranges of values for groundwater in crystalline rocks in the Piedmont province as reported in Table 2.3-14 in the North Anna ESP Application ER. Attachments 1 through 5 and Figure 1 are hereby incorporated by reference into this response and exhibit.	Tony Banks Steve Tipsword Carter Cooke SME-Tony Banks Loran Matthews	Environmental Lead Health Physicist-North Anna Sr. Env Compliance Coordinator-North Anna Environmental Lead Geologist	Dominion Dominion Dominion Dominion Bechtel

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49	SER 2-132	SER Section 2.4.13.3	Applicant reported that the only observation of piezometric head difference made between the saprolite and the bedrock indicates an upward hydraulic gradient. Please explain what this is and the conditions necessary for it to occur.	Applicant concurs that "an upward hydraulic gradient means that the piezometric head at the bedrock is higher than than of the upper saprolite layer" and provides the following additional information: Groundwater flow is generally three-dimensional. Groundwater flow velocities in the horizontal are determined by the horizontal hydraulic gradient and horizontal hydraulic conductivity, while those in the vertical are determined by the vertical hydraulic gradient and vertical hydraulic conductivity. The vertical hydraulic gradient is calculated by dividing the piezometric head difference (Δh) between a well pair by the vertical distance between the mid-point of the two well screens (Δz). At the North Anna ESP site, observation wells OW-845 and OW-846 were installed as a well pair. OW-845 was installed in bedrock and OW-846 was installed in the saprolite. Water level measurement taken in these wells indicate that the piezometric head in bedrock well OW-845 is 0.1 to 0.3 ft higher than the piezometric head in saprolite well OW-846, with the corresponding vertical hydraulic gradient ranging from 0.005 to 0.015 ft/ft. These data indicate an upward component of groundwater flow from the bedrock to the saprolite. Vertically-upward groundwater flow components are normally expected in the vicinity of surface water features that are sustained by groundwater discharge (e.g., in and around a lake or river). The occurrence of an upward hydraulic gradient at the ESP site is consistent with the site being adjacent to Lake Anna. This topic is discussed in more detail in Dominion's response to DSER Open Item 2.4-9 (Reference 1). References: 1. March 3, 2005 Letter from Eugene S. Grecheck, Vice President-Nuclear Support Services, Dominion, to U.S. Nuclear Regulatory Commission, Document Control Desk, "Dominion Nuclear North Anna, LLC, North Anna Early Site Permit Application, Response to Draft Safety Evaluation Report Open Items," Response to DSER Open Item 2.4-9, pages 45-47.	Stewart Taylor	Manager, G&HES	Bechtel

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50	SER 2-136	SER Section 2.4.13.3	The SER states that "The staff concludes that, because of incomplete knowledge of the subsurface hydrological and chemical properties and the likely composition of the radwaste effluent itself, significant uncertainty exists in the characteristics of radionuclide migration in the subsurface at the ESP site at the time of ESP review. The staff has determined that after the reactor design is selected and additional details related to radwaste tank design and the location within the proposed site are known, appropriate subsurface hydrological characterization can be completed." The Board has several questions relating to this passage, as follows:				
			A. What prevents the Applicant and Staff from developing more sufficient knowledge [data] on the "subsurface hydrological and chemical properties" at this time? Isn't this an appropriate part of the ESP assessment?	Applicant agrees with the NRC staff's response and provides the following additional information: Because the design of the plant is not yet known, the specific locations of accidental release points are not available. Without this information, it is not possible to delineate the possible subsurface pathways at the site or to evaluate these pathways to determine the most critical event. Also, the volumes and radionuclide inventories of any above- or below-ground tanks that might be associated with the various reactor designs are not available. Without knowing which radionuclides might be present in a radwaste system, it is not possible to characterize their chemical properties.	Stewart Taylor	Manager, G&HES	Bechtel
			B. What prevents the Applicant and Staff from developing a plant parameter envelope for the "likely composition of the radwaste effluent?" PPE assumptions were made for other liquid effluent releases, thus please explain why it was not done here.	Applicant agrees with the NRC staff's response.	Stewart Taylor	Manager, G&HES	Bechtel
			C. Absent a baseline delineating the existing chemical and radiological contamination on the site, what measures will be taken to distinguish between any existing contamination from Virginia Power's Units 1 and 2 and Dominion's proposed Units 3 and 4?	For impacts to members of the public and the environment from normal gaseous and liquid effluents, multi-unit plants typically have separate radioactive waste storage tanks and systems, components, and discharge points in order to control, monitor and document the type and amount of radioactive effluents discharged into the environment from each reactor unit. The standard NRC Technical Specifications for normal radiological gaseous and liquid effluents have controls that are on a unit specific basis. Further, 10 C.F.R. § 20.1302 requires each licensee to conduct surveys of radiation and radioactivity in effluent releases both in unrestricted (offsite) and controlled (onsite) areas. Thus, it is expected that the applicant will provide a sufficient level of detail at the COL stage to allow the Staff to evaluate the radiological impact of normal operation of a new unit as distinct from that of any existing operating unit.	Stewart Taylor Tony Banks	Manager, G&HES Environmental Lead	Bechtel Dominion
			D. Legal Question: Absent the foregoing information, should an ESP be granted? How does this comport with the Commission's statement that "where adequate information is not available, early site permits will not be issued?" 54 Fed. Reg. 15372, 15378 (April 18, 1989).				
51	SER 2-136	SER Section 2.4.13.3	The Staff proposed permit condition 4 would require the permit holder to "design any new unit's radwaste systems with such features to preclude any and all accidental releases of radionuclides into any potential liquid pathway." Isn't this impossible? Please explain how you would interpret and implement such a requirement?	Applicant agrees with the NRC staff's response.	Stewart Taylor	Manager, G&HES	Bechtel
52	SER 2-146, SER 2-166	SER Section 2.5.1.1.1, 2.5.1.3.2	Please provide a regulatory or other authoritative definition of "capable tectonic source."	Applicant agrees with the NRC staff's response.	Scott Lindvall	Principal Geologist	WLA

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53	SER 2-148 to 2-161	SER Section 2.5.1.1.1	The Applicant and Staff reject a number of geological hypotheses, including Weem's tectonic origin for the seven local fault lines (2-148, 2-164) and Marple and Talwani's research regarding the existence of central and northern segments of the East Coast Fault System (2-161). What are the consequences to the safety of the plant if any or all of these rejected hyptheses are correct?	The preponderance of data do not support, and in fact contradict, the hypotheses presented by Weems for a tectonic origin of seven fall [not fault] lines and Marple and Talwani for the central and northern segments of the East Coast Fault System (ECFS). With respect to Weems, the applicant presented a detailed analysis of geologic and geomorphic data to support its conclusion that the fall lines are not tectonic features. The staff concluded that the applicant has accurately characterized the seven fall lines of Weems as nontectonic features and notes that the evidence for the fall lines as Quaternary tectonic features are based solely on the work of Weems in a non-peer reviewed publication and that no other geologists in the region have made this inference. A more detailed description of this evaluation is presented in section 2.5.1.3.1 of the SER, at pages 2-163 to 2-165, and in Dominion's response to RAI 2.5.1-3. If, however, the hypothesis of Weems is actually correct, and one or more of the fall lines represent an active tectonic feature, then a possible consequence to the safety of the plant may be higher ground motions at the site. An increased ground motion hazard, if any, would depend primarily on the activity rate (earthquake recurrence), magnitude distribution, and proximity of the fall line(s) to the site. If the activity rate were consistent with historical seismicity and magnitude potential were similar to the EPRI seismic source zones covering the fall line(s), then the hazard from such a feature would already be captured by the existing EPRI seismic source zone(s). A sensitivity analysis was not specifically performed for the any of the fall lines and these features were not included in the source model for the PSHA. The Applicant did examine the effect of the northern segment of the ECFS (ECFS-N) as a potential seismic source in the PSHA and therefore the impact on the ground motion hazard at the plant can be more formally described for the ECFS. The Staff found that evidence presented by Marple and Talwani is questionable and that the evidence for both the existence and recent activity of the northern segment of the ECFS is low. The staff also agreed with the Applicant's inclusion of the ECFS-N in the PSHA with a low probability of existence (10%). Given the parameters assigned to the ECFS-N (SER; page 2-176), inclusion of this potential source (which lies 70 miles southeast of the site) would increase the mean 10-5 ground motion by about 0.5%, and would increase the mean 10-4 ground motion by even less. Therefore, there would be no significant impact on the site hazard by including the ECFS-N as a potential seismic source. The central segment of the ECFS (ECFS-C) was not included in the PSHA because this segment has similar parameters to the ECFS-N segment but is even farther from the site, so its impact on site hazard would be even less than for the ECFS-N. Finally, the southern segment of the ECFS (ECFS-S) was included in the seismic source model used to calculate the SSE. The ECFS-S, which Marple and Talwani proposed as the source of the 1886 Charleston earthquake, was conservatively layered on to the existing Charleston source characterizations for each Earth Science Team (EST). The ECFS-S was characterized using the same maximum magnitude (Mw 6.8 to 7.5) and mean recurrence (550 years) values assigned to the Charleston seismic source in the 2002 USGS source model (Frankel et al., 2002). For the low frequency ground motion (1-Hz spectral acceleration) the ECFS-S increased the total median and mean hazard by 6% and 11% (respectively) at the 10-5 hazard level. For the high frequency ground motion (10-Hz spectral acceleration), the ECFS-S did not contribute significantly to the overall hazard. Because of the increase in hazard for low-frequency motions, the ECFS-S segment was included in all hazard calculations. References: Frankel, A.D., Petersen, M.D., Mueller, C.S., Haller, K.M., Wheeler, R.L., Leyendecker, E.V., Wesson, R.L., Harmsen, S.C., Cramer, C.H., Perkins, D.M., and Rukstales, K.S., Documentation for the 2002 Update of the National Seismic Hazard Maps, U.S. Geological Survey Open-File Report 02-420, 2002.	Scott Lindvall	Principal Geologist	WLA

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54	SER 2-166 to 2-167	SER Section 2.5.1.3.2	The SER states that in 1974 the Staff concluded that "unnamed fault 'a' is not a capable tectonic source." In the SER the Staff concludes that the Applicant has "adequately investigated the possible extension of fault "a" and that "the ESP site has no fault displacement potential." What does this mean? Please state and explain the Staff's current conclusion or opinion as to whether unnamed fault "a" is a "capable tectonic source."	Applicant agrees with the NRC staff's response.	Scott Lindvall	Principal Geologist	WLA
55	SER 2-168	SER Section 2.5.1.4	The SER states that "These results provide an adequate basis to conclude that no capable tectonic faults exist in the plant area (5 mi) that have the potential to cause near-surface displacement." Does the Staff so conclude? Or is this merely a statement that, given these results, such a conclusion is possible?	Applicant agrees with the NRC staff's response.	Scott Lindvall	Principal Geologist	WLA
56	SER 2-174+	SER Section 2.5.2.1.6	The March 2005 ACRS testimony notes that the site Safe Shutdown Earthquake exceeds the design SSE at high frequencies for the designs that have been certified to date. No mention of this issue occurs in the subsections that deal with seismic issues. What is the significance and current status of this issue?	Applicant agrees with the NRC staff's response.	Joe Litehiser	Seismolgy Engr Group Supervisor	Bechtel
57	SER 2-177	SER Section 2.5.2.1.6	The SER states that the determination of a safe shutdown earthquake (SSE) for the site uses a "reference probability." Probability of what?	Applicant agrees with the NRC staff's response.	Joe Litehiser	Seismolgy Engr Group Supervisor	Bechtel
58	SER 2-177	SER Section 2.5.2.1.6	The SER states that the Staff "calculated a reference probability level for the 29 nuclear power plant sites in the CEUS; the median reference probability for these 29 sites, using median hazard results, is 10^{-5} per year." Please provide the results of these calculations.	Applicant agrees with the NRC staff's response.	Robin McGuire	President	REI
59	SER 2-177	SER Section 2.5.2.1.6	Please explain whether there have been any advances in seismic science or data relative to the safety of nuclear power plants since the 29 CEUS reactors were originally sited several decades ago and why it is appropriate to automatically use the median probability from those sites as the benchmark for safety on an ESP that might be issued in 2007 and apply to reactors built perhaps in 2027 or even 2047.	Advances in seismic science and data have been made in understanding earthquake ground motions in the CEUS and in understanding the mean recurrence intervals of large earthquakes in the New Madrid seismic zone and in the Charleston, South Carolina, region. These advances have affected the calculation of ground motion hazard (the annual probability of exceedance vs. spectral amplitude) throughout the CEUS. As a result, the overall trend in seismic hazards has increased for the CEUS. With regard to safety, the basic premise of the probabilistic seismic hazard analysis required by the NRC rules is that the level of seismic hazard applicable to existing units is acceptable for both existing and new units. As the Commission stated in issuing these rules "the basic premise in establishing the target exceedance probability is that the current design levels are adequate," 61 Fed. Reg. 65,157, 65,164 (Dec. 11, 1996).	Robin McGuire	President	REI
60	SER 2-178	SER Section 2.5.2.1.6	The Applicant has proposed that the seismic reference probability for the SSE for the ESP be relaxed by a factor of at least 5. Does the Staff agree with this relaxation and if so, why?	Applicant agrees with the NRC staff's response.	Robin McGuire	President	REI
61	SER 2-177	SER Table 2.5.2-1	Table 2.5.2-1 (SSAR Table 2.5-22) compares median and mean values of ground motion acceleration values for the1989 PSHA model and the Updated PSHA model. The ground motion acceleration values for the mean estimates were higher than the median estimated values. Were all of the sites participating in the sample in the CEUS? How many were in the sample? As regards the mean values, what portion of the sample had acceleration values higher than the mean value at the various frequencies?	Applicant agrees with the NRC staff's response.	Robin McGuire	President	REI

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62	SER 2-177 to 2-201	SER Section 2.5.2.1.6	Applicant used two different methods to determine the ground motion response spectra for the final SSE. The first method, referred to as a performance-based method, was studied by the NRC Staff, who raised several questions and indicated to Applicant that it would need more time and resources to review this new method. Applicant then notified Staff that it would revise its submittal and base the selected SSE on the reference probability approach, in accordance with RG 1.165, indicating that it would retain the performance-based approach as an "alternate and further justification for the final SSE."	If the seismic hazard curve (ground motion amplitude vs. annual probability of exceedance) at a site is fixed, then a higher reference probability would correspond to a lower spectral acceleration value. However, at CEUS sites the seismic hazard curves have increased for the three reasons mentioned in the question. Therefore, a fixed spectral acceleration value corresponds to a higher annual probability of exceedance, and the use of a higher reference probability does not correspond to a lower spectral acceleration value, it still corresponds to the seismic design level for that structural period at that nuclear plant. This is the technical basis for using a higher reference probability, that it results in seismic design levels that are consistent with or higher than design levels at existing nuclear power plants. As defined in Regulatory Guide 1.165, the "reference probability" is the annual probability level such that 50% of a set of currently operating plants (selected by the NRC in Table B.1 of RG 1.165) has an annual median probability of exceeding the SSE that is below this level. However, in addition to recommending a reference probability, RG 1.165 also defines the procedure that was used to determine the reference probability and that should be used in the future if general revisions to PSHA methods or data bases result in significant changes in hazard predictions for the selected plant sites in Table B.1. As noted above, significant changes have occurred in the data bases and the effect of these changes has been incorporated into an estimate of an updated reference probability used to develop the NAPS ESP SSE. Inherent in this procedure is the basic premise that the level of seismic hazard applicable to existing units is acceptable for both existing and new units. Indeed, in issuing the final rule adopting probabilistic seismic hazard analysis as the method of establishing the SSE, the Commission stated "the basic premise in establishing the target exceedance probability is that the current design levels are adequate," 61 Fed. Reg. 65,157, 65,164 (Dec. 111, 1996). Therefore, the benchmark for new plants is not a specific numerical exceedance value, but the level of exceedance corresponding to the set of reference plants. When Reg. Guide 1.165 was published, the reference probability given for this set of plants in Reg. Guide 1.165 was calculated at 1 E-5 based on LLNL and EPRI PSHA's from the 1980s. The NRC concurred with applicant that based on current knowledge, the reference probability for this set of plants is more accurately on the order of 5E-5.	Robin McGuire	President	REI
63			In using the reference probability approach, Applicant departed from the recommendation clearly stated in RG 1.165 and used a higher reference probability (5x10-5 rather than 1x10-5). In justification of using the higher reference probability, Applicant listed three reasons: (1) higher ground motion estimates from the EPRI ground motion models, (2) shorter recurrence intervals for the New Madrid and Charleston seismic sources, and (3) the use of mean hazard instead of the median hazard. As pointed out in the SER at 2-199, each of these three factors, particularly the first two, increase the overall hazard for the CEUS and specifically for the 29 nuclear power plant sites used to determine the original reference probability. Would the use of a higher reference probability generally result in a lower spectral acceleration value? What would the difference be? Since most of the justification used by the Applicant would tend to increase the overall seismic hazard, how does that justify using a higher reference probability?	See Response to Question 62			

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64	SER 2-241	SER Section 2.5.4.3.7	According to Applicant, damping ratios for rock are generally between 0.5 and 4.5 percent. Applicant selected 2 percent for the zone III-V rock based on engineering judgment and experience. The Staff agrees. Why do all the seismic spectra curves in the SER and SSAR use 5% critical damping?	Applicant agrees with the NRC staff's response.	Robin McGuire	President	REI
65	SER 1-5, SSER E-1	SER Section 1.3, 7/18/05 ACRS letter, Appendix E.	Applicant and NRC terminology appear to accept the possible existence of more than two new nuclear units at the North Anna site so long as the total thermal power is below 9000 MW. However, the ACRS letter of July 18 to Chairman Diaz states an ACRS conclusion that "the proposed site, subject to the permit conditions recommended by the NRC staff, can be used for up to two nuclear power units each of up to 4300 MW [4500 MW] without undue risk to the public health and safety." Does the NRC view the ACRS statement as limiting their concurrence only for the condition of two units?	DNNA's ESP application defines a unit as follows: Each unit represents a portion of the total generation capacity to be added and would consist of one or more reactors or reactor modules. These multiple reactors or modules (the number of which may vary depending on the reactor type selected) would be grouped into distinct operating units. Each unit would consist of a plant of one or more modules that would not exceed 4500 MWth of nuclear generating capacity. Application at 2-1-3. DNNA interprets the ACRS letter as referring to units as defined in the Application.	Marvin Smith	Project Director	Dominion
66	SER 15-4	SER Section 15.3	Why is there no discussion in the Application or the SER related to the planned measurement of radioactive materials in the air, soil and groundwater?	Applicant agrees with the NRC staff's response.	John Costello	Supervisor, Nuclear Emergency Preparedness	Dominion

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67	SER 2-231	SER Section 2.5.4.1.6	Why is there such a wide range in the measured Factors of Safety (0.91 to 3.61) for soils in near proximity to each other?	The range of factors of safety against liquefaction noted in the question (0.91 to 3.61) were derived for in-situ soils under the Units 1 and 2 Service Water Reservoir (SWR) for a seismic margin assessment in 1994. The soils analyzed were typical of those found across the North Anna site, namely saprolitic soils consisting mostly of silty sand. These soils are derived from weathering of the bedrock underlying the site. Sound bedrock is found at depths ranging from around 30 to 100 ft below original site grade, depending on the intensity of weathering. The zones above the sound bedrock (Zone IV) identified at North Anna consist of weathered rock (Zone III), overlain by very dense granular saprolite (Zone IIB), loose to dense saprolite (Zone IIA) and finally residual soil (Zone I). Zones III and IIB are too dense to liquefy, and there is very little Zone I present at the site. Thus, almost all of the liquefaction analysis has been limited to the Zone IIA saprolite. Since liquefaction only occurs in saturated granular soils, computation of Factor of Safety (FS) against liquefaction is limited to granular Zone IIA soils near or below the ground water table. Because the degree of weathering generally intensifies towards the surface, the upper Zone IIA saprolite is typically looser than the underlying less weathered saprolite. Liquefaction potential of granular soils is inversely proportional to relative density, i.e., loose soils (low relative density) have higher liquefaction potential than dense soils (high relative density). Thus, in a typical soil column of Zone IIA saprolite at North Anna, FS against liquefaction of the near surface soils (below the water table) is low while FS of the deeper denser soils is high. The thickness of the Zone IIA saprolite varies considerably throughout the site, but a typical thickness is around 30 ft. It is not uncommon to have FS values of around 1 at the top of the column, with values in excess of 3 at the bottom, within a vertical distance of 30 ft or less. As noted above, the degree of weathering generally intensifies towards the ground surface. However, this weathering is a chemical process that causes oxidation of the rock minerals due to exposure to water and air. The oxidation process has different effects on different minerals, with some minerals, like quartz, being essentially immune. Thus, where the mineral composition of the parent bedrock is varied, as is the case at North Anna, the degree of weathering in localized zones of the soil can be quite different, and this is reflected in different relative densities. As a result, liquefaction potential can be significantly different, not only between soils at the top and bottom of the column, but also between adjacent zones in the column.	John Davie	Senior Principal Geotechnical Engr	Bechtel
68	SER 2-234	SER Section 2.5.4.1.10	Applicant has indicated that zone IIA saprolite is not suitable to support any safety-related structure without ground improvement and has proposed techniques to improve subsurface conditions. Soil borings indicate that IIA saprolite is abundant on the existing plant site and the ESP site. See Tables 2.5-29, 2.5-32, 2.5-38 ,and 2.5-40. Construction sections of now abandoned former units 3 and 4, such as intake and discharge piping, containment pad, etc., might be salvaged and incorporated into the proposed new facilities. What actions would be taken to assure that settlement problems associated with certain sections of the existing plant do not occur at the new sites?	As with existing Units 1 and 2, the foundations for the abandoned Units 3 and 4 reactors are on sound bedrock. When construction was stopped on Units 3 and 4, the foundations were left in place and the area was backfilled up to around El. 250 ft. This is uncontrolled fill and no new structures will be founded on it. If any of the new safety-related facilities are to be located in the area of the abandoned Units 3 and 4, the existing backfill will be removed, along with any remaining parts of the units themselves, excluding the foundation mats, which will be left in place. For a new reactor that is founded above the level of the abandoned foundations, concrete will be placed between these foundations and the basemat of the reactor. For other safety-related structures, either concrete or engineered structural backfill will be placed between the abandoned foundations and the basemat of the structure. We understand that the drilled piers that were installed for the Units 3 and 4 turbine building are still in place. If new facilities are planned for that area, these piers and the surrounding soil will be removed. The Service Water Reservoir pumphouse underwent appreciable settlement due to compression of the underlying Zone IIA saprolite consisting mainly of micaceous sandy silts. This settlement is documented in Appendix 3E of the UFSAR and is one of the reasons why the ESP application stated that Zone IIA saprolitic soils would be removed from beneath all safety-related structures or would be modified using ground improvement techniques. No existing Units 3 and 4 shallow foundations on Zone IIA saprolite will be used for the new facilities. Buried piping is different from foundations in that there is little or no increase in the net loading on the soil beneath the pipe, and settlement is rarely a concern for well-bedded buried pipes, even in relatively loose or soft soils. No existing buried pipes will be re-used for new safety-related piping. In non-safety-related situations, consideration would be given to using existing buried pipe only if it could be verified that the pipe still met applicable design criteria.	John Davie	Senior Principal Geotechnical Engr	Bechtel
69	SER 2-250	SER Section 2.5.6.1	According to Applicant, the North Anna Dam was designed and constructed to meet the requirements for a seismic Class 1 structure in support of the existing NAPS units. Does this mean that Lake Anna could be used for safety-related water use purposes for the existing units? If so, why was this not also considered for similar purposes with the proposed units?	The North Anna Dam is designed and constructed to meet all requirements for a Seismic Class I structure. Lake Anna is a second independent source of service water for Units 1 and 2. The other source is the service water reservoir. These two independent sources of water form the ultimate heat sink for Units 1 and 2. If the service water system was needed to perform its safety-related functions during a design basis accident, Lake Anna could be a water source. For some new unit reactors (e.g. the ESBWR, AP1000, PBMR, and IRIS) a conventional UHS water source is not necessary due to the passive emergency cooling system design and the use of water stored in onsite tanks. For the other reactors, where a conventional UHS is required, the new UHS would be required to meet different seismic criteria than those under which the North Anna dam was qualified for the existing units.	Craig Talbot	Senior Hydrologic Eng. Specialist	Bechtel

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				Rather than pursue a possible lengthy and complex process to determine if the North Anna dam would meet a different set of seismic requirements for the new units, the applicant chose to select a different UHS water source (a UHS cooling tower over a water storage basin) that would more readily meet the required seismic criteria. References: North Anna Power Station, Updated Final Safety Analysis Report. Revision 38, Updated Online. Dominion. January 10, 2003.			
70	General		Why isn't it reasonable to use observed ground water flow and settling data for Units 1 & 2 as a predictor for behavior of Units 3 & 4?	Applicant agrees with the NRC staff's response and provides the following additional information: Groundwater levels observed during site characterization for Units 1 and 2 are not representative of current conditions because they do not reflect the presence of Lake Anna, nor do they reflect the alteration of subsurface conditions caused by the construction of Units 1 and 2. The NAPS UFSAR (Reference 1) notes that the filling of the reservoir raised the local base level of ground-water discharge about 50 feet and thereby reduced the hydraulic gradient across the site to about 6 feet per 100 feet. Also, the founding of large structures on bedrock and placement of backfill has locally altered the hydrogeologic characteristics. Therefore, it is not reasonable to use groundwater levels observed prior to the filling of Lake Anna and construction of Units 1 and 2 as predictors for the hydrogeologic behavior of Units 3 and 4. With respect to settlement data, the majority of Category I structures for Units 1 and 2 are founded on rock and have not experienced any significant settlement. The Service Water Reservoir pumphouse underwent appreciable settlement due to compression of the underlying Zone IIA saprolite consisting mainly of micaceous sandy silts. This settlement is documented in Appendix 3E of the UFSAR and is one of the reasons why the ESP application stated that Zone IIA saprolitic soils would be removed from beneath all safety-related structures or would be modified using ground improvement techniques. The reactors for the new unit(s) will be founded on competent rock or on concrete placed on sound rock, and thus minimal settlement is anticipated. For other safety-related structures with foundation levels not deep enough to extend into sound rock, the overlying Zone IIA saprolite will be removed and replaced with granular structural fill compacted to at least 95% of the maximum dry density obtained from the modified Proctor test. Depending on the location, this fill would be underlain by (1) sound rock, (2) weathered rock and sound rock, or (3) very dense granular Zone IIB saprolite, weathered rock and sound rock. These rock and dense soils will undergo minimal settlement, even under high bearing pressures. References: North Anna Power Station, Updated Final Safety Analysis Report, Revision 41, Updated Online 06/15/06, Section 2.4.13, page 2.4-15.	Stewart Taylor	Manager, G&HES	Bechtel
71	3/2/05 ACRS Transcript 154-160	3/2/05 ACRS Transcript	The SSE for the proposed units is much higher than the SSE for the existing 2 units (0.15 g versus possibly 0.5g). Is this an issue for the existing plants or is it simply a different way of looking at seismic information?	Applicant agrees with the NRC staff's response.	Joe Litehiser	Seismolgy Engr Group Supervisor	Bechtel
			Radiological Effluent Release Dose Consequences From Normal Operations				
72	SER 11-2	SER Section 11.1.3.1	In this section and throughout the report, it is presumed that fission product inventories scale directly with reactor thermal power. See, for example, SER Section 15.3.4, p 15-6, "Source Terms." For some isotopes, this is not strictly true. As one example, Cs-134, a critical radionuclide, is produced by neutron capture in nonradioactive Cs-133 which is a fission product. Cs-134 thus scales with the square of reactor fluence not with reactor power. Is this effect of sufficient consequence to require modification of any of the radioisotope concentration tables?	Applicant agrees with the NRC staff's response and provides the following additional information: In the Application, only the ABWR source terms are scaled proportional to reactor power. It is a common practice within the industry to assume that the core isotopic inventory can be scaled proportional to thermal power. In fact, as indicated in ABWR SSAR Section 11.1.3, the ABWR concentrations of fission and activation products in the reactor coolant are estimated by scaling the standard concentrations in ANSI/ANS-18.1 in direct proportion to power. However, assuming that isotopes formed by activation of fission products increase proportional to the square of the power, the impact of this increase is evaluated below. The ABWR isotopic activities and doses given in the design certification document are increased in the Application by 10%, proportional with the increase in power from 3926 to 4300 MWt. This adjustment is made in calculating site-specific activities and doses for both accidents and routine releases. As indicated in ABWR SSAR Chapter 15, the design basis accidents considered for the ABWR are based on releases of only iodines and noble gases to the environment. Since all the isotopes of iodines and noble gases are produced principally as either fission products or daughters of fission products, it is reasonable to assume that their activities are proportional to reactor power, as advocated in TID-14844, the well-known document referenced in 10 CFR 100. Hence, neutron capture effect is not an issue for accident doses.	Sharad Jha	Principal Nuclear Engr	Bechtel

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				In evaluating effluent doses from routine releases, particulates are considered in addition to iodines and noble gases. Of the 68 gaseous and liquid effluent activities shown in ABWR SSAR Tables 12.2-20 and 12.2-22, respectively, by inspection it appears only six isotopes are formed primarily by neutron capture in either a fission product or a descendent of a fission product: Sr-89, Rh-106, Ag-110m, Sb-124, Cs-134, and Cs-136. Since the power multiplier is 1.10, the square is 1.21. Therefore, if one assumes that these six isotopes increase by the square of the power increase, a further increase in the activities of the affected isotopes by about 11% is possible. The effluent concentration limits (ECLs) in 10 CFR 20 Appendix B, Table 2 are indicative of the dose significance of isotopes in liquid and gaseous effluents. In Application ER Table 5.4-6, the activity concentrations in liquid effluent are compared to the ECLs. It is seen from this table that the liquid effluent concentrations of the six isotopes are well within the limits, with Cs-134 having the largest contribution at 2% of the ECL. As indicated in the footnote of Application ER Table 5.4-6, the effluent concentrations in the table are obtained by taking the composite maximum activity for each isotope from multiple reactor designs (AP1000, ABWR, ESBWR, and ACR-700). The Cs-134 concentration of 1.8 x 10^{-8} µCi/ml for the site is due to AP1000, which has an activity release for Cs-134 that is about 50% higher than ABWR. In fact, the ABWR activity is not bounding for any of the six isotopes, with the bounding composite value for each isotope being higher than the ABWR by at least 50%. Hence, increasing the ABWR activities by 11% will have no impact on the liquid effluent concentrations and doses presented in the application. In Application ER Table 5.4-7, the activity concentrations in gaseous effluent are compared to the ECLs. It is seen from this table that the gaseous effluent concentrations of the six isotopes are well within the limits, with Cs-134 having the largest contribution at 0.0008% of the ECL. Based on these insignificant contributions, it may be concluded that increasing the ABWR activities by 11% will have no impact on the gaseous effluent concentrations and doses presented in the application. Based on the above discussion, it may be concluded that the neutron capture effect is not of sufficient consequence to require modification of any of the radioisotope concentration tables in the Application. References: Document 23A6100, ABWR Standard Safety Analysis Report, General Electric, Revision 8. TID-14844, Calculation of Distance Factors for Power and Test Reactor Sites, U. S. Atomic Energy Commission, March 1962.			
73	SER 11-2, SSER viii	SER Section 11.1.3.1, SSER Exec. Sum.	The thermal power limit was increased to 9000 MW (SSER viii) with an appropriate scaling of isotope concentrations. However, the original plant designs were based upon particular temperature and flow conditions and a power increase would appear to produce a shift in one or the other of these numbers. Wouldn't this factor contribute to increased fission product release that is greater than a linear extrapolation?	The SSER alludes to an increase in power from 4300 to 4500 MWt per unit, resulting in a total power of 9000 MWt for the two new units. This change reflects the explicit addition of the ESBWR in Revision 6 of the Application, with the incorporation of ESBWR-specific information from Revision 1 of the ESBWR DCD. In Application revisions prior to Revision 6, the ESBWR was assumed to be bounded by the ABWR at a power of 4300 MWt. As indicated in Table 12.2-1 of the ESBWR DCD, the ESBWR is rated at 4500 MWt. Since the power of the ESBWR is not being changed from the DCD to the Application, there is no need to scale the source terms that are obtained from the ESBWR DCD and used in the ESP Application. However, as stated in Section15.3 of the SSAR and Section 7.1.3 of the ER, since the ESBWR is still in the process of being certified by the NRC, the ESBWR activities and doses in the Application have been increased by a margin of 25% to cover uncertainty; this does not represent an increase in power. It should be noted that the ESBWR is the only design being evaluated at 4500 MWt. The source terms for the other designs being considered for the ESP site are not being scaled up to 4500 MWt. References: Document 26A6642, ESBWR Design Control Document, Tier 2 Material, General Electric, Revision 1.	Sharad Jha	Principal Nuclear Engr	Bechtel
74	SER 11-3	SER Section 11.1.3.2	Identical values are quoted for maximum annual dose equivalents during normal operation for both thyroid and total body doses. This would appear to imply that air or water exposure to radioactive iodine is inconsequential. Is this not an unexpected result?	Applicant agrees with the NRC staff's response and provides the following additional information: Reflecting the source terms prior to Revision 6 of the Application, SER Section 11.1.3.2 indicated that the maximum total body dose from liquid effluents would be 1.3 mrem to an adult and that the maximum thyroid dose would be 1.3 mrem to an infant. These doses are for different age groups. It is just a coincidence that both organs were calculated to receive the same dose. Each organ dose is calculated independently based on the intake pathways and organ- and isotope-dependent dose conversion factors. For North Anna, the most significant contributor to the total body dose is the fish ingestion pathway while the thyroid dose is primarily due to the drinking water pathway. Hence, having similar doses for thyroid and total body does not imply that iodine contribution is inconsequential.	Sharad Jha	Principal Nuclear Engr	Bechtel

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75	SSER 11-1	SSER Section 11.1	Is there a regulation or other authoritative definition of "source term?" If so, please provide it.	10 CFR 50.2 contains the following definition: "*Source term* refers to the magnitude and mix of the radionuclides released from the fuel, expressed as fractions of the fission product inventory in the fuel, as well as their physical and chemical form, and the timing of their release." References: 10CFR50.2	Sharad Jha	Principal Nuclear Engr	Bechtel
76	SSER 11-1	SSER Section 11.1.1	Based on the PPE for Units 3 and 4, what radiation dose is received (a) immediately outside the reactor containment and (b) at the EAB boundary, from direct transmission of radiation through the reactor shield?	(a) Applicant agrees with the NRC staff's response.	Sharad Jha	Principal Nuclear Engr	Bechtel
				(b) As indicated in Application ER Section 5.4.1.3, the direct radiation dose at the site boundary is expected to be negligible (less than 1 mrem per year).	Sharad Jha	Principal Nuclear Engr	Bechtel
77	SSER 11-2	SSER Table 11.1-1	Legal Question: Table 11.1-1 refers to the Part 50 Appendix I doses as "objectives." Please explain how these objectives are included in the proposed ESP and whether they are legally enforceable. Please explain whether it would it be a violation to exceed these objectives.				
78	SSER 11-2	SSER Table 11.1-1	Legal Question: Table 11.1-1 refers to the Part 50 Appendix I doses on a per unit basis. Please explain whether it is your position that, since the Dominion group of companies would have four reactors on the site, it would be allowed to quadruple the amount of radiation it can release under Appendix I?				
79	SSER 11-2	SSER Table 11.1-1	Legal Question: Table 11.1-1 refers to the 40 CFR Part 190 environmental dose standards. Would it be a violation to exceed these standards? How will they be incorporated into the proposed ESP?				
80	SSER 11-2	SSER Table 11.1-1	Legal Question: Table 11.1-1 specifies that the 40 CFR Part 190 dose limits are for the entire site and apply to all operating units. How will the Part 190 25 mrem/yr total body dose limit be allocated between the two existing reactors (Units 1 and 2) and proposed Units 3 and 4? How will compliance be monitored and measured?				
81	SSER 11-3	SSER Section 11.1.1	The SER states that the Applicant calculated a collective whole body dose for the population within 50 miles of the ESP site. Please provide this collective whole body dose amount and the calculations supporting it. Please confirm whether this dose is based on the PPE maximums and that it segregates the existing units from the proposed units.	Applicant agrees with the NRC staff's response and provides the following additional information: The doses in ER Table 5.4-12 are calculated using the LADTAP II and GASPAR II computer programs, based on a PPE approach of taking the composite maximum release of each isotope from multiple reactor designs. The table also shows that the natural background radiation dose to the population is 9.2×10^5 person-rem per year. Hence, the relative contribution from the new units is insignificant. Although the dose from the existing units is not shown in the Application, Table 11B-8 of the UFSAR for the existing units indicates a total population dose of 12.7 person-rem per year from Units 1 and 2. References: NUREG/CR-4013, LADTAP II – Technical Reference and User Guide, Prepared for the U. S. Nuclear Regulatory Commission by Pacific Northwest Laboratory, April 1986. NUREG/CR-4653, GASPAR II – Technical Reference and User Guide, Prepared for the U. S. Nuclear Regulatory Commission by Pacific Northwest Laboratory, March 1987. North Anna Power Station Updated Final Safety Analysis Report, Revision 38.	Sharad Jha	Principal Nuclear Engr	Bechtel

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82	SSER 11-3	SSER Section 11.1	NRC Reg. Guide 8.29 uses a coefficient of 4 x 10^{-4} fatal cancers per rem for purposes of occupational radiation risk estimates and states that "the scientific community generally assumes that any exposure to ionizing radiation can cause biological effects." Assuming (a) a linear no threshold application of the Reg Guide coefficient, (b) that proposed Units 3 and 4 operate for 40 years, and (c) using the population estimate provided by the Applicant in response to RAI 2.1.3-1 (SER page 2-8), please calculate and provide the estimated number of additional fatal cancers resulting from routine operation of Units 3 and 4 for the 50 mile radius area assuming the two units operate for 40 years.	Applicant agrees with the NRC staff's response and provides the following additional information: Note that the requested calculation applies the 2065 peak population of 3.7 x 10^{6} for the entire 40-year operation duration from 2025 to 2065, and therefore overstates the consequences. If the 2040 population projection were used as an intermediate value, less than one fatal cancer would be projected.	Sharad Jha	Principal Nuclear Engr	Bechtel
83		SSER Section 11.1.1	Have you calculated or estimated the collective whole body dose for the population within 50 miles of the ESP site in the event of a fuel melt DBA? If so, please provide these data and the basis for your estimate or calculation.	Applicant agrees with the NRC staff's response and provides the following additional information: Dominion also did not calculate accident doses to the population. In accordance with NUREG-1555, population doses within 50 miles are calculated for routine releases only. As there is no regulatory requirement to calculate population doses from accidents, this calculation has not been performed. References: NUREG-1555, Standard Review Plans for Environmental Reviews for Nuclear Power Plants, U.S. Nuclear Regulatory Commission, October 1999.	Sharad Jha	Principal Nuclear Engr	Bechtel
84	SSER 11-4	SSER Section 11.1.3.1	Legal Question: 10 CFR § 20.1301(a) specifies that "each licensee" shall conduct operations so that the TEDE to individual members of the of the public from the "licensed operation" does not exceed 100 mrem per year, exclusive of background. In the case of multiple reactors at a site, would it ever be possible to multiply the maximum dose allowed by the number of units so that a four unit site could provide an exposure up to 400 mrem per year to an exposed individual? If this is ever possible, under what conditions would it be allowed?				
85	SSER 11-4	SSER Section 11.1.3.1	The SSER refers to Table 5.4-11, which specifies that the total radioactive effluents from the plants will produce a dose of 6.4 mrem/yr and that the total from the "existing units" is 0.32 mrem/yr. Is this correct? Why does the PPE for the two new reactors show them emitting twenty times the amount of radiation as the two existing reactors?	Applicant agrees with the NRC staff's response and provides the following additional information: Whereas the doses for the existing units calculated using the Offsite Dose Calculation Manual (ODCM) are fairly realistic, the doses for the proposed units are very conservative. A comparison of the liquid effluents indicates that the composite activities released from the proposed units are about twice as high as those in the effluent report for the existing units. A comparison of the gaseous effluents indicates that the activities released from the proposed units are about one hundred times higher than those in the effluent report for the existing units. These conservative, bounding estimates of activity releases for the new units therefore explain the factor of 20 between the projected doses for the new units and the actual doses for the existing units.	Sharad Jha	Principal Nuclear Engr	Bechtel
86	SSER 11-4, 11-5	SSER Section 11.1.3.2	The SER states that it performed independent evaluations or calculations and obtained "similar" results for the following tables of data provided by the Applicant. Please provide the Staff's independent calculations, evaluations, and similar results for Tables 5.4-6, 5.4-7, 5.4-8, 5.4-9 and 5.4-10 of the ER.	Applicant has no additional information.			
87	SSER 11-4, 11-6	SSER Section 11.1.3.1, 11.1.3.2	The SER states that the Applicant's results of 6.4 mrem/yr for the whole body, 27 mrem/yr for the thyroid, and 11 mrem/yr to bone are smaller than the maximum doses specified in 40 CFR § 190.10(a). Did the Staff calculate the results? What were the Staff's results for whole body, thyroid, and bone?	Applicant has no additional information.			
			Emergency Planning				

#	Document Page	Document Section	Inquiry	Dominion Response	Author/SME (Note 1)	Title	Organization
89	SER 13-1	SER Section 13.3	In the event of an emergency, what are the respective responsibilities of Dominion Resources, Virginia Electric Power Co., Dominion Nuclear North Anna, North Anna Power Station (the Applicant) and Old Dominion Electric Corporation? Would personnel from these respective organizations have to work in close cooperation on emergency issues?	Virginia Electric and Power Company and Dominion Nuclear North Anna (DNNA) are subsidiaries of Dominion Resources, Inc. Virginia Electric and Power Company (dba Virginia Power) operates the existing units at the North Anna Power Station site. DNNA is the ESP applicant. If Dominion were to proceed with the development of new units at the ESP site, it would enter into an arrangement with Virginia Power to coordinate and implement an integrated emergency plan. Personnel from various Dominion Resources subsidiaries for would act in close cooperation in the event of an emergency. Old Dominion Electric Cooperative holds a financial interest in the existing North Anna units but ODEC personnel are not involved in any aspect of plant operations, including response to emergencies.	John Costello	Supervisor, Nuclear Emergency Preparedness	Dominion
90	SER 13-3	SER Section 13.3.1.1	The SER uses the term ETE (evacuation time estimate) and also refers to "the ETE" as if it is a specific document. Are all SER references to "the ETE" a reference to the "EM/TEC01-220, "Evacuation Time Estimates for the North Anna Power Station and Surrounding Jurisdictions," dated November 2, 2001? Please provide "the ETE."	Applicant agrees with the NRC staff's response.	John Costello	Supervisor, Nuclear Emergency Preparedness	Dominion
91	SER 13-13	SER Section 13.3.1.1	Section 13.3.3.3 covers "Onsite Emergency Organizations." For purposes of the ESP application, is the NAPS site (beyond the ESP boundary) considered not "onsite?" If not, please explain how the term onsite and offsite are used with regard to emergency planning. Are NAPS and ESP treated as one site?	Applicant agrees with the NRC staff's response.	John Costello	Supervisor, Nuclear Emergency Preparedness	Dominion
92	SER 13-37	SER Section 13.3.3.10.3	The SER states that "Dominion would use both fixed and portable radiation monitoring equipment to perform dose assessment..." Does the use of the word "Dominion" here also include Virginia Power and Dominion Nuclear North Anna?	Applicant agrees with the NRC staff's response.	John Costello	Supervisor, Nuclear Emergency Preparedness	Dominion
93	SER 13-39	SER Section 13.3.3.11.1	The SER states that "evacuation decisions would be based on dose projections or offsite monitoring results." Section 5.9.6 "Radiological Monitoring" in the North Anna EIS provides a general description of the offsite monitoring to be carried out at Units 3 and 4. Please explain why this information is not included as a part of the SER.	Applicant agrees with the NRC staff's response	John Costello	Supervisor, Nuclear Emergency Preparedness	Dominion
94	SER 13-44	SER Section 13.3.3.11.3	The SER states that the Staff "applied current requirements" on Federal guidance relating to protective action recommendations (in the event of an accidental release of radioactivity). The Staff acknowledged that the Federal guidance may change and that "[a] COL or OL applicant should address any such changes, and the staff will determine compliance with the requirements, in this area during a COL or OL review." The Board has the following questions related to this statement in the SER:				
95			A. Legal Question: Please explain how this statement in the SER comports with 10 CFR § 52.39(a)(1) which states that the "Commission may not impose new requirements, including new emergency planning requirements, on the early site permit or the site for which it was issued, unless the Commission determines that a modification is necessary either to bring the permit or site into compliance with the Commission's regulations and orders in effect at the time the permit was issued, or to assure adequate protection of the public health and safety or the common defense and security."				

#	Document Page	Document Section	Inquiry	Dominion Response	Author/SME (Note 1)	Title	Organization
96			B. Legal Question: Contrary to the statement in the SER, does 10 CFR § 50.39(a)(1) mean that the Applicant is immunized (grandfathered) against any more stringent regulatory requirements or guidance for up to 80 years (the term of the ESP (20 years) plus extensions (20 years) plus the term of any COL (40 years)) unless a change can be shown to be "necessary . . . to assure adequate protection of the public health and safety or the common defense and security?"				
97			C. Legal Question: The SER states, at page 13-49, that "the staff did not consider the extent to which future radiological protection procedures would address radiological protection and onsite contamination control functions." Would the Applicant be exempt from these future procedures (unless they are shown to be necessary to assure adequate protection of public health and safety)? Please explain.				
			Accident Analysis				
99	SER 15-4	SER Section 15.3.1	What is the basis for the statement that the proposed Design Based Accidents for the ABWR and AP-1000 reactor designs would bound the DNBs for CANDU and gas-cooled reactors?	Applicant agrees with the NRC staff's response and provides the following additional information: Application SSAR Section 15.3 states that the ACR-700 source term information is preliminary but is expected to be bounded by the AP1000 LOCA. It further states that the advanced gas reactor designs (GT-MHR and PBMR) use mechanistic accident source terms and postulate relatively small environmental releases, compared with the water reactor technologies. Application SSAR Section 15.1 states the following about the AP1000, the ABWR, and the ESBWR: "The accidents for some of the newer reactor types being considered are not as well defined as those for these LWRs and, hence, the accepted analytical methodologies and assumptions applied to LWRs may not apply to these newer reactors. However, because of their greater potential for inherent safety, the accident radiological consequences of the other reactors being considered for the site are expected to be bounded by the AP1000, the ABWR, and the ESBWR. If one of these other designs is eventually selected for the ESP site, the COL application would either verify that the AP1000, the ABWR, and the ESBWR doses are bounding or provide a complete evaluation of accident radiological consequences compared with regulatory limits."	Sharad Jha	Principal Nuclear Engr	Bechtel
100	SSER 15-3, 15-9	SSER Section 15.1	The SSER states that the Applicant's response to Supplemental RAI 1 revealed that the highest 2-hour dose at the EAB for certain of the ESBWR DBAs does not occur in the first two hours. How did the Staff handle this fact in developing its proposed site specific X/Q values in Table 15.3-1?	Applicant agrees with the NRC staff's response and provides the following additional note: Note provided by Applicant: As indicated in the footnotes of Application SSAR Tables 15.4-12b and 15.4-23b, the maximum EAB doses for two ESBWR accidents (Failure of Small Lines Carrying Primary Coolant Outside Containment and LOCA) occur between 2 and 4 hours but are calculated based on the maximum X/Q between 0 and 2 hours.	Sharad Jha	Principal Nuclear Engr	Bechtel
101	SSER 15-6	SSER Section 15.3.2	Given that the Applicant and Staff have each calculated the site specific X/Q values for this ESP site, why should the "postulated X/Q values in the certified ABWR DCD" or the proposed X/Q values for the AP1000 DCD be used?	Applicant agrees with the NRC staff's response and provides the following additional information: In any COL proceeding referencing the North Anna ESP, the COL applicant would demonstrate that postulated X/Q values from the design certification document for the selected design bound the site specific X/Q values established in the ESP proceeding.	Sharad Jha	Principal Nuclear Engr	Bechtel
102	SSER 15-6	SSER Section 15.3.3	The SSER states that "Smaller X/Q values are associated with greater dilution capability, resulting in lower radiological doses. The radiological consequences are thus inversely proportional to the X/Q values." Don't you mean that they are directly proportional? Please explain.	Applicant agrees with the NRC staff's response.	Sharad Jha	Principal Nuclear Engr	Bechtel

#	Document Page	Document Section	Inquiry	Dominion Response	Author/SME (Note 1)	Title	Organization
103	SSER 15-7	SSER Section 15.3.3	The SSER states that "the applicant provided a set of bounding reactor accident source terms as a set of PPE values." Please explain how the the Staff knows that, in fact, the Applicant's source terms are bounding. In this context, does "bounding" simply mean that, by definition, the ultimate reactor accident source terms in the COL must be within the PPE in order to comply with the ESP?	Applicant agrees with the NRC staff's response and provides the following additional information: The source terms used for design basis accident (DBA) analyses are from the design certification documents for the AP1000, ABWR, and ESBWR. References: AP1000 Document No. APP-GW-GL-700, AP1000 Design Control Document, Tier 2 Material, Westinghouse, Revision 2, 2002. Document 23A6100, ABWR Standard Safety Analysis Report, General Electric, Revision 8. Document 26A6642, ESBWR Design Control Document, Tier 2 Material, General Electric, Revision 1.	Sharad Jha	Principal Nuclear Engr	Bechtel
104	SSER 15-8	SSER Section 15.3.5	The SSER states that the Staff "has verified the design specific source terms the applicant has provided." Please describe what the Staff did to verify these source terms.	Applicant agrees with the NRC staff's response.	Sharad Jha	Principal Nuclear Engr	Bechtel
105	SSER 15-9	SSER Table 15.3-1	The SSER states that the Staff intends to include the site-specific X/Q values listed as site characteristics in Appendix A in any ES Table 15.3-1 includes a value for "4 to 30 day LPZ." Why is this value not included in Appendix A.3?	Applicant agrees with the NRC staff's response.	Sharad Jha	Principal Nuclear Engr	Bechtel
106	SSER 15-9	SSER Section 15.3.5	The SSER states that the Applicant calculated the radiological consequences at the EAB and LBZ boundary based on the ESBWR source term and X/Qs and that the results obtained by the Applicant are below the TEDE doses specified in 10 CFR § 50.34(a)(1). Please describe what the Staff did to verify the Applicant's calculations.	Applicant agrees with the NRC staff's response.	Sharad Jha	Principal Nuclear Engr	Bechtel
107	SSER 15-9	SSER Table 15.3.-1	Why are the dispersion factors in Table 5-14 in the Draft EIS different from the dispersion factors in Table 15.3-1 in the SSER? Example: EIS Table 5-14 SSER Table 15.3-1 0-2 hr. EAB 3.3×10^{-5} 2.26×10^{-4} 0-8 hr. EAB 2.17×10^{-6} 2.05×10^{-5} 8-24 hr LPZ 1.5×10^{-6} 1.3×10^{-5} 1-4 D. LPZ 1.2×10^{-6} 5.58×10^{-6}	Applicant agrees with the NRC staff's response and provides the following clarification: The second row in the example table in the question contains 0-8 hr X/Q values for the LPZ, not the EAB.	Sharad Jha	Principal Nuclear Engr	Bechtel
			General Questions				
108	Responses to RAIs (one of nine).		Some RAIs posed complex questions that did not always appear to be completely addressed in the response. Two examples are RAI 3.8-9, which addresses the increase in neutron dose from the Gas Cooled Pebble Bed reactor, and E 3.8-16, which requests in-core differences in LWRs and Advanced Reactors with respect to seven cited features. What actions would NRC typically take to obtain the information requested?	Applicant agrees with the NRC staff's response and provides the following additional information. Note: The RAI that addressed the increase in neutron dose in gas-cooled reactors is RAI E3.8-9. Prior to answering any Request for Additional Information (RAI), the applicant and NRC staff typically have a conference call to make sure that the question is understood. This discussion may affect the applicant's response, focusing it on the information that the NRC staff is seeking. When an applicant submits information that the NRC considers inadequate in response to its RAI, the NRC Staff typically obtains the information by supplementing its original information request or by sending additional requests to the applicant.	Joseph Hegner	Licensing Lead	Dominion
109	General	General	If a plant is built that derives from the current ESP, are there any regulatory repercussions if actual release rates and doses exceed the values approved in the ESP?	Applicant accepts the NRC staff's response and provides the following additional information: In any COL proceeding referencing the North Anna ESP, the applicant would be required pursuant to 10 C.F.R. § 52.79(a)(1) to demonstrate that the PPE source terms bound the source terms for the selected design. If the applicant demonstrates that the PPE source terms are bounding, the dose values calculated in the ESP will also be bounding. If the applicant cannot demonstrate that the PPE source terms are bounding, it would be required to seek a variance pursuant to 10 C.F.R. § 52.93(b) and demonstrate compliance with the same technically relevant criteria considered in the ESP proceeding. See also COL Action Item 11.1-1.	Tony Banks	Environmental Lead	Dominion
110	General	General	Does NRC regularly check actual routine releases from nuclear plants against the claimed releases in applications or licenses?	Applicant agrees with the NRC staff's response.	Tony Banks	Environmental Lead	Dominion

#	Document Page	Document Section	Inquiry	Dominion Response	Author/SME (Note 1)	Title	Organization
111	SER xiii	SER Exec. Sum.	The Part 52 ESP process is intended to address and resolve site-related issues. The SER serves to identify matters resolved in the Staff's safety review and to identify remaining items to be addressed in a later proceeding (CP, COL, or a design certification proceeding). Many site issues are not resolved because they are related to final design or are simply put off to later licensing actions. Might it be assumed that only those issues resolved in the SER, FEIS, and Commission rulings and decisions will be considered resolved for purposes of future hearings? If this is not the case, how are carryover site-related issues flagged for handling if they are not listed in an action file such as the COL Action Item list?	10 C.F.R. § 52.39(a)(2) accords finality to "those matters resolved in the proceeding for issuance or renewal of the early site permit" but does not further define those matters. Dominion interprets that the "matters resolved" in the ESP proceeding consist of those issues that the NRC staff has resolved in its SER and FEIS, unless reversed upon adjudicatory review, and any other matters resolved upon hearing in the ESP proceeding. If a COL Action item defers the resolution of some issue to the COL proceeding, that issue (i.e. how that action item will be resolved) may be considered in the hearing on the COL application.	Joe Hegner	Licensing Lead	Dominion
112	SER 2-88	SER Section 2.4.4.3	COL Action Item 2.4-6 requires that an Applicant should demonstrate that the UHS reservoirs are designed to satisfy the NRC's regulations. The NRC Staff says that the detailed design of underground UHS reservoirs is not within the scope of ESP review. Is it true that an ESP permits some site work including the possible construction of cooling towers? If so, could this issue and COL Action Item 2-4-7 fall between the cracks?	Applicant agrees with the NRC staff's response.	Doug Kemp	Mechanical Engr Group Supervisor	Bechtel
113	SER 2-89	SER Section 2.4.4.3	COL Action Item 2.4-7 concerns the adequacy of the remaining liquid volume stored in the UHS. How do you determine what is adequate or are you saying that that determination be made and incorporated into a plan of action?	Applicant agrees with the NRC staff's response.	Doug Kemp	Mechanical Engr Group Supervisor	Bechtel
114	SSER A-7 to A-9	SSER Section A-2	Why aren't the following Action Items identified for a COL application?				
115			A. Radiation exposures to construction personnel should be reevaluated in light of the specific steam supply system chosen. A projected person-rem exposure of 120 person-rem/yr. gives some likelihood of adverse health effects when projected over the entire construction cycle. See Section 4.9.4 of NUREG 1811.	Applicant agrees with the NRC staff's response and provides the following additional information: The projected person-rem exposure of 120 person-rem/yr is a very conservative estimate based on a peak work force of 5000 workers (for two units being constructed simultaneously). This estimate reasonably encompasses the work force that would be required for any specific steam supply system chosen. It is therefore not expected that the choice of the specific steam supply system would cause this estimate to be exceeded, and the NRC staff saw no need for a confirmatory analysis in a COL application.	Tony Banks SME - Marvin Smith	Environmental Lead Project Director	Dominion
			B. The impact of localized fogging on transportation accidents should be evaluated.	Applicant concurs with the NRC staff's response.	Tony Banks	Environmental Lead	Dominion
			C. The potential release paths of radioactivity into the environment during normal operation should be established and evaluated.	Applicant agrees with the NRC staff's response and provides the additional following information: COL Action Item 2.3-3 requires the COL applicant to verify specific release point characteristics and specific locations of receptors used to generation long-term (routine release) atmospheric dispersion site characteristics.	Tony Banks	Environmental Lead	Dominion
			D. The procedures and equipment to be used to maintain tritium releases and concentrations below EPA limits should be defined.	Applicant agrees with the NRC staff's response.	Tony Banks	Environmental Lead	Dominion
			E. Specified allowed soil settling rates should be readdressed in light in of subsoil compositions identified for the COL.	The reactors for the new unit(s) will be founded on competent rock or on concrete placed on sound rock, which may include the abandoned Units 3 and 4 foundations, and thus minimal settlement is anticipated. For other safety-related structures with foundation levels not deep enough to extend into sound rock, the overlying Zone IIA saprolite will be removed and replaced with granular structural fill compacted to at least 95% of the maximum dry density obtained from the modified Proctor test. Depending on the location, this fill would be underlain by (1) sound rock, (2) weathered rock and sound rock, or (3) very dense granular Zone IIB saprolite, weathered rock and sound rock. These rock and dense soils will undergo minimal settlement, even under high bearing pressures. Such settlement will occur in the short term, i.e., during and/or immediately after construction. There will be no long-term settlement under the stated conditions. For these reasons, and because the specific location and adequacy of the foundations are design issues that must be addressed in the COL proceeding, a COL Action Item on soil settling rates is not deemed necessary.	John Davie	Senior Principal Geotechnical Engr	Bechtel
116	SSER viii	SER Exec. Sum.	Appendix A is described as "certain site-related items that an applicant will need to address at the combined license or construction stage" and that "these items . . . are more appropriately addressed at later stages."				

#	Document Page	Document Section	Inquiry	Dominion Response	Author/SME (Note 1)	Title	Organization
			A. Legal Question: Does Appendix A run afoul of 10 CFR § 52.39(a)(1), which states that an ESP is final and that thereafter "the Commission may not impose new requirements . . . on the site?" Please provide legal support and analysis.				
			B. Legal Question: How does the quoted provision comport with the Commission's refusal, when it promulgated the ESP regulations, to condone the issuance of "partial" ESP permits. See 54 Fed Reg. 15372, 15378 n.3 (April 18, 1989) ("the Commission declines to follow the suggestion . . . that partial early site permits be issued."). By incorporating so many items to be determined later, isn't the Staff proposing a "partial ESP?"				
			C. Legal Question: How does this provision comport with the Commission's statement that "[w]here adequate information is not available, early site permits will not be issued?" 54 Fed Reg. at 15378 n.3.				
			D. Legal Question: Are all of these matters unresolved within the meaning of 10 CFR § 52.39(a)(2). If not, why not?				
			E. Legal Question: Will a petition alleging that the site or Applicant is not in compliance with a permit conditions, COL action item, site characteristic, or bounding parameter specified in Appendix A be within the scope and litigable (provided it meets the other criteria of 10 CFR § 2.309(f)(2)) at the COL stage?				
					Note 1-Author and SME are the same if one name is listed		

North Anna ESP Application
ASLB Safety Question No. 48 Response
February 7, 2007

ATTACHMENT 1

AREVA

Environmental Laboratory Analysis Report

29 Research Drive
Westboro, MA 01581
508-898-9970

Customer Dominion Nuclear
Attention James Breaden

Report Date 01/19/05
Receipt Date 01/04/05

Dominion Nuclear
North Anna Power Station
PO Box 402, Route 700
Mineral, VA 23117

Lab. Sample No. L6851-01 Client ID 10 STATION 01A Product GAMMA SPECTROMETRY
Reference Date 12/28/04 Analysis Date 01/11/05 Matrix Ground Water

Nuclide	Activity Concentration +/- 2 * Sigma (pCi/L)			TPU 1 Sigma (pCi/L)	Measured MDC (pCi/L)	Required MDC (pCi/L)	Flags
AcTh-228	9E-01	+/-	6.7E+00	3.4E+00	1.2E+01		
Ag-108m	4E-01	+/-	1.4E+00	7.1E-01	2.4E+00		
Ag-110m	-5E-01	+/-	2.1E+00	1.0E+00	3.7E+00		
Ba-140	-2.1E+00	+/-	3.2E+00	1.6E+00	5.1E+00	6.0E+01	
Be-7	-9E+00	+/-	1.5E+01	7.3E+00	2.6E+01		
Ce-141	-3E-01	+/-	2.8E+00	1.4E+00	4.8E+00		
Ce-144	-4.5E+00	+/-	9.6E+00	4.8E+00	1.7E+01		
Co-57	5E-01	+/-	1.2E+00	6.1E-01	2.0E+00		
Co-58	-1.2E+00	+/-	1.8E+00	8.9E-01	3.2E+00	1.5E+01	
Co-60	-8E-01	+/-	1.8E+00	8.9E-01	3.3E+00	1.5E+01	
Cr-51	6E+00	+/-	1.8E+01	9.1E+00	3.0E+01		
Cs-134	1.4E+00	+/-	1.7E+00	8.8E-01	2.9E+00	1.5E+01	
Cs-137	9E-01	+/-	1.7E+00	8.3E-01	2.8E+00	1.5E+01	
Fe-59	1.9E+00	+/-	4.6E+00	2.3E+00	7.9E+00	3.0E+01	
I-131	-1.9E+00	+/-	4.8E+00	2.4E+00	8.4E+00	1.0E+01	
K-40	2E+01	+/-	2.6E+01	1.3E+01	4.3E+01		
La-140	-2.4E+00	+/-	3.7E+00	1.9E+00	7.0E+00	1.5E+01	
Mn-54	-3E-01	+/-	1.6E+00	7.8E-01	2.7E+00	1.5E+01	
Nb-95	-1.8E+00	+/-	1.9E+00	9.7E-01	3.5E+00	1.5E+01	
Ru-103	-1.8E+00	+/-	1.8E+00	9.1E-01	3.3E+00		
Ru-106	-8E+00	+/-	1.5E+01	7.5E+00	2.6E+01		
Sb-124	-1.1E+00	+/-	4.2E+00	2.1E+00	7.7E+00		
Sb-125	4E-01	+/-	4.4E+00	2.2E+00	7.4E+00		
Se-75	3E-01	+/-	2.0E+00	9.8E-01	3.3E+00		
Zn-65	1.8E+00	+/-	5.1E+00	2.6E+00	8.4E+00	3.0E+01	
Zr-95	0E+00	+/-	3.0E+00	1.5E+00	5.2E+00	3.0E+01	

Flags: a The measured MDC is greater than the required MDC
b The activity concentration is greater than three times its one sigma counting uncertainty.
c Peak was found

Approved by
E. M. Moreno
Sample Control and Measurements Lead

Reporting Level Ratio:

MAILED
JAN 19 2005
FRAMATOME ANP
ENVIRONMENTAL LAB

cc:

AREVA

Environmental Laboratory Analysis Report

29 Research Drive
Westboro, MA 01581
508-898-9970

Customer
Dominion Nuclear
North Anna Power Station
PO Box 402, Route 700
Mineral, VA 23117
Attn: James Breeden

Product H-3

Report Date 01/12/05
Receipt Date 01/04/05

LSN	Client ID & Description	Reference Date	Analysis Date	Nuclide	Activity Concentration +/- 2-Sigma (pCi/L)	TPU 1 Sigma (pCi/L)	Measured MDC (pCi/L)	Required MDC (pCi/L)	Reporting Flags	Level Ratio
Ground Water										
L8651-01	10 STATION 01A	12/29/2004	01/10/2005	H-3	3.3E+02 +/- 8.7E+02	4.3E+02	1.3E+03	2.0E+03		

Flags: a The measured MDC is greater than the required MDC.
b The activity concentration is greater than three times its one sigma counting uncertainty.

Approved by
E. M. Moreno 1/12/05
E. M. Moreno
Sample Control and Measurements Lead

c:

MAILED
JAN 12 2005
FRAMATOME ANP
ENVIRONMENTAL LAB

AREVA

Environmental Laboratory Analysis Report

29 Research Drive
Westboro, MA 01581
508-898-9970

Customer Dominion Nuclear
Attention James Breeden

Report Date 04/08/05
Receipt Date 04/04/05

Dominion Nuclear
North Anna Power Station
PO Box 402, Route 700
Mineral, VA 23117

Lab. Sample No. L9053-01 Client ID 10 STATION 01A Product GAMMA SPECTROMETRY
Reference Date 03/30/05 Analysis Date 04/07/05 Matrix Ground Water

Nuclide	Activity Concentration +/- 2 - Sigma (pCi/L)			TPU 1 Sigma (pCi/L)	Measured MDC (pCi/L)	Required MDC (pCi/L)	Flags
AcTh-228	0E+00	+/-	1.1E+01	5.7E+00	2.1E+01		
Ag-108m	-3E-01	+/-	2.9E+00	1.4E+00	5.2E+00		
Ag-110m	-1.1E+00	+/-	4.2E+00	2.1E+00	8.1E+00		
Ba-140	3E+00	+/-	5.4E+00	2.7E+00	9.4E+00	6.0E+01	
Be-7	-7E+00	+/-	2.6E+01	1.3E+01	4.9E+01		
Ce-141	2.3E+00	+/-	5.5E+00	2.8E+00	9.3E+00		
Ce-144	1.3E+01	+/-	2.2E+01	1.1E+01	3.6E+01		
Co-57	4E-01	+/-	2.7E+00	1.4E+00	4.7E+00		
Co-58	-1.2E+00	+/-	3.4E+00	1.7E+00	6.5E+00	1.5E+01	
Co-60	1E+00	+/-	3.7E+00	1.9E+00	6.5E+00	1.5E+01	
Cr-51	3.7E+01	+/-	3.1E+01	1.6E+01	5.0E+01		
Cs-134	3.2E+00	+/-	3.2E+00	1.6E+00	5.0E+00	1.5E+01	
Cs-137	1.6E+00	+/-	3.2E+00	1.6E+00	5.5E+00	1.5E+01	
Fe-59	-3.2E+00	+/-	9.3E+00	4.6E+00	1.9E+01	3.0E+01	
I-131	5E+00	+/-	6.0E+00	3.0E+00	9.8E+00	1.0E+01	
K-40	-1E+01	+/-	4.2E+01	2.1E+01	8.2E+01		
La-140	3.4E+00	+/-	6.2E+00	3.1E+00	1.1E+01	1.5E+01	
Mn-54	-2.4E+00	+/-	3.0E+00	1.5E+00	6.3E+00	1.5E+01	
Nb-95	4.7E+00	+/-	5.9E+00	2.9E+00	9.7E+00	1.5E+01	
Ru-103	-4E-01	+/-	3.6E+00	1.8E+00	6.6E+00		
Ru-106	1.1E+01	+/-	2.7E+01	1.4E+01	4.7E+01		
Sb-124	4.9E+00	+/-	7.6E+00	3.8E+00	1.3E+01		
Sb-125	-3.4E+00	+/-	8.9E+00	4.5E+00	1.7E+01		
Se-75	-2.1E+00	+/-	3.8E+00	1.9E+00	7.0E+00		
Zn-65	2E+00	+/-	1.7E+01	8.5E+00	3.0E+01	3.0E+01	
Zr-95	1.9E+00	+/-	5.1E+00	2.5E+00	9.0E+00	3.0E+01	

Flags: a The measured MDC is greater than the required MDC
b The activity concentration is greater than three times its one sigma counting uncertainty.
c Peak was found

Reporting Level Ratio:

Approved by
E. M. Moreno
Sample Control and Measurements Lead

MAILED
APR 11 2005
FRAMATOME ANP
ENVIRONMENTAL LAB

cc:

AREVA

Environmental Laboratory Analysis Report

29 Research Drive
Westboro, MA 01581
508-898-9970

Customer
Dominion Nuclear
North Anna Power Station
PO Box 402, Route 700
Mineral, VA 23117
Attn: James Breeden

Product H-3

Report Date 05/04/05
Receipt Date 04/04/05

LSN	Client ID & Description	Reference Date	Analysis Date	Nuclide	Activity Concentration +/- 2-Sigma (pCi/L)	TPU 1 Sigma (pCi/L)	Measured MDC (pCi/L)	Required MDC (pCi/L)	Flags	Reporting Level Ratio
Ground Water										
L8053-01	10 STATION 01A	03/30/2005	04/27/2005	H-3	2.5E+02 +/- 6.0E+02	3.0E+02	9.4E+02	2.0E+03		

Flags:
a The measured MDC is greater than the required MDC.
b The activity concentration is greater than three times its one sigma counting uncertainty.

Approved by
E. M. Moreno
Sample Control and Measurements Lead

c:

MAILED
MAY 0 4 2005
FRAMATOME ANP
ENVIRONMENTAL LAB

AREVA

Environmental Laboratory Analysis Report

29 Research Drive
Westboro, MA 01581
508-573-6650

Customer Dominion Nuclear
Attention James Breeden

Report Date 01/11/06
Receipt Date 01/04/06

Dominion Nuclear
North Anna Power Station
PO Box 402, Route 700
Mineral, VA 23117

Lab. Sample No. L10351-01 Client ID 10 STATION 01A Product GAMMA SPECTROMETRY
Reference Date 12/26/05 Analysis Date 01/10/06 Matrix Ground Water

Nuclide	Activity Concentration +/- 2 - Sigma (pCi/L)			TPU 1 Sigma (pCi/L)	Measured MDC (pCi/L)	Required MDC (pCi/L)	Flags
AcTh-228	7.1E+00	+/-	5.0E+00	3.0E+00	9.8E+00		a
Ag-108m	8E-01	+/-	1.4E+00	7.0E-01	2.3E+00		
Ag-110m	-5E-01	+/-	2.4E+00	1.2E+00	4.3E+00		
Ba-140	-2.2E+00	+/-	4.0E+00	2.0E+00	7.5E+00	6.0E+01	
Be-7	-4E+00	+/-	1.5E+01	7.4E+00	2.6E+01		
Ce-141	4E-01	+/-	2.0E+00	9.9E-01	3.3E+00		
Ce-144	-4.1E+00	+/-	8.6E+00	4.3E+00	1.5E+01		
Co-57	1E+00	+/-	1.1E+00	5.4E-01	1.8E+00		
Co-58	-1E+00	+/-	1.8E+00	8.9E-01	3.2E+00	1.5E+01	
Co-60	-3E-01	+/-	2.0E+00	9.9E-01	3.5E+00	1.5E+01	
Cr-51	-1.3E+01	+/-	1.7E+01	8.7E+00	3.0E+01		
Cs-134	8E-01	+/-	2.2E+00	1.1E+00	3.8E+00	1.5E+01	
Cs-137	-8E-01	+/-	1.8E+00	9.1E-01	3.2E+00	1.8E+01	
Fe-59	5E-01	+/-	3.9E+00	2.0E+00	6.8E+00	3.0E+01	
I-131	-3.9E+00	+/-	4.8E+00	2.4E+00	8.5E+00	1.0E+01	
K-40	1.9E+01	+/-	3.1E+01	1.6E+01	5.2E+01		
La-140	-2.5E+00	+/-	4.6E+00	2.3E+00	8.6E+00	1.5E+01	
Mn-54	1E-01	+/-	1.7E+00	8.3E-01	2.9E+00	1.5E+01	
Nb-95	-4E-01	+/-	2.1E+00	1.0E+00	3.7E+00	1.5E+01	
Ru-103	-8E-01	+/-	2.0E+00	9.9E-01	3.6E+00		
Ru-106	-1E+01	+/-	1.7E+01	8.4E+00	3.0E+01		
Sb-124	-1E+00	+/-	5.2E+00	2.6E+00	9.5E+00		
Sb-125	8E-01	+/-	4.3E+00	2.2E+00	7.4E+00		
Se-75	1.7E+00	+/-	1.8E+00	9.1E-01	3.0E+00		
Zn-65	9.9E+00	+/-	7.7E+00	3.9E+00	1.2E+01	3.0E+01	
Zr-95	2.2E+00	+/-	3.0E+00	1.5E+00	4.9E+00	3.0E+01	

Flags: a The measured MDC is greater than the required MDC
b The activity concentration is greater than three times its one sigma counting uncertainty.
c Peak was found

Reporting Level Ratio:

Approved by
1/12/06
E. M. Moreno
Sample Control & Measurements Supervisor

c: Barbara Thompson
Steve Tipsword

AREVA

Environmental Laboratory Analysis Report

29 Research Drive
Westboro, MA 01581
508-573-6650

Customer
Dominion Nuclear
North Anna Power Station
PO Box 402, Route 700
Mineral, VA 23117

Attn: James Breeden

Product H-3

Report Date 01/18/06
Receipt Date 01/04/06

LSN	Client ID & Description	Reference Date	Analysis Date	Nuclide	Activity Concentration +/- 2-Sigma (pCi/L)	TPU 1 Sigma (pCi/L)	Measured MDC (pCi/L)	Required MDC (pCi/L)	Reporting Flags	Level Ratio
Ground Water										
L10361-01	10 STATION 01A	12/28/2005	01/06/2006	H-3	7.3E+02 +/- 9.9E+02	5.0E+02	1.5E+03	2.0E+03		

Flags:
a The measured MDC is greater than the required MDC.
b The activity concentration is greater than three times its one sigma counting uncertainty.

Approved by
E. M. Moreno
Sample Control & Measurements Supervisor

c: Barbara Thompson
Steve Tipsword

AREVA

Environmental Laboratory Analysis Report

29 Research Drive
Westboro, MA 01581
508-573-6650

Customer Dominion Nuclear
Attention Barbara Thompson

Report Date 07/13/06
Receipt Date 07/05/06

Dominion Nuclear
North Anna Power Station
PO Box 402, Route 700
Mineral, VA 23117

Lab. Sample No. L11075-01 Client ID LOC CODE 10 STATION 01A Product GAMMA SPECTROMETRY
Reference Date 06/28/06 Analysis Date 07/12/06 Matrix Ground Water

Nuclide	Activity Concentration +/- 2 - Sigma (pCi/L)			TPU 1 Sigma (pCi/L)	Measured MDC (pCi/L)	Required MDC (pCi/L)	Flags
AcTh-228	3.6E+00	+/-	7.0E+00	3.5E+00	1.2E+01		
Ag-108m	2E-01	+/-	1.3E+00	6.5E-01	2.3E+00		
Ag-110m	1E-01	+/-	2.3E+00	1.1E+00	4.1E+00		
Ba-140	-1.4E+00	+/-	3.7E+00	1.9E+00	7.2E+00	6.0E+01	
Be-7	-1.1E+01	+/-	1.4E+01	7.2E+00	2.7E+01		
Ce-141	1E-01	+/-	3.1E+00	1.6E+00	5.3E+00		
Ce-144	-1E+00	+/-	1.1E+01	5.4E+00	1.9E+01		
Co-57	-1.3E+00	+/-	1.3E+00	6.6E-01	2.4E+00		
Co-58	-4E-01	+/-	1.5E+00	7.6E-01	2.8E+00	1.5E+01	
Co-60	-9E-01	+/-	1.8E+00	9.1E-01	3.5E+00	1.5E+01	
Cr-51	-1.4E+01	+/-	1.8E+01	9.1E+00	3.3E+01		
Cs-134	2E+00	+/-	1.7E+00	8.6E-01	2.6E+00	1.5E+01	
Cs-137	1.4E+00	+/-	1.7E+00	8.4E-01	2.7E+00	1.8E+01	
Fe-59	-6E-01	+/-	3.7E+00	1.9E+00	6.9E+00	3.0E+01	
I-131	-4.4E+00	+/-	5.2E+00	2.6E+00	9.6E+00	1.0E+01	
K-40	-9E+00	+/-	2.4E+01	1.2E+01	4.5E+01		
La-140	-1.6E+00	+/-	4.3E+00	2.1E+00	8.3E+00	1.5E+01	
Mn-54	5E-01	+/-	1.6E+00	8.2E-01	2.9E+00	1.5E+01	
Nb-95	-1.1E+00	+/-	1.9E+00	9.3E-01	3.5E+00	1.5E+01	
Ru-103	-1.2E+00	+/-	1.9E+00	9.6E-01	3.5E+00		
Ru-106	-1E+01	+/-	1.6E+01	7.9E+00	2.9E+01		
Sb-124	-1.1E+00	+/-	4.2E+00	2.1E+00	8.2E+00		
Sb-125	2.2E+00	+/-	4.4E+00	2.2E+00	7.4E+00		
Se-75	1.3E+00	+/-	2.2E+00	1.1E+00	3.7E+00		
Zn-65	-1.8E+00	+/-	3.7E+00	1.9E+00	7.1E+00	3.0E+01	
Zr-95	-3E-01	+/-	2.9E+00	1.4E+00	5.2E+00	3.0E+01	

Flags: a The measured MDC is greater than the required MDC
b The activity concentration is greater than three times its one sigma counting uncertainty.
c Peak was found

Reporting Level Ratio:

Approved by
E. M. Moreno
Sample Control & Measurements Supervisor
7/13/06

cc: James Breeden
Steve Tipsword

AREVA

Environmental Laboratory Analysis Report

29 Research Drive
Westboro, MA 01581
508-573-6650

Customer
Dominion Nuclear
North Anna Power Station
PO Box 402, Route 700
Mineral, VA 23117
Attn: Barbara Thompson

Product H-3

Report Date 07/19/06
Receipt Date 07/05/06

LSN	Client ID & Description	Reference Date	Analysis Date	Nuclide	Activity Concentration +/- 2-Sigma (pCi/L)	TPU 1 Sigma (pCi/L)	Measured MDC (pCi/L)	Required MDC (pCi/L)	Flags	Reporting Level Ratio
Ground Water										
L11075-01	LOC CODE 10 STATION 01A	06/28/2006	07/14/2006	H-3	-2.3E+02 +/- 8.8E+02	4.4E+02	1.4E+03	2.0E+03		

Flags:
a The measured MDC is greater than the required MDC.
b The activity concentration is greater than three times its one sigma counting uncertainty.

Approved by
for E. M. Moreno 7/20/06
Sample Control & Measurements Supervisor

c: James Breeden
Steve Tipsword

AREVA

Environmental Laboratory Analysis Report

29 Research Drive
Westboro, MA 01581
508-573-6650

Customer
Dominion Nuclear
North Anna Power Station
PO Box 402, Route 700
Mineral, VA 23117
Attn: Barbara Thompson

Product SR-89, SR-90

Report Date 08/11/06
Receipt Date 07/05/06

LSN	Client ID & Description	Reference Date	Analysis Date	Nuclide	Activity Concentration +/- 2-Sigma (pCi/L)	TPU 1 Sigma (pCi/L)	Measured MDC (pCi/L)	Required MDC (pCi/L)	Reporting Flags	Level Ratio
Ground Water										
L11075-01	LOC CODE 10 STATION 01A	06/28/2006	08/10/2006	Sr-89	1.3E+00 +/- 3.6E+00	1.9E+00	5.5E+00	1.0E+01		
L11075-01	LOC CODE 10 STATION 01A	06/28/2006	08/11/2006	Sr-90	-2E-01 +/- 1.0E+00	5.1E-01	1.8E+00	2.0E+00		

Flags: a The measured MDC is greater than the required MDC.
b The activity concentration is greater than three times its one sigma counting uncertainty.

Approved by
for E. M. Moreno
Sample Control & Measurements Supervisor
8/11/06

c: James Breeden
Steve Tipsword

AREVA

Environmental Laboratory Analysis Report

29 Research Drive
Westboro, MA 01581
508-573-6650

Customer Dominion Nuclear
Attention Bob Simmons

Report Date 10/12/06
Receipt Date 10/02/06

Dominion Nuclear
North Anna Power Station
PO Box 402, Route 700
Mineral, VA 23117

Lab. Sample No. L11465-01 Client ID LOC CODE 10 STATION 01A Product GAMMA SPECTROMETRY
Reference Date 09/27/06 Analysis Date 10/10/06 Matrix Ground Water

Nuclide	Activity Concentration +/- 2 - Sigma (pCi/L)			TPU 1 Sigma (pCi/L)	Measured MDC (pCi/L)	Required MDC (pCi/L)	Flags
AcTh-228	2E+00	+/-	7.6E+00	3.8E+00	1.3E+01		
Ag-108m	1E-01	+/-	1.7E+00	8.4E-01	2.9E+00		
Ag-110m	7E-01	+/-	2.5E+00	1.3E+00	4.4E+00		
Ba-140	1.4E+00	+/-	4.1E+00	2.0E+00	7.0E+00	6.0E+01	
Be-7	2.9E+01	+/-	2.0E+01	9.9E+00	3.1E+01		c
Ce-141	8E-01	+/-	2.7E+00	1.4E+00	4.6E+00		
Ce-144	1E+00	+/-	1.1E+01	5.5E+00	1.9E+01		
Co-57	3E-01	+/-	1.4E+00	7.1E-01	2.4E+00		
Co-58	7E-01	+/-	2.0E+00	1.0E+00	3.5E+00	1.5E+01	
Co-60	-2E-01	+/-	1.8E+00	9.3E-01	3.3E+00	1.5E+01	
Cr-51	-3E+00	+/-	2.1E+01	1.0E+01	3.6E+01		
Cs-134	1.1E+00	+/-	2.1E+00	1.1E+00	3.5E+00	1.5E+01	
Cs-137	2.5E+00	+/-	2.0E+00	1.0E+00	3.2E+00	1.8E+01	
Fe-59	-2.1E+00	+/-	4.2E+00	2.1E+00	7.6E+00	3.0E+01	
I-131	3.4E+00	+/-	5.7E+00	2.9E+00	9.5E+00	1.0E+01	
K-40	5.3E+01	+/-	2.6E+01	1.3E+01	3.7E+01		bc
La-140	1.6E+00	+/-	4.7E+00	2.3E+00	8.1E+00	1.5E+01	
Mn-54	8E-01	+/-	2.0E+00	9.9E-01	3.4E+00	1.5E+01	
Nb-95	-3.3E+00	+/-	2.4E+00	1.2E+00	4.6E+00	1.5E+01	
Ru-103	-2.1E+00	+/-	2.0E+00	1.0E+00	3.6E+00		
Ru-106	-2E+00	+/-	1.9E+01	9.4E+00	3.3E+01		
Sb-124	7E-01	+/-	4.8E+00	2.4E+00	8.6E+00		
Sb-125	-4.2E+00	+/-	5.2E+00	2.6E+00	9.3E+00		
Se-75	1.8E+00	+/-	2.4E+00	1.2E+00	3.9E+00		
Zn-65	-3.5E+00	+/-	4.3E+00	2.1E+00	8.0E+00	3.0E+01	
Zr-95	-7E-01	+/-	3.8E+00	1.8E+00	6.5E+00	3.0E+01	

Flags: a The measured MDC is greater than the required MDC
b The activity concentration is greater than three times its one sigma counting uncertainty.
c Peak was found

Reporting Level Ratio:

Approved by
10/12/06
for E.M. Moreno
Sample Control & Measurements Supervisor

cc: Dwain Salling
James Breeden
Steve Tipsword

AREVA

29 Research Drive
Westboro, MA 01581
508-573-6650

Environmental Laboratory Analysis Report

Customer
Dominion Nuclear
North Anna Power Station
PO Box 402, Route 700
Mineral, VA 23117
Attn: Bob Simmons

Product H-3

Report Date 10/24/06
Receipt Date 10/02/06

LSN	Client ID & Description	Reference Date	Analysis Date	Nuclide	Activity Concentration +/- 2-Sigma (pCi/L)	TPU 1 Sigma (pCi/L)	Measured MDC (pCi/L)	Required MDC (pCi/L)	Flags	Reporting Level Ratio
Ground Water										
L11466-01	LOC CODE 10 STATION 01A	09/27/2006	10/19/2006	H-3	-1.14E+03 +/- 9.2E+02	4.6E+02	1.6E+03	2.0E+03		

Flags: a The measured MDC is greater than the required MDC.
b The activity concentration is greater than three times its one sigma counting uncertainty.

Approved by
E M. Moreno
Sample Control & Measurements Supervisor
10/25/06

c: Dwain Salling
James Breeden
Steve Tipsword

North Anna ESP Application
ASLB Safety Question No. 48 Response
February 7, 2007

ATTACHMENT 2

AREVA

Environmental Laboratory Analysis Report

29 Research Drive
Westboro, MA 01581
508-898-9970

Customer Dominion Nuclear
Attention James Breeden

Report Date 08/23/05
Receipt Date 08/08/05

Dominion Nuclear
North Anna Power Station
PO Box 402, Route 700
Mineral, VA 23117

Lab. Sample No. L9703-01 Client ID 81 ISFSI WELL#1 Product GAMMA SPECTROMETRY
Reference Date 08/01/05 Analysis Date 08/10/05 Matrix Well Water

Nuclide	Activity Concentration +/- 2 - Sigma (pCi/L)			TPU 1 Sigma (pCi/L)	Measured MDC (pCi/L)	Required MDC (pCi/L)	Flags
AcTh-228	-5E+00	+/-	1.0E+01	5.2E+00	1.8E+01		
Ag-108m	-5E-01	+/-	1.6E+00	8.1E-01	2.8E+00		
Ag-110m	-2.3E+00	+/-	2.8E+00	1.4E+00	5.2E+00		
Ba-140	-1.1E+00	+/-	3.2E+00	1.6E+00	6.0E+00	6.0E+01	
Be-7	6E+00	+/-	1.7E+01	8.4E+00	2.8E+01		
Ce-141	-5.1E+00	+/-	4.2E+00	2.1E+00	7.3E+00		
Ce-144	1.1E+00	+/-	9.8E+00	4.9E+00	1.7E+01		
Co-57	4E-01	+/-	1.2E+00	6.1E-01	2.0E+00		
Co-58	-8E-01	+/-	2.2E+00	1.1E+00	4.0E+00	1.5E+01	
Co-60	1E+00	+/-	2.1E+00	1.1E+00	3.6E+00	1.5E+01	
Cr-51	0E+00	+/-	1.6E+01	8.0E+00	2.7E+01		
Cs-134	2.1E+00	+/-	2.1E+00	1.1E+00	3.5E+00	1.5E+01	
Cs-137	5E-01	+/-	1.8E+00	9.1E-01	3.1E+00	1.8E+01	
Fe-59	-4.5E+00	+/-	5.9E+00	3.0E+00	1.1E+01	3.0E+01	
I-131	1.6E+00	+/-	3.2E+00	1.6E+00	5.4E+00	1.0E+01	
K-40	-2.3E+01	+/-	4.5E+01	2.2E+01	7.9E+01		
La-140	-1.2E+00	+/-	3.7E+00	1.8E+00	6.9E+00	1.5E+01	
Mn-54	-1E-01	+/-	2.1E+00	1.0E+00	3.6E+00	1.5E+01	
Nb-95	1E+00	+/-	2.4E+00	1.2E+00	4.1E+00	1.5E+01	
Ru-103	-1.2E+00	+/-	2.1E+00	1.1E+00	3.7E+00		
Ru-106	-1.1E+01	+/-	1.7E+01	8.5E+00	3.1E+01		
Sb-124	3.3E+00	+/-	5.6E+00	2.8E+00	9.3E+00		
Sb-125	1E-01	+/-	5.1E+00	2.6E+00	8.7E+00		
Se-75	1.2E+00	+/-	2.1E+00	1.0E+00	3.4E+00		
Zn-65	2.1E+00	+/-	8.1E+00	4.1E+00	1.4E+01	3.0E+01	
Zr-95	-1.9E+00	+/-	3.5E+00	1.7E+00	6.3E+00	3.0E+01	

Flags: a The measured MDC is greater than the required MDC
b The activity concentration is greater than three times its one sigma counting uncertainty.
c Peak was found

Reporting Level Ratio:

Approved by
8/23/05
E. M. Moreno
Sample Control and Measurements Lead

c:

AREVA

Environmental Laboratory Analysis Report

29 Research Drive
Westboro, MA 01581
508-898-9970

Customer Dominion Nuclear
Attention James Breeden

Report Date 08/16/05
Receipt Date 08/08/05

Dominion Nuclear
North Anna Power Station
PO Box 402, Route 700
Mineral, VA 23117

Lab. Sample No. L9703-02 Client ID 84 ISFSI WELL#4 Product GAMMA SPECTROMETRY
Reference Date 08/01/05 Analysis Date 08/11/05 Matrix Well Water

Nuclide	Activity Concentration +/- 2 - Sigma (pCi/L)	TPU 1 Sigma (pCi/L)	Measured MDC (pCi/L)	Required MDC (pCi/L)	Flags
AcTh-228	-6E+00 +/- 1.2E+01	6.1E+00	2.3E+01		
Ag-108m	1E+00 +/- 2.2E+00	1.1E+00	3.8E+00		
Ag-110m	-1.5E+00 +/- 4.1E+00	2.0E+00	7.6E+00		
Ba-140	-6E-01 +/- 5.8E+00	2.9E+00	1.1E+01	6.0E+01	
Be-7	1.3E+01 +/- 2.6E+01	1.3E+01	4.4E+01		
Ce-141	-2.7E+00 +/- 4.4E+00	2.2E+00	7.7E+00		
Ce-144	-8E+00 +/- 1.5E+01	7.3E+00	2.6E+01		
Co-57	2E+00 +/- 1.9E+00	9.7E-01	3.1E+00		
Co-58	-2E-01 +/- 3.0E+00	1.5E+00	5.4E+00	1.5E+01	
Co-60	1.5E+00 +/- 3.5E+00	1.7E+00	5.9E+00	1.5E+01	
Cr-51	3.4E+01 +/- 2.6E+01	1.3E+01	4.1E+01		
Cs-134	6E-01 +/- 3.3E+00	1.7E+00	5.8E+00	1.5E+01	
Cs-137	3.2E+00 +/- 2.9E+00	1.5E+00	4.7E+00	1.8E+01	
Fe-59	-1.9E+00 +/- 9.5E+00	4.7E+00	1.8E+01	3.0E+01	
I-131	1E+00 +/- 5.4E+00	2.7E+00	9.3E+00	1.0E+01	
K-40	2.4E+01 +/- 5.6E+01	2.8E+01	9.6E+01		
La-140	-7E-01 +/- 6.6E+00	3.3E+00	1.2E+01	1.5E+01	
Mn-54	-1.3E+00 +/- 2.7E+00	1.4E+00	5.2E+00	1.5E+01	
Nb-95	-6E-01 +/- 3.5E+00	1.7E+00	6.3E+00	1.6E+01	
Ru-103	-1.9E+00 +/- 3.1E+00	1.5E+00	5.7E+00		
Ru-106	-1.8E+01 +/- 2.6E+01	1.3E+01	4.9E+01		
Sb-124	2E+00 +/- 7.8E+00	3.9E+00	1.4E+01		
Sb-125	-6E-01 +/- 7.3E+00	3.7E+00	1.3E+01		
Se-75	-1E-01 +/- 3.1E+00	1.5E+00	5.4E+00		
Zn-65	1E+00 +/- 1.1E+01	5.7E+00	2.0E+01	3.0E+01	
Zr-95	1.2E+00 +/- 5.6E+00	2.8E+00	9.8E+00	3.0E+01	

Flags: a The measured MDC is greater than the required MDC
b The activity concentration is greater than three times its one sigma counting uncertainty.
c Peak was found

Reporting Level Ratio:

Approved by
E. M. Moreno 8/16/05
E. M. Moreno
Sample Control and Measurements Lead

c:

AREVA

Environmental Laboratory Analysis Report

29 Research Drive
Westboro, MA 01581
508-898-9970

Customer
Dominion Nuclear
North Anna Power Station
PO Box 402, Route 700
Mineral, VA 23117

Attn: James Breeden

Product SR-89, SR-90

Report Date 09/07/05
Receipt Date 08/08/05

LSN	Client ID & Description	Reference Date	Analysis Date	Nuclide	Activity Concentration +/- 2-Sigma (pCi/L)	TPU 1 Sigma (pCi/L)	Measured MDC (pCi/L)	Required MDC (pCi/L)	Reporting Flags Level Ratio
Well Water									
L9703-01	81 ISFSI WELL#1	08/01/2005	08/17/2005	Sr-89	9E-01 +/- 4.5E+00	2.3E+00	8.2E+00	1.0E+01	
L9703-01	81 ISFSI WELL#1	08/01/2005	08/29/2005	Sr-90	-5E-01 +/- 1.0E+00	5.2E-01	1.8E+00	2.0E+00	
L9703-02	84 ISFSI WELL#4	08/01/2005	08/17/2005	Sr-89	1.4E+00 +/- 4.0E+00	2.0E+00	7.4E+00	1.0E+01	
L9703-02	84 ISFSI WELL#4	08/01/2005	08/29/2005	Sr-90	6.5E-01 +/- 9.5E-01	4.8E-01	1.6E+00	2.0E+00	

Flags:
a The measured MDC is greater than the required MDC.
b The activity concentration is greater than three times its one sigma counting uncertainty.

Approved by
E. M. Moreno 9/8/05
E. M. Moreno
Sample Control and Measurements Lead

c:

AREVA

Environmental Laboratory Analysis Report

29 Research Drive
Westboro, MA 01581
508-898-9970

Customer

Dominion Nuclear
North Anna Power Station
PO Box 402, Route 700
Mineral, VA 23117

Attn: James Breeden

Product H-3

Report Date 08/16/05
Receipt Date 08/08/05

LSN	Client ID & Description	Reference Date	Analysis Date	Nuclide	Activity Concentration +/- 2-Sigma (pCi/L)	TPU 1 Sigma (pCi/L)	Measured MDC (pCi/L)	Required MDC (pCi/L)	Flags	Reporting Level Ratio
Well Water										
L9703-01	81 ISFSI WELL#1	08/01/2005	08/11/2005	H-3	1.1E+02 +/- 9.1E+02	4.5E+02	1.4E+03	2.0E+03		
L9703-02	84 ISFSI WELL#4	08/01/2005	08/11/2005	H-3	-2.1E+02 +/- 9.0E+02	4.5E+02	1.4E+03	2.0E+03		

Flags:
a The measured MDC is greater than the required MDC.
b The activity concentration is greater than three times its one sigma counting uncertainty.

Approved by
E. M. Moreno 8/16/05
E. M. Moreno
Sample Control and Measurements Lead

c:

North Anna ESP Application
ASLB Safety Question No. 48 Response
February 7, 2007

ATTACHMENT 3

COMMONWEALTH of VIRGINIA

Department of Health
OFFICE OF DRINKING WATER
Lexington Environmental Engineering Field Office

ROCKBRIDGE SQUARE SHOPPING CENTER
131 WALKER STREET
LEXINGTON, VIRGINIA 24450-2431
PHONE: (540) 463-7136
FAX: (540) 463-3892

October 26, 2004

SUBJECT: Louisa County
Water – North Anna Power Plant

Mr. Donald Huffman
P.O. Box 402
Mineral, VA 23117

Dear Mr. Huffman:

This office has received the results of chemical samples taken from your system on 09/22/04. I have reviewed these results and find that North Anna Power Plant complies with all current chemical standards for those parameters tested with the following exception of high Iron and Manganese in specific wells.

Iron and manganese in these concentrations can cause aesthetic problems within the distribution system by staining porcelain bathroom fixtures and imparting a bitter taste in heated beverages such as tea and coffee. It may impart brownish discolorations to laundered goods.

These tests keep the North Anna Power Plant's system current on required chemical testing and the results indicate compliance with all primary maximum contamination levels. If you have any questions concerning these results or what the different constituents mean, you may contact Jim Moore or me.

Sincerely,

Carl S. Christiansen
Environmental Health Specialist Supervisor

CSC/tmd
cc Louisa County Health Department
VDH – ODW – Richmond Central

WATER QUALITY REPORT
COMMONWEALTH OF VIRGINIA
Department Of General Services
DIVISION OF CONSOLIDATED LABORATORY SERVICES

September 30, 2004

LIMS ID: 1148249

Lexington Regional Office
131 Walker Street,
Lexington, VA24450-2431

Region: 2
Process Lab:
RICHMOND

PWS OWNER
NORTH ANNA POWER PLANT/HUFFMAN, DONALD
1022 HALEY DRIVE
P O BOX 402
MINERAL,VA 23117

PWSID	SOURCE
2109600	

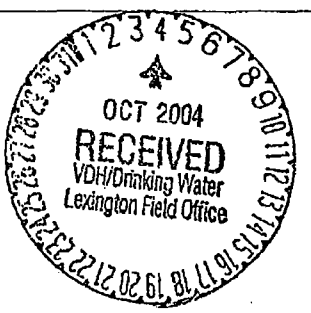
FIELD DATA ITEMS:

Date Receive	09/27/2004	Sampling Date	09/22/2004	Collected By	C.S.C.
Order Number	80026405	Source ID	EP004	VDH Sample Type	RT
Fluoride		Category	CH	PB CU	
Chemist		Compliance	Y	Original Lims Number	
F Method		Sample Location	EP WELL 4 TAP		

CONTAMINANT ID	PARAMETER	PMCL (ppm)	SMCL (ppm)	RESULT	ANALYSIS DATE	ANALYST
1005	Arsenic			< 0.002 ppm	09/29/2004	ABOROWSKI
1010	Barium	2		< 0.20 ppm	09/29/2004	ABOROWSKI
1015	Cadmium	.005		< 0.002 ppm	09/29/2004	ABOROWSKI
1020	Chromium	.1		< 0.01 ppm	09/29/2004	ABOROWSKI
1030	Lead	.015		.031 ppm	09/29/2004	ABOROWSKI
1035	Mercury	0.002		< 0.0002 ppm	09/29/2004	ABOROWSKI
1045	Selenium	.05		< 0.01 ppm	09/29/2004	ABOROWSKI
1002	Aluminum			< 0.05 ppm	09/29/2004	ABOROWSKI
1028	Iron		.3	1.06 ppm	09/29/2004	ABOROWSKI
1032	Manganese		0.05	.058 ppm	09/29/2004	ABOROWSKI
1095	Zinc		5	4.7 ppm	09/29/2004	ABOROWSKI
1022	Copper		1.3	< 0.20 ppm	09/29/2004	ABOROWSKI
1052	Sodium			8.04 ppm	09/29/2004	ABOROWSKI
1036	Nickel	.1		< 0.01 ppm	09/29/2004	ABOROWSKI
1085	Thallium	.002		< 0.002 ppm	09/29/2004	ABOROWSKI
1074	Antimony	.006		< 0.002 ppm	09/29/2004	ABOROWSKI
1075	Beryllium	.004		< 0.002 ppm	09/29/2004	ABOROWSKI

APPROVED BY: MMOUER DATE APPROVED: 09/30/2004 3 WQR

METALS



WATER QUALITY REPORT
COMMONWEALTH OF VIRGINIA
Department Of General Services
DIVISION OF CONSOLIDATED LABORATORY SERVICES

October 07, 2004

LIMS ID: 1148251

Lexington Regional Office
131 Walker Street,
Lexington, VA24450-2431

Region: 2
Process Lab:
RICHMOND

PWS OWNER	PWSID	SOURCE
NORTH ANNA POWER PLANT/HUFFMAN, DONALD **1022 HALEY DRIVE** **P O BOX 402** **MINERAL,VA 23117**	**2109600**	

FIELD DATA ITEMS:

Date Receive	09/28/2004	Sampling Date	09/22/2004	Collected By	NG
Order Number	80026405	Source ID	EP004	VDH Sample Type	RT
Fluoride		Category	CH	PB CU	
Chemist		Compliance	Y	Original Lims Number	
F Method		Sample Location	EP WELL 4 TAP		

CONTAMINANT ID	PARAMETER	PMCL (ppm)	SMCL (ppm)	RESULT	ANALYSIS DATE	ANALYST
1038	Nitrate+Nitrite as N	10		< 0.05 mg/l	09/30/2004	RMUSTAK

APPROVED BY: CMORTON DATE APPROVED: 10/07/2004 23 WQR

INORGANIC

The results on this form indicate that all contaminants tested are below the Maximum Contaminant Levels as set forth by the USEPA. Call (540) 463-7136 with any questions. CJC Carl Christiansen
Environmental Health Specialist

WATER QUALITY REPORT

COMMONWEALTH OF VIRGINIA

Department of General Services

DIVISION OF CONSOLIDATED LABORATORY SERVICES

7 October 2004

1148245

MAIL TO:

Office of Drinking Water, Lexington
131 Walker St
Lexington, VA 24450

REGION: 2

PWS OWNER	PWSID	SOURCE
NORTH ANNA POWER PLANT/HUFFMAN, DONALD **P O BOX 402** **1022 HALEY DRIVE** **MINERAL, VA 23117**	**2109600**	

LIMS NO.: **1148245**
DATE RECEIVED: 24 Sep 2004
SAMPLING DATE: **22 Sep 2004 11:00**
SAMPLE LOCATION: **EP WELL 4 TAP**
SAMPLE TYPE: **RT**
COLLECTED BY: **CSC**

FIELD TESTS: Temp: pH: Alk: Chl: CO2: Hrd:

PRESERVATIVE:

CONT ID	PARAMETER	PMCL (ppm)	SMCL (ppm)	RESULT	ANALYSIS DATE	ANALYST
1925	pH HOLD TIME EXCEEDED, INVALID FOR SDWA COMPLIANCE REPORTING			6.80 PH	28 Sep 2004	RROWSHAN
1927	Alkalinity (Total)			63 mg/l	28 Sep 2004	RROWSHAN
1928	Alkalinity - Bicarbonate			63 mg/l	28 Sep 2004	RROWSHAN
1929	Alkalinity - Carbonate			< 1 mg/l	28 Sep 2004	RROWSHAN
1017	Chloride			15.4 mg/l	27 Sep 2004	RMUSTAK
1055	Sulfate			< 5.00 mg/l	27 Sep 2004	RMUSTAK
1905	Color - PCU			6.3 PCU	27 Sep 2004	STHRASH
1064	Specific Conductance			183 µmhos/cm	24 Sep 2004	PJONES
1930	RESIDUE, TOTAL FILTERABLE (DRIED AT 180C), MG/L			133 mg/l	28 Sep 2004	LDELEON
1058	Volatile Dissolved Solids (500°C)			19 mg/l	28 Sep 2004	LDELEON
1059	Fixed Dissolved Solids (500°C)			114 mg/l	28 Sep 2004	LDELEON
1025	Fluoride			< 0.20 mg/l	01 Oct 2004	MCREWEY
1027	Sulfide			< 0.03 mg/l	04 Oct 2004	PJONES
1914	Calcium Hardness			44 mg/l	04 Oct 2004	ECARSON
1915	Hardness - Total			76 mg/l	04 Oct 2004	ECARSON

The results on this form indicate that all contaminants tested are below the Maximum Contaminant Levels as set forth by the USEPA. Call (540) 463-7136 with any questions.

Carl Christiansen
Environmental Health Specialist

APPROVED BY: FBLACKSHEAR DATE APPROVED: 06 Oct 2004 1 WQRNRLK

WATER QUALITY REPORT
COMMONWEALTH OF VIRGINIA
Department Of General Services
DIVISION OF CONSOLIDATED LABORATORY SERVICES

September 29, 2004

LIMS ID: 1148252

Lexington Regional Office
131 Walker Street,
Lexington, VA24450-2431

Region: 2
Process Lab:
RICHMOND

PWS OWNER
NORTH ANNA POWER PLANT/HUFFMAN, DONALD
1022 HALEY DRIVE
P O BOX 402
MINERAL,VA 23117

PWSID	SOURCE
2109600	

FIELD DATA ITEMS:

Date Receive	09/27/2004	Sampling Date	09/22/2004	Collected By	C.S.C
Order Number	80026405	Source ID	EP006	VDH Sample Type	RT
Fluoride		Category	CH	PB CU	
Chemist		Compliance	Y	Original Lims Number	
F Method		Sample Location	EP WELL 6 TAP		

CONTAMINANT ID	PARAMETER	PMCL (ppm)	SMCL (ppm)	RESULT	ANALYSIS DATE	ANALYST
1038	Nitrate+Nitrite as N	10		< 0.05 mg/l	09/29/2004	RMUSTAK

APPROVED BY: CMORTON DATE APPROVED: 09/29/2004 4 WQR

INORGANIC

The results on this form indicate that all contaminants tested are below the Maximum Contaminant Levels as set forth by the USEPA. Call (540) 463-7136 with any questions. CSC Carl Christiansen
Environmental Health Specialist

WATER QUALITY REPORT
COMMONWEALTH OF VIRGINIA
Department Of General Services
DIVISION OF CONSOLIDATED LABORATORY SERVICES

September 30, 2004

LIMS ID: 1148250

Lexington Regional Office
131 Walker Street,
Lexington, VA24450-2431

Region: 2
Process Lab:
RICHMOND

PWS OWNER
NORTH ANNA POWER PLANT/HUFFMAN, DONALD
1022 HALEY DRIVE
P O BOX 402
MINERAL,VA 23117

PWSID	SOURCE
2109600	

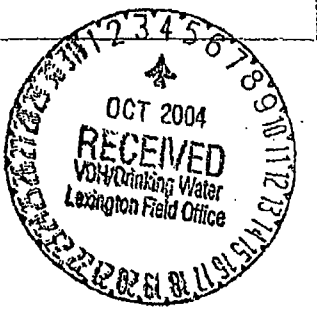
FIELD DATA ITEMS:

Date Receive	09/27/2004	Sampling Date	09/22/2004	Collected By	C.S.C
Order Number	80026405	Source ID	EP006	VDH Sample Type	RT
Fluoride		Category	CH	PB CU	
Chemist		Compliance	Y	Original Lims Number	
F Method		Sample Location	EP WELL 6 TAP		

CONTAMINANT ID	PARAMETER	PMCL (ppm)	SMCL (ppm)	RESULT	ANALYSIS DATE	ANALYST
1005	Arsenic			< 0.002 ppm	09/29/2004	ABOROWSKI
1010	Barium	2		< 0.20 ppm	09/29/2004	ABOROWSKI
1015	Cadmium	.005		< 0.002 ppm	09/29/2004	ABOROWSKI
1020	Chromium	.1		< 0.01 ppm	09/29/2004	ABOROWSKI
1030	Lead	.015		0.002 ppm	09/29/2004	ABOROWSKI
1035	Mercury	0.002		< 0.0002 ppm	09/29/2004	ABOROWSKI
1045	Selenium	.05		< 0.01 ppm	09/29/2004	ABOROWSKI
1002	Aluminum			0.22 ppm	09/29/2004	ABOROWSKI
1028	Iron		.3	7.11 ppm	09/29/2004	ABOROWSKI
1032	Manganese		0.05	0.072 ppm	09/29/2004	ABOROWSKI
1095	Zinc		5	1.51 ppm	09/29/2004	ABOROWSKI
1022	Copper		1.3	< 0.20 ppm	09/29/2004	ABOROWSKI
1052	Sodium			7.6 ppm	09/29/2004	ABOROWSKI
1036	Nickel	.1		< 0.01 ppm	09/29/2004	ABOROWSKI
1085	Thallium	.002		< 0.002 ppm	09/29/2004	ABOROWSKI
1074	Antimony	.006		< 0.002 ppm	09/29/2004	ABOROWSKI
1075	Beryllium	.004		< 0.002 ppm	09/29/2004	ABOROWSKI

APPROVED BY: MMOUER DATE APPROVED: 09/30/2004 4 WQR

METALS



WATER QUALITY REPORT

COMMONWEALTH OF VIRGINIA

Department of General Services

DIVISION OF CONSOLIDATED LABORATORY SERVICES

7 October 2004

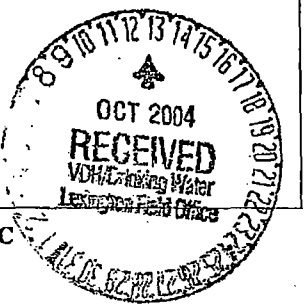
1148247

MAIL TO:

Office of Drinking Water, Lexington
131 Walker St
Lexington, VA 24450

REGION: 2

PWS OWNER	PWSID	SOURCE
NORTH ANNA POWER PLANT/HUFFMAN, DONALD **P O BOX 402** **1022 HALEY DRIVE** **MINERAL, VA 23117**	**2109600**	



LIMS NO.: 1148247
DATE RECEIVED: 24 Sep 2004
SAMPLING DATE: 22 Sep 2004 11:00
SAMPLE LOCATION: EP WELL 6 TAP
SAMPLE TYPE: RT
COLLECTED BY: CSC

FIELD TESTS: Temp: Chl: PRESERVATIVE:
pH: CO2:
Alk: Hrd:

CONT ID	PARAMETER	PMCL (ppm)	SMCL (ppm)	RESULT	ANALYSIS DATE	ANALYST
1925	pH HOLD TIME EXCEEDED, INVALID FOR SDWA COMPLIANCE REPORTING			7.33 PH	28 Sep 2004	RROWSHAN
1927	Alkalinity (Total)			80 mg/l	28 Sep 2004	RROWSHAN
1928	Alkalinity - Bicarbonate			80 mg/l	28 Sep 2004	RROWSHAN
1929	Alkalinity - Carbonate			< 1 mg/l	28 Sep 2004	RROWSHAN
1017	Chloride			< 5.00 mg/l	27 Sep 2004	RMUSTAK
1055	Sulfate			8.13 mg/l	27 Sep 2004	RMUSTAK
1905	Color - PCU			< 5 PCU	27 Sep 2004	STHRASH
1064	Specific Conductance			180 µmhos/cm	24 Sep 2004	PJONES
1930	RESIDUE, TOTAL FILTERABLE (DRIED AT 180C), MG/L			134 mg/l	28 Sep 2004	LDELEON
1058	Volatile Dissolved Solids (500°C)			15 mg/l	28 Sep 2004	LDELEON
1059	Fixed Dissolved Solids (500°C)			119 mg/l	28 Sep 2004	LDELEON
1025	Fluoride			< 0.20 mg/l	01 Oct 2004	MCREWEY
1027	Sulfide			< 0.03 mg/l	04 Oct 2004	PJONES
1914	Calcium Hardness			52 mg/l	04 Oct 2004	ECARSON
1915	Hardness - Total			80 mg/l	04 Oct 2004	ECARSON

The results on this form indicate that all contaminants tested are below the Maximum Contaminant Levels as set forth by the USEPA. Call (540) 463-7136 with any questions.

CSC
Carl Christiansen
Environmental Health Specialist

APPROVED BY: FBLACKSHEAR DATE APPROVED: 06 Oct 2004 1 WQRNRLK

V ATER QUALITY REPORT
COMMONWEALTH OF VIRGINIA
Department Of General Services
DIVISION OF CONSOLIDATED LABORATORY SERVICES

October 14, 2004

LIMS ID: 1148261

Lexington Regional Office
131 Walker Street,
Lexington, VA24450-2431

Region: 2
Process Lab:
RICHMOND

PWS OWNER
NORTH ANNA POWER PLANT/HUFFMAN, DONALD
1022 HALEY DRIVE
P O BOX 402
MINERAL,VA 23117

PWSID	SOURCE
2109600	

FIELD DATA ITEMS:

Date Receive	09/24/2004	Sampling Date	09/22/2004	Collected By	CSC
Order Number	80026405	Source ID	EP006	VDH Sample Type	RT
Fluoride		Category	CH	PB CU	
Chemist		Compliance	Y	Original Lims Number	
F Method		Sample Location	EP WELL 6 TAP		

CONTAMINANT ID	PARAMETER	PMCL (ppm)	SMCL (ppm)	RESULT	ANALYSIS DATE	ANALYST
2212	Dichlorodifluoromethane			< 0.5 ppb	10/12/2004	LGREEN
2210	Methyl Chloride (Chloromethane)			< 0.5 ppb	10/12/2004	LGREEN
2976	Vinyl Chloride			< 0.5 ppb	10/12/2004	LGREEN
2214	Methyl Bromide (Bromomethane)			< 0.5 ppb	10/12/2004	LGREEN
2216	Chloroethane			< 0.5 ppb	10/12/2004	LGREEN
2218	Trichlorofluoromethane			< 0.5 ppb	10/12/2004	LGREEN
2977	1,1-Dichloroethene			< 0.5 ppb	10/12/2004	LGREEN
2964	Dichloromethane (Methylene Chloride)			< 0.5 ppb	10/12/2004	LGREEN
2979	trans-1,2-Dichloroethene			< 0.5 ppb	10/12/2004	LGREEN
2978	1,1-Dichloroethane			< 0.5 ppb	10/12/2004	LGREEN
2380	cis-1,2-Dichloroethene			< 0.5 ppb	10/12/2004	LGREEN
2941	Chloroform			< 0.5 ppb	10/12/2004	LGREEN
2981	1,1,1-Trichloroethane			< 0.5 ppb	10/12/2004	LGREEN
2982	Carbon Tetrachloride			< 0.5 ppb	10/12/2004	LGREEN
2980	1,2-Dichloroethane			< 0.5 ppb	10/12/2004	LGREEN
2984	Trichloroethene			< 0.5 ppb	10/12/2004	LGREEN
2983	1,2-Dichloropropane			< 0.5 ppb	10/12/2004	LGREEN
2408	Dibromomethane			< 0.5 ppb	10/12/2004	LGREEN
2943	Bromodichloromethane			< 0.5 ppb	10/12/2004	LGREEN
2228	cis-1,3-Dichloropropene			< 0.5 ppb	10/12/2004	LGREEN
2224	trans-1,3-Dichloropropene			< 0.5 ppb	10/12/2004	LGREEN
2985	1,1,2-Trichloroethane			< 0.5 ppb	10/12/2004	LGREEN
2987	Tetrachloroethylene (Perchloroethylene)			< 0.5 ppb	10/12/2004	LGREEN
2944	Dibromochloromethane			< 0.5 ppb	10/12/2004	LGREEN
2989	Chlorobenzene			< 0.5 ppb	10/12/2004	LGREEN
2986	1,1,1,2-Tetrachloroethane			< 0.5 ppb	10/12/2004	LGREEN
2942	Bromoform			< 0.5 ppb	10/12/2004	LGREEN
2988	1,1,2,2-Tetrachloroethane			< 0.5 ppb	10/12/2004	LGREEN

The results on this form indicate that all contaminants tested are below the Maximum Contaminant Levels as set forth by the USEPA. Call (540) 463-7136 with any questions.

Carl Christiansen
Environmental Health Specialist

2004 OCT 15 PM 12:08

V \TER QUALITY REPORT
COMMONWEALTH OF VIRGINIA
Department Of General Services
DIVISION OF CONSOLIDATED LABORATORY SERVICES

October 14, 2004

LIMS ID: 1148261

09/24/2004 09/22/2004 CSC

CONTAMINANT ID	PARAMETER	PMCL (ppm)	SMCL (ppm)	RESULT	ANALYSIS DATE	ANALYST
2965	o-Chlorotoluene (2-Chlorotoluene)			< 0.5 ppb	10/12/2004	LGREEN
2966	p-Chlorotoluene (4-Chlorotoluene)			< 0.5 ppb	10/12/2004	LGREEN
2967	m-Dichlorobenzene (1,3-Dichlorobenzene)			< 0.5 ppb	10/12/2004	LGREEN
2969	p-Dichlorobenzene			< 0.5 ppb	10/12/2004	LGREEN
2968	o-Dichlorobenzene			< 0.5 ppb	10/12/2004	LGREEN
2378	1,2,4-Trichlorobenzene			< 0.5 ppb	10/12/2004	LGREEN
2420	1,2,3-Trichlorobenzene			< 0.5 ppb	10/12/2004	LGREEN
2990	Benzene			< 0.5 ppb	10/12/2004	LGREEN
2991	Toluene			0.6 ppb	10/12/2004	LGREEN
2992	Ethylbenzene			< 0.5 ppb	10/12/2004	LGREEN
2994	Isopropylbenzene			< 0.5 ppb	10/12/2004	LGREEN
2998	n-Propylbenzene			< 0.5 ppb	10/12/2004	LGREEN
2426	t-Butylbenzene			< 0.5 ppb	10/12/2004	LGREEN
2428	s-Butylbenzene			< 0.5 ppb	10/12/2004	LGREEN
2248	Naphthalene			< 0.5 ppb	10/12/2004	LGREEN
2430	Bromochloromethane			< 0.5 ppb	10/12/2004	LGREEN
2422	n-Butylbenzene			< 0.5 ppb	10/12/2004	LGREEN
2931	1,2-Dibromo-3-chloropropane			< 0.5 ppb	10/12/2004	LGREEN
2232	1,2-Ethylenedibromide			< 0.5 ppb	10/12/2004	LGREEN
2412	1,3-Dichloropropane			< 0.5 ppb	10/12/2004	LGREEN
2416	2,2-Dichloropropane			< 0.5 ppb	10/12/2004	LGREEN
2410	1,1-Dichloropropene			< 0.5 ppb	10/12/2004	LGREEN
2246	Hexachlorobutadiene			< 0.5 ppb	10/12/2004	LGREEN
2030	4-Isopropyltoluene			< 0.5 ppb	10/12/2004	LGREEN
2996	Styrene			< 0.5 ppb	10/12/2004	LGREEN
2414	1,2,3-Trichloropropane			< 0.5 ppb	10/12/2004	LGREEN
2418	1,2,4-Trimethylbenzene			< 0.5 ppb	10/12/2004	LGREEN
2424	1,3,5-Trimethylbenzene			< 0.5 ppb	10/12/2004	LGREEN
1925	pH			1.5 PH	10/12/2004	LGREEN
2955	Total Xylenes			< 0.5 ppb	10/12/2004	LGREEN
2251	Methyl t-butyl ether (MTBE)			< 5.0 ppb	10/12/2004	LGREEN
2993	Bromobenzene			< 0.5 ppb	10/12/2004	LGREEN

APPROVED BY: GJACKSON DATE APPROVED: 10/14/2004 2 WQR

VOLATILES

North Anna ESP Application
ASLB Safety Question No. 48 Response
February 7, 2007

ATTACHMENT 4

Security Tanks well -

ENVIRONMENTAL SYSTEMS SERVICE, LTD.

Page: 1

Work Order #: 59105
Contract #: 00/48
Customer #: 1703
Customer PO #: 70002765

DOMINION GENERATION
ATTN: MR. M. R. BOATWRIGHT
P. O. BOX 402
MINERAL, VA 23117

Job Location:
Collected by: DAVID SHUMWAY
Date Received: 02/28/2006

ANALYSIS REPORT

COMMENT: PWSID# 6061597; METALS ANALYSES PERFORMED BY CHEMICAL SOLUTIONS, LTD.

TAG #:	SAMPLE POINT:	SAMPLE DATE:
54225	P.O.E.	02/27/2006

Description	Result	Unit	Rpt. Limit	Method	Anlys Date	Time	Ini
Alkalinity, Total	43.0	mg/l	2	SM 2320B	03/09/06	10:00	AW
Alkalinity, Bicarbonate	43.0	mg/l	2	SM 2320B	03/09/06	10:00	AW
Alkalinity, Carbonate	<2	mg/l	2	SM 2320B	03/09/06	10:00	AW
Calcium Hardness (CALC.)	25.0	mg/l	0.125	SM 2340 B	03/13/06		JF
Corrosion Index (CALC.)	11.05	N/A	N/A	SM 2330B	03/20/06		TB
Chloride	2.67	mg/l	0.50	SM 4500C1C	03/01/06		PH
Color, Apparent	8	CU	5	SM 2120 A,B	02/28/06	09:25	TB
Conductivity	94.8	umhos/cm	1.0	EPA 120.1	03/03/06	16:05	TA
Fluoride	<0.10	mg/l	0.10	SM 4500FC	02/28/06		PH
Total Hardness	45.1	mg/l	2	SM 2340C	03/14/06		PH
Hydrogen Sulfide	<0.20	mg/l	0.20	EPA 376.2	03/06/06	11:30	AW
Langelier Index	-1.31	N/A	N/A	CALCULATION	03/20/06		TB
pH	8.02	SU	N/A	SM 4500HB	02/28/06	09:31	TA
Orthophosphate, as P	<0.05	mg/l	0.05	SM 4500PE	02/28/06	10:00	PH
Silica, as SiO2	26.2	mg/l	0.05	EPA 200.7	03/05/06	16:00	BLS
Sulfate	<10	mg/l	10	SM 4500SO4D	02/28/06	10:30	AW
Total Dissolved Solids	85.0	mg/l	1.00	SM 2540C	03/01/06	13:25	JI
Total Dissolved Solids, Fixed	57.0	mg/l	1.00	SM 2540E	03/06/06	15:05	JI
Total Dissolved Solids, Volati	28.0	mg/l	1.00	SM 2540E	03/06/06	15:05	JI
Turbidity	0.36	NTU	0.10	SM 2130 B	03/01/06	10:30	TA

Reviewed by: ESS LAB SERVICES

Report Date: March 21, 2006
VA LAB ID# 00115

ENVIRONMENTAL SYSTEMS SERVICE, LTD.

Work Order #: 59105
Contract #: 00/48
Customer #: 1703
Customer PO #: 70002765

DOMINION GENERATION
ATTN: MR. M. R. BOATWRIGHT
P. O. BOX 402
MINERAL, VA 23117

Job Location:
Collected by: DAVID SHUMWAY
Date Received: 02/28/2006

ANALYSIS REPORT

Description	Result	Unit	Rpt. Limit	Method	Anlys Date	Time	Init
Aluminum, Total Recoverable	<0.005	mg/l	0.005	EPA 200.8	03/09/06		SB
Arsenic, Total Recoverable	<0.003	mg/l	0.003	EPA 200.8	03/09/06		SB
Barium, Total Recoverable	0.021	mg/l	0.005	EPA 200.8	03/09/06		SB
Beryllium, Total Recoverable	<0.002	mg/l	0.002	EPA 200.8	03/09/06		SB
Cadmium, Total Recoverable	<0.005	mg/l	0.005	EPA 200.8	03/09/06		SB
Chromium, Total Recoverable	<0.005	mg/l	0.005	EPA 200.8	03/09/06		SB
Copper, Total Recoverable	<0.005	mg/l	0.005	EPA 200.8	03/09/06		SB
Iron, Total Recoverable	<0.05	mg/l	0.05	EPA 200.8	03/09/06		SB
Mercury, Total Recoverable	<0.0005	mg/l	0.0005	EPA 245.1	03/09/06		SB
Manganese, Total Recoverable	<0.005	mg/l	0.005	EPA 200.8	03/09/06		SB
Sodium, Total Recoverable	2.6	mg/l	0.05	EPA 200.8	03/13/06		JF
Nickel, Total Recoverable	<0.005	mg/l	0.005	EPA 200.8	03/09/06		SB
Lead, Total Recoverable	<0.005	mg/l	0.005	EPA 200.8	03/09/06		SB
Antimony, Total Recoverable	<0.002	mg/l	0.002	EPA 200.8	03/09/06		SB
Selenium, Total Recoverable	<0.01	mg/l	0.01	EPA 200.8	03/09/06		SB
Thallium, Total Recoverable	<0.002	mg/l	0.002	EPA 200.8	03/09/06		SB
Zinc, Total Recoverable	0.062	mg/l	0.005	EPA 200.8	03/09/06		SB
Nitrite + Nitrate	0.68	mg/l	0.02	SM 4500NO3E	03/02/06	18:00	LMG

Reviewed by: _____
ESS LAB SERVICES

Report Date: March 21, 2006
VA LAB ID# 00115

North Anna ESP Application
ASLB Safety Question No. 48 Response
February 7, 2007

ATTACHMENT 5

Table 7
Summary of Groundwater Test Results
North Anna COL
MACTEC Engineering and Consulting, Inc.
Project # 6470-06-1472

Analytical Method →		EPA Method 300.0A [1]						EPA Method 353.1 [1]	EPA Method 350.1 [1]	EPA Method 310.1 [1]	EPA Method 160.1 [1]
Tested Parameters →		Bromide	Chloride	Fluoride	Nitrate [2]	Nitrite [2]	Sulfate [3]	Nitrate/Nitrite as Nitrogen	Nitrogen as Ammonia	Total Alkalinity	Total Dissolved Solids
Sample ID	Sample Date										
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
OW-901	11/16/2006	<0.25	8.8	0.12	0.13	0.30	2.1	0.19	0.14	74.0	133
OW-945 [4]	11/17/2006	<0.25	0.93	<0.10	<0.02	<0.02	0.52	<0.05	<0.05	<5.0	11.0
OW-946	11/28/2006	<0.25	1.5	0.027 B,J	NT	NT	0.69	0.065	<0.05	22.0	64.0
OW-947 [4]	11/17/2006	<0.25	1.9	0.049 B	0.92	<0.02	2.1	0.97	<0.05	25.0	72.0
OW-949	11/28/2006	<0.25	2.3	0.094 B,J	NT	NT	2.9	0.52	<0.05	38.0	93.0
OW-950	11/16/2006	<0.25	25.3	0.14	0.32	0.13	17.2	0.65	0.14	71.0	162
OW-951 [4]	11/17/2006	<0.25	9.3	0.63	0.25	0.17 B	592	0.39	0.078	184	1090

NOTES:

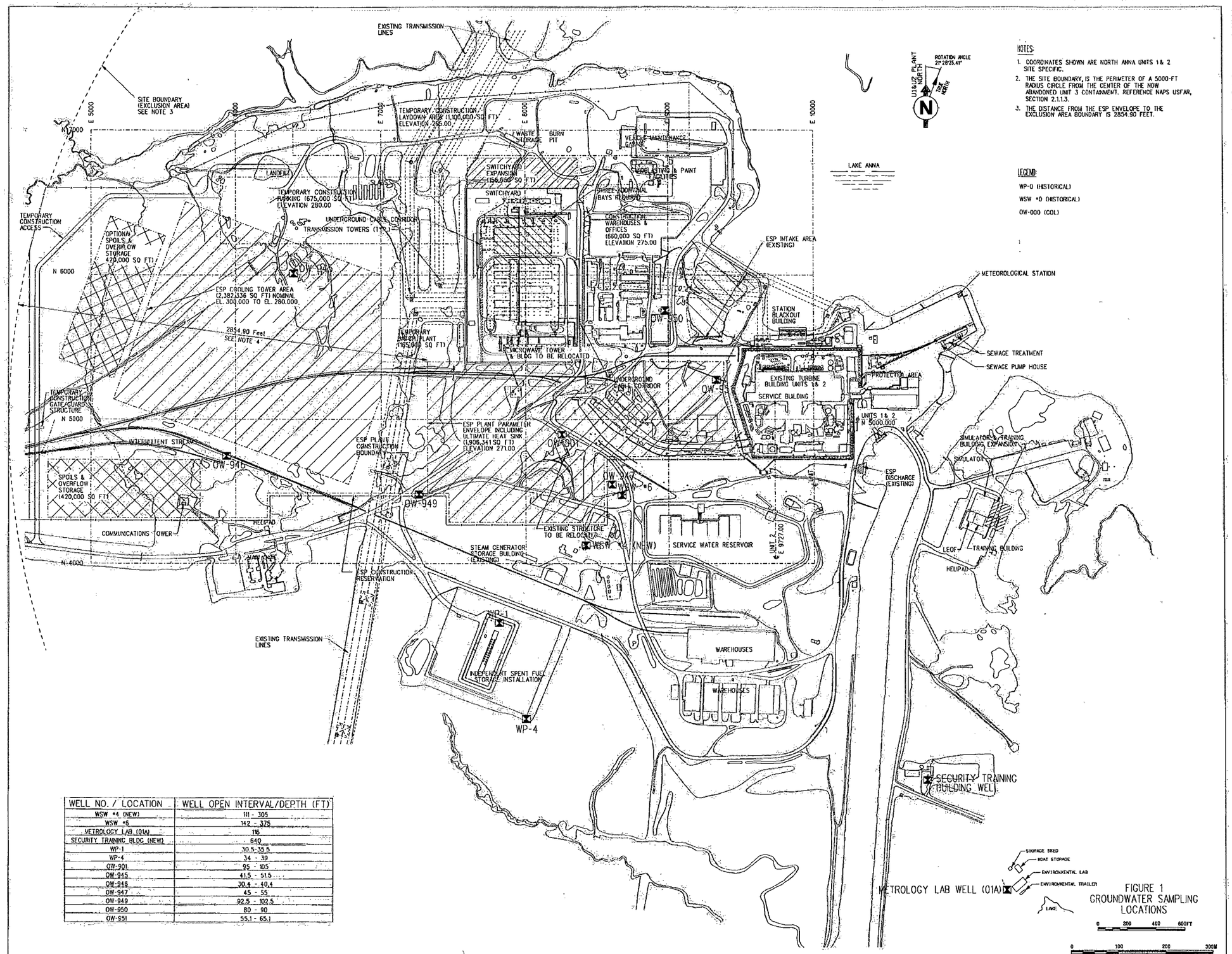
< (value) indicates analyte not detected at or above the referenced Reporting Limit (RL)
B = Estimated Result. Result is less than Reporting Limit
J = Method blank contamination. The associated method blank contains the target analyte at a reportable level
NT = Not Tested

(1) "Methods for Chemical Analysis of Water and Waste", EPA-600/4-79-020, March 1983 and subsequent revisions
(2) These tests not assigned, but were conducted on some samples by the lab in addition to the assigned Nitrate/Nitrite due to these tests having been part of a standard suite of testing.
(3) Sulfate (an assigned test) was accepted as substitute for sulfide (an originally-assigned test); see report text for further discussion.

(4) Anion tests and Nitrogen as Ammonia tests were performed either outside the recommended hold time (Anions) or using a reagent past its expiration date (Ammonia). Review of results and consultation with Dominion and Bechtel through the non-conformance process resulted in a determination that the sample test results are acceptable "as-is". See report text for further discussion.

Prepared by: _____ Date: 1-22-07

Checked by: _____ Date: 1-23-07



WELL NO. / LOCATION	WELL OPEN INTERVAL/DEPTH (FT)
WSW #4 (NEW)	111 - 305
WSW #6	142 - 375
METROLOGY LAB (01A)	116
SECURITY TRAINING BLDG (NEW)	640
WP-1	30.5-35.5
WP-4	34 - 39
OW-901	95 - 105
OW-945	41.5 - 51.5
OW-946	30.4 - 40.4
OW-947	45 - 55
OW-949	92.5 - 102.5
OW-950	80 - 90
OW-951	55.1 - 65.1

FIGURE 1
GROUNDWATER SAMPLING LOCATIONS

ATTACHMENT 6

Additional Radiological Sampling Data

Sample	Date	Sample Media	Nuclide	Value	Units
Domestic Water	05/10/06	Water	H-3	<166	pCi/L
Header of Mat Sumps	05/10/06	Water	H-3	1110	pCi/L
ISFSI Well #1	06/22/06	Water	H-3	<1300	pCi/L
ISFSI Well #1	06/22/06	Water	Gamma Emitters	<MDC	pCi/L
ISFSI Well #1	06/22/06	Water	Sr-89/-90	<MDC	pCi/L
ISFSI Well #4	06/22/06	Water	H-3	<1300	pCi/L
ISFSI Well #4	06/22/06	Water	Gamma Emitters	<MDC	pCi/L
ISFSI Well #4	06/22/06	Water	Sr-89/-90	<MDC	pCi/L
U-1 Mat Sump East	06/27/06	Water	H-3	<725	pCi/L
U-1 Mat Sump South	06/27/06	Water	H-3	<725	pCi/L
U-2 Mat Sump East	06/27/06	Water	H-3	1740	pCi/L
U-2 Mat Sump South	06/27/06	Water	H-3	<725	pCi/L
U-1 Mat Sump East	07/13/06	Water	H-3	476	pCi/L
U-1 Mat Sump South	07/13/06	Water	H-3	1060	pCi/L
U-2 Mat Sump East	07/13/06	Water	H-3	1210	pCi/L
U-2 Mat Sump South	07/13/06	Water	H-3	1180	pCi/L
Header of Mat Sumps	07/13/06	Water	H-3	689	pCi/L
Soil Sample from U-3 Boring	09/03/06	Soil	Gamma Emitters	<MDC	Bq/g
Header of Mat Sumps	11/03/06	Water	H-3	<483	pCi/L
U-1 Mat Sump East	11/10/06	Water	H-3	701	pCi/L
U-1 Mat Sump South	11/10/06	Water	H-3	697	pCi/L
U-2 Mat Sump East	11/11/06	Water	H-3	1430	pCi/L
U-2 Mat Sump South	11/11/06	Water	H-3	764	pCi/L
Aux Bldg GW Monitoring Well	11/11/06	Water	H-3	846	pCi/L
U-2 Valve Pit Ground water	11/13/06	Water	H-3	1880	pCi/L
U-3 Well #901	11/22/06	Water	H-3	<461	pCi/L
U-3 Well #945	11/22/06	Water	H-3	<461	pCi/L
U-3 Well #947	11/22/06	Water	H-3	<461	pCi/L
U-3 Well #950	11/22/06	Water	H-3	<461	pCi/L
U-2 Valve Pit Ground water	11/30/06	Water	H-3	2080	pCi/L
U-3 Well #946	11/22/06	Water	H-3	1610	pCi/L
U-3 Well #949	11/22/06	Water	H-3	<477	pCi/L
U-3 Well #951	11/22/06	Water	H-3	500*	pCi/L
U-1 Mat Sump East	03/02/07	Water	H-3	907	pCi/L
U-1 Mat Sump South	03/02/07	Water	H-3	1080	pCi/L
U-2 Mat Sump East	03/02/07	Water	H-3	654	pCi/L

U-2 Mat Sump South	03/02/07	Water	H-3	785	pCi/L
Header of Mat Sumps	02/16/07	Water	H-3	<470	pCi/L

* Sample reanalyzed (initial count measured at 12,000 pCi/L).

Additional Chemical Monitoring Data

Unit 1 Aux Bldg GW Monitoring Well

Date	Cl, ppm	SO_4, ppm	pH
04/04/06	<100	<100	7.22
12/18/06	137	<100	7.01
03/04/07	102	<100	8.47

Unit 2 Mat Sump

Date	Cl, ppm	SO_4, ppm	pH
04/04/06	<100	<100	7.37
12/18/06	<100	<100	7.12
03/04/07	<100	<100	11.94