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Dominion®

August 10, 2004

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Serial No. 04-348
ESP/JDH
Docket No. 52-008

DOMINION NUCLEAR NORTH ANNA, LLC
NORTH ANNA EARLY SITE PERMIT APPLICATION
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION NO. 6

In its June 1, 2004 letter titled "Request for Additional Information Letter No. 6," the NRC requested additional information regarding certain aspects of Dominion Nuclear North Anna, LLC's (Dominion) Early Site Permit application. This letter contains our responses to the following requests for additional information:

1.3-2, 1.3-3, 2.1.2-1, 2.1.2-2, 2.1.3-1, 2.1.3-2, 13.3-4, 13.3-5, 13.3-6, 13.3-7, 13.3-8, 13.3-9, 15.4-1, 15.4-2, 15.4-3, 15.4-4, 15.4-5, 15.4-6, 17.1-3

It is our intent to update the North Anna ESP application to reflect our responses to these and other RAIs to support issuance of the NRC staff's draft safety and environmental evaluations scheduled for later this year. Planned changes to the application are identified following the response to each RAI.

If you have any questions or require additional information, please contact us.

Very truly yours,

Eugene S. Grecheck
Vice President-Nuclear Support Services

Enclosures: 1. Response to NRC RAI Letter No. 6
2. Revisions to SSAR Section 2.1.3 and ER Section 2.5 in response to RAI 2.1.3-1
3. Revisions to SSAR Section 15.4 in response to RAIs 15.4-2, -3, -5, and -6.

Commitments made in this letter:

1. Revise North Anna ESP application to reflect RAI responses.

cc: U. S. Nuclear Regulatory Commission, Region II
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COMMONWEALTH OF VIRGINIA

COUNTY OF HENRICO

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by Eugene S. Grecheck, who is Vice President, Nuclear Support Services, of Dominion Nuclear North Anna, LLC. He has affirmed before me that he is duly authorized to execute and file the foregoing document on behalf of Dominion Nuclear North Anna, LLC, and that the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 10th day of August, 2004.

My Commission expires: 3/31/08

Maggie McCline
Notary Public

(SEAL)

Enclosure 1

Response to NRC RAI Letter No. 6

RAI 1.3-2 (NRC 6/1/04 Letter)

Please provide the following information regarding Table 1.3-1, Plant Parameters Envelope:

a) Plant parameters envelope (PPE) Section 9.3.2, "Post-Accident," lists 10 CFR Part 20 and 10 CFR Part 50, Appendix I as "Bounding values." Please describe how these "bounding values" were used in the radiological post-accident dose consequences analyses. Also, please add the dose criteria in 10 CFR 50.34(a)(1) as bounding value references or explain why these references are not needed.

b) PPE Section 9.3.2, "Post-Accident," lists items 1, 3, 4, 5, and 7 of Table 1.3-2 as "Bound Notes." Please explain how data from these notes (which refer to bounding values for the AP1000, ABWR/ESBWR, PBMR, ACR-700, and IRIS) were used for the accident analyses, and please provide the values to which these notes refer.

c) PPE Section 10.1.2, "Post-Accident," lists 10 CFR Part 100 as a "bounding value." Please explain how this "bounding value" was used for analyses of the liquid radwaste system. Also, please list the accidents to which this bounding value applies.

d) PPE Section 10.1.2, "Post-Accident," lists items 1, 3, 4, and 5 of Table 1.3-2 as "Bound Notes." Please explain how data from these notes were used for the accident analyses, and please provide the values to which these notes refer.

Response

a) 10 CFR 20 and 10 CFR 50, Appendix I, “Bounding Values” were not used in the Section 9.3.2, “Post-Accident,” analysis performed in support of the ESP application. Those two requirements, dealing with normal releases and ALARA considerations, respectively, were incorrectly cited in the PPE table as relevant to the parameter of interest. The PPE table will be corrected to delete those requirements.

In certain instances, the stated PPE value is an acceptance criterion. Such is the case in this instance. The correct regulatory reference for post-accident dose consequence analysis is 10 CFR 50.34(a)(1). The response to RAI 1.3-1, which will be submitted by separate letter, will provide the regulatory basis for the North Anna ESP, Section 9.3.2, “Post-Accident,” analysis.

b) Section 9.3.2, “Post-Accident,” SSAR Table 1.3-2, “Bound Notes,” indicates that the same NRC requirements were cited by several vendors as applicable to this

parameter. As stated in the response to Part a) above, those references were incorrect and the PPE table will be revised.

c) The "bounding value" of 10 CFR 100 was not used in the Section 10.1.2, "Post-Accident" analysis of the liquid radwaste system for the North Anna ESP application. As will be shown in the response to RAI 1.3-1, there are no evaluated accidents in the ESP application associated with Section 10.1.2.

d) Section 10.1.2, "Post-Accident," SSAR Table 1.3-2 "Bound Notes" data were not used in the analysis performed in support of the North Anna ESP application. As will be shown in the response to RAI 1.3-1, there are no evaluated accidents in the ESP application associated with Section 10.1.2.

Application Revision

SSAR Table 1.3-1 and ER Table 3.1-1, Section 9.3.2, "Post Accident," will be revised to delete references to 10 CFR 20 and 10 CFR 50, Appendix I.

RAI 1.3-3 (NRC 6/1/04 Letter)

Tables 1.3-1 through 1.3-8 in SSAR Section 1.3 reference "bounding values" from various advanced reactor design criteria. Please clarify the relationship between the items in the "bounding values" provided in the tables and references. For example, PPE Section 9.4.3, "Elevation (Post Accident)" in Table 1.3-1 contains an assumption of ground level release. The "Bound Notes" column refers to five different reactor designs. The design control document for one of the designs, the advanced boiling water reactor, does not assume a ground level release.

Response

The Plant Parameter Envelope (PPE) is a compilation of parameters that generally describe a bounding (or limiting) plant design. The PPE is not intended to reflect the design of any single reactor type, but to provide assumed parameters for a reactor that might in the future be built at the ESP site. The assumed parameter values in the PPE were developed from a diverse group of reactor designs, and the "Bounding Value" is the limiting value from those designs. The "Bound Notes" column provides information as to the source of the bounding value and other pertinent information for the parameter.

In the example referenced, Section 9.4.3 describes the bounding elevation of the release point for a post accident (non-routine) release. The Tier 2 Design Control Document for the ABWR, Chapter 15, describes the release path and consequences for a post accident release. Section 15.6.4, Steam System Piping Break Outside Containment, subsection 15.6.4.5.1.2, Fission Product Transport to the Environment, states that the transport pathway is a direct unfiltered release to the environment. This release would bypass the stack filters and would occur through building leakage. This design basis accident is a ground level release.

For this parameter, the more restrictive (or conservative) assumption is a ground level release.

Application Revision

None.

RAI 2.1.2-1 (NRC 6/1/04 Letter)

Please provide the following information regarding Dominion's approach to obtaining appropriate regulatory approvals to purchase or lease the ESP site from Virginia Power and Old Dominion Electric Cooperative should a decision be made to seek a combined license:

a) List regulatory agencies (other than the NRC) from which Dominion would need approval to purchase or lease the ESP site.

b) State whether the ESP site incorporates the entire exclusion area boundary as shown in the SSAR.

c) State the duration of a lease that Dominion would seek should it elect to take that approach.

Response

a) Virginia State Corporation Commission and possibly North Carolina Utilities Commission approval would be required.

b) The current North Anna Power Station Exclusion Area Boundary would continue to be the Exclusion Area Boundary for the existing units and any new units. This single exclusion area includes property that is not part of the ESP site. The use of the current exclusion area for the new units would be established by agreement between Dominion Nuclear North Anna and other NAPS owners.

c) Dominion has not determined a specified term for any lease. However, any lease would provide that 1) the term of the lease would not expire until after termination of all NRC licenses for any facilities on the leased property, and 2) the lease may not be cancelled or terminated, prior to the termination of all NRC licenses for any facilities on the leased property, except with prior written consent of the NRC (e.g., consent in connection with the transfer of licenses under 10 CFR 50.80).

Application Revision

None.

RAI 2.1.2-2 (NRC 6/1/04 Letter)

Please describe how an agreement or conveyance document (e.g., a lease or deed) would provide for the use of the North Anna Power Station site as a single exclusion area in the event additional reactors are constructed there.

Response

Any lease or deed would provide mutual use of the existing site and the leased premises as a single exclusion area and single restricted area for all nuclear units at the North Anna site. Each party would agree to immediately notify the other in the event of an emergency and to abide by the reasonable requests of the party declaring the emergency condition to exclude non-plant personnel and property from the exclusion area. The parties would agree to work cooperatively to control third party activity within the exclusion area and prevent any such activity that might otherwise present an unacceptable hazard to nuclear operations. This approach is consistent with the single exclusion area established by agreement for the Indian Point units (when Units 1 and 2 were owned by the Consolidated Edison Company and Unit 3 was owned by the Power Authority of the State of New York) and for the Nine Mile Point and Fitzpatrick plants.

Application Revision

None.

RAI 2.1.3-1 (NRC 6/1/04 Letter)

SSAR Section 2.1.3 projects population distribution, including transient population, for the low population zone, population center, and population density for the proposed ESP site up to 2040. If the ESP were approved and issued in 2006, and assuming a COL application is submitted near the end of the ESP term with projected start-up of new units in about 2026, and an operational period of 40 years for new units, the projected year for end of plant life is about 2066. Please project population distribution, including transient population, for the low population zone, population center, and population density for the proposed ESP site up to about 2066.

Response

SSAR Section 2.1.3.6 and ER Section 2.5.1.5 provide the following justification for use of the year 2065 for population projections: "Given an approved ESP period of 20 years and an assumed ESP approval date of 2005, the startup of new units is conservatively assumed to be 2025. Assuming an operational period of 40 years for new units, new unit operations could extend until 2065." Population data projected to 2065 is considered to be consistent with the RAI request of "about 2066."

Low Population Zone (LPZ). The LPZ distance for the existing units is specified in Section 2.1.3.4 of the North Anna UFSAR. The LPZ for the existing units is bounded by a 6-mile-radius circle centered at the Unit 1 reactor containment building. The LPZ boundary was established to ensure that the dose limitation requirements of 10 CFR 100.21 and 10 CFR 50.34 are met. The LPZ for the ESP site is the same as the LPZ for the existing units as described in SSAR Section 2.1.3.4. A 6-mile-radius circle centered at the Unit 1 containment building defines the LPZ for the ESP site. The population distribution analysis is based on the 2000 Census and for projections through the Year 2065. The 6-mile radius LPZ falls within the 8-10 km (5-6.2 mile) range. For reporting purposes, the LPZ is represented by the population enclosed within the 10-km distance circle (Reference SSAR Section 2.1.3.4).

Population Center. Based on the 2000 Census data, and for population projections up to the Year 2065, analysis shows that no population center with more than 25,000 residents would exist within approximately 16 km from the reactor. This meets the criterion that the population center distance should be at least one and one third times the distance to the outer boundary of the LPZ [13.33 km based on the 10 km distance to the LPZ].

Population Density. Based on 2000 Census data, and for population projections up to the Year 2065, the weighted population density, including transient population, would be less than 500 persons per square mile for any radial distance out to 20 miles. This meets the Regulatory Guide 4.7 criteria for population density.

Application Revision

See Enclosure 2 for changes to SSAR Section 2.1.3 and ER Section 2.5.

RAI 2.1.3-2 (NRC 6/1/04 Letter)

Please describe appropriate protective measures that could be taken on behalf of the populace in the low population zone in the event of a radiological emergency.

Response

In the event of a radiological emergency, the plant staff would analyze conditions, classify the event, and notify Commonwealth of Virginia and local authorities. They would formulate protective action recommendations, as appropriate, and provide those to the Virginia Emergency Operations Center. The Commonwealth of Virginia would make a protective action decision and notify the affected populace as described in SSAR Section 13.3.2.2.2.e.3. The protective action decisions would apply to the populace within the Low Population Zone, which is included within the plume exposure pathway emergency planning zone described in SSAR Section 13.3.2.2.1.1.

Application Revision

None.

RAI 13.3-4 (NRC 6/1/04 Letter)

SSAR Section 13.3.2.2.2.c.2 (Radiological Laboratories) lists five radiological count laboratory resources, and states that "If required at the time of the event, these additional resources can be obtained through purchase agreements with private institutions" [emphasis added]. In North Anna Emergency Plan (NAEP) Section 5.3.2 (Vendor and Contractor Support), the same five radiological count laboratory resources are listed, and the comparable sentence reads "If required at the time of the event, additional resources can be obtained through purchase agreements with private institutions." Please explain the differences in these statements.

In addition, please identify the general capabilities of: (1) the University of Virginia, Charlottesville, VA; (2) the Virginia Commonwealth Laboratories, Richmond, VA; and (3) Newport News Shipbuilding & Drydock, Newport News, VA, to provide radiological monitoring and analysis services during an emergency, in support of the ESP site.

Response

No difference was intended. It was not the intent of SSAR Section 13.3.2.2.2.c.2 to refer to purchase agreements with private institutions exclusive of those listed nor was it the intent of North Anna Emergency Plan (NAEP) Section 5.3.2 to imply that such purchase agreements would be executed with private institutions listed only. Rather the list of private institutions is a sampling of relatively nearby sources of assistance. As appropriate, should such assistance ever be needed, then assistance would be procured in a timely manner from any available source.

The general capabilities for providing radiological monitoring and analysis services during an emergency in support of the ESP site by: 1) the University of Virginia, Charlottesville, VA; 2) the Virginia Commonwealth Laboratories, Richmond, VA; and 3) Newport News Shipbuilding & Drydock, Newport News, VA are described below.

The University of Virginia (UVa) is a major university that encompasses a vast complex of schools, a level-one trauma center and teaching hospital, research facilities, as well as arts and athletic venues. It is one of the top five schools in the country among public universities. UVa is a 1.2 billion dollar a year business which employs over 11,000 faculty and staff in the areas of Information Technology, Engineering, Research and Development, Business, Finance, Administration, Public Relations, Athletics, and Facilities Management. The UVa Office of Environmental Health and the Radiation Safety Office manage all aspects of the use of radioactive materials and radiation producing equipment at UVa. The Radiation Safety Office responsibilities extend to the hospital, medical school research and academic areas. In order to meet these responsibilities the Radiation Safety Office controls and monitors radiation exposures to employees exposed to radiation during their work, calibrates radiation survey

instruments and conducts radiation surveys. The UVa Medical Center consists of an integrated network of primary and specialty care services ranging from wellness programs and routine checkups to the most technologically advanced care. In addition, the Department of Physics at UVa has experimental and theoretical research programs in atomic physics, condensed matter physics, nuclear and particle physics, and high energy physics, as well as experimental programs in gravitational physics and biological physics. The Physics Department and the Institute of Nuclear and Particle Physics support some of the leading research groups in this basic area of physics.

The Virginia Commonwealth Laboratories, also known as the Commonwealth of Virginia Department of General Services Division of Consolidated Laboratory Services (DCLS), provide analytical testing services. DCLS may be called on to respond to various health and environmental emergencies in Virginia. Its Bureau of Analytical Services performs analytical testing for state regulatory, environmental, and public health programs. Laboratories are located in Richmond and Abingdon, Virginia. Water, sediment, tissue, air, soil, and other samples may be analyzed for the presence of metals and/or radiation by the its Metals/Radiochemistry Group.

Newport News Shipbuilding and Dry Dock, also known as Northrop Grumman Newport News, is the nation's sole designer, builder and refueler of nuclear-powered aircraft carriers and one of only two companies capable of designing and building nuclear-powered submarines. Accordingly, staff and facilities necessary to support radiological survey, monitoring and analysis functions are part of the organization. Newport News Industrial (NNI), an unincorporated division of Northrop Grumman Newport News, has provided services to more than half of the country's nuclear utilities and to scores of fossil fuel and hydroelectric plants, refineries, chemical plants, and paper mills. NNI is primarily skilled in valve and boiler water circulating pump services, but also involved with maintenance and repair of turbines, diesels, heat exchangers, and condensers as well as modifications and repair of major piping and electrical systems.

Application Revision

None.

RAI 13.3-5 (NRC 6/1/04 Letter)

Please describe the specific provisions (i.e., the "means" referred to in SSAR Section 13.3.2.2.2.f) for communications with contiguous State and local governments within the 10-mile and 50-mile emergency planning zones (EPZs), and with Federal emergency response organizations. In addition, please describe the extent to which existing site communications will be utilized.

Response

The North Anna Emergency Plan (NAEP) describes provisions for communications at the plant site as they currently exist. These include an Insta-Phone hot loop between the licensee, the Virginia Emergency Operations Center, and the risk jurisdiction warning points. In addition, there is a direct automatic ringdown circuit between the licensee and the Virginia Emergency Operations Center, and both private branch exchange and off-premises exchange access to the public switched network. Existing site communications may be used to support new units. However, it is premature to identify the specific extent to which these capabilities might be used in support of new units at the ESP site since equivalent or superior means may become available due to technological advancements in the future. Thus, without specifying the technology, Dominion would ensure that means would be provided for communicating with contiguous State and local governments within the 10-mile and 50-mile emergency planning zones (EPZs) described in SSAR Section 13.3.2.2.1.1, and with Federal emergency response organizations that meet regulatory requirements.

Application Revision

None.

RAI 13.3-6 (NRC 6/1/04 Letter)

SSAR Section 13.3.2.2.2.j.1 (Evacuation of Onsite Individuals) states that onsite evacuees would use personal vehicles for transportation to emergency assembly areas, and references the North Anna Emergency Plan (NAEP). NAEP Section 6.3.2 (Onsite Criteria for the Exclusion Area) states that evacuees *may* use personal vehicles. Please explain the differences between these statements. In addition, please describe the transportation to emergency assembly areas for any onsite individuals who do not have their personal vehicle available onsite.

Response

No difference was intended. It was not the intent of SSAR Section 13.3.2.2.2.j.1 to commit that onsite evacuees would use only personal vehicles for transportation to emergency assembly areas nor was it the intent of NAEP Section 6.3.2 to imply that some evacuees would be transported by other than personal vehicles. There is not now, nor is it anticipated that there would be, public transportation to the ESP site. It is anticipated that should onsite individuals not have their personal vehicle available onsite, then they would travel as passengers in personal vehicles driven by others. This approach is currently implemented at the existing units.

Application Revision

None.

RAI 13.3-7 (NRC 6/1/04 Letter)

SSAR Section 13.3.2.2.2.j.2 (Protective Action Recommendations) describes the bases for making protective action recommendations, and SSAR Section 13.3.2.2.2.d (Emergency Classification System) describes the timing for providing the recommendations, and how the emergency action levels would be used in determining the type and timing of protective measures to consider.

Please describe the mechanism for recommending protective actions to the appropriate State and local authorities, including how EALs would be used to determine protective action recommendations (e.g., sheltering, evacuation, use of potassium iodide/KI), consistent with EPA 400-R-92-001 (Manual of Protective Action Guides and Protective Actions for Nuclear Incidents). Describe how those recommendations would be provided to the appropriate State and local authorities. Describe how changes to, or termination of, protective action recommendations would be provided to State and/or local authorities.

Response

10 CFR 50.47(b)(10) states in part that guidelines for the choice of protective actions during an emergency, consistent with federal guidance, are developed and in place. Supplement 3, Criteria for Protective Action Recommendations for Severe Accidents, to NUREG-0654/FEMA-REP-1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants," which was issued for interim use and comment, contains the current federal guidance. Additional guidance is provided by EPA 400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Accidents (EPA 400), dated May 1992. It should be noted that within the past year the Commission directed the NRC staff to evaluate this guidance to assure that it continues to reflect the current state of knowledge with regard to evacuation and sheltering and to update the guidance as necessary. Accordingly, on June 29, 2004, a statement of work (Job Code: J3162) was issued by NRC to have NUREG-0654, Supplement 3, "Criteria for Protective Action Recommendations for Severe Accidents" reviewed. Therefore, the response to this RAI is provided with the understanding that, in the context of the North Anna ESP application, federal guidance may change before it would become applicable.

In the event of a radiological emergency, the plant staff would analyze conditions and classify the event using the EALs discussed and agreed upon with offsite authorities and approved by the NRC pursuant to the requirements of 10 CFR 50 Appendix E. It is anticipated that protective action recommendations would be formulated coincident with General Emergency conditions only. In most cases, the initial protective action recommendation would be made without benefit of dose assessment results, that is, based on plant conditions leading to classification of the General Emergency. If there was a controlled release of radioactive material from the containment, with assurance that the release would be short term (puff release) and the area near the plant could not

be evacuated before the plume would arrive, then a sheltering protective action recommendation might be issued. However, in most cases, it is anticipated that the recommendation would be to evacuate areas within about five miles in all directions. If dose projections or offsite monitoring results indicate evacuation dose thresholds of 1 Rem Total Effective Dose Equivalent or 5 Rem Thyroid Committed Dose Equivalent are exceeded to a distance not previously evacuated, then a protective action recommendation to evacuate the affected area(s) would be issued accordingly. Revision of any protective action recommendation would include consideration of actions taken in response to previous protective action recommendations.

The Commonwealth of Virginia has elected to address use of potassium iodide (KI) as a supplemental protective action for the general public in its plans. Accordingly, a recommendation for the Commonwealth to implement their potassium iodide strategies for the general public would be issued if the projected dose at or beyond the site boundary is equal to or greater than 5 Rem Thyroid Committed Dose Equivalent.

Initial protective action recommendations and any changes are formally communicated directly to the Commonwealth of Virginia Emergency Operations Center (EOC) using a dedicated automatic ringdown circuit. In case of instrument failure, a commercial telephone would be used as a back-up communications path. The Commonwealth of Virginia would make a protective action decision and notify the affected populace as described in SSAR Section 13.3.2.2.2.e.3.

Termination of protective action recommendations would be discussed with the Commonwealth of Virginia prior to issuance to ensure it would have no adverse effect on offsite response actions.

Application Revision

None.

RAI 13.3-8 (NRC 6/1/04 Letter)

Please discuss the extent to which the ESP application is intended to address Evaluation Criteria V.H.l and V.H.2 of Supp. 2 to NUREG-0654/FEMA-REP-1 for the TSC, OSC, and EOF; including addressing NUREG-0696. If the application is intended to address these criteria, please provide additional information to address the applicable NUREG-0696 criteria. Please state whether or not Dominion intends to utilize the existing TSC, OSC, and EOF, which support North Anna Units 1 & 2, for the ESP site. If so, provide information consistent with Evaluation Criteria V.H.l and V.H.2 of Supp. 2 regarding the impact of the new reactors on these facilities.

Response

The SSAR addresses NUREG-0654/FEMA-REP-1, Supplement 2, Evaluation Criteria V.H.1 and V.H.2, to the extent that the applicant would make provisions for emergency facilities and equipment to support an emergency response, specifically, a Technical Support Center (TSC), an Operations Support Center (OSC) and an Emergency Operations Facility (EOF) that satisfy the functions described in SSAR Section 13.3.2.2.2.h, sub-sections 1 through 3. NUREG-0654/FEMA-REP-1, Supplement 2, Evaluation Criteria V.H.1 and V.H.2 are similar to NUREG-0654/FEMA-REP-1, Evaluation Criteria II.H.1 and II.H.2, in that both references refer to facilities in accordance with NUREG-0696. However, NUREG-0654/FEMA-REP-1, Revision 1, was published in November 1980, three months before NUREG-0696 was issued in final form. SECY memorandum S81-19, dated February 19, 1981, provided Commission approval of NUREG-0696 as general guidance only. NRC Generic Letter No. 81-17, Functional Criteria for Emergency Response Facilities (NUREG-0696), dated March 5, 1981, advised licensees that the Commission had approved NUREG-0696, but clarified that:

- It provided general guidance only
- It was an acceptable way to meet the NRC rules and regulations
- Compliance with NUREG-0696 was not a requirement
- It would be used by the NRC staff to evaluate conceptual design submittals for adequacy

NUREG 0737, Supplement 1, Clarification of TMI Action Plan Requirements, Requirements for Emergency Response Capability, issued via NRC Generic Letter 82-33 on December 17, 1982, specifically indicated that NUREGs referenced therein were not to be "misconstrued as requirements to be levied on licensees or as inflexible criteria to be used by staff reviewers." Therefore, while NUREG-0696 was used as a reference when the descriptions in SSAR Section 13.3.2.2.2.h, sub-sections 1 through 3, were written, it is not necessary or appropriate to provide additional information addressing NUREG-0696 criteria at this time. A description of the TSC would be included in the COL application. The COL application would also include descriptions of

the conceptual designs for an OSC and EOF. Because the details of TSC, OSC, and LEOF would differ based on the reactor design selected at COL, Dominion has not made a decision at this time whether to use the existing facilities to support new units.

Application Revision

None.

RAI 13.3-9 (NRC 6/1/04 Letter)

SSAR Section 13.3.2.1 (Identification of Physical Characteristics) states that (1) physical characteristics unique to the ESP site have been analyzed to determine whether they could pose a significant impediment to the development of emergency plans; (2) a preliminary analysis of evacuation times has been used to identify these characteristics, including seasonal recreation visitors around the lake, school populations, etc.; and (3) a description of the analysis methods and results is provided in the most recent Evacuation Time Estimate (ETE) for North Anna.

Please state whether any physical characteristics unique to the proposed ESP site were, or were not, identified from the ETE, or any other source/analysis, that could pose a significant impediment to the development of emergency plans for the ESP site. If such physical characteristics were identified, please provide a discussion and detailed analysis that addresses the physical characteristics of concern, including how they could pose a significant impediment to the development of emergency plans for the ESP site.

Response

No physical characteristics unique to the North Anna ESP site were identified that could pose a significant impediment to the development of emergency plans for the ESP site. The evacuation time estimate submitted with the SSAR (Reference No. 42 in SSAR Section 13.3) identified no areas of congestion during the evacuation analyses.

Application Revision

None.

RAI 15.4-1 (NRC 6/1/04 Letter)

SSAR Section 15.4 states that the site-specific doses were calculated by multiplying the design certification doses by the ratio of the site χ/Qs to design certification χ/Qs. The SSAR shows the χ/Qs for the AP1000 design for the exclusion area boundary (EAB) and low population zone (LPZ). Westinghouse has revised its χ/Qs in the AP1000 design certification control document since submittal of the North Anna ESP application. Please use the χ/Qs in the most recent Westinghouse AP1000 Design Control Document (dated April 26, 2004), and, based on the AP1000 χ/Qs, provide the site-specific doses and fission product releases for all design basis accidents (DBAs) in SSAR Chapter 15. If you elect not to use the updated values in the accident analysis, please so state.

Response

The ESP application uses the χ/Qs from Revision 2 of the Westinghouse AP1000 Design Control Document. This was the most recent complete revision of the document at the time the application was submitted. Since the AP1000 design is still in the process of being certified, the χ/Qs may change again before the certification is completed. Dominion elects not to update to the latest χ/Qs in the ESP application. Site-specific doses would be updated, as necessary, in the COL application, after a specific reactor design has been selected.

Application Revision

None.

RAI 15.4-2 (NRC 6/1/04 Letter)

SSAR Section 15.4 states that for the ABWR design, an equivalent total effective dose equivalent (TEDE) value is estimated by multiplying the thyroid dose by 0.03 and adding the product to the whole body dose. The results of this calculation are shown in Table 15.4-1. Please explain how this dose compares to that for the General Electric ABWR design, which is certified with the thyroid and whole body doses specified in 10 CFR Part 100.

Response

In response to RAI 15.4-3, the SSAR will be revised to show the thyroid and whole body doses from the ABWR design certification document in addition to the estimated TEDE value. In presenting the ESP site doses, the thyroid and whole body doses are converted to TEDE in order to demonstrate compliance with the acceptance criteria in 10 CFR 50.34(a)(1).

Application Revision

See Enclosure 3 to this letter for changes to the tables in SSAR Section 15.4.

RAI 15.4-3 (NRC 6/1/04 Letter)

Several tables in SSAR Section 15.4 present doses for ABWR design basis accidents in TEDE units (e.g., Table 15.4-12). Since the General Electric ABWR design is certified with thyroid and whole body doses, please provide thyroid and whole body doses for ABWR design basis accidents.

Response

The ABWR dose tables in Section 15.4 will be revised to show the thyroid and whole body doses from the design certification document as well as the equivalent TEDE value.

Application Revision

See Enclosure 3 to this letter for changes to SSAR Tables 15.4-12, 15.4-18, 15.4-19, 15.4-23, and 15.4-27.

RAI 15.4-4 (NRC 6/1/04 Letter)

Several tables in SSAR Section 15.4 present the time-dependent activity releases for each design basis accident (e.g., Table 15.4-13). Please provide the references and the methodology used to determine the time-dependent activity release values in these tables. Also, please ensure the values in these tables appropriately reflect the AP1000 design χ/Qs as discussed in RAI 15.4-1.

Response

The references and methodology used to determine activity release values were provided in the response to RAI E7.1-3 in Dominion's May 17, 2004 letter to the NRC, Serial No. 04-170.

As explained in the response to RAI 15.4-1, Dominion has elected not to revise the AP1000 χ/Qs in the application to reflect the latest values.

Application Revision

None.

RAI 15.4-5 (NRC 6/1/04 Letter)

SSAR Table 15.4-1 summarizes the resulting doses at the ESP site for postulated design basis accidents using AP1000 and the ABWRs as surrogate designs. For each design basis accident, please provide (1) AP1000 and ABWR doses used for the exclusion area boundary (EAB) and low population (LPZ), and (2) the ratios of site-specific χ/Qs to design certification χ/Qs used.

Response

The dose tables in SSAR Section 15.4 will be revised to show the χ/Qs and doses from the AP1000 and ABWR design certification documents as well as the ratios of site-specific χ/Qs to design certification χ/Qs.

Application Revision

See Enclosure 3 to this letter for changes to the tables in SSAR Section 15.4.

RAI 15.4-6 (NRC 6/1/04 Letter)

Several tables in SSAR Section 15.4 present doses for AP1000 design basis accidents. Please clarify whether the 0- to 2-hour EAB doses are for the 2-hour period with the greatest EAB doses. If they are not, please provide the doses for the 2-hour period with the greatest EAB doses.

Response

The greatest EAB dose occurs during the first two hours of the accident for all AP1000 accidents evaluated in SSAR Section 15 except for the Loss-of-Coolant Accident (LOCA). As indicated in Section 15.6.5.3.8.1 of the AP1000 Design Control Document, the period from 1 to 3 hours yields the greatest EAB dose for a LOCA. SSAR Table 15.4-21 will be revised to reflect this time period.

Application Revision

See Enclosure 3 to this letter for changes to SSAR Table 15.4-21.

RAI 17.1-3 (NRC 6/1/04 Letter)

Please provide copies of the following documents:

a) Quality Assurance Program Plan (QAPP)," Bechtel Document Number: 24830-001-GAQ-00001-001, dated August 5, 2003

b) "Bechtel Nuclear Quality Assurance Manual," Revision 4, dated November 1, 2002

Response

Because they contain proprietary information, copies of the Bechtel Quality Assurance Program Plan and Nuclear Quality Assurance Manual were submitted by separate letter dated August 10, 2004 (Serial No. 04-481).

Application Revision

None.

Enclosure 2

Revisions to SSAR Section 2.1.3 and ER Section 2.5
For Response to RAI 2.1.3-1

The following changes to the SSAR and ER include those as a result of the response to RAI 2.1.3-1 and corrected and updated population figures. On May 13, 2004, Dominion advised the NRC of population figure errors and of our intent to correct those errors in a subsequent revision.

SSAR Sections 2.1.3, 2.1.3.1, and 2.1.3.2 will be revised to read as follows:

2.1.3 **Population Distribution**

The population distribution surrounding the ESP site, up to an 80-kilometer (50-mile) radius, has been estimated, based on the most recent United States Census Bureau decennial census data (Reference 4). The population distribution encompasses 9 concentric rings at 2 km (1.2 mi.), 4 km (2.5 mi.), 6 km (3.7 mi.), 8 km (5.0 mi.), 10 km (6.2 mi.), 16 km (10 mi.), 40 km (24.9 mi.), 60 km (37.3 mi.), and 80 km (50 mi.), and 16 directional sectors. The projected population estimates for Years 2010, 2020, 2030, 2040, and 2065 have been calculated with a formula adopted from the Weldon Cooper Center for Public Service (Reference 6) using the 1990 Census and 2000 Census data as the base.

2.1.3.1 **Resident Population Within 10 Miles**

Figure 2.1-2 shows the general locations of the municipalities and other features within 10 miles (16 kilometers) of the ESP site. According to the 2000 Census survey, Mineral, which has a population of 424 located within about 1 square mile (incorporated), is the largest community within 10 miles of the site (Reference 4). As reported in NAPS Updated Final Safety Analysis Report (UFSAR) (Reference 3, Section 2.1.3.1), the population in 1990 was 452. Therefore, the population of Mineral has remained constant during the past decade.

The population distribution within 10 miles of the site has been computed by overlaying the 2000 Census block points data (the smallest unit of census data) (Reference 4) on the grid shown on Figure 2.1-2, and summing the population of the census block points falling in each of the polar sectors comprising the grid. The census block-point summation and allocation has been accomplished using the Landview 5 (LV5) software, operating directly on census data, and the MARPLOT mapping software (Reference 5). The system can display Census 2000 demographic data, jurisdictional entities and many statistical entities of the U.S. Census Bureau. It can also calculate Census 2000 population, racial distribution, census block count and housing unit count within a user-defined radius. Using MARPLOT, the grid system was created as shown on Figure 2.1-2. LV5 was designed to summarize the population distribution and other information, once the user selected an area of interest within the grid system. The entire grid system is evenly divided into sixteen directions, each direction consisting of 22.5 degrees.

The population distributions and related information were collected and the results tabulated in all distances of interest for all sixteen directions. In order to generate more accurate counts, census block points were used in LV5 to calculate population distributions. The LV5 results show that the Year 2000 resident population within 10 km (6 miles) and 16 km (10 miles) of the ESP site were 5,890 and 15,511 persons, respectively.

Population projections for the area within 10 miles of the ESP site up to 65 years from the 2000 Census were developed. The formula used for average annual growth (percentage of growth) is adopted from Reference 6. The Weldon Cooper Center for Public Service group has performed the 2001 provisional population estimates for the Commonwealth of Virginia.

$$\text{Annual Average Growth} = \frac{\text{Log}_{10}(\text{Population}_{2000}/\text{Population}_{1990})}{(2000-1990)\times 0.4342945}$$

The 1990 population within each county and city considered in Virginia and Maryland were also obtained from the U.S. Census Bureau (Reference 12). The same formula also is used for projection of the transient population up to the Year 2065. The 16km (10-mile) resident and transient population for Year 2000 is shown in Figure 2.1-4. The resident and transient 16km (10-mile) population projections for the years 2010, 2020, 2030, 2040, and 2065 are given in Figure 2.1-5 through Figure 2.1-8A.

2.1.3.2 Resident Population Between 10 and 50 Miles

The 50-mile (80-km) radius centered at the ESP site covers thirty counties and four cities in Virginia and one county in Maryland. The Town of Louisa is located approximately 12 miles to the west of the ESP site. The population of the town has increased from 1088 (Reference 12) to 1401 (Reference 2, Section 2.2.8.5) between 1990 and 2000. Estimates of the Year 2000 resident population from within 10 miles to 50 miles from the ESP site were computed using the same methodology used to develop the 10-mile population distribution.

The population grid from 10 to 50 miles is shown on Figure 2.1-3 and the 50-mile population distribution for Year 2000 is shown on Figure 2.1-9.

Population projections for the area between 10 and 50 miles for the years 2010, 2020, 2030, 2040, and 2065 are based on the same methodology as the 10-mile projections. These population projections are given in Figure 2.1-10 through Figure 2.1-13A, respectively.

Besides the thirty counties within Virginia, the 50-mile radius from the ESP site also encompasses a portion of Charles County, Maryland. The population portion

within that 50-mile radius for Charles County, which at its closest point is 37 miles northeast of the site, is 9,270 based on the 2000 Census data.

The last paragraph of SSAR Section 2.1.3.3.1 will be revised to read as follows:

Transient population within 10 miles of the ESP site when combined with the resident population in that same area for Year 2000 and for projected Years 2010, 2020, 2030, 2040, and 2065 are presented in Figure 2.1-4 through Figure 2.1-8A.

The last paragraph of SSAR Section 2.1.3.3.2 will be revised to read as follows:

Transient population between 10 and 50 miles of the ESP site when combined with the resident population in that area for Year 2000 and for projected years 2010, 2020, 2030, 2040, and 2065 are presented in Figure 2.1-9 through Figure 2.1-13A.

SSAR Sections 2.1.3.4 and 2.1.3.5 will be revised to read as follows:

2.1.3.4 **Low Population Zone**

The Low Population Zone (LPZ) for the ESP site is the same as the LPZ for the existing units. As shown in Figure 2.1-2, a 6-mile-radius circle centered at the Unit 1 containment building defines the LPZ. Design basis accidents (DBAs) are evaluated in Chapter 15 to demonstrate that doses at the LPZ are within the dose limits of 10 CFR 100.21(c). Exposure of individuals to radiation in the LPZ would be within the limits established in 10 CFR 50.34(a)(1)(ii).

The resident and transient population distribution within the LPZ is indicated in Figure 2.1-4 through Figure 2.1-8A, based on the 2000 Census and projections through Year 2065. These figures use an increment of 2 km for distances within a 10-km radius of the ESP site. The 6-mile radius LPZ falls within the 8-10 km (5-6.2 mi.) range. For reporting purposes, the LPZ population is represented by the population enclosed within the 10-km distance circle.

In summary, the LPZ resident and transient population for Year 2000 and the projected population through Year 2065 are as follows:

Year	Population
2000	16,705
2010	22,841
2020	28,978
2030	35,112
2040	41,247
2065	56,588

The only school in the LPZ is Livingston Elementary, which is located in Spotsylvania County, 5.7 miles to the north-northeast of the ESP site. Schools within 10 miles of the ESP site are listed in Table 2.1-3 (Reference 8) (Reference 9).

As demonstrated in the previous section, the only significant source of transient population within 10 miles is recreational use of Lake Anna. Since most of the lake area falls within the LPZ, almost the entire estimated peak transient population within 10 miles could be in the LPZ.

Considering the available road network leading from the LPZ, together with the availability of private as well as public vehicles, there is reasonable assurance that these populations could be evacuated in a timely manner in the event of a design-basis accident.

2.1.3.5 Population Center

The nearest population center to the ESP site with more than 25,000 residents is the City of Charlottesville, with a 2000 Census population of 45,049 (Reference 4). The closest point of Charlottesville to the site is 36 miles west. The next closest potential population center is Fredericksburg, which is 22 miles northeast of the ESP site. Fredericksburg has a projected Year 2065 population of about 20,950. The distance to Fredericksburg is well in excess of the minimum population center distance required by 10 CFR 100.

The 2nd and 3rd paragraphs of SSAR Section 2.1.3.6 will be revised to read as follows:

Figure 2.1-14 shows the actual cumulative populations in Year 2000 and projected cumulative population in Year 2065 as a function of 10-mile to 50-mile radial distances from the site. On the same figure, population density curves,

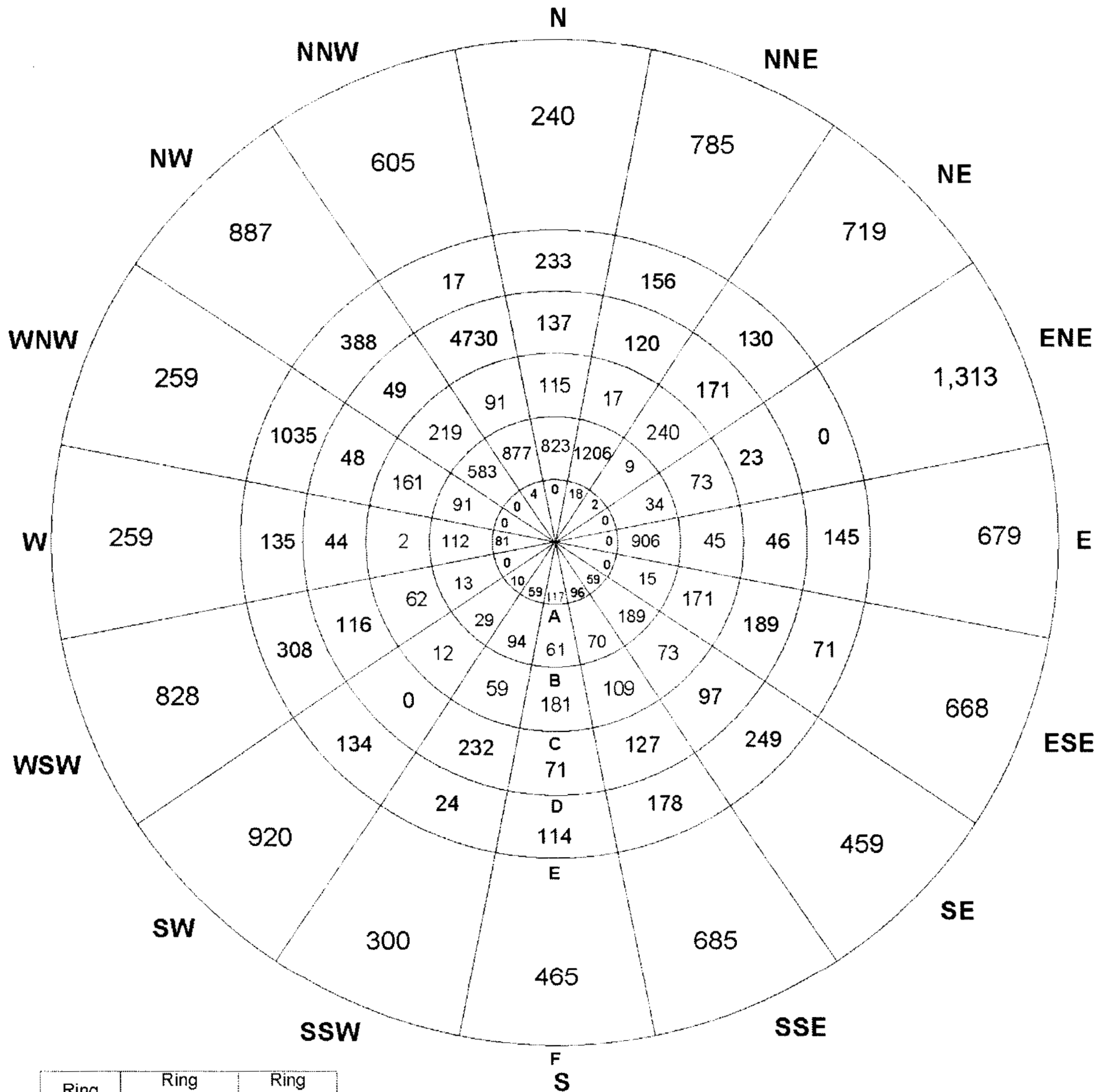
spanning the same radial distances, are shown for 500 persons per square mile, and 1000 persons per square mile.

By inspection of the curves for actual population densities of Year 2000 and Year 2065 projections, it is concluded that at the time of initial site approval and within about 5 years thereafter, the population densities, including weighted transient population, averaged over any radial distance out to 20 miles (cumulative population at a distance divided by the circular area at that distance), would not exceed 500 persons per square mile. The results conform to the guidance in RG 4.7, Regulatory Position C.4 (Reference 10).

Reference 12 of SSAR Section 2.1 References will be revised to read as follows:

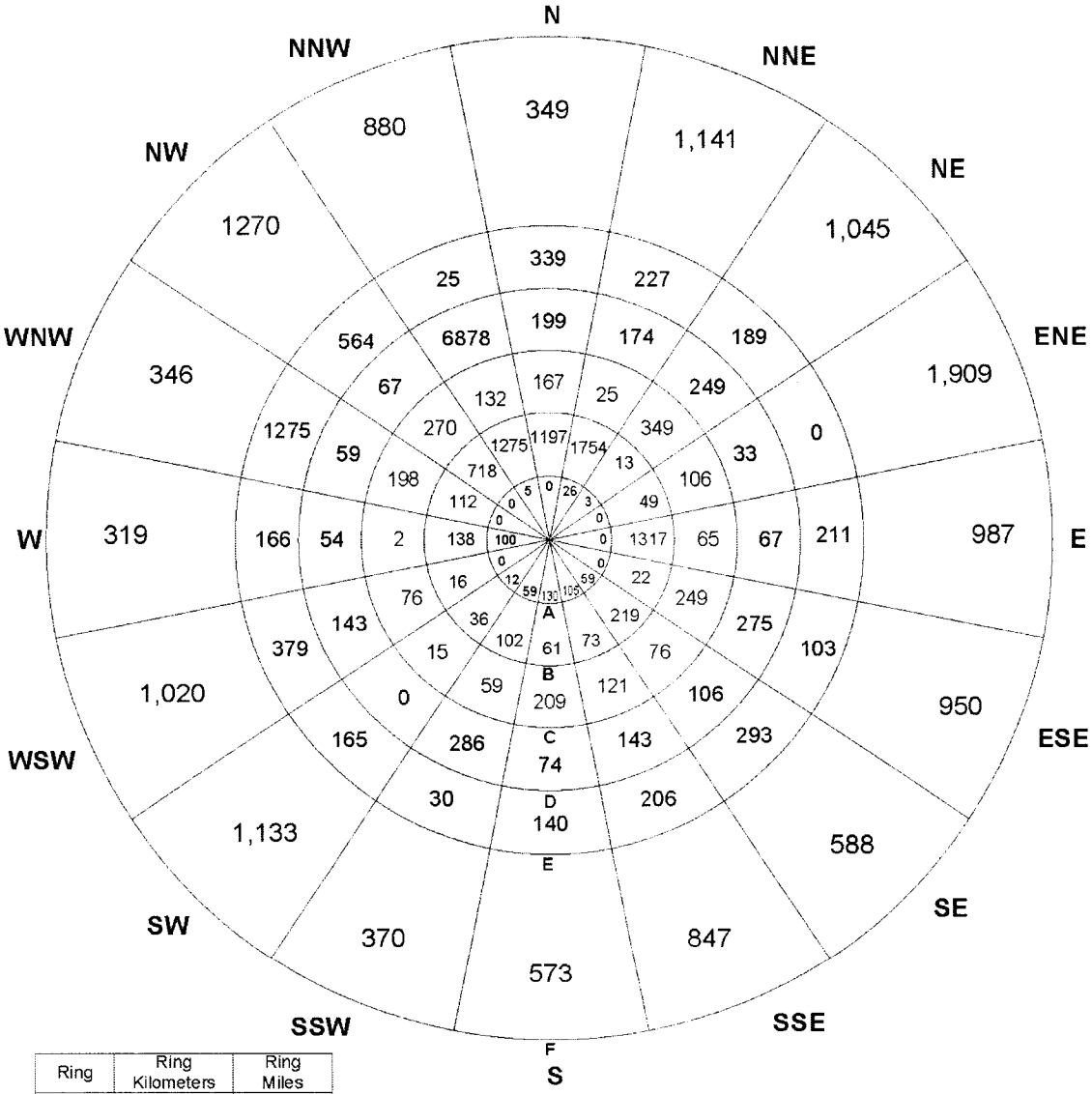
12. U.S. Department of Commerce, Bureau of the Census, 1990 Census of Population, website, www.census.gov/main/www/cen1990.html, accessed October 1, 2002.

As shown on the following pages, new SSAR Figures 2.1-8A and 2.1-13A will be added and Figures 2.1-4, 2.1-5, 2.1-6, 2.1-7, 2.1-8, 2.1-10, 2.1-11, 2.1-12, 2.1-13, and 2.1-14 will be revised.



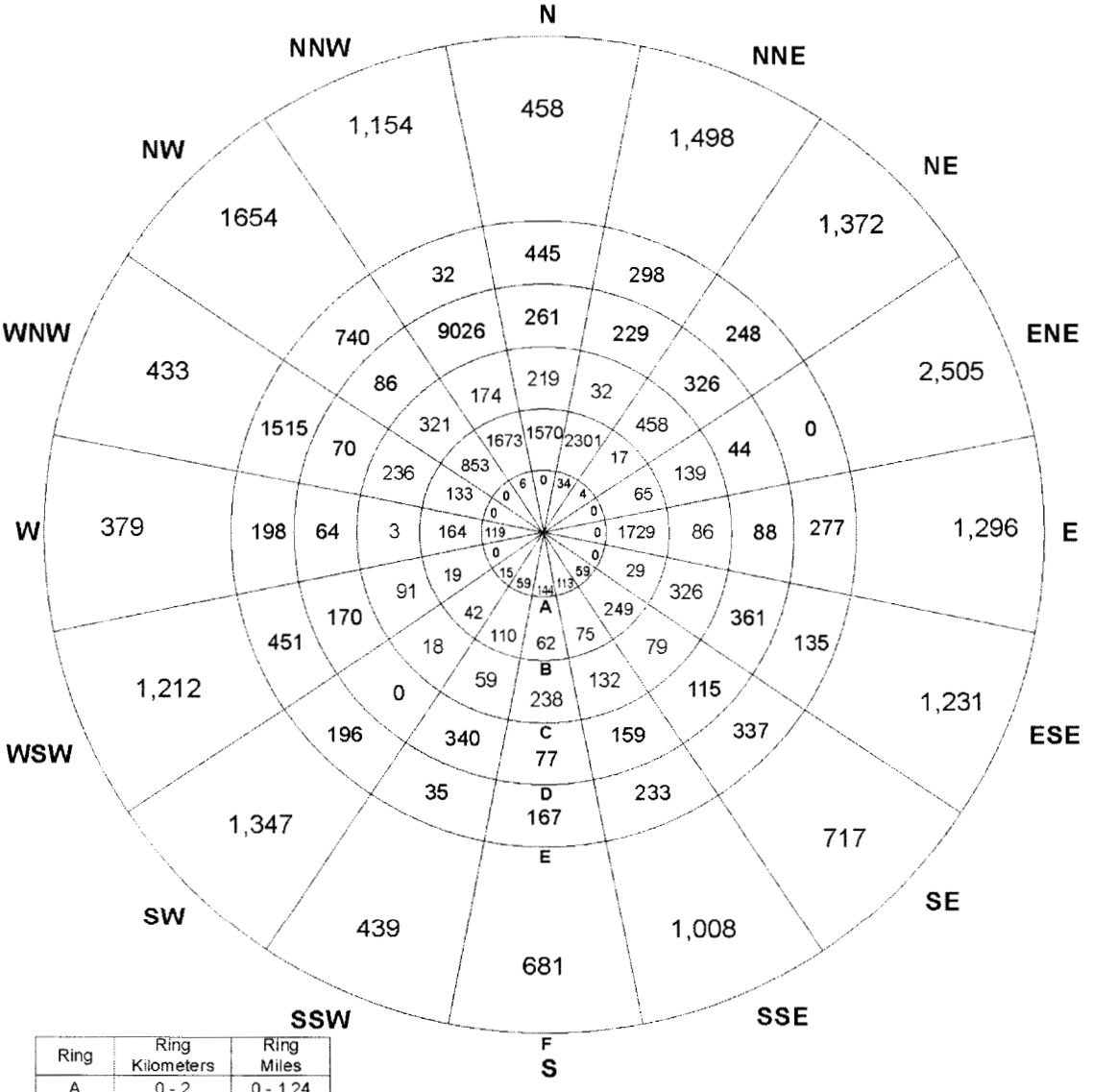
Ring	Ring Kilometers	Ring Miles
A	0 - 2	0 - 1.24
B	2 - 4	1.24 - 2.5
C	4 - 6	2.5 - 3.73
D	6 - 8	3.73 - 5.0
E	8 - 10	5.0 - 6.2
F	10 - 16	6.2 - 10.0

Figure 2.1-4 16-Kilometer (10 Mile) Resident and Transient Population Distribution -2000



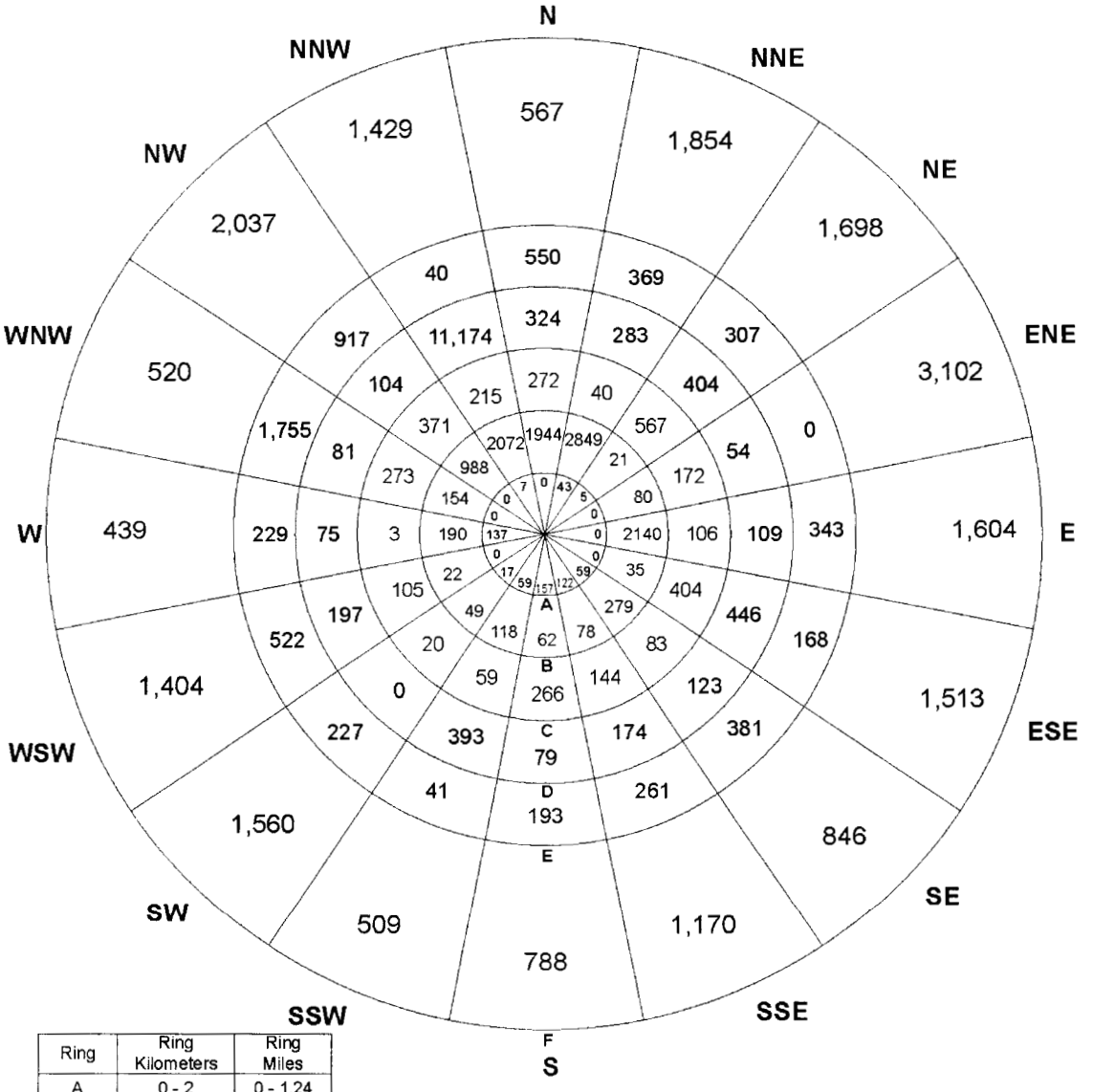
Ring	Ring Kilometers	Ring Miles
A	0 - 2	0 - 1.24
B	2 - 4	1.24 - 2.5
C	4 - 6	2.5 - 3.73
D	6 - 8	3.73 - 5.0
E	8 - 10	5.0 - 6.2
F	10 - 16	6.2 - 10.0

Figure 2.1-5 **16-Kilometer (10 Mile) Resident and Transient Population Distribution -2010**



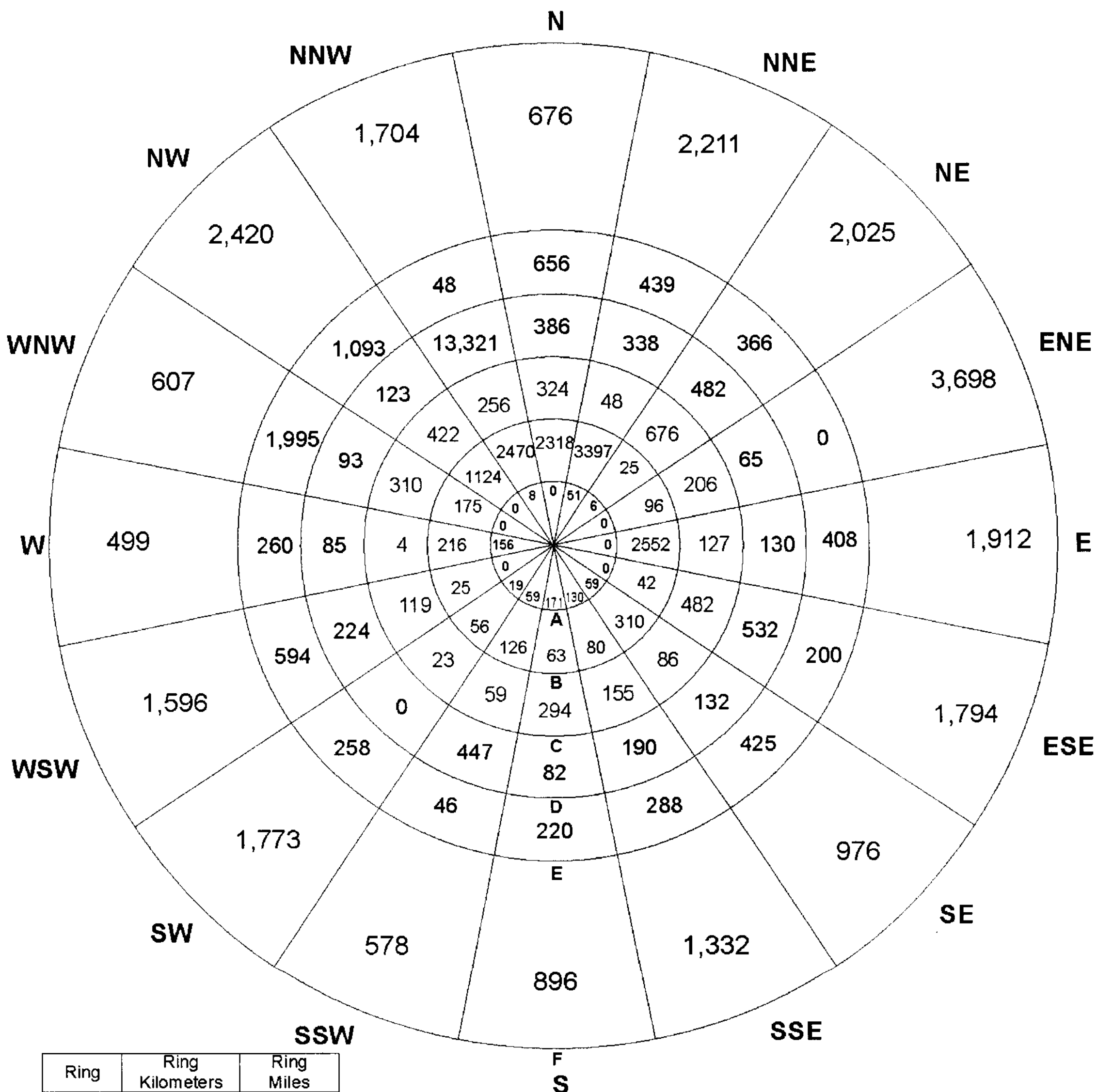
Ring	Ring Kilometers	Ring Miles
A	0 - 2	0 - 1.24
B	2 - 4	1.24 - 2.5
C	4 - 6	2.5 - 3.73
D	6 - 8	3.73 - 5.0
E	8 - 10	5.0 - 6.2
F	10 - 16	6.2 - 10.0

Figure 2.1-6 **16-Kilometer (10 Mile) Resident and Transient Population Distribution -2020**



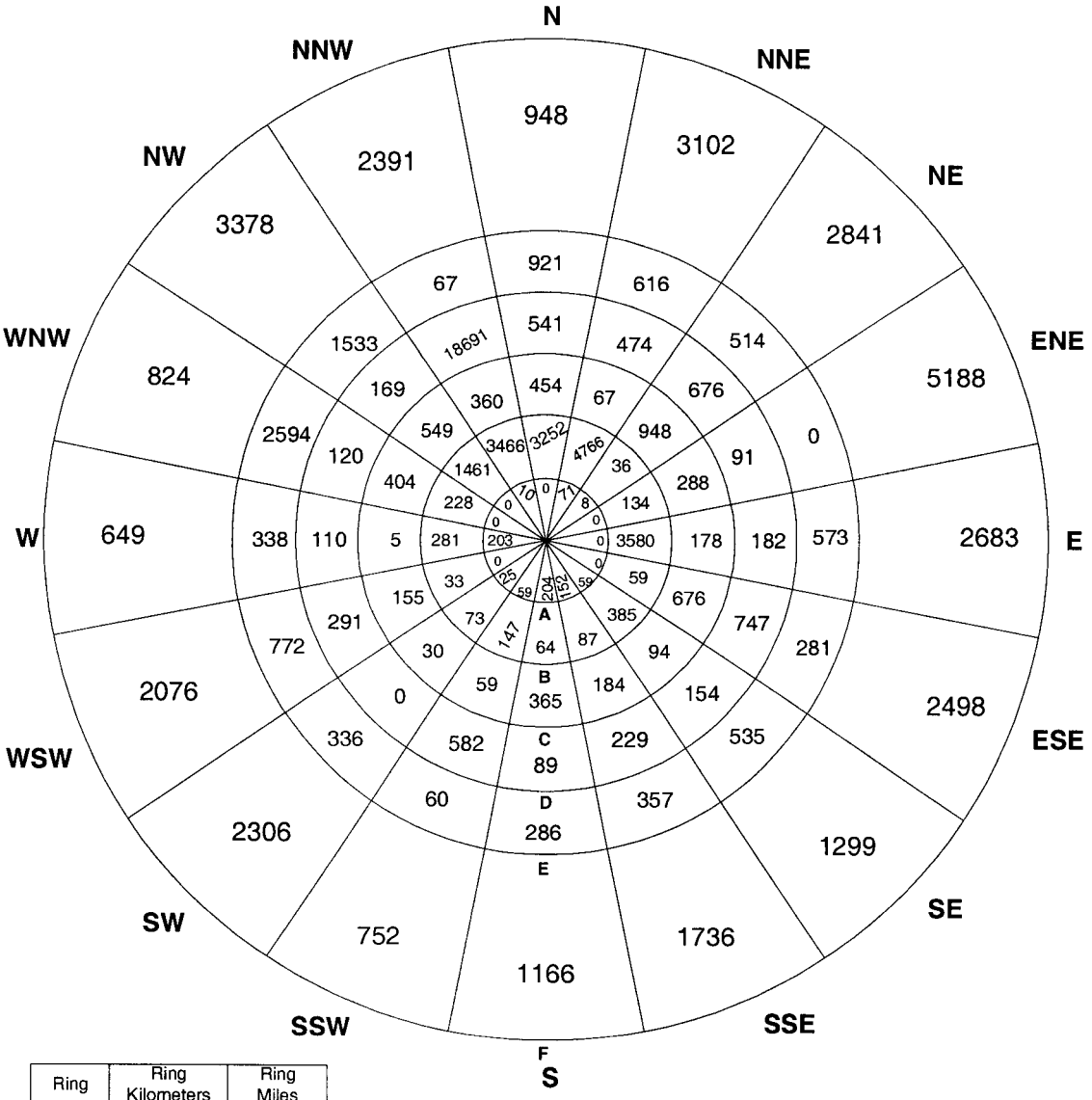
Ring	Ring Kilometers	Ring Miles
A	0 - 2	0 - 1.24
B	2 - 4	1.24 - 2.5
C	4 - 6	2.5 - 3.73
D	6 - 8	3.73 - 5.0
E	8 - 10	5.0 - 6.2
F	10 - 16	6.2 - 10.0

Figure 2.1-7 16-Kilometer (10 Mile) Resident and Transient Population Distribution -2030



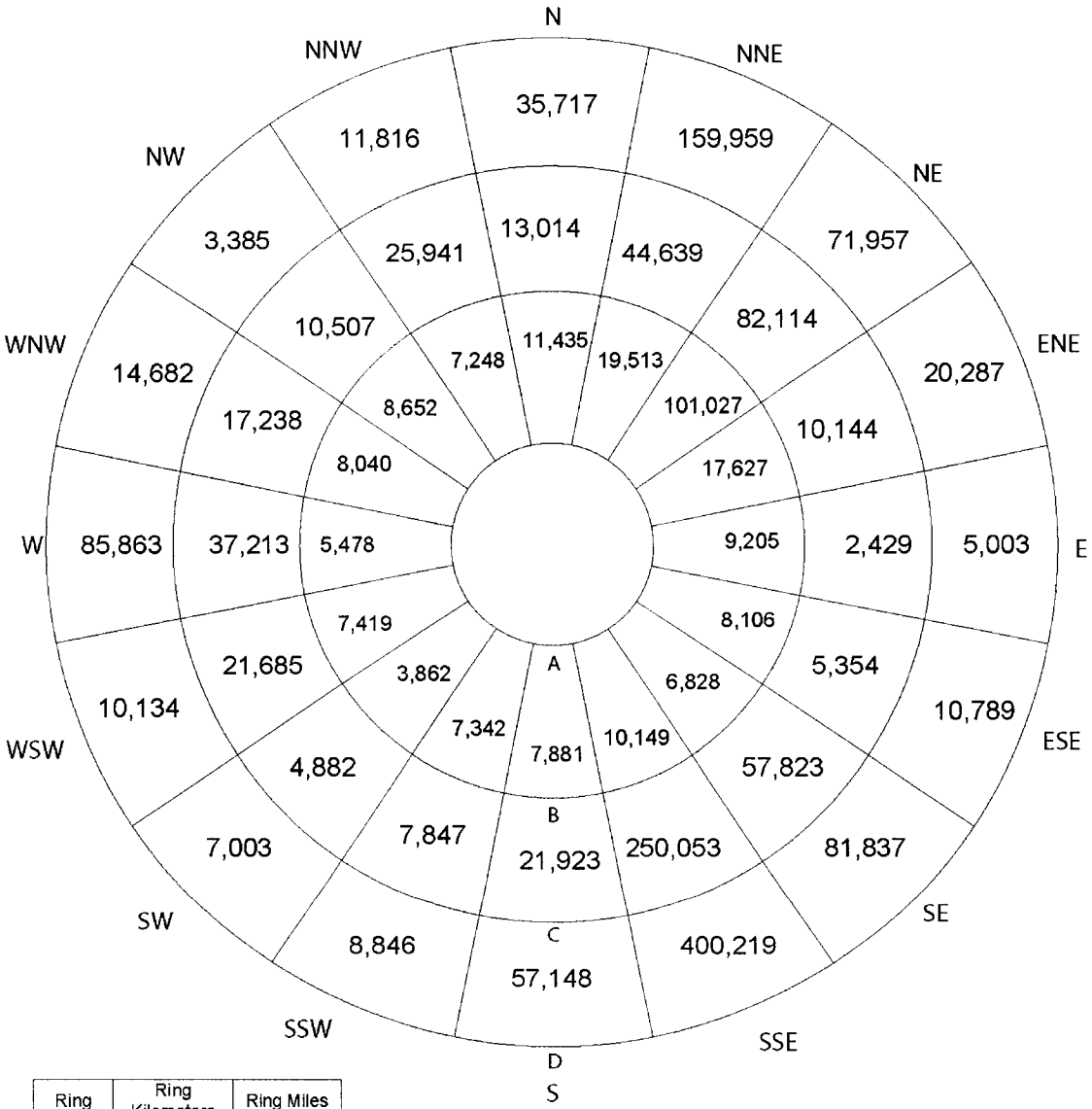
Ring	Ring Kilometers	Ring Miles
A	0 - 2	0 - 1.24
B	2 - 4	1.24 - 2.5
C	4 - 6	2.5 - 3.73
D	6 - 8	3.73 - 5.0
E	8 - 10	5.0 - 6.2
F	10 - 16	6.2 - 10.0

Figure 2.1-8 16-Kilometer (10 Mile) Resident and Transient Population Distribution –2040



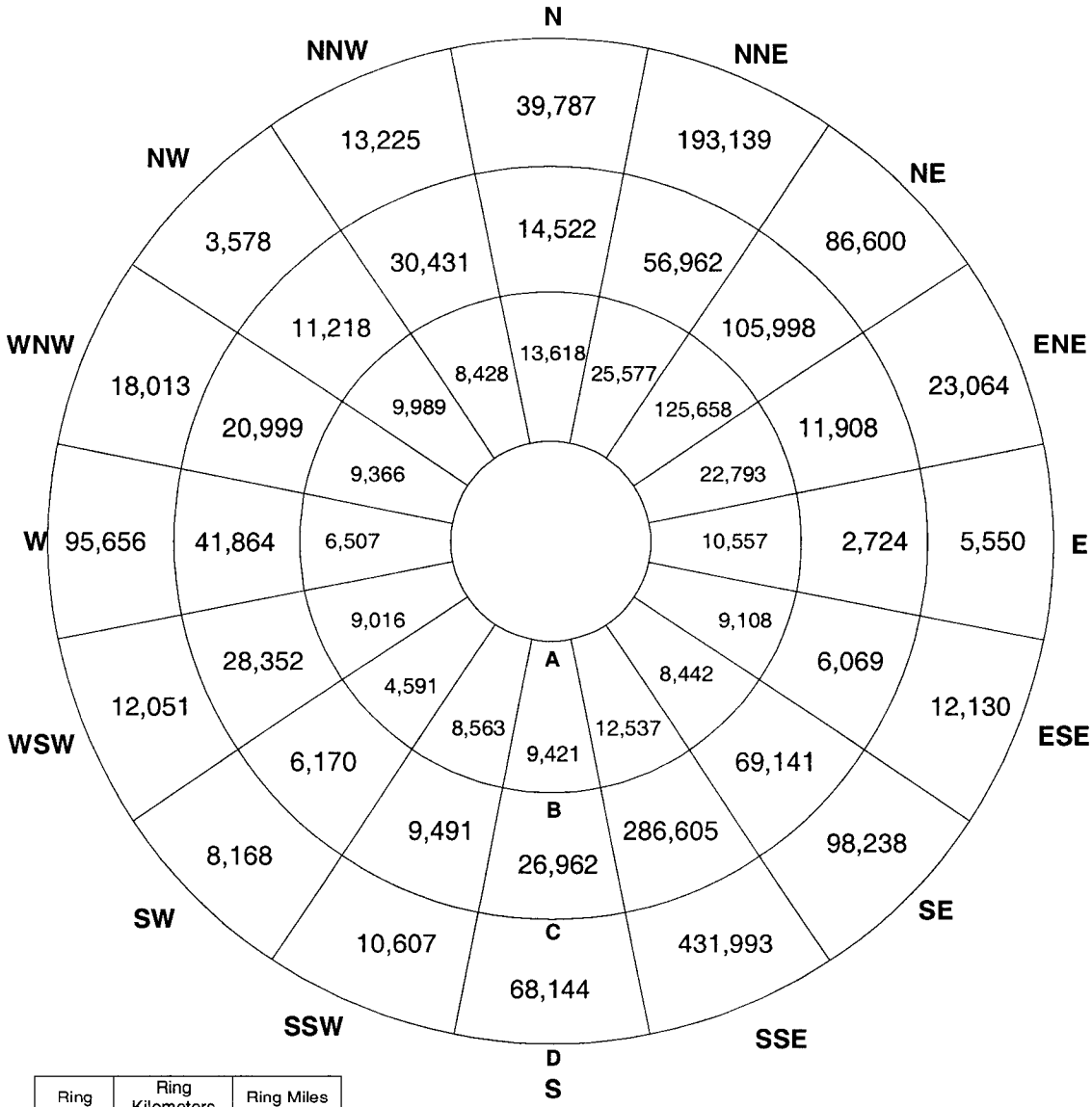
Ring	Ring Kilometers	Ring Miles
A	0 - 2	0 - 1.24
B	2 - 4	1.24 - 2.5
C	4 - 6	2.5 - 3.73
D	6 - 8	3.73 - 5.0
E	8 - 10	5.0 - 6.2
F	10 - 16	6.2 - 10.0

Figure 2.1-8A **16-Kilometer (10 Mile) Resident and Transient Population Distribution-2065**



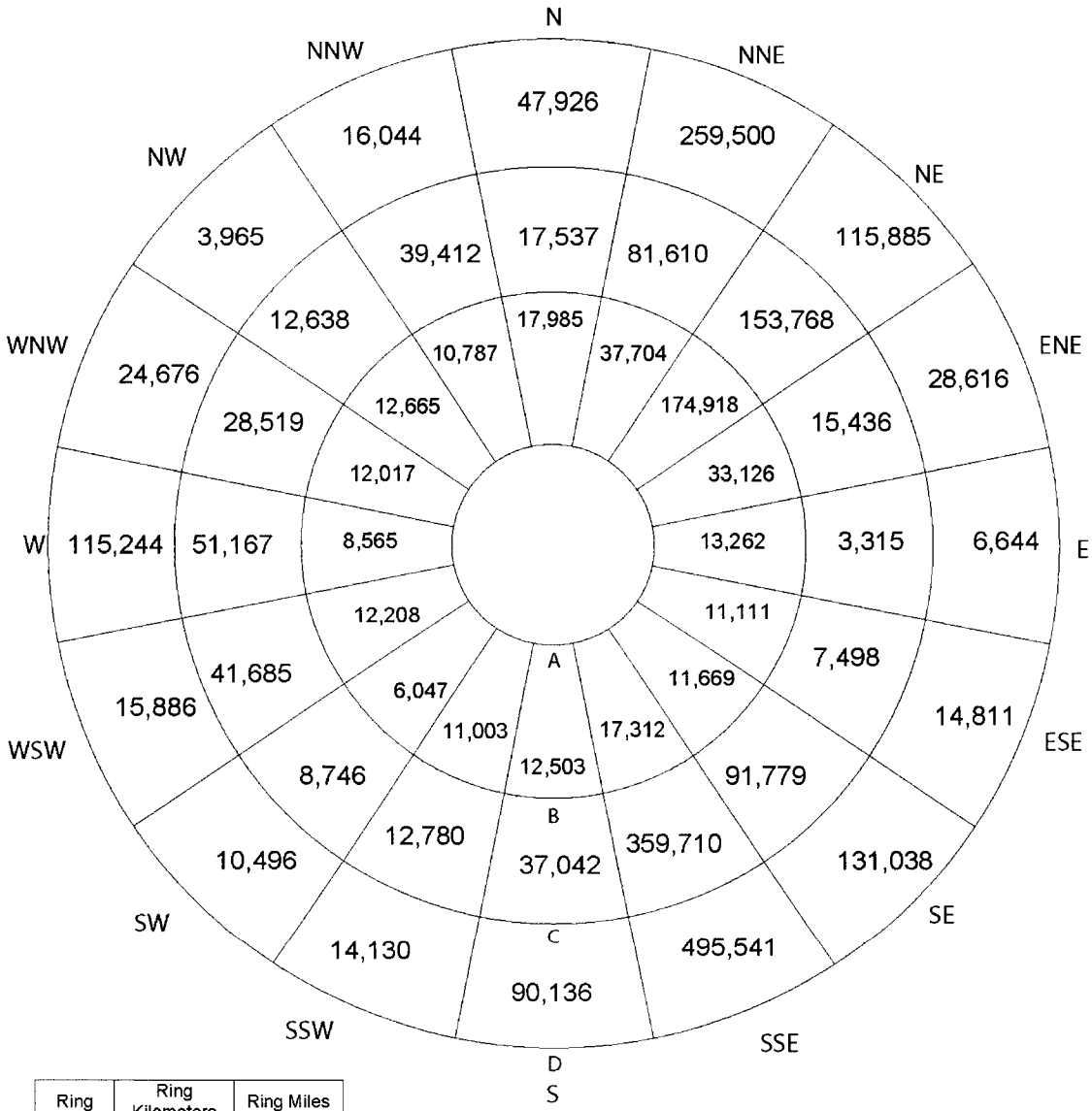
Ring	Ring Kilometers	Ring Miles
A	0 - 16	0 - 10
B	16 - 40	10 - 24.9
C	40 - 60	24.9 - 37.3
D	60 - 80	37.3 - 50

Figure 2.1-10 80-Kilometer (50 Mile) Resident and Transient Population Distribution -2010



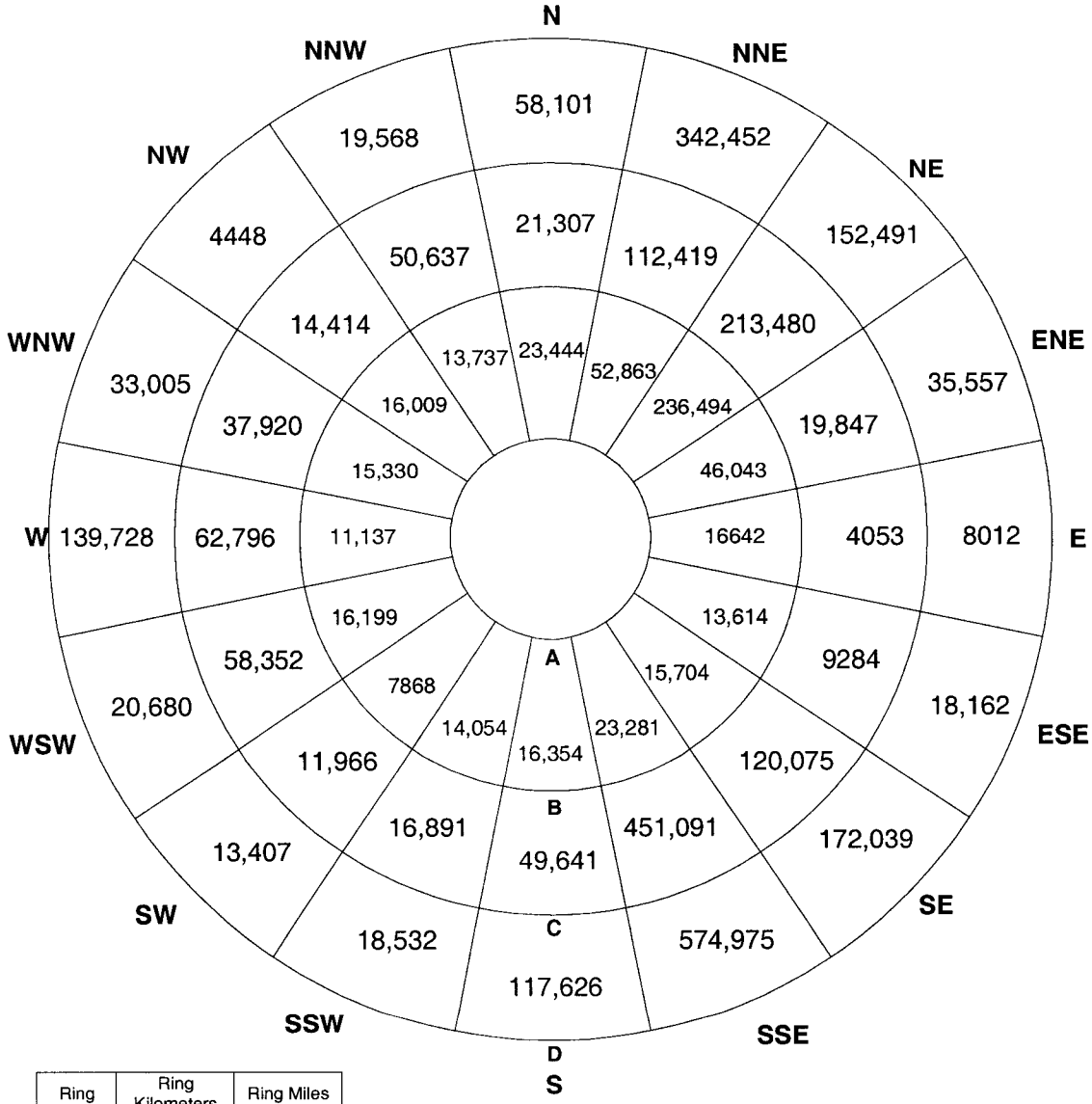
Ring	Ring Kilometers	Ring Miles
A	0 - 16	0 - 10
B	16 - 40	10 - 24.9
C	40 - 60	24.9 - 37.3
D	60 - 80	37.3 - 50

Figure 2.1-11 80 – Kilometer (50 Mile) Resident and Transient Population Distribution – 2020



Ring	Ring Kilometers	Ring Miles
A	0 - 16	0 - 10
B	16 - 40	10 - 24.9
C	40 - 60	24.9 - 37.3
D	60 - 80	37.3 - 50

Figure 2.1-13 80-Kilometer (50 Mile) Resident and Transient Population Distribution -2040



Ring	Ring Kilometers	Ring Miles
A	0 - 16	0 - 10
B	16 - 40	10 - 24.9
C	40 - 60	24.9 - 37.3
D	60 - 80	37.3 - 50

Figure 2.1-13A 80-Kilometer (50 Mile) Resident and Transient Population Distribution - 2065

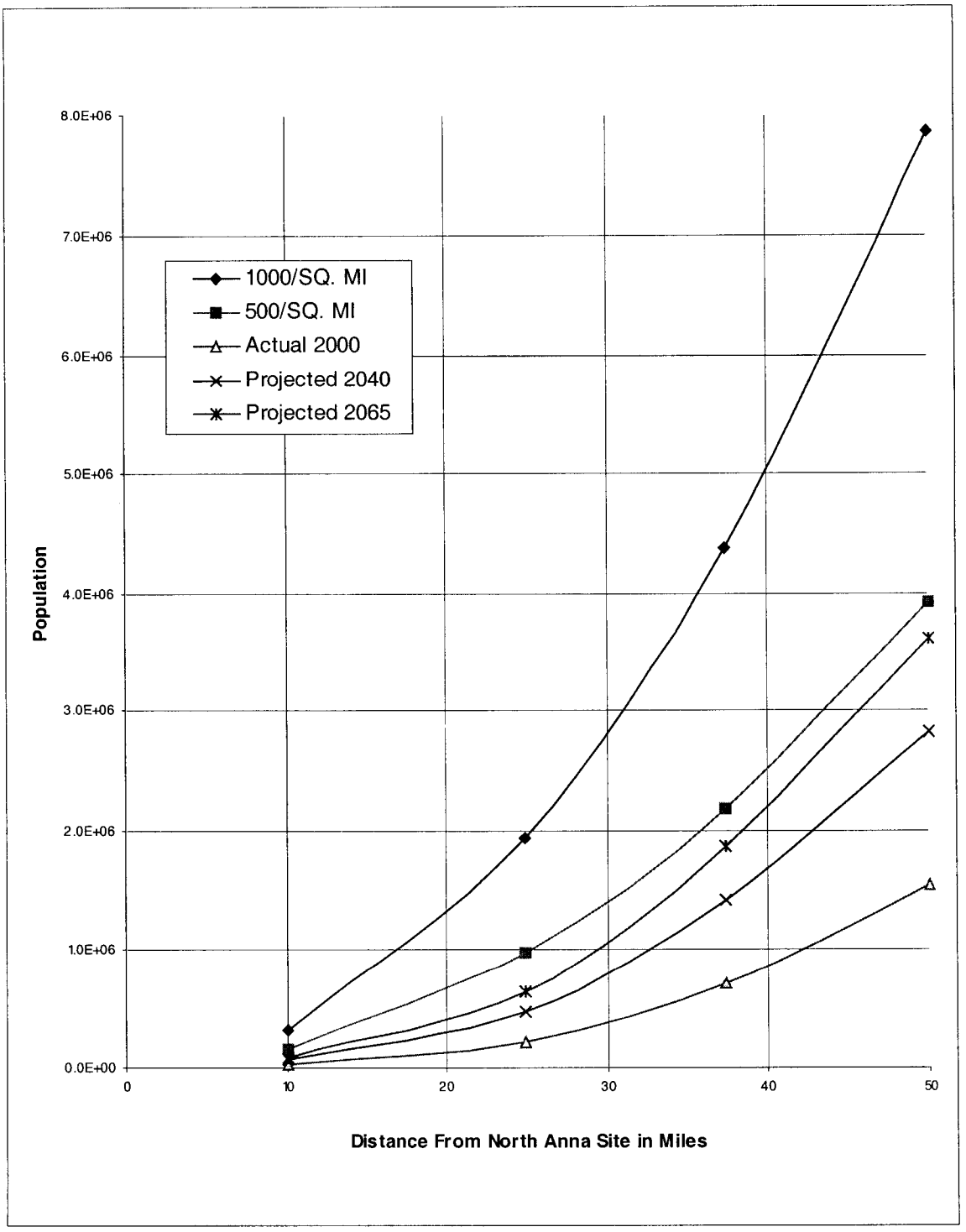


Figure 2.1-14 Population Density

ER Sections 2.5.1 and 2.5.1.1 will be revised to read as follows:

2.5.1 **Demography**

The population distribution surrounding the ESP site, up to an 80-km (50-mi.) radius, has been estimated, based on the most recent U.S. Census Bureau decennial census data (Reference 1). The population distribution encompasses nine concentric rings at 2 km (1.2 mi.), 4 km (2.5 mi.), 6 km (3.7 mi.), 8 km (5.0 mi.), 10 km (6.2 mi.), 16 km (10 mi.), 40 km (24.9 mi.), 60 km (37.3 mi.), and 80 km (50 mi.), and 16 directional sectors. The projected population estimates for Years 2010, 2020, 2030, 2040, and 2065 have been calculated with a formula adopted from the Weldon Cooper Center for Public Service (Reference 2) using the 1990 Census and 2000 Census data as the base.

2.5.1.1 **Resident Population Within 16 km (10 miles)**

Figure 2.5-1 shows the general locations of the municipalities and other features within 10 miles (16 km) of the ESP site. According to the 2000 Census survey, Mineral, which has a population of 424 located within about 1 square mile (incorporated), is the largest community within 10 miles of the site (Reference 5). As reported in NAPS UFSAR (Reference 4, Section 2.1.3.1), the population in 1990 was 452. Therefore, the population of Mineral has remained constant during the past decade.

The population distribution within 16km (10 miles) of the site has been computed by overlaying the 2000 Census block points data (the smallest unit of census data) (Reference 1) on the grid shown on Figure 2.5-1, and summing the population of the census block points falling in each of the polar sectors comprising the grid. The census block-point summation and allocation has been accomplished using the Landview 5 (LV5) software, operating directly on census data, and the MARPLOT mapping software (Reference 1). The system can display Census 2000 demographic data, jurisdictional entities and many statistical entities of the U.S. Census Bureau. It can also calculate Census 2000 population, racial distribution, census block count and housing unit count within a user-defined radius. Using MARPLOT, the grid system was created as shown on Figure 2.5-1. LV5 was designed to summarize the population distribution and other information, once the user selected an area of interest within the grid system. The entire grid system is evenly divided into 16 radial directions, each direction consisting of 22.5 degrees.

The population distributions and related information have been recorded on a spreadsheet to tabulate the results at the distances of interest for all sixteen directions. In order to generate more accurate counts, census block points were used in LV5 to calculate population distributions.

Population projections for the area within 10 miles of the ESP site up to 65 years from the 2000 Census were developed. The formula used for average annual growth (percentage of growth) is adopted from (Reference 2). The Weldon Cooper Center for Public Service group has performed the 2001 provisional population estimates for the Commonwealth of Virginia.

$$\text{Annual Average Growth} = \frac{\text{Log}_{10}(\text{Population}_{2000} / \text{Population}_{1990})}{(2000 - 1990) \times 0.4342945}$$

The 1990 population within each county and city considered in Virginia and Maryland were also obtained from the U.S. Census Bureau (Reference 25). The same formula is also used for projection of the transient population up to the year 2065. The 10-mile population distribution for Year 2000 is shown on Figure 2.5-3. The 16 km (10 mile) resident and transient population projections for the year 2010, 2020, 2030, 2040, and 2065 are given in Figure 2.5-4 through Figure 2.5-7A.

In 2000, the total population within 16 km (10 mi.) of the ESP site was 15,511. Based on the average annual growth, the estimated population for 2010 is 20,996. This is a projected increase of 35.4 percent. In 2020, an estimated 26,480 people will live within the 16-km (10-mi) radius of the site. This constitutes a 26.1 percent increase from 2010. For each decade, there is a slight downward trend in the percent increase of the population. The growth between 2020 and 2030 is projected to be 20.7 percent and between 2030 and 2040 to be 17.2 percent. Table 2.5-1 presents the population distribution within a 16-km (10-mi) radius of the ESP site for four decades (2000 to 2040).

Table 2.5-2 presents the estimated sex distribution of the population within a 16-km (10-mi) radius of the ESP site. The ratio of men to women is fairly consistent throughout the different concentric rings. The ratio of men to women in Virginia is slightly over 96 men to every 100 women (see Table 2.5-3). The ratio of men to women living within the 16-km (10-mi) radius of the ESP site is about the same: 97 men to every 100 women.

Table 2.5-4 presents the estimated age distribution of the population within a 16-km (10-mi) radius of the ESP site. The number of individuals in the 20-to-24 age group and the 65 and over age group is significantly lower than the rest of the age groups. However, this is typical of the Commonwealth of Virginia as a whole (see Table 2.5-14). The percentage of each age group tends to be very similar across each concentric ring. There appear to be no large groupings of any specific age group.

Table 2.5-6 presents the racial and ethnic distribution of the population within a 16-km (10-mi) radius of the ESP site. The white population is by far the majority within the 0- to 16-km (0- to 10-mi.) radius, with 12,805 people (82.6 percent of

the population). However, the percentage of white people living within a given radius changes throughout the entire 16-km (10-mi.) radius from 94.3 percent in the 2-km (1.2-mi.) radius to 76.4 percent in the 8-km (5-mi.) radius to 83.6 percent in the 16-km (10-mi.) radius.

The percentage of black people living within a given radius also changes greatly throughout the entire 16-km (10-mi) radius from 4.8 percent in the 2-km (1.2-mi.) radius to 21.5 percent in the 8-km (5-mi.) radius to 13.5 percent in the 16-km (10-mi.) radius. The overall percentage of black people within the 0- to 16-km (0- to 10-mi.) radius from the site is 14.9 percent (2309 people).

Table 2.5-7 presents the estimated income distribution of the population within a 16-km (10-mi.) radius of the ESP site. Income distribution provided in the 2000 census data set has been recorded only up to Year 1999. Most of the individuals 15 years of age and older earn below $25,000 per year. Within the 0- to 16-km (0- to 10-mi.) radius, an estimated 5404 individuals (approximately 45.7 percent) earn less than $25,000. This is consistent with the overall Virginia numbers within one percent (see Table 2.5-7). The percentage of individuals earning between $50,000 and $75,000, between $75,000 and $100,000, and over $100,000 increases almost consistently throughout the different concentric rings.

Overall, the characteristics of the population within each concentric ring are basically the same.

The first three paragraphs of ER Section 2.5.1.2 will be revised to read as follows:

2.5.1.2 Resident Population Between 16 km (10 miles) and 80 km (50 miles)

The 80-km (50-mi.) radius around the ESP site covers thirty counties and four cities in Virginia and one county in Maryland (See Figure 2.5-2). The Town of Louisa is located approximately 12 miles to the west of the site. The population of the town has increased from 1088 (Reference 4) to 1400 ((Reference 9), Section 2.2.8.5) between 1990 and 2002. About 40 miles south-southwest of the site is Richmond, Virginia, with a population of 197,790 in the Year 2000. About 36 miles west of the ESP site is Charlottesville, Virginia, which has a population of 45,049 according to the 2000 Census. About 22 miles northeast of the ESP site is Fredericksburg, Virginia, with a population of 19,279. The nearest population center with more than 25,000 residents is the City of Charlottesville. The closest point of Fredericksburg is 22 miles to the northeast with a projected 2065 population of about 20,950.

In addition to the thirty counties within Virginia, the 80-km (50-mi.) radius from the ESP site also encompasses Charles County, Maryland. The population distribution within that 80-km (50-mi.) radius for Charles County, which at its

closest point is 37 miles northeast from the site, is 9270 based on the 2000 Census data.

The 80-km (50-mi.) Year 2000 resident and transient population distribution throughout the four concentric distance rings and the 16 directional sectors is shown on Figure 2.5-8. The resident and transient population projections for the area between 16 and 80 km (10 and 50 mi.) for years 2010, 2020, 2030, 2040, and 2065 are based on the same methodology as the 16-km (10-mi.) projections. These population projections throughout the four concentric rings and the 16 directional sectors are given in Figure 2.5-9 through Figure 2.5-12A.

The second to last paragraph of ER Section 2.5.1.2 will be revised to read as follows:

Table 2.5-7 presents the income distribution of the population in the counties that contribute most of the current NAPS employees in comparison with the entire state of Virginia. The counties' income-distributed populations closely track within 4 percent. The exceptions are Henrico County's $1000-$25,000 income group (which is 5.3 percentage points lower than the Virginia average), Louisa County's $1000-$25,000 income group (which is 5.5 percentage points higher than the Virginia average), the City of Richmond's $1000-$25,000 income group (which is 9.8 percentage points higher than the Virginia average), Spotsylvania County's $1000-$25,000 income group (which is 6.3 percentage points lower than the Virginia average), and Henrico County's $25,000-to-$50,000 income group (which is 6.6 percentage points higher than the Virginia average).

The last paragraph of ER Section 2.5.1.3.1 will be revised to read as follows:

Transient population within 16 km of the ESP site combined with the resident population in that area for Year 2000 and for projected years 2010, 2020, 2030, 2040, and 2065 are presented in Figure 2.5-3 through Figure 2.5-7A.

The last paragraph of ER Section 2.5.1.3.2 will be revised to read as follows:

Transient population between 16 km and 80 km of the ESP site combined with the resident population in that area for Year 2000 and for projected years 2010, 2020, 2030, 2040, and 2065 are presented in Figure 2.5-8 through Figure 2.5-12A.

The 2nd and 3rd paragraphs of ER Section 2.5.1.5 will be revised to read as follows:

Figure 2.5-13 shows the actual cumulative populations in Year 2000 and projected cumulative population in Year 2065 as a function of 10-mile to 50-mile radial distances from the site. On the same figure, population density curves, spanning the same radial distances, are shown for 500 persons per square mile, and of 1000 persons per square mile.

By inspection of the curves for actual population densities of Year 2000 and Year 2065 projections, it is concluded that at the time of initial site approval and within about 5 years thereafter, the population densities, including weighted transient population, averaged over any radial distance out to 20 miles (cumulative population at a distance divided by the circular area at that distance), would not exceed 500 persons per square mile. The results conform to the guidance in RG 4.7, Regulatory Position C.4 (Reference 7).

The following new reference will be added to ER Section 2.5 References:

25. U.S. Department of Commerce, Bureau of the Census, 1990 Census of Population, Website, www.census.gov/main/www/cen1990.html, accessed October 1, 2002.

ER Table 2.5-12 will be revised to add a footnote as shown below:

Table 2.5-12 Racial and Ethnic Distribution of Population in the Major Employee-Contributing Counties and Virginia

Race Group	Henrico		Louisa		Orange		City of Richmond		Spotsylvania		Virginia	
	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
White	180,761	68.9	19,617	76.5	21,833	84.4	75,744	38.3	74,924	82.9	5,120,110	72.3
Black	64,805	24.7	5530	21.6	3566	13.8	113,108	57.2	11,255	12.5	1,390,293	19.6
Indian	920	0.4	108	0.4	53	0.2	479	0.2	288	0.3	21,172	0.3
Asian	9451	3.6	64	0.3	88	0.3	2471	1.2	1243	1.4	261,025	3.7
Hawaiian	82	0.0	3	0.0	5	0.0	157	0.1	45	0.1	3946	0.1
Other	2562	1.0	46	0.2	102	0.4	2948	1.5	941	1.0	138,900	2.0
Multi	3719	1.4	259	1.0	234	0.9	2883	1.5	1699	1.9	143,069	2.0
Hispanic	5946	2.3	182	0.7	330	1.3	5074	2.6	2536	2.8	329,540	4.7
Total*	262,300	—	25,627	—	25,881	—	197,790	—	90,395	—	7,078,515	—

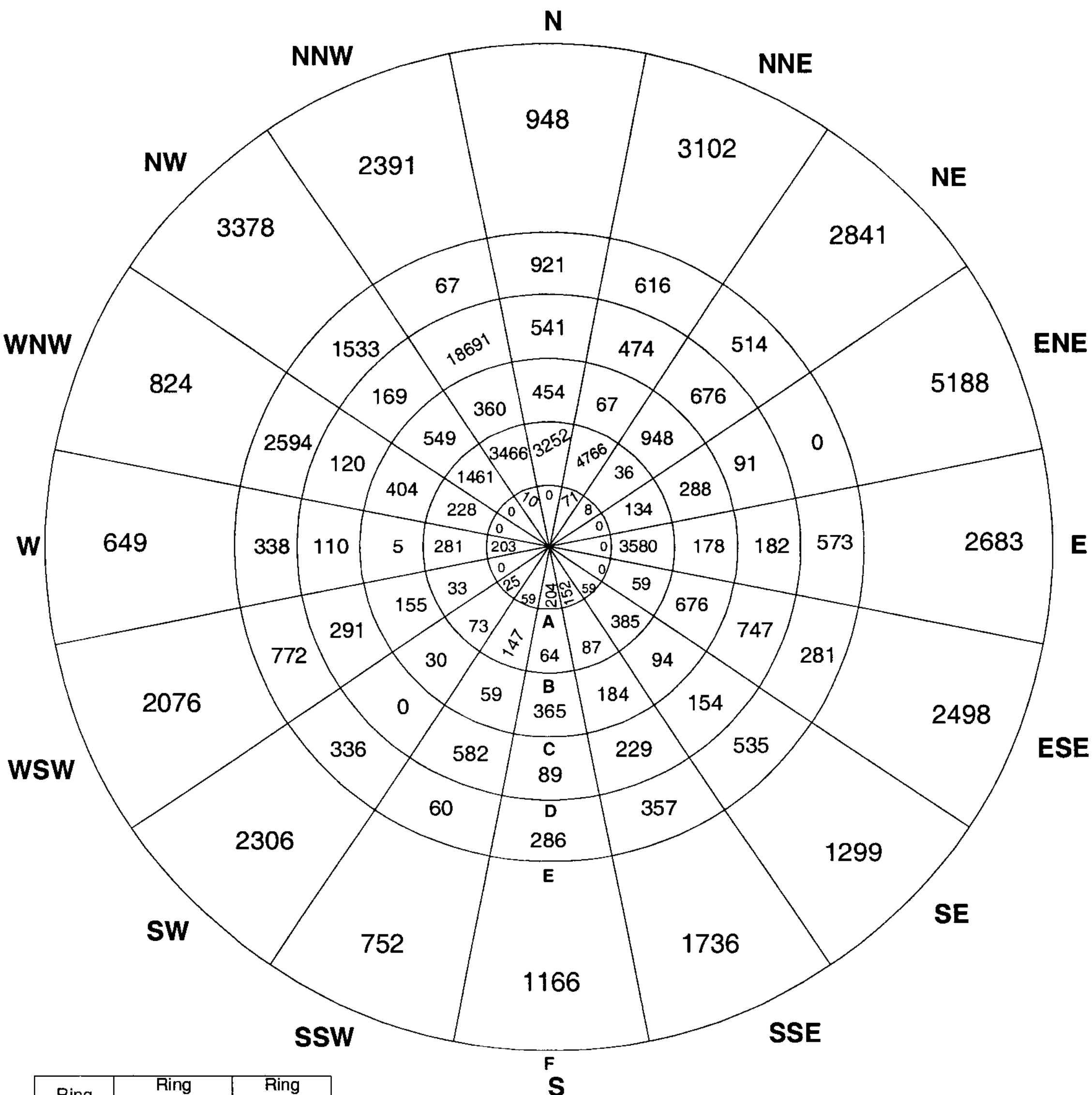
*Total does not include Hispanic category.

Two entries on ER Table 2.5-15 will be revised as follows:

> For the North-Northeast sector, Present Date (2002), the population for 16-40 km will be changed from 14,622 to 14,662.
>
> For the North-Northwest sector, 40-year Date (2040), a population of 8 will be added for 0-2 km.

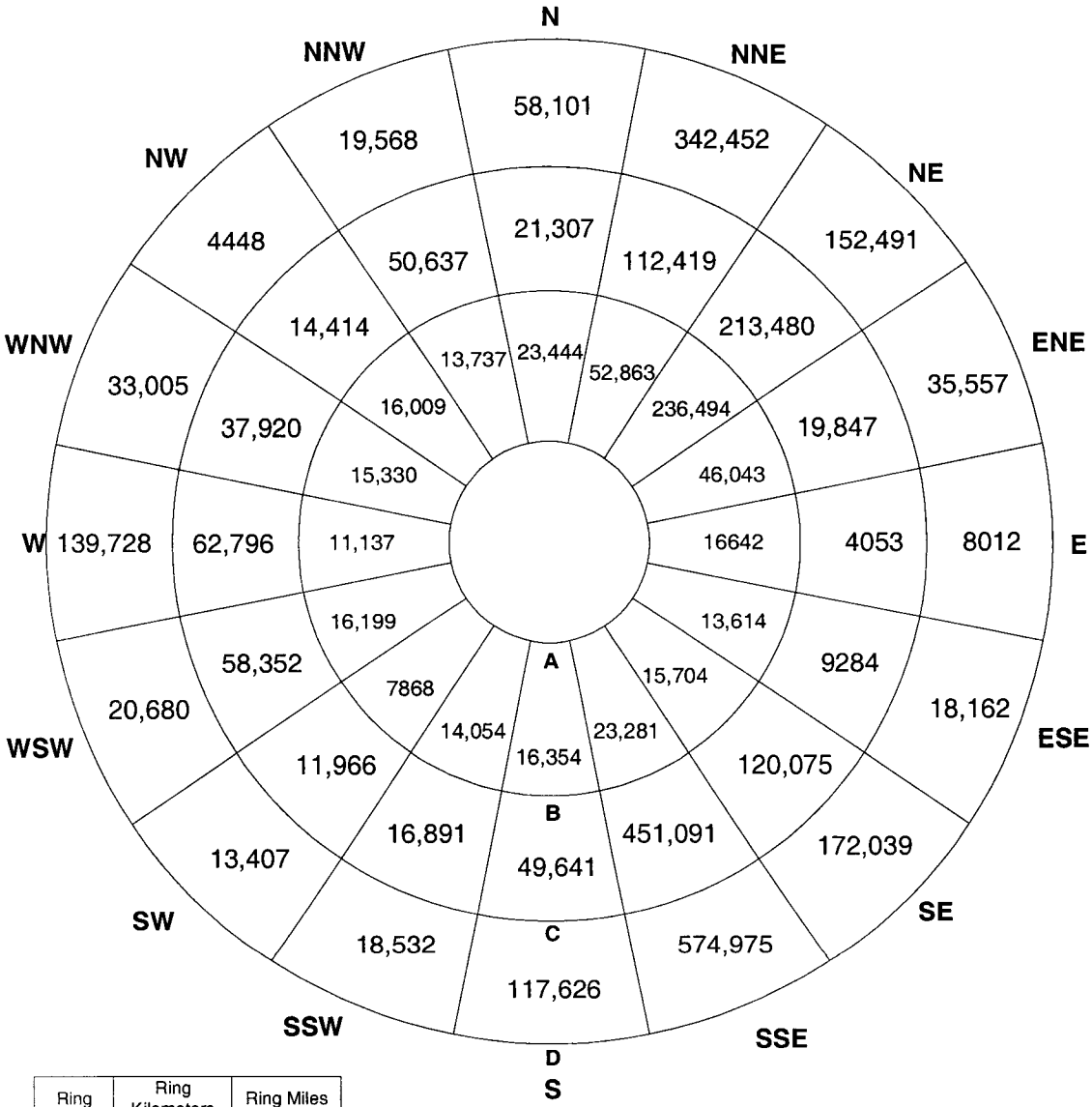
New ER Figures 2.5-7A and 2.5-12A will be added and ER Figure 2.5-13 will be revised as shown on the following pages.

ER Figure 2.5-10 will be revised to change the population for the outer ring, WSW sector, from 12,054 to 12,051.



Ring	Ring Kilometers	Ring Miles
A	0 - 2	0 - 1.24
B	2 - 4	1.24 - 2.5
C	4 - 6	2.5 - 3.73
D	6 - 8	3.73 - 5.0
E	8 - 10	5.0 - 6.2
F	10 - 16	6.2 - 10.0

Figure 2.5-7A 16-Kilometer (10 Mile) Resident and Transient Population Distribution-2065



Ring	Ring Kilometers	Ring Miles
A	0 - 16	0 - 10
B	16 - 40	10 - 24.9
C	40 - 60	24.9 - 37.3
D	60 - 80	37.3 - 50

Figure 2.5-12A 80-Kilometer (50 Mile) Resident and Transient Population Distribution - 2065

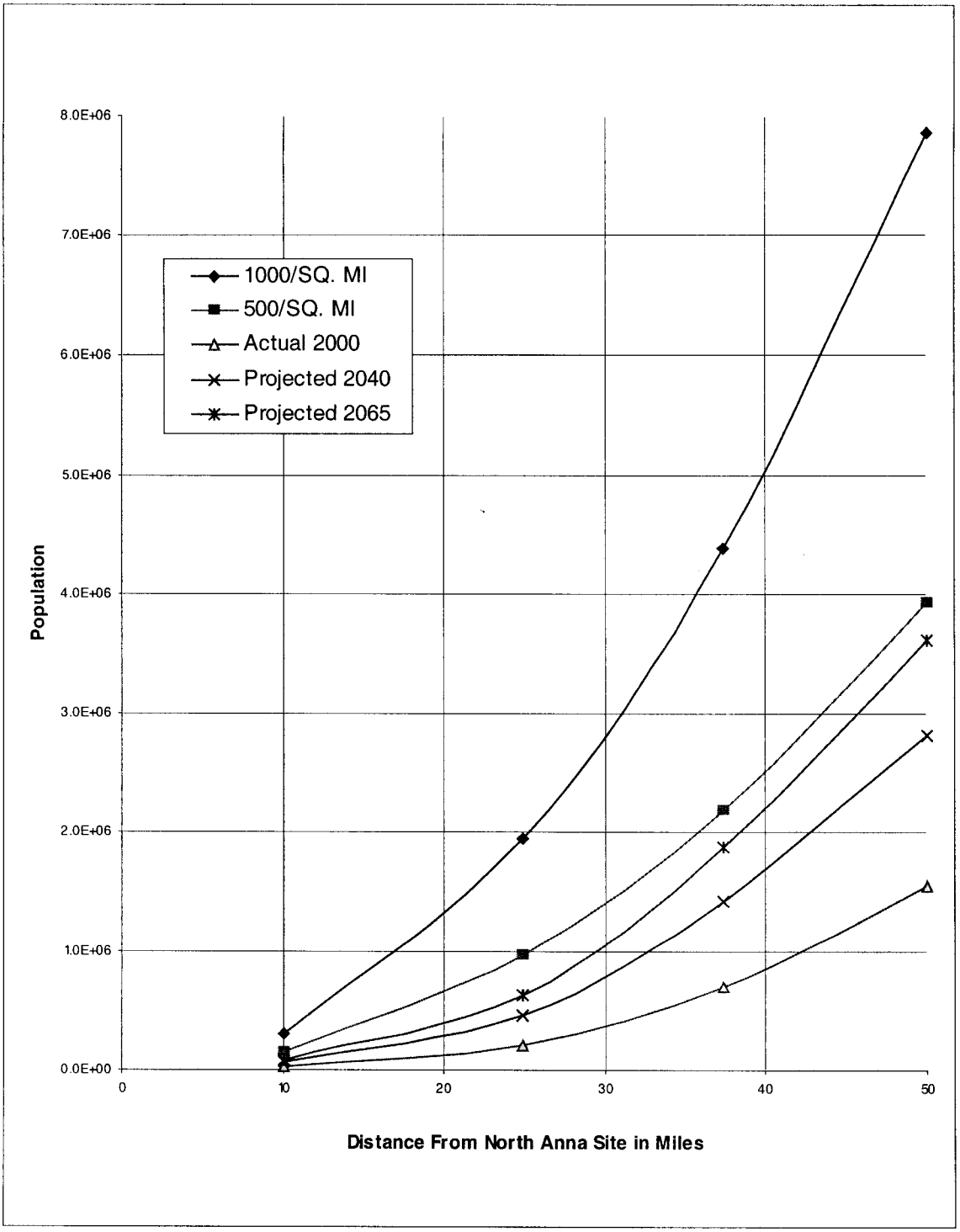


Figure 2.5-13 Population Distribution

Enclosure 3

Revisions to SSAR Sections 15.2 and 15.4 for the Responses to RAI 15.4-2, 15.4-3, 15.4-5, and 15.4-6

The table in the text of SSAR Section 15.2 will be revised to read as follows:

Site-Specific χ/Q Values

	χ/Q (sec/m^3)	
Time	**EAB**	**LPZ**
0–2 hr	2.26E-4	-
0–8 hr	-	2.05E-5
8–24 hr	-	1.36E-5
24–96 hr	-	5.58E-6
96–720 hr	-	1.55E-6

The table in the text of SSAR Section 15.4 will be revised to read as follows:

Design Certification χ/Q Values and Ratios to Site χ/Q Values

		χ/Q (sec/m^3)		χ/Q Ratio (Site/DC)	
	Time (hr)	**AP1000**	**ABWR**	**AP1000**	**ABWR**
EAB	0 - 2	6.00E-04	1.37E-03	3.77E-01	1.65E-01
LPZ	0 - 8	1.35E-04	1.56E-04	1.52E-01	1.31E-01
	8 - 24	1.00E-04	9.61E-05	1.36E-01	1.42E-01
	24 - 96	5.40E-05	3.36E-05	1.03E-01	1.66E-01
	96 - 720	2.20E-05	7.42E-06	7.05E-02	2.09E-01

Note: Ratio (Site/DC) columns show the ratios of site χ/Qs to design certification χ/Qs.

SSAR Tables 15.4-1, 15.4-3, 15.4-5, 15.4-7, 15.4-9, 15.4-10, 15.4-12, 15.4-14, 15.4-16, 15.4-18, 15.4-19, 15.4-21, 15.4-23, 15.4-25, and 15.4-27 will be revised as shown on the following pages.

Table 15.4-1 Summary of Design Basis Accident Doses

SRP Section	Accident	Reactor	TEDE (Rem) EAB	TEDE (Rem) LPZ	TEDE (Rem) Limit
15.1.5	PWR Main Steam Line Break				
	Pre-Existing Iodine Spike	AP1000	2.6E-01	6.1E-02	25
	Accident-Initiated Iodine Spike	AP1000	3.0E-01	2.2E-01	2.5
15.2.8	PWR Feedwater System Pipe Break	AP1000	3.0E-01	2.2E-01	2.5
15.3.3	Reactor Coolant Pump Rotor Seizure	AP1000	9.4E-01	9.1E-02	2.5
	(Locked Rotor Accident)	ABWR	Not Postulated		2.5
15.3.4	Reactor Coolant Pump Shaft Break	AP1000	9.4E-01	9.1E-02	2.5
		ABWR	Not Postulated		2.5
15.4.8	PWR Rod Ejection Accident	AP1000	1.1E+00	2.5E-01	6.3
15.4.9	BWR Control Rod Drop Accident	ABWR	Not Postulated		6.3
15.6.2	Failure of Small Lines Carrying	AP1000	4.9E-01	4.6E-02	2.5
	Primary Coolant Outside Containment	ABWR	4.3E-02	3.9E-03	2.5
15.6.3	PWR Steam Generator Tube Rupture				
	Pre-Existing Iodine Spike	AP1000	1.1E+00	5.2E-02	25
	Accident-Initiated Iodine Spike	AP1000	5.7E-01	3.7E-02	2.5
15.6.4	BWR Main Steam Line Break				
	Pre-Existing Iodine Spike	ABWR	5.1E-01	4.6E-02	25
	Accident-Initiated Iodine Spike	ABWR	2.5E-02	2.3E-03	2.5
15.6.5	Loss-of-Coolant Accident	AP1000	9.3E+00	1.5E+00	25
		ABWR	1.8E+00	2.1E+00	25
15.7.4	Fuel Handling Accident	AP1000	9.0E-01	9.1E-02	6.3
		ABWR	6.2E-01	5.7E-02	6.3

Note: The AP1000 design certification indicates that the doses for the feedwater system pipe break are bounded by the main steam line break (Reference 1, Section 15.2.8.3).

The AP1000 design certification indicates that the doses for the reactor coolant pump shaft break are bounded by the reactor coolant pump rotor seizure (Reference 1, Section 15.3.4.2).

The ABWR design certification indicates that there are no radiological consequences for the reactor coolant pump rotor seizure, the reactor coolant pump shaft break, and the control rod drop accident (Reference 2, Sections 15.3.3.5, 15.3.4.5, and 15.4.10.6).

Table 15.4-3 Doses for AP1000 Main Steam Line Break, Pre-Existing Iodine Spike

	AP1000 TEDE (Rem)		χ/Q Ratio	Site TEDE (Rem)	
Time	**EAB**	**LPZ**	**(Site/AP1000)**	**EAB**	**LPZ**
0 – 2 hr	7.00E-01		3.77E-01	2.64E-01	
0 – 8 hr		2.40E-01	1.52E-01		3.64E-02
8 - 24 hr		8.00E-02	1.36E-01		1.09E-02
24 - 96 hr		1.30E-01	1.03E-01		1.34E-02
96 - 720 hr		0.00E+00	7.05E-02		0.00E+00
Total	7.00E-01	4.50E-01		2.64E-01	6.08E-02
Limit				25	25

Table 15.4-5 Doses for AP1000 Main Steam Line Break, Accident-Initiated Iodine Spike

	AP1000 TEDE (Rem)		χ/Q Ratio	Site TEDE (Rem)	
Time	EAB	LPZ	(Site/AP1000)	EAB	LPZ
0 - 2 hr	8.00E-01		3.77E-01	3.01E-01	
0 - 8 hr		6.40E-01	1.52E-01		9.72E-02
8 - 24 hr		4.20E-01	1.36E-01		5.71E-02
24 - 96 hr		6.30E-01	1.03E-01		6.51E-02
96 - 720 hr		0.00E+00	7.05E-02		0.00E+00
Total	8.00E-01	1.69E+00		3.01E-01	2.19E-01
Limit				2.5	2.5

Table 15.4-7 Doses for AP1000 Locked Rotor Accident

	AP1000 TEDE (Rem)		χ/Q Ratio	Site TEDE (Rem)	
Time	EAB	LPZ	(Site/AP1000)	EAB	LPZ
0 - 2 hr	2.50E+00		3.77E-01	9.42E-01	
0 - 8 hr		6.00E-01	1.52E-01		9.11E-02
8 - 24 hr		0.00E+00	1.36E-01		0.00E+00
24 - 96 hr		0.00E+00	1.03E-01		0.00E+00
96 - 720 hr		0.00E+00	7.05E-02		0.00E+00
Total	2.50E+00	6.00E-01		9.42E-01	9.11E-02
Limit				2.5	2.5

Table 15.4-9 Doses for AP1000 Rod Ejection Accident

	AP1000 TEDE (Rem)		χ/Q Ratio	Site TEDE (Rem)	
Time	EAB	LPZ	(Site/AP1000)	EAB	LPZ
0 - 2 hr	3.00E+00		3.77E-01	1.13E+00	
0 - 8 hr		1.40E+00	1.52E-01		2.13E-01
8 - 24 hr		2.60E-01	1.36E-01		3.54E-02
24 - 96 hr		4.60E-02	1.03E-01		4.75E-03
96 - 720 hr		1.20E-02	7.05E-02		8.45E-04
Total	3.00E+00	1.72E+00		1.13E+00	2.54E-01
Limit				6.3	6.3

Table 15.4-10 Doses for AP1000 Failure of Small Lines Carrying Primary Coolant Outside Containment

	AP1000 TEDE (Rem)		χ/Q Ratio	Site TEDE (Rem)	
Time	EAB	LPZ	(Site/AP1000)	EAB	LPZ
0 - 2 hr	1.30E+00		3.77E-01	4.90E-01	
0 - 8 hr		3.00E-01	1.52E-01		4.56E-02
8 – 24 hr		0.00E+00	1.36E-01		0.00E+00
24 - 96 hr		0.00E+00	1.03E-01		0.00E+00
96 - 720 hr		0.00E+00	7.05E-02		0.00E+00
Total	1.30E+00	3.00E-01		4.90E-01	4.56E-02
Limit				2.5	2.5

Note: No activity release information is available for this accident.

Table 15.4-12 Doses for ABWR Failure of Small Lines Carrying Primary Coolant Outside Containment

	ABWR EAB Dose (Sv)			χ/Q Ratio	Site TEDE (Rem)	
Time	W. Body	Thyroid	TEDE	(Site/ABWR)	EAB	LPZ
0 - 2 hr	9.40E-04	4.80E-02	2.38E-03	1.65E-01	4.30E-02	
0 - 8 hr	9.40E-04	4.80E-02	2.38E-03	1.50E-02		3.90E-03
8 - 24 hr						0.00E+00
24 - 96 hr						0.00E+00
96 - 720 hr						0.00E+00
Total	9.40E-04	4.80E-02	2.38E-03		4.30E-02	3.90E-03
Limit					2.5	2.5

Note: The ABWR TEDE is whole body dose plus 3% of thyroid dose. Since the ABWR design certification document does not include an LPZ dose for this accident, the site LPZ dose is obtained by multiplying the ABWR EAB dose by ratio of site LPZ χ/Q to ABWR EAB χ/Q. The site doses include a multiplier of 1.10 for power adjustment.

Table 15.4-14 Doses for AP1000 Steam Generator Tube Rupture, Pre-Existing Iodine Spike

	AP1000 TEDE (Rem)		χ/Q Ratio	Site TEDE (Rem)	
Time	EAB	LPZ	(Site/AP1000)	EAB	LPZ
0 - 2 hr	3.00E+00		3.77E-01	1.13E+00	
0 - 8 hr		3.20E-01	1.52E-01		4.86E-02
8 - 24 hr		2.60E-02	1.36E-01		3.54E-03
24 - 96 hr		0.00E+00	1.03E-01		0.00E+00
96 - 720 hr		0.00E+00	7.05E-02		0.00E+00
Total	3.00E+00	3.46E-01		1.13E+00	5.21E-02
Limit				25	25

Table 15.4-16 Doses for AP1000 Steam Generator Tube Rupture, Accident-Initiated Iodine Spike

	AP1000 TEDE (Rem)		χ/Q Ratio	Site TEDE (Rem)	
Time	EAB	LPZ	(Site/AP1000)	EAB	LPZ
0 - 2 hr	1.50E+00		3.77E-01	5.65E-01	
0 - 8 hr		1.80E-01	1.52E-01		2.73E-02
8 - 24 hr		7.20E-02	1.36E-01		9.79E-03
24 - 96 hr		0.00E+00	1.03E-01		0.00E+00
96 - 720 hr		0.00E+00	7.05E-02		0.00E+00
Total	1.50E+00	2.52E-01		5.65E-01	3.71E-02
Limit				2.5	2.5

Table 15.4-18 Doses for ABWR Main Steam Line Break, Pre-Existing Iodine Spike

	ABWR EAB Dose (Sv)			χ/Q Ratio	Site TEDE (Rem)	
Time	W. Body	Thyroid	TEDE	(Site/ABWR)	EAB	LPZ
0 - 2 hr	1.30E-02	5.10E-01	2.83E-02	1.65E-01	5.11E-01	
0 - 8 hr	1.30E-02	5.10E-01	2.83E-02	1.50E-02		4.64E-02
8 - 24 hr						0.00E+00
24 - 96 hr						0.00E+00
96 - 720 hr						0.00E+00
Total	1.30E-02	5.10E-01	2.83E-02		5.11E-01	4.64E-02
Limit					25	25

Note: The ABWR TEDE is whole body dose plus 3% of thyroid dose. Since the ABWR design certification document does not include an LPZ dose for this accident, the site LPZ dose is obtained by multiplying the ABWR EAB dose by ratio of site LPZ χ/Q to ABWR EAB χ/Q. The site doses include a multiplier of 1.10 for power adjustment.

Table 15.4-19 Doses for ABWR Main Steam Line Break, Accident-Initiated Iodine Spike

	ABWR EAB Dose (Sv)			χ/Q Ratio	Site TEDE (Rem)	
Time	W. Body	Thyroid	TEDE	(Site/ABWR)	EAB	LPZ
0 - 2 hr	6.20E-04	2.60E-02	1.40E-03	1.65E-01	2.53E-02	
0 - 8 hr	6.20E-04	2.60E-02	1.40E-03	1.50E-02		2.29E-03
8 - 24 hr						0.00E+00
24 - 96 hr						0.00E+00
96 - 720 hr						0.00E+00
Total	6.20E-04	2.60E-02	1.40E-03		2.53E-02	2.29E-03
Limit					2.5	2.5

Note: The ABWR TEDE is whole body dose plus 3% of thyroid dose. Since the ABWR design certification document does not include an LPZ dose for this accident, the site LPZ dose is obtained by multiplying the ABWR EAB dose by ratio of site LPZ χ/Q to ABWR EAB χ/Q. The site doses include a multiplier of 1.10 for power adjustment.

Table 15.4-21 Doses for AP1000 Loss-of-Coolant Accident

	AP1000 TEDE (Rem)		χ/Q Ratio	Site TEDE (Rem)	
Time	EAB	LPZ	(Site/AP1000)	EAB	LPZ
1 - 3 hr	2.48E+01		3.77E-01	9.34E+00	
0 - 8 hr		9.20E+00	1.52E-01		1.40E+00
8 - 24 hr		3.30E-01	1.36E-01		4.49E-02
24 - 96 hr		3.10E-01	1.03E-01		3.20E-02
96 - 720 hr		2.90E-01	7.05E-02		2.04E-02
Total	2.48E+01	1.01E+01		9.34E+00	1.49E+00
Limit				25	25

Note: For the EAB, the period from 1 to 3 hours yields the maximum two-hour dose.

Table 15.4-23 Doses for ABWR Loss-of-Coolant Accident

	ABWR EAB Dose (Sv)			ABWR LPZ Dose (Sv)			χ/Q Ratio	Site TEDE (Rem)	
Time	W. Body	Thyroid	TEDE	W. Body	Thyroid	TEDE	(Site/ABWR)	EAB	LPZ
0 - 2 hr	4.10E-02	1.90E+00	9.80E-02				1.65E-01	1.77E+00	
0 - 8 hr				1.00E-02	3.10E-01	1.93E-02	1.31E-01		2.78E-01
8 - 24 hr				8.00E-03	2.00E-01	1.40E-02	1.42E-01		2.17E-01
24 - 96 hr				1.10E-02	7.90E-01	3.47E-02	1.66E-01		6.31E-01
96 - 720 hr				9.00E-03	1.10E+00	4.20E-02	2.09E-01		9.61E-01
Total	4.10E-02	1.90E+00	9.80E-02	3.80E-02	2.40E+00	1.10E-01		1.77E+00	2.09E+00
Limit								25	25

Note: The ABWR TEDE is whole body dose plus 3% of thyroid dose. The site doses include a multiplier of 1.10 for power adjustment.

Table 15.4-25 Doses for AP1000 Fuel Handling Accident

	AP1000 TEDE (Rem)		χ/Q Ratio	Site TEDE (Rem)	
Time	EAB	LPZ	(Site/AP1000)	EAB	LPZ
0 - 2 hr	2.40E+00		3.77E-01	9.04E-01	
0 - 8 hr		6.00E-01	1.52E-01		9.11E-02
8 - 24 hr		0.00E+00	1.36E-01		0.00E+00
24 - 96 hr		0.00E+00	1.03E-01		0.00E+00
96 - 720 hr		0.00E+00	7.05E-02		0.00E+00
Total	2.40E+00	6.00E-01		9.04E-01	9.11E-02
Limit				6.3	6.3

Table 15.4-27 Doses for ABWR Fuel Handling Accident

	ABWR EAB Dose (Sv)			χ/Q Ratio	Site TEDE (Rem)	
Time	**W. Body**	**Thyroid**	**TEDE**	**(Site/ABWR)**	**EAB**	**LPZ**
0 - 2 hr	1.20E-02	7.50E-01	3.45E-02	1.65E-01	6.23E-01	
0 - 8 hr	1.20E-02	7.50E-01	3.45E-02	1.50E-02		5.65E-02
8 - 24 hr						0.00E+00
24 - 96 hr						0.00E+00
96 - 720 hr						0.00E+00
Total	1.20E-02	7.50E-01	3.45E-02		6.23E-01	5.65E-02
Limit					6.3	6.3

Note: The ABWR TEDE is whole body dose plus 3% of thyroid dose. The site LPZ dose is obtained by multiplying ABWR EAB dose by ratio of site LPZ χ/Q to ABWR EAB χ/Q. The site doses include a multiplier of 1.10 for power adjustment.