APPENDIX F

Telephone Survey

F. TELEPHONE SURVEY

F.1 INTRODUCTION

The development of evacuation time estimates for the Emergency Planning Zone (EPZ) of the VCSNS Site requires the identification of travel patterns, car ownership and household size of the population within the EPZ. Demographic information can be obtained from Census data. The use of this data has several limitations when applied to emergency planning. First, the Census data do not encompass the range of information needed to identify the time required for preliminary activities (mobilization) that must be undertaken prior to evacuating the area. Secondly, Census data do not contain attitudinal responses needed from the population of the EPZ and consequently may not accurately represent the anticipated behavioral characteristics of the evacuating populace.

These concerns are addressed by conducting a telephone survey of a representative sample of the EPZ population. The survey is designed to elicit information from the public concerning family demographics and estimates of response times to well defined events. The design of the survey includes a limited number of questions of the form "What would you do if ...?" and other questions regarding activities with which the respondent is familiar ("How long does it take you to ...?")

F.2 SURVEY INSTRUMENT AND SAMPLING PLAN

Attachment A presents the final survey instrument used in this study. A draft of the instrument was submitted to stakeholders for comment. Comments were received and the survey instrument was modified accordingly, prior to conducting the survey.

Following the completion of the instrument, a sampling plan was developed. A sample size of approximately 550 **completed** survey forms yields results with a sampling error of ±4% at the 95% confidence level. The sample must be drawn from the EPZ population. Consequently, a list of zip codes in the EPZ was developed using GIS software. This list is shown in Table F-1. Along with each zip code, an estimate of the population and number of households in each area was determined by overlaying Census data and the EPZ boundary, again using GIS software. The proportional number of desired completed survey interviews for each area was identified, as shown in Table F-1.

Due to the sparse population of the zip codes within the EPZ, the area which was sampled was expanded (within the zip codes identified) so that an appropriate sample could be gathered. The over-sampling was computed in proportion to the entire zip code population. The approach is justified on the basis that the area outside of the EPZ has similar land-use and housing characteristics as does the EPZ. The completed survey adhered to the over-sampling plan.

The completed survey adhered to the sampling plan.

Table F-1. VCSNS Telephone Survey Sampling Plan

Zip Code	Population within EPZ (2000)	Households	Required Sample	Oversampling Due to Sparse Population
29015	1,173	371	49	14
29036	2,495	943	124	102
29063	576	205	27	204
29065	733	289	38	6
29075	1,692	676	89	23
29126	2,164	856	113	21
29127	414	161	21	57
29180	1,930	671	88	122
Totals:	**11,177**	**4,172**	**550**	**550**
Average Household Size:			**2.68**	
Total Sample Required:			**550**	

F.3 SURVEY RESULTS

The results of the survey fall into two categories. First, the household demographics of the area can be identified. Demographic information includes such factors as household size, automobile ownership, and automobile availability. The distributions of the time to perform certain pre-evacuation activities are the second category of survey results. These data are processed to develop the trip generation distributions used in the evacuation modeling effort, as discussed in Section 5.

A review of the survey instrument reveals that several questions have a "don't know" (DK) or "refused" entry for a response. It is accepted practice in conducting surveys of this type to accept the answers of a respondent who offers a DK response for a few questions or who refuses to answer a few questions. To address the issue of occasional DK/refused responses from a large sample, the practice is to assume that the distribution of these responses is the same as the underlying distribution of the positive responses. In effect, the DK/refused responses are ignored and the distributions are based upon the positive data that is acquired.

F.3.1 Household Demographic Results

Household Size

Figure F-1 presents the distribution of household size within the EPZ. The average household contains 2.68 people. The estimated household size (2.68 persons) used to determine the survey sample (Table F-1) was drawn from Census data. The agreement between the average household size obtained from the survey and from the Census is an indication of the reliability of the survey.

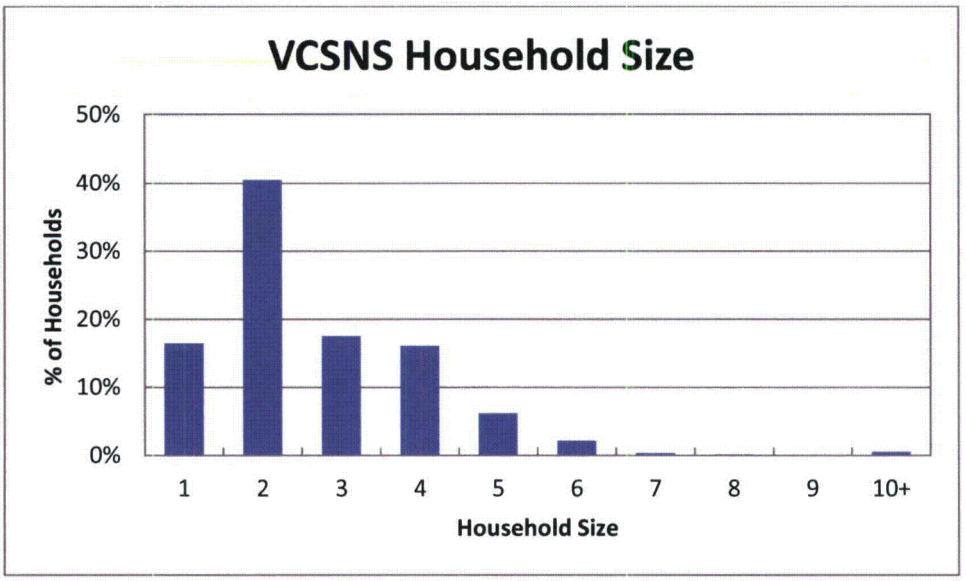

Figure F-1. Household Size in the EPZ

Automobile Ownership

The average number of automobiles available per household in the EPZ is 2.22. It should be noted that approximately 4.76 percent of households do not have access to an automobile. The distribution of automobile ownership is presented in Figure F-2. Figure F-3 and Figure F-4 present the automobile availability by household size. Note that the majority of households without access to a car are single person households. As expected, nearly all households of 2 or more people have access to at least one vehicle.

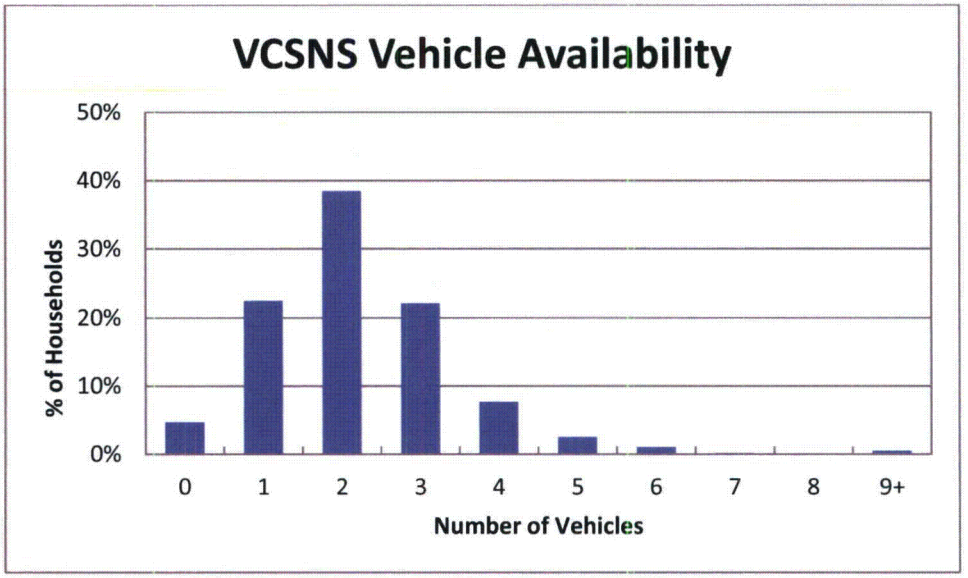

Figure F-2. Household Vehicle Availability

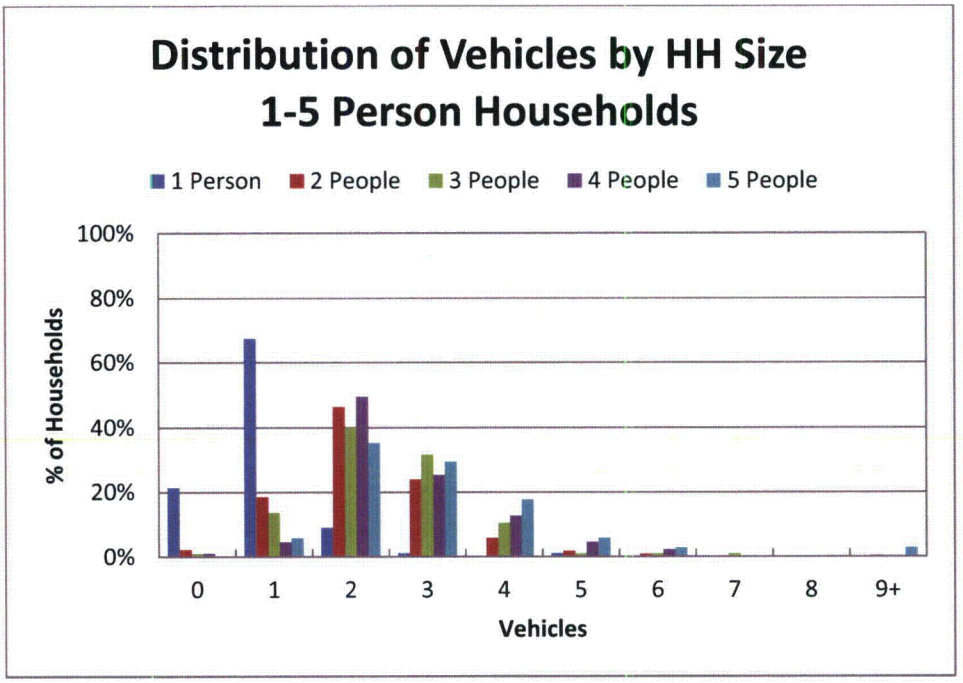

Figure F-3. Vehicle Availability - 1 to 5 Person Households

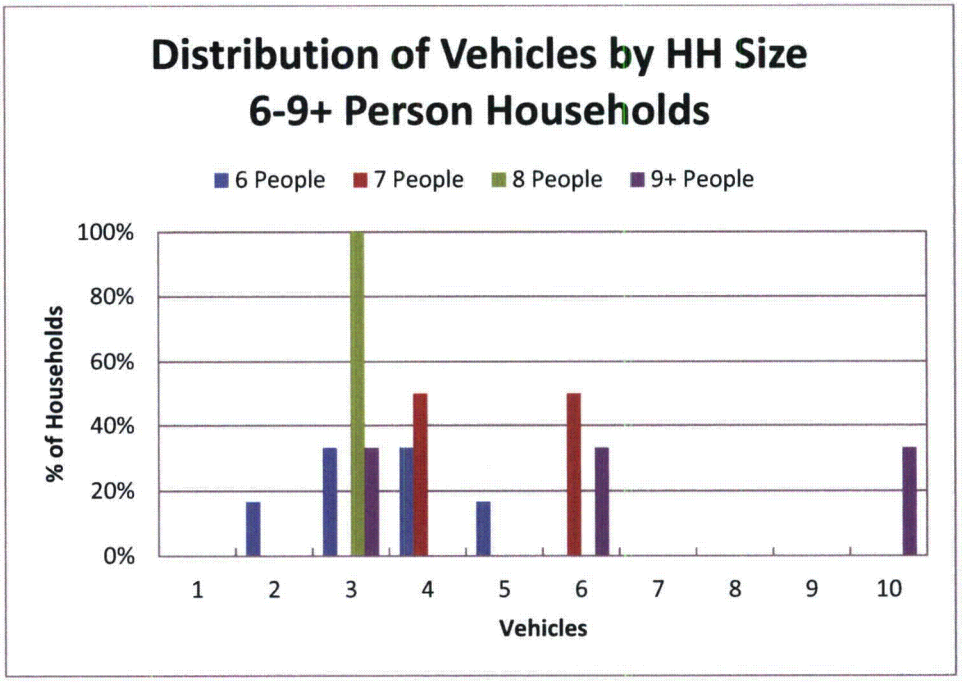

Figure F-4. Vehicle Availability - 6 to 9+ Person Households

Commuters

Figure F-5 presents the distribution of the number of commuters in each household. Commuters are defined as household members who travel to work or college on a daily basis. The data shows an average of 1.19 commuters in each household in the EPZ.

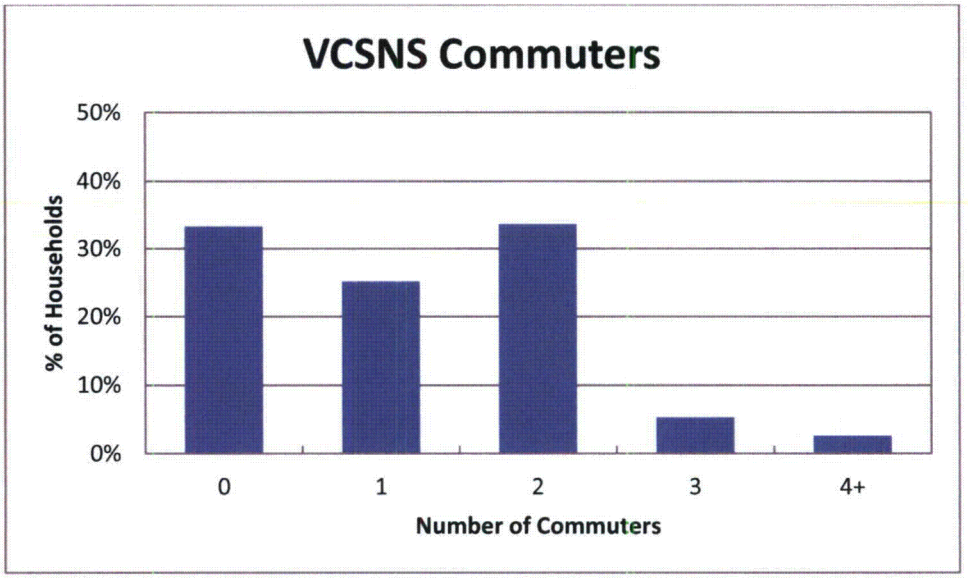

Figure F-5. Commuters in Households in the EPZ

Commuter Travel Modes

Figure F-6 presents the mode of travel that commuters use on a daily basis. The vast majority of commuters use their private automobiles to travel to work. The data shows an average of 1.01 employees per vehicle, assuming 2 people per vehicle – on average – for carpools.

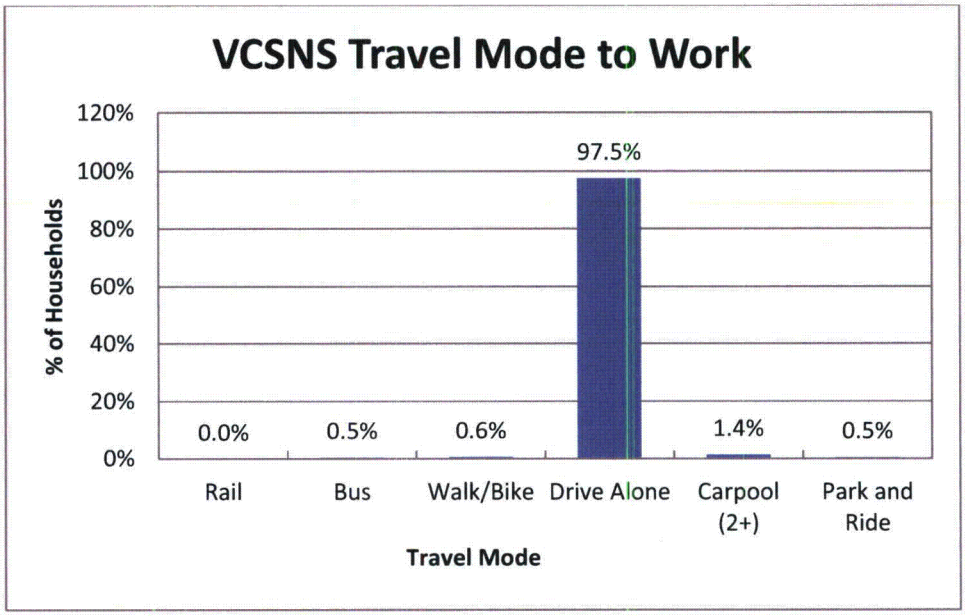

Figure F-6. Modes of Travel in the EPZ

F.3.2 Evacuation Response

Several questions were asked to gauge the population's response to an emergency. These are now discussed:

"How many of the vehicles would your household use during an evacuation?" The response is shown in Figure F-7. On average, evacuating households would use 1.49 vehicles.

"Would your family await the return of other family members prior to evacuating the area?" Of the survey participants who responded, 78 percent said they would await the return of other family members before evacuating and 22 percent indicated that they would not await the return of other family members.

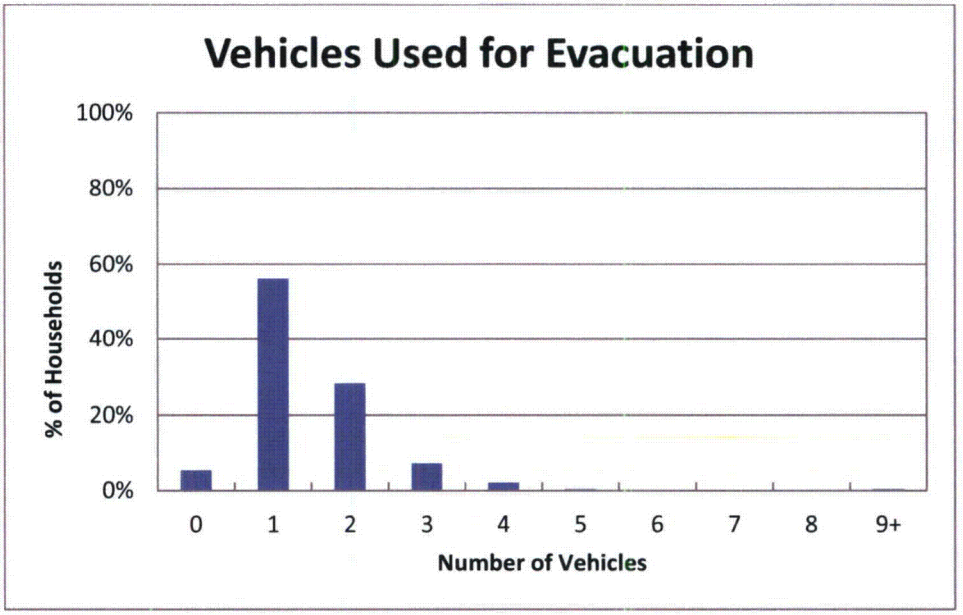

Figure F-7. Number of Vehicles Used for Evacuation

F.3.3 Time Distribution Results

The survey asked several questions about the amount of time it takes to perform certain pre-evacuation activities. These activities involve actions taken by residents during the course of their day-to-day lives. Thus, the answers fall within the realm of the responder's experience.

The mobilization distributions provided below are the result of having applied the analysis described in Section 5.4.1 on the component activities of the mobilization.

"How long does it take the commuter to complete preparation for leaving work?" Figure F-8 presents the cumulative distribution; in all cases, the activity is completed by about 90 minutes. Seventy-five percent can leave within 30 minutes.

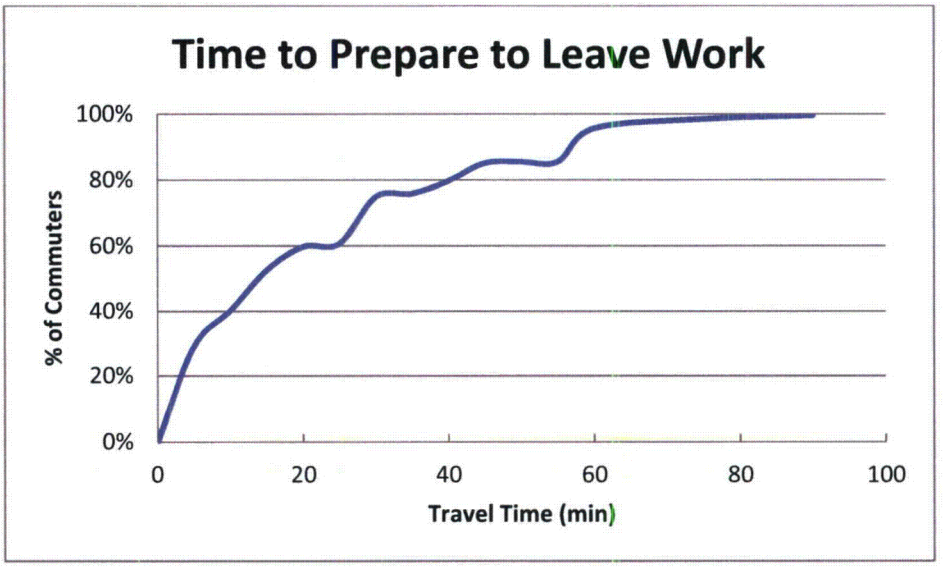

Figure F-8. Time to Prepare to Leave Work/School

"How long would it take the commuter to travel home?" Figure F-9 presents the work to home travel time for the EPZ. About 85 percent of commuters can arrive home within 40 minutes of leaving work; all within 90 minutes.

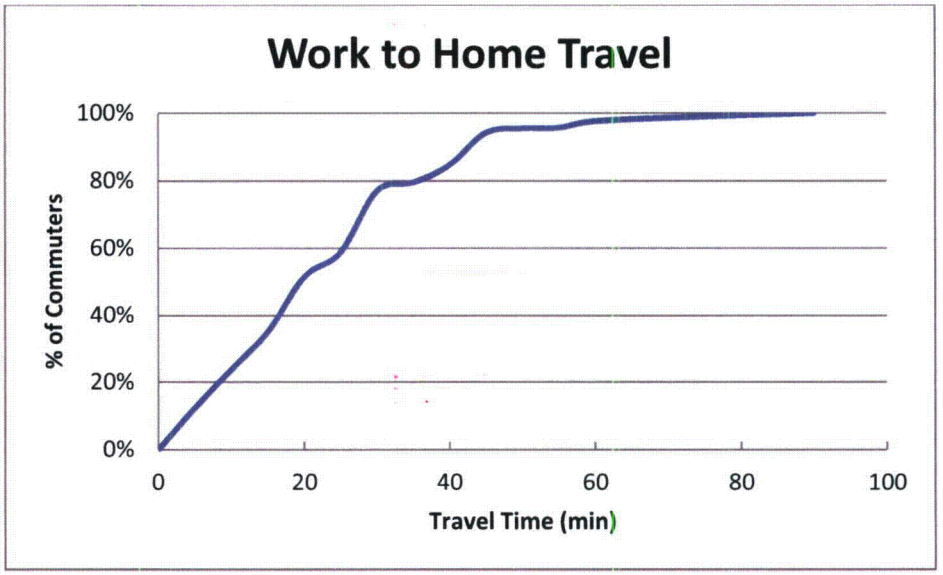

Figure F-9. Work to Home Travel Time

"How long would it take the family to pack clothing, secure the house, and load the car?" Figure F-10 presents the time required to prepare for leaving on an evacuation trip. In many ways this activity mimics a family's preparation for a short holiday or weekend away from home. Hence, the responses represent the experience of the responder in performing similar activities.

The distribution shown in Figure F-10 has a long "tail." About 60 percent of households can be ready to leave home within 30 minutes; the remaining households require up to an additional one hour and forty five minutes.

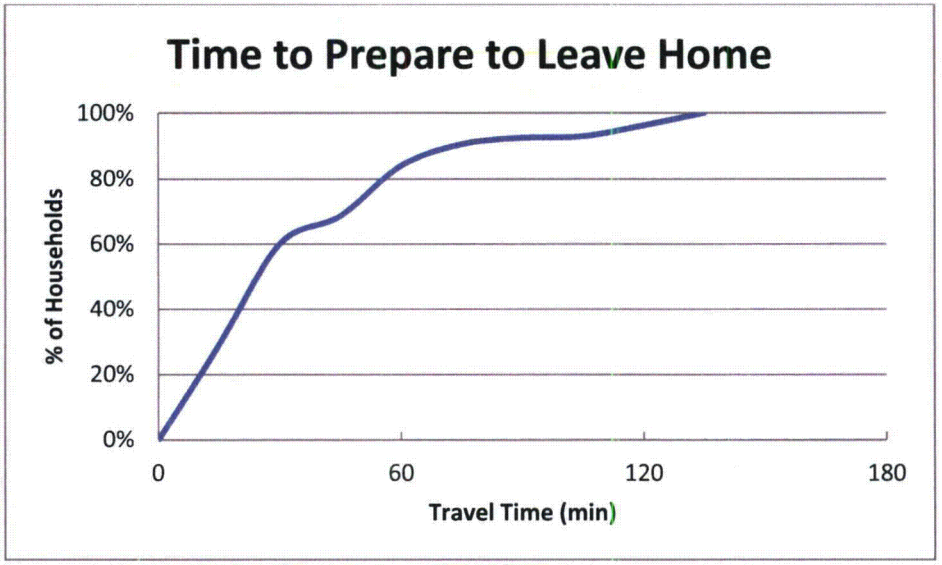

Figure F-10. Time to Prepare Home for Evacuation

F.4 CONCLUSIONS

The telephone survey provides valuable, relevant data associated with the EPZ population, which have been used to quantify demographics specific to the EPZ, and "mobilization time" which can influence evacuation time estimates.

ATTACHMENT A

Telephone Survey Instrument

Telephone Survey Instrument

Hello, my name is _____ and I'm working for First Market Research on a survey for Fairfield, Lexington, Newberry, and Richland Counties to identify local behavior during emergency situations. This information will be used for emergency planning and will be shared with local officials to enhance emergency response plans in your area for all hazards; emergency planning for some hazards may require evacuation. Your responses will greatly contribute to local emergency preparedness. I will not ask for your name.

COL. 1	Unused
COL. 2	Unused
COL. 3	Unused
COL. 4	Unused
COL. 5	Unused
Sex	COL. 8
	1 Male
	2 Female

INTERVIEWER: ASK TO SPEAK TO THE HEAD OF HOUSEHOLD OR THE SPOUSE OF THE HEAD OF HOUSEHOLD. (Terminate call if not a residence.)

DO NOT ASK:

1A.	Record area code. To Be Determined	COL. 9-11	
1B.	Record exchange number. To Be Determined	COL. 12-14	
2.	What is your home zip code?	COL. 15-19	
3A.	In total, how many cars, or other vehicles are usually available to the household? (DO NOT READ ANSWERS)	COL. 20	SKIP TO
		1 ONE	Q. 4
		2 TWO	Q. 4
		3 THREE	Q. 4
		4 FOUR	Q. 4
		5 FIVE	Q. 4
		6 SIX	Q. 4
		7 SEVEN	Q. 4
		8 EIGHT	Q. 4
		9 NINE OR MORE	Q. 4
		0 ZERO (NONE)	Q. 3B
		X DON'T KNOW/REFUSED	Q. 3B
3B.	In an emergency, could you get a ride out of the area with a neighbor or friend?	COL. 21	
		1 YES	
		2 NO	
		X DON'T KNOW/REFUSED	

4.	How many people usually live in this household? (DO NOT READ ANSWERS)	COL. 22	COL. 23
		1 ONE	0 TEN
		2 TWO	1 ELEVEN
		3 THREE	2 TWELVE
		4 FOUR	3 THIRTEEN
		5 FIVE	4 FOURTEEN
		6 SIX	5 FIFTEEN
		7 SEVEN	6 SIXTEEN
		8 EIGHT	7 SEVENTEEN
		9 NINE	8 EIGHTEEN
			9 NINETEEN OR MORE
			X DON'T KNOW/REFUSED

5.	How many adults in the household commute to a job, or to college on a daily basis?	COL. 24	SKIP TO
		0 ZERO	Q. 9
		1 ONE	Q. 6
		2 TWO	Q. 6
		3 THREE	Q. 6
		4 FOUR OR MORE	Q. 6
		5 DON'T KNOW/REFUSED	Q. 9

INTERVIEWER: For each person identified in Question 5, ask Questions 6, 7, and 8.

6. Thinking about commuter #1, how does that person usually travel to work or college? (REPEAT QUESTION FOR EACH COMMUTER)

	Commuter #1	Commuter #2	Commuter #3	Commuter #4
	COL. 25	COL. 26	COL. 27	COL. 28
Rail	1	1	1	1
Bus	2	2	2	2
Walk/Bicycle	3	3	3	3
Drive Alone	4	4	4	4
Carpool-2 or more people	5	5	5	5
Don't know/Refused	6	6	6	6

7. How much time on average, would it take Commuter #1 to travel home from work or college? (REPEAT QUESTION FOR EACH COMMUTER) (DO NOT READ ANSWERS)

COMMUTER #1				COMMUTER #2			
COL. 29		COL. 30		COL. 31		COL. 32	
1	5 MINUTES OR LESS	1	46-50 MINUTES	1	5 MINUTES OR LESS	1	46-50 MINUTES
2	6-10 MINUTES	2	51-55 MINUTES	2	6-10 MINUTES	2	51-55 MINUTES
3	11-15 MINUTES	3	56 – 1 HOUR	3	11-15 MINUTES	3	56 – 1 HOUR
4	16-20 MINUTES	4	OVER 1 HOUR, BUT LESS THAN 1 HOUR 15 MINUTES	4	16-20 MINUTES	4	OVER 1 HOUR, BUT LESS THAN 1 HOUR 15 MINUTES

5	21-25 MINUTES	5	BETWEEN 1 HOUR 16 MINUTES AND 1 HOUR 30 MINUTES	5	21-25 MINUTES	5	BETWEEN 1 HOUR 16 MINUTES AND 1 HOUR 30 MINUTES
6	26-30 MINUTES	6	BETWEEN 1 HOUR 31 MINUTES AND 1 HOUR 45 MINUTES	6	26-30 MINUTES	6	BETWEEN 1 HOUR 31 MINUTES AND 1 HOUR 45 MINUTES
7	31-35 MINUTES	7	BETWEEN 1 HOUR 46 MINUTES AND 2 HOURS	7	31-35 MINUTES	7	BETWEEN 1 HOUR 46 MINUTES AND 2 HOURS
8	36-40 MINUTES	8	OVER 2 HOURS (SPECIFY _____)	8	36-40 MINUTES	8	OVER 2 HOURS (SPECIFY _____)
9	41-45 MINUTES	9		9	41-45 MINUTES	9	
		0				0	
		X	DON'T KNOW /REFUSED			X	DON'T KNOW /REFUSED

COMMUTER #3

COL. 33		COL. 34		COL. 35		COL. 36	
1	5 MINUTES OR LESS	1	46-50 MINUTES	1	5 MINUTES OR LESS	1	46-50 MINUTES
2	6-10 MINUTES	2	51-55 MINUTES	2	6-10 MINUTES	2	51-55 MINUTES
3	11-15 MINUTES	3	56 – 1 HOUR	3	11-15 MINUTES	3	56 – 1 HOUR
4	16-20 MINUTES	4	OVER 1 HOUR, BUT LESS THAN 1 HOUR 15 MINUTES	4	16-20 MINUTES	4	OVER 1 HOUR, BUT LESS THAN 1 HOUR 15 MINUTES
5	21-25 MINUTES	5	BETWEEN 1 HOUR 16 MINUTES AND 1 HOUR 30 MINUTES	5	21-25 MINUTES	5	BETWEEN 1 HOUR 16 MINUTES AND 1 HOUR 30 MINUTES
6	26-30 MINUTES	6	BETWEEN 1 HOUR 31 MINUTES AND 1 HOUR 45 MINUTES	6	26-30 MINUTES	6	BETWEEN 1 HOUR 31 MINUTES AND 1 HOUR 45 MINUTES
7	31-35 MINUTES	7	BETWEEN 1 HOUR 46 MINUTES AND 2 HOURS	7	31-35 MINUTES	7	BETWEEN 1 HOUR 46 MINUTES AND 2 HOURS
8	36-40 MINUTES	8	OVER 2 HOURS (SPECIFY _____)	8	36-40 MINUTES	8	OVER 2 HOURS (SPECIFY _____)
9	41-45 MINUTES	9		9	41-45 MINUTES	9	
		0				0	
		X	DON'T KNOW /REFUSED			X	DON'T KNOW /REFUSED

8. Approximately how much time does it take Commuter #1 to complete preparation for leaving work or college prior to starting the trip home? (REPEAT QUESTION FOR EACH COMMUTER) (DO NOT READ ANSWERS)

COMMUTER #1

COL. 37		COL. 38		COL. 39		COL. 40	
1	5 MINUTES OR LESS	1	46-50 MINUTES	1	5 MINUTES OR LESS	1	46-50 MINUTES
2	6-10 MINUTES	2	51-55 MINUTES	2	6-10 MINUTES	2	51-55 MINUTES
3	11-15 MINUTES	3	56 – 1 HOUR	3	11-15 MINUTES	3	56 – 1 HOUR
4	16-20 MINUTES	4	OVER 1 HOUR, BUT LESS THAN 1 HOUR 15 MINUTES	4	16-20 MINUTES	4	OVER 1 HOUR, BUT LESS THAN 1 HOUR 15 MINUTES

5	21-25 MINUTES	5	BETWEEN 1 HOUR 16 MINUTES AND 1 HOUR 30 MINUTES	5	21-25 MINUTES	5	BETWEEN 1 HOUR 16 MINUTES AND 1 HOUR 30 MINUTES
6	26-30 MINUTES	6	BETWEEN 1 HOUR 31 MINUTES AND 1 HOUR 45 MINUTES	6	26-30 MINUTES	6	BETWEEN 1 HOUR 31 MINUTES AND 1 HOUR 45 MINUTES
7	31-35 MINUTES	7	BETWEEN 1 HOUR 46 MINUTES AND 2 HOURS	7	31-35 MINUTES	7	BETWEEN 1 HOUR 46 MINUTES AND 2 HOURS
8	36-40 MINUTES	8	OVER 2 HOURS (SPECIFY _____)	8	36-40 MINUTES	8	OVER 2 HOURS (SPECIFY _____)
9	41-45 MINUTES	9		9	41-45 MINUTES	9	
		0				0	
		X	DON'T KNOW /REFUSED			X	DON'T KNOW /REFUSED

COMMUTER #3

COL. 41		COL. 42	
1	5 MINUTES OR LESS	1	46-50 MINUTES
2	6-10 MINUTES	2	51-55 MINUTES
3	11-15 MINUTES	3	56 – 1 HOUR
4	16-20 MINUTES	4	OVER 1 HOUR, BUT LESS THAN 1 HOUR 15 MINUTES
5	21-25 MINUTES	5	BETWEEN 1 HOUR 16 MINUTES AND 1 HOUR 30 MINUTES
6	26-30 MINUTES	6	BETWEEN 1 HOUR 31 MINUTES AND 1 HOUR 45 MINUTES
7	31-35 MINUTES	7	BETWEEN 1 HOUR 46 MINUTES AND 2 HOURS
8	36-40 MINUTES	8	OVER 2 HOURS (SPECIFY _____)
9	41-45 MINUTES	9	
		0	
		X	DON'T KNOW /REFUSED

COMMUTER #4

COL. 43		COL. 44	
1	5 MINUTES OR LESS	1	46-50 MINUTES
2	6-10 MINUTES	2	51-55 MINUTES
3	11-15 MINUTES	3	56 – 1 HOUR
4	16-20 MINUTES	4	OVER 1 HOUR, BUT LESS THAN 1 HOUR 15 MINUTES
5	21-25 MINUTES	5	BETWEEN 1 HOUR 16 MINUTES AND 1 HOUR 30 MINUTES
6	26-30 MINUTES	6	BETWEEN 1 HOUR 31 MINUTES AND 1 HOUR 45 MINUTES
7	31-35 MINUTES	7	BETWEEN 1 HOUR 46 MINUTES AND 2 HOURS
8	36-40 MINUTES	8	OVER 2 HOURS (SPECIFY _____)
9	41-45 MINUTES	9	
		0	
		X	DON'T KNOW /REFUSED

9. If you were advised by local authorities to evacuate, how much time would it take the household to pack clothing, medications, secure the house, load the car, and complete preparations prior to evacuating the area? (DO NOT READ ANSWERS)

COL. 45		COL. 46	
1	LESS THAN 15 MINUTES	1	3 HOURS TO 3 HOURS 15 MINUTES
2	15-30 MINUTES	2	3 HOURS 16 MINUTES TO 3 HOURS 30 MINUTES
3	31-45 MINUTES	3	3 HOURS 31 MINUTES TO 3 HOURS 45 MINUTES
4	46 MINUTES – 1 HOUR	4	3 HOURS 46 MINUTES TO 4 HOURS
5	1 HOUR TO 1 HOUR 15 MINUTES	5	4 HOURS TO 4 HOURS 15 MINUTES
6	1 HOUR 16 MINUTES TO 1 HOUR 30 MINUTES	6	4 HOURS 16 MINUTES TO 4 HOURS 30 MINUTES
7	1 HOUR 31 MINUTES TO 1 HOUR 45 MINUTES	7	4 HOURS 31 MINUTES TO 4 HOURS 45 MINUTES
8	1 HOUR 46 MINUTES TO 2 HOURS	8	4 HOURS 46 MINUTES TO 5 HOURS

9 2 HOURS TO 2 HOURS 15 MINUTES
0 2 HOURS 16 MINUTES TO 2 HOURS 30 MINUTES
X 2 HOURS 31 MINUTES TO 2 HOURS 45 MINUTES
Y 2 HOURS 46 MINUTES TO 3 HOURS
9 5 HOURS TO 5 HOURS 30 MINUTES
0 5 HOURS 31 MINUTES TO 6 HOURS
X OVER 6 HOURS (SPECIFY _____)

COL. 47
1 DON'T KNOW/REFUSED

---

10. Please choose one of the following (READ ANSWERS):

A. I would await the return of household commuters to evacuate together.

B. I would evacuate independently and meet other household members later.

COL. 50
1 A
2 B
X DON'T KNOW/REFUSED

---

11. How many vehicles would your household use during an evacuation? (DO NOT READ ANSWERS)

COL. 51
1 ONE
2 TWO
3 THREE
4 FOUR
5 FIVE
6 SIX
7 SEVEN
8 EIGHT
9 NINE OR MORE
0 ZERO (NONE)
X DON'T KNOW/REFUSED

Thank you very much. _____

(TELEPHONE NUMBER CALLED)

IF REQUESTED:

For additional information, contact your County Emergency Management Agency during normal business hours.

County	EMA Phone
Fairfield	(803) 635-5505
Lexington	(803) 785-8343
Newberry	(803) 321-2135
Richland	(803) 576-3400

APPENDIX G

Traffic Management Plan

G. TRAFFIC MANAGEMENT PLAN

NUREG/CR-7002 indicates that the existing TCPs and ACPs identified by the offsite agencies should be used in the evacuation simulation modeling. The traffic and access control plans for the EPZ are discussed in the following documents:

- Fairfield County Emergency Operations Plan, Annex E, Appendix 7, Page E-15
- Lexington County Emergency Operations Plan, Annex 25a, Appendix 4, Page 25a-27
- Newberry County Emergency Operations Plan, Annex Q, Appendix 3, Page Q-57
- Richland County Emergency Operations Plan, Annex 25C, Appendix 3, Page 58
- South Carolina Operational Radiological Emergency Response, Part 3 Table to Figure 1, Page 3-12

These plans were reviewed and the TCPs and ACPs were modeled accordingly. Figure G-1 is a map of the existing traffic control points.

G.1 Traffic Control Points

As discussed in Section 9, traffic control points at intersections (which are controlled) are modeled as actuated signals. If an intersection has a pre-timed signal, stop, or yield control, and the intersection is identified as a traffic control point, the control type was changed to an actuated signal in the DYNEV II system. Table K-2 provides the control type and node number for those nodes which are controlled. If the existing control was changed due to the point being a TCP, the control type is indicated as "Traffic Control Point" in Table K-2.

As discussed in Section 7.3, there is limited traffic congestion within the EPZ. As such, no additional traffic control points are recommended.

G.2 Access Control Points

It is assumed that ACPs will be established within 2 hours of the advisory to evacuate (ATE) to discourage through travelers from using major through routes which traverse the EPZ. There are no ACPs identified in the existing emergency plans for Lexington and Fairfield Counties. Newberry and Richland County emergency plans state that entrance barricades will be placed at all routes of ingress other than at TCPs, and entrance into the area will be strictly enforced by local law enforcement.

As discussed in Section 3.6, external traffic is considered on Interstate-26, US-76, and US-176, which enter the EPZ in Newberry and Richland Counties, and on US-321 in the Shadow Region in Fairfield County. The access control procedure discussed above for Newberry and Richland Counties will stop the flow of traffic into the EPZ at 2 hours after the ATE, while the TCPs along US-321 in Fairfield County (See Figure G-1) can be used to stop the flow of traffic through the area in Fairfield County. As such, no additional ACPs are recommended.

Traffic and access control points should be periodically reviewed by state and county emergency planners with local and state police agencies.

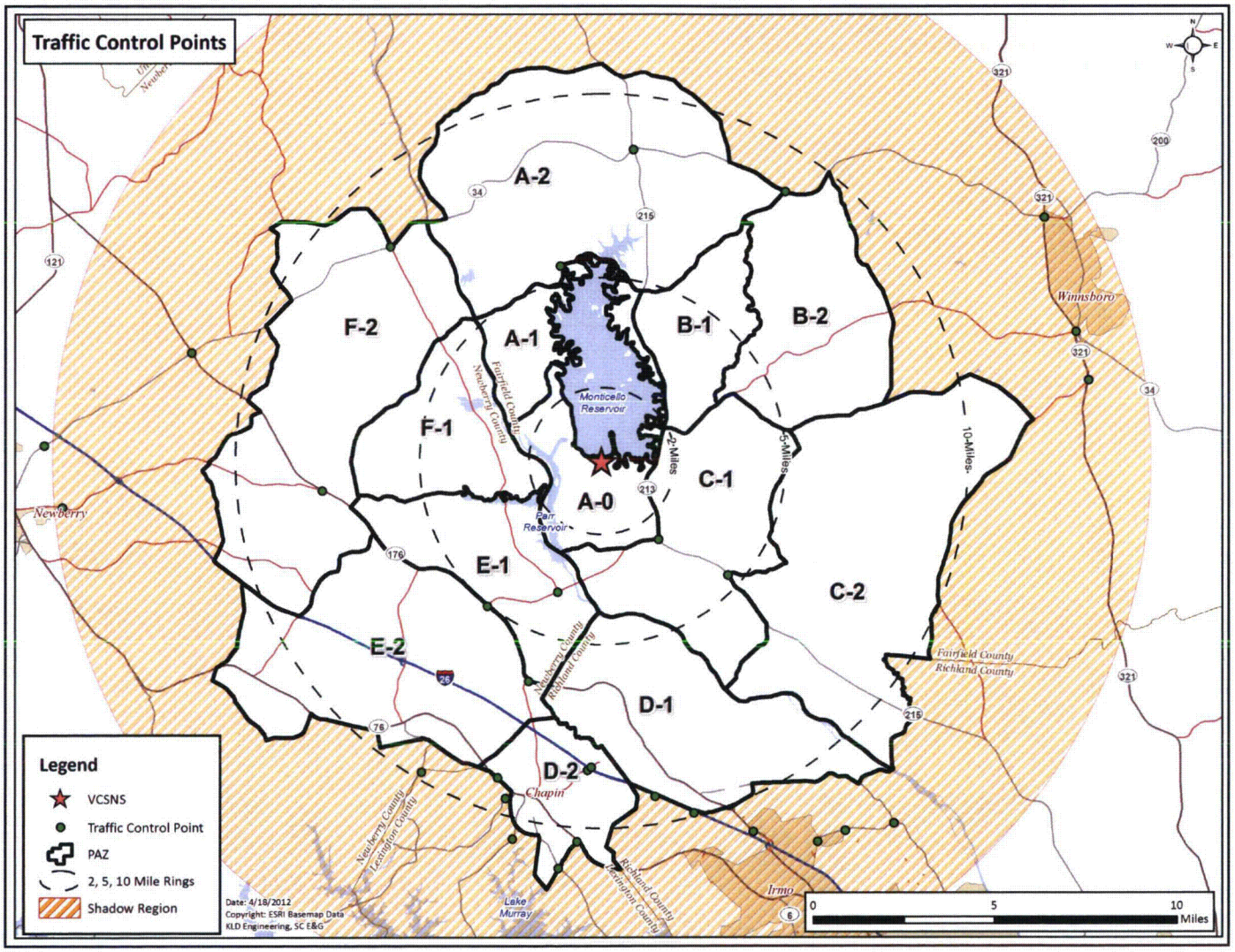

Figure G-1. VCSNS Traffic Control Points

APPENDIX H

Evacuation Regions

H. EVACUATION REGIONS

This appendix presents the evacuation percentages for each Evacuation Region (Table H-1) and maps of all Evacuation Regions. The percentages presented in Table H-1 are based on the methodology discussed in assumption 5 of Section 2.2 and shown in Figure 2-1.

Note the baseline ETE study assumes 20 percent of households will not comply with the shelter advisory, as per Section 2.5.2 of NUREG/CR-7002.

Table H-1. Percent of PAZ Population Evacuating for Each Region

Region	Description	Protective Action Zone												
		A-0	A-1	A-2	B-1	B-2	C-1	C-2	D-1	D-2	E-1	E-2	F-1	F-2
R01	2-Mile Ring	100%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
R02	5-Mile Ring	100%	100%	20%	100%	20%	100%	20%	20%	20%	100%	20%	100%	20%
R03	Full EPZ	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Evacuate 2-Mile Radius and Downwind to 5 Miles														
R04	S, SSW	100%	100%	20%	100%	20%	20%	20%	20%	20%	20%	20%	20%	20%
R05	SW, WSW	100%	100%	20%	100%	20%	100%	20%	20%	20%	20%	20%	20%	20%
R06	W	100%	20%	20%	100%	20%	100%	20%	20%	20%	20%	20%	20%	20%
R07	WNW, NW	100%	20%	20%	20%	20%	100%	20%	20%	20%	20%	20%	20%	20%
R08	NNW, N	100%	20%	20%	20%	20%	100%	20%	20%	20%	100%	20%	20%	20%
R09	NNE, NE	100%	20%	20%	20%	20%	20%	20%	20%	20%	100%	20%	20%	20%
R10	ENE, E	100%	20%	20%	20%	20%	20%	20%	20%	20%	100%	20%	100%	20%
R11	ESE, SE, SSE	100%	100%	20%	20%	20%	20%	20%	20%	20%	20%	20%	100%	20%
Evacuate 5-Mile Radius and Downwind to the EPZ Boundary														
R12	S	100%	100%	100%	100%	20%	100%	20%	20%	20%	100%	20%	100%	20%
R13	SSW, SW	100%	100%	100%	100%	100%	100%	20%	20%	20%	100%	20%	100%	20%
R14	WSW, W	100%	100%	20%	100%	100%	100%	100%	20%	20%	100%	20%	100%	20%
R15	WNW, NW	100%	100%	20%	100%	20%	100%	100%	100%	20%	100%	20%	100%	20%
R16	NNW	100%	100%	20%	100%	20%	100%	100%	100%	100%	100%	20%	100%	20%
R17	N, NNE	100%	100%	20%	100%	20%	100%	20%	100%	100%	100%	100%	100%	20%
R18	NE	100%	100%	20%	100%	20%	100%	20%	20%	100%	100%	100%	100%	100%
R19	ENE, E	100%	100%	20%	100%	20%	100%	20%	20%	20%	100%	100%	100%	100%
R20	ESE	100%	100%	20%	100%	20%	100%	20%	20%	20%	100%	20%	100%	100%
R21	SE, SSE	100%	100%	100%	100%	20%	100%	20%	20%	20%	100%	20%	100%	100%
Shelter-in-Place until 90% ETE for R01, then Evacuate						PAZ(s) Shelter-in-Place				PAZ(s) Evacuate				

Table H-1. Continued

Region	Description	Protective Action Zone												
		A-0	A-1	A-2	B-1	B-2	C-1	C-2	D-1	D-2	E-1	E-2	F-1	F-2
Staged Evacuation - 2-Mile Radius Evacuates, then Evacuate Downwind to 5 Miles														
R22	5-Mile Ring	100%	100%	20%	100%	20%	100%	20%	20%	20%	100%	20%	100%	20%
R23	S, SSW	100%	100%	20%	100%	20%	20%	20%	20%	20%	20%	20%	20%	20%
R24	SW, WSW	100%	100%	20%	100%	20%	100%	20%	20%	20%	20%	20%	20%	20%
R25	W	100%	20%	20%	100%	20%	100%	20%	20%	20%	20%	20%	20%	20%
R26	WNW, NW	100%	20%	20%	20%	20%	100%	20%	20%	20%	20%	20%	20%	20%
R27	NNW, N	100%	20%	20%	20%	20%	100%	20%	20%	20%	100%	20%	20%	20%
R28	NNE, NE	100%	20%	20%	20%	20%	20%	20%	20%	20%	100%	20%	20%	20%
R29	ENE, E	100%	20%	20%	20%	20%	20%	20%	20%	20%	100%	20%	100%	20%
R30	ESE, SE, SSE	100%	100%	20%	20%	20%	20%	20%	20%	20%	20%	20%	100%	20%
Shelter-in-Place until 90% ETE for R01, then Evacuate						PAZ(s) Shelter-in-Place				PAZ(s) Evacuate				

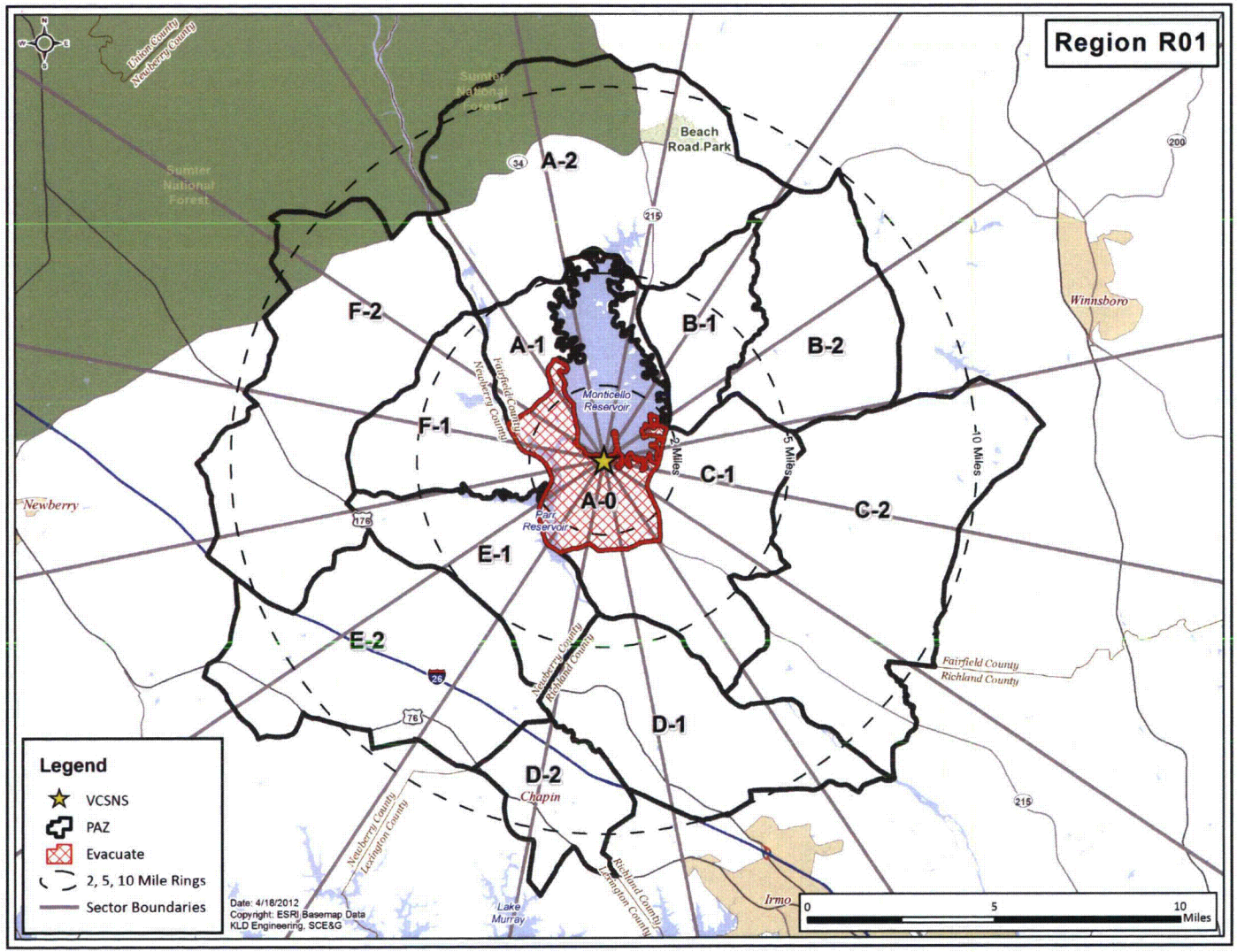

Figure H-1. Region R01

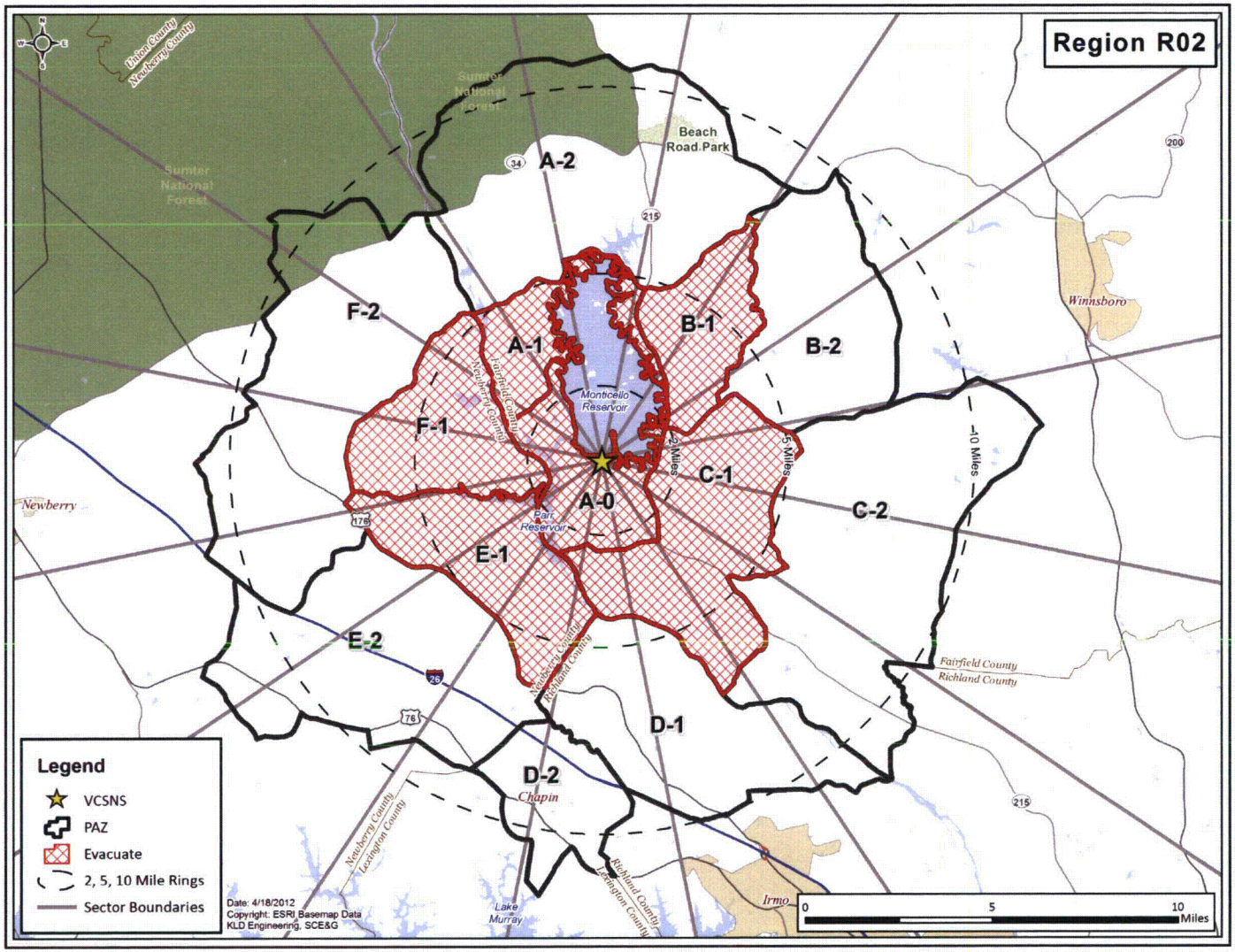

Figure H-2. Region R02

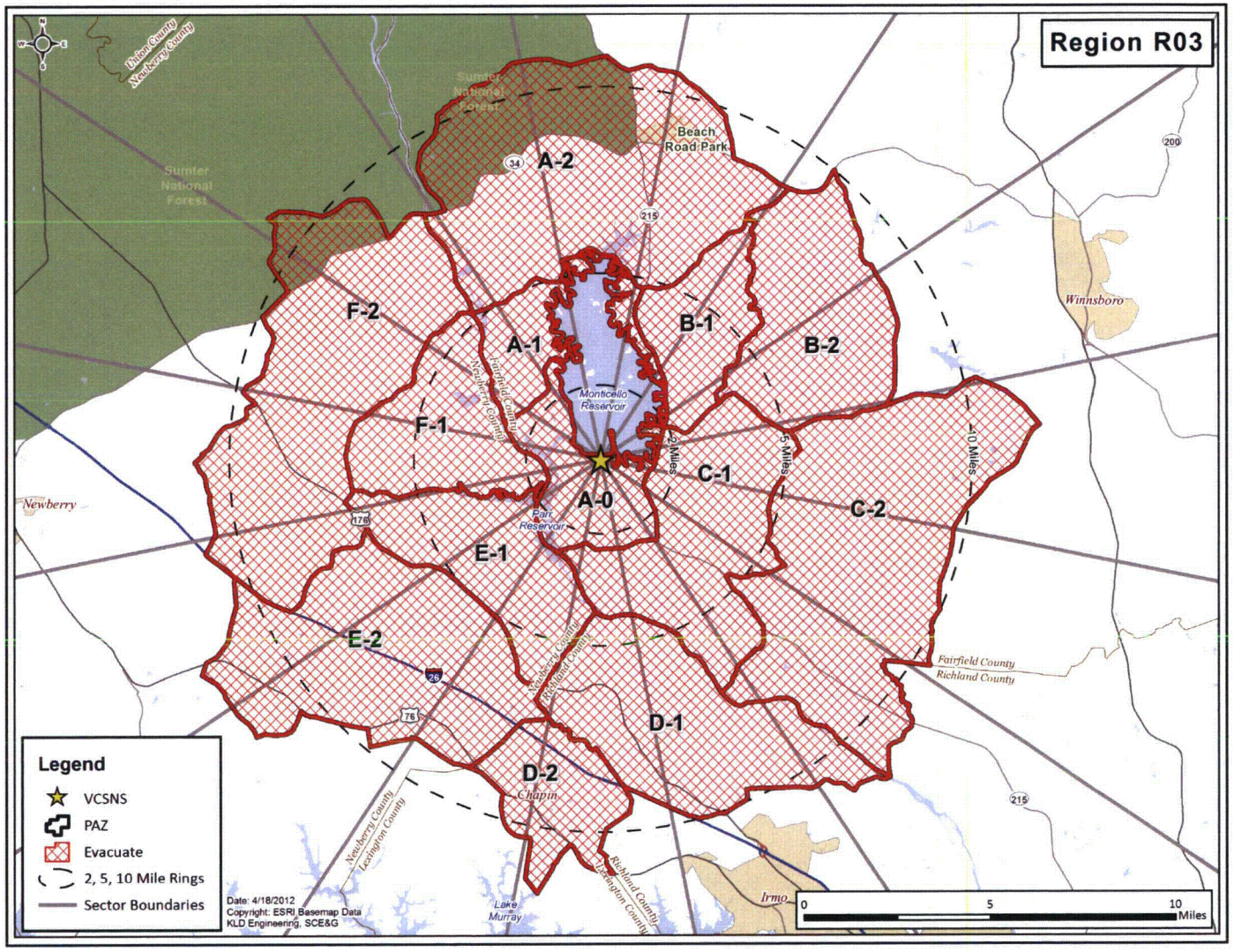

Figure H-3. Region R03

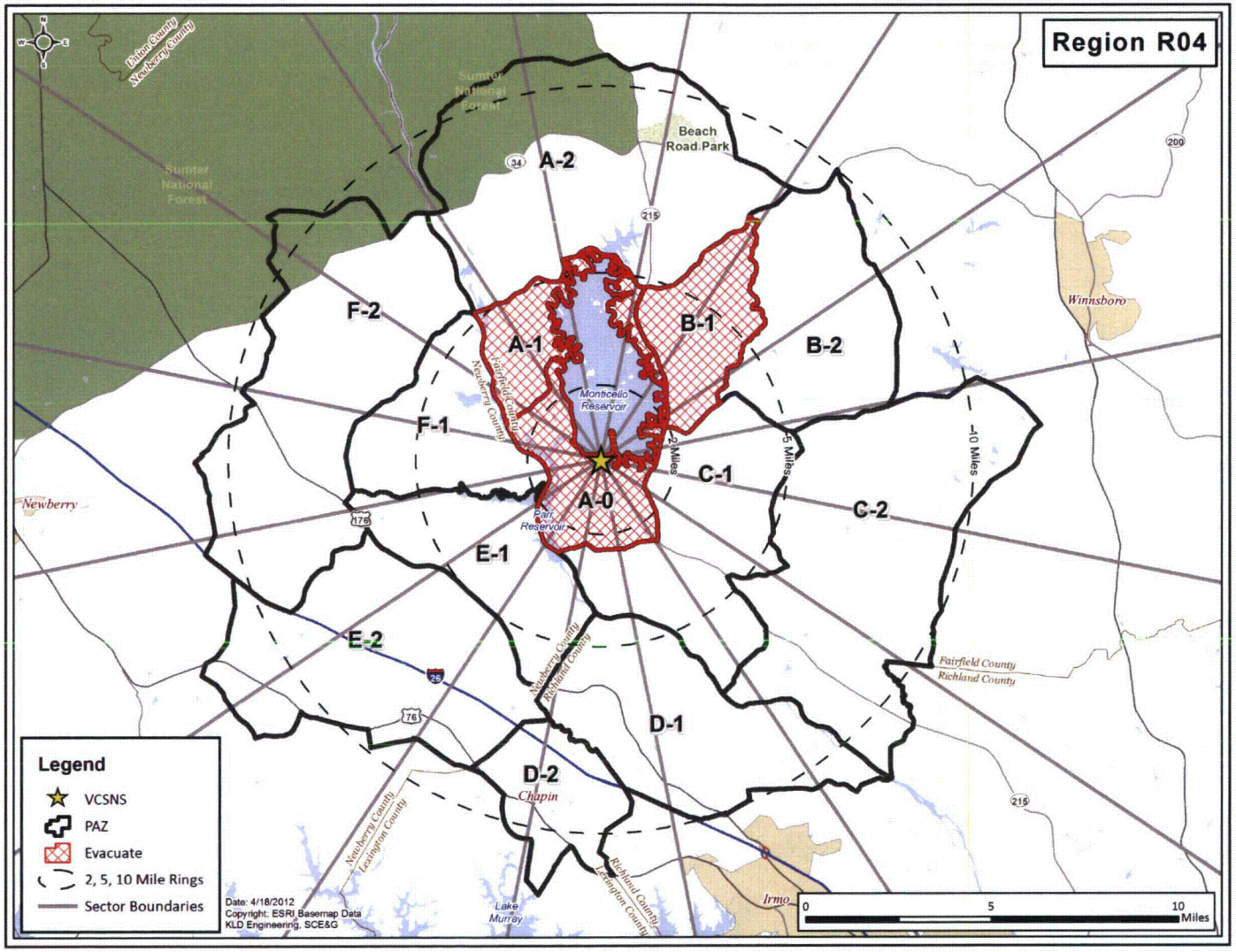

Figure H-4. Region R04

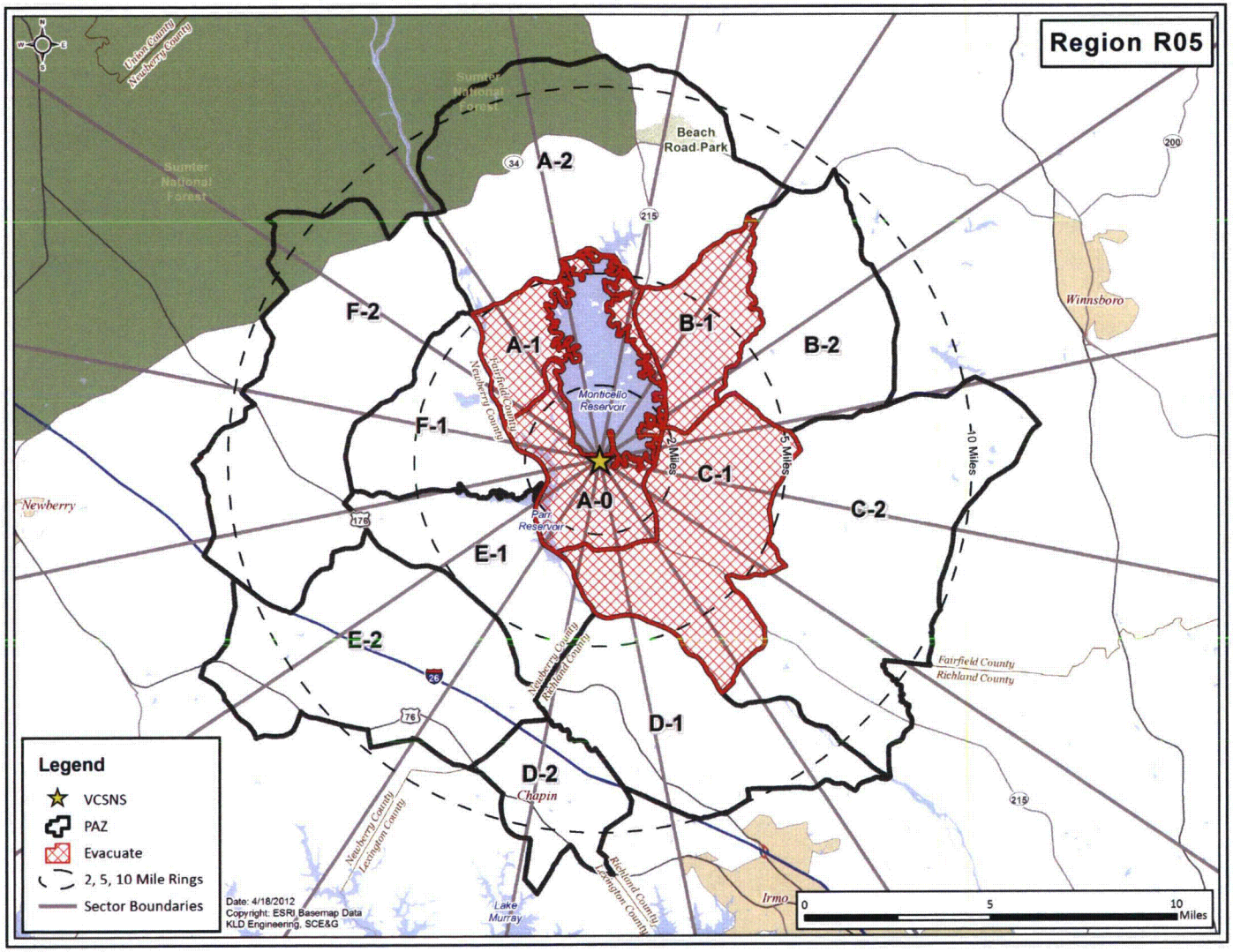

Figure H-5. Region R05

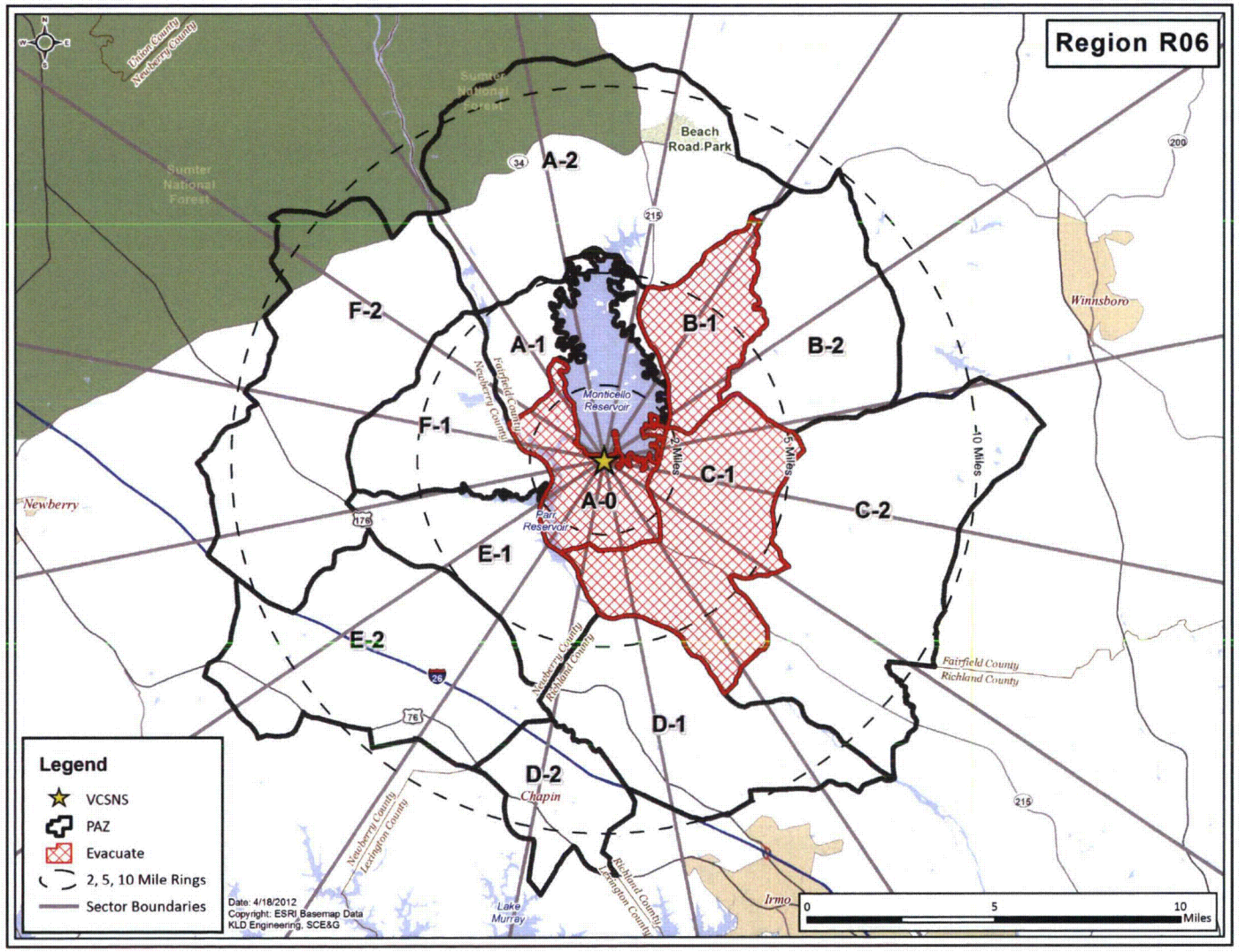

Figure H-6. Region R06

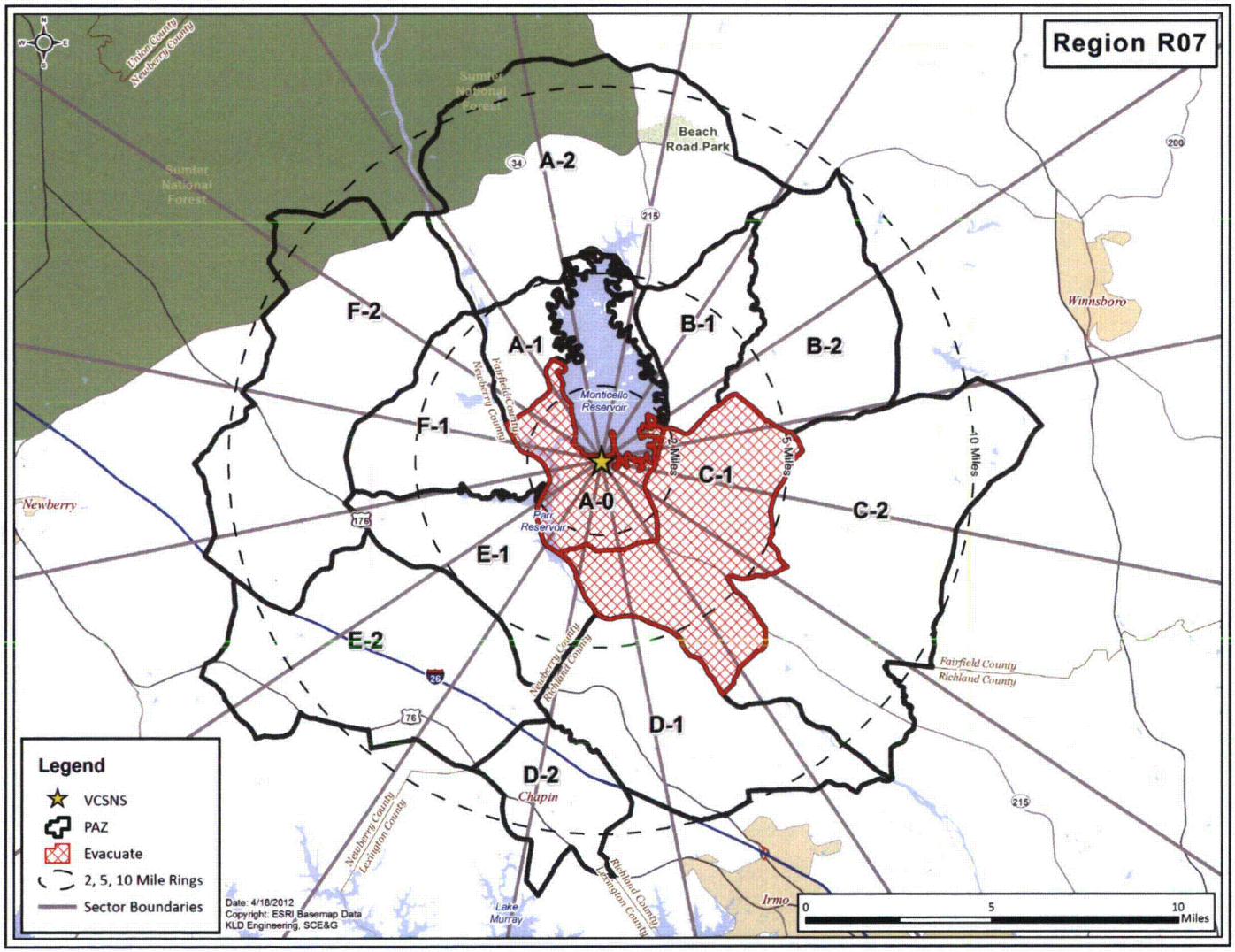

Figure H-7. Region R07

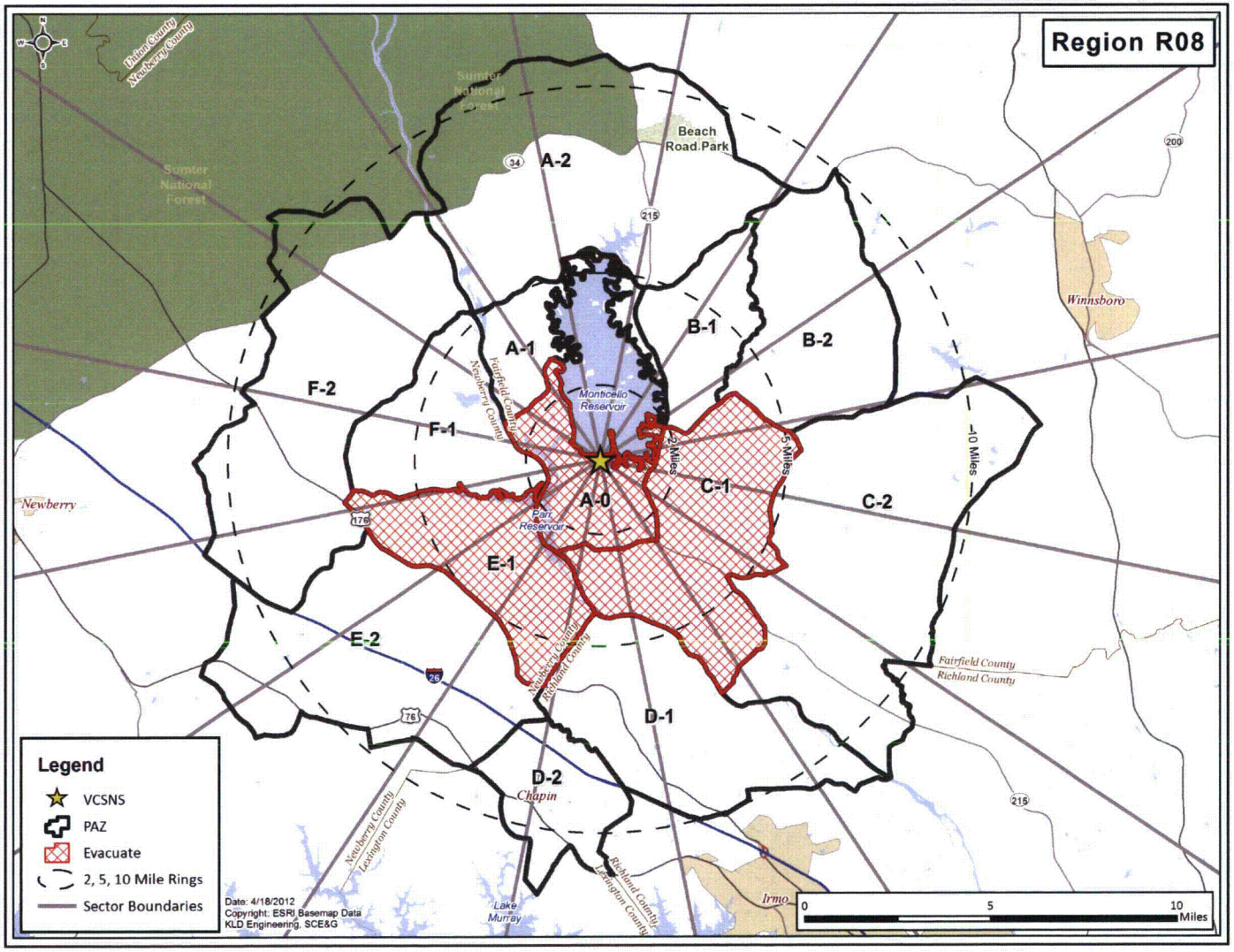

Figure H-8. Region R08

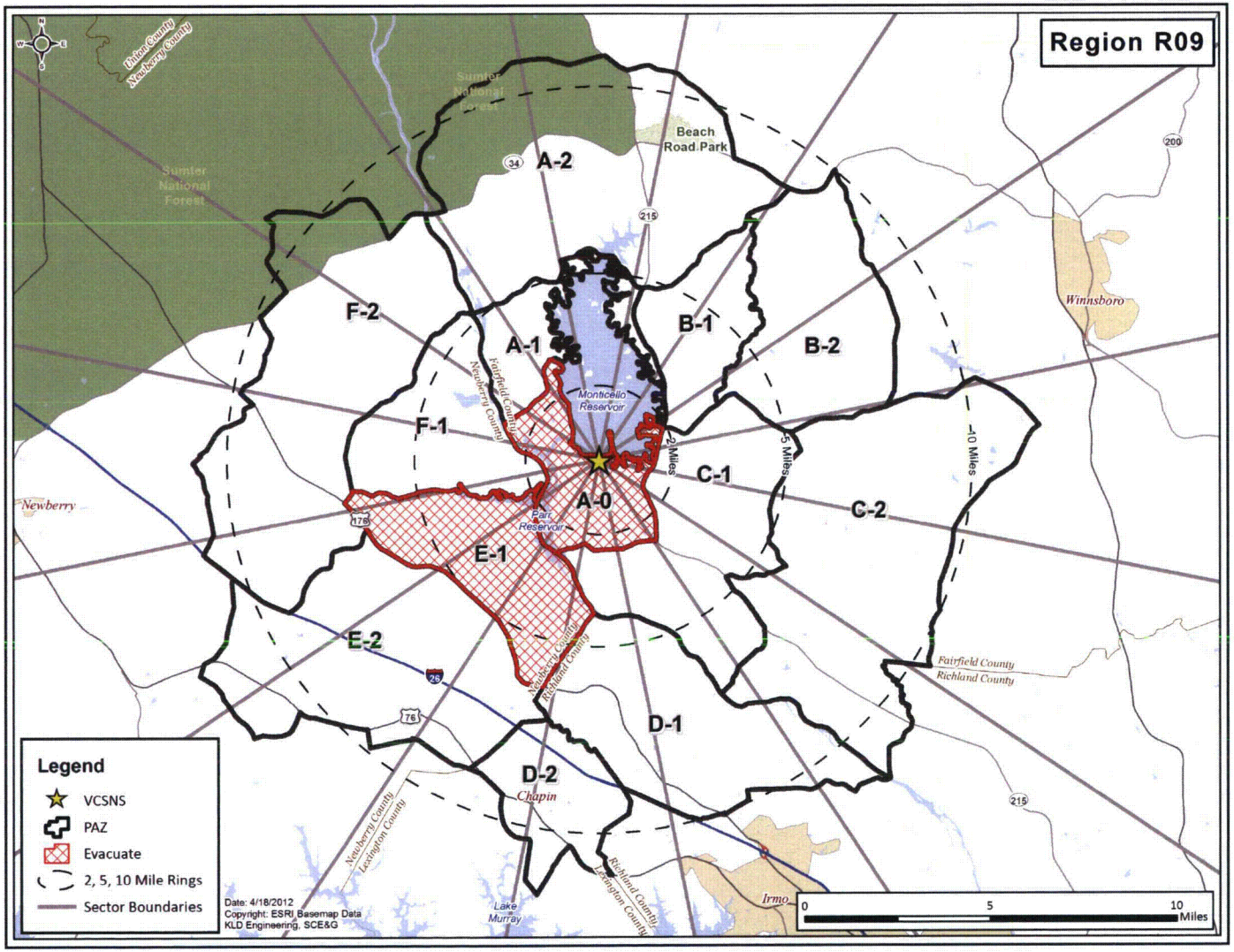

Figure H-9. Region R09

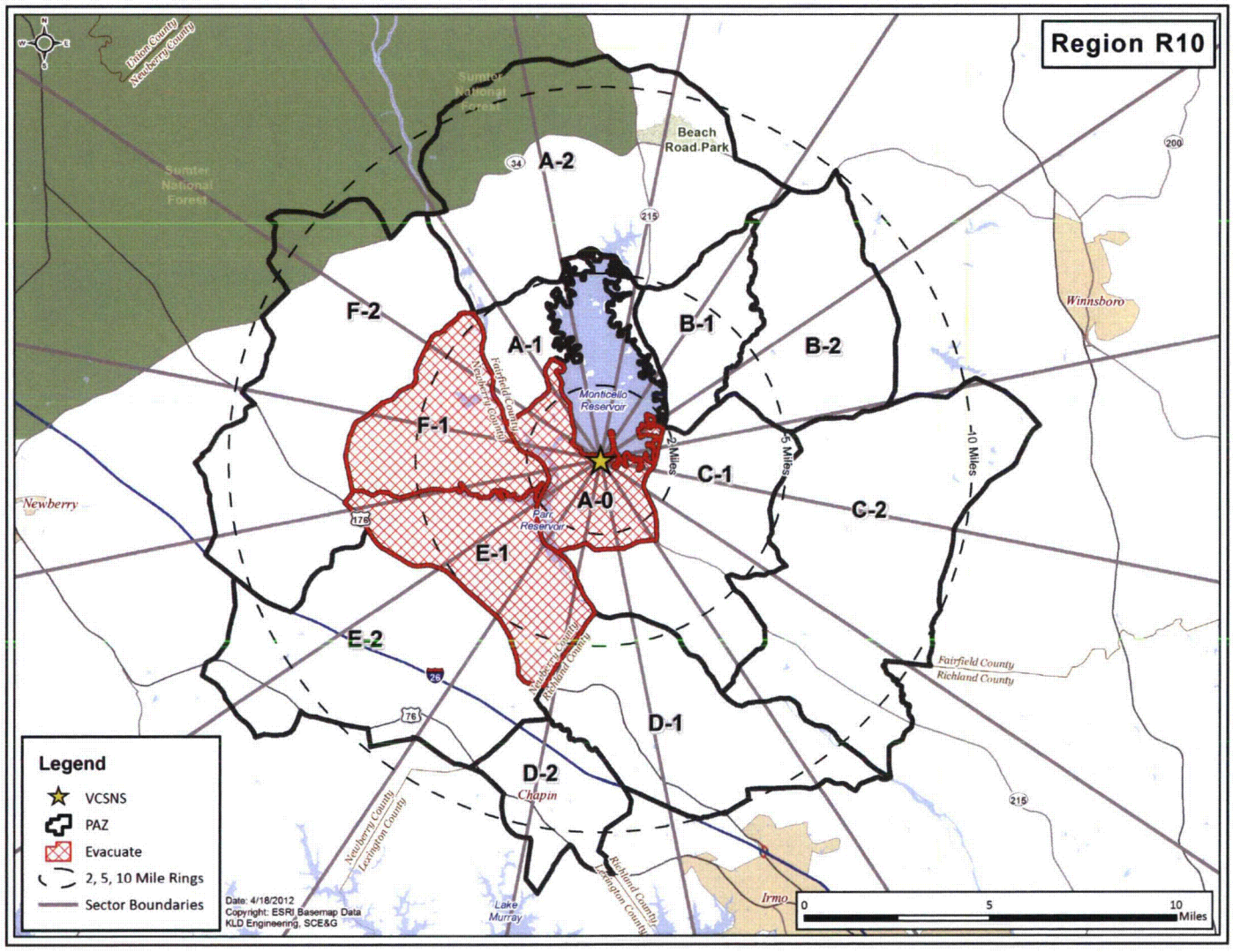

Figure H-10. Region R10

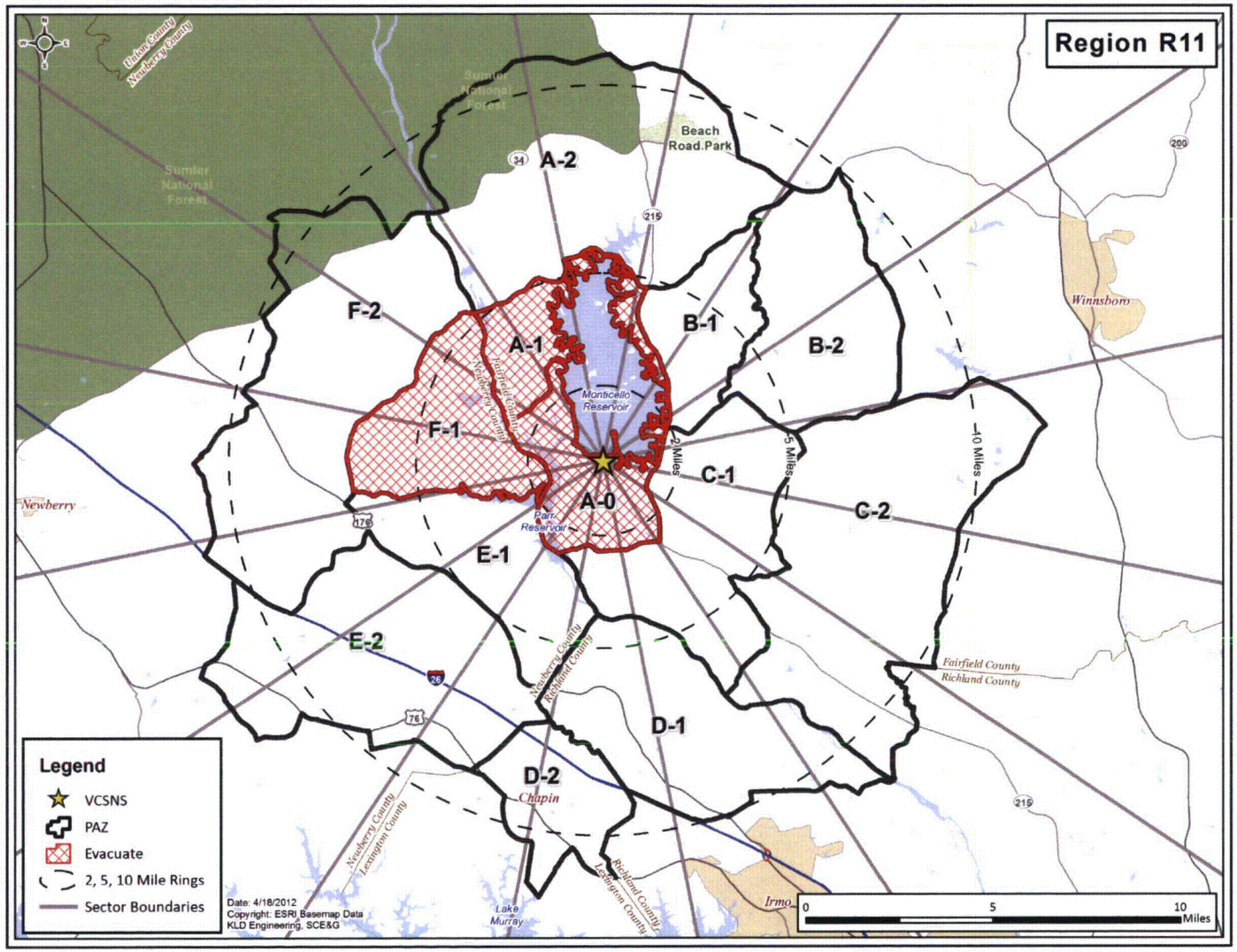

Figure H-11. Region R11

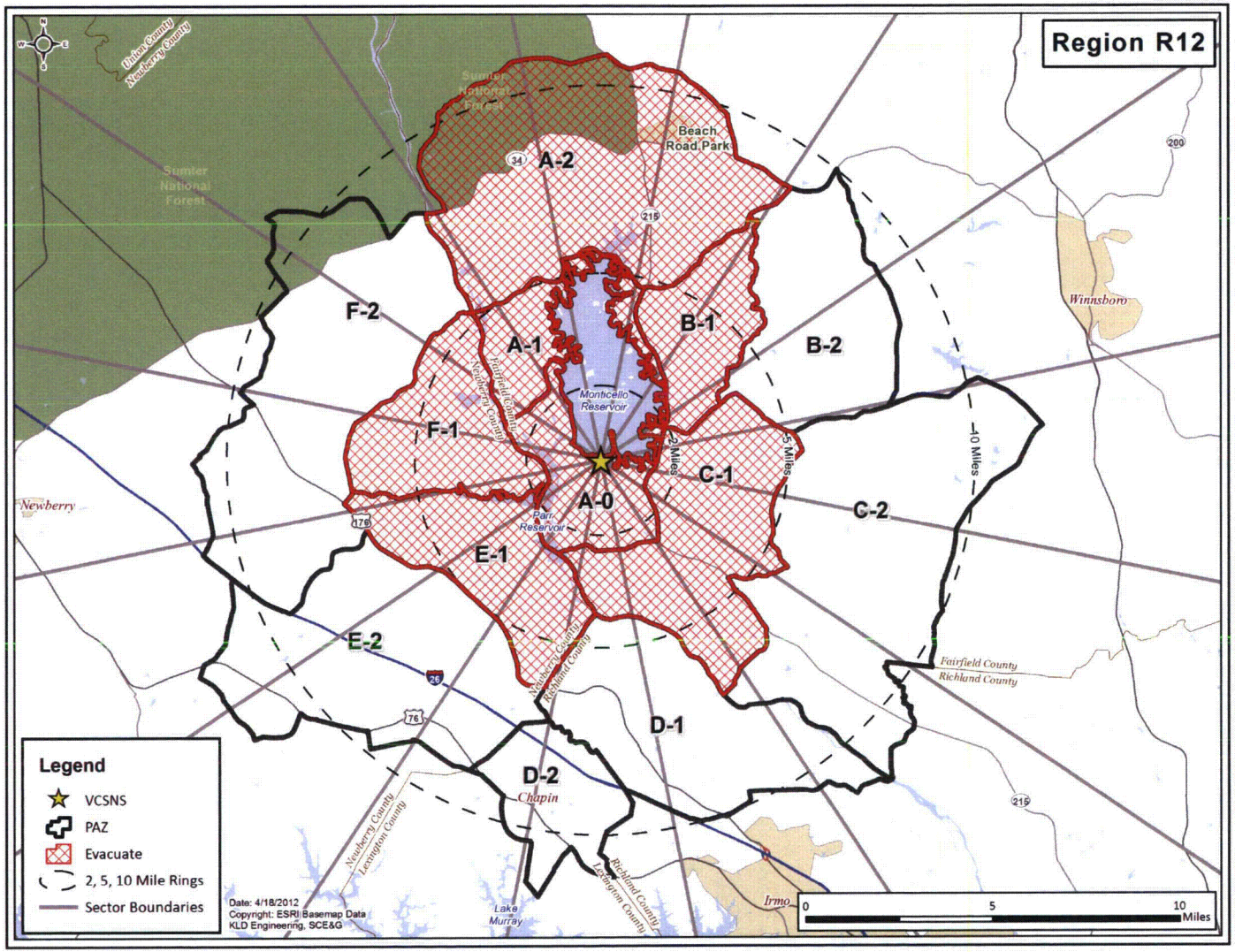

Figure H-12. Region R12

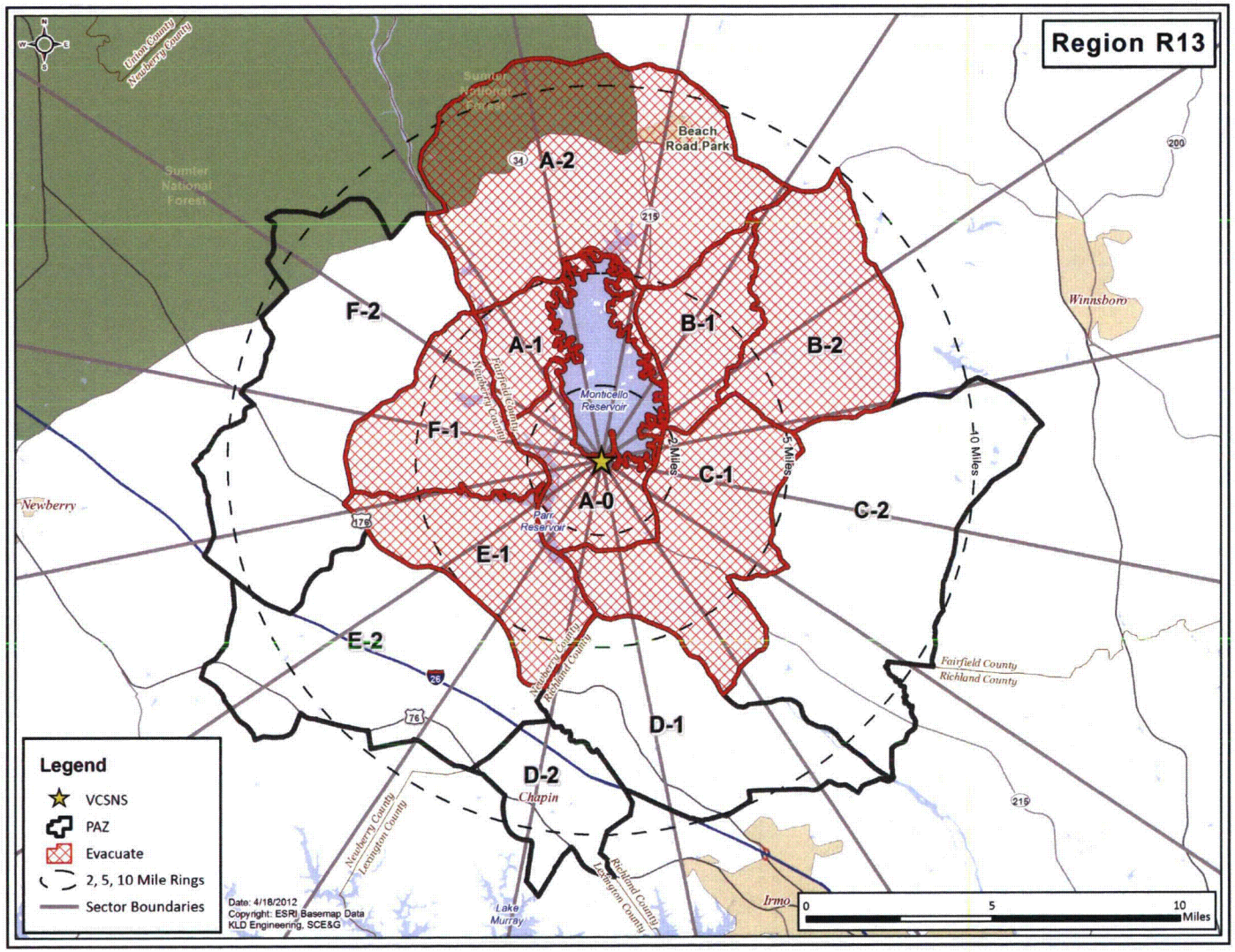

Figure H-13. Region R13

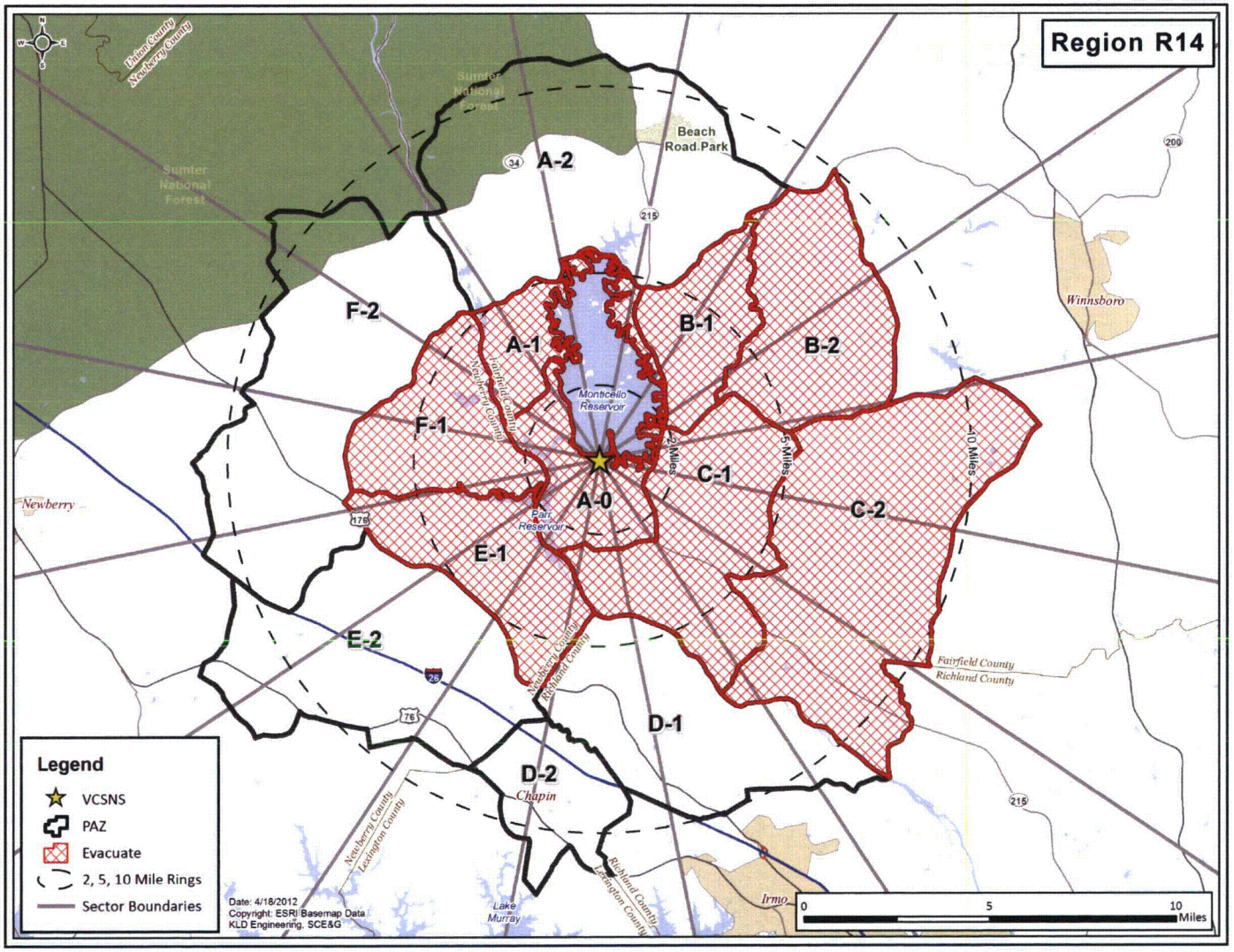

Figure H-14. Region R14

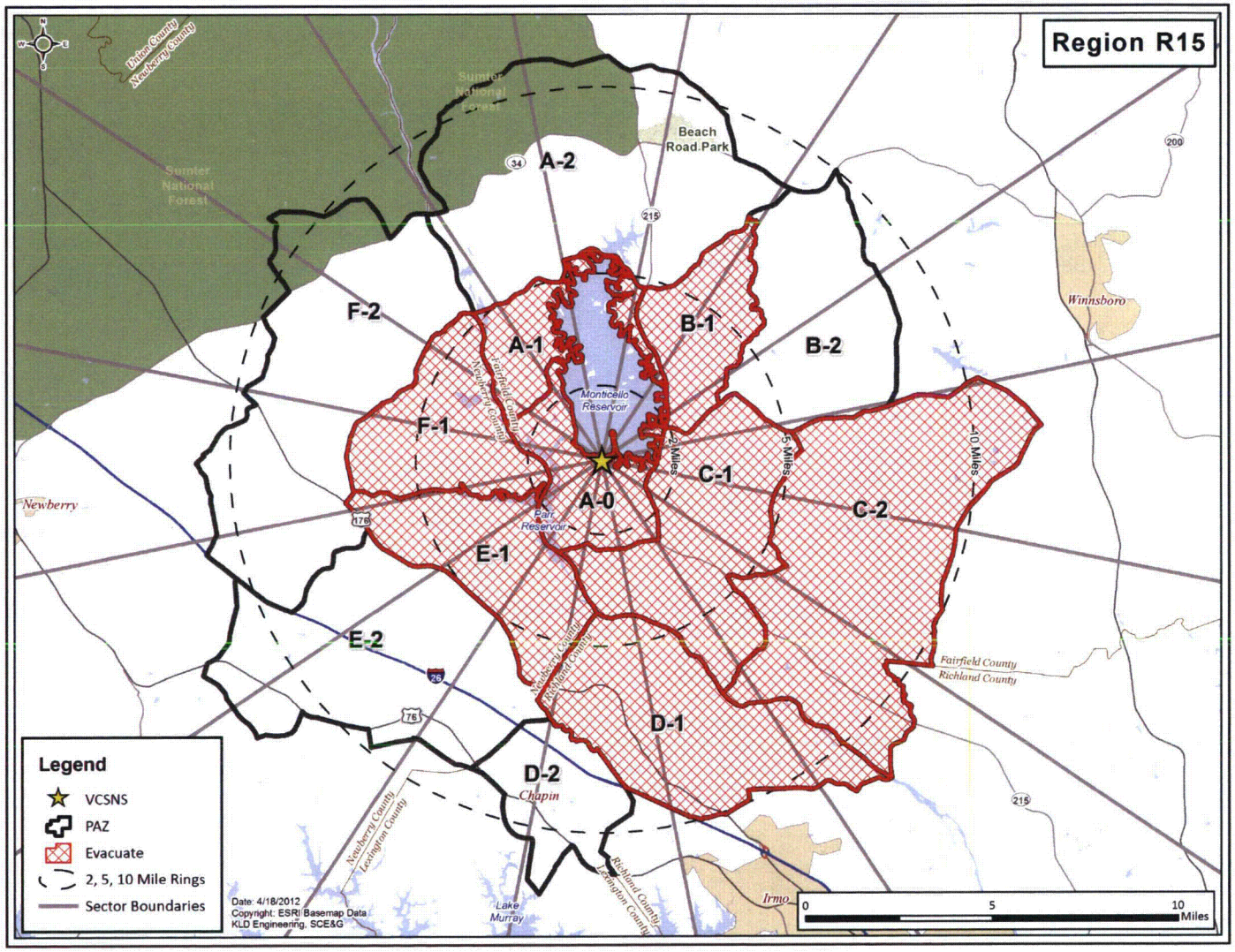

Figure H-15. Region R15

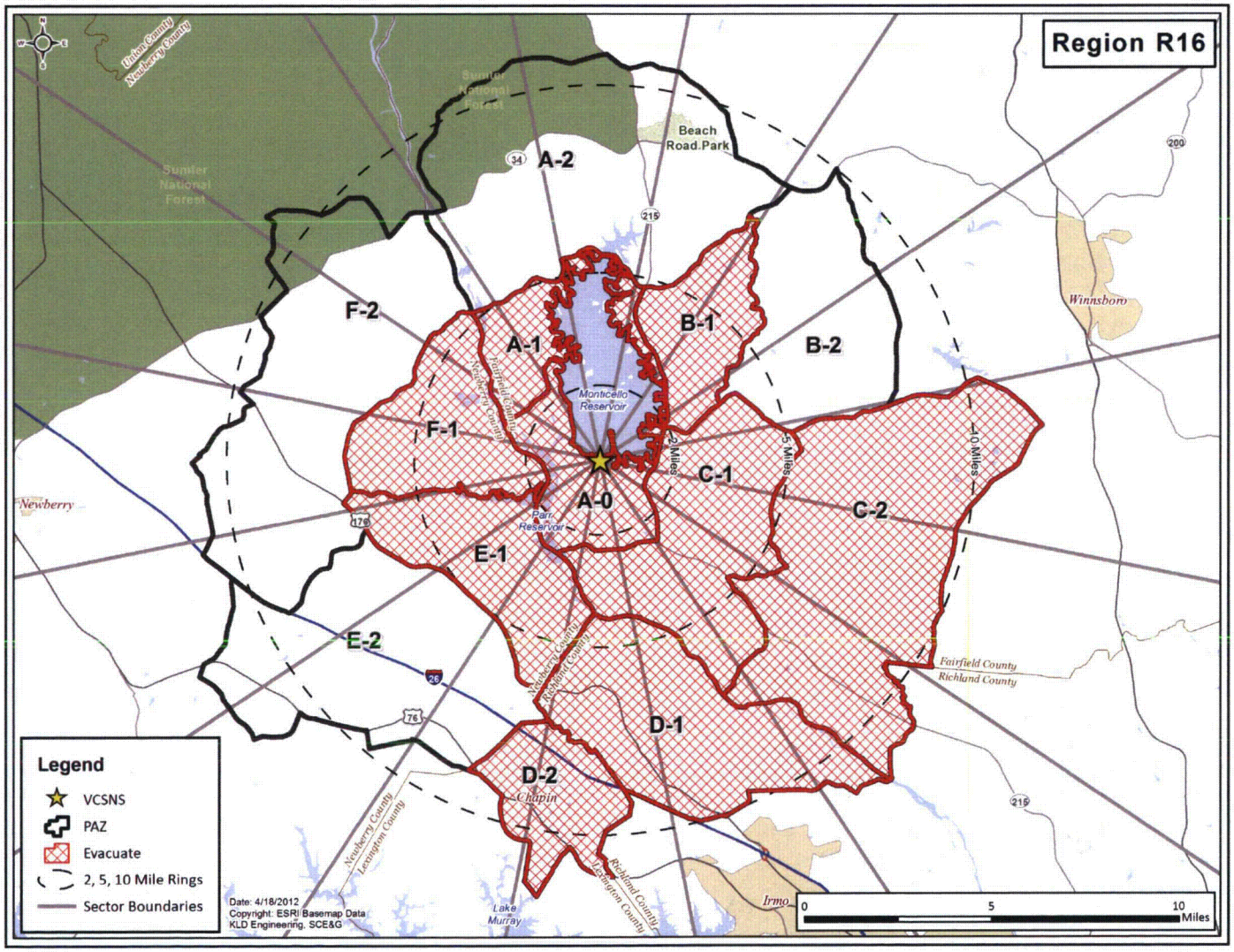

Figure H-16. Region R16

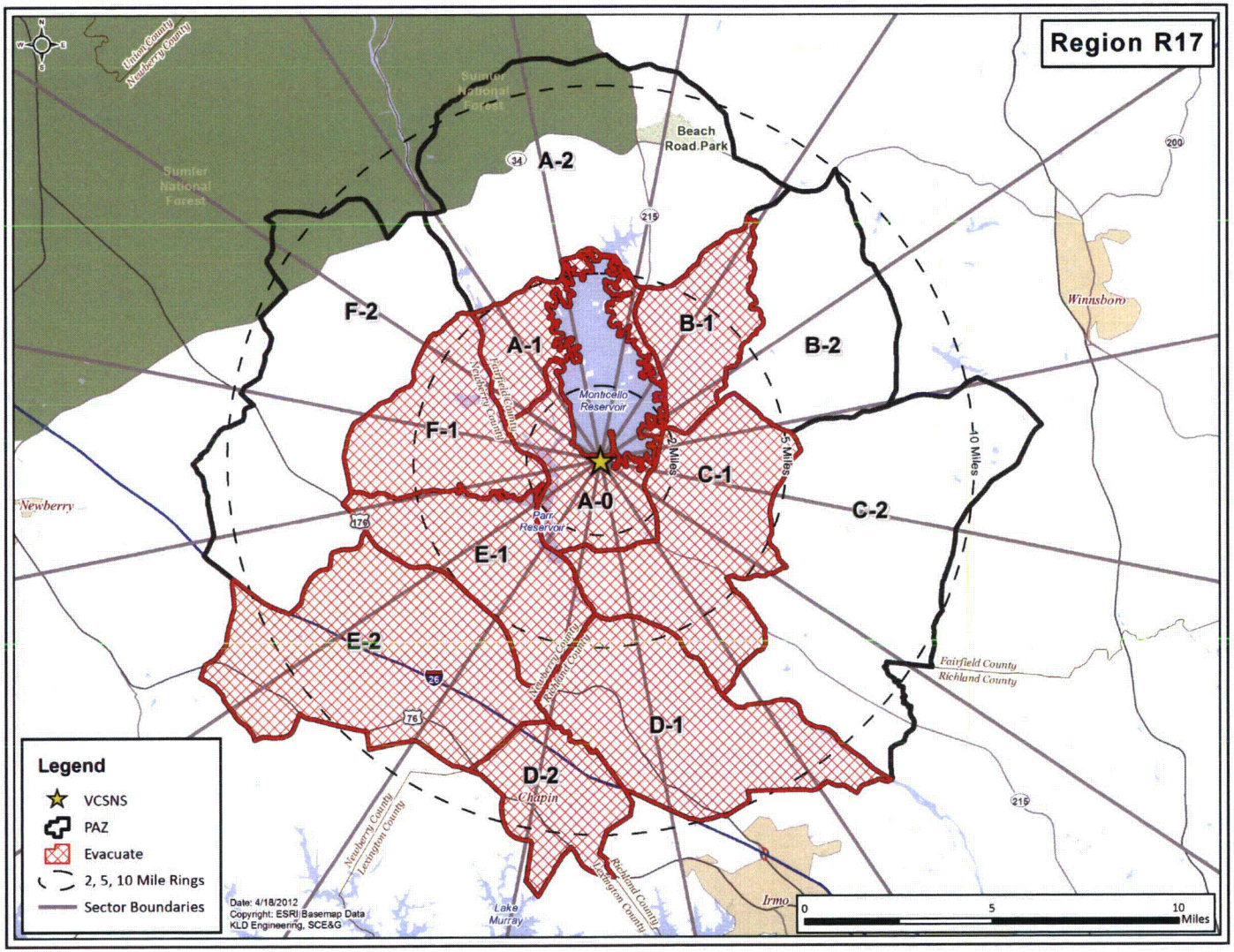

Figure H-17. Region R17

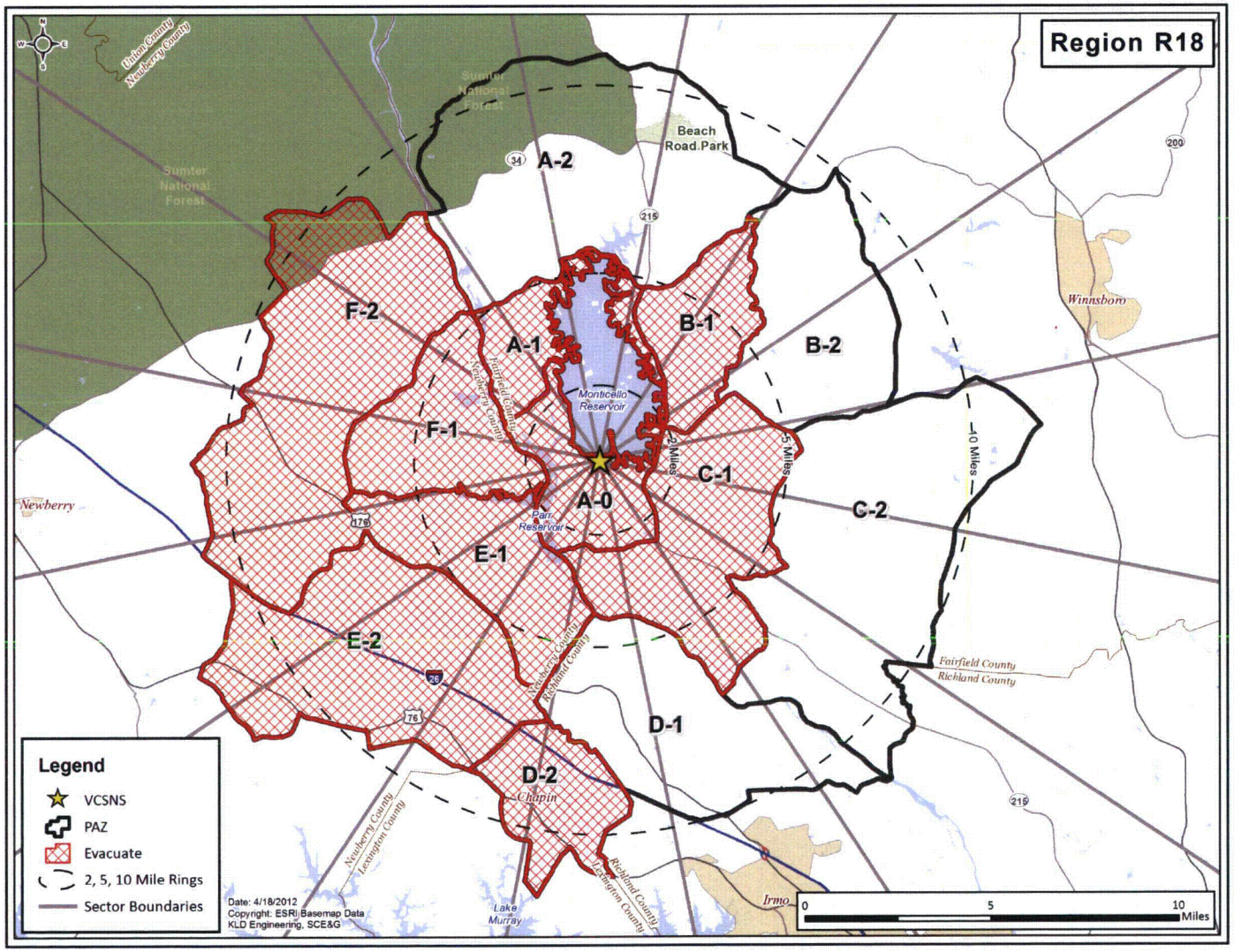

Figure H-18. Region R18

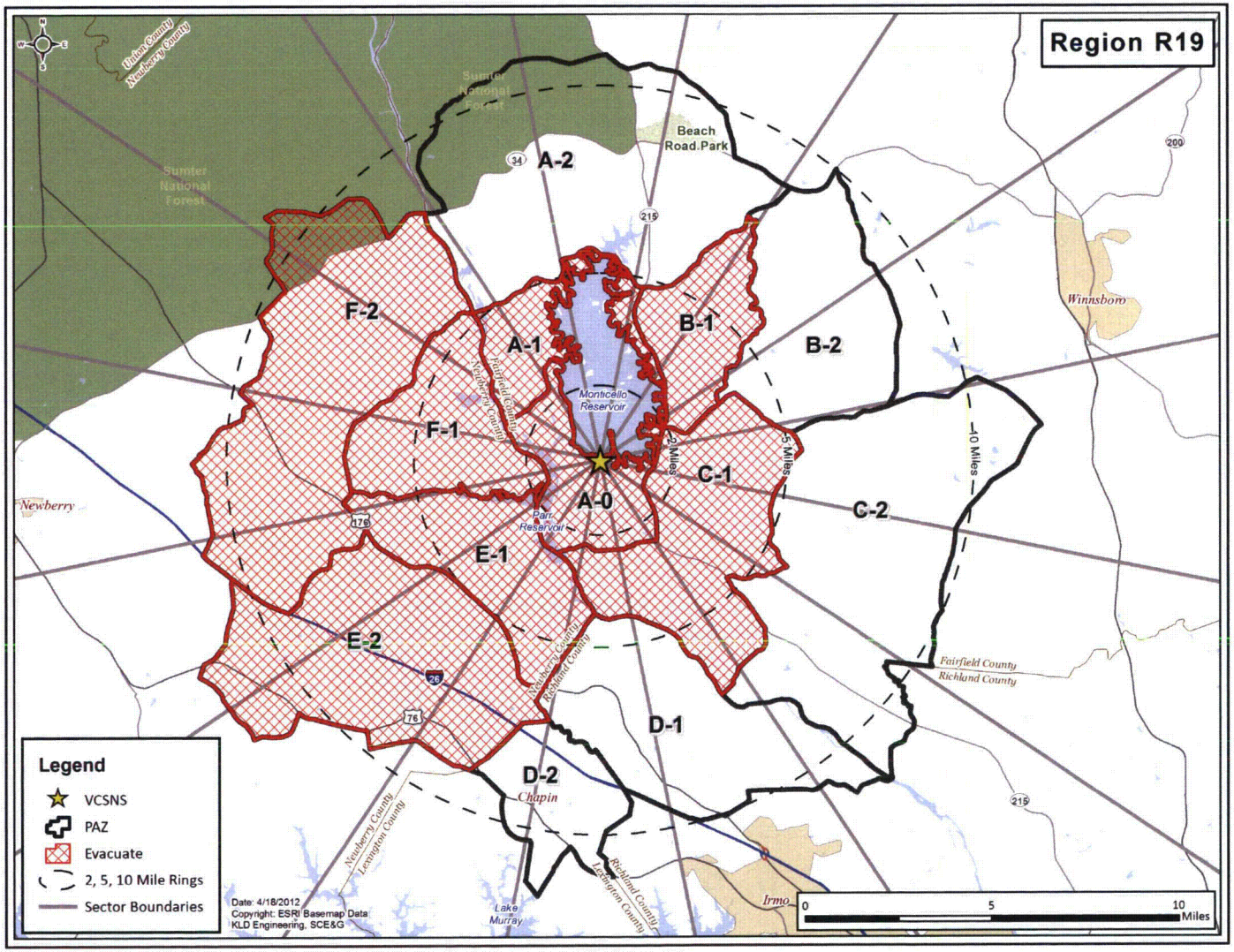

Figure H-19. Region R19

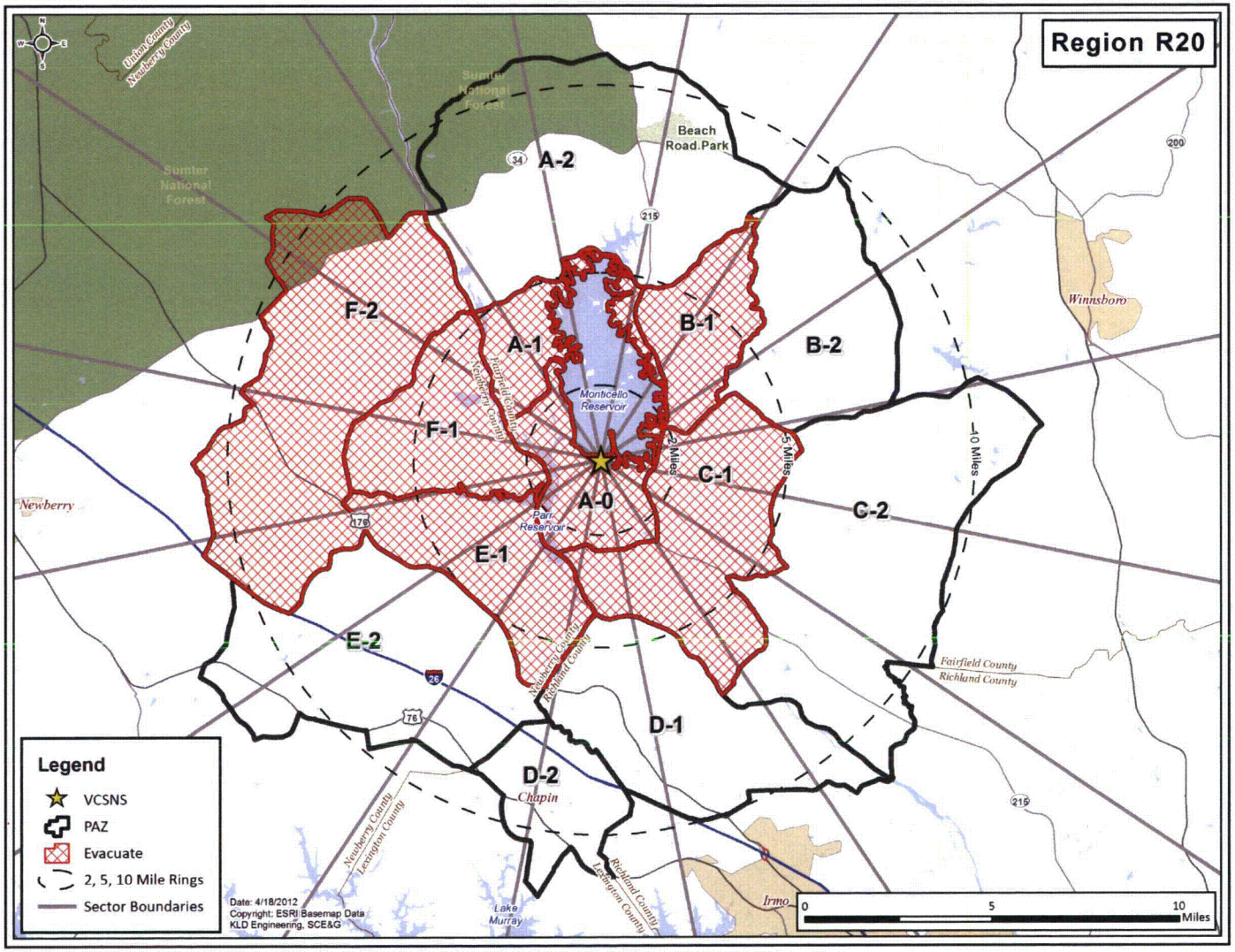

Figure H-20. Region R20

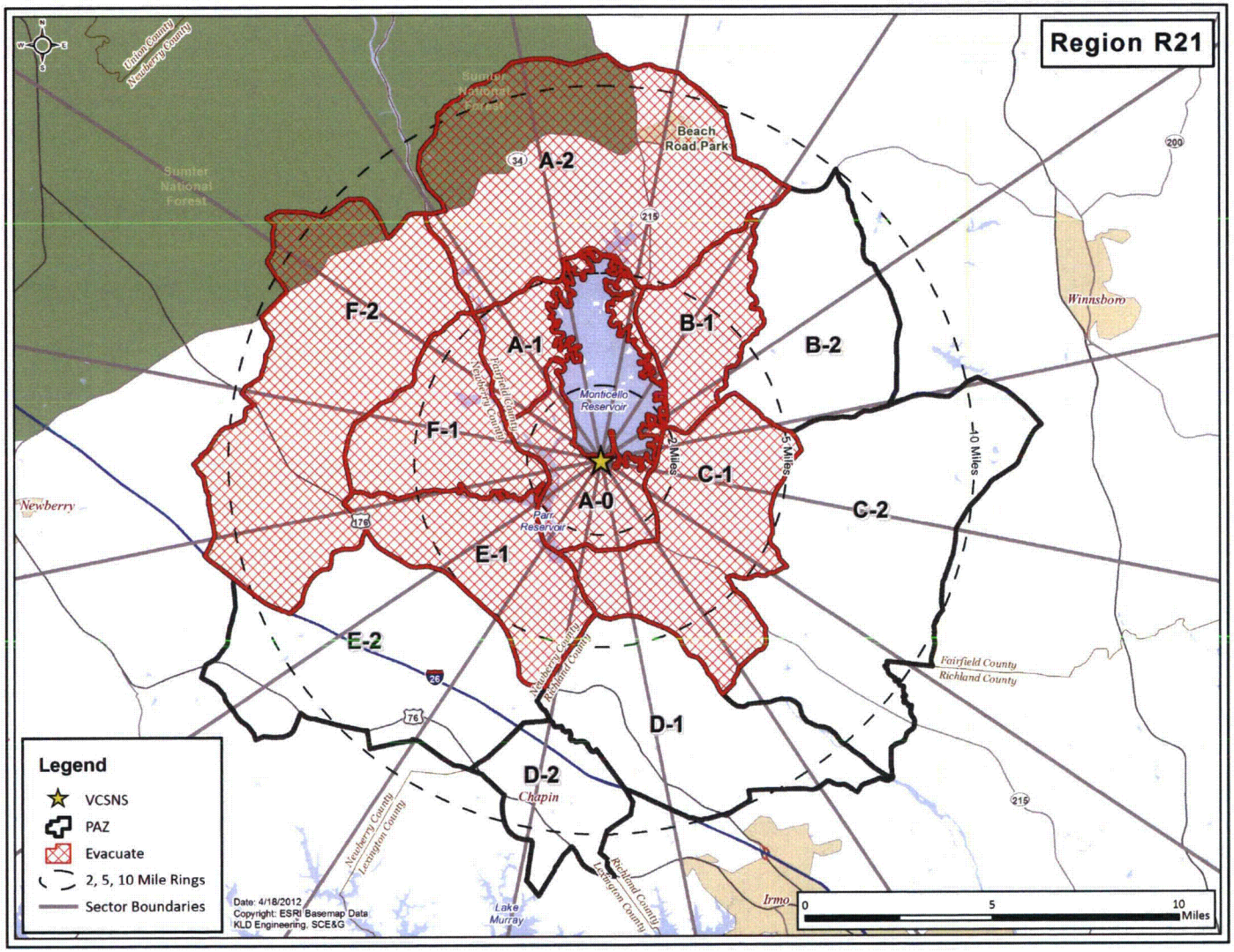

Figure H-21. Region R21

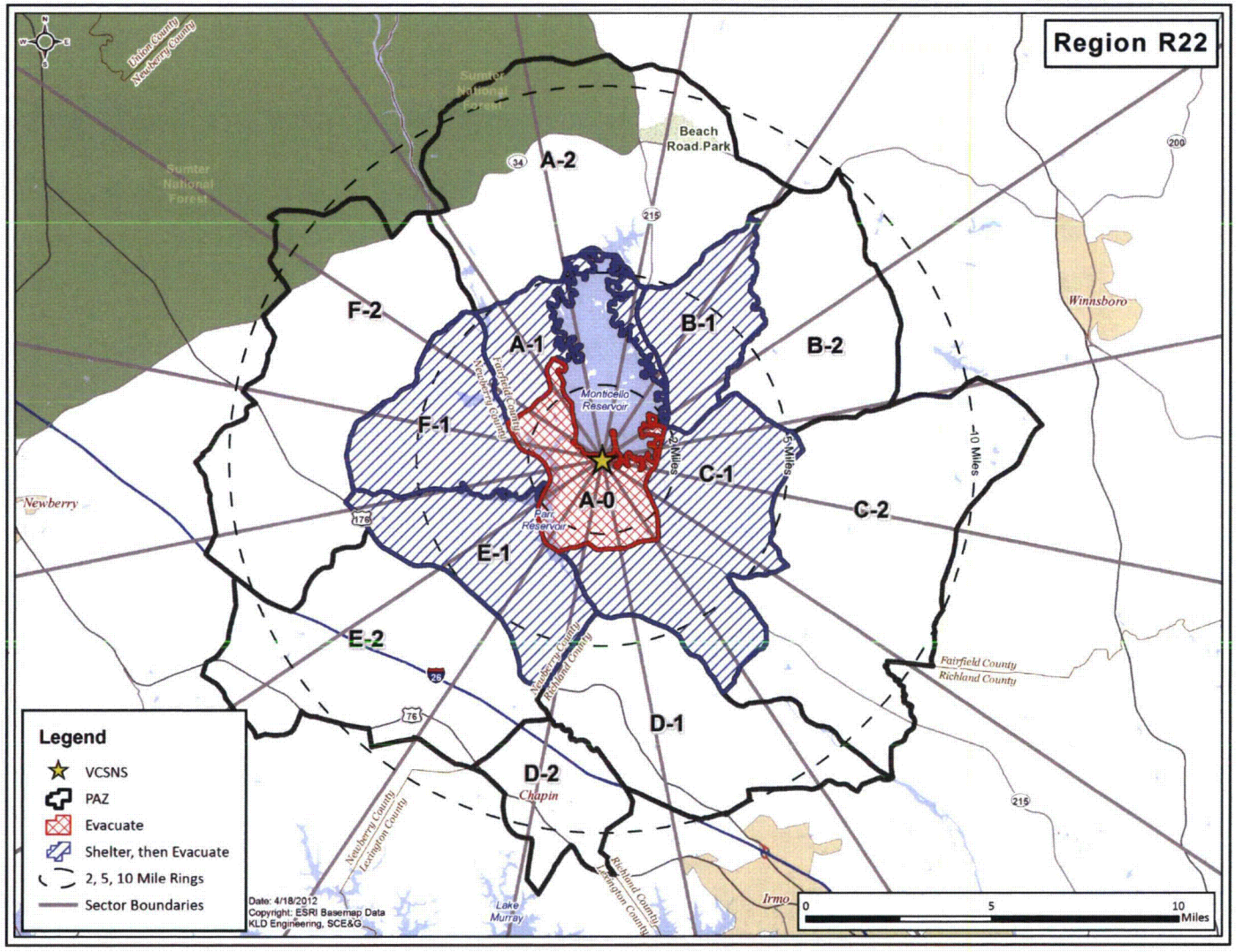

Figure H-22. Region R22

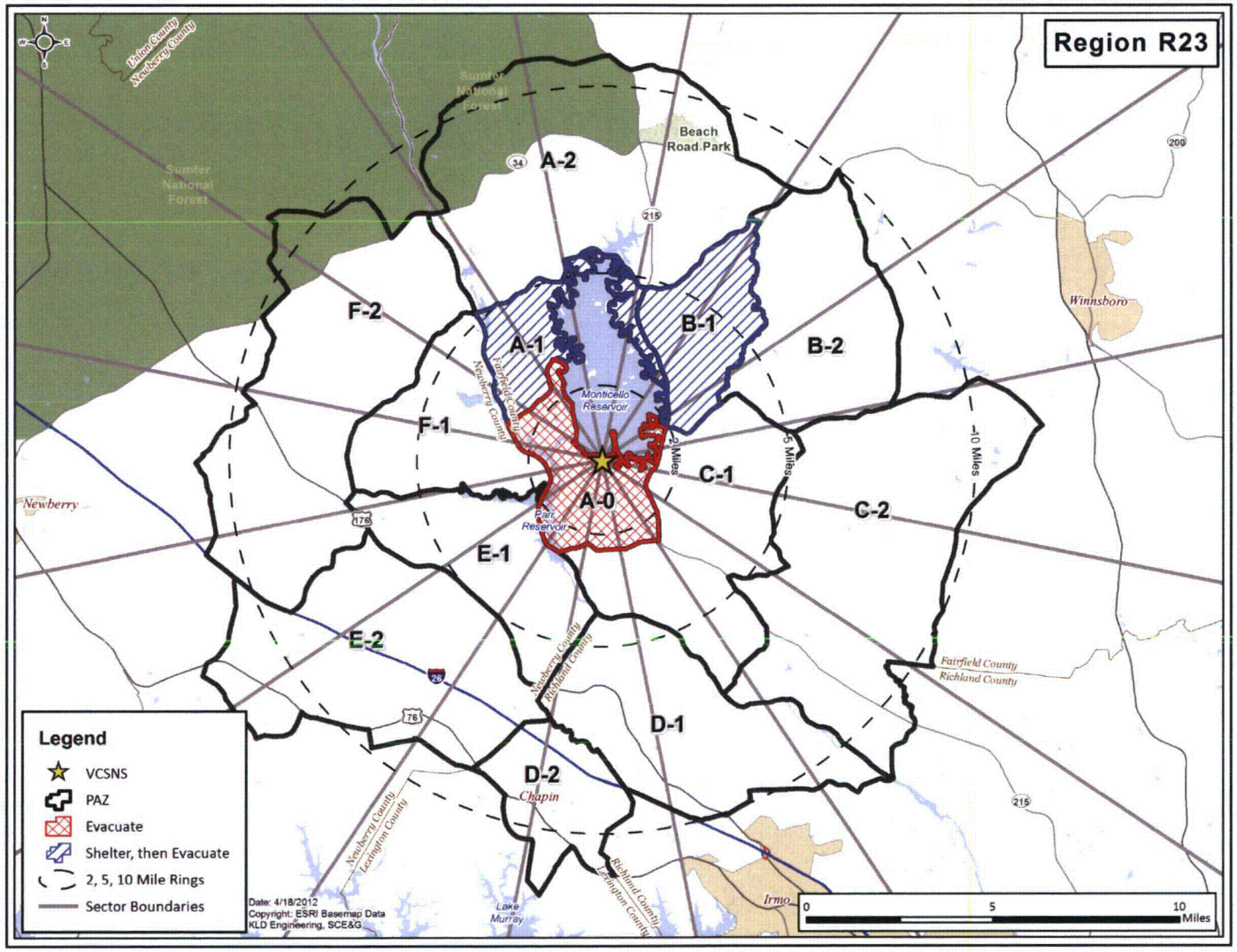

Figure H-23. Region R23

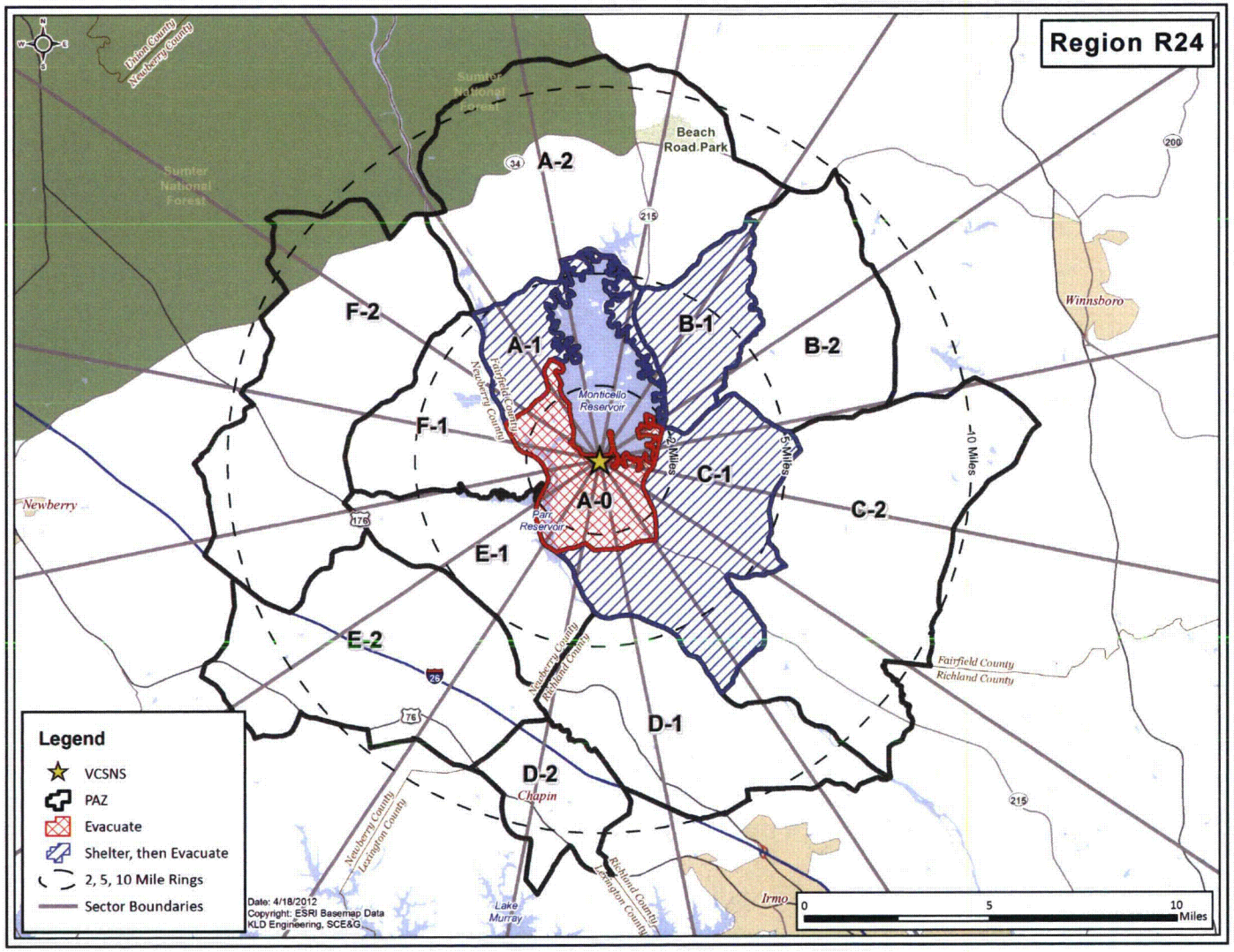

Figure H-24. Region R24

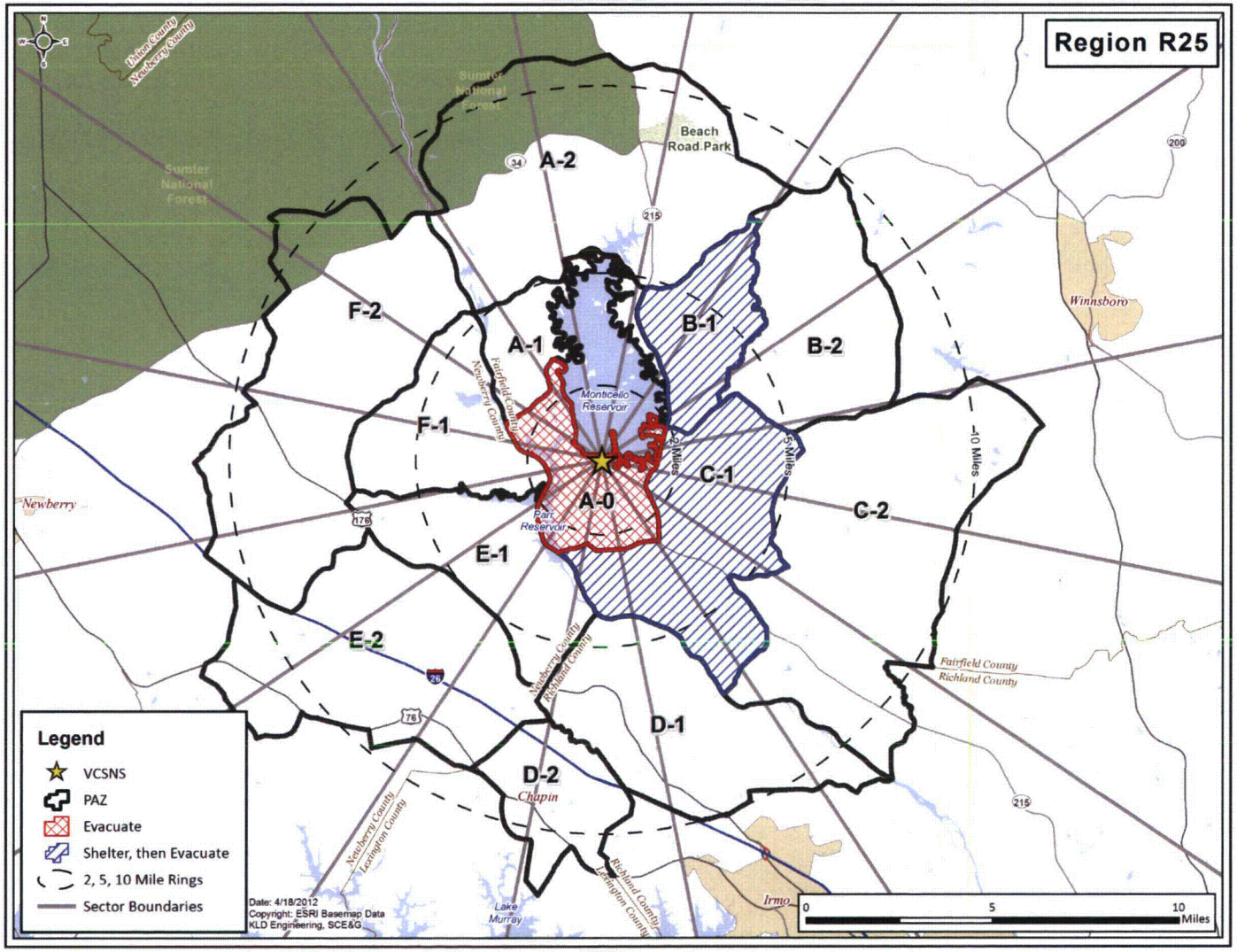

Figure H-25 Region R25

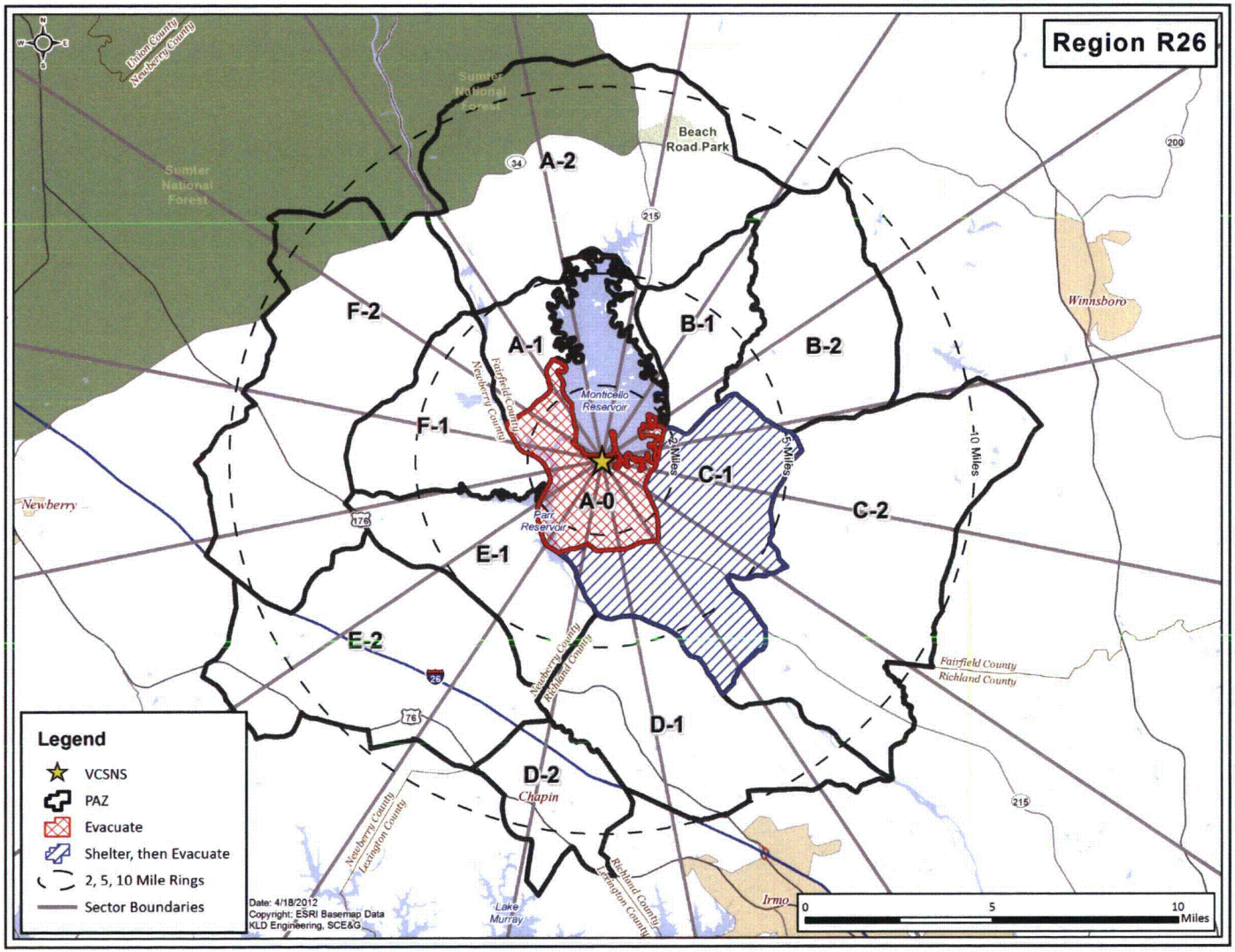

Figure H-26. Region R26

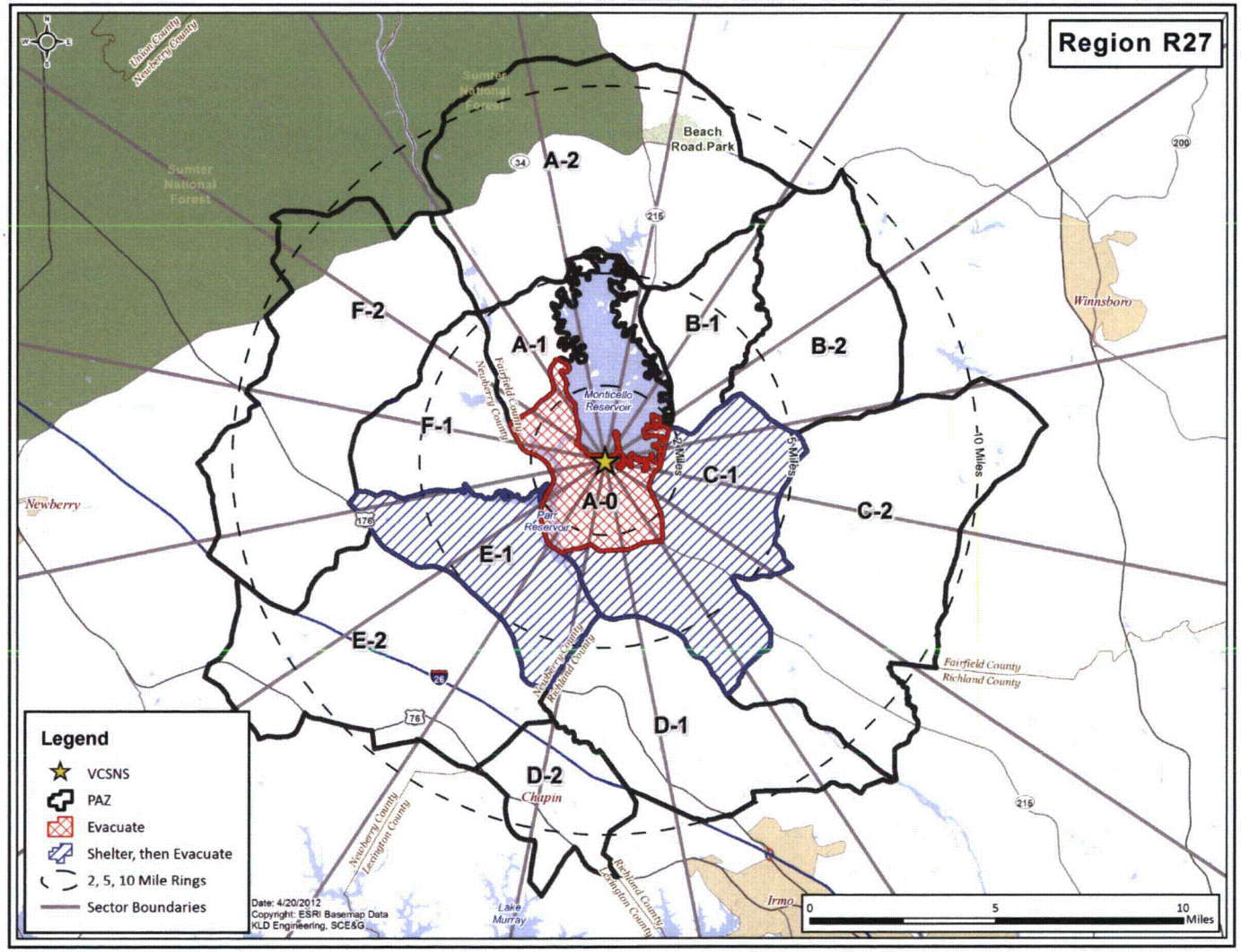

Figure H-27. Region R27

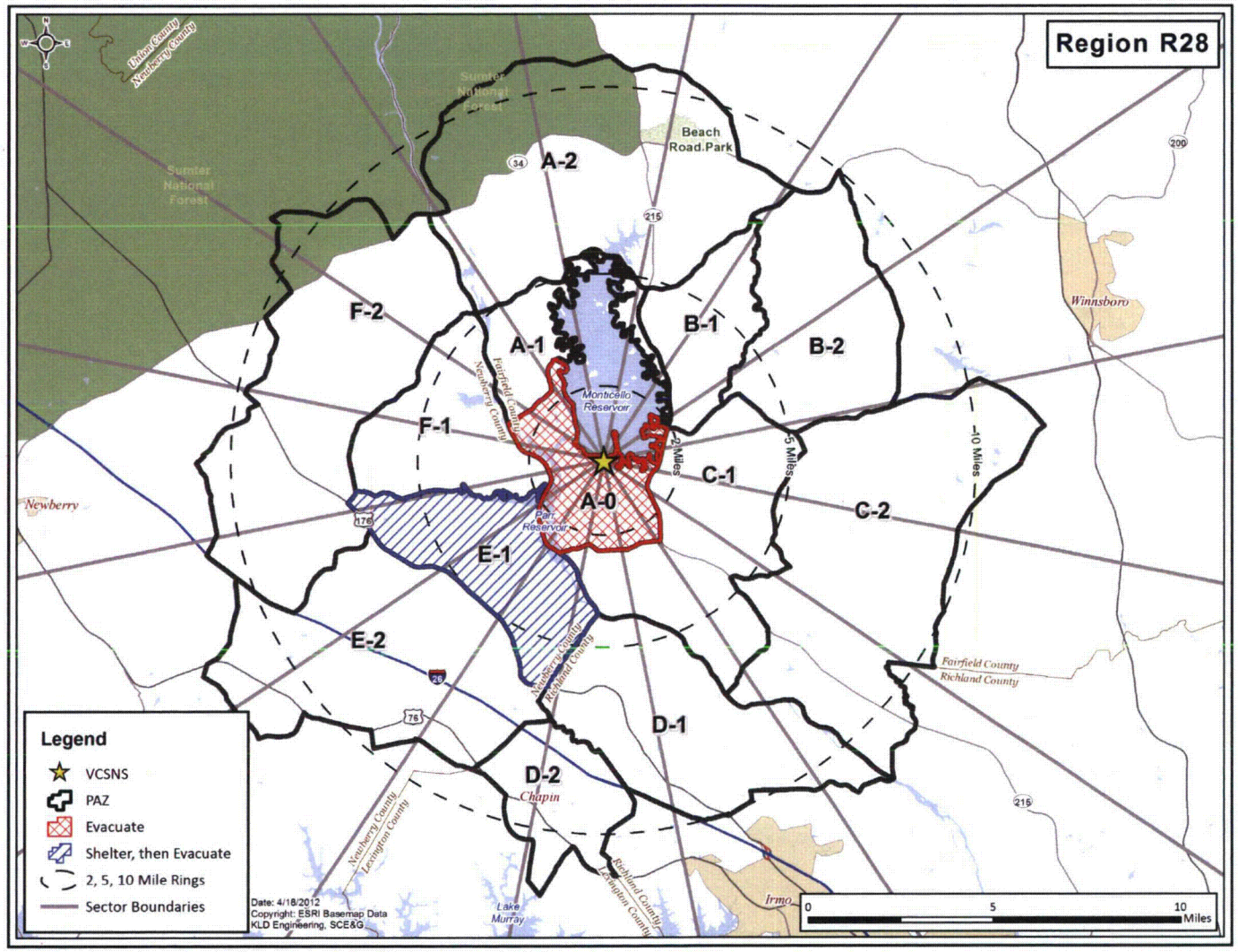

Figure H-28. Region R28

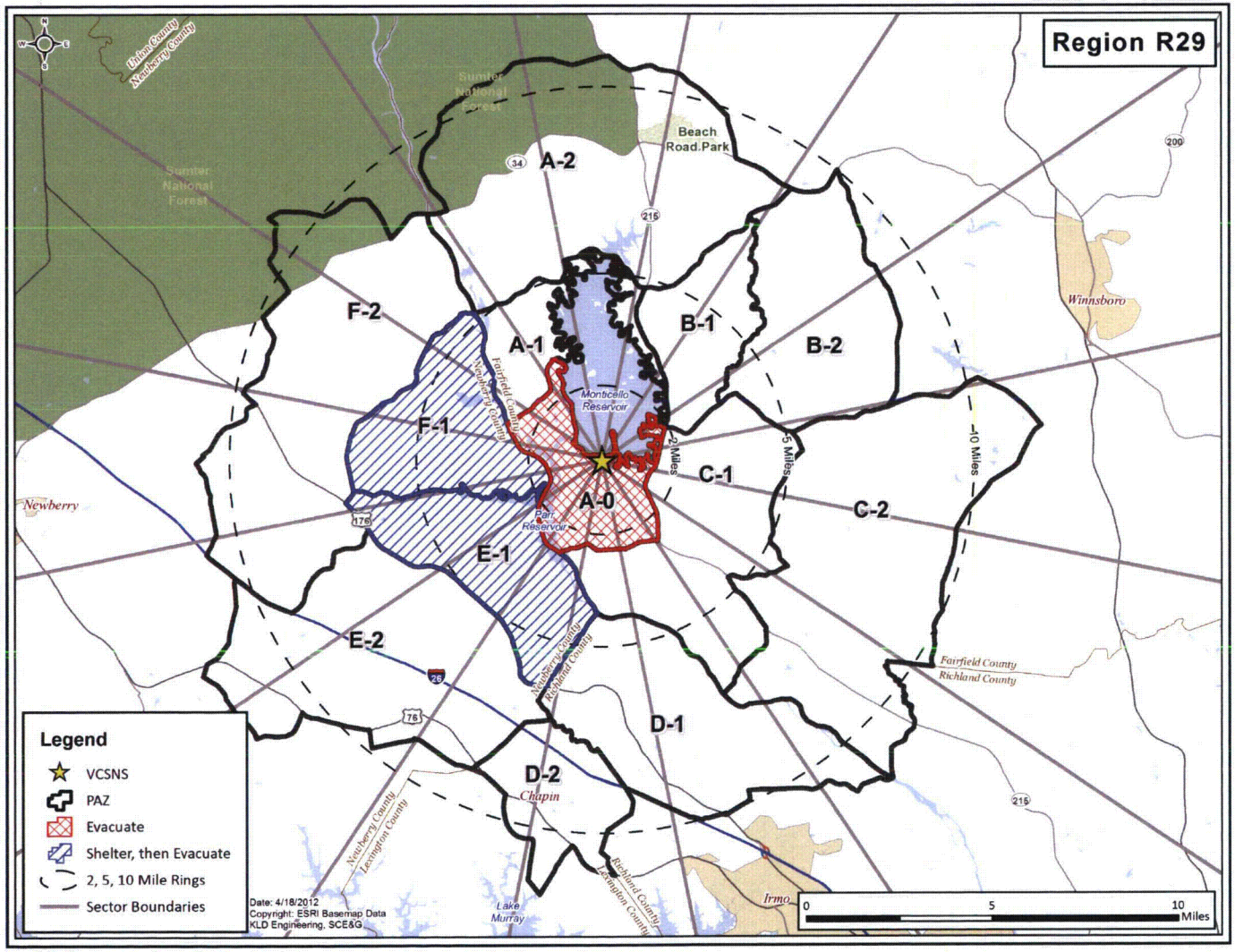

Figure H-29. Region R29

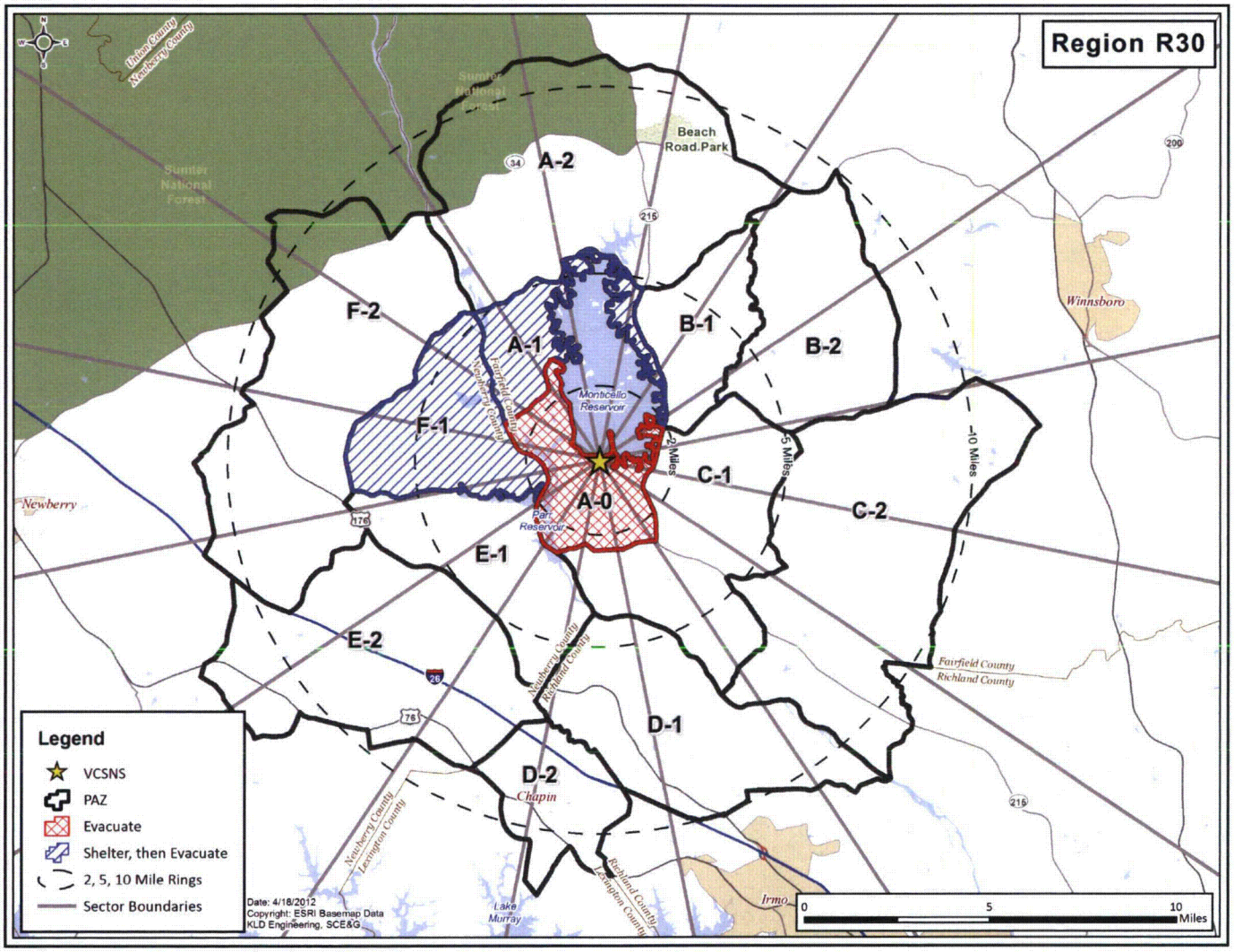

Figure H-30. Region R30

APPENDIX J

Representative Inputs and Outputs from the DYNEV II System

J. REPRESENTATIVE INPUTS TO AND OUTPUTS FROM THE DYNEV II SYSTEM

This appendix presents data input to and output from the DYNEV II System. Table J-1 provides the volume and queues for the ten highest volume signalized intersections in the study area. Refer to Table K-2 and the figures in Appendix K for a map showing the geographic location of each intersection.

Table J-2 provides source (vehicle loading) and destination information for five roadway segments (link) in the analysis network. Refer to Table K-1 and the figures in Appendix K for a map showing the geographic location of each link.

Table J-3 provides network–wide statistics (average travel time, average speed and number of vehicles) for an evacuation of the entire EPZ (Region R03) for each scenario. As expected, Scenarios 8 and 11, which are ice scenarios, exhibit the slowest average speed and longest average travel times.

Table J-4 provides statistics (average speed and travel time) for the major evacuation routes (US 76, US 176, I-26) for an evacuation of the entire EPZ (Region R03) under Scenario 1 conditions. As discussed in Section 7.3 and shown in Figures 7-3 and 7-4, there is no material congestion within the EPZ. Consequently, the speeds shown in this table reflect free-flow speeds.

Table J-5 provides the number of vehicles discharged and the cumulative percent of total vehicles discharged for each link exiting the analysis network, for an evacuation of the entire EPZ (Region R03) under Scenario 1 conditions. Refer to Table K-1 and the figures in Appendix K for a map showing the geographic location of each link.

Figures J-1 through J-14 plot the trip generation time versus the ETE for each of the 14 Scenarios considered. The distance between the trip generation and ETE curves is the travel time. Plots of trip generation versus ETE are indicative of the level of traffic congestion during evacuation. For low population density sites, the curves are close together, indicating short travel times and minimal traffic congestion. For higher population density sites, the curves are farther apart indicating longer travel times and the presence of traffic congestion. As seen in Figures J-1 through J-14, the curves are closely aligned since there is no traffic congestion in the EPZ, which was discussed in detail in Section 7.3.

Table J-1. Characteristics of the Ten Highest Volume Signalized Intersections

Node	Location	Intersection Control	Approach (Up Node)	Total Volume (Veh)	Max. Turn Queue (Veh)
393	US 76/US 176 and SH 27/Woodrow St	Actuated	392	3,422	0
			394	407	0
			TOTAL	**3,829**	-
630	US 76/US 176 and Koon Rd	Actuated	631	720	1
			936	2,617	0
			392	416	0
			TOTAL	**3,753**	-
218	US 76 and US 176	Actuated	852	1,039	0
			612	1,772	0
			936	647	0
			TOTAL	**3,458**	-
221	US 76 and SH 6	Actuated	222	2,959	11
			220	401	0
			TOTAL	**3,360**	-
222	US 76 and Marina Rd	Actuated	221	91	0
			709	176	0
			821	2,782	0
			TOTAL	**3,049**	-
809	US 76 and SH 219	Actuated	808	1,120	2
			843	718	0
			810	905	0
			TOTAL	**2,743**	-
225	US -76 and Lowman Home Barn Rd	Actuated	226	2,395	0
			224	119	0
			710	159	0
			TOTAL	**2,673**	-

Table J-1. Characteristics of the Ten Highest Volume Signalized Intersections, Cont'd

Node	Location	Intersection Control	Approach (Up Node)	Total Volume (Veh)	Max. Turn Queue (Veh)
226	US-76 and Three Dog Rd	Actuated	227	2,286	0
			225	124	0
			819	47	0
			818	58	0
			TOTAL	**2,515**	-
686	US-76 and Wessinger Rd	Actuated	687	636	0
			228	1,550	0
			227	134	0
			815	13	0
			TOTAL	**2,333**	-
810	US 76 and SH 34	Actuated	809	1,005	0
			921	895	0
			813	393	0
			TOTAL	**2,293**	-

Table J-2. Sample Simulation Model Input

Link	Vehicles Entering Network on this Link	Directional Preference	Candidate Destination Nodes	Destination Capacity
2	4	E, SE	8032	1698
			8664	1698
			8061	1698
86	14	E	8664	1698
322	36	S	8391	1698
			8395	1698
			8824	6750
498	13	W	8813	2161
			8814	3810
			8720	1698
682	24	E	8141	1698
			8470	1698
			8032	1698
781	13	W	8401	1698
			8363	4500
			8813	2161
899	54	E	8664	1698
			8061	1698
			8141	1698
1019	9	SW	8720	1698
			8391	1698
			8395	1698
1175	33	SW	8813	2161
			8814	3810
			8720	1698

Table J-3. Selected Model Outputs for the Evacuation of the Entire EPZ (Region R03)

Scenario	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Network-Wide Average Travel Time (Min/Veh-Mi)	1.02	1.15	1.02	1.15	1.06	1.03	1.16	1.33	1.02	1.15	1.33	1.06	1.20	1.14
Network-Wide Average Speed (mph)	58.76	52.09	58.98	52.01	56.56	58.27	51.78	45.15	59.00	52.02	45.27	56.57	49.95	52.81
Total Vehicles Exiting Network	28,080	28,208	27,740	27,877	18,584	28,346	28,470	28,621	27,691	27,827	27,978	18,582	33,487	28,104

Table J-4. Average Evacuation Route Travel Time (min) for Region R03, Scenario 1

Elapsed Time (hours)									
		1		2		3		4	
Route#	Length (miles)	Speed	Travel Time	Speed	Travel Time	Speed	Travel Time	Speed	Travel Time
Interstate 26 WB	14.68	71.7	12.3	71.8	12.3	74.2	11.9	74.3	11.9
Interstate 26 EB	14.68	72.3	12.2	72.2	12.2	74.1	11.9	74.8	11.8
US 76 WB	12.86	51.3	15.0	51.2	15.1	50.7	15.2	51.7	14.9
US 76 EB	12.87	50.4	15.3	50.6	15.3	50.1	15.4	51.6	15.0
US 176 WB	18.69	55.4	20.2	55.4	20.2	56.1	20	56.2	19.9
US 176 EB	18.69	54.9	20.4	55.3	20.3	55.7	20.1	55.7	20.1

Table J-5. Simulation Model Outputs at Network Exit Links for Region R03, Scenario 1

EPZ Exit Link	Elapsed Time (hours)			
	1	2	3	4
	Vehicles Discharged During the Indicated Time Interval			
	Cumulative Percent of Vehicles Discharged During the Indicated Time Interval			
37	440	993	1119	1144
	5.52	4.76	4.15	4.10
71	195	574	663	670
	2.44	2.75	2.46	2.40
92	243	642	868	914
	3.05	3.07	3.22	3.28
150	134	403	523	549
	1.68	1.93	1.94	1.97
180	130	631	818	845
	1.63	3.02	3.04	3.03
541	2124	4670	5726	5774
	26.66	22.36	21.25	20.71
592	454	1804	2442	2577
	5.69	8.64	9.06	9.24
597	469	1581	2164	2248
	5.88	7.57	8.03	8.06
609	122	351	455	480
	1.53	1.68	1.69	1.72
636	3	17	25	27
	0.04	0.08	0.09	0.10
638	32	110	145	152
	0.40	0.52	0.54	0.54
707	233	639	896	970
	2.92	3.06	3.33	3.48
995	128	627	956	1042
	1.61	3.00	3.55	3.74

Table J-6. Simulation Model Outputs at Network Exit Links for Region R03, Scenario 1

Continued from previous page

EPZ Exit Link	Elapsed Time (hours)			
	1	2	3	4
	Vehicles Discharged During the Indicated Time Interval			
	Cumulative Percent of Vehicles Discharged During the Indicated Time Interval			
1111	257	670	856	897
	3.23	3.21	3.18	3.22
1113	423	1025	1303	1339
	5.30	4.91	4.84	4.80
1125	2251	5405	6940	7099
	28.25	25.88	25.76	25.46
1131	332	745	1046	1155
	4.17	3.57	3.88	4.14

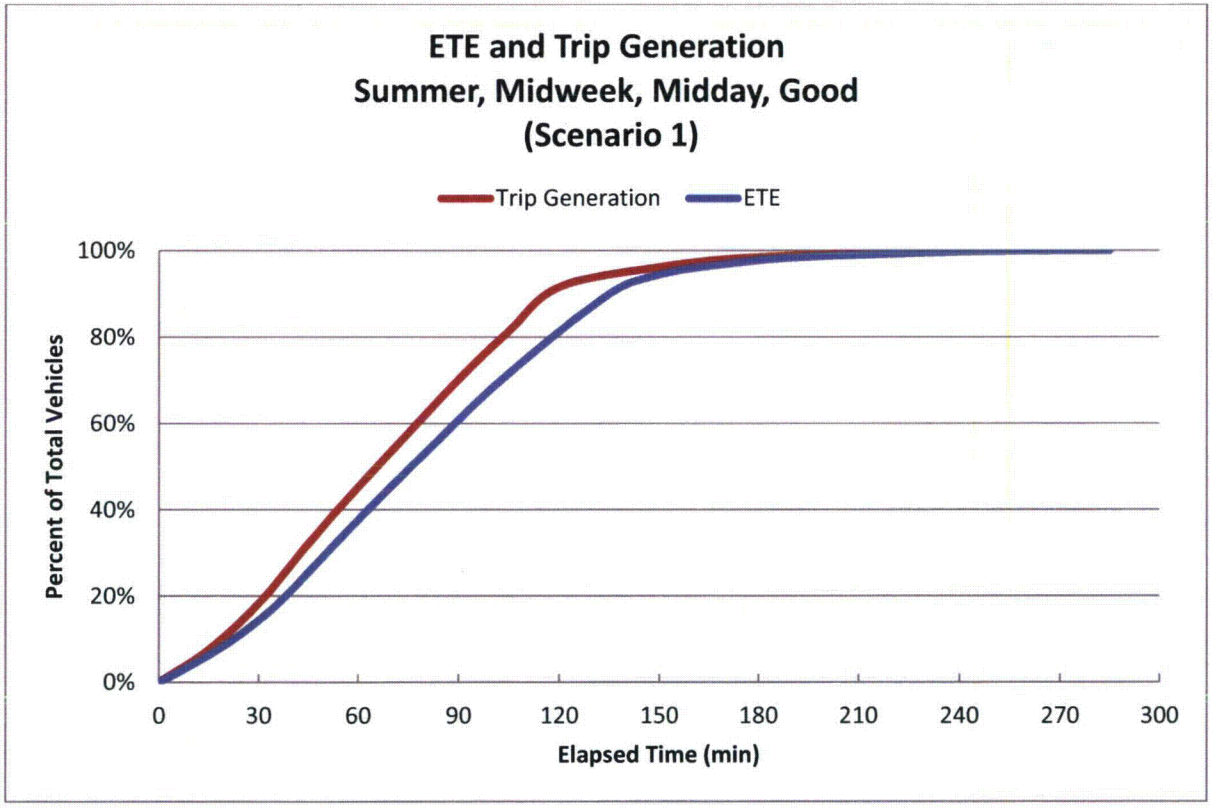

Figure J-1. ETE and Trip Generation Summer, Midweek, Midday, Good Weather (Scenario 1)

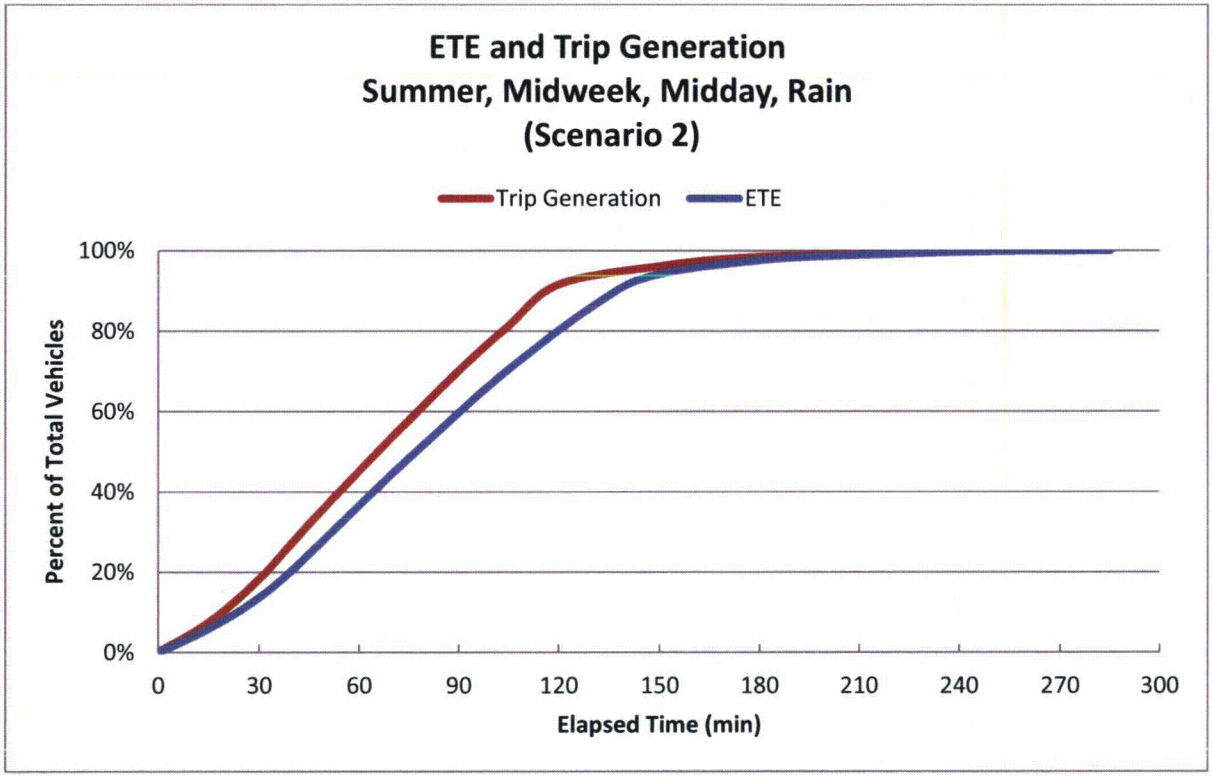

Figure J-2. ETE and Trip Generation Summer, Midweek, Midday, Rain (Scenario 2)

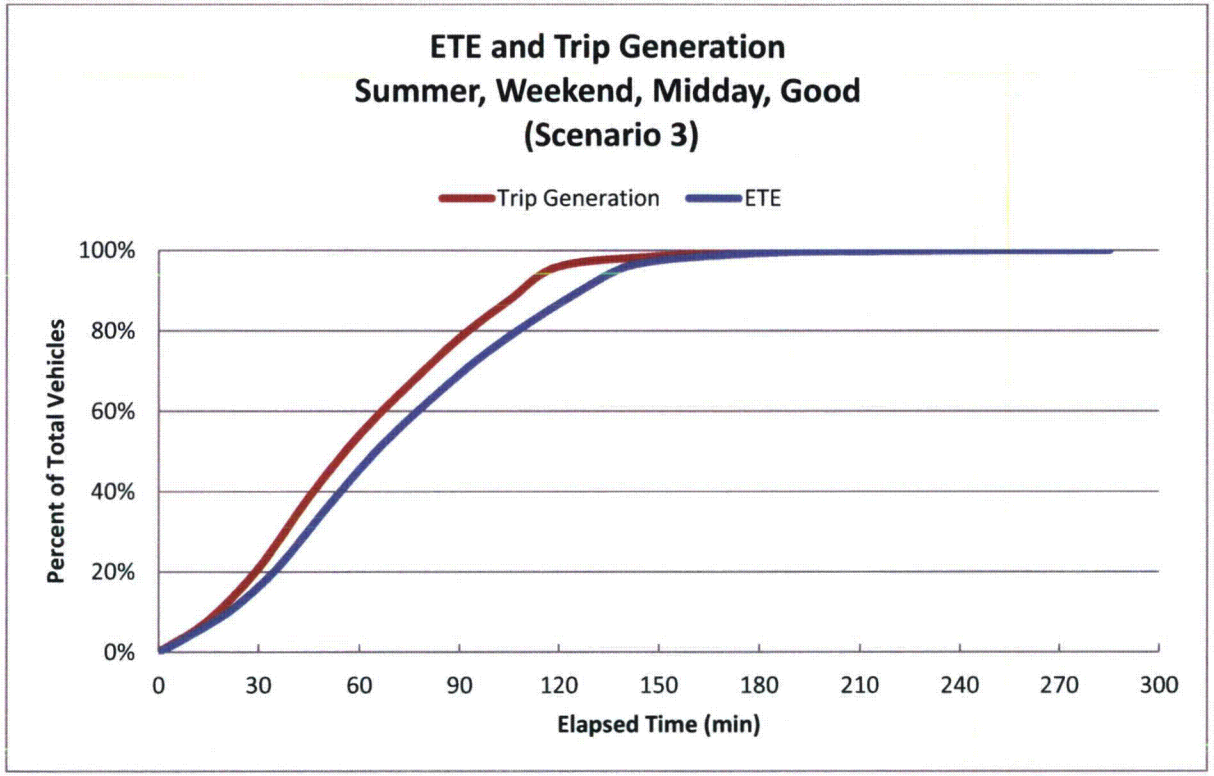

Figure J-3. ETE and Trip Generation Summer, Weekend, Midday, Good Weather (Scenario 3)

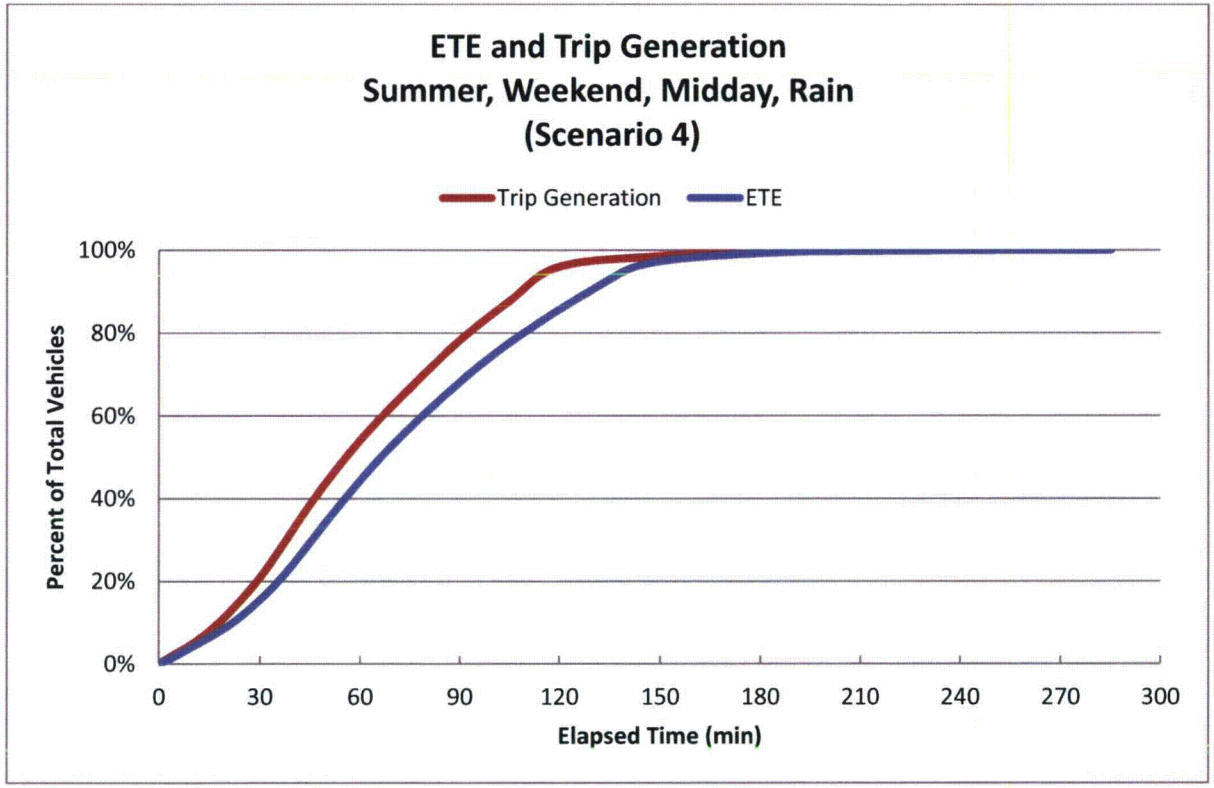

Figure J-4. ETE and Trip Generation Summer, Weekend, Midday, Rain (Scenario 4)

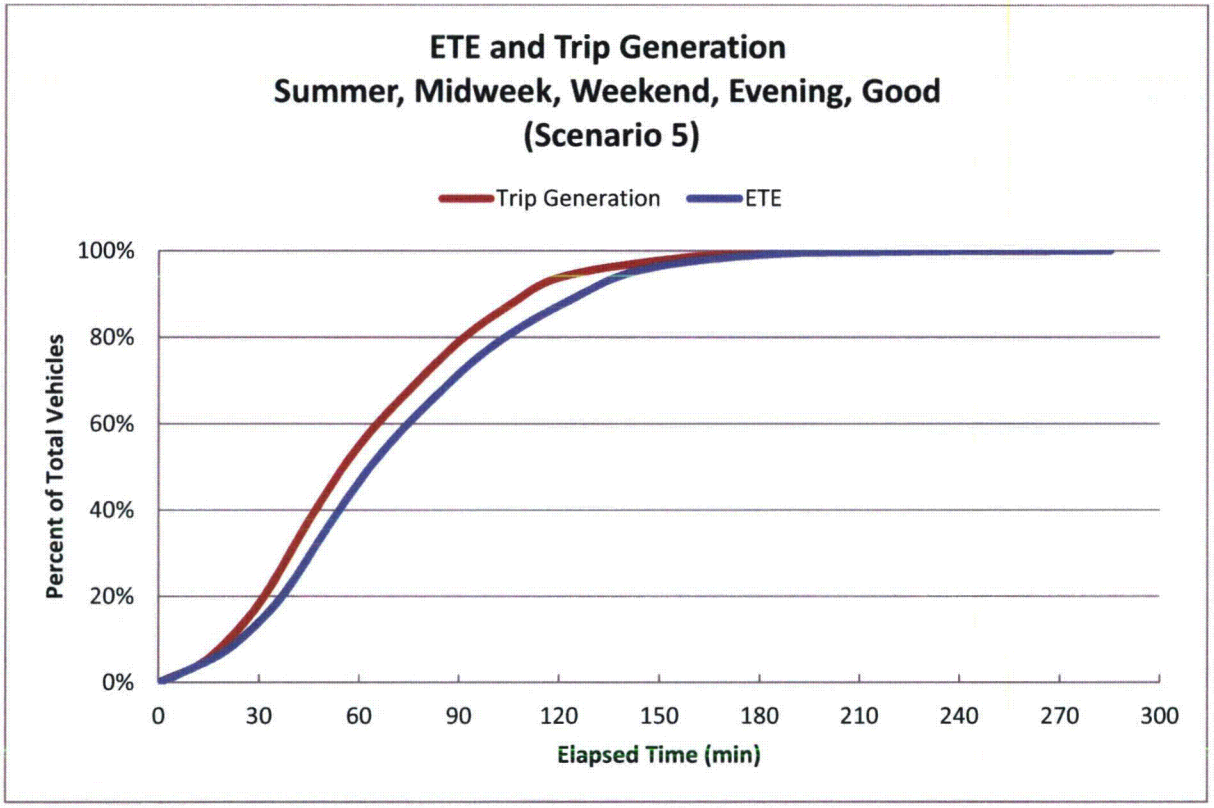

Figure J-5. ETE and Trip Generation Summer, Midweek, Weekend, Evening, Good Weather (Scenario 5)

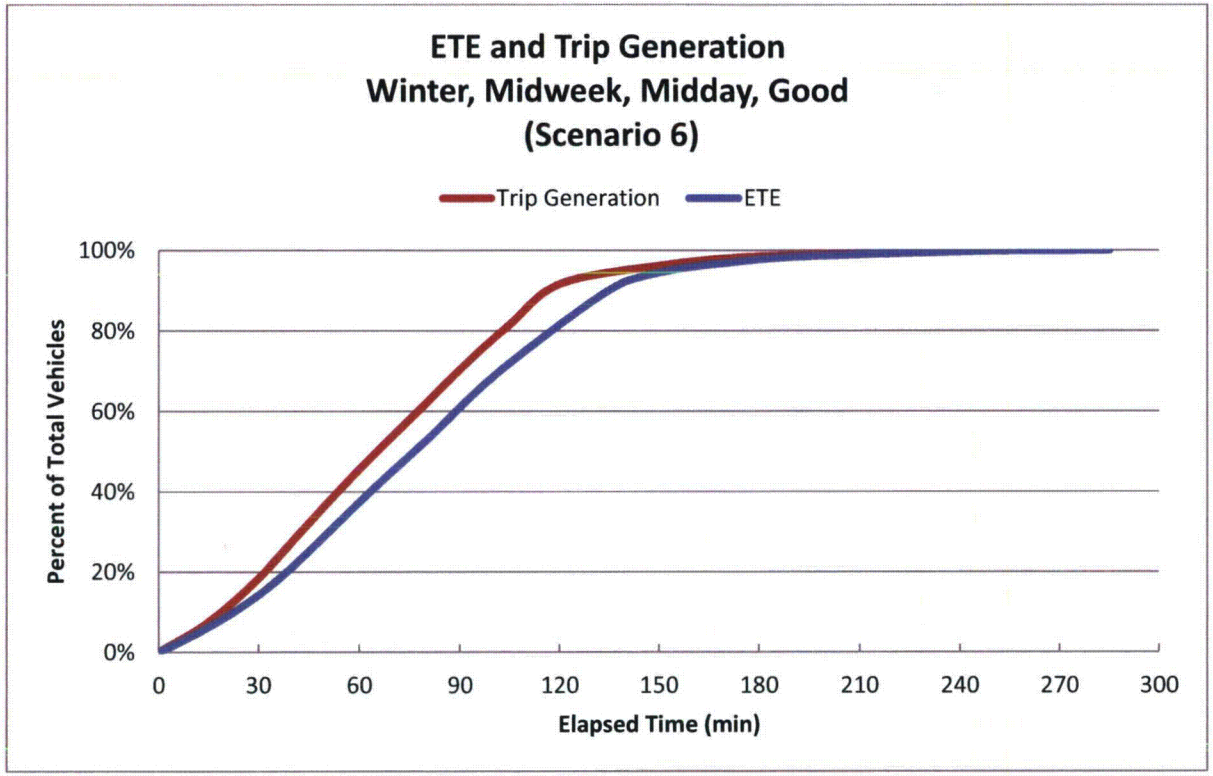

Figure J-6. ETE and Trip Generation Winter, Midweek, Midday, Good Weather (Scenario 6)

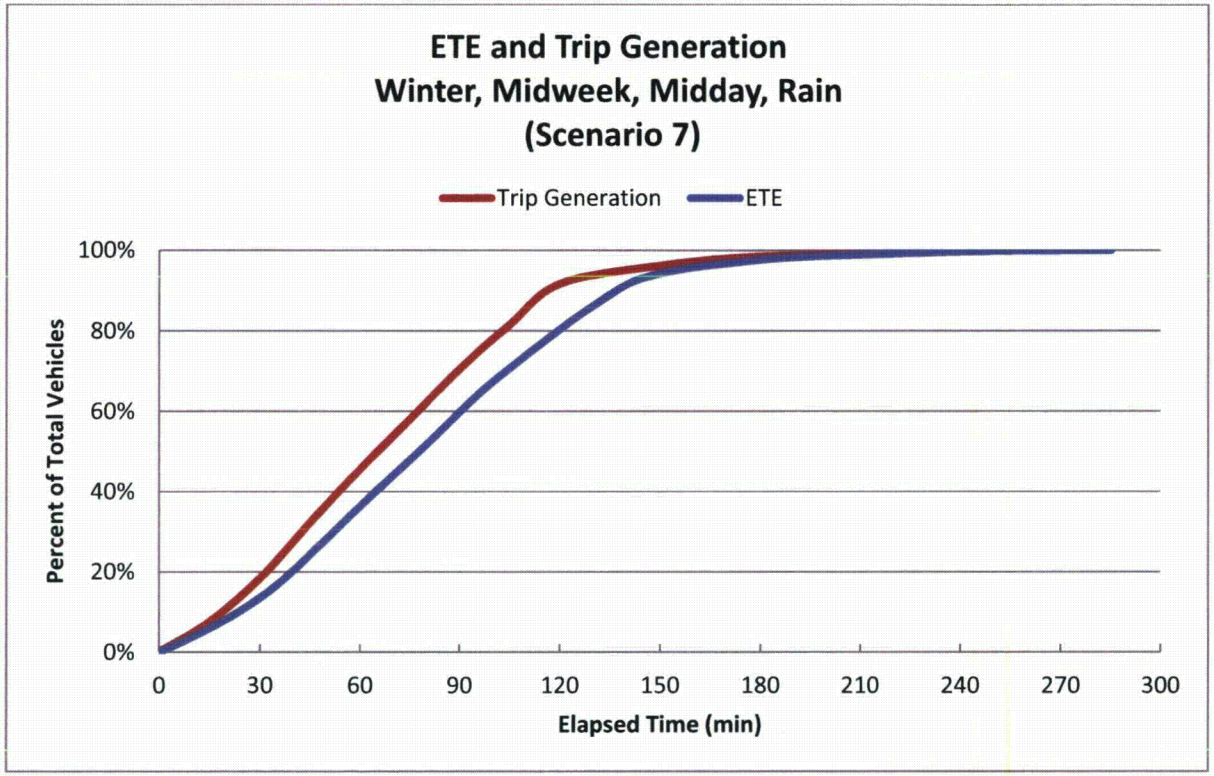

Figure J-7. ETE and Trip Generation Winter, Midweek, Midday, Rain (Scenario 7)

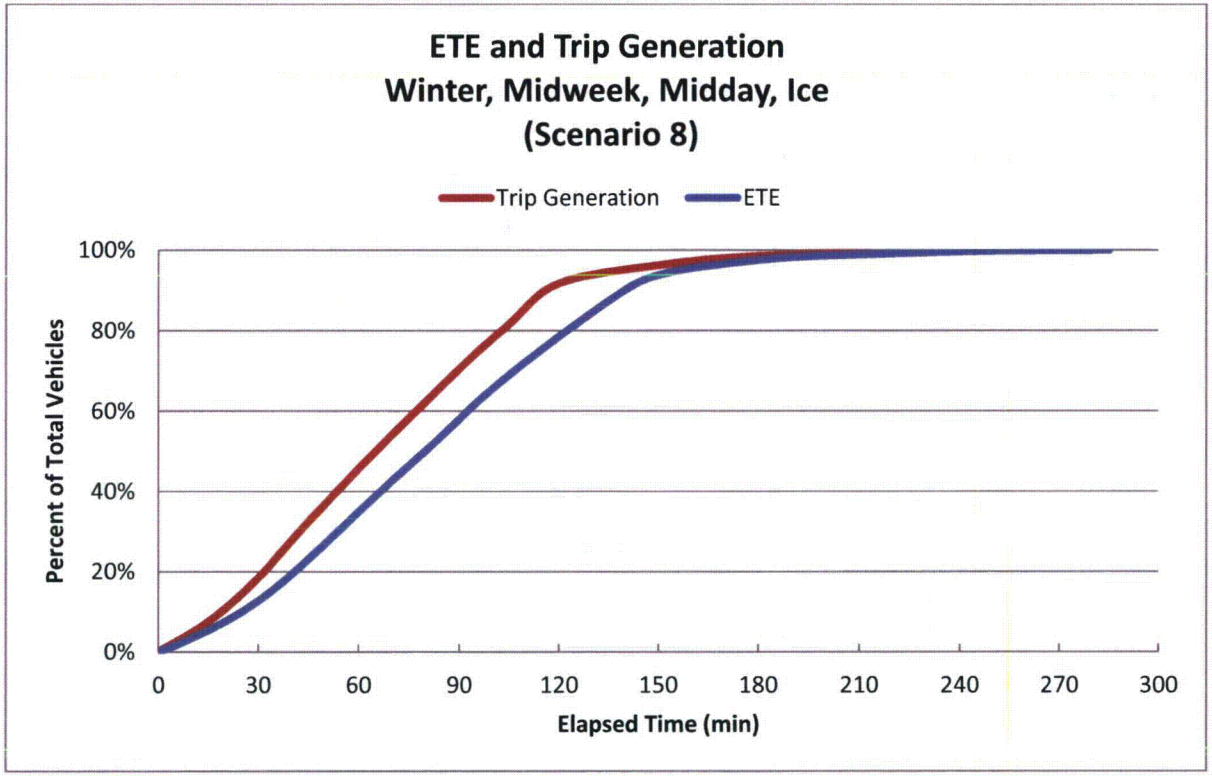

Figure J-8. ETE and Trip Generation Winter, Midweek, Midday, Ice (Scenario 8)

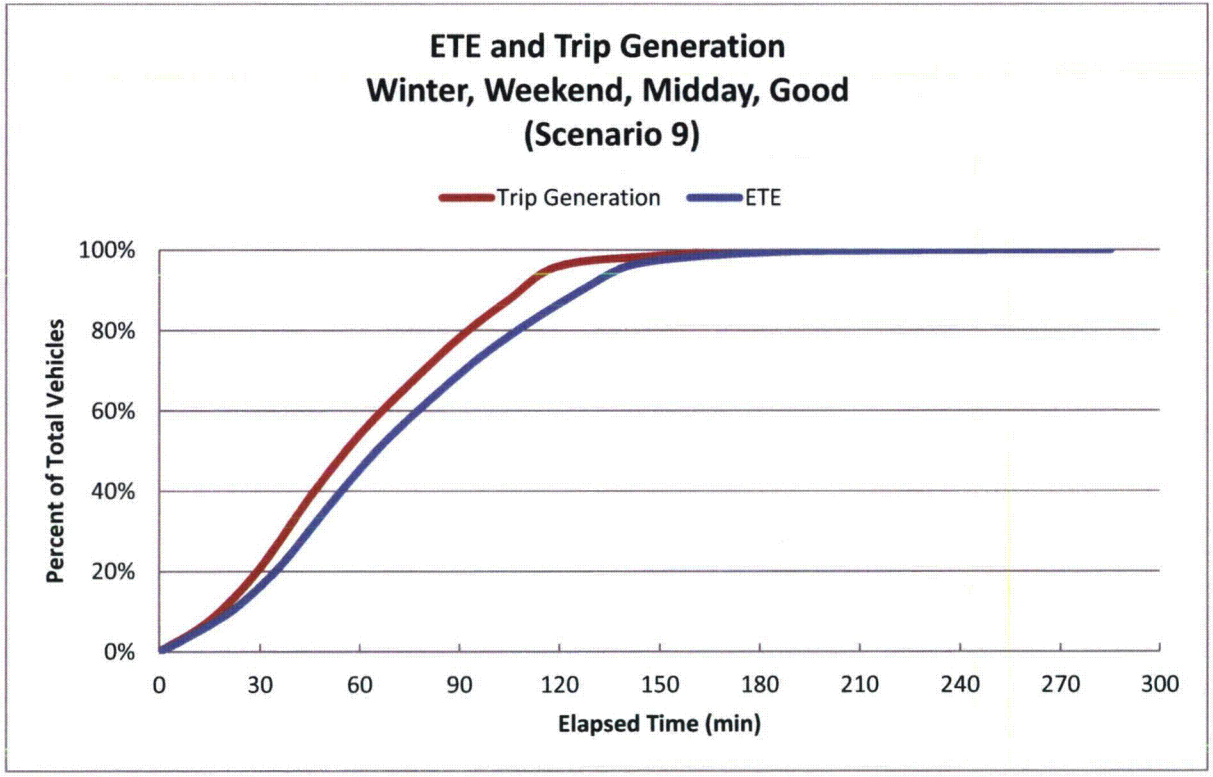

Figure J-9. ETE and Trip Generation Winter, Weekend, Midday, Good Weather (Scenario 9)

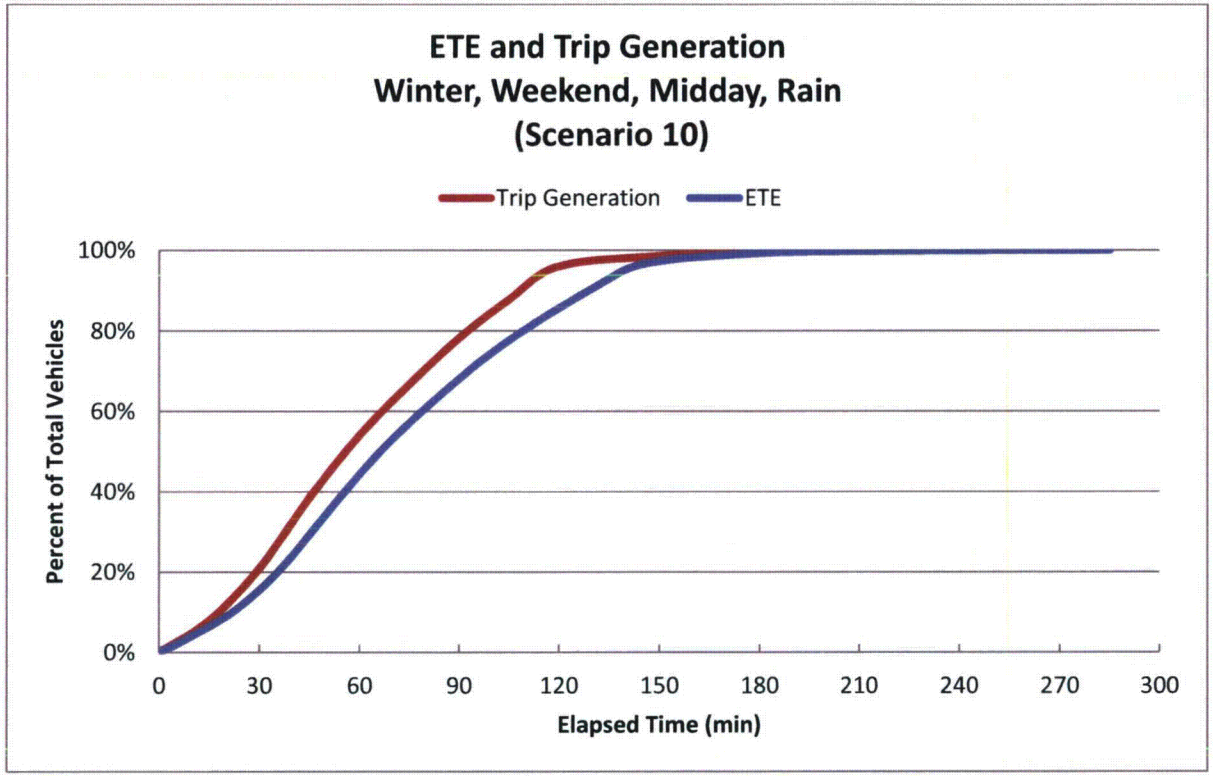

Figure J-10. ETE and Trip Generation Winter, Weekend, Midday, Rain (Scenario 10)

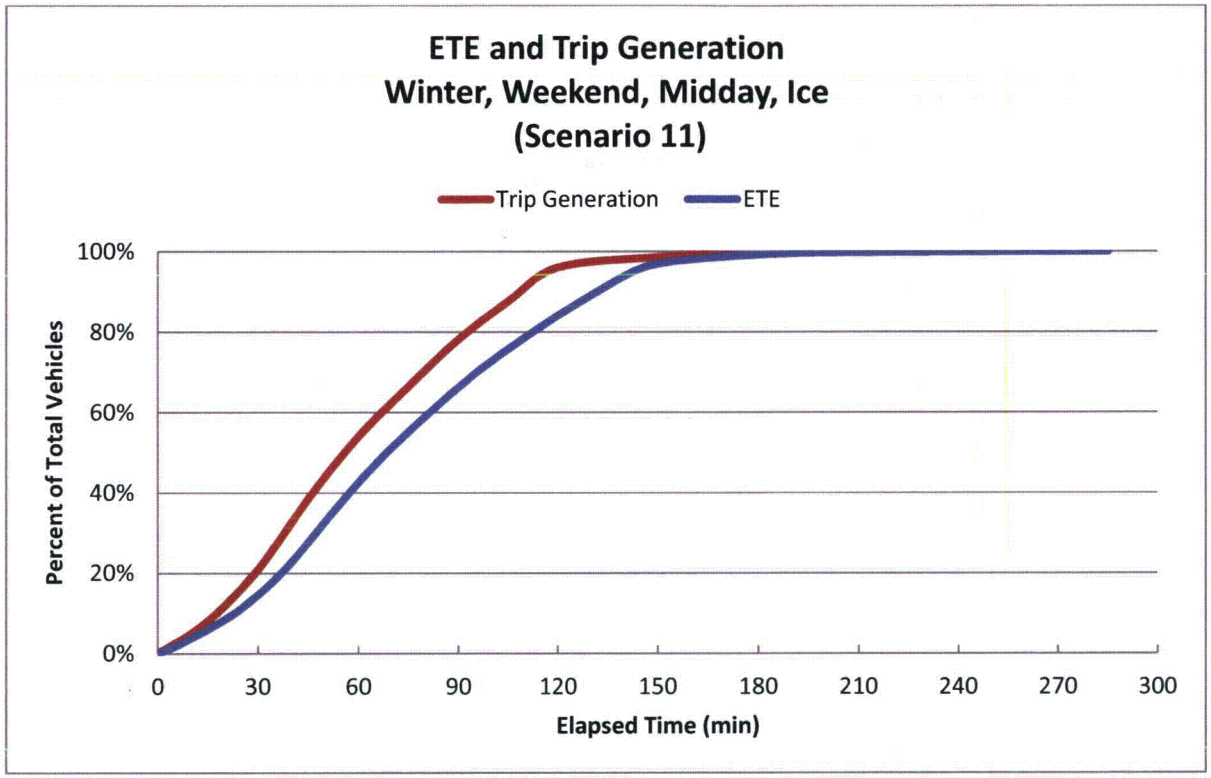

Figure J-11. ETE and Trip Generation Winter, Weekend, Midday, Ice (Scenario 11)

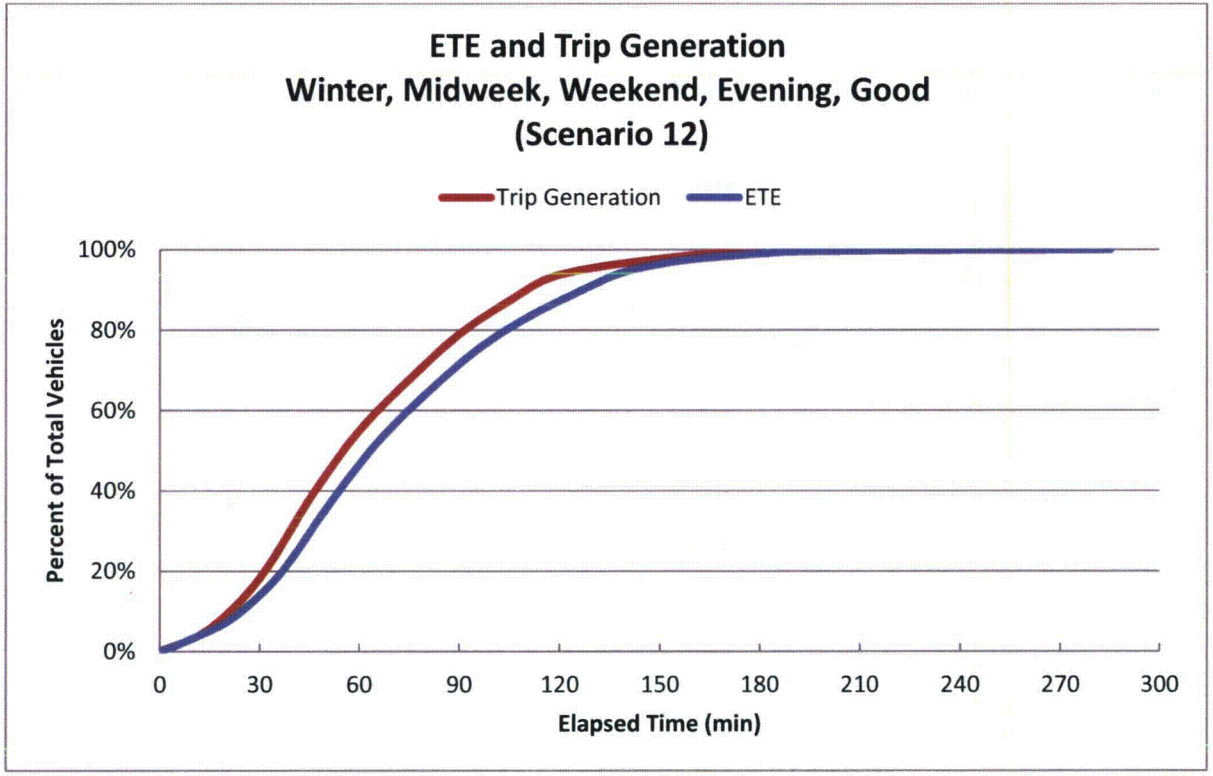

Figure J-12. ETE and Trip Generation Winter, Midweek, Weekend, Evening, Good Weather (Scenario 12)

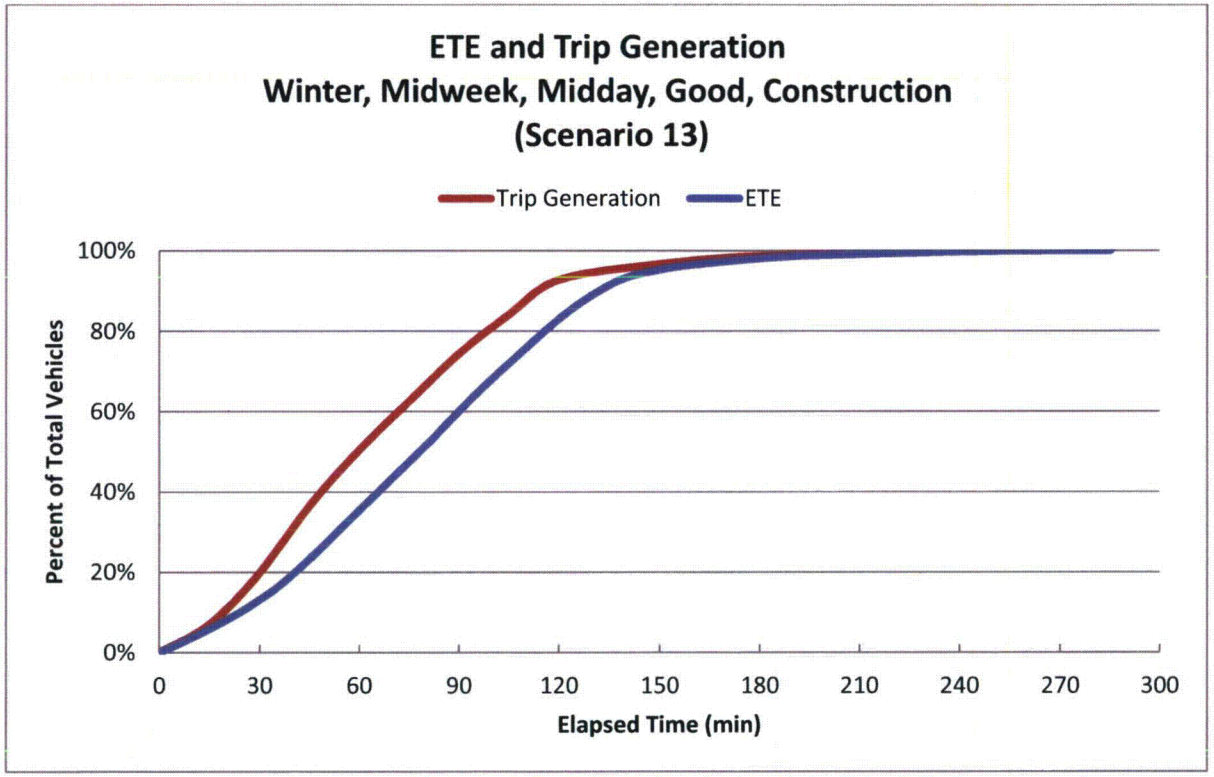

Figure J-13. ETE and Trip Generation Summer, Midweek, Midday, Good Weather, Construction (Scenario 13)

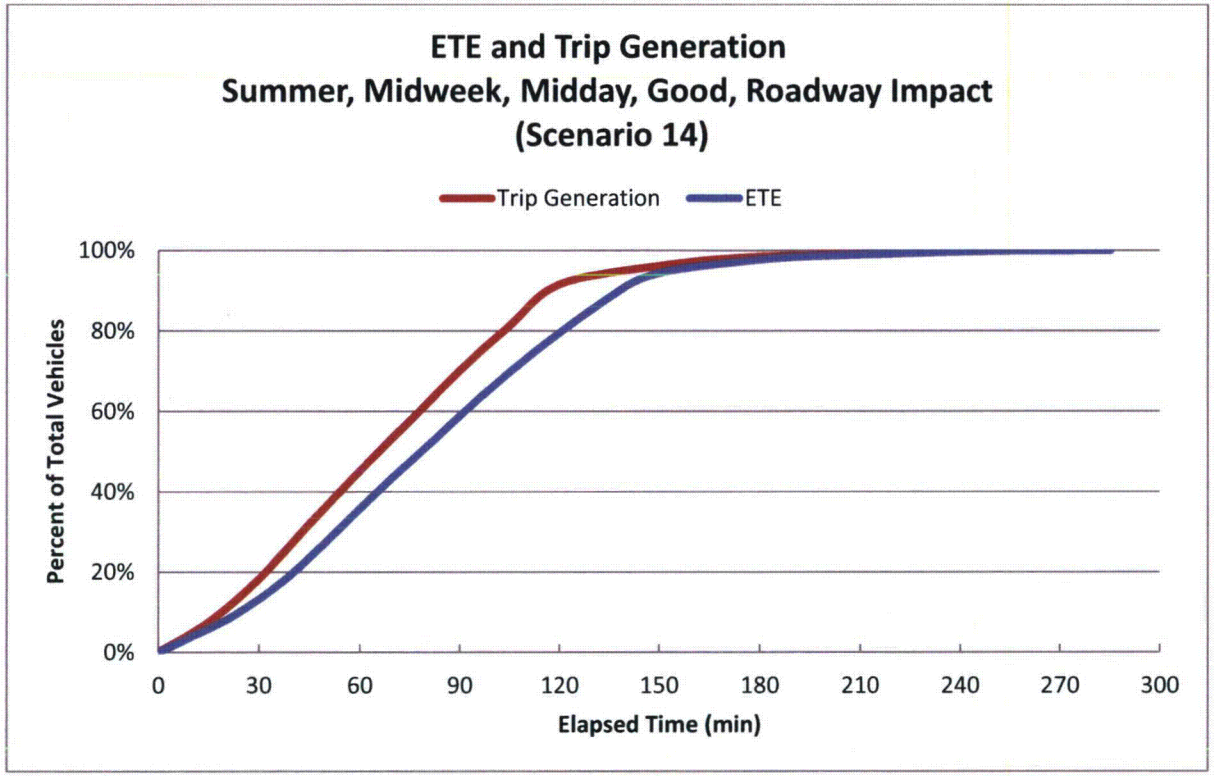

Figure J-14. ETE and Trip Generation Summer, Midweek, Midday, Good Weather, Roadway Impact (Scenario 14)