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Chapter 2 Site Characteristics

Chapter 2 describes the characteristics of the Vogtle Electric Generating Plant (VEGP) site. The site location and description are provided in sufficient detail to support a safety assessment. The chapter is divided into five sections:

- Geography and Demography (Section 2.1)
- Identification of Potential Hazards in Site Vicinity (Section 2.2)
- Meteorology (Section 2.3)
- Hydrologic Engineering (Section 2.4)
- Geology, Seismology, and Geotechnical Engineering (Section 2.5)

2.1 Geography and Demography

2.1.1 Site Location and Description

2.1.1.1 Site Location

The proposed Units 3 and 4 will be built on the existing VEGP site. The 3,169-acre VEGP site is located on a coastal plain bluff on the southwest side of the Savannah River in eastern Burke County. The site exclusion area boundary (EAB) is bounded by River Road, Hancock Landing Road, and 1.7 miles of the Savannah River (River Miles 150.0 to 151.7). The property boundary entirely encompasses the EAB and extends beyond River Road in some areas. The site is approximately 30 river miles above the US 301 bridge and directly across the river from the Department of Energy's (DOE's) Savannah River Site (SRS) (Barnwell County, South Carolina). The VEGP site is approximately 15 mi east-northeast of Waynesboro, Georgia, and 26 mi southeast of Augusta, Georgia, the nearest population center (i.e., having more than 25,000 residents). It is also about 100 mi from Savannah, Georgia, and 150 river miles from the mouth of the Savannah River.

The VEGP site is situated within three major resource areas: the Southern Piedmont, the Carolina and Georgia Sand Hills, and the Coastal Plain. These characteristics are typical of land forms that resulted from historical marine sediment deposits in central and eastern Georgia. There are no mountains in the general area.

Burke County includes five incorporated towns: Waynesboro, Girard, Keysville, Midville, and Sardis. Of these five towns, only the town of Girard is within 10 mi of the VEGP site. According to the 2000 Census survey, Girard, which has a population of 227, is the largest community within 10 mi of the VEGP site **(USCB 2000b)**. Figure 2.1-1 shows Girard and its location with respect to the VEGP site. Access to the site is by River Road via US Route 25, Georgia Routes 56, 80, 24, and 23. A railroad spur connects the site to the Norfolk Southern Savannah-to-Augusta track.

Figure 2.1-2 shows highways, railways and airports located in the 50 mi surrounding area. The nearest highway, Interstate 20 (I-20), passing through Augusta and connecting Columbia, South Carolina, with Atlanta, Georgia, is located approximately 29 mi north of the VEGP site.

2.1.1.2 Site Description

VEGP Units 3 and 4 (Westinghouse Electric Company, LLC [Westinghouse] AP1000 certified reactor design plants) will be located in the power block area shown in Figure 1-4. The centerline of the proposed VEGP Unit 3 will be located approximately 1,700 ft west and 400 ft south of the center of the existing VEGP Unit 2 containment building. The proposed VEGP Unit 4 will be approximately 800 ft west of proposed VEGP Unit 3. The coordinates of the center of the containment building for VEGP Units 3 and 4 are as follows:

	Georgia East Coordinates (NAD27)		UTM Coordinates (NAD83)		Latitude/Longitude	
Unit	1001 – Georgia East (US ft)		Zone 17 – 84W to 78W (m)		(NAD83)(Deg/Min/Sec)	
3	N	1,142,600	N	3,667,170	N	33 08 27
	E	621,800	E	428,320	E	81 46 07
4	N	1,142,600	N	3,667,170	N	33 08 27
	E	621,000	E	428,070	E	81 46 16

No commercial, industrial, institutional, recreational, or residential structures are located within the site area, with the exception of Plant Wilson, the Georgia Power Company (GPC) combustion turbine plant. The nearest point to the exclusion area boundary (EAB) is located approximately 3,400 ft southwest of the proposed VEGP Units 3 and 4 power block area.

2.1.1.3 Boundary for Establishing Effluent Release Limits

VEGP Units 3 and 4 will be located within the power block area, which is the perimeter of a 775-ft-radius circle with the centroid at a point between the two AP1000 units. The EAB as described previously, will be the same as the exclusion area boundary for the existing VEGP units. There are no residents in this exclusion area. No unrestricted areas within the site boundary are accessible to members of the public. Access within the property boundary is controlled as discussed in Section 2.1.2. Detailed discussion of effluent release points is provided in Section 2.3.5.

All areas outside the exclusion area will be unrestricted areas in the context of 10 CFR 20. Additionally, the guidelines provided in 10 CFR 50, Appendix I, for radiation exposures to meet the criterion “as low as is reasonably achievable” would be applied at the EAB.

2.1.2 Exclusion Area Authority and Control

The EAB is bounded by River Road, Hancock Landing Road, and 1.7 miles of the Savannah River (River Miles 150.0 to 151.7) as shown in Figure 1-4.

2.1.2.1 Authority

Ownership general information required by 10 CFR 50.33 is described in Part 1, Chapter 3 of the ESP application. The co-owners own the entire plant exclusion area in fee simple including mineral rights. Pursuant to the VEGP owner's agreement, GPC, for itself and as agent for the co-owners, has delegated to Southern Nuclear Operating Company, Inc. (SNC) complete authority to regulate any and all access and activity within the entire plant exclusion area.

The perimeter of the VEGP EAB is adequately posted with "No Trespassing" signs on land and with signs along the Savannah River, and indicate the actions to be taken in the event of emergency conditions at the plant.

2.1.2.2 Control of Activities Unrelated to Plant Operation

There are only two facilities within the EAB that have authorized activities unrelated to nuclear plant operations, the visitor's center and the GPC combustion turbine plant, Plant Wilson.

The exclusion area outside the controlled area fence will be posted and will be closed to persons who have not received permission to enter the property.

The access route to the visitor's center is from River Road along the main plant access road to the road leading to the visitor's center. Access to the visitor's center is controlled by security at the pavilion (access control point) on the plant entrance road. Normally, only a few administrative personnel are located at the visitor's center. Because of the remote location of the site, the number of visitors at the center is minimal. However, approved persons visiting the center will occupy the center and the area and parking lot immediately adjacent to the center. In the event of emergency conditions at the plant, the emergency plan provides for notification of visitors to the center concerning the proper actions to be taken and evacuation instructions. Plant Wilson is controlled and operated by VEGP staff. Access to the facility from New River Road is limited by locked gates. The emergency plan also provides for notification and evacuation of VEGP personnel at Plant Wilson.

SNC normally will not control passage or use of the Savannah River along the exclusion area boundary. "No trespassing" signs are posted near the river indicating the actions to be taken in the event of emergency conditions at the plant.

2.1.2.3 Arrangements for Traffic Control

No state or county roads, railways, or waterways traverse the VEGP exclusion area.

SNC has made arrangements with the Burke County Sheriff for control of traffic nearby in the event of an emergency. Evacuation of the EAB including the Visitors Center and Plant Wilson is addressed in Section 13.3 and the Emergency Plan (Part 5 of the ESP application).

2.1.3 Population Distribution

The population distribution surrounding the VEGP site, up to a 50-mi (80 km) radius, was estimated based on the year 2000 US Census Bureau decennial census data **(NRC 2003)**. The population distribution is estimated in 10 concentric bands at 0 to 1 mi, 1 to 2 mi, 2 to 3 mi, 3 to 4 mi, 4 to 5 mi, 5 to 10 mi, 10 to 20 mi, 20 to 30 mi, 30 to 40 mi, and 40 to 50 mi from the center of the power block area (generating facilities and switchyard), shown in Figure 1-4 and 16 directional sectors, each direction consisting of 22.5 degrees. The population projections for 2010, 2020, 2030, 2040, and 2070 have been estimated by calculating an annualized growth rate using the 1980 and 2000 census data (by county) as the base **(USCB 1990a, 2000a)**.

2.1.3.1 Resident Population Within 10 Mi

Figure 2.1-1 shows the general locations of the municipalities and other features within 10 mi (16 km) of the VEGP site. According to the 2000 Census, Girard, with a population of 227, is the largest community within 10 mi of the site (USCB 2000b). The population of Girard showed an increase of 16.4 percent in the last decade from a population of 195 in 1990 to a population of 227 in 2000 **(USCB 1990b)**.

The population distribution within 10 mi of the site was computed by overlaying the 2000 Census block points data (the smallest unit of census data) on the grid shown in Figure 2.1-1 and summing the population of the census block points within each sector. SNC used SECPOP 2000, a code developed for the NRC by Sandia National Laboratories, to calculate population by emergency planning zone sectors **(NRC 2003)**. SECPOP uses 2000 block data from the US Census Bureau and overlays it into the sectors in the annuli prescribed by the user. The 1980 and 2000 population distributions for each county considered in Georgia and South Carolina were obtained from the U.S Census Bureau and used to calculate a growth rate over 20 years **(USCB 1990a, 2000a)**. Each county growth rate was annualized and used to project future populations within each sector, taking into account the percentage of each sector that each county occupied.

The population distributions and related information were collected and the results tabulated for all distances of interest in all 16 directions. All the north-northeast to east sectors in South Carolina are occupied by the SRS, which has no residents. SRS transients are accounted for in the SRS Emergency Plan and, therefore, are not included in the VEGP Emergency Plan. The SRS will remain a government-controlled facility in perpetuity. The SECPOP 2000 results show that in 2000, the combined resident and transient populations within 5 mi and 10 mi of the VEGP site were 687 and 3,560 persons, respectively. The resident and transient 10-mi population for

2000 and projections for 2010 through 2070 are shown in Figures 2.1-3 through 2.1-8 and are summarized in the table below.

Year	2000	2010	2020	2030	2040	2070
Population 0–10 miles	3,560	3,822	4,108	4,406	4,737	5,877

2.1.3.2 Resident Population Between 10 and 50 Mi

The 50-mi (80-km) radius centered at the VEGP site includes all, or parts of, 16 counties in Georgia, and 12 counties in South Carolina (Figure 2.1-9). Augusta, Georgia, approximately 26 mi northwest of the VEGP site, had a population of 195,182 in year 2000. Estimates of the year 2000 resident population between 10 and 50 mi from the VEGP site were computed using the same methodology used to develop the 10-mi population distribution.

The population grid to 50 mi is shown in Figure 2.1-9. The 10–50-mi population for 2000 and projections for 2010 through 2070 are shown in Figures 2.1-10 through Figure 2.1-15. The total 0–50 mile population and projections are summarized in the table below.

Year	2000	2010	2020	2030	2040	2070
Population 0–50 miles	674,101	770,243	893,950	1,056,017	1,272,093	2,530,357

2.1.3.3 Transient Population

2.1.3.3.1 Transient Population Within 10 Miles

Information concerning transient population for the 10-mi radius was obtained from the VEGP Emergency Plan. The transient population includes hunters and fishermen at recreational areas along the Savannah River. Up to 200 hunters and fishermen may be located along the Savannah River on any weekend day during the hunting season **(SNC 2004)**. Although most hunters and fishermen likely reside in the area, this information is not definitive. Therefore, all hunters and fishermen were included as transient population. The construction workforce for VEGP Units 3 and 4 and the existing staff at VEGP were not included as transient population within 10 mi of the plant because they are counted as residents within the 10–50 mi radius area.

Portions of the SRS fall within 10 mi of the VEGP site. However, SRS workers are not counted as transient population in the VEGP Emergency Plan because SRS is responsible for its own evacuation plan. **(SNC 2004)**

2.1.3.3.2 Transient Population Between 10 and 50 Miles

Colleges, schools, hospitals, a military base, and the SRS are between 10 and 50 mi from the VEGP site. In addition, thousands of people visit Augusta and the surrounding area out to the 50-mi limit annually during the week of the Masters Tournament and for other annual events within a 50-mi radius. However, compared to the resident population within a 50-mi radius, the transient population is expected to be very small.

2.1.3.4 Low Population Zone

The low population zone (LPZ) for VEGP Units 3 and 4 is the same as the LPZ for the existing VEGP units and consists of the area falling within a 2-mi radius of the midpoint between the VEGP Unit 1 and Unit 2 containment buildings. The resident and transient population distribution within the LPZ is indicated in Figures 2.1-3 through 2.1-8, based on the 2000 Census and projections through 2070. The LPZ population projections are also shown in the table below.

Year	2000	2010	2020	2030	2040	2070
Population	93	100	109	116	126	157

There are no schools in the LPZ. One private school is located approximately 9 mi west of the site, Lord's House of Praise Christian School, with an enrollment of approximately 50 students. S.G.A. Elementary School is the nearest public school and is located in the town of Sardis approximately 11 mi from the VEGP site **(BCS 2006)**. As stated in the previous section, the only significant transient population within 10 mi is hunters and fishermen along the banks of the Savannah River. Approximately 50 hunters and fishermen could be considered transient population within the LPZ. River Road is the only road within the LPZ. No towns, recreational facilities, hospitals, schools, prisons, or beaches are within the LPZ **(SNC 2004)**. Design basis accidents are evaluated in Chapter 15 to demonstrate that doses at the LPZ will be within the dose limits of 10 CFR 100.21(c) and 10 CFR 50.34(a)(1)(ii). Evacuation of the LPZ is addressed in SSAR Section 13.3 and the referenced Emergency Plan (Part 5 of the ESP application).

2.1.3.5 Population Center

The nearest population center to the VEGP site with more than 25,000 residents is the City of Augusta, Georgia, with a 2000 population of 195,182 **(USCB 2000b)**. Augusta is approximately 26 miles north-northwest of the VEGP site.

2.1.3.6 Population Density

Regulatory Position C.4 of Regulatory Guide 4.7, *General Site Suitability Criteria for Nuclear Power Plants*, Revision 2, April 1998 (RG 4.7) and NRC Review Standard RS-002, *Processing*

Applications for Early Site Permits, May 3, 2004 (RS-002) provide guidance on suitable population densities. Given an ESP approval date of 2010, a conservative startup date of 2030 (at the end of an ESP approval period of 20 years), and an operational period of 40 years, operations could extend until 2070. Figure 2.1-16 is a plot of population density to radial distance from the plant. Three VEGP site curves, one actual and two projected, were plotted to illustrate that the VEGP site vicinity population density is well below the regulatory guidance for population density. The three VEGP curves show the cumulative population in 2000 within 20 mi of the site and projected cumulative populations in 2040 and 2070. On the same figure, spanning the same radial distances, regulatory guidance population curves are plotted for hypothetical densities of 500 persons per square mile and 1,000 persons per square mile. Based on these projections, population densities, averaged over any radial distance out to 20 mi, are expected to be less than 500 persons per square mile over the lifetime of the new units. Figure 2.1-17 provides a representation of the LPZ that includes topographic features, as well as transportation routes (i.e., highways, railways, and waterways).

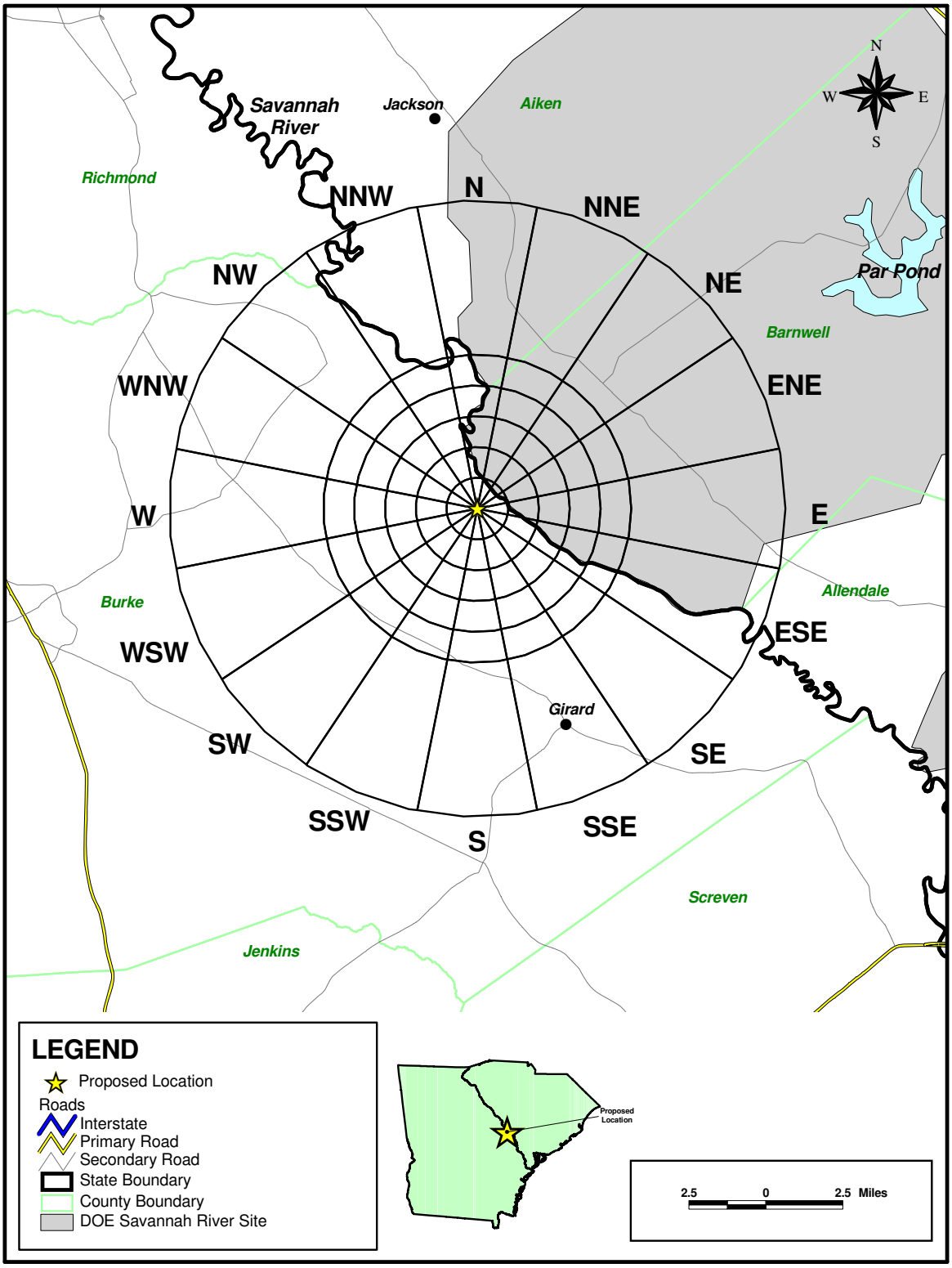


Figure 2.1-1 10-Mile Surrounding Area

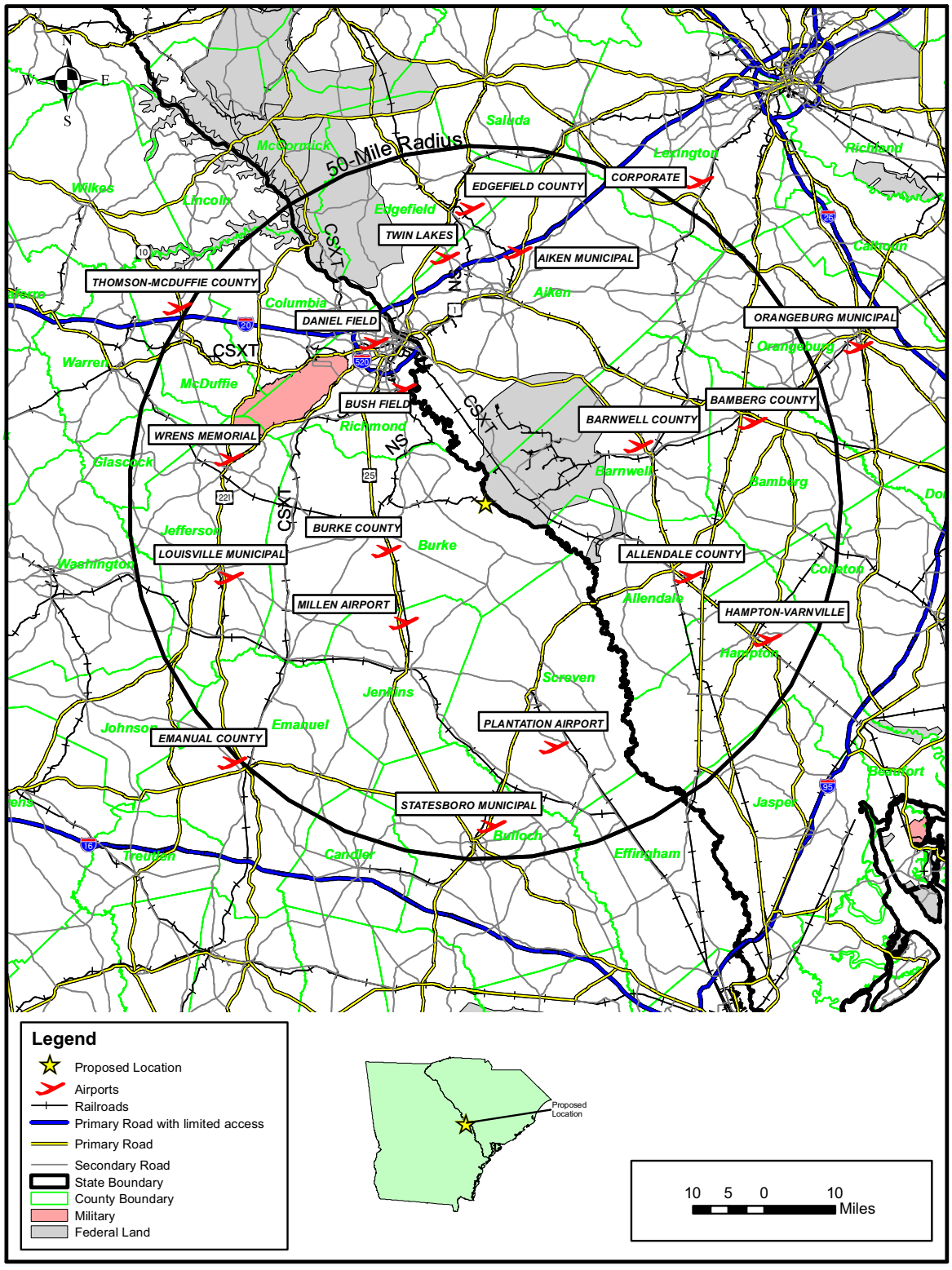


Figure 2.1-2 50-Mile Surrounding Area

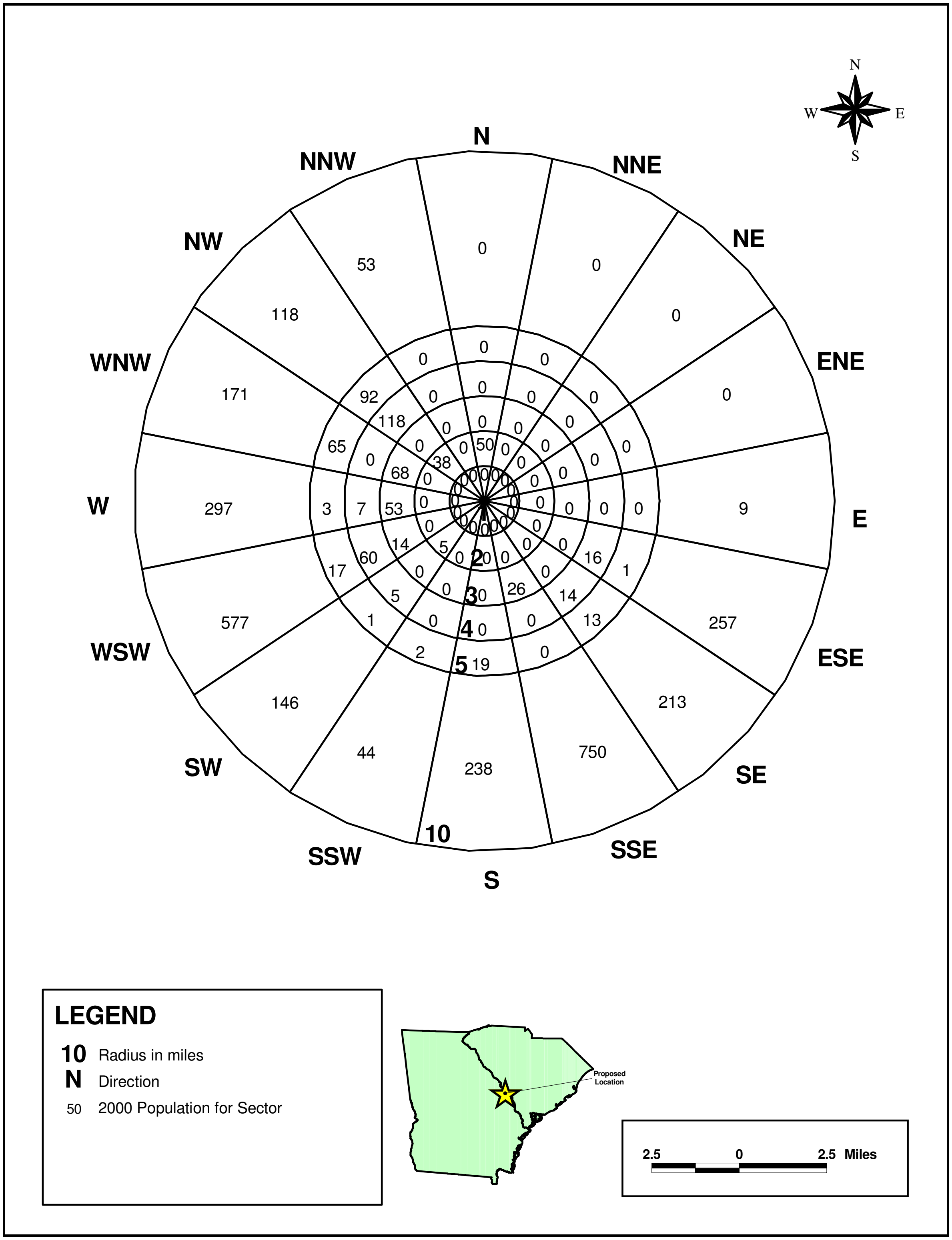


Figure 2.1-3 10-Mile Resident and Transient Population Distribution – 2000

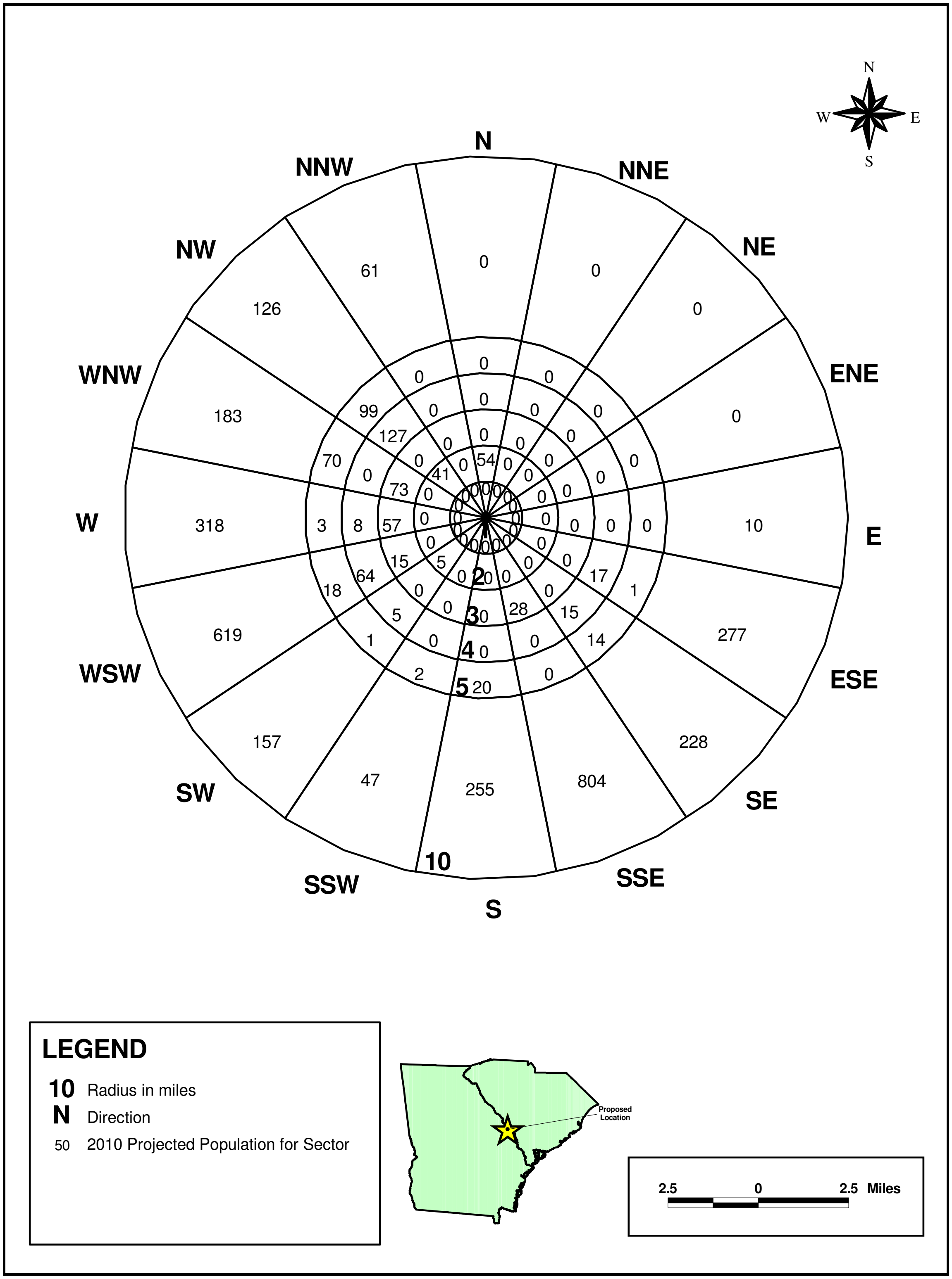


Figure 2.1-4 10-Mile Resident and Transient Population Distribution – 2010

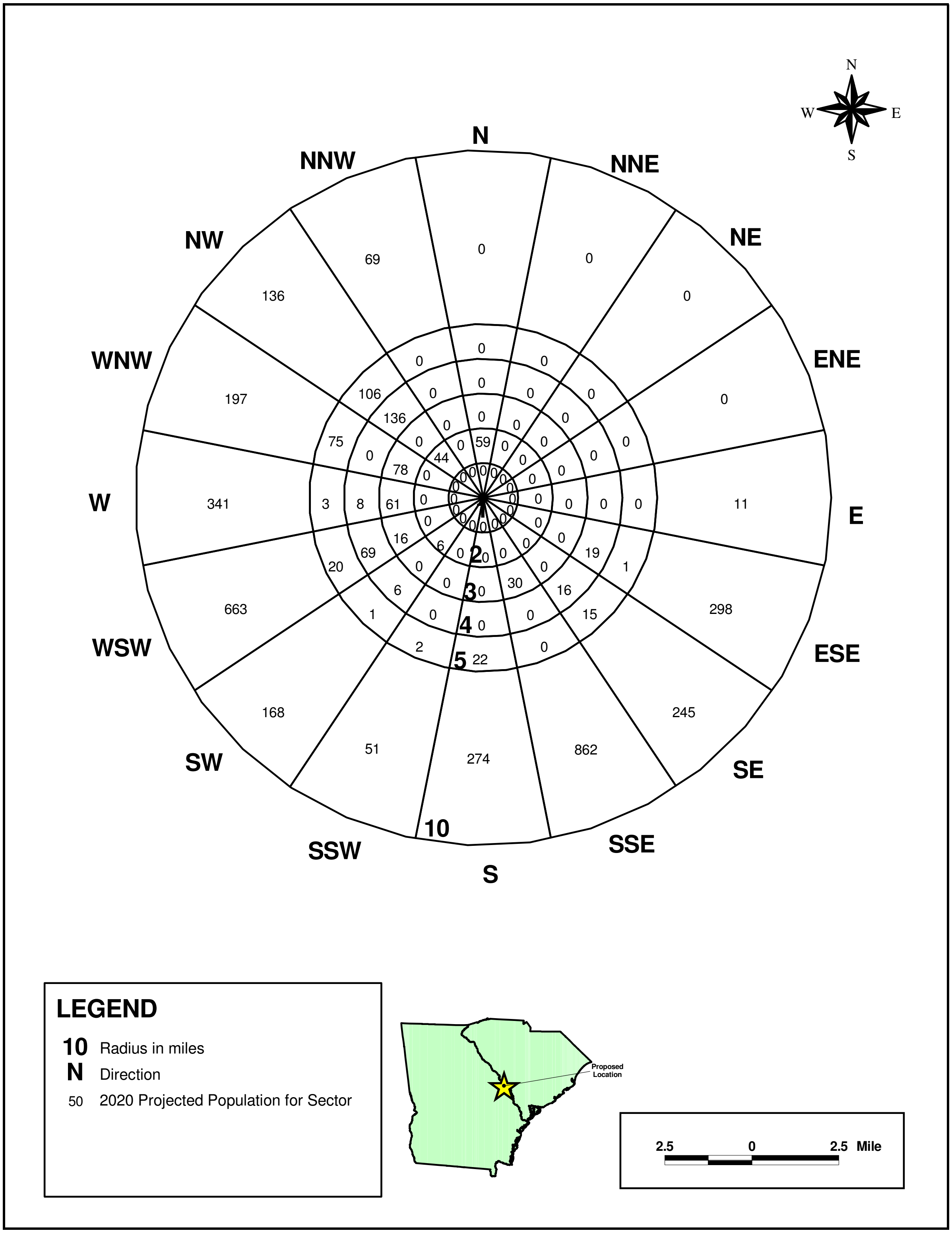


Figure 2.1-5 10-Mile Resident and Transient Population Distribution – 2020

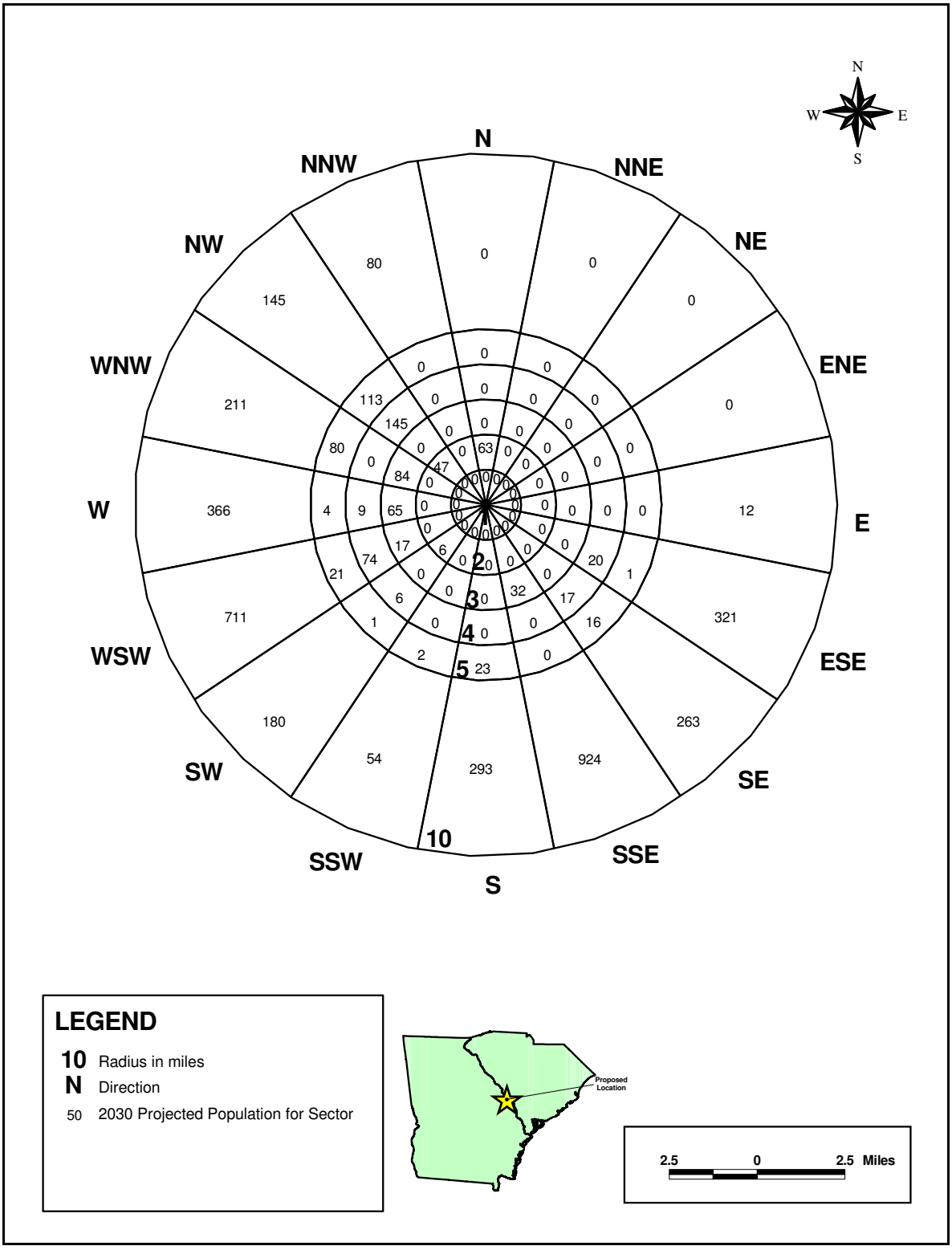


Figure 2.1-6 10-Mile Resident and Transient Population Distribution – 2030

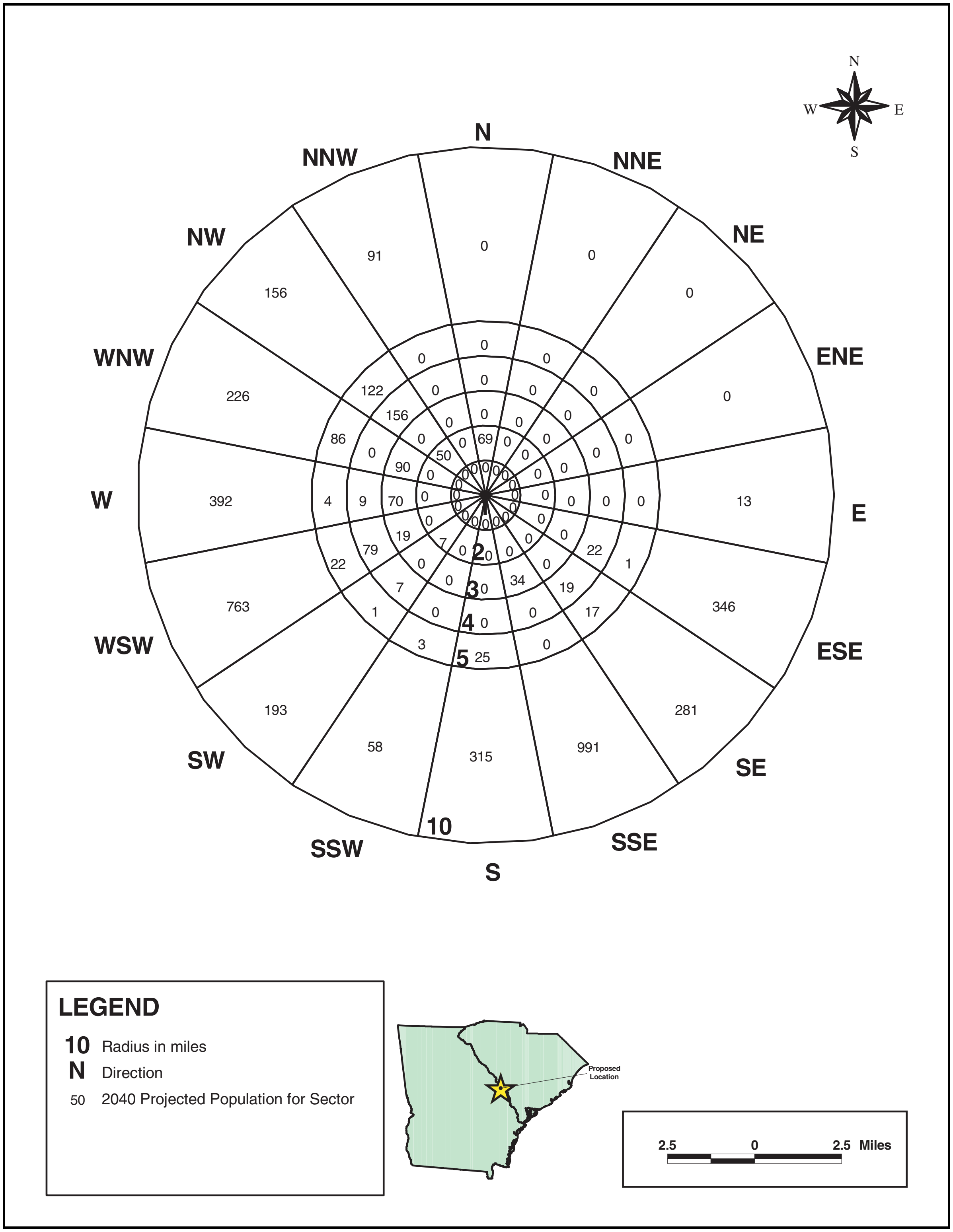


Figure 2.1-7 10-Mile Resident and Transient Population Distribution – 2040

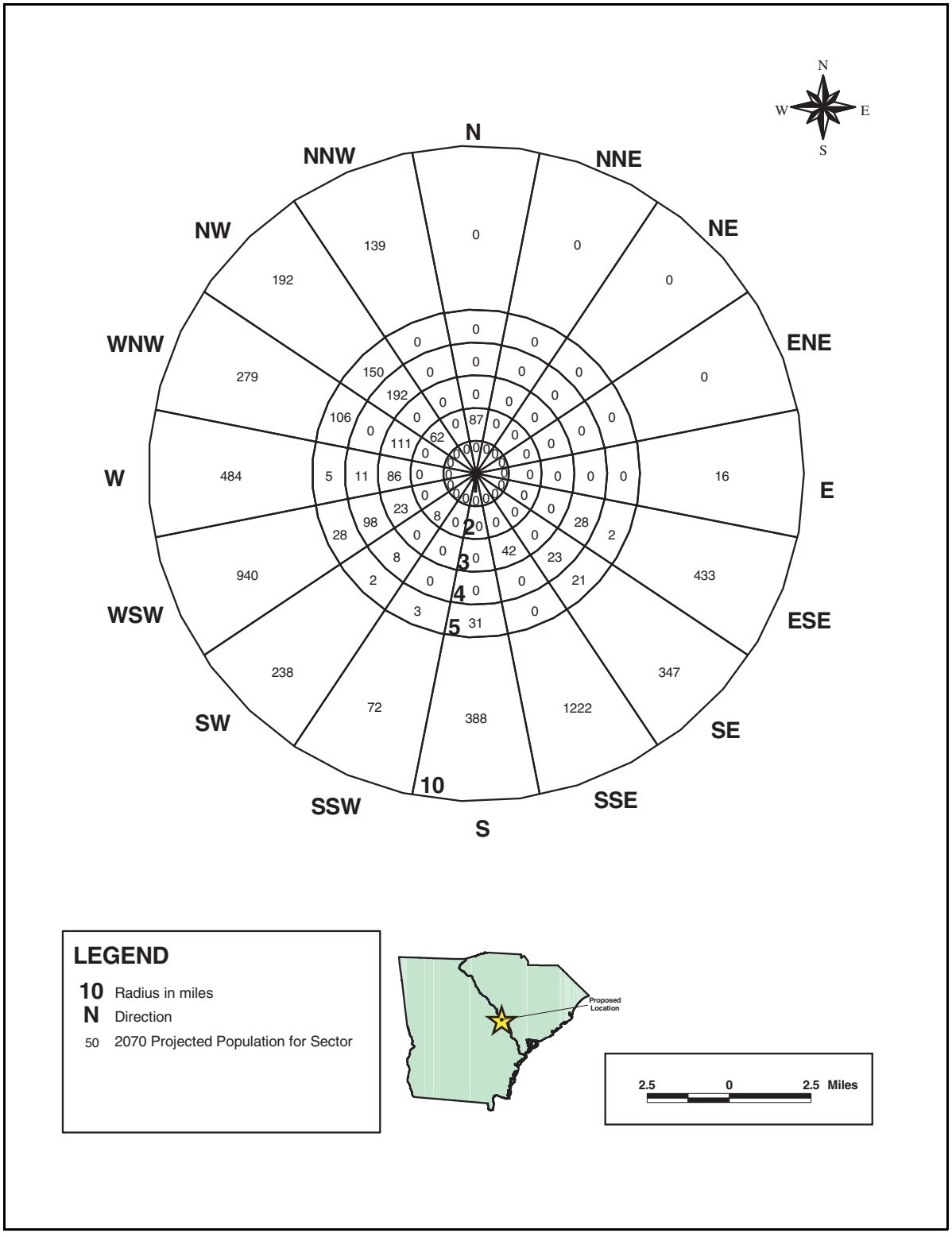


Figure 2.1-8 10-Mile Resident and Transient Population Distribution – 2070

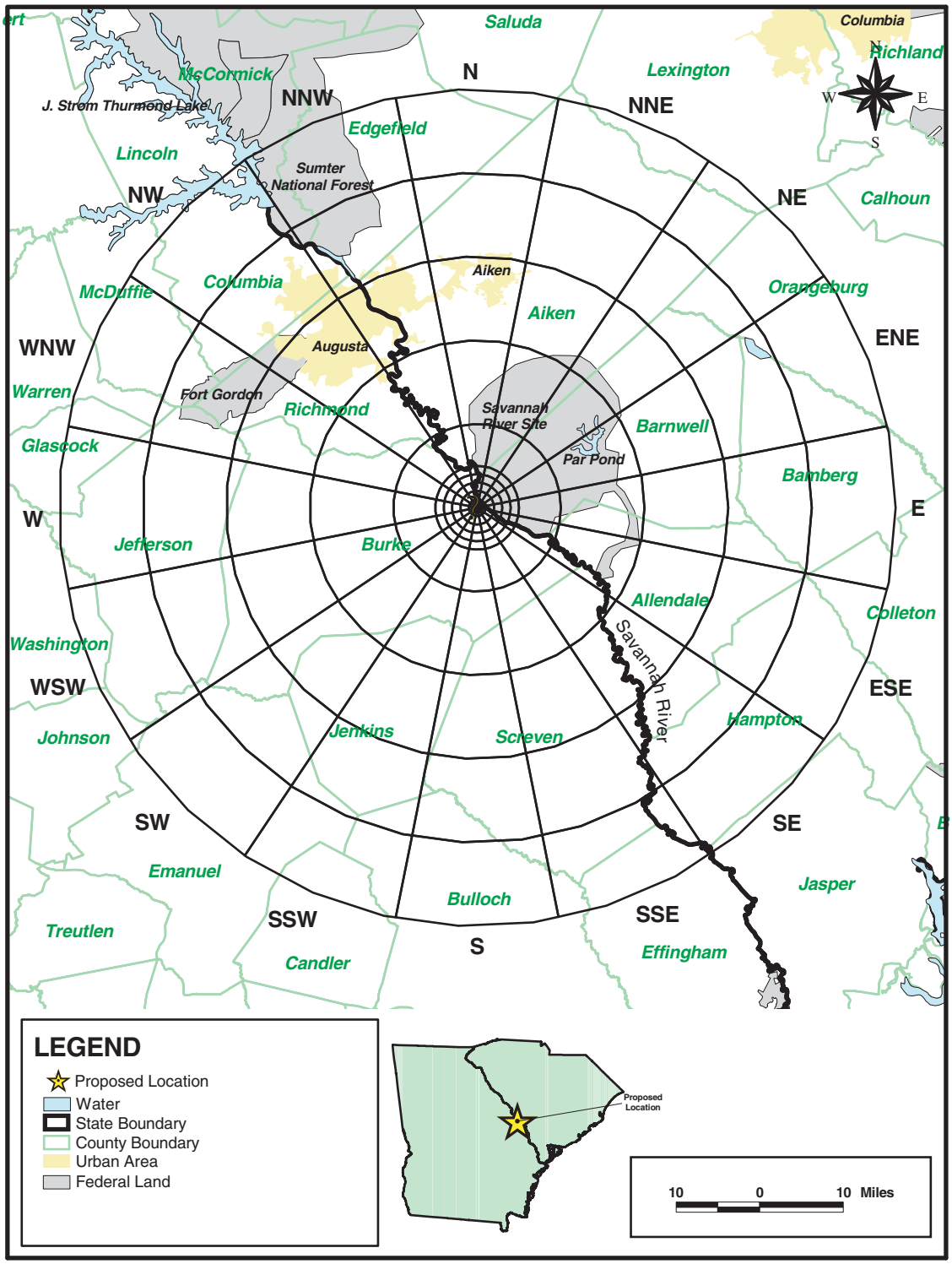


Figure 2.1-9 Population Grid Out to 50 Miles

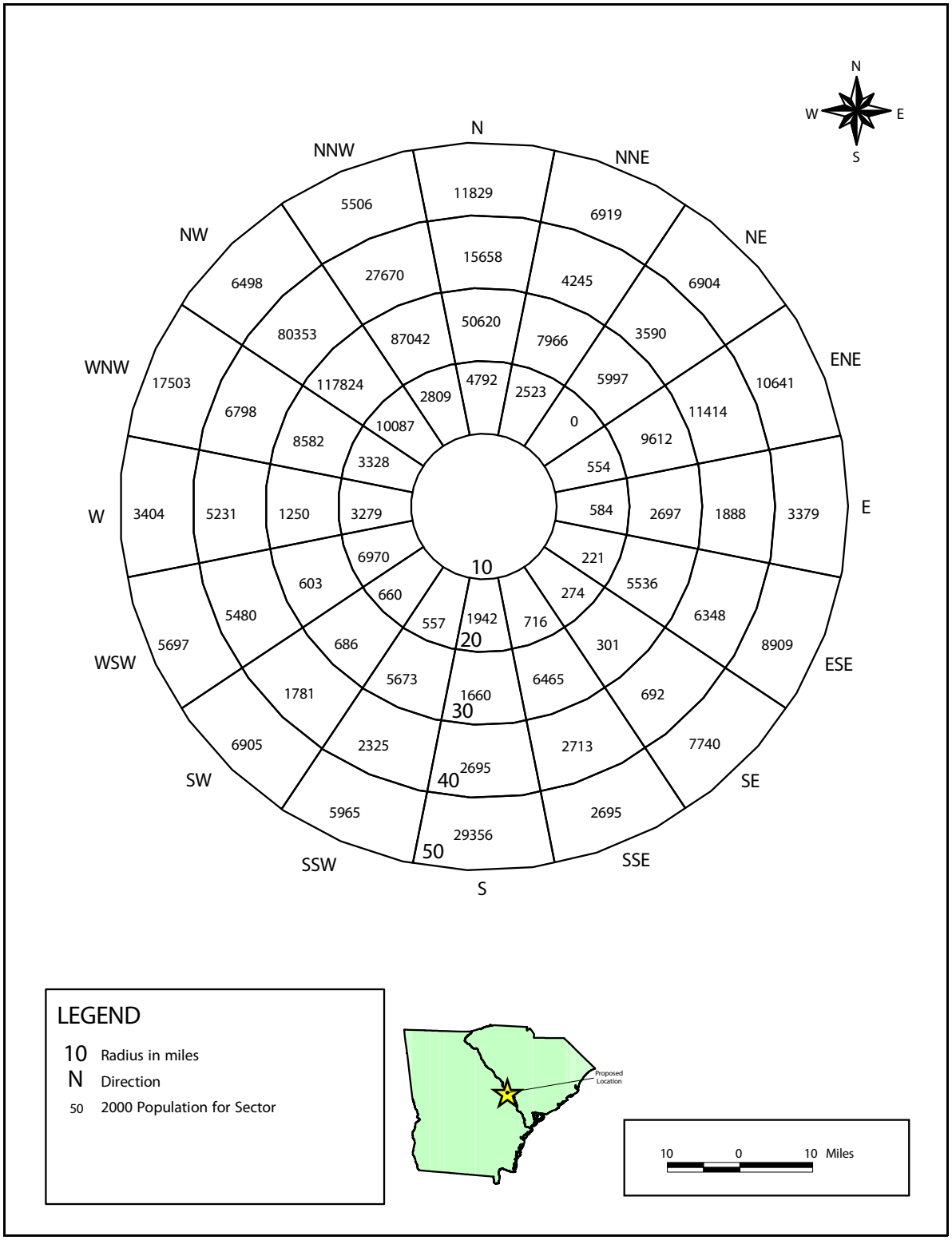


Figure 2.1-10 10 to 50-Mile Resident Population Distribution 2000

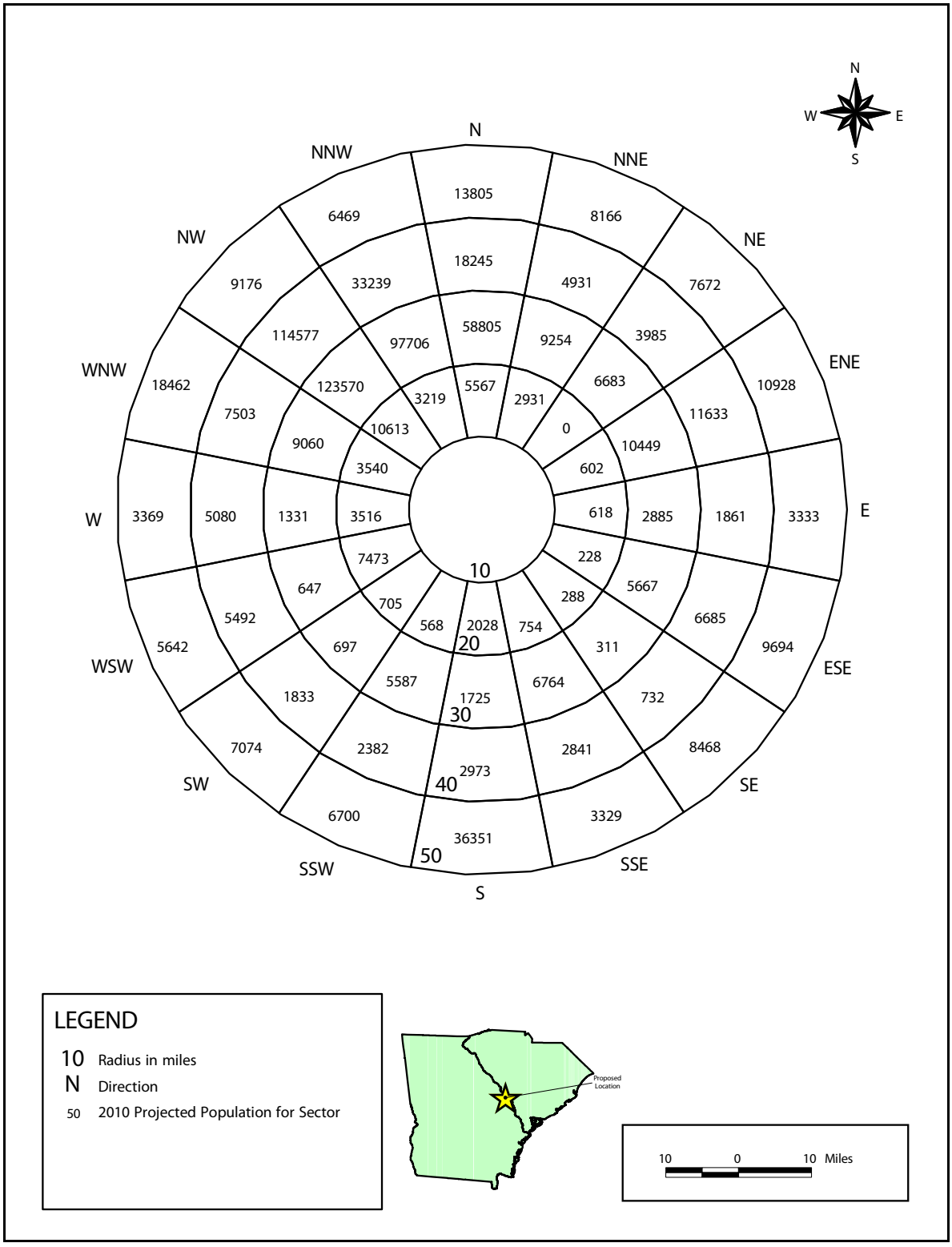


Figure 2.1-11 10 to 50-Mile Resident Population Distribution 2010

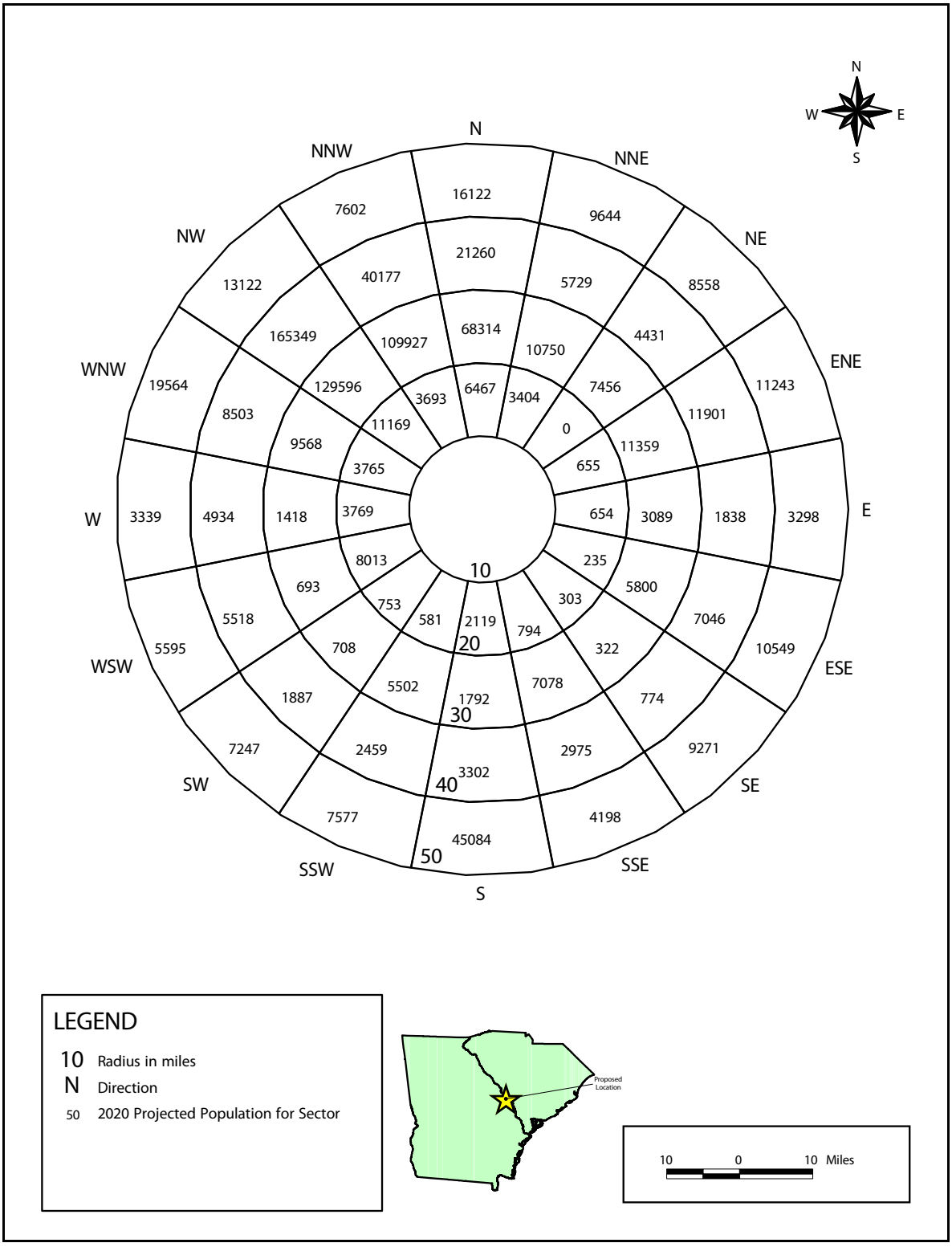


Figure 2.1-12 10 to 50-Mile Resident Population Distribution 2020

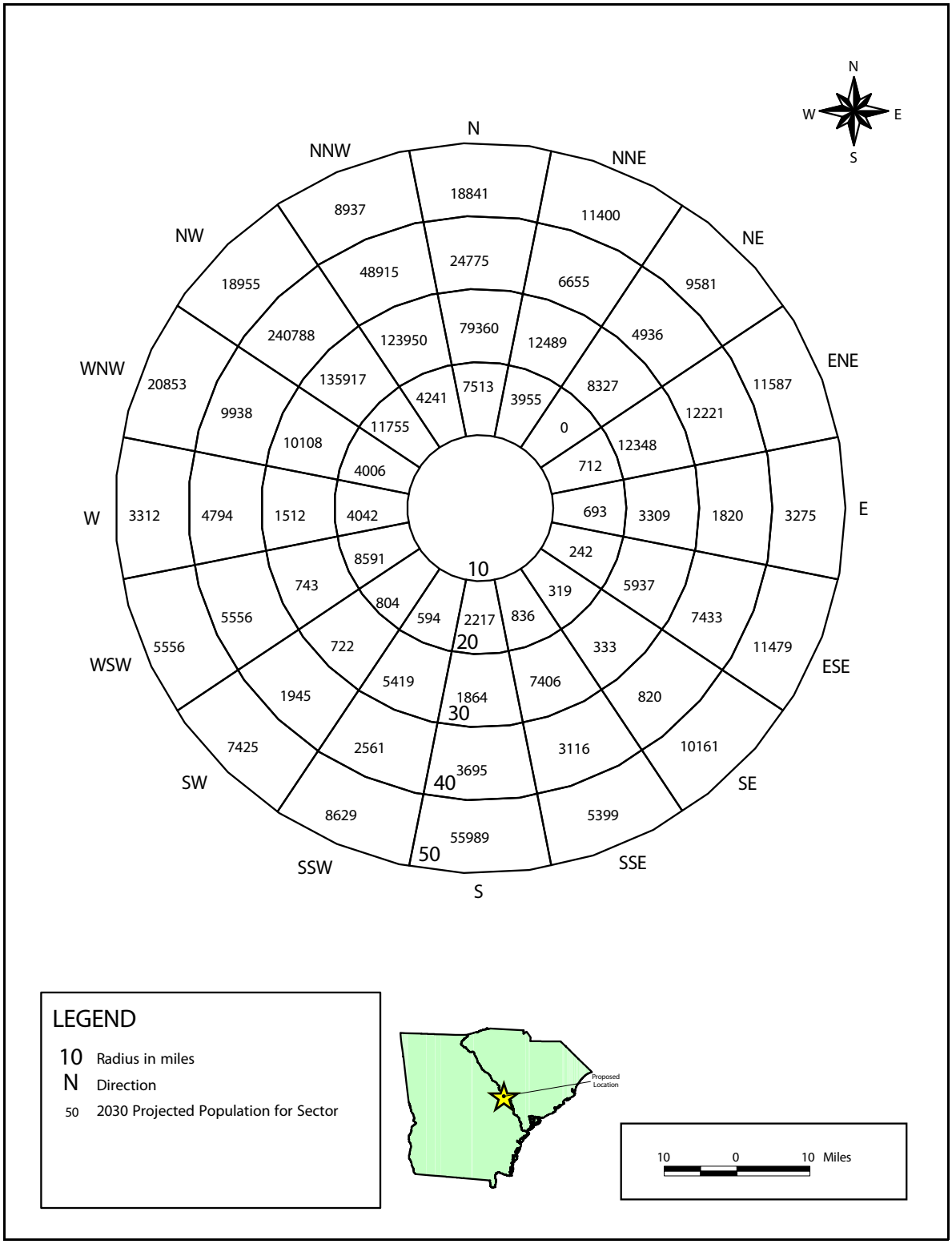


Figure 2.1-13 10 to 50-Mile Resident Population Distribution 2030

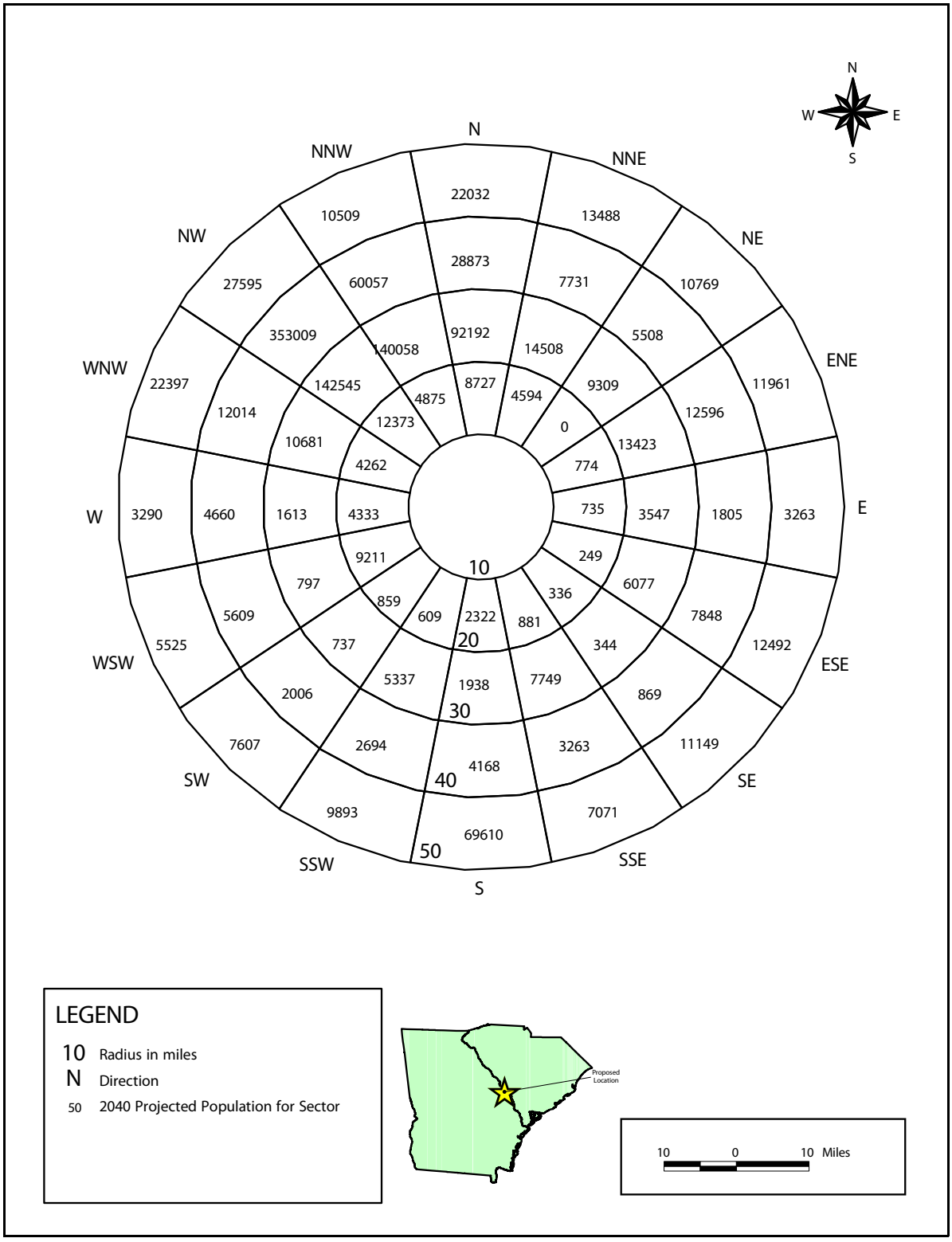


Figure 2.1-14 10 to 50-Mile Resident Population Distribution 2040

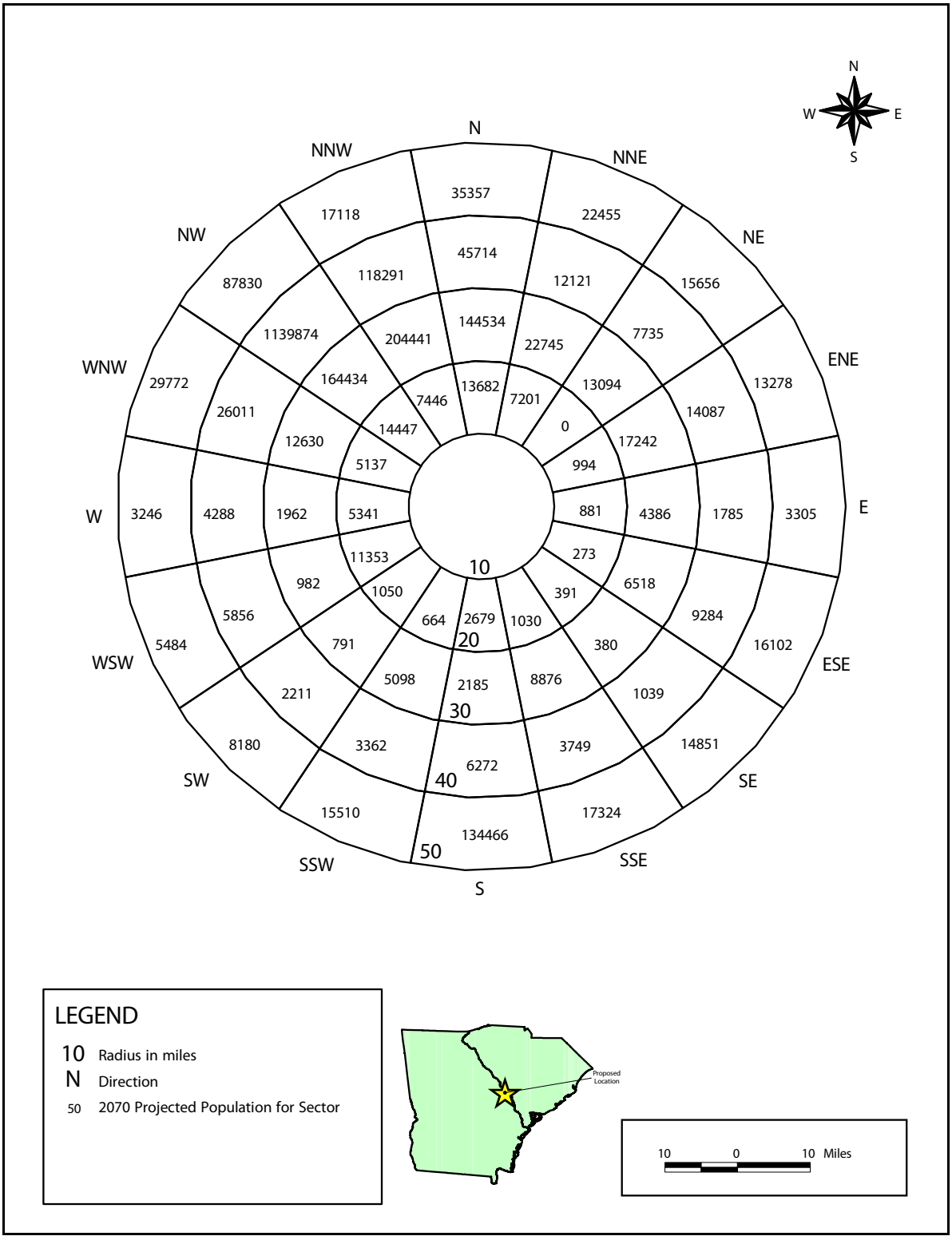


Figure 2.1-15 10 to 50-Mile Resident Population Distribution 2070

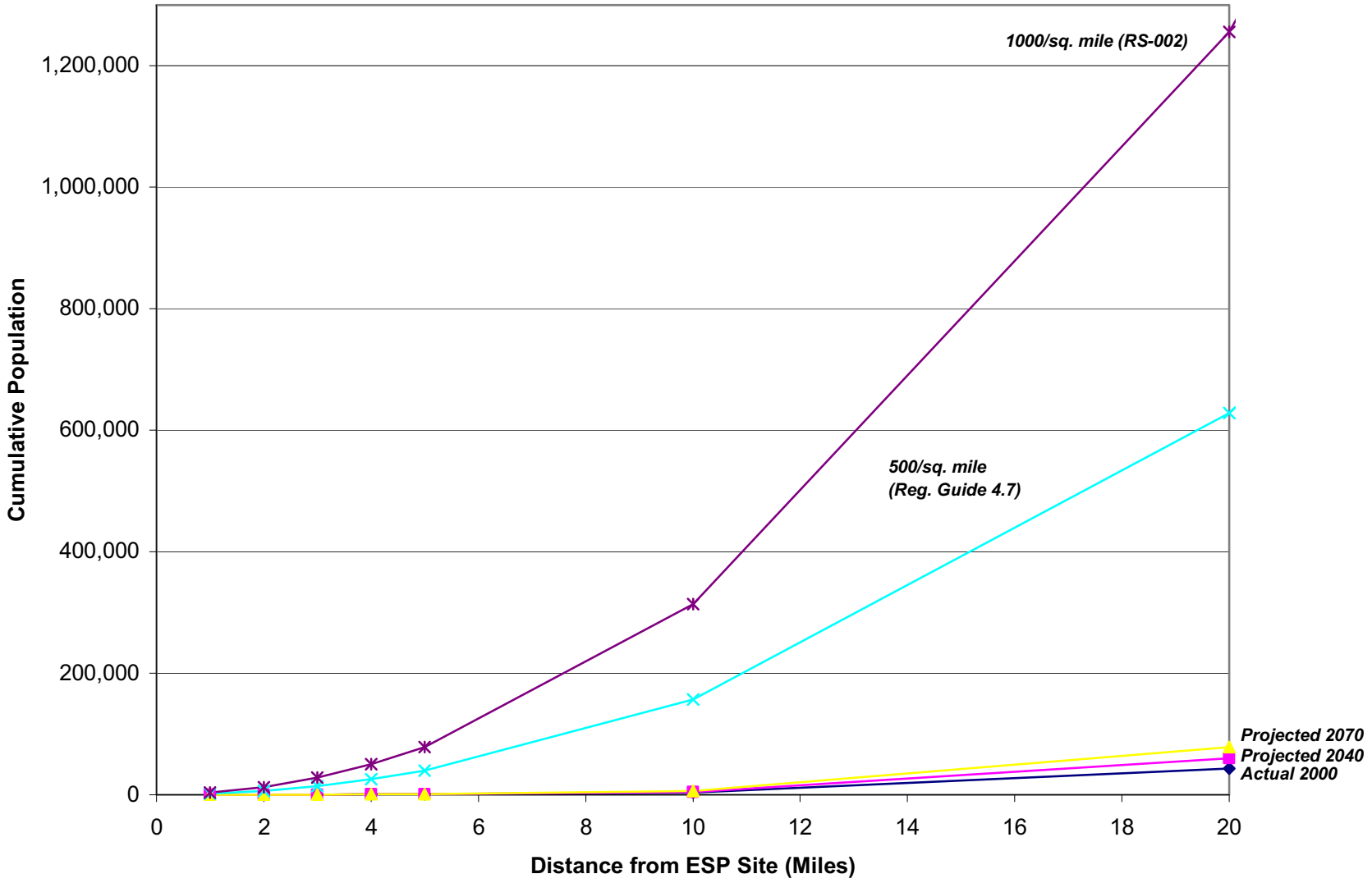
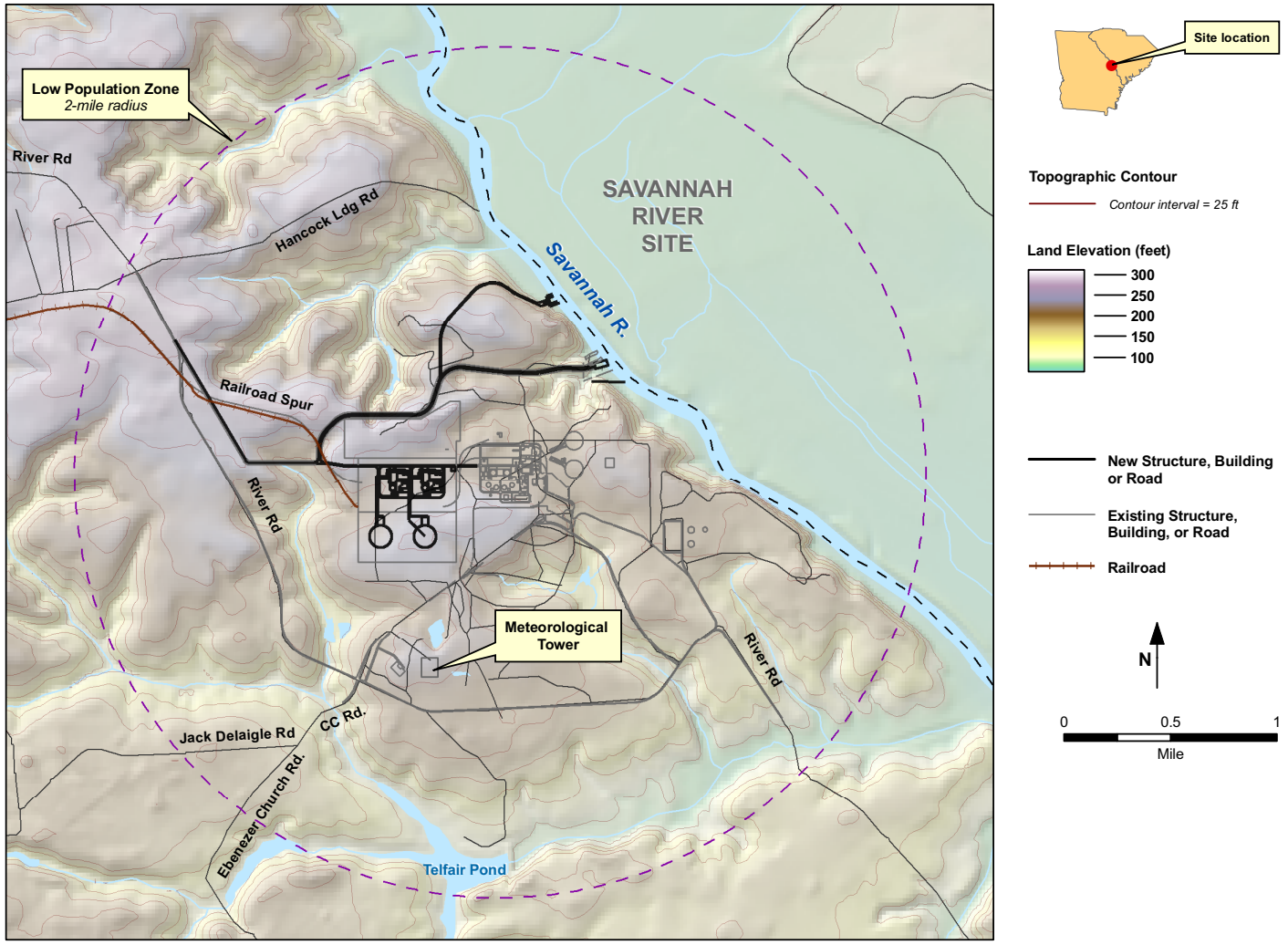


Figure 2.1-16 Population Compared to NRC Siting Criteria



Source data: ESRI, Data & Maps and StreetMap USA, 2005. USGS, seamless data distribution, NED shaded relief.
Vogtle Project Drawing No. 0-C2-00 10-00001.

Figure 2.1-17 Low Population Zone

Section 2.1 References

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