APPENDIX G – PLANT PARAMETER ENVELOPE AND SITE PARAMETER ENVELOPE

The interdisciplinary team of subject matter experts assigned to prepare the advanced nuclear reactor (ANR) generic environmental impact statement (GEIS) used the following methodology to develop the plant parameter envelope (PPE) and site parameter envelope (SPE) values and assumptions in this appendix:

- regulatory limits and permitting requirements relevant to the resource as established by Federal, State, or local agencies
- relevant information obtained from other NRC GEISs, including the License Renewal GEIS (NRC 2013-TN2654) and the Continued Storage GEIS (NRC 2014-TN4117)
- empirical knowledge gained from conducting evaluations and analyses for past new reactor EISs
- values and assumptions derived from other documents applying a PPE/SPE approach (such as the National Reactor Innovation Center PPE Report [NRIC 2021-TN6940])
- subject matter expertise and/or development of calculations and formulas based upon education and experience with the resource

For details about the PPE and SPE values and assumptions, see the applicable resource section in Chapter 3. The PPE and SPE values and assumptions are used only to support the findings for Category 1 issues. Category 2 issues do not have PPE and SPE values and assumptions.

Table G-1 PPE and SPE for ANRs

Parameter	Values and Assumptions	Basis/Methodology
Reactor Site Criteria	10 CFR Part 100 (TN282) Subpart B Evaluation Factors for Stationary Power Reactor Site Applications on or After January 10, 1997 Reactor siting factors to be considered by the applicant shall include: 1. 10 CFR 100.20 Factors to be considered when evaluating sites 2. 10 CFR 100.21 Non-seismic siting criteria 3. 10 CFR 100.23 Geologic and seismic siting criteria	Adherence to siting criteria regulations has been determined to minimize impacts associated with environmental review evaluations.
Site Size and Location	1. 100 ac 2. Complies with applicable zoning 3. Consistent with the objectives of any relevant land use plans 4. Complies with the Coastal Zone Management Act of 1972 (16 U.S.C. § 1451 *et seq*; TN1243) and the Farmland Protection Policy Act of 1981 (7 U.S.C. §§ 4201 *et seq*.; TN708), if applicable 5. Completed structures would not be sited within 1 mi of and would not be visible from Federal or State parks or wilderness areas, areas designated as Class I under Section 162 of the Clean Air Act (42 U.S.C. § 7472-TN6954), or a Wild and Scenic River or a National Heritage River, or a river of similar State designation 6. No existing residential areas within 0.5 mi of site	The NRC staff recognizes that, without a detailed consideration of specific land use conditions, as much as 100 ac of land can be dedicated to a project within a feasible setting without noticeably influencing the availability of land for other purposes. The NRC staff assumes any proposed project would meet NRC siting regulations in 10 CFR Part 100 (TN282), or the applicable NRC siting regulations in place at the time the application is docketed. Establishing industrial facilities close to residences can affect the use and enjoyment of residents who desire home environments that are less influenced by the sights, noise, odors, and other parameters acceptable to industrial and commercial workplace settings. A minimum distance of 0.5 mi bounds a generic determination that potential conflicts with residences would be SMALL, although a consideration of specific site conditions could indicate that closer distances could still be SMALL. An even greater distance (1 mi) is needed to bound a generic determination that a project would have only a SMALL potential for adversely affecting features such as Federal or State parks and conservation areas, whose qualities are even more sensitive to industrial influences.
Permanent Footprint of Disturbance	1. 30 ac of vegetated lands 2. Counts only land that supports vegetation as of project baseline 3. No prime or unique farmland, or other farmland of statewide or local importance (see Section 3.1.1 for definitions); or site does not abut actively managed agricultural land and is not situated in a predominantly agricultural landscape 4. No floodplains, surface water features, riparian habitat, late successional vegetation, or dedicated conservation land 5. No more than 0.5 ac of wetlands in permanent or temporary disturbance on the site or ROWs 6. The site and any existing ROWs do not have legacy contamination requiring cleanup to protect human health or the environment 7. No Individual Permits required under Section 404 of the Clean Water Act (33 U.S.C. § 1344-TN1019) 8. Use of best management practices (BMPs) for soil erosion, sediment control, and stormwater management 9. Implementation of mitigation specified in Clean Water Act permits 10. Habitat is not known to be potentially suitable for one or more Federal or State threatened or endangered species	The total footprint of disturbance within areas of existing vegetation (30 ac permanent plus an additional 20 ac of temporary for a total of 50 ac) constitutes an estimate by NRC staff of how much natural habitat excluding unusually sensitive habitats can be disturbed, regardless of geometric shape, in almost any landscape without noticeably altering wildlife numbers or behavior. The value of 0.5 ac of wetlands corresponds to the upper ceiling for project-wide impacts on wetlands under many Nationwide Permits (33 CFR Part 330; TN4318) determined by the U.S. Army Corps of Engineers (USACE) to constitute minimal impact.
Temporary Footprint of Disturbance	1. Additional 20 ac of vegetated land 2. Counts only land that supports vegetation as of project baseline 3. Meets assumptions for permanent footprint 4. Restored to original grade and seeded or planted with indigenous vegetation once construction is complete.	This additional temporary disturbance is factored together with the assumption of no more than 30 ac permanent disturbance into the overall disturbance area of 50 ac (see above). Temporary disturbance of most natural habitats followed by restoration constitutes less impact per acre than permanent or long-term disturbance. The limit of 0.5 ac of wetland impacts in most Nationwide Permits (33 CFR Part 330; TN4318) is a project-wide limit, inclusive of all associated permanent and temporary impacts.
Offsite rights-of-way (ROW)	1. No longer than 1 mi and no wider than 100 ft, but allows for unlimited additional mileage for linear features built within existing ROWs or directly adjacent to existing ROWs or public highways 2. Does not cause the total project-wide wetland fill to exceed 0.5 ac 3. Would not involve ground disturbance to streams greater than 10 ft in width 4. Does not cross or pass within 1 mi of parks, wildlife refuges, or conservation lands	Dimensions of up to 1 mi long and 100 ft wide constitutes an upper estimate by the NRC staff as to how much new ROW can be established anywhere in most rural landscapes without noticeably affecting fragmented land uses or natural habitats, without consideration of project-specific factors. The staff, based on its experience conducting

Parameter	Values and Assumptions	Basis/Methodology
	5. Does not cross or pass within 1 mi of, or is not visible from, Federal or State parks or wilderness areas, areas designated as Class I under Section 162 of the Clean Air Act (42 U.S.C. § 7472-TN6954), or a Wild and Scenic River or a National Heritage River, or a river of similar State designation 6. May span wetlands, waters of the United States, floodplains, shoreline, or riparian lands 7. Any new transmission poles or towers would be constructed outside of wetlands and floodplains 8. Pipelines or buried utilities would be directionally drilled under surface waters to avoid physical disturbance of shorelines or bottom substrates 9. Use of BMPs for soil erosion, sediment control, and stormwater management 10. Implementation of mitigation specified in Clean Water Act permits 11. No physical disturbance to streams greater than 10 ft in width below the ordinary high-water mark 12. Access roads crossing non-jurisdictional surface water features meet the substantive requirements of Nationwide Permits 12 or 14 regarding limits on disturbance and requirements for mitigation	environmental reviews, concludes that co-location of new facilities within existing ROWs or in new ROWs immediately adjacent to existing ROWs or along existing roadways results in minimal land use or ecological impacts. Such ROWs do not fragment existing land uses or natural habitats or introduce utility structures to settings previously lacking such facilities. Additional assumptions address sensitive facilities, which, if present, would necessitate a project-specific analysis to assess the significance of impacts. The limit of 0.5 ac of wetland impacts in most Nationwide Permits (33 CFR Part 330; TN4318) is a project-wide limit, inclusive of impacts from all project elements, including offsite features.
Maximum Building and Structure Height	1. 50 ft, except 200 ft for meteorological towers and 100 feet for mechanical draft cooling towers 2. None of the structures would be built within or be visible from Federal or State parks or wilderness areas, other areas designated as Class I under Section 162 of the Clean Air Act (42 U.S.C. § 7472-TN6954), or designated Wild and Scenic Rivers 3. No transmission poles/towers over 100 ft	Fifty feet constitutes a conservative estimate of building heights that would not likely result in significant visual intrusion or wildlife collision mortality in most settings. This conclusion is based upon NRC reviews in past reactor EISs. The staff recognizes that meteorological towers must be taller to function, and that there would be no need for more than one or two meteorological towers per site. A transmission line with poles or towers over 100 FT would be visible in a forested area and would highly visible in an open area. Most poles of under 100 ft are not highly distinct visually from the distribution poles for lower voltage electric lines that are common visual features in most settings. Mechanical draft cooling towers are typically 50-100 ft in height based off previous new reactor EIS analyses.
Intake and Discharge	1. Adhere to the best available technology requirements of Clean Water Act (CWA) 316(b) (33 U.S.C. § 1326-TN4823) 2. Operated in compliance with CWA Section 316 (b) and 40 CFR 125.83 (TN254), including compliance with monitoring and recordkeeping requirements in 40 CFR 125.87 and 40 CFR 125.88, respectively 3. Best available technologies are employed in the design and operation of intake and discharge structures to minimize alterations due to scouring, sediment transport, increased turbidity, and erosion 4. Adherence to requirements in National Pollutant Discharge Elimination System (NPDES) permits issued by the U.S. Environmental Protection Agency (EPA) or a given State	Requirements established in the subject regulations have been developed to be protective of aquatic biota, including protection of aquatic biota from excessive impingement or entrainment.
In-Water Structures (including intake and discharge structures)	1. Constructed in compliance with provisions of the CWA Section 404 (33 U.S.C. § 1344-TN1019) and Section 10 of the Rivers and Harbors Appropriation Act of 1899 (33 U.S.C. §§ 401 *et seq.*; TN660) 2. Adverse effects of building activities controlled and localized using BMPs such as installation of turbidity curtains or installation of cofferdams 3. Any shorelines or other areas temporarily disturbed to build intake and discharge structures would be restored using regionally indigenous vegetation 4. Construction duration would be less than 7 years	Requirements of existing regulations related to in-water construction are protective of aquatic resources and have been found to keep the adverse impacts of building activities localized and temporary.
Cooling Towers	1. No natural draft cooling towers 2. Would be equipped with drift eliminators 3. Makeup water would be fresh (salinity less than 1 ppt)	Various past new reactor EISs indicate that natural draft cooling towers are tall structures over 200 ft in height that may be visible from substantial distances and from which salt drift and fogging may affect substantial areas of offsite land.
Other Cooling Features	1. No once-through cooling 2. No new cooling ponds 3. No new reservoirs 4. No spray irrigation ponds	Once-through cooling systems have a substantial potential for significant impacts on aquatic biota from entrainment and impingement and are essentially not possible due to Section 316(b) of the Clean Water Act (33 U.S.C. § 1326-TN4823). Operation of cooling ponds can have potentially significant effects on aquatic and terrestrial biota. Building reservoirs can affect large areas of aquatic and terrestrial habitats, including sensitive wetland, floodplain, and riparian habitats.
Copper Alloy Tubes	1. No use of copper alloy tubes	According to the License Renewal GEIS, copper alloy tubes can introduce metal contaminants into discharged blowdown water that can be harmful to aquatic biota.

Parameter	Values and Assumptions	Basis/Methodology
Criteria Pollutant and Hazardous Air Pollutant Emissions	1. Criteria pollutants emitted from vehicles and standby power equipment during construction and operations are less than Clean Air Act de minimis levels set by the EPA if located in a nonattainment or maintenance area 2. Hazardous Air Pollutant emissions will be within regulatory limits 3. Construction and operation activities meet the permitting requirements of applicable State and local agencies 4. Use of BMPs for dust control	Requirements of existing regulations related to air emissions have been found to be protective of human health and the environment.
Greenhouse Gas Emissions	ANR construction and operation, including uranium fuel cycle activities, transportation of fuel and waste, and decommissioning will emit no more than 2,534,000 MT CO_2(e) for the lifespan of the project of 97 years	Appendix H provides estimates of emissions of greenhouse gases associated with building, operation, fuel cycle, transportation of fuel and waste, and decommissioning. 1. Construction equipment would emit 78,000 MT CO_2(e) during a 7-year construction period 2. Construction workforce would emit 86,000 MT CO_2(e) during a 7-year construction period 3. Plant operations would emit 362,000 MT CO_2(e) during a 40- year period 4. Plant workforce would emit 272,000 MT CO_2(e) during a 40- year period 5. The uranium fuel cycle would emit 1,620,000 MT CO_2(e) during a 40-year period. Transportation of Fuel and Waste would emit 42,000 MT CO_2(e) during a 40-year period 6. Decommissioning equipment would emit 38,000 MT CO_2(e) during a 10-year period 7. Decommissioning workforce would emit 16,000 MT CO_2(e) during a 10-year period 8. SAFSTOR workforce would emit 20,000 MT CO_2e during a 40-year period Previous new reactor reviews which have a larger fuel cycle contribution based on Table S-3 have concluded that the impact of the contribution of greenhouse gases is SMALL.
Cooling System Air Quality	1. Hazardous Air Pollutant emissions will be within regulatory limits 2. Subject to State permitting requirements	The License Renewal GEIS (NRC 2013-TN2654) and supplemental EISs for individual plant relicensing evaluated the impact of continued operation of cooling towers, including natural draft cooling towers, at existing power plants for an additional 20 years and found the impacts to be SMALL.
Ozone and NOx Emissions	Transmission line voltage no higher than 1200 kV	Impacts of existing transmission lines on air quality are addressed in the License Renewal GEIS (NRC 2013-TN2654) and Supplemental EISs for individual plant relicensing, which have found impacts to be SMALL. The License Renewal GEIS evaluated lines up to 1,200 kV.
Total Plant Water Demand	1. Less than or equal to a daily average 6,000 gpm 2. The total plant water demand accounts for the maximum amount of water supply required for all plant needs 3. The total plant water demand may include water from multiple sources (e.g., surface water, groundwater, and/or municipal water sources to meet certain water quality criteria)	The NRC staff developed the total plant water demand PPE by considering water requirements for all plant systems from the set of currently known ANR designs considered by NRIC (2021-TN6940). The NRC staff rounded this value up to the nearest 1,000 gpm to derive the PPE.
Municipal Water Availability	The amount available from municipal water systems exceeds the amount of municipal water required by the plant (gpm) If municipal water is used for plant water supply: 1. Municipal Water Availability accounts for all existing and planned future uses 2. An agreement or permit for the usage amount can be obtained from the municipality	Municipal water availability at a site is the amount of excess capacity in the municipal systems that is available after accounting for all existing and planned future uses. The NRC staff can generically conclude that the proposed project's municipal water requirements would not noticeably affect water resources at the site, if bounded by municipal water availability and the capacity of the municipal systems.

Parameter	Values and Assumptions	Basis/Methodology
Surface Water Availability – Flowing (Stream or River) (not applicable if plant does not use cooling water)	1. The average rate of plant withdrawal does not exceed 3 percent of the 95 percent exceedance daily flow for the waterbody (cfs) 2. Average plant water withdrawals do not reduce discharge from the flowing waterbody by more than 3 percent of the 95 percent exceedance daily flow and do not prevent the maintenance of applicable instream flow requirements 3. The 95 percent exceedance daily flow accounts for existing and planned future withdrawals 4. Water availability is demonstrated by the ability to obtain a withdrawal permit issued by State, regional or tribal governing authorities 5. Water rights for the withdrawal amount are obtainable, if needed 6. Changes in littoral zone water levels and hydroperiod resulting from surface water withdrawals are within historical annual or seasonal fluctuations 7. If withdrawals are from an estuary or intertidal zone, then changes to salinity gradients are within the normal tidal or seasonal movements that characterize the waterbody	The staff reviewed surface water withdrawals from and related impacts on flowing waterbodies versus low-flow metrics at the of currently operating and newly licensed large light-water reactors (LWRs). In the reviews of previous analyses, the staff found that water withdrawal rates at or below 3 percent of the water available during low flow conditions did not result in noticeable impacts. Therefore, the NRC staff generically concluded that plant surface water withdrawals that do not exceed 3 percent of the 95 percent exceedance daily flow in the flowing waterbody used as the source, while accounting for all existing and planned withdrawals, would not noticeably affect surface water resources at the site. Plant water withdrawal may alter salinity gradients in flowing water bodies. The License Renewal GEIS (NRC 1996-TN288 and NRC 2013-TN2654) evaluated the impact of plant withdrawals on altering salinity gradients at operating plants and found the impacts to be SMALL if they are localized and are within the normal tidal or seasonal movements of salinity gradients that characterize the waterbody.
Surface Water Availability – Non-Flowing (not applicable if plant does not use cooling water)	1. Water availability of the Great Lakes, the Gulf of Mexico, oceans, estuaries, and intertidal zones exceeds the amount of water required by the plant 2. Water availability is demonstrated by the ability to obtain a withdrawal permit issued by State, regional or tribal governing authorities 3. Water rights for the withdrawal amount are obtainable, if needed 4. Changes in littoral zone water levels and hydroperiod resulting from surface water withdrawals are within historical annual or seasonal fluctuations 5. If withdrawals are from an estuary or intertidal zone, then changes to salinity gradients are within the normal tidal or seasonal movements that characterize the waterbody 6. Coastal Zone Management Act of 1972 (16 U.S.C. §§ 1451 *et seq.*; TN1243) consistency determination is obtainable, if applicable	The staff can generally conclude that the total plant water demand of 6,000 gpm would not result in water use conflicts in the Great Lakes, the Gulf of Mexico, oceans, estuaries, and intertidal zones, because the plant demand would be negligible as compared to water availability. The staff acknowledges, however, that smaller non-flowing surface waterbodies (e.g., inland lakes, man-made ponds, and reservoirs) have limited water availability. These waterbodies are not included in the staff's generic analysis. Plant water withdrawal may alter salinity gradients in non-flowing waterbodies. The License Renewal GEIS (NRC 1996-TN288 and NRC 2013-TN2654) evaluated the impact of plant withdrawals on altering salinity gradients at operating plants and found the impacts to be SMALL if they are localized and are within the normal tidal or seasonal movements of salinity gradients that characterize the waterbody.
Municipal Systems' Available Capacity to Receive and Treat Plant Effluent	1. The available capacity of the municipal systems to treat effluent exceeds the expected amount of plant effluent (gpm) 2. Municipal Systems' Available Capacity to Receive and Treat Plant Effluent accounts for all existing and planned future discharges 3. Agreement to discharge to a municipal treatment system is obtainable	Municipal systems' available receiving and treatment capacity is determined while accounting for all existing and reasonably foreseeable future discharges. The NRC staff can generically conclude that plant effluent treated by a municipal system would not noticeably affect water resources at the site, if bounded by the municipal systems' available capacity. The constituents present in plant effluent are addressed in the municipal systems' discharge permits.
Groundwater Withdrawal for Plant Uses	1. Less than or equal to 50 gpm 2. Withdrawal results in no more than 1 ft of drawdown at the site boundary 3. Withdrawals are not derived from an EPA-designated Sole Source Aquifer, or from any aquifer designated by a State, tribe, or regional authority to have special protections to limit drawdown 4. Withdrawals meet the permitting requirements of applicable State and local agencies 5. Changes in wetland water levels and hydroperiod resulting from groundwater use are within historical annual or seasonal fluctuations 6. Parameter value of 50 gpm is the total withdrawal for all plant uses (excluding dewatering)	This site parameter was based on the staff's determination in the License Renewal GEIS that ≤100 gpm groundwater withdrawal creates negligible or small impacts at operating nuclear power plants because this use rate would not generally lower groundwater levels beyond the site boundary. The groundwater withdrawal rate parameter was adjusted lower based on simplified modeling showing that effects on groundwater levels at the site boundary from pumping 50 gpm on a 100 ac site would approximate the effects from pumping 100 gpm on a larger site the size of a typical large LWR. The staff assumed that groundwater withdrawals for plant uses would result in less than a 1 ft reduction in groundwater levels at the site boundary. The threshold of 1 ft was selected as a *de minimis* value likely to be less than the natural annual fluctuations in groundwater levels at most sites.

Parameter	Values and Assumptions	Basis/Methodology
Groundwater Withdrawal for Excavation or Foundation Dewatering	1. Dewatering rate less than or equal to 50 gpm 2. Dewatering results in negligible drawdown at the site boundary 3. Dewatering discharge has minimal effects on the quality of the receiving waterbody (e.g., as demonstrated by conformance with NPDES permit requirements) 4. Changes in wetland water levels and hydroperiod resulting from dewatering are within historical annual or seasonal fluctuations 5. Parameter value of 50 gpm represents the long-term dewatering rate (the initial rate may be larger)	The groundwater dewatering parameter was based on the staff's determination that impacts would be small if dewatering would not lower groundwater levels beyond the site boundary, which is consistent with the License Renewal GEIS. Based on simplified modeling, the staff determined that, relative to the plant site area, the effects on groundwater levels caused by dewatering withdrawals of 50 gpm at a 100 ac ANR site would be similar to the effects caused by dewatering withdrawals of 100 gpm on a larger site the size of a typical large LWR. Consistent with the smaller site area for the ANR, the staff assumed in this simplified modeling that the area to be dewatered and the depth of groundwater drawdown at the excavation/foundation would be smaller for an ANR than for a typical large LWR.
Groundwater Quality	1. The plant is outside the recharge area for any EPA-designated Sole Source Aquifer or any aquifer designated to have special protections by a State, tribal, or regional authority 2. The plant is outside the wellhead protection area or designated contributing area for any public water supply well 3. No planned plant discharges to the subsurface (by infiltration or injection), including stormwater discharge 4. Applicable requirements and guidance on spill prevention and control are followed, including relevant BMPs and Integrated Pollution Prevention Plan 5. A groundwater protection program conforming to NEI 07-07 (NEI 2019-TN6775) is established and followed	Because groundwater quality degradation would have the greatest effects on other users of the resource when groundwater at the plant site contributes to the source water for other users, the potential impacts on groundwater quality from plant construction and operation will be minimized when the plant is located outside the recharge areas for critical groundwater supplies and when there are no planned discharges to the subsurface. In addition, spill prevention/control requirements and a groundwater protection program help to prevent releases of contaminants to groundwater and to minimize the impacts of any releases that inadvertently occur.
Impacts on Aquatic Biota	1. Adherence to regulatory limits in 40 CFR 125.84 (TN254) 2. Adherence to requirements in NPDES permits issued by the EPA or a given State	Requirements of existing regulations related to aquatic biota impacts are protective of aquatic resources and have been found to keep adverse impacts localized and temporary.
Radiological Environmental Hazards	For protection against radiation, the applicant must meet the regulatory requirements of: 1. 10 CFR 20.1101 Radiation Protection Programs (10 CFR Part 20-TN283) if issued a license 2. 10 CFR 20.1201 Occupational dose limits for adults 3. 10 CFR 20.1301 Dose limits for individual members of the public 4. Appendix B of 10 CFR Part 20 Annual Limits on Intake (ALIs) and Derived Air Concentrations (DACs) of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sewerage 5. 10 CFR 50.34a (10 CFR Part 50-TN249) Design objectives for equipment to control releases of radioactive material in effluents—nuclear power reactors 6. 10 CFR 50.36a Technical specifications on effluents from nuclear power reactors Applicants would demonstrate in their application that any radiological nonhuman biota doses would be below IAEA (1992-TN712) and NCRP (1991-TN729) guidelines Application contains sufficient technical information for the staff to complete the detailed technical safety review Application will be found to be in compliance by the staff with the above regulations through a radiation protection program and an effluent release monitoring program.	Requirements of existing regulations related to radiological health have been found to be protective of workers and members of the public and are minimized through a radiation protection program that implements ALARA.
Nonradiological Environmental Hazards	1. The applicant must adhere to all applicable Federal, State, local, or tribal regulatory limits and permit conditions for chemical hazards, biological hazards, and physical hazards from a proposed advanced reactor 2. The applicant will follow nonradiological public and occupational health BMPs and mitigation measures, as appropriate, to govern building and operations-related activities	Requirements of existing regulations related to nonradiological environmental hazards are protective of human health and have been found to keep the adverse impacts of building and operations-related activities localized and temporary.

Parameter	Values and Assumptions	Basis/Methodology
Wildlife-Related Noise Generation	85 dBA 50 ft from the source	NRC staff has historically relied upon the Federal Highway Administration Construction Noise Handbook (WSDOT 2017-TN5313) to determine that a noise level of 85 dBA 50 ft from the source is typical.
Human-Related Noise Generation	1. 65 dBA at site boundary, unless a relevant State or local noise abatement law or ordinance sets a different threshold, which would then be the presumptive threshold for PPE purposes. 2. If an applicant cannot meet the 65 dBA threshold through mitigation, then the applicant must obtain a various or exception with the relevant State or local regulator. 3. Project will implement BMPs, including such as modeling, foliage planting, construction of noise buffers, and the timing of construction and/or operation activities.	The License Renewal GEIS (NUREG-1437; NRC 2013-TN2654) determined that noise levels are considered acceptable if the day-night average sound level outside a residence is less than 65 dBA. This limit is also included in the NRC Environmental Standard Review Plans (NUREG-1555; NRC 2000-TN614).
Radiological Waste Management	Applicants must meet the regulatory requirements of 10 CFR Part 20 (TN283) (e.g. 20.1406 and Subpart K), 10 CFR Part 61 (TN252), 10 CFR Part 71 (TN301), and 10 CFR Part 72 (TN4884) Quantities of LLRW generated at an ANR would be less than the quantities of LLRW generated at existing nuclear power plants, which generate an average of 21,200 ft^3 (600 m^3) and 2,000 Ci (7.4×10^{13} Bq) per year for boiling water reactors and half that amount for pressurized water reactors (NRC 2013-TN2654)	Requirements of existing regulations related to radiological waste management have been found to be protective of human health and the environment.
Nonradiological Waste Management	Resource Conservation and Recovery Act (RCRA) Small Quantity Generator (EPA 2020-TN6590) for Mixed Waste 1. Applicants must meet all applicable permit conditions, regulations, and BMPs related to solid, liquid, and gaseous waste management 2. For hazardous waste generation, applicants must meet the conformity with the appropriate hazard waste quantity generation level in accordance with RCRA (EPA 2020-TN6590) 3. For sanitary waste, applicants must treat sanitary waste in a permitted process 4. Perform mitigation measures, to the extent practicable, such as recycling, process improvements, or using a less hazardous substance	Requirements of existing regulations and applicable permits related to nonradiological waste management have been found to be protective of human health and the environment and have been found to keep the adverse impacts of building and operation activities localized and temporary.
Postulated Accidents	For design basis accidents,[1] the exclusion area boundary maximum total effective dose equivalent (TEDE) for any 2-hour period and the low-population zone maximum TEDE for the duration of the accident release For accidents involving releases of hazardous chemicals: • ANR inventory of a regulated substance is less than its Threshold Quantity (TQ). TQs are found in 40 CFR 68.130, Tables 1, 2, 3, and 4 (TN5494); and • ANR inventory of an EHS is less than its Threshold Planning Quantity (TPQ). TPQs are found in 40 CFR Part 355, Appendices A and B (TN5493). A cost screening analysis determines that the maximum benefit for avoiding an accident is so small that a SAMDA analysis is not justified based on a minimum cost to design an appropriate SAMDA. The proposed site is not within the jurisdiction of the United States Court of Appeals for the Ninth Circuit	Requirements of existing regulations related to postulated accidents are protective of human health. The applicant would have to demonstrate meeting the dose requirements contained in 10 CFR 50.34(a)(1) (TN249) Design objectives for equipment to control releases of radioactive material in effluents – nuclear power reactors, or 10 CFR 52.17(a)(1) (TN251), Contents of applications; technical information, or 10 CFR 52.79(a)(1)(A), Contents of applications; technical information in Final Safety Analysis Report (FSAR), as applicable. For hazardous chemical accidents, the applicant would make a comparison of hazardous chemical inventories to the TQs found in 40 CFR 68.130, Tables 1, 2, 3, and 4 (TN5494); and the TPQs in 40 CFR Part 355, Appendices A and B (TN5493). For SAMDAs, the staff expects that the safety analysis would have core damage frequencies (CDFs) that would likely be substantially less than CDFs associated with the current reactor fleet. For non-LWR SAMA screening and assessments, event or release category frequency could be used in place of CDFs. In such cases a cost screening could determine that the maximum benefit for avoiding an accident is so small that a SAMDA is not justified based on a minimum cost to design an

[1] For the purposes of this GEIS, “Design Basis Accidents” are related to a spectrum of accidents that will be evaluated for satisfying siting requirements (e.g., 10 CFR Part 100-TN282) and the safety analysis requirements (e.g., 10 CFR Part 50-TN249, 10 CFR Part 52-TN251) or the applicable NRC safety and siting regulations in place at the time the application is docketed).

Parameter	Values and Assumptions	Basis/Methodology
		appropriate SAMDA. This cost screening process would be based on the available risk information from the safety analysis report and apply the cost formulas from NUREG/BR-0058 (NRC 2020-TN6806). Acts of terrorism: If within the jurisdiction of the United States Court of Appeals for the Ninth Circuit, appropriate staff analysis would be performed based in part on the physical protection requirements under 10 CFR Part 73 (TN423).
Site Employment	Peak project-related in-migrating workforce including families does not exceed established local planning and growth projections for infrastructure and service demands	Some construction and operations workers and their families are assumed to relocate to the economic region of the proposed project. Staff assumes growth planning for the affected infrastructure and services would factor these changes into baseline service demand projections. This assumption is based on staff experience since 2005 for more than 20 license application reviews. Peak project-related workforce increases are assumed to cause minimal effects on most services and infrastructure as long as increases are within local government planning projections.
Community Services and Infrastructure (e.g., housing availability; school capacities)	1. the housing vacancy rate in the affected economic region remains at least 5 percent of the housing stock after removing sufficient rental units to accommodate the in-migrating construction workers, 2. student:teacher ratios in the affected economic region do not decline below the locally mandated levels after including the school age children of the in-migrating construction worker families housing and education resources would be the only resource areas where noticeable impacts might occur	This assumption is based on staff experience since 2005 with more than twenty license application reviews. Staff experience indicates a healthy housing market maintains a vacancy rate of five percent of the total housing stock, and any local, regional, or state mandated threshold (e.g., a student:teacher ratio) establishes the point of inflection from a SMALL impact to a MODERATE impact.
Transportation Systems and Traffic	Level of service (LOS) determination for affected roadways does not change	Movement between LOS classes (A, B, C, D, E, F) would be noticeable to drivers. Increased traffic that does not trigger a movement between these classes would be a minor impact. This assumption is based on the industry-standard LOS approach that has been used in previous NRC NEPA assessments since 2005.
Fuel Cycle	Table S-3 bounds the impacts for ANRs fuels, because of uranium fuel cycle changes since WASH-1248 (AEC 1974-TN23), including: • Increasing use of in situ leach uranium mining • Transitioning of U.S. uranium enrichment technology from gaseous diffusion to gas centrifugation. • Current LWRs are using nuclear fuel more efficiently due to higher levels of fuel burnup • Less reliance on coal fired electrical generation plants Sources of enriched lithium would be from U.S. stockpiles or from foreign sources Reprocessing capacity up to 900 MTU/yr Uranium fuel cycle impacts will bound the thorium fuel cycle impacts Waste and spent fuel inventories, as well as their associated certified spent fuel shipping and storage containers, are not significantly different from what has been considered for LWR evaluations in NUREG-2157 (NRC 2014-TN4117). Must satisfy the regulatory requirements of 10 CFR Part 40 (TN4882) *Domestic Licensing of Source Material*, 10 CFR Part 50 (TN249) *Domestic Licensing of Production and Utilization Facilities*, 10 CFR Part 70 (TN4883), *Domestic Licensing of Special Nuclear Material*, 10 CFR Part 71 (TN301), *Packaging and Transportation of Radioactive Material*, 10 CFR Part 72 (TN4884), *Licensing Requirements for the Independent Storage of Spent Fuel, High-Level Radioactive Waste, and Reactor-related Greater Than Class C Waste*, and 10 CFR Part 73 (TN423), *Physical Protection of Plants and Materials.*	Advances in the uranium fuel cycle (as noted in the values and assumptions columns) have reduced the various impacts of the fuel cycle from what is presented in Table S-3. For example, higher burnup levels allow for longer periods of time between refueling thus reducing the annual number of fuel assemblies discharged from a reactor. As such, Table S-3 bounds the impacts associated with ANR fuel cycles. Requirements of existing regulations related to the safe processing, storage, transportation, and security of nuclear material have been found to be protective of workers and members of the public. Fuel fabrication impacts for metal fuel and liquid fueled molten salt are not included in the staff's generic analysis.
Transportation of Unirradiated ANR Fuel	Consistency with thresholds for the maximum shipment distances in Tables 3.15-2 and 3.15-3, 59,160 km and 118,320 km respectively.	Accident frequencies for transportation of unirradiated fuel are expected to be lower than those used in the analysis in WASH-1238 (AEC 1972-

Parameter	Values and Assumptions	Basis/Methodology
	The shipments are normalized to a net electrical output of 880 MW(e), i.e., 1,100 MW(e) with an 80 percent capacity factor from WASH-1238 (AEC 1972-TN22) The parameter does not apply to situations where an ANR applicant proposes shipping the unirradiated fuel by air, ship or barge; or where an applicant proposes that an unirradiated fuel transportation package be approved using the provisions of 10 CFR 71.12, 10 CFR 71.41(c), or 10 CFR 71.41(d) (10 CFR Part 71-TN301)	TN22). This is based on the NRC staff review of the trends in improvements in highway safety and security, and an overall reduction in traffic accident, injury, and fatality rates since WASH-1238 was published. Although packages for all types of unirradiated fuel have not been designed or certified by the NRC, these packages must comply with the packaging requirements contained in 10 CFR Part 71 (TN301) and for this reason, the impacts of radiological accidents during transport of unirradiated fuel to ANR are expected to be smaller than those listed in Table S–4 in 10 CFR 51.52 (TN250). The PPE applies to situations where the enrichment of the unirradiated ANR fuel is 20 percent or less, based on the unlimited A_2 value in Table A-1 in 10 CFR Part 71 for unirradiated uranium enriched to 20 percent or less (10 CFR Part 71-TN301).
Transportation of Radioactive Waste from ANRs	Consistency with thresholds for the maximum shipment distance in Table 3.15-7, 293,145 km. The shipments are normalized to a net electrical output of 880 MWe, i.e., 1,100 MWe with an 80 percent capacity factor and a shipment volume of 2.34 m^3/shipment from WASH-1238 (AEC 1972-TN22). This PPE does not apply to situations where an ANR applicant proposes shipping the radioactive waste by air, ship or barge; or where an applicant proposes that a radioactive waste transportation package be approved using the provisions of 10 CFR 71.12, 10 CFR 71.41(c), or 10 CFR 71.41(d) (10 CFR Part 71-TN301)	Reviewed impacts from previous LWR early site permit (ESP) and combined license (COL) environmental analyses, which have concluded that the impacts of transportation of radioactive waste were SMALL. ANRs are expected to generate lower volumes of low-level radioactive wastes than LWRs because they have less complex systems, structures, and components.
Transportation of Irradiated Fuel from ANRs	Consistency with the thresholds for the maximum shipment distances, and burnup included in Tables 3.15-8 through 3.15-10, 505,393 km and 1,010,786 km. The shipments are normalized to a net electrical output of 880 MWe, i.e., 1,100 MWe with an 80 percent capacity factor and a shipment capacity of 0.5 MTU/shipment from WASH-1238 (AEC 1972-TN22) This PPE is based on a maximum peak rod burnup of 62 GWd/MTU for uranium oxide fuel and 133 GWd/MTU for TRISO (TRi-structural ISOtropic) fuel This PPE does not apply to situations where an ANR applicant proposes shipping the irradiated ANR fuel by air, ship or barge; or where an ANR applicant proposes that an irradiated ANR fuel transportation package be approved using the provisions of 10 CFR 71.12, 10 CFR 71.41(c), or 10 CFR 71.41(d) (10 CFR Part 71-TN301) such as might be applied for when shipping a complete irradiated ANR core In addition, the irradiated ANR fuel must be shipped in a transportation package that meets all of the applicable NRC regulations	Reviewed impacts from previous LWR ESP and COL environmental analyses, which have concluded that the impacts of transportation of irradiated fuel were SMALL.
Decommissioning	The ANR would be within the bounds of the Decommissioning GEIS (NRC 2002-TN665) based on the following assumptions: 1. Doses to the public would be well below applicable regulatory standards regardless of which decommissioning method considered in decommissioning GEIS is used 2. Occupational doses would be well below applicable regulatory standards during the license term 3. The quantities of Class C or greater than Class C wastes generated would be comparable to or less than the amounts of solid waste generated by reactors licensed before 2002 4. The air quality impacts of decommissioning are expected to be negligible 5. Measures are readily available to avoid potential significant water quality impacts from erosion or spills. The liquid radioactive waste system design includes features to limit release of radioactive material to the environment, such as pipe chases and tank collection basins. These features will minimize the amount of radioactive material in spills and leakage that would have to be addressed at decommissioning 6. The ecological impacts of decommissioning are expected to be negligible 7. The socioeconomic impacts should be neither detectable nor destabilizing	NUREG-0586 Supplement 1 Decommissioning GEIS (NRC 2002-TN665) Requirements of existing regulations related to decommissioning activities have been found to be protective of workers, members of the public, and the environment.
Operational Life of the Plant	40-year operational life, assuming a 40-year license	10 CFR 50.51(a) (TN249) and 52.104 (TN251).

Parameter	Values and Assumptions	Basis/Methodology
Construction Phase of the Plant	7-year construction life to complete construction activities	Based off previous new reactor EIS reviews.

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10 CFR Part 50. *Code of Federal Regulations*, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities." TN249.

10 CFR Part 51. *Code of Federal Regulations*, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions." TN250.

10 CFR Part 52. *Code of Federal Regulations*, Title 10, *Energy*, Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants." TN251.

10 CFR Part 61. *Code of Federal Regulations*, Title 10, *Energy*, Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste." TN252.

10 CFR Part 70. *Code of Federal Regulations*, Title 10, *Energy*, Part 70, "Domestic Licensing of Special Nuclear Material." TN4883.

10 CFR Part 71. *Code of Federal Regulations*, Title 10, *Energy*, Part 71, "Packaging and Transportation of Radioactive Material." TN301.

10 CFR Part 72. *Code of Federal Regulations*, Title 10, *Energy*, Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater than Class C Waste." TN4884.

10 CFR Part 73. *Code of Federal Regulations*, Title 10, *Energy*, Part 73, "Physical Protection of Plants and Materials." TN423.

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