

3. DEMAND ESTIMATION

The estimates of demand, expressed in terms of people and vehicles, constitute a critical element in developing an evacuation plan. These estimates consist of three components:

1. An estimate of population within the Emergency Planning Zone (EPZ), stratified into groups (resident, employee, transient).
2. An estimate, for each population group, of mean occupancy per evacuating vehicle. This estimate is used to determine the number of evacuating vehicles.
3. An estimate of potential double-counting of vehicles.

Appendix E presents much of the source material for the population estimates. Our primary source of population data, the 2000 Census, however, is not adequate for directly estimating some transient groups.

Throughout the year, vacationers and tourists enter the EPZ. These non-residents may dwell within the EPZ for a short period (e.g. a few days or one or two weeks), or may enter and leave within one day. Estimates of the size of these population components must be obtained, so that the associated number of evacuating vehicles can be ascertained.

The potential for double-counting people and vehicles must be addressed. For example:

- A resident who works and shops within the EPZ could be counted as a resident, again as an employee and once again as a shopper.
- A visitor who stays at a hotel and spends time at a park, then goes shopping could be counted three times.

Furthermore, the number of vehicles at a location depends on time of day. For example, motel parking lots may be full at dawn and empty at noon. Similarly, parking lots at area parks, which are full at noon, may be almost empty at dawn. Estimating counts of vehicles by simply adding up the capacities of different types of parking facilities will tend to overestimate the number of transients and can lead to ETE that are too conservative.

Analysis of the population characteristics of the WLS EPZ indicates the need to identify three distinct groups:

- Permanent residents - people who are year round residents of the EPZ.
- Transients - people who reside outside of the EPZ who enter the area for a specific purpose (shopping, recreation) and then leave the area.
- Employees - people who reside outside of the EPZ and commute to businesses within the EPZ on a daily basis.

Estimates of the population and number of evacuating vehicles for each of the population groups are presented for each ERPA and by polar coordinate representation (population rose). The WLS EPZ has been subdivided into 14 ERPA. The EPZ is shown in Figure 3-1.

Permanent Residents

The primary source for estimating permanent population is the latest U.S. Census data. The average household size (2.62 persons/household) and the number of evacuating vehicles per household (1.44 vehicles/household) were adapted from the telephone survey results.

Enercon Services provided population estimates for 2000 using geographic information systems (GIS) software and Census block data. County projection numbers were obtained for the counties in the EPZ; these numbers were used in a regression analysis with the 2000 Census estimates to estimate the 2007 EPZ population. Table 3-1 shows that the EPZ population has increased 7.4 percent over the last 7 years.

Permanent resident population and vehicle estimates for 2007 are presented in Table 3-2. Figures 3-2 and 3-3 present the permanent resident population and permanent resident vehicle estimates by sector and distance from the WLS. This “rose” was constructed using GIS software.

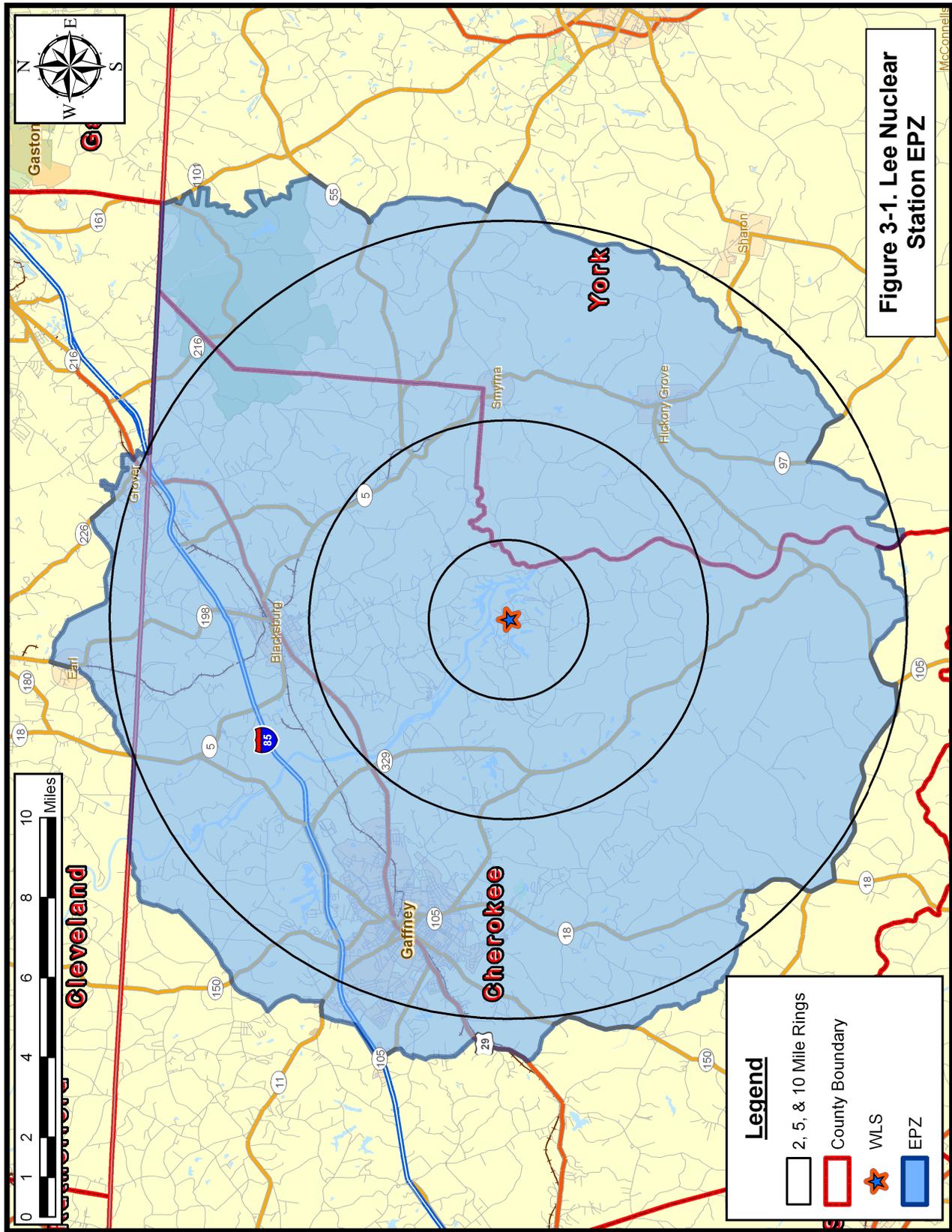
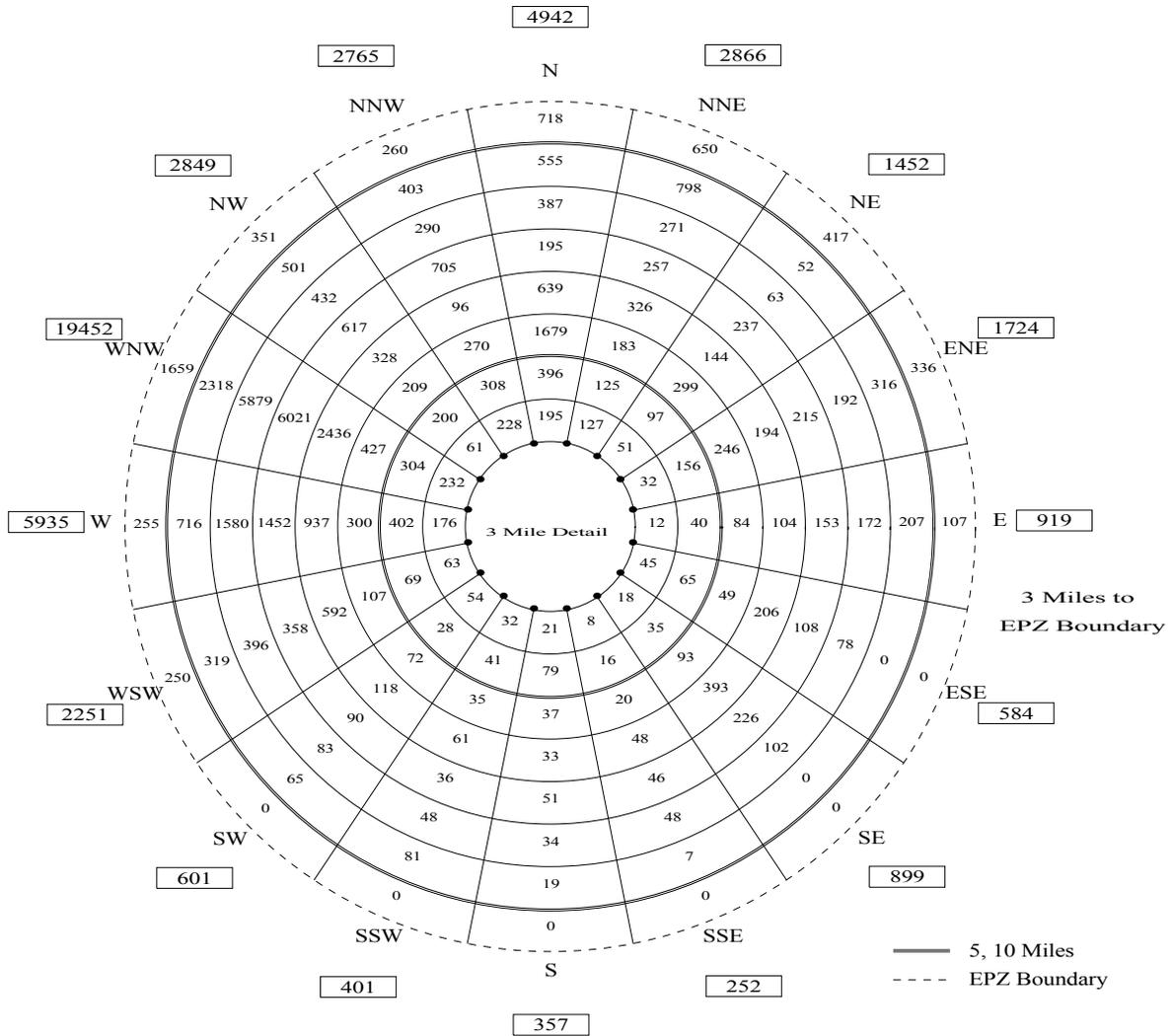


Figure 3-1. Lee Nuclear Station EPZ

Table 3-1. EPZ Permanent Resident Population		
ERPA	2000 Population	2007 Population
A-0	509	543
A-1	2,849	3,074
A-2	5,065	5,396
A-3	2,250	2,398
B-1	290	332
B-2	1,266	1,362
C-1	1,049	1,120
C-2	1,284	1,505
D-1	2,557	2,726
D-2	1,323	1,509
E-2	577	660
F-2	490	525
G-2	4,593	4,901
H-2	20,810	22,198
TOTAL	44,914	48,249
Population Growth:		7.4%

Table 3-2. Permanent Resident Population and Vehicles by ERPA		
ERPA	2007 Population	Vehicles
A-0	543	298
A-1	3,074	1,689
A-2	5,396	2,965
A-3	2,398	1,320
B-1	332	183
B-2	1,362	748
C-1	1,120	613
C-2	1,505	827
D-1	2,726	1,498
D-2	1,509	828
E-2	660	365
F-2	525	287
G-2	4,901	2,695
H-2	22,198	12,204
TOTAL	48,249	26,520



Resident Population			
Miles	Ring Subtotal	Total Miles	Cumulative Total
0-1	28	0-1	28
1-2	515	0-2	543
2-3	1043	0-3	1586
3-4	1355	0-4	2941
4-5	2361	0-5	5302
5-6	4110	0-6	9412
6-7	6655	0-7	16067
7-8	10767	0-8	26834
8-9	10055	0-9	36889
9-10	6357	0-10	43246
10-EPZ	5003	0-EPZ	48249

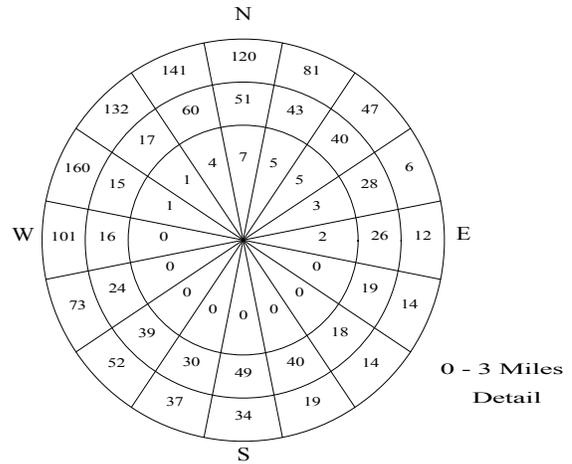
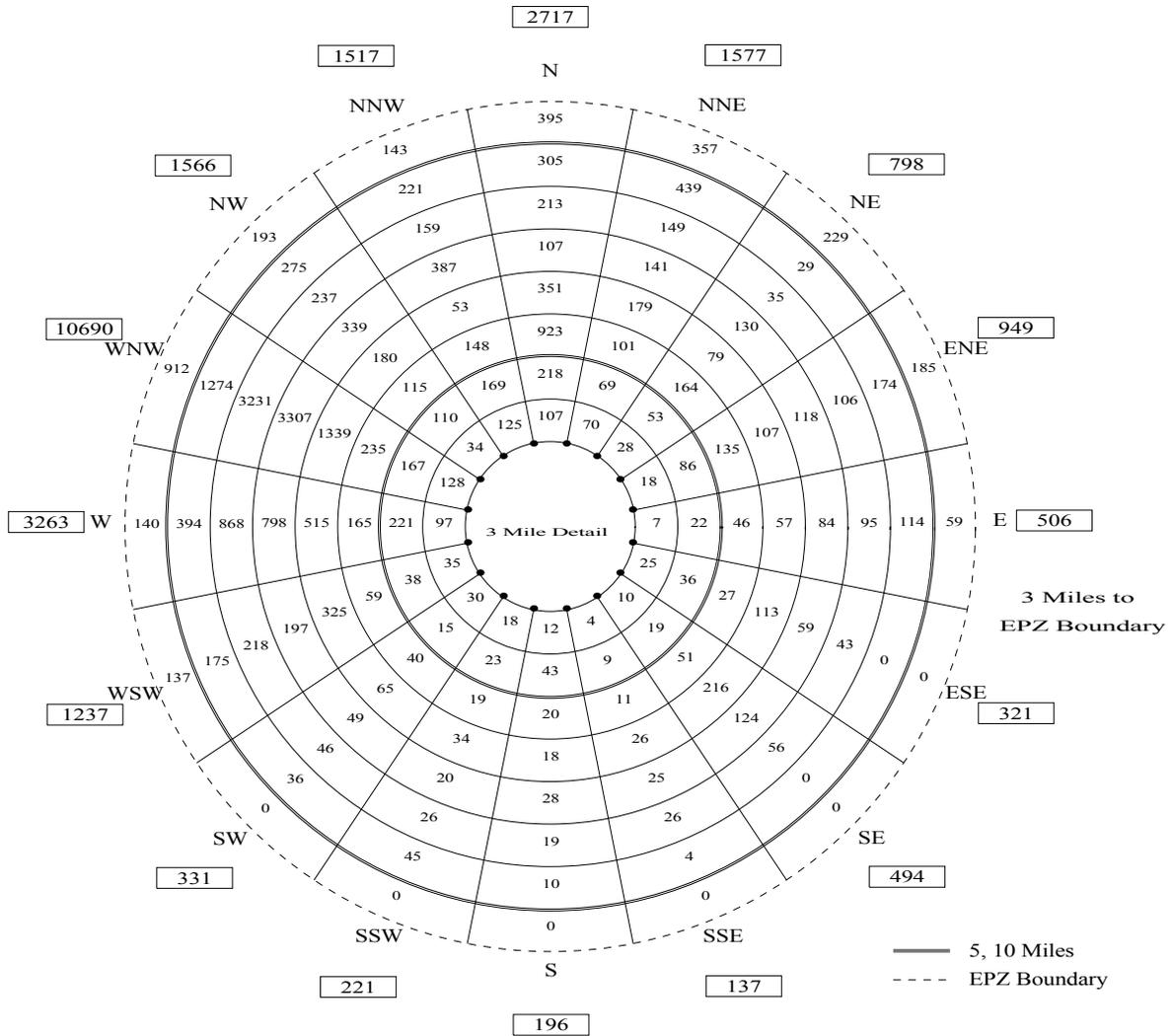


Figure 3-2. Permanent Residents by Sector



Resident Vehicles			
Miles	Ring Subtotal	Total Miles	Cumulative Total
0-1	17	0-1	17
1-2	281	0-2	298
2-3	575	0-3	873
3-4	748	0-4	1621
4-5	1298	0-5	2919
5-6	2259	0-6	5178
6-7	3657	0-7	8835
7-8	5913	0-8	14748
8-9	5527	0-9	20275
9-10	3495	0-10	23770
10-EPZ	2750	0-EPZ	26520

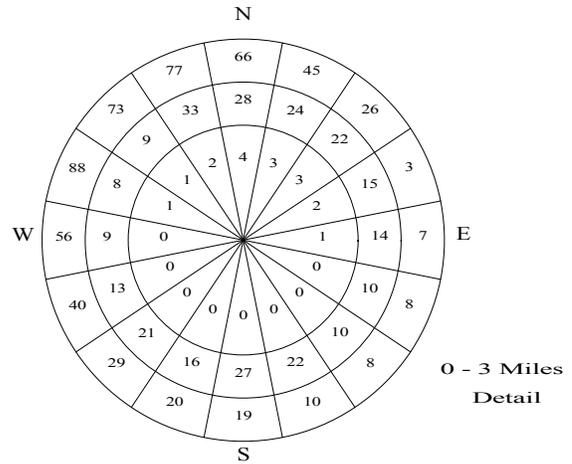


Figure 3-3. Permanent Resident Vehicles by Sector

Transient Population

Transient population groups are defined as those people (who are not permanent residents, nor commuting employees) who enter the EPZ for a specific purpose (shopping, recreation). Transients may spend less than one day or stay overnight at camping facilities, hotels and motels. The Lee EPZ has a number of areas and facilities that attract transients, including:

- Hotels and Motels – mostly business guests
- Prime Outlets at Gaffney – shopping
- Kings Mountain National Military Park
- Kings Mountain State Park

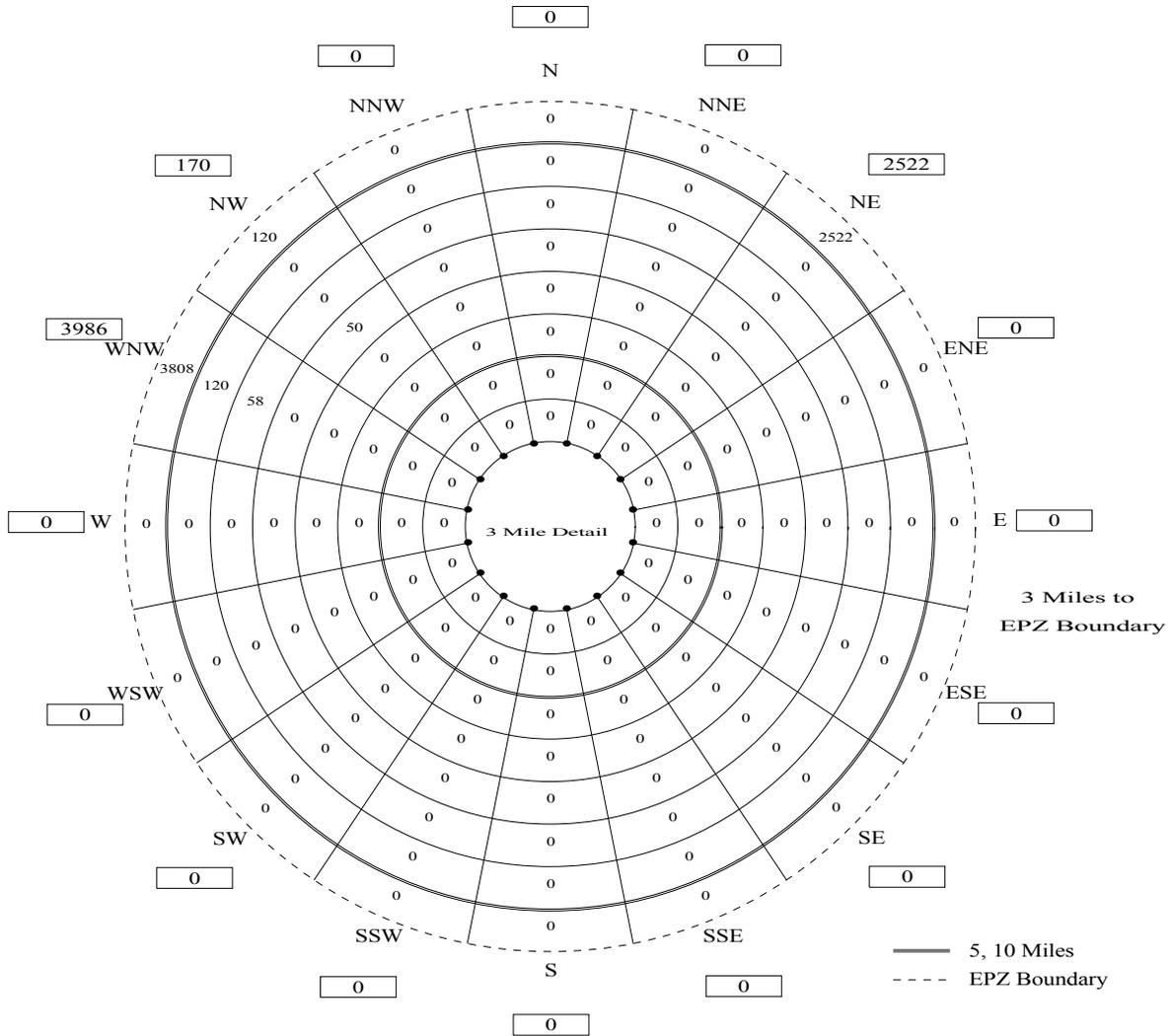
Estimates of the number of rooms, percentage of occupied rooms, and the number of vehicles per room were provided by Cherokee County Office of Emergency Management (OEM) for the hotels and motels in the EPZ. These numbers were used to estimate the number of evacuating vehicles for transients at each of the hotels and motels. A total of 1,132 transients in 566 vehicles are assigned to hotels and motels in the EPZ.

The Prime Outlets at Gaffney features over 80 brand name stores. The outlets are located just outside the EPZ, but have been included in the ETE study due to their close proximity to the ERPA H-2 boundary. Overhead imagery was used to estimate the number of parking spots (1,250) at the facility. Estimates of the percentage of parking spots occupied during the week and on weekends were provided by the marketing department for the outlets – peaking at 85% on a summer weekend. The number of transients and of transient vehicles for the outlets is estimated assuming 1 vehicle per family and using the average household size of 2.62 persons to estimate the number of families.

Tour buses also frequent the outlets. Statistics provided by the marketing department indicate that 302 tour buses visited the outlets in 2006, with a total of 11,589 passengers (approximately 40 passengers per bus). The peak month was March with 69 buses. Tour buses stop at the outlets on Tuesdays (senior citizens), Saturday and Sunday. The number of tour buses on a peak day is estimated as 6 buses given 69 buses in the month of March, 4 weeks per month, and 3 days per week ($69 \div 4 \div 3 \approx 6$). A total of 3,024 transients in 1,075 vehicles are estimated for a peak day at the Prime Outlets based on the procedure outlined above.

Kings Mountain Park is in the northeastern portion of the EPZ. The western portion of the park is a National Military Park which features equestrian trails, some small campsites, a historical battleground, and a visitors center. York County OEM estimates the peak transient attendance at the national portion of the park at 500 visitors. We assume 2 visitors per vehicle for a total of 250 transient vehicles. The national park hosts a Revolutionary War Reenactment each year in October. Appendix I explores the effects on ETE of additional visitors at the park for the reenactment.

The eastern portion of the park is a State Park. The state park features camping, fishing, hiking and other recreational activities. According to websites for the park and data from York County OEM, there are a total of 116 campsites that provide electricity and water, 10 primitive camp sites that can hold up to 30 people per site, and 2 group lodging sites. Camp Cherokee and Camp York are the group camps and they can sleep 104 people and 140 people, respectively. Statistics provided by Cherokee County OEM estimate that 2,000 transients are in the state park during the day and 1,400 at night, during peak times. We assume 8 visitors per site with electricity and water, 25 visitors per site for primitive camping, and that the group camps are completely full. There are approximately 600 day trippers at the park based on the Cherokee County OEM data. We assume 2 transients per vehicle for the State Park, with the exception of the group camps, which we assume are evacuated by bus with 50 people per bus. These data and assumptions provide an estimate of 2,022 transients in 899 vehicles at Kings Mountain State Park.



Transient Population			
Miles	Ring Subtotal	Total Miles	Cumulative Total
0-1	0	0-1	0
1-2	0	0-2	0
2-3	0	0-3	0
3-4	0	0-4	0
4-5	0	0-5	0
5-6	0	0-6	0
6-7	0	0-7	0
7-8	50	0-8	50
8-9	58	0-9	108
9-10	120	0-10	228
10-EPZ	6450	0-EPZ	6678

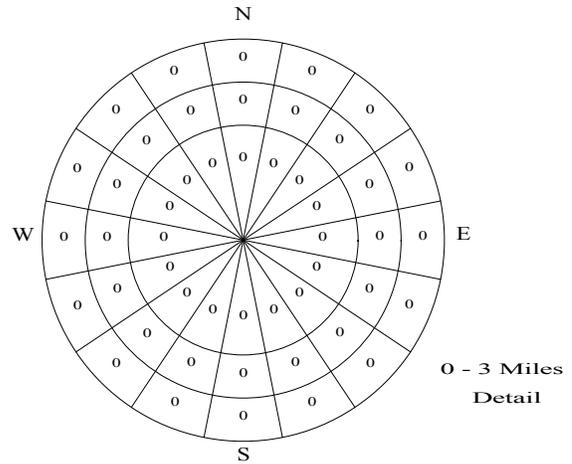
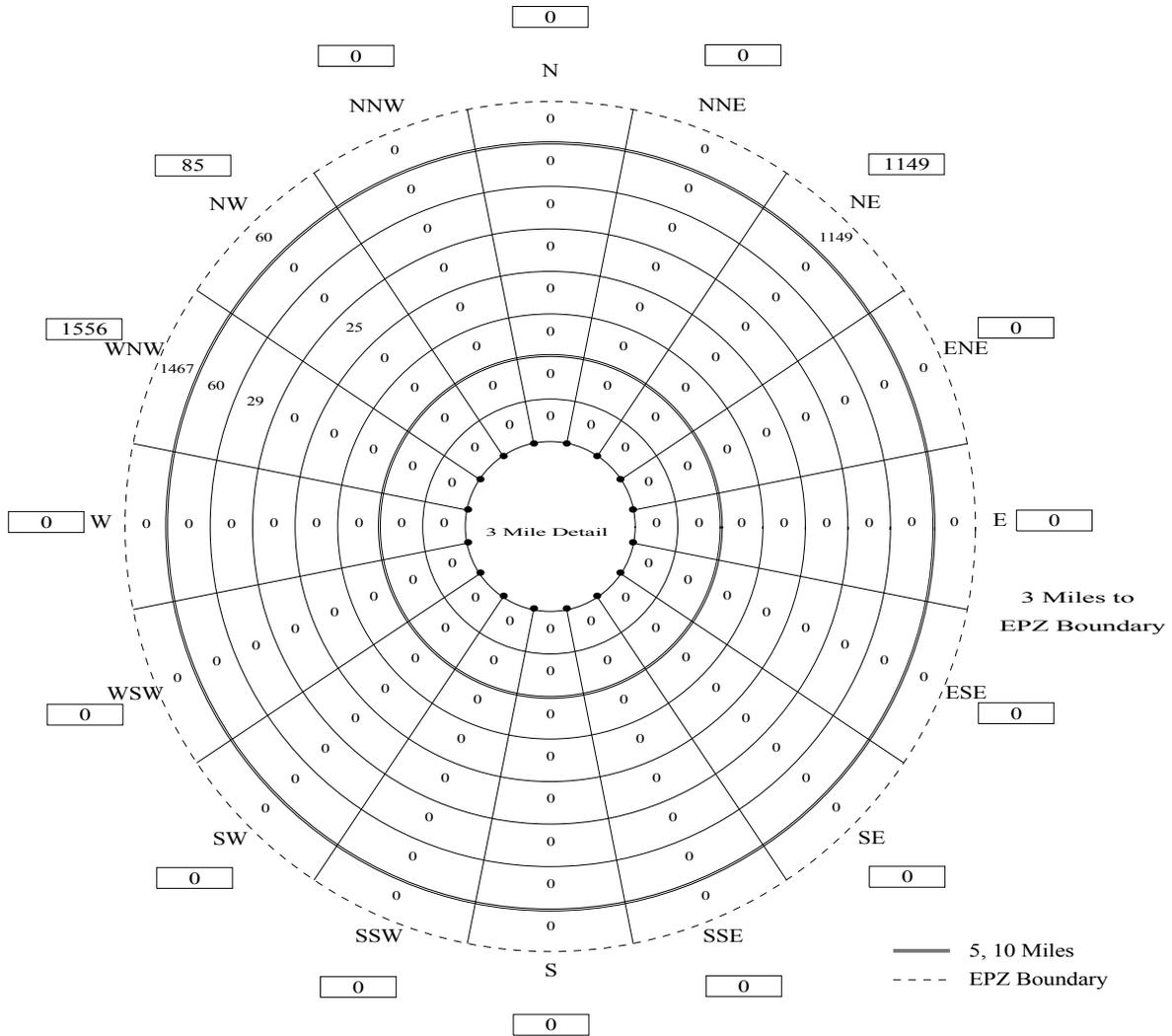


Figure 3-4. Transient Population by Sector



Transient Vehicles			
Miles	Ring Subtotal	Total Miles	Cumulative Total
0-1	0	0-1	0
1-2	0	0-2	0
2-3	0	0-3	0
3-4	0	0-4	0
4-5	0	0-5	0
5-6	0	0-6	0
6-7	0	0-7	0
7-8	25	0-8	25
8-9	29	0-9	54
9-10	60	0-10	114
10-EPZ	2676	0-EPZ	2790

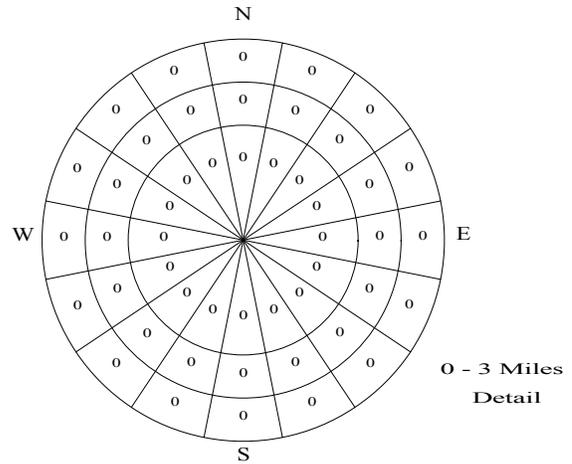


Figure 3-5. Transient Vehicles by Sector

Employees

Employees who work within the EPZ fall into two categories:

- Those who live and work in the EPZ
- Those who live outside of the EPZ and commute to jobs within the EPZ.

Those of the first category are already counted as part of the permanent resident population. To avoid double counting, we focus on those commuting employees who will evacuate along with the permanent resident population.

Year 2000 Census journey-to-work data for South Carolina was used to estimate the number of employees commuting into the EPZ. This data defines the number of persons working in a specified county by their place of residence (origin-county). The data indicates that, on average, 24% of workers in Cherokee County and 25% of workers in York County commute to work from outside the county. GIS software was used to estimate the percentage of population in the county that resides within the EPZ – 74.2% for Cherokee County and 1.9% for York County. These percentages are then applied to the journey-to-work data to estimate the number of people commuting to work in Cherokee and York Counties from areas outside of the EPZ. Table 3-3 indicates that employment in Cherokee County is decreasing by 1.6% per year; this rate is used to extrapolate the 2000 employment numbers to the Year 2007.

It is assumed that the majority of employment in Cherokee County is in the City of Gaffney, with some employment in Blacksburg. It is further assumed that there are no non-EPZ employees in the York County and Cleveland County portions of the EPZ. Overhead imagery from Google Earth was used to locate major employment areas in Gaffney and distribute the non-EPZ employees accordingly.

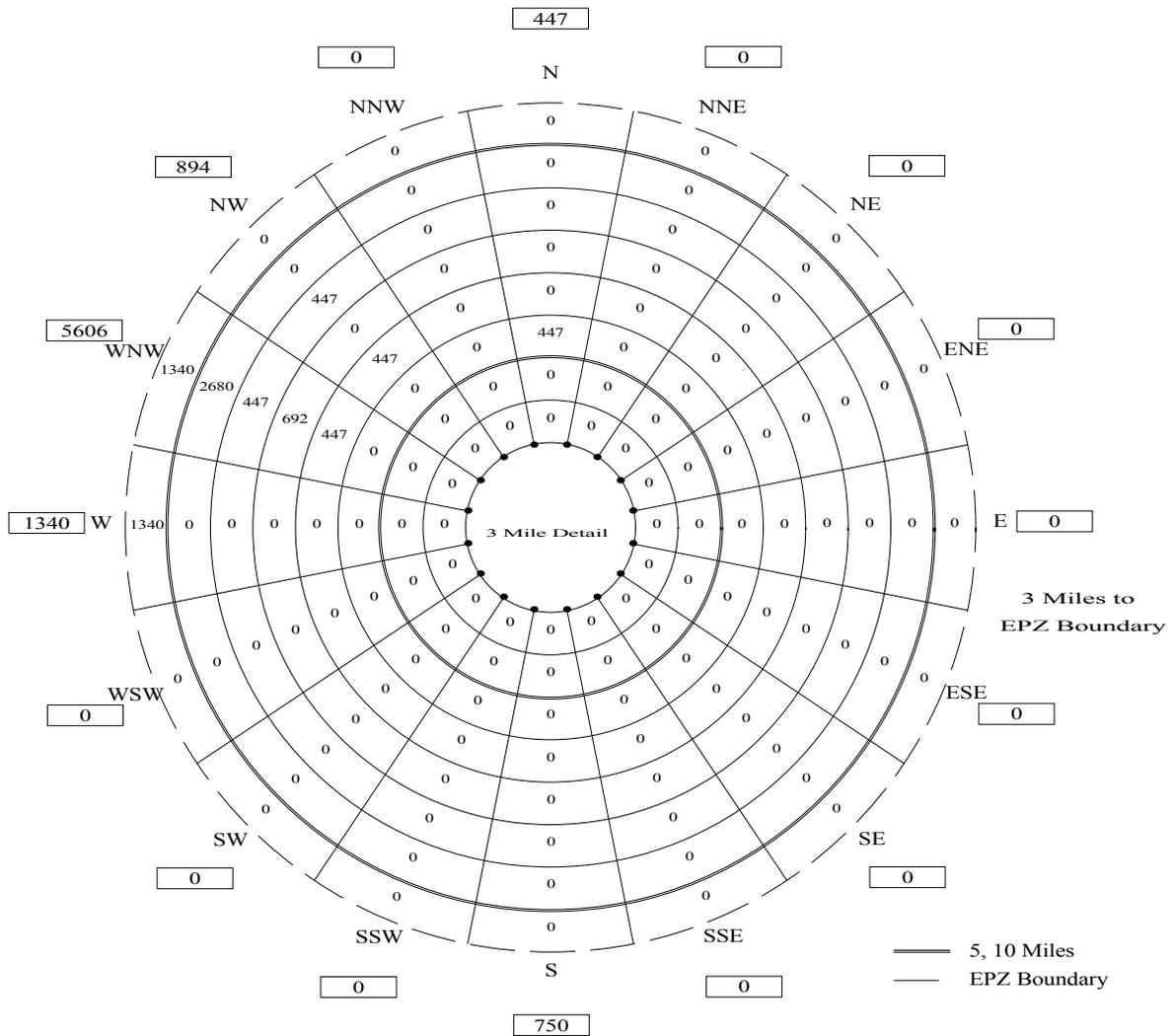
An additional 750 employees were included at the proposed Lee Nuclear Station location. A vehicle occupancy of 1.03 persons per employee-vehicle obtained from the telephone survey was used to determine the number of evacuating employee vehicles.

Table 3-4 presents non-EPZ Resident employee and vehicle estimates by ERPA. Figures 3-6 and 3-7 present these data by sector.

Table 3-3. Cherokee County Employment	
Year	Total Jobs on January 31*
2001	20,395
2002	18,918
2003	19,072
2004	19,156
2005	18,765
Yearly Job Growth Rate	-1.6%

*These numbers obtained from the US Department of Labor website

Table 3-4. Summary of Non-EPZ Employees and Employee Vehicles		
ERPA	2007 Employees	Employee Vehicles
A-0	750	728
A-1	NO EMPLOYMENT	
A-2	447	434
A-3	NO EMPLOYMENT	
B-1		
B-2		
C-1		
C-2		
D-1		
D-2		
E-2		
F-2		
G-2		
H-2	7,840	7,612
TOTAL	9,037	8,774



Employees			
Miles	Ring Subtotal	Total Miles	Cumulative Total
0-1	750	0-1	750
1-2	0	0-2	750
2-3	0	0-3	750
3-4	0	0-4	750
4-5	0	0-5	750
5-6	447	0-6	1197
6-7	894	0-7	2091
7-8	692	0-8	2783
8-9	894	0-9	3677
9-10	2680	0-10	6357
10-EPZ	2680	0-EPZ	9037

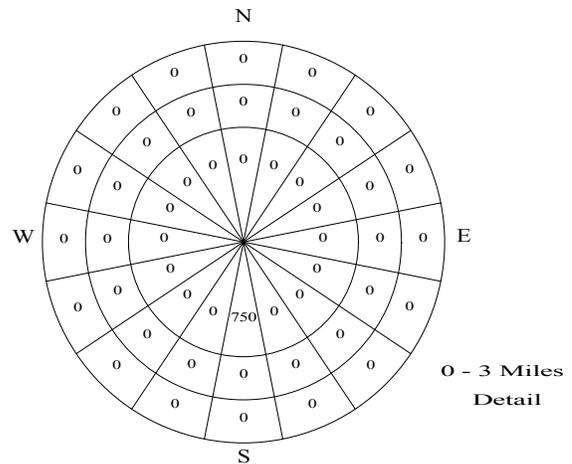
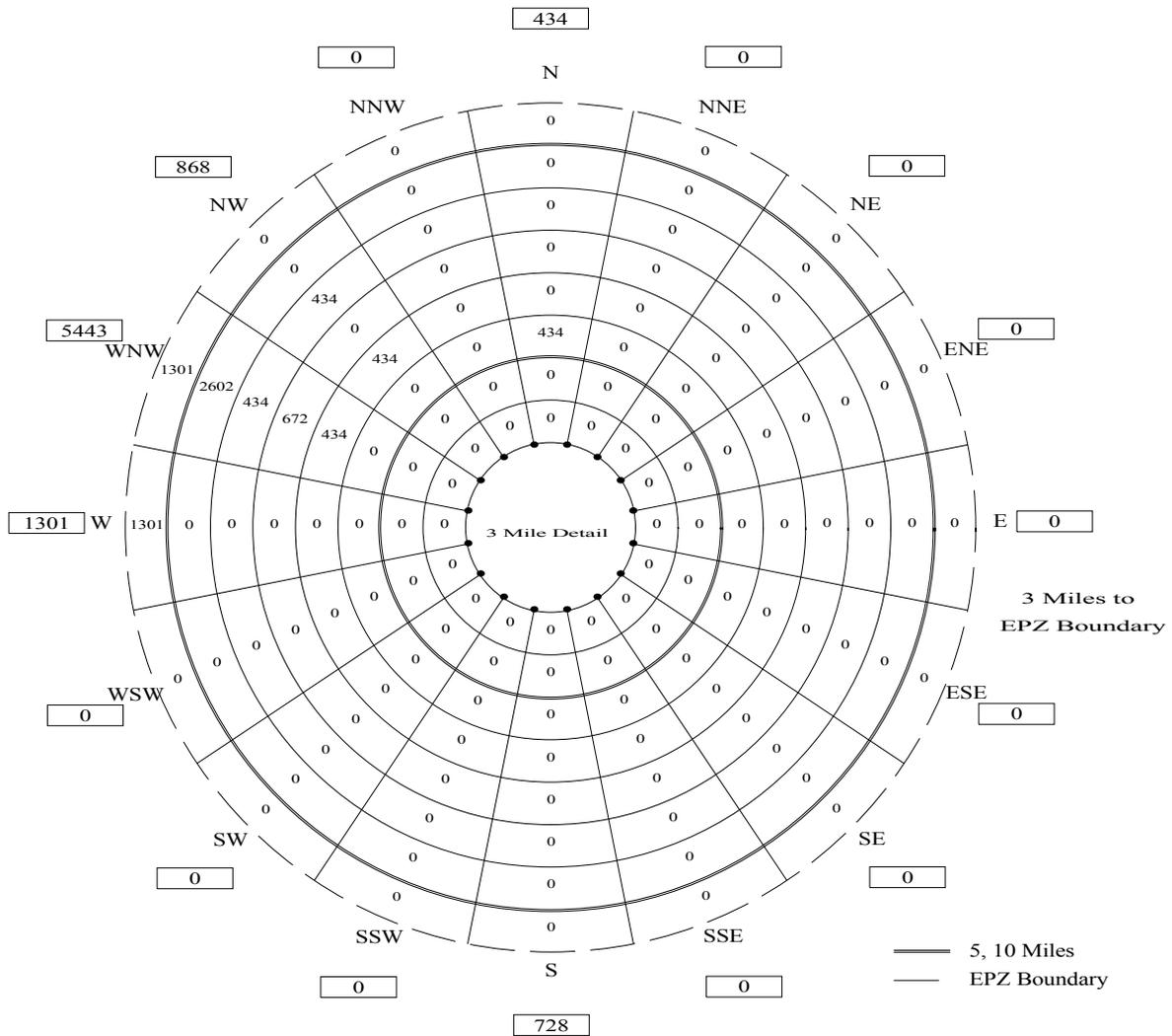


Figure 3-6. Employee Population by Sector



Employee Vehicles			
Miles	Ring Subtotal	Total Miles	Cumulative Total
0-1	728	0-1	728
1-2	0	0-2	728
2-3	0	0-3	728
3-4	0	0-4	728
4-5	0	0-5	728
5-6	434	0-6	1162
6-7	868	0-7	2030
7-8	672	0-8	2702
8-9	868	0-9	3570
9-10	2602	0-10	6172
10-EPZ	2602	0-EPZ	8774

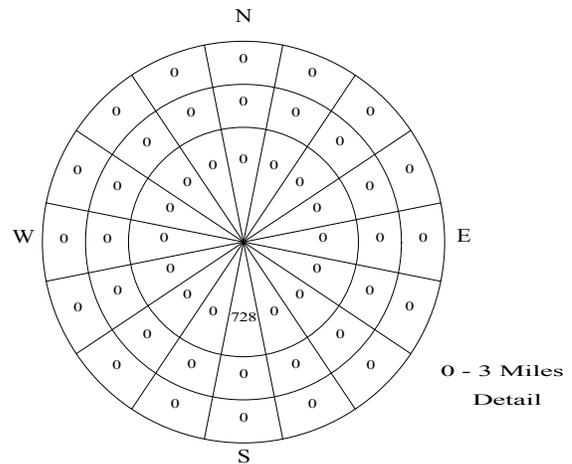


Figure 3-7. Employee Vehicles by Sector

Medical Facilities

Data request forms were completed for each of the medical facilities within the WLS EPZ. Chapter 8 details the evacuation of medical facilities and their patients. The number and type of evacuating vehicles that need to be provided depends on the patients' state of health. Buses can transport up to 40 people; vans, up to 12 people; ambulances, up to 2 people (patients).

Total Demand in Addition to Permanent Population

Vehicles will be traveling through the EPZ (external-external trips) at the time of an accident. After the Advisory to Evacuate is announced, these through travelers will also evacuate. These through vehicles are assumed to travel on the major routes – Interstate 85 and US Route 29 – as well as some of the minor routes in the EPZ – Route 150 and Route 11. It is assumed that this traffic will continue to enter the EPZ during the first 60 minutes following the Advisory to Evacuate. We estimate 300 vehicles per lane for the major routes and 150 vehicles per lane for the minor routes for a total of 6,300 vehicles entering the EPZ as external-external trips during this period.