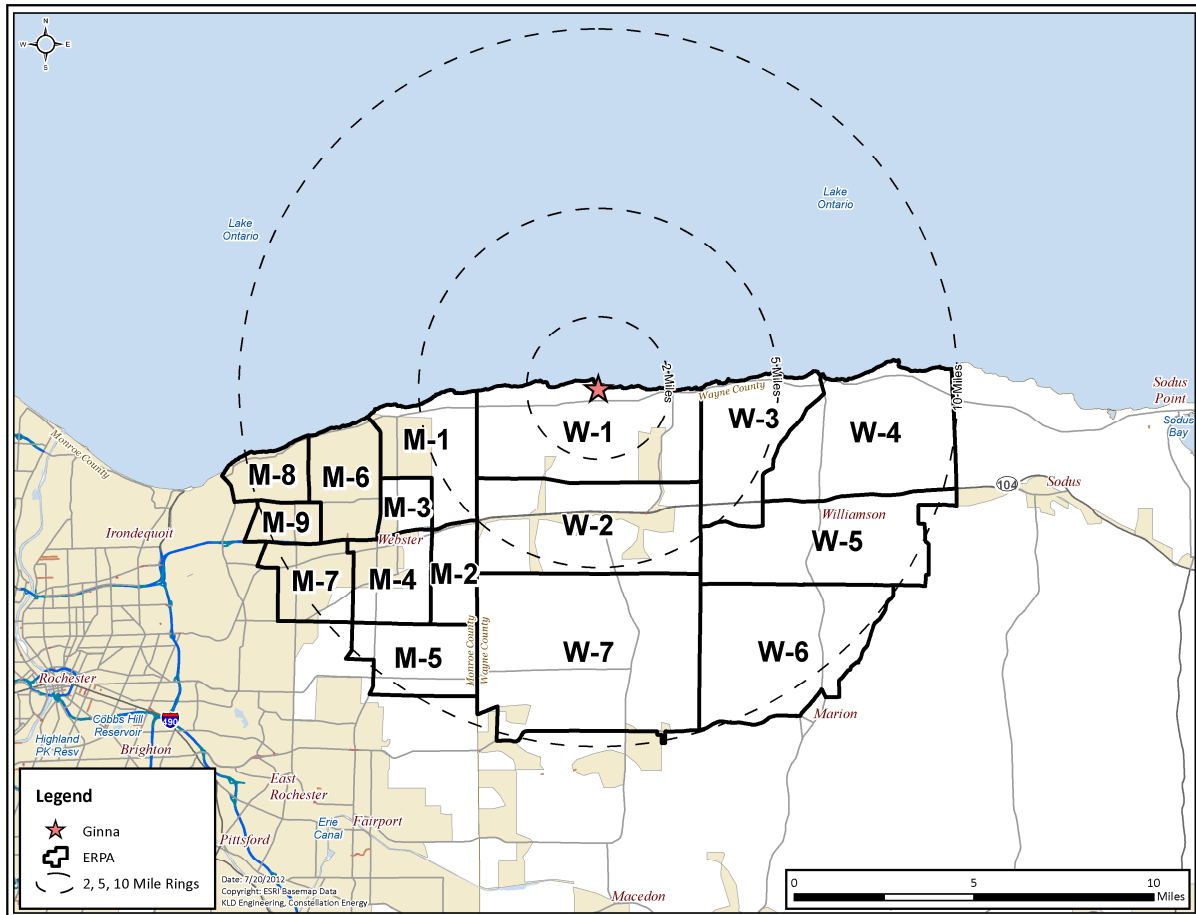


***R.E. Ginna Nuclear Power Plant
Development of Evacuation Time Estimates***



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EXECUTIVE SUMMARY

This report describes the analyses undertaken and the results obtained by a study to develop Evacuation Time Estimates (ETE) for the R.E. Ginna Nuclear Power Plant (Ginna) located in Wayne, New York. ETE are part of the required planning basis and provide Constellation Energy Nuclear Group, LLC (CENG) and State and local governments with site-specific information needed for Protective Action decision-making.

In the performance of this effort, guidance is provided by documents published by Federal Governmental agencies. Most important of these are:

- Criteria for Development of Evacuation Time Estimate Studies, NUREG/CR-7002, November 2011.
- Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants, NUREG-0654/FEMA-REP-1, Rev. 1, November 1980.
- Development of Evacuation Time Estimates for Nuclear Power Plants, NUREG/CR-6863, January 2005.
- 10CFR50, Appendix E – “Emergency Planning and Preparedness for Production and Utilization Facilities”

Overview of Project Activities

This project began in February, 2012 and extended over a period of 9 months. The major activities performed are briefly described in chronological sequence:

- Attended “kick-off” meetings with CENG personnel and emergency management personnel representing state and county governments.
- Accessed U.S. Census Bureau data files for the year 2010. Studied Geographical Information Systems (GIS) maps of the area in the vicinity of the Ginna Plant, then conducted a detailed field survey of the highway network.
- Synthesized this information to create an analysis network representing the highway system topology and capacities within the Emergency Planning Zone (EPZ), plus a Shadow Region covering the region between the EPZ boundary and approximately 15 miles radially from the plant.
- Designed and sponsored a telephone survey of residents within the EPZ to gather focused data needed for this ETE study that were not contained within the census database. The survey instrument was reviewed and modified by the licensee and offsite response organization (ORO) personnel prior to the survey.
- Data collection forms (provided to the OROs at the kickoff meeting) were returned with data pertaining to employment, transients, and special facilities in Wayne and Monroe

counties. The traffic demand and trip-generation rates of evacuating vehicles were estimated from the gathered data. The trip generation rates reflected the estimated mobilization time (i.e., the time required by evacuees to prepare for the evacuation trip) computed using the results of the telephone survey of EPZ residents.

- Following federal guidelines, the EPZ is subdivided into 16 Emergency Response Planning Areas (ERPAs). These ERPAs are then grouped within circular areas or “keyhole” configurations (circles plus radial sectors) that define a total of 25 Evacuation Regions.
- The time-varying external circumstances are represented as Evacuation Scenarios, each described in terms of the following factors: (1) Season (Summer, Winter); (2) Day of Week (Midweek, Weekend); (3) Time of Day (Midday, Evening); and (4) Weather (Good, Rain, Snow). One special event scenario – the Webster Father’s Day Soccer Tournament – was considered. One roadway impact scenario was considered where State Route 104 was closed just below the intersection with Plank Road.
- Staged evacuation was considered for those regions wherein the 2 mile radius and sectors downwind to 5 miles were evacuated.
- As per NUREG/CR-7002, the Planning Basis for the calculation of ETE is:
 - A rapidly escalating accident at Ginna that quickly assumes the status of General Emergency such that the Advisory to Evacuate is virtually coincident with the siren alert, and no early protective actions have been implemented.
 - While an unlikely accident scenario, this planning basis will yield ETE, measured as the elapsed time from the Advisory to Evacuate until the stated percentage of the population exits the impacted Region, that represent “upper bound” estimates. This conservative Planning Basis is applicable for all initiating events.
- If the emergency occurs while schools are in session, the ETE study assumes that the children will be evacuated by bus directly to reception centers or host schools located outside the EPZ. Parents, relatives, and neighbors are advised to not pick up their children at school prior to the arrival of the buses dispatched for that purpose. The ETE for schoolchildren are calculated separately.
- Evacuees who do not have access to a private vehicle will either ride-share with relatives, friends or neighbors, or be evacuated by buses provided as specified in the county evacuation plans. Those in special facilities will likewise be evacuated with public transit, as needed: bus, van, or ambulance, as required. Separate ETE are calculated for the transit-dependent evacuees, for homebound special needs population, and for those evacuated from special facilities.

Computation of ETE

A total of 280 ETE were computed for the evacuation of the general public. Each ETE quantifies the aggregate evacuation time estimated for the population within one of the 25 Evacuation Regions to evacuate from that Region, under the circumstances defined for one of the 14

Evacuation Scenarios ($25 \times 14 = 350$). Separate ETE are calculated for transit-dependent evacuees, including schoolchildren for applicable scenarios.

Except for Region R03, which is the evacuation of the entire EPZ, only a portion of the people within the EPZ would be advised to evacuate. That is, the Advisory to Evacuate applies only to those people occupying the specified impacted region. It is assumed that 100 percent of the people within the impacted region will evacuate in response to this Advisory. The people occupying the remainder of the EPZ outside the impacted region may be advised to take shelter.

The computation of ETE assumes that 20% of the population within the EPZ but outside the impacted region, will elect to “voluntarily” evacuate. In addition, 20% of the population in the Shadow Region will also elect to evacuate. These voluntary evacuees could impede those who are evacuating from within the impacted region. The impedance that could be caused by voluntary evacuees is considered in the computation of ETE for the impacted region.

Staged evacuation is considered wherein those people within the 2-mile region evacuate immediately, while those beyond 2 miles, but within the EPZ, shelter-in-place. Once 90% of the 2-mile region is evacuated, those people beyond 2 miles begin to evacuate. As per federal guidance, 20% of people beyond 2 miles will evacuate (non-compliance) even though they are advised to shelter-in-place.

The computational procedure is outlined as follows:

- A link-node representation of the highway network is coded. Each link represents a unidirectional length of highway; each node usually represents an intersection or merge point. The capacity of each link is estimated based on the field survey observations and on established traffic engineering procedures.
- The evacuation trips are generated at locations called “zonal centroids” located within the EPZ and Shadow Region. The trip generation rates vary over time reflecting the mobilization process, and from one location (centroid) to another depending on population density and on whether a centroid is within, or outside, the impacted area.
- The evacuation model computes the routing patterns for evacuating vehicles that are compliant with federal guidelines (outbound relative to the location of the plant), then simulate the traffic flow movements over space and time. This simulation process estimates the rate that traffic flow exits the impacted region.

The ETE statistics provide the elapsed times for 90 percent and 100 percent, respectively, of the population within the impacted region, to evacuate from within the impacted region. These statistics are presented in tabular and graphical formats. The 90th percentile ETE have been identified as the values that should be considered when making protective action decisions because the 100th percentile ETE are prolonged by those relatively few people who take longer to mobilize. This is referred to as the “evacuation tail” in Section 4.0 of NUREG/CR-7002.

The use of a public outreach (information) program to emphasize the need for evacuees to minimize the time needed to prepare to evacuate (secure the home, assemble needed clothes,

medicines, etc.) should also be considered.

Traffic Management

This study references the comprehensive traffic management plans provided by Wayne and Monroe Counties, and identifies critical intersections.

Selected Results

A compilation of selected information is presented on the following pages in the form of Figures and Tables extracted from the body of the report; these are described below.

- Figure 6-1 displays a map of the Ginna EPZ showing the layout of the 16 ERPAs that comprise, in aggregate, the EPZ.
- Table 3-1 presents the estimates of permanent resident population in each ERPA based on the 2010 Census data.
- Table 6-1 defines each of the 25 Evacuation Regions in terms of their respective groups of ERPAs.
- Table 6-2 lists the Evacuation Scenarios.
- Tables 7-1 and 7-2 are compilations of ETE. These data are the times needed to clear the indicated regions of 90 and 100 percent of the population occupying these regions, respectively. These computed ETE include consideration of mobilization time and of estimated voluntary evacuations from other regions within the EPZ and from the Shadow Region.
- Tables 7-3 and 7-4 present ETE for the 2-mile region for un-staged and staged evacuations for the 90th and 100th percentiles, respectively.
- Table 8-7 presents ETE for the schoolchildren in good weather.
- Table 8-11 presents ETE for the transit-dependent population in good weather.
- Figure H-8 presents an example of an Evacuation Region (Region R08) to be evacuated under the circumstances defined in Table 6-1. Maps of all regions are provided in Appendix H.

Conclusions

- General population ETE were computed for 350 unique cases – a combination of 25 unique Evacuation Regions and 14 unique Evacuation Scenarios. Table 7-1 and Table 7-2 document these ETE for the 90th and 100th percentiles. These ETE range from 1:35 (hr:min) to 2:45 at the 90th percentile.
- Inspection of Table 7-1 and Table 7-2 indicates that the ETE for the 100th percentile are significantly longer than those for the 90th percentile because they are directly dependent on the mobilization times, creating an evacuation tail (See Figures 7-8 through 7-21). This fact implies that the congestion within the EPZ dissipates prior to the end of mobilization, as is displayed in Figure 7-7.
- Inspection of Table 7-3 and Table 7-4 indicates that a staged evacuation provides no benefits to evacuees from within the 2 mile region and unnecessarily delays the evacuation of those beyond 2 miles (compare Regions R02 and R04 through R08 with

Regions R20 through R25, respectively, in Tables 7-1 and 7-2). See Section 7.6 for additional discussion.

- Comparison of Scenarios 3 (summer, midweek, midday) and 13 (summer, midweek, midday) in Table 7-2 indicates that the special event does not materially affect the ETE. See Section 7.5 for additional discussion.
- Comparison of Scenarios 1 and 14 in Table 7-1 indicates that the roadway closure – State Route 404 just below the intersection with Plank Road – does not affect ETE. See Section 7.5 for additional discussion.
- Webster is the most congested area during an evacuation. All congestion within the EPZ clears by 3 hours and 10 minutes after the Advisory to Evacuate. See Section 7.3 and Figures 7-3 through 7-7.
- Separate ETE were computed for schools (and evacuating preschools), medical facilities, transit-dependent persons and homebound special needs persons. The average single-wave ETE for these facilities are within a similar range as the general population ETE at the 90th percentile. See Section 8.
- Table 8-5 indicates that there are enough transportation resources to evacuate the population in a single wave. See Sections 8.4 and 8.5.
- The general population ETE at the 90th percentile is insensitive to reductions in the base trip generation time of 3 hours and 45 minutes due to the traffic congestion within the EPZ. See Table M-1.
- The general population ETE is insensitive to the voluntary evacuation of vehicles in the Shadow Region (tripling the shadow evacuation percentage only increases 90th percentile ETE by 5 minutes). See Table M-2.
- A population increase of 51% or decrease of 87% result in ETE changes which meet the criteria for updating ETE between decennial Censuses. See Section M.3.

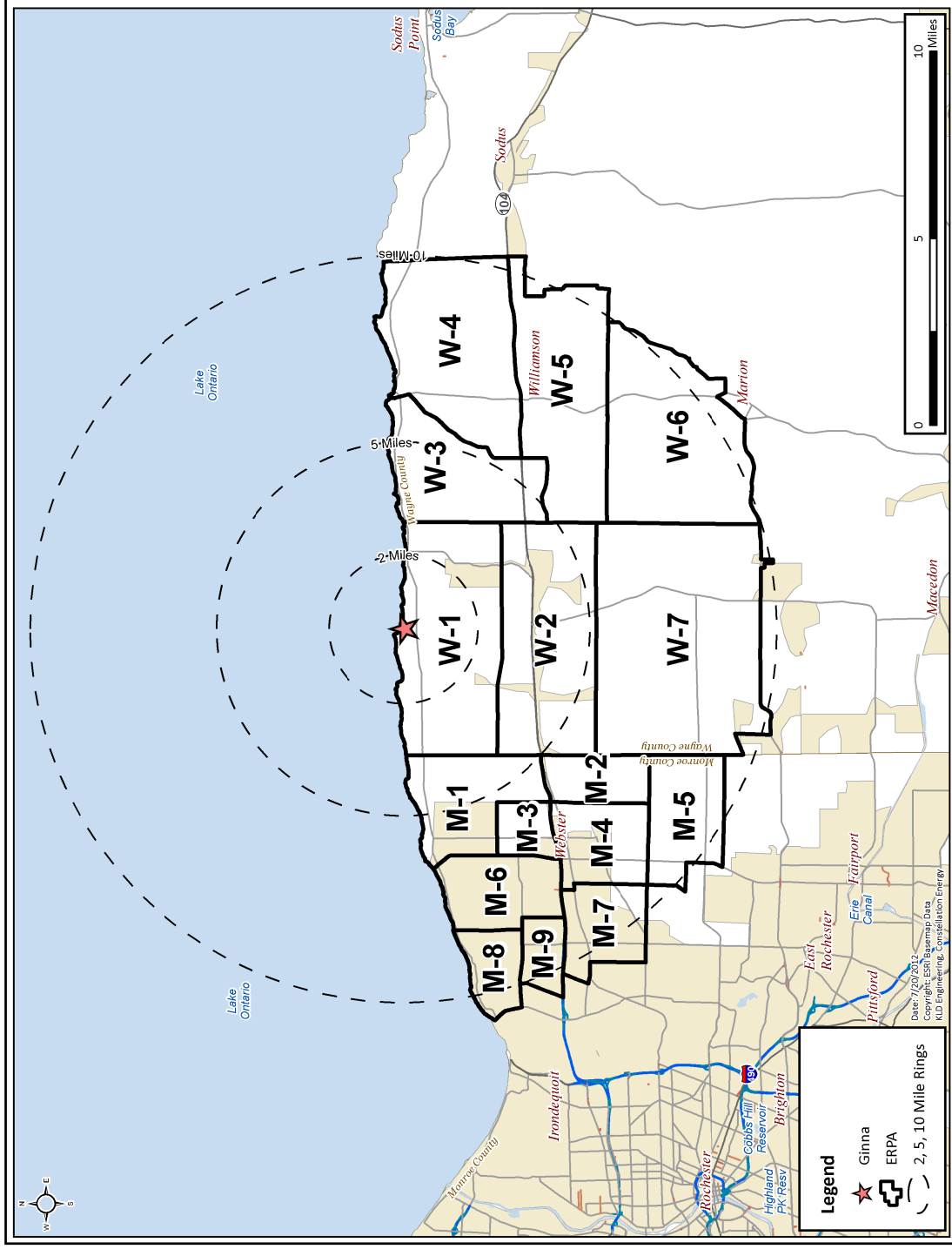


Figure 6-1. Ginna EPZ ERPAS

Table 3-1. EPZ Permanent Resident Population

ERPA	2000 Population	2010 Population
M-1	3,938	4,721
M-2	477	666
M-3	355	1,039
M-4	6,903	8,088
M-5	1,311	1,323
M-6	6,831	7,088
M-7	7,556	9,525
M-8	3,074	3,151
M-9	3,896	3,931
W-1	3,817	4,197
W-2	5,951	5,939
W-3	1,064	1,168
W-4	2,191	2,117
W-5	3,916	4,232
W-6	2,147	2,189
W-7	4,509	4,575
TOTAL	57,936	63,949
EPZ Population Growth:		10.4%

Table 6-1. Description of Evacuation Regions

Basic Regions																		
Region	Description	Degrees	ERPA															
			W-1	W-2	W-3	W-4	W-5	W-6	W-7	M-1	M-2	M-3	M-4	M-5	M-6	M-7	M-8	M-9
R01	2-Mile Region		x															
R02	5-Mile Region		x	x	x					x								
R03	Full EPZ		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Evacuate 2-Mile Region and Downwind to 5 Miles																		
Region	Wind Direction From:	Degrees	ERPA															
			W-1	W-2	W-3	W-4	W-5	W-6	W-7	M-1	M-2	M-3	M-4	M-5	M-6	M-7	M-8	M-9
R04	N	349 - 11	x	x														
R05	NNE, NE, ENE	12 - 78	x	x						x								
R06	E, ESE	79 - 124	x							x								
	SE, SSE, S, SSW, SW	125 - 236	See Region R01															
R07	WSW, W	237 - 281	x		x													
R08	WNW, NW, NNW	282 - 348	x	x	x													
Evacuate 5-Mile Region and Downwind to the EPZ Boundary																		
Region	Wind Direction From:	Degrees	ERPA															
			W-1	W-2	W-3	W-4	W-5	W-6	W-7	M-1	M-2	M-3	M-4	M-5	M-6	M-7	M-8	M-9
R09	N	349 - 11	x	x	x		x	x	x	x	x			x				
R10	NNE	12 - 33	x	x	x				x	x	x	x	x	x		x		
R11	NE	34 - 56	x	x	x				x	x	x	x	x	x	x	x	x	x
R12	ENE	57 - 78	x	x	x					x	x	x	x	x	x	x	x	x
R13	E	79 - 101	x	x	x					x		x	x		x	x	x	x
R14	ESE	102 - 124	x	x	x					x					x		x	
	SE, SSE, S, SSW, SW	125 - 236	See Region R02															
R15	WSW	237 - 258	x	x	x	x				x								
R16	W	259 - 281	x	x	x	x	x			x								
R17	WNW	282 - 303	x	x	x	x	x	x		x								
R18	NW	304 - 326	x	x	x	x	x	x	x	x								
R19	NNW	327 - 348	x	x	x		x	x	x	x								
Staged Evacuation - 2-Mile Region Evacuates, then Evacuate Downwind to 5 Miles																		
Region	Wind Direction From:	Degrees	ERPA															
			W-1	W-2	W-3	W-4	W-5	W-6	W-7	M-1	M-2	M-3	M-4	M-5	M-6	M-7	M-8	M-9
R20	No Wind		x	x	x					x								
R21	N	349 - 11	x	x														
R22	NNE, NE, ENE	12 - 78	x	x						x								
R23	E, ESE	79 - 124	x							x								
	SE, SSE, S, SSW, SW	125 - 236	See Region R01															
R24	WSW, W	237 - 281	x		x													
R25	WNW, NW, NNW	282 - 348	x	x	x													
Key																		
ERPA Evacuate			ERPA Shelter-in-Place			Shelter-in-Place until 90% ETE for R01, then Evacuate												

Table 6-2. Evacuation Scenario Definitions

Scenario	Season ¹	Day of Week	Time of Day	Weather	Special
1	Summer	Midweek	Midday	Good	None
2	Summer	Midweek	Midday	Rain	None
3	Summer	Weekend	Midday	Good	None
4	Summer	Weekend	Midday	Rain	None
5	Summer	Midweek, Weekend	Evening	Good	None
6	Winter	Midweek	Midday	Good	None
7	Winter	Midweek	Midday	Rain	None
8	Winter	Midweek	Midday	Snow	None
9	Winter	Weekend	Midday	Good	None
10	Winter	Weekend	Midday	Rain	None
11	Winter	Weekend	Midday	Snow	None
12	Winter	Midweek, Weekend	Evening	Good	None
13	Summer	Weekend	Midday	Good	Webster Father's Day Soccer Tournament
14	Summer	Midweek	Midday	Good	Roadway Impact – Lane Closure on SR 104 WB

¹ Winter means that school is in session (also applies to spring and autumn). Summer means that school is not in session.

Table 7-1. Time to Clear the Indicated Area of 90 Percent of the Affected Population

Scenario:	Summer		Summer		Summer		Winter		Winter		Winter		Summer		Summer	
	Midweek		Weekend		Midweek		Midweek		Midweek		Midweek		Weekend		Weekend	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Region	Midweek		Midweek		Midweek		Midweek		Midweek		Midweek		Midweek		Midweek	
	Good Weather	Rain	Good Weather	Rain	Good Weather	Rain	Good Weather	Rain	Good Weather	Rain	Good Weather	Rain	Good Weather	Rain	Good Weather	Rain
Entire 2-Mile Region, 5-Mile Region, and EPZ																
R01	1:50	1:50	1:35	1:35	1:35	1:50	1:50	2:15	1:35	1:35	2:05	1:35	1:35	1:35	1:55	1:50
R02	2:00	2:00	1:55	1:55	1:45	2:00	2:05	2:20	1:55	1:55	2:10	1:45	1:55	1:55	1:55	1:50
R03	2:15	2:20	1:55	2:00	1:50	2:15	2:25	2:45	1:55	2:00	2:15	1:50	1:55	1:55	1:55	2:20
2-Mile Region and Keyhole to 5 Miles																
R04	2:00	2:05	1:55	2:00	1:50	2:05	2:05	2:15	1:55	2:00	2:10	1:50	1:55	1:55	2:00	2:00
R05	2:00	2:00	1:55	2:00	1:45	2:00	2:00	2:15	1:55	2:00	2:10	1:45	1:55	1:55	2:00	2:00
R06	1:50	1:50	1:35	1:35	1:35	1:50	1:50	2:15	1:35	1:35	2:05	1:35	1:35	1:35	1:50	1:50
R07	2:00	1:55	1:45	1:45	1:40	2:00	1:55	2:15	1:45	1:45	2:10	1:40	1:45	1:45	1:55	1:55
R08	2:00	2:05	1:55	2:00	1:50	2:05	2:05	2:15	1:55	2:05	2:10	1:50	1:55	1:55	2:00	2:00
5-Mile Region and Keyhole to EPZ Boundary																
R09	2:00	2:00	1:50	1:55	1:45	2:00	2:00	2:20	1:55	1:55	2:15	1:45	1:50	1:50	2:00	2:00
R10	2:00	2:00	1:55	1:55	1:50	2:00	2:05	2:25	1:50	1:55	2:10	1:50	1:50	1:50	1:55	1:55
R11	2:15	2:25	1:55	2:00	1:50	2:15	2:25	2:40	1:55	2:00	2:15	1:50	1:55	1:55	2:15	2:15
R12	2:15	2:25	1:55	2:00	1:50	2:15	2:25	2:40	1:55	2:00	2:15	1:50	1:55	1:55	2:15	2:15
R13	2:10	2:25	1:55	2:00	1:50	2:15	2:25	2:40	1:50	2:00	2:15	1:50	1:55	1:55	2:15	2:15
R14	2:00	2:00	1:50	1:55	1:45	1:55	2:00	2:15	1:50	1:55	2:10	1:45	1:50	1:50	2:00	2:00
R15	2:00	2:00	1:55	1:55	1:45	2:00	2:00	2:15	1:55	2:00	2:10	1:45	1:55	1:55	2:00	2:00
R16	2:05	2:05	1:55	1:55	1:45	2:05	2:05	2:15	1:55	1:55	2:15	1:45	1:55	1:55	2:05	2:05
R17	2:05	2:05	1:55	1:55	1:45	2:05	2:05	2:20	1:55	1:55	2:10	1:45	1:55	1:55	2:00	2:00
R18	2:05	2:05	1:55	2:00	1:45	2:00	2:05	2:20	1:55	2:00	2:15	1:45	1:55	1:55	2:05	2:05
R19	2:00	2:05	1:55	1:55	1:45	2:00	2:05	2:20	1:55	1:55	2:15	1:45	1:55	1:55	2:00	2:00
Staged Evacuation - 2-Mile Region and Keyhole to 5 Miles																
R20	2:10	2:15	2:10	2:15	2:10	2:10	2:15	2:45	2:10	2:15	2:45	2:10	2:05	2:05	2:10	2:10
R21	2:10	2:10	2:05	2:10	2:05	2:10	2:10	2:30	2:05	2:10	2:30	2:05	2:05	2:05	2:10	2:10
R22	2:10	2:15	2:10	2:10	2:10	2:10	2:10	2:35	2:10	2:15	2:40	2:10	2:10	2:10	2:10	2:10
R23	2:05	2:10	2:05	2:05	2:05	2:05	2:10	2:40	2:05	2:10	2:40	2:05	2:05	2:05	2:05	2:05
R24	2:10	2:05	2:05	2:05	2:00	2:10	2:05	2:30	2:05	2:05	2:30	2:00	2:05	2:05	2:05	2:05
R25	2:10	2:10	2:10	2:10	2:05	2:10	2:10	2:35	2:10	2:10	2:35	2:05	2:10	2:10	2:10	2:10

Table 7-2. Time to Clear the Indicated Area of 100 Percent of the Affected Population

	Summer		Summer		Summer		Winter		Winter		Winter		Summer		Summer	
	Midweek		Weekend		Midweek		Midweek		Weekend		Midweek		Weekend		Midweek	
Scenario:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)		
Region	Midday		Midday		Evening	Midday		Midday		Midday		Evening	Midday	Midday		
	Good Weather	Rain	Good Weather	Rain	Good Weather	Good Weather	Rain	Snow	Good Weather	Rain	Snow	Good Weather	Special Event	Roadway Impact		
	Entire 2-Mile Region, 5-Mile Region, and EPZ															
R01	3:45	3:45	3:45	3:45	3:45	3:45	3:45	4:15	3:45	3:45	4:15	3:45	3:45	3:45	3:45	3:45
R02	3:50	3:50	3:50	3:50	3:50	3:50	3:50	4:20	3:50	3:50	4:20	3:50	3:50	3:50	3:50	3:50
R03	3:55	3:55	3:55	3:55	3:55	3:55	3:55	4:25	3:55	3:55	4:25	3:55	3:55	3:55	3:55	3:55
2-Mile Region and Keyhole to 5 Miles																
R04	3:50	3:50	3:50	3:50	3:50	3:50	3:50	4:20	3:50	3:50	4:20	3:50	3:50	3:50	3:50	3:50
R05	3:50	3:50	3:50	3:50	3:50	3:50	3:50	4:20	3:50	3:50	4:20	3:50	3:50	3:50	3:50	3:50
R06	3:50	3:50	3:50	3:50	3:50	3:50	3:50	4:20	3:50	3:50	4:20	3:50	3:50	3:50	3:50	3:50
R07	3:50	3:50	3:50	3:50	3:50	3:50	3:50	4:20	3:50	3:50	4:20	3:50	3:50	3:50	3:50	3:50
R08	3:50	3:50	3:50	3:50	3:50	3:50	3:50	4:20	3:50	3:50	4:20	3:50	3:50	3:50	3:50	3:50
5-Mile Region and Keyhole to EPZ Boundary																
R09	3:55	3:55	3:55	3:55	3:55	3:55	3:55	4:25	3:55	3:55	4:25	3:55	3:55	3:55	3:55	3:55
R10	3:55	3:55	3:55	3:55	3:55	3:55	3:55	4:25	3:55	3:55	4:25	3:55	3:55	3:55	3:55	3:55
R11	3:55	3:55	3:55	3:55	3:55	3:55	3:55	4:25	3:55	3:55	4:25	3:55	3:55	3:55	3:55	3:55
R12	3:55	3:55	3:55	3:55	3:55	3:55	3:55	4:25	3:55	3:55	4:25	3:55	3:55	3:55	3:55	3:55
R13	3:55	3:55	3:55	3:55	3:55	3:55	3:55	4:25	3:55	3:55	4:25	3:55	3:55	3:55	3:55	3:55
R14	3:55	3:55	3:55	3:55	3:55	3:55	3:55	4:25	3:55	3:55	4:25	3:55	3:55	3:55	3:55	3:55
R15	3:55	3:55	3:55	3:55	3:55	3:55	3:55	4:25	3:55	3:55	4:25	3:55	3:55	3:55	3:55	3:55
R16	3:55	3:55	3:55	3:55	3:55	3:55	3:55	4:25	3:55	3:55	4:25	3:55	3:55	3:55	3:55	3:55
R17	3:55	3:55	3:55	3:55	3:55	3:55	3:55	4:25	3:55	3:55	4:25	3:55	3:55	3:55	3:55	3:55
R18	3:55	3:55	3:55	3:55	3:55	3:55	3:55	4:25	3:55	3:55	4:25	3:55	3:55	3:55	3:55	3:55
R19	3:55	3:55	3:55	3:55	3:55	3:55	3:55	4:25	3:55	3:55	4:25	3:55	3:55	3:55	3:55	3:55
Staged Evacuation - 2-Mile Region and Keyhole to 5 Miles																
R20	3:50	3:50	3:50	3:50	3:50	3:50	3:50	4:20	3:50	3:50	4:20	3:50	3:50	3:50	3:50	3:50
R21	3:50	3:50	3:50	3:50	3:50	3:50	3:50	4:20	3:50	3:50	4:20	3:50	3:50	3:50	3:50	3:50
R22	3:50	3:50	3:50	3:50	3:50	3:50	3:50	4:20	3:50	3:50	4:20	3:50	3:50	3:50	3:50	3:50
R23	3:50	3:50	3:50	3:50	3:50	3:50	3:50	4:20	3:50	3:50	4:20	3:50	3:50	3:50	3:50	3:50
R24	3:50	3:50	3:50	3:50	3:50	3:50	3:50	4:20	3:50	3:50	4:20	3:50	3:50	3:50	3:50	3:50
R25	3:50	3:50	3:50	3:50	3:50	3:50	3:50	4:20	3:50	3:50	4:20	3:50	3:50	3:50	3:50	3:50

Table 7-3. Time to Clear 90 Percent of the 2-Mile Region

Scenario:	Summer		Summer		Summer		Winter		Winter		Winter		Summer		Summer	
	Midweek		Weekend		Midweek		Midweek		Weekend		Midweek		Weekend		Weekend	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Region	Midday		Midday		Evening		Midday		Midday		Midday		Evening		Midday	
	Good Weather	Rain	Good Weather	Rain	Good Weather	Good Weather	Rain	Snow	Good Weather	Rain	Snow	Good Weather	Good Weather	Special Event	Roadway Impact	Midweek
Unstaged Evacuation - 2-Mile Region																
R01	1:50	1:50	1:35	1:35	1:35	1:50	1:50	2:15	1:35	1:35	2:05	1:35	1:35	1:35	1:50	1:50
Unstaged Evacuation - 2-Mile Region and Keyhole to 5-Miles																
R02	1:50	1:50	1:35	1:35	1:35	1:50	1:50	2:15	1:35	1:35	2:05	1:35	1:35	1:35	1:50	1:50
R04	1:50	1:50	1:35	1:35	1:35	1:50	1:50	2:15	1:35	1:35	2:05	1:35	1:35	1:35	1:50	1:50
R05	1:50	1:50	1:35	1:35	1:35	1:50	1:50	2:15	1:35	1:35	2:05	1:35	1:35	1:35	1:50	1:50
R06	1:50	1:50	1:35	1:35	1:35	1:50	1:50	2:15	1:35	1:35	2:05	1:35	1:35	1:35	1:50	1:50
R07	1:50	1:50	1:35	1:35	1:35	1:50	1:50	2:15	1:35	1:35	2:05	1:35	1:35	1:35	1:50	1:50
R08	1:50	1:50	1:35	1:35	1:35	1:50	1:50	2:15	1:35	1:35	2:05	1:35	1:35	1:35	1:50	1:50
Staged Evacuation - 2-Mile Region and Keyhole to 5-Miles																
R20	2:00	2:00	1:55	1:55	1:55	2:00	2:00	2:25	1:55	1:55	2:25	1:55	1:55	1:55	2:00	2:00
R21	1:55	1:55	1:40	1:40	1:40	1:55	1:55	2:20	1:40	1:40	2:10	1:40	1:40	1:40	1:55	1:55
R22	1:55	1:55	1:50	1:50	1:50	1:55	1:55	2:25	1:50	1:50	2:20	1:50	1:50	1:50	1:55	1:55
R23	1:55	1:55	1:50	1:50	1:50	1:55	1:55	2:25	1:50	1:50	2:20	1:50	1:50	1:50	1:55	1:55
R24	1:55	1:55	1:50	1:50	1:50	1:55	1:55	2:25	1:50	1:50	2:20	1:50	1:50	1:50	1:55	1:55
R25	1:55	1:55	1:50	1:50	1:50	1:55	1:55	2:25	1:50	1:50	2:20	1:50	1:50	1:50	1:55	1:55

Table 7-4. Time to Clear 100 Percent of the 2-Mile Region

	Summer		Summer		Summer		Winter		Winter		Winter		Winter		Summer		Summer	
	Midweek		Weekend		Midweek		Midweek		Weekend		Midweek		Weekend		Weekend		Midweek	
Scenario:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)				
Region	Midday		Midday		Evening		Midday		Midday		Midday		Evening		Evening		Midday	
	Good Weather	Rain	Good Weather	Rain	Good Weather	Good Weather	Rain	Snow	Good Weather	Rain	Snow	Good Weather	Rain	Snow	Good Weather	Special Event	Roadway Impact	
Unstaged Evacuation - 2-Mile Region																		
R01	3:45	3:45	3:45	3:45	3:45	3:45	3:45	4:15	3:45	3:45	4:15	3:45	3:45	3:45	3:45	3:45	3:45	3:45
Unstaged Evacuation - 2-Mile Region and Keyhole to 5-Miles																		
R02	3:45	3:45	3:45	3:45	3:45	3:45	3:50	4:15	3:45	3:45	4:15	3:45	3:45	3:45	3:45	3:45	3:45	3:45
R04	3:45	3:45	3:45	3:45	3:45	3:50	3:45	4:15	3:45	3:45	4:15	3:45	3:45	3:45	3:45	3:45	3:45	3:45
R05	3:45	3:45	3:45	3:45	3:45	3:45	3:45	4:15	3:45	3:45	4:15	3:45	3:45	3:45	3:45	3:45	3:45	3:45
R06	3:45	3:50	3:45	3:45	3:45	3:45	3:45	4:15	3:45	3:45	4:15	3:45	3:45	3:45	3:45	3:45	3:50	3:50
R07	3:45	3:45	3:45	3:45	3:45	3:45	3:45	4:15	3:45	3:45	4:15	3:45	3:45	3:45	3:45	3:45	3:45	3:45
R08	3:45	3:45	3:45	3:45	3:45	3:50	3:45	4:15	3:45	3:45	4:15	3:45	3:45	3:45	3:45	3:45	3:45	3:45
Staged Evacuation - 2-Mile Region and Keyhole to 5-Miles																		
R20	3:45	3:45	3:45	3:45	3:45	3:50	3:45	4:20	3:45	3:45	4:15	3:45	3:45	3:45	3:45	3:45	3:45	3:45
R21	3:45	3:45	3:45	3:45	3:45	3:45	3:45	4:20	3:45	3:45	4:15	3:45	3:45	3:45	3:45	3:45	3:50	3:50
R22	3:45	3:45	3:45	3:45	3:45	3:50	3:45	4:20	3:45	3:45	4:15	3:45	3:45	3:45	3:45	3:45	3:45	3:45
R23	3:45	3:45	3:45	3:45	3:45	3:45	3:45	4:15	3:45	3:45	4:15	3:45	3:45	3:45	3:45	3:45	3:45	3:45
R24	3:45	3:45	3:45	3:45	3:45	3:45	3:45	4:15	3:45	3:45	4:15	3:45	3:45	3:45	3:45	3:45	3:45	3:45
R25	3:45	3:45	3:45	3:45	3:45	3:45	3:45	4:20	3:45	3:45	4:15	3:45	3:45	3:45	3:45	3:45	3:50	3:50

Table 8-7. School Evacuation Time Estimates – Good Weather

School	Driver Mobilization Time (min)	Loading Time (min)	Dist. To EPZ Bdry (mi)	Average Speed (mph)	Travel Time to EPZ Bdry (min)	ETE (hr:min)	Dist. EPZ Bdry to R.C./R.L. (mi.)	Travel Time from EPZ Bdry to H.S. (min)	ETE to R.C./R.L (hr:min)
MONROE COUNTY SCHOOLS									
Dewitt Road Elementary School	90	15	School is outside the EPZ			1:45	13.6	21	2:10
Klem Road North Elementary School	90	15	3.4	9.6	22	2:10	13.5	21	2:30
Klem Road South Elementary School	90	15	3.5	9.6	23	2:10	13.4	21	2:30
Plank Road North Elementary School	90	15	School is outside the EPZ			1:45	12.5	19	2:05
Plank Road South Elementary School	90	15	School is outside the EPZ			1:45	12.3	19	2:05
Rochester Christian School	90	15	School is outside the EPZ			1:45	10.8	17	2:05
Schlegel Road Elementary School	90	15	7.1	12.2	35	2:20	13.4	21	2:45
Schroeder High School	90	15	2.3	11.5	13	2:00	13.4	21	2:20
Spry Middle School	90	15	4.3	10.0	26	2:15	13.4	21	2:35
St Rita's School	90	15	School is outside the EPZ			1:45	13.9	21	2:10
State Road Elementary School	90	15	5.7	10.9	32	2:20	13.4	21	2:40
Thomas High School	90	15	1.9	11.5	11	2:00	13.4	21	2:20
Webster Christian School	90	15	4.0	10.0	25	2:10	13.5	21	2:35
Webster Montessori School	90	15	0.2	11.7	2	1:50	13.1	20	2:10
Willink Middle School	90	15	2.2	11.5	12	2:00	13.4	21	2:20
WAYNE COUNTY SCHOOLS									
Freewill Elementary School	47	15	3.7	37.7	6	1:10	8.4	13	1:25
Hop Skip & Jump Preschool	90	15	7.9	30.8	16	2:05	8.5	13	2:15
James A. Beneway High School	29	15	6.0	33.3	11	0:55	8.4	13	1:10
Lake Ontario Child Development	90	15	4.7	42.4	7	1:55	17.5	27	2:20
Magic Years Nursery School	90	15	6.7	44.7	10	1:55	7.7	12	2:10
Marion Central Middle/High School	90	15	2.4	44.4	4	1:50	14.0	21	2:10
Marion Elementary School	90	15	School is outside the EPZ			1:45	13.9	21	2:10
Ontario Elementary School	23	15	6.8	35.1	12	0:50	8.4	13	1:05
Ontario Primary School	18	15	7.1	36.7	12	0:45	8.4	13	1:00
Raggedy Ann & Andy Day Care	90	15	4.2	42.4	6	1:55	17.2	26	2:20

School	Driver Mobilization Time (min)	Loading Time (min)	Dist. To EPZ Bdry (mi)	Average Speed (mph)	Travel Time to EPZ Bdry (min)	ETE (hr:min)	Dist. EPZ Bdry to R.C./R.L. (mi.)	Travel Time from EPZ Bdry to H.S. (min)	ETE to R.C./R.L. (hr:min)
Rhyme Tyme Child Care Center	90	15	7.7	30.8	15	2:00	8.4	13	2:15
The Tot Spot Day Care Center	90	15	7.4	30.6	15	2:00	8.4	13	2:15
Thomas C. Armstrong Middle School	39	15	6.0	25.3	15	1:10	8.4	13	1:25
Wayne Education Center	90	15	3.4	46.0	5	1:50	17.5	27	2:20
Wayne Finger Lake BOCES	90	15	3.4	46.0	5	1:50	17.5	27	2:20
Wayne Technical & Career Center	90	15	3.4	46.0	5	1:50	17.5	27	2:20
Williamson Elementary School	23	15	6.3	45.8	9	0:50	14.1	22	1:10
Williamson Middle School	23	15	6.3	45.8	9	0:50	14.1	22	1:10
Williamson Senior High School	23	15	5.1	45.8	7	0:45	14.1	22	1:10
Maximum for EPZ:						2:20	Maximum:		
Average for EPZ:						1:45	Average:		

Table 8-11. Transit-Dependent Evacuation Time Estimates – Good Weather

Route Number	Bus Number	One-Wave					Distance to R. C. (miles)	Two-Wave						
		Mobilization (min)	Route Length (miles)	Speed (mph)	Route Travel Time (min)	Pickup Time (min)		ETE (hr:min)	Travel Time to R. C. (min)	Unload (min)	Driver Rest (min)	Route Travel Time (min)	Pickup Time (min)	ETE (hr:min)
M-1 Route A	1	90	16.3	19.2	51	30	2:55	10.7	16	5	10	45	30	4:45
M-1 Route A	2	110	16.3	27.1	36	30	3:00	10.7	16	5	10	45	30	4:50
M-1 Route B	1	90	16.7	19.2	52	30	2:55	10.7	16	5	10	45	30	4:45
M-1 Route B	2 & 3	110	16.7	25.1	40	30	3:00	10.7	16	5	10	45	30	4:50
M-2 Route C	1	90	15.6	17.4	54	30	2:55	10.7	16	5	10	44	30	4:45
M-3 Route D	1	90	14.0	15.1	56	30	3:00	10.7	16	5	10	42	30	4:45
M-4 Route E	1	90	12.5	13.3	57	30	3:00	9.4	14	5	10	42	30	4:45
M-4 Route E	2 & 3	110	12.5	18.6	40	30	3:05	9.4	14	5	10	42	30	4:50
M-4 Route F	1	90	14.5	20.6	42	30	2:45	9.4	14	5	10	46	30	4:30
M-4 Route F	2 & 3	110	14.5	21.4	41	30	3:05	9.4	14	5	10	45	30	4:50
M-4 Route G	1	90	12.1	18.9	38	30	2:40	9.4	14	5	10	42	30	4:25
M-4 Route G	2 & 3	110	12.1	17.8	41	30	3:05	9.4	14	5	10	41	30	4:45
M-5 Route H	1	90	12.6	40.7	19	30	2:20	9.4	14	5	10	40	30	4:00
M-5 Route H	2	90	12.6	40.7	19	30	2:20	9.4	14	5	10	40	30	4:00
M-5 Route I	1	90	18.5	42.4	26	30	2:30	9.4	14	5	10	48	30	4:20
M-5 Route I	2	90	18.5	42.4	26	30	2:30	10.7	16	5	10	50	30	4:25
M-6 Route J	1	90	10.1	13.8	44	30	2:45	10.7	16	5	10	38	30	4:25
M-6 Route J	2	90	10.1	13.8	44	30	2:45	10.7	16	5	10	38	30	4:25
M-6 Route K	1	90	13.4	44.4	18	30	2:20	10.7	16	5	10	42	30	4:05
M-6 Route K	2	90	13.4	44.4	18	30	2:20	10.7	16	5	10	42	30	4:05
M-6 Route L	1	90	9.6	16.2	36	30	2:40	10.7	16	5	10	37	30	4:20
M-6 Route L	2	90	9.6	16.2	36	30	2:40	10.7	16	5	10	37	30	4:20
M-7 Route M	1	90	7.1	13.9	31	30	2:35	15.3	23	5	10	42	30	4:30
M-7 Route M	2 & 3	100	7.1	14.6	29	30	2:40	15.3	23	5	10	42	30	4:30
M-7 Route M	4 & 5	110	7.1	17.4	24	30	2:45	15.3	23	5	10	42	30	4:35
M-7 Route N	1	90	9.9	20.0	30	30	2:30	15.3	23	5	10	45	30	4:25
M-7 Route N	2 & 3	100	9.9	21.4	28	30	2:40	15.3	23	5	10	47	30	4:35
M-7 Route N	4 & 5	110	9.9	23.7	25	30	2:50	15.3	23	5	10	47	30	4:45
M-8 Route P	1	90	4.0	8.8	27	30	2:30	10.7	16	5	10	33	30	4:05
M-8 Route Q	1	90	4.4	42.8	6	30	2:10	10.7	16	5	10	33	30	3:45

		One-Wave							Two-Wave								
Route Number	Bus Number	Mobilization (min)	Route Length (miles)	Speed (mph)	Route Travel Time (min)	Pickup Time (min)	ETE (hr:min)	Distance to R. C. (miles)	Travel Time to R. C. (min)	Unload (min)	Driver Rest (min)	Route Travel Time (min)	Pickup Time (min)	ETE (hr:min)			
M-8 Route Q	2	110	4.4	41.6	6	30	2:30	10.7	16	5	10	34	30	4:10			
M-9 Route R	1 & 2	90	7.1	8.8	48	30	2:50	10.7	16	5	10	37	30	4:30			
M-9 Route R	3 & 4	110	7.1	17.4	24	30	2:45	10.7	16	5	10	35	30	4:25			
W-1 Route 1	1	90	18.7	39.6	28	30	2:30	8.2	12	5	10	48	30	4:15			
W-1 Route 1	2	90	18.7	39.6	28	30	2:30	8.2	12	5	10	44	30	4:15			
W-1 Route 2	1	90	16.2	36.1	27	30	2:30	8.4	13	5	10	46	30	4:15			
W-1 Route 2	2	110	16.2	38.5	25	30	2:50	8.4	13	5	10	41	30	4:30			
W-1 Route 3	1	90	14.9	35.8	25	30	2:25	7.7	12	5	10	40	30	4:05			
W-1 Route 3	2	110	14.9	36.7	24	30	2:45	7.7	12	5	10	41	30	4:25			
W-2 Route 1	1	90	11.3	45.4	15	30	2:15	8.4	13	5	10	37	30	3:50			
W-2 Route 1	2	110	11.3	46.0	15	30	2:35	8.4	13	5	10	39	30	4:15			
W-2 Route 2	1	90	16.1	33.9	28	30	2:30	8.4	13	5	10	45	30	4:15			
W-2 Route 2	2	110	16.1	36.8	26	30	2:50	8.4	13	5	10	45	30	4:35			
W-2 Route 3	1	90	16.4	47.0	21	30	2:25	7.7	12	5	10	41	30	4:05			
W-2 Route 3	2	110	16.4	47.3	21	30	2:45	7.7	12	5	10	42	30	4:25			
W-3 Route 1	1	90	15.9	40.9	23	30	2:25	17.5	26	5	10	58	30	4:35			
W-3 Route 2	1	90	7.8	49.4	9	30	2:10	20.6	31	5	10	50	30	4:20			
W-4 Route 1	1	90	6.5	26.4	15	30	2:15	17.2	26	5	10	44	30	4:10			
W-4 Route 2	1	90	10.1	22.0	28	30	2:30	17.2	26	5	10	48	30	4:30			
W-5 Route 1	1	90	8.9	36.7	15	30	2:15	17.2	26	5	10	46	30	4:15			
W-5 Route 2	1	90	6.4	46.8	8	30	2:10	14.5	22	5	10	40	30	4:00			
W-5 Route 3	1	90	7.0	50.4	8	30	2:10	14.5	22	5	10	40	30	4:00			
W-6 Route 1	1	90	7.8	49.4	10	30	2:10	14.5	22	5	10	41	30	4:00			
W-6 Route 2	1	90	6.5	46.0	8	30	2:10	14.1	21	5	10	39	30	4:00			
W-6 Route 3	1	90	10.0	45.0	13	30	2:15	14.1	21	5	10	43	30	4:05			
W-6 Route 4	1	90	7.7	43.8	11	30	2:15	14.2	21	5	10	41	30	4:05			
W-7 Route 1	1	90	13.3	32.5	25	30	2:25	8.4	13	5	10	38	30	4:05			
W-7 Route 2	1	90	10.8	43.2	15	30	2:15	8.4	13	5	10	35	30	3:50			
W-7 Route 3	1	90	9.9	45.7	13	30	2:15	8.4	13	5	10	34	30	3:50			
		Maximum ETE:							Maximum ETE:							4:50	
		Average ETE:							Average ETE:							4:20	

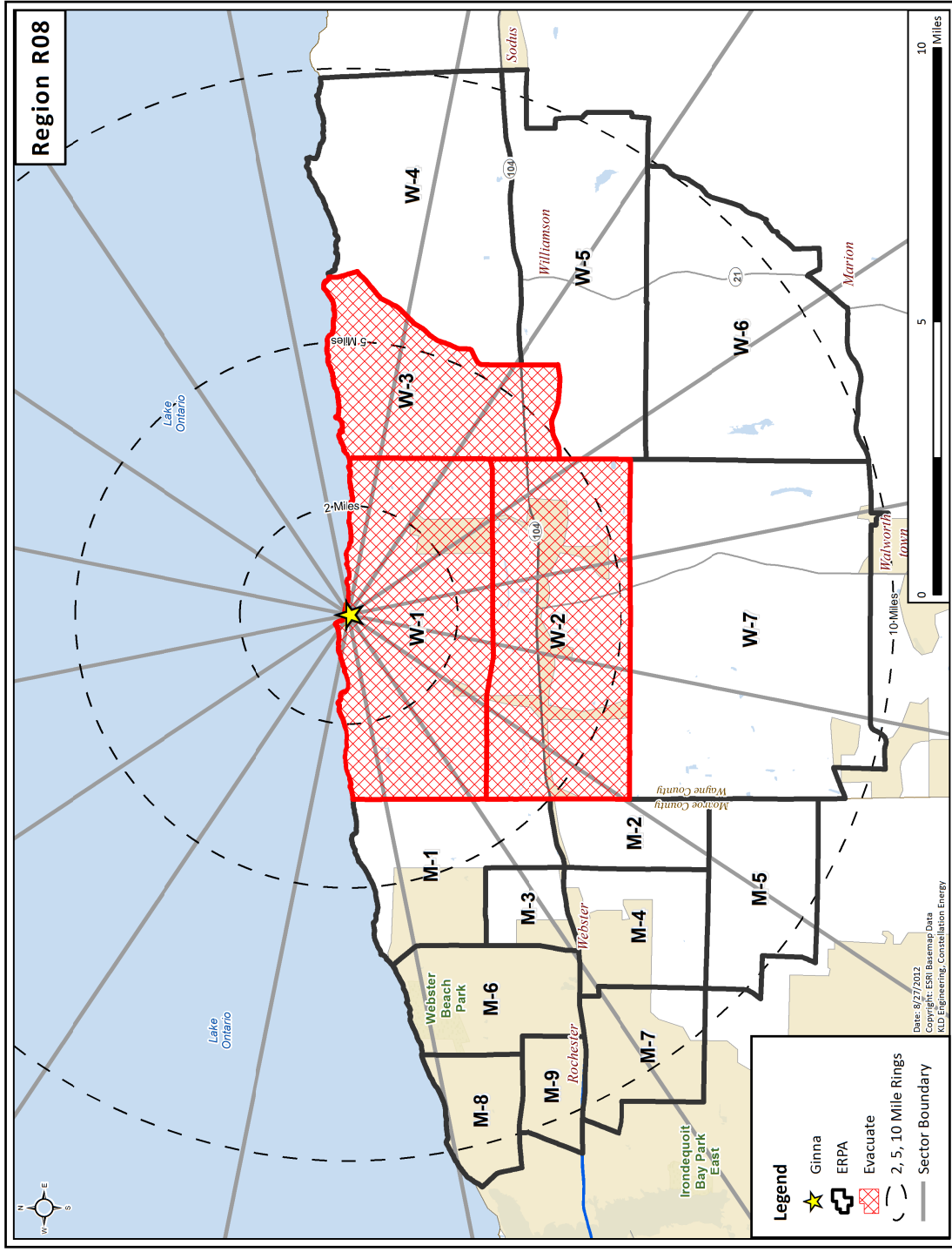


Figure H-8. Region R08

1 INTRODUCTION

This report describes the analyses undertaken and the results obtained by a study to develop Evacuation Time Estimates (ETE) for the R.E. Ginna Nuclear Power Plant (Ginna), located in Ontario, Wayne County, New York. ETE provide State and local governments with site-specific information needed for Protective Action decision-making.

In the performance of this effort, guidance is provided by documents published by Federal Governmental agencies. Most important of these are:

- Criteria for Development of Evacuation Time Estimate Studies, NUREG/CR-7002, November 2011.
- Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants, NUREG 0654/FEMA REP 1, Rev. 1, November 1980.
- Analysis of Techniques for Estimating Evacuation Times for Emergency Planning Zones, NUREG/CR 1745, November 1980.
- Development of Evacuation Time Estimates for Nuclear Power Plants, NUREG/CR-6863, January 2005.

The work effort reported herein was supported and guided by local stakeholders who contributed suggestions, critiques, and the local knowledge base required. Table 1-1 presents a summary of stakeholders and interactions.

Table 1-1. Stakeholder Interaction

Stakeholder	Nature of Stakeholder Interaction
CENG	Meetings to define data requirements and set up contacts with local government agencies
Monroe and Wayne County Emergency Management Departments	Obtain emergency plans and special facility data
New York State Office of Emergency Management	Obtain emergency and traffic management plans
Local and State Police Agencies	Obtain emergency and traffic management plans

1.1 Overview of the ETE Process

The following outline presents a brief description of the work effort in chronological sequence:

1. Information Gathering:
 - a. Defined the scope of work in discussions with representatives from CENG.
 - b. Attended meetings with emergency planners from Monroe County EMD and Wayne County EMD to identify issues to be addressed and resources available.

- c. Conducted a detailed field survey of the highway system and of area traffic conditions within the Emergency Planning Zone (EPZ) and Shadow Region.
 - d. Obtained demographic data from the 2010 census, Monroe County EMD and Wayne County EMD.
 - e. Conducted a random sample telephone survey of EPZ residents.
 - f. Conducted a data collection effort to identify and describe schools, special facilities, major employers, transportation providers, and other important information.
2. Estimated distributions of Trip Generation times representing the time required by various population groups (permanent residents, employees, and transients) to prepare (mobilize) for the evacuation trip. These estimates are primarily based upon the random sample telephone survey.
3. Defined Evacuation Scenarios. These scenarios reflect the variation in demand, in trip generation distribution and in highway capacities, associated with different seasons, day of week, time of day and weather conditions.
4. Reviewed the existing traffic management plan to be implemented by local and state police in the event of an incident at the plant. Traffic control is applied at specified Traffic Control Points (TCP) located within the EPZ.
5. Used existing Emergency Response Planning Areas (ERPAs) to define Evacuation Regions. The EPZ is partitioned into 16 ERPAs along jurisdictional and geographic boundaries. "Regions" are groups of contiguous ERPAs for which ETE are calculated. The configurations of these Regions reflect wind direction and the radial extent of the impacted area. Each Region, other than those that approximate circular areas, approximates a "key-hole section" within the EPZ as recommended by NUREG/CR-7002.
6. Estimated demand for transit services for persons at "Special Facilities" and for transit-dependent persons at home.
7. Prepared the input streams for the DYNEV II system.
 - a. Estimated the evacuation traffic demand, based on the available information derived from Census data, and from data provided by local and state agencies, CENG and from the telephone survey.
 - b. Applied the procedures specified in the 2010 Highway Capacity Manual (HCM¹) to the data acquired during the field survey, to estimate the capacity of all highway segments comprising the evacuation routes.
 - c. Developed the link-node representation of the evacuation network, which is used as the basis for the computer analysis that calculates the ETE.

¹ Highway Capacity Manual (HCM 2010), Transportation Research Board, National Research Council, 2010.

- d. Calculated the evacuating traffic demand for each Region and for each Scenario.
 - e. Specified selected candidate destinations for each “origin” (location of each “source” where evacuation trips are generated over the mobilization time) to support evacuation travel consistent with outbound movement relative to the location of the Ginna Plant.
- 8. Executed the DYNEV II model to determine optimal evacuation routing and compute ETE for all residents, transients and employees (“general population”) with access to private vehicles. Generated a complete set of ETE for all specified Regions and Scenarios.
 - 9. Documented ETE in formats in accordance with NUREG/CR-7002.
 - 10. Calculated the ETE for all transit activities including those for special facilities (schools, medical facilities, etc.), for the transit-dependent population and for homebound special needs population.

1.2 The R.E. Ginna Nuclear Power Plant

Ginna is located along the shores of Lake Ontario in Ontario, Wayne County, New York. The site is approximately 25 miles northeast of Rochester, NY. The Emergency Planning Zone (EPZ) consists of parts of Wayne and Monroe Counties in New York. Figure 1-1 displays the area surrounding Ginna. This map identifies the communities in the area and the major roads.

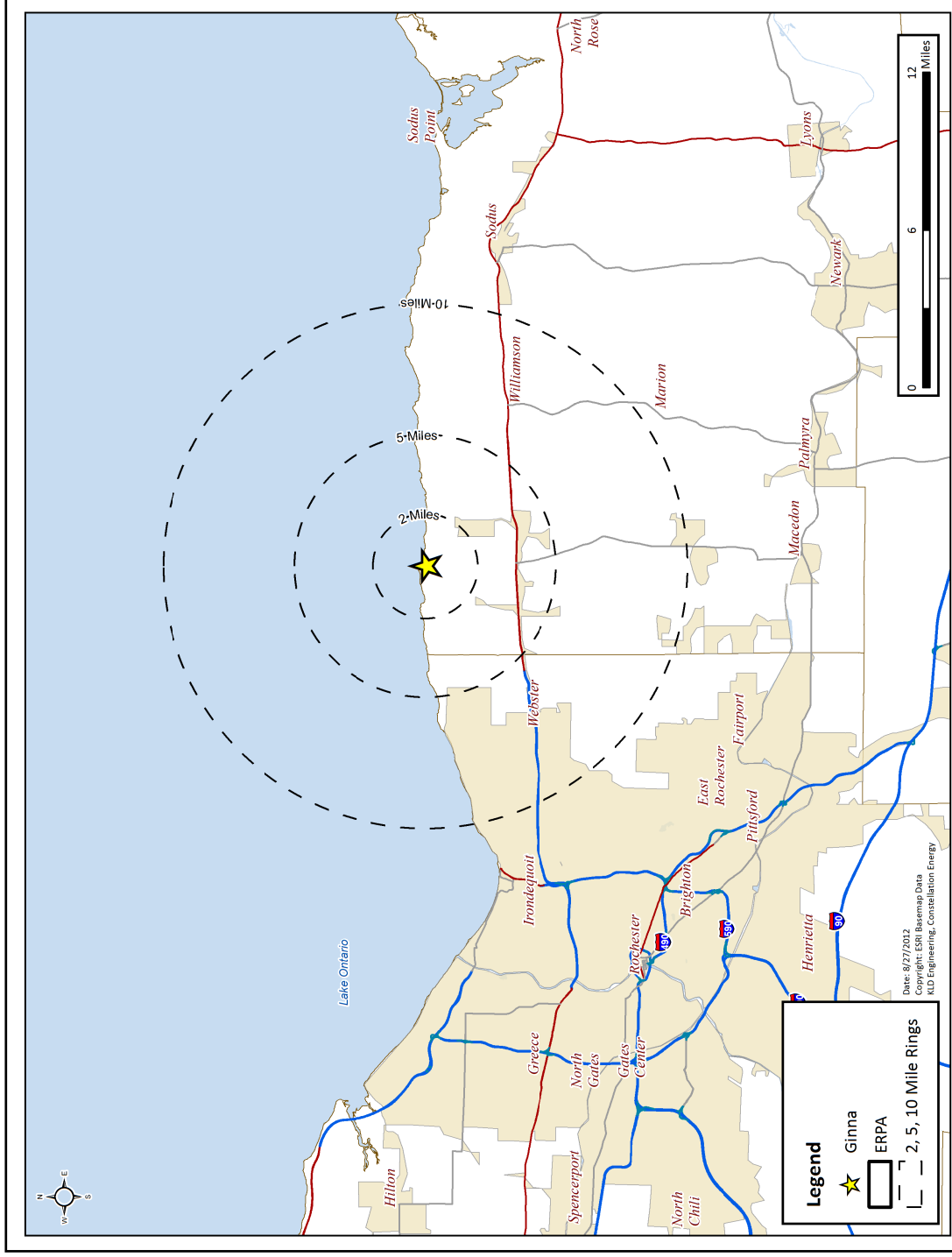


Figure 1-1. R.E. Ginna Nuclear Power Plant Location

1.3 Preliminary Activities

These activities are described below.

Field Surveys of the Highway Network

KLD personnel drove the entire highway system within the EPZ and the Shadow Region which consists of the area between the EPZ boundary and approximately 15 miles radially from the plant. The characteristics of each section of highway were recorded. These characteristics are shown in Table 1-2:

Table 1-2. Highway Characteristics

- | | |
|---|---|
| • Number of lanes | • Posted speed |
| • Lane width | • Actual free speed |
| • Shoulder type & width | • Abutting land use |
| • Interchange geometries | • Control devices |
| • Lane channelization & queuing capacity (including turn bays/lanes) | • Intersection configuration (including roundabouts where applicable) |
| • Geometrics: curves, grades (>4%) | • Traffic signal type |
| • Unusual characteristics: Narrow bridges, sharp curves, poor pavement, flood warning signs, inadequate delineations, toll booths, etc. | |

Video and audio recording equipment were used to capture a permanent record of the highway infrastructure. No attempt was made to meticulously measure such attributes as lane width and shoulder width; estimates of these measures based on visual observation and recorded images were considered appropriate for the purpose of estimating the capacity of highway sections. For example, Exhibit 15-7 in the HCM indicates that a reduction in lane width from 12 feet (the “base” value) to 10 feet can reduce free flow speed (FFS) by 1.1 mph – not a material difference – for two-lane highways. Exhibit 15-30 in the HCM shows little sensitivity for the estimates of Service Volumes at Level of Service (LOS) E (near capacity), with respect to FFS, for two-lane highways.

The data from the audio and video recordings were used to create detailed geographical information systems (GIS) shapefiles and databases of the roadway characteristics and of the traffic control devices observed during the road survey; this information was referenced while preparing the input stream for the DYNEV II System.

As documented on page 15-5 of the HCM 2010, the capacity of a two-lane highway is 1700 passenger cars per hour in one direction. For freeway sections, a value of 2250 vehicles per hour per lane is assigned, as per Exhibit 11-17 of the HCM 2010. The road survey has identified several segments which are characterized by adverse geometrics on two-lane highways which are reflected in reduced values for both capacity and speed. These estimates are consistent with the service volumes for LOS E presented in HCM Exhibit 15-30. These links may be

identified by reviewing Appendix K. Link capacity is an input to DYNEV II which computes the ETE. Further discussion of roadway capacity is provided in Section 4 of this report.

Traffic signals are either pre-timed (signal timings are fixed over time and do not change with the traffic volume on competing approaches), or are actuated (signal timings vary over time based on the changing traffic volumes on competing approaches). Actuated signals require detectors to provide the traffic data used by the signal controller to adjust the signal timings. These detectors are typically magnetic loops in the roadway, or video cameras mounted on the signal masts and pointed toward the intersection approaches. If detectors were observed on the approaches to a signalized intersection during the road survey, detailed signal timings were not collected as the timings vary with traffic volume. TCPs at locations which have control devices are represented as actuated signals in the DYNEV II system.

If no detectors were observed, the signal control at the intersection was considered pre-timed, and detailed signal timings were gathered for several signal cycles. These signal timings were input to the DYNEV II system used to compute ETE, as per NUREG/CR-7002 guidance.

Figure 1-2 presents the link-node analysis network that was constructed to model the evacuation roadway network in the EPZ and Shadow Region. The directional arrows on the links and the node numbers have been removed from Figure 1-2 to clarify the figure. The detailed figures provided in Appendix K depict the analysis network with directional arrows shown and node numbers provided. The observations made during the field survey were used to calibrate the analysis network.

Telephone Survey

A telephone survey was undertaken to gather information needed for the evacuation study. Appendix F presents the survey instrument, the procedures used and tabulations of data compiled from the survey returns.

These data were utilized to develop estimates of vehicle occupancy to estimate the number of evacuating vehicles during an evacuation and to estimate elements of the mobilization process. This database was also referenced to estimate the number of transit-dependent residents.

Computing the Evacuation Time Estimates

The overall study procedure is outlined in Appendix D. Demographic data were obtained from several sources, as detailed later in this report. These data were analyzed and converted into vehicle demand data. The vehicle demand was loaded onto appropriate "source" links of the analysis network using GIS mapping software. The DYNEV II system was then used to compute ETE for all Regions and Scenarios.

Analytical Tools

The DYNEV II System that was employed for this study is comprised of several integrated computer models. One of these is the DYNEV (DYnamic Network Evacuation) macroscopic simulation model, a new version of the IDYNEV model that was developed by KLD under contract with the Federal Emergency Management Agency (FEMA).

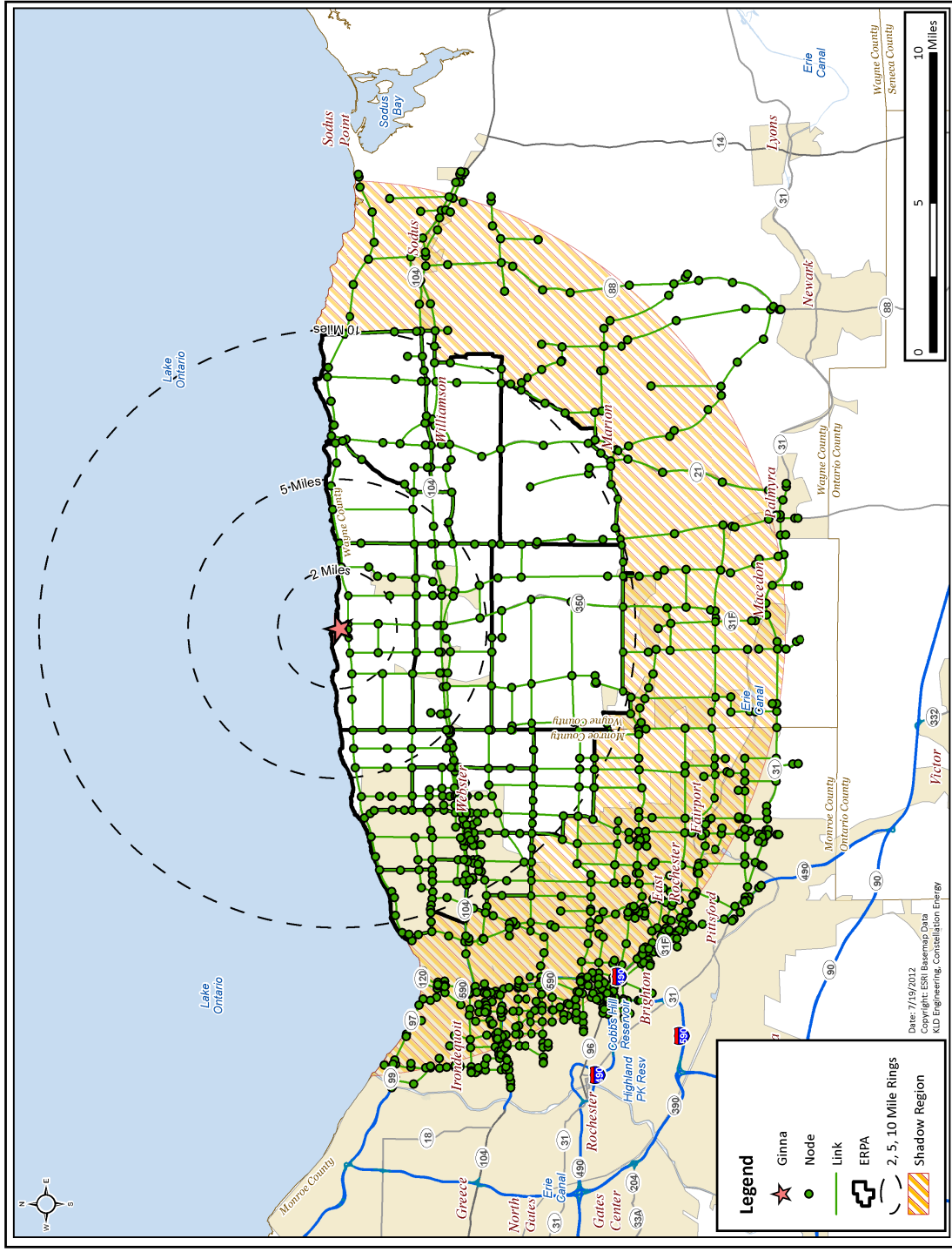


Figure 1-2. Ginna Link-Node Analysis Network

DYNEV II consists of four sub-models:

- A macroscopic traffic simulation model (for details, see Appendix C).
- A Trip Distribution (TD), model that assigns a set of candidate destination (D) nodes for each “origin” (O) located within the analysis network, where evacuation trips are “generated” over time. This establishes a set of O-D tables.
- A Dynamic Traffic Assignment (DTA), model which assigns trips to paths of travel (routes) which satisfy the O-D tables, over time. The TD and DTA models are integrated to form the DTRAD (Dynamic Traffic Assignment and Distribution) model, as described in Appendix B.
- A Myopic Traffic Diversion model which diverts traffic to avoid intense, local congestion, if possible.

Another software product developed by KLD, named UNITES (UNified Transportation Engineering System) was used to expedite data entry and to automate the production of output tables.

The dynamics of traffic flow over the network are graphically animated using the software product, EVAN (EVacuation ANimator), developed by KLD. EVAN is GIS based, and displays statistics such as LOS, vehicles discharged, average speed, and percent of vehicles evacuated, output by the DYNEV II System. The use of a GIS framework enables the user to zoom in on areas of congestion and query road name, town name and other geographical information.

The procedure for applying the DYNEV II System within the framework of developing ETE is outlined in Appendix D. Appendix A is a glossary of terms.

For the reader interested in an evaluation of the original model, I-DYNEV, the following references are suggested:

- NUREG/CR-4873 – Benchmark Study of the I-DYNEV Evacuation Time Estimate Computer Code
- NUREG/CR-4874 – The Sensitivity of Evacuation Time Estimates to Changes in Input Parameters for the I-DYNEV Computer Code

The evacuation analysis procedures are based upon the need to:

- Route traffic along paths of travel that will expedite their travel from their respective points of origin to points outside the EPZ.
- Restrict movement toward the plant to the extent practicable, and disperse traffic demand so as to avoid focusing demand on a limited number of highways.
- Move traffic in directions that are generally outbound, relative to the Ginna location.

DYNEV II provides a detailed description of traffic operations on the evacuation network. This description enables the analyst to identify bottlenecks and to develop countermeasures that are designed to represent the behavioral responses of evacuees. The effects of these countermeasures may then be tested with the model.

1.4 Comparison with Prior ETE Study

Table 1-3 presents a comparison of the present ETE study with the 2004 study. The major factors contributing to the differences between the ETE values obtained in this study and those of the previous study can be summarized as follows:

- Voluntary and shadow evacuations are considered at a different percentage.
- The highway representation is far more detailed, providing evacuating vehicles with more route choices.
- Traffic control points and actuated signals are incorporated into the simulation model.

Table 1-3. ETE Study Comparisons

Topic	Previous ETE Study	Current ETE Study
Resident Population Basis	2000 Census, extrapolated to 2003. Population = 58,614	ArcGIS Software using 2010 US Census blocks; area ratio method used. Population = 63,949
Resident Population Vehicle Occupancy	Based on residential telephone survey adapted from Nine Mile Point, 1.25 evacuating vehicles per household	Based on 2012 telephone survey: 1.33 evacuating vehicles per household, 1.92 persons per vehicle.
Employee Population	Employment journey to work data identified the proportion of employees who commute into the EPZ relative to the total number of employees. These proportions were applied on an ERPA by ERPA basis to total employment information for the year 2000 from NYS Dept. of Labor. Employees = 13,076	Employee estimates based on information provided about major employers in EPZ. 1.08 employees per vehicle based on telephone survey results. Employees = 8,417
Transit-Dependent Population	Defined as households with 0 vehicles + households with 1 and 2 vehicles with commuters who do not return home. Household size varies by county and number of vehicles in household. Total of 3,067 people without access to a vehicle, requiring 104 bus runs.	Estimates based upon U.S. Census data and the results of the telephone survey. A total of 2,046 people who do not have access to a vehicle, requiring 69 buses to evacuate. An additional 222 homebound special needs persons needed special transportation to evacuate (113 required a bus, 47 required a wheelchair-accessible vehicle, and 62 required an ambulance).

Topic	Previous ETE Study	Current ETE Study
Transient Population	Based on telephone calls to individual facilities Transients = 2,103	Transient estimates based upon information provided about transient attractions in EPZ. Transients = 2,102
Special Facilities Population	Special facility population based on information provided by each county within the EPZ. Special Facility Population = 68 Vehicles originating at special facilities =18	Special facility population based on information provided by each county within the EPZ. Current census = 492 Vans Required = 32 Wheelchair Bus Required = 16 Ambulances Required = 2
School Population	School population based on information provided by each county within the EPZ. School enrollment = 15,430 Vehicles originating at schools = 364	School population based on information provided by each county within the EPZ. School enrollment = 15,033 Buses required = 284
Voluntary evacuation from within EPZ in areas outside region to be evacuated	50 percent within circle. 35 percent in annular ring between the circle and EPZ boundary.	20 percent of the population within the EPZ, but not within the Evacuation Region (see Figure 2-1)
Shadow Evacuation	Population in areas west and southwest of the EPZ boundary in Monroe County within the bounding state highways in the west and state highway 31 in the south was considered. Nominally, 30 percent of this population will move away from the EPZ.	20% of people outside of the EPZ within the Shadow Region (see Figure 7-2)
Network Size	1,148 Links; 444 Nodes	1,539 links; 1,049 nodes
Roadway Geometric Data	Field surveys conducted in 2002 Road capacities based on 2000 HCM	Field surveys conducted in February 2012. Roads and intersections were video archived. Road capacities based on 2010 HCM.
School Evacuation	Direct evacuation	Direct evacuation to designated Reception Center/Receiving Location.
Ridesharing	50 percent of transit-dependent persons will evacuate with a neighbor or friend.	50 percent of transit-dependent persons will evacuate with a neighbor or friend.

Topic	Previous ETE Study	Current ETE Study
Trip Generation for Evacuation	<p>Based on residential telephone survey of specific pre-trip mobilization activities:</p> <p>Residents with commuters returning leave between 30 and 150 minutes</p> <p>Residents without commuters returning leave between 15 and 120 minutes</p> <p>Employees and transients leave between 15 and 90 minutes.</p> <p>All times measured from the Advisory to Evacuate for all above.</p> <p>Additional time to clear snow added to residential evacuation times for snow scenarios.</p> <p>Xerox facility in Webster is notified before the Advisory to Evacuate is issued the general public. Xerox begins mobilizing 30 minutes before general public.</p>	<p>Based on residential telephone survey of specific pre-trip mobilization activities:</p> <p>Residents with commuters returning leave between 30 and 225 minutes.</p> <p>Residents without commuters returning leave between 15 and 165 minutes.</p> <p>Employees and transients leave between 15 and 105 minutes.</p> <p>All times measured from the Advisory to Evacuate.</p> <p>Additional time to clear snow added to residential mobilization times for snow scenarios.</p> <p>ATE virtually coincident with the siren alert for all population groups, as per NUREG/CR-7002</p>
Weather	Clear or Rain or Snow	Good, Rain, or Snow. The capacity and free flow speed of all links in the network are reduced by 10% in the event of rain and 20% for snow.
Modeling	IDYNEV System: TRAD and PC DYNEV	DYNEV II System – Version 4.0.8.0
Special Events	None considered	<p>Webster Father's Day Soccer Tournament</p> <p>Special Event Population = 2,500 additional transients</p>
Evacuation Cases	35 Regions and 12 Scenarios producing 420 unique cases.	25 Regions (central sector wind direction and each adjacent sector technique used) and 14 Scenarios producing 350 unique cases.
Evacuation Time Estimates Reporting	Reported for 50, 90, 95, and 100 percentile population. Results presented by Region	ETE reported for 90 th and 100 th percentile population. Results presented by Region and Scenario.

Topic	Previous ETE Study	Current ETE Study
Evacuation Time Estimates for the entire EPZ, 90th percentile	<p>Winter Weekday Midday, Good Weather: 4:55</p> <p>Summer Weekend, Midday, Good Weather: 3:05</p>	<p>Winter Weekday Midday, Good Weather: 2:15</p> <p>Summer Weekend, Midday, Good Weather: 1:55</p>

2 STUDY ESTIMATES AND ASSUMPTIONS

This section presents the estimates and assumptions utilized in the development of the evacuation time estimates.

2.1 Data Estimates

1. Population estimates are based upon Census 2010 data.
2. Estimates of employees who reside outside the EPZ and commute to work within the EPZ are based upon data provided by the county emergency management departments.
3. Population estimates at special facilities are based on provided by the county emergency management departments.
4. Roadway capacity estimates are based on field surveys and the application of the Highway Capacity Manual 2010.
5. Population mobilization times are based on a statistical analysis of data acquired from a random sample telephone survey of EPZ residents (see Section 5 and Appendix F).
6. The relationship between resident population and evacuating vehicles is developed from the telephone survey. Average values of 2.56 persons per household and 1.33 evacuating vehicles per household are used. The relationship between persons and vehicles for employees and transients is as follows:
 - a. Employees: 1.08 employees per vehicle (telephone survey results) for all major employers.
 - b. Parks: Vehicle occupancy varies based upon data gathered from local transient facilities.
 - c. Special Events: Assumed transients attending the Webster Father's Day Soccer Tournament show travel as families/households in a single vehicle, and used the average household size of 2.56 persons to estimate the number of vehicles.

2.2 Study Methodological Assumptions

1. ETE are presented for the evacuation of the 90th and 100th percentiles of population for each Region and for each Scenario. The percentile ETE is defined as the elapsed time from the Advisory to Evacuate issued to a specific Region of the EPZ, to the time that Region is clear of the indicated percentile of evacuees. A Region is defined as a group of ERPAs that is issued an Advisory to Evacuate. A scenario is a combination of circumstances, including time of day, day of week, season, and weather conditions.
2. The ETE are computed and presented in tabular format and graphically, in a format compliant with NUREG/CR-7002.
3. Evacuation movements (paths of travel) are generally outbound relative to the plant to the extent permitted by the highway network. All major evacuation routes are used in the analysis.
4. Regions are defined by the underlying “keyhole” or circular configurations as specified in Section 1.4 of NUREG/CR-7002. These Regions, as defined, display irregular boundaries reflecting the geography of the ERPAs included within these underlying configurations.
5. As indicated in Figure 2-2 of NUREG/CR-7002, 100% of people within the impacted “keyhole” evacuate. 20% of those people within the EPZ, not within the impacted keyhole, will voluntarily evacuate. 20% of those people within the Shadow Region will voluntarily evacuate. See Figure 2-1 for a graphical representation of these evacuation percentages. Sensitivity studies explore the effect on ETE of increasing the percentage of voluntary evacuees in the Shadow Region (see Appendix M).
6. A total of 14 “Scenarios” representing different temporal variations (season, time of day, day of week) and weather conditions are considered. These Scenarios are outlined in Table 2-1.
7. Scenario 14 considers the closure of a State Route 404 just south of the intersection with Plank Road.
8. The models of the I-DYNEV System were recognized as state of the art by the Atomic Safety & Licensing Board (ASLB) in past hearings. (Sources: Atomic Safety & Licensing Board Hearings on Seabrook and Shoreham; Urbanik¹). The models have continuously been refined and extended since those hearings and were independently validated by a consultant retained by the NRC. The new DYNEV II model incorporates the latest technology in traffic simulation and in dynamic traffic assignment.

¹ Urbanik, T., et. al. Benchmark Study of the I-DYNEV Evacuation Time Estimate Computer Code, NUREG/CR-4873, Nuclear Regulatory Commission, June, 1988.

Table 2-1. Evacuation Scenario Definitions

Scenario	Season ²	Day of Week	Time of Day	Weather	Special
1	Summer	Midweek	Midday	Good	None
2	Summer	Midweek	Midday	Rain	None
3	Summer	Weekend	Midday	Good	None
4	Summer	Weekend	Midday	Rain	None
5	Summer	Midweek, Weekend	Evening	Good	None
6	Winter	Midweek	Midday	Good	None
7	Winter	Midweek	Midday	Rain	None
8	Winter	Midweek	Midday	Snow	None
9	Winter	Weekend	Midday	Good	None
10	Winter	Weekend	Midday	Rain	None
11	Winter	Weekend	Midday	Snow	None
12	Winter	Midweek, Weekend	Evening	Good	None
13	Summer	Weekend	Midday	Good	Webster Father's Day Soccer Tournament
14	Summer	Midweek	Midday	Good	Roadway Impact – Lane Closure on SR 104 WB

² Winter assumes that school is in session (also applies to spring and autumn). Summer assumes that school is not in session.

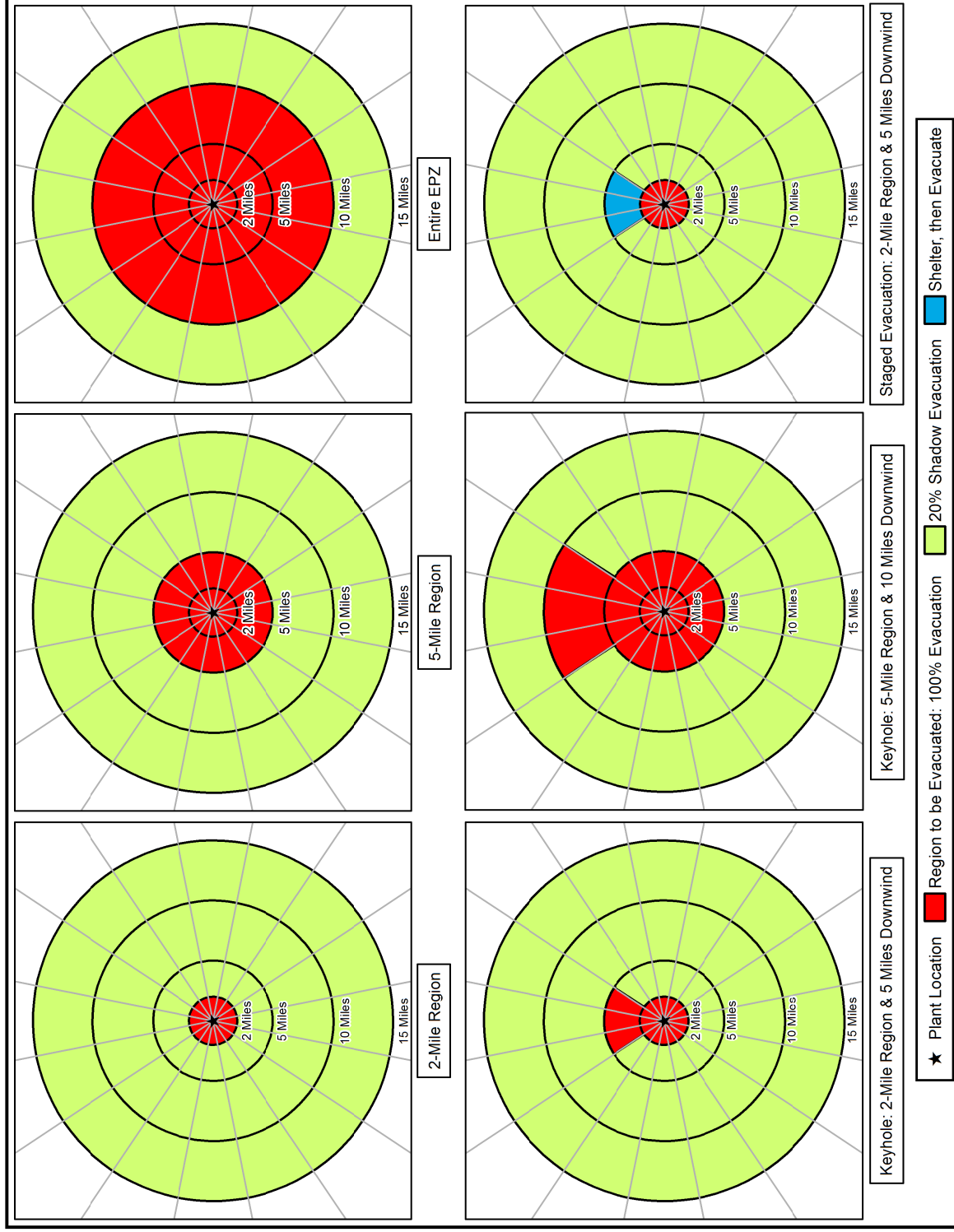


Figure 2-1. Voluntary Evacuation Methodology

2.3 Study Assumptions

1. The Planning Basis Assumption for the calculation of ETE is a rapidly escalating accident that requires evacuation, and includes the following:
 - a. Advisory to Evacuate is announced coincident with the siren notification.
 - b. Mobilization of the general population will commence within 15 minutes after siren notification.
 - c. ETE are measured relative to the Advisory to Evacuate.
2. It is assumed that everyone within the group of ERPAs forming a Region that is issued an Advisory to Evacuate will, in fact, respond and evacuate in general accord with the planned routes.
3. 65 percent of the households in the EPZ have at least 1 commuter; 34 percent of those households with commuters will await the return of a commuter before beginning their evacuation trip, based on the telephone survey results. Therefore 22 percent ($65\% \times 34\% = 22\%$) of EPZ households will await the return of a commuter, prior to beginning their evacuation trip.
4. The ETE will also include consideration of “through” (External-External) trips during the time that such traffic is permitted to enter the evacuated Region. “Normal” traffic flow is assumed to be present within the EPZ at the start of the emergency.
5. Access Control Points (ACP) will be staffed within approximately 120 minutes following the siren notifications, to divert traffic attempting to enter the EPZ. Earlier activation of ACP locations could delay returning commuters. It is assumed that no through traffic will enter the EPZ after this 120 minute time period.
6. Traffic Control Points (TCP) within the EPZ will be staffed over time, beginning at the Advisory to Evacuate. Their number and location will depend on the Region to be evacuated and resources available. The objectives of these TCP are:
 - a. Facilitate the movements of all (mostly evacuating) vehicles at the location.
 - b. Discourage inadvertent vehicle movements towards the plant.
 - c. Provide assurance and guidance to any traveler who is unsure of the appropriate actions or routing.
 - d. Act as local surveillance and communications center.
 - e. Provide information to the emergency operations center (EOC) as needed, based on direct observation or on information provided by travelers.

In calculating ETE, it is assumed that evacuees will drive safely, travel in directions identified in the plan, and obey all control devices and traffic guides.

7. Buses will be used to transport those without access to private vehicles:
 - a. If schools are in session, transport (buses) will evacuate students directly to the designated receiving location.
 - b. It is assumed parents will pick up children at day care centers prior to evacuation.
 - c. Buses, wheelchair vans and ambulances will evacuate patients at medical facilities and at any senior facilities within the EPZ, as needed.
 - d. Transit-dependent general population will be evacuated to Reception Centers.
 - e. Schoolchildren, if school is in session, are given priority in assigning transit vehicles.
 - f. Bus mobilization time is considered in ETE calculations.
 - g. Analysis of the number of required round-trips (“waves”) of evacuating transit vehicles is presented.
 - h. Transport of transit-dependent evacuees from reception centers to congregate care centers is not considered in this study.
8. Provisions are made for evacuating the transit-dependent portion of the general population to reception centers by bus, based on the assumption that some of these people will ride-share with family, neighbors, and friends, thus reducing the demand for buses. We assume that the percentage of people who rideshare is 50 percent. This assumption is based upon reported experience for other emergencies³, and on guidance in Section 2.2 of NUREG/CR-7002.
9. Two types of adverse weather scenarios are considered. Rain may occur for either winter or summer scenarios; snow occurs in winter scenarios only. It is assumed that the rain or snow begins earlier or at about the same time the evacuation advisory is issued. No weather-related reduction in the number of transients who may be present in the EPZ is assumed. It is assumed that roads are passable and that the appropriate agencies are plowing the roads as they would normally when snowing.

Adverse weather scenarios affect roadway capacity and the free flow highway speeds. The factors applied for the ETE study are based on recent research on the effects of weather on roadway operations⁴; the factors are shown in Table 2-2.

³ Institute for Environmental Studies, University of Toronto, THE MISSISSAUGA EVACUATION FINAL REPORT, June 1981. The report indicates that 6,600 people of a transit-dependent population of 8,600 people shared rides with other residents; a ride share rate of 76% (Page 5-10).

⁴ Agarwal, M. et. Al. Impacts of Weather on Urban Freeway Traffic Flow Characteristics and Facility Capacity, Proceedings of the 2005 Mid-Continent Transportation Research Symposium, August, 2005. The results of this paper are included as Exhibit 10-15 in the HCM 2010.

10. School buses used to transport students are assumed to transport 70 students per bus for elementary schools and 50 students per bus for middle and high schools, based on discussions with county offices of emergency management. Transit buses used to transport the transit-dependent general population are assumed to transport 30 people per bus.

Table 2-2. Model Adjustment for Adverse Weather

Scenario	Highway Capacity*	Free Flow Speed*	Mobilization Time for General Population
Rain	90%	90%	No Effect
Snow	80%	80%	Clear driveway before leaving home (See Figure F-13)
*Adverse weather capacity and speed values are given as a percentage of good weather conditions. Roads are assumed to be passable.			

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 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 2010 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 Ginna 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 Ginna EPZ is subdivided into 16 ERPAs. The EPZ is shown in Figure 3-1.

3.1 Permanent Residents

The primary source for estimating permanent population is the latest U.S. Census data. The average household size (2.56 persons/household – See Figure F-1) and the number of evacuating vehicles per household (1.33 vehicles/household – See Figure F-8) were adapted from the telephone survey results.

Population estimates are based upon Census 2010 data. The estimates are created by cutting the census block polygons by the ERPA and EPZ boundaries. A ratio of the original area of each census block and the updated area (after cutting) is multiplied by the total block population to estimate what the population is within the EPZ. This methodology assumes that the population is evenly distributed across a census block. Table 3-1 provides the permanent resident population within the EPZ, by ERPA based on this methodology.

The year 2010 permanent resident population is divided by the average household size and then multiplied by the average number of evacuating vehicles per household in order to estimate number of vehicles. Permanent resident population and vehicle estimates are presented in Table 3-2. Figure 3-2 and Figure 3-3 present the permanent resident population and permanent resident vehicle estimates by sector and distance from the Ginna Plant. This “rose” was constructed using GIS software.

It can be argued that this estimate of permanent residents overstates, somewhat, the number of evacuating vehicles, especially during the summer. It is certainly reasonable to assert that some portion of the population would be on vacation during the summer and would travel elsewhere. A rough estimate of this reduction can be obtained as follows:

- Assume 50 percent of all households vacation for a two-week period over the summer.
- Assume these vacations, in aggregate, are uniformly dispersed over 10 weeks, i.e. 10 percent of the population is on vacation during each two-week interval.
- Assume half of these vacationers leave the area.

On this basis, the permanent resident population would be reduced by 5 percent in the summer and by a lesser amount in the off-season. Given the uncertainty in this estimate, we elected to apply no reductions in permanent resident population for the summer scenarios to account for residents who may be out of the area.

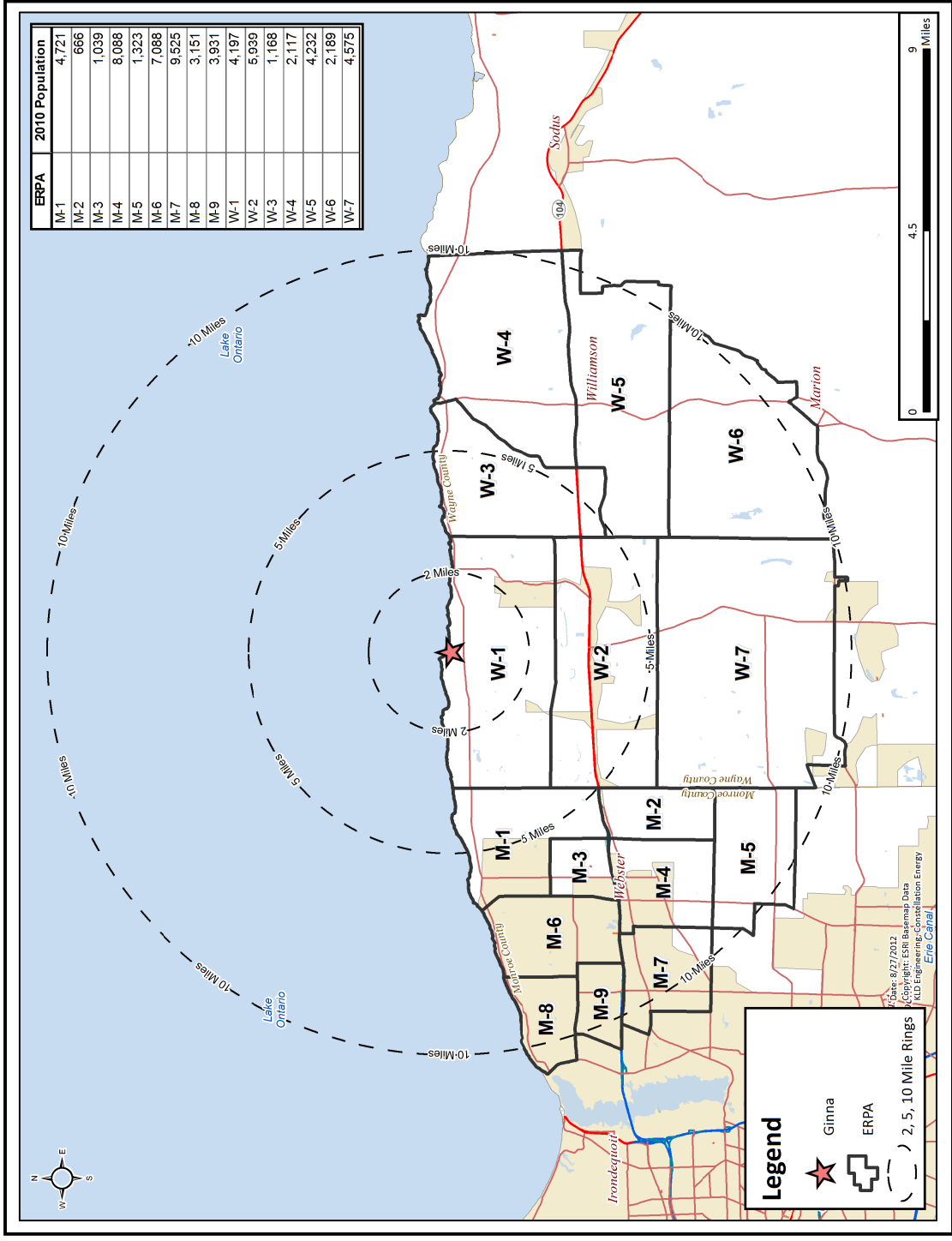


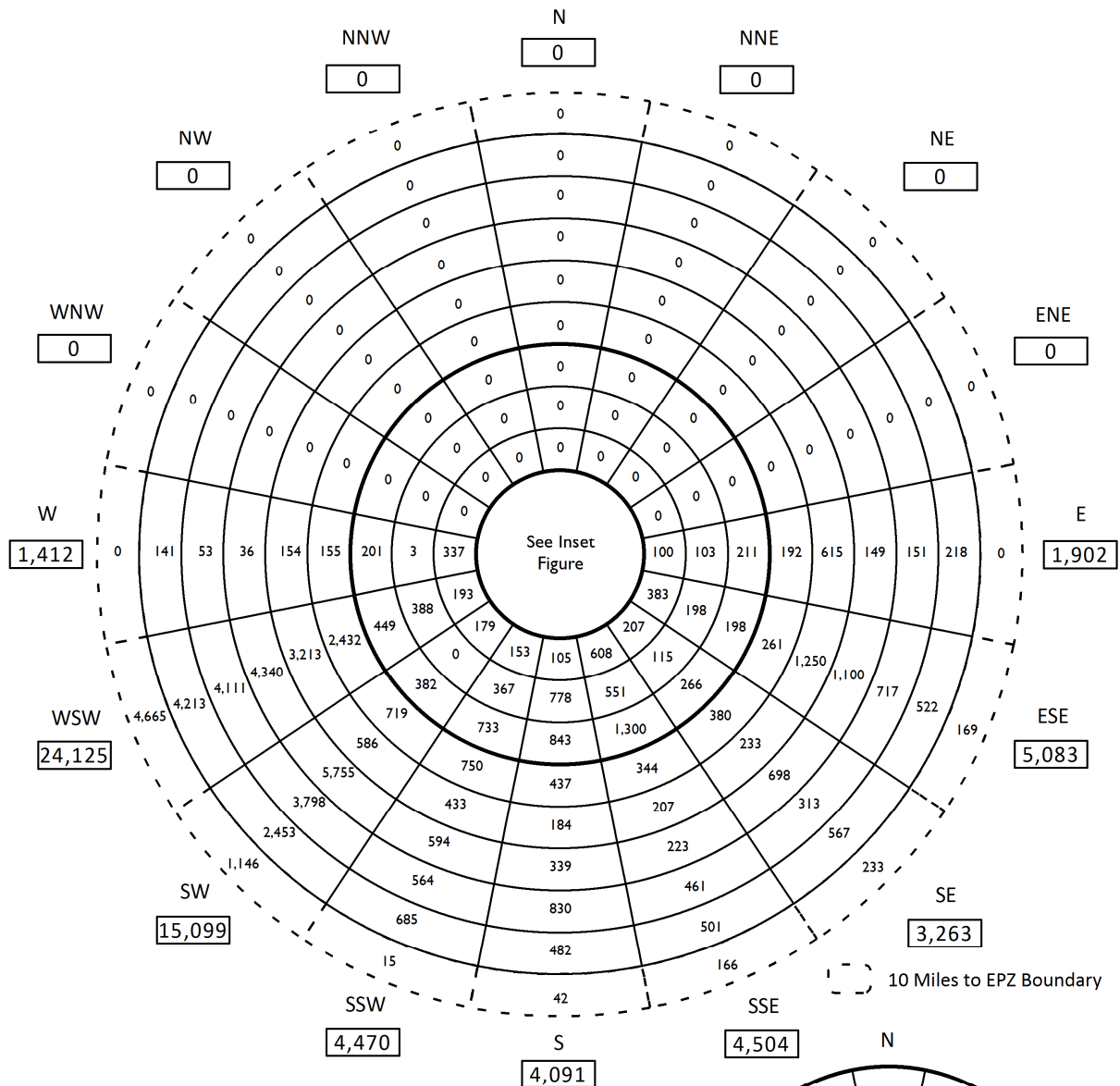
Figure 3-1. R.E. Ginna Nuclear Power Plant EPZ

Table 3-1. EPZ Permanent Resident Population

ERPA	2000 Population	2010 Population
M-1	3,938	4,721
M-2	477	666
M-3	355	1,039
M-4	6,903	8,088
M-5	1,311	1,323
M-6	6,831	7,088
M-7	7,556	9,525
M-8	3,074	3,151
M-9	3,896	3,931
W-1	3,817	4,197
W-2	5,951	5,939
W-3	1,064	1,168
W-4	2,191	2,117
W-5	3,916	4,232
W-6	2,147	2,189
W-7	4,509	4,575
TOTAL	57,936	63,949
EPZ Population Growth:		10.4%

Table 3-2. Permanent Resident Population and Vehicles by ERPA

ERPA	2010 Population	2010 Resident Vehicles
M-1	4,721	2,456
M-2	666	344
M-3	1,039	539
M-4	8,088	4,204
M-5	1,323	688
M-6	7,088	3,683
M-7	9,525	4,950
M-8	3,151	1,639
M-9	3,931	2,044
W-1	4,197	2,180
W-2	5,939	3,088
W-3	1,168	609
W-4	2,117	1,107
W-5	4,232	2,201
W-6	2,189	1,141
W-7	4,575	2,380
TOTAL	63,949	33,253



Resident Population

Miles	Subtotal by Ring	Cumulative Total
0 - 1	160	160
1 - 2	1,443	1,603
2 - 3	2,265	3,868
3 - 4	2,503	6,371
4 - 5	4,583	10,954
5 - 6	5,670	16,624
6 - 7	6,875	23,499
7 - 8	13,234	36,733
8 - 9	10,998	47,731
9 - 10	9,782	57,513
10 - EPZ	6,436	63,949
Total:		63,949

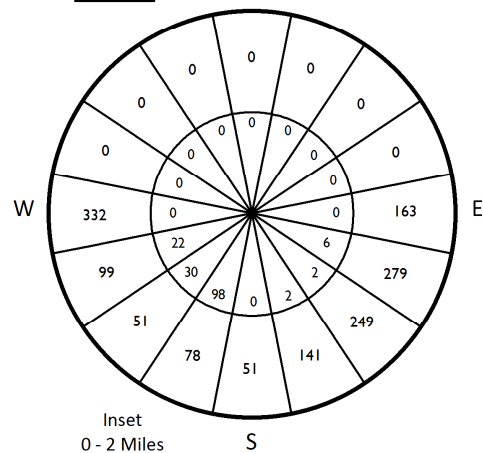
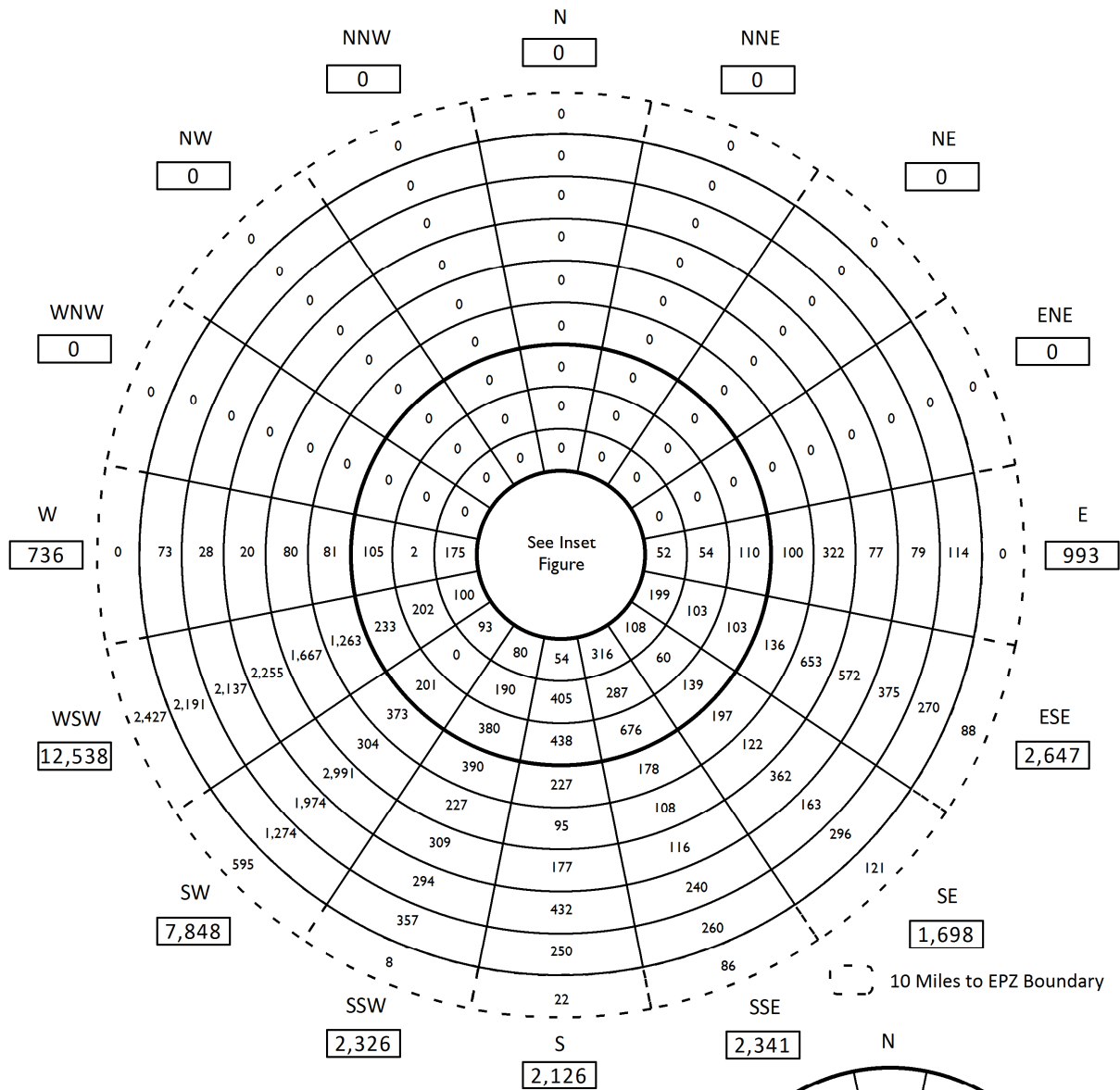


Figure 3-2. Permanent Resident Population by Sector



Resident Vehicles

Miles	Subtotal by Ring	Cumulative Total
0 - 1	83	83
1 - 2	749	832
2 - 3	1,177	2,009
3 - 4	1,303	3,312
4 - 5	2,385	5,697
5 - 6	2,945	8,642
6 - 7	3,578	12,220
7 - 8	6,879	19,099
8 - 9	5,722	24,821
9 - 10	5,085	29,906
10 - EPZ	3,347	33,253
Total:		33,253

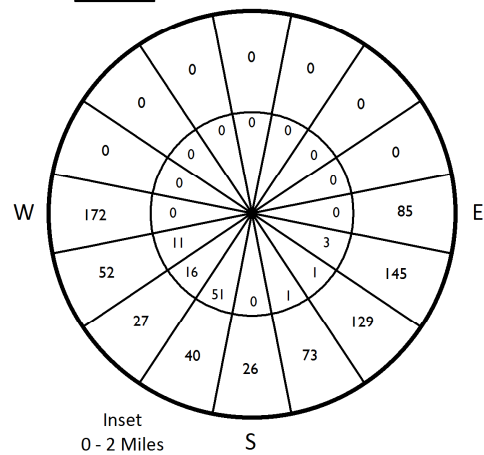


Figure 3-3. Permanent Resident Vehicles by Sector

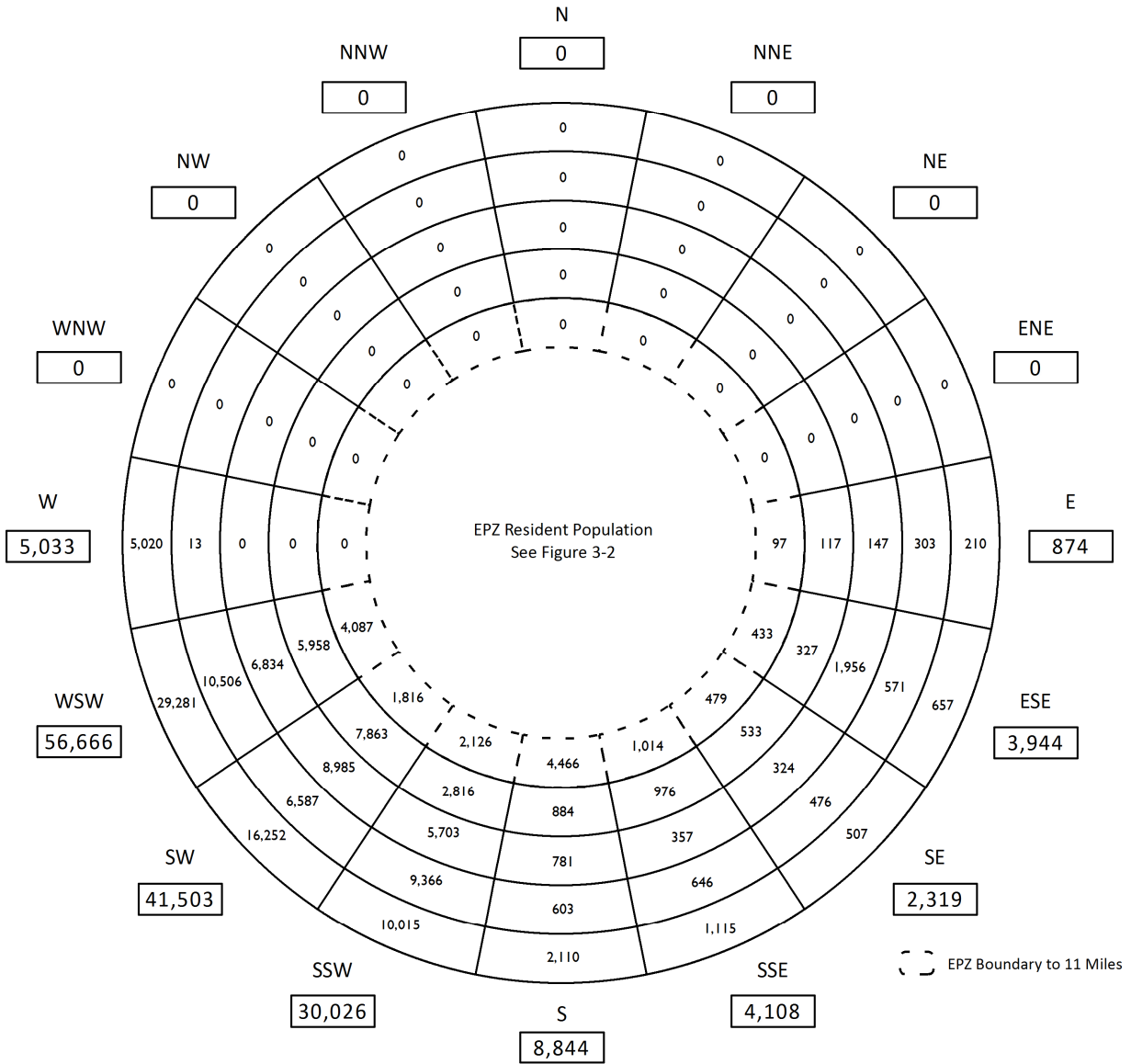
3.2 Shadow Population

A portion of the population living outside the evacuation area extending to 15 miles radially from the Ginna Plant (in the Shadow Region) may elect to evacuate without having been instructed to do so. Based upon NUREG/CR-7002 guidance, it is assumed that 20 percent of the permanent resident population, based on U.S. Census Bureau data, in this Shadow Region will elect to evacuate.

Shadow population characteristics (household size, evacuating vehicles per household, mobilization time) are assumed to be the same as that for the EPZ permanent resident population. Table 3-3, Figure 3-4, and Figure 3-5 present estimates of the shadow population and vehicles, by sector.

Table 3-3. Shadow Population and Vehicles by Sector

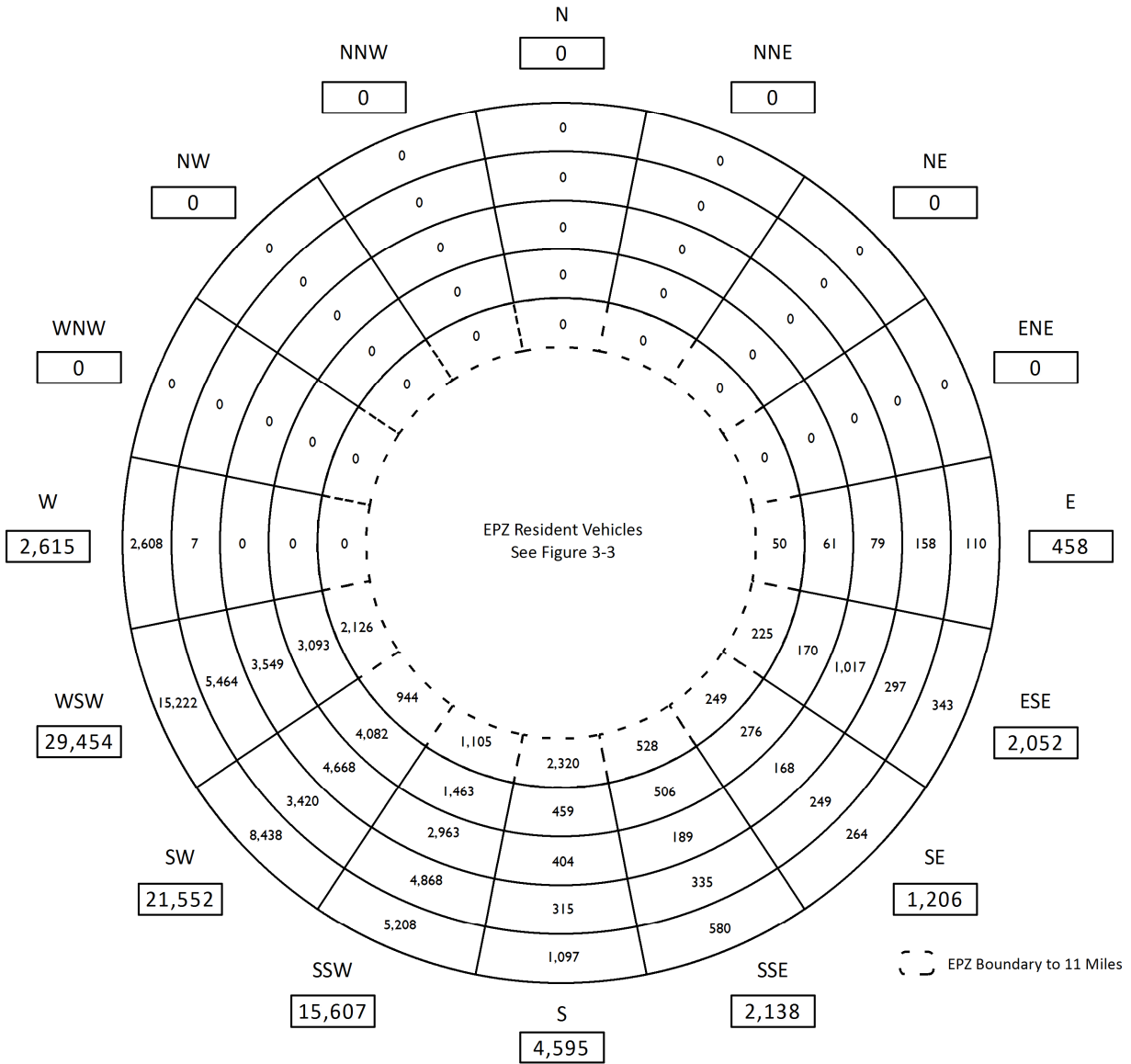
Sector	Population	Evacuating Vehicles
N	0	0
NNE	0	0
NE	0	0
ENE	0	0
E	874	458
ESE	3,944	2,052
SE	2,319	1,206
SSE	4,108	2,138
S	8,844	4,595
SSW	30,026	15,607
SW	41,503	21,552
WSW	56,666	29,454
W	5,033	2,615
WNW	0	0
NW	0	0
NNW	0	0
TOTAL	153,317	79,677



Shadow Population

Miles	Subtotal by Ring	Cumulative Total
EPZ - 11	14,518	14,518
11 - 12	19,474	33,992
12 - 13	25,087	59,079
13 - 14	29,071	88,150
14 - 15	65,167	153,317
Total:		153,317

Figure 3-4. Shadow Population by Sector



Shadow Vehicles

Miles	Subtotal by Ring	Cumulative Total
EPZ - 11	7,547	7,547
11 - 12	10,110	17,657
12 - 13	13,037	30,694
13 - 14	15,113	45,807
14 - 15	33,870	79,677
Total:		79,677

Figure 3-5. Shadow Vehicles by Sector

3.3 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 lodging facilities. Data for all facilities was provided by the counties. The Ginna EPZ has a number of areas and facilities that attract transients, including:

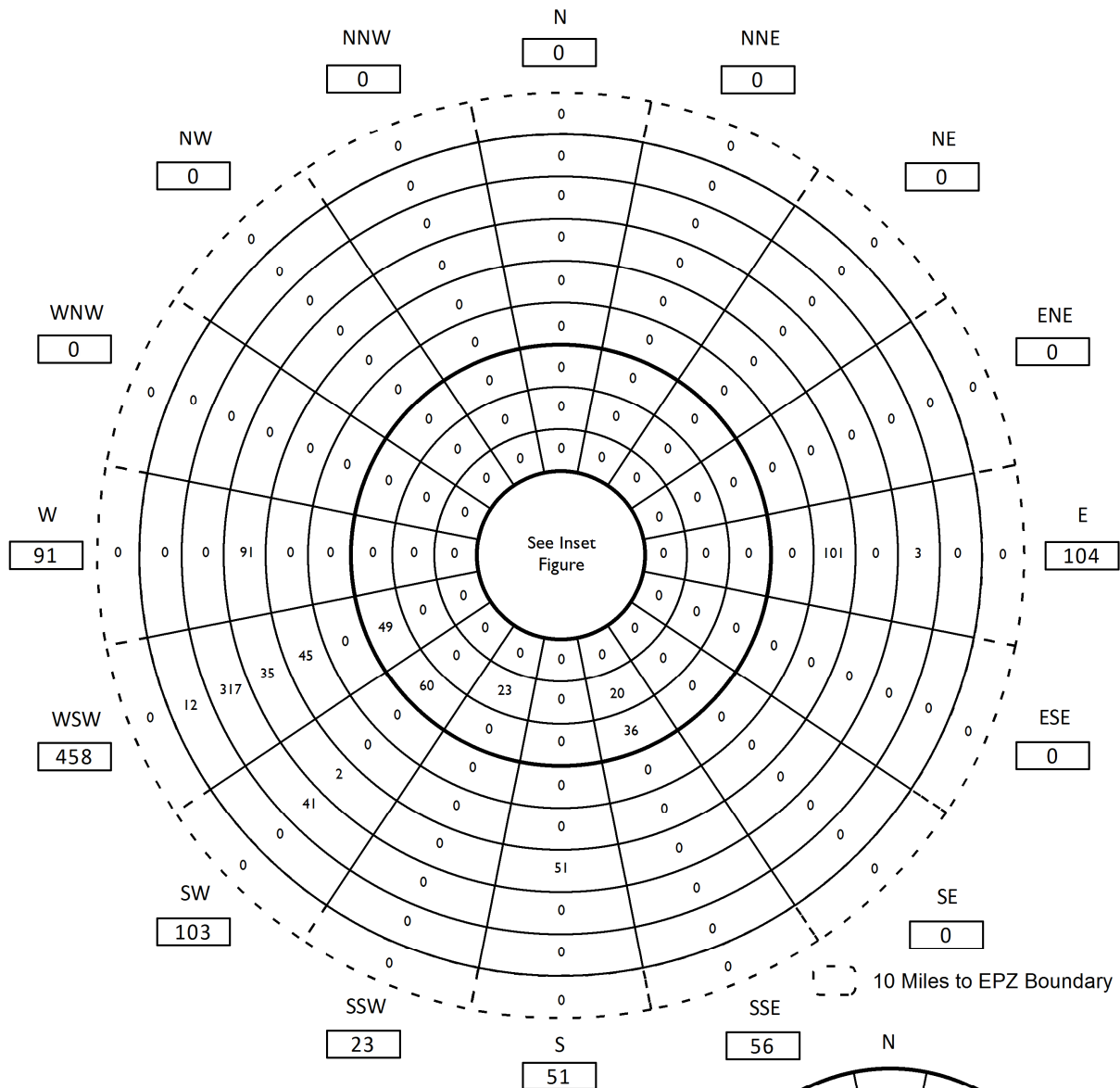
- Golf Courses – 240 transients in 95 vehicles
- Lodging Facilities – 720 transients in 360 vehicles
- Marinas – 267 transients in 104 vehicles
- Parks – 875 transients in 327 vehicles

Appendix E summarizes the transient data that was estimated for the EPZ. Table E-5 presents the number of transients visiting recreational areas, while Table E-6 presents the number of transients at lodging facilities within the EPZ.

Table 3-4 presents transient population and transient vehicle estimates by ERPA. Figure 3-6 and Figure 3-7 present these data by sector and distance from the plant.

Table 3-4. Summary of Transients and Transient Vehicles

ERPA	Transients	Transient Vehicles
M-1	125	49
M-2	0	0
M-3	114	45
M-4	111	43
M-5	0	0
M-6	750	320
M-7	234	105
M-8	75	30
M-9	0	0
W-1	0	0
W-2	296	139
W-3	259	101
W-4	8	3
W-5	0	0
W-6	0	0
W-7	130	51
TOTAL	2,102	886



Transient Vehicles

Miles	Subtotal by Ring	Cumulative Total
0 - 1	0	0
1 - 2	0	0
2 - 3	0	0
3 - 4	43	43
4 - 5	145	188
5 - 6	0	188
6 - 7	146	334
7 - 8	179	513
8 - 9	361	874
9 - 10	12	886
10 - EPZ	0	886
Total:		886

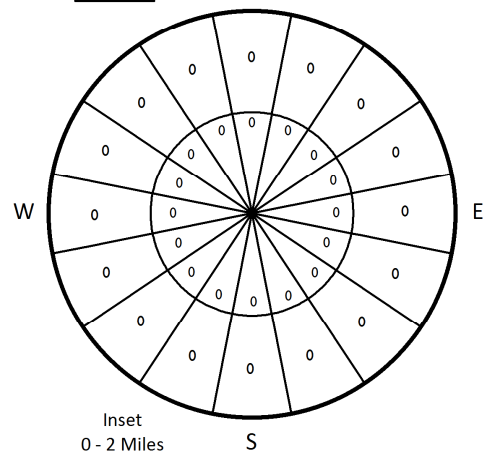


Figure 3-7. Transient Vehicles by Sector

3.4 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 only on those employees commuting from outside the EPZ who will evacuate along with the permanent resident population.

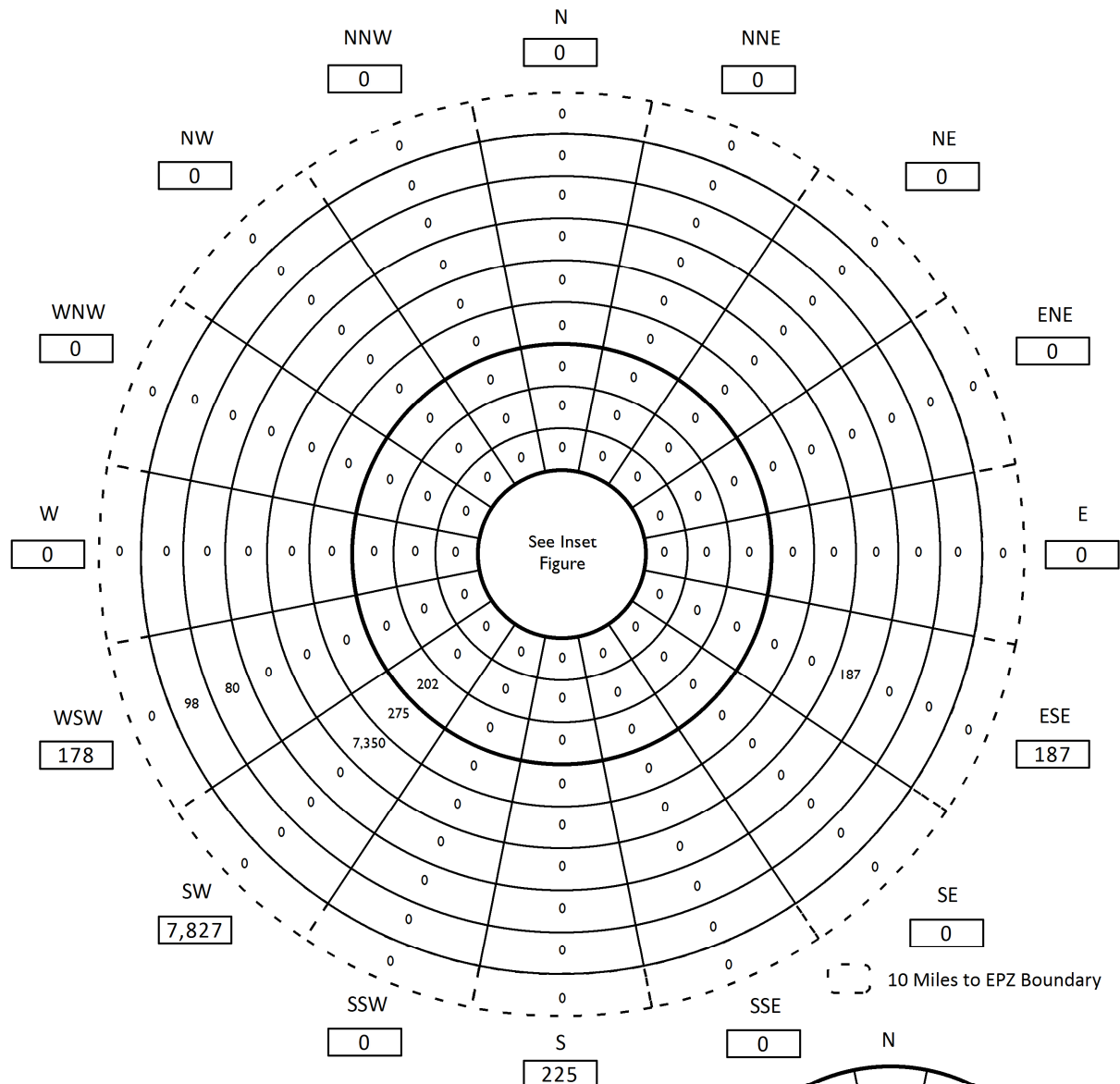
Data provided by Wayne and Monroe counties were used to estimate the number of employees commuting into the EPZ for those employers who did not provide data.

In Table E-4, the Employees (Max Shift) is multiplied by the percent Non-EPZ factor to determine the number of employees who are not residents of the EPZ. A vehicle occupancy of 1.08 employees per vehicle obtained from the telephone survey (See Figure F-7) was used to determine the number of evacuating employee vehicles for all major employers.

Table 3-5 presents non-EPZ Resident employee and vehicle estimates by ERPA. Figure 3-8 and Figure 3-9 present these data by sector.

Table 3-5. Summary of Non-EPZ Resident Employees and Employee Vehicles

ERPA	Employees	Employee Vehicles
M-1	275	255
M-2	0	0
M-3	7,350	6,806
M-4	25	24
M-5	0	0
M-6	0	0
M-7	153	143
M-8	0	0
M-9	0	0
W-1	225	209
W-2	202	189
W-3	0	0
W-4	187	174
W-5	0	0
W-6	0	0
W-7	0	0
TOTAL	8,417	7,800



Employees

Miles	Subtotal by Ring	Cumulative Total
0 - 1	225	225
1 - 2	0	225
2 - 3	0	225
3 - 4	0	225
4 - 5	202	427
5 - 6	275	702
6 - 7	7,350	8,052
7 - 8	187	8,239
8 - 9	80	8,319
9 - 10	98	8,417
10 - EPZ	0	8,417
Total:		8,417

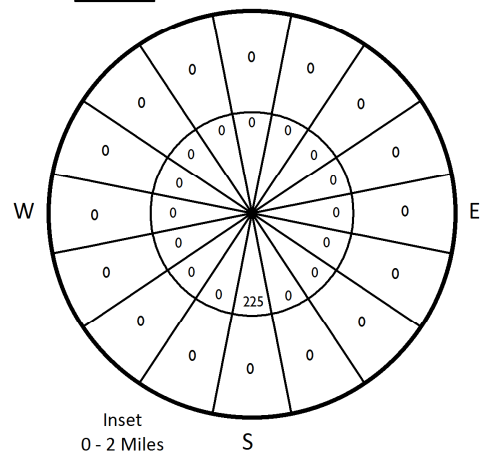
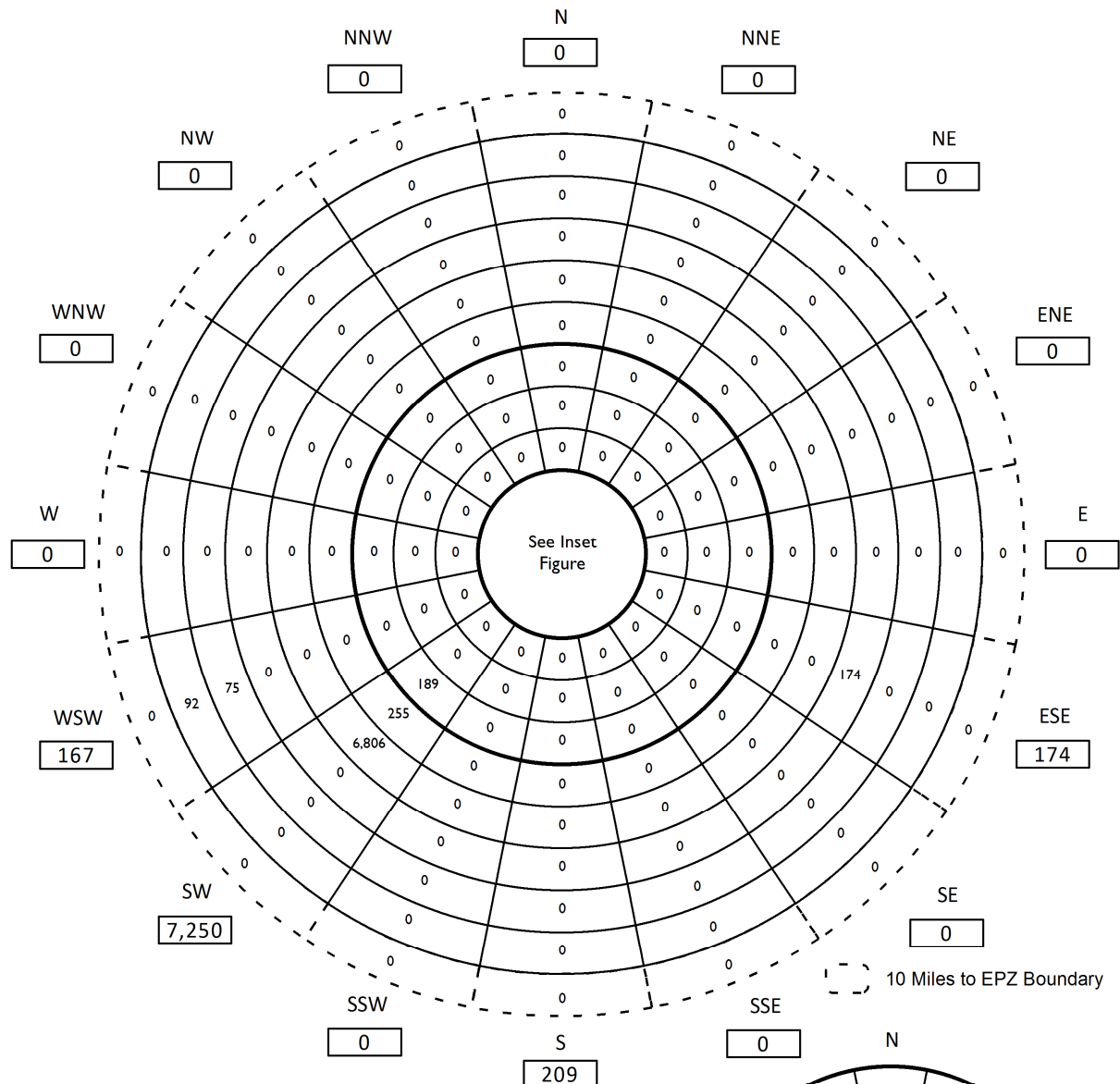


Figure 3-8. Employee Population by Sector



Employee Vehicles

Miles	Subtotal by Ring	Cumulative Total
0 - 1	209	209
1 - 2	0	209
2 - 3	0	209
3 - 4	0	209
4 - 5	189	398
5 - 6	255	653
6 - 7	6,806	7,459
7 - 8	174	7,633
8 - 9	75	7,708
9 - 10	92	7,800
10 - EPZ	0	7,800
Total:		7,800

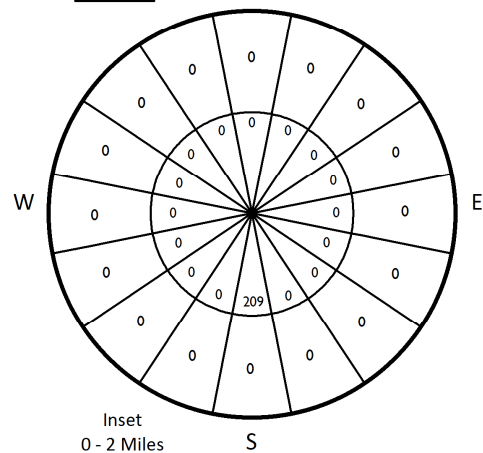


Figure 3-9. Employee Vehicles by Sector

3.5 Medical Facilities

Data were provided by the counties for each of the medical facilities within the EPZ. Table E-3 in Appendix E summarizes the data gathered. Section 8 details the evacuation of medical facilities and their patients. The number and type of evacuating vehicles that need to be provided depend on the patients' state of health. It is estimated that buses can transport up to 30 people; wheelchair vans, up to 4 people; wheelchair buses up to 15 people; and ambulances, up to 2 people.

3.6 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 traversing the EPZ – State Route 104, I-590 and I-490. It is assumed that this traffic will continue to enter the EPZ during the first 120 minutes following the Advisory to Evacuate.

Average Annual Daily Traffic (AADT) data was obtained from Federal Highway Administration to estimate the number of vehicles per hour on the aforementioned routes. The AADT was multiplied by the K-Factor, which is the proportion of the AADT on a roadway segment or link during the design hour, resulting in the design hour volume (DHV). The design hour is usually the 30th highest hourly traffic volume of the year, measured in vehicles per hour (vph). The DHV is then multiplied by the D-Factor, which is the proportion of the DHV occurring in the peak direction of travel (also known as the directional split). The resulting values are the directional design hourly volumes (DDHV), and are presented in Table 3-6, for each of the routes considered. The DDHV is then multiplied by 2 hours (access control points – ACP – are assumed to be activated at 120 minutes after the advisory to evacuate) to estimate the total number of external vehicles loaded on the analysis network. As indicated, there are 17,134 vehicles entering the EPZ as external-external trips prior to the activation of the ACP and the diversion of this traffic. This number is reduced by 60% for evening scenarios (Scenarios 5 and 12) as discussed in Section 6.

3.7 Special Event

One special event (Scenario 13) is considered for the ETE study – the Webster Father's Day Soccer Tournament. Data were obtained from the county indicating that 5,000 people attended the event, 50% of which traveled from beyond the EPZ boundary. Using the average household size of 2.56 as an estimated vehicle occupancy rate yields a total of 977 additional transit vehicles that were incorporated at various parking locations around the event. The special event vehicle trips were generated utilizing the same mobilization distributions for transients. Public transportation is not provided for this event and was not considered in the special event analysis.

Table 3-6. R.E. Ginna Nuclear Power Plant EPZ External Traffic

Upstream Node	Downstream Node	Road Name	Direction	HPMS ¹ AADT	K-Factor ²	D-Factor ²	Hourly Volume	External Traffic
8061	61	SR 104	WB	7,574	0.118	0.5	447	894
8049	49	SR 104	EB	15,147	0.116	0.5	879	1,758
8004	4	I-590	NB	7,574	0.118	0.5	447	894
8189	169	I-490	NB	74,657	0.091	0.5	3,397	6,794
8185	185	I-490	SB	74,657	0.091	0.5	3,397	6,794
TOTAL:								17,134

¹Highway Performance Monitoring System (HPMS), Federal Highway Administration (FHWA), Washington, D.C., 2011

²HCM 2010

3.8 Summary of Demand

A summary of population and vehicle demand is provided in Table 3-7 and Table 3-8, respectively. This summary includes all population groups described in this section. Additional population groups – transit-dependent, special facility and school population – are described in greater detail in Section 8. A total of 125,322 people and 75,780 vehicles are considered in this study.

Table 3-7. Summary of Population Demand

ERPA	Residents	Transit-Dependent	Transients	Employees	Special Facilities	Schools & Preschools	Shadow Population	External Traffic	Total
M-1	4,721	151	125	275	0	589	0	0	5,861
M-2	666	21	0	0	0	0	0	0	687
M-3	1,039	33	114	7,350	0	0	0	0	8,536
M-4	8,088	259	111	25	73	1,814	0	0	10,370
M-5	1,323	42	0	0	0	0	0	0	1,365
M-6	7,088	227	750	0	0	1,461	0	0	9,526
M-7	9,525	305	234	153	372	1,953	0	0	12,542
M-8	3,151	101	75	0	0	0	0	0	3,327
M-9	3,931	126	0	0	0	2,744	0	0	6,801
W-1	4,197	134	0	225	10	0	0	0	4,566
W-2	5,939	190	296	202	2	2,954	0	0	9,583
W-3	1,168	37	259	0	0	0	0	0	1,464
W-4	2,117	68	8	187	0	24	0	0	2,404
W-5	4,232	135	0	0	7	2,044	0	0	6,418
W-6	2,189	70	0	0	0	639	0	0	2,898
W-7	4,575	146	130	0	28	366	0	0	5,245
Shadow	0	0	0	0	0	3,065	30,663	0	33,728
Total	63,949	2,046	2,102	8,417	492	17,653	30,663	0	125,322

NOTE: Shadow Population has been reduced to 20%. Refer to Figure 2-1 for additional information.

NOTE: Special Facilities included are all medical facilities.

Table 3-8. Summary of Vehicle Demand

ERPA	Residents	Transit-Dependent	Transients	Employees	Special Facilities	Schools & Preschools	Shadow Population	External Traffic	Total
M-1	2,456	10	49	255	0	16	0	0	2,786
M-2	344	2	0	0	0	0	0	0	346
M-3	539	2	45	6,806	0	0	0	0	7,392
M-4	4,204	18	43	24	12	52	0	0	4,353
M-5	688	4	0	0	0	0	0	0	692
M-6	3,683	16	320	0	0	44	0	0	4,063
M-7	4,950	20	105	143	38	56	0	0	5,312
M-8	1,639	6	30	0	0	0	0	0	1,675
M-9	2,044	8	0	0	0	78	0	0	2,130
W-1	2,180	10	0	209	4	0	0	0	2,403
W-2	3,088	12	139	189	4	112	0	0	3,524
W-3	609	2	101	0	0	0	0	0	712
W-4	1,107	4	3	174	0	2	0	0	1,290
W-5	2,201	10	0	0	4	82	0	0	2,283
W-6	1,141	4	0	0	0	26	0	0	1,169
W-7	2,380	10	51	0	4	12	0	0	2,455
Shadow	0	0	0	0	0	88	15,935	17,134	33,153
Total	33,253	138	886	7,800	66	568	15,935	17,134	75,780

NOTE: Buses represented as two passenger vehicles. Refer to Section 8 for additional information.

4 ESTIMATION OF HIGHWAY CAPACITY

The ability of the road network to service vehicle demand is a major factor in determining how rapidly an evacuation can be completed. The capacity of a road is defined as the maximum hourly rate at which persons or vehicles can reasonably be expected to traverse a point or uniform section of a lane of roadway during a given time period under prevailing roadway, traffic and control conditions, as stated in the 2010 Highway Capacity Manual (HCM 2010).

In discussing capacity, different operating conditions have been assigned alphabetical designations, A through F, to reflect the range of traffic operational characteristics. These designations have been termed "Levels of Service" (LOS). For example, LOS A connotes free-flow and high-speed operating conditions; LOS F represents a forced flow condition. LOS E describes traffic operating at or near capacity.

Another concept, closely associated with capacity, is "Service Volume" (SV). Service volume is defined as "The maximum hourly rate at which vehicles, bicycles or persons reasonably can be expected to traverse a point or uniform section of a roadway during an hour under specific assumed conditions while maintaining a designated level of service." This definition is similar to that for capacity. The major distinction is that values of SV vary from one LOS to another, while capacity is the service volume at the upper bound of LOS E, only.

This distinction is illustrated in Exhibit 11-17 of the HCM 2010. As indicated there, the SV varies with Free Flow Speed (FFS), and LOS. The SV is calculated by the DYNEV II simulation model, based on the specified link attributes, FFS, capacity, control device and traffic demand.

Other factors also influence capacity. These include, but are not limited to:

- Lane width
- Shoulder width
- Pavement condition
- Horizontal and vertical alignment (curvature and grade)
- Percent truck traffic
- Control device (and timing, if it is a signal)
- Weather conditions (rain, snow, fog, wind speed, ice)

These factors are considered during the road survey and in the capacity estimation process; some factors have greater influence on capacity than others. For example, lane and shoulder width have only a limited influence on Base Free Flow Speed (BFFS¹) according to Exhibit 15-7 of the HCM. Consequently, lane and shoulder widths at the narrowest points were observed during the road survey and these observations were recorded, but no detailed measurements of lane or shoulder width were taken. Horizontal and vertical alignment can influence both FFS and capacity. The estimated FFS were measured using the survey vehicle's speedometer and observing local traffic, under free flow conditions. Capacity is estimated from the procedures of

¹ A very rough estimate of BFFS might be taken as the posted speed limit plus 10 mph (HCM 2010 Page 15-15)

the 2010 HCM. For example, HCM Exhibit 7-1(b) shows the sensitivity of Service Volume at the upper bound of LOS D to grade (capacity is the Service Volume at the upper bound of LOS E).

As discussed in Section 2.3, it is necessary to adjust capacity figures to represent the prevailing conditions during inclement weather. Based on limited empirical data, weather conditions such as rain reduce the values of free speed and of highway capacity by approximately 10 percent. Over the last decade new studies have been made on the effects of rain on traffic capacity. These studies indicate a range of effects between 5 and 20 percent depending on wind speed and precipitation rates. As indicated in Section 2.3, we employ a reduction in free speed and in highway capacity of 10 percent and 20 percent for rain and snow, respectively.

Since congestion arising from evacuation may be significant, estimates of roadway capacity must be determined with great care. Because of its importance, a brief discussion of the major factors that influence highway capacity is presented in this section.

Rural highways generally consist of: (1) one or more uniform sections with limited access (driveways, parking areas) characterized by “uninterrupted” flow; and (2) approaches to at-grade intersections where flow can be “interrupted” by a control device or by turning or crossing traffic at the intersection. Due to these differences, separate estimates of capacity must be made for each section. Often, the approach to the intersection is widened by the addition of one or more lanes (turn pockets or turn bays), to compensate for the lower capacity of the approach due to the factors there that can interrupt the flow of traffic. These additional lanes are recorded during the field survey and later entered as input to the DYNEV II system.

4.1 Capacity Estimations on Approaches to Intersections

At-grade intersections are apt to become the first bottleneck locations under local heavy traffic volume conditions. This characteristic reflects the need to allocate access time to the respective competing traffic streams by exerting some form of control. During evacuation, control at critical intersections will often be provided by traffic control personnel assigned for that purpose, whose directions may supersede traffic control devices. The existing traffic management plans documented in the county emergency plans are extensive and were adopted without change.

The per-lane capacity of an approach to a signalized intersection can be expressed (simplistically) in the following form:

$$Q_{cap,m} = \left(\frac{3600}{h_m} \right) \times \left(\frac{G - L}{C} \right)_m = \left(\frac{3600}{h_m} \right) \times P_m$$

where:

$Q_{cap,m}$ = Capacity of a single lane of traffic on an approach, which executes

		movement, m , upon entering the intersection; vehicles per hour (vph)
h_m	=	Mean queue discharge headway of vehicles on this lane that are executing movement, m ; seconds per vehicle
G	=	Mean duration of GREEN time servicing vehicles that are executing movement, m , for each signal cycle; seconds
L	=	Mean "lost time" for each signal phase servicing movement, m ; seconds
C	=	Duration of each signal cycle; seconds
P_m	=	Proportion of GREEN time allocated for vehicles executing movement, m , from this lane. This value is specified as part of the control treatment.
m	=	The movement executed by vehicles after they enter the intersection: through, left-turn, right-turn, and diagonal.

The turn-movement-specific mean discharge headway h_m , depends in a complex way upon many factors: roadway geometrics, turn percentages, the extent of conflicting traffic streams, the control treatment, and others. A primary factor is the value of "saturation queue discharge headway", h_{sat} , which applies to through vehicles that are not impeded by other conflicting traffic streams. This value, itself, depends upon many factors including motorist behavior. Formally, we can write,

$$h_m = f_m(h_{sat}, F_1, F_2, \dots)$$

where:

h_{sat}	=	Saturation discharge headway for through vehicles; seconds per vehicle
F_1, F_2	=	The various known factors influencing h_m
$f_m()$	=	Complex function relating h_m to the known (or estimated) values of h_{sat} , F_1, F_2, \dots

The estimation of h_m for specified values of h_{sat} , F_1 , F_2 , ... is undertaken within the DYNEV II simulation model by a mathematical model². The resulting values for h_m always satisfy the condition:

$$h_m \geq h_{sat}$$

²Lieberman, E., "Determining Lateral Deployment of Traffic on an Approach to an Intersection", McShane, W. & Lieberman, E., "Service Rates of Mixed Traffic on the far Left Lane of an Approach". Both papers appear in Transportation Research Record 772, 1980. Lieberman, E., Xin, W., "Macroscopic Traffic Modeling For Large-Scale Evacuation Planning", presented at the TRB 2012 Annual Meeting, January 22-26, 2012

That is, the turn-movement-specific discharge headways are always greater than, or equal to the saturation discharge headway for through vehicles. These headways (or its inverse equivalent, “saturation flow rate”), may be determined by observation or using the procedures of the HCM 2010.

The above discussion is necessarily brief given the scope of this ETE report and the complexity of the subject of intersection capacity. In fact, Chapters 18, 19 and 20 in the HCM 2010 address this topic. The factors, F_1, F_2, \dots , influencing saturation flow rate are identified in equation (18-5) of the HCM 2010.

The traffic signals within the EPZ and Shadow Region are modeled using representative phasing plans and phase durations obtained as part of the field data collection. Traffic responsive signal installations allow the proportion of green time allocated (P_m) for each approach to each intersection to be determined by the expected traffic volumes on each approach during evacuation circumstances. The amount of green time (G) allocated is subject to maximum and minimum phase duration constraints; 2 seconds of yellow time are indicated for each signal phase and 1 second of all-red time is assigned between signal phases, typically. If a signal is pre-timed, the yellow and all-red times observed during the road survey are used. A lost time (L) of 2.0 seconds is used for each signal phase in the analysis.

4.2 Capacity Estimation along Sections of Highway

The capacity of highway sections -- as distinct from approaches to intersections -- is a function of roadway geometrics, traffic composition (e.g. percent heavy trucks and buses in the traffic stream) and, of course, motorist behavior. There is a fundamental relationship which relates service volume (i.e. the number of vehicles serviced within a uniform highway section in a given time period) to traffic density. The top curve in Figure 4-1 illustrates this relationship.

As indicated, there are two flow regimes: (1) Free Flow (left side of curve); and (2) Forced Flow (right side). In the Free Flow regime, the traffic demand is fully serviced; the service volume increases as demand volume and density increase, until the service volume attains its maximum value, which is the capacity of the highway section. As traffic demand and the resulting highway density increase beyond this "critical" value, the rate at which traffic can be serviced (i.e. the service volume) can actually decline below capacity (“capacity drop”). Therefore, in order to realistically represent traffic performance during congested conditions (i.e. when demand exceeds capacity), it is necessary to estimate the service volume, V_F , under congested conditions.

The value of V_F can be expressed as:

$$V_F = R \times Capacity$$

where:

R = Reduction factor which is less than unity

We have employed a value of $R=0.90$. The advisability of such a capacity reduction factor is based upon empirical studies that identified a fall-off in the service flow rate when congestion occurs at “bottlenecks” or “choke points” on a freeway system. Zhang and Levinson³ describe a research program that collected data from a computer-based surveillance system (loop detectors) installed on the Interstate Highway System, at 27 active bottlenecks in the twin cities metro area in Minnesota over a 7-week period. When flow breakdown occurs, queues are formed which discharge at lower flow rates than the maximum capacity prior to observed breakdown. These queue discharge flow (QDF) rates vary from one location to the next and also vary by day of week and time of day based upon local circumstances. The cited reference presents a mean QDF of 2,016 passenger cars per hour per lane (pcphpl). This figure compares with the nominal capacity estimate of 2,250 pcphpl estimated for the ETE and indicated in Appendix K for freeway links. The ratio of these two numbers is 0.896 which translates into a capacity reduction factor of 0.90.

Since the principal objective of evacuation time estimate analyses is to develop a “realistic” estimate of evacuation times, use of the representative value for this capacity reduction factor ($R=0.90$) is justified. This factor is applied only when flow breaks down, as determined by the simulation model.

Rural roads, like freeways, are classified as “uninterrupted flow” facilities. (This is in contrast with urban street systems which have closely spaced signalized intersections and are classified as “interrupted flow” facilities.) As such, traffic flow along rural roads is subject to the same effects as freeways in the event traffic demand exceeds the nominal capacity, resulting in queuing and lower QDF rates. As a practical matter, rural roads rarely break down at locations away from intersections. Any breakdowns on rural roads are generally experienced at intersections where other model logic applies, or at lane drops which reduce capacity there. Therefore, the application of a factor of 0.90 is appropriate on rural roads, but rarely, if ever, activated.

The estimated value of capacity is based primarily upon the type of facility and on roadway geometrics. Sections of roadway with adverse geometrics are characterized by lower free-flow speeds and lane capacity. Exhibit 15-30 in the Highway Capacity Manual was referenced to estimate saturation flow rates. The impact of narrow lanes and shoulders on free-flow speed and on capacity is not material, particularly when flow is predominantly in one direction as is the case during an evacuation.

The procedure used here was to estimate “section” capacity, V_E , based on observations made traveling over each section of the evacuation network, based on the posted speed limits and travel behavior of other motorists and by reference to the 2010 HCM. The DYNEV II simulation model determines for each highway section, represented as a network link, whether its capacity would be limited by the “section-specific” service volume, V_E , or by the intersection-specific capacity. For each link, the model selects the lower value of capacity.

³Lei Zhang and David Levinson, “Some Properties of Flows at Freeway Bottlenecks,” Transportation Research Record 1883, 2004.

4.3 Application to the R.E. Ginna Nuclear Power Plant Study Area

As part of the development of the link-node analysis network for the study area, an estimate of roadway capacity is required. The source material for the capacity estimates presented herein is contained in:

2010 Highway Capacity Manual (HCM)
Transportation Research Board
National Research Council
Washington, D.C.

The highway system in the study area consists primarily of three categories of roads and, of course, intersections:

- Two-Lane roads: Local, State
- Multi-Lane Highways (at-grade)
- Freeways

Each of these classifications will be discussed.

4.3.1 Two-Lane Roads

Ref: HCM Chapter 15

Two lane roads comprise the majority of highways within the EPZ. The per-lane capacity of a two-lane highway is estimated at 1700 passenger cars per hour (pc/h). This estimate is essentially independent of the directional distribution of traffic volume except that, for extended distances, the two-way capacity will not exceed 3200 pc/h. The HCM procedures then estimate Level of Service (LOS) and Average Travel Speed. The DYNEV II simulation model accepts the specified value of capacity as input and computes average speed based on the time-varying demand: capacity relations.

Based on the field survey and on expected traffic operations associated with evacuation scenarios:

- Most sections of two-lane roads within the EPZ are classified as “Class I”, with “level terrain”; some are “rolling terrain”.
- “Class II” highways are mostly those within urban and suburban centers.

4.3.2 Multi-Lane Highway

Ref: HCM Chapter 14

Exhibit 14-2 of the HCM 2010 presents a set of curves that indicate a per-lane capacity ranging from approximately 1900 to 2200 pc/h, for free-speeds of 45 to 60 mph, respectively. Based on observation, the multi-lane highways outside of urban areas within the EPZ service traffic with free-speeds in this range. The actual time-varying speeds computed by the simulation model reflect the demand: capacity relationship and the impact of control at intersections. A

conservative estimate of per-lane capacity of 1900 pc/h is adopted for this study for multi-lane highways outside of urban areas, as shown in Appendix K.

4.3.3 Freeways

Ref: HCM Chapters 10, 11, 12, 13

Chapter 10 of the HCM 2010 describes a procedure for integrating the results obtained in Chapters 11, 12 and 13, which compute capacity and LOS for freeway components. Chapter 10 also presents a discussion of simulation models. The DYNEV II simulation model automatically performs this integration process.

Chapter 11 of the HCM 2010 presents procedures for estimating capacity and LOS for "Basic Freeway Segments". Exhibit 11-17 of the HCM 2010 presents capacity vs. free speed estimates, which are provided below.

Free Speed (mph):	55	60	65	70+
Per-Lane Capacity (pc/h):	2250	2300	2350	2400

The inputs to the simulation model are highway geometrics, free-speeds and capacity based on field observations. The simulation logic calculates actual time-varying speeds based on demand: capacity relationships. A conservative estimate of per-lane capacity of 2250 pc/h is adopted for this study for freeways, as shown in Appendix K.

Chapter 12 of the HCM 2010 presents procedures for estimating capacity, speed, density and LOS for freeway weaving sections. The simulation model contains logic that relates speed to demand volume: capacity ratio. The value of capacity obtained from the computational procedures detailed in Chapter 12 depends on the "Type" and geometrics of the weaving segment and on the "Volume Ratio" (ratio of weaving volume to total volume).

Chapter 13 of the HCM 2010 presents procedures for estimating capacities of ramps and of "merge" areas. There are three significant factors to the determination of capacity of a ramp-freeway junction: The capacity of the freeway immediately downstream of an on-ramp or immediately upstream of an off-ramp; the capacity of the ramp roadway; and the maximum flow rate entering the ramp influence area. In most cases, the freeway capacity is the controlling factor. Values of this merge area capacity are presented in Exhibit 13-8 of the HCM 2010, and depend on the number of freeway lanes and on the freeway free speed. Ramp capacity is presented in Exhibit 13-10 and is a function of the ramp free flow speed. The DYNEV II simulation model logic simulates the merging operations of the ramp and freeway traffic in accord with the procedures in Chapter 13 of the HCM 2010. If congestion results from an excess of demand relative to capacity, then the model allocates service appropriately to the two entering traffic streams and produces LOS F conditions (The HCM does not address LOS F explicitly).

4.3.4 Intersections

Ref: HCM Chapters 18, 19, 20, 21

Procedures for estimating capacity and LOS for approaches to intersections are presented in Chapter 18 (signalized intersections), Chapters 19, 20 (un-signalized intersections) and Chapter 21 (roundabouts). The complexity of these computations is indicated by the aggregate length of these chapters. The DYNEV II simulation logic is likewise complex.

The simulation model explicitly models intersections: Stop/yield controlled intersections (both 2-way and all-way) and traffic signal controlled intersections. Where intersections are controlled by fixed time controllers, traffic signal timings are set to reflect average (non-evacuation) traffic conditions. Actuated traffic signal settings respond to the time-varying demands of evacuation traffic to adjust the relative capacities of the competing intersection approaches.

The model is also capable of modeling the presence of manned traffic control. At specific locations where it is advisable or where existing plans call for overriding existing traffic control to implement manned control, the model will use actuated signal timings that reflect the presence of traffic guides. At locations where a special traffic control strategy (continuous left-turns, contra-flow lanes) is used, the strategy is modeled explicitly. Where applicable, the location and type of traffic control for nodes in the evacuation network are noted in Appendix K. The characteristics of the ten highest volume signalized intersections are detailed in Appendix J.

4.4 Simulation and Capacity Estimation

Chapter 6 of the HCM is entitled, “HCM and Alternative Analysis Tools.” The chapter discusses the use of alternative tools such as simulation modeling to evaluate the operational performance of highway networks. Among the reasons cited in Chapter 6 to consider using simulation as an alternative analysis tool is:

“The system under study involves a group of different facilities or travel modes with mutual interactions invoking several procedural chapters of the HCM. Alternative tools are able to analyze these facilities as a single system.”

This statement succinctly describes the analyses required to determine traffic operations across an area encompassing an EPZ operating under evacuation conditions. The model utilized for this study, DYNEV II, is further described in Appendix C. It is essential to recognize that simulation models do not replicate the methodology and procedures of the HCM – they *replace* these procedures by describing the complex interactions of traffic flow and computing Measures of Effectiveness (MOE) detailing the operational performance of traffic over time and by location. The DYNEV II simulation model includes some HCM 2010 procedures only for the purpose of estimating capacity.

All simulation models must be calibrated properly with field observations that quantify the performance parameters applicable to the analysis network. Two of the most important of

these are: (1) Free flow speed (FFS); and (2) saturation headway, h_{sat} . The first of these is estimated by direct observation during the road survey; the second is estimated using the concepts of the HCM 2010, as described earlier. These parameters are listed in Appendix K, for each network link.

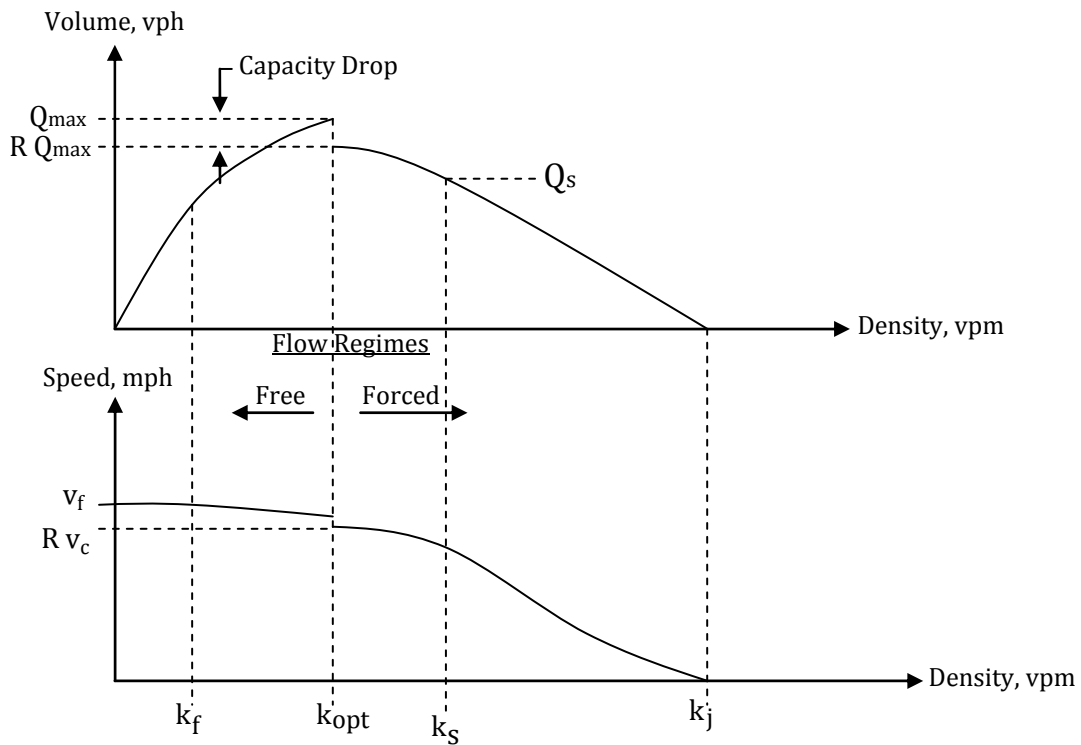


Figure 4-1. Fundamental Diagrams

5 ESTIMATION OF TRIP GENERATION TIME

Federal Government guidelines (see NUREG CR-7002) specify that the planner estimate the distributions of elapsed times associated with mobilization activities undertaken by the public to prepare for the evacuation trip. The elapsed time associated with each activity is represented as a statistical distribution reflecting differences between members of the public. The quantification of these activity-based distributions relies largely on the results of the telephone survey. We define the sum of these distributions of elapsed times as the Trip Generation Time Distribution.

5.1 Background

In general, an accident at a nuclear power plant is characterized by the following Emergency Classification Levels (see Appendix 1 of NUREG 0654 for details):

1. Unusual Event
2. Alert
3. Site Area Emergency
4. General Emergency

At each level, the Federal guidelines specify a set of Actions to be undertaken by the Licensee, and by State and Local offsite authorities. As a Planning Basis, we will adopt a conservative posture, in accordance with Section 1.2 of NUREG/CR-7002, that a rapidly escalating accident will be considered in calculating the Trip Generation Time. We will assume:

1. The Advisory to Evacuate will be announced coincident with the siren notification.
2. Mobilization of the general population will commence within 15 minutes after the siren notification.
3. ETE are measured relative to the Advisory to Evacuate.

We emphasize that the adoption of this planning basis is not a representation that these events will occur within the indicated time frame. Rather, these assumptions are necessary in order to:

1. Establish a temporal framework for estimating the Trip Generation distribution in the format recommended in Section 2.13 of NUREG/CR-6863.
2. Identify temporal points of reference that uniquely define "Clear Time" and ETE.

It is likely that a longer time will elapse between the various classes of an emergency.

For example, suppose one hour elapses from the siren alert to the Advisory to Evacuate. In this case, it is reasonable to expect some degree of spontaneous evacuation by the public during this one-hour period. As a result, the population within the EPZ will be lower when the Advisory to Evacuate is announced, than at the time of the siren alert. In addition, many will engage in preparation activities to evacuate, in anticipation that an Advisory will be broadcast. Thus, the time needed to complete the mobilization activities and the number of people remaining to evacuate the EPZ after the Advisory to Evacuate, will both be somewhat less than

the estimates presented in this report. Consequently, the ETE presented in this report are higher than the actual evacuation time, if this hypothetical situation were to take place.

The notification process consists of two events:

1. Transmitting information using the alert notification systems available within the EPZ (e.g. sirens, tone alerts, EAS broadcasts, loud speakers).
2. Receiving and correctly interpreting the information that is transmitted.

The population within the EPZ is dispersed over an area of approximately 157 square miles and is engaged in a wide variety of activities. It must be anticipated that some time will elapse between the transmission and receipt of the information advising the public of an accident.

The amount of elapsed time will vary from one individual to the next depending on where that person is, what that person is doing, and related factors. Furthermore, some persons who will be directly involved with the evacuation process may be outside the EPZ at the time the emergency is declared. These people may be commuters, shoppers and other travelers who reside within the EPZ and who will return to join the other household members upon receiving notification of an emergency.

As indicated in Section 2.13 of NUREG/CR-6863, the estimated elapsed times for the receipt of notification can be expressed as a distribution reflecting the different notification times for different people within, and outside, the EPZ. By using time distributions, it is also possible to distinguish between different population groups and different day-of-week and time-of-day scenarios, so that accurate ETE may be computed.

For example, people at home or at work within the EPZ will be notified by siren, and/or tone alert and/or radio (if available). Those well outside the EPZ will be notified by telephone, radio, TV and word-of-mouth, with potentially longer time lags. Furthermore, the spatial distribution of the EPZ population will differ with time of day - families will be united in the evenings, but dispersed during the day. In this respect, weekends will differ from weekdays.

As indicated in Section 4.1 of NUREG/CR-7002, the information required to compute trip generation times is typically obtained from a telephone survey of EPZ residents. Such a survey was conducted in support of this ETE study. Appendix F presents the survey sampling plan, survey instrument, and raw survey results. It is important to note that the shape and duration of the evacuation trip mobilization distribution is important at sites where traffic congestion is not expected to cause the evacuation time estimate to extend in time well beyond the trip generation period. The remaining discussion will focus on the application of the trip generation data obtained from the telephone survey to the development of the ETE documented in this report.

5.2 Fundamental Considerations

The environment leading up to the time that people begin their evacuation trips consists of a sequence of events and activities. Each event (other than the first) occurs at an instant in time and is the outcome of an activity.

Activities are undertaken over a period of time. Activities may be in "series" (i.e. to undertake an activity implies the completion of all preceding events) or may be in parallel (two or more activities may take place over the same period of time). Activities conducted in series are functionally dependent on the completion of prior activities; activities conducted in parallel are functionally independent of one another. The relevant events associated with the public's preparation for evacuation are:

<u>Event Number</u>	<u>Event Description</u>
1	Notification
2	Awareness of Situation
3	Depart Work
4	Arrive Home
5	Depart on Evacuation Trip

Associated with each sequence of events are one or more activities, as outlined below:

Table 5-1. Event Sequence for Evacuation Activities

Event Sequence	Activity	Distribution
1 → 2	Receive Notification	1
2 → 3	Prepare to Leave Work	2
2,3 → 4	Travel Home	3
2,4 → 5	Prepare to Leave to Evacuate	4
N/A	Snow Clearance	5

These relationships are shown graphically in Figure 5-1.

- An Event is a 'state' that exists at a point in time (e.g., depart work, arrive home)
- An Activity is a 'process' that takes place over some elapsed time (e.g., prepare to leave work, travel home)

As such, a completed Activity changes the 'state' of an individual (e.g. the activity, 'travel home' changes the state from 'depart work' to 'arrive home'). Therefore, an Activity can be described as an 'Event Sequence'; the elapsed times to perform an event sequence vary from one person to the next and are described as statistical distributions on the following pages.

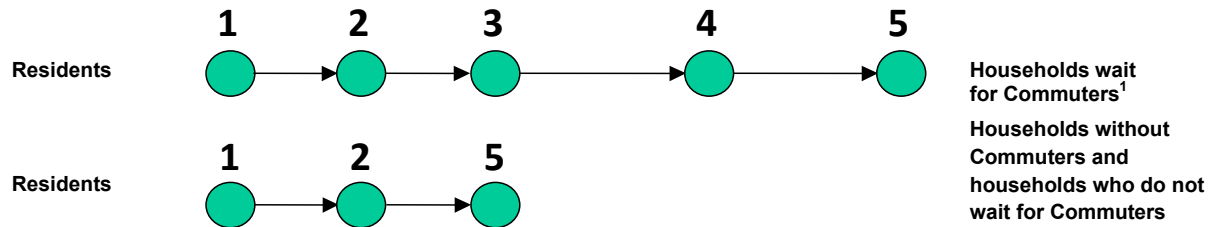
An employee who lives outside the EPZ will follow sequence (c) of Figure 5-1. A household

within the EPZ that has one or more commuters at work, and will await their return before beginning the evacuation trip will follow the first sequence of Figure 5-1(a). A household within the EPZ that has no commuters at work, or that will not await the return of any commuters, will follow the second sequence of Figure 5-1(a), regardless of day of week or time of day.

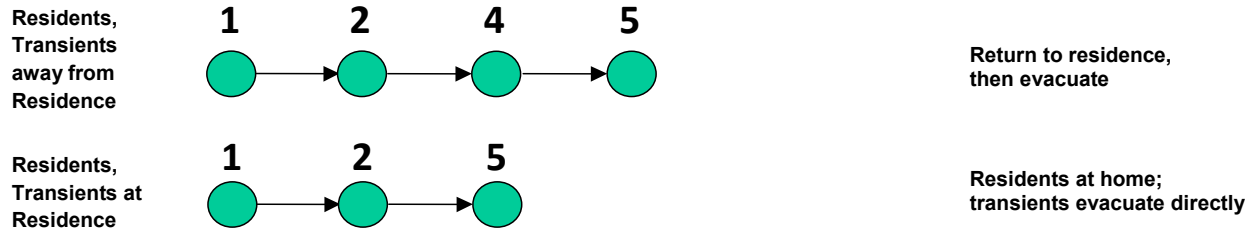
Households with no commuters on weekends or in the evening/night-time, will follow the applicable sequence in Figure 5-1(b). Transients will always follow one of the sequences of Figure 5-1(b). Some transients away from their residence could elect to evacuate immediately without returning to the residence, as indicated in the second sequence.

It is seen from Figure 5-1, that the Trip Generation time (i.e. the total elapsed time from Event 1 to Event 5) depends on the scenario and will vary from one household to the next. Furthermore, Event 5 depends, in a complicated way, on the time distributions of all activities preceding that event. That is, to estimate the time distribution of Event 5, we must obtain estimates of the time distributions of all preceding events. For this study, we adopt the conservative posture that all activities will occur in sequence.

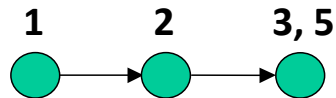
In some cases, assuming certain events occur strictly sequential (for instance, commuter returning home before beginning preparation to leave, or removing snow only after the preparation to leave) can result in rather conservative (that is, longer) estimates of mobilization times. It is reasonable to expect that at least some parts of these events will overlap for many households, but that assumption is not made in this study.



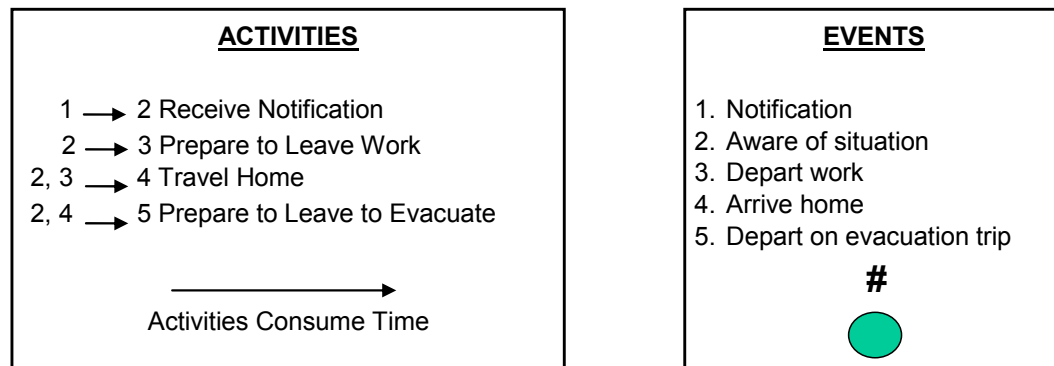
(a) Accident occurs during midweek, at midday; year round



(b) Accident occurs during weekend or during the evening²



(c) Employees who live outside the EPZ



¹ Applies for evening and weekends also if commuters are at work.

² Applies throughout the year for transients.

Figure 5-1. Events and Activities Preceding the Evacuation Trip

5.3 Estimated Time Distributions of Activities Preceding Event 5

The time distribution of an event is obtained by "summing" the time distributions of all prior contributing activities. (This "summing" process is quite different than an algebraic sum since it is performed on distributions – not scalar numbers).

Time Distribution No. 1, Notification Process: Activity 1 → 2

It is assumed (based on the presence of sirens within the EPZ) that 87 percent of those within the EPZ will be aware of the accident within 30 minutes with the remainder notified within the following 15 minutes. The notification distribution is given below:

Table 5-2. Time Distribution for Notifying the Public

Elapsed Time (Minutes)	Percent of Population Notified
0	0%
5	7%
10	13%
15	27%
20	47%
25	66%
30	87%
35	92%
40	97%
45	100%

Distribution No. 2, Prepare to Leave Work: Activity 2 → 3

It is reasonable to expect that the vast majority of business enterprises within the EPZ will elect to shut down following notification and most employees would leave work quickly. Commuters, who work outside the EPZ could, in all probability, also leave quickly since facilities outside the EPZ would remain open and other personnel would remain. Personnel or farmers responsible for equipment/livestock would require additional time to secure their facility. The distribution of Activity 2 → 3 shown in Table 5-3 reflects data obtained by the telephone survey. This distribution is plotted in Figure 5-2.

Table 5-3. Time Distribution for Employees to Prepare to Leave Work

Elapsed Time (Minutes)	Cumulative Percent Employees Leaving Work	Elapsed Time (Minutes)	Cumulative Percent Employees Leaving Work
0	0%	35	91%
5	50%	40	91%
10	70%	45	94%
15	78%	50	94%
20	82%	55	94%
25	83%	60	100%
30	91%		

NOTE: The survey data was normalized to distribute the "Don't know" response. That is, the sample was reduced in size to include only those households who responded to this question. The underlying assumption is that the distribution of this activity for the "Don't know" responders, if the event takes place, would be the same as those responders who provided estimates.

Distribution No. 3, Travel Home: Activity 3 → 4

These data are provided directly by those households which responded to the telephone survey. This distribution is plotted in Figure 5-2 and listed in Table 5-4.

Table 5-4. Time Distribution for Commuters to Travel Home

Elapsed Time (Minutes)	Cumulative Percent Returning Home	Elapsed Time (Minutes)	Cumulative Percent Returning Home
0	0%	35	90%
5	9%	40	94%
10	22%	45	99%
15	36%	50	99%
20	59%	55	99%
25	66%	60	100%
30	87%		

NOTE: The survey data was normalized to distribute the "Don't know" response

Distribution No. 4, Prepare to Leave Home: Activity 2, 4 → 5

These data are provided directly by those households which responded to the telephone survey. This distribution is plotted in Figure 5-2 and listed in Table 5-5.

Table 5-5. Time Distribution for Population to Prepare to Evacuate

Elapsed Time (Minutes)	Cumulative Percent Ready to Evacuate
0	0%
15	14%
30	63%
45	72%
60	87%
75	94%
90	95%
105	95%
120	98%
135	100%

NOTE: The survey data was normalized to distribute the "Don't know" response

Distribution No. 5, Snow Clearance Time Distribution

Inclement weather scenarios involving snowfall must address the time lags associated with snow clearance. It is assumed that snow equipment is mobilized and deployed during the snowfall to maintain passable roads. The general consensus is that the snow-plowing efforts are generally successful for all but the most extreme blizzards when the rate of snow accumulation exceeds that of snow clearance over a period of many hours.

Consequently, it is reasonable to assume that the highway system will remain passable – albeit at a lower capacity – under the vast majority of snow conditions. Nevertheless, for the vehicles to gain access to the highway system, it may be necessary for driveways and employee parking lots to be cleared to the extent needed to permit vehicles to gain access to the roadways. These clearance activities take time; this time must be incorporated into the trip generation time distributions. These data are provided by those households which responded to the telephone survey. This distribution is plotted in Figure 5-2 and listed in Table 5-6.

Note that those respondents (56%) who answered that they would not take time to clear their driveway were assumed to be ready immediately at the start of this activity. Essentially they would drive through the snow on the driveway to access the roadway and begin their evacuation trip.

Table 5-6. Time Distribution for Population to Clear 6"-8" of Snow

Elapsed Time (Minutes)	Cumulative Percent Completing Snow Removal
0	56%
15	66%
30	88%
45	92%
60	96%
75	98%
90	98%
105	98%
120	99%
135	100%

NOTE: The survey data was normalized to distribute the "Don't know" response

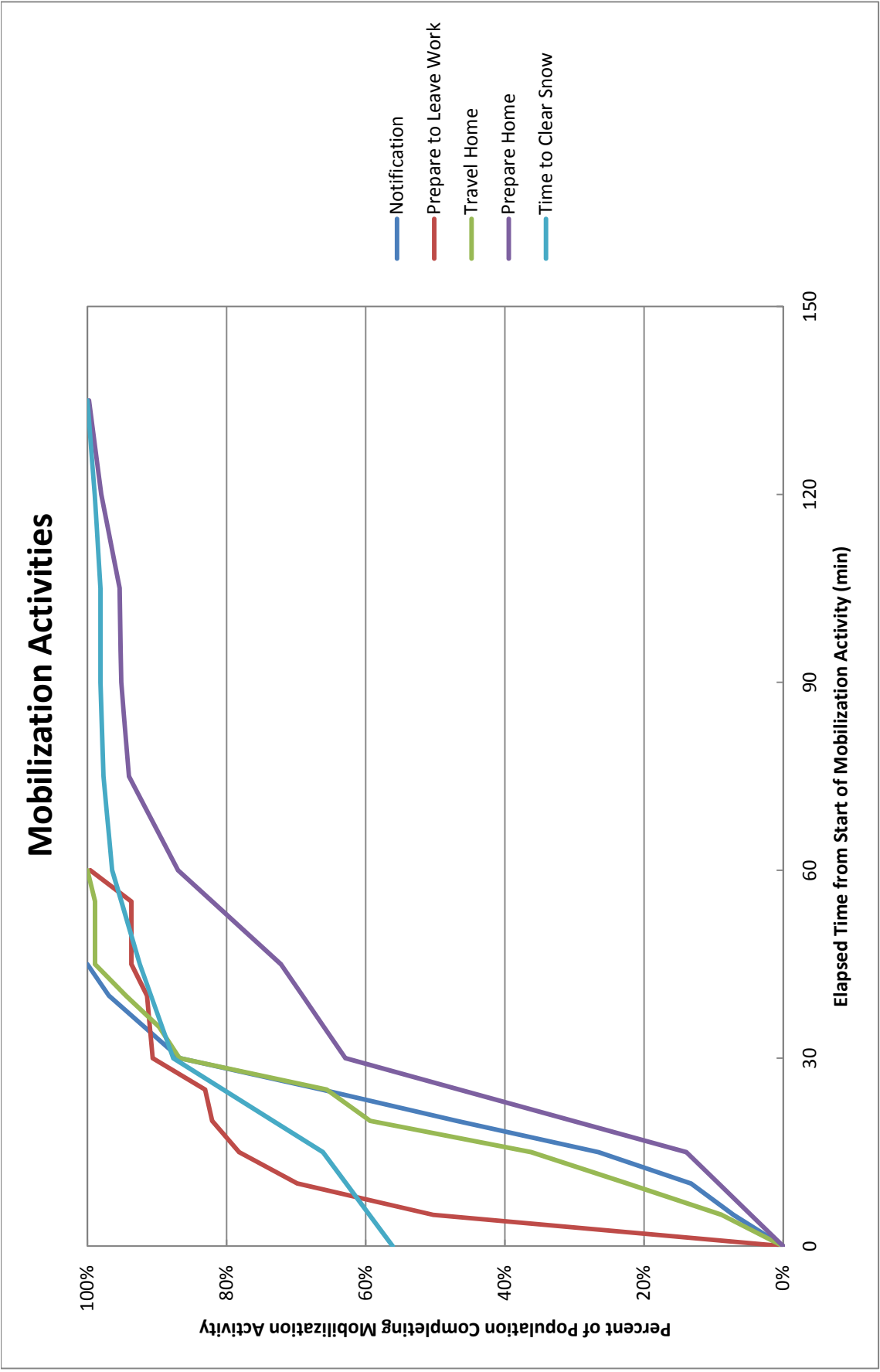


Figure 5-2. Evacuation Mobilization Activities

5.4 Calculation of Trip Generation Time Distribution

The time distributions for each of the mobilization activities presented herein must be combined to form the appropriate Trip Generation Distributions. As discussed above, this study assumes that the stated events take place in sequence such that all preceding events must be completed before the current event can occur. For example, if a household awaits the return of a commuter, the work-to-home trip (Activity 3 → 4) must precede Activity 4 → 5.

To calculate the time distribution of an event that is dependent on two sequential activities, it is necessary to “sum” the distributions associated with these prior activities. The distribution summing algorithm is applied repeatedly as shown to form the required distribution. As an outcome of this procedure, new time distributions are formed; we assign “letter” designations to these intermediate distributions to describe the procedure. Table 5-7 presents the summing procedure to arrive at each designated distribution.

Table 5-7. Mapping Distributions to Events

Apply “Summing” Algorithm To:	Distribution Obtained	Event Defined
Distributions 1 and 2	Distribution A	Event 3
Distributions A and 3	Distribution B	Event 4
Distributions B and 4	Distribution C	Event 5
Distributions 1 and 4	Distribution D	Event 5
Distributions C and 5	Distribution E	Event 5
Distributions D and 5	Distribution F	Event 5

Table 5-8 presents a description of each of the final trip generation distributions achieved after the summing process is completed.

Table 5-8. Description of the Distributions

Distribution	Description
A	Time distribution of commuters departing place of work (Event 3). Also applies to employees who work within the EPZ who live outside, and to Transients within the EPZ.
B	Time distribution of commuters arriving home (Event 4).
C	Time distribution of residents with commuters who return home, leaving home to begin the evacuation trip (Event 5).
D	Time distribution of residents without commuters returning home, leaving home to begin the evacuation trip (Event 5).
E	Time distribution of residents with commuters who return home, leaving home to begin the evacuation trip, after snow clearance activities (Event 5).
F	Time distribution of residents with no commuters returning home, leaving to begin the evacuation trip, after snow clearance activities (Event 5).

5.4.1 Statistical Outliers

As already mentioned, some portion of the survey respondents answer “don’t know” to some questions or choose to not respond to a question. The mobilization activity distributions are based upon actual responses. But, it is the nature of surveys that a few numeric responses are inconsistent with the overall pattern of results. An example would be a case in which for 500 responses, almost all of them estimate less than two hours for a given answer, but 3 say “four hours” and 4 say “six or more hours”.

These “outliers” must be considered: are they valid responses, or so atypical that they should be dropped from the sample?

In assessing outliers, there are three alternates to consider:

- 1) Some responses with very long times may be valid, but reflect the reality that the respondent really needs to be classified in a different population subgroup, based upon special needs;
- 2) Other responses may be unrealistic (6 hours to return home from commuting distance, or 2 days to prepare the home for departure);
- 3) Some high values are representative and plausible, and one must not cut them as part of the consideration of outliers.

The issue of course is how to make the decision that a given response or set of responses are to be considered “outliers” for the component mobilization activities, using a method that objectively quantifies the process.

There is considerable statistical literature on the identification and treatment of outliers singly or in groups, much of which assumes the data is normally distributed and some of which uses non-

parametric methods to avoid that assumption. The literature cites that limited work has been done directly on outliers in sample survey responses.

In establishing the overall mobilization time/trip generation distributions, the following principles are used:

- 1) It is recognized that the overall trip generation distributions are conservative estimates, because they assume a household will do the mobilization activities sequentially, with no overlap of activities;
- 2) The individual mobilization activities (prepare to leave work, travel home, prepare home, clear snow) are reviewed for outliers, and then the overall trip generation distributions are created (see Figure 5-1, Table 5-7, Table 5-8);
- 3) Outliers can be eliminated either because the response reflects a special population (e.g. special needs, transit dependent) or lack of realism, because the purpose is to estimate trip generation patterns for personal vehicles;
- 4) To eliminate outliers,
 - a) the mean and standard deviation of the specific activity are estimated from the responses,
 - b) the median of the same data is estimated, with its position relative to the mean noted,
 - c) the histogram of the data is inspected, and
 - d) all values greater than 3.5 standard deviations are flagged for attention, taking special note of whether there are gaps (categories with zero entries) in the histogram display.

In general, only flagged values more than 4 standard deviations from the mean are allowed to be considered outliers, with gaps in the histogram expected.

When flagged values are classified as outliers and dropped, steps “a” to “d” are repeated.

- 5) As a practical matter, even with outliers eliminated by the above, the resultant histogram, viewed as a cumulative distribution, is not a normal distribution. A typical situation that results is shown below in Figure 5-3.

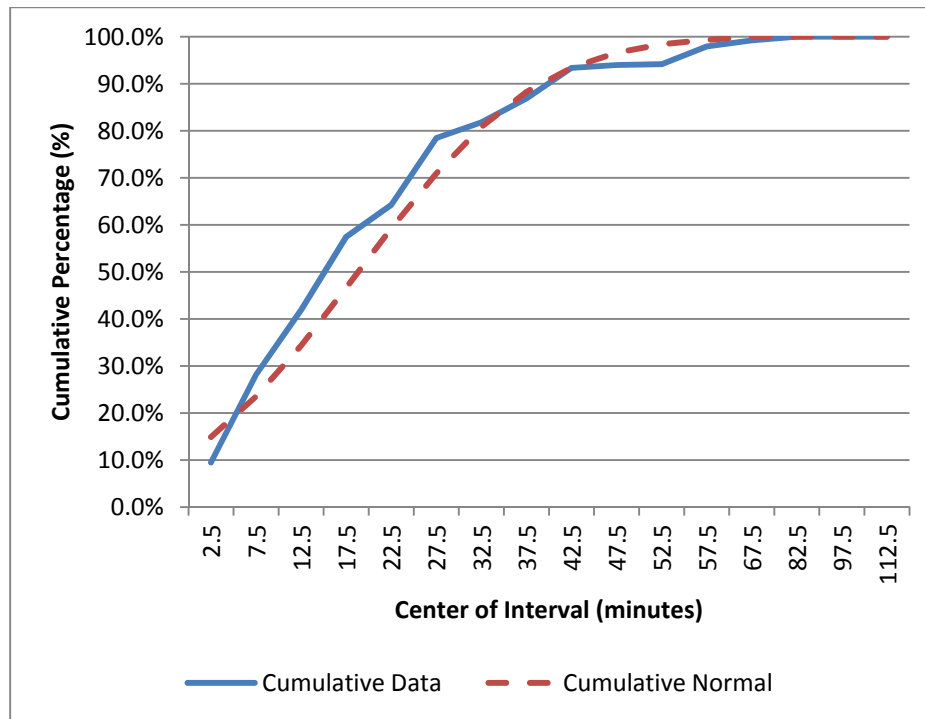


Figure 5-3. Comparison of Data Distribution and Normal Distribution

- 6) In particular, the cumulative distribution differs from the normal distribution in two key aspects, both very important in loading a network to estimate evacuation times:

- Most of the real data is to the left of the “normal” curve above, indicating that the network loads faster for the first 80-85% of the vehicles, potentially causing more (and earlier) congestion than otherwise modeled;
- The last 10-15% of the real data “tails off” slower than the comparable “normal” curve, indicating that there is significant traffic still loading at later times.

Because these two features are important to preserve, it is the histogram of the data that is used to describe the mobilization activities, not a “normal” curve fit to the data. One could consider other distributions, but using the shape of the *actual* data curve is unambiguous and preserves these important features;

- 7) With the mobilization activities each modeled according to Steps 1-6, including preserving the features cited in Step 6, the overall (or total) mobilization times are constructed.

This is done by using the data sets and distributions under different scenarios (e.g. commuter returning, no commuter returning, no snow or snow in each). In general, these are additive, using

weighting based upon the probability distributions of each element; Figure 5-4 presents the combined trip generation distributions designated A, C, D, E and F. These distributions are presented on the same time scale. (As discussed earlier, the use of strictly additive activities is a conservative approach, because it makes all activities sequential – preparation for departure follows the return of the commuter; snow clearance follows the preparation for departure, and so forth. In practice, it is reasonable that some of these activities are done in parallel, at least to some extent – for instance, preparation to depart begins by a household member at home while the commuter is still on the road.)

The mobilization distributions that result are used in their tabular/graphical form as direct inputs to later computations that lead to the ETE.

The DYNEV II simulation model is designed to accept varying rates of vehicle trip generation for each origin centroid, expressed in the form of histograms. These histograms, which represent Distributions A, C, D, E and F, properly displaced with respect to one another, are tabulated in Table 5-9 (Distribution B, Arrive Home, omitted for clarity).

The final time period (15) is 600 minutes long. This time period is added to allow the analysis network to clear, in the event congestion persists beyond the trip generation period. Note that there are no trips generated during this final time period.

5.4.2 Staged Evacuation Trip Generation

As defined in NUREG/CR-7002, staged evacuation consists of the following:

1. ERPAs comprising the 2 mile region are advised to evacuate immediately
2. ERPAs comprising regions extending from 2 to 5 miles downwind are advised to shelter in-place while the 2 mile region is cleared
3. As vehicles evacuate the 2 mile region, sheltered people from 2 to 5 miles downwind continue preparation for evacuation
4. The population sheltering in the 2 to 5 mile region are advised to begin evacuating when approximately 90% of those originally within the 2 mile region evacuate across the 2 mile region boundary
5. Non-compliance with the shelter recommendation is the same as the shadow evacuation percentage of 20%

Assumptions

1. The population in the shadow region beyond the EPZ boundary, extending to approximately 15 miles radially from the plant, will react as they do for all non-staged evacuation scenarios. That is 20% of these households will elect to evacuate with no shelter delay.
2. 20% of the EPZ population in ERPA beyond 5 miles will elect to evacuate with no shelter delay.
3. The transient population will not be expected to stage their evacuation because of the limited sheltering options available to people who may be at parks, on a beach, or at other venues. Also, notifying the transient population of a staged evacuation would prove difficult.
4. Employees will also be assumed to evacuate without first sheltering.

Procedure

1. Trip generation for population groups in the 2 mile region will be as computed based upon the results of the telephone survey and analysis.
2. Trip generation for the population subject to staged evacuation will be formulated as follows:
 - a. Identify the 90th percentile evacuation time for the ERPAs comprising the two mile region. This value, T_{Scen}^* , is obtained from simulation results. It will become the time at which the region being sheltered will be told to evacuate for each scenario.
 - b. The resultant trip generation curves for staging are then formed as follows:
 - i. The non-shelter trip generation curve is followed until a maximum of 20% of the total trips are generated (to account for shelter non-compliance).
 - ii. No additional trips are generated until time T_{Scen}^*

- iii. Following time T_{Scen}^* , the balance of trips are generated:
 1. by stepping up and then following the non-shelter trip generation curve (if T_{Scen}^* is \leq max trip generation time) or
 2. by stepping up to 100% (if T_{Scen}^* is $>$ max trip generation time)
- c. Note: This procedure implies that there may be different staged trip generation distributions for different scenarios. NUREG/CR-7002 uses the statement “approximately 90th percentile” as the time to end staging and begin evacuating. The value of T_{Scen}^* is 1:45 for non-snow scenarios and 2:15 for snow scenarios.
3. Staged trip generation distributions are created for the following population groups:
 - a. Residents with returning commuters
 - b. Residents without returning commuters
 - c. Residents with returning commuters and snow conditions
 - d. Residents without returning commuters and snow conditions

Figure 5-5 presents the staged trip generation distributions for both residents with and without returning commuters; the 90th percentile two-mile evacuation time is 105 minutes for good weather and 135 minutes for snow scenarios. At the 90th percentile evacuation time, approximately 20% of the population (who have completed their mobilization activities) advised to shelter has nevertheless departed the area. These people do not comply with the shelter advisory. Also included on the plot are the trip generation distributions for these groups as applied to the regions advised to evacuate immediately.

Since the 90th percentile evacuation time occurs before the end of the trip generation time, after the sheltered region is advised to evacuate, the shelter trip generation distribution rises to meet the balance of the non-staged trip generation distribution. Following time T_{Scen}^* , the balance of staged evacuation trips that are ready to depart are released within 15 minutes. After $T_{Scen}^* + 15$, the remainder of evacuation trips are generated in accordance with the unstaged trip generation distribution.

Table 5-10 provides the trip generation histograms for staged evacuation.

5.4.3 Trip Generation for Waterways and Recreational Areas

In the Monroe County Radiological Emergency Preparedness Plan, Procedure J item II B 1 states that:

Coast Guard Station Rochester to initiate PRE COMMS instructing local marinas that all vessels stay 10 Statute miles clear of Ginna Station until further notice; (NOTE: The National Weather Service, NWS, radio (162.40 MHz) and/or the Emergency Alert System, may also be used to inform boaters).

There is no time estimate given for these activities. It is assumed boaters will return to marinas within the mobilization time of transients within the EPZ.

Table 5-9. Trip Generation Histograms for the EPZ Population for Unstaged Evacuation

Time Period	Duration (Min)	Percent of Total Trips Generated Within Indicated Time Period					
		Employees (Distribution A)	Transients (Distribution A)	Residents with Commuters (Distribution C)	Residents Without Commuters (Distribution D)	Residents With Snow (Distribution E)	Residents Without Snow (Distribution F)
1	15	8%	8%	0%	1%	0%	1%
2	15	37%	37%	0%	9%	0%	5%
3	15	34%	34%	3%	26%	2%	17%
4	15	11%	11%	10%	28%	6%	22%
5	15	5%	5%	19%	15%	13%	17%
6	15	4%	4%	20%	10%	17%	14%
7	15	1%	1%	17%	5%	16%	9%
8	15	0%	0%	12%	1%	14%	5%
9	15	0%	0%	8%	2%	11%	3%
10	15	0%	0%	4%	2%	7%	2%
11	15	0%	0%	3%	1%	4%	2%
12	30	0%	0%	3%	0%	6%	2%
13	30	0%	0%	1%	0%	3%	1%
14	30	0%	0%	0%	0%	1%	0%
15	600	0%	0%	0%	0%	0%	0%

NOTE:

- Shadow vehicles are loaded onto the analysis network (Figure 1-2) using Distributions C and E for good weather and snow, respectively.
- Special event vehicles are loaded using Distribution A.

Trip Generation Distributions

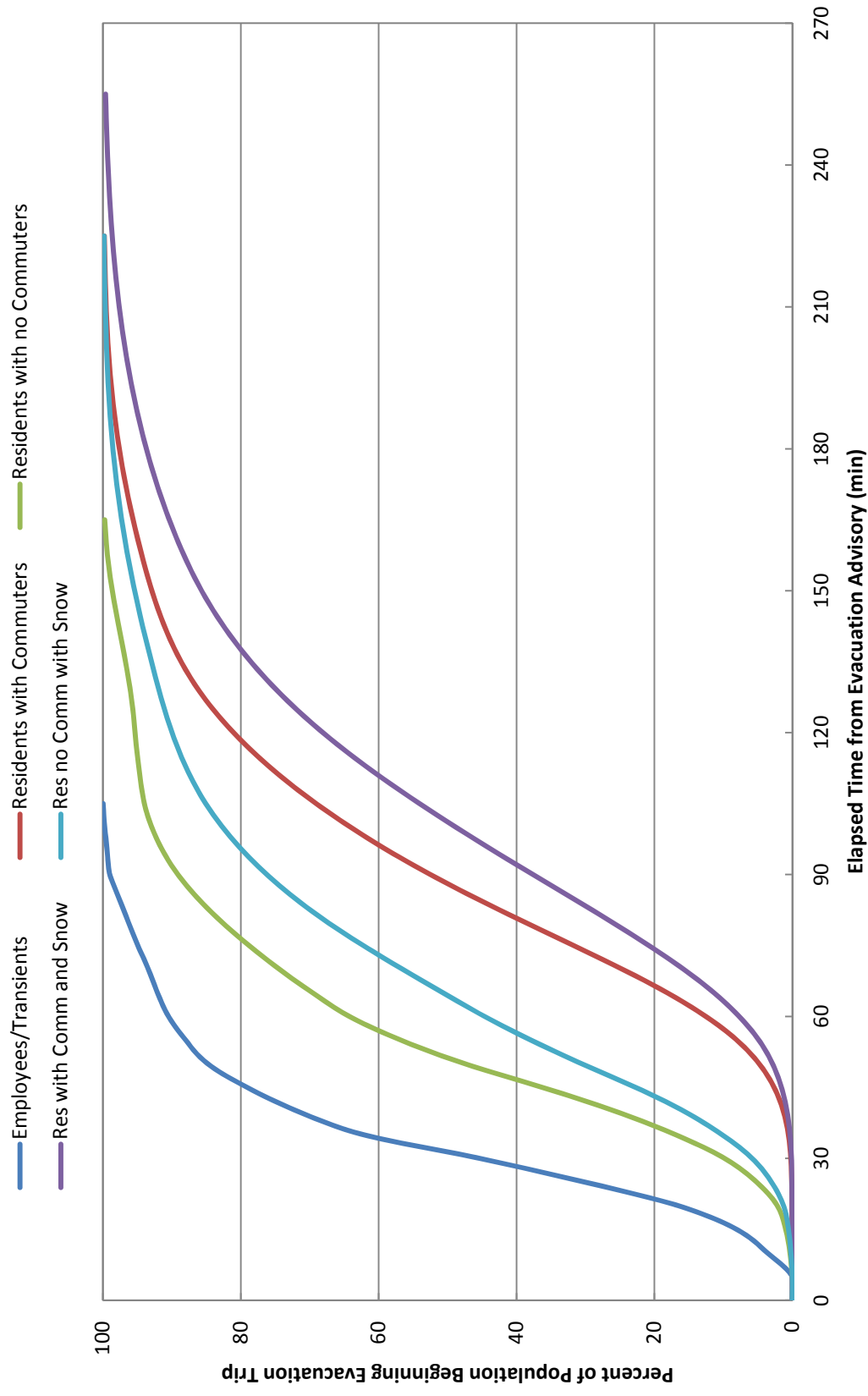


Figure 5-4. Comparison of Trip Generation Distributions

Table 5-10. Trip Generation Histograms for the EPZ Population for Staged Evacuation

Time Period	Duration (Min)	Percent of Total Trips Generated Within Indicated Time Period*			
		Residents with Commuters (Distribution C)	Residents Without Commuters (Distribution D)	Residents With Commuters Snow (Distribution E)	Residents Without Commuters Snow (Distribution F)
1	15	0%	0%	0%	0%
2	15	0%	2%	0%	1%
3	15	1%	5%	0%	4%
4	15	2%	6%	2%	4%
5	15	3%	3%	2%	3%
6	15	4%	2%	4%	3%
7	15	4%	1%	3%	2%
8	15	67%	76%	3%	1%
9	15	8%	2%	2%	1%
10	15	4%	2%	70%	76%
11	15	3%	1%	4%	2%
12	30	3%	0%	6%	2%
13	30	1%	0%	3%	1%
14	30	0%	0%	1%	0%
15	600	0%	0%	0%	0%

*Trip Generation for Employees and Transients (see Table 5-9) is the same for Unstaged and Staged Evacuation.

Staged and Unstaged Evacuation Trip Generation

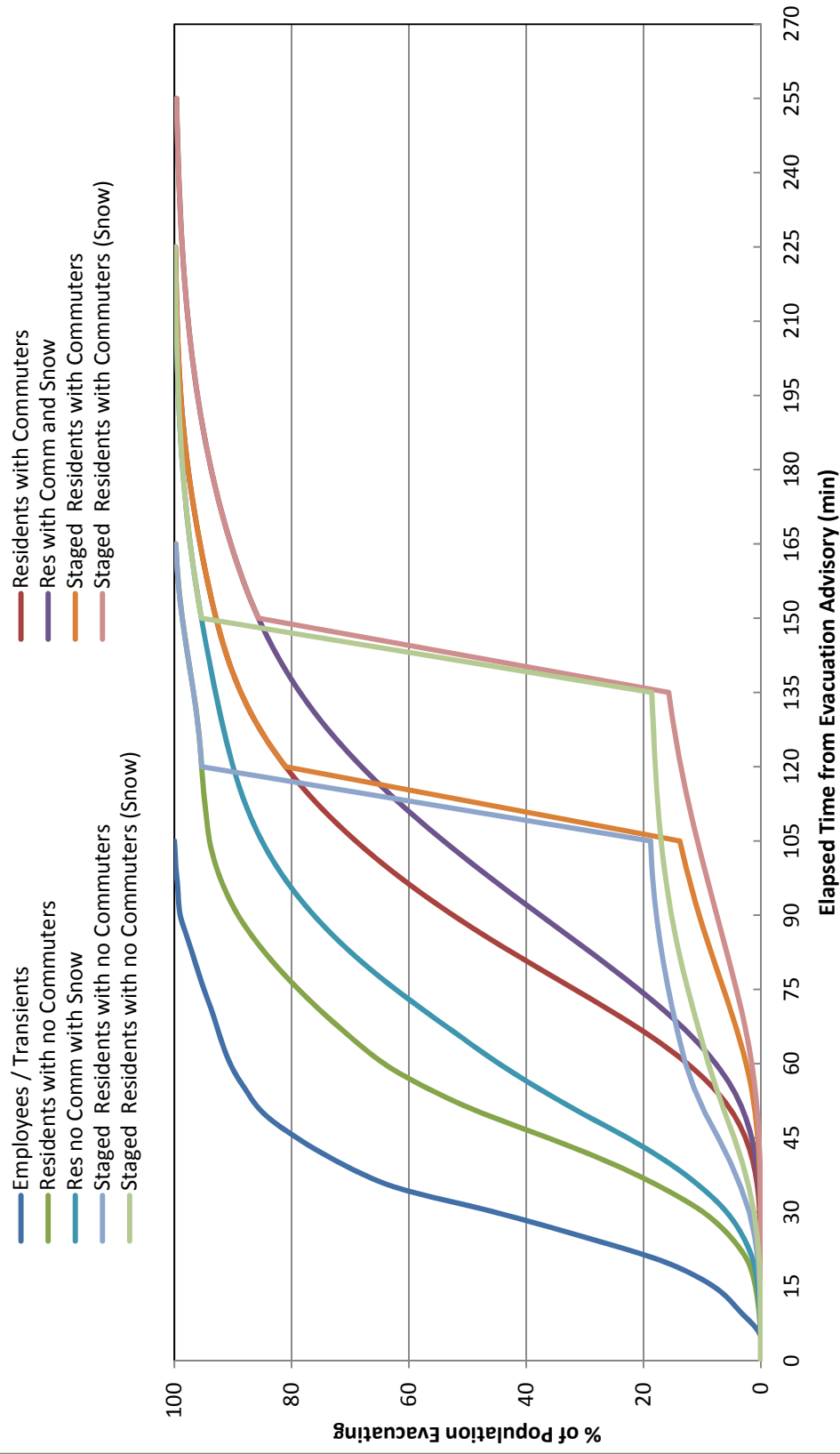


Figure 5-5. Comparison of Staged and Unstaged Trip Generation Distributions in the 2 to 5 Mile Region

6 DEMAND ESTIMATION FOR EVACUATION SCENARIOS

An evacuation “case” defines a combination of Evacuation Region and Evacuation Scenario. The definitions of “Region” and “Scenario” are as follows:

Region	A grouping of contiguous evacuating ERPAs that forms either a “keyhole” sector-based area, or a circular area within the EPZ, that must be evacuated in response to a radiological emergency.
Scenario	A combination of circumstances, including time of day, day of week, season, and weather conditions. Scenarios define the number of people in each of the affected population groups and their respective mobilization time distributions.

A total of 25 Regions were defined which encompass all the groupings of ERPAs considered. These Regions are defined in Table 6-1. The ERPA configurations are identified in Figure 6-1. Each keyhole sector-based area consists of a central circle centered at the power plant, and three adjoining sectors, each with a central angle of 22.5 degrees, as per NUREG/CR-7002 guidance. The central sector coincides with the wind direction. These sectors extend to 5 miles from the plant (Regions R04 through R08) or to the EPZ boundary (Regions R09 through R19). Regions R01, R02 and R03 represent evacuations of circular areas with radii of 2, 5 and 10 miles, respectively. Regions R20 through R25 are identical to Regions R02 and R04 through R08, respectively; however, those ERPAs between 2 miles and 5 miles are staged until 90% of the 2-mile region (Region R01) has evacuated.

A total of 14 Scenarios were evaluated for all Regions. Thus, there are a total of $25 \times 14 = 350$ evacuation cases. Table 6-2 is a description of all Scenarios.

Each combination of region and scenario implies a specific population to be evacuated. Table 6-3 presents the percentage of each population group estimated to evacuate for each scenario. Table 6-4 presents the vehicle counts for each scenario for an evacuation of Region R03 – the entire EPZ.

The vehicle estimates presented in Section 3 are peak values. These peak values are adjusted depending on the scenario and region being considered, using scenario and region specific percentages; the scenario percentages are presented in Table 6-3, while the regional percentages are provided in Table H-1. The percentages presented in Table 6-3 were determined as follows:

The number of residents with commuters during the week (when workforce is at its peak) is equal to the product of 65% (the number of households with at least one commuter) and 34% (the number of households with a commuter that would await the return of the commuter prior to evacuating). See assumption 3 in Section 2.3. It is estimated for weekend and evening scenarios that 10% of households with commuters will have a commuter at work during those times.

Employment is assumed to be at its peak during the winter, midweek, midday scenarios.

Employment is reduced slightly (96%) for summer, midweek, midday scenarios. This is based on the estimation that 50% of the employees commuting into the EPZ will be on vacation for a week during the approximate 12 weeks of summer. It is further estimated that those taking vacation will be uniformly dispersed throughout the summer with approximately 4% of employees vacationing each week. It is further estimated that only 10% of the employees are working in the evenings and during the weekends.

Transient activity is estimated to be at its peak during summer weekends and less (50%) during the week. As shown in Appendix E, there are six lodging facilities offering overnight accommodations in the EPZ; thus, transient activity still exists in the evening hours – 30% for summer and 20% for winter. Transient activity on winter weekends is estimated to be 40%.

As noted in the shadow footnote to Table 6-3, the shadow percentages are computed using a base of 20% (see assumption 5 in Section 2.2); to include the employees within the shadow region who may choose to evacuate, the voluntary evacuation is multiplied by a scenario-specific proportion of employees to permanent residents in the shadow region. For example, using the values provided in Table 6-4 for Scenario 1, the shadow percentage is computed as follows:

$$20\% \times \left(1 + \frac{7,488}{7,424 + 25,829}\right) = 25\%$$

One special event – the Webster Father’s Day Soccer Tournament – was considered as Scenario 13. Thus, the special event traffic is 100% evacuated for Scenario 13, and 0% for all other scenarios.

It is estimated that summer school enrollment is approximately 10% of enrollment during the regular school year for summer, midweek, midday scenarios. School is not in session during weekends and evenings, thus no buses for school children are needed under those circumstances. As discussed in Section 7, schools are in session during the winter season, midweek, midday and 100% of buses will be needed under those circumstances. Transit buses for the transit-dependent population are set to 100% for all scenarios as it is assumed that the transit-dependent population is present in the EPZ for all scenarios.

External traffic is estimated to be reduced by 60% during evening scenarios and is 100% for all other scenarios.

Table 6-1. Description of Evacuation Regions

Basic Regions																		
Region	Description	Degrees	ERPA															
			W-1	W-2	W-3	W-4	W-5	W-6	W-7	M-1	M-2	M-3	M-4	M-5	M-6	M-7	M-8	M-9
R01	2-Mile Region		x															
R02	5-Mile Region		x	x	x					x								
R03	Full EPZ		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Evacuate 2-Mile Region and Downwind to 5 Miles																		
Region	Wind Direction From:	Degrees	ERPA															
			W-1	W-2	W-3	W-4	W-5	W-6	W-7	M-1	M-2	M-3	M-4	M-5	M-6	M-7	M-8	M-9
R04	N	349 - 11	x	x														
R05	NNE, NE, ENE	12 - 78	x	x						x								
R06	E, ESE	79 - 124	x							x								
	SE, SSE, S, SSW, SW	125 - 236	See Region R01															
R07	WSW, W	237 - 281	x		x													
R08	WNW, NW, NNW	282 - 348	x	x	x													
Evacuate 5-Mile Region and Downwind to the EPZ Boundary																		
Region	Wind Direction From:	Degrees	ERPA															
			W-1	W-2	W-3	W-4	W-5	W-6	W-7	M-1	M-2	M-3	M-4	M-5	M-6	M-7	M-8	M-9
R09	N	349 - 11	x	x	x		x	x	x	x	x			x				
R10	NNE	12 - 33	x	x	x				x	x	x	x	x	x		x		
R11	NE	34 - 56	x	x	x				x	x	x	x	x	x	x	x	x	x
R12	ENE	57 - 78	x	x	x					x	x	x	x	x	x	x	x	x
R13	E	79 - 101	x	x	x					x		x	x		x	x	x	x
R14	ESE	102 - 124	x	x	x					x					x		x	
	SE, SSE, S, SSW, SW	125 - 236	See Region R02															
R15	WSW	237 - 258	x	x	x	x				x								
R16	W	259 - 281	x	x	x	x	x			x								
R17	WNW	282 - 303	x	x	x	x	x	x		x								
R18	NW	304 - 326	x	x	x	x	x	x	x	x								
R19	NNW	327 - 348	x	x	x		x	x	x	x								
Staged Evacuation - 2-Mile Region Evacuates, then Evacuate Downwind to 5 Miles																		
Region	Wind Direction From:	Degrees	ERPA															
			W-1	W-2	W-3	W-4	W-5	W-6	W-7	M-1	M-2	M-3	M-4	M-5	M-6	M-7	M-8	M-9
R20	No Wind		x	x	x					x								
R21	N	349 - 11	x	x														
R22	NNE, NE, ENE	12 - 78	x	x						x								
R23	E, ESE	79 - 124	x							x								
	SE, SSE, S, SSW, SW	125 - 236	See Region R01															
R24	WSW, W	237 - 281	x		x													
R25	WNW, NW, NNW	282 - 348	x	x	x													
Key																		
ERPA Evacuate			ERPA Shelter-in-Place			Shelter-in-Place until 90% ETE for R01, then Evacuate												

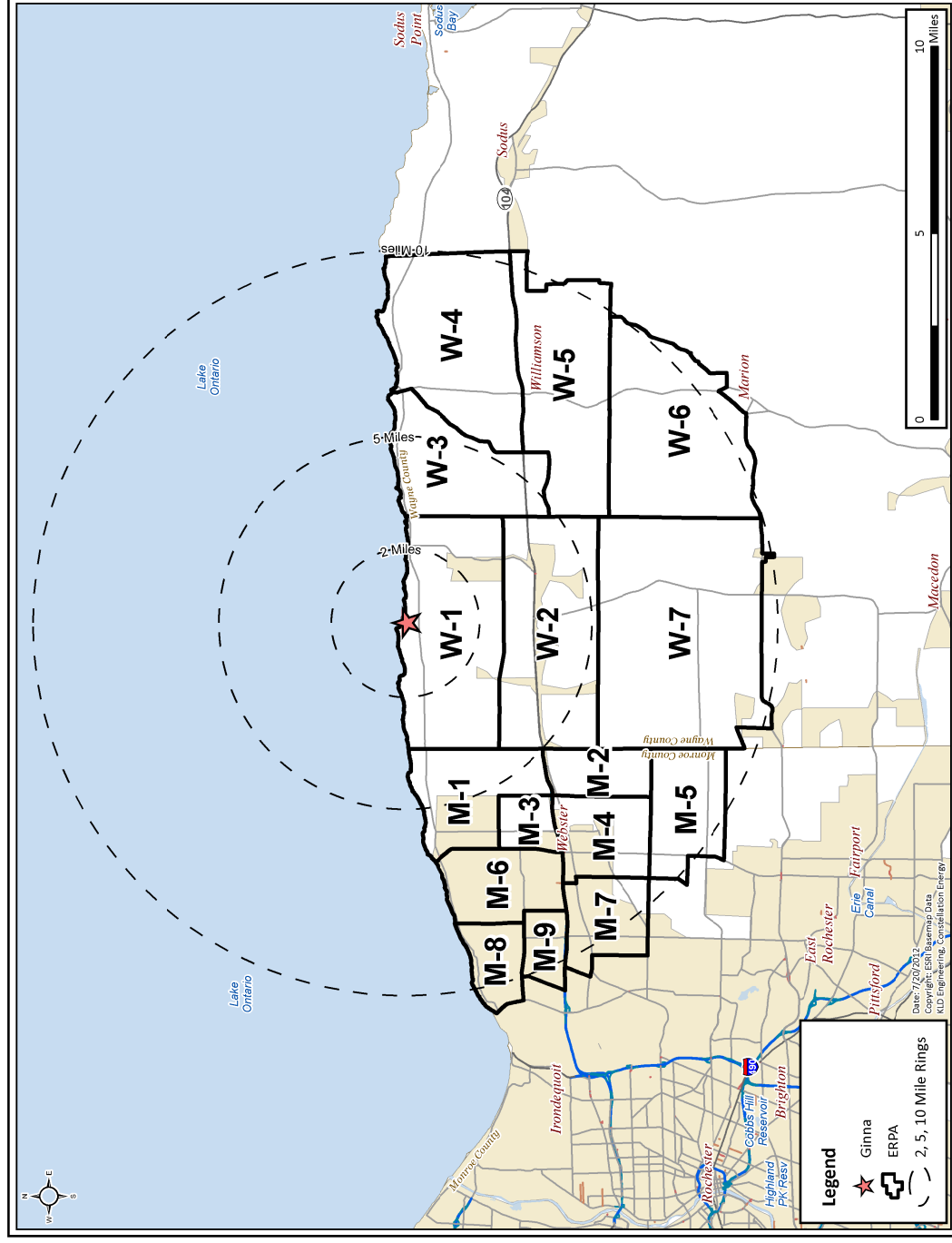


Figure 6-1. Ginna EPZ ERPAS

Table 6-2. Evacuation Scenario Definitions

Scenario	Season ¹	Day of Week	Time of Day	Weather	Special
1	Summer	Midweek	Midday	Good	None
2	Summer	Midweek	Midday	Rain	None
3	Summer	Weekend	Midday	Good	None
4	Summer	Weekend	Midday	Rain	None
5	Summer	Midweek, Weekend	Evening	Good	None
6	Winter	Midweek	Midday	Good	None
7	Winter	Midweek	Midday	Rain	None
8	Winter	Midweek	Midday	Snow	None
9	Winter	Weekend	Midday	Good	None
10	Winter	Weekend	Midday	Rain	None
11	Winter	Weekend	Midday	Snow	None
12	Winter	Midweek, Weekend	Evening	Good	None
13	Summer	Weekend	Midday	Good	Webster Father's Day Soccer Tournament
14	Summer	Midweek	Midday	Good	Roadway Impact – Lane Closure on SR 104 WB

¹ Winter means that school is in session (also applies to spring and autumn). Summer means that school is not in session.

Table 6-3. Percent of Population Groups Evacuating for Various Scenarios

Scenario	Households With Returning Commuters	Households Without Returning Commuters	Employees	Transients	Shadow	Special Events	School Buses	Transit Buses	External Through Traffic
1	22%	78%	96%	50%	25%	0%	10%	100%	100%
2	22%	78%	96%	50%	25%	0%	10%	100%	100%
3	2%	98%	10%	100%	20%	0%	0%	100%	100%
4	2%	98%	10%	100%	20%	0%	0%	100%	100%
5	2%	98%	10%	30%	20%	0%	0%	100%	40%
6	22%	78%	100%	40%	25%	0%	100%	100%	100%
7	22%	78%	100%	40%	25%	0%	100%	100%	100%
8	22%	78%	100%	40%	25%	0%	100%	100%	100%
9	2%	98%	10%	40%	20%	0%	0%	100%	100%
10	2%	98%	10%	40%	20%	0%	0%	100%	100%
11	2%	98%	10%	40%	20%	0%	0%	100%	100%
12	2%	98%	10%	20%	20%	0%	0%	100%	40%
13	2%	98%	10%	100%	20%	100%	0%	100%	100%
14	22%	78%	96%	50%	25%	0%	10%	100%	100%

Resident Households with Commuters Households of EPZ residents who await the return of commuters prior to beginning the evacuation trip.

Resident Households with No Commuters ..Households of EPZ residents who do not have commuters or will not await the return of commuters prior to beginning the evacuation trip.

Employees.....EPZ employees who live outside the EPZ

Transients People who are in the EPZ at the time of an accident for recreational or other (non-employment) purposes.

Shadow Residents and employees in the shadow region (outside of the EPZ) who will spontaneously decide to relocate during the evacuation. The basis for the values shown is a 20% relocation of shadow residents along with a proportional percentage of shadow employees.

Special Events Additional vehicles in the EPZ due to the identified special event.

School and Transit Buses Vehicle-equivalents present on the road during evacuation servicing schools and transit-dependent people (1 bus is equivalent to 2 passenger vehicles).

External Through Traffic Traffic on interstates/freeways and major arterial roads at the start of the evacuation. This traffic is stopped by access control approximately 2 hours after the evacuation begins.

Table 6-4. Vehicle Estimates by Scenario

Scenario	Households With Returning Commuters	Households Without Returning Commuters	Employees	Transients	Shadow	Special Events	School Buses	Transit Buses	External Through Traffic	Total Scenario Vehicles
1	7,424	25,829	7,488	443	19,524	-	57	138	17,134	78,037
2	7,424	25,829	7,488	443	19,524	-	57	138	17,134	78,037
3	742	32,511	780	886	16,309	-	-	138	17,134	68,500
4	742	32,511	780	886	16,309	-	-	138	17,134	68,500
5	742	32,511	780	266	16,309	-	-	138	6,854	57,600
6	7,424	25,829	7,800	354	19,673	-	568	138	17,134	78,920
7	7,424	25,829	7,800	354	19,673	-	568	138	17,134	78,920
8	7,424	25,829	7,800	354	19,673	-	568	138	17,134	78,920
9	742	32,511	780	354	16,309	-	-	138	17,134	67,968
10	742	32,511	780	354	16,309	-	-	138	17,134	67,968
11	742	32,511	780	354	16,309	-	-	138	17,134	67,968
12	742	32,511	780	177	16,309	-	-	138	6,854	57,511
13	742	32,511	780	886	16,309	977	-	138	17,134	69,477
14	7,424	25,829	7,488	443	19,524	-	57	138	17,134	78,037

Note: Vehicle estimates are for an evacuation of the entire EPZ (Region R03)

7 GENERAL POPULATION EVACUATION TIME ESTIMATES (ETE)

This section presents the ETE results of the computer analyses using the DYNEV II System described in Appendices B, C and D. These results cover 25 regions within the Ginna Nuclear EPZ and the 14 Evacuation Scenarios discussed in Section 6.

The ETE for all Evacuation Cases are presented in Table 7-1 and Table 7-2. These tables present the estimated times to clear the indicated population percentages from the Evacuation Regions for all Evacuation Scenarios. The ETE of the 2-mile region in both staged and un-staged regions are presented in Table 7-3 and Table 7-4. Table 7-5 defines the Evacuation Regions considered. The tabulated values of ETE are obtained from the DYNEV II System outputs which are generated at 5-minute intervals.

7.1 Voluntary Evacuation and Shadow Evacuation

“Voluntary evacuees” are people within the EPZ in ERPAs for which an Advisory to Evacuate has not been issued, yet who elect to evacuate. “Shadow evacuation” is the voluntary outward movement of some people from the Shadow Region (outside the EPZ) for whom no protective action recommendation has been issued. Both voluntary and shadow evacuations are assumed to take place over the same time frame as the evacuation from within the impacted Evacuation Region.

The ETE for the Ginna EPZ addresses the issue of voluntary evacuees in the manner shown in Figure 7-1. Within the EPZ, 20 percent of people located in ERPAs outside of the evacuation region who are not advised to evacuate, are assumed to elect to evacuate. Similarly, it is assumed that 20 percent of those people in the Shadow Region will choose to leave the area.

Figure 7-2 presents the area identified as the Shadow Region. This region extends radially from the plant to cover a region between the EPZ boundary and approximately 15 miles. The population and number of evacuating vehicles in the Shadow Region were estimated using the same methodology that was used for permanent residents within the EPZ (see Section 3.1). As discussed in Section 3.2, it is estimated that a total of 153,317 people reside in the Shadow Region; 20 percent of them would evacuate. See Table 6-4 for the number of evacuating vehicles from the Shadow Region.

Traffic generated within this Shadow Region, traveling away from the plant location, has the potential for impeding evacuating vehicles from within the Evacuation Region. All ETE calculations include this shadow traffic movement.

7.2 Staged Evacuation

As defined in NUREG/CR-7002, staged evacuation consists of the following:

1. ERPAs comprising the 2 mile region are advised to evacuate immediately.
2. ERPAs comprising regions extending from 2 to 5 miles downwind are advised to shelter in-place while the two mile region is cleared.

3. As vehicles evacuate the 2 mile region, people from 2 to 5 miles downwind continue preparation for evacuation while they shelter.
4. The population sheltering in the 2 to 5 mile region is advised to evacuate when approximately 90% of the 2 mile region evacuating traffic crosses the 2 mile region boundary.
5. Non-compliance with the shelter recommendation is the same as the shadow evacuation percentage of 20%.

See Section 5.4.2 for additional information on staged evacuation.

7.3 Patterns of Traffic Congestion during Evacuation

Figure 7-3 through Figure 7-7 illustrate the patterns of traffic congestion that arise for the case when the entire EPZ (Region R03) is advised to evacuate during the summer, midweek, midday period under good weather conditions (Scenario 1).

Traffic congestion, as the term is used here, is defined as Level of Service (LOS) F. LOS F is defined as follows (HCM 2010, page 5-5):

The HCM uses LOS F to define operations that have either broken down (i.e., demand exceeds capacity) or have exceeded a specified service measure value, or combination of service measure values, that most users would consider unsatisfactory. However, particularly for planning applications where different alternatives may be compared, analysts may be interested in knowing just how bad the LOS F condition is. Several measures are available to describe individually, or in combination, the severity of a LOS F condition:

- *Demand-to-capacity ratios* describe the extent to which capacity is exceeded during the analysis period (e.g., by 1%, 15%, etc.);
- *Duration of LOS F* describes how long the condition persists (e.g., 15 min, 1 h, 3 h); and
- *Spatial extent measures* describe the areas affected by LOS F conditions. These include measures such as the back of queue, and the identification of the specific intersection approaches or system elements experiencing LOS F conditions.

All highway "links" which experience LOS F are delineated in these figures by a thick red line; all others are lightly indicated. Congestion develops rapidly around concentrations of population and traffic bottlenecks. Figure 7-3 displays the developing congestion within the population centers of Webster to the southwest of Ginna, and Ontario to the south, just 30 minutes after the Advisory to Evacuate (ATE). Note that State Route 104 (SR 104), which is servicing the external-external trips is displaying heavy traffic demand (LOS D and E) on those sections exiting the EPZ to the west. There is never any congestion within 2 miles of the plant due to sufficient roadway capacity and pathways to exit the area.

At one hour after the ATE, Figure 7-4 displays fully-developed congestion within these

population centers and along the exiting sections along SR 104. The most severely impacted area is in northwest Webster at the Xerox Headquarters. The congestion on the southwest is now involving shadow evacuees from the Shadow Region in western Penfield, Fairport and East Rochester. The confluence of the congestion in the Penfield is clearly impacting the rate of travel out of the southwestern boundary of the EPZ. Congestion also exists on SR 350 extending from the Town of Ontario to the EPZ boundary directly south of the plant.

At 2 hours after the ATE, as shown in Figure 7-5, congestion still persists but has migrated away from the plant. There is heavy traffic flow but no congestion within the 5-mile region and Wayne County, and the majority of congestion in the southwest is outside the EPZ. Congestion still persists in Webster as vehicles wait to access SR 104 westbound, or decide to take alternate routes to the south or west.

At 2 hours and 30 minutes after the ATE, as shown in Figure 7-6, the only congestion remaining in the EPZ due to vehicles evacuating from the Webster area on Shoecraft Road, State Road and Plank Road. Congestion in the shadow region continues as most vehicles wait to access I-490 and I-590.

At 3 hours and 10 minutes after the ATE, as shown in Figure 7-7, the EPZ has cleared of all congestions and there is only congestion remaining in East Rochester. The entire network clears of congestion at 3:25 after the ATE.

7.4 Evacuation Rates

Evacuation is a continuous process, as implied by Figure 7-8 through Figure 7-21. These figures indicate the rate at which traffic flows out of the indicated areas for the case of an evacuation of the full EPZ (Region R03) under the indicated conditions. One figure is presented for each scenario considered.

As indicated in Figure 7-8, there is typically a long "tail" to these distributions. Vehicles begin to evacuate an area slowly at first, as people respond to the ATE at different rates. Then traffic demand builds rapidly (slopes of curves increase). When the system becomes congested, traffic exits the EPZ at rates somewhat below capacity until some evacuation routes have cleared. As more routes clear, the aggregate rate of egress slows since many vehicles have already left the EPZ. Towards the end of the process, relatively few evacuation routes service the remaining demand. The fact that the "tail" of the ETE curve extends considerably beyond the time at which congestion is cleared, is indicative of the mobilization time of residents with commuters, which can be as long as 3 hours and 45 minutes.

This decline in aggregate flow rate, towards the end of the process, is characterized by these curves flattening and gradually becoming horizontal. Ideally, it would be desirable to fully saturate all evacuation routes equally so that all will service traffic near capacity levels and all will clear at the same time. For this ideal situation, all curves would retain the same slope until the end – thus minimizing evacuation time. In reality, this ideal is generally unattainable reflecting the spatial variation in population density, mobilization rates and in highway capacity over the EPZ.

7.5 Evacuation Time Estimate (ETE) Results

Table 7-1 through Table 7-2 present the ETE values for all 25 Evacuation Regions and all 14 Evacuation Scenarios. Table 7-3 through Table 7-4 present the ETE values for the 2-Mile region for both staged and un-staged keyhole regions downwind to 5 miles. They are organized as follows:

Table	Contents
7-1	ETE represents the elapsed time required for 90 percent of the population within a Region, to evacuate from that Region. All Scenarios are considered, as well as Staged Evacuation scenarios.
7-2	ETE represents the elapsed time required for 100 percent of the population within a Region, to evacuate from that Region. All Scenarios are considered, as well as Staged Evacuation scenarios.
7-3	ETE represents the elapsed time required for 90 percent of the population within the 2-mile Region, to evacuate from that Region with both Concurrent and Staged Evacuations.
7-4	ETE represents the elapsed time required for 100 percent of the population within the 2-mile Region, to evacuate from that Region with both Concurrent and Staged Evacuations.

The animation snapshots described above reflect the ETE statistics for the concurrent (un-staged) evacuation scenarios and regions, which are displayed in Figure 7-3 through Figure 7-7. Most of the congestion is located beyond the 5-mile radius; some congestion exists between the 2 and 5 mile radii, and virtually none within the 2-mile radius. This is reflected in the ETE statistics:

- The 90th percentile ETE for Region R01 (2-mile area) generally range between 1:35 (hr:min) and 1:50 (slightly higher for snow).
- The 90th percentile ETE for Region R02 (5-mile area) generally range between 1:45 (hr:min) and 2:00 (slightly higher for rain and snow).
- The 90th percentile ETE for Regions R03 (full EPZ) and R09 – R19 (which extend to the EPZ boundary) generally range between 1:50 (hr:min) and 2:00 (slightly higher for rain and snow).

The 100th percentile ETE for all Regions and for all Scenarios are directly dependent on the mobilization times. This fact implies that the congestion within the EPZ dissipates prior to the end of mobilization, as is displayed in Figure 7-7.

Comparison of Scenarios 3 and 13 in Table 7-1 indicates that the Special Event – the Webster Father’s Day Soccer Tournament – has no impact on the ETE for the 90th percentile. The additional 977 vehicles present for the special event are fast-mobilizing transients located less than 2-miles from the EPZ boundary. Any increased congestion these vehicles cause early on is

negated by how quickly they are able to mobilize and exit the EPZ.

Comparison of Scenarios 1 and 14 in Table 7-1 indicates that the roadway closure – SR 404 just south of the intersection of Plank Road – does not have an effect on ETE. There is sufficient roadway capacity for vehicles to find other routes, and the additional congestion created does not back up into the EPZ.

7.6 Staged Evacuation Results

Table 7-3 and Table 7-4 present a comparison of the ETE compiled for the concurrent (unstaged) and staged evacuation studies. Note that Regions R20 through R25 are the same geographic areas as Regions R02 and, R04 through R08, respectively.

To determine whether the staged evacuation strategy is worthy of consideration, one must show that the ETE for the 2 Mile region can be reduced without significantly affecting the region between 2 miles and 5 miles. In all cases, as shown in these tables, the ETE for the 2 mile region increases when a staged evacuation is implemented. The reason for this is that the congestion within the 5-mile area does not extend upstream to the extent that it penetrates to within 2 miles of Ginna. Consequently, the impedance, due to this congestion within the 5-mile area, to evacuees from within the 2-mile area is not sufficient to materially influence the 90th percentile ETE for the 2-mile area. Therefore, staging the evacuation to sharply reduce congestion within the 5-mile area provides no benefits to evacuees from within the 2 mile region and unnecessarily delays the evacuation of those beyond 2 miles.

While failing to provide assistance to evacuees from within the 2-mile region, staging produces a negative impact on the ETE for those evacuating from within the 5-mile area. A comparison of ETE between graphically similar Regions retards the 90th percentile evacuation time for those in the 2 to 5-mile area by up to 20 minutes (see Table 7-1). This extending of ETE is due to the delay in beginning the evacuation trip, experienced by those who shelter, plus the effect of the trip-generation “spike” (significant volume of traffic beginning the evacuation trip at the same time) that follows their eventual ATE, in creating congestion within the EPZ area beyond 2 miles.

In summary, the staged evacuation option provides no benefits and adversely impacts many evacuees located beyond 2 miles away from the plant.

7.7 Guidance on Using ETE Tables

The user first determines the percentile of population for which the ETE is sought (The NRC guidance calls for the 90th percentile). The applicable value of ETE within the chosen Table may then be identified using the following procedure:

1. Identify the applicable **Scenario**:
 - Season
 - Summer
 - Winter (also Autumn and Spring)
 - Day of Week

- Midweek
 - Weekend
- Time of Day
 - Midday
 - Evening
- Weather Condition
 - Good Weather
 - Rain
 - Snow
- Special Event
 - Webster Father's Day Soccer Tournament
 - Road Closure (A lane on SR 104 WB is closed)
- Evacuation Staging
 - No, Staged Evacuation is not considered
 - Yes, Staged Evacuation is considered

While these Scenarios are designed, in aggregate, to represent conditions throughout the year, some further clarification is warranted:

- The conditions of a summer evening (either midweek or weekend) and rain are not explicitly identified in the Tables. For these conditions, Scenarios (2) and (4) apply.
 - The conditions of a winter evening (either midweek or weekend) and rain are not explicitly identified in the Tables. For these conditions, Scenarios (7) and (10) for rain apply.
 - The conditions of a winter evening (either midweek or weekend) and snow are not explicitly identified in the Tables. For these conditions, Scenarios (8) and (11) for snow apply.
 - The seasons are defined as follows:
 - Summer assumes that public schools are not in session.
 - Winter (includes Spring and Autumn) considers that public schools are in session.
 - Time of Day: Midday implies the time over which most commuters are at work or are travelling to/from work.
2. With the desired percentile ETE and Scenario identified, now identify the **Evacuation Region**:
- Determine the projected azimuth direction of the plume (coincident with the wind direction). This direction is expressed in terms of compass orientation: from N, NNE, NE, ...
 - Determine the distance that the Evacuation Region will extend from the nuclear power plant. The applicable distances and their associated candidate Regions are given below:
 - 2 Miles (Region R01)
 - To 5 Miles (Region R02, R04 through R08)
 - To EPZ Boundary (Regions R03, R09 through R19)
 - Enter Table 7-5 and identify the applicable group of candidate Regions based on the

distance that the selected Region extends from the Ginna Plant. Select the Evacuation Region identifier in that row, based on the azimuth direction of the plume, from the first column of the Table.

3. Determine the **ETE Table based on the percentile selected. Then, for the Scenario** identified in Step 1 and the **Region** identified in Step 2, proceed as follows:

- The columns of Table 7-1 are labeled with the Scenario numbers. Identify the proper column in the selected Table using the Scenario number defined in Step 1.
- Identify the row in this table that provides ETE values for the Region identified in Step 2.
- The unique data cell defined by the column and row so determined contains the desired value of ETE expressed in Hours:Minutes.

Example

It is desired to identify the ETE for the following conditions:

- Sunday, August 10th at 4:00 AM.
- It is raining.
- Wind direction is from the northeast (NE).
- Wind speed is such that the distance to be evacuated is judged to be a 5-mile radius and downwind to 10 miles (to EPZ boundary).
- The desired ETE is that value needed to evacuate 90 percent of the population from within the impacted Region.
- A staged evacuation is not desired.

Table 7-1 is applicable because the 90th percentile ETE is desired. Proceed as follows:

1. Identify the Scenario as summer, weekend, evening and raining. Entering Table 7-1, it is seen that there is no match for these descriptors. However, the clarification given above assigns this combination of circumstances to Scenario 4.
2. Enter Table 7-5 and locate the Region described as “Evacuate 5-Mile Radius and Downwind to the EPZ Boundary” for wind direction from the NE (toward the SW) and read Region R11 in the first column of that row.
3. Enter Table 7-1 to locate the data cell containing the value of ETE for Scenario 4 and Region R11. This data cell is in column (4) and in the row for Region R11; it contains the ETE value of 2:00.

Table 7-1. Time to Clear the Indicated Area of 90 Percent of the Affected Population

Scenario:	Summer		Summer		Summer		Winter		Winter		Winter		Summer		Summer	
	Midweek		Weekend		Midweek		Midweek		Midweek		Midweek		Weekend		Weekend	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Region	Midweek		Midweek		Midweek		Midweek		Midweek		Midweek		Midweek		Midweek	
	Good Weather	Rain	Good Weather	Rain	Good Weather	Rain	Good Weather	Rain	Good Weather	Rain	Good Weather	Rain	Good Weather	Rain	Good Weather	Rain
Entire 2-Mile Region, 5-Mile Region, and EPZ																
R01	1:50	1:50	1:35	1:35	1:35	1:50	1:50	2:15	1:35	1:35	2:05	1:35	1:35	1:35	1:55	1:50
R02	2:00	2:00	1:55	1:55	1:45	2:00	2:05	2:20	1:55	1:55	2:10	1:45	1:55	1:55	1:55	1:50
R03	2:15	2:20	1:55	2:00	1:50	2:15	2:25	2:45	1:55	2:00	2:15	1:50	1:55	1:55	1:55	2:20
2-Mile Region and Keyhole to 5 Miles																
R04	2:00	2:05	1:55	2:00	1:50	2:05	2:05	2:15	1:55	2:00	2:10	1:50	1:55	1:55	2:00	2:00
R05	2:00	2:00	1:55	2:00	1:45	2:00	2:00	2:15	1:55	2:00	2:10	1:45	1:55	1:55	2:00	2:00
R06	1:50	1:50	1:35	1:35	1:35	1:50	1:50	2:15	1:35	1:35	2:05	1:35	1:35	1:35	1:50	1:50
R07	2:00	1:55	1:45	1:45	1:40	2:00	1:55	2:15	1:45	1:45	2:10	1:40	1:45	1:45	1:55	1:55
R08	2:00	2:05	1:55	2:00	1:50	2:05	2:05	2:15	1:55	2:05	2:10	1:50	1:55	1:55	2:00	2:00
5-Mile Region and Keyhole to EPZ Boundary																
R09	2:00	2:00	1:50	1:55	1:45	2:00	2:00	2:20	1:55	1:55	2:15	1:45	1:50	1:50	2:00	2:00
R10	2:00	2:00	1:55	1:55	1:50	2:00	2:05	2:25	1:50	1:55	2:10	1:50	1:50	1:50	1:55	1:55
R11	2:15	2:25	1:55	2:00	1:50	2:15	2:25	2:40	1:55	2:00	2:15	1:50	1:55	1:55	2:15	2:15
R12	2:15	2:25	1:55	2:00	1:50	2:15	2:25	2:40	1:55	2:00	2:15	1:50	1:55	1:55	2:15	2:15
R13	2:10	2:25	1:55	2:00	1:50	2:15	2:25	2:40	1:50	2:00	2:15	1:50	1:55	1:55	2:15	2:15
R14	2:00	2:00	1:50	1:55	1:45	1:55	2:00	2:15	1:50	1:55	2:10	1:45	1:50	1:50	2:00	2:00
R15	2:00	2:00	1:55	1:55	1:45	2:00	2:00	2:15	1:55	2:00	2:10	1:45	1:55	1:55	2:00	2:00
R16	2:05	2:05	1:55	1:55	1:45	2:05	2:05	2:15	1:55	1:55	2:15	1:45	1:55	1:55	2:05	2:05
R17	2:05	2:05	1:55	1:55	1:45	2:05	2:05	2:20	1:55	1:55	2:10	1:45	1:55	1:55	2:00	2:00
R18	2:05	2:05	1:55	2:00	1:45	2:00	2:05	2:20	1:55	2:00	2:15	1:45	1:55	1:55	2:05	2:05
R19	2:00	2:05	1:55	1:55	1:45	2:00	2:05	2:20	1:55	1:55	2:15	1:45	1:55	1:55	2:00	2:00
Staged Evacuation - 2-Mile Region and Keyhole to 5 Miles																
R20	2:10	2:15	2:10	2:15	2:10	2:10	2:15	2:45	2:10	2:15	2:45	2:10	2:05	2:05	2:10	2:10
R21	2:10	2:10	2:05	2:10	2:05	2:10	2:10	2:30	2:05	2:10	2:30	2:05	2:05	2:05	2:10	2:10
R22	2:10	2:15	2:10	2:10	2:10	2:10	2:10	2:35	2:10	2:15	2:40	2:10	2:10	2:10	2:10	2:10
R23	2:05	2:10	2:05	2:05	2:05	2:05	2:10	2:40	2:05	2:10	2:40	2:05	2:05	2:05	2:05	2:05
R24	2:10	2:05	2:05	2:05	2:00	2:10	2:05	2:30	2:05	2:05	2:30	2:00	2:05	2:05	2:05	2:05
R25	2:10	2:10	2:10	2:10	2:05	2:10	2:10	2:35	2:10	2:10	2:35	2:05	2:10	2:10	2:10	2:10

Table 7-2. Time to Clear the Indicated Area of 100 Percent of the Affected Population

Scenario:	Summer		Summer		Summer		Winter		Winter		Winter		Summer		Summer	
	Midweek		Weekend		Midweek		Midweek		Weekend		Midweek		Weekend		Midweek	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Region	Midday		Midday		Midday		Midday		Midday		Midday		Midday		Midday	
	Good Weather	Rain	Good Weather	Rain	Good Weather	Rain	Good Weather	Rain	Good Weather	Rain	Good Weather	Rain	Good Weather	Rain	Good Weather	Rain
Entire 2-Mile Region, 5-Mile Region, and EPZ																
R01	3:45	3:45	3:45	3:45	3:45	3:45	3:45	4:15	3:45	3:45	4:15	3:45	3:45	3:45	3:45	3:45
R02	3:50	3:50	3:50	3:50	3:50	3:50	3:50	4:20	3:50	3:50	4:20	3:50	3:50	3:50	3:50	3:50
R03	3:55	3:55	3:55	3:55	3:55	3:55	3:55	4:25	3:55	3:55	4:25	3:55	3:55	3:55	3:55	3:55
2-Mile Region and Keyhole to 5 Miles																
R04	3:50	3:50	3:50	3:50	3:50	3:50	3:50	4:20	3:50	3:50	4:20	3:50	3:50	3:50	3:50	3:50
R05	3:50	3:50	3:50	3:50	3:50	3:50	3:50	4:20	3:50	3:50	4:20	3:50	3:50	3:50	3:50	3:50
R06	3:50	3:50	3:50	3:50	3:50	3:50	3:50	4:20	3:50	3:50	4:20	3:50	3:50	3:50	3:50	3:50
R07	3:50	3:50	3:50	3:50	3:50	3:50	3:50	4:20	3:50	3:50	4:20	3:50	3:50	3:50	3:50	3:50
R08	3:50	3:50	3:50	3:50	3:50	3:50	3:50	4:20	3:50	3:50	4:20	3:50	3:50	3:50	3:50	3:50
5-Mile Region and Keyhole to EPZ Boundary																
R09	3:55	3:55	3:55	3:55	3:55	3:55	3:55	4:25	3:55	3:55	4:25	3:55	3:55	3:55	3:55	3:55
R10	3:55	3:55	3:55	3:55	3:55	3:55	3:55	4:25	3:55	3:55	4:25	3:55	3:55	3:55	3:55	3:55
R11	3:55	3:55	3:55	3:55	3:55	3:55	3:55	4:25	3:55	3:55	4:25	3:55	3:55	3:55	3:55	3:55
R12	3:55	3:55	3:55	3:55	3:55	3:55	3:55	4:25	3:55	3:55	4:25	3:55	3:55	3:55	3:55	3:55
R13	3:55	3:55	3:55	3:55	3:55	3:55	3:55	4:25	3:55	3:55	4:25	3:55	3:55	3:55	3:55	3:55
R14	3:55	3:55	3:55	3:55	3:55	3:55	3:55	4:25	3:55	3:55	4:25	3:55	3:55	3:55	3:55	3:55
R15	3:55	3:55	3:55	3:55	3:55	3:55	3:55	4:25	3:55	3:55	4:25	3:55	3:55	3:55	3:55	3:55
R16	3:55	3:55	3:55	3:55	3:55	3:55	3:55	4:25	3:55	3:55	4:25	3:55	3:55	3:55	3:55	3:55
R17	3:55	3:55	3:55	3:55	3:55	3:55	3:55	4:25	3:55	3:55	4:25	3:55	3:55	3:55	3:55	3:55
R18	3:55	3:55	3:55	3:55	3:55	3:55	3:55	4:25	3:55	3:55	4:25	3:55	3:55	3:55	3:55	3:55
R19	3:55	3:55	3:55	3:55	3:55	3:55	3:55	4:25	3:55	3:55	4:25	3:55	3:55	3:55	3:55	3:55
Staged Evacuation - 2-Mile Region and Keyhole to 5 Miles																
R20	3:50	3:50	3:50	3:50	3:50	3:50	3:50	4:20	3:50	3:50	4:20	3:50	3:50	3:50	3:50	3:50
R21	3:50	3:50	3:50	3:50	3:50	3:50	3:50	4:20	3:50	3:50	4:20	3:50	3:50	3:50	3:50	3:50
R22	3:50	3:50	3:50	3:50	3:50	3:50	3:50	4:20	3:50	3:50	4:20	3:50	3:50	3:50	3:50	3:50
R23	3:50	3:50	3:50	3:50	3:50	3:50	3:50	4:20	3:50	3:50	4:20	3:50	3:50	3:50	3:50	3:50
R24	3:50	3:50	3:50	3:50	3:50	3:50	3:50	4:20	3:50	3:50	4:20	3:50	3:50	3:50	3:50	3:50
R25	3:50	3:50	3:50	3:50	3:50	3:50	3:50	4:20	3:50	3:50	4:20	3:50	3:50	3:50	3:50	3:50

Table 7-3. Time to Clear 90 Percent of the 2-Mile Area within the Indicated Region

Scenario:	Summer		Summer		Summer		Winter		Winter		Winter		Summer		Summer	
	Midweek		Weekend		Midweek		Midweek		Weekend		Midweek		Weekend		Weekend	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Region	Midday		Midday		Evening		Midday		Midday		Midday		Evening		Midday	
	Good Weather	Rain	Good Weather	Rain	Good Weather	Good Weather	Rain	Snow	Good Weather	Rain	Snow	Good Weather	Good Weather	Special Event	Roadway Impact	Midweek
Unstaged Evacuation - 2-Mile Region																
R01	1:50	1:50	1:35	1:35	1:35	1:50	1:50	2:15	1:35	1:35	2:05	1:35	1:35	1:35	1:50	1:50
Unstaged Evacuation - 2-Mile Region and Keyhole to 5-Miles																
R02	1:50	1:50	1:35	1:35	1:35	1:50	1:50	2:15	1:35	1:35	2:05	1:35	1:35	1:35	1:50	1:50
R04	1:50	1:50	1:35	1:35	1:35	1:50	1:50	2:15	1:35	1:35	2:05	1:35	1:35	1:35	1:50	1:50
R05	1:50	1:50	1:35	1:35	1:35	1:50	1:50	2:15	1:35	1:35	2:05	1:35	1:35	1:35	1:50	1:50
R06	1:50	1:50	1:35	1:35	1:35	1:50	1:50	2:15	1:35	1:35	2:05	1:35	1:35	1:35	1:50	1:50
R07	1:50	1:50	1:35	1:35	1:35	1:50	1:50	2:15	1:35	1:35	2:05	1:35	1:35	1:35	1:50	1:50
R08	1:50	1:50	1:35	1:35	1:35	1:50	1:50	2:15	1:35	1:35	2:05	1:35	1:35	1:35	1:50	1:50
Staged Evacuation - 2-Mile Region and Keyhole to 5-Miles																
R20	2:00	2:00	1:55	1:55	1:55	2:00	2:00	2:25	1:55	1:55	2:25	1:55	1:55	1:55	2:00	2:00
R21	1:55	1:55	1:40	1:40	1:40	1:55	1:55	2:20	1:40	1:40	2:10	1:40	1:40	1:40	1:55	1:55
R22	1:55	1:55	1:50	1:50	1:50	1:55	1:55	2:25	1:50	1:50	2:20	1:50	1:50	1:50	1:55	1:55
R23	1:55	1:55	1:50	1:50	1:50	1:55	1:55	2:25	1:50	1:50	2:20	1:50	1:50	1:50	1:55	1:55
R24	1:55	1:55	1:50	1:50	1:50	1:55	1:55	2:25	1:50	1:50	2:20	1:50	1:50	1:50	1:55	1:55
R25	1:55	1:55	1:50	1:50	1:50	1:55	1:55	2:25	1:50	1:50	2:20	1:50	1:50	1:50	1:55	1:55

Table 7-4. Time to Clear 100 Percent of the 2-Mile Area within the Indicated Region

	Summer		Summer		Summer	Winter			Winter			Winter	Summer	Summer
	Midweek		Weekend		Midweek Weekend	Midweek			Midweek			Midweek Weekend	Weekend	Midweek
Scenario:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Region	Midday		Midday		Evening	Midday			Midday			Evening	Evening	Midday
	Good Weather	Rain	Good Weather	Rain	Good Weather	Good Weather	Rain	Snow	Good Weather	Rain	Snow	Good Weather	Special Event	Roadway Impact
Unstaged Evacuation - 2-Mile Region														
R01	3:45	3:45	3:45	3:45	3:45	3:45	3:45	4:15	3:45	3:45	4:15	3:45	3:45	3:45
Unstaged Evacuation - 2-Mile Region and Keyhole to 5-Miles														
R02	3:45	3:45	3:45	3:45	3:45	3:45	3:50	4:15	3:45	3:45	4:15	3:45	3:45	3:45
R04	3:45	3:45	3:45	3:45	3:45	3:50	3:45	4:15	3:45	3:45	4:15	3:45	3:45	3:45
R05	3:45	3:45	3:45	3:45	3:45	3:45	3:45	4:15	3:45	3:45	4:15	3:45	3:45	3:45
R06	3:45	3:50	3:45	3:45	3:45	3:45	3:45	4:15	3:45	3:45	4:15	3:45	3:45	3:50
R07	3:45	3:45	3:45	3:45	3:45	3:45	3:45	4:15	3:45	3:45	4:15	3:45	3:45	3:45
R08	3:45	3:45	3:45	3:45	3:45	3:50	3:45	4:15	3:45	3:45	4:15	3:45	3:45	3:45
Staged Evacuation - 2-Mile Region and Keyhole to 5-Miles														
R20	3:45	3:45	3:45	3:45	3:45	3:50	3:45	4:20	3:45	3:45	4:15	3:45	3:45	3:45
R21	3:45	3:45	3:45	3:45	3:45	3:45	3:45	4:20	3:45	3:45	4:15	3:45	3:45	3:50
R22	3:45	3:45	3:45	3:45	3:45	3:50	3:45	4:20	3:45	3:45	4:15	3:45	3:45	3:45
R23	3:45	3:45	3:45	3:45	3:45	3:45	3:45	4:15	3:45	3:45	4:15	3:45	3:45	3:45
R24	3:45	3:45	3:45	3:45	3:45	3:45	3:45	4:15	3:45	3:45	4:15	3:45	3:45	3:45
R25	3:45	3:45	3:45	3:45	3:45	3:45	3:45	4:20	3:45	3:45	4:15	3:45	3:45	3:50

Table 7-5. Description of Evacuation Regions

Basic Regions																		
Region	Description	Degrees	ERPA															
			W-1	W-2	W-3	W-4	W-5	W-6	W-7	M-1	M-2	M-3	M-4	M-5	M-6	M-7	M-8	M-9
R01	2-Mile Region		x															
R02	5-Mile Region		x	x	x					x								
R03	Full EPZ		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Evacuate 2-Mile Region and Downwind to 5 Miles																		
Region	Wind Direction From:	Degrees	ERPA															
			W-1	W-2	W-3	W-4	W-5	W-6	W-7	M-1	M-2	M-3	M-4	M-5	M-6	M-7	M-8	M-9
R04	N	349 - 11	x	x														
R05	NNE, NE, ENE	12 - 78	x	x						x								
R06	E, ESE	79 - 124	x							x								
	SE, SSE, S, SSW, SW	125 - 236	See Region R01															
R07	WSW, W	237 - 281	x		x													
R08	WNW, NW, NNW	282 - 348	x	x	x													
Evacuate 5-Mile Region and Downwind to the EPZ Boundary																		
Region	Wind Direction From:	Degrees	ERPA															
			W-1	W-2	W-3	W-4	W-5	W-6	W-7	M-1	M-2	M-3	M-4	M-5	M-6	M-7	M-8	M-9
R09	N	349 - 11	x	x	x		x	x	x	x	x			x				
R10	NNE	12 - 33	x	x	x				x	x	x	x	x	x		x		
R11	NE	34 - 56	x	x	x				x	x	x	x	x	x	x	x	x	x
R12	ENE	57 - 78	x	x	x					x	x	x	x	x	x	x	x	x
R13	E	79 - 101	x	x	x					x		x	x		x	x	x	x
R14	ESE	102 - 124	x	x	x					x					x		x	
	SE, SSE, S, SSW, SW	125 - 236	See Region R02															
R15	WSW	237 - 258	x	x	x	x				x								
R16	W	259 - 281	x	x	x	x	x			x								
R17	WNW	282 - 303	x	x	x	x	x	x		x								
R18	NW	304 - 326	x	x	x	x	x	x	x	x								
R19	NNW	327 - 348	x	x	x		x	x	x	x								
Staged Evacuation - 2-Mile Region Evacuates, then Evacuate Downwind to 5 Miles																		
Region	Wind Direction From:	Degrees	ERPA															
			W-1	W-2	W-3	W-4	W-5	W-6	W-7	M-1	M-2	M-3	M-4	M-5	M-6	M-7	M-8	M-9
R20	No Wind		x	x	x					x								
R21	N	349 - 11	x	x														
R22	NNE, NE, ENE	12 - 78	x	x						x								
R23	E, ESE	79 - 124	x							x								
	SE, SSE, S, SSW, SW	125 - 236	See Region R01															
R24	WSW, W	237 - 281	x		x													
R25	WNW, NW, NNW	282 - 348	x	x	x													
Key																		
ERPA Evacuate			ERPA Shelter-in-Place			Shelter-in-Place until 90% ETE for R01, then Evacuate												

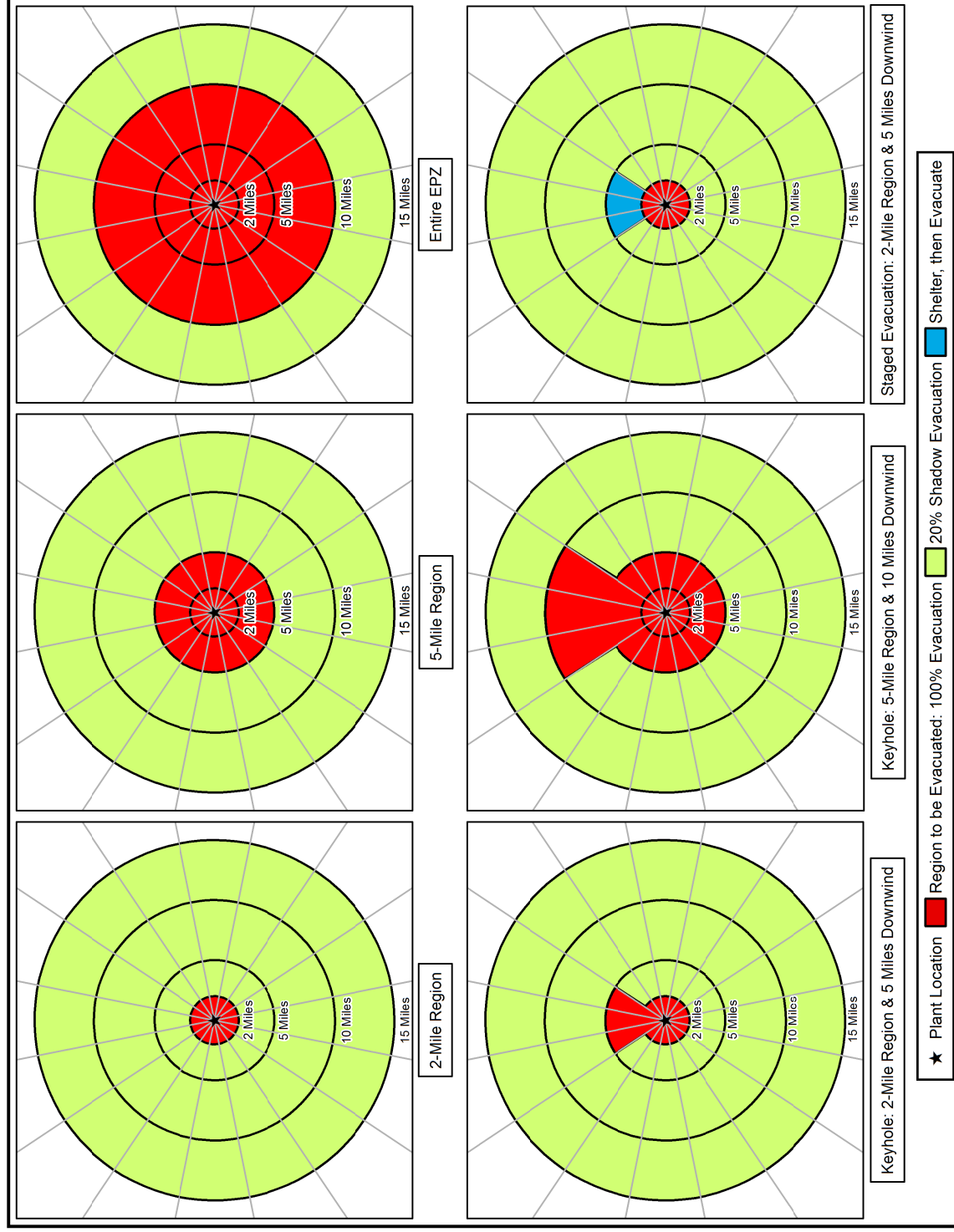


Figure 7-1. Voluntary Evacuation Methodology

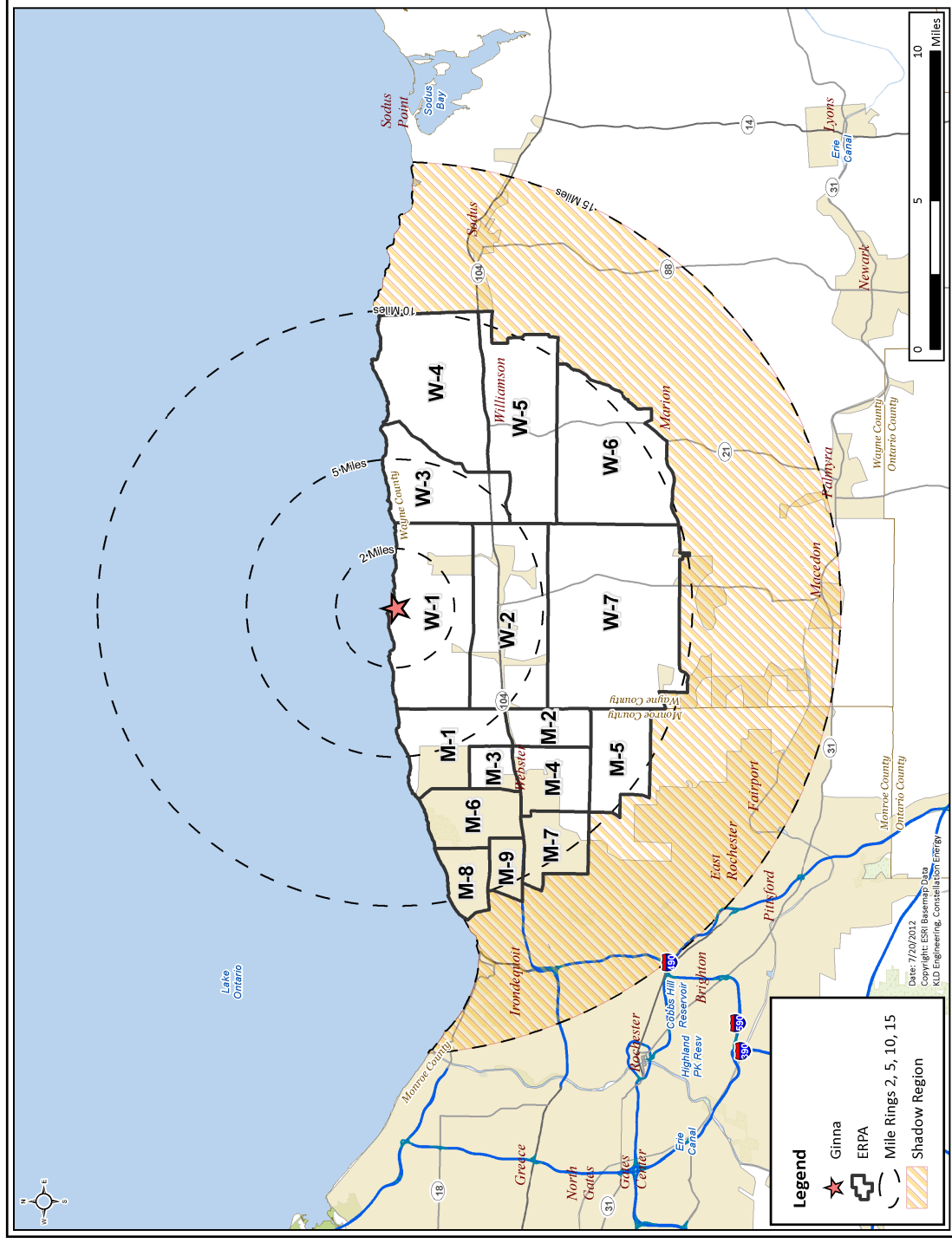


Figure 7-2. R.E. Ginna Nuclear Power Plant Shadow Region

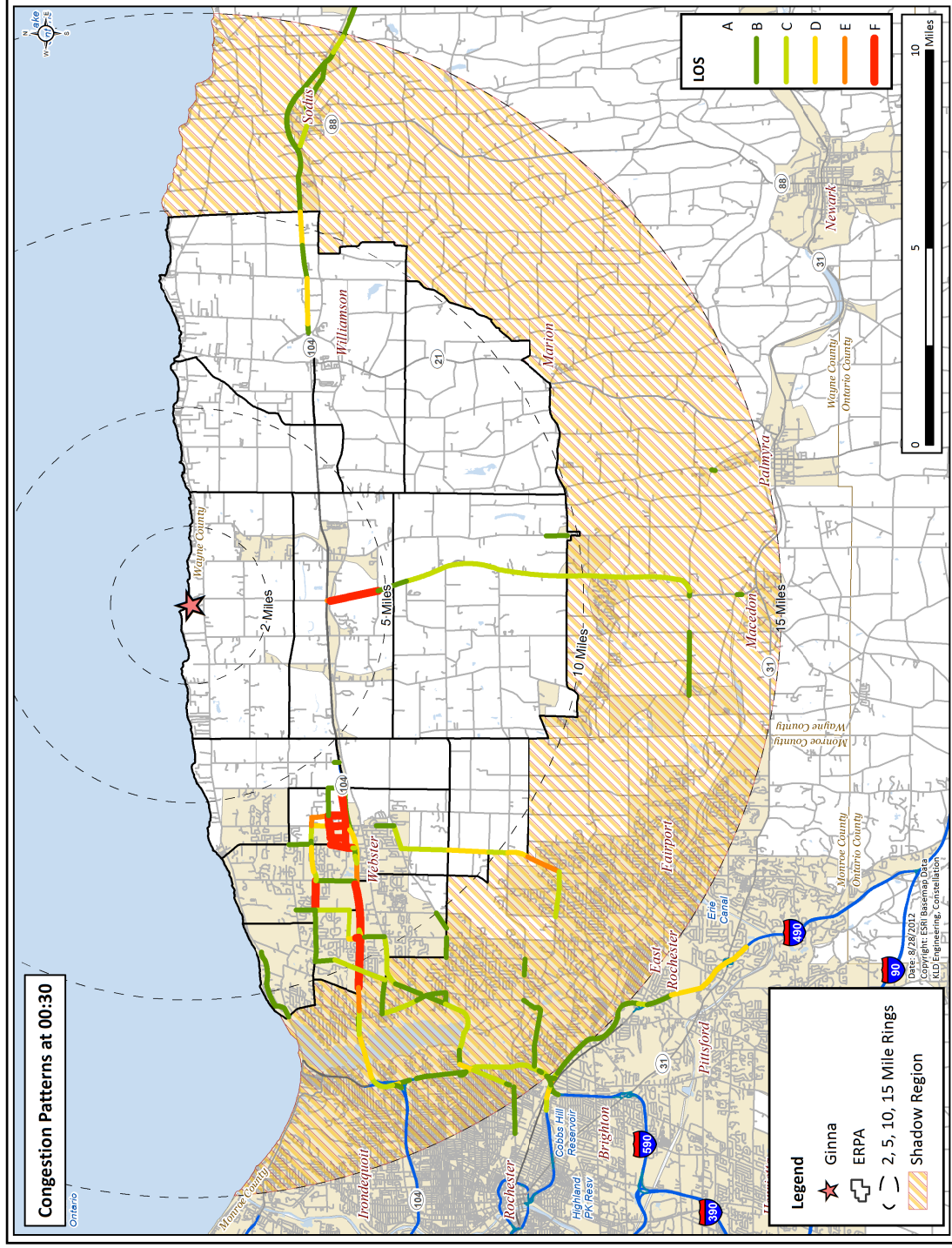


Figure 7-3. Congestion Patterns at 30 Minutes after the Advisory to Evacuate

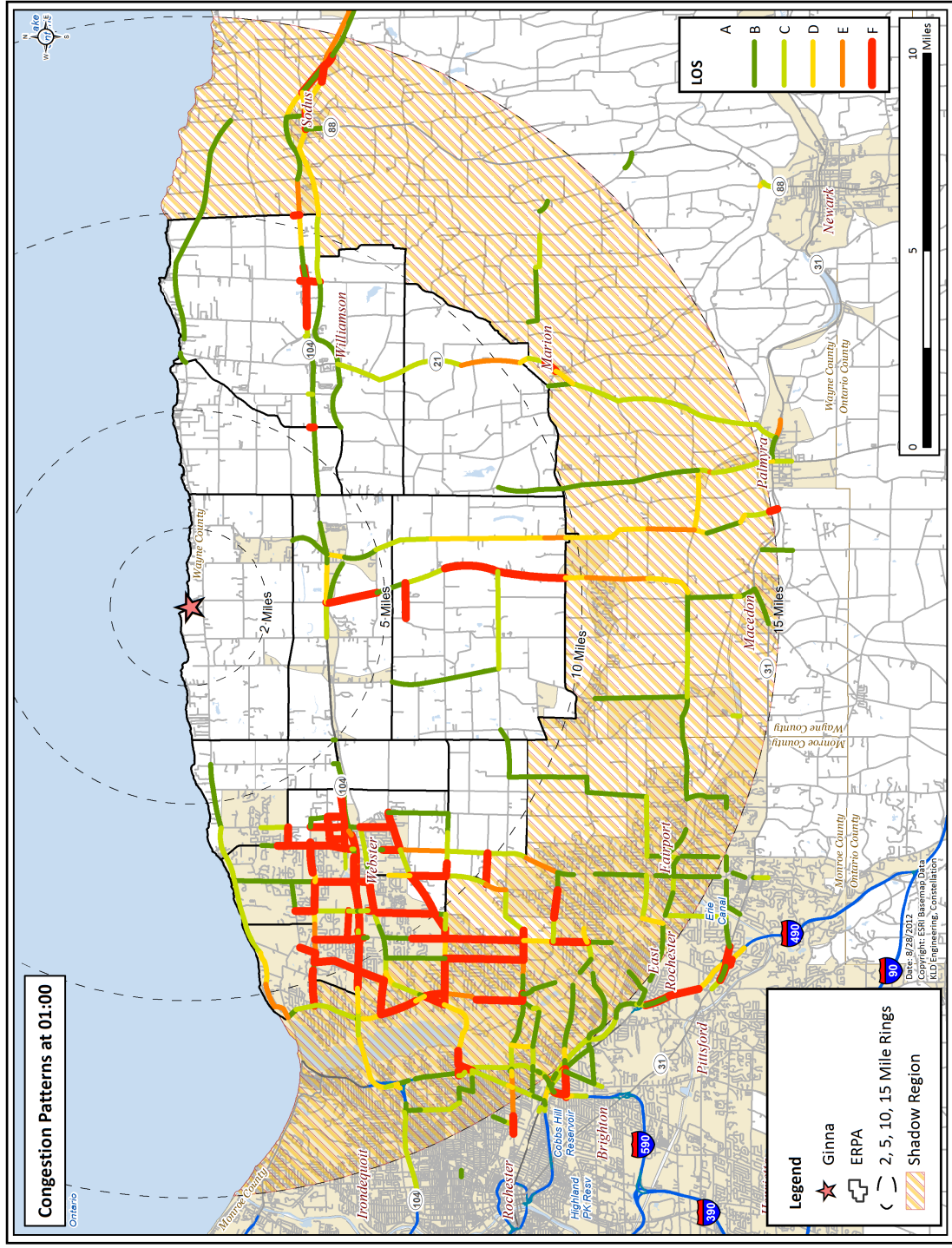


Figure 7-4. Congestion Patterns at 1 Hour after the Advisory to Evacuate

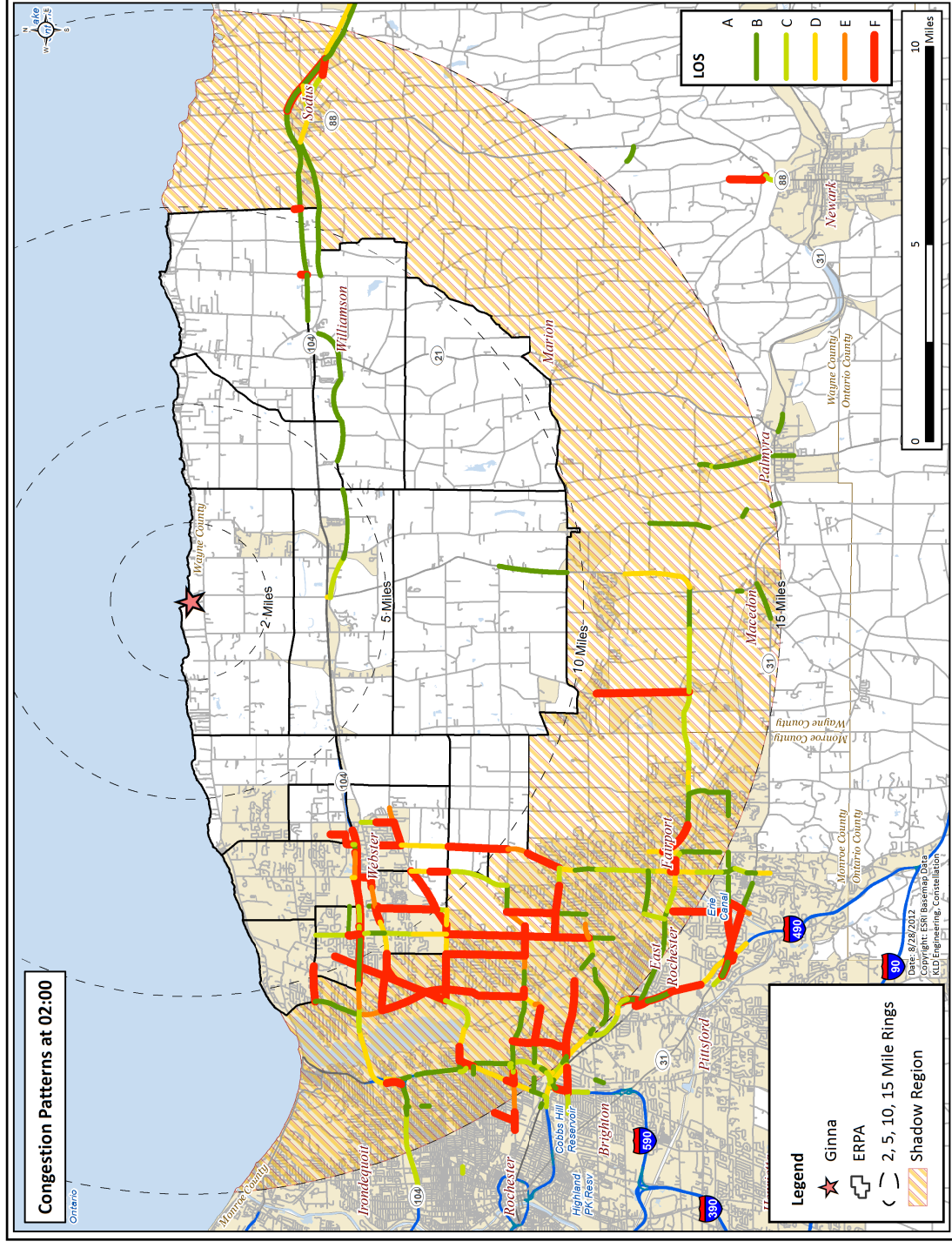


Figure 7-5. Congestion Patterns at 2 Hours after the Advisory to Evacuate

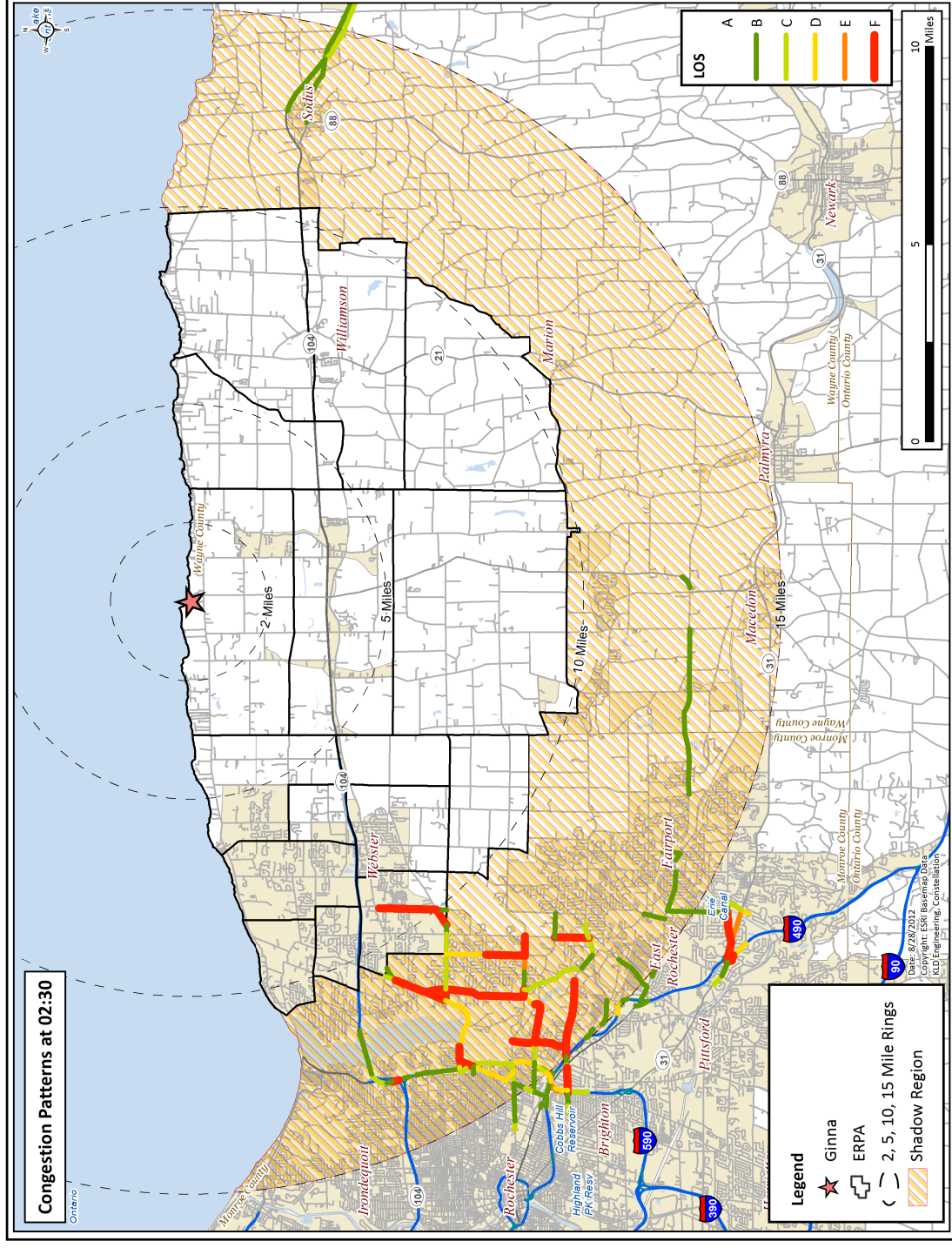


Figure 7-6. Congestion Patterns at 2 Hours and 30 Minutes after the Advisory to Evacuate

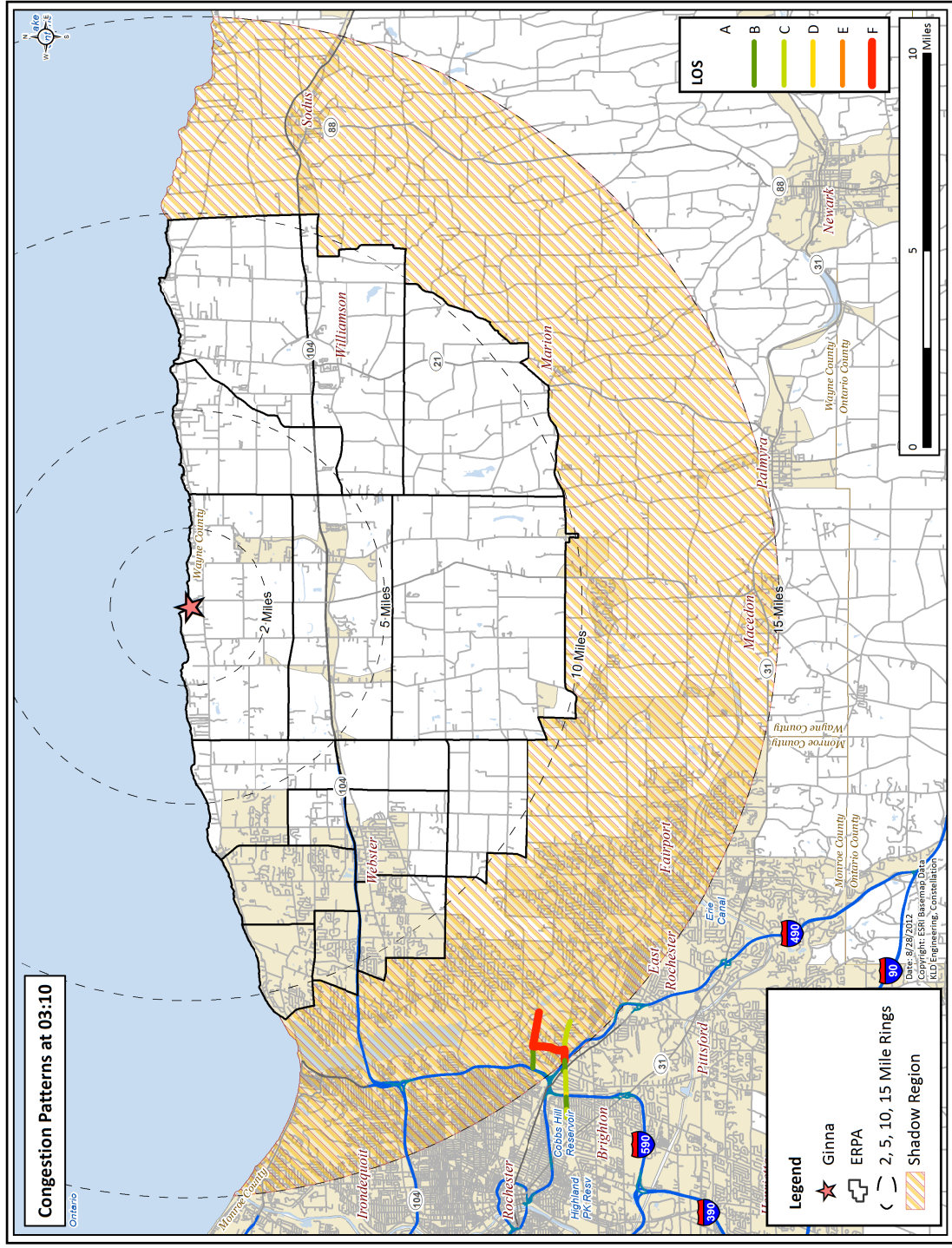


Figure 7-7. Congestion Patterns at 3 Hours and 10 Minutes after the Advisory to Evacuate

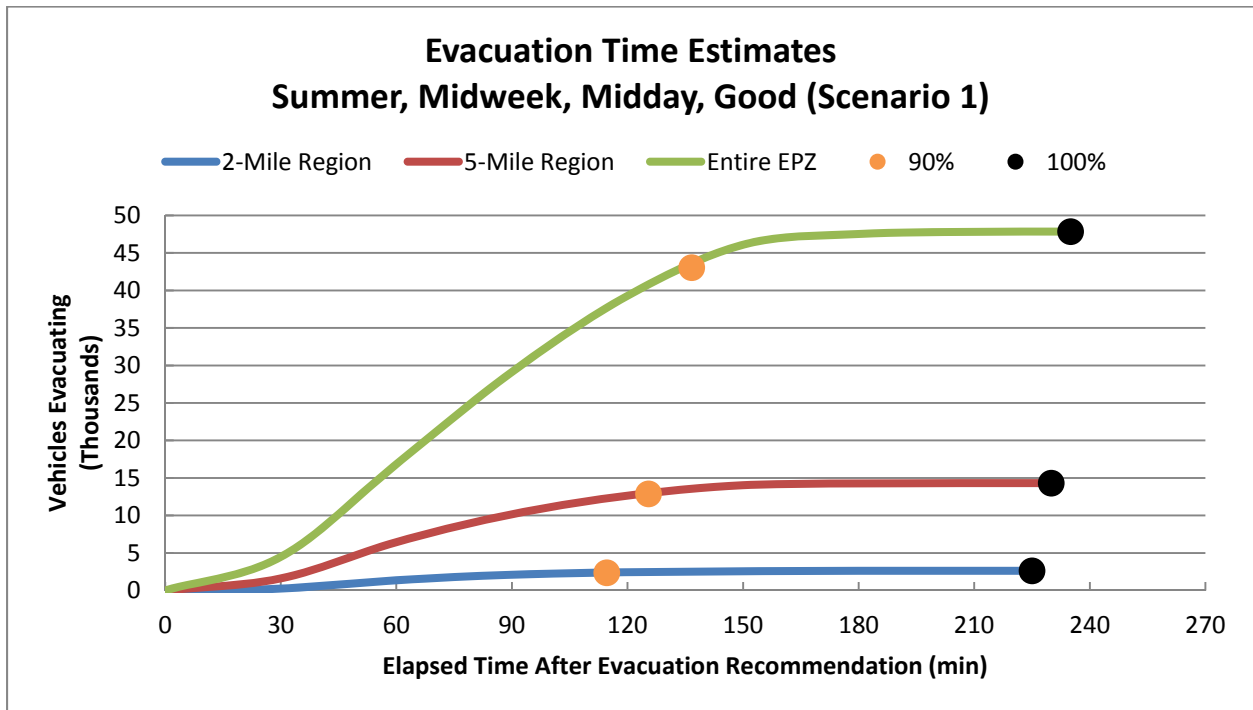


Figure 7-8. Evacuation Time Estimates - Scenario 1 for Region R03

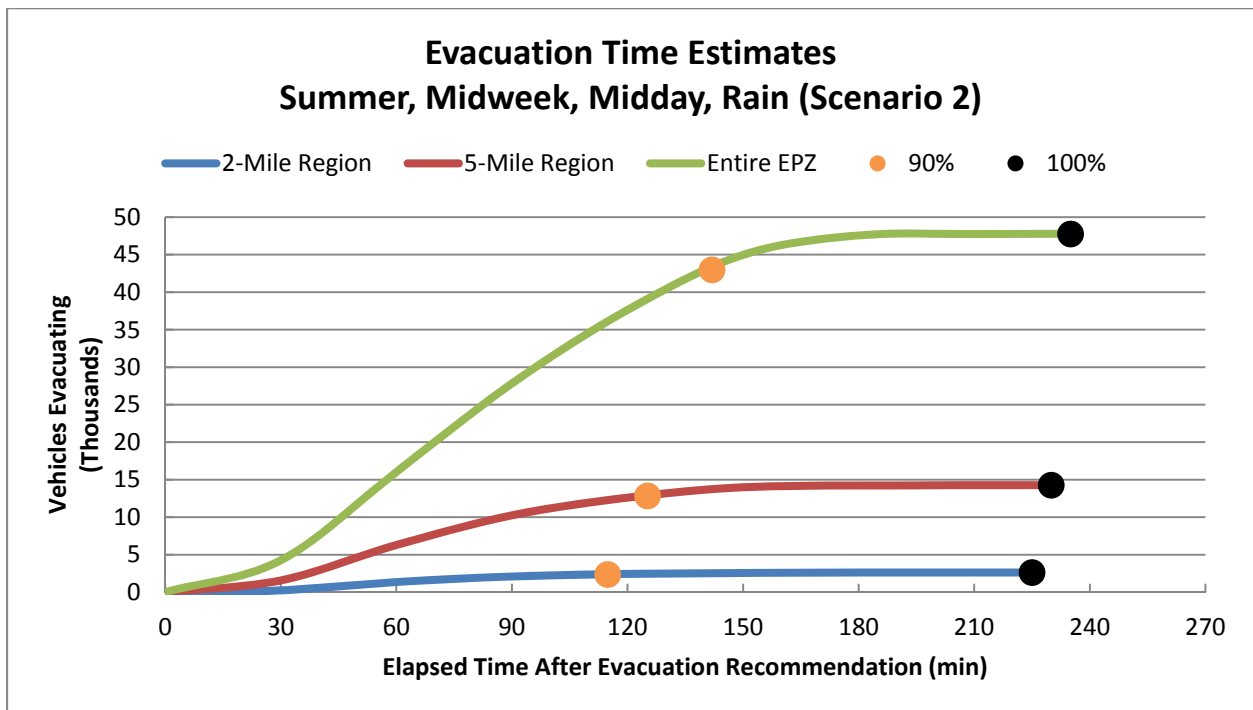


Figure 7-9. Evacuation Time Estimates - Scenario 2 for Region R03

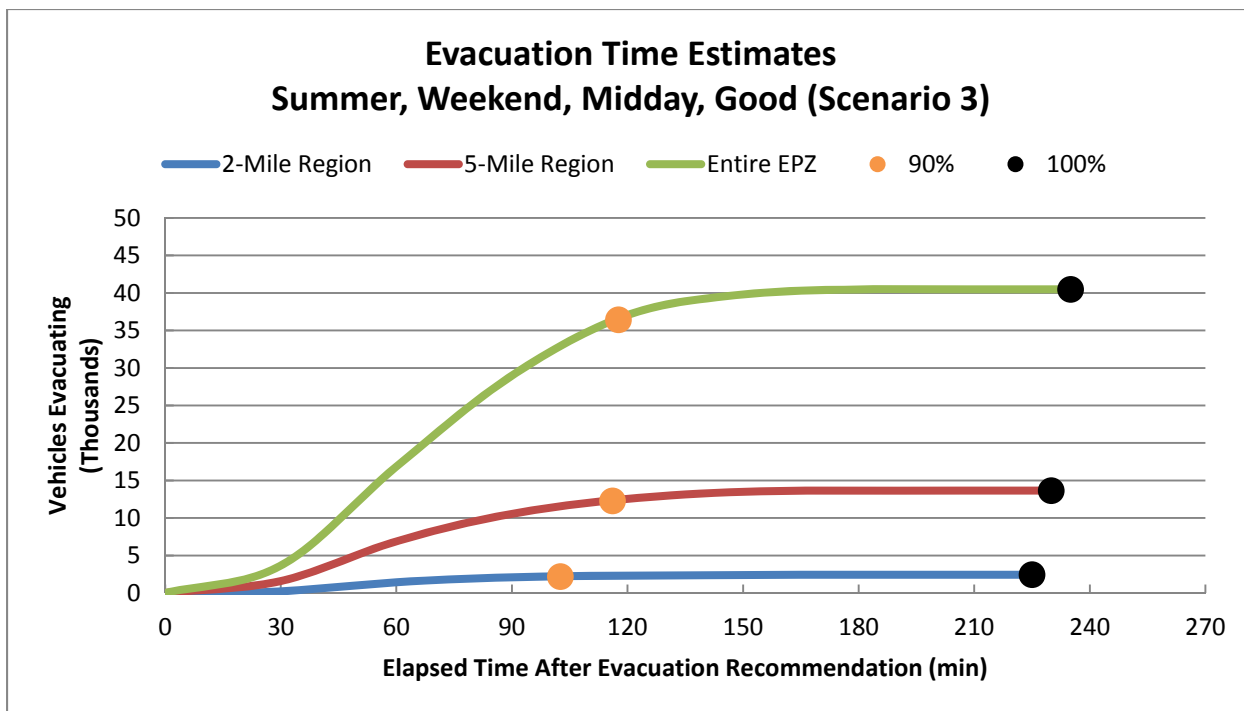


Figure 7-10. Evacuation Time Estimates - Scenario 3 for Region R03

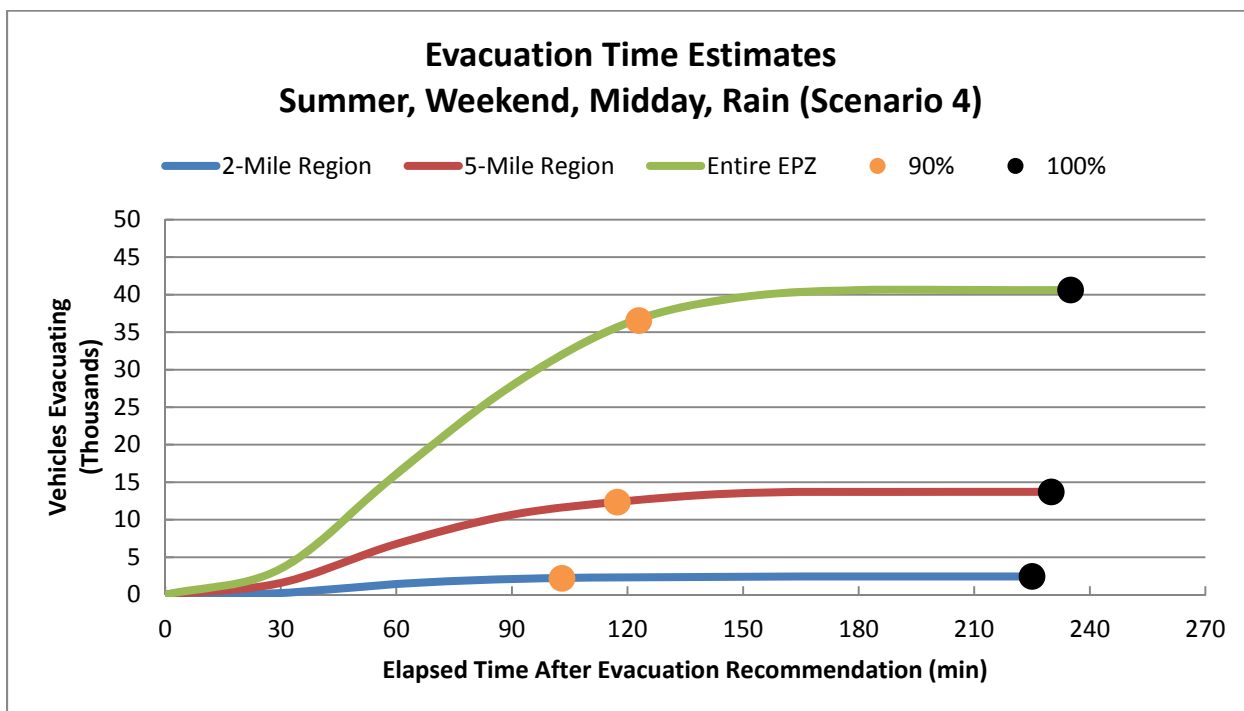


Figure 7-11. Evacuation Time Estimates - Scenario 4 for Region R03

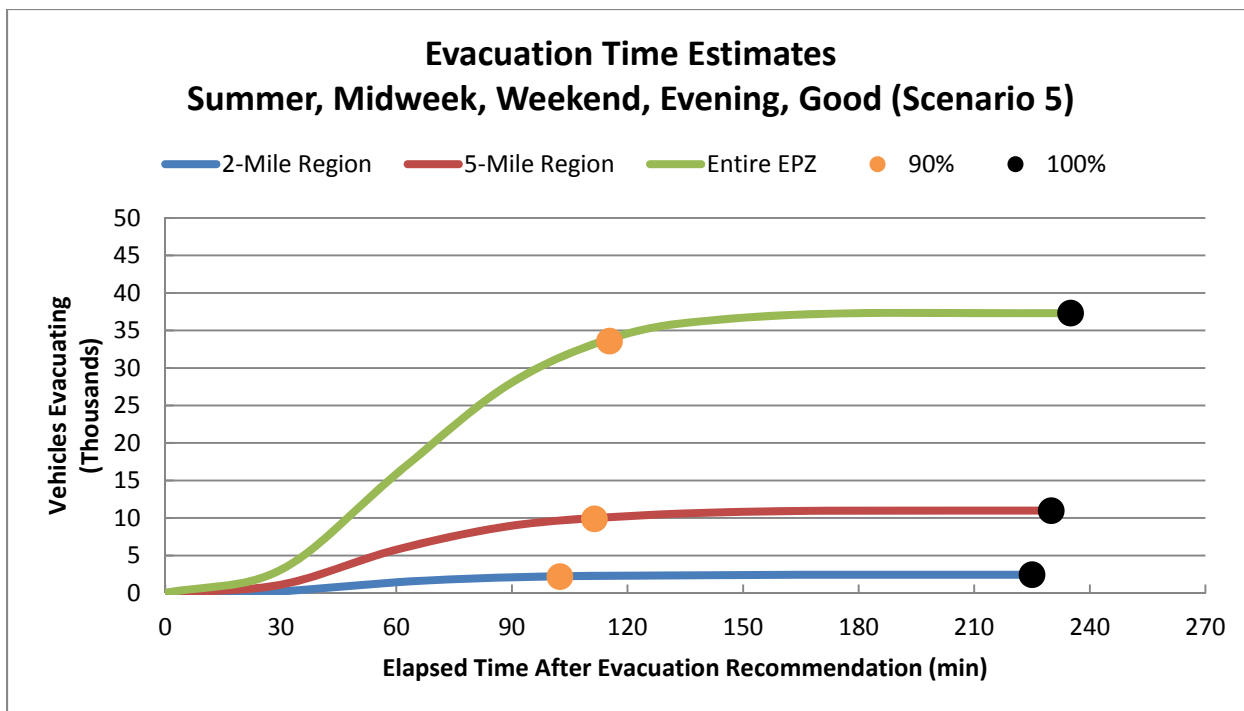


Figure 7-12. Evacuation Time Estimates - Scenario 5 for Region R03

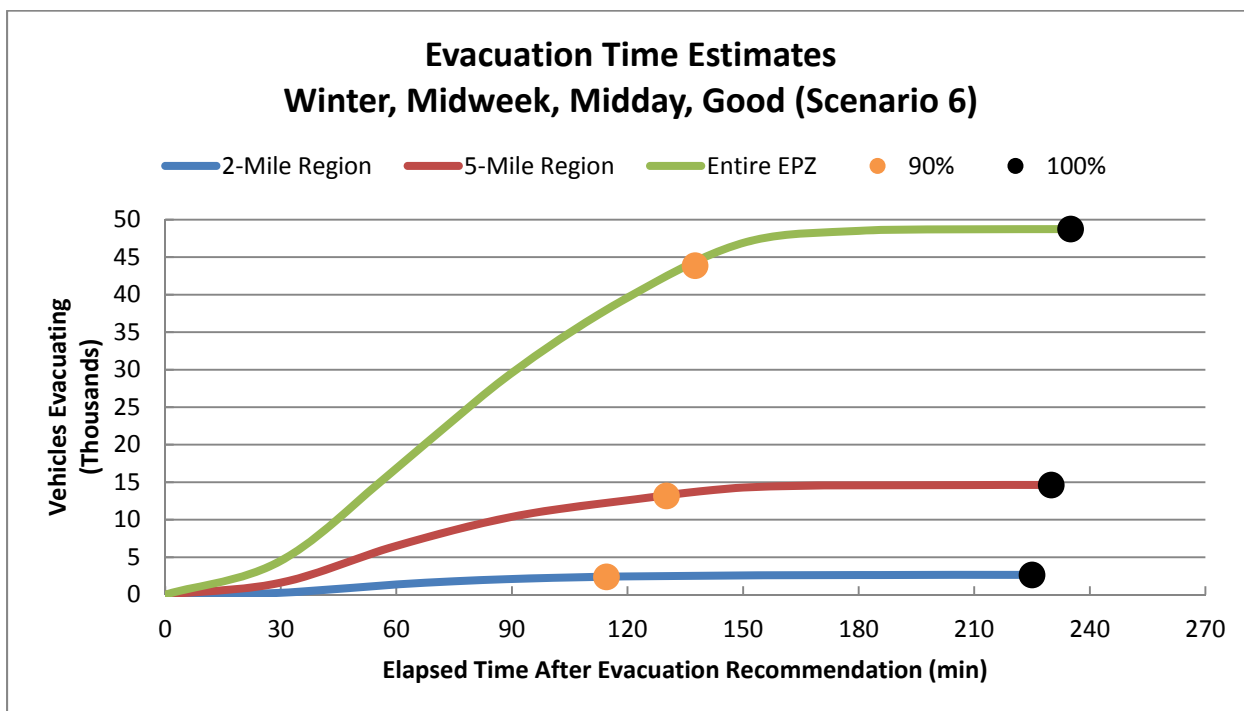


Figure 7-13. Evacuation Time Estimates - Scenario 6 for Region R03

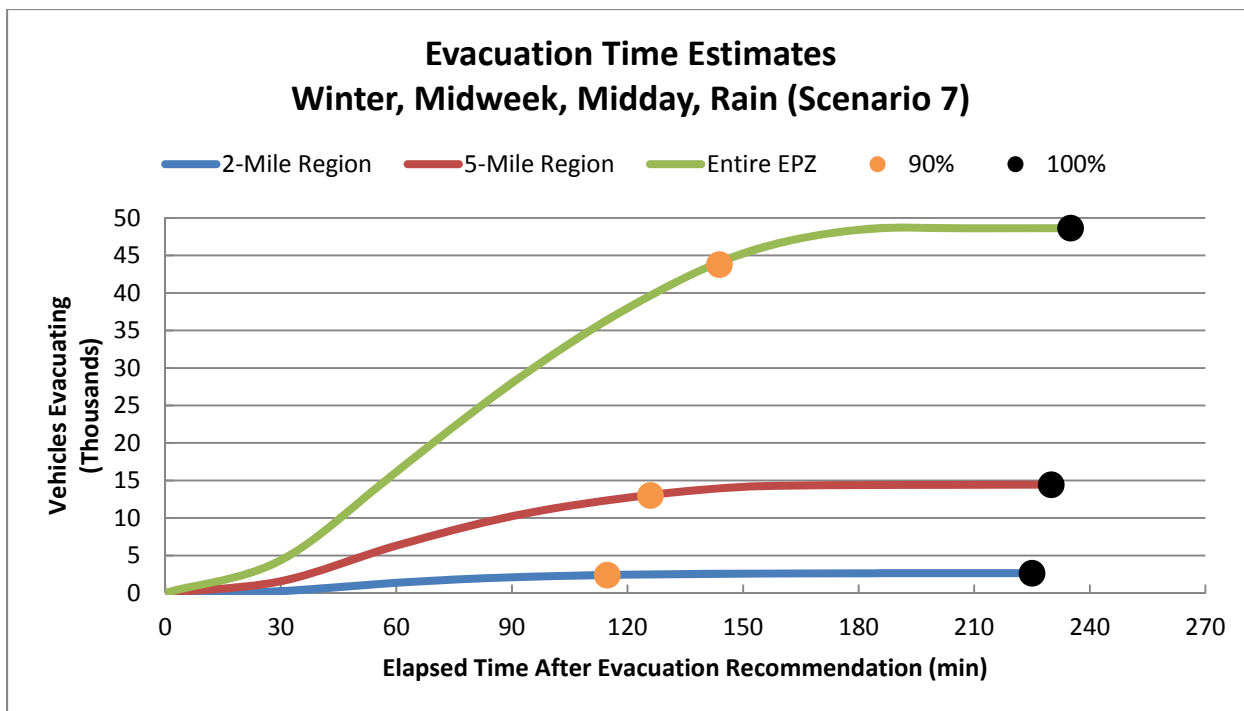


Figure 7-14. Evacuation Time Estimates - Scenario 7 for Region R03

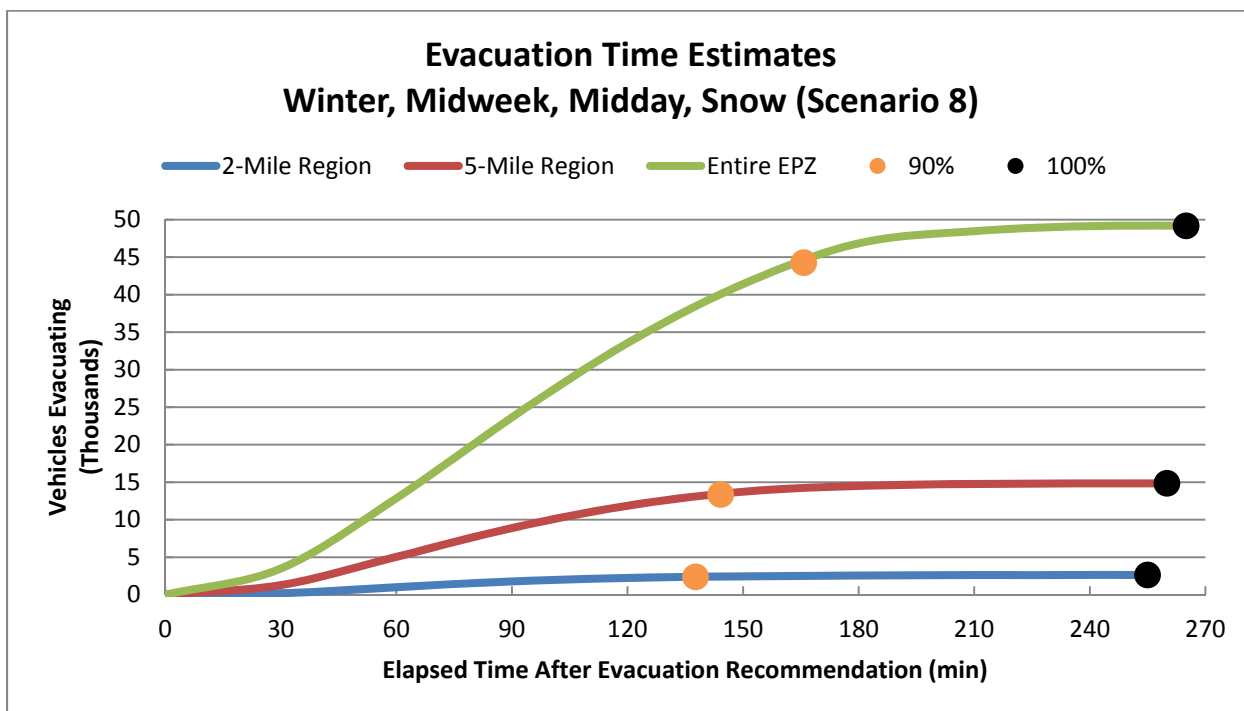


Figure 7-15. Evacuation Time Estimates - Scenario 8 for Region R03

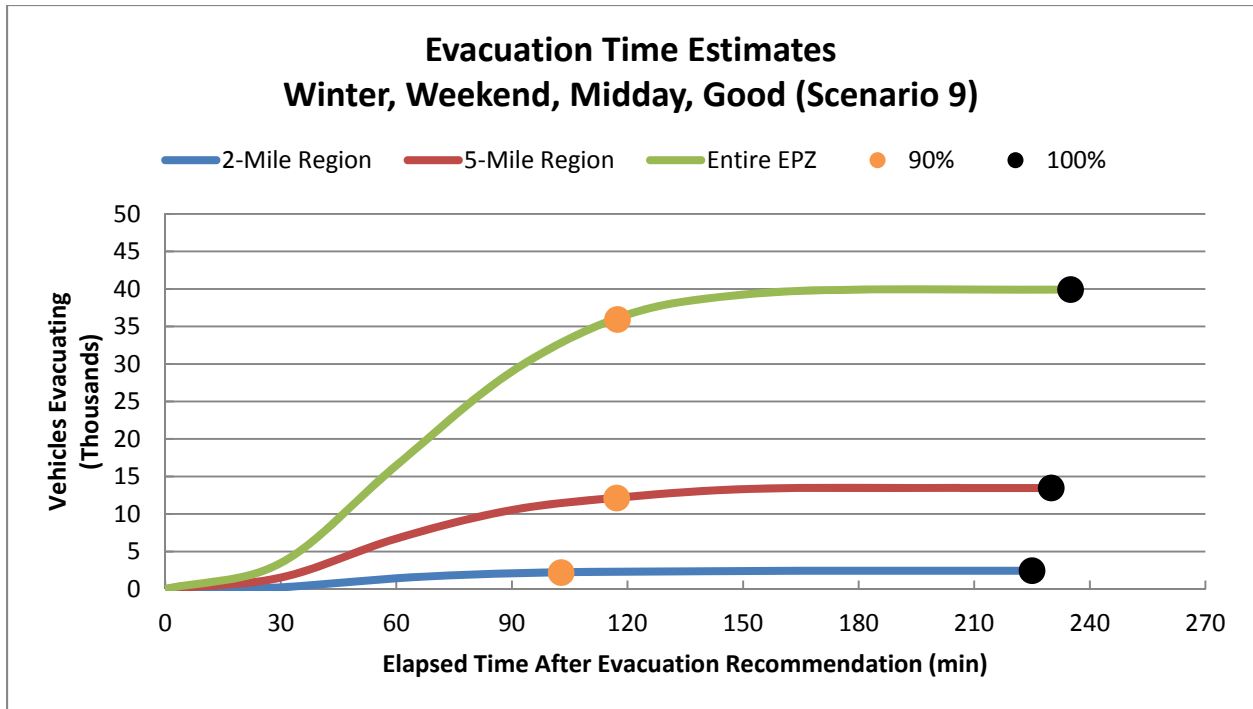


Figure 7-16. Evacuation Time Estimates - Scenario 9 for Region R03

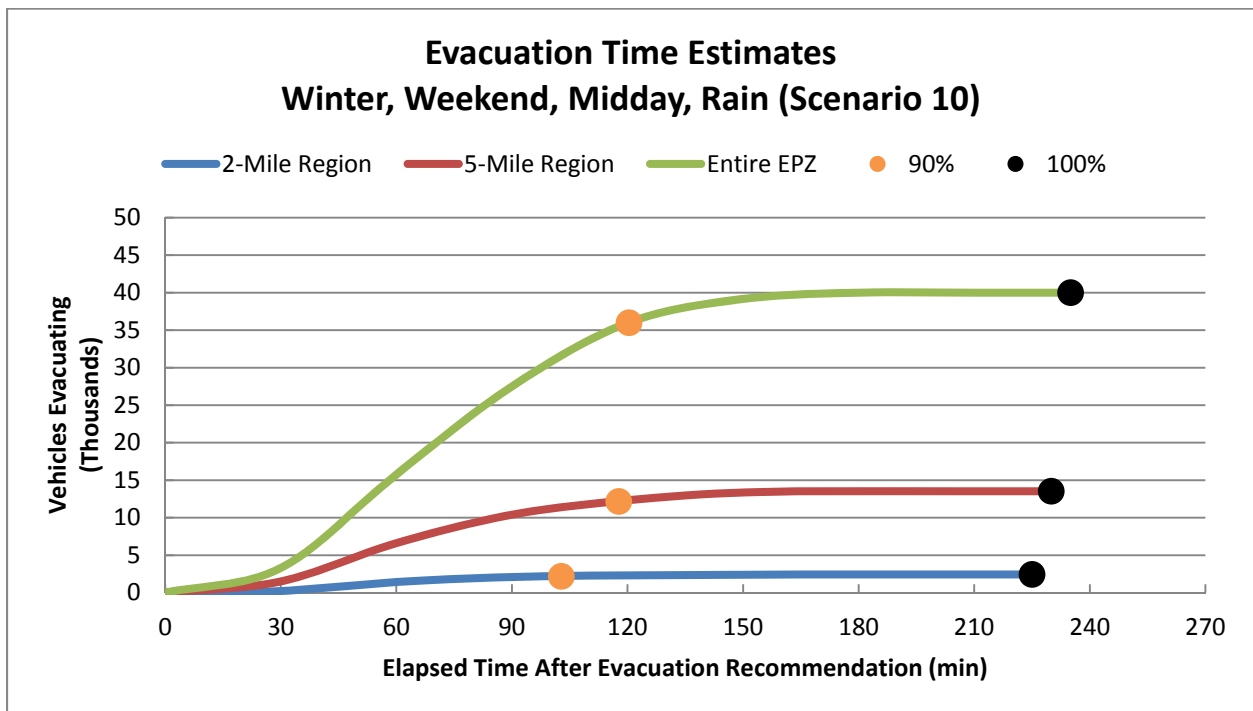


Figure 7-17. Evacuation Time Estimates - Scenario 10 for Region R03

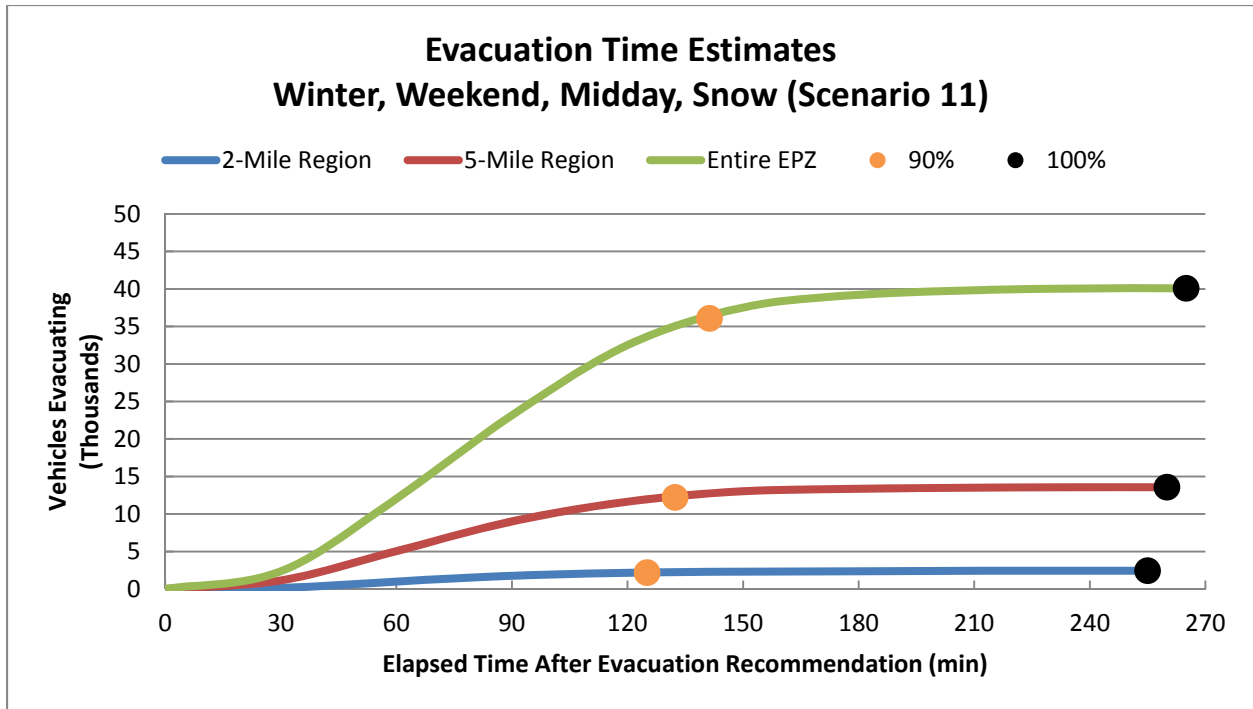


Figure 7-18. Evacuation Time Estimates - Scenario 11 for Region R03

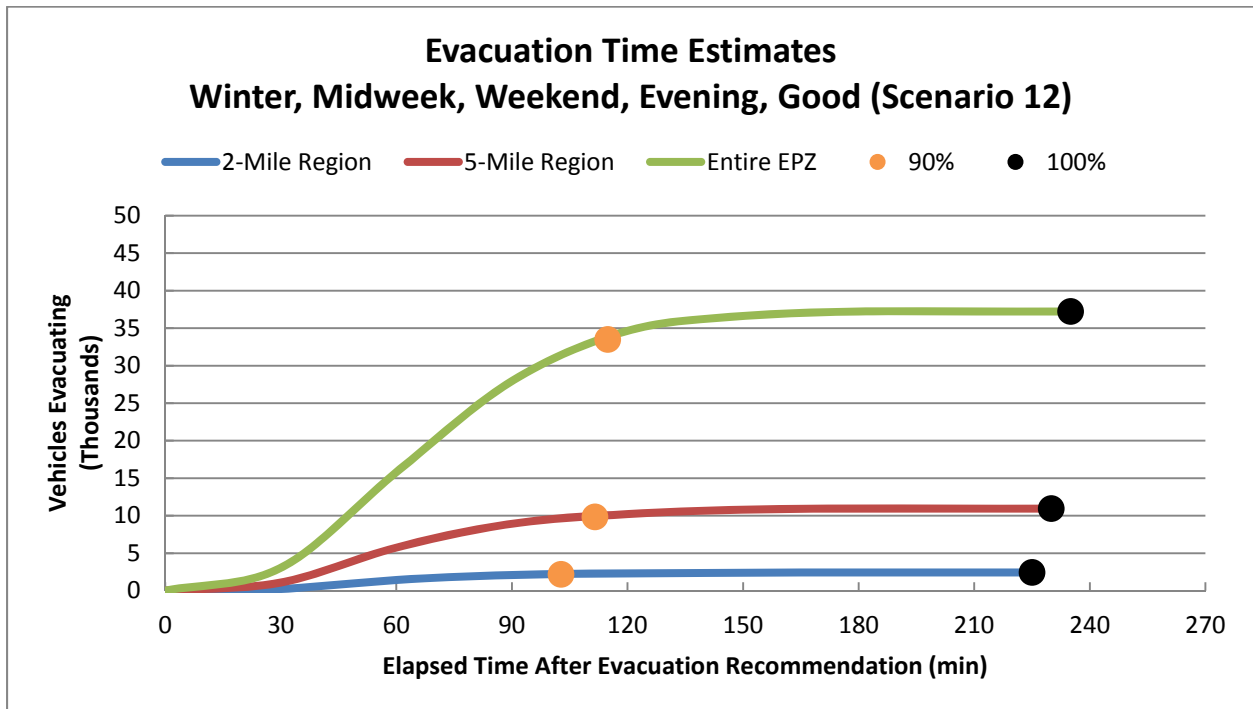


Figure 7-19. Evacuation Time Estimates - Scenario 12 for Region R03

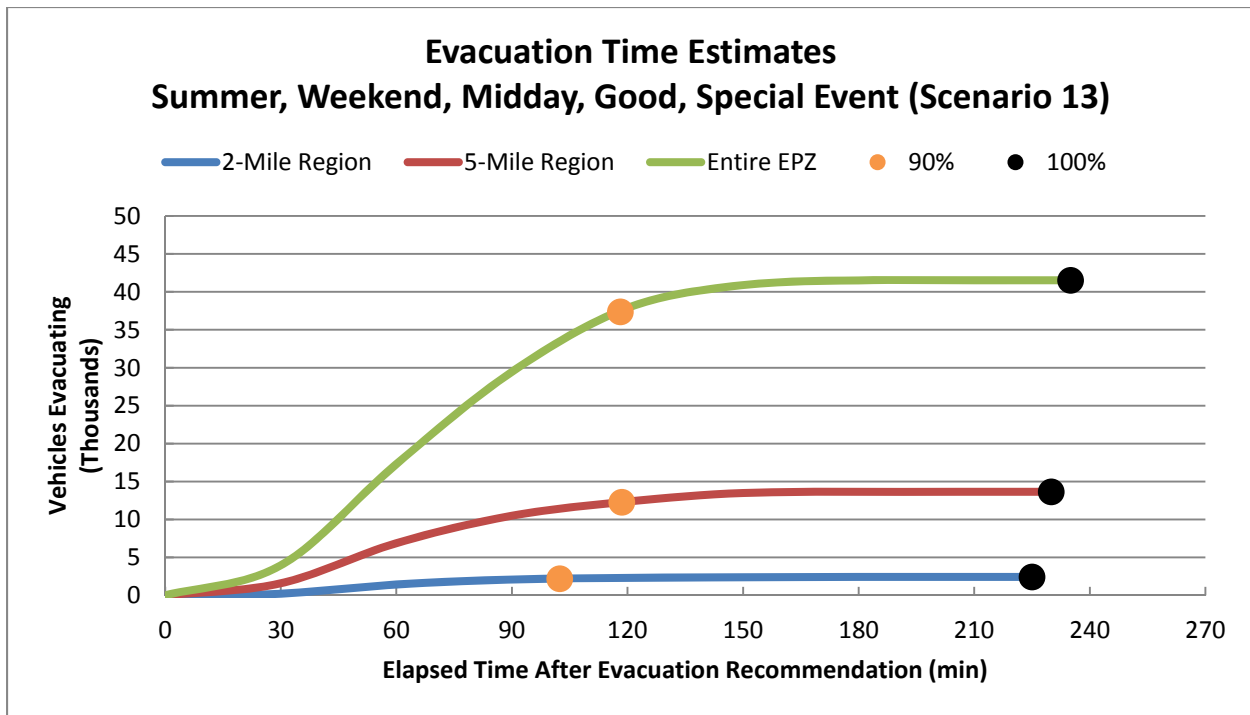


Figure 7-20. Evacuation Time Estimates - Scenario 13 for Region R03

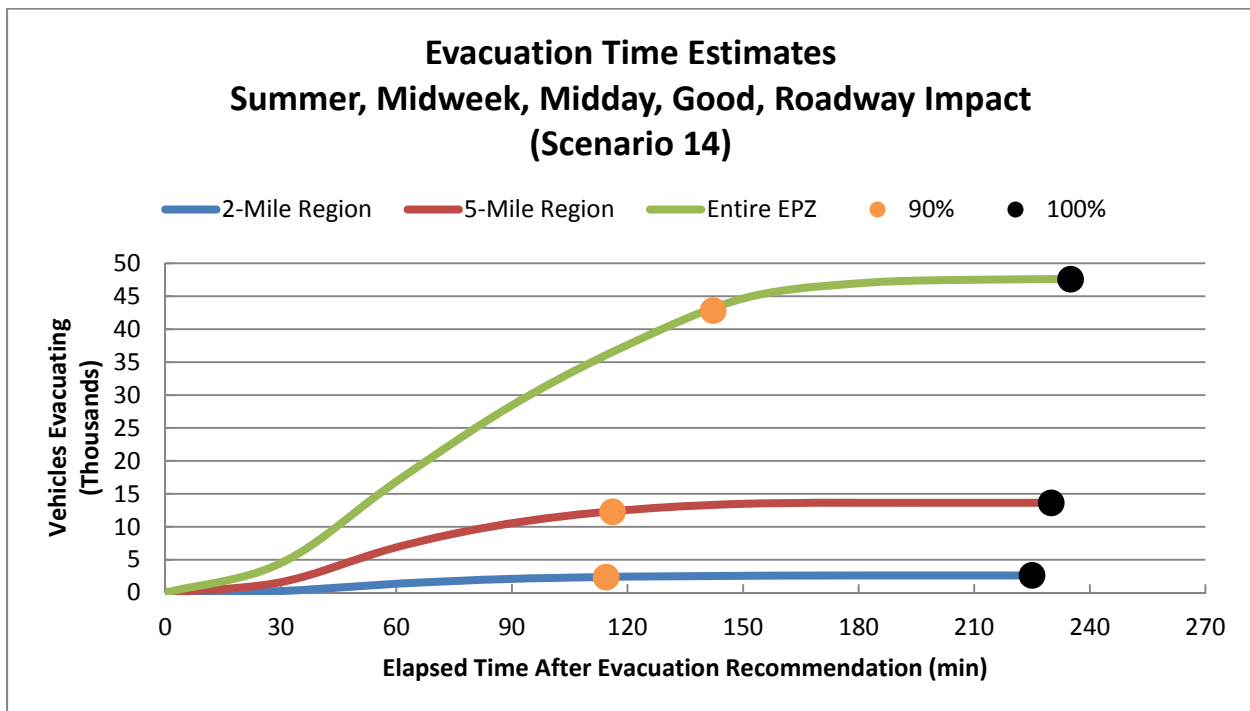


Figure 7-21. Evacuation Time Estimates - Scenario 14 for Region R03

8 TRANSIT-DEPENDENT AND SPECIAL FACILITY EVACUATION TIME ESTIMATES

This section details the analyses applied and the results obtained in the form of evacuation time estimates for transit vehicles. The demand for transit service reflects the needs of three population groups: (1) residents with no vehicles available; (2) residents of special facilities such as schools, and medical facilities; and (3) homebound special needs population.

These transit vehicles mix with the general evacuation traffic that is comprised mostly of “passenger cars” (pc’s). The presence of each transit vehicle in the evacuating traffic stream is represented within the modeling paradigm described in Appendix D as equivalent to two pc’s. This equivalence factor represents the longer size and more sluggish operating characteristics of a transit vehicle, relative to those of a pc.

Transit vehicles must be mobilized in preparation for their respective evacuation missions. Specifically:

- Bus drivers must be alerted
- They must travel to the bus depot
- They must be briefed there and assigned to a route or facility

These activities consume time. Based on discussion with the offsite agencies, it is estimated that bus mobilization time will average approximately 90 minutes extending from the Advisory to Evacuate, to the time when buses first arrive at the facility to be evacuated, unless county data states otherwise.

During this mobilization period, other mobilization activities are taking place. One of these is the action taken by parents, neighbors, relatives and friends to pick up children from school prior to the arrival of buses, so that they may join their families. Virtually all studies of evacuations have concluded that this “bonding” process of uniting families is universally prevalent during emergencies and should be anticipated in the planning process. The current public information disseminated to residents of the Ginna EPZ indicates that schoolchildren will be evacuated to receiving locations, and that parents should pick schoolchildren up at these receiving locations. As discussed in Section 2, this study assumes a fast breaking general emergency. Therefore, children are evacuated to host schools. Picking up children at school could add to traffic congestion at the schools, delaying the departure of the buses evacuating schoolchildren, which may have to return in a subsequent “wave” to the EPZ to evacuate the transit-dependent population. This report provides estimates of buses under the assumption that no children will be picked up by their parents (in accordance with NUREG/CR-7002), to present an upper bound estimate of buses required. It is assumed that children at day-care centers are picked up by parents or guardians and that the time to perform this activity is included in the trip generation times discussed in Section 5.

The procedure for computing transit-dependent ETE is to:

- Estimate demand for transit service
- Estimate time to perform all transit functions

- Estimate route travel times to the EPZ boundary and to the reception centers/receiving locations

8.1 Transit Dependent People Demand Estimate

The telephone survey (see Appendix F) results were used to estimate the portion of the population requiring transit service:

- Those persons in households that do not have a vehicle available.
- Those persons in households that do have vehicle(s) that would not be available at the time the evacuation is advised.

In the latter group, the vehicle(s) may be used by a commuter(s) who does not return (or is not expected to return) home to evacuate the household.

Table 8-1 presents estimates of transit-dependent people. Note:

- Estimates of persons requiring transit vehicles include schoolchildren. For those evacuation scenarios where children are at school when an evacuation is ordered, separate transportation is provided for the schoolchildren. The actual need for transit vehicles by residents is thereby less than the given estimates. However, estimates of transit vehicles are not reduced when schools are in session.
- It is reasonable and appropriate to consider that many transit-dependent persons will evacuate by ride-sharing with neighbors, friends or family. For example, nearly 80 percent of those who evacuated from Mississauga, Ontario who did not use their own cars, shared a ride with neighbors or friends. Other documents report that approximately 70 percent of transit dependent persons were evacuated via ride sharing. **We will adopt a conservative estimate that 50 percent of transit dependent persons will ride share, in accordance with NUREG/CR-7002.**

The estimated number of bus trips needed to service transit-dependent persons is based on an estimate of average bus occupancy of 30 persons at the conclusion of the bus run. Transit vehicle seating capacities typically equal or exceed 60 children on average (roughly equivalent to 40 adults). If transit vehicle evacuees are two thirds adults and one third children, then the number of "adult seats" taken by 30 persons is $20 + (2/3 \times 10) = 27$. On this basis, the average load factor anticipated is $(27/40) \times 100 = 68$ percent. Thus, if the actual demand for service exceeds the estimates of Table 8-1 by 50 percent, the demand for service can still be accommodated by the available bus seating capacity.

$$\left[20 + \left(\frac{2}{3} \times 10 \right) \right] \div 40 \times 1.5 = 1.00$$

Table 8-1 indicates that transportation must be provided for 2,046 people. Therefore, a total of **69 bus runs** are required to transport this population to reception centers.

To illustrate this estimation procedure, we calculate the number of persons, P, requiring public transit or ride-share, and the number of buses, B, required for the Ginna Plant EPZ:

$$P = \text{No. of HH} \times \sum_{i=0}^n \{(\% \text{ HH with } i \text{ vehicles}) \times [(Average \text{ HH Size}) - i]\} \times A^i C^i$$

Where,

A = Percent of households with commuters

C = Percent of households who will not await the return of a commuter

$$P = 25,043 \times [0.014 \times 1.29 + 0.251 \times (1.67 - 1) \times 0.65 \times 0.66 + 0.560 \times (2.71 - 2) \times (0.65 \times 0.66)^2] = 4,091$$

$$B = (0.5 \times P) \div 30 = 69$$

These calculations are explained as follows:

- All members (1.29 avg.) of households (HH) with no vehicles (1.4%) will evacuate by public transit or ride-share. The term 25,043 (number of households) x 0.014 x 1.29, accounts for these people.
- The members of HH with 1 vehicle away (25.1%), who are at home, equal (1.67-1). The number of HH where the commuter will not return home is equal to (25,043 x 0.251 x 0.65 x 0.66), as 65% of EPZ households have a commuter, 66% of which would not return home in the event of an emergency. The number of persons who will evacuate by public transit or ride-share is equal to the product of these two terms.
- The members of HH with 2 vehicles that are away (56.0%), who are at home, equal (2.71 – 2). The number of HH where neither commuter will return home is equal to 25,043 x 0.56 x (0.65 x 0.66)². The number of persons who will evacuate by public transit or ride-share is equal to the product of these two terms (the last term is squared to represent the probability that neither commuter will return).
- Households with 3 or more vehicles are assumed to have no need for transit vehicles.
- The total number of persons requiring public transit is the sum of such people in HH with no vehicles, or with 1 or 2 vehicles that are away from home.

Table 8-1 far exceeds the number of registered transit-dependent persons in the EPZ as provided by the counties (discussed below in Section 8.5). This is consistent with the findings of NUREG/CR-6953, Volume 2, in that a large majority of the transit-dependent population within the EPZs of U.S. nuclear plants does not register with their local emergency response agency.

8.2 School Population – Transit Demand

Table 8-2 presents the school population and transportation requirements for the direct evacuation of all schools within the EPZ for the latest available school year. This information was provided by the local county emergency management agencies. The column in Table 8-2 entitled “Buses Required” specifies the number of buses required for each school under the following set of assumptions and estimates:

- No students will be picked up by their parents prior to the arrival of the buses.
- While many high school students commute to school using private automobiles (as discussed in Section 2.4 of NUREG/CR-7002), the estimate of buses required for school evacuation do not consider the use of these private vehicles.
- Bus capacity, expressed in students per bus, is set to 70 for primary schools and 50 for middle and high schools, unless county data states otherwise.
- Those staff members who do not accompany the students will evacuate in their private vehicles.
- No allowance is made for student absenteeism, typically 3 percent daily.

It is recommended that the counties in the EPZ introduce procedures whereby the schools are contacted prior to the dispatch of buses from the depot (approximately one hour after the Advisory to Evacuate), to ascertain the current estimate of students to be evacuated. In this way, the number of buses dispatched to the schools will reflect the actual number needed. The need for buses would be reduced by any high school students who have evacuated using private automobiles (if permitted by school authorities). Those buses originally allocated to evacuate schoolchildren that are not needed due to children being picked up by their parents, can be gainfully assigned to service other facilities or those persons who do not have access to private vehicles or to ride-sharing.

Table 8-3 presents a list of the school receiving locations for each school in the EPZ. Students will be transported to these locations where they will be subsequently retrieved by their respective families.

8.3 Medical Facility Demand

Table 8-4 presents the census of medical facilities in the EPZ. 492 people have been identified as living in, or being treated in, these facilities. The capacity and current census for each facility were provided by the county emergency management agencies. This data includes the number of ambulatory, wheelchair-bound and bedridden patients at each facility.

The transportation requirements for the medical facility population are also presented in Table 8-4. The number of ambulance runs is determined by assuming that 2 patients can be accommodated per ambulance trip; the number of wheelchair bus runs assumes 15 wheelchairs per trip and the number of bus runs estimated assumes 30 ambulatory patients per trip.

8.4 Evacuation Time Estimates for Transit Dependent People

EPZ bus resources are assigned to evacuating schoolchildren (if school is in session at the time of the ATE) as the first priority in the event of an emergency. In the event that the allocation of buses dispatched from the depots to the various facilities and to the bus routes is somewhat “inefficient”, or if there is a shortfall of available drivers, then there may be a need for some buses to return to the EPZ from the reception center after completing their first evacuation trip, to complete a “second wave” of providing transport service to evacuees. For this reason, the ETE for the transit-dependent population will be calculated for both a one wave transit evacuation and for two waves. Of course, if the impacted Evacuation Region is other than R03 (the entire EPZ), then there will likely be ample transit resources relative to demand in the impacted Region and this discussion of a second wave would likely not apply.

When school evacuation needs are satisfied, subsequent assignments of buses to service the transit-dependent should be sensitive to their mobilization time. Clearly, the buses should be dispatched after people have completed their mobilization activities and are in a position to board the buses when they arrive at the pick-up points.

Evacuation Time Estimates for transit trips were developed using both good weather and adverse weather conditions. Figure 8-1 presents the chronology of events relevant to transit operations. The elapsed time for each activity will now be discussed with reference to Figure 8-1.

Activity: Mobilize Drivers (A→B→C)

Mobilization is the elapsed time from the Advisory to Evacuate until the time the buses arrive at the facility to be evacuated. It is assumed that for a rapidly escalating radiological emergency with no observable indication before the fact, drivers would likely require 90 minutes to be contacted, to travel to the depot, be briefed, and to travel to the transit-dependent facilities. Mobilization time is slightly longer in adverse weather – 100 minutes when raining, 110 minutes when snowing.

Activity: Board Passengers (C→D)

Based on discussions with offsite agencies, a loading time of 15 minutes (20 minutes for rain and 25 minutes for snow) for school buses is used.

For multiple stops along a pick-up route (transit-dependent bus routes) estimation of travel time must allow for the delay associated with stopping and starting at each pick-up point. The time, t , required for a bus to decelerate at a rate, “ a ”, expressed in ft/sec/sec, from a speed, “ v ”, expressed in ft/sec, to a stop, is $t = v/a$. Assuming the same acceleration rate and final speed following the stop yields a total time, T , to service boarding passengers:

$$T = t + B + t = B + 2t = B + \frac{2v}{a},$$

Where B = Dwell time to service passengers. The total distance, “ s ” in feet, travelled during the deceleration and acceleration activities is: $s = v^2/a$. If the bus had not stopped to service

passengers, but had continued to travel at speed, v , then its travel time over the distance, s , would be: $s/v = v/a$. Then the total delay (i.e. pickup time, P) to service passengers is:

$$P = T - \frac{v}{a} = B + \frac{v}{a}$$

Assigning reasonable estimates:

- $B = 50$ seconds: a generous value for a single passenger, carrying personal items, to board per stop
- $v = 25$ mph = 37 ft/sec
- $a = 4$ ft/sec/sec, a moderate average rate

Then, $P \approx 1$ minute per stop. Allowing 30 minutes pick-up time per bus run implies 30 stops per run, for good weather. It is assumed that bus acceleration and speed will be less in rain; total loading time is 40 minutes per bus in rain, 50 minutes in snow.

Activity: Travel to EPZ Boundary (D→E)

School Evacuation

Transportation resources available were provided by the EPZ county emergency management agencies and are summarized in Table 8-5. Also included in the table are the number of buses needed to evacuate schools, medical facilities, transit-dependent population, homebound special needs (discussed below in Section 8.5). These numbers indicate there are sufficient resources available to evacuate everyone in a single wave.

The buses servicing the schools are ready to begin their evacuation trips at 105 minutes after the advisory to evacuate – 90 minutes mobilization time plus 15 minutes loading time – in good weather. The UNITES software discussed in Section 1.3 was used to define bus routes along the most likely path from a school being evacuated to the EPZ boundary, traveling toward the appropriate school reception center. This is done in UNITES by interactively selecting the series of nodes from the school to the EPZ boundary. Each bus route is given an identification number and is written to the DYNEV II input stream. DYNEV computes the route length and outputs the average speed for each 5 minute interval, for each bus route. The specified bus routes are documented in Table 8-6 (refer to the maps of the link-node analysis network in Appendix K for node locations). Data provided by DYNEV during the appropriate timeframe depending on the mobilization and loading times (i.e., 100 to 105 minutes after the advisory to evacuate for good weather) were used to compute the average speed for each route, as follows:

$$\text{Average Speed } \left(\frac{\text{mi.}}{\text{hr}} \right) = \left[\frac{\sum_{i=1}^n \text{length of link } i \text{ (mi)}}{\sum_{i=1}^n \left\{ \text{Delay on link } i \text{ (min.)} + \frac{\text{length of link } i \text{ (mi.)}}{\text{current speed on link } i \left(\frac{\text{mi.}}{\text{hr.}} \right)} \times \frac{60 \text{ min.}}{1 \text{ hr.}} \right\}} \right] \times \frac{60 \text{ min.}}{1 \text{ hr.}}$$

The average speed computed (using this methodology) for the buses servicing each of the schools in the EPZ is shown in Table 8-7 through Table 8-9 for school evacuation, and in Table 8-11 through Table 8-13 for the transit vehicles evacuating transit-dependent persons, which are discussed later. The travel time to the EPZ boundary was computed for each bus using the computed average speed and the distance to the EPZ boundary along the most likely route out of the EPZ. The travel time from the EPZ boundary to the Reception Center was computed assuming an average speed of 40 mph, 35 mph, and 30 mph for good weather, rain and snow, respectively. Speeds were reduced in Table 8-7 through Table 8-9 and in Table 8-11 through Table 8-13 to 55 mph (50 mph for rain – 10% decrease – and 44 mph for snow – 20% decrease) for those calculated bus speeds which exceed 35 mph, as the school bus speed limit for state routes in New York is 55 mph.

Table 8-7 (good weather), Table 8-8 (rain) and Table 8-9 (snow) present the following evacuation time estimates (rounded up to the nearest 5 minutes) for schools in the EPZ: (1) The elapsed time from the Advisory to Evacuate until the bus exits the EPZ; and (2) The elapsed time until the bus reaches the School Reception Center. The evacuation time out of the EPZ can be computed as the sum of times associated with Activities A→B→C, C→D, and D→E (For example: 90 min. + 15 + 22 = 2:10 for Klem Road North Elementary School, with good weather, rounded up to the nearest 5 minutes). The evacuation time to the School Reception Center is determined by adding the time associated with Activity E→F (discussed below), to this EPZ evacuation time.

Evacuation of Transit-Dependent Population

The buses dispatched from the depots to service the transit-dependent evacuees will be scheduled so that they arrive at their respective routes after their passengers have completed their mobilization. As shown in Figure 5-4 (Residents with no Commuters), 90 percent of the evacuees will complete their mobilization when the buses will begin their routes, approximately 90 minutes after the Advisory to Evacuate. The county plans identify bus routes and number of busses assigned to each route for all ERPA (Table 8-10). The start of service on these routes is separated by 10 or 20 minute headways, as shown in Table 8-11 through Table 8-13. The use of bus headways ensures that those people who take longer to mobilize will be picked up. Mobilization time is 10 minutes longer in rain and 20 minutes longer in snow to account for slower travel speeds and reduced roadway capacity.

Those buses servicing the transit-dependent evacuees will first travel along their pick-up routes, then proceed out of the EPZ. Transit-dependent pick-up locations are provided annually to EPZ residents in the emergency preparedness brochure. It is assumed that residents will walk to and congregate at these pre-designated pick-up locations, and that they can arrive at the stops within the 90 minute bus mobilization time (good weather).

As previously discussed, a pickup time of 30 minutes (good weather) is estimated for 30 individual stops to pick up passengers, with an average of one minute of delay associated with each stop. Longer pickup times of 40 minutes and 50 minutes are used for rain and snow, respectively.

The travel distance along the respective pick-up routes within the EPZ is estimated using the UNITES software. Bus travel times within the EPZ are computed using average speeds computed by DYNEV, using the aforementioned methodology that was used for school evacuation.

Table 8-11 through Table 8-13 present the transit-dependent population evacuation time estimates for each bus route calculated using the above procedures for good weather, rain and snow, respectively.

For example, the ETE for ERPA M-1 Route A is computed as $90 + 51 + 30 = 2:55$ for good weather (rounded up to nearest 5 minutes). Here, 51 minutes is the time to travel 16.3 miles at 19.2 mph, the average speed output by the model for this route. The ETE for a second wave (discussed below) is presented in the event there is a shortfall of available buses or bus drivers, as previously discussed.

Activity: Travel to Reception Centers (E→F)

The distances from the EPZ boundary to the reception centers are measured using GIS software along the most likely route from the EPZ exit point to the reception center. The reception centers are mapped in Figure 10-1. For a one-wave evacuation, this travel time outside the EPZ does not contribute to the ETE. For a two-wave evacuation, the ETE for buses must be considered separately, since it could exceed the ETE for the general population. Assumed bus speeds of 40 mph, 35 mph, and 30 mph for good weather, rain, and snow, respectively, will be applied for this activity for buses servicing the transit-dependent population.

Activity: Passengers Leave Bus (F→G)

A bus can empty within 5 minutes. The driver takes a 10 minute break.

Activity: Bus Returns to Route for Second Wave Evacuation (G→C)

The buses assigned to return to the EPZ to perform a “second wave” evacuation of transit-dependent evacuees will be those that have already evacuated transit-dependent people who mobilized more quickly. The first wave of transit-dependent people depart the bus, and the bus then returns to the EPZ, travels to its route and proceeds to pick up more transit-dependent evacuees along the route. The travel time back to the EPZ is equal to the travel time to the reception center.

The second-wave ETE for ERPA M-1 Route A is computed as follows for good weather:

- Bus arrives at reception center at 3:11 in good weather (2:55 to exit EPZ + 16 minute travel time to reception center).
- Bus discharges passengers (5 minutes) and driver takes a 10-minute rest: 15 minutes.
- Bus returns to EPZ and completes second route: 16 minutes (equal to travel time to reception center) + 29 minutes (26.3 miles @ 55 mph) = 45 minutes
- Bus completes pick-ups along route: 30 minutes.
- Bus exits EPZ at time $2:55 + 0:16 + 0:15 + 0:45 + 0:30 = 4:45$ (rounded to nearest 5 minutes) after the Advisory to Evacuate.

The ETE for the completion of the second wave for all transit-dependent bus routes are provided in Table 8-11 through Table 8-13. The average ETE for a two-wave evacuation of transit-dependent people exceeds the ETE for the general population at the 90th percentile.

The relocation of transit-dependent evacuees from the reception centers to congregate care centers, if the counties decide to do so, is not considered in this study.

Evacuation of Medical Facilities

The bus operations for this group are similar to those for school evacuation except:

- Vans are assigned on the basis of 12 patients to allow for staff to accompany the patients.
- The passenger loading time will be longer at approximately one minute per patient to account for the time to move patients from inside the facility to the vehicles.

Table 8-4 indicates that 32 van runs, 16 wheelchair bus runs and 2 ambulance runs are needed to service all of the special facilities in the EPZ. According to Table 8-5, the counties can collectively provide 78 vans, 20 wheel-chair accessible buses and 45 ambulances. Thus, there are sufficient resources to evacuate all persons from the special facilities in a single wave.

As is done for the schools, it is estimated that mobilization time averages 90 minutes. Specially trained medical support staff (working their regular shift) will be on site to assist in the evacuation of patients. Additional staff (if needed) could be mobilized over this same 90 minute timeframe.

Table 8-14 through Table 8-16 summarize the ETE for medical facilities within the EPZ for good weather, rain, and snow. Based on the locations of the medical facilities in Figure E-4, it is estimated that buses will have to travel 5 miles, on average, to leave the EPZ. Loading times of 1 minute, 5 minutes, and 15 minutes are assumed for ambulatory patients, wheelchair bound patients, and bedridden patients, respectively. Average speeds output by the model for Scenario 6 (Scenario 7 for rain and Scenario 8 for snow) Region 3, capped at 55 mph (50 mph for rain and 44 mph for snow), are used to compute travel time to EPZ boundary. The travel time to the EPZ boundary is computed by dividing the average distance of 5 miles by the average travel speed. The ETE is the sum of the mobilization time, total passenger loading time, and travel time out of the EPZ. Concurrent loading on multiple buses, wheelchair buses/vans, and ambulances at capacity is assumed. All ETE are rounded to the nearest 5 minutes. For example, the calculation of ETE for the Maplewood Nursing Home with 10 ambulatory residents during good weather is:

$$\text{ETE: } 90 + 10 \times 1 + 30 = 130 \text{ min. or } 2:10.$$

It is assumed that special facility population is directly evacuated to appropriate host medical facilities. Relocation of this population to permanent facilities and/or passing through the reception center before arriving at the host facility are not considered in this analysis.

8.5 Special Needs Population

The county emergency management agencies have a combined registration for transit-dependent and homebound special needs persons. Based on data provided by the counties, there are an estimated 169 homebound special needs people within the Monroe County portion of the EPZ and 53 people within the Wayne County portion of the EPZ who require transportation assistance to evacuate. In total there are 113 ambulatory persons, 47 wheelchair-bound persons and 62 bedridden persons.

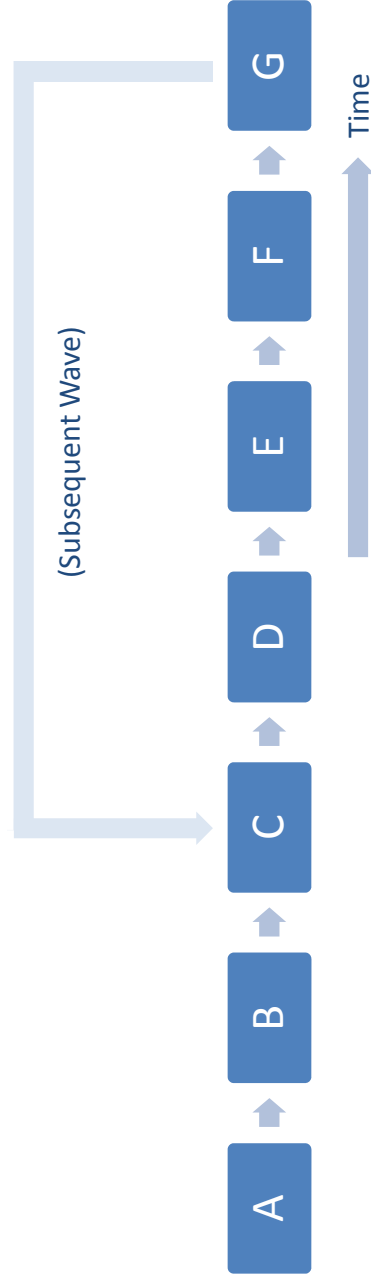
ETE for Homebound Special Needs Persons

Table 8-17 summarizes the ETE for homebound special needs people. The table is categorized by type of vehicle required and then broken down by weather condition. The table takes into consideration the deployment of multiple vehicles to reduce the number of stops per vehicle. It is conservatively assumed that ambulatory and wheelchair bound special needs households are spaced 3 miles apart and bedridden households are spaced 5 miles apart. Van and bus speeds approximate 20 mph between households and ambulance speeds approximate 30 mph in good weather (10% slower in rain, 20% slower in snow). Mobilization times of 90 minutes were used (100 minutes for rain, and 110 minutes for snow). The last HH is assumed to be 5 miles from the EPZ boundary, and the network-wide average speed, capped at 40 mph (35 mph for rain and 30 mph for snow), after the last pickup is used to compute travel time. ETE is computed by summing mobilization time, loading time at first household, travel to subsequent households, loading time at subsequent households, and travel time to EPZ boundary. All ETE are rounded to the nearest 5 minutes.

For example, assuming no more than one special needs person per HH implies that 113 ambulatory households need to be serviced. While only 11 vans are needed from a capacity perspective, if 29 vans are deployed to service these special needs HH, then each would require about 4 stops. The following outlines the ETE calculations:

1. Assume 29 vans are deployed, each with about 4 stops, to service a total of 113 HH.
2. The ETE is calculated as follows:
 - a. Vans arrive at the first pickup location: 90 minutes
 - b. Load HH members at first pickup: 5 minutes
 - c. Travel to subsequent pickup locations: 3 @ 9 minutes = 27 minutes
 - d. Load HH members at subsequent pickup locations: 3 @ 5 minutes = 15 minutes
 - e. Travel to EPZ boundary: 11 minutes (5 miles at 26.5 mph).

ETE: $90 + 5 + 27 + 15 + 11 = 2:30$ rounded up to the nearest 5 minutes



Event	
A	Advisory to Evacuate
B	Bus Dispatched from Depot
C	Bus Arrives at Facility/Pick-up Route
D	Bus Departs for Reception Center
E	Bus Exits Region
F	Bus Arrives at Reception Center/Receiving Location
G	Bus Available for "Second Wave" Evacuation Service
Activity	
A→B	Driver Mobilization
B→C	Travel to Facility or to Pick-up Route
C→D	Passengers Board the Bus
D→E	Bus Travels Towards Region Boundary
E→F	Bus Travels Towards Reception Center Outside the EPZ
F→G	Passengers Leave Bus; Driver Takes a Break

Figure 8-1. Chronology of Transit Evacuation Operations

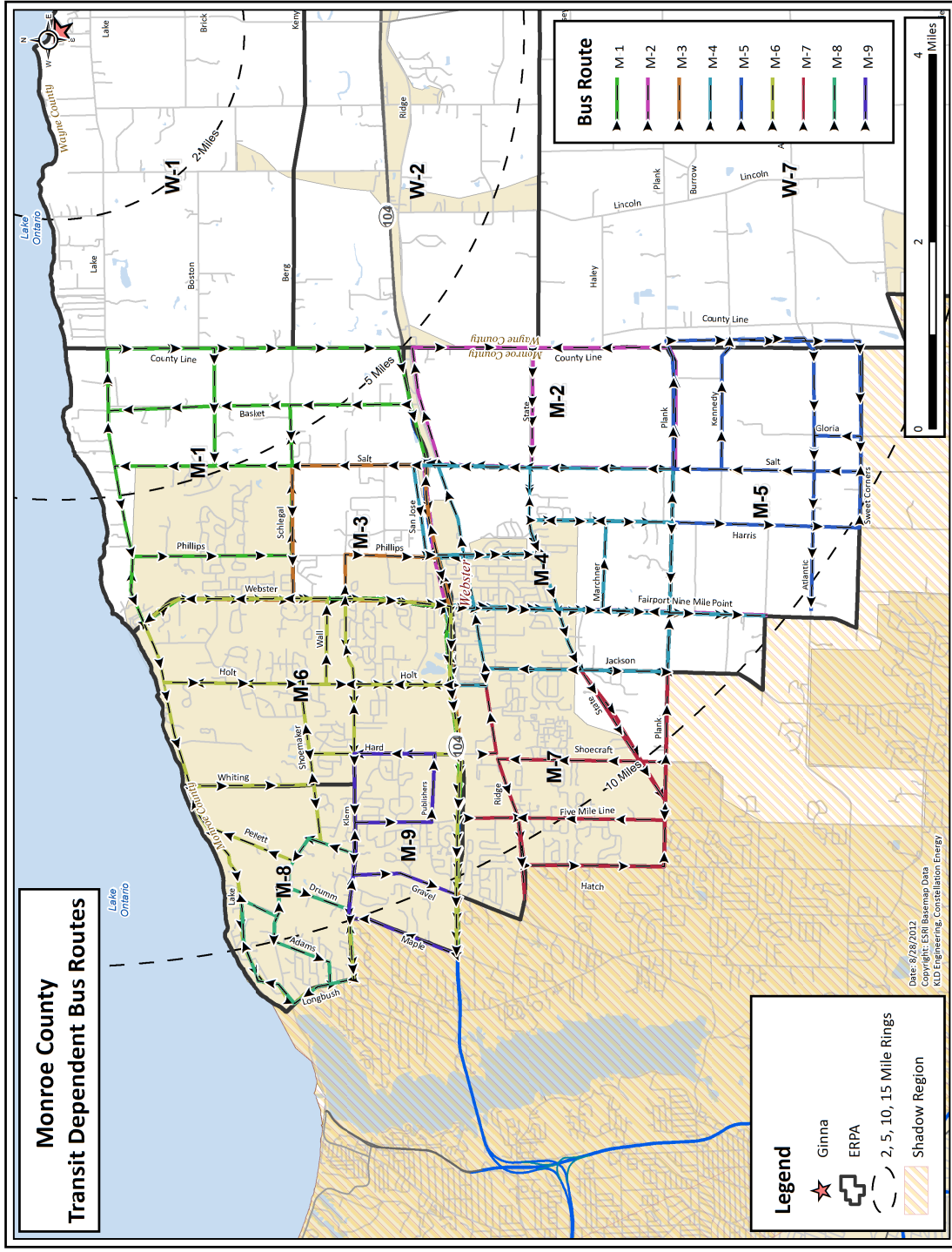


Figure 8-2. Monroe County Transit Dependent Bus Routes

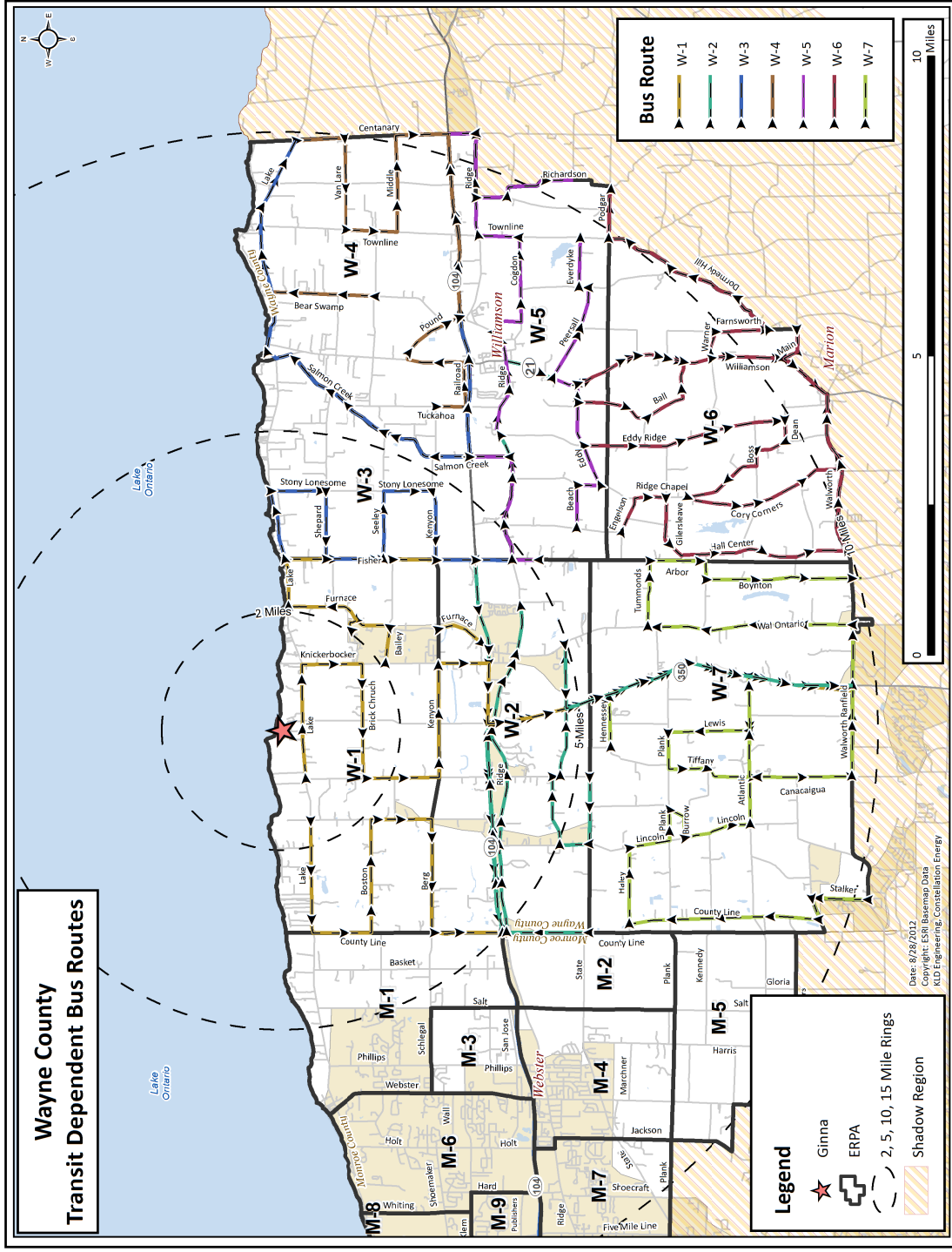


Figure 8-3. Wayne County Transit Dependent Bus Routes

Table 8-1. Transit-Dependent Population Estimates

2010 EPZ Population	Survey Average HH Size with Indicated No. of Vehicles			Estimated No. of Households	Survey Percent HH with Indicated No. of Vehicles			Survey Percent HH with Commuters	Survey Percent HH with Non- Returning Commuters	Total People Requiring Transport	Estimated Ridesharing Percentage	People Requiring Public Transit	Percent Population Requiring Public Transit
	0	1	2		0	1	2						
64,109	1.29	1.67	2.71	25,043	1.4%	25.1%	56.0%	65%	66%	4,091	50%	2,046	3.2%

Table 8-2. School and Evacuating Preschool Population Demand Estimates

ERPA	School Name	Enrollment	Staff	Bus Runs Required
SCHOOLS				
M-1	Schlegel Road Elementary School	512	77	8
M-4	Spry Middle School	1,048	161	17
M-4	State Road Elementary School	536	69	9
M-6	Klem Road North Elementary School	534	66	9
M-6	Klem Road South Elementary School	533	70	9
M-6	Webster Christian School	220	38	4
M-7	Schroeder High School	1,504	308	26
M-9	Thomas High School	1,388	216	23
M-9	Willink Middle School	977	163	16
W-2	James A. Beneway High School	811	148	20
W-2	Ontario Elementary School	356	194	8
W-2	Ontario Primary School	347	40	6
W-2	Thomas C. Armstrong Middle School	549	166	15
W-5	Wayne Education Center	179	37	5
W-5	Wayne Finger Lake BOCES	19	7	1
W-5	Wayne Technical & Career Center	231	44	6
W-5	Williamson Elementary School	460	85	8
W-5	Williamson Middle School	325	95	9
W-5	Williamson Senior High School	378	100	10
W-6	Marion Central Middle/High School	563	76	13
W-7	Freewill Elementary School	314	52	6
S.R.	Dewitt Road Elementary School	517	73	8
S.R.	Marion Elementary School	625	83	11
S.R.	Plank Road North Elementary School	576	63	9
S.R.	Plank Road South Elementary School	557	80	9
S.R.	Rochester Christian School	106	20	2
S.R.	St Rita's School	332	33	5
<i>Schools Subtotal:</i>		14,497	2,564	272
PRESCHOOLS				
M-7	Webster Montessori School	118	23	2
W-2	Hop Skip & Jump Preschool	89	7	2
W-2	Rhyme Tyme Child Care Center	74	6	2
W-2	The Tot Spot Day Care Center	155	12	3
W-4	Raggedy Ann & Andy Day Care	22	2	1
W-5	Lake Ontario Child Development	78	6	2
<i>Preschools Subtotal:</i>		536	56	12
TOTAL:		15,033	2,620	284

Table 8-3. School and Preschool Receiving Locations

School/Preschool	Receiving Location
Dewitt Road Elementary School	Monroe Community College
Klem Road North Elementary School	
Klem Road South Elementary School	
Plank Road North Elementary School	
Plank Road South Elementary School	
Rochester Christian School	
Schlegel Road Elementary School	
Schroeder High School	
Spry Middle School	
St Rita's School	
State Road Elementary School	
Thomas High School	
Webster Christian School	
Webster Montessori School	
Willink Middle School	
Lake Ontario Child Development	Newark High School
Raggedy Ann & Andy Day Care	
Wayne Education Center	
Wayne Finger Lake BOCES	
Wayne Technical & Career Center	
Williamson Elementary School	
Williamson Middle School	
Williamson Senior High School	
Marion Central Middle/High School	Newark Middle School
Marion Elementary School	
Freewill Elementary School	Palmyra-Macedon High School
Hop Skip & Jump Preschool	
James A. Beneway High School	
Ontario Elementary School	
Ontario Primary School	
Rhyme Tyme Child Care Center	
The Tot Spot Day Care Center	
Thomas C. Armstrong Middle School	

Table 8-4. Special Facility Transit Demand

ERPA	Facility Name	Municipality	Capacity	Current Census	Ambulatory	Wheel-chair Bound	Bed-ridden	Van Runs	Wheel-chair Bus Runs	Ambulance
MONROE COUNTY										
M-4	Maplewood Nursing Home	Webster	74	73	10	63	0	1	5	0
M-7	Cherry Ridge	Webster	273	273	206	64	3	18	5	2
M-7	AHEPA 67	Webster	50	50	45	5	0	4	1	0
M-7	Quinby Park Apartments	Webster	49	49	45	4	0	4	1	0
	Monroe County Subtotal:		446	445	306	136	3	27	12	2
WAYNE COUNTY										
W-1	Ontario Community Residence	Ontario	10	10	7	3	0	1	1	0
W-2	Pines of Peace Hospice Center	Ontario	2	2	1	1	0	1	1	0
W-5	Williamson Community Residence	Williamson	7	7	5	2	0	1	1	0
W-7	Wayne ARC Day Activity Training Program	Walworth	28	28	19	9	0	2	1	0
	Wayne County Subtotal:		47	47	32	15	0	5	4	0
	TOTAL:		493	492	338	151	3	32	16	2

Table 8-5. Summary of Transportation Resources

Transportation Resource	Buses	Vans	Wheelchair Buses	Wheelchair Vans	Ambulances
Resources Available					
Regional Transit Service Inc.	250				
Monroe County EMS Coordinator			10		
Medical Motor Services	14	30		40	
Rochester Medical Transport					
Genesee Transportation					
Para-transit		48			
A&E Medical Transport			10		
Wayne Area Transportation Services (WATS)	12				
Wayne Central School District	17				
Ganada Central School District	17				
Penfield Central School District	5				
Marion Central School District	6				
Lyons Central School District	12				
Sodus Central School District	20				
Newark School District	4				
Palmyra-Macedon School District	3				
Wayne County Nursing Home				3	
Local Fire Departments and Towns					45
TOTAL:	360	78	20	43	45
Resources Needed					
Schools (Table 8-2):	284				
Medical Facilities (Table 8-4):		32	16		2
Transit-Dependent Population (Table 8-10):	69				
Homebound Special Needs (Section 8.5):		29		16	31
TOTAL TRANSPORTATION NEEDS:	353	61	16	16	33

Table 8-6. Bus Route Descriptions

Bus Route Number	Description	Nodes Traversed from Route Start to EPZ Boundary
1	Raggedy Ann & Lake Ontario Child	38, 39, 928, 40, 778, 793, 41, 42
2	Magic Years & Williamson Schools	38, 186, 116, 187, 188, 189, 190, 191, 192, 193
3	Marion High School	189, 190, 191, 192, 193
4	Ontario Schools	29, 30, 74, 903, 75, 76, 77, 78, 1025, 79
5	Freewill Elementary School	77, 78, 1025, 79
6	Webster Schools	22, 21, 20, 19, 18, 920, 747
7	Webster Christian School	289, 923, 290, 755, 20, 19, 18, 920, 747
8	Klem Schools	295, 303, 304, 305, 416, 921, 417, 18, 920, 747
9	Thomas High, Willink & Schroeder	417, 18, 920, 747
10	Webster Montessori School	422, 375, 411
20	Maplewood Nursing Home	264, 358, 766, 294, 293, 292, 291, 290, 755, 20, 19, 18, 920
21	Cherry Ridge	761, 361, 362, 419, 981, 418, 417, 18, 920
22	AHEPA 67 and Quimby Park Apartments	635, 299, 298, 751, 297, 753, 19, 18, 920
23	Ontario Community Residence	636, 637, 893, 34, 35, 36, 37, 38, 39, 928, 40, 778, 793, 41
24	Pines of Peace Hospice Center	100, 112, 34, 35, 36, 37, 38, 39, 928, 40, 778, 793, 41
25	Williamson Community Residence	115, 116, 186, 38, 39, 928, 40, 778, 793, 41
26	Wayne ARC Day Activity Training Program	105, 662, 663, 659, 664, 665, 666, 796, 192
30	W-1 Route 1	341, 136, 137, 138, 886, 25, 26, 27, 28, 29, 30, 74, 903, 75, 76, 77, 78, 1025, 79
31	W-1 Route 2	954, 209, 71, 211, 773, 772, 891, 31, 30, 74, 903, 75, 76, 77, 78, 1025, 79
32	W-1 Route 3	95, 96, 97, 98, 99, 892, 32, 31, 30, 74, 903, 75, 76, 77, 78, 1025, 79
33	W-2 Route 1	903, 101, 102, 103, 654, 655, 656, 657, 658, 659, 1026, 660
34	W-2 Route 2	27, 28, 29, 30, 74, 903, 75, 76, 77, 78, 1025, 79
35	W-2 Route 3	93, 349, 74, 774, 100, 112, 113, 114, 776, 115, 116, 187, 188, 189, 190, 191, 192, 193
36	W-3 Route 1	212, 636, 637, 893, 34, 112, 113, 114, 776, 115, 116, 186, 38, 39, 928, 40, 778, 793, 41, 42
37	W-3 Route 2	791, 790, 216, 111, 217, 218, 219, 220, 221, 222
38	W-4 Route	641, 897, 39, 928, 40, 778, 793, 41, 42
39	W-4 Route 2	218, 219, 220, 221, 683, 899, 41, 42
40	W-5 Route 1	112, 113, 114, 36, 37, 38, 39, 928, 40, 778, 793, 41, 42
41	W-5 Route 2	189, 190, 197, 649

Bus Route Number	Description	Nodes Traversed from Route Start to EPZ Boundary
42	W-5 Route 3	114, 776, 115, 116, 117, 118, 119, 120, 121, 122, 123
43	W-6 Route 1	187, 188, 189, 190, 197, 649
45	W-6 Route 2	188, 189, 190, 191, 192, 193
46	W-6 Route 3	799, 798, 998, 797, 796, 192, 193
47	W-6 Route 4	656, 657, 658, 659, 664, 665, 666, 796, 192, 193
48	W-7 Route 1	144, 145, 146, 77, 78, 1025, 79
49	W-7 Route 2	75, 76, 77, 146, 147, 986, 148, 149, 782, 78, 1025, 79
50	W-7 Route 3	103, 654, 655, 656, 657, 658, 659, 1026, 660
51	M-1 Route A	136, 137, 138, 886, 25, 24, 749, 23, 22, 21, 20, 19, 18, 920
52	M-1 Route B	136, 225, 228, 239, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 926, 262, 757, 21, 20, 19, 18, 920
53	M-2 Route C	233, 232, 231, 23, 22, 21, 20, 19, 18, 920
54	M-3 Route D	230, 242, 256, 257, 258, 259, 260, 261, 926, 262, 757, 21, 20, 19, 18, 920
55	M-4 Route E	246, 883, 261, 926, 262, 263, 927, 264, 770, 265, 266, 267, 268, 269, 270
56	M-4 Route F	758, 760, 750, 231, 232, 233, 357, 249, 264, 770, 265, 266, 267, 268, 269, 270
57	M-4 Route G	926, 262, 263, 927, 264, 770, 265, 266, 267, 268, 269, 270
58	M-5 Route H	404, 406, 407, 1020, 237, 336, 269, 270
59	M-5 Route I	406, 407, 1020, 1021, 238, 337, 270
60	M-6 Route J	251, 287, 288, 289, 923, 290, 755, 20, 19, 18, 920
61	M-6 Route K	251, 287, 342, 300, 343, 344, 345, 346, 347, 332, 333, 312
62	M-6 Route L	258, 951, 634, 289, 295, 296, 922, 297, 753, 19, 18, 920
63	M-7 Route M	766, 294, 359, 299, 298, 751, 297, 753, 19, 18, 920
64	M-7 Route N	418, 981, 419, 362, 363, 364, 365
65	M-8 ROUTE P	348, 306, 307, 308, 309, 310, 311, 312
66	M-8 Route Q	300, 343, 344, 345, 346, 347, 332, 333, 312
67	M-9 Route R	295, 303, 304, 305, 306, 307, 369, 370, 1018, 365
80	SR 104 EB	747, 920, 18, 19, 20, 21, 22, 23, 749, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 928, 40, 778, 793, 41
81	SR 104 WB	41, 793, 778, 40, 928, 39, 38, 37, 36, 35, 34, 33, 32, 31, 30, 29, 28, 27, 26, 25, 24, 749, 23, 22, 21, 20, 19, 18, 920, 747
82	SR 250 SB	261, 926, 262, 263, 927, 264, 770, 265, 266, 267, 268, 269, 270
83	SR 350 SB	74, 903, 75, 76, 77, 78
84	SR 21 SB	38, 186, 116, 187, 188, 189, 190, 191, 192
85	SR 286 WB	77, 146, 406, 407, 1020, 237, 336, 269

Table 8-7. School Evacuation Time Estimates - Good Weather

School	Driver Mobilization Time (min)	Loading Time (min)	Dist. To EPZ Bdry (mi)	Average Speed (mph)	Travel Time to EPZ Bdry (min)	ETE (hr:min)	Dist. EPZ Bdry to R.C./R.L. (mi.)	Travel Time from EPZ Bdry to H.S. (min)	ETE to R.C./R.L. (hr:min)
MONROE COUNTY SCHOOLS									
Dewitt Road Elementary School	90	15	School is outside the EPZ			1:45	13.6	21	2:10
Klem Road North Elementary School	90	15	3.4	9.6	22	2:10	13.5	21	2:30
Klem Road South Elementary School	90	15	3.5	9.6	23	2:10	13.4	21	2:30
Plank Road North Elementary School	90	15	School is outside the EPZ			1:45	12.5	19	2:05
Plank Road South Elementary School	90	15	School is outside the EPZ			1:45	12.3	19	2:05
Rochester Christian School	90	15	School is outside the EPZ			1:45	10.8	17	2:05
Schlegel Road Elementary School	90	15	7.1	12.2	35	2:20	13.4	21	2:45
Schroeder High School	90	15	2.3	11.5	13	2:00	13.4	21	2:20
Spry Middle School	90	15	4.3	10.0	26	2:15	13.4	21	2:35
St Rita's School	90	15	School is outside the EPZ			1:45	13.9	21	2:10
State Road Elementary School	90	15	5.7	10.9	32	2:20	13.4	21	2:40
Thomas High School	90	15	1.9	11.5	11	2:00	13.4	21	2:20
Webster Christian School	90	15	4.0	10.0	25	2:10	13.5	21	2:35
Webster Montessori School	90	15	0.2	11.7	2	1:50	13.1	20	2:10
Willink Middle School	90	15	2.2	11.5	12	2:00	13.4	21	2:20
WAYNE COUNTY SCHOOLS									
Freewill Elementary School	47	15	3.7	37.7	6	1:10	8.4	13	1:25
Hop Skip & Jump Preschool	90	15	7.9	30.8	16	2:05	8.5	13	2:15
James A. Beneway High School	29	15	6.0	33.3	11	0:55	8.4	13	1:10
Lake Ontario Child Development	90	15	4.7	42.4	7	1:55	17.5	27	2:20
Magic Years Nursery School	90	15	6.7	44.7	10	1:55	7.7	12	2:10
Marion Central Middle/High School	90	15	2.4	44.4	4	1:50	14.0	21	2:10
Marion Elementary School	90	15	School is outside the EPZ			1:45	13.9	21	2:10
Ontario Elementary School	23	15	6.8	35.1	12	0:50	8.4	13	1:05
Ontario Primary School	18	15	7.1	36.7	12	0:45	8.4	13	1:00
Raggedy Ann & Andy Day Care	90	15	4.2	42.4	6	1:55	17.2	26	2:20

School	Driver Mobilization Time (min)	Loading Time (min)	Dist. To EPZ Bdry (mi)	Average Speed (mph)	Travel Time to EPZ Bdry (min)	ETE (hr:min)	Dist. EPZ Bdry to R.C./R.L. (mi.)	Travel Time from EPZ Bdry to H.S. (min)	ETE to R.C./R.L. (hr:min)
Rhyme Tyme Child Care Center	90	15	7.7	30.8	15	2:00	8.4	13	2:15
The Tot Spot Day Care Center	90	15	7.4	30.6	15	2:00	8.4	13	2:15
Thomas C. Armstrong Middle School	39	15	6.0	25.3	15	1:10	8.4	13	1:25
Wayne Education Center	90	15	3.4	46.0	5	1:50	17.5	27	2:20
Wayne Finger Lake BOCES	90	15	3.4	46.0	5	1:50	17.5	27	2:20
Wayne Technical & Career Center	90	15	3.4	46.0	5	1:50	17.5	27	2:20
Williamson Elementary School	23	15	6.3	45.8	9	0:50	14.1	22	1:10
Williamson Middle School	23	15	6.3	45.8	9	0:50	14.1	22	1:10
Williamson Senior High School	23	15	5.1	45.8	7	0:45	14.1	22	1:10
Maximum for EPZ:						2:20	Maximum:		
Average for EPZ:						1:45	Average:		

Table 8-8. School Evacuation Time Estimates - Rain

School	Driver Mobilization Time (min)	Loading Time (min)	Dist. To EPZ Bdry (mi)	Average Speed (mph)	Travel Time to EPZ Bdry (min)	ETE (hr:min)	Dist. EPZ Bdry to R.C./R.L. (mi.)	Travel Time from EPZ Bdry to H.S. (min)	ETE to R.C./R.L. (hr:min)
MONROE COUNTY SCHOOLS									
Dewitt Road Elementary School	100	20	School is outside the EPZ			2:00	13.6	24	2:25
Klem Road North Elementary School	100	20	3.4	13.7	16	2:20	13.5	24	2:40
Klem Road South Elementary School	100	20	3.5	13.7	16	2:20	13.4	24	2:40
Plank Road North Elementary School	100	20	School is outside the EPZ			2:00	12.5	22	2:25
Plank Road South Elementary School	100	20	School is outside the EPZ			2:00	12.3	22	2:25
Rochester Christian School	100	20	School is outside the EPZ			2:00	10.8	19	2:20
Schlegel Road Elementary School	100	20	7.1	11.1	39	2:40	13.4	24	3:05
Schroeder High School	100	20	2.3	10.7	14	2:15	13.4	24	2:40
Spry Middle School	100	20	4.3	8.9	29	2:30	13.4	23	2:55
St Rita's School	100	20	School is outside the EPZ			2:00	13.9	24	2:25
State Road Elementary School	100	20	5.7	10.0	35	2:35	13.4	24	3:00
Thomas High School	100	20	1.9	10.7	11	2:15	13.4	24	2:35
Webster Christian School	100	20	4.0	8.2	30	2:30	13.5	24	2:55
Webster Montessori School	100	20	0.2	10.8	2	2:05	13.1	23	2:25
Willink Middle School	100	20	2.2	10.7	13	2:15	13.4	24	2:40
WAYNE COUNTY SCHOOLS									
Freewill Elementary School	47	20	3.7	34.0	7	1:15	8.4	15	1:30
Hop Skip & Jump Preschool	100	20	7.9	38.9	13	2:15	8.5	15	2:30
James A. Beneway High School	29	20	6.0	22.2	17	1:10	8.4	15	1:25
Lake Ontario Child Development	100	20	4.7	47.2	6	2:10	17.5	30	2:40
Magic Years Nursery School	100	20	6.7	42.4	10	2:10	7.7	14	2:25
Marion Central Middle/High School	100	20	2.4	41.6	4	2:05	14.0	24	2:30
Marion Elementary School	100	20	School is outside the EPZ			2:00	13.9	24	2:25
Ontario Elementary School	23	20	6.8	24.0	18	1:05	8.4	15	1:20
Ontario Primary School	18	20	7.1	26.8	16	0:55	8.4	15	1:10
Raggedy Ann & Andy Day Care	100	20	4.2	47.2	6	2:10	17.2	30	2:40
Rhyme Tyme Child Care Center	100	20	7.7	38.9	12	2:15	8.4	15	2:30

School	Driver Mobilization Time (min)	Loading Time (min)	Dist. To EPZ Bdry (mi)	Average Speed (mph)	Travel Time to EPZ Bdry (min)	ETE (hr:min)	Dist. EPZ Bdry to R.C./R.L. (mi.)	Travel Time from EPZ Bdry to H.S. (min)	ETE to R.C./R.L. (hr:min)
The Tot Spot Day Care Center	100	20	7.4	38.9	12	2:15	8.4	15	2:30
Thomas C. Armstrong Middle School	39	20	6.0	20.0	19	1:20	8.4	15	1:35
Wayne Education Center	100	20	3.4	42.4	5	2:05	17.5	30	2:35
Wayne Finger Lake BOCES	100	20	3.4	42.4	5	2:05	17.5	30	2:35
Wayne Technical & Career Center	100	20	3.4	42.4	5	2:05	17.5	30	2:35
Williamson Elementary School	23	20	6.3	40.9	10	0:55	14.1	25	1:20
Williamson Middle School	23	20	6.3	40.9	10	0:55	14.1	25	1:20
Williamson Senior High School	23	20	5.1	40.9	8	0:55	14.1	25	1:20
Maximum for EPZ:						2:40	Maximum:		
Average for EPZ:						2:00	Average:		

Table 8-9. School Evacuation Time Estimates - Snow

School	Driver Mobilization Time (min)	Loading Time (min)	Dist. To EPZ Bdry (mi)	Average Speed (mph)	Travel Time to EPZ Bdry (min)	ETE (hr:min)	Dist. EPZ Bdry to R.C./R.L. (mi.)	Travel Time from EPZ Bdry to H.S. (min)	ETE to R.C./R.L (hr:min)
MONROE COUNTY SCHOOLS									
Dewitt Road Elementary School	110	25	School is outside the EPZ			2:15	13.6	28	2:45
Klem Road North Elementary School	110	25	3.4	12.3	17	2:35	13.5	27	3:00
Klem Road South Elementary School	110	25	3.5	12.3	18	2:35	13.4	27	3:00
Plank Road North Elementary School	110	25	School is outside the EPZ			2:15	12.5	26	2:45
Plank Road South Elementary School	110	25	School is outside the EPZ			2:15	12.3	25	2:40
Rochester Christian School	110	25	School is outside the EPZ			2:15	10.8	22	2:40
Schlegel Road Elementary School	110	25	7.1	10.3	42	3:00	13.4	27	3:25
Schroeder High School	110	25	2.3	9.5	15	2:30	13.4	27	3:00
Spry Middle School	110	25	4.3	7.9	33	2:50	13.4	27	3:15
St Rita's School	110	25	School is outside the EPZ			2:15	13.9	28	2:45
State Road Elementary School	110	25	5.7	9.2	38	2:55	13.4	27	3:20
Thomas High School	110	25	1.9	9.5	13	2:30	13.4	27	2:55
Webster Christian School	110	25	4.0	7.9	31	2:50	13.5	27	3:15
Webster Montessori School	110	25	0.2	7.9	2	2:20	13.1	27	2:45
Willink Middle School	110	25	2.2	9.5	14	2:30	13.4	27	3:00
WAYNE COUNTY SCHOOLS									
Freewill Elementary School	47	25	3.7	31.0	8	1:20	8.4	17	1:40
Hop Skip & Jump Preschool	110	25	7.9	23.9	20	2:35	8.5	17	2:55
James A. Beneway High School	29	25	6.0	24.6	15	1:10	8.4	17	1:30
Lake Ontario Child Development	110	25	4.7	43.3	7	2:25	17.5	35	3:00
Magic Years Nursery School	110	25	6.7	37.0	11	2:30	7.7	16	2:45
Marion Central Middle/High School	110	25	2.4	36.2	5	2:20	14.0	28	2:50
Marion Elementary School	110	25	School is outside the EPZ			2:15	13.9	28	2:45
Ontario Elementary School	23	25	6.8	25.6	17	1:05	8.4	17	1:25
Ontario Primary School	18	25	7.1	27.3	16	1:00	8.4	17	1:20
Raggedy Ann & Andy Day Care	110	25	4.2	43.3	6	2:25	17.2	35	3:00
Rhyme Tyme Child Care Center	110	25	7.7	23.9	20	2:35	8.4	17	2:55

School	Driver Mobilization Time (min)	Loading Time (min)	Dist. To EPZ Bdry (mi)	Average Speed (mph)	Travel Time to EPZ Bdry (min)	ETE (hr:min)	Dist. EPZ Bdry to R.C./R.L. (mi.)	Travel Time from EPZ Bdry to H.S. (min)	ETE to R.C./R.L. (hr:min)
The Tot Spot Day Care Center	110	25	7.4	23.9	19	2:35	8.4	17	2:55
Thomas C. Armstrong Middle School	39	25	6.0	22.4	17	1:25	8.4	17	1:40
Wayne Education Center	110	25	3.4	36.9	6	2:25	17.5	35	3:00
Wayne Finger Lake BOCES	110	25	3.4	36.9	6	2:25	17.5	35	3:00
Wayne Technical & Career Center	110	25	3.4	36.9	6	2:25	17.5	35	3:00
Williamson Elementary School	23	25	6.3	36.9	11	1:00	14.1	29	1:30
Williamson Middle School	23	25	6.3	36.9	11	1:00	14.1	29	1:30
Williamson Senior High School	23	25	5.1	37.2	9	1:00	14.1	29	1:30
Maximum for EPZ:						3:00	Maximum:		
Average for EPZ:						2:10	Average:		

Table 8-10. Summary of Transit-Dependent Bus Routes

Route	No. of Buses	Route Description	Length (mi.)
M-1 Route A	2	Services half of ERPA M-1	16.3
M-1 Route B	3	Services half of ERPA M-1	16.7
M-2 Route C	1	Services ERPA M-2	15.6
M-3 Route D	1	Services ERPA M-3	14.0
M-4 Route E	3	Services half of the eastern portion of ERPA M-4	12.5
M-4 Route F	3	Services half of the eastern portion of ERPA M-4	14.5
M-4 Route G	3	Services the western portion of ERPA M-4	12.1
M-5 Route H	2	Services the northern portion ERPA M-5	13.2
M-5 Route I	2	Services the southern portion ERPA M-5	18.5
M-6 Route J	2	Services the eastern portion of ERPA M-6	10.1
M-6 Route K	2	Services the northern portion of ERPA M-6	13.4
M-6 Route L	2	Services the southern portion of ERPA M-6	9.6
M-7 Route M	5	Services the eastern portion of ERPA M-7	7.1
M-7 Route N	5	Services the western portion of ERPA M-8	9.9
M-8 Route P	1	Services the eastern portion of ERPA M-8	4.0
M-8 Route Q	2	Services the western portion of ERPA M-8	4.4
M-9 Route R	4	Services ERPA M-9	7.1
W-1 Route 1	2	Services the western portion of ERPA W-1	18.7
W-1 Route 2	2	Services the central portion of ERPA W-1	16.2
W-1 Route 3	2	Services the eastern portion of ERPA W-1	14.9
W-2 Route 1	2	Services the southern portion of ERPA W-2	11.3
W-2 Route 2	2	Services ERPA W-2 along Route 104	16.1
W-2 Route 3	2	Services ERPA W-2 along Ridge Road	16.4
W-3 Route 1	1	Services the western portion of ERPA W-3	15.9
W-3 Route 2	1	Services the eastern portion of ERPA W-3	7.8
W-4 Route 1	1	Services the southern portion of ERPA W-4	6.5
W-4 Route 2	1	Services the northern portion of ERPA W-4	10.1
W-5 Route 1	1	Services the northern portion of ERPA W-5	8.9
W-5 Route 2	1	Services the southern portion of ERPA W-5	6.4
W-5 Route 3	1	Services the central portion of ERPA W-5	7.0
W-6 Route 1	1	Services the eastern portion of ERPA W-6	7.8
W-6 Route 2	1	Services the central portion of ERPA W-6	6.5
W-6 Route 3	1	Services the central-western portion of ERPA W-6	10.0
W-6 Route 4	1	Services the western portion of ERPA W-6	7.7
W-7 Route 1	1	Services the western portion of ERPA W-7	13.3
W-7 Route 2	1	Services the central portion of ERPA W-7	10.8
W-7 Route 3	1	Services the eastern portion of ERPA W-7	9.9
Total:	69		

Table 8-11. Transit-Dependent Evacuation Time Estimates - Good Weather

Route Number	Bus Number	One-Wave					ETE (hr:min)	Distance to R. C. (miles)	Two-Wave					
		Mobilization (min)	Route Length (miles)	Speed (mph)	Route Travel Time (min)	Pickup Time (min)			Travel Time to R. C. (min)	Unload (min)	Driver Rest (min)	Route Travel Time (min)	Pickup Time (min)	ETE (hr:min)
M-1 Route A	1	90	16.3	19.2	51	30	2:55	10.7	16	5	10	45	30	4:45
M-1 Route A	2	110	16.3	27.1	36	30	3:00	10.7	16	5	10	45	30	4:50
M-1 Route B	1	90	16.7	19.2	52	30	2:55	10.7	16	5	10	45	30	4:45
M-1 Route B	2 & 3	110	16.7	25.1	40	30	3:00	10.7	16	5	10	45	30	4:50
M-2 Route C	1	90	15.6	17.4	54	30	2:55	10.7	16	5	10	44	30	4:45
M-3 Route D	1	90	14.0	15.1	56	30	3:00	10.7	16	5	10	42	30	4:45
M-4 Route E	1	90	12.5	13.3	57	30	3:00	9.4	14	5	10	42	30	4:45
M-4 Route E	2 & 3	110	12.5	18.6	40	30	3:05	9.4	14	5	10	42	30	4:50
M-4 Route F	1	90	14.5	20.6	42	30	2:45	9.4	14	5	10	46	30	4:30
M-4 Route F	2 & 3	110	14.5	21.4	41	30	3:05	9.4	14	5	10	45	30	4:50
M-4 Route G	1	90	12.1	18.9	38	30	2:40	9.4	14	5	10	42	30	4:25
M-4 Route G	2 & 3	110	12.1	17.8	41	30	3:05	9.4	14	5	10	41	30	4:45
M-5 Route H	1	90	12.6	40.7	19	30	2:20	9.4	14	5	10	40	30	4:00
M-5 Route H	2	90	12.6	40.7	19	30	2:20	9.4	14	5	10	40	30	4:00
M-5 Route I	1	90	18.5	42.4	26	30	2:30	9.4	14	5	10	48	30	4:20
M-5 Route I	2	90	18.5	42.4	26	30	2:30	10.7	16	5	10	50	30	4:25
M-6 Route J	1	90	10.1	13.8	44	30	2:45	10.7	16	5	10	38	30	4:25
M-6 Route J	2	90	10.1	13.8	44	30	2:45	10.7	16	5	10	38	30	4:25
M-6 Route K	1	90	13.4	44.4	18	30	2:20	10.7	16	5	10	42	30	4:05
M-6 Route K	2	90	13.4	44.4	18	30	2:20	10.7	16	5	10	42	30	4:05
M-6 Route L	1	90	9.6	16.2	36	30	2:40	10.7	16	5	10	37	30	4:20
M-6 Route L	2	90	9.6	16.2	36	30	2:40	10.7	16	5	10	37	30	4:20
M-7 Route M	1	90	7.1	13.9	31	30	2:35	15.3	23	5	10	42	30	4:30
M-7 Route M	2 & 3	100	7.1	14.6	29	30	2:40	15.3	23	5	10	42	30	4:30
M-7 Route M	4 & 5	110	7.1	17.4	24	30	2:45	15.3	23	5	10	42	30	4:35
M-7 Route N	1	90	9.9	20.0	30	30	2:30	15.3	23	5	10	45	30	4:25
M-7 Route N	2 & 3	100	9.9	21.4	28	30	2:40	15.3	23	5	10	47	30	4:35
M-7 Route N	4 & 5	110	9.9	23.7	25	30	2:50	15.3	23	5	10	47	30	4:45
M-8 Route P	1	90	4.0	8.8	27	30	2:30	10.7	16	5	10	33	30	4:05
M-8 Route Q	1	90	4.4	42.8	6	30	2:10	10.7	16	5	10	33	30	3:45

		One-Wave							Two-Wave								
Route Number	Bus Number	Mobilization (min)	Route Length (miles)	Speed (mph)	Route Travel Time (min)	Pickup Time (min)	ETE (hr:min)	Distance to R. C. (miles)	Travel Time to R. C. (min)	Unload (min)	Driver Rest (min)	Route Travel Time (min)	Pickup Time (min)	ETE (hr:min)			
M-8 Route Q	2	110	4.4	41.6	6	30	2:30	10.7	16	5	10	34	30	4:10			
M-9 Route R	1 & 2	90	7.1	8.8	48	30	2:50	10.7	16	5	10	37	30	4:30			
M-9 Route R	3 & 4	110	7.1	17.4	24	30	2:45	10.7	16	5	10	35	30	4:25			
W-1 Route 1	1	90	18.7	39.6	28	30	2:30	8.2	12	5	10	48	30	4:15			
W-1 Route 1	2	90	18.7	39.6	28	30	2:30	8.2	12	5	10	44	30	4:15			
W-1 Route 2	1	90	16.2	36.1	27	30	2:30	8.4	13	5	10	46	30	4:15			
W-1 Route 2	2	110	16.2	38.5	25	30	2:50	8.4	13	5	10	41	30	4:30			
W-1 Route 3	1	90	14.9	35.8	25	30	2:25	7.7	12	5	10	40	30	4:05			
W-1 Route 3	2	110	14.9	36.7	24	30	2:45	7.7	12	5	10	41	30	4:25			
W-2 Route 1	1	90	11.3	45.4	15	30	2:15	8.4	13	5	10	37	30	3:50			
W-2 Route 1	2	110	11.3	46.0	15	30	2:35	8.4	13	5	10	39	30	4:15			
W-2 Route 2	1	90	16.1	33.9	28	30	2:30	8.4	13	5	10	45	30	4:15			
W-2 Route 2	2	110	16.1	36.8	26	30	2:50	8.4	13	5	10	45	30	4:35			
W-2 Route 3	1	90	16.4	47.0	21	30	2:25	7.7	12	5	10	41	30	4:05			
W-2 Route 3	2	110	16.4	47.3	21	30	2:45	7.7	12	5	10	42	30	4:25			
W-3 Route 1	1	90	15.9	40.9	23	30	2:25	17.5	26	5	10	58	30	4:35			
W-3 Route 2	1	90	7.8	49.4	9	30	2:10	20.6	31	5	10	50	30	4:20			
W-4 Route 1	1	90	6.5	26.4	15	30	2:15	17.2	26	5	10	44	30	4:10			
W-4 Route 2	1	90	10.1	22.0	28	30	2:30	17.2	26	5	10	48	30	4:30			
W-5 Route 1	1	90	8.9	36.7	15	30	2:15	17.2	26	5	10	46	30	4:15			
W-5 Route 2	1	90	6.4	46.8	8	30	2:10	14.5	22	5	10	40	30	4:00			
W-5 Route 3	1	90	7.0	50.4	8	30	2:10	14.5	22	5	10	40	30	4:00			
W-6 Route 1	1	90	7.8	49.4	10	30	2:10	14.5	22	5	10	41	30	4:00			
W-6 Route 2	1	90	6.5	46.0	8	30	2:10	14.1	21	5	10	39	30	4:00			
W-6 Route 3	1	90	10.0	45.0	13	30	2:15	14.1	21	5	10	43	30	4:05			
W-6 Route 4	1	90	7.7	43.8	11	30	2:15	14.2	21	5	10	41	30	4:05			
W-7 Route 1	1	90	13.3	32.5	25	30	2:25	8.4	13	5	10	38	30	4:05			
W-7 Route 2	1	90	10.8	43.2	15	30	2:15	8.4	13	5	10	35	30	3:50			
W-7 Route 3	1	90	9.9	45.7	13	30	2:15	8.4	13	5	10	34	30	3:50			
		Maximum ETE:							Maximum ETE:							4:50	
		Average ETE:							Average ETE:							4:20	

Table 8-12. Transit-Dependent Evacuation Time Estimates - Rain

Route Number	Bus Number	One-Wave					Distance to R. C. (miles)	Two-Wave					
		Mobilization (min)	Route Length (miles)	Speed (mph)	Route Travel Time (min)	Pickup Time (min)		ETE (hr:min)	Travel Time to R. C. (min)	Unload (min)	Driver Rest (min)	Route Travel Time (min)	Pickup Time (min)
M-1 Route A	1	100	16.3	16.1	61	40	3:25	18	5	10	50	40	5:30
M-1 Route A	2	120	16.3	20.4	48	40	3:30	18	5	10	50	40	5:35
M-1 Route B	1	100	16.7	15.6	64	40	3:25	18	5	10	50	40	5:30
M-1 Route B	2 & 3	120	16.7	20.8	48	40	3:30	18	5	10	50	40	5:35
M-2 Route C	1	100	15.6	14.8	63	40	3:25	18	5	10	49	40	5:30
M-3 Route D	1	100	14.0	12.3	68	40	3:30	18	5	10	47	40	5:35
M-4 Route E	1	100	12.5	13.2	57	40	3:20	16	5	10	47	40	5:20
M-4 Route E	2 & 3	120	12.5	16.7	45	40	3:25	16	5	10	47	40	5:25
M-4 Route F	1	100	14.5	24.6	35	40	3:00	16	5	10	50	40	5:05
M-4 Route F	2 & 3	120	14.5	26.2	33	40	3:15	16	5	10	50	40	5:20
M-4 Route G	1	100	12.1	24.0	30	40	2:55	16	5	10	46	40	4:55
M-4 Route G	2 & 3	120	12.1	24.7	29	40	3:10	16	5	10	46	40	5:10
M-5 Route H	1	100	12.6	36.4	21	40	2:45	16	5	10	45	40	4:45
M-5 Route H	2	100	12.6	36.4	21	40	2:45	16	5	10	45	40	4:45
M-5 Route I	1	100	18.5	38.5	29	40	2:50	16	5	10	52	40	4:55
M-5 Route I	2	100	18.5	38.5	29	40	2:50	18	5	10	55	40	5:00
M-6 Route J	1	100	10.1	12.5	48	40	3:10	18	5	10	42	40	5:10
M-6 Route J	2	100	10.1	12.5	48	40	3:10	18	5	10	42	40	5:10
M-6 Route K	1	100	13.4	39.7	20	40	2:45	18	5	10	53	40	4:55
M-6 Route K	2	100	13.4	39.7	20	40	2:45	18	5	10	53	40	4:55
M-6 Route L	1	100	9.6	15.0	38	40	3:00	18	5	10	42	40	5:00
M-6 Route L	2	100	9.6	15.0	38	40	3:00	18	5	10	42	40	5:00
M-7 Route M	1	100	7.1	11.8	36	40	3:00	26	5	10	47	40	5:10
M-7 Route M	2 & 3	110	7.1	13.0	33	40	3:05	26	5	10	47	40	5:15
M-7 Route M	4 & 5	120	7.1	15.5	27	40	3:10	26	5	10	47	40	5:20
M-7 Route N	1	100	9.9	14.1	42	40	3:05	26	5	10	54	40	5:25
M-7 Route N	2 & 3	110	9.9	15.2	39	40	3:10	26	5	10	54	40	5:30
M-7 Route N	4 & 5	120	9.9	17.2	35	40	3:15	26	5	10	54	40	5:35
M-8 Route P	1	100	4.0	9.6	25	40	2:45	18	5	10	35	40	4:35
M-8 Route Q	1	100	4.4	38.5	7	40	2:30	18	5	10	42	40	4:30

Route Number	Bus Number	One-Wave						Distance to R. C. (miles)	Two-Wave						
		Mobilization (min)	Route Length (miles)	Speed (mph)	Route Travel Time (min)	Pickup Time (min)	ETE (hr:min)		Travel Time to R. C. (min)	Unload (min)	Driver Rest (min)	Route Travel Time (min)	Pickup Time (min)	ETE (hr:min)	
M-8 Route Q	2	120	4.4	38.6	7	40	2:50	10.7	18	5	10	41	40	4:45	
M-9 Route R	1 & 2	100	7.1	9.6	44	40	3:05	10.7	18	5	10	39	40	5:00	
M-9 Route R	3 & 4	120	7.1	20.1	21	40	3:05	10.7	18	5	10	39	40	5:00	
W-1 Route 1	1	100	18.7	32.5	34	40	2:55	8.2	14	5	10	49	40	4:55	
W-1 Route 1	2	100	18.7	32.5	34	40	2:55	8.2	14	5	10	49	40	4:55	
W-1 Route 2	1	100	16.2	29.2	33	40	2:55	8.4	14	5	10	47	40	4:55	
W-1 Route 2	2	120	16.2	41.7	23	40	3:05	8.4	14	5	10	46	40	5:05	
W-1 Route 3	1	100	14.9	28.4	31	40	2:55	7.7	13	5	10	44	40	4:50	
W-1 Route 3	2	120	14.9	40.9	22	40	3:05	7.7	13	5	10	44	40	5:00	
W-2 Route 1	1	100	11.3	41.8	16	40	2:40	8.4	14	5	10	44	40	4:35	
W-2 Route 1	2	120	11.3	42.9	16	40	3:00	8.4	14	5	10	43	40	4:55	
W-2 Route 2	1	100	16.1	27.9	35	40	2:55	8.4	14	5	10	47	40	4:55	
W-2 Route 2	2	120	16.1	42.2	23	40	3:05	8.4	14	5	10	46	40	5:05	
W-2 Route 3	1	100	16.4	43.3	23	40	2:45	7.7	13	5	10	49	40	4:45	
W-2 Route 3	2	120	16.4	42.9	23	40	3:05	7.7	13	5	10	48	40	5:05	
W-3 Route 1	1	100	15.9	39.7	24	40	2:45	17.5	30	5	10	61	40	5:15	
W-3 Route 2	1	100	7.8	44.6	11	40	2:35	20.6	35	5	10	58	40	5:05	
W-4 Route 1	1	100	6.5	27.6	14	40	2:35	17.2	29	5	10	49	40	4:50	
W-4 Route 2	1	100	10.1	21.1	29	40	2:50	17.2	29	5	10	56	40	5:15	
W-5 Route 1	1	100	8.9	37.3	14	40	2:35	17.2	29	5	10	52	40	4:55	
W-5 Route 2	1	100	6.4	42.4	9	40	2:30	14.5	25	5	10	46	40	4:40	
W-5 Route 3	1	100	7.0	45.8	9	40	2:30	14.5	25	5	10	46	40	4:40	
W-6 Route 1	1	100	7.8	44.2	11	40	2:35	14.5	25	5	10	47	40	4:45	
W-6 Route 2	1	100	6.5	42.9	9	40	2:30	14.1	24	5	10	46	40	4:40	
W-6 Route 3	1	100	10.0	40.2	15	40	2:35	14.1	24	5	10	50	40	4:45	
W-6 Route 4	1	100	7.7	40.1	11	40	2:35	14.2	24	5	10	49	40	4:45	
W-7 Route 1	1	100	13.3	31.6	25	40	2:50	8.4	14	5	10	43	40	4:45	
W-7 Route 2	1	100	10.8	38.5	17	40	2:40	8.4	14	5	10	41	40	4:35	
W-7 Route 3	1	100	9.9	42.0	14	40	2:35	8.4	14	5	10	44	40	4:30	
							Maximum ETE:	Maximum ETE:							5:35
							Average ETE:	Average ETE:							5:00

Table 8-13. Transit Dependent Evacuation Time Estimates - Snow

Route Number	Bus Number	One-Wave					Distance to R. C. (miles)	Two-Wave					
		Mobilization (min)	Route Length (miles)	Speed (mph)	Route Travel Time (min)	Pickup Time (min)		ETE (hr:min)	Travel Time to R. C. (min)	Unload (min)	Driver Rest (min)	Route Travel Time (min)	Pickup Time (min)
M-1 Route A	1	110	16.3	14.5	67	50	3:50	10.7	5	10	57	50	6:15
M-1 Route A	2	130	16.3	18.6	52	50	3:55	10.7	5	10	57	50	6:20
M-1 Route B	1	110	16.7	14.9	67	50	3:50	10.7	5	10	58	50	6:15
M-1 Route B	2 & 3	130	16.7	19.0	53	50	3:55	10.7	5	10	58	50	6:20
M-2 Route C	1	110	15.6	13.9	67	50	3:50	10.7	5	10	56	50	6:15
M-3 Route D	1	110	14.0	12.0	70	50	3:50	10.7	5	10	54	50	6:15
M-4 Route E	1	110	12.5	13.1	57	50	3:40	9.4	5	10	53	50	6:00
M-4 Route E	2 & 3	130	12.5	17.3	43	50	3:45	9.4	5	10	53	50	6:05
M-4 Route F	1	110	14.5	22.9	38	50	3:20	9.4	5	10	57	50	5:45
M-4 Route F	2 & 3	130	14.5	23.4	37	50	3:40	9.4	5	10	57	50	6:05
M-4 Route G	1	110	12.1	20.8	35	50	3:15	9.4	5	10	53	50	5:35
M-4 Route G	2 & 3	130	12.1	20.6	35	50	3:40	9.4	5	10	52	50	6:00
M-5 Route H	1	110	12.6	33.0	23	50	3:05	9.4	5	10	52	50	5:25
M-5 Route H	2	110	12.6	33.0	23	50	3:05	9.4	5	10	52	50	5:25
M-5 Route I	1	110	18.5	34.8	32	50	3:15	9.4	5	10	60	50	5:40
M-5 Route I	2	110	18.5	34.8	32	50	3:15	10.7	5	10	62	50	5:45
M-6 Route J	1	110	10.1	10.3	59	50	3:40	10.7	5	10	50	50	6:00
M-6 Route J	2	110	10.1	10.3	59	50	3:40	10.7	5	10	49	50	6:00
M-6 Route K	1	110	13.4	35.2	23	50	3:05	10.7	5	10	61	50	5:35
M-6 Route K	2	110	13.4	35.2	23	50	3:05	10.7	5	10	61	50	5:35
M-6 Route L	1	110	9.6	12.9	45	50	3:25	10.7	5	10	48	50	5:40
M-6 Route L	2	110	9.6	12.9	45	50	3:25	10.7	5	10	48	50	5:40
M-7 Route M	1	110	7.1	9.7	44	50	3:25	15.3	5	10	54	50	5:55
M-7 Route M	2 & 3	120	7.1	10.6	40	50	3:35	15.3	5	10	54	50	6:05
M-7 Route M	4 & 5	130	7.1	12.1	35	50	3:40	15.3	5	10	54	50	6:10
M-7 Route N	1	110	9.9	13.1	45	50	3:30	15.3	5	10	58	50	6:05
M-7 Route N	2 & 3	120	9.9	14.6	41	50	3:35	15.3	5	10	62	50	6:15
M-7 Route N	4 & 5	130	9.9	15.8	38	50	3:40	15.3	5	10	62	50	6:20
M-8 Route P	1	110	4.0	6.0	40	50	3:20	10.7	5	10	44	50	5:30
M-8 Route Q	1	110	4.4	33.7	8	50	2:50	10.7	5	10	48	50	5:05
M-8 Route Q	2	130	4.4	34.0	8	50	3:10	10.7	5	10	47	50	5:25

Route Number	Bus Number	One-Wave					Distance to R. C. (miles)	Two-Wave					
		Mobilization (min)	Route Length (miles)	Speed (mph)	Route Travel Time (min)	Pickup Time (min)		ETE (hr:min)	Travel Time to R. C. (min)	Unload (min)	Driver Rest (min)	Route Travel Time (min)	Pickup Time (min)
M-9 Route R	1 & 2	110	7.1	9.2	46	50	3:30	10.7	5	10	51	50	5:50
M-9 Route R	3 & 4	130	7.1	16.9	25	50	3:30	10.7	5	10	45	50	5:45
W-1 Route 1	1	110	18.7	26.4	43	50	3:25	8.2	5	10	56	50	5:45
W-1 Route 1	2	110	18.7	26.4	43	50	3:25	8.2	5	10	56	50	5:45
W-1 Route 2	1	110	16.2	22.1	44	50	3:25	8.4	5	10	53	50	5:40
W-1 Route 2	2	130	16.2	29.5	33	50	3:35	8.4	5	10	53	50	5:50
W-1 Route 3	1	110	14.9	21.5	41	50	3:25	7.7	5	10	50	50	5:35
W-1 Route 3	2	130	14.9	27.2	33	50	3:35	7.7	5	10	50	50	5:50
W-2 Route 1	1	110	11.3	37.0	18	50	3:00	8.4	5	10	53	50	5:15
W-2 Route 1	2	130	11.3	37.6	18	50	3:20	8.4	5	10	53	50	5:35
W-2 Route 2	1	110	16.1	21.7	45	50	3:25	8.4	5	10	53	50	5:40
W-2 Route 2	2	130	16.1	28.2	34	50	3:35	8.4	5	10	52	50	5:50
W-2 Route 3	1	110	16.4	38.0	26	50	3:10	7.7	5	10	51	50	5:25
W-2 Route 3	2	130	16.4	36.9	27	50	3:30	7.7	5	10	55	50	5:50
W-3 Route 1	1	110	15.9	34.6	27	50	3:10	17.5	5	10	70	50	6:05
W-3 Route 2	1	110	7.8	39.5	12	50	2:55	20.6	5	10	65	50	5:50
W-4 Route 1	1	110	6.5	23.2	17	50	3:00	17.2	5	10	57	50	5:40
W-4 Route 2	1	110	10.1	24.3	25	50	3:05	17.2	5	10	65	50	5:50
W-5 Route 1	1	110	8.9	29.9	18	50	3:00	17.2	5	10	63	50	5:45
W-5 Route 2	1	110	6.4	37.6	10	50	2:55	14.5	5	10	53	50	5:25
W-5 Route 3	1	110	7.0	39.1	11	50	2:55	14.5	5	10	53	50	5:25
W-6 Route 1	1	110	7.8	39.5	12	50	2:55	14.5	5	10	55	50	5:25
W-6 Route 2	1	110	6.5	37.3	10	50	2:55	14.1	5	10	53	50	5:25
W-6 Route 3	1	110	10.0	36.0	17	50	3:00	14.1	5	10	57	50	5:35
W-6 Route 4	1	110	7.7	35.6	13	50	2:55	14.2	5	10	54	50	5:25
W-7 Route 1	1	110	13.3	27.4	29	50	3:10	8.4	5	10	50	50	5:25
W-7 Route 2	1	110	10.8	34.5	19	50	3:00	8.4	5	10	51	50	5:15
W-7 Route 3	1	110	9.9	36.9	16	50	3:00	8.4	5	10	49	50	5:15
							Maximum ETE:	Maximum ETE:					6:20
							Average ETE:	Average ETE:					5:45

Table 8-14. Special Facility Evacuation Time Estimates - Good Weather

Medical Facility	Patient	Mobilization (min)	Loading Rate (min per person)	People	Total Loading Time (min)	Dist. To EPZ Bdry (mi)	Travel Time to EPZ Boundary (min)	ETE (hr:min)
Maplewood Nursing Home	Ambulatory	90	1	10	10	4.0	30	2:10
	Wheelchair bound	90	5	63	75	4.0	5	2:50
	Bedridden	90	15	0	0	4.0	30	2:00
Cherry Ridge	Ambulatory	90	1	206	30	2.4	10	2:10
	Wheelchair bound	90	5	64	75	2.4	3	2:50
	Bedridden	90	15	3	30	2.4	10	2:10
AHEPA 67	Ambulatory	90	1	45	30	3.5	13	2:15
	Wheelchair bound	90	5	5	25	3.5	15	2:10
	Bedridden	90	15	0	0	3.5	18	1:50
Quinby Park Apartments	Ambulatory	90	1	45	30	2.8	10	2:10
	Wheelchair bound	90	5	4	20	2.8	14	2:05
	Bedridden	90	15	0	0	2.8	13	1:45
Ontario Community Residence	Ambulatory	90	1	7	7	9.3	12	1:50
	Wheelchair bound	90	5	3	15	9.3	11	2:00
	Bedridden	90	15	0	0	9.3	15	1:45
Pines of Peace Hospice Center	Ambulatory	90	1	1	1	8.5	13	1:45
	Wheelchair bound	90	5	1	5	8.5	13	1:50
	Bedridden	90	15	0	0	8.5	14	1:45
Williamson Community Residence	Ambulatory	90	1	5	5	4.7	9	1:45
	Wheelchair bound	90	5	2	10	4.7	8	1:50
	Bedridden	90	15	0	0	4.7	10	1:40
Wayne ARC Day Activity Training Program	Ambulatory	90	1	19	19	3.9	5	1:55
	Wheelchair bound	90	5	9	45	3.9	5	2:20
	Bedridden	90	15	0	0	3.9	5	1:35
Maximum ETE:								2:50
Average ETE:								2:05

Table 8-15. Special Facility Evacuation Time Estimates - Rain

Medical Facility	Patient	Mobilization (min)	Loading Rate (min per person)	People	Total Loading Time (min)	Dist. To EPZ Bdry (mi)	Travel Time to EPZ Boundary (min)	ETE (hr:min)
Maplewood Nursing Home	Ambulatory	100	1	10	10	4.0	32	2:25
	Wheelchair bound	100	5	63	75	4.0	5	3:00
	Bedridden	100	15	0	0	4.0	36	2:20
Cherry Ridge	Ambulatory	100	1	206	30	2.4	14	2:25
	Wheelchair bound	100	5	64	75	2.4	3	3:00
	Bedridden	100	15	3	30	2.4	14	2:25
AHEPA 67	Ambulatory	100	1	45	30	3.5	15	2:25
	Wheelchair bound	100	5	5	25	3.5	16	2:25
	Bedridden	100	15	0	0	3.5	23	2:05
Quinby Park Apartments	Ambulatory	100	1	45	30	2.8	12	2:25
	Wheelchair bound	100	5	4	20	2.8	15	2:15
	Bedridden	100	15	0	0	2.8	17	2:00
Ontario Community Residence	Ambulatory	100	1	7	7	9.3	13	2:00
	Wheelchair bound	100	5	3	15	9.3	12	2:10
	Bedridden	100	15	0	0	9.3	15	1:55
Pines of Peace Hospice Center	Ambulatory	100	1	1	1	8.5	13	1:55
	Wheelchair bound	100	5	1	5	8.5	13	2:00
	Bedridden	100	15	0	0	8.5	14	1:55
Williamson Community Residence	Ambulatory	100	1	5	5	4.7	9	1:55
	Wheelchair bound	100	5	2	10	4.7	8	2:00
	Bedridden	100	15	0	0	4.7	10	1:50
Wayne ARC Day Activity Training Program	Ambulatory	100	1	19	19	3.9	5	2:05
	Wheelchair bound	100	5	9	45	3.9	5	2:30
	Bedridden	100	15	0	0	3.9	5	1:45
Maximum ETE:								3:00
Average ETE:								2:15

Table 8-16. Special Facility Evacuation Time Estimates - Snow

Medical Facility	Patient	Mobilization (min)	Loading Rate (min per person)	People	Total Loading Time (min)	Dist. To EPZ Bdry (mi)	Travel Time to EPZ Boundary (min)	ETE (hr:min)
Maplewood Nursing Home	Ambulatory	110	1	10	10	4.0	38	2:40
	Wheelchair bound	110	5	63	75	4.0	6	3:15
	Bedridden	110	15	0	0	4.0	39	2:30
Cherry Ridge	Ambulatory	110	1	206	30	2.4	17	2:40
	Wheelchair bound	110	5	64	75	2.4	4	3:10
	Bedridden	110	15	3	30	2.4	17	2:40
AHEPA 67	Ambulatory	110	1	45	30	3.5	19	2:40
	Wheelchair bound	110	5	5	25	3.5	22	2:40
	Bedridden	110	15	0	0	3.5	26	2:20
Quinby Park Apartments	Ambulatory	110	1	45	30	2.8	16	2:40
	Wheelchair bound	110	5	4	20	2.8	19	2:30
	Bedridden	110	15	0	0	2.8	20	2:10
Ontario Community Residence	Ambulatory	110	1	7	7	9.3	15	2:15
	Wheelchair bound	110	5	3	15	9.3	14	2:20
	Bedridden	110	15	0	0	9.3	18	2:10
Pines of Peace Hospice Center	Ambulatory	110	1	1	1	8.5	15	2:10
	Wheelchair bound	110	5	1	5	8.5	15	2:10
	Bedridden	110	15	0	0	8.5	17	2:10
Williamson Community Residence	Ambulatory	110	1	5	5	4.7	10	2:05
	Wheelchair bound	110	5	2	10	4.7	10	2:10
	Bedridden	110	15	0	0	4.7	12	2:05
Wayne ARC Day Activity Training Program	Ambulatory	110	1	19	19	3.9	6	2:15
	Wheelchair bound	110	5	9	45	3.9	6	2:45
	Bedridden	110	15	0	0	3.9	6	2:00
Maximum ETE:								3:15
Average ETE:								2:30

Table 8-17. Homebound Special Needs Population Evacuation Time Estimates

Vehicle Type	People Requiring Vehicle	Vehicles deployed	Stops	Weather Conditions	Mobilization Time (min)	Loading Time at 1 st Stop (min)	Travel to Subsequent Stops (min)	Total Loading Time at Subsequent Stops (min)	Travel Time to EPZ Boundary (min)	ETE (hr:min)
Vans	113	29	4	Normal	90	5	27	15	11	2:30
				Rain	100		30		14	2:45
				Snow	110		33		16	3:00
Wheelchair Vans	47	16	3	Normal	90	5	18	10	11	2:15
				Rain	100		20		14	2:30
				Snow	110		22		16	2:45
Ambulances	62	31	2	Normal	90	15	10	15	11	2:25
				Rain	100		11		14	2:35
				Snow	110		13		16	2:50
Maximum ETE:										3:00
Average ETE:										2:40

9 TRAFFIC MANAGEMENT STRATEGY

This section discusses the suggested traffic control and management strategy that is designed to expedite the movement of evacuating traffic. The resources required to implement this strategy include:

- Personnel with the capabilities of performing the planned control functions of traffic guides (preferably, not necessarily, law enforcement officers).
- Traffic Control Devices to assist these personnel in the performance of their tasks. These devices should comply with the guidance of the Manual of Uniform Traffic Control Devices (MUTCD) published by the Federal Highway Administration (FHWA) of the U.S.D.O.T. All state and most county transportation agencies have access to the MUTCD, which is available on-line: <http://mutcd.fhwa.dot.gov> which provides access to the official PDF version.
- A plan that defines all locations, provides necessary details and is documented in a format that is readily understood by those assigned to perform traffic control.

The functions to be performed in the field are:

1. Facilitate evacuating traffic movements that safely expedite travel out of the EPZ.
2. Discourage traffic movements that move evacuating vehicles in a direction which takes them significantly closer to the power plant, or which interferes with the efficient flow of other evacuees.

The terms "facilitate" and "discourage" rather than "enforce" and "prohibit" are employed to indicate the need for flexibility in performing the traffic control function. There are always legitimate reasons for a driver to prefer a direction other than that indicated. For example:

- A driver may be traveling home from work or from another location, to join other family members prior to evacuating.
- An evacuating driver may be travelling to pick up a relative, or other evacuees.
- The driver may be an emergency worker en route to perform an important activity.

The implementation of a plan must also be flexible enough for the application of sound judgment by the traffic guide.

The traffic management plan is the outcome of the following process:

1. The existing TCPs and ACPs identified by the offsite agencies in their existing emergency plans serve as the basis of the traffic management plan, as per NUREG/CR-7002.
2. Computer analysis of the evacuation traffic flow environment.
This analysis identifies the best routing and those critical intersections that experience pronounced congestion. Any critical intersections that are not identified in the existing offsite plans are suggested as additional TCPs and ACPs
3. A field survey of the highway network within 15 miles of the power plant. The schematics describing traffic and access control at suggested additional TCPs and ACPs, which are presented in Appendix G, are based on data collected during field surveys,

upon large scale maps, and on overhead photos.

4. Consultation with emergency management and law enforcement personnel.

Trained personnel who are experienced in controlling traffic and are aware of the likely evacuation traffic patterns should review the control tactics at the suggested additional TCPs and ACPs.

5. Prioritization of TCPs and ACPs.

Application of traffic and access control at some TCPs and ACPs will have a more pronounced influence on expediting traffic movements than at other TCPs and ACPs. For example, TCPs controlling traffic originating from areas in close proximity to the power plant could have a more beneficial effect on minimizing potential exposure to radioactivity than those TCPs located far from the power plant. These priorities should be assigned by state/county emergency management representatives and by law enforcement personnel.

It is recommended that the control tactics identified in the schematics in Appendix G be reviewed by the state and county emergency planners, and local and state police. Specifically the number and locations of the suggested TCPs should be reviewed in detail, and the indicated resource requirements should be reconciled with current assets and consideration be given to incorporating them into the county Radiological Emergency Preparedness Plans.

The use of Intelligent Transportation Systems (ITS) technologies can reduce manpower and equipment needs, while still facilitating the evacuation process. Dynamic Message Signs (DMS) can be placed within the EPZ to provide information to travelers regarding traffic conditions, route selection, and reception center information. DMS can also be placed outside of the EPZ to warn motorists to avoid using routes that may conflict with the flow of evacuees away from the power plant. Highway Advisory Radio (HAR) can be used to broadcast information to evacuees en route through their vehicle stereo systems. Automated Traveler Information Systems (ATIS) can also be used to provide evacuees with information. Internet websites can provide traffic and evacuation route information before the evacuee begins their trip, while on board navigation systems (GPS units), cell phones, and pagers can be used to provide information en route. These are only several examples of how ITS technologies can benefit the evacuation process. Consideration should be given that ITS technologies be used to facilitate the evacuation process, and any additional signage placed should consider evacuation needs.

The ETE analysis treated all controlled intersections that are existing TCP locations in the offsite agency plans as being controlled by actuated signals.

Chapters 2N and 5G, and Part 6 of the 2009 MUTCD are particularly relevant and should be reviewed during emergency response training.

The ETE calculations reflect the assumption that all “external-external” trips are interdicted and diverted after 2 hours have elapsed from the ATE.

All transit vehicles and other responders entering the EPZ to support the evacuation are assumed to be unhindered by personnel manning ACPs and TCPs.

Study Assumptions 5 and 6 in Section 2.3 discuss ACP and TCP staffing schedules and operations.

10 EVACUATION ROUTES

Evacuation routes are comprised of two distinct components:

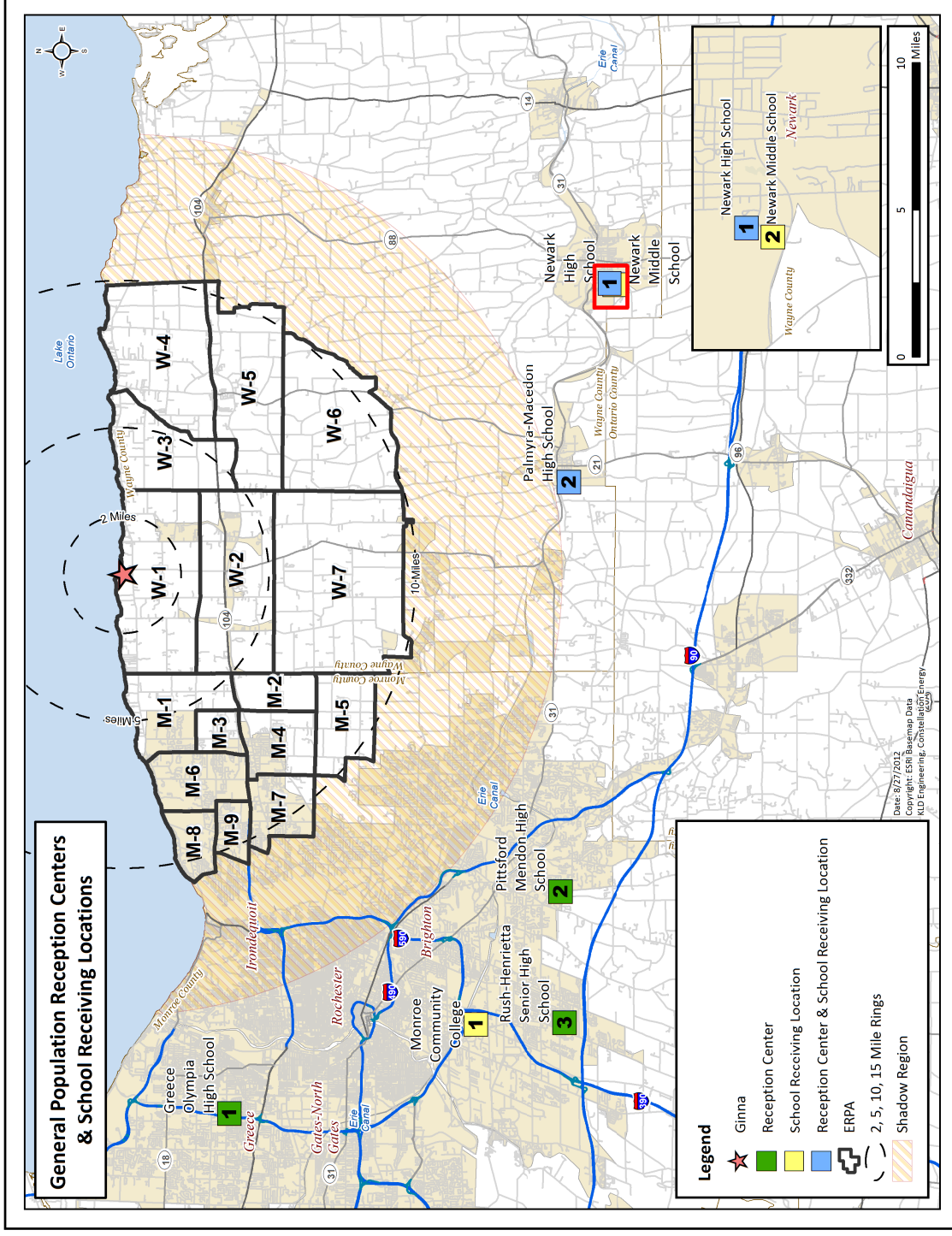
- Routing from an ERPA being evacuated to the boundary of the Evacuation Region and thence out of the EPZ.
- Routing of transit-dependent evacuees from the EPZ boundary to reception centers.

Evacuees will select routes within the EPZ in such a way as to minimize their exposure to risk. This expectation is met by the DYNEV II model routing traffic away from the location of the plant, to the extent practicable. The DTRAD model satisfies this behavior by routing traffic so as to balance traffic demand relative to the available highway capacity to the extent possible. See Appendices B through D for further discussion.

The routing of transit-dependent evacuees from the EPZ boundary to reception centers is designed to minimize the amount of travel outside the EPZ, from the points where these routes cross the EPZ boundary.

Figure 10-1 present a map showing the general population and school reception centers for evacuees. The major evacuation routes for the EPZ are presented in Figure 10-2.

It is assumed that all school evacuees will be taken to the appropriate school receiving locations and subsequently picked up by parents or guardians. Transit-dependent evacuees are transported to the nearest reception center for each county. This study does not consider the transport of evacuees from reception centers to congregate care centers, if the counties do make the decision to relocate evacuees.



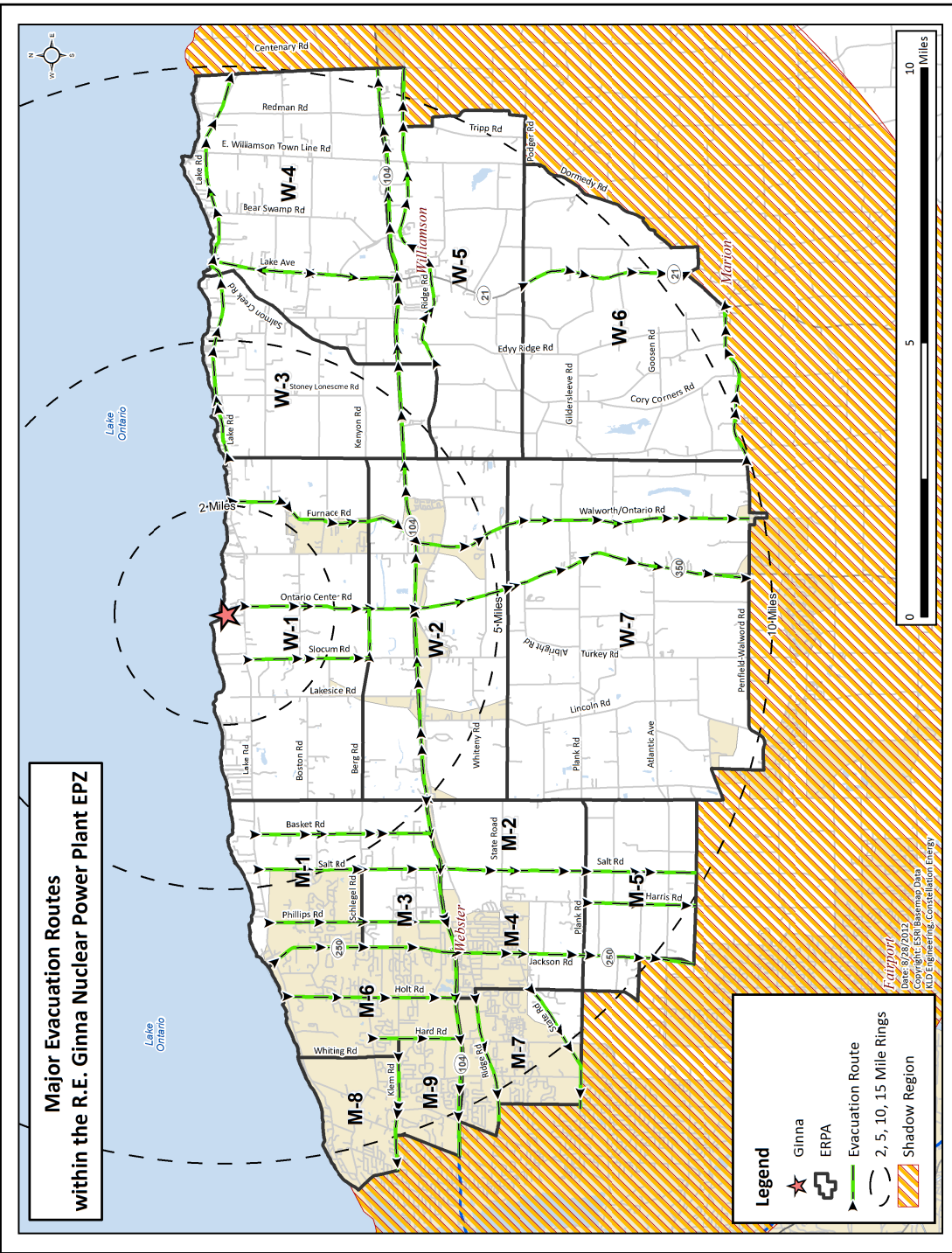


Figure 10-2. Evacuation Route Map

11 SURVEILLANCE OF EVACUATION OPERATIONS

There is a need for surveillance of traffic operations during the evacuation. There is also a need to clear any blockage of roadways arising from accidents or vehicle disablement. Surveillance can take several forms.

1. Traffic control personnel, located at Traffic Control and Access Control points, provide fixed-point surveillance.
2. Ground patrols may be undertaken along well-defined paths to ensure coverage of those highways that serve as major evacuation routes.
3. Aerial surveillance of evacuation operations may also be conducted using helicopter or fixed-wing aircraft, if available.
4. Cellular phone calls (if cellular coverage exists) from motorists may also provide direct field reports of road blockages.

These concurrent surveillance procedures are designed to provide coverage of the entire EPZ as well as the area around its periphery. It is the responsibility of the counties to support an emergency response system that can receive messages from the field and be in a position to respond to any reported problems in a timely manner. This coverage should quickly identify, and expedite the response to any blockage caused by a disabled vehicle.

Tow Vehicles

In a low-speed traffic environment, any vehicle disablement is likely to arise due to a low-speed collision, mechanical failure or the exhaustion of its fuel supply. In any case, the disabled vehicle can be pushed onto the shoulder, thereby restoring traffic flow. Past experience in other emergencies indicates that evacuees who are leaving an area often perform activities such as pushing a disabled vehicle to the side of the road without prompting.

While the need for tow vehicles is expected to be low under the circumstances described above, it is still prudent to be prepared for such a need. Consideration should be given that tow trucks with a supply of gasoline be deployed at strategic locations within, or just outside, the EPZ. These locations should be selected so that:

- They permit access to key, heavily loaded, evacuation routes.
- Responding tow trucks would most likely travel counter-flow relative to evacuating traffic.

Consideration should also be given that the state and local emergency management agencies encourage gas stations to remain open during the evacuation.

12 CONFIRMATION TIME

It is necessary to confirm that the evacuation process is effective in the sense that the public is complying with the Advisory to Evacuate. The Counties have developed procedures to confirm evacuation. "To assist the confirmation process, the Ginna Emergency Planning Calendar contains a "Notification Sign" that the members of the household are instructed to place in a window visible from the street, so law enforcement personnel will know that they have left home".¹ Detailed below is a complementary approach for confirming evacuation, which could be utilized as needed.

The suggested procedure employs a stratified random sample and a telephone survey. The size of the sample is dependent on the expected number of households that do not comply with the Advisory to Evacuate. It is reasonable to assume, for the purpose of estimating sample size that at least 80 percent of the population within the EPZ will comply with the Advisory to Evacuate. On this basis, an analysis could be undertaken (see Table 12-1) to yield an estimated sample size of approximately 300.

The confirmation process should start at about 2 hours and 15 minutes after the Advisory to Evacuate, which is when approximately 90 percent of evacuees have completed their mobilization activities (see Table 5-9). At this time, virtually all evacuees will have departed on their respective trips and the local telephone system will be largely free of traffic.

As indicated in Table 12-1, approximately 7½ person hours are needed to complete the telephone survey. If six people are assigned to this task, each dialing a different set of telephone exchanges (e.g., each person can be assigned a different set of ERPAs), then the confirmation process will extend over a timeframe of about 75 minutes. Thus, the confirmation should be completed before the evacuated area is cleared. Of course, fewer people would be needed for this survey if the Evacuation Region were only a portion of the EPZ. Use of modern automated computer controlled dialing equipment or other technologies (e.g., reverse 911 or equivalent) can significantly reduce the manpower requirements and the time required to undertake this type of confirmation survey.

If this method is indeed used by the offsite agencies, consideration should be given to maintain a list of telephone numbers within the EPZ in the EOC at all times. Such a list could be purchased from vendors and could be periodically updated. As indicated above, the confirmation process should not begin until 2 hours and 15 minutes after the Advisory to Evacuate, to ensure that households have had enough time to mobilize. This 2 hours and 15 minutes timeframe will enable telephone operators to arrive at their workplace, obtain a call list and prepare to make the necessary phone calls.

Should the number of telephone responses (i.e., people still at home) exceed 20 percent, then the telephone survey should be repeated after an hour's interval until the confirmation process is completed.

¹Wayne County REP Plan Rev 16, Appendix A Evacuation Plan 2011

Table 12-1. Estimated Number of Telephone Calls Required for Confirmation of Evacuation

Problem Definition

Estimate number of phone calls, n , needed to ascertain the proportion, F of households that have not evacuated.

Reference: Burstein, H., Attribute Sampling, McGraw Hill, 1971

Given:

- No. of households plus other facilities, N , within the EPZ (est.) = 25,100
- Est. proportion, F , of households that will not evacuate = 0.20
- Allowable error margin, e : 0.05
- Confidence level, α : 0.95 (implies $A = 1.96$)

Applying Table 10 of cited reference,

$$p = F + e = 0.25; \quad q = 1 - p = 0.75$$

$$n = \frac{A^2 pq + e}{e^2} = 308$$

Finite population correction:

$$n_F = \frac{nN}{n + N - 1} = 304$$

Thus, some 300 telephone calls will confirm that approximately 20 percent of the population has not evacuated. If only 10 percent of the population does not comply with the Advisory to Evacuate, then the required sample size, $n_F = 215$.

Est. Person Hours to complete 300 telephone calls

Assume:

- Time to dial using touch tone (random selection of listed numbers): 30 seconds
- Time for 6 rings (no answer): 36 seconds
- Time for 4 rings plus short conversation: 60 sec.
- Interval between calls: 20 sec.

Person Hours:

$$\frac{300[30 + 0.8(36) + 0.2(60) + 20]}{3600} = 7.6$$

APPENDIX A

Glossary of Traffic Engineering Terms

A. GLOSSARY OF TRAFFIC ENGINEERING TERMS

Table A-1. Glossary of Traffic Engineering Terms

Term	Definition
Analysis Network	A graphical representation of the geometric topology of a physical roadway system, which is comprised of directional links and nodes.
Link	A network link represents a specific, one-directional section of roadway. A link has both physical (length, number of lanes, topology, etc.) and operational (turn movement percentages, service rate, free-flow speed) characteristics.
Measures of Effectiveness	Statistics describing traffic operations on a roadway network.
Node	A network node generally represents an intersection of network links. A node has control characteristics, i.e., the allocation of service time to each approach link.
Origin	A location attached to a network link, within the EPZ or Shadow Region, where trips are generated at a specified rate in vehicles per hour (vph). These trips enter the roadway system to travel to their respective destinations.
Prevailing Roadway and Traffic Conditions	Relates to the physical features of the roadway, the nature (e.g., composition) of traffic on the roadway and the ambient conditions (weather, visibility, pavement conditions, etc.).
Service Rate	Maximum rate at which vehicles, executing a specific turn maneuver, can be discharged from a section of roadway at the prevailing conditions, expressed in vehicles per second (vps) or vehicles per hour (vph).
Service Volume	Maximum number of vehicles which can pass over a section of roadway in one direction during a specified time period with operating conditions at a specified Level of Service (The Service Volume at the upper bound of Level of Service, E, equals Capacity). Service Volume is usually expressed as vehicles per hour (vph).
Signal Cycle Length	The total elapsed time to display all signal indications, in sequence. The cycle length is expressed in seconds.
Signal Interval	A single combination of signal indications. The interval duration is expressed in seconds. A signal phase is comprised of a sequence of signal intervals, usually green, yellow, red.

Term	Definition
Signal Phase	A set of signal indications (and intervals) which services a particular combination of traffic movements on selected approaches to the intersection. The phase duration is expressed in seconds.
Traffic (Trip) Assignment	A process of assigning traffic to paths of travel in such a way as to satisfy all trip objectives (i.e., the desire of each vehicle to travel from a specified origin in the network to a specified destination) and to optimize some stated objective or combination of objectives. In general, the objective is stated in terms of minimizing a generalized "cost". For example, "cost" may be expressed in terms of travel time.
Traffic Density	The number of vehicles that occupy one lane of a roadway section of specified length at a point in time, expressed as vehicles per mile (vpm).
Traffic (Trip) Distribution	A process for determining the destinations of all traffic generated at the origins. The result often takes the form of a Trip Table, which is a matrix of origin-destination traffic volumes.
Traffic Simulation	A computer model designed to replicate the real-world operation of vehicles on a roadway network, so as to provide statistics describing traffic performance. These statistics are called Measures of Effectiveness.
Traffic Volume	The number of vehicles that pass over a section of roadway in one direction, expressed in vehicles per hour (vph). Where applicable, traffic volume may be stratified by turn movement.
Travel Mode	Distinguishes between private auto, bus, rail, pedestrian and air travel modes.
Trip Table or Origin-Destination Matrix	A rectangular matrix or table, whose entries contain the number of trips generated at each specified origin, during a specified time period, that are attracted to (and travel toward) each of its specified destinations. These values are expressed in vehicles per hour (vph) or in vehicles.
Turning Capacity	The capacity associated with that component of the traffic stream which executes a specified turn maneuver from an approach at an intersection.

APPENDIX B

DTRAD: Dynamic Traffic Assignment and Distribution Model

B. DYNAMIC TRAFFIC ASSIGNMENT AND DISTRIBUTION MODEL

This section describes the integrated dynamic trip assignment and distribution model named DTRAD (Dynamic Traffic Assignment and Distribution) that is expressly designed for use in analyzing evacuation scenarios. DTRAD employs logit-based path-choice principles and is one of the models of the DYNEV II System. The DTRAD module implements path-based *Dynamic Traffic Assignment* (DTA) so that time dependent Origin-Destination (OD) trips are “assigned” to routes over the network based on prevailing traffic conditions.

To apply the DYNEV II System, the analyst must specify the highway network, link capacity information, the time-varying volume of traffic generated at all origin centroids and, optionally, a set of accessible candidate destination nodes on the periphery of the EPZ for selected origins. DTRAD calculates the optimal dynamic trip distribution (i.e., trip destinations) and the optimal dynamic trip assignment (i.e., trip routing) of the traffic generated at each origin node traveling to its set of candidate destination nodes, so as to minimize evacuee travel “cost”.

Overview of Integrated Distribution and Assignment Model

The underlying premise is that the selection of destinations and routes is intrinsically coupled in an evacuation scenario. That is, people in vehicles seek to travel out of an area of potential risk as rapidly as possible by selecting the “best” routes. The model is designed to identify these “best” routes in a manner that realistically distributes vehicles from origins to destinations and routes them over the highway network, in a consistent and optimal manner, reflecting evacuee behavior.

For each origin, a set of “candidate destination nodes” is selected by the software logic and by the analyst to reflect the desire by evacuees to travel away from the power plant and to access major highways. The specific destination nodes within this set that are selected by travelers and the selection of the connecting paths of travel, are both determined by DTRAD. This determination is made by a logit-based path choice model in DTRAD, so as to minimize the trip “cost”, as discussed later.

The traffic loading on the network and the consequent operational traffic environment of the network (density, speed, throughput on each link) vary over time as the evacuation takes place. The DTRAD model, which is interfaced with the DYNEV simulation model, executes a succession of “sessions” wherein it computes the optimal routing and selection of destination nodes for the conditions that exist at that time.

Interfacing the DYNEV Simulation Model with DTRAD

The DYNEV II system reflects NRC guidance that evacuees will seek to travel in a general direction away from the location of the hazardous event. An algorithm was developed to support the DTRAD model in dynamically varying the Trip Table (O-D matrix) over time from one DTRAD session to the next. Another algorithm executes a “mapping” from the specified “geometric” network (link-node analysis network) that represents the physical highway system, to a “path” network that represents the vehicle [turn] movements. DTRAD computations are performed on the “path” network: DYNEV simulation model, on the “geometric” network.

DTRAD Description

DTRAD is the DTA module for the DYNEV II System.

When the road network under study is large, multiple routing options are usually available between trip origins and destinations. The problem of loading traffic demands and propagating them over the network links is called Network Loading and is addressed by DYNEV II using macroscopic traffic simulation modeling. Traffic assignment deals with computing the distribution of the traffic over the road network for given O-D demands and is a model of the route choice of the drivers. Travel demand changes significantly over time, and the road network may have time dependent characteristics, e.g., time-varying signal timing or reduced road capacity because of lane closure, or traffic congestion. To consider these time dependencies, DTA procedures are required.

The DTRAD DTA module represents the dynamic route choice behavior of drivers, using the specification of dynamic origin-destination matrices as flow input. Drivers choose their routes through the network based on the travel cost they experience (as determined by the simulation model). This allows traffic to be distributed over the network according to the time-dependent conditions. The modeling principles of D-TRAD include:

- It is assumed that drivers not only select the best route (i.e., lowest cost path) but some also select less attractive routes. The algorithm implemented by DTRAD archives several “efficient” routes for each O-D pair from which the drivers choose.
- The choice of one route out of a set of possible routes is an outcome of “discrete choice modeling”. Given a set of routes and their generalized costs, the percentages of drivers that choose each route is computed. The most prevalent model for discrete choice modeling is the logit model. DTRAD uses a variant of Path-Size-Logit model (PSL). PSL overcomes the drawback of the traditional multinomial logit model by incorporating an additional deterministic path size correction term to address path overlapping in the random utility expression.
- DTRAD executes the TA algorithm on an abstract network representation called “the path network” which is built from the actual physical link-node analysis network. This execution continues until a stable situation is reached: the volumes and travel times on the edges of the path network do not change significantly from one iteration to the next. The criteria for this convergence are defined by the user.
- Travel “cost” plays a crucial role in route choice. In DTRAD, path cost is a linear summation of the generalized cost of each link that comprises the path. The generalized cost for a link, a , is expressed as

$$c_a = \alpha t_a + \beta l_a + \gamma s_a ,$$

where c_a is the generalized cost for link a , and α , β , and γ are cost coefficients for link travel time, distance, and supplemental cost, respectively. Distance and supplemental costs are defined as invariant properties of the network model, while travel time is a dynamic property dictated by prevailing traffic conditions. The DYNEV simulation model

computes travel times on all edges in the network and DTRAD uses that information to constantly update the costs of paths. The route choice decision model in the next simulation iteration uses these updated values to adjust the route choice behavior. This way, traffic demands are dynamically re-assigned based on time dependent conditions. The interaction between the DTRAD traffic assignment and DYNEV II simulation models is depicted in Figure B-1. Each round of interaction is called a Traffic Assignment Session (TA session). A TA session is composed of multiple iterations, marked as loop B in the figure.

- The supplemental cost is based on the “survival distribution” (a variation of the exponential distribution). The Inverse Survival Function is a “cost” term in DTRAD to represent the potential risk of travel toward the plant:

$$s_a = -\beta \ln(p), 0 \leq p \leq 1; \beta > 0$$

$$p = \frac{d_n}{d_0}$$

d_n = Distance of node, n , from the plant

d_0 = Distance from the plant where there is zero risk

β = Scaling factor

The value of $d_0 = 15$ miles, the outer distance of the shadow region. Note that the supplemental cost, s_a , of link, a , is (high, low), if its downstream node, n , is (near, far from) the power plant.

Network Equilibrium

In 1952, John Wardrop wrote:

Under equilibrium conditions traffic arranges itself in congested networks in such a way that no individual trip-maker can reduce his path costs by switching routes.

The above statement describes the “User Equilibrium” definition, also called the “Selfish Driver Equilibrium”. It is a hypothesis that represents a [hopeful] condition that evolves over time as drivers search out alternative routes to identify those routes that minimize their respective “costs”. It has been found that this “equilibrium” objective to minimize costs is largely realized by most drivers who routinely take the same trip over the same network at the same time (i.e., commuters). Effectively, such drivers “learn” which routes are best for them over time. Thus, the traffic environment “settles down” to a near-equilibrium state.

Clearly, since an emergency evacuation is a sudden, unique event, it does not constitute a long-term learning experience which can achieve an equilibrium state. Consequently, DTRAD was not designed as an equilibrium solution, but to represent drivers in a new and unfamiliar situation, who respond in a flexible manner to real-time information (either broadcast or observed) in such a way as to minimize their respective costs of travel.

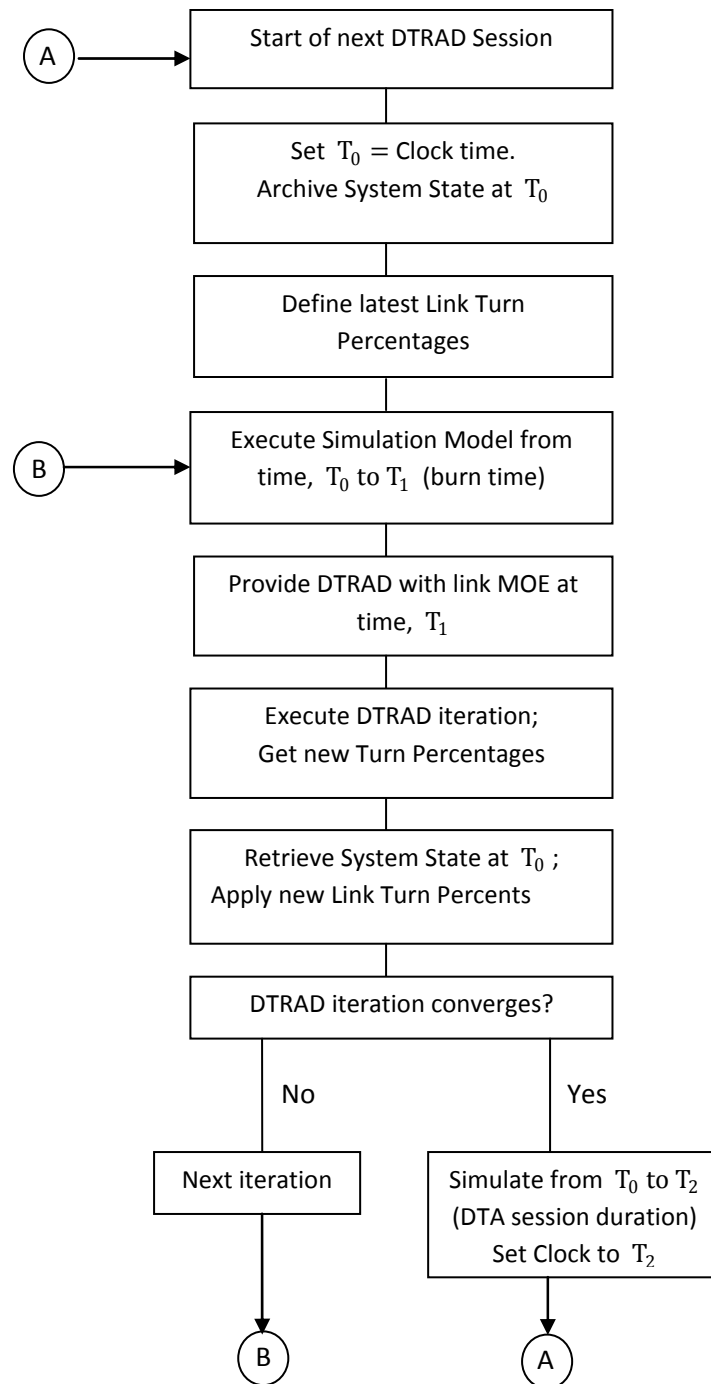


Figure B-1. Flow Diagram of Simulation-DTRAD Interface

APPENDIX C

DYNEV Traffic Simulation Model

C. DYNEV TRAFFIC SIMULATION MODEL

The DYNEV traffic simulation model is a *macroscopic* model that describes the operations of traffic flow in terms of aggregate variables: vehicles, flow rate, mean speed, volume, density, queue length, *on each link*, for each turn movement, during each Time Interval (simulation time step). The model generates trips from “sources” and from Entry Links and introduces them onto the analysis network at rates specified by the analyst based on the mobilization time distributions. The model simulates the movements of all vehicles on all network links over time until the network is empty. At intervals, the model outputs Measures of Effectiveness (MOE) such as those listed in Table C-1.

Model Features Include:

- Explicit consideration is taken of the variation in density over the time step; an iterative procedure is employed to calculate an average density over the simulation time step for the purpose of computing a mean speed for moving vehicles.
- Multiple turn movements can be serviced on one link; a separate algorithm is used to estimate the number of (fractional) lanes assigned to the vehicles performing each turn movement, based, in part, on the turn percentages provided by the DTRAD model.
- At any point in time, traffic flow on a link is subdivided into two classifications: queued and moving vehicles. The number of vehicles in each classification is computed. Vehicle spillback, stratified by turn movement for each network link, is explicitly considered and quantified. The propagation of stopping waves from link to link is computed within each time step of the simulation. There is no “vertical stacking” of queues on a link.
- Any link can accommodate “source flow” from zones via side streets and parking facilities that are not explicitly represented. This flow represents the evacuating trips that are generated at the source.
- The relation between the number of vehicles occupying the link and its storage capacity is monitored every time step for every link and for every turn movement. If the available storage capacity on a link is exceeded by the demand for service, then the simulator applies a “metering” rate to the entering traffic from both the upstream feeders and source node to ensure that the available storage capacity is not exceeded.
- A “path network” that represents the specified traffic movements from each network link is constructed by the model; this path network is utilized by the DTRAD model.
- A two-way interface with DTRAD: (1) provides link travel times; (2) receives data that translates into link turn percentages.
- Provides MOE to animation software, EVAN
- Calculates ETE statistics

All traffic simulation models are data-intensive. Table C-2 outlines the necessary input data elements.

To provide an efficient framework for defining these specifications, the physical highway environment is represented as a network. The unidirectional links of the network represent roadway sections: rural, multi-lane, urban streets or freeways. The nodes of the network generally represent intersections or points along a section where a geometric property changes (e.g. a lane drop, change in grade or free flow speed).

Figure C-1 is an example of a small network representation. The freeway is defined by the sequence of links, (20,21), (21,22), and (22,23). Links (8001, 19) and (3, 8011) are Entry and Exit links, respectively. An arterial extends from node 3 to node 19 and is partially subsumed within a grid network. Note that links (21,22) and (17,19) are grade-separated.

Table C-1. Selected Measures of Effectiveness Output by DYNEV II

Measure	Units	Applies To
Vehicles Discharged	Vehicles	Link, Network, Exit Link
Speed	Miles/Hours (mph)	Link, Network
Density	Vehicles/Mile/Lane	Link
Level of Service	LOS	Link
Content	Vehicles	Network
Travel Time	Vehicle-hours	Network
Evacuated Vehicles	Vehicles	Network, Exit Link
Trip Travel Time	Vehicle-minutes/trip	Network
Capacity Utilization	Percent	Exit Link
Attraction	Percent of total evacuating vehicles	Exit Link
Max Queue	Vehicles	Node, Approach
Time of Max Queue	Hours:minutes	Node, Approach
Route Statistics	Length (mi); Mean Speed (mph); Travel Time (min)	Route
Mean Travel Time	Minutes	Evacuation Trips; Network

Table C-2. Input Requirements for the DYNEV II Model

HIGHWAY NETWORK

- Links defined by upstream and downstream node numbers
- Link lengths
- Number of lanes (up to 9) and channelization
- Turn bays (1 to 3 lanes)
- Destination (exit) nodes
- Network topology defined in terms of downstream nodes for each receiving link
- Node Coordinates (X,Y)
- Nuclear Power Plant Coordinates (X,Y)

GENERATED TRAFFIC VOLUMES

- On all entry links and source nodes (origins), by Time Period

TRAFFIC CONTROL SPECIFICATIONS

- Traffic signals: link-specific, turn movement specific
- Signal control treated as fixed time or actuated
- Location of traffic control points (these are represented as actuated signals)
- Stop and Yield signs
- Right-turn-on-red (RTOR)
- Route diversion specifications
- Turn restrictions
- Lane control (e.g. lane closure, movement-specific)

DRIVER'S AND OPERATIONAL CHARACTERISTICS

- Driver's (vehicle-specific) response mechanisms: free-flow speed, discharge headway
- Bus route designation.

DYNAMIC TRAFFIC ASSIGNMENT

- Candidate destination nodes for each origin (optional)
- Duration of DTA sessions
- Duration of simulation "burn time"
- Desired number of destination nodes per origin

INCIDENTS

- Identify and Schedule of closed lanes
- Identify and Schedule of closed links

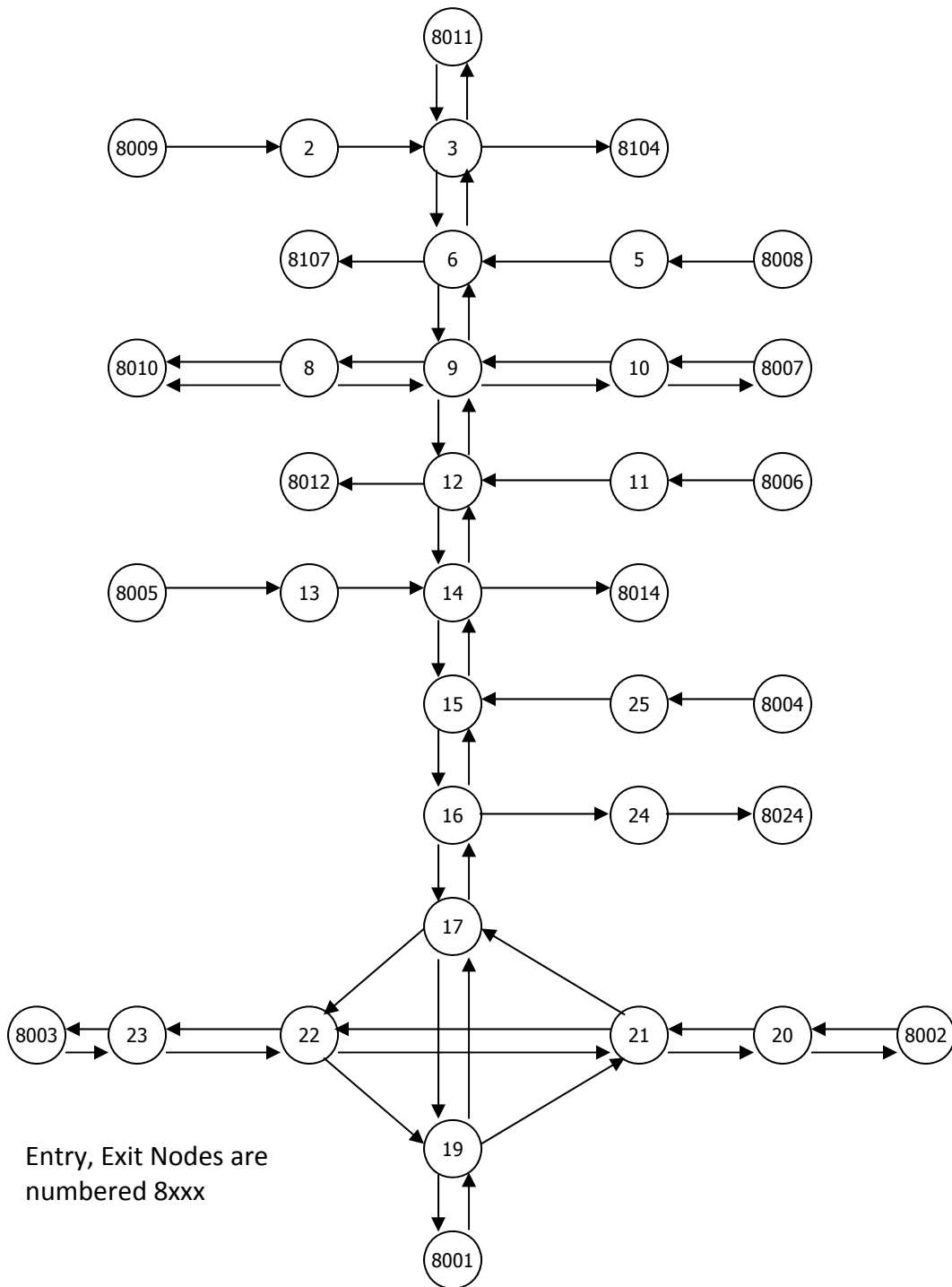


Figure C-1. Representative Analysis Network

C.1 Methodology

C.1.1 The Fundamental Diagram

It is necessary to define the fundamental diagram describing flow-density and speed-density relationships. Rather than “settling for” a triangular representation, a more realistic representation that includes a “capacity drop”, $(1-R)Q_{\max}$, at the critical density when flow conditions enter the forced flow regime, is developed and calibrated for each link. This representation, shown in Figure C-2, asserts a constant free speed up to a density, k_f , and then a linear reduction in speed in the range, $k_f \leq k \leq k_c = 45$ vpm, the density at capacity. In the flow-density plane, a quadratic relationship is prescribed in the range, $k_c < k \leq k_s = 95$ vpm which roughly represents the “stop-and-go” condition of severe congestion. The value of flow rate, Q_s , corresponding to k_s , is approximated at $0.7 RQ_{\max}$. A linear relationship between k_s and k_j completes the diagram shown in Figure C-2. Table C-3 is a glossary of terms.

The fundamental diagram is applied to moving traffic on every link. The specified calibration values for each link are: (1) Free speed, v_f ; (2) Capacity, Q_{\max} ; (3) Critical density, $k_c = 45$ vpm; (4) Capacity Drop Factor, $R = 0.9$; (5) Jam density, k_j . Then, $v_c = \frac{Q_{\max}}{k_c}$, $k_f = k_c - \frac{(v_f - v_c) k_c^2}{Q_{\max}}$. Setting $\bar{k} = k - k_c$, then $Q = RQ_{\max} - \frac{RQ_{\max}}{8333} \bar{k}^2$ for $0 \leq \bar{k} \leq \bar{k}_s = 50$. It can be shown that $Q = (0.98 - 0.0056 \bar{k}) RQ_{\max}$ for $\bar{k}_s \leq \bar{k} \leq \bar{k}_j$, where $\bar{k}_s = 50$ and $\bar{k}_j = 175$.

C.1.2 The Simulation Model

The simulation model solves a sequence of “unit problems”. Each unit problem computes the movement of traffic on a link, for each specified turn movement, over a specified time interval (TI) which serves as the simulation time step for all links. Figure C-3 is a representation of the unit problem in the time-distance plane. Table C-3 is a glossary of terms that are referenced in the following description of the unit problem procedure.

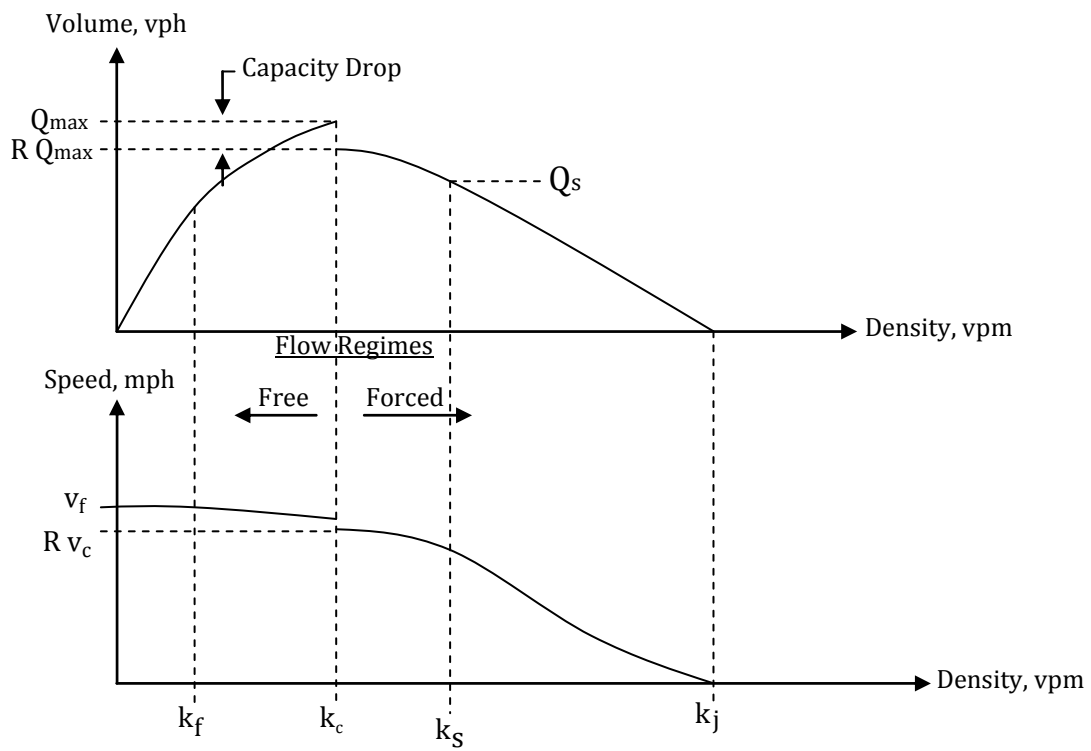


Figure C-2. Fundamental Diagrams



Table C-3. Glossary

Cap	The maximum number of vehicles, of a particular movement, that can discharge from a link within a time interval.
E	The number of vehicles, of a particular movement, that enter the link over the time interval. The portion, E_{TI} , can reach the stop-bar within the TI.
G/C	The green time: cycle time ratio that services the vehicles of a particular turn movement on a link.
h	The mean queue discharge headway, seconds.
k	Density in vehicles per lane per mile.
\bar{k}	The average density of <u>moving</u> vehicles of a particular movement over a TI, on a link.
L	The length of the link in feet.
L_b, L_e	The queue length in feet of a particular movement, at the [beginning, end] of a time interval.
LN	The number of lanes, expressed as a floating point number, allocated to service a particular movement on a link.
L_v	The mean effective length of a queued vehicle including the vehicle spacing, feet.
M	Metering factor (Multiplier): 1.
M_b, M_e	The number of moving vehicles on the link, of a particular movement, that are moving at the [beginning, end] of the time interval. These vehicles are assumed to be of equal spacing, over the length of link upstream of the queue.
O	The total number of vehicles of a particular movement that are discharged from a link over a time interval.
O_Q, O_M, O_E	The components of the vehicles of a particular movement that are discharged from a link within a time interval: vehicles that were Queued at the beginning of the TI; vehicles that were Moving within the link at the beginning of the TI; vehicles that Entered the link during the TI.
P_x	The percentage, expressed as a fraction, of the total flow on the link that executes a particular turn movement, x.

Q_b, Q_e	The number of queued vehicles on the link, of a particular turn movement, at the [beginning, end] of the time interval.
Q_{max}	The maximum flow rate that can be serviced by a link for a particular movement in the absence of a control device. It is specified by the analyst as an estimate of link capacity, based upon a field survey, with reference to the HCM.
R	The factor that is applied to the capacity of a link to represent the “capacity drop” when the flow condition moves into the forced flow regime. The lower capacity at that point is equal to RQ_{max} .
$RCap$	The remaining capacity available to service vehicles of a particular movement after that queue has been completely serviced, within a time interval, expressed as vehicles.
S_x	Service rate for movement x, vehicles per hour (vph).
t_1	Vehicles of a particular turn movement that enter a link over the first t_1 seconds of a time interval, can reach the stop-bar (in the absence of a queue downstream) within the same time interval.
TI	The time interval, in seconds, which is used as the simulation time step.
v	The mean speed of travel, in feet per second (fps) or miles per hour (mph), of <u>moving</u> vehicles on the link.
v_Q	The mean speed of the last vehicle in a queue that discharges from the link within the TI. This speed differs from the mean speed of moving vehicles, v .
W	The width of the intersection in feet. This is the difference between the link length which extends from stop-bar to stop-bar and the block length.

The formulation and the associated logic presented below are designed to solve the unit problem for each sweep over the network (discussed below), for each turn movement serviced on each link that comprises the evacuation network, and for each TI over the duration of the evacuation.

Given = $Q_b, M_b, L, TI, E_0, LN, G/C, h, L_v, R_0, L_c, E, M$

Compute = O, Q_e, M_e

Define $O = O_Q + O_M + O_E$; $E = E_1 + E_2$

1. For the first sweep, $s = 1$, of this TI, get initial estimates of mean density, k_0 , the R – factor, R_0 and entering traffic, E_0 , using the values computed for the final sweep of the prior TI. For each subsequent sweep, $s > 1$, calculate $E = \sum_i P_i O_i + S$ where P_i, O_i are the relevant turn percentages from feeder link, i , and its total outflow (possibly metered) over this TI; S is the total source flow (possibly metered) during the current TI. Set iteration counter, $n = 0$, $k = k_0$, and $E = E_0$.

2. Calculate $v(k)$ such that $k \leq 130$ using the analytical representations of the fundamental diagram.

Calculate $Cap = \frac{Q_{max}(TI)}{3600} (G/C) LN$, in vehicles, this value may be reduced

due to metering

Set $R = 1.0$ if $G/C < 1$ or if $k \leq k_c$; Set $R = 0.9$ only if $G/C = 1$ and $k > k_c$

Calculate queue length, $L_b = Q_b \frac{L_v}{LN}$

3. Calculate $t_1 = TI - \frac{L}{V}$. If $t_1 < 0$, set $t_1 = E_1 = O_E = 0$; Else, $E_1 = E \frac{t_1}{TI}$.

4. Then $E_2 = E - E_1$; $t_2 = TI - t_1$

5. If $Q_b \geq Cap$, then

$O_Q = Cap, O_M = O_E = 0$

If $t_1 > 0$, then

$Q'_e = Q_b + M_b + E_1 - Cap$

Else

$Q'_e = Q_b - Cap$

End if

Calculate Q_e and M_e using Algorithm A (below)

6. Else ($Q_b < Cap$)

$O_Q = Q_b$, $RCap = Cap - O_Q$

7. If $M_b \leq RCap$, then

8. If $t_1 > 0$, $O_M = M_b$, $O_E = \min\left(RCap - M_b, \frac{t_1 \text{Cap}}{TI}\right) \geq 0$
 $Q'_e = E_1 - O_E$
 If $Q'_e > 0$, then
 Calculate Q_e, M_e with Algorithm A
 Else
 $Q_e = 0$, $M_e = E_2$
 End if
 Else ($t_1 = 0$)
 $O_M = \left(\frac{v(TI) - L_b}{L - L_b}\right) M_b$ and $O_E = 0$
 $M_e = M_b - O_M + E$; $Q_e = 0$
 End if
9. Else ($M_b > RCap$)
 $O_E = 0$
 If $t_1 > 0$, then
 $O_M = RCap$, $Q'_e = M_b - O_M + E_1$
 Calculate Q_e and M_e using Algorithm A
10. Else ($t_1 = 0$)
 $M_d = \left[\left(\frac{v(TI) - L_b}{L - L_b}\right) M_b\right]$
 If $M_d > RCap$, then
 $O_M = RCap$
 $Q'_e = M_d - O_M$
 Apply Algorithm A to calculate Q_e and M_e
 Else
 $O_M = M_d$
 $M_e = M_b - O_M + E$ and $Q_e = 0$
 End if
 End if
 End if
11. Calculate a new estimate of average density, $\bar{k}_n = \frac{1}{4}[k_b + 2k_m + k_e]$,
 where k_b = density at the beginning of the TI
 k_e = density at the end of the TI
 k_m = density at the mid-point of the TI
 All values of density apply only to the moving vehicles.
- If $|\bar{k}_n - \bar{k}_{n-1}| > \epsilon$ and $n < N$
 where N = max number of iterations, and ϵ is a convergence criterion, then

12. set $n = n + 1$, and return to step 2 to perform iteration, n , using $k = \bar{k}_n$.
End if

Computation of unit problem is now complete. Check for excessive inflow causing spillback.

13. If $Q_e + M_e > \frac{(L-W) LN}{L_v}$, then

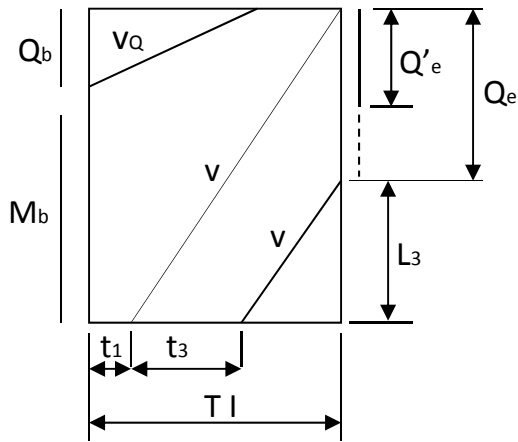
The number of excess vehicles that cause spillback is: $SB = Q_e + M_e - \frac{(L-W) \cdot LN}{L_v}$,
where W is the width of the upstream intersection. To prevent spillback, meter the outflow from the feeder approaches and from the source flow, S , during this TI by the amount, SB . That is, set

$$M = 1 - \frac{SB}{(E + S)} \geq 0, \text{ where } M \text{ is the metering factor (over all movements).}$$

This metering factor is assigned appropriately to all feeder links and to the source flow, to be applied during the next network sweep, discussed later.

Algorithm A

This analysis addresses the flow environment over a TI during which moving vehicles can



join a standing or discharging queue. For the case shown, $Q_b \leq Cap$, with $t_1 > 0$ and a queue of length, Q'_e , formed by that portion of M_b and E that reaches the stop-bar within the TI, but could not discharge due to inadequate capacity. That is, $Q_b + M_b + E_1 > Cap$. This queue length, $Q'_e = Q_b + M_b + E_1 - Cap$ can be extended to Q_e by traffic entering the approach during the current TI, traveling at speed, v , and reaching the rear of the queue within the TI. A portion of the entering vehicles, $E_3 = E \frac{t_3}{TI}$, will likely join the queue. This analysis calculates t_3 , Q_e and M_e for the input

values of L , TI , v , E , t , L_v , LN , Q'_e .

When $t_1 > 0$ and $Q_b \leq Cap$:

Define: $L'_e = Q'_e \frac{L_v}{LN}$. From the sketch, $L_3 = v(TI - t_1 - t_3) = L - (Q'_e + E_3) \frac{L_v}{LN}$.

Substituting $E_3 = \frac{t_3}{TI} E$ yields: $-vt_3 + \frac{t_3}{TI} E \frac{L_v}{LN} = L - v(TI - t_1) - L'_e$. Recognizing that the first two terms on the right hand side cancel, solve for t_3 to obtain:

$$t_3 = \frac{L'_e}{\left[v - \frac{E}{TI} \frac{L_v}{LN} \right]} \quad \text{such that } 0 \leq t_3 \leq TI - t_1$$

If the denominator, $\left[v - \frac{E}{TI} \frac{L_v}{LN} \right] \leq 0$, set $t_3 = TI - t_1$.

$$\text{Then, } Q_e = Q'_e + E \frac{t_3}{TI}, \quad M_e = E \left(1 - \frac{t_1 + t_3}{TI} \right)$$

The complete Algorithm A considers all flow scenarios; space limitation precludes its inclusion, here.

C.1.3 Lane Assignment

The “unit problem” is solved for each turn movement on each link. Therefore it is necessary to calculate a value, LN_x , of allocated lanes for each movement, x . If in fact all lanes are specified by, say, arrows painted on the pavement, either as full lanes or as lanes within a turn bay, then the problem is fully defined. If however there remain un-channelized lanes on a link, then an analysis is undertaken to subdivide the number of these physical lanes into turn movement specific virtual lanes, LN_x .

C.2 Implementation

C.2.1 Computational Procedure

The computational procedure for this model is shown in the form of a flow diagram as Figure C-4. As discussed earlier, the simulation model processes traffic flow for each link independently over TI that the analyst specifies; it is usually 60 seconds or longer. The first step is to execute an algorithm to define the sequence in which the network links are processed so that as many links as possible are processed after their feeder links are processed, within the same network sweep. Since a general network will have many closed loops, it is not possible to guarantee that every link processed will have all of its feeder links processed earlier.

The processing then continues as a succession of time steps of duration, TI , until the simulation is completed. Within each time step, the processing performs a series of “sweeps” over all network links; this is necessary to ensure that the traffic flow is synchronous over the entire network. Specifically, the sweep ensures continuity of flow among all the network links; in the context of this model, this means that the values of E , M , and S are all defined for each link such that they represent the synchronous movement of traffic from each link to all of its outbound links. These sweeps also serve to compute the metering rates that control spillback.

Within each sweep, processing solves the “unit problem” for each turn movement on each link. With the turn movement percentages for each link provided by the DTRAD model, an algorithm

allocates the number of lanes to each movement serviced on each link. The timing at a signal, if any, applied at the downstream end of the link, is expressed as a G/C ratio, the signal timing needed to define this ratio is an input requirement for the model. The model also has the capability of representing, with macroscopic fidelity, the actions of actuated signals responding to the time-varying competing demands on the approaches to the intersection.

The solution of the unit problem yields the values of the number of vehicles, O , that discharge from the link over the time interval and the number of vehicles that remain on the link at the end of the time interval as stratified by queued and moving vehicles: Q_e and M_e . The procedure considers each movement separately (multi-piping). After all network links are processed for a given network sweep, the updated consistent values of entering flows, E ; metering rates, M ; and source flows, S are defined so as to satisfy the “no spillback” condition. The procedure then performs the unit problem solutions for all network links during the following sweep.

Experience has shown that the system converges (i.e. the values of E , M and S “settle down” for all network links) in just two sweeps if the network is entirely under-saturated or in four sweeps in the presence of extensive congestion with link spillback. (The initial sweep over each link uses the final values of E and M , of the prior TI). At the completion of the final sweep for a TI, the procedure computes and stores all measures of effectiveness for each link and turn movement for output purposes. It then prepares for the following time interval by defining the values of Q_b and M_b for the start of the next TI as being those values of Q_e and M_e at the end of the prior TI. In this manner, the simulation model processes the traffic flow over time until the end of the run. Note that there is no space-discretization other than the specification of network links.

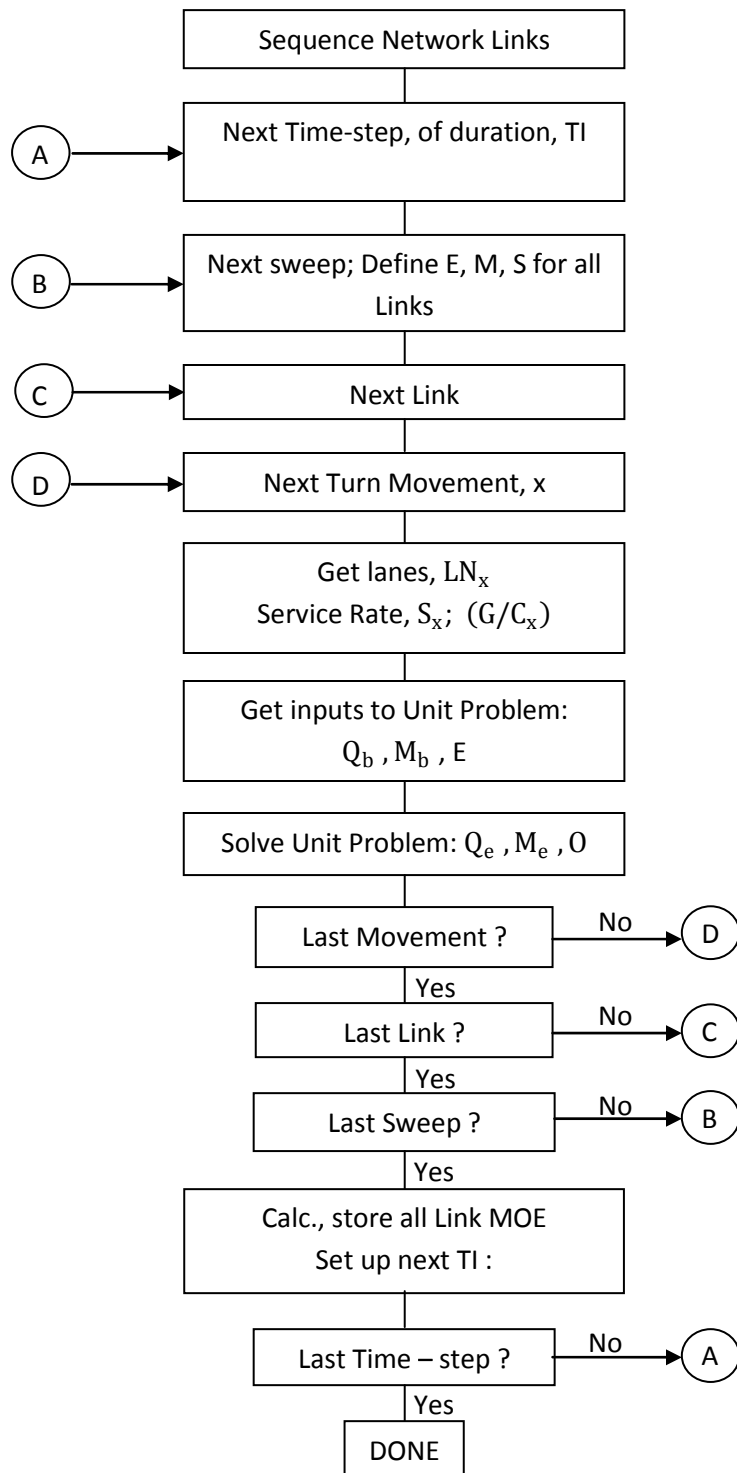


Figure C-4. Flow of Simulation Processing (See Glossary: Table C-3)

C.2.2 Interfacing with Dynamic Traffic Assignment (DTRAD)

The **DYNEV II** system reflects NRC guidance that evacuees will seek to travel in a general direction away from the location of the hazardous event. Thus, an algorithm was developed to identify an appropriate set of destination nodes for each origin based on its location and on the expected direction of travel. This algorithm also supports the DTRAD model in dynamically varying the Trip Table (O-D matrix) over time from one DTRAD session to the next.

Figure B-1 depicts the interaction of the simulation model with the DTRAD model in the **DYNEV II** system. As indicated, **DYNEV II** performs a succession of DTRAD “sessions”; each such session computes the turn link percentages for each link that remain constant for the session duration, $[T_0, T_2]$, specified by the analyst. The end product is the assignment of traffic volumes from each origin to paths connecting it with its destinations in such a way as to minimize the network-wide cost function. The output of the DTRAD model is a set of updated link turn percentages which represent this assignment of traffic.

As indicated in Figure B-1, the simulation model supports the DTRAD session by providing it with operational link MOE that are needed by the path choice model and included in the DTRAD cost function. These MOE represent the operational state of the network at a time, $T_1 \leq T_2$, which lies within the session duration, $[T_0, T_2]$. This “burn time”, $T_1 - T_0$, is selected by the analyst. For each DTRAD iteration, the simulation model computes the change in network operations over this burn time using the latest set of link turn percentages computed by the DTRAD model. Upon convergence of the DTRAD iterative procedure, the simulation model accepts the latest turn percentages provided by the DTA model, returns to the origin time, T_0 , and executes until it arrives at the end of the DTRAD session duration at time, T_2 . At this time the next DTA session is launched and the whole process repeats until the end of the **DYNEV II** run.

Additional details are presented in Appendix B.

APPENDIX D

Detailed Description of Study Procedure

D. DETAILED DESCRIPTION OF STUDY PROCEDURE

This appendix describes the activities that were performed to compute Evacuation Time Estimates. The individual steps of this effort are represented as a flow diagram in Figure D-1. Each numbered step in the description that follows corresponds to the numbered element in the flow diagram.

Step 1

The first activity was to obtain EPZ boundary information and create a GIS base map. The base map extends beyond the Shadow Region which extends approximately 15 miles (radially) from the power plant location. The base map incorporates the local roadway topology, a suitable topographic background and the EPZ boundary.

Step 2

2010 Census block information was obtained in GIS format. This information was used to estimate the resident population within the EPZ and Shadow Region and to define the spatial distribution and demographic characteristics of the population within the study area. Data for employees, transients, schools, and other facilities were obtained from local emergency management agencies.

Step 3

A kickoff meeting was conducted with major stakeholders (state and local emergency managers, on-site and off-site utility emergency managers, local and state law enforcement agencies). The purpose of the kickoff meeting was to present an overview of the work effort, identify key agency personnel, and indicate the data requirements for the study. Specific requests for information were presented to local emergency managers. Unique features of the study area were discussed to identify the local concerns that should be addressed by the ETE study.

Step 4

Next, a physical survey of the roadway system in the study area was conducted to determine the geometric properties of the highway sections, the channelization of lanes on each section of roadway, whether there are any turn restrictions or special treatment of traffic at intersections, the type and functioning of traffic control devices, gathering signal timings for pre-timed traffic signals, and to make the necessary observations needed to estimate realistic values of roadway capacity.

Step 5

A telephone survey of households within the EPZ was conducted to identify household dynamics, trip generation characteristics, and evacuation-related demographic information of the EPZ population. This information was used to determine important study factors including the average number of evacuating vehicles used by each household, and the time required to perform pre-evacuation mobilization activities.

Step 6

A computerized representation of the physical roadway system, called a link-node analysis network, was developed using the UNITES software developed by KLD. Once the geometry of the network was completed, the network was calibrated using the information gathered during the road survey (Step 4). Estimates of highway capacity for each link and other link-specific characteristics were introduced to the network description. Traffic signal timings were input accordingly. The link-node analysis network was imported into a GIS map. 2010 Census data were overlaid in the map, and origin centroids where trips would be generated during the evacuation process were assigned to appropriate links.

Step 7

The EPZ is subdivided into 16 ERPAs. Based on wind direction and speed, Regions (groupings of ERPA) that may be advised to evacuate, were developed.

The need for evacuation can occur over a range of time-of-day, day-of-week, seasonal and weather-related conditions. Scenarios were developed to capture the variation in evacuation demand, highway capacity and mobilization time, for different time of day, day of the week, time of year, and weather conditions.

Step 8

The input stream for the DYNEV II model, which integrates the dynamic traffic assignment and distribution model, DTRAD, with the evacuation simulation model, was created for a prototype evacuation case – the evacuation of the entire EPZ for a representative scenario.

Step 9

After creating this input stream, the DYNEV II System was executed on the prototype evacuation case to compute evacuating traffic routing patterns consistent with the appropriate NRC guidelines. DYNEV II contains an extensive suite of data diagnostics which check the completeness and consistency of the input data specified. The analyst reviews all warning and error messages produced by the model and then corrects the database to create an input stream that properly executes to completion.

The model assigns destinations to all origin centroids consistent with a (general) radial evacuation of the EPZ and Shadow Region. The analyst may optionally supplement and/or replace these model-assigned destinations, based on professional judgment, after studying the topology of the analysis highway network. The model produces link and network-wide measures of effectiveness as well as estimates of evacuation time.

Step 10

The results generated by the prototype evacuation case are critically examined. The examination includes observing the animated graphics (using the EVAN software which operates on data produced by DYNEV II) and reviewing the statistics output by the model. This is a labor-intensive activity, requiring the direct participation of skilled engineers who possess the necessary practical experience to interpret the results and to determine the causes of any problems reflected in the results.

Essentially, the approach is to identify those bottlenecks in the network that represent locations where congested conditions are pronounced and to identify the cause of this congestion. This cause can take many forms, either as excess demand due to high rates of trip generation, improper routing, a shortfall of capacity, or as a quantitative flaw in the way the physical system was represented in the input stream. This examination leads to one of two conclusions:

- The results are satisfactory; or
- The input stream must be modified accordingly.

This decision requires, of course, the application of the user's judgment and experience based upon the results obtained in previous applications of the model and a comparison of the results of the latest prototype evacuation case iteration with the previous ones. If the results are satisfactory in the opinion of the user, then the process continues with Step 13. Otherwise, proceed to Step 11.

Step 11

There are many "treatments" available to the user in resolving apparent problems. These treatments range from decisions to reroute the traffic by assigning additional evacuation destinations for one or more sources, imposing turn restrictions where they can produce significant improvements in capacity, changing the control treatment at critical intersections so as to provide improved service for one or more movements, or in prescribing specific treatments for channelizing the flow so as to expedite the movement of traffic along major roadway systems. Such "treatments" take the form of modifications to the original prototype evacuation case input stream. All treatments are designed to improve the representation of evacuation behavior.

Step 12

As noted above, the changes to the input stream must be implemented to reflect the modifications undertaken in Step 11. At the completion of this activity, the process returns to Step 9 where the DYNEV II System is again executed.

Step 13

Evacuation of transit-dependent evacuees and special facilities are included in the evacuation analysis. Fixed routing for transit buses and for school buses, ambulances, and other transit vehicles are introduced into the final prototype evacuation case data set. DYNEV II generates route-specific speeds over time for use in the estimation of evacuation times for the transit dependent and special facility population groups.

Step 14

The prototype evacuation case was used as the basis for generating all region and scenario-specific evacuation cases to be simulated. This process was automated through the UNITES user interface. For each specific case, the population to be evacuated, the trip generation distributions, the highway capacity and speeds, and other factors are adjusted to produce a customized case-specific data set.

Step 15

All evacuation cases are executed using the DYNEV II System to compute ETE. Once results were available, quality control procedures were used to assure the results were consistent, dynamic routing was reasonable, and traffic congestion/bottlenecks were addressed properly.

Step 16

Once vehicular evacuation results are accepted, average travel speeds for transit and special facility routes were used to compute evacuation time estimates for transit-dependent permanent residents, schools, hospitals, and other special facilities.

Step 17

The simulation results are analyzed, tabulated and graphed. The results were then documented, as required by NUREG/CR-7002.

Step 18

Following the completion of documentation activities, the ETE criteria checklist (see Appendix N) was completed. An appropriate report reference is provided for each criterion provided in the checklist.

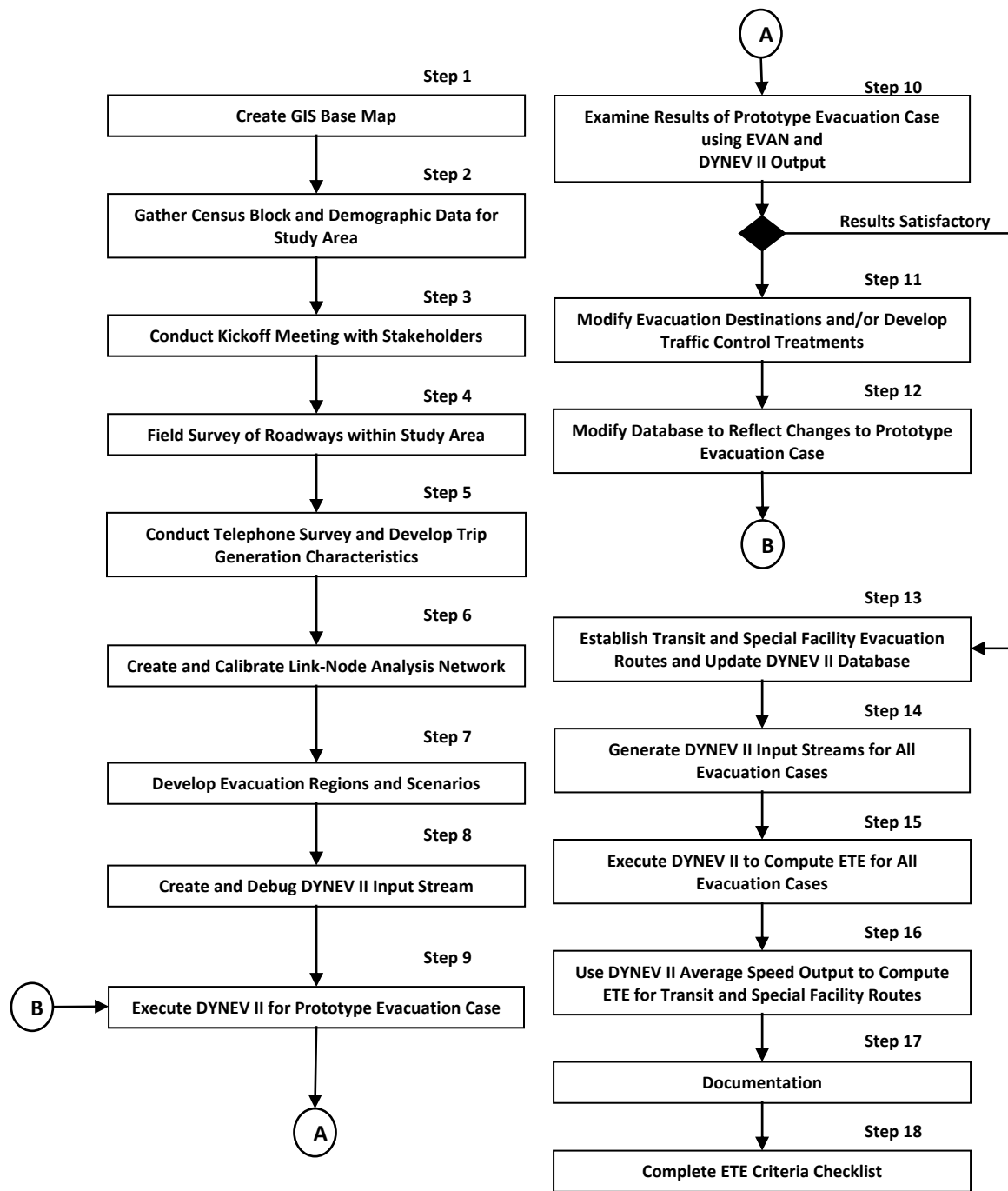


Figure D-1. Flow Diagram of Activities

APPENDIX E

Special Facility Data

E. SPECIAL FACILITY DATA

The following tables list population information, as of August, 2012, for special facilities that are located within the Ginna EPZ. Special facilities are defined as schools, preschools and medical care facilities. Transient population data is included in the tables for recreational areas and lodging facilities. Employment data is included in the tables for major employers. Each table is grouped by county. The location of the facility is defined by its straight-line distance (miles) and direction (magnetic bearing) from the center point of the plant. Maps of each school, preschool, medical facility, major employer, recreational area and lodging facility are also provided.

Table E-1. Schools and within the EPZ

ERPA	Distance (miles)	Dire- ction	School Name	Street Address	Municipality	Phone	Enroll- ment	Staff
MONROE COUNTY								
M-1	5.6	WSW	Schlegel Road Elementary School	1548 Schlegel Road	Webster	(585) 265-2500	512	77
M-4	7.9	SW	Spry Middle School	119 South Ave	Webster	(585) 265-6500	1,048	161
M-4	7.7	SW	State Road Elementary School	1401 State Road	Webster	(585) 872-4200	536	69
M-6	8.2	WSW	Klem Road North Elementary School	1015 Klem Road	Webster	(585) 872-1770	534	66
M-6	8.2	WSW	Klem Road South Elementary School	1025 Klem Road	Webster	(585) 872-1320	533	70
M-6	7.8	WSW	Webster Christian School	675 Holt Road	Webster	(585) 872-5150	220	38
M-7	9.5	WSW	Schroeder High School	875 Ridge Road	Webster	(585) 670-5000	1,504	308
M-9	9.2	WSW	Thomas High School	800 Five Mile Line Road	Webster	(585) 670-8000	1,388	216
M-9	8.8	WSW	Willink Middle School	900 Publishers Parkway	Webster	(585) 670-1030	977	163
S.R.	10.9	WSW	Dewitt Road Elementary School	722 Dewitt Road	Webster	(585) 671-0710	517	73
S.R.	11.0	SW	Plank Road North Elementary School	705 Plank Road	Penfield	(585) 671-8858	576	63
S.R.	11.1	SW	Plank Road South Elementary School	715 Plank Road	Webster	(585) 671-3190	557	80
S.R.	12.3	SW	Rochester Christian School	260 Embury Road	Rochester	(585) 671-4910	106	20
S.R.	11.0	WSW	St Rita's School	1008 Maple Drive	Webster	(585) 671-3132	332	33
<i>Monroe County Subtotals:</i>							9,340	1,437
WAYNE COUNTY								
W-2	3.8	S	James A. Beneway High School	6200 Ontario Center Road	Ontario Center	(315) 524-1050	811	148
W-2	3.8	S	Ontario Elementary School	1730 Ridge Road	Ontario Center	(315) 524-1153	356	194
W-2	3.9	S	Ontario Primary School	1730 Ridge Road	Ontario Center	(315) 524-1150	347	40
W-2	3.9	S	Thomas C. Armstrong Middle School	6076 Ontario Center Road	Ontario	(315) 524-1080	549	166
W-5	7.9	ESE	Wayne Education Center	4440 Ridge Road	Williamson	(315) 589-7900	179	31
W-5	7.9	ESE	Wayne Finger Lake BOCES	4440 Ridge Road	Williamson	(315) 332-7400	19	7
W-5	7.9	ESE	Wayne Technical & Career Center	4440 Ridge Road	Williamson	(315) 589-7900	231	44
W-5	7.6	ESE	Williamson Elementary School	6036 Highland Avenue	Williamson	(315) 589-9668	460	85
W-5	7.5	ESE	Williamson Middle School	4184 Miller Street	Williamson	(315) 589-9665	325	95
W-5	7.3	SE	Williamson Senior High School	5891 New York 21	Williamson	(315) 589-9621	378	100
W-6	9.5	SE	Marion Central Middle/High School	4034 Warner Road	Marion	(315) 926-4228	563	76
W-7	8.2	S	Freewill Elementary School	4320 Canandaigua Road	Walworth	(315) 524-1170	314	52
S.R.	11.0	SSE	Marion Elementary School	3863 North Main Street	Marion	(315) 926-4256	625	83
<i>Wayne County Subtotals:</i>							5,157	1,121
TOTAL:							14,497	2,558

Table E-2. Preschools within the EPZ

ERPA	Distance (miles)	Direction	School Name	Street Address	Municipality	Phone	Enrollment
MONROE COUNTY							
M-1	6.0	WSW	Webster Early Learning Center & Day Care	369 Phillips Road	Webster	(585) 216-9740	82
M-3	7.3	SW	Railroad Junction School Age Program	10 May Street	Webster	(585) 872-2160	156
M-3	7.3	SW	Toddler's Workshop Child Care	12 May Street	Webster	(585) 872-0663	149
M-3	6.5	WSW	Webster Presbyterian Church Preschool	550 Webster Road	Webster	(585) 265-9700	21
M-4	6.9	SW	Positive Preschool	1460 Ridge Road	Webster	(585) 265-2002	28
M-4	7.7	SW	Webster Nursery School	59 South Avenue	Webster	(585) 265-2430	43
M-6	8.1	WSW	Webster KinderCare	856 Holt Road	Webster	(585) 872-6530	140
M-6	8.1	WSW	YMCA of Greater Rochester	1025 Klem Road	Webster	(585) 671-8414	80
M-7	8.3	SW	Doodle Bugs! Children's Centers	979 Jackson Road	Webster	(585) 872-2300	176
M-7	10.5	SW	Webster Montessori School	1310 5 Mile Line Road	Webster	(585) 347-0055	118
M-8	10.0	WSW	Woodside Nursery School	570 Klem Road	Webster	(585) 671-6757	20
<i>Monroe County Subtotals:</i>							1,013
WAYNE COUNTY							
W-2	4.1	SSE	Hop Skip & Jump Preschool	6341 Ontario Center Rd	Ontario	(315) 524-5537	89
W-2	3.8	SSW	Rhyme Tyme Child Care Center	944 New York 104	Ontario	(315) 524-5170	74
W-2	3.8	SSW	The Tot Spot Day Care Center	6225 Slocum Road	Ontario	(315) 524-4264	155
W-4	6.6	ESE	Raggedy Ann & Andy Day Care	3955 New York 104	Williamson	(315) 589-9310	22
W-5	6.2	ESE	Lake Ontario Child Development	6395 Tuckahoe Road	Williamson	(315) 589-7421	78
<i>Wayne County Subtotals:</i>							418
TOTAL:							1,431

Table E-3. Medical Facilities within the EPZ

ERPA	Dist. (miles)	Dire- ction	Facility Name	Street Address	Municipality	Phone	Cap- acity	Current Census	Ambul- atory Patients	Wheel- chair Patients	Bed- ridden Patients
MONROE COUNTY											
M-4	7.7	SW	Maplewood Nursing Home	100 Daniel Drive	Webster	(585) 872-1800	74	73	10	63	0
M-7	9.0	SW	Ahepa 67 Apartments	100 Ahepa Circle	Webster	(585) 872-6300	50	50	45	5	0
M-7	9.4	WSW	Cherry Ridge	900 Cherry Ridge Boulevard	Webster	(585) 697-6700	273	273	206	64	3
M-7	9.2	WSW	Quinby Park Senior Apartments	1030 Shoecraft Road	Webster	(585) 671-1450	49	49	45	4	0
Monroe County Subtotals:							446	445	306	136	3
WAYNE COUNTY											
W-1	2.9	SE	Ontario Community Residence	2420 Trimble Road	Ontario	(315) 524-1970	10	10	7	3	0
W-5	4.5	SSE	Pines of Peace Hospice Center	2378 Ridge Road	Ontario	(315) 524-2388	2	2	1	1	0
W-5	7.1	ESE	Williamson Community Residence	4080 Circle Drive	Williamson	(315) 589-8811	7	7	5	2	0
W-7	9.8	S	Wayne ARC Day Activity Training Program	2261 Marion Road	Walworth	(315) 986-1630	28	28	19	9	0
Wayne County Subtotals:							47	47	32	15	0
TOTAL:							493	492	338	151	3

Table E-4. Major Employers within the EPZ

ERPA	Distance (miles)	Direction	Facility Name	Street Address	Municipality	Phone	Employees (max shift)	% Non-EPZ	Employees (Non EPZ)
MONROE COUNTY									
M-1	5.4	SW	Paychex Inc.	675 Basket Road	Webster	(585) 216-0820	550	50%	275
M-3	6.5	SW	Xerox Headquarters	800 Phillips Road	Webster	(585) 422-9098	7,500	98%	7,350
M-4	8.1	WSW	Wegmans	900 Holt Road	Webster	(585) 872-0780	250	10%	25
M-7	9.1	WSW	Hegedorn's Inc.	964 Ridge Road	Webster	(585) 671-0230	80	25%	20
M-7	9.6	WSW	Lowe's Home Improvement	900 5 Mile Line Road	Webster	(585) 787-7900	110	25%	28
M-7	8.5	WSW	Towne Center at Webster	1028 Ridge Road	Webster	N/A	90	61%	55
M-7	9.1	WSW	Webster Square	950 Ridge Road	Webster	N/A	100	50%	50
Monroe County Subtotals:							8,680	-	7,803
WAYNE COUNTY									
W-1	0.0	S	R.E. Ginna Nuclear Power Plant	1503 Lake Road	Ontario	N/A	450	50%	225
W-2	4.4	SW	Harbec Inc.	369 New York 104	Ontario	(585) 265-0010	141	44%	63
W-2	4.3	SW	Optimax Systems Inc.	6367 Dean Parkway	Ontario	(585) 265-1066	170	44%	75
W-2	4.3	SW	Vette Corporation	6377 Dean Parkway	Ontario	(585) 265-0330	65	44%	29
W-2	4.3	SW	Weco Manufacturing	6364 Dean Parkway	Ontario	(585) 265-3000	78	44%	35
W-4	7.3	ESE	Dr Pepper Snapple Group	4363 New York 104	Williamson	(315) 589-2011	353	44%	156
W-4	7.5	ESE	R Brooks Associates Inc	6546 Pound Road	Williamson	(315) 589-4000	69	44%	31
Wayne County Subtotals:							1,326	-	614
TOTAL:							10,006	-	8,417

Table E-5. Recreational Attractions within the EPZ

ERPA	Distance (miles)	Dire- ction	Facility Name	Street Address	Municipality	Phone	Transients	Vehicles
MONROE COUNTY								
M-1	4.8	WSW	Irving R. Kent Park	1700 Schlegel Road	Webster	(585) 872-2911	105	41
M-1	4.9	WSW	Webster East Golf Course	440 Salt Road	Webster	(585) 265-1708	20	8
M-3	6.7	WSW	Webster Recreation Center	1350 Chiyoda Drive	Webster	(585) 872-2911	114	45
M-4	8.0	SW	Milton R. Case Park	South Avenue	Webster	(585) 872-2911	6	2
M-4	8.2	SW	Ridgecrest Park	988 Ebner Drive	Webster	(585) 872-2911	105	41
M-6	7.8	WSW	North Ponds Park	750 Holt Road	Webster	(585) 872-7103	90	35
M-6	7.3	W	Webster County Park	255 Holt Road	Webster	(585) 872-0083	272	91
M-7	8.7	WSW	Ridge Park	1000 Ridge Road	Webster	(585) 872-2911	108	42
M-8	9.9	WSW	Vosburg Road Park	Vosburg Road	Webster	(585) 872-2911	30	12
M-8	8.4	WSW	Whiting Road Park	Whiting Road	Webster	(585) 872-2911	45	18
Monroe County Subtotals:							895	335
WAYNE COUNTY								
W-2	4.7	SSE	The Brookwoods Country Club	2101 Country Club Lane	Ontario	(315) 524-7184	90	36
W-3	6.2	E	Pultneyville Marina	7539 Lake Avenue	Pultneyville	(315) 589-8922	259	101
W-4	8.3	E	Hughes Marina/Anchor Campsites	5003 Lake Road	Williamson	(315) 589-2752	8	3
W-7	7.9	S	Greystone Golf Club	1400 Atlantic Avenue	Walworth	(585) 234-4653	130	51
Wayne County Subtotals:							487	191
TOTAL:							1,382	526

Table E-6. Lodging Facilities within the EPZ

ERPA	Distance (miles)	Dire- ction	Facility Name	Street Address	Municipality	Phone	Transients	Vehicles
MONROE COUNTY								
M-6	8.8	WSW	Hampton Inn - Rochester/Webster	878 Hard Road	Webster	(585) 671-2050	180	90
M-6	8.1	WSW	Holiday Inn Express Hotel & Suites Webster	860 Holt Road	Webster	(585) 872-0900	208	104
M-7	8.9	WSW	Fairfield inn	915 Hard Road	Webster	(585) 671-1500	126	63
Monroe County Subtotals:							514	257
WAYNE COUNTY								
W-2	3.9	SSW	Cornerstone Inn	6270 Lakeside Road	Ontario	(315) 524-5024	46	23
W-2	4.4	SW	Ontario Motel	440 State Route 104	Ontario	(585) 265-1881	120	60
W-2	3.5	SSE	The Twin Rock Motel	1785 New York 104	Ontario	(315) 524-6411	40	20
Wayne County Subtotals:							206	103
TOTAL:							720	360

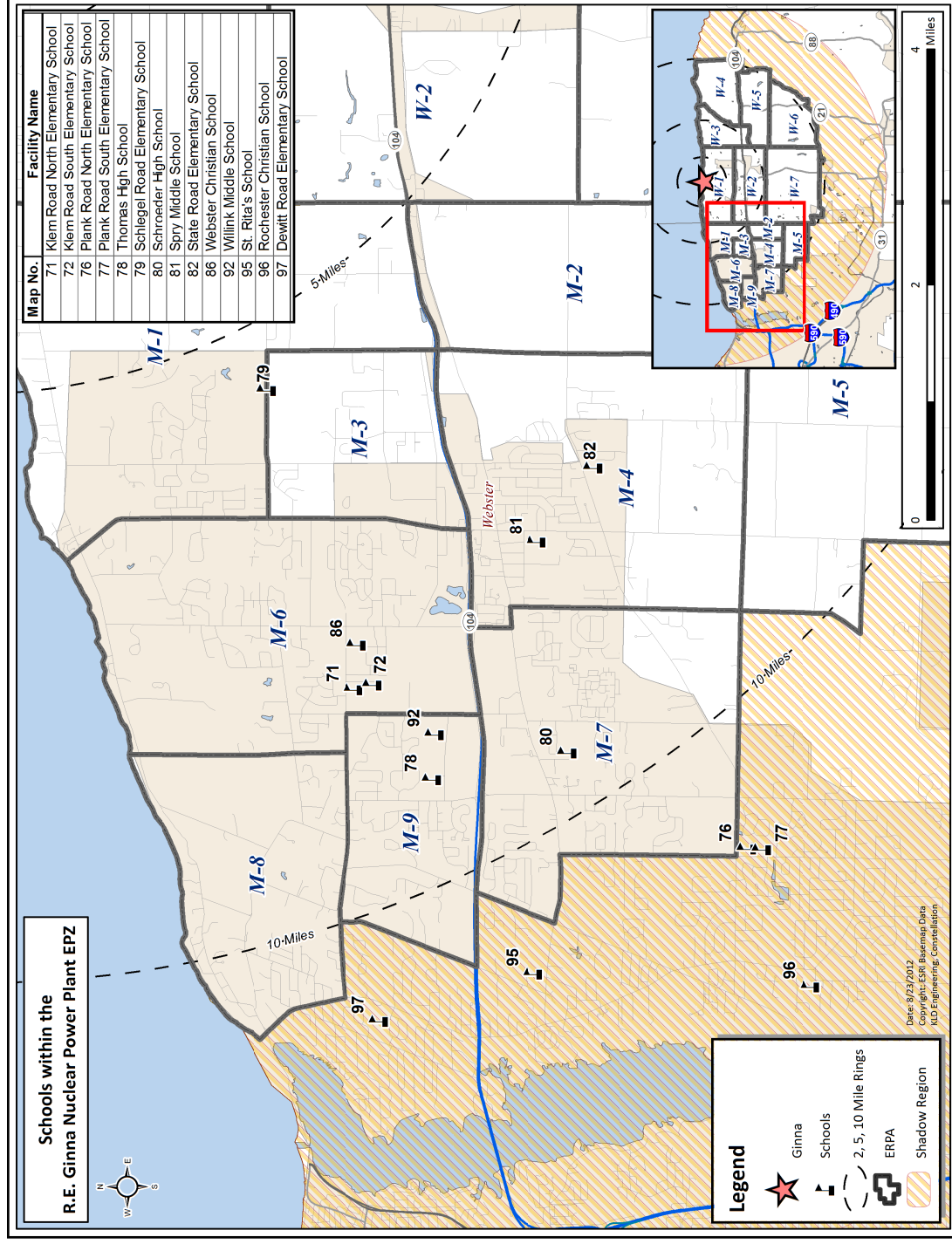


Figure E-1. Monroe County Schools within the EPZ

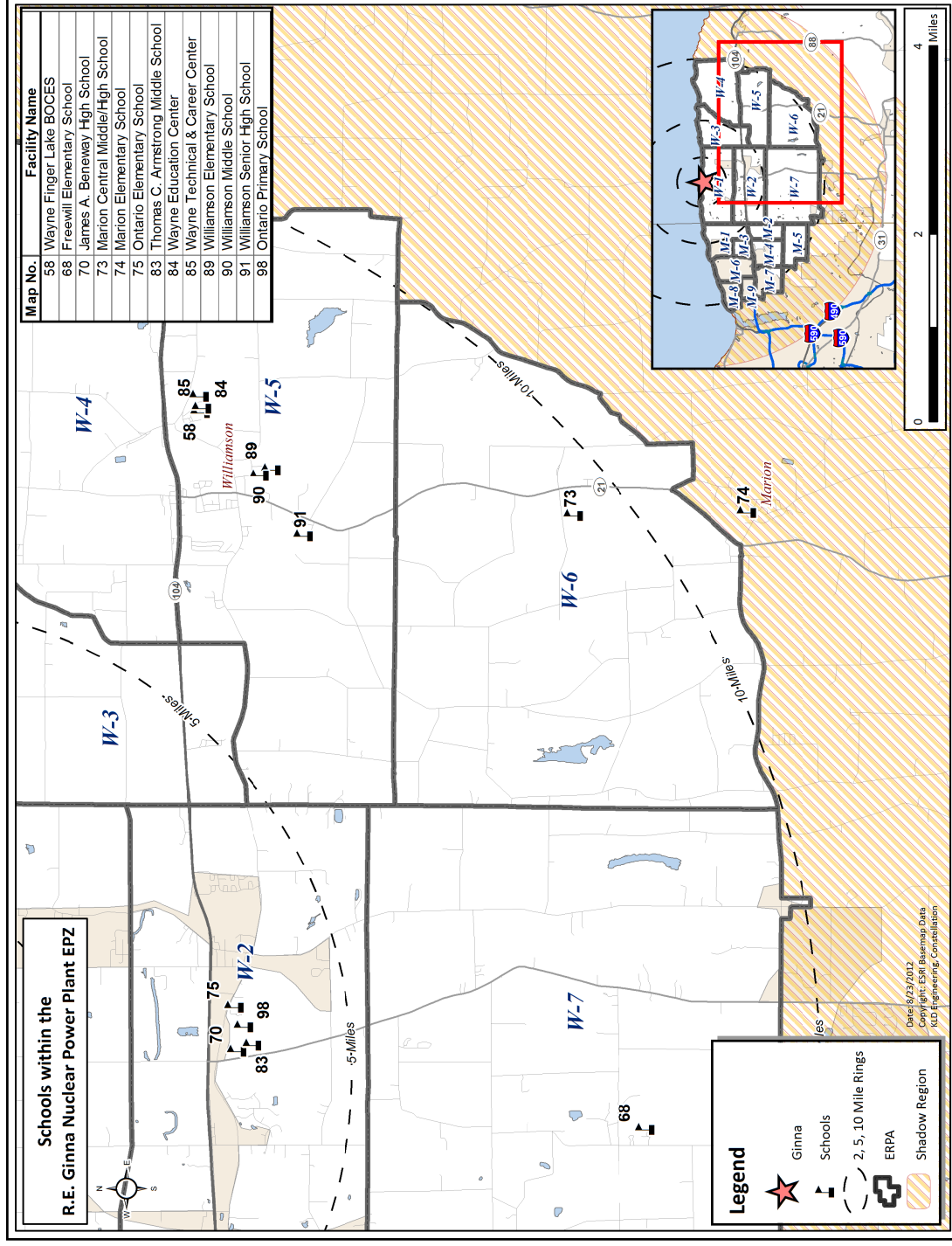


Figure E-2. Wayne County Schools within the EPZ

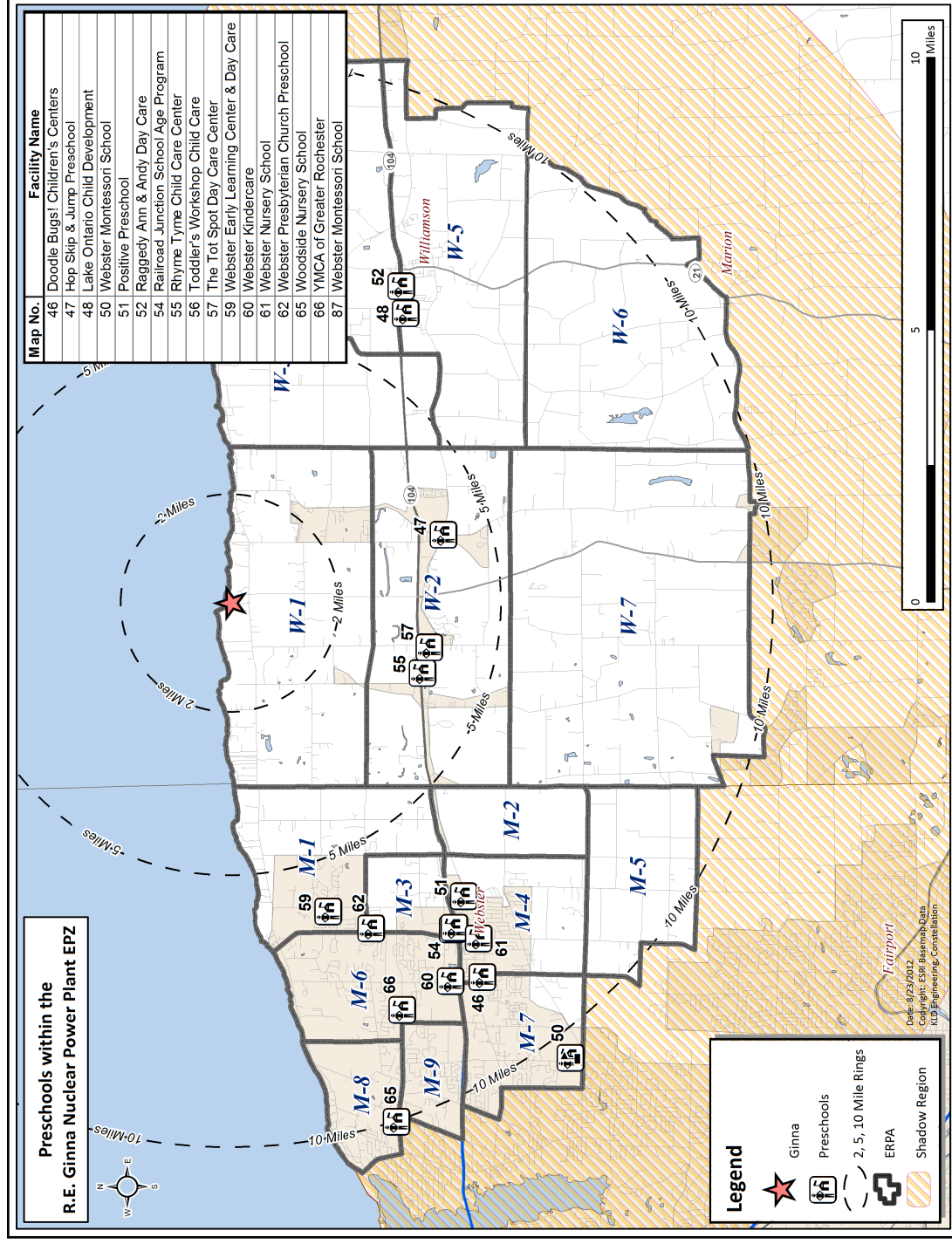


Figure E-3. Preschools within the EPZ

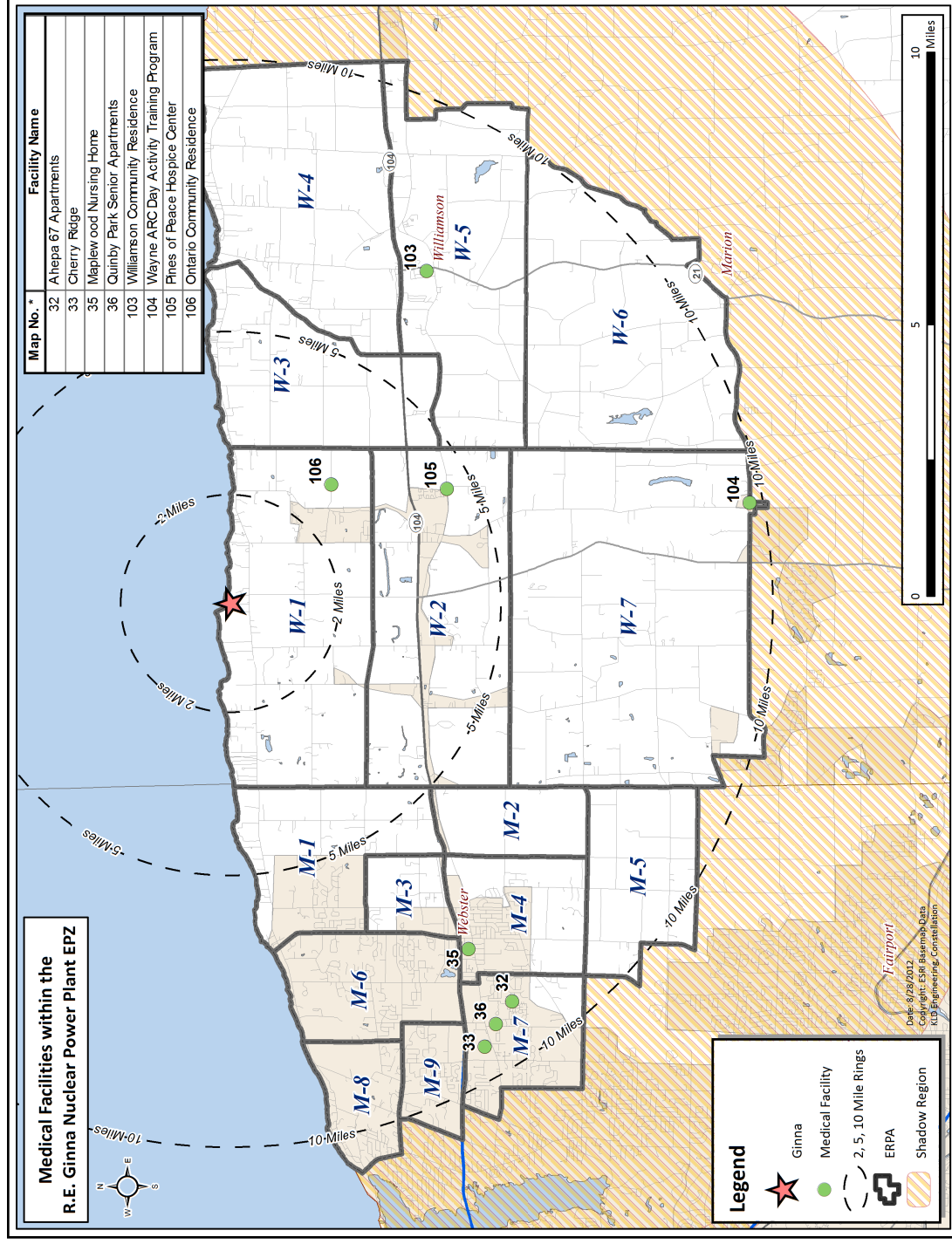


Figure E-4. Medical Facilities within the EPZ

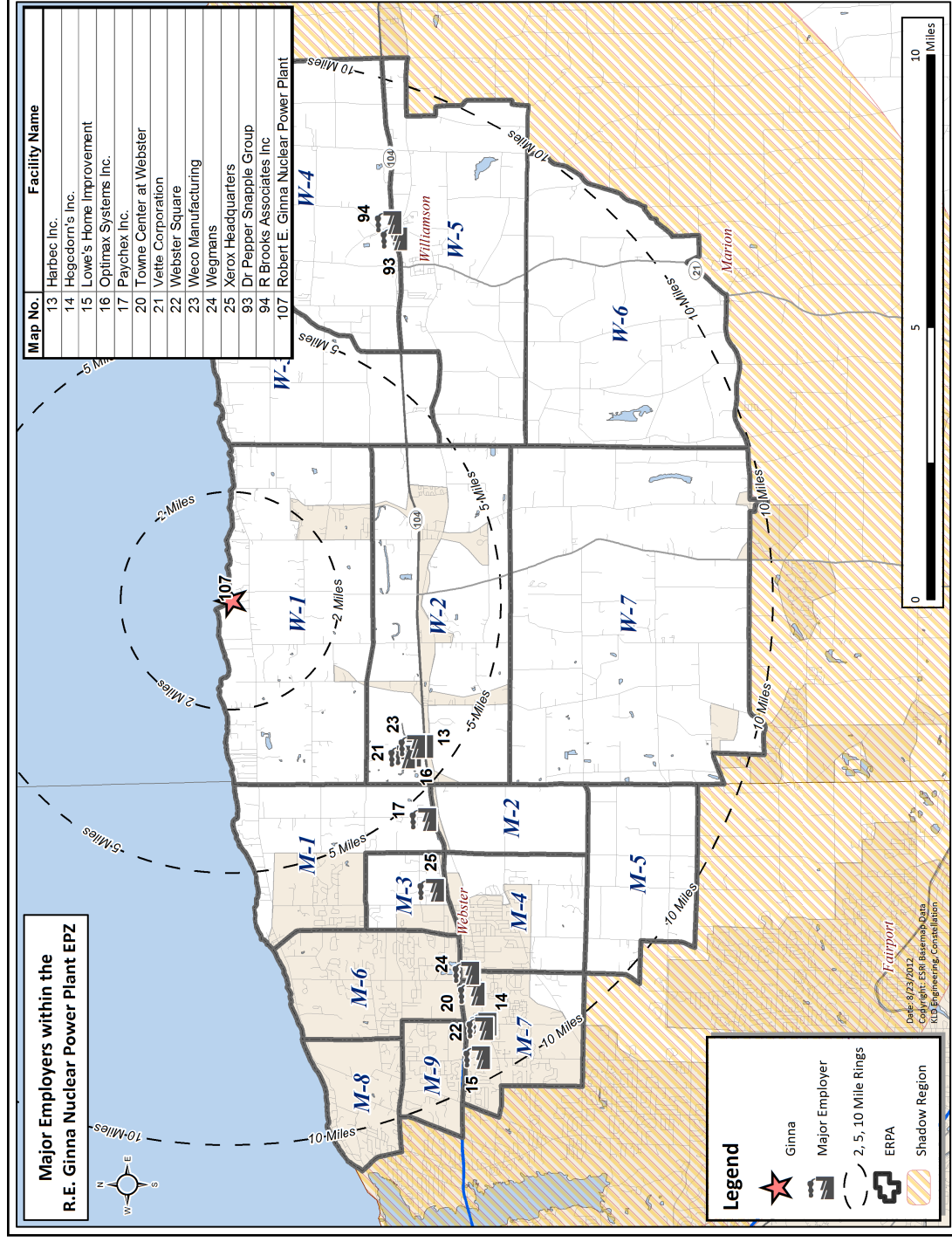


Figure E-5. Major Employers within the EPZ

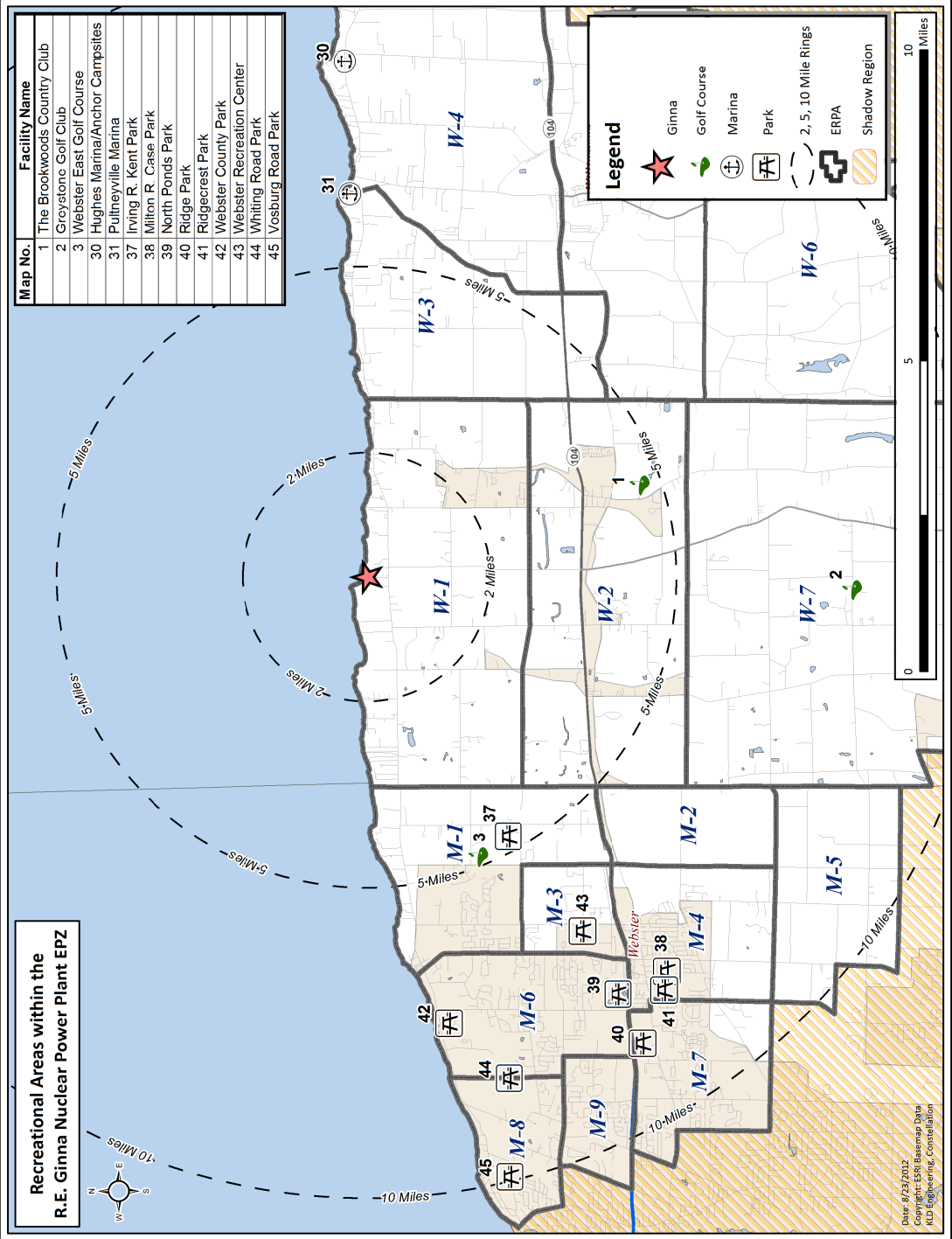


Figure E-6. Recreational Areas within the EPZ

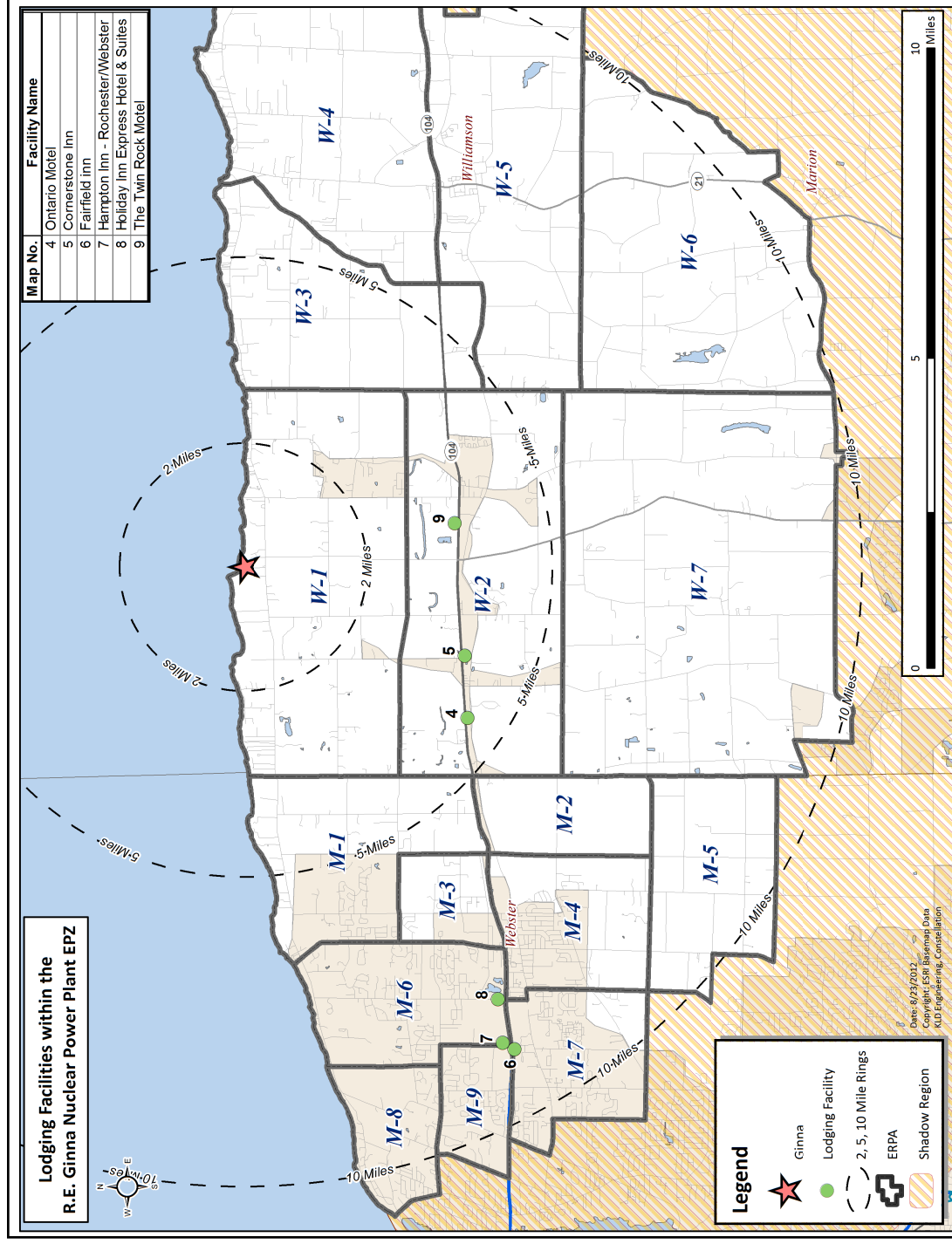


Figure E-7. Lodging within the EPZ

APPENDIX F

Telephone Survey

F. TELEPHONE SURVEY

F.1 Introduction

The development of evacuation time estimates for the Ginna EPZ 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.¹

Following the completion of the instrument, a sampling plan was developed. A sample size of approximately 500 **completed** survey forms yields results with a sampling error of $\pm 4.5\%$ 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 a close approximation of 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. Note that the average household size computed in Table F-1 was an estimate for sampling purposes and was not used in the ETE study.

The completed survey adhered to the sampling plan.

Table F-1. R.E. Ginna Nuclear Power Plant Telephone Survey Sampling Plan

Zip Code	Population within EPZ (2010)	Households	Required Sample
14450	341	112	2
14502	1,358	511	10
14505	1,962	723	14
14519	11,254	4,397	87
14526	688	253	5
14551	14	6	0
14568	2,479	946	19
14580	38,679	15,265	305
14589	7,334	2,921	58
Total	64,109	25,134	500
Average Household Size		2.55	

¹ Wayne and Monroe County Emergency Planners requested that several additional questions be added to the telephone survey, in order to provide specific information that would be useful to them but that is not required for the calculation of ETE. The results from these supplementary questions were documented in a separate memo.

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 2.56 people. The estimated household size (2.55 persons) used to determine the survey sample (Table F-1) was drawn from Census data. The close agreement between the average household size obtained from the survey and from the Census is an indication of the reliability of the survey.

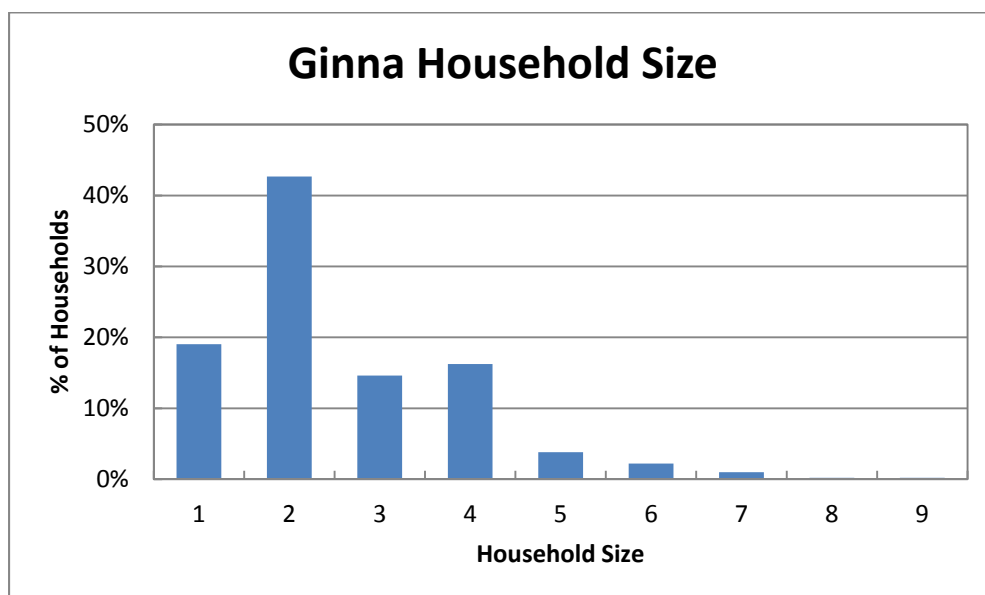


Figure F-1. Household Size in the EPZ

Automobile Ownership

The average number of automobiles available per household in the EPZ is 2.00. It should be noted that approximately 1.4 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.

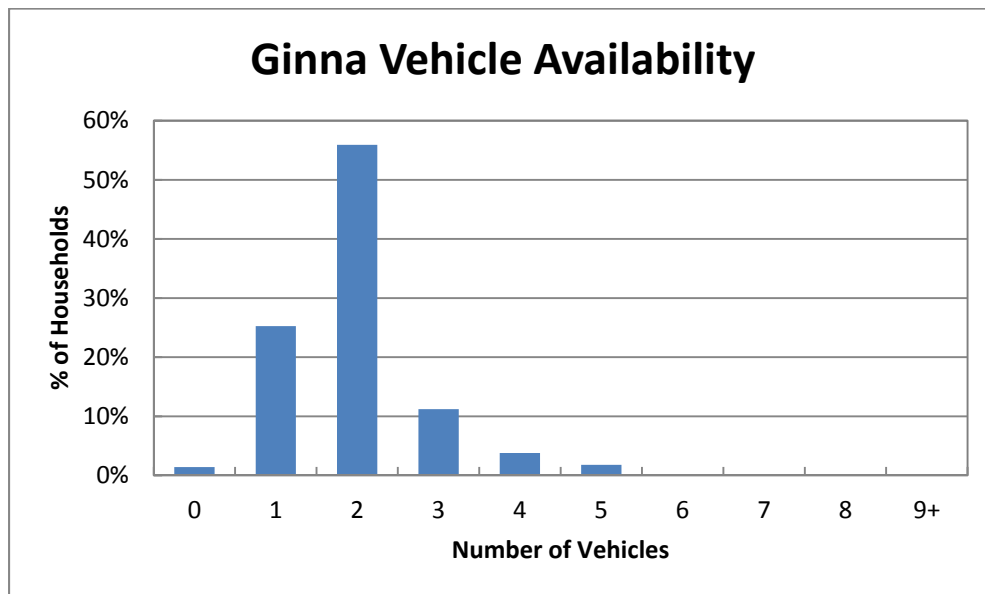


Figure F-2. Household Vehicle Availability

Distribution of Vehicles by HH Size 1-5 Person Households

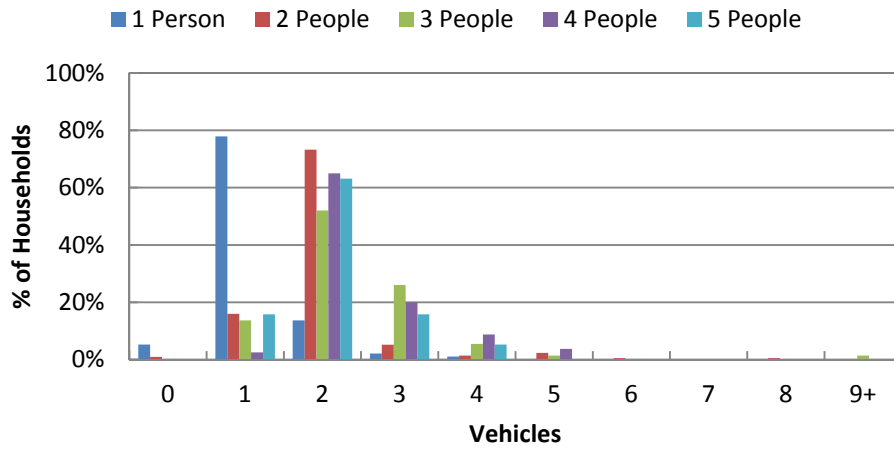


Figure F-3. Vehicle Availability - 1 to 5 Person Households

Distribution of Vehicles by HH Size 6-9+ Person Households

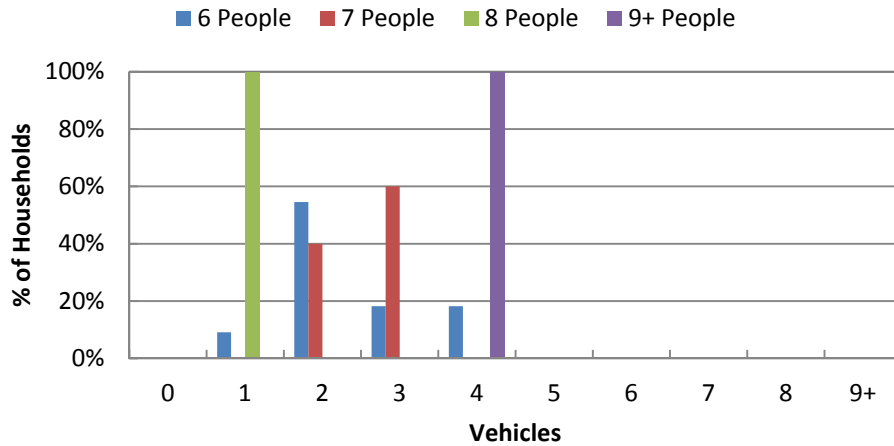


Figure F-4. Vehicle Availability - 6 to 9+ Person Households

Ridesharing

75% of the households surveyed (who do not own a vehicle) responded that they would share a ride with a neighbor, relative, or friend if a car was not available to them when advised to evacuate in the event of an emergency. Note, however, that only those households with no access to a vehicle – 8 total out of the sample size of 500 – answered this question. Thus, the results are not statistically significant. As such, the NRC recommendation of 50% ridesharing is used throughout this study. Figure F-5 presents this response.

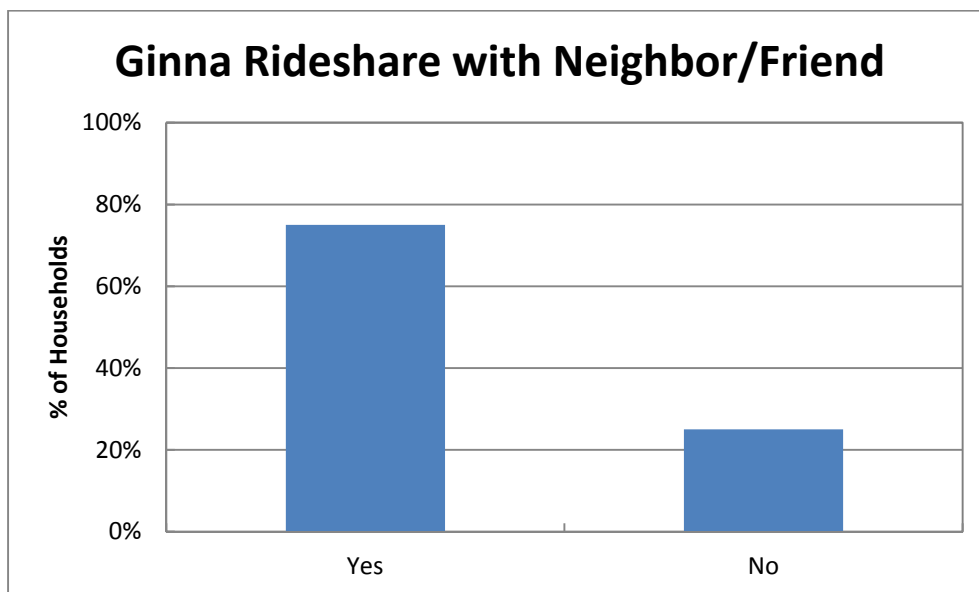


Figure F-5. Household Ridesharing Preference

Commuters

Figure F-6 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 1.14 commuters in each household in the EPZ, and 65% of households have at least one commuter.

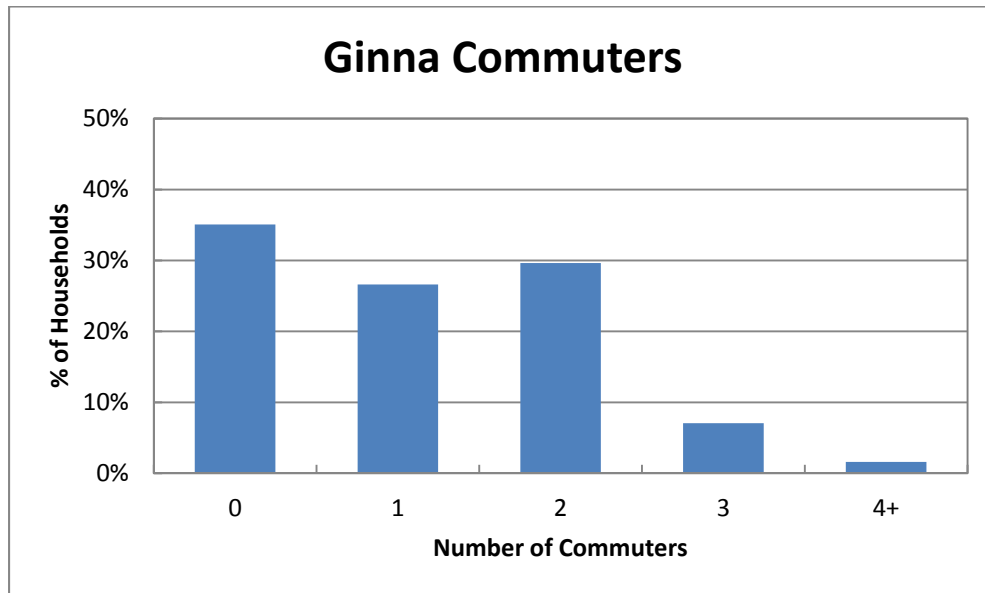


Figure F-6. Commuters in Households in the EPZ

Commuter Travel Modes

Figure F-7 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 1.08 employees per vehicle, assuming 2 people per vehicle – on average – for carpools.

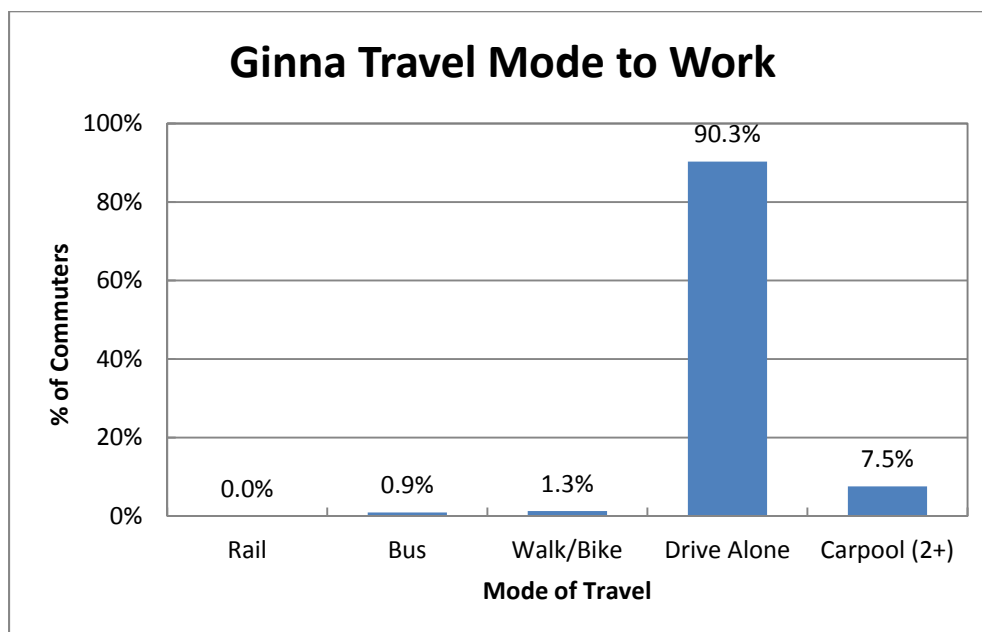


Figure F-7. Modes of Travel in the EPZ

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-8. On average, evacuating households would use 1.33 vehicles.

"Would your family await the return of other family members prior to evacuating the area?" Of the survey participants who responded, 34 percent said they would await the return of other family members before evacuating and 66 percent indicated that they would not await the return of other family members.

"What would you do with your pet(s) if you had to evacuate?" Based on the responses to the survey, 44 percent of households do not have a family pet. Of the households with pets, 45 percent would take their pets to a public assembly center or shelter, 43 percent would take their pets somewhere else and 11 percent would not take their pets, as shown in Figure F-9.

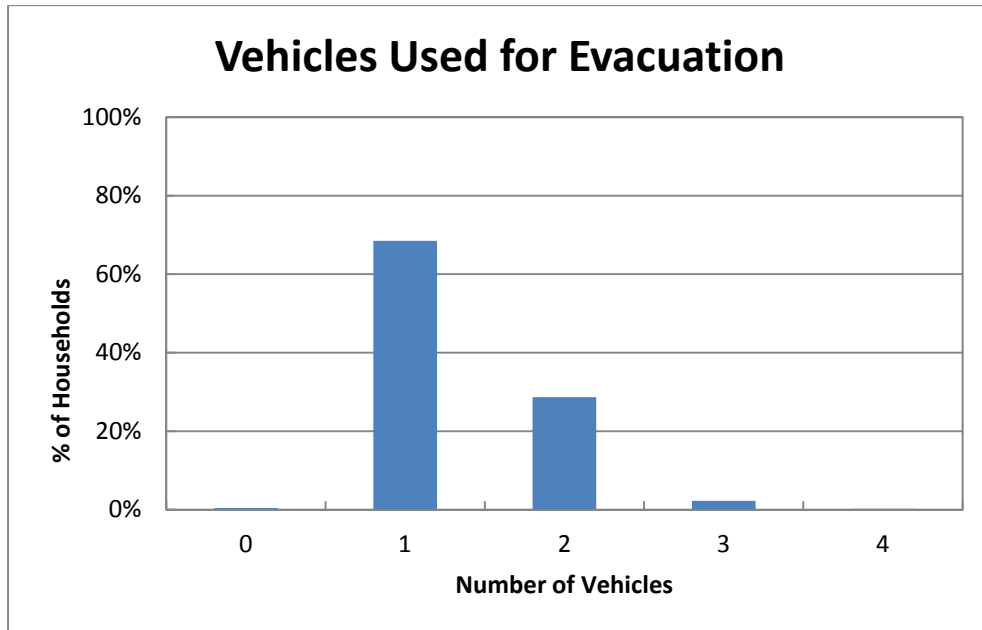


Figure F-8. Number of Vehicles Used for Evacuation

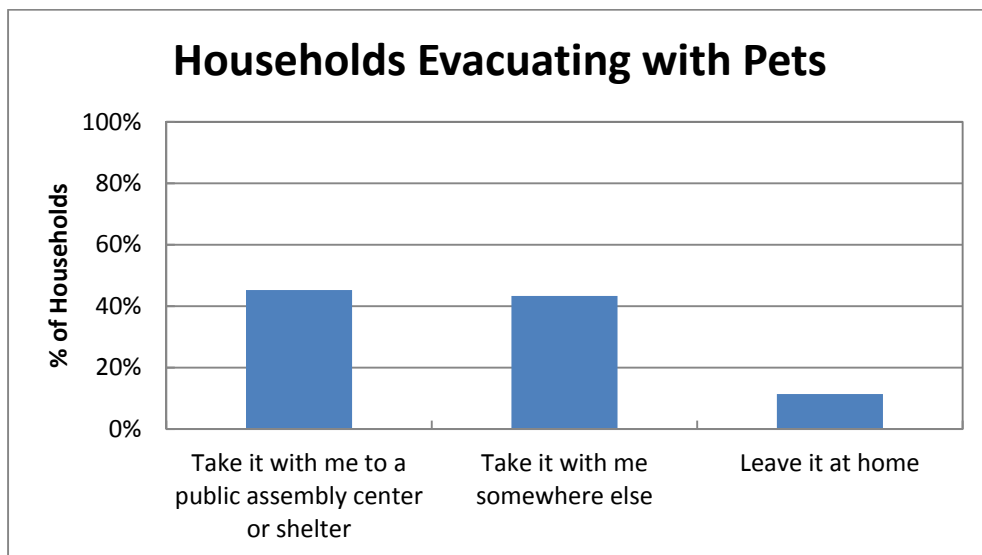


Figure F-9. Households Evacuating with Pets

“Emergency officials advise you to take shelter at home in an emergency. Would you?” This question is designed to elicit information regarding compliance with instructions to shelter in place. The results indicate that 75 percent of households who are advised to shelter in place would do so; the remaining 25 percent would choose to evacuate the area. 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. Thus, the data obtained above is in good agreement with the federal guidance.

“Emergency officials advise you to take shelter at home now in an emergency and possibly evacuate later while people in other areas are advised to evacuate now. Would you?” This question is designed to elicit information specifically related to the possibility of a staged evacuation. That is, asking a population to shelter in place now and then to evacuate after a specified period of time. Results indicate that 68 percent of households would follow instructions and delay the start of evacuation until so advised, while the balance of 32 percent would choose to begin evacuating immediately.

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-10 presents the cumulative distribution; in all cases, the activity is completed by about 75 minutes. Ninety percent can leave within 30 minutes.

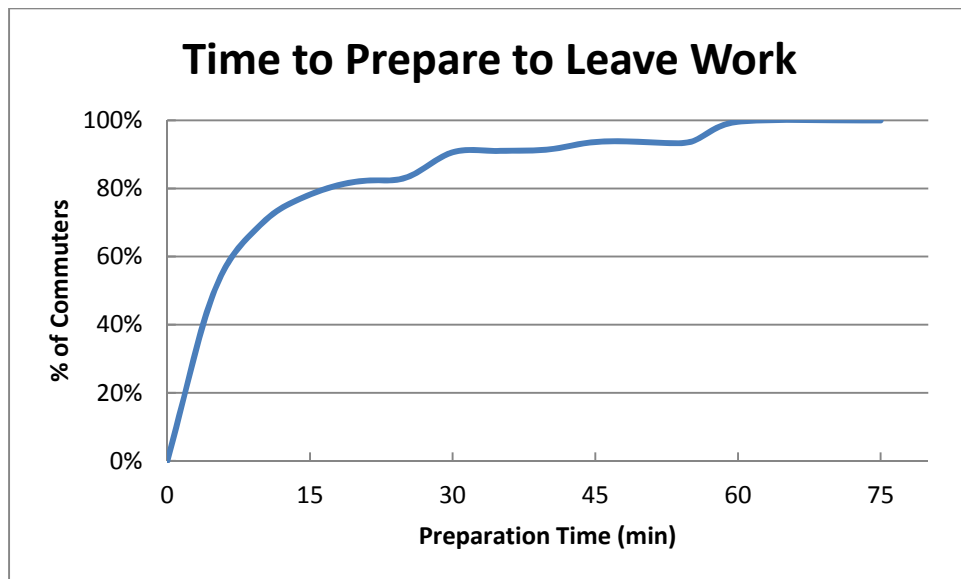


Figure F-10. Time Required to Prepare to Leave Work/School

“How long would it take the commuter to travel home?” Figure F-11 presents the work to home travel time for the EPZ. About 90 percent of commuters can arrive home within about 35 minutes of leaving work; all within 60 minutes.

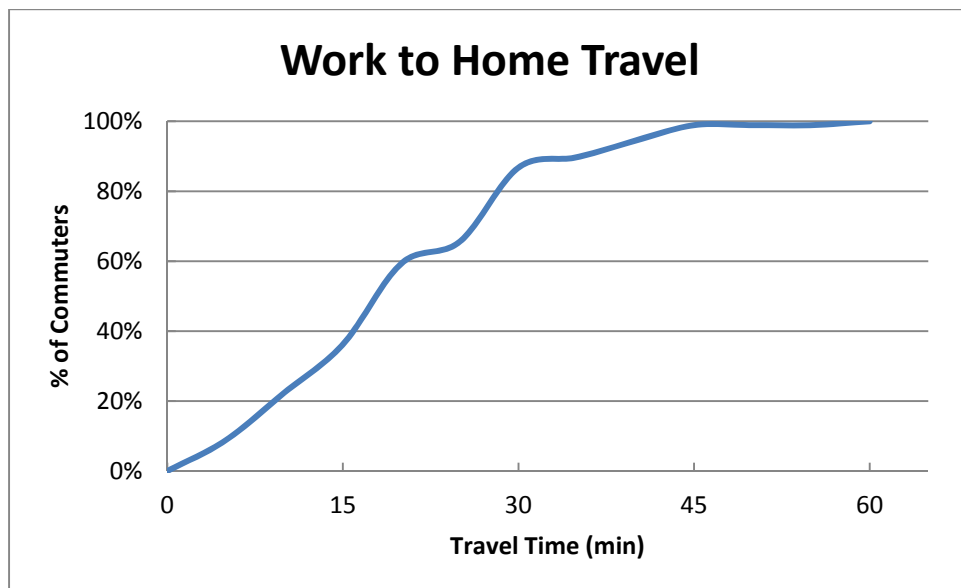


Figure F-11. Work to Home Travel Time

“How long would it take the family to pack clothing, secure the house, and load the car?”

Figure F-12 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-12 has a long “tail.” About 87 percent of households can be ready to leave home within 60 minutes; the remaining households require up to an additional hour and a half.

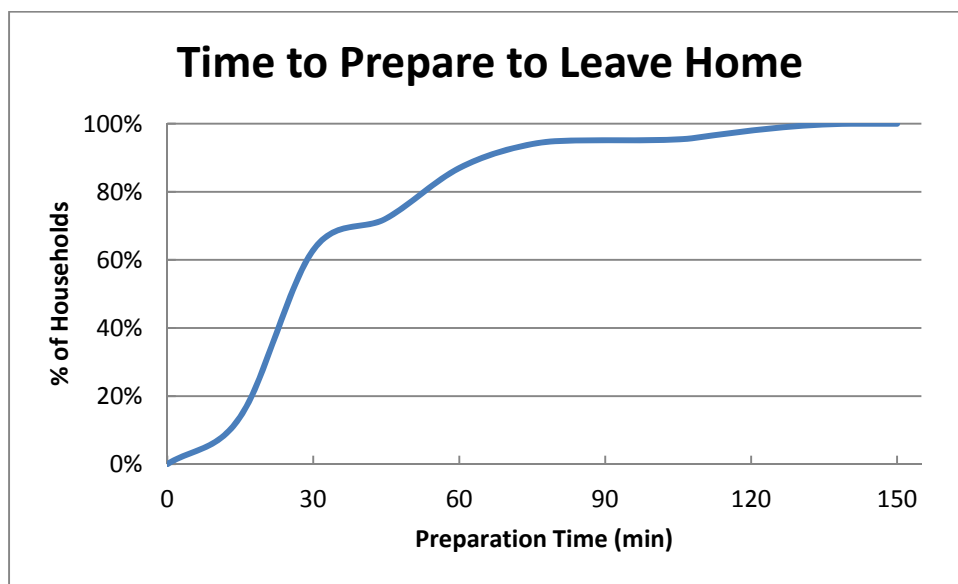


Figure F-12. Time to Prepare Home for Evacuation

"How long would it take you to clear 6 to 8 inches of snow from your driveway?" During adverse, snowy weather conditions, an additional activity must be performed before residents can depart on the evacuation trip. Although snow scenarios assume that the roads and highways have been plowed and are passable (albeit at lower speeds and capacities), it may be necessary to clear a private driveway prior to leaving the home so that the vehicle can access the street. Figure F-13 presents the time distribution for removing 6 to 8 inches of snow from a driveway. The time distribution for clearing the driveway has a long tail; about 88 percent of driveways are passable within 30 minutes. The last driveway is cleared 135 minutes after the start of this activity. Note that those respondents (56%) who answered that they would not take time to clear their driveway were assumed to be ready immediately at the start of this activity. Essentially they would drive through the snow on the driveway to access the roadway and begin their evacuation trip.

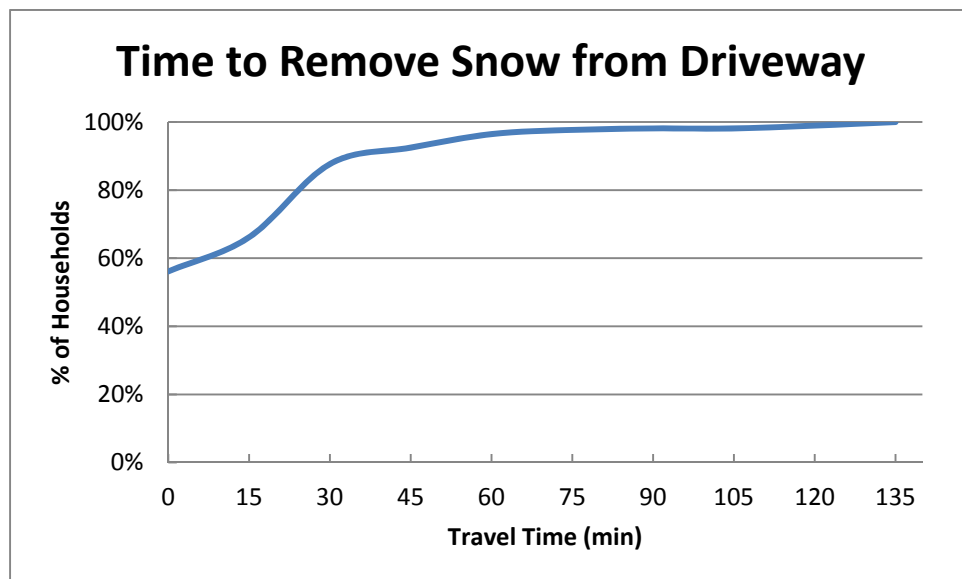


Figure F-13. Time to Clear Driveway of 6"-8" of Snow

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 on a survey for your county emergency management agency 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, some of which may require evacuation. Your responses will greatly contribute to local emergency preparedness. I will not ask for your name or any personal information, and the survey will take less than 10 minutes to complete.

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	<u>COL. 9-11</u>	
1B.	Record exchange number. To Be Determined	<u>COL. 12-14</u>	
2A.	What is your home zip code? (DO NOT READ ANSWERS)	<u>COL. 15</u>	
	14450	1	
	14502	2	
	14505	3	
	14519	4	
	14526	5	
	14568	6	
	14580	7	
	14589	8	
	All Other Zip Codes or Don't Know/Refused	Out of Study Area – Terminate Call	
3A.	In total, how many running cars, or other vehicles are usually available to the household? (DO NOT READ ANSWERS)	<u>COL. 20</u>	<u>SKIP TO</u>
		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?	<u>COL. 21</u>		
	1	YES	
	2	NO	
	X	DON'T KNOW/REFUSED	
4. How many people usually live in this household? (DO NOT READ ANSWERS)	<u>COL. 22</u>	<u>COL. 23</u>	
	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 people in the household commute to a job, or to college on a daily basis?	<u>COL. 24</u>	<u>SKIP TO</u>	
	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
	<u>COL. 25</u>	<u>COL. 26</u>	<u>COL. 27</u>	<u>COL. 28</u>
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

<u>COL. 29</u>	<u>COL. 30</u>	<u>COL. 31</u>	<u>COL. 32</u>
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

<u>COMMUTER #3</u>		<u>COMMUTER #4</u>	
<u>COL. 33</u>	<u>COL. 34</u>	<u>COL. 35</u>	<u>COL. 36</u>
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)

<u>COMMUTER #1</u>		<u>COMMUTER #2</u>	
<u>COL. 37</u>	<u>COL. 38</u>	<u>COL. 39</u>	<u>COL. 40</u>
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

<u>COMMUTER #3</u>		<u>COMMUTER #4</u>	
<u>COL. 41</u>	<u>COL. 42</u>	<u>COL. 43</u>	<u>COL. 44</u>
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

-
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)

<u>COL. 45</u>	<u>COL. 46</u>
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	9 5 HOURS TO 5 HOURS 30 MINUTES
0 2 HOURS 16 MINUTES TO 2 HOURS 30 MINUTES	0 5 HOURS 31 MINUTES TO 6 HOURS
X 2 HOURS 31 MINUTES TO 2 HOURS 45 MINUTES	X OVER 6 HOURS (SPECIFY _____)
Y 2 HOURS 46 MINUTES TO 3 HOURS	
Z WILL NOT EVACUATE	<u>COL. 47</u>
	1 DON'T KNOW/REFUSED

-
- 10 If there is 6-8" of snow on your driveway or curb, would you need to shovel out to evacuate? If yes, how much time, on average, would it take you to clear the 6-8" of snow to move the car from the driveway or curb to begin the evacuation trip? Assume the roads are passable. (DO NOT READ RESPONSES)

COL. 48

- 1 LESS THAN 15 MINUTES
2 15-30 MINUTES
3 31-45 MINUTES
4 46 MINUTES – 1 HOUR
5 1 HOUR TO 1 HOUR 15 MINUTES
6 1 HOUR 16 MINUTES TO 1 HOUR 30 MINUTES
7 1 HOUR 31 MINUTES TO 1 HOUR 45 MINUTES
8 1 HOUR 46 MINUTES TO 2 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
Z NO, WILL NOT SHOVEL OUT

COL. 49

- 1 OVER 3 HOURS (SPECIFY _____)
2 DON'T KNOW/REFUSED

-
11. 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

-
12. 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
-

13A.	Emergency officials advise you to shelter-in-place in an emergency because you are not in the area of risk. Would you: (READ ANSWERS) A. SHELTER-IN-PLACE; or B. EVACUATE	<u>COL. 52</u> 1 A 2 B X DON'T KNOW/REFUSED
13B.	Emergency officials advise you to shelter-in-place now in an emergency and possibly evacuate later while people in other areas are advised to evacuate now. Would you: (READ ANSWERS) A. SHELTER-IN-PLACE; or B. EVACUATE	<u>COL. 53</u> 1 A 2 B X DON'T KNOW/REFUSED
13C.	Emergency officials advise you to evacuate in an emergency. Where would you evacuate to?: (DO NOT READ ANSWERS)	
	<u>COL 54</u>	
1	A RELATIVE'S OR FRIEND'S HOME	(Go to Question 14)
2	A RECEPTION CENTER	(Go to Question 13D)
3	A HOTEL, MOTEL OR CAMPGROUND	(Go to Question 14)
4	A SECOND/SEASONAL HOME	(Go to Question 14)
5	OTHER (specify)	(Go to Question 14)
6	WOULD NOT EVACUATE	(Go to Question 14)
X	DON'T KNOW REFUSED	(Go to Question 14)
13D.	After the Reception Center, do you plan on going to a Red Cross Shelter?	<u>COL. 55</u> 1 YES 2 NO X DON'T KNOW/REFUSED
14A.	What type of pets do you have, and how many of each type? (DO NOT READ ANSWERS)	
	<u>COL 56-60</u>	<u>COL 61:</u> (For species listed in COL 56 list number of pets)
<u>1</u>	DOG	<u>COL 62:</u> (For species listed in COL 57 list number of pets)
<u>2</u>	CAT	<u>COL 63:</u> (For species listed in COL 58 list number of pets)
<u>3</u>	OTHER SMALL MAMMAL	<u>COL 64:</u> (For species listed in COL 59 list number of pets)
<u>4</u>	BIRD	<u>COL 65:</u> (For species listed in COL 60 list number of pets)
<u>5</u>	REPTILE	
<u>6</u>	HORSE	
<u>7</u>	FISH	
<u>8</u>	OTHER (Specify)	
<u>9</u>	NO PETS (Go To End of Survey)	
X	DON'T KNOW/REFUSED	

14B. What would you do with your pet(s) if you had to evacuate? (READ ANSWERS)

COL. 66

- 1 TAKE IT WITH ME TO A SHELTER
2 TAKE IT WITH ME SOMEWHERE ELSE
3 LEAVE IT AT HOME
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
Wayne County	(315) 946-5663
Monroe County	(585) 753-3810

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 were provided by each county.

These plans were reviewed and the TCPs were modeled accordingly.

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 Traffic Control Point, the control type is indicated as “TCP” in Table K-2.

Figure G-1 maps the TCPs identified in the county emergency plans. These TCPs are concentrated along ERPA boundaries and major intersections within the EPZ which were identified as the congested areas/roadways in Section 7.3. These TCPs would be manned during evacuation by traffic guides who would direct evacuees

As discussed in Section 7.3, the animation of evacuation traffic conditions indicates several critical intersections which could be bottlenecks during evacuation. These critical intersections were cross-checked with the EPZ county emergency plans. All of the intersections, except two – Shoecraft Road and State Road, and Shoecraft Road and Plank Road in Monroe County – were identified as TCPs in the county plan. As these are two of the last congested intersections to clear, the county may want to consider these intersection as TCPs.

Figure G-2 and Figure G-3 show the schematics for these TCPs, in case Monroe County should decide to add them to the traffic control plans. Both intersections are all-way stops, a type of control that is not designed for high traffic volume. The use of a control officer facilitates the movement of traffic out of the EPZ and increases the vehicle flow rate on the feeder roadways.

G.2 Access Control Points

It is assumed that ACPs will be established within 2 hours of the advisory to evacuate to discourage through travelers from using major through routes which traverse the EPZ. As discussed in Section 3.7, external traffic was only considered on three routes which traverse the study area – SR 104, I-590 and I-490 – in this analysis. The generation of these external trips ceased at 2 hours after the advisory to evacuate in the simulation.

According to the county’s emergency plans, the access control points will be manned after the advisory to evacuate has been given. It is recommended that ACPs along the three aforementioned routes be the top priority in assigning manpower and equipment as they are

the major routes entering the EPZ, which will typically carry the highest volume of through traffic.

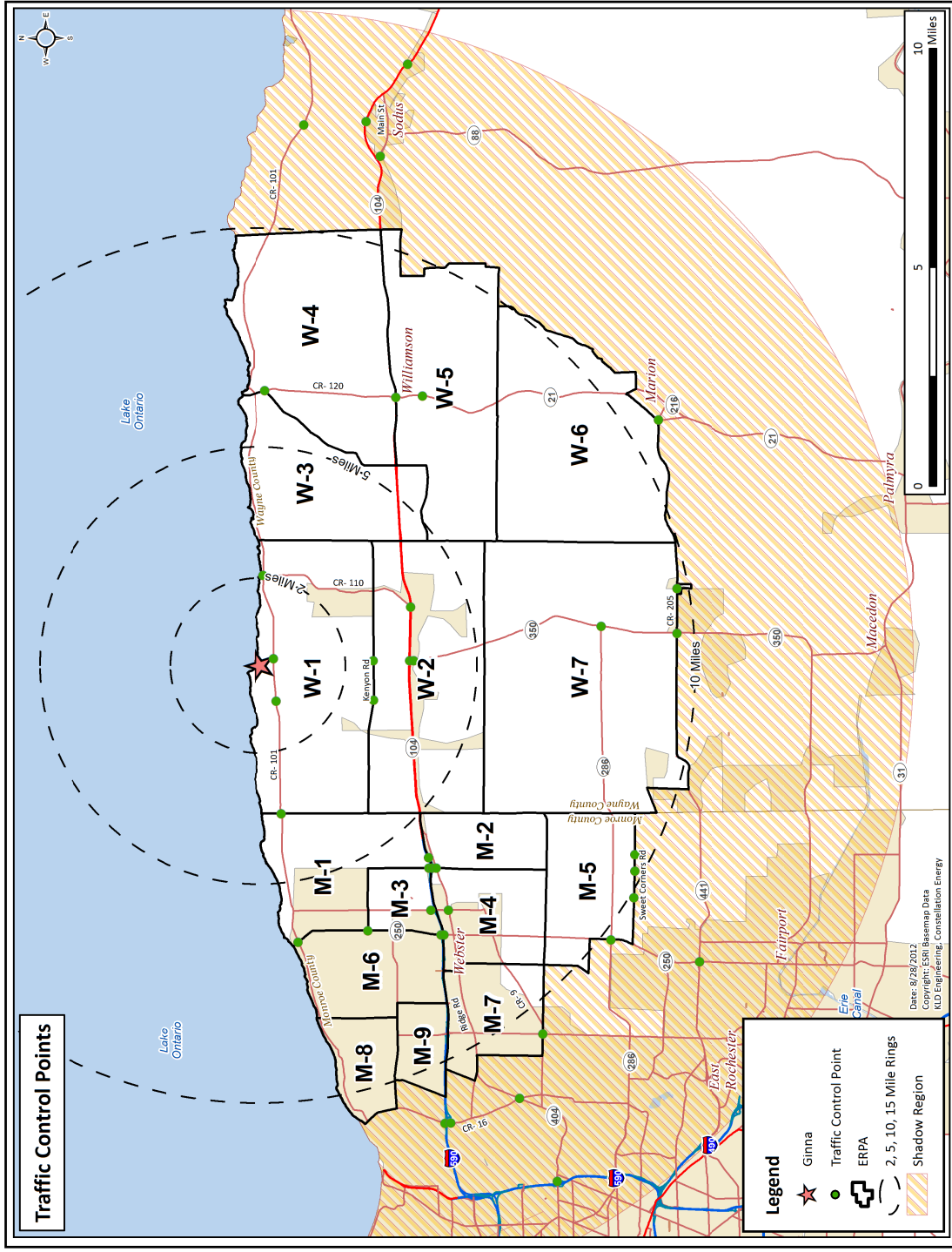
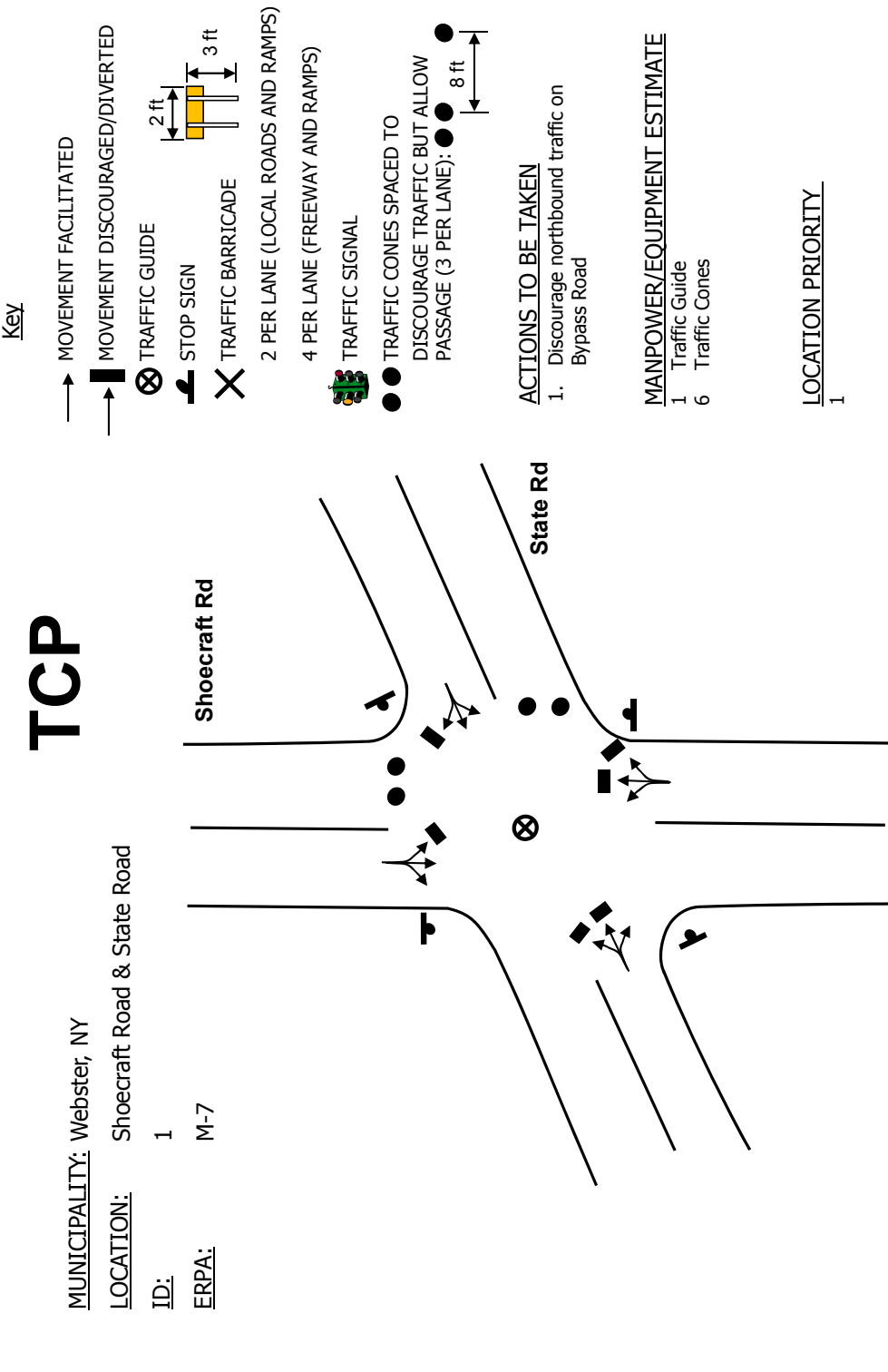


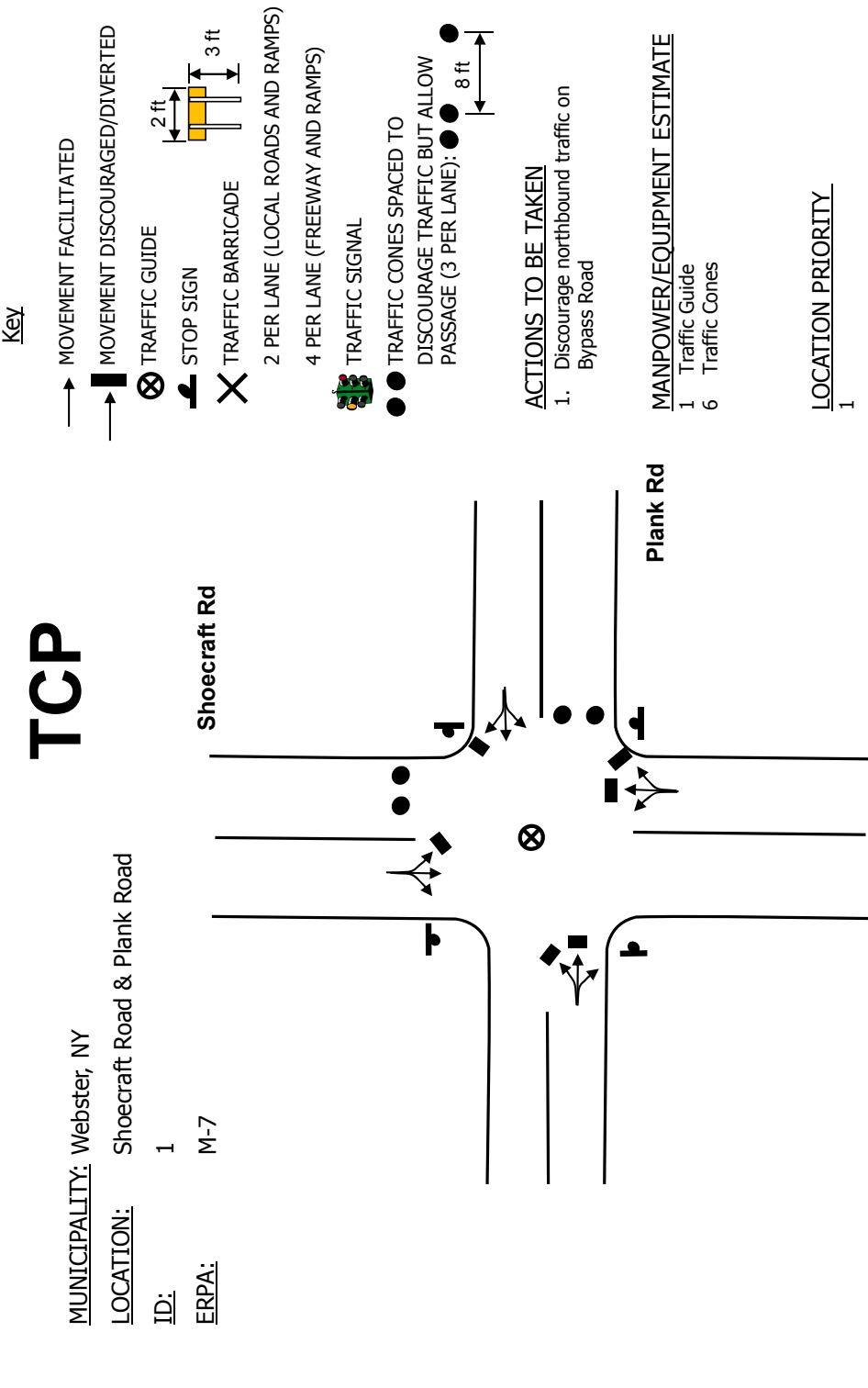
Figure G-1. Traffic Control Points for the R.E. Ginna Nuclear Power Plant



****Traffic Guide should position himself safely**

Figure G-2. Intersection of Shoecraft Road and State Road

- Key
- MOVEMENT FACILITATED
 - MOVEMENT DISCOURAGED/DIVERTED
 - ⊗ TRAFFIC GUIDE
 - ⏹ STOP SIGN
 - ⊗ TRAFFIC BARRICADE
 - 2 PER LANE (LOCAL ROADS AND RAMPS)
 - 4 PER LANE (FREEWAY AND RAMPS)
 - TRAFFIC SIGNAL
 - TRAFFIC CONES SPACED TO DISCOURAGE TRAFFIC BUT ALLOW PASSAGE (3 PER LANE): ● ● ● 8 ft
- ACTIONS TO BE TAKEN
1. Discourage northbound traffic on Bypass Road
- MANPOWER/EQUIPMENT ESTIMATE
- | | |
|---|---------------|
| 1 | Traffic Guide |
| 6 | Traffic Cones |
- LOCATION PRIORITY
- | |
|---|
| 1 |
|---|



****Traffic Guide should position himself safely**

Figure G-3. Intersection of Shoecraft Road and Plank Road

APPENDIX H
Evacuation Regions

H EVACUATION REGIONS

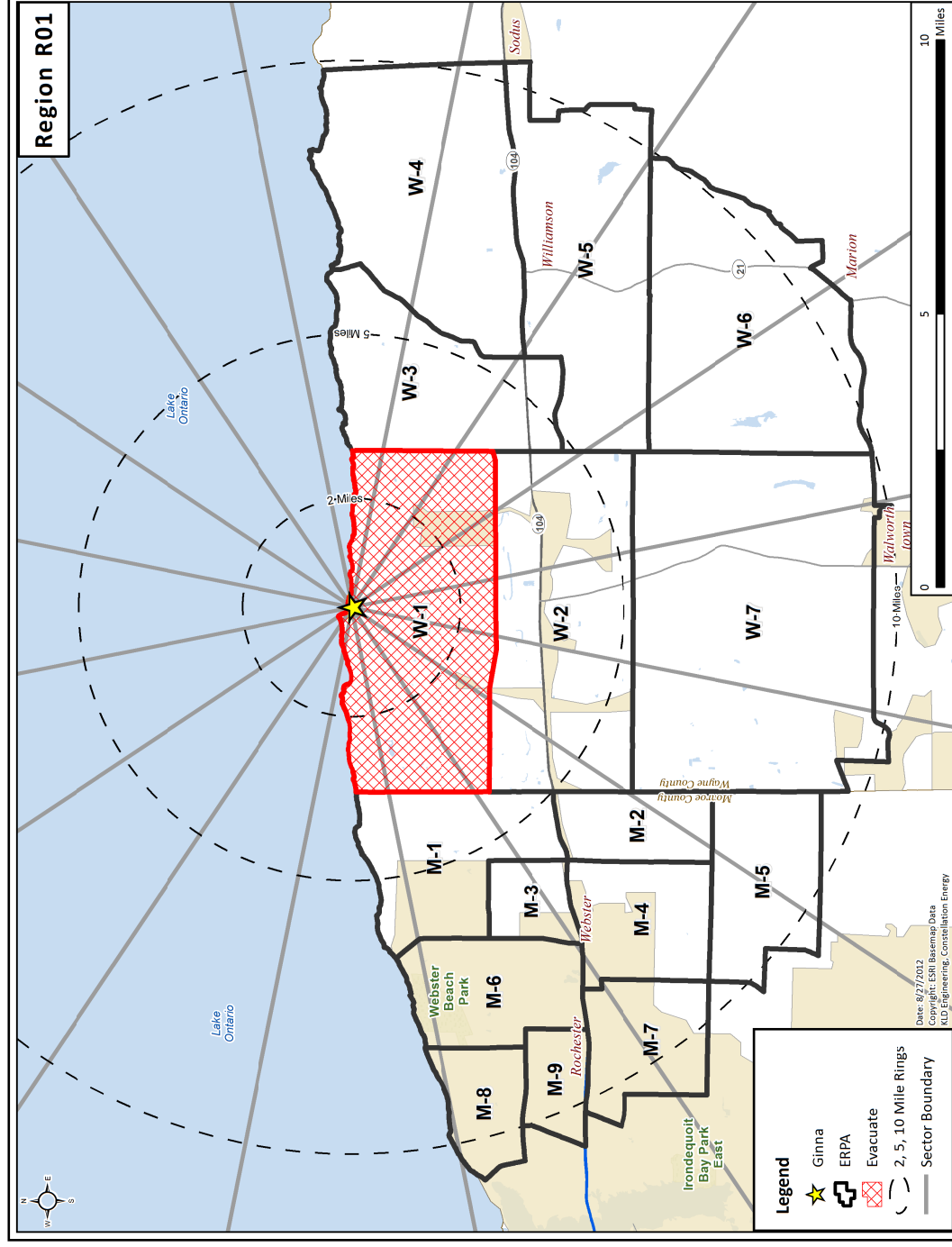
This appendix presents the evacuation percentages for each Evacuation Region (Table H-1) and maps of all Evacuation Regions. The percentages presented in Table H-1 are based on the methodology discussed in assumption 5 of Section 2.2 and shown in Figure 2-1.

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 ERPA Population Evacuating for Each Region

Basic Regions																		
Region	Description	Degrees	ERPA															
			W-1	W-2	W-3	W-4	W-5	W-6	W-7	M-1	M-2	M-3	M-4	M-5	M-6	M-7	M-8	M-9
R01	2-Mile Region		100%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
R02	5-Mile Region		100%	100%	100%	20%	20%	20%	20%	20%	100%	20%	20%	20%	20%	20%	20%	20%
R03	Full EPZ		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Evacuate 2-Mile Region and Downwind to 5 Miles																		
Region	Wind Direction From:	Degrees	ERPA															
			W-1	W-2	W-3	W-4	W-5	W-6	W-7	M-1	M-2	M-3	M-4	M-5	M-6	M-7	M-8	M-9
R04	N	349 to 11	100%	100%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
R05	NNE, NE, ENE	12 to 78	100%	100%	20%	20%	20%	20%	20%	100%	20%	20%	20%	20%	20%	20%	20%	20%
R06	E, ESE	79 to 124	100%	20%	20%	20%	20%	20%	20%	100%	20%	20%	20%	20%	20%	20%	20%	20%
	SE, SSE, S, SSW, SW	125 to 236	See Region R01															
R07	WSW, W	237 to 281	100%	20%	100%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
R08	WNW, NW, NNW	282 to 348	100%	100%	100%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Evacuate 5-Mile Region and Downwind to the EPZ Boundary																		
Region	Wind Direction From:	Degrees	ERPA															
			W-1	W-2	W-3	W-4	W-5	W-6	W-7	M-1	M-2	M-3	M-4	M-5	M-6	M-7	M-8	M-9
R09	N	349 to 11	100%	100%	100%	20%	100%	100%	100%	100%	100%	20%	20%	100%	20%	20%	20%	20%
R10	NNE	12 to 33	100%	100%	100%	20%	20%	100%	20%	100%	100%	100%	100%	100%	20%	100%	20%	20%
R11	NE	34 to 56	100%	100%	100%	20%	20%	100%	20%	100%	100%	100%	100%	100%	100%	100%	100%	100%
R12	ENE	57 to 78	100%	100%	100%	20%	20%	20%	20%	100%	100%	100%	100%	100%	100%	100%	100%	100%
R13	E	79 to 101	100%	100%	100%	20%	20%	20%	20%	100%	20%	100%	100%	20%	100%	100%	100%	100%
R14	ESE	102 to 124	100%	100%	100%	20%	20%	20%	20%	100%	20%	20%	20%	20%	100%	20%	100%	20%
	SE, SSE, S, SSW, SW	125 to 236	See Region R02															
R15	WSW	237 to 258	100%	100%	100%	100%	20%	20%	20%	100%	20%	20%	20%	20%	20%	20%	20%	20%
R16	W	259 to 281	100%	100%	100%	100%	20%	20%	100%	20%	20%	20%	20%	20%	20%	20%	20%	20%
R17	WNW	282 to 303	100%	100%	100%	100%	100%	100%	100%	100%	20%	20%	20%	20%	20%	20%	20%	20%
R18	NW	304 to 326	100%	100%	100%	100%	100%	100%	100%	100%	20%	20%	20%	20%	20%	20%	20%	20%
R19	NNW	327 to 348	100%	100%	100%	20%	100%	100%	100%	100%	20%	20%	20%	20%	20%	20%	20%	20%

Staged Evacuation - 2-Mile Region Evacuates, then Evacuate Downwind to 5 Miles																		
Region	Wind Direction From:	Degrees	ERPA															
			W-1	W-2	W-3	W-4	W-5	W-6	W-7	M-1	M-2	M-3	M-4	M-5	M-6	M-7	M-8	M-9
R20	No Wind		100%	100%	100%	20%	20%	20%	20%	20%	100%	20%	20%	20%	20%	20%	20%	20%
R21	N	349 to 11	100%	100%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
R22	NNE, NE, ENE	12 to 78	100%	100%	20%	20%	20%	20%	20%	20%	100%	20%	20%	20%	20%	20%	20%	20%
R23	E, ESE	79 to 124	100%	20%	20%	20%	20%	20%	20%	20%	100%	20%	20%	20%	20%	20%	20%	20%
	SE, SSE, S, SSW, SW	125 to 236	See Region R01															
R24	WSW, W	237 to 281	100%	20%	100%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
R25	WNW, NW, NNW	282 to 348	100%	100%	100%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Key																		
ERPA Evacuate		ERPA Shelter-in-Place			Shelter-in-Place until 90% ETE for R01, then Evacuate													



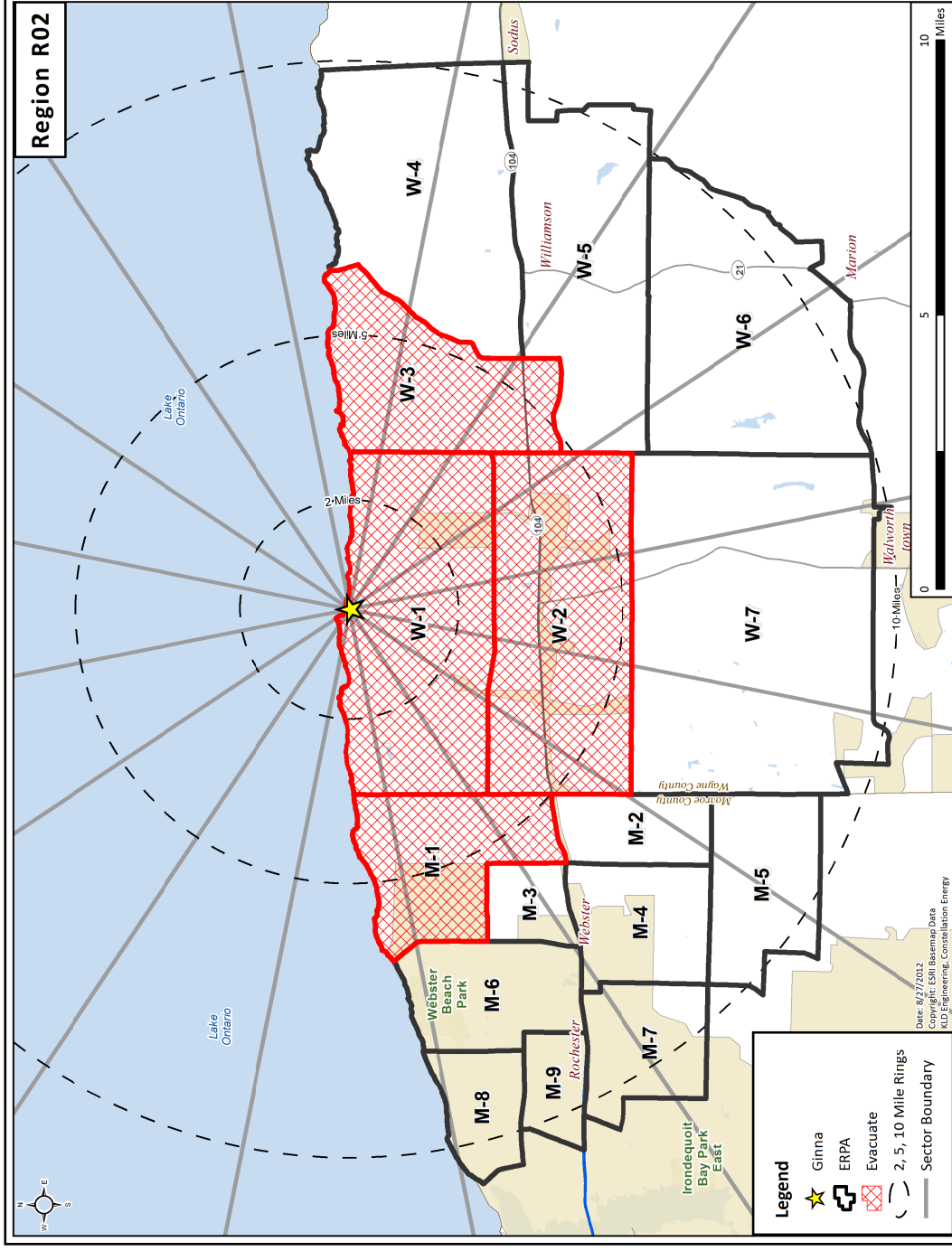


Figure H-2. Region R02

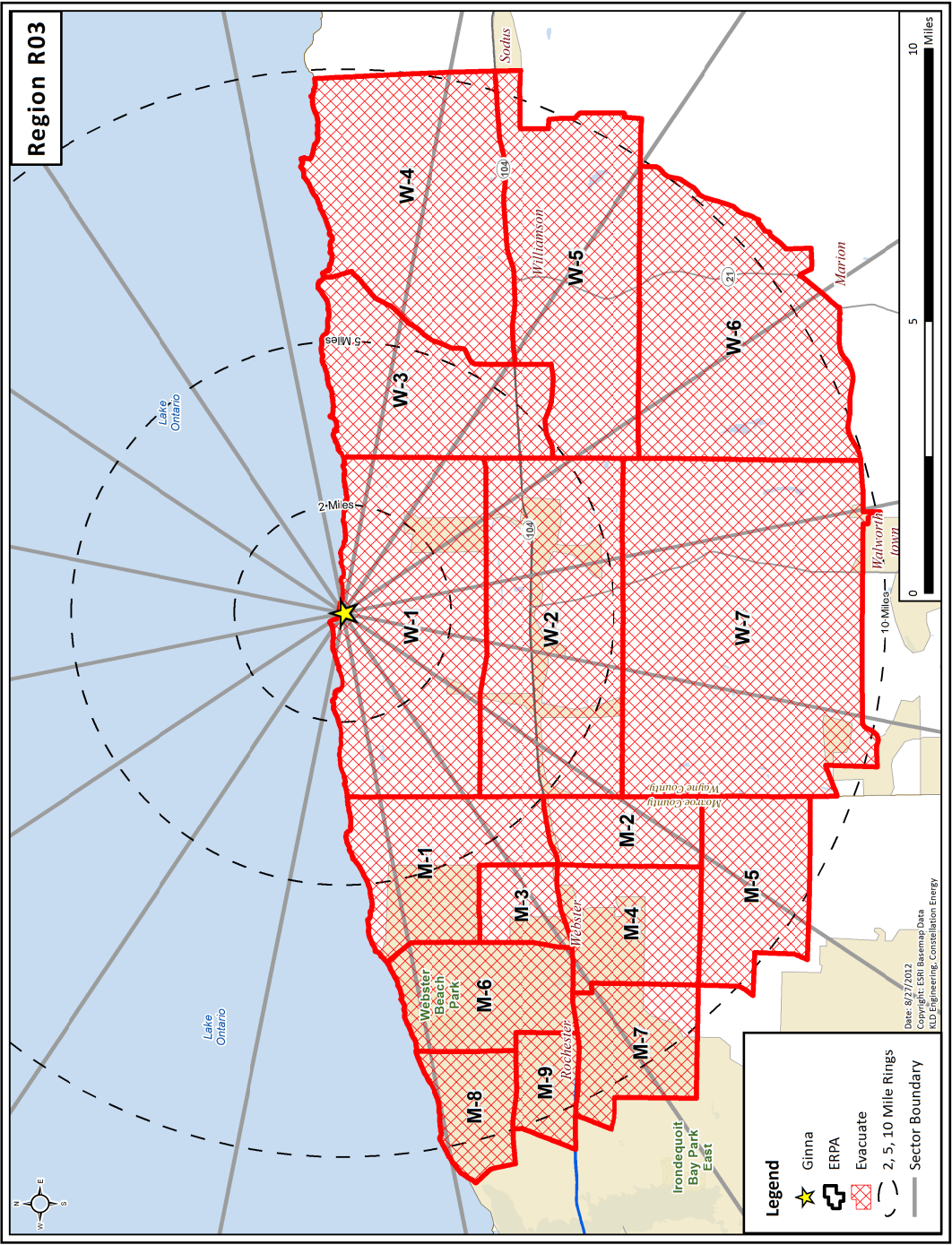


Figure H-3. Region R03

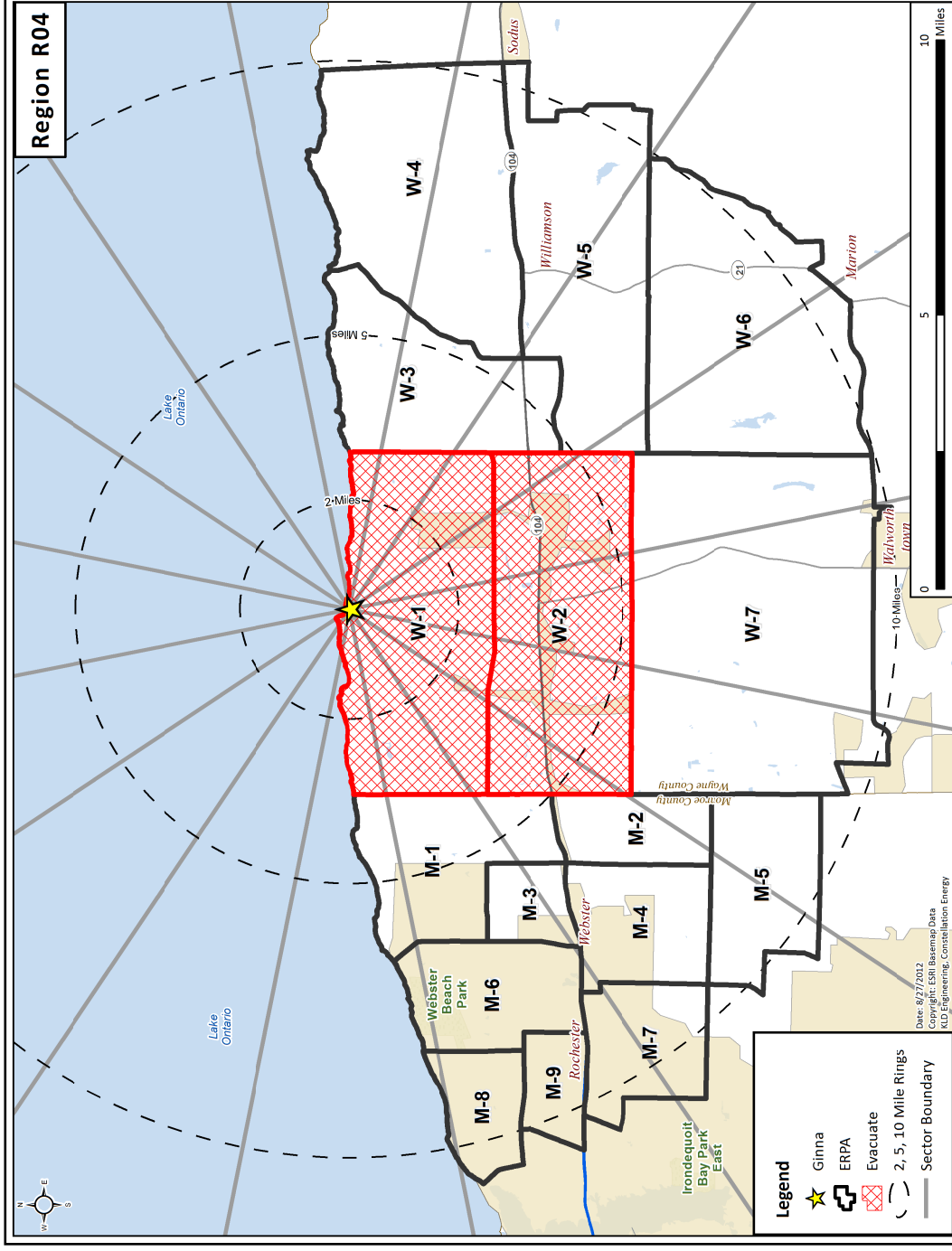
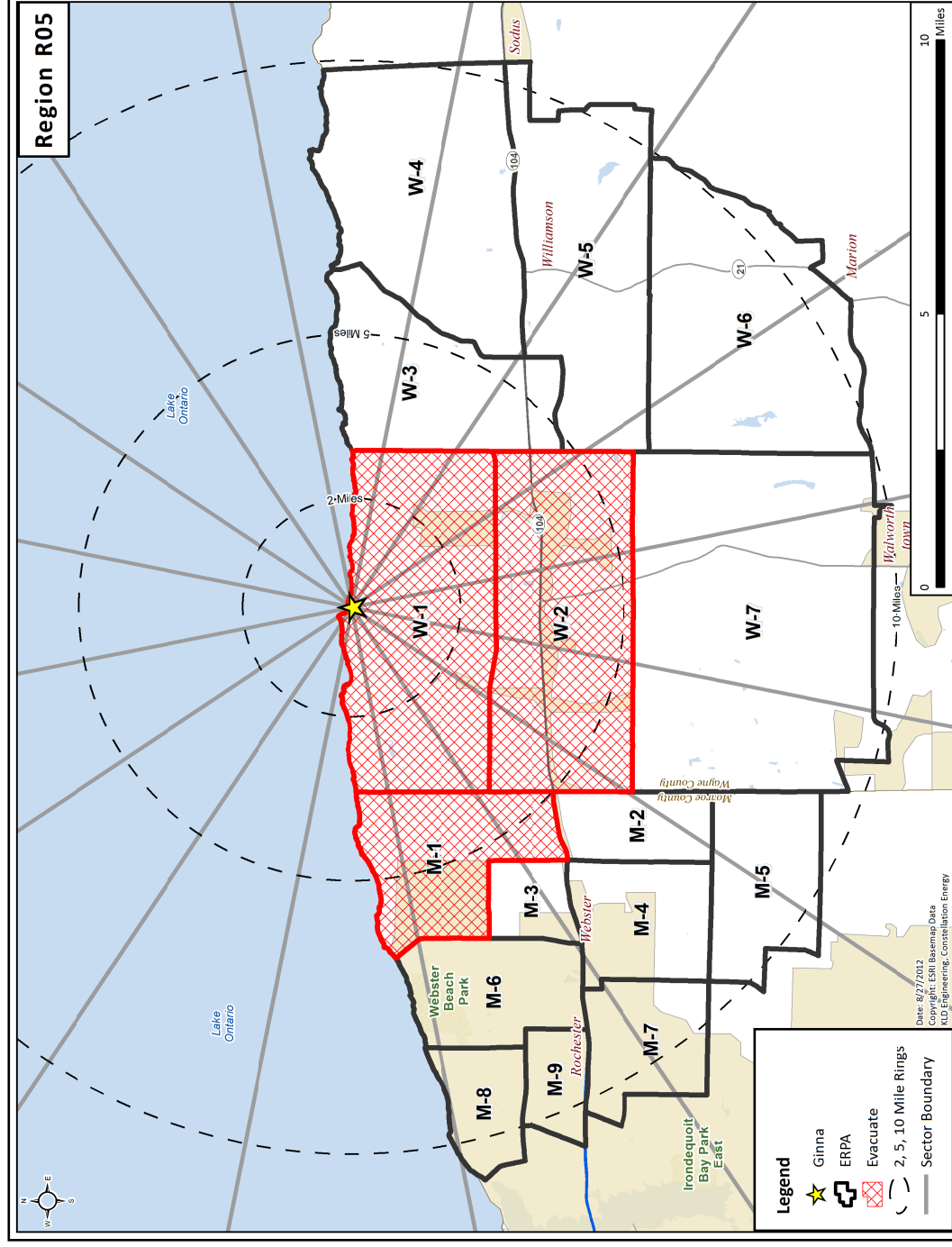


Figure H-4. Region R04



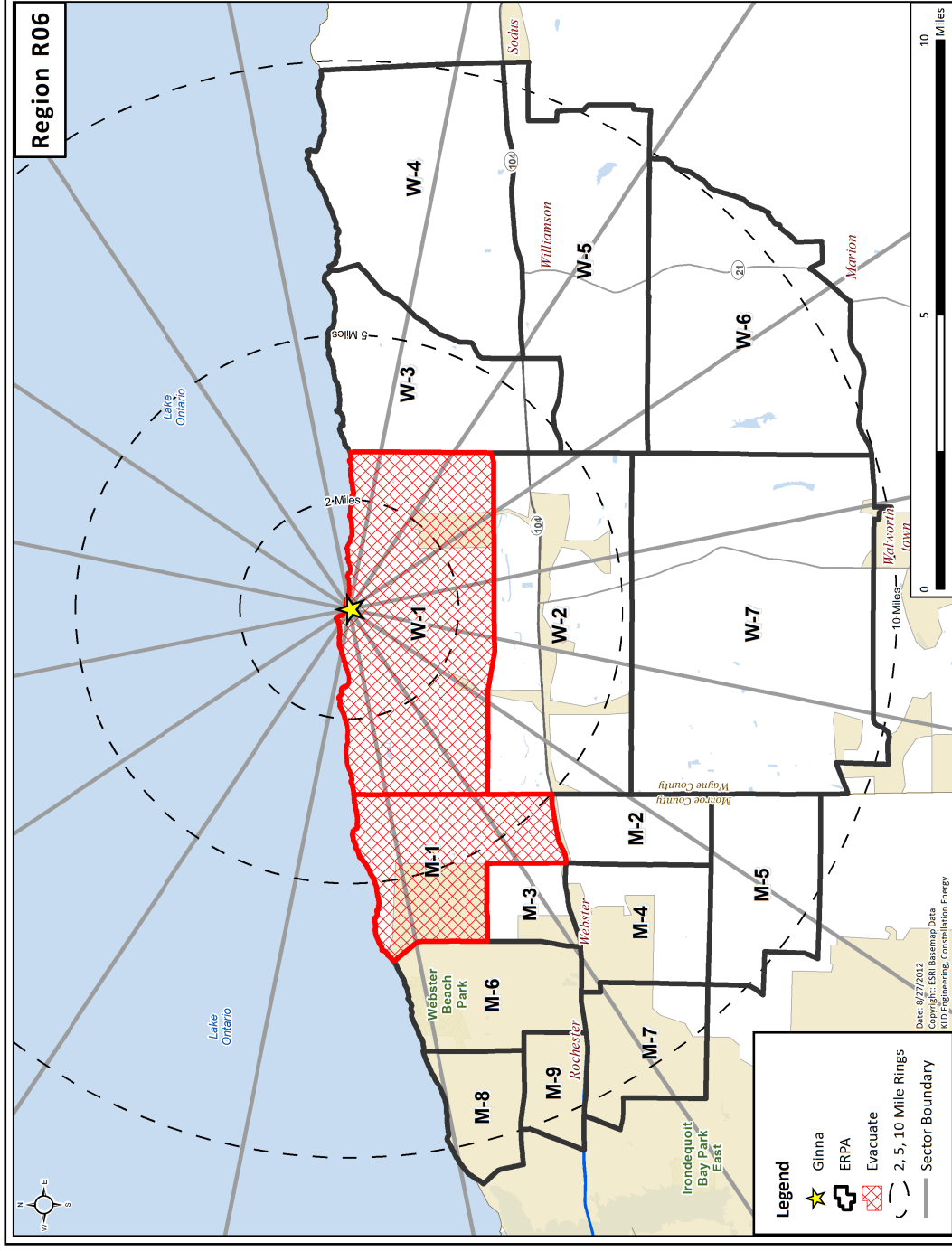


Figure H-6. Region R06

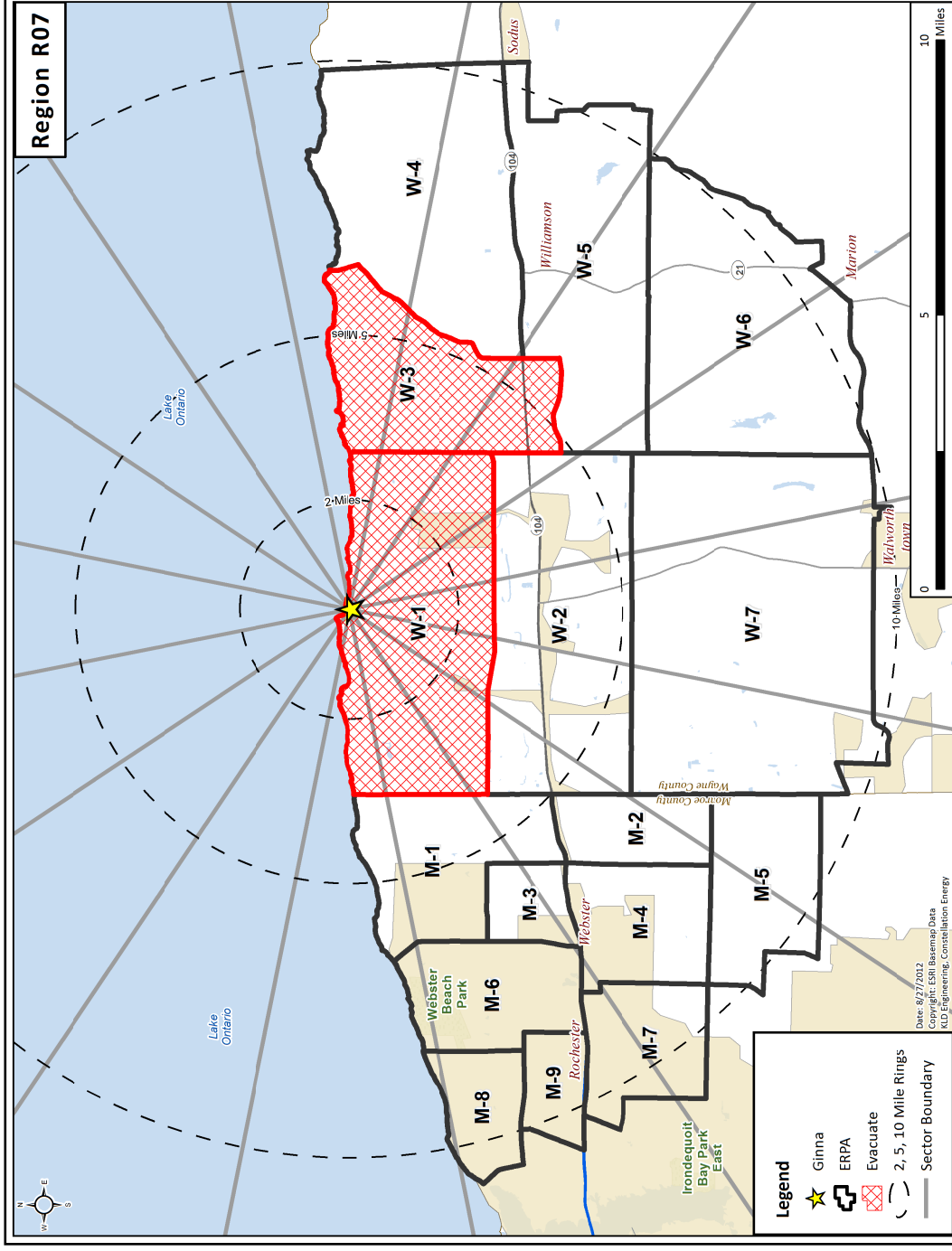


Figure H-7. Region R07

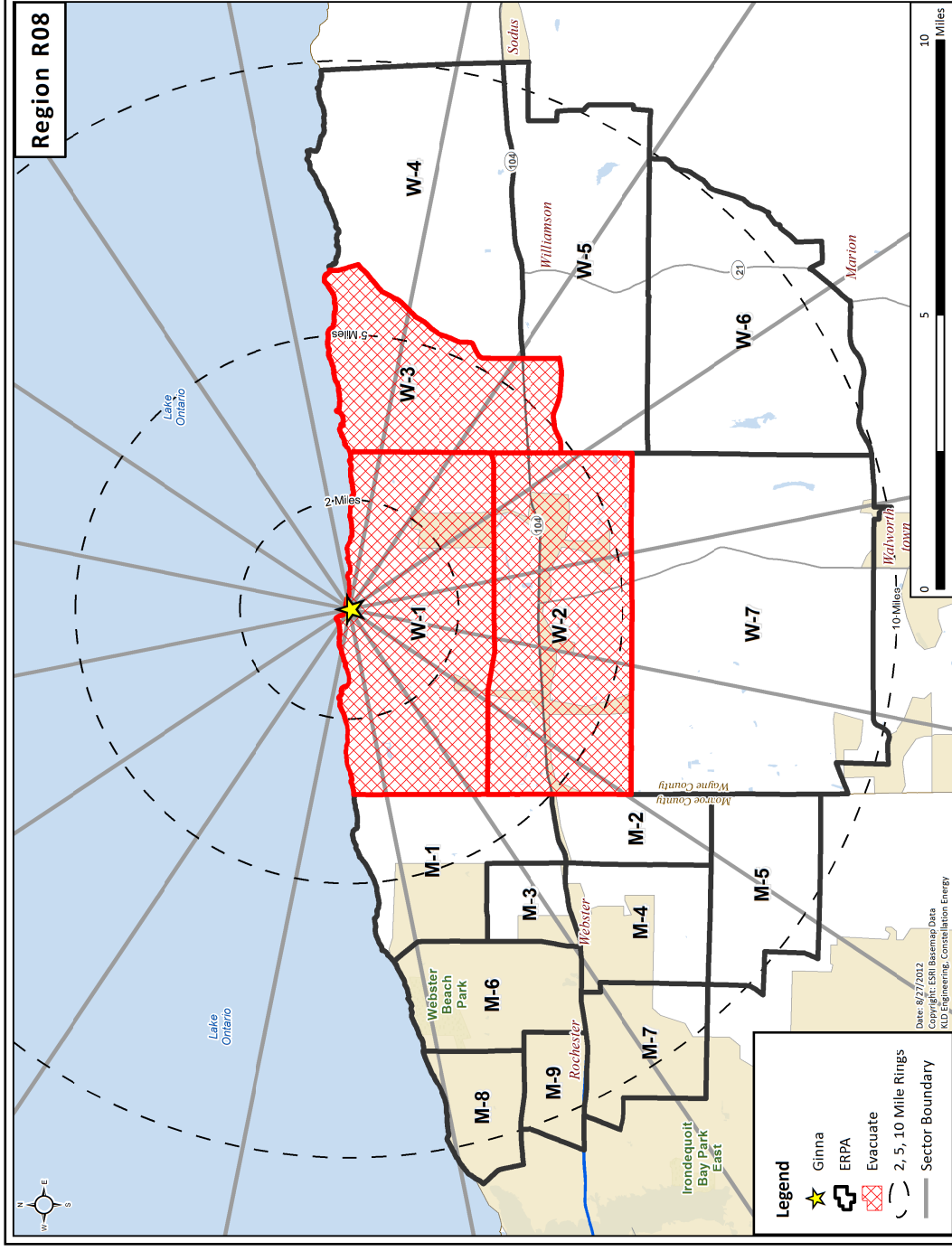
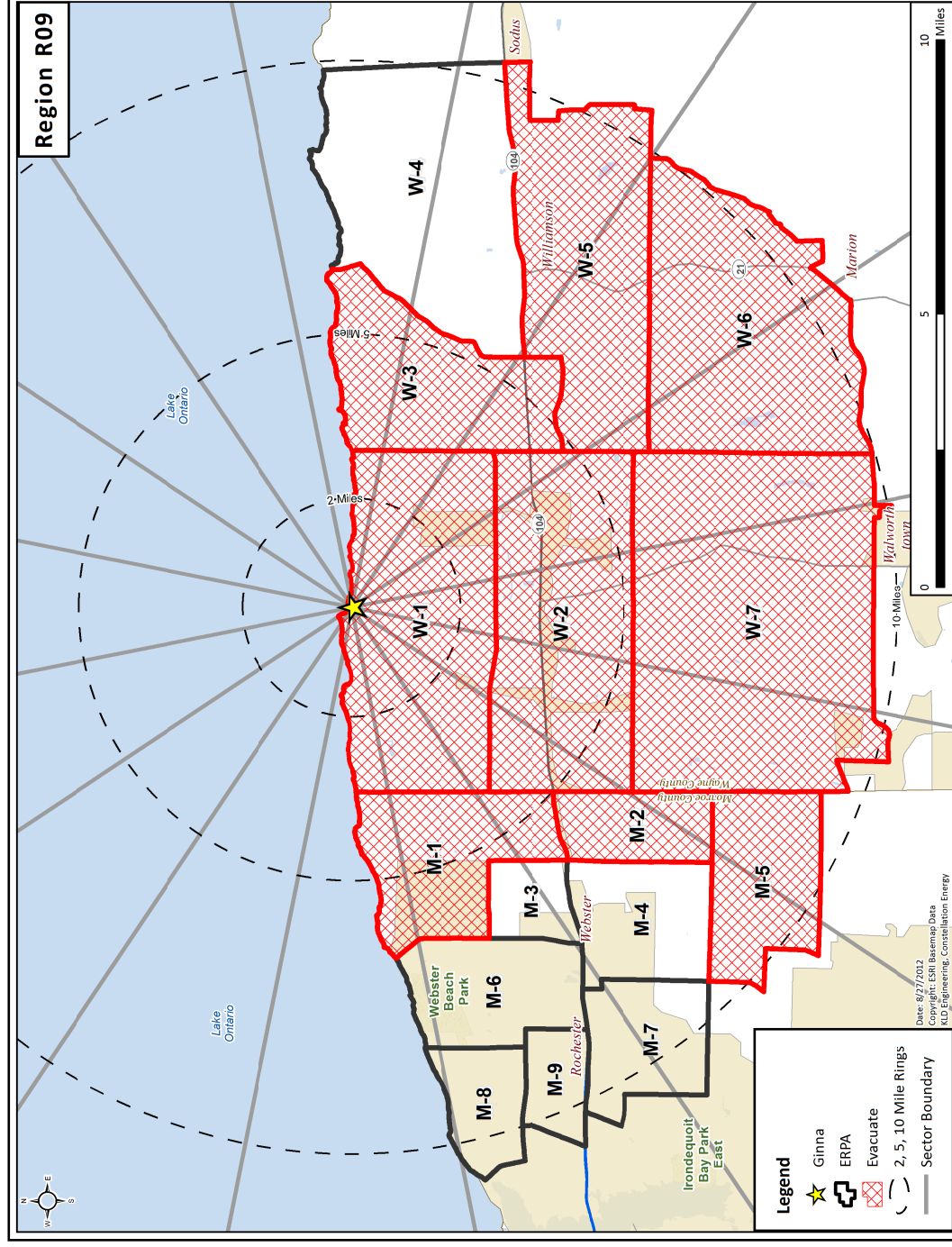


Figure H-8. Region R08



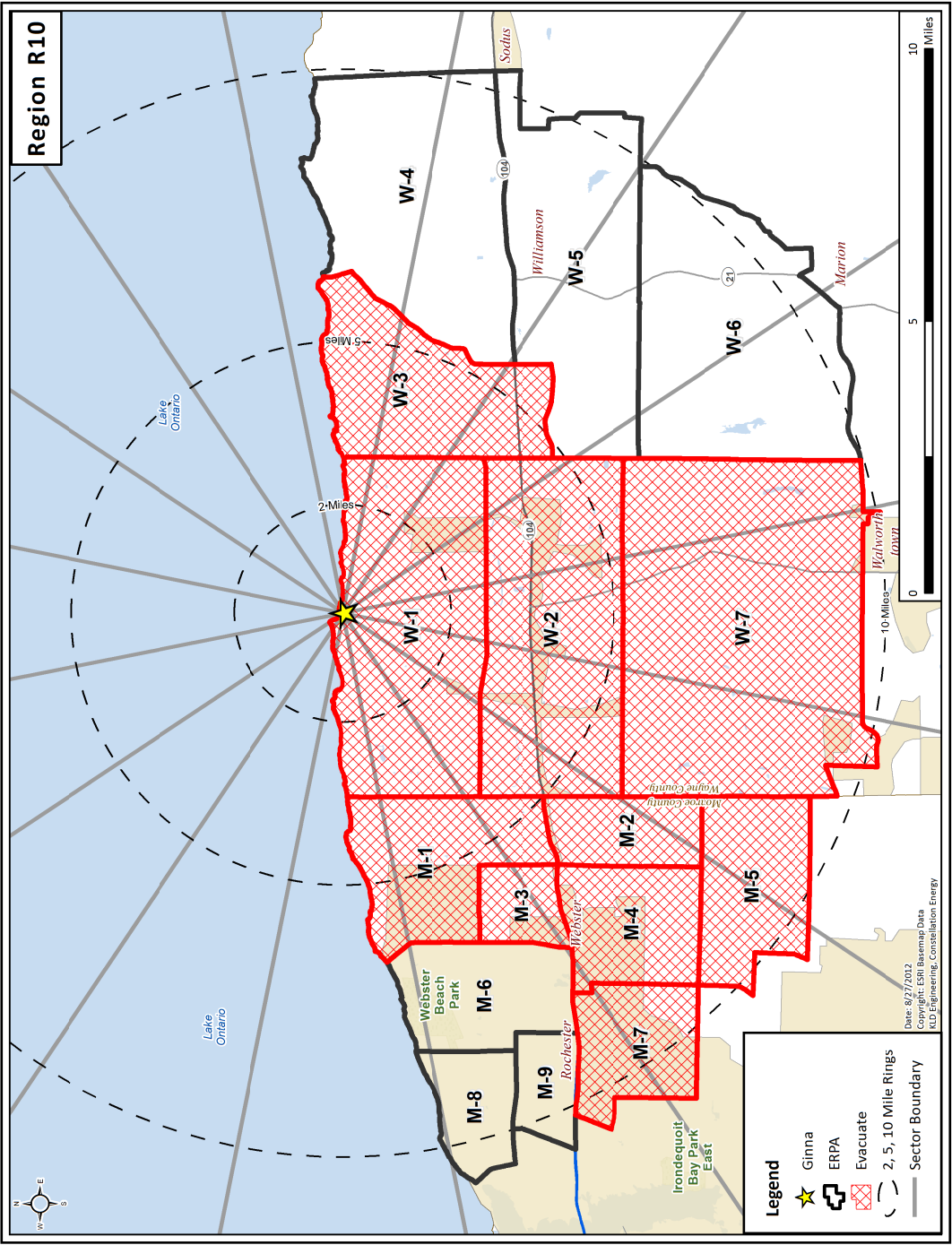


Figure H-10. Region R10

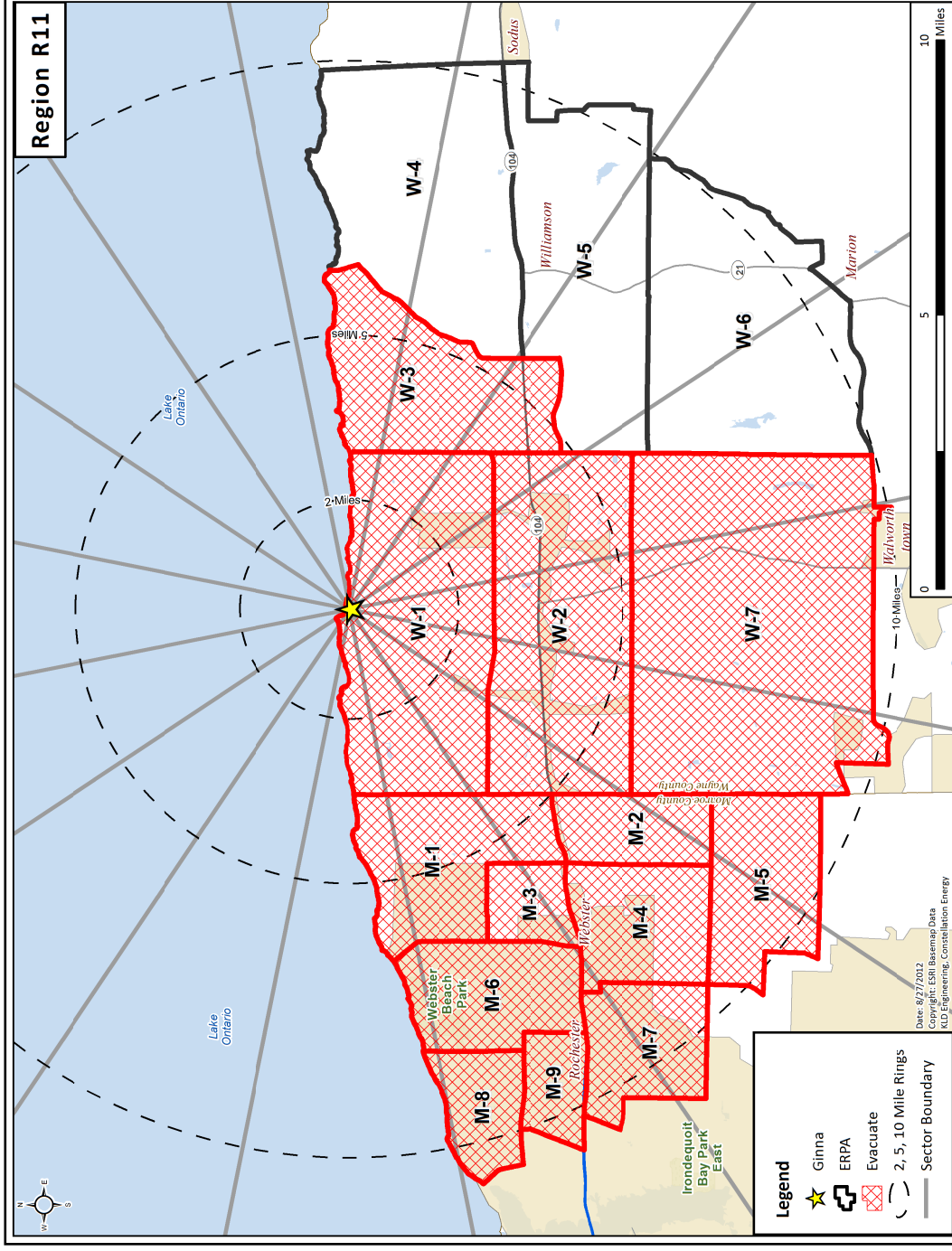


Figure H-11. Region R11

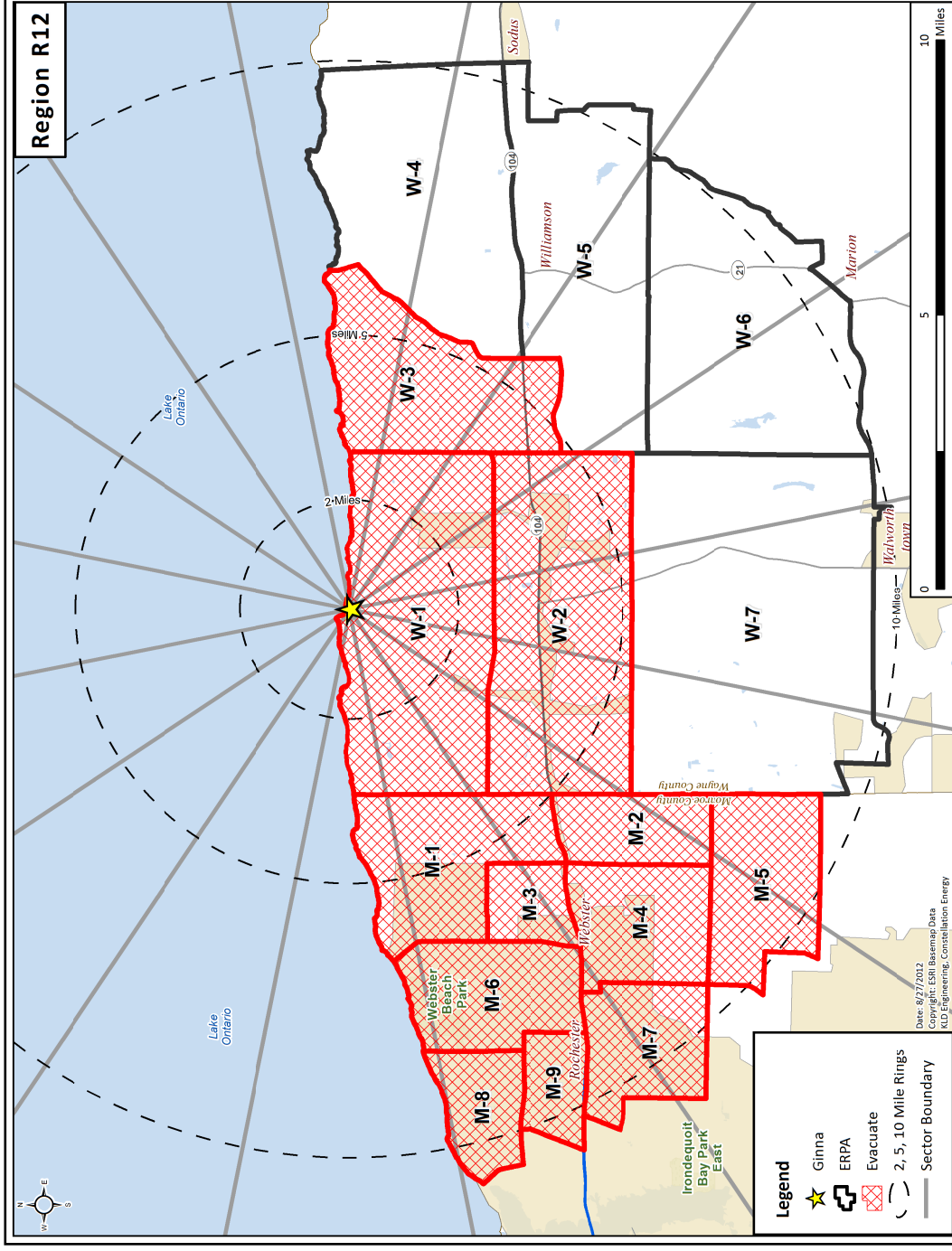


Figure H-12. Region R12

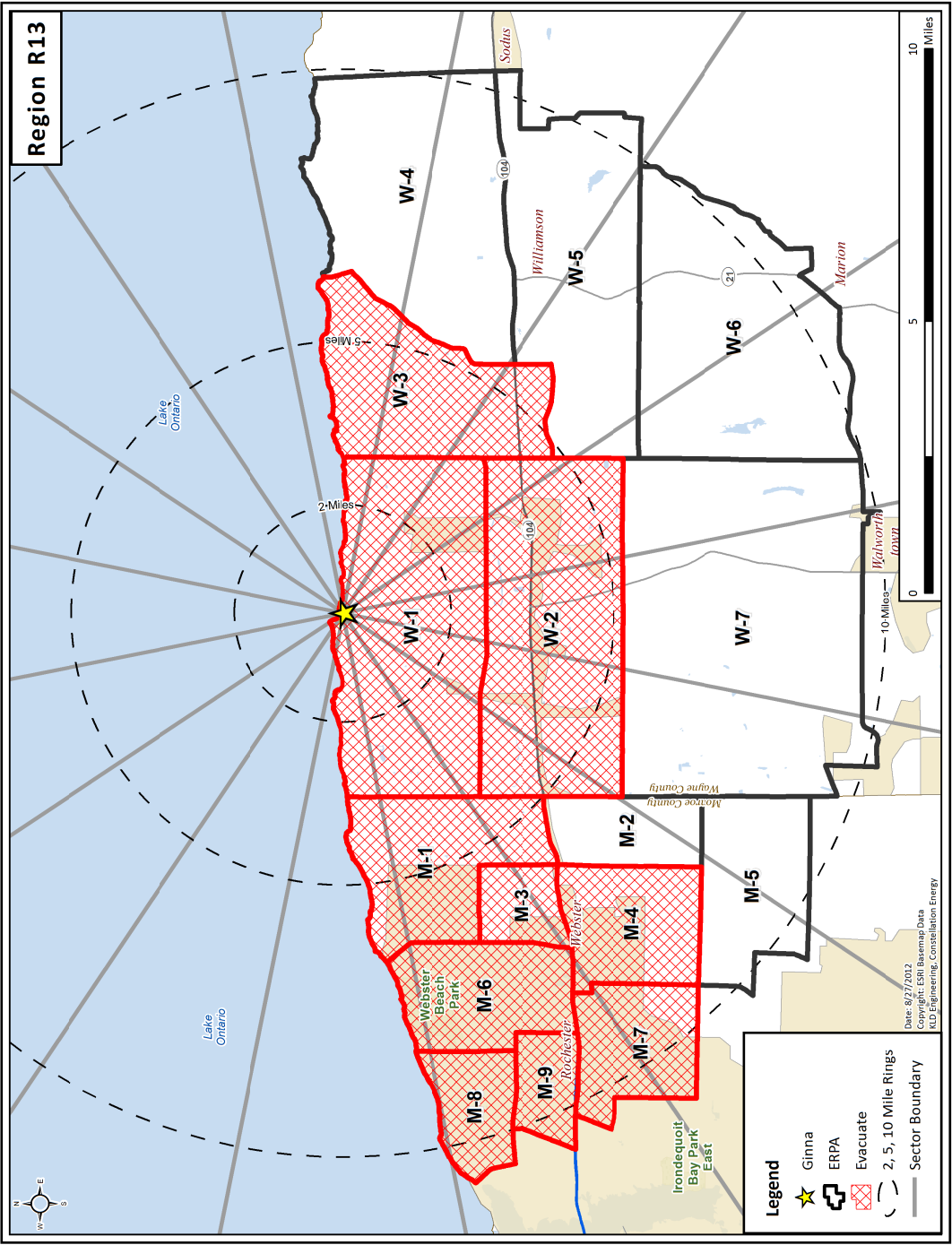
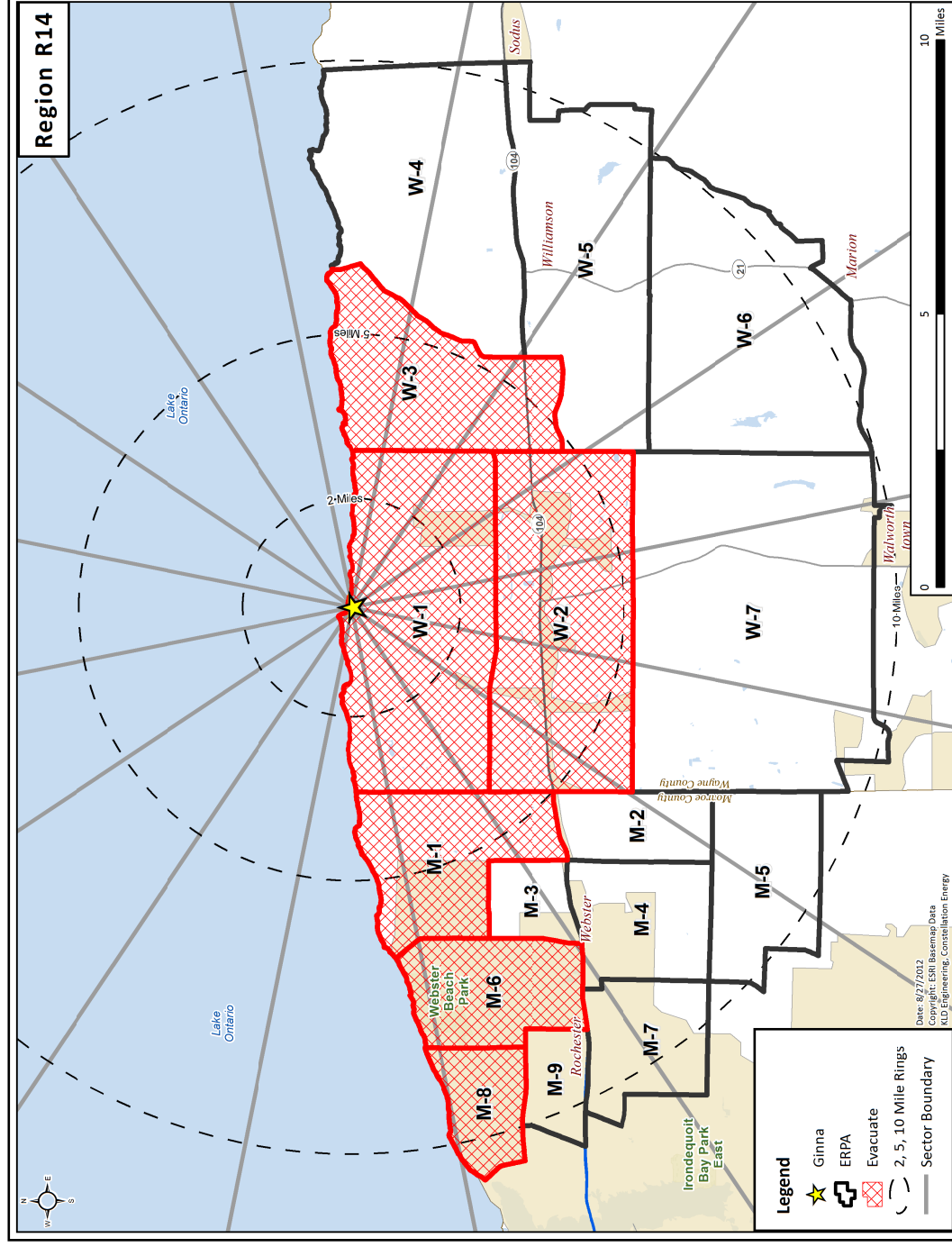


Figure H-13. Region R13



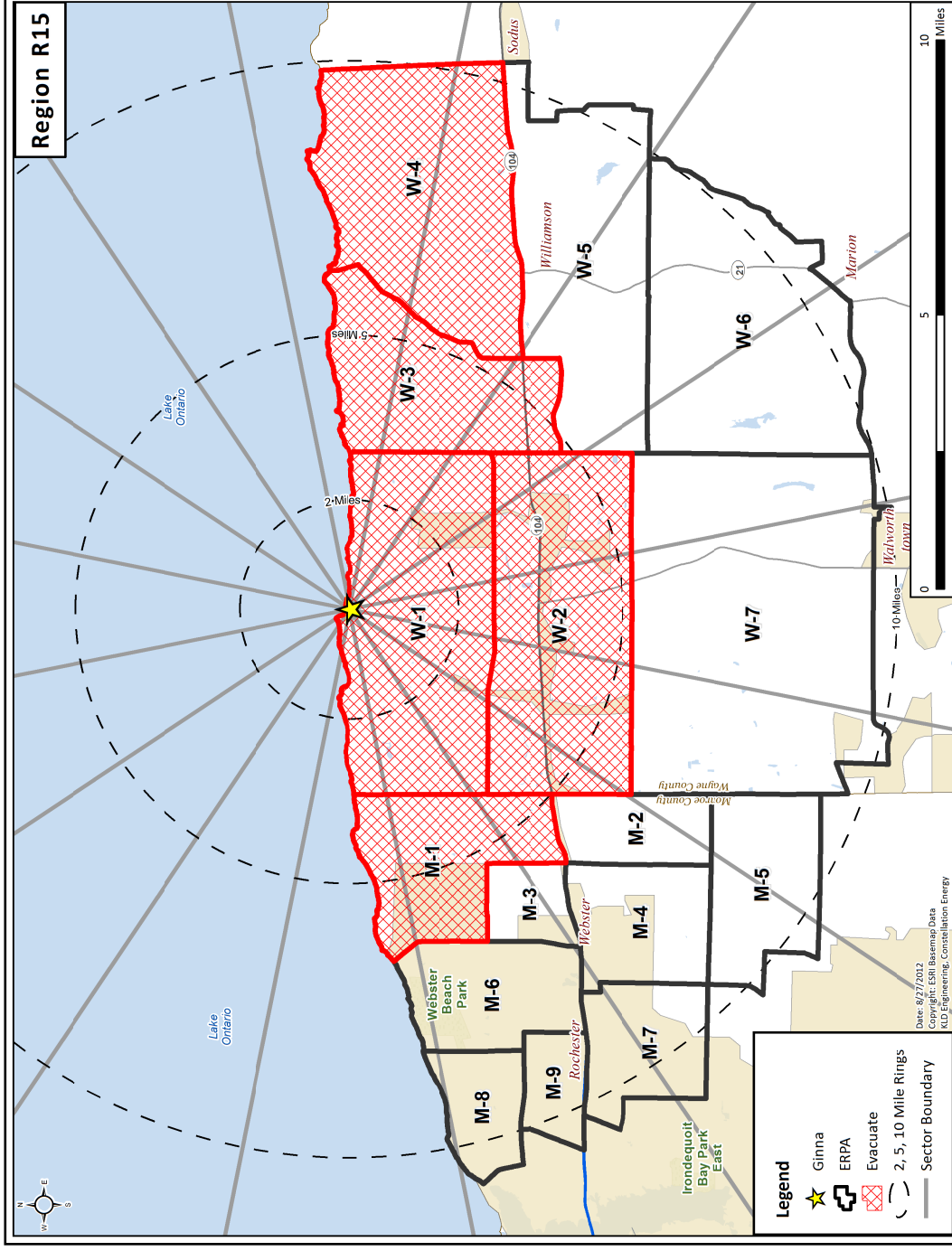
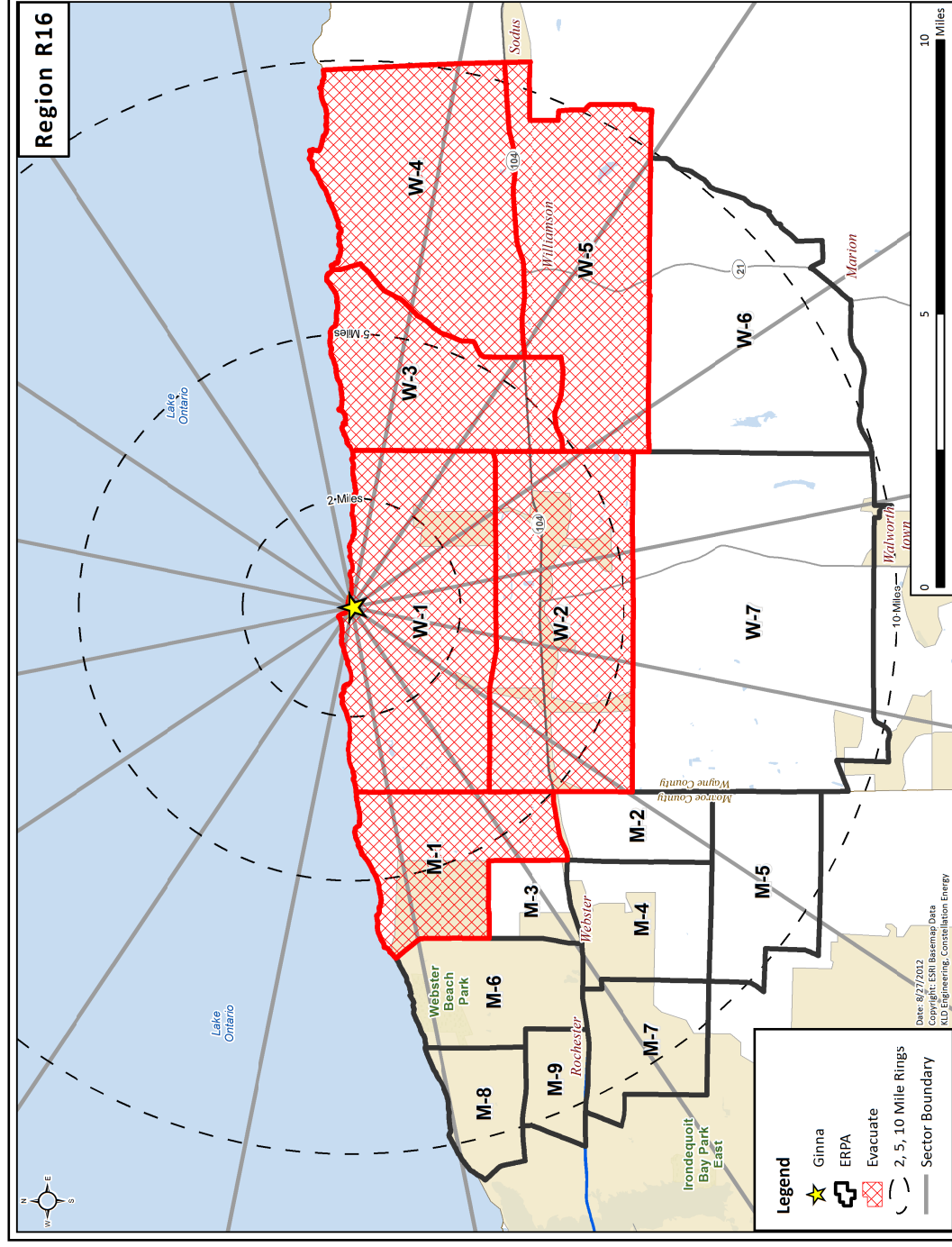
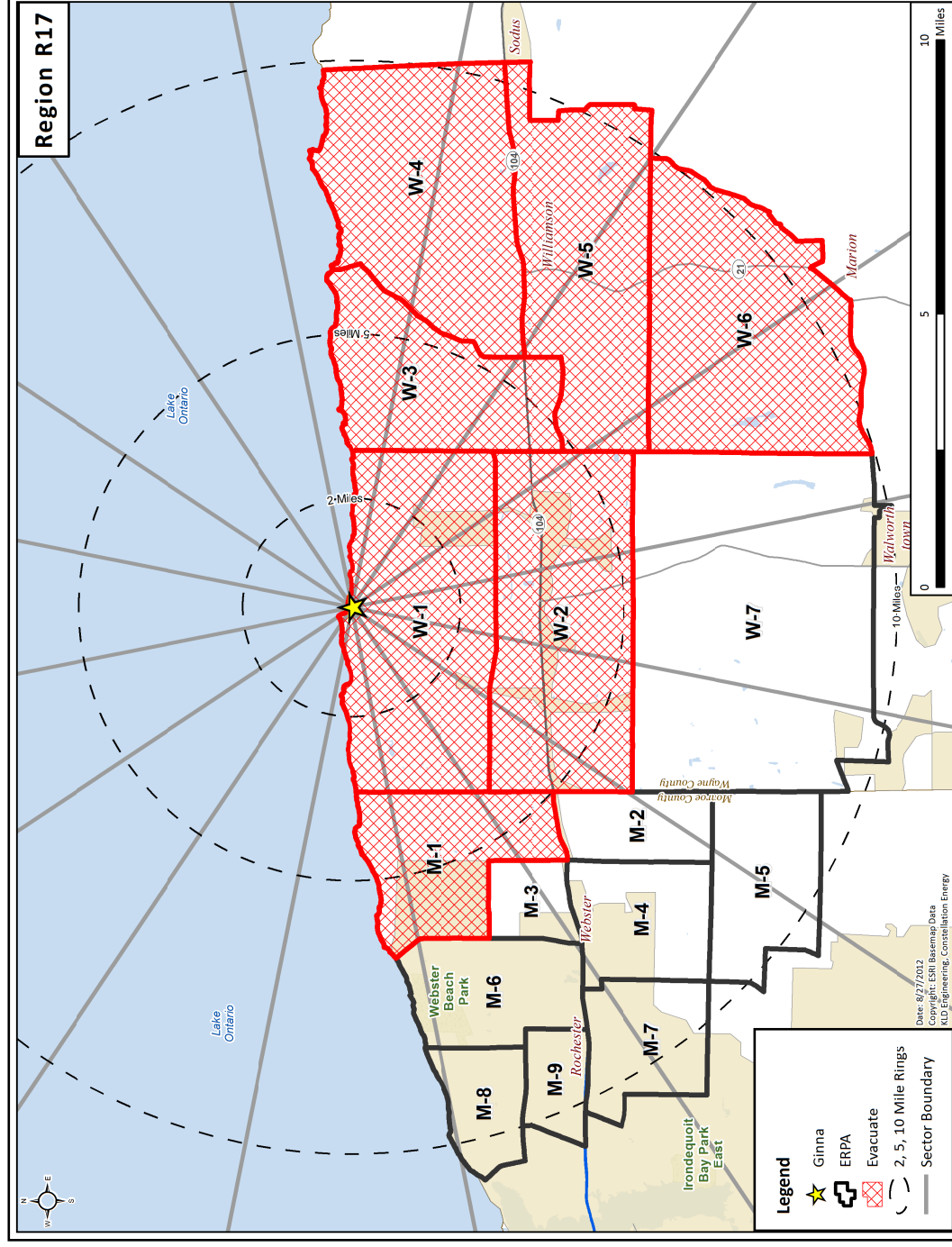


Figure H-15. Region R15





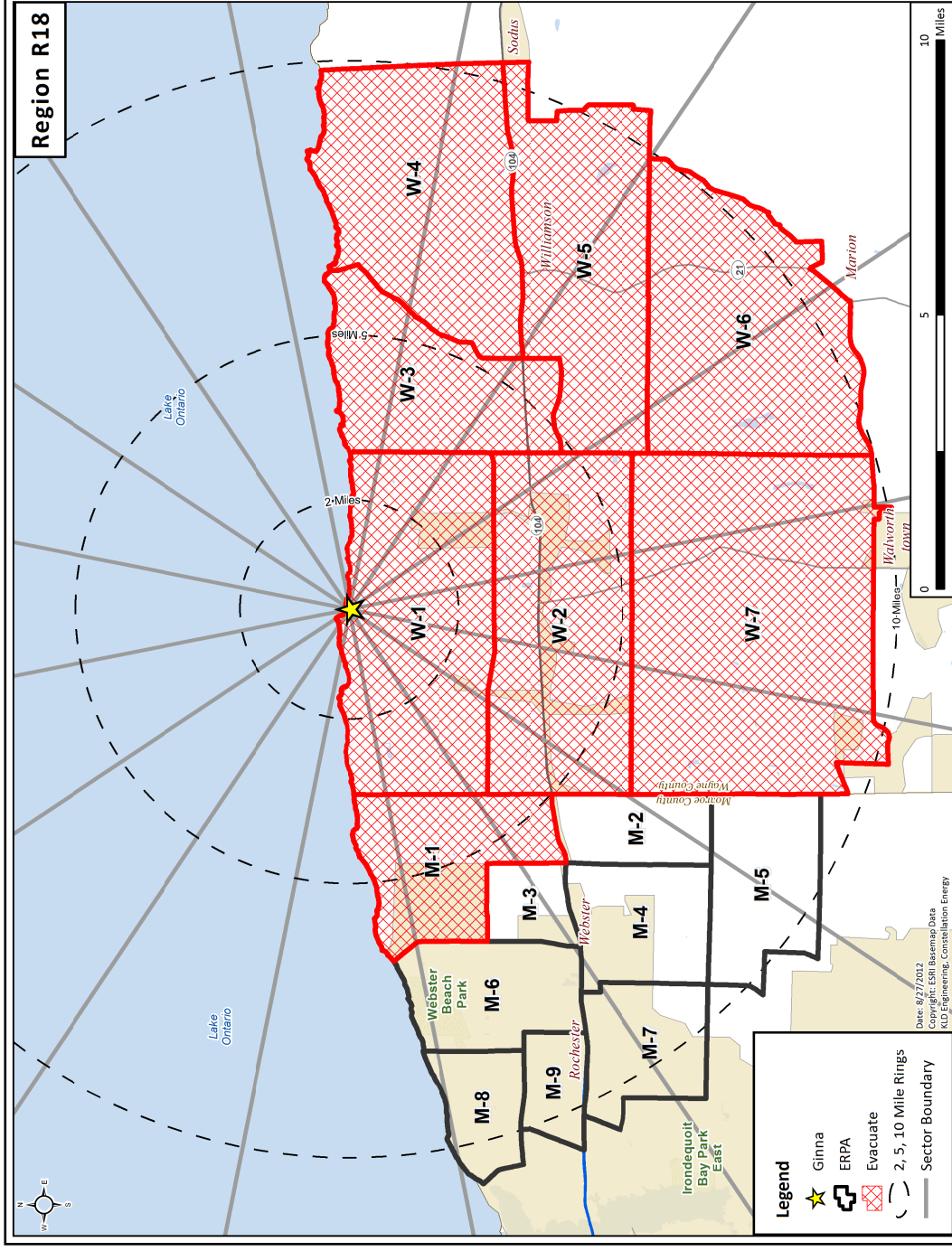
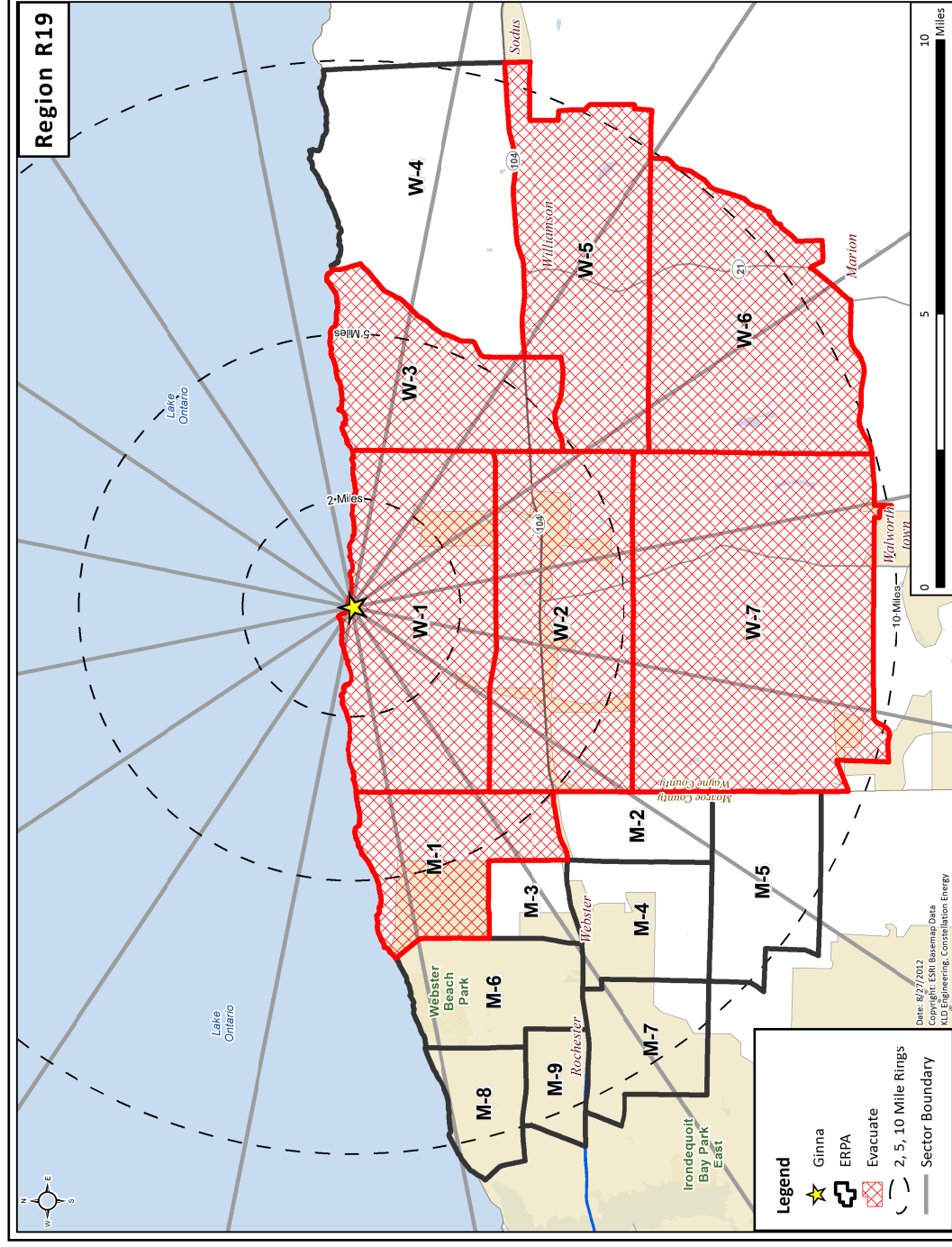


Figure H-18. Region R18



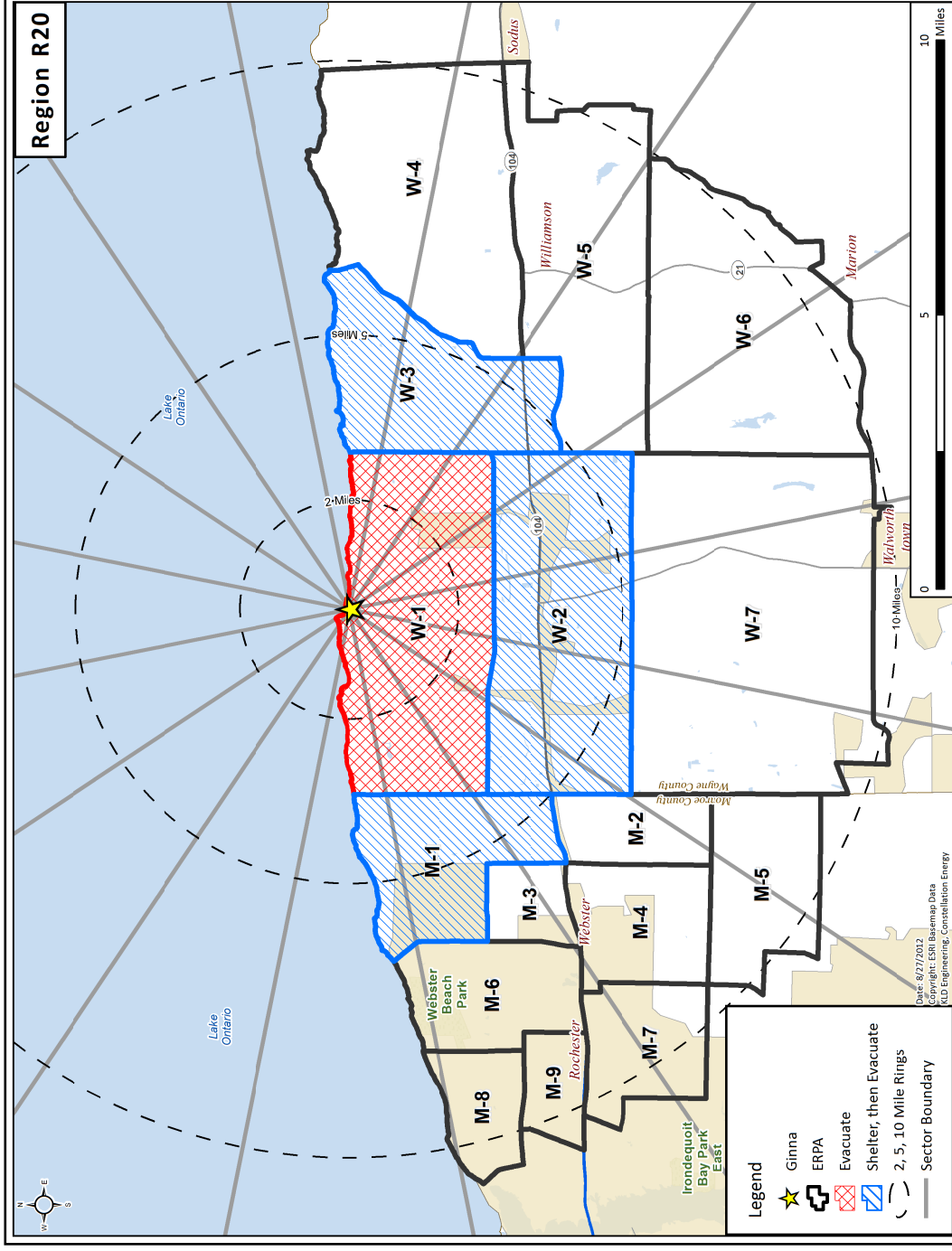


Figure H-20. Region R20

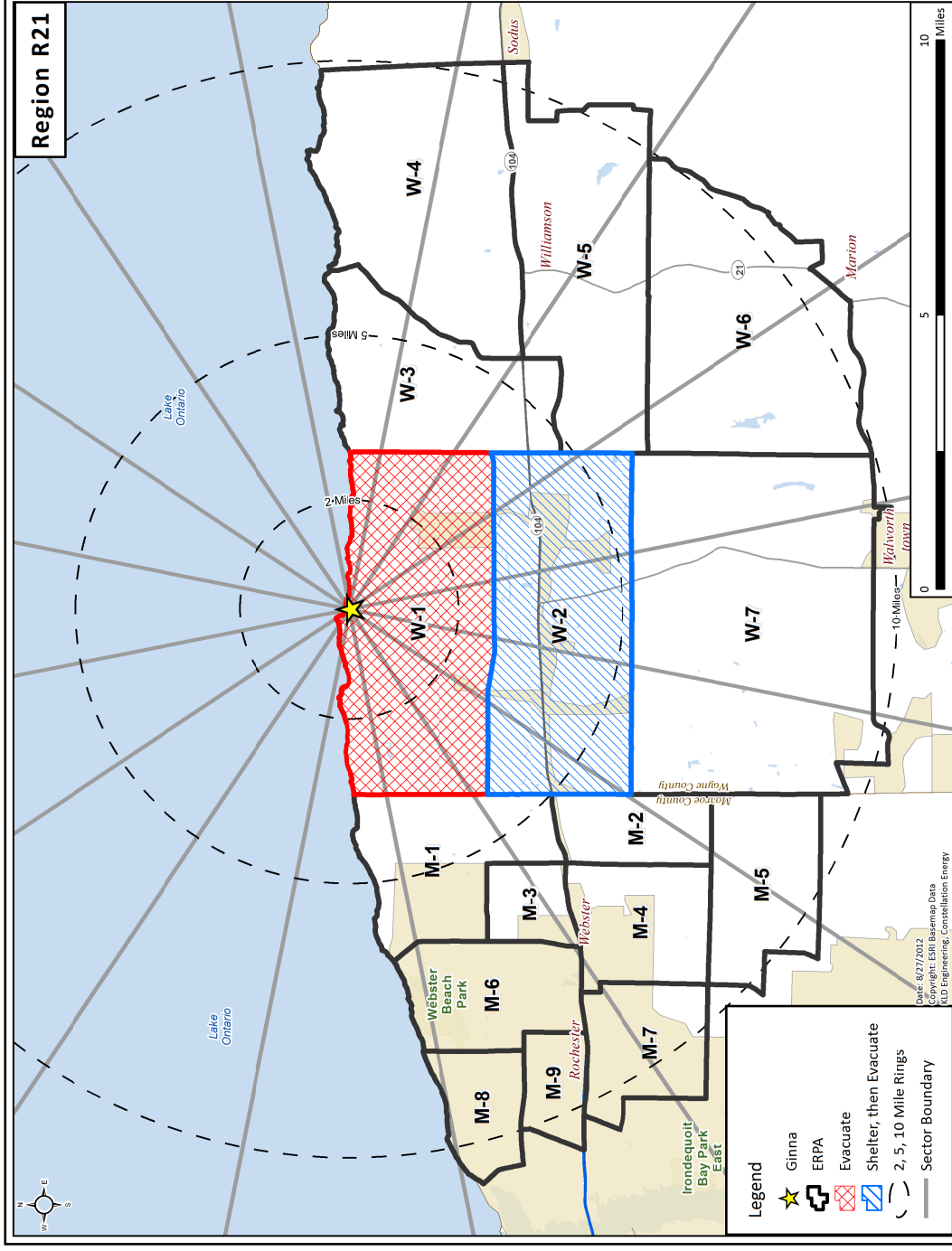
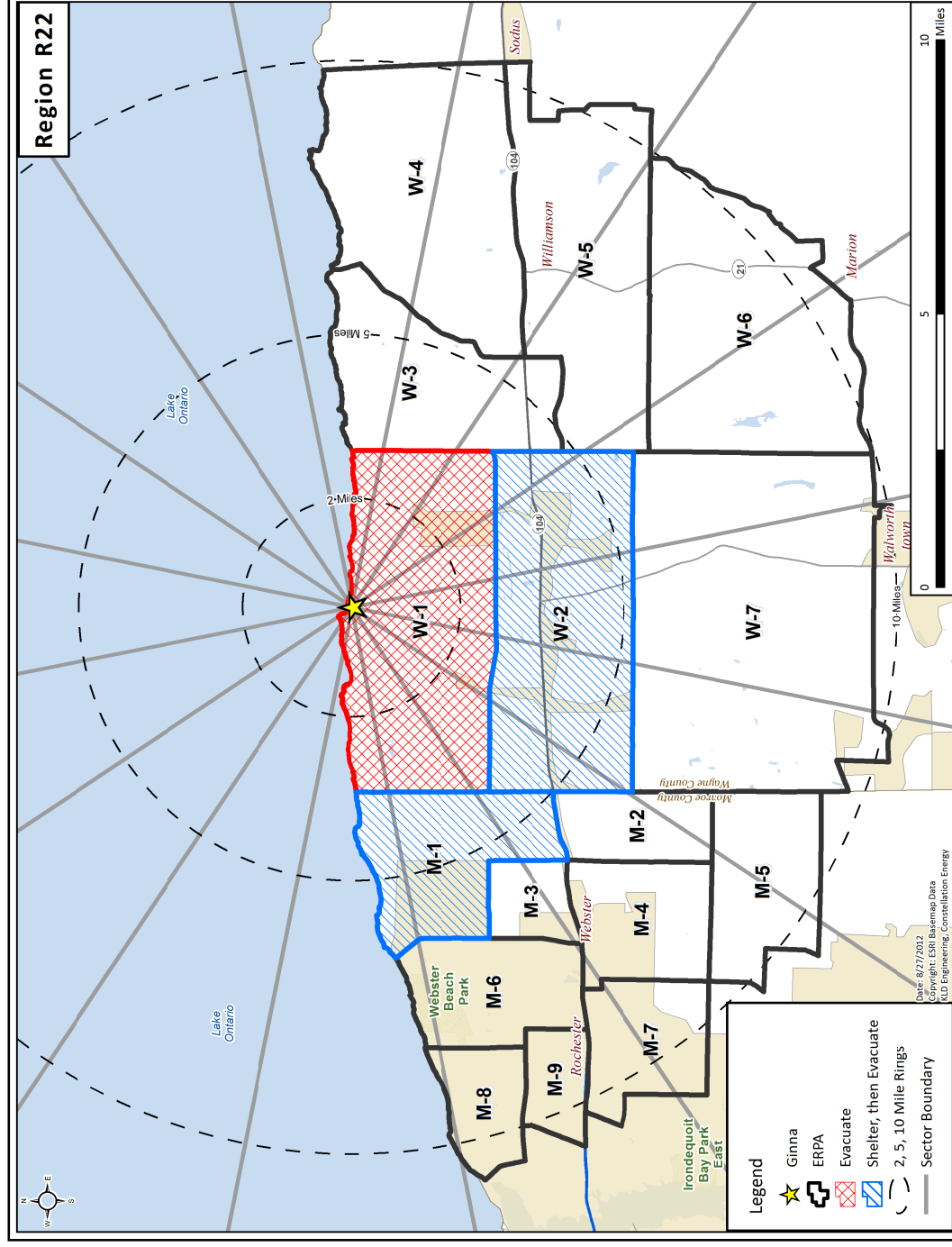


Figure H-21. Region R21



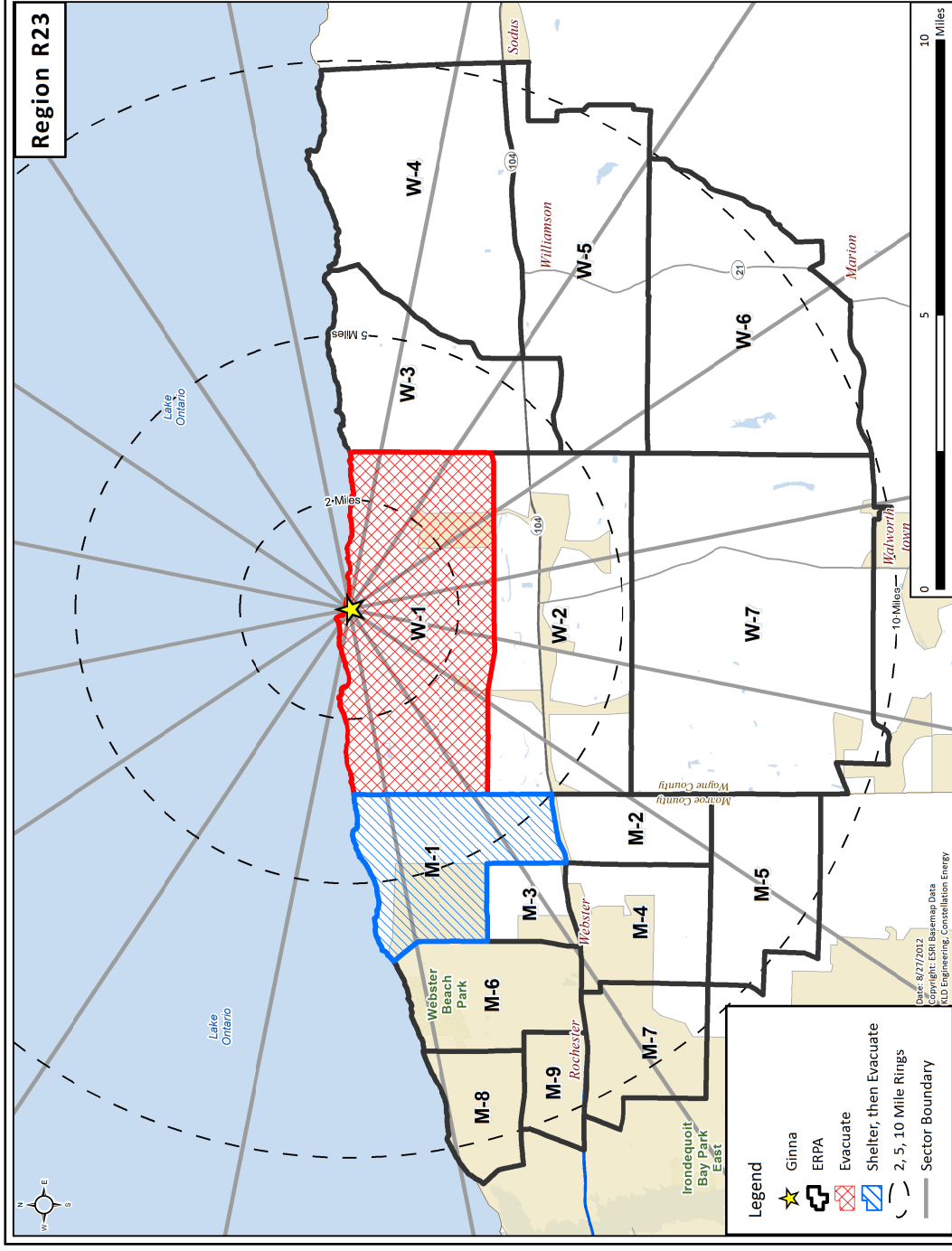


Figure H-23. Region R23

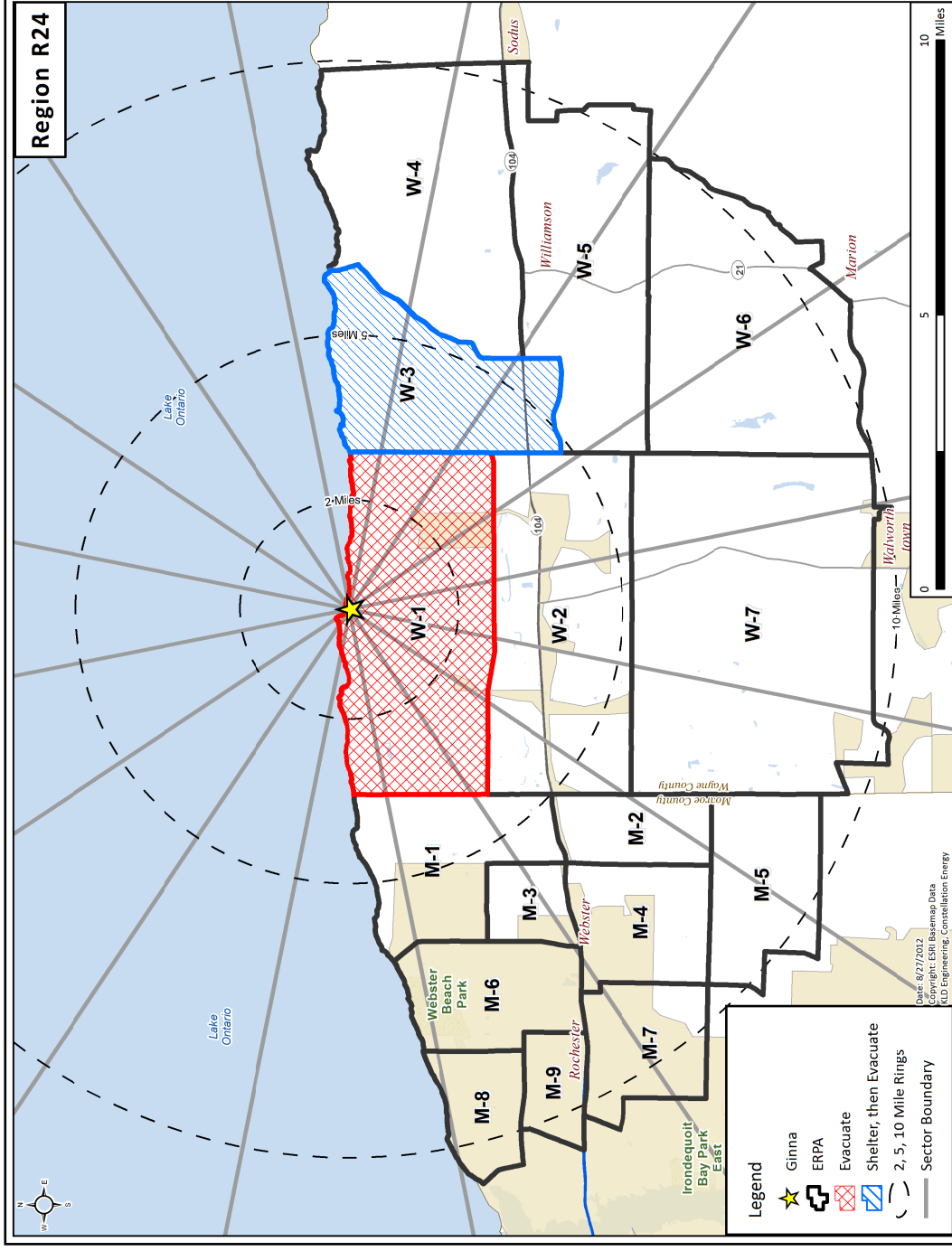
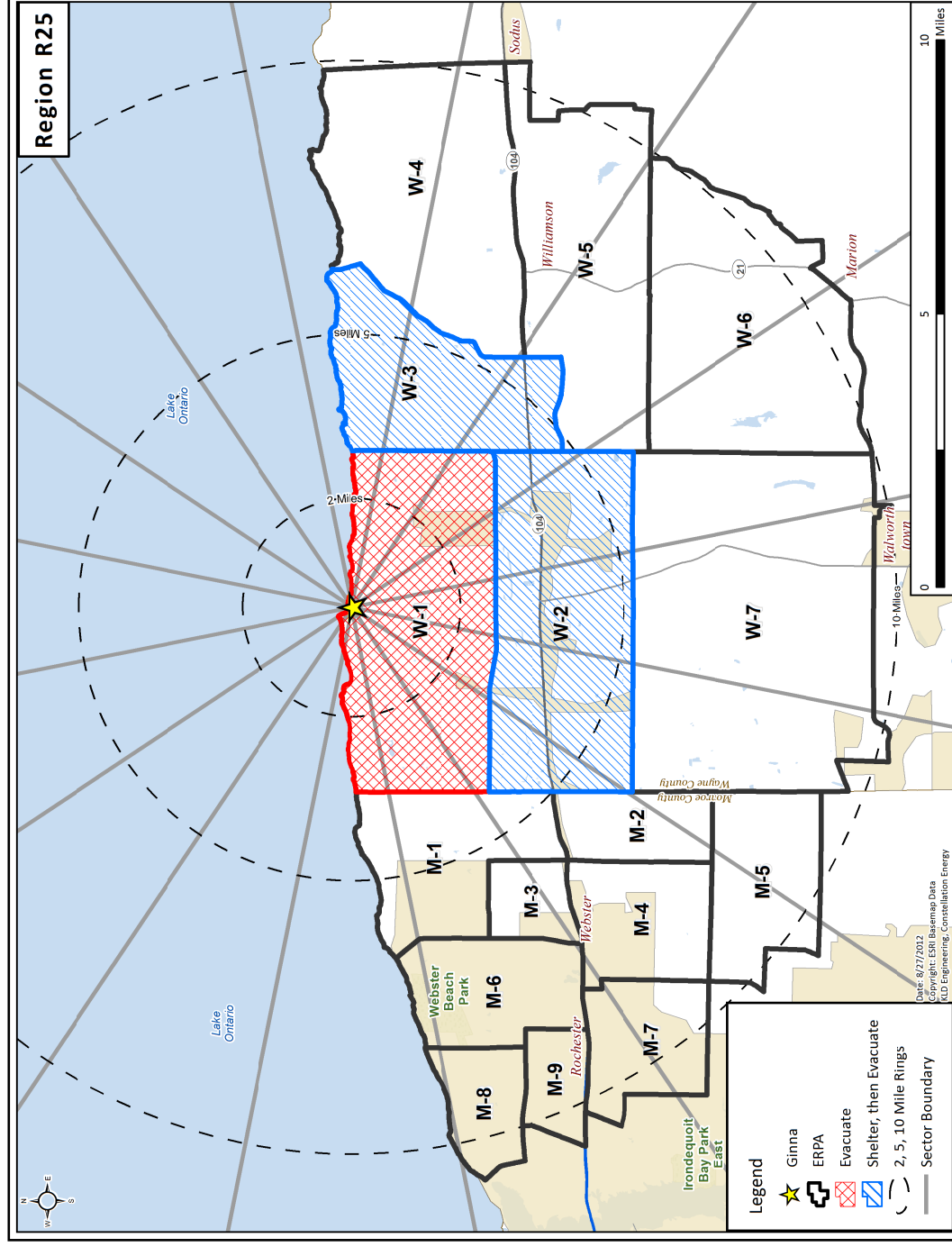


Figure H-24. Region R24



APPENDIX J

Representative Inputs to 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 several roadway segments (links) 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 snow 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 – SR 104, SR 250, SR 350 SR 21 and SR 286 – 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 through 7-7, SR 250 is congested for the first two hours of the evacuation. As such, the average speeds are comparably slower (and travel times longer) than other evacuation routes.

Table J-5 provides the cumulative 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.

Figure J-1 through Figure 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 Figure J-1 through Figure J-14, the curves are spatially separated as a result of the 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)
46	SR 104 & Ridge Rd	Actuated	45	3,042	246
			675	1,838	37
			673	2,720	151
			TOTAL	7,600	-
317	SR 404 & Bay Rd	Actuated	978	3,483	291
			368	3,877	390
			TOTAL	7,360	-
381	SR 404 & N Winton Rd	Actuated	380	6,950	87
			455	34	0
			811	138	5
			TOTAL	7,122	-
377	SR 404 & Plank Rd	Actuated	318	1,749	448
			317	5,108	332
			TOTAL	6,857	-
321	SR 286 & Blossom Rd	Actuated	320	3,892	446
			415	2,141	37
			443	0	0
			TOTAL	6,033	-
39	SR 104 & Pound Rd	Actuated	38	3,443	0
			928	1,922	0
			897	295	2
			118	97	0
			TOTAL	5,757	-
38	SR 104 & SR 21	Actuated	37	3,130	0
			39	1,927	0
			896	367	0
			186	260	0
			TOTAL	5,684	-
159	SR 441 & 5 Mile Line Rd	Actuated	918	2,257	91
			424	3,188	226
			TOTAL	5,445	-
318	Plank Rd & Creek St	Actuated	317	2,473	384
			376	2,872	163
			TOTAL	5,345	-
441	Penfield Rd & East Ave	Actuated	440	2,918	0
			442	0	0
			167	2,336	0
			TOTAL	5,254	-

Table J-2. Sample Simulation Model Input

Link Number	Vehicles Entering Network on this Link	Directional Preference	Destination Nodes	Destination Capacity
258	106	W	8061	6,750
			8393	1,698
			8329	1,698
596	83	SW	8004	6,750
			8185	4,500
			8839	1,698
530	248	W	8061	6,750
			8004	6,750
			8189	9,000
1202	145	SE	8801	1,698
			8089	1,698
			8135	1,698
157	49	S	8630	1,698
			8801	1,698
			8089	1,698
369	30	S	8089	1,698
673	97	SW	8329	1,698
828	60	SW	8393	1,698
1000	102	S	8587	1,698
			8185	4,500
			8942	1,698
1252	54	SW	8004	6,750
			8185	4,500
			8189	9,000

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

Scenario	1	2	3	4	5	6	7
Network-Wide Average Travel Time (Min/Veh-Mi)	2.3	2.7	2.0	2.4	1.9	2.3	2.7
Network-Wide Average Speed (mph)	26.4	22.2	30.6	25.2	31.4	25.8	21.9
Total Vehicles Exiting Network	83,335	83,192	72,592	72,977	60,432	84,335	84,451
Scenario	8	9	10	11	12	13	14
Network-Wide Average Travel Time (Min/Veh-Mi)	3.0	1.9	2.3	2.5	1.9	2.0	2.7
Network-Wide Average Speed (mph)	19.9	31.4	26.3	23.8	31.9	29.8	22.4
Total Vehicles Exiting Network	84,884	71,964	72,164	72,254	60,237	73,701	83,624

Table J-4. Average Speed (mph) and Travel Time (min) for Major Evacuation Routes (Region R03, Scenario 1)

Elapsed Time (hours)							
Route#	Length (miles)	1		2		3	
		Speed (mph)	Travel Time (min)	Speed	Travel Time	Speed	Travel Time
SR 104 EB	20.4	43.0	28.4	62.4	19.6	60.7	20.1
SR 104 WB	20.4	23.6	51.8	29.2	41.9	65.3	18.7
SR 250 SB	4.6	19.7	14.1	13.5	20.6	43.9	6.3
SR 350 SB	6.2	21.1	17.6	51.0	7.3	51.8	7.2
SR 21 SB	6.4	43.6	8.8	46.2	8.3	48.1	8.0
SR 286 WB	7.2	45.4	9.5	48.1	9.0	53.4	8.1

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

Network Exit Link	Elapsed Time (hours)		
	1	2	3
	Cumulative Vehicles Discharged by the Indicated Time		
	Cumulative Percent of Vehicles Discharged by the Indicated Time		
5	2,565	7,066	10,703
	13%	12%	13%
114	997	2,327	3,318
	5%	4%	4%
131	1,922	7,864	9,833
	10%	13%	12%
177	328	1,096	1,287
	2%	2%	2%
180	408	1,470	1,729
	2%	2%	2%
182	586	1,956	2,244
	3%	3%	3%
254	187	693	789
	1%	1%	1%
257	332	1,364	1,705
	2%	2%	2%
319	5,446	12,031	15,778
	27%	20%	19%
355	4,172	8,658	11,671
	21%	14%	14%
584	624	2,169	3,201
	3%	4%	4%
680	203	1,214	1,542
	1%	2%	2%
885	80	559	689
	0%	1%	1%
903	171	859	1,042
	1%	1%	1%
952	130	584	711
	1%	1%	1%
961	98	1,310	2,112
	0%	2%	3%
966	225	1,382	2,068
	1%	2%	3%
1024	202	643	778

Network Exit Link	Elapsed Time (hours)		
	1	2	3
	Cumulative Vehicles Discharged by the Indicated Time		
	Cumulative Percent of Vehicles Discharged by the Indicated Time		
	1%	1%	1%
1073	42	113	127
	0%	0%	0%
1085	524	1,888	2,532
	3%	3%	3%
1106	48	255	292
	0%	0%	0%
1287	101	477	753
	1%	1%	1%
1288	43	441	1,476
	0%	1%	2%
1290	175	1,304	1,720
	1%	2%	2%
1308	264	818	1,265
	1%	1%	2%
1405	285	1,684	2,135
	1%	3%	3%

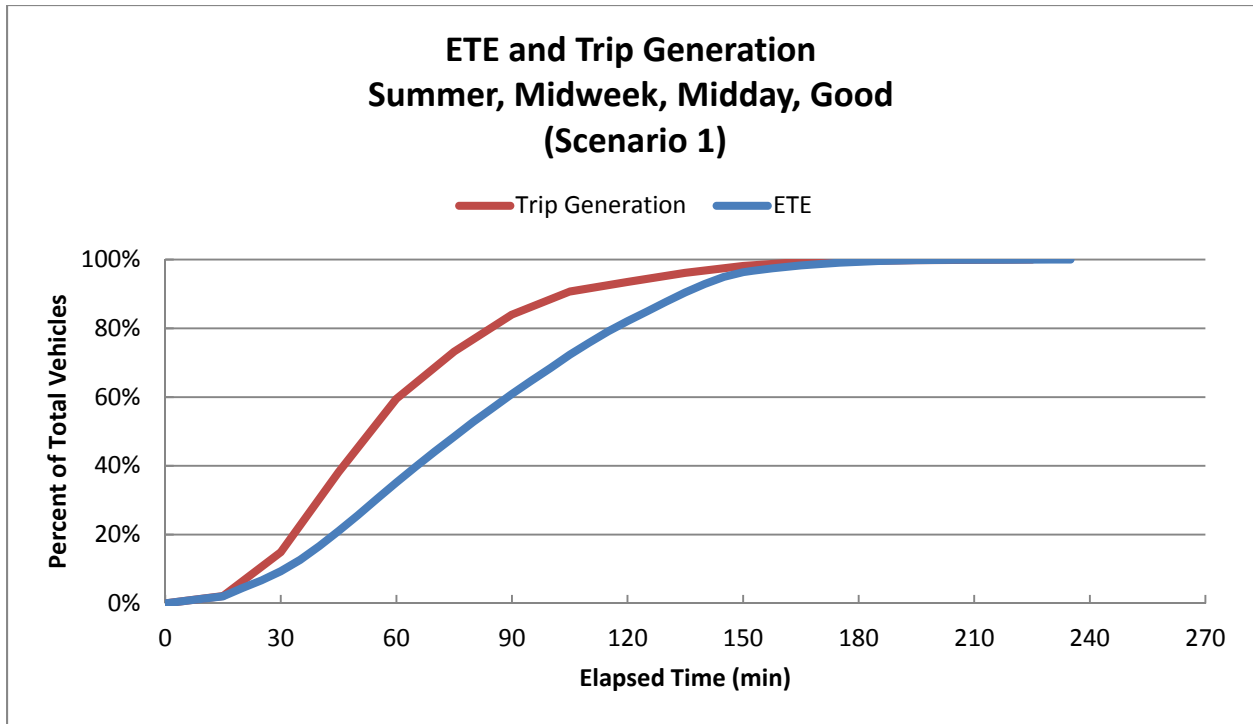


Figure J-1. ETE and Trip Generation: Summer, Midweek, Midday, Good Weather (Scenario 1)

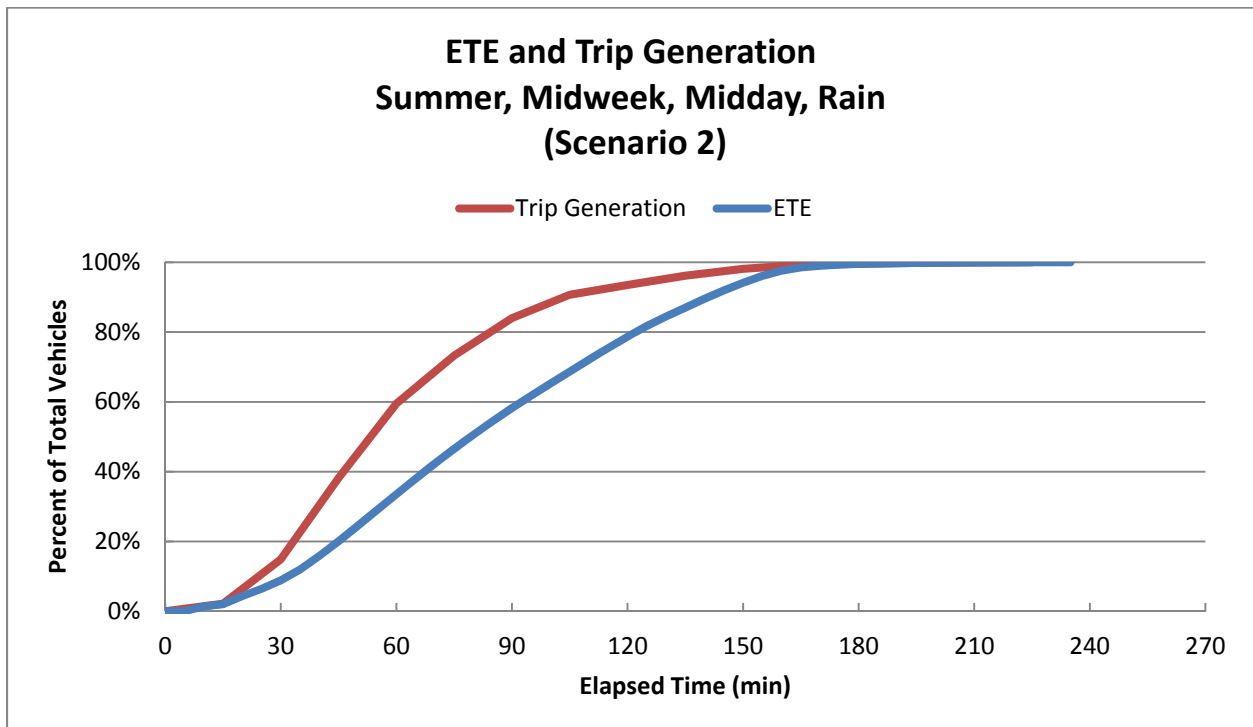


Figure J-2. ETE and Trip Generation: Summer, Midweek, Midday, Rain (Scenario 2)

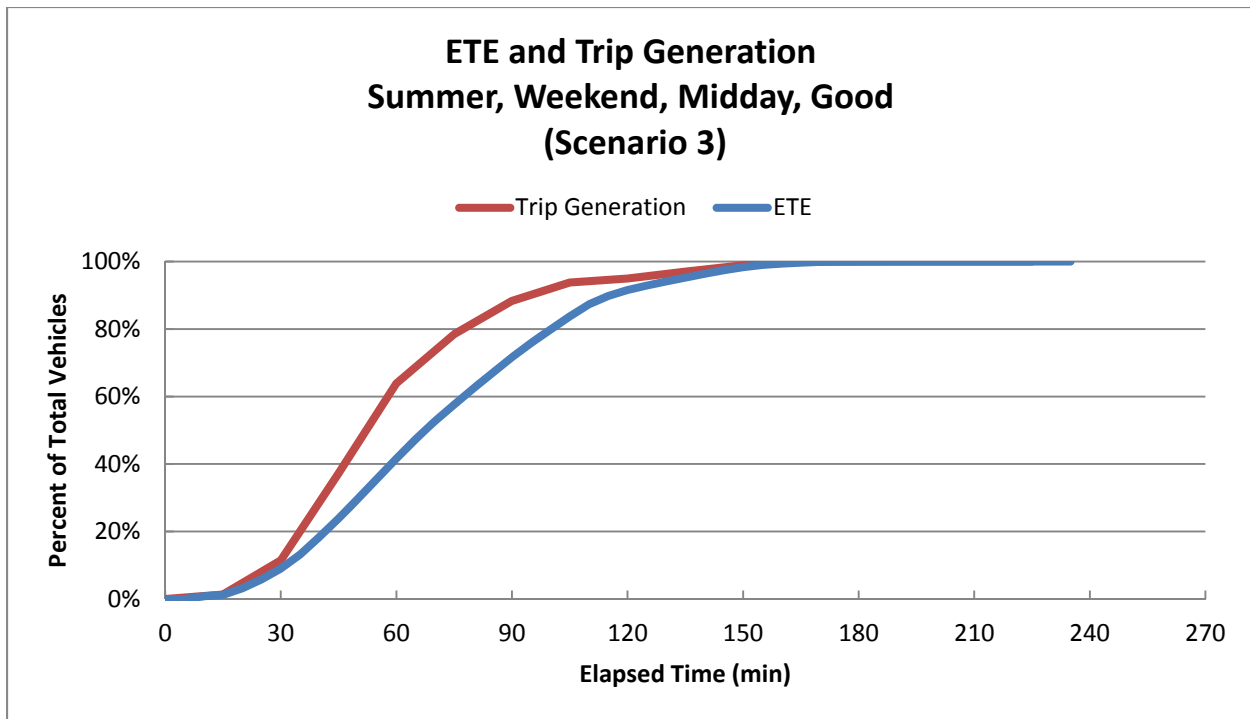


Figure J-3. ETE and Trip Generation: Summer, Weekend, Midday, Good Weather (Scenario 3)

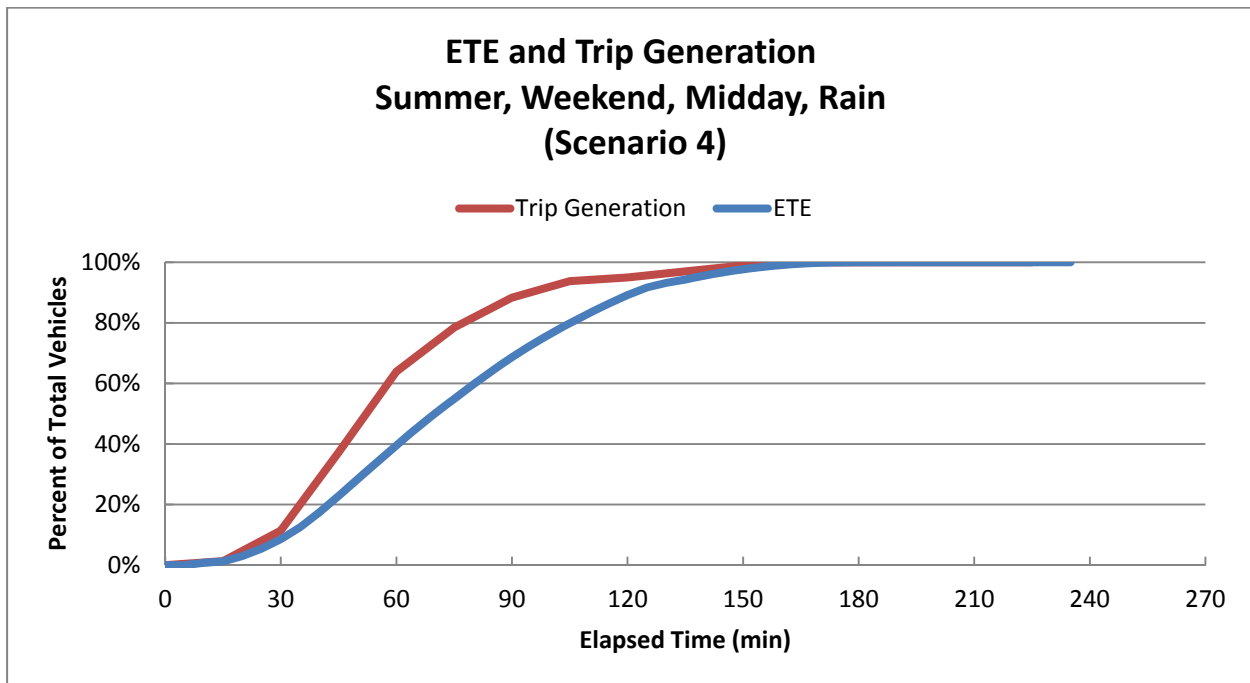


Figure J-4. ETE and Trip Generation: Summer, Weekend, Midday, Rain (Scenario 4)

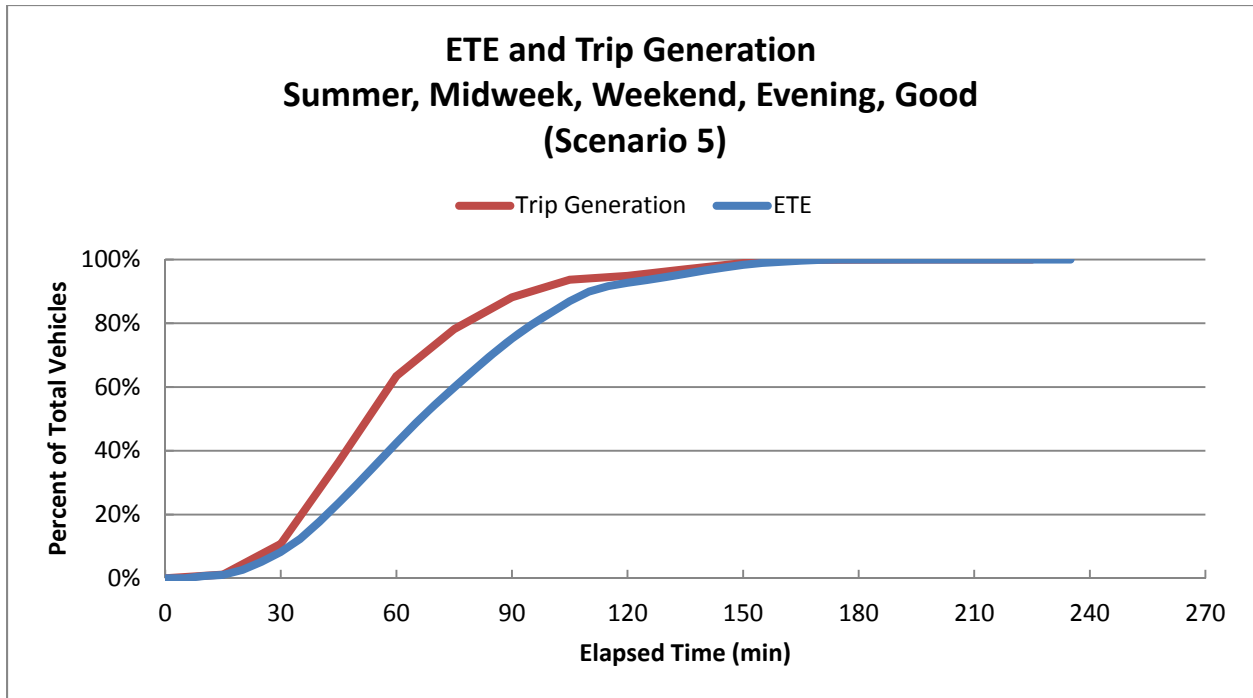


Figure J-5. ETE and Trip Generation: Summer, Midweek, Weekend, Evening, Good Weather (Scenario 5)

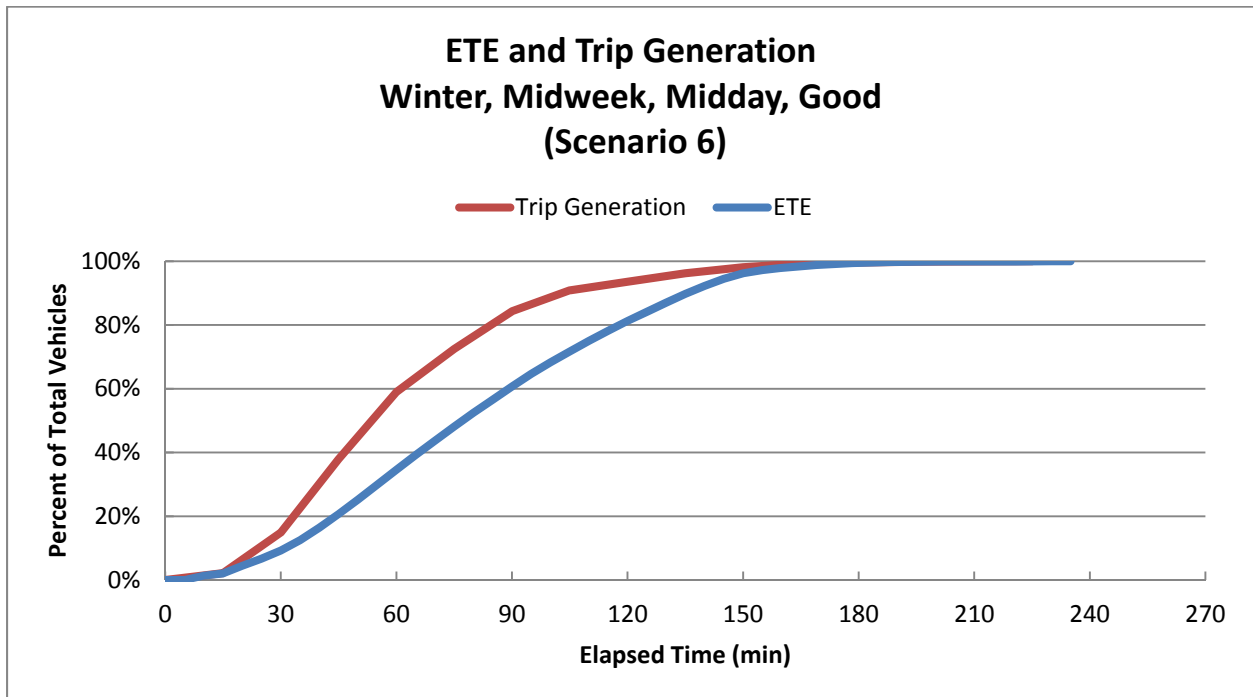


Figure J-6. ETE and Trip Generation: Winter, Midweek, Midday, Good Weather (Scenario 6)

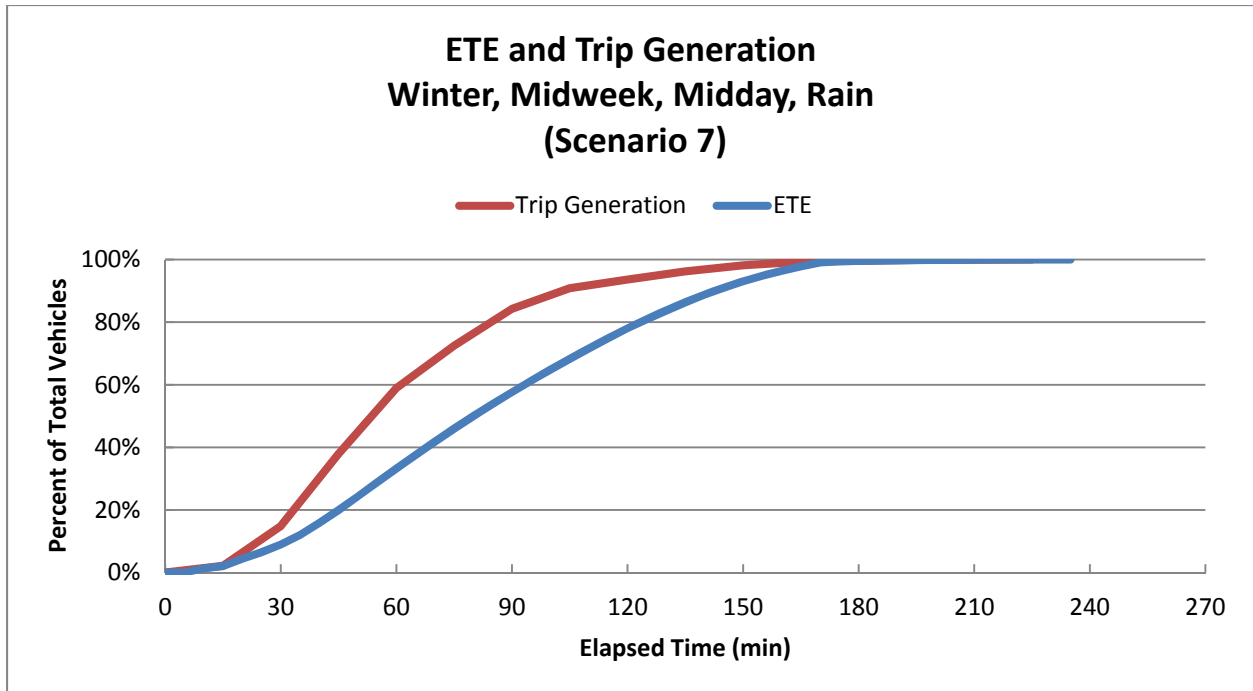


Figure J-7. ETE and Trip Generation: Winter, Midweek, Midday, Rain (Scenario 7)

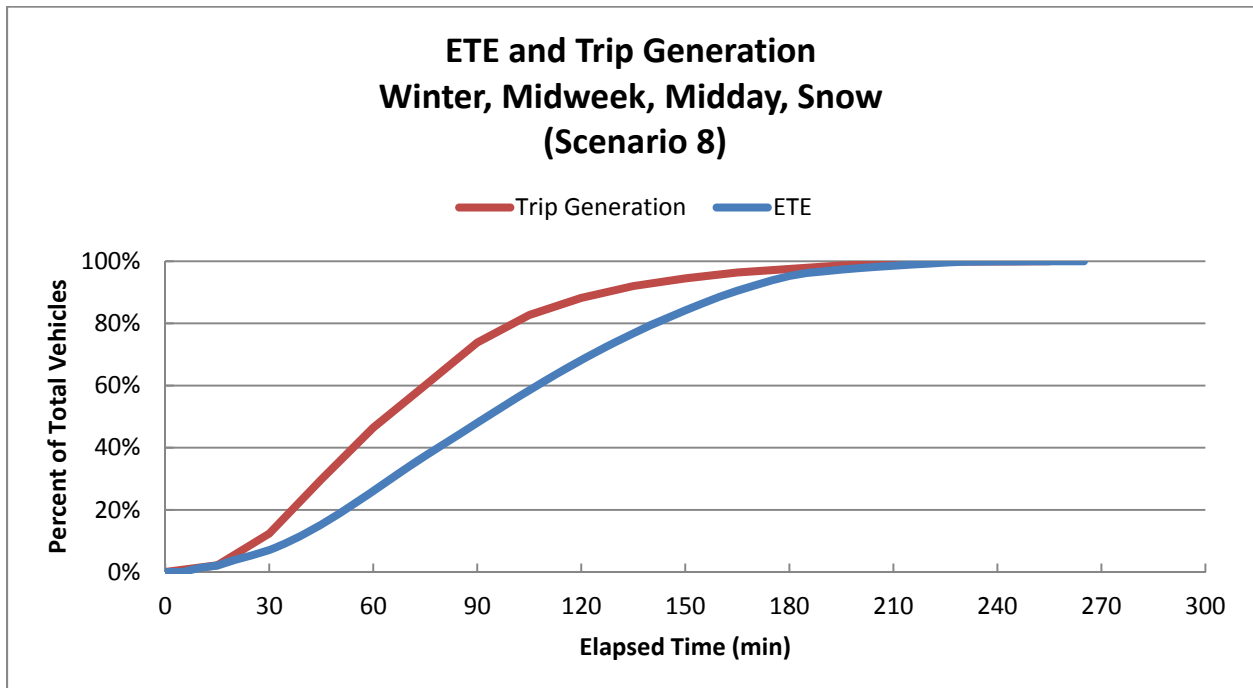


Figure J-8. ETE and Trip Generation: Winter, Midweek, Midday, Snow (Scenario 8)

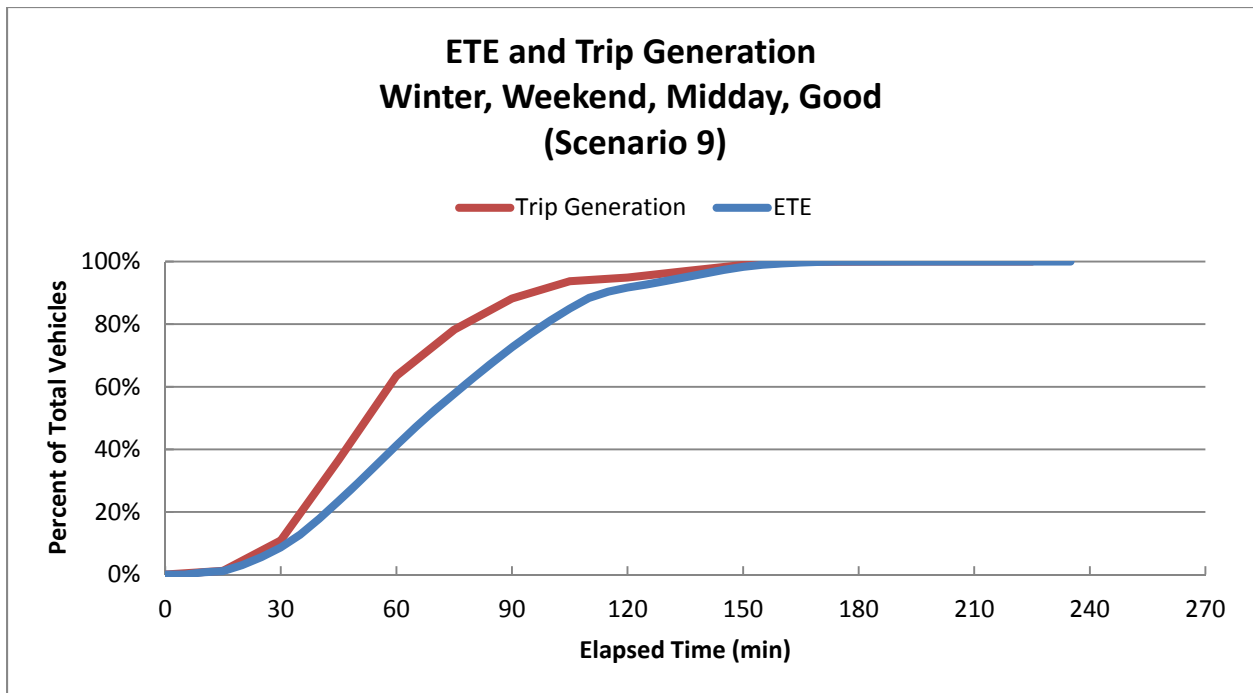


Figure J-9. ETE and Trip Generation: Winter, Weekend, Midday, Good Weather (Scenario 9)

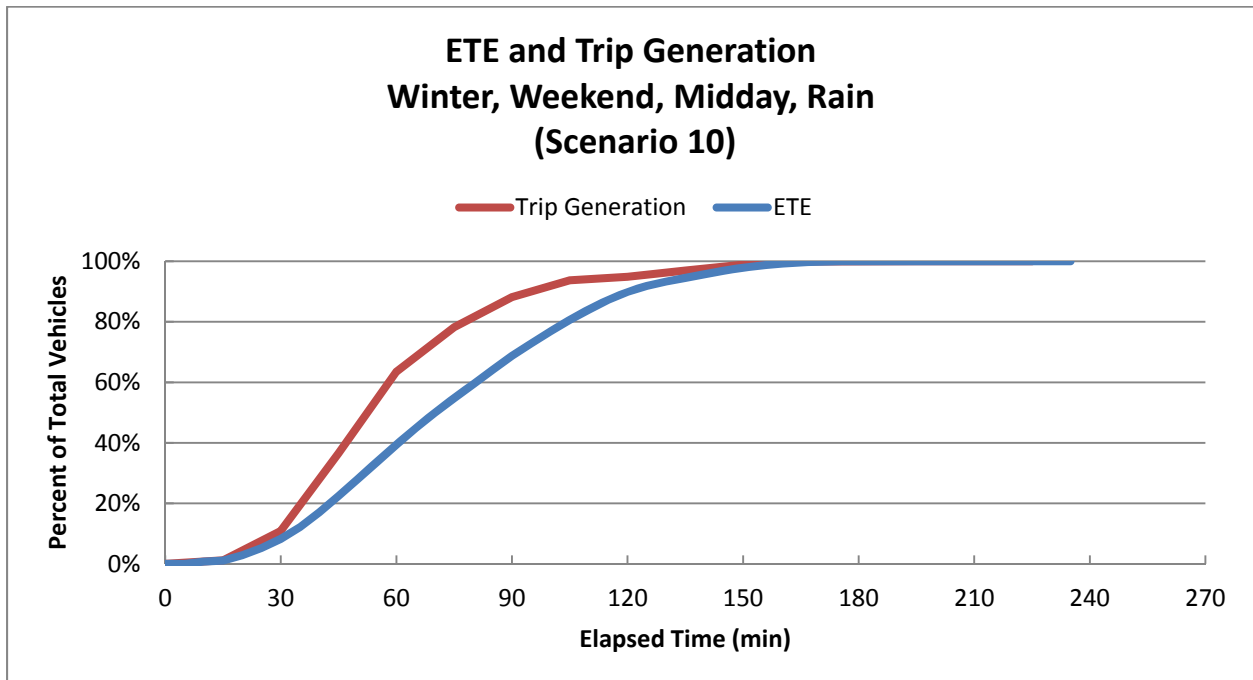


Figure J-10. ETE and Trip Generation: Winter, Weekend, Midday, Rain (Scenario 10)

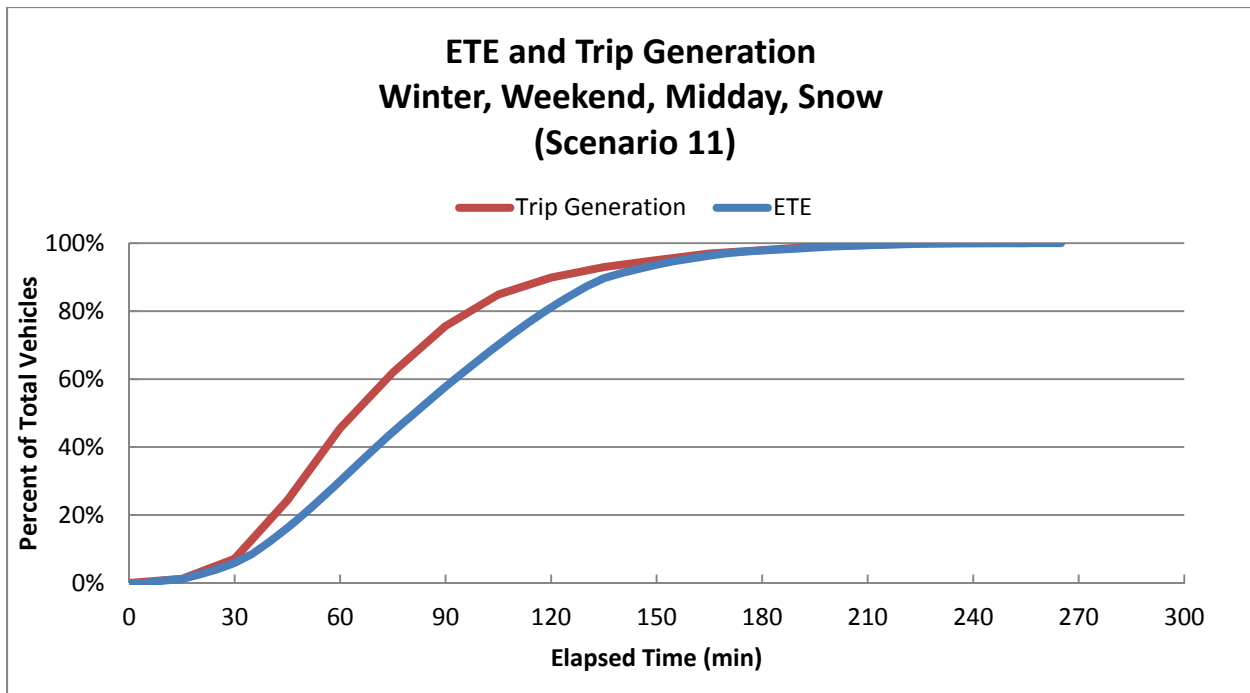


Figure J-11. ETE and Trip Generation: Winter, Weekend, Midday, Snow (Scenario 11)

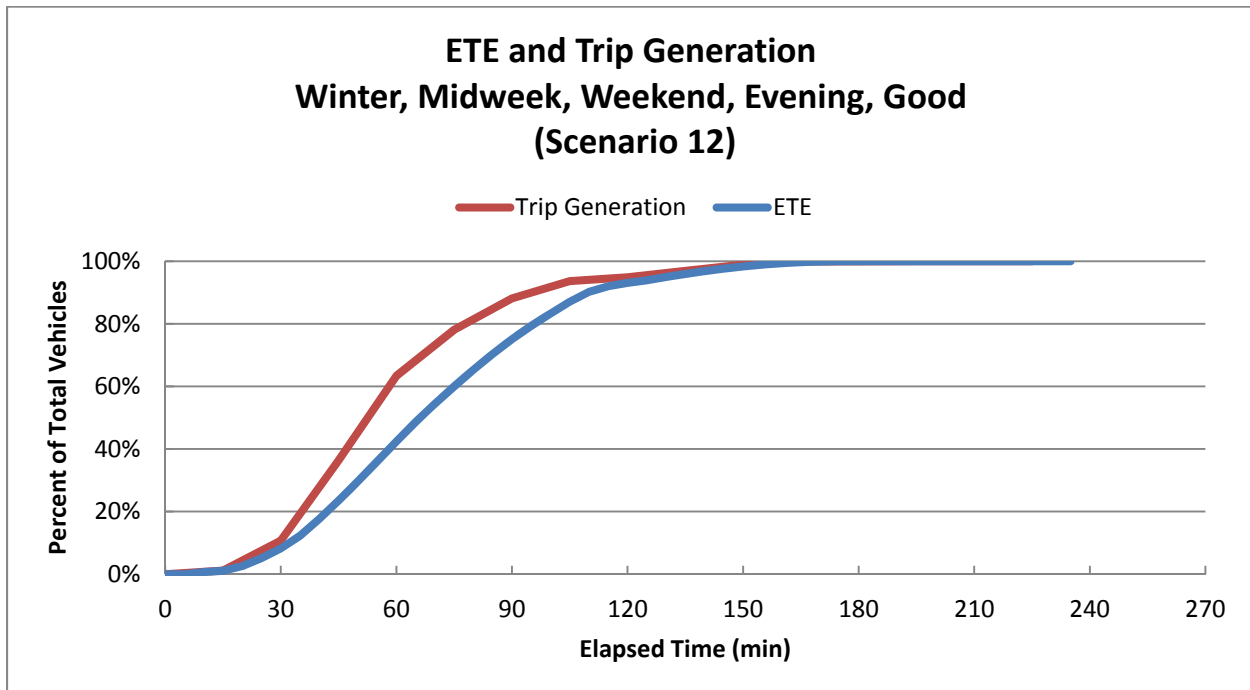


Figure J-12. ETE and Trip Generation: Winter, Midweek, Weekend, Evening, Good Weather (Scenario 12)

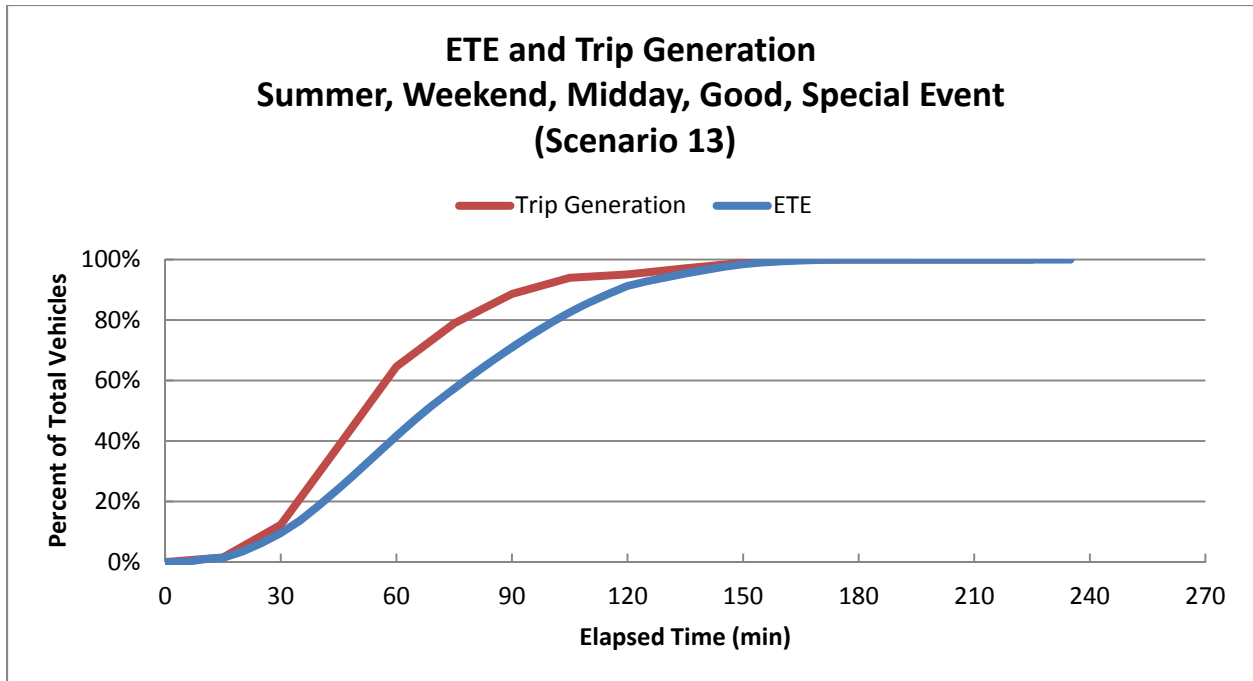


Figure J-13. ETE and Trip Generation: Summer, Weekend, Midday, Good Weather, Special Event (Scenario 13)

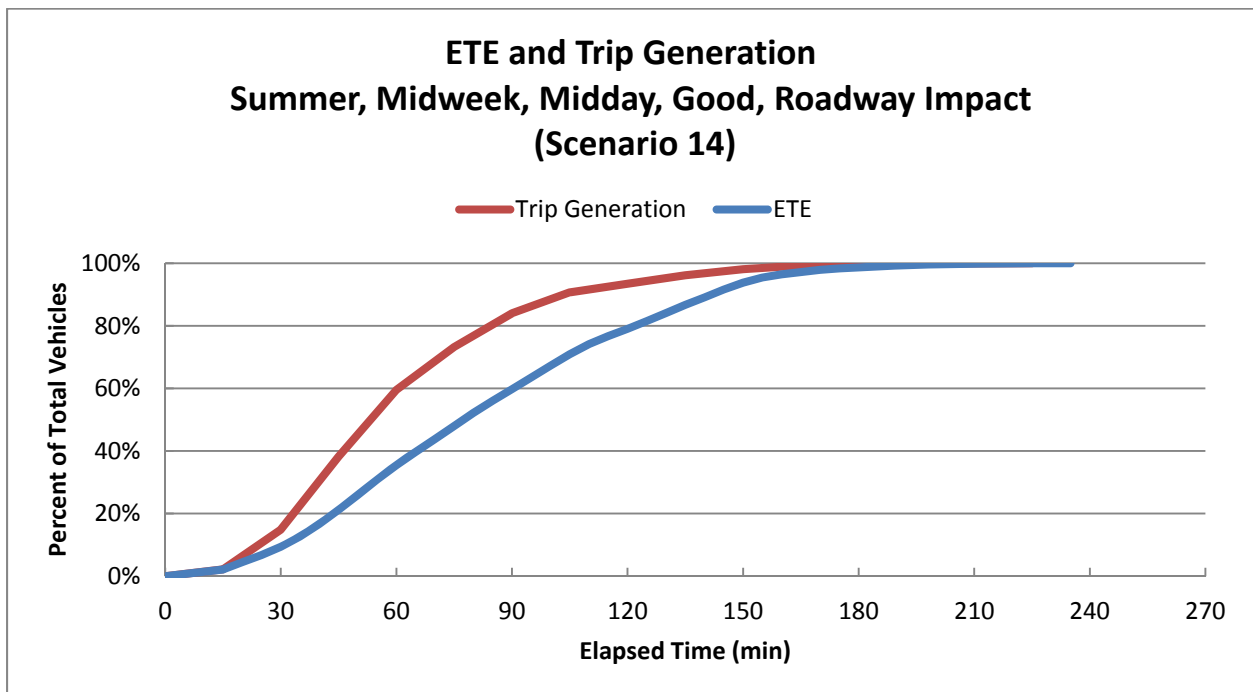


Figure J-14. ETE and Trip Generation: Summer, Midweek, Midday, Good Weather, Roadway Impact (Scenario 14)

APPENDIX K

Evacuation Roadway Network

K. EVACUATION ROADWAY NETWORK

As discussed in Section 1.3, a link-node analysis network was constructed to model the roadway network within the study area. Figure K-1 provides an overview of the link-node analysis network. The figure has been divided up into 44 more detailed figures (Figure K-2 through Figure K-45) which show each of the links and nodes in the network.

The analysis network was calibrated using the observations made during the field survey conducted in February 2012. Table K-1 lists the characteristics of each roadway section modeled in the ETE analysis. Each link is identified by its road name and the upstream and downstream node numbers. The geographic location of each link can be observed by referencing the grid map number provided in Table K-1. The roadway type identified in Table K-1 is generally based on the following criteria:

- Freeway: limited access highway, 2 or more lanes in each direction, high free flow speeds
- Freeway ramp: ramp on to or off of a limited access highway
- Major arterial: 3 or more lanes in each direction
- Minor arterial: 2 or more lanes in each direction
- Collector: single lane in each direction
- Local roadways: single lane in each direction, local roads with low free flow speeds

The term, “No. of Lanes” in Table K-1 identifies the number of lanes that extend throughout the length of the link. Many links have additional lanes on the immediate approach to an intersection (turn pockets); these have been recorded and entered into the input stream for the DYNEV II System.

As discussed in Section 1.3, lane width and shoulder width were not physically measured during the road survey. Rather, estimates of these measures were based on visual observations and recorded images.

Table K-2 identifies each node in the network that is controlled and the type of control (stop sign, yield sign, pre-timed signal, actuated signal, traffic control point) at that node. Uncontrolled nodes are not included in Table K-2. The location of each node can be observed by referencing the grid map number provided.

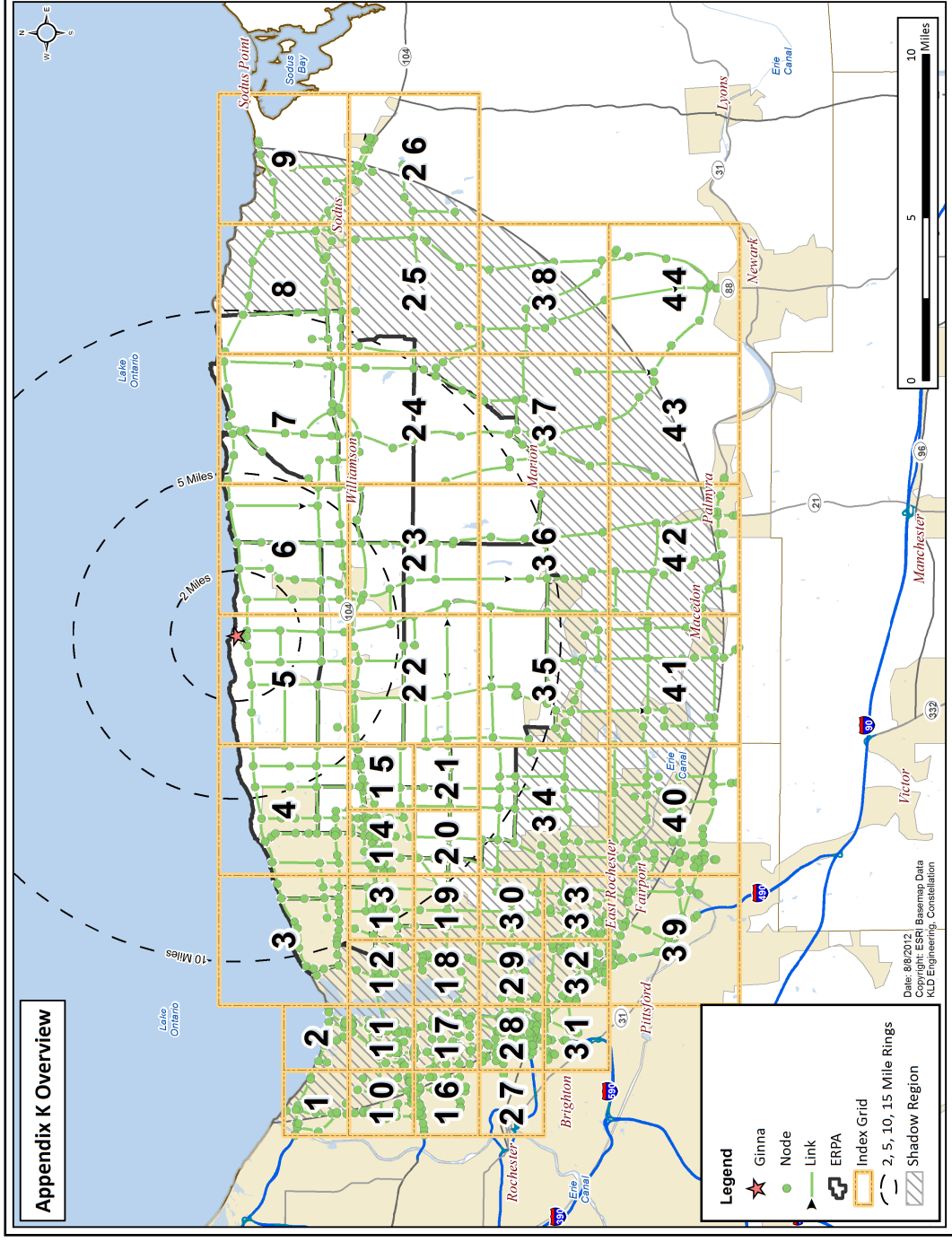


Figure K-1. Ginna Nuclear Power Plant Link-Node Analysis Network

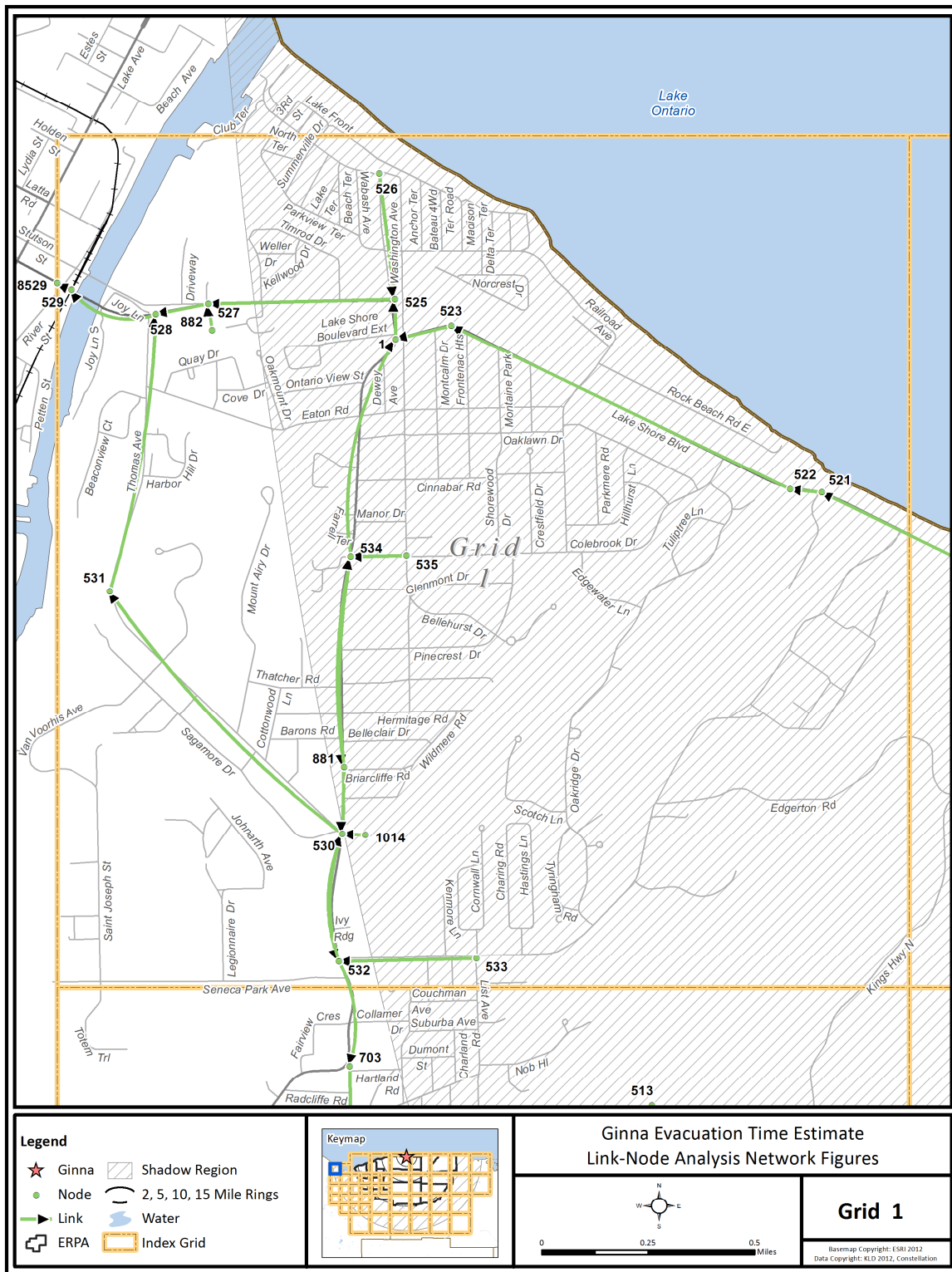


Figure K-2. Link-Node Analysis Network – Grid 1

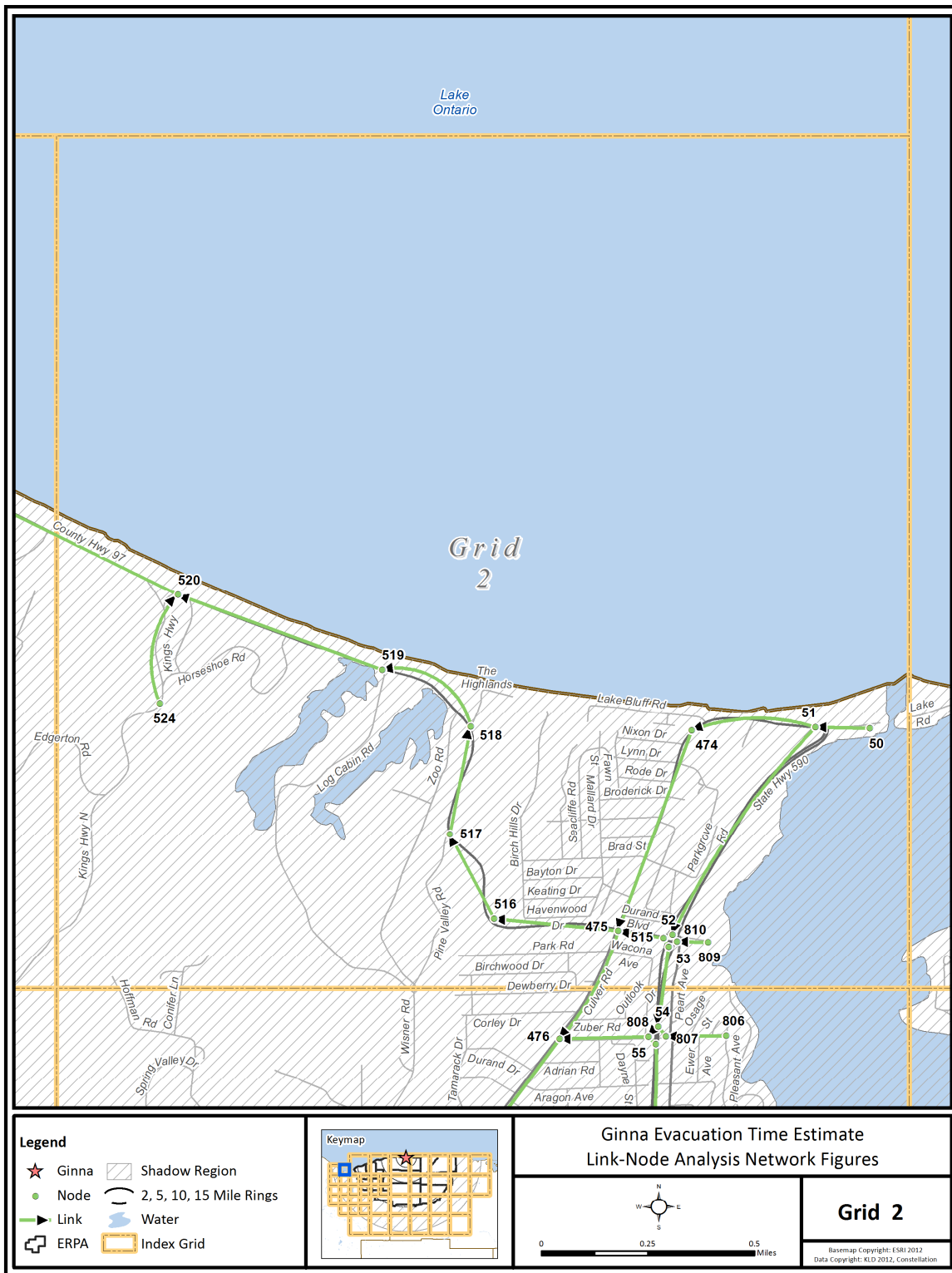


Figure K-3. Link-Node Analysis Network – Grid 2

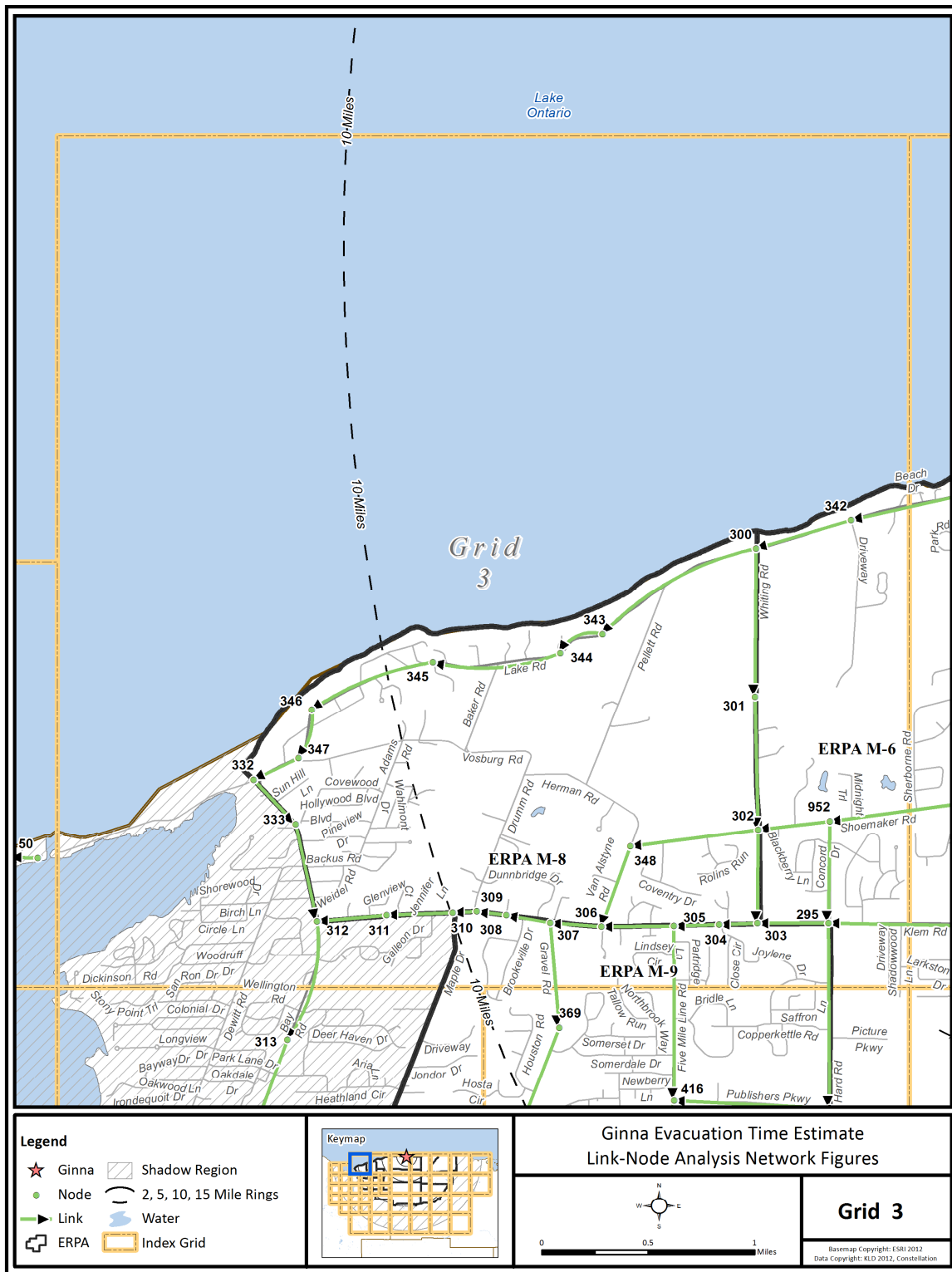


Figure K-4. Link-Node Analysis Network – Grid 3

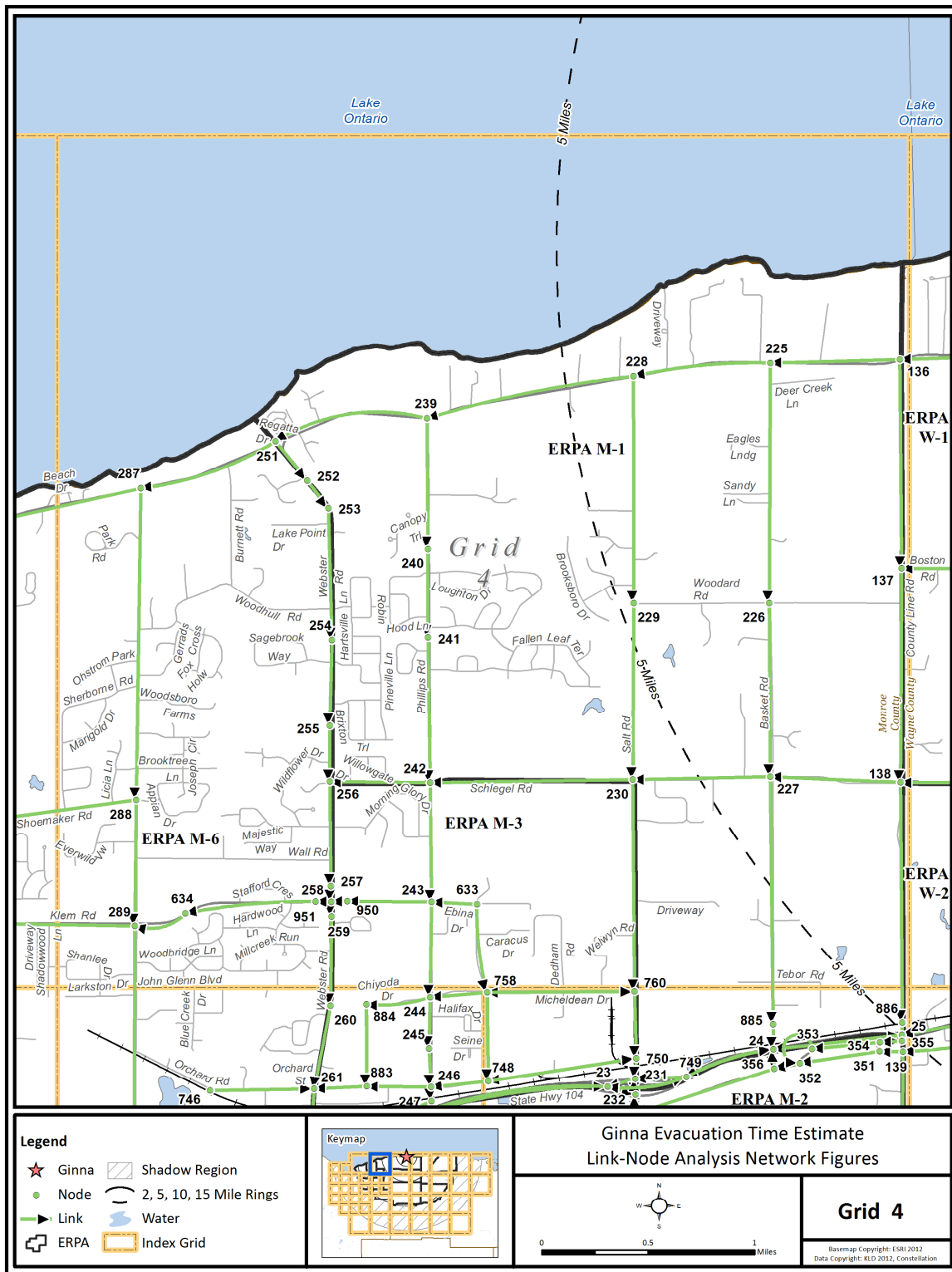


Figure K-5. Link-Node Analysis Network – Grid 4

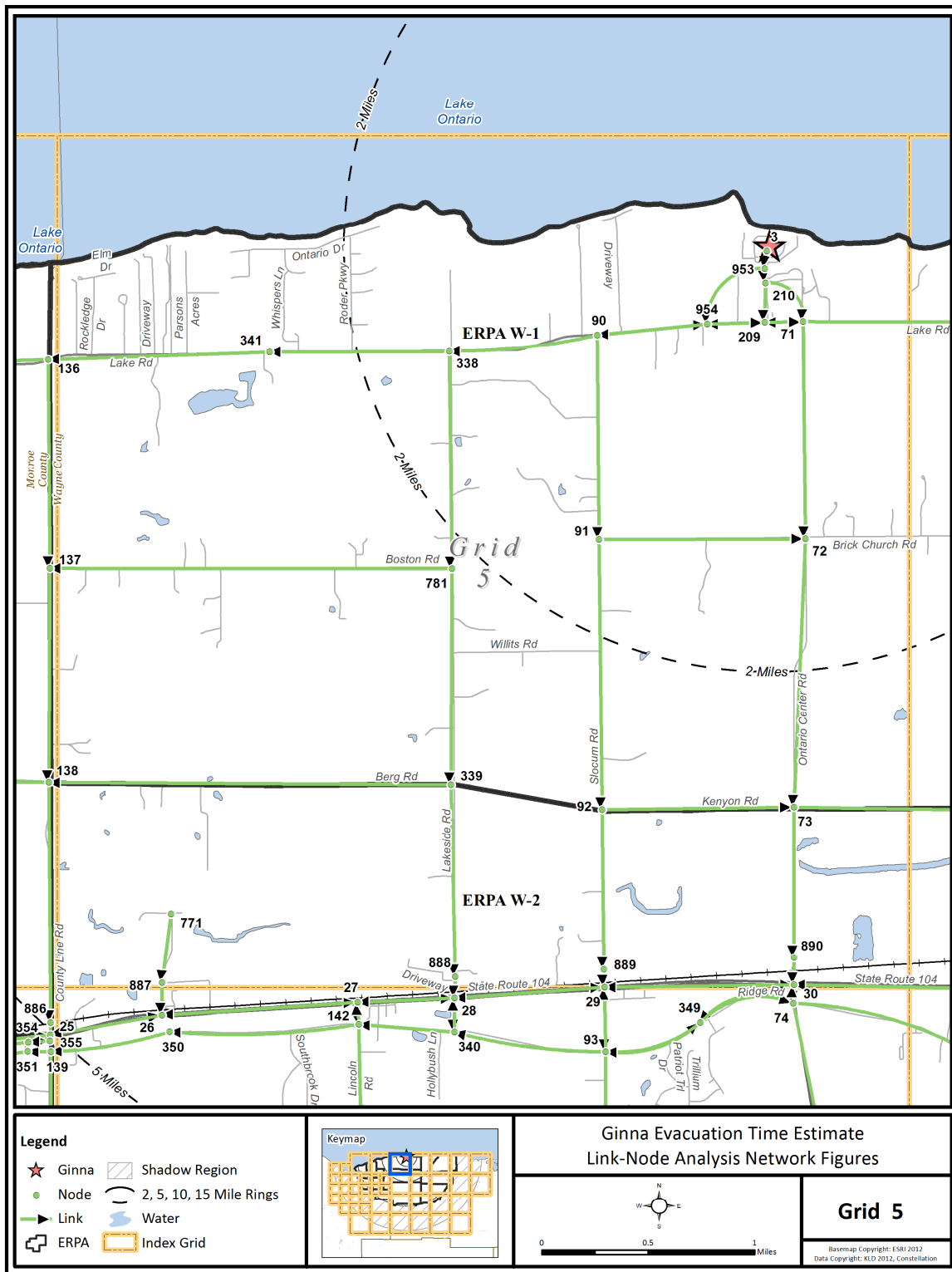


Figure K-6. Link-Node Analysis Network – Grid 5

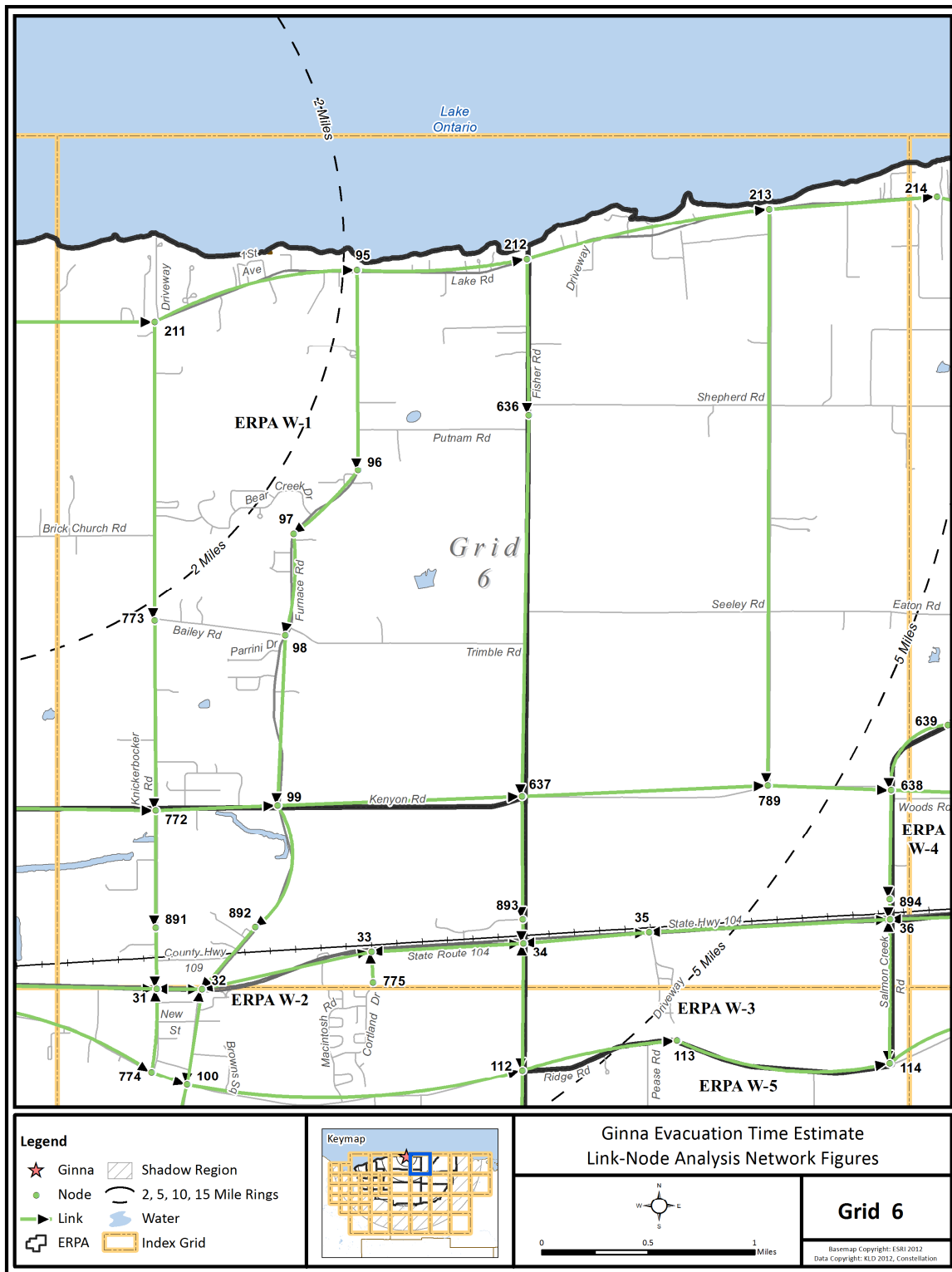


Figure K-7. Link-Node Analysis Network – Grid 6

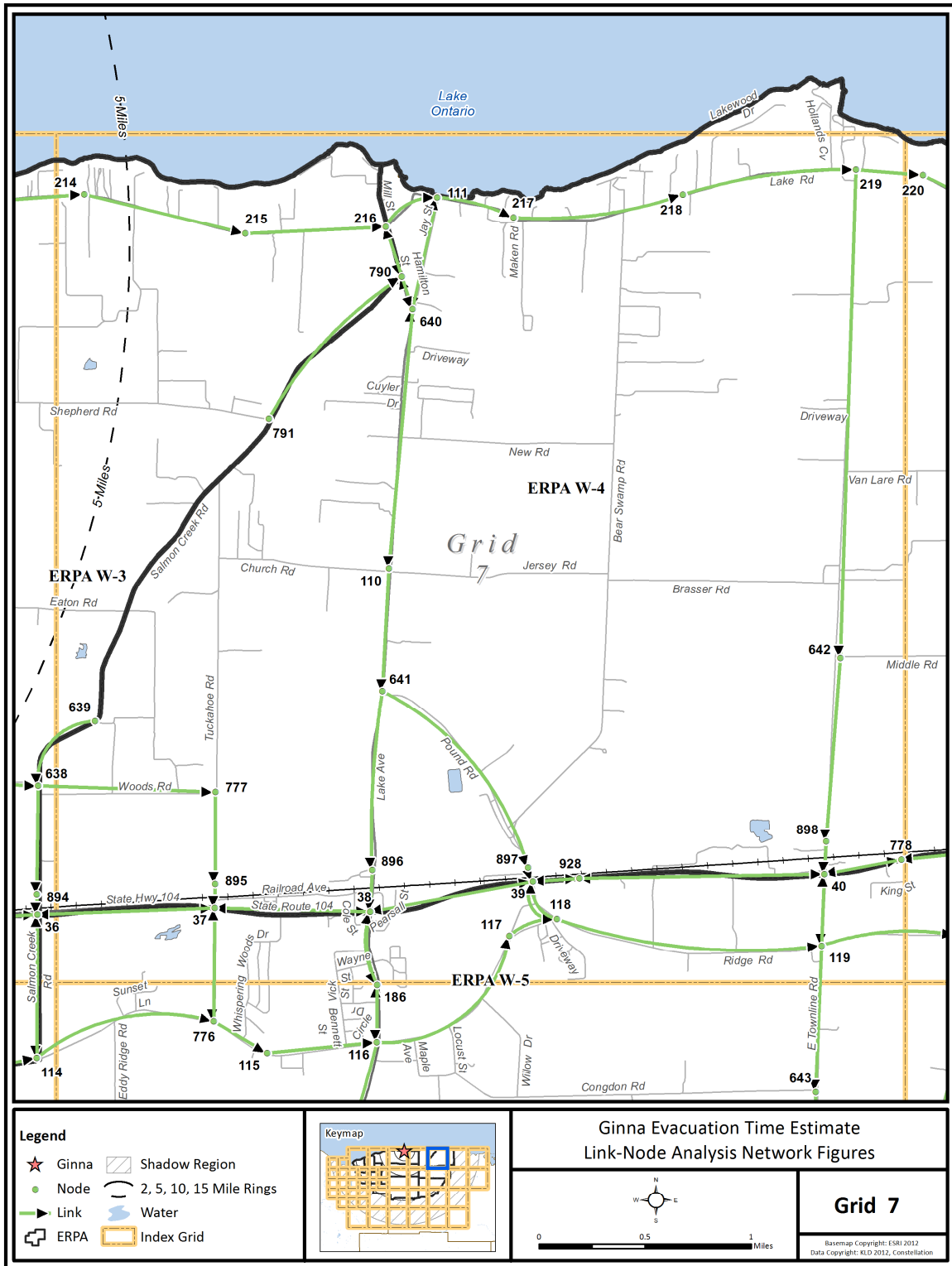


Figure K-8. Link-Node Analysis Network – Grid 7



Figure K-9. Link-Node Analysis Network – Grid 8

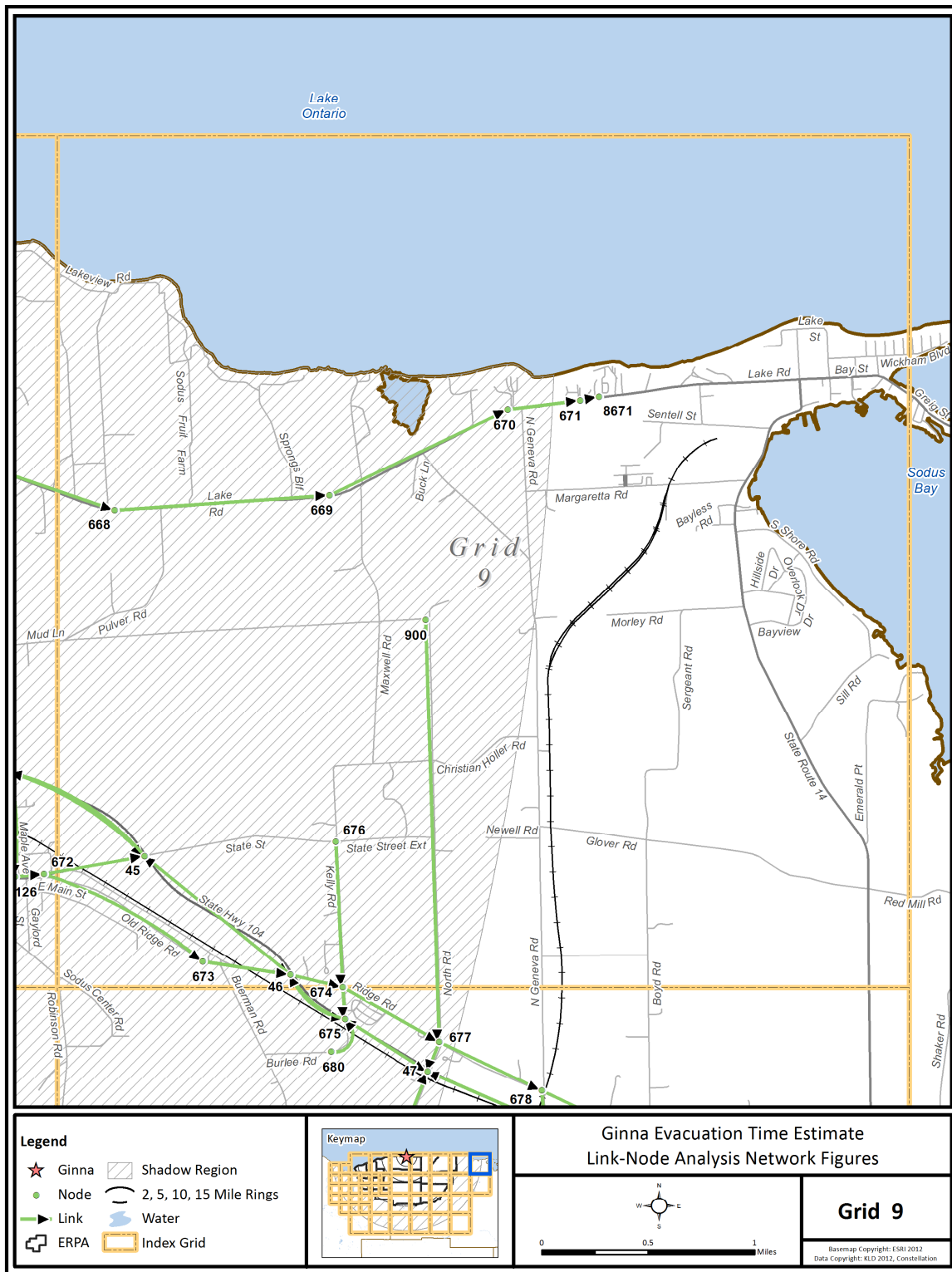


Figure K-10. Link-Node Analysis Network – Grid 9

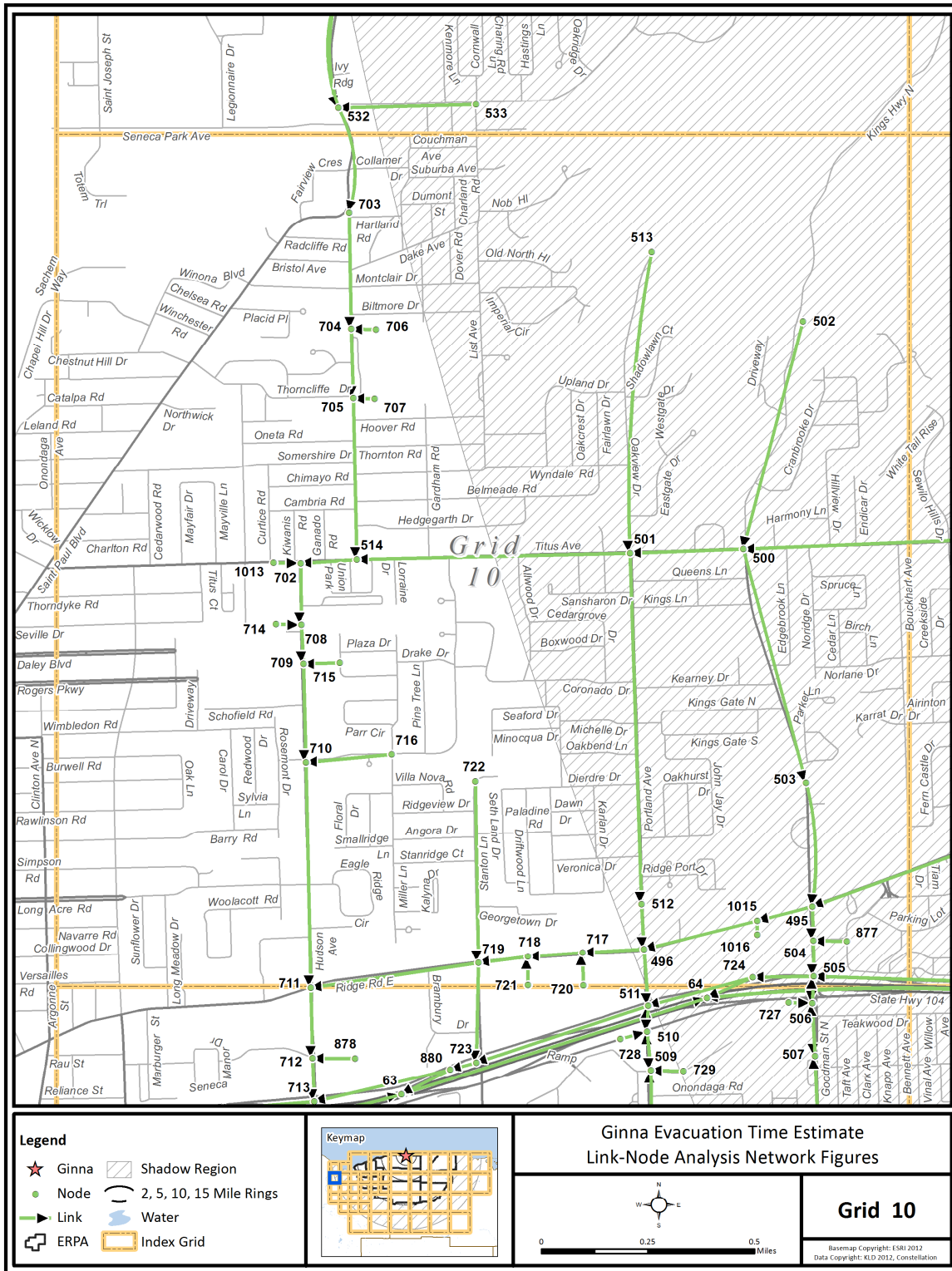


Figure K-11. Link-Node Analysis Network – Grid 10

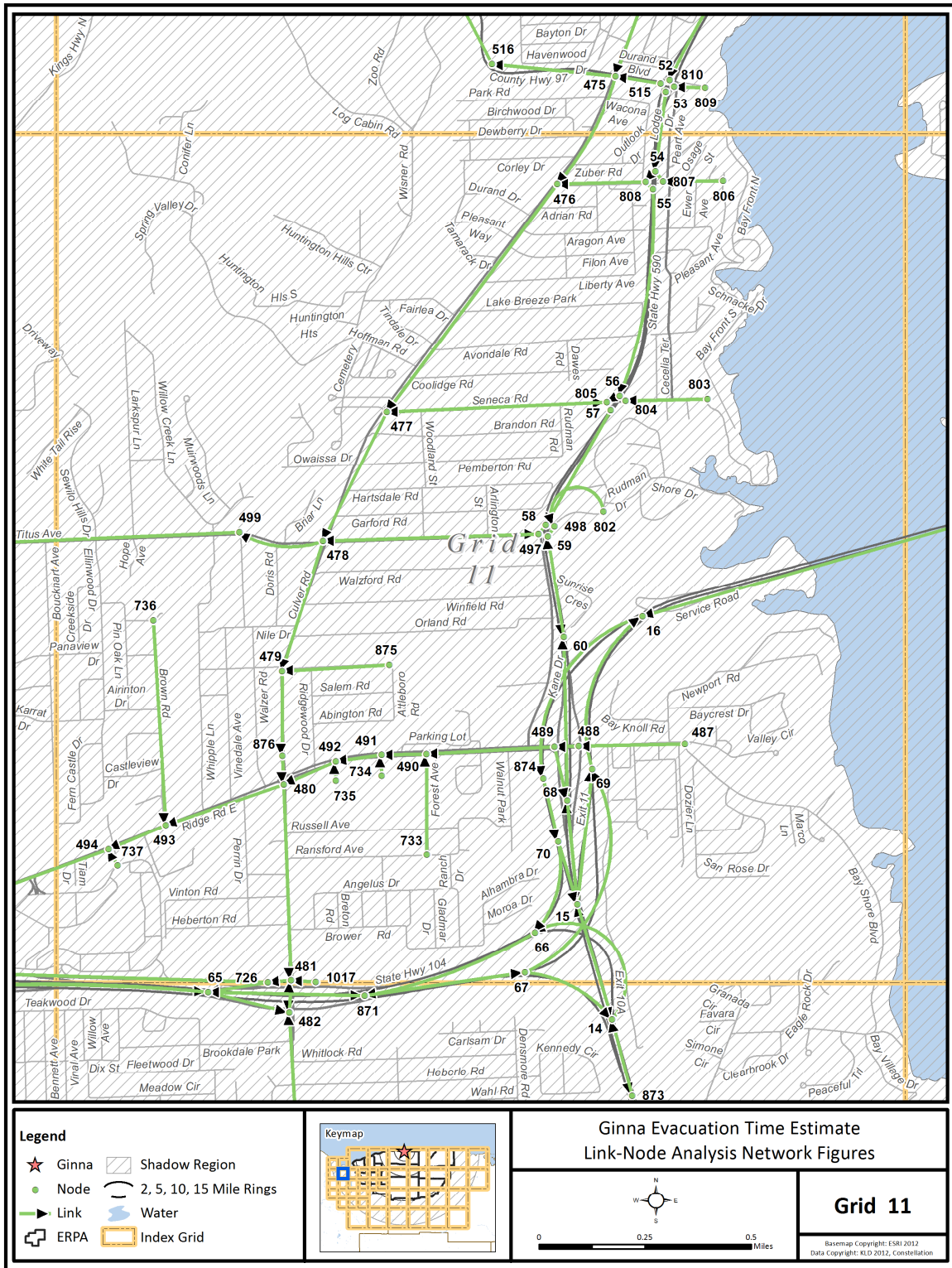


Figure K-12. Link-Node Analysis Network – Grid 11

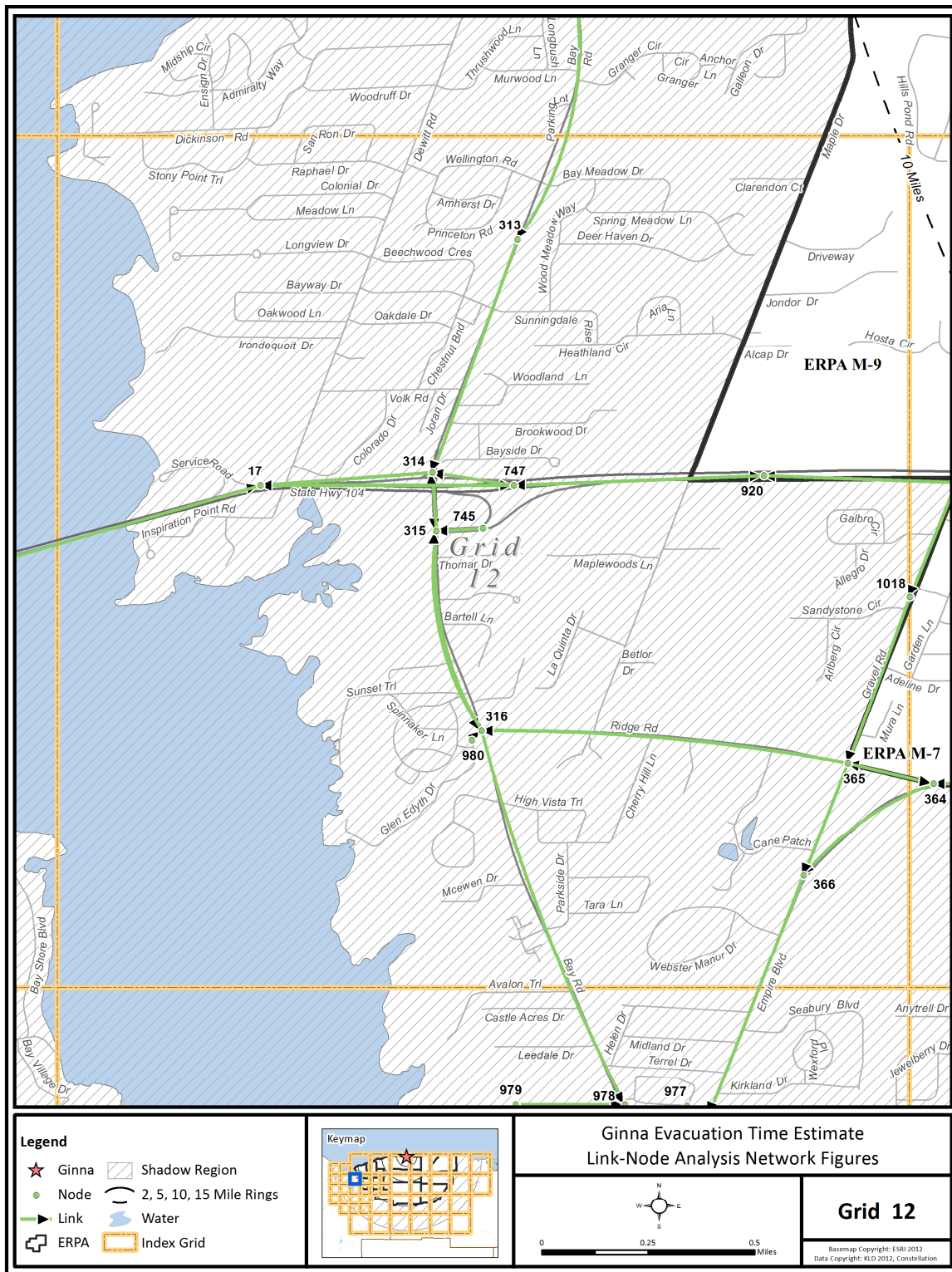


Figure K-13. Link-Node Analysis Network – Grid 12

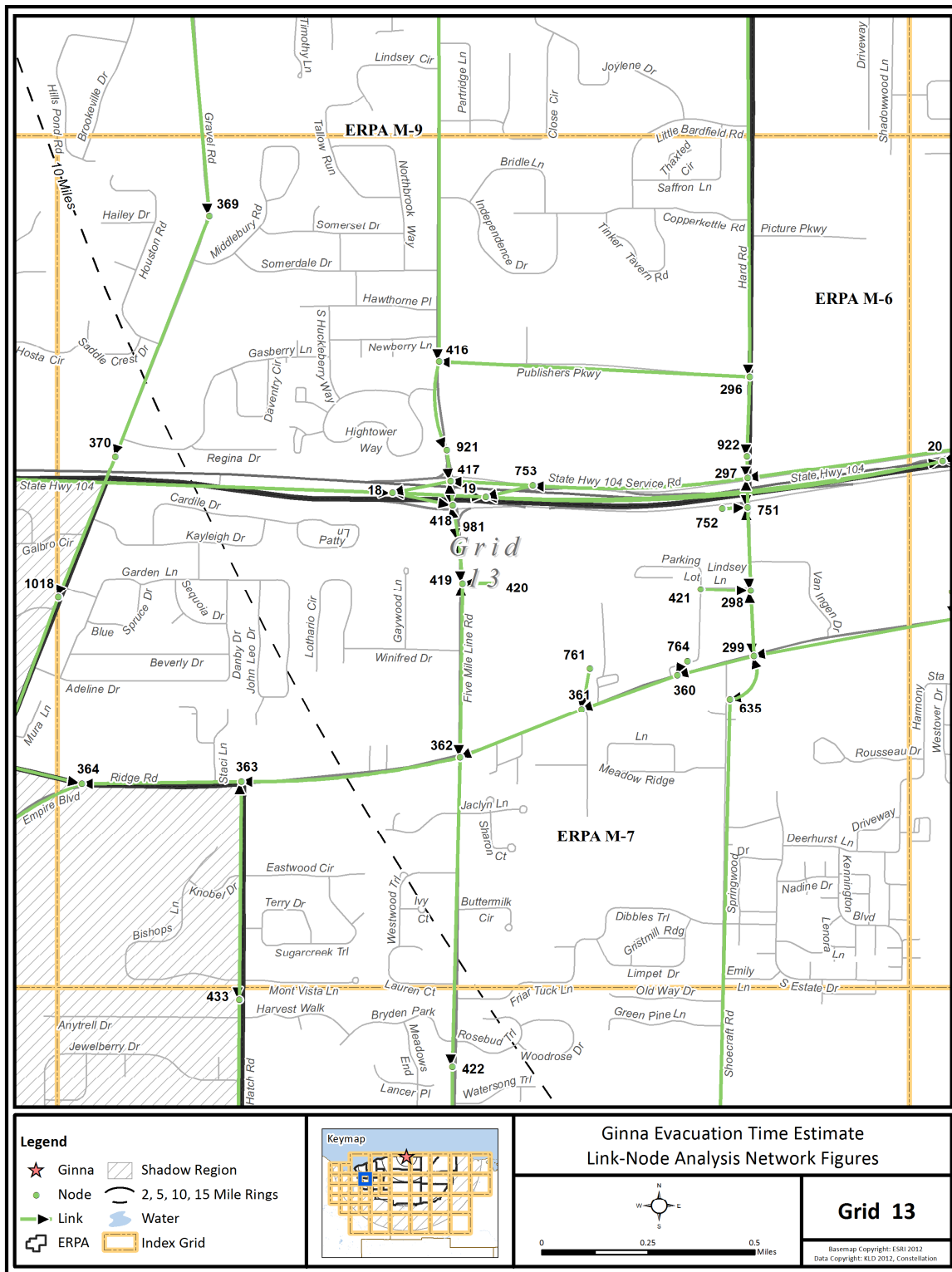


Figure K-14. Link-Node Analysis Network – Grid 13

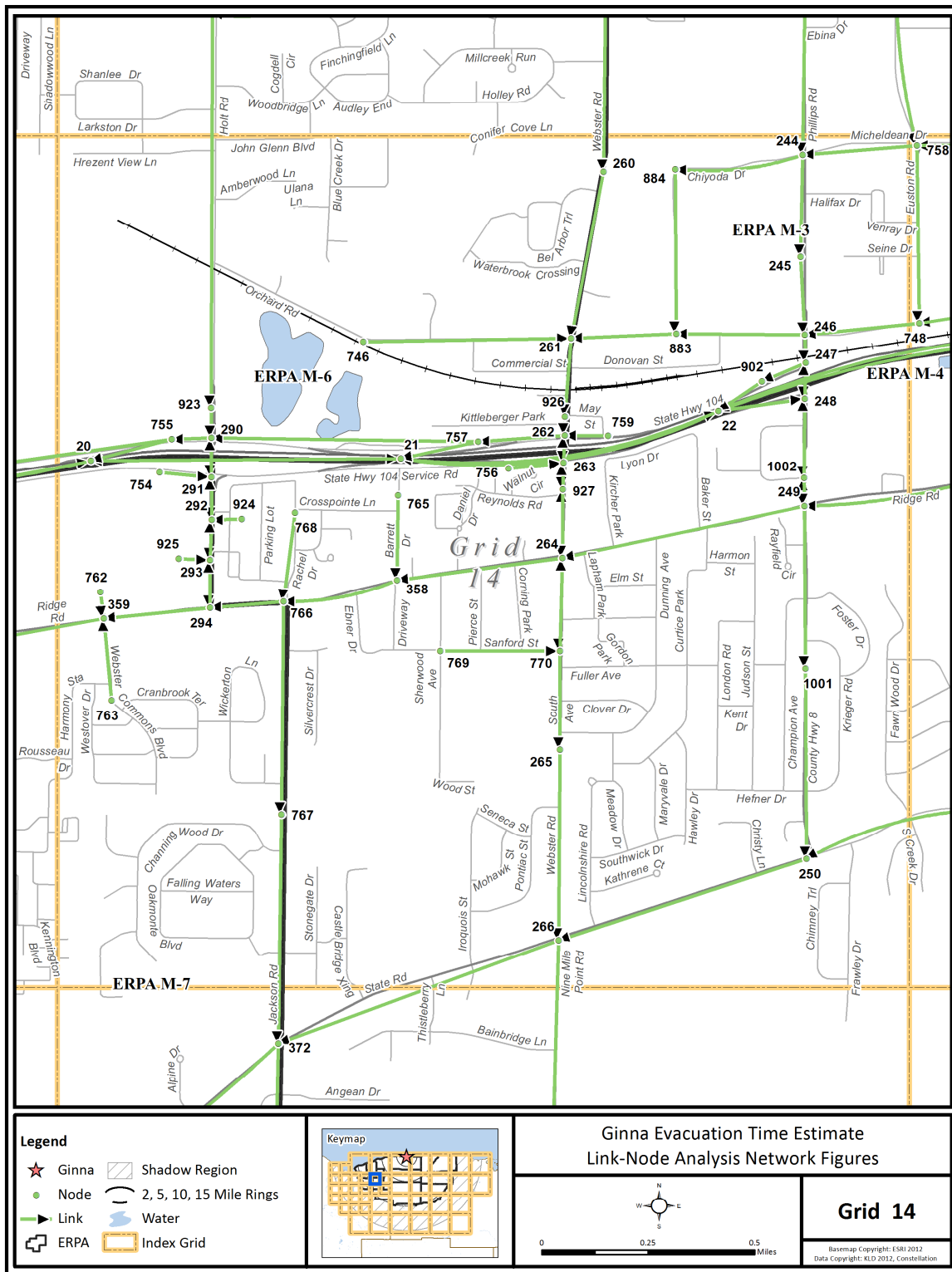


Figure K-15. Link-Node Analysis Network – Grid 14

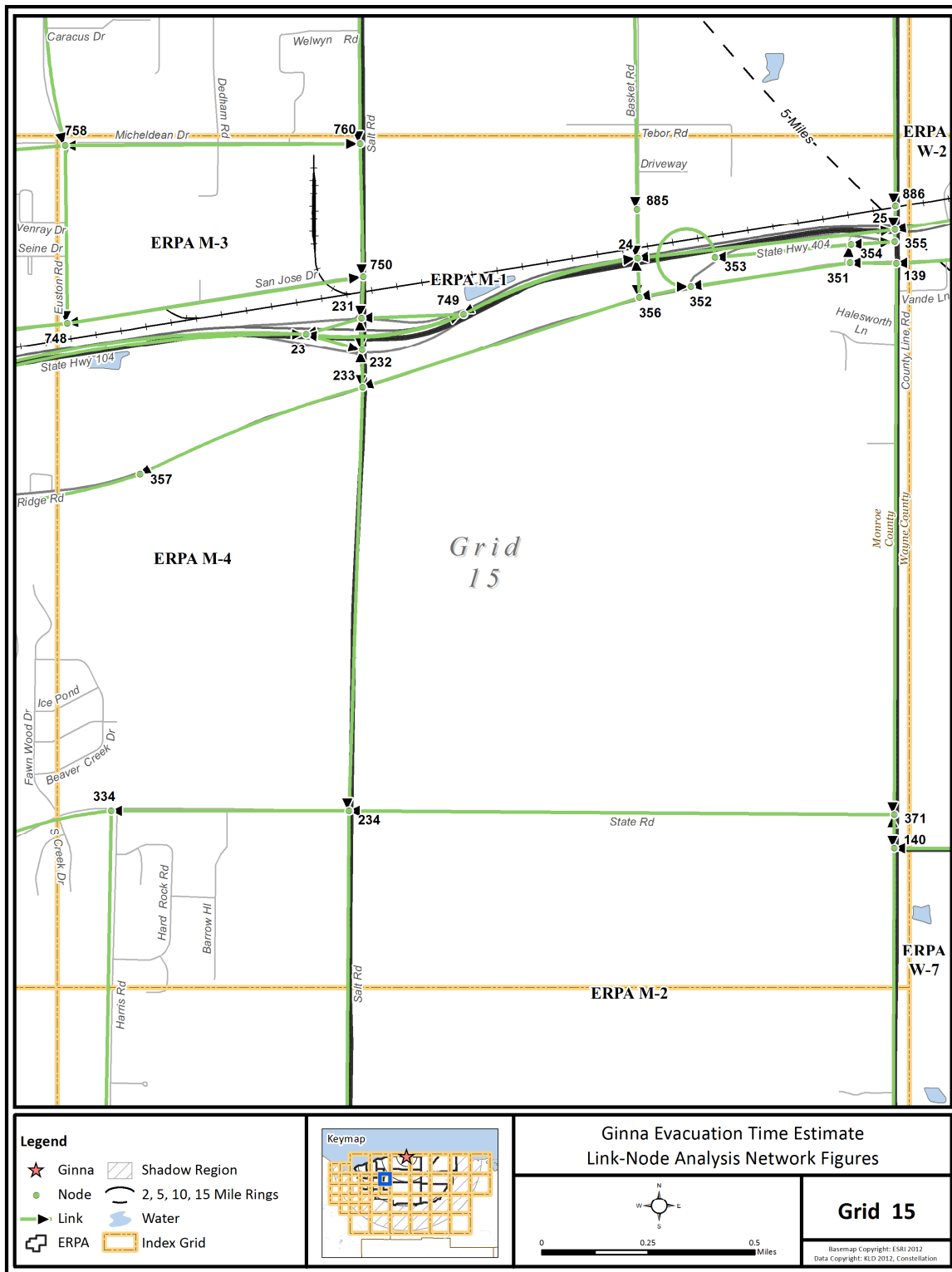
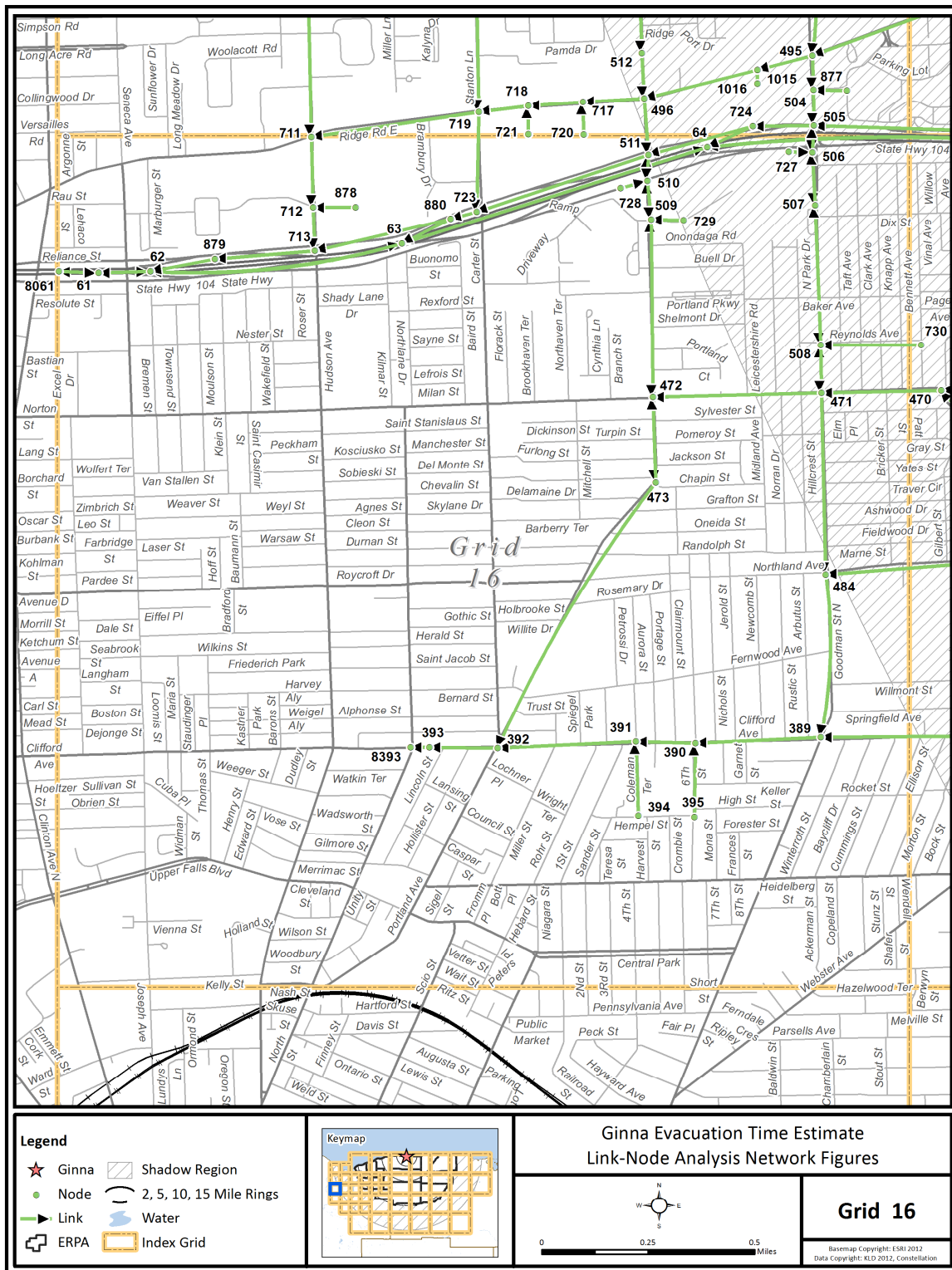


Figure K-16. Link-Node Analysis Network – Grid 15



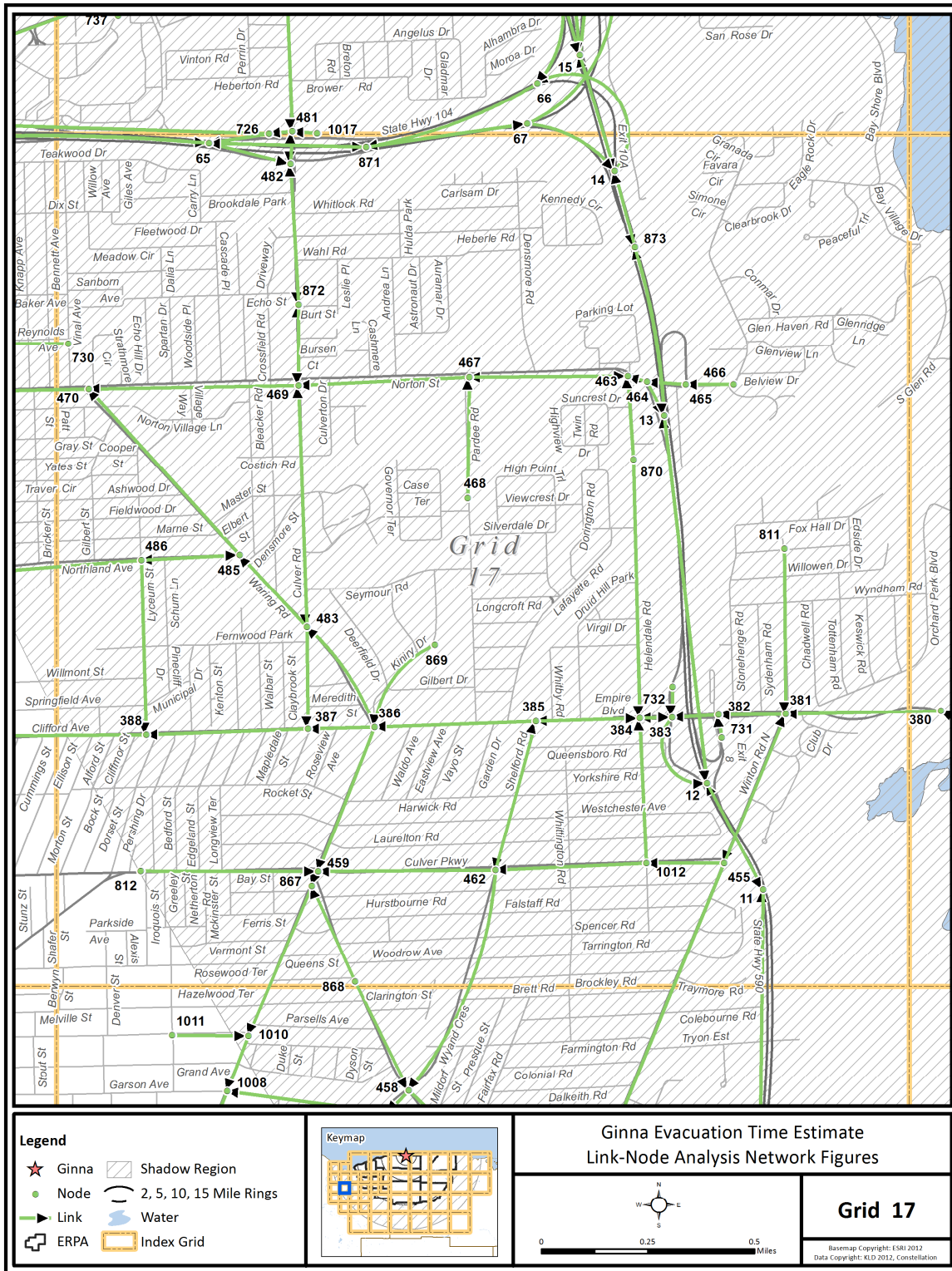


Figure K-18. Link-Node Analysis Network – Grid 17

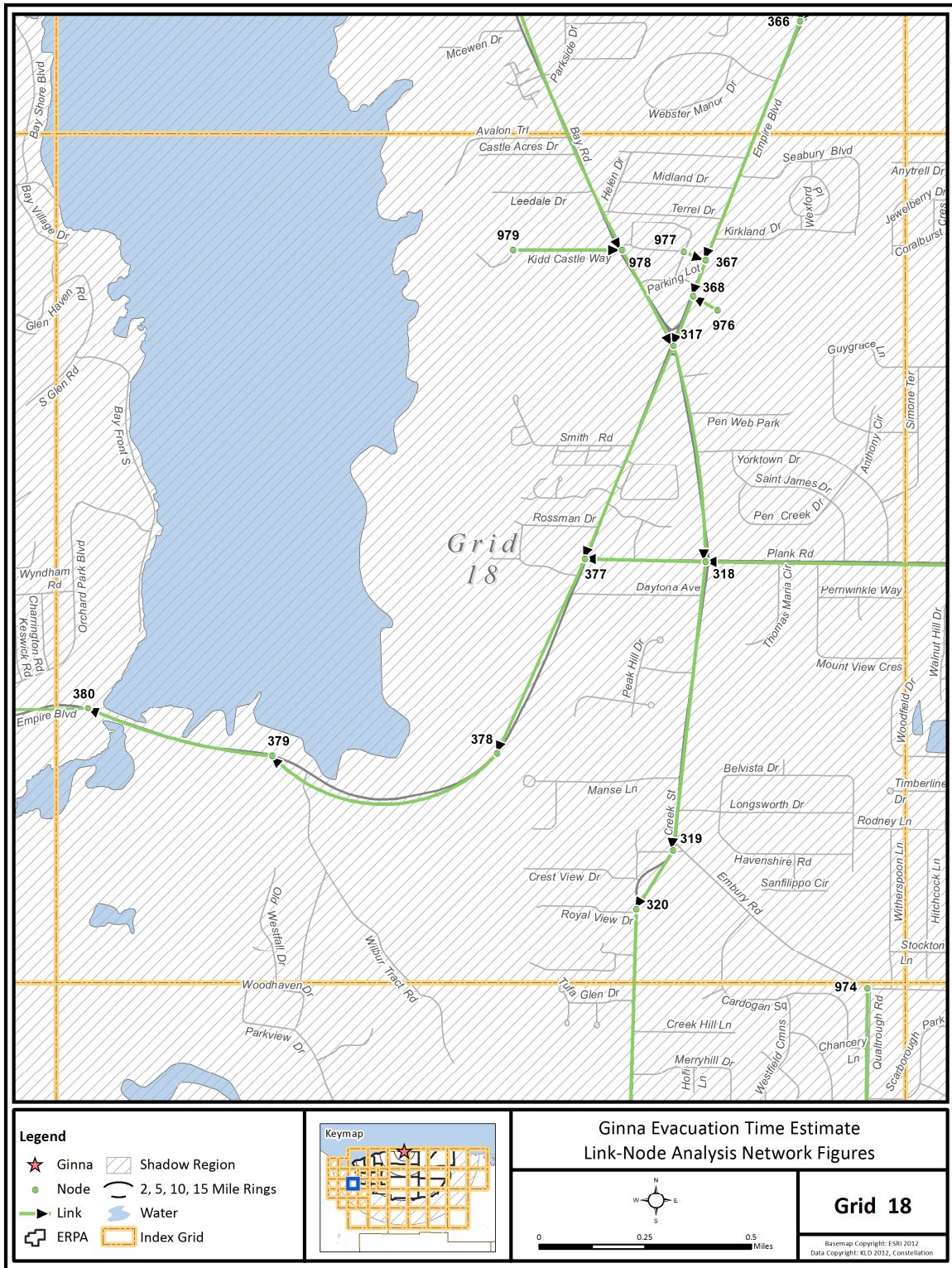
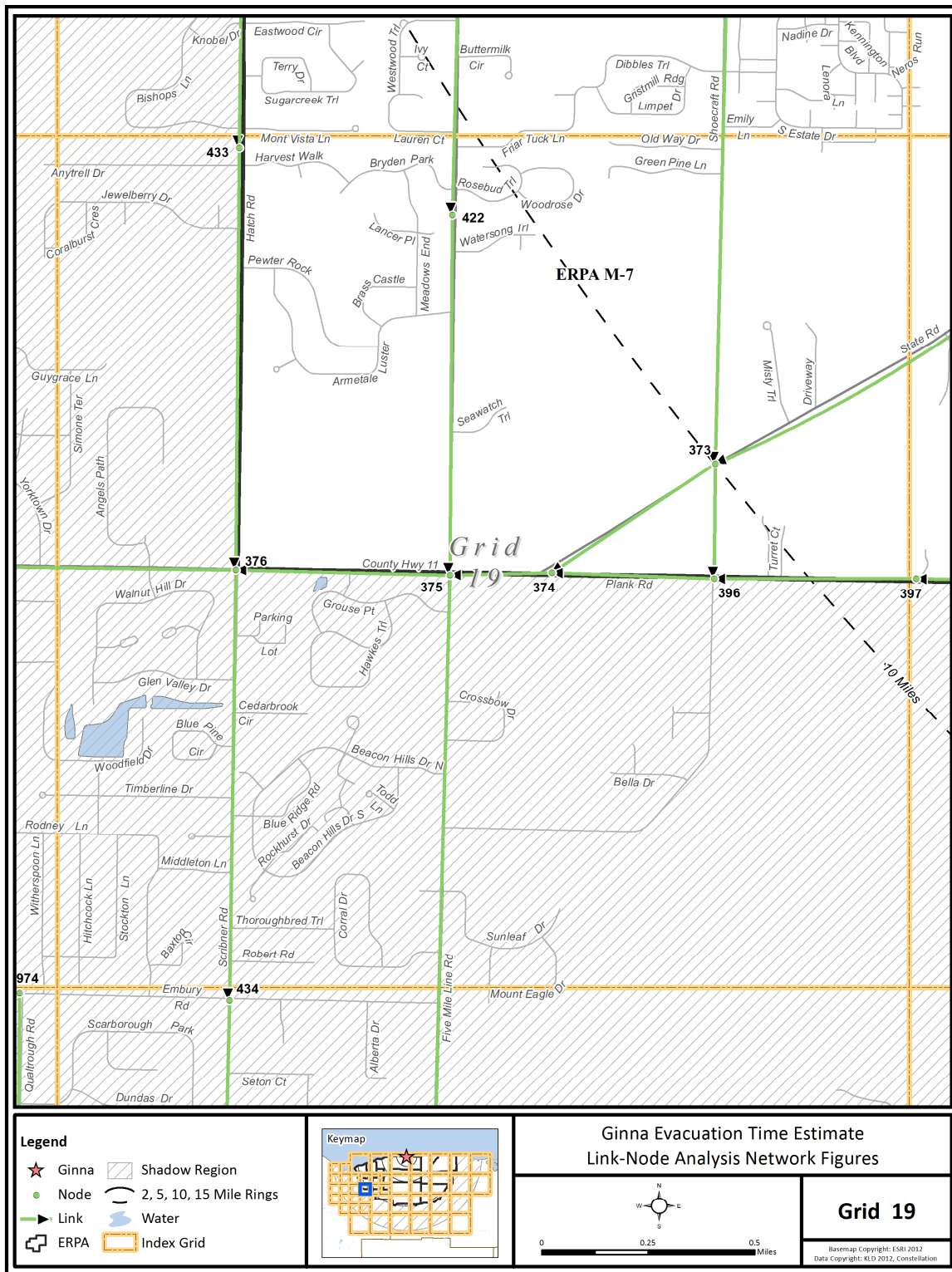


Figure K-19. Link-Node Analysis Network – Grid 18



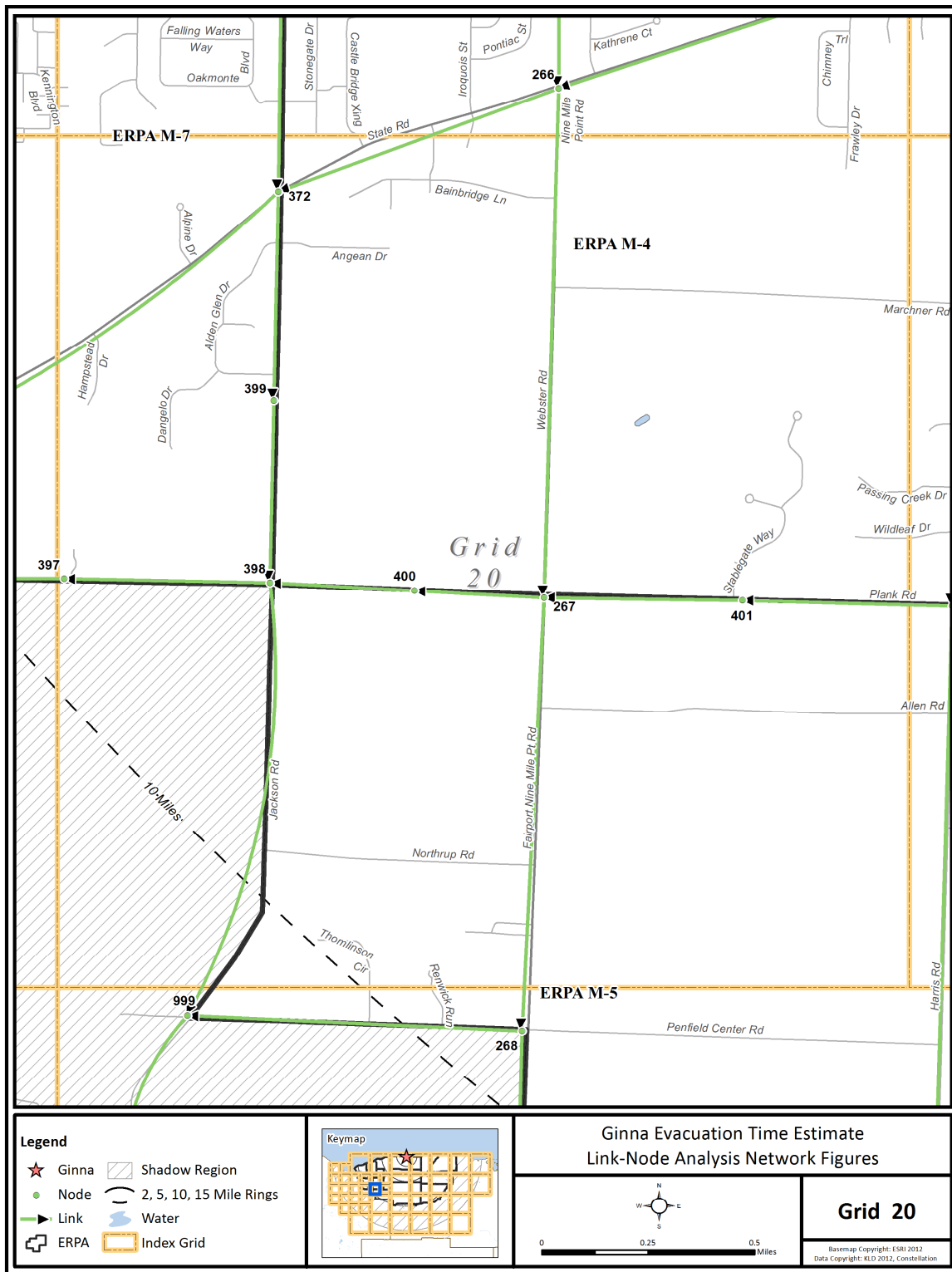


Figure K-21. Link-Node Analysis Network – Grid 20

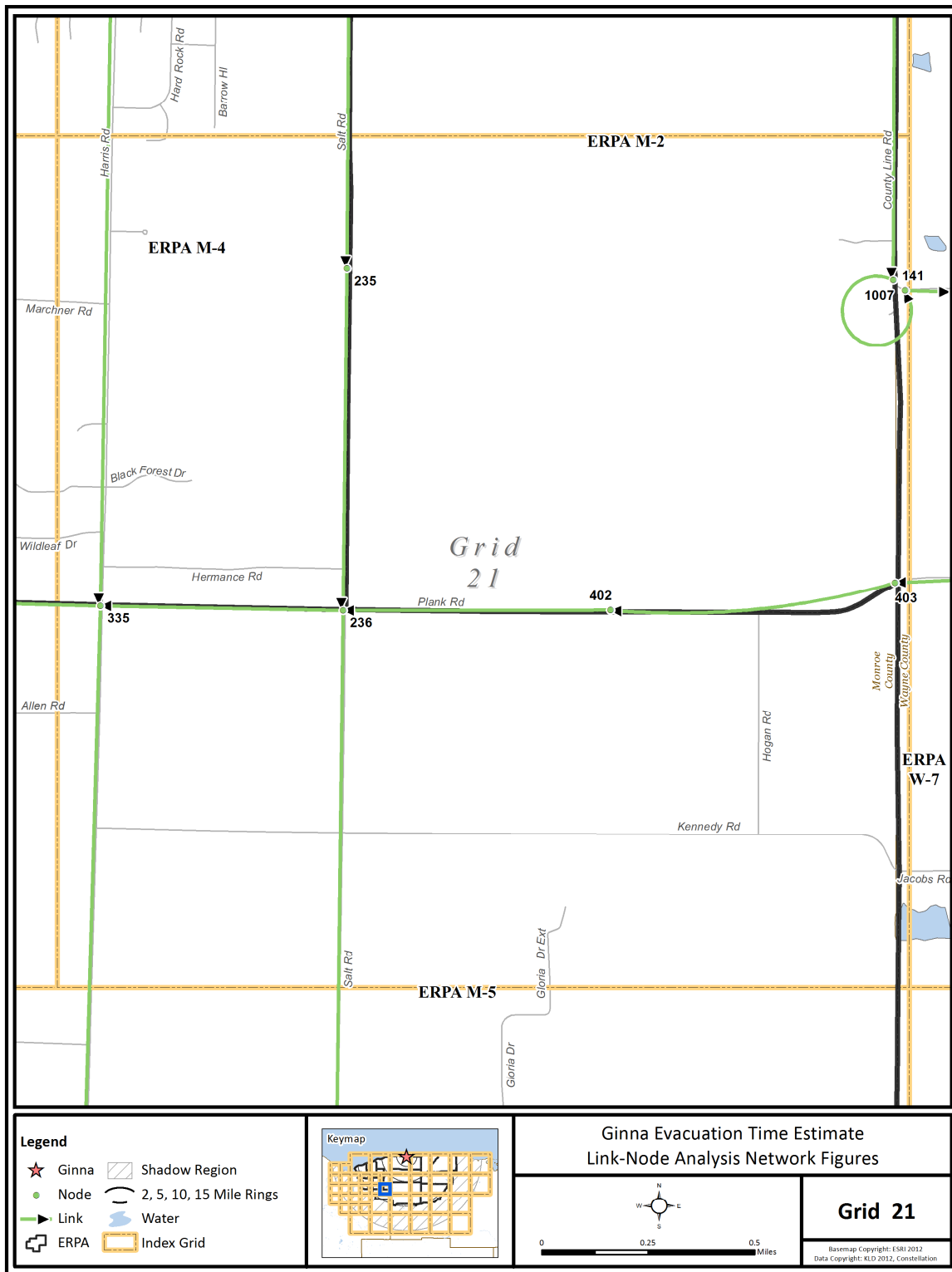


Figure K-22. Link-Node Analysis Network – Grid 21

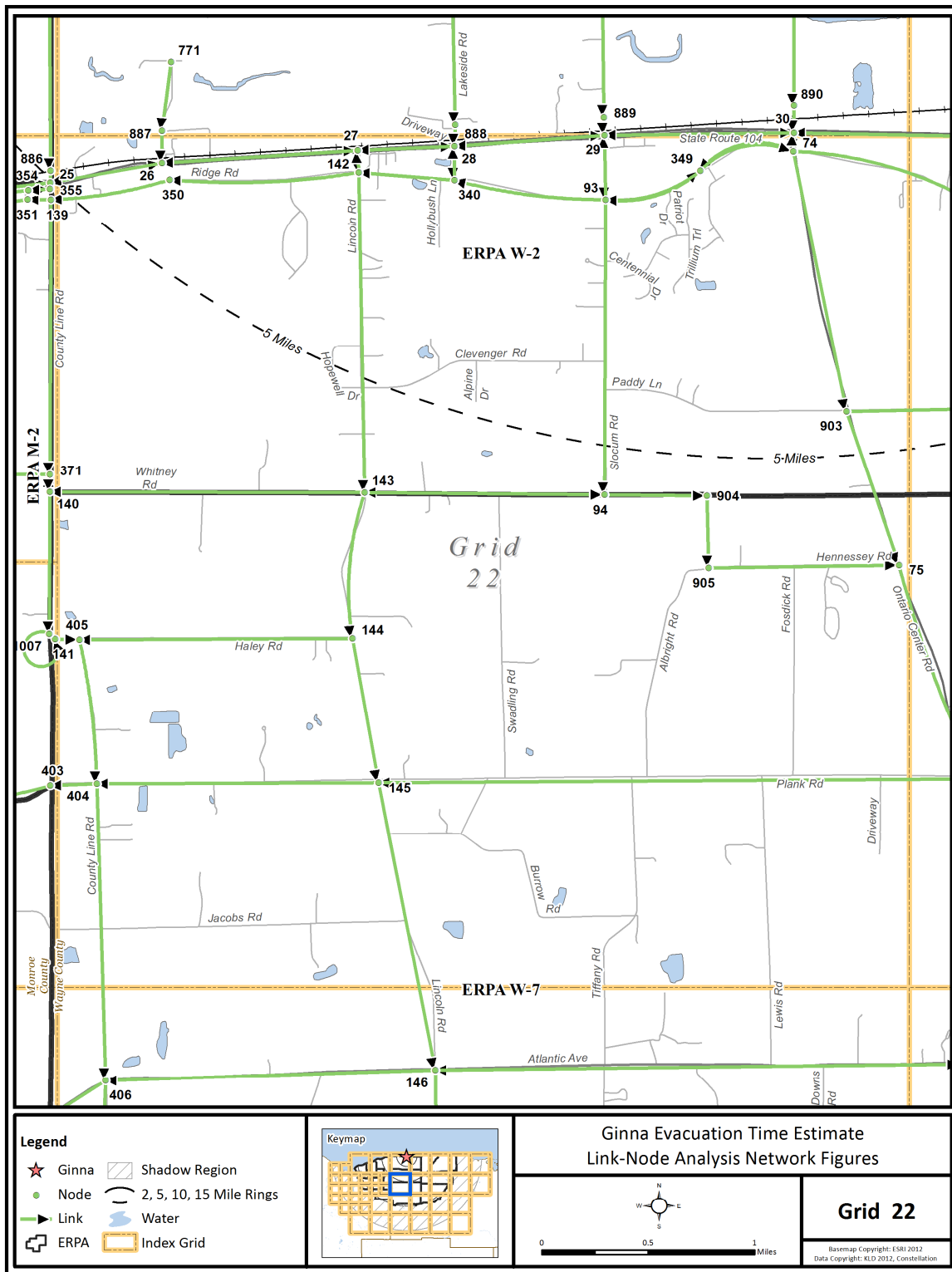


Figure K-23. Link-Node Analysis Network – Grid 22

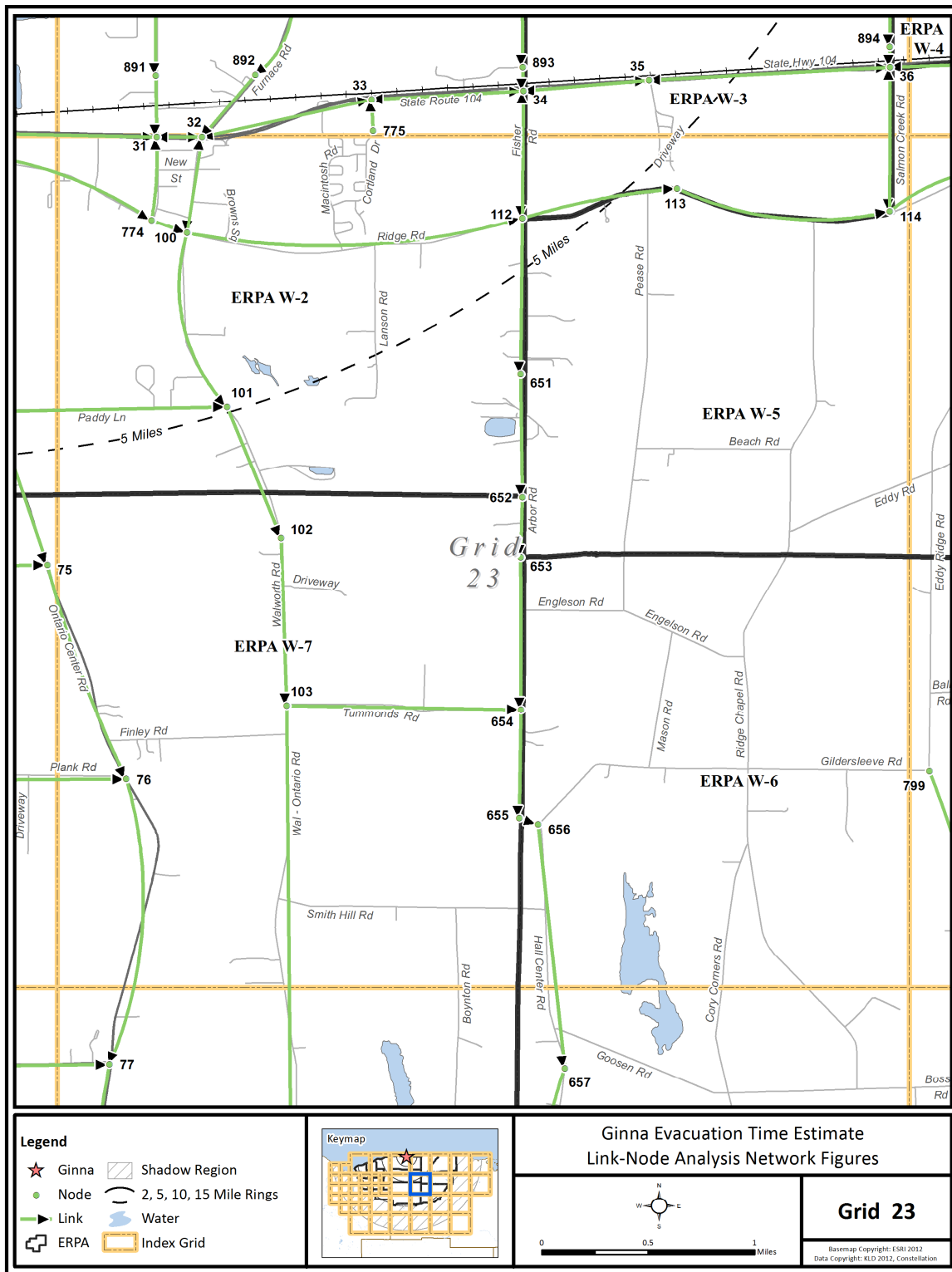


Figure K-24. Link-Node Analysis Network – Grid 23

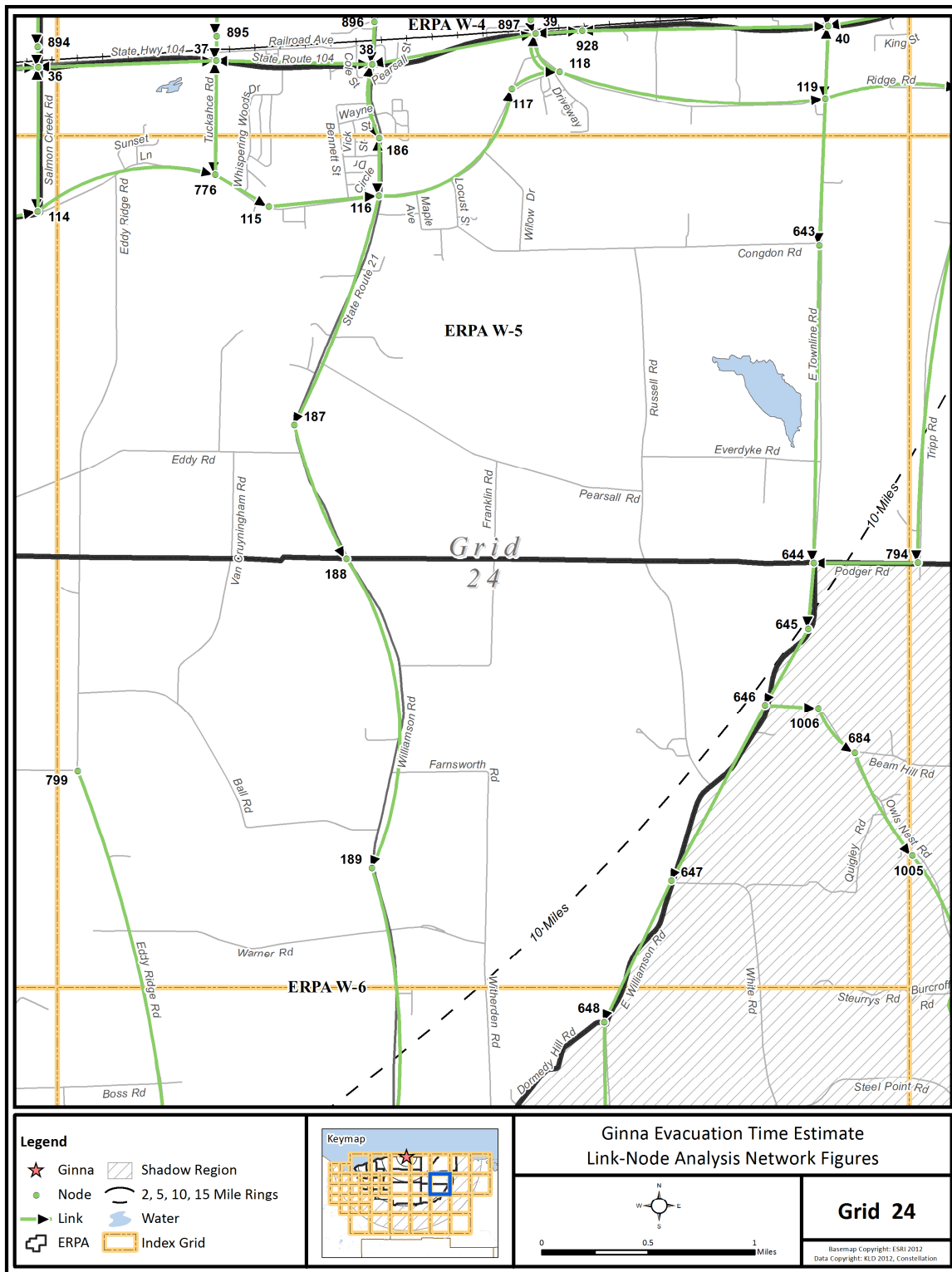


Figure K-25. Link-Node Analysis Network – Grid 24

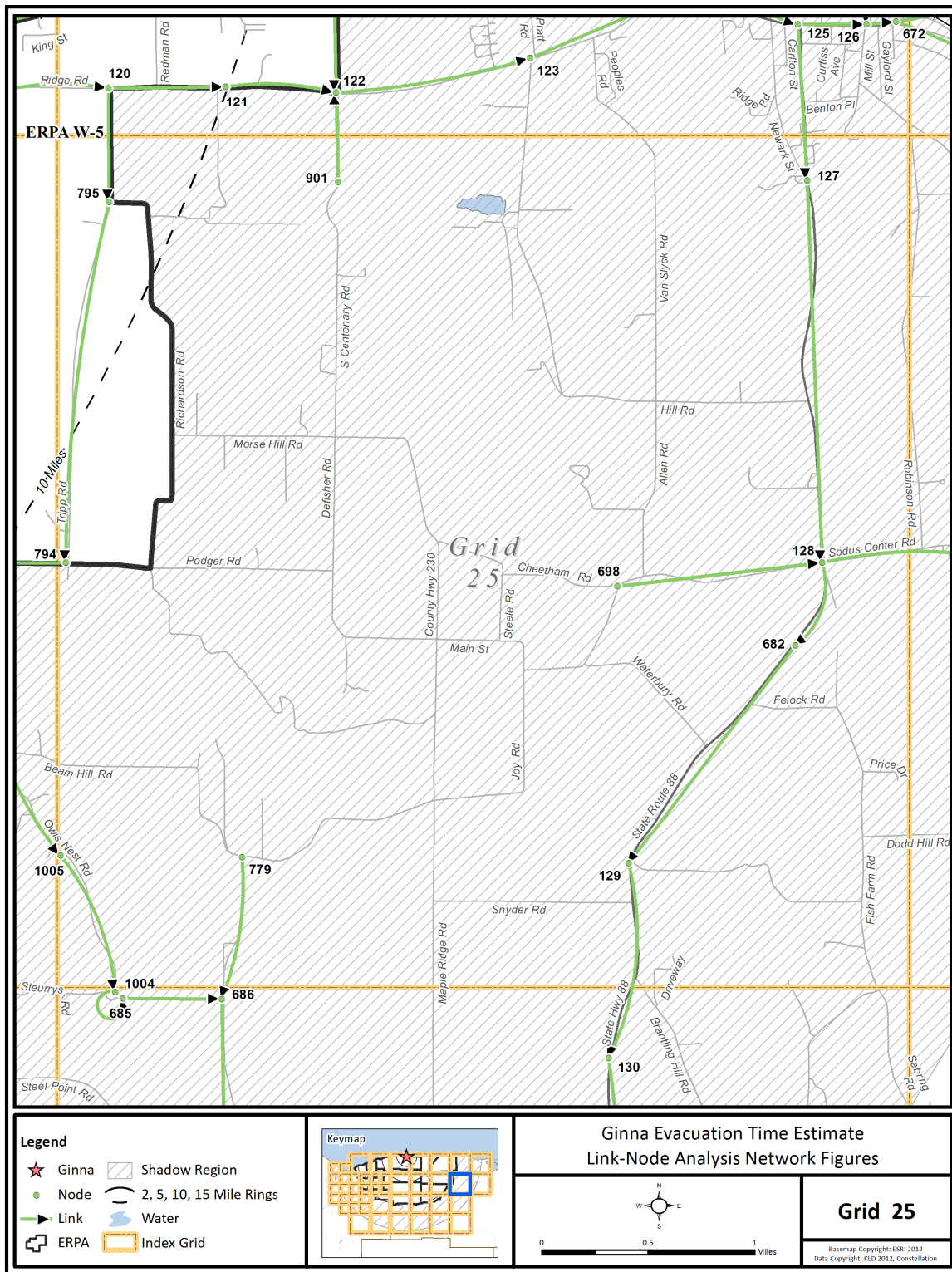


Figure K-26. Link-Node Analysis Network – Grid 25

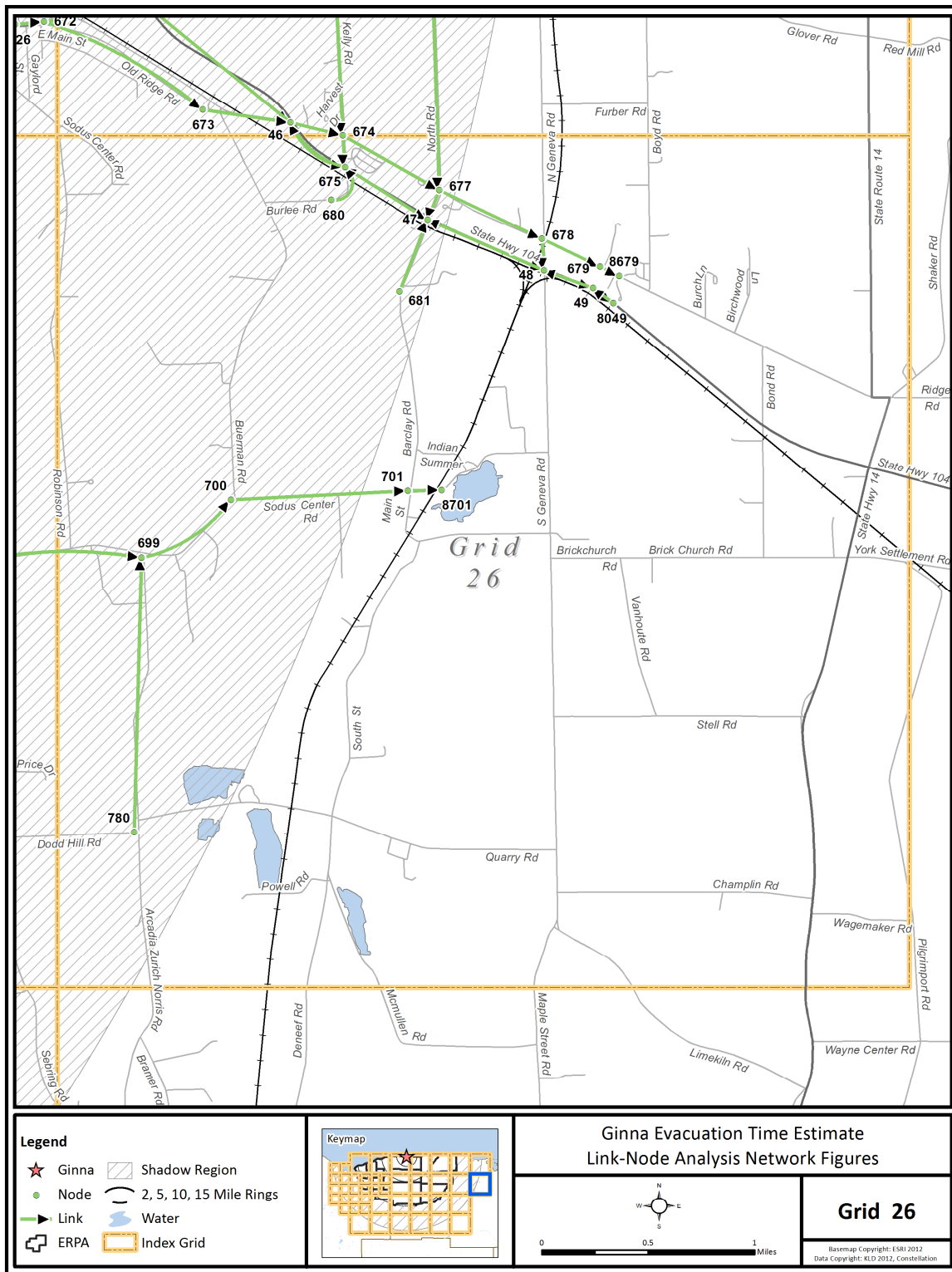
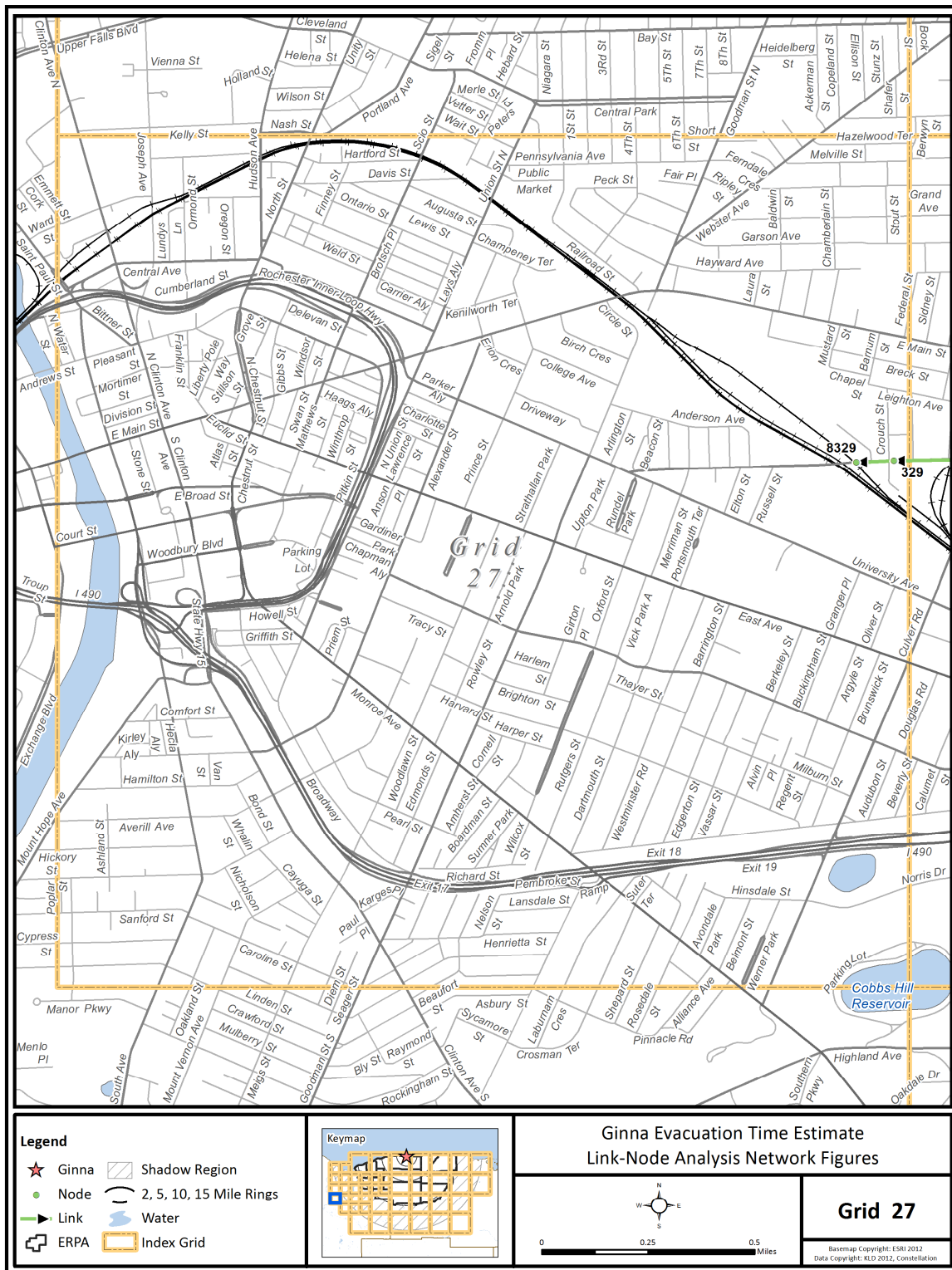


Figure K-27. Link-Node Analysis Network – Grid 26



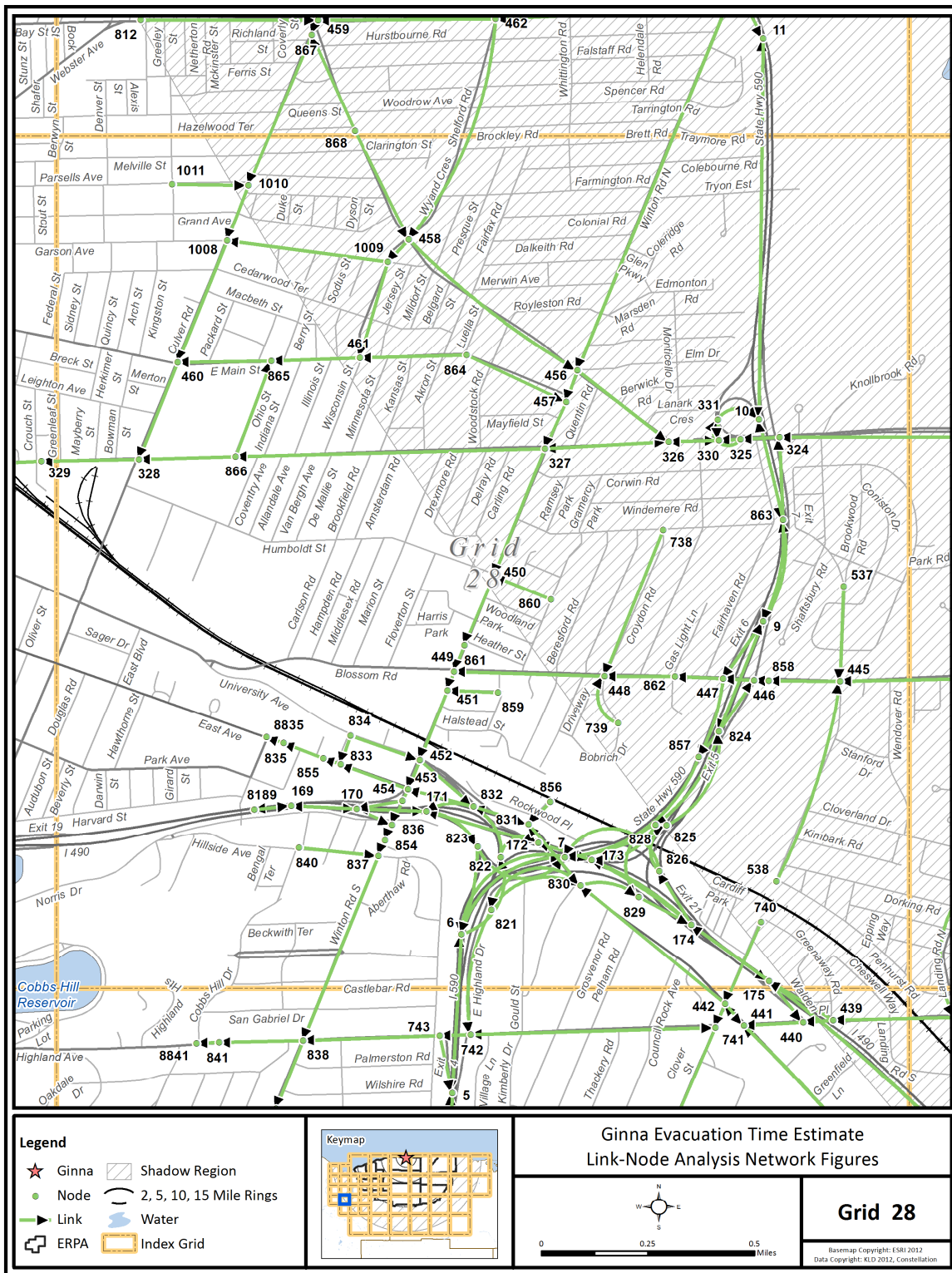


Figure K-29. Link-Node Analysis Network – Grid 28

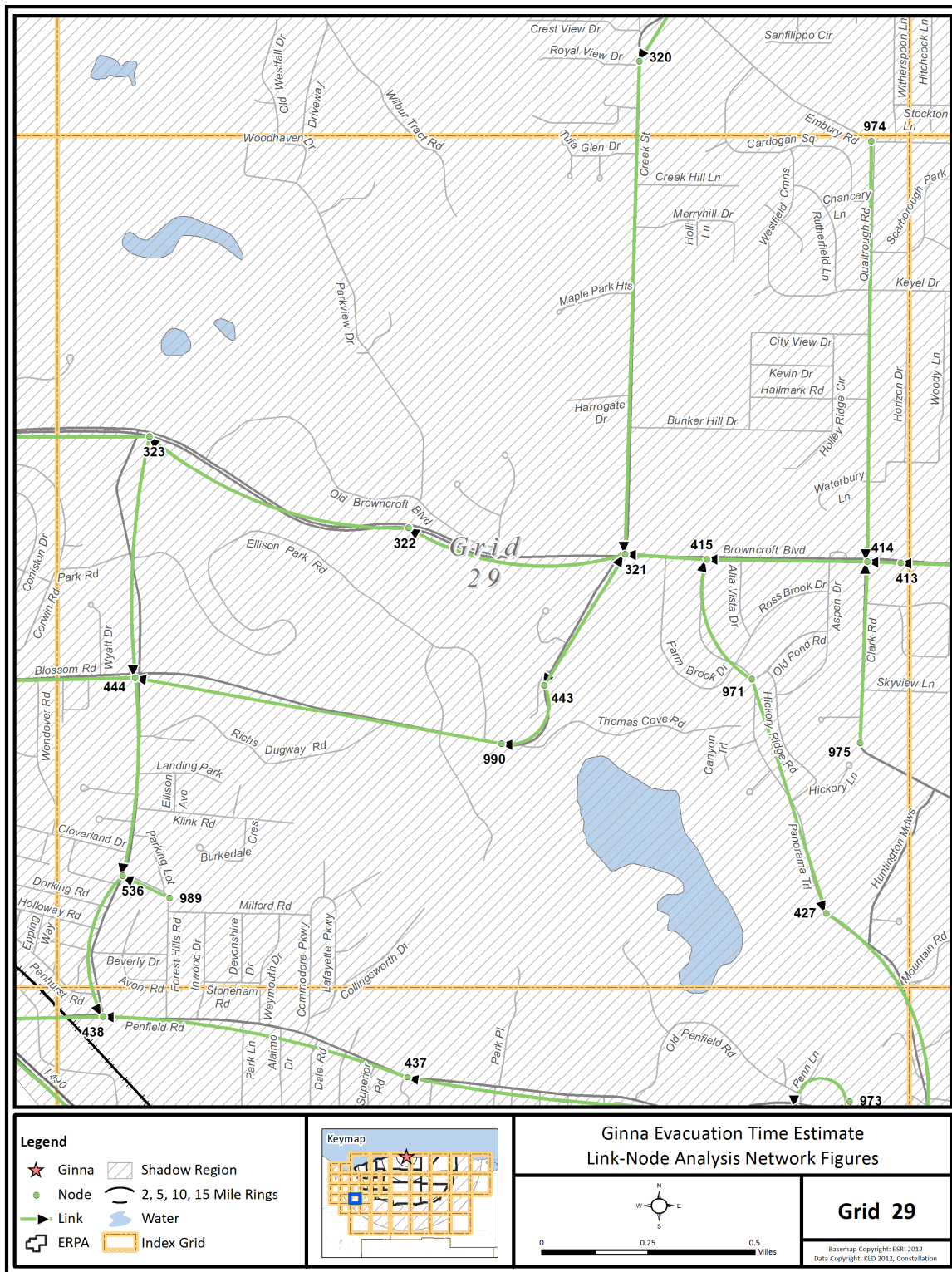


Figure K-30. Link-Node Analysis Network – Grid 29

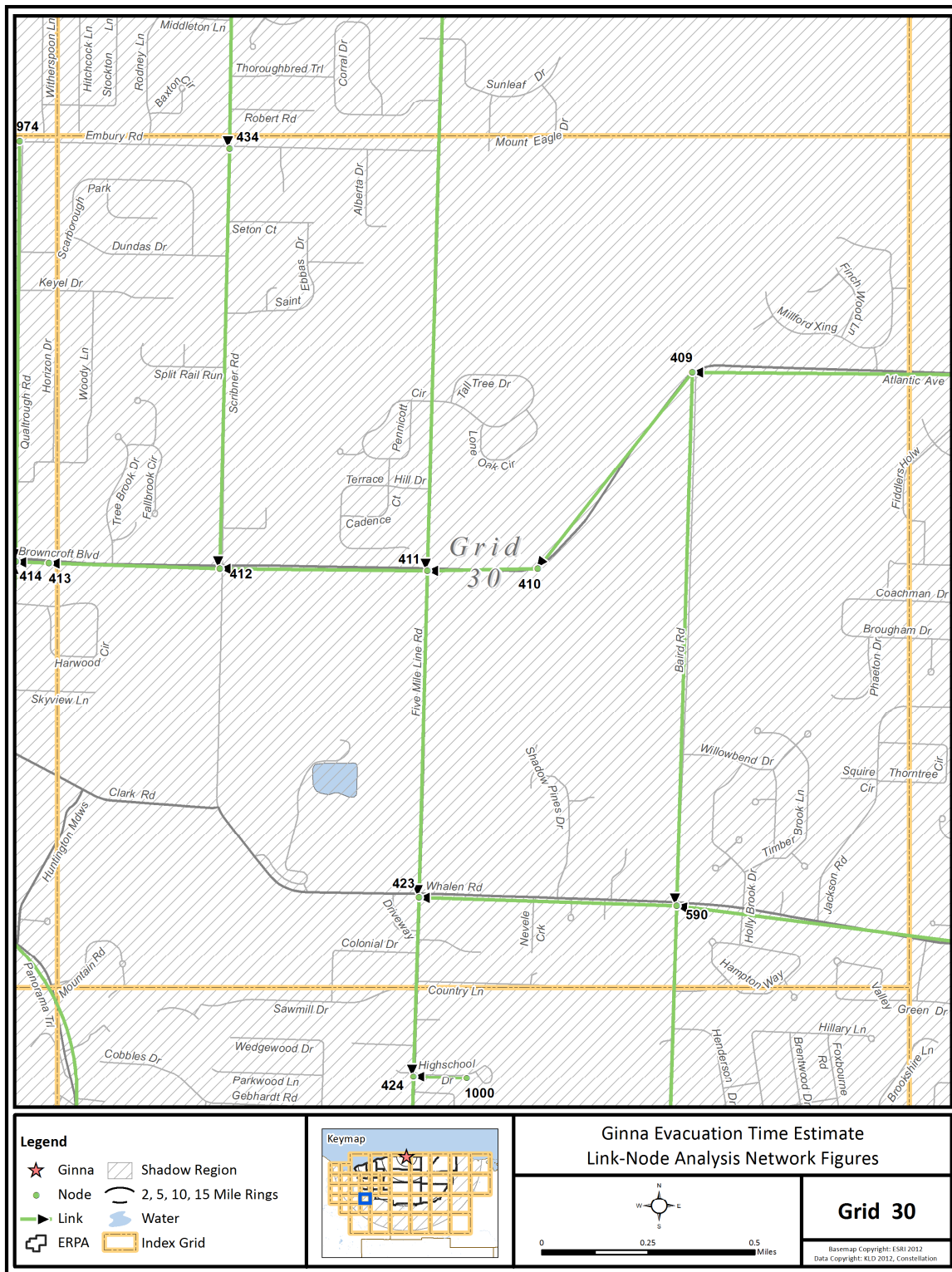


Figure K-31. Link-Node Analysis Network – Grid 30

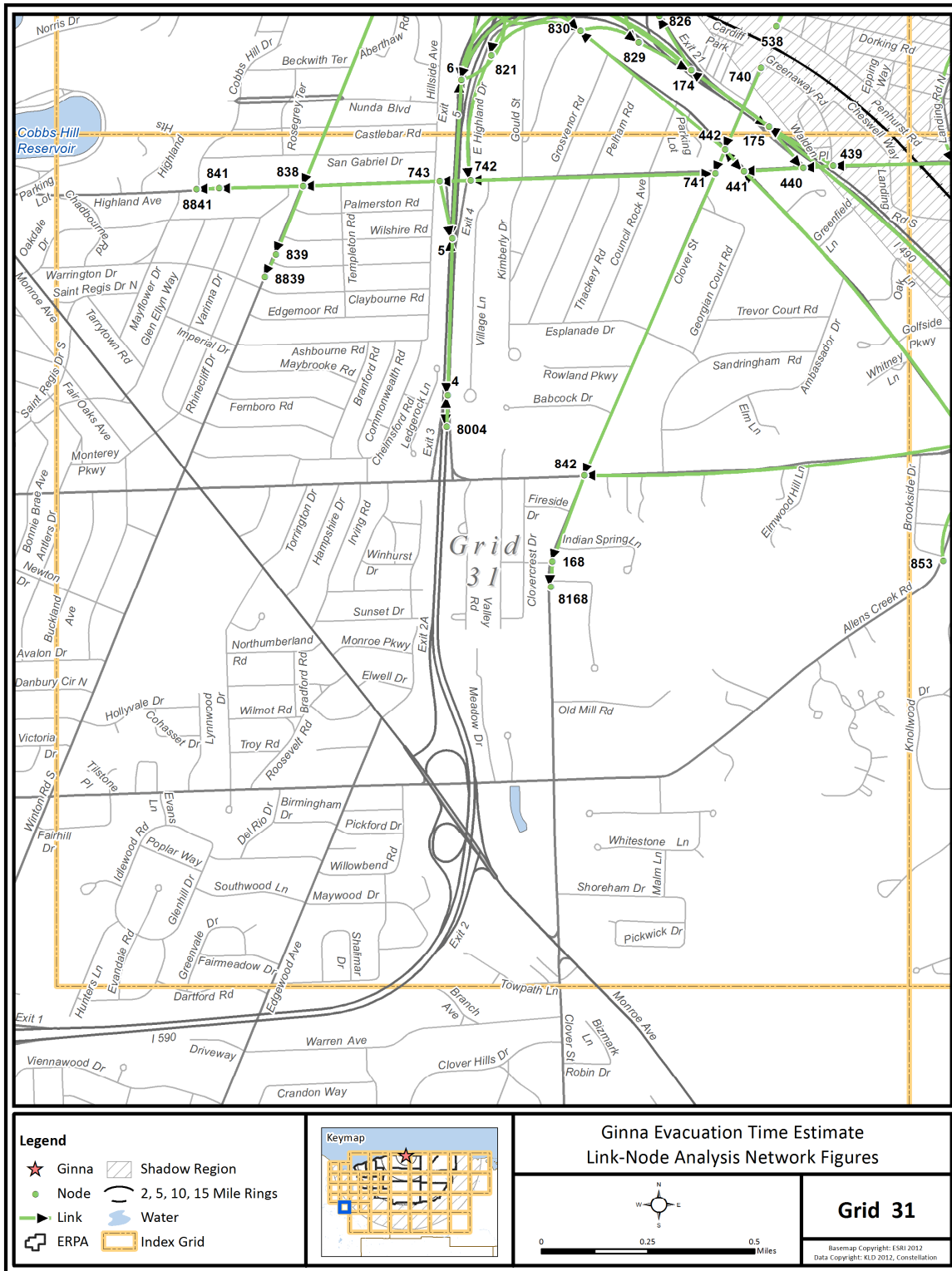


Figure K-32. Link-Node Analysis Network – Grid 31

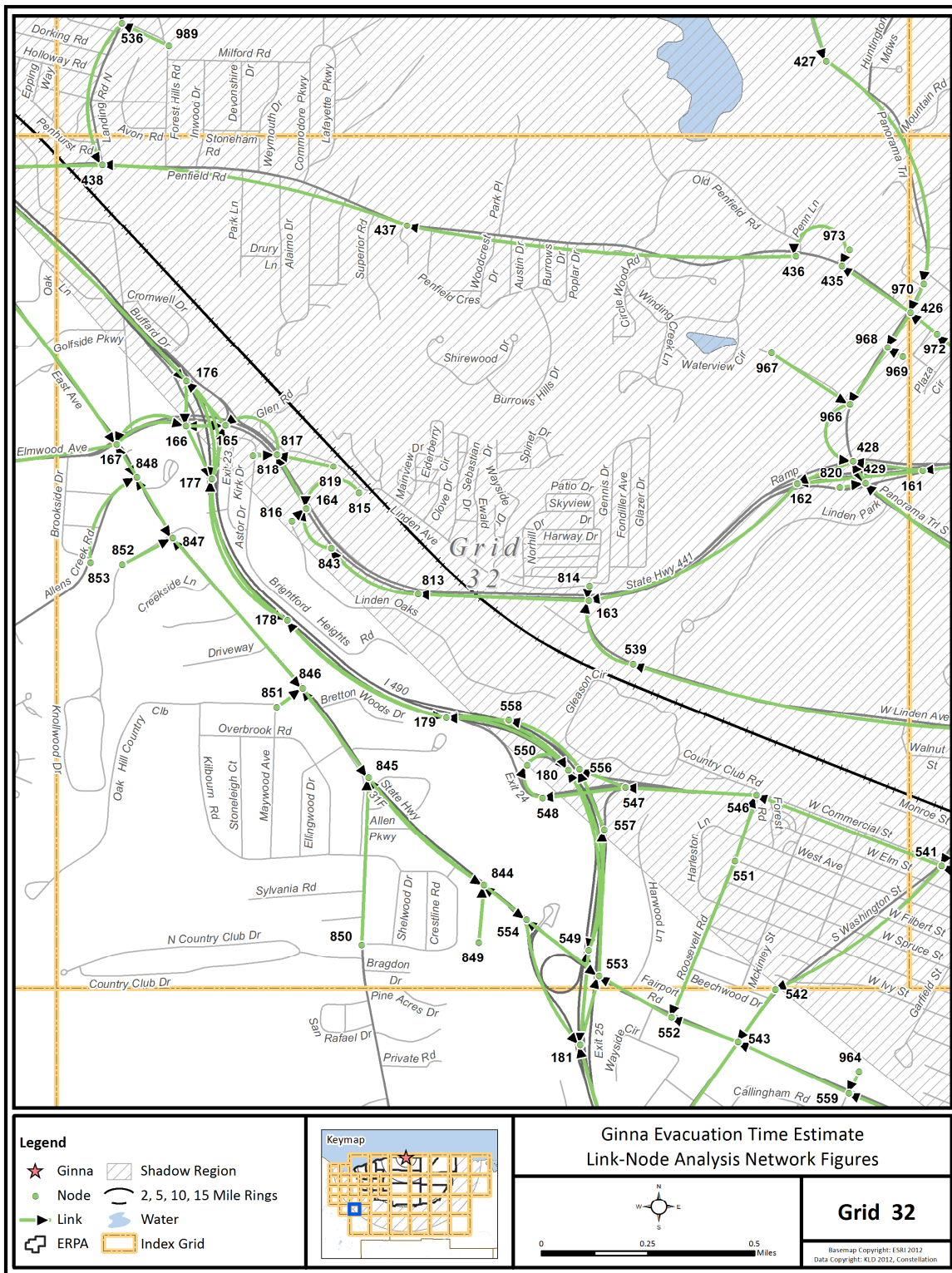


Figure K-33. Link-Node Analysis Network – Grid 32

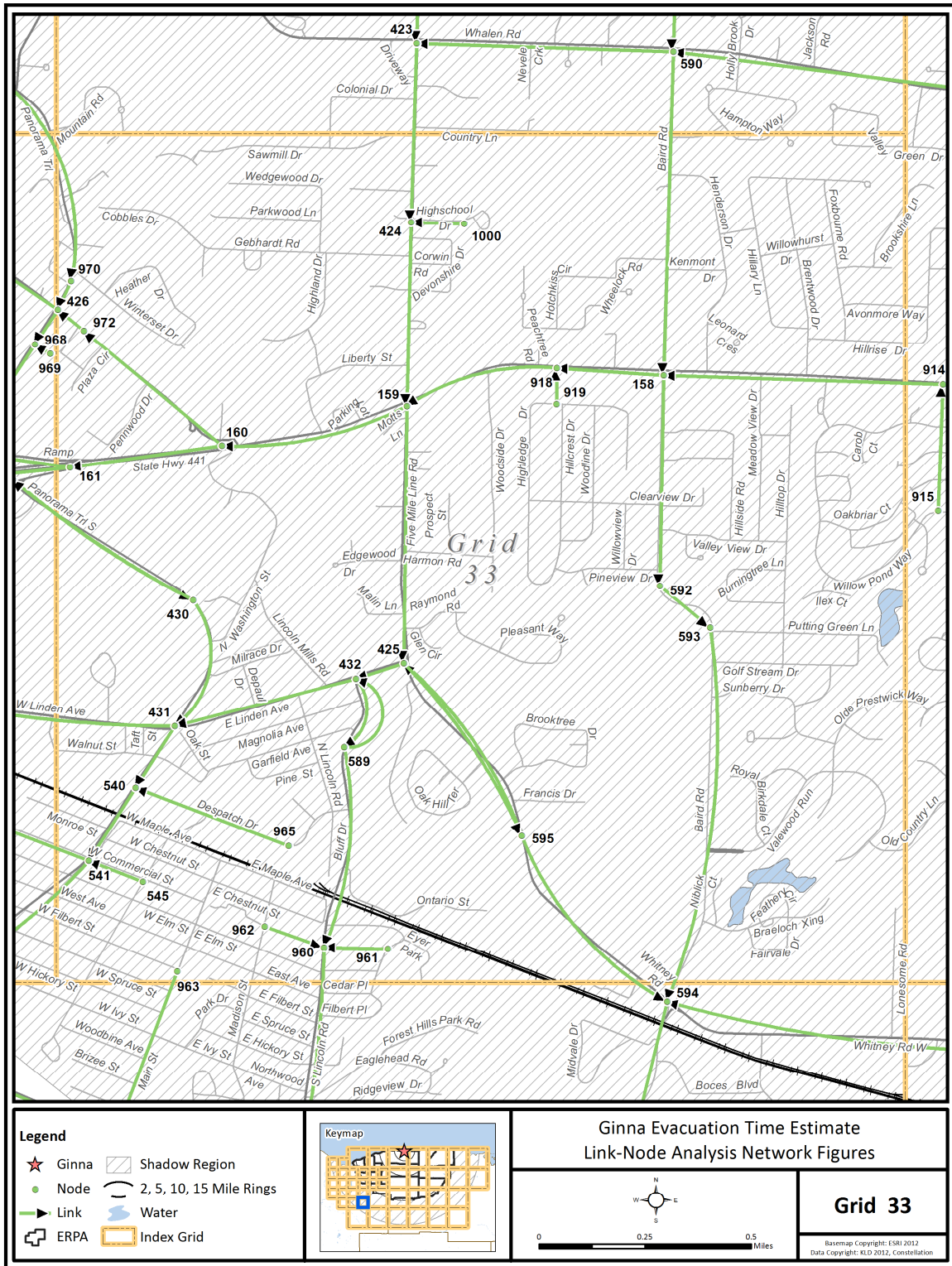


Figure K-34. Link-Node Analysis Network – Grid 33

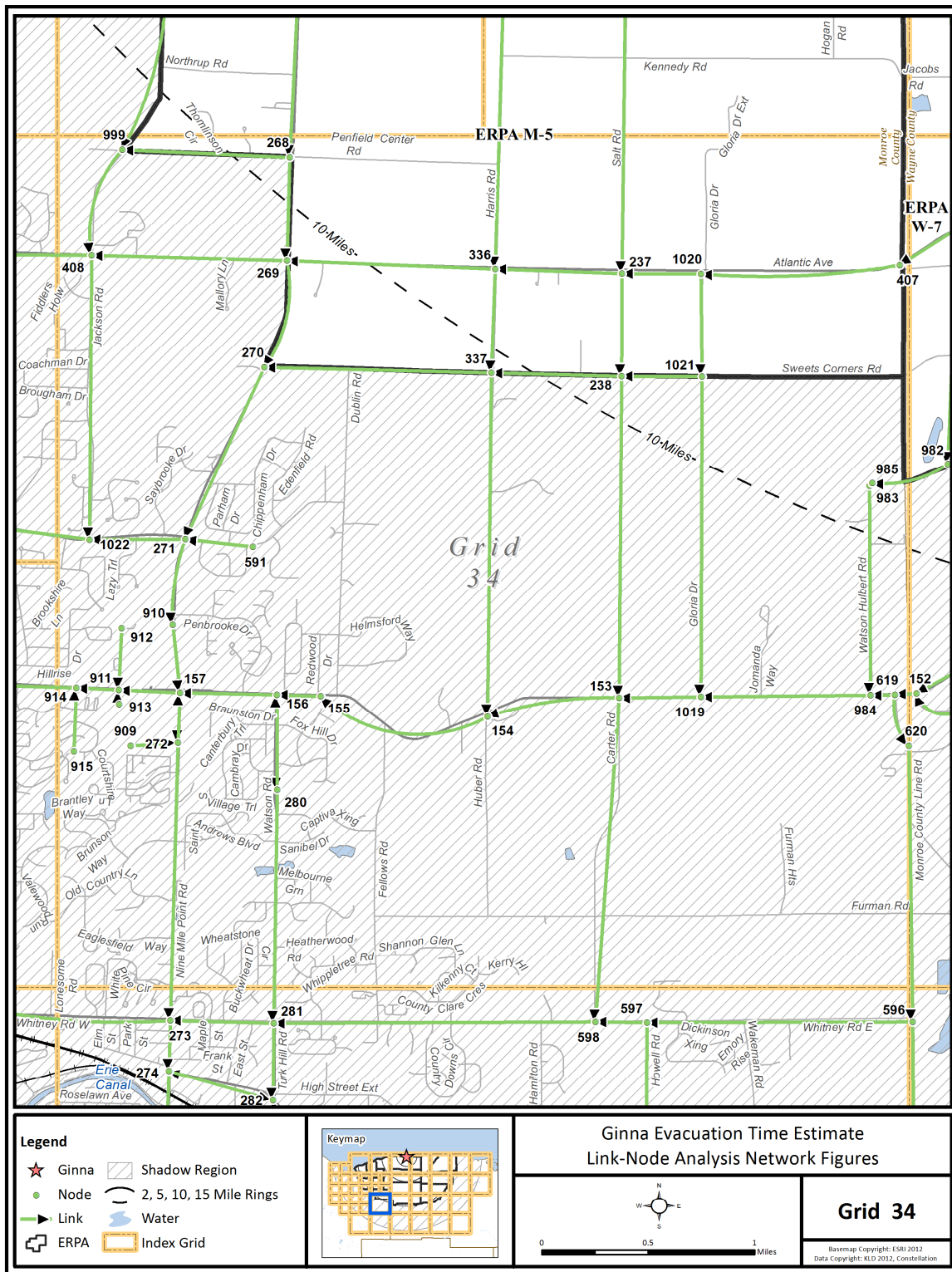


Figure K-35. Link-Node Analysis Network – Grid 34

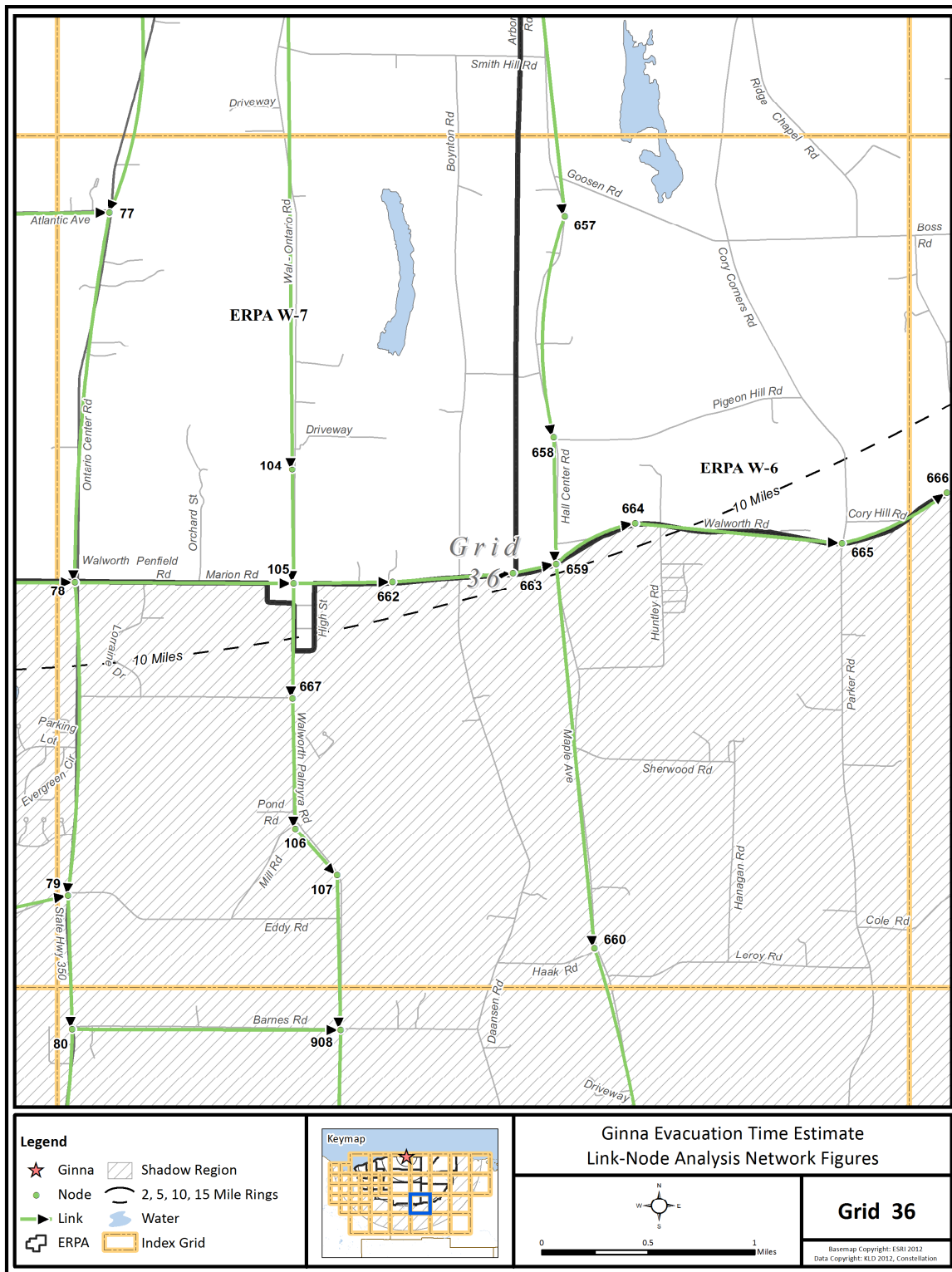
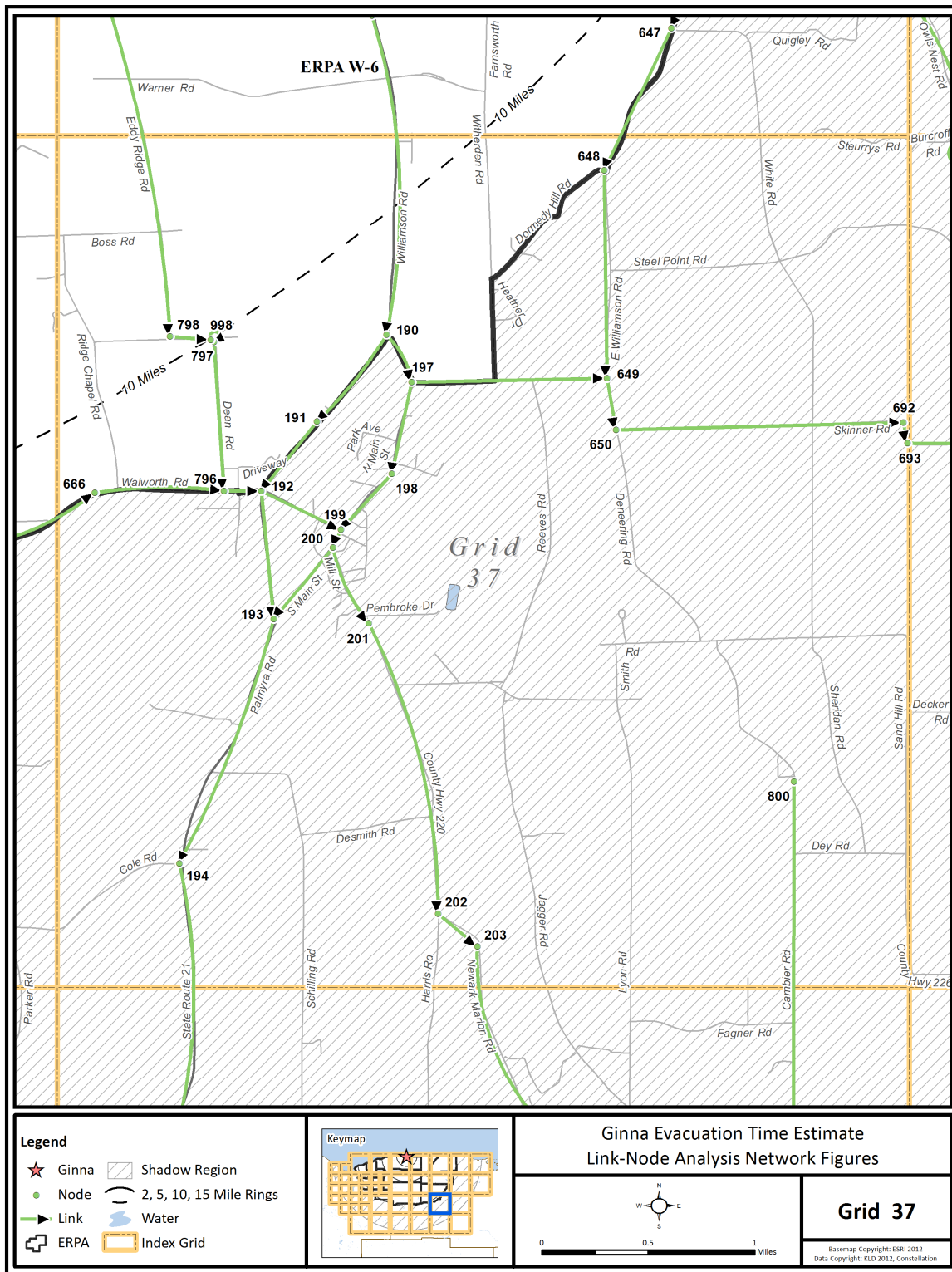


Figure K-37. Link-Node Analysis Network – Grid 36



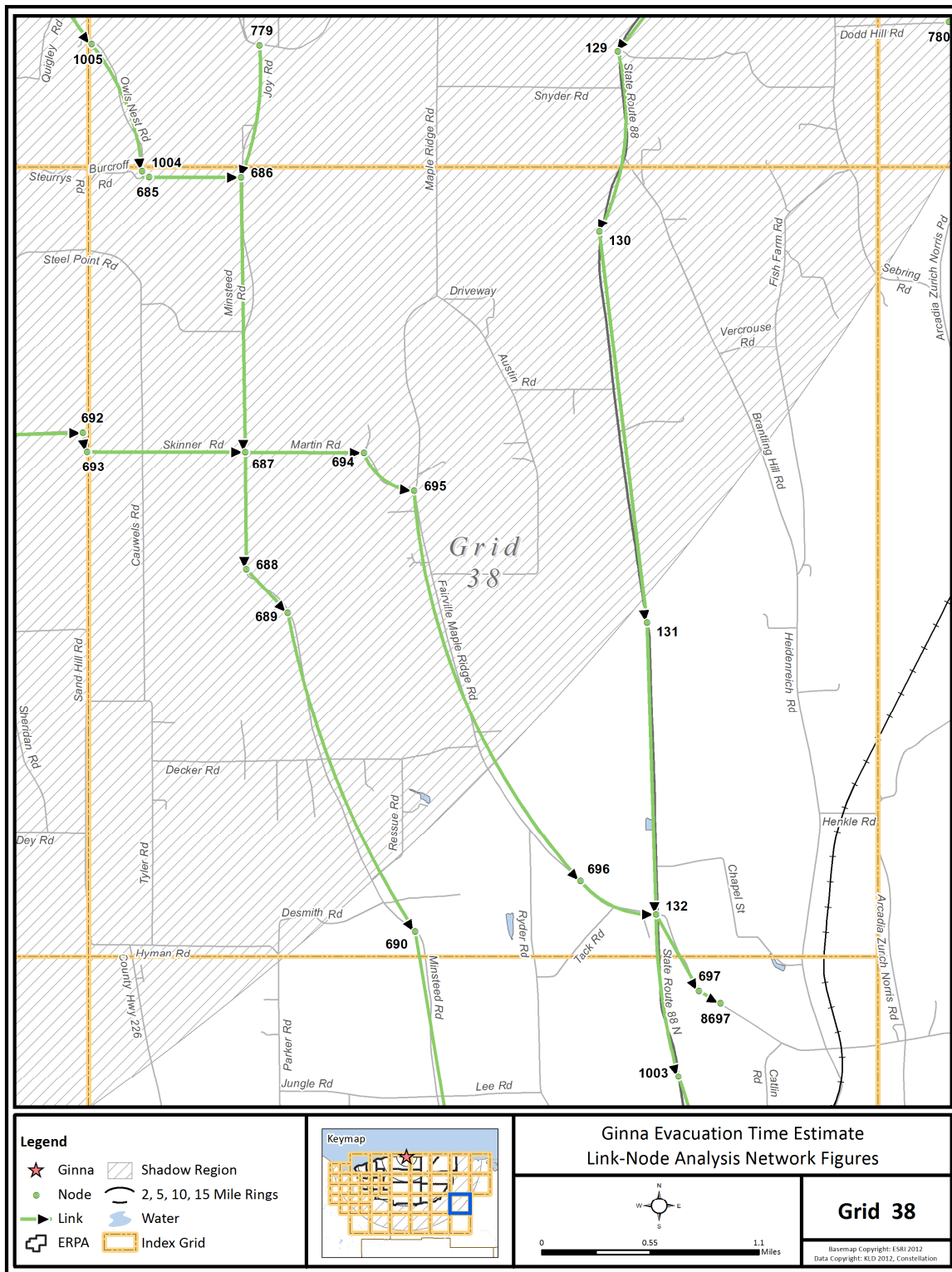


Figure K-39. Link-Node Analysis Network – Grid 38

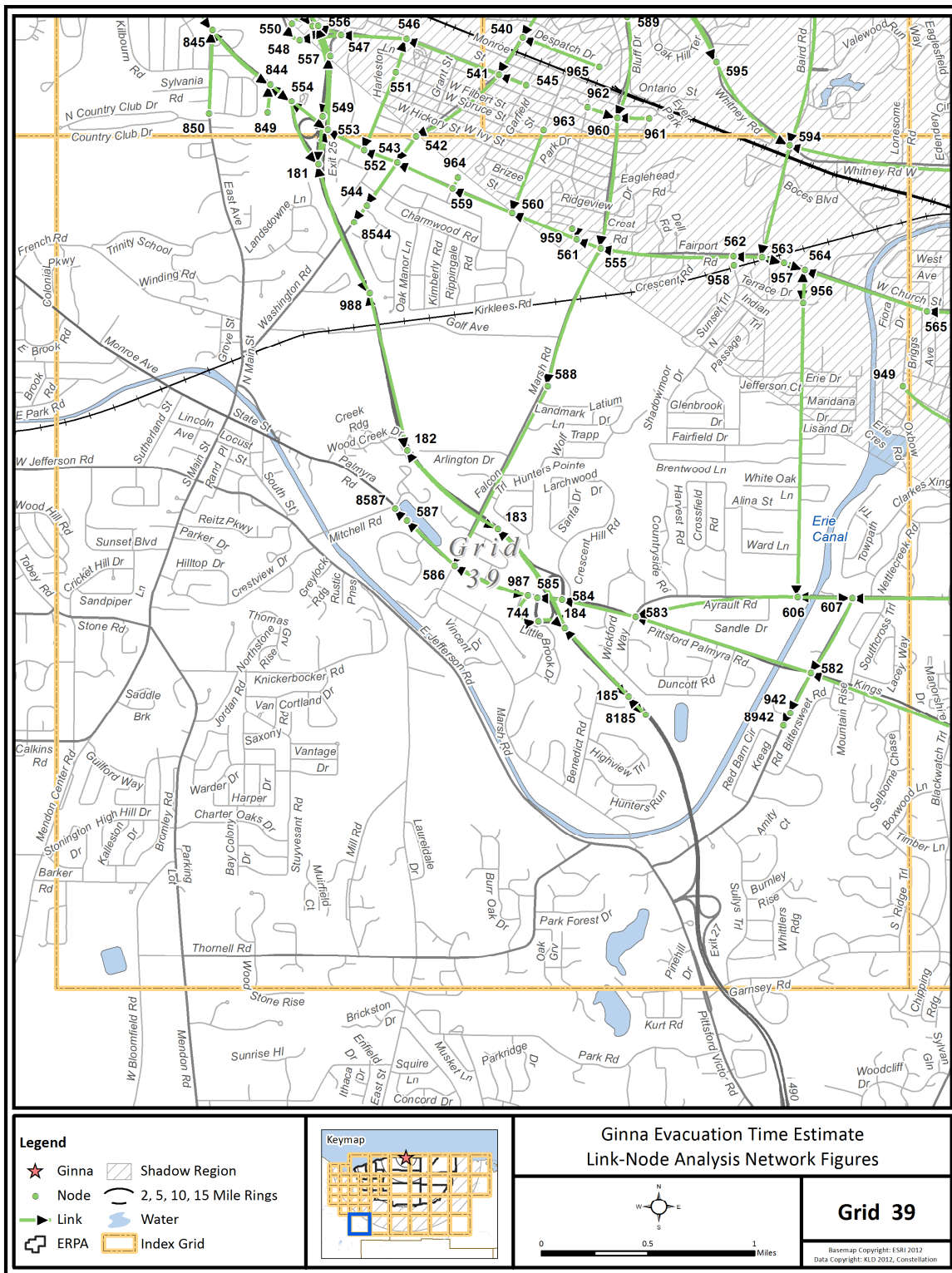


Figure K-40. Link-Node Analysis Network – Grid 39

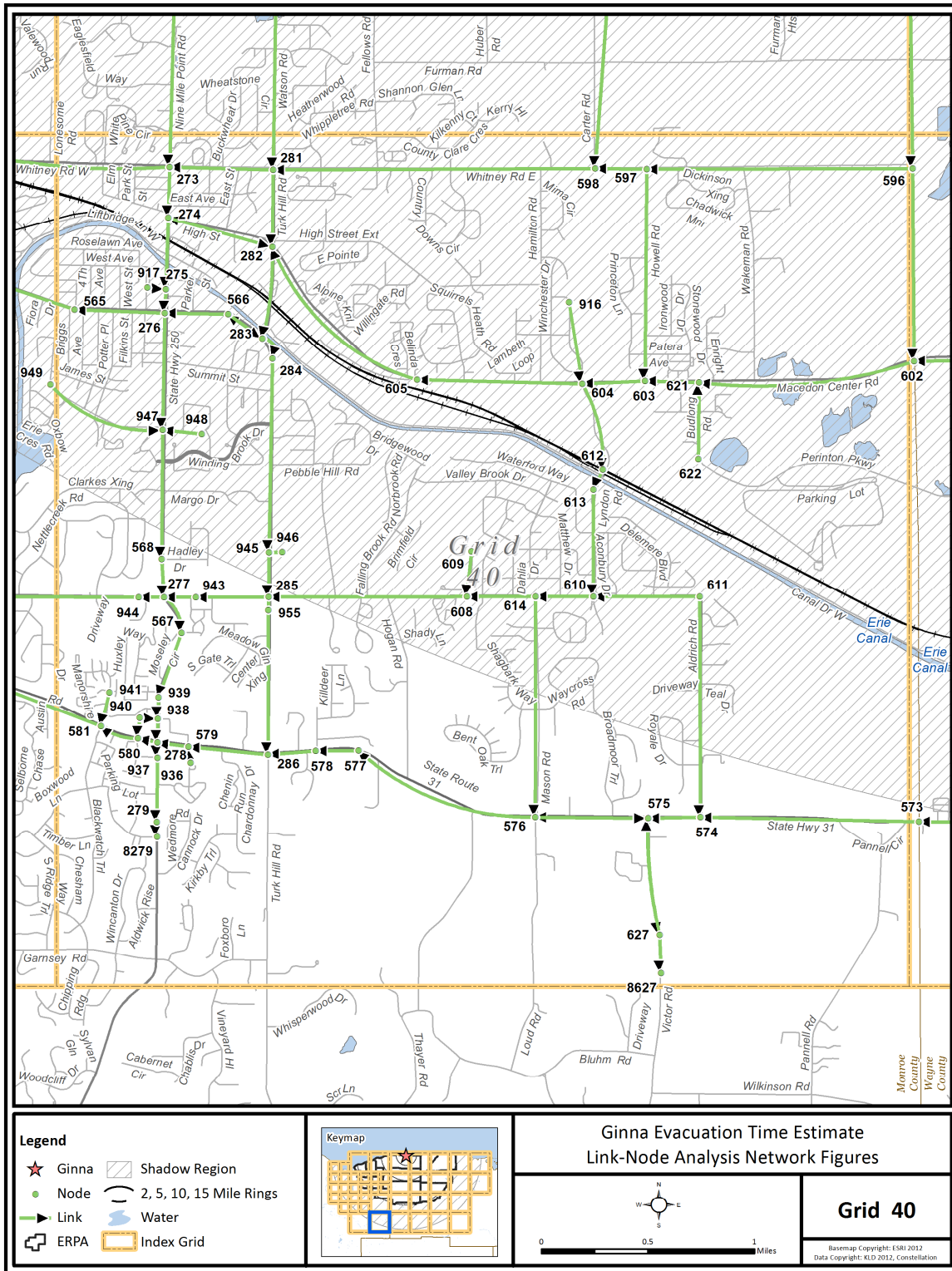


Figure K-41. Link-Node Analysis Network – Grid 40

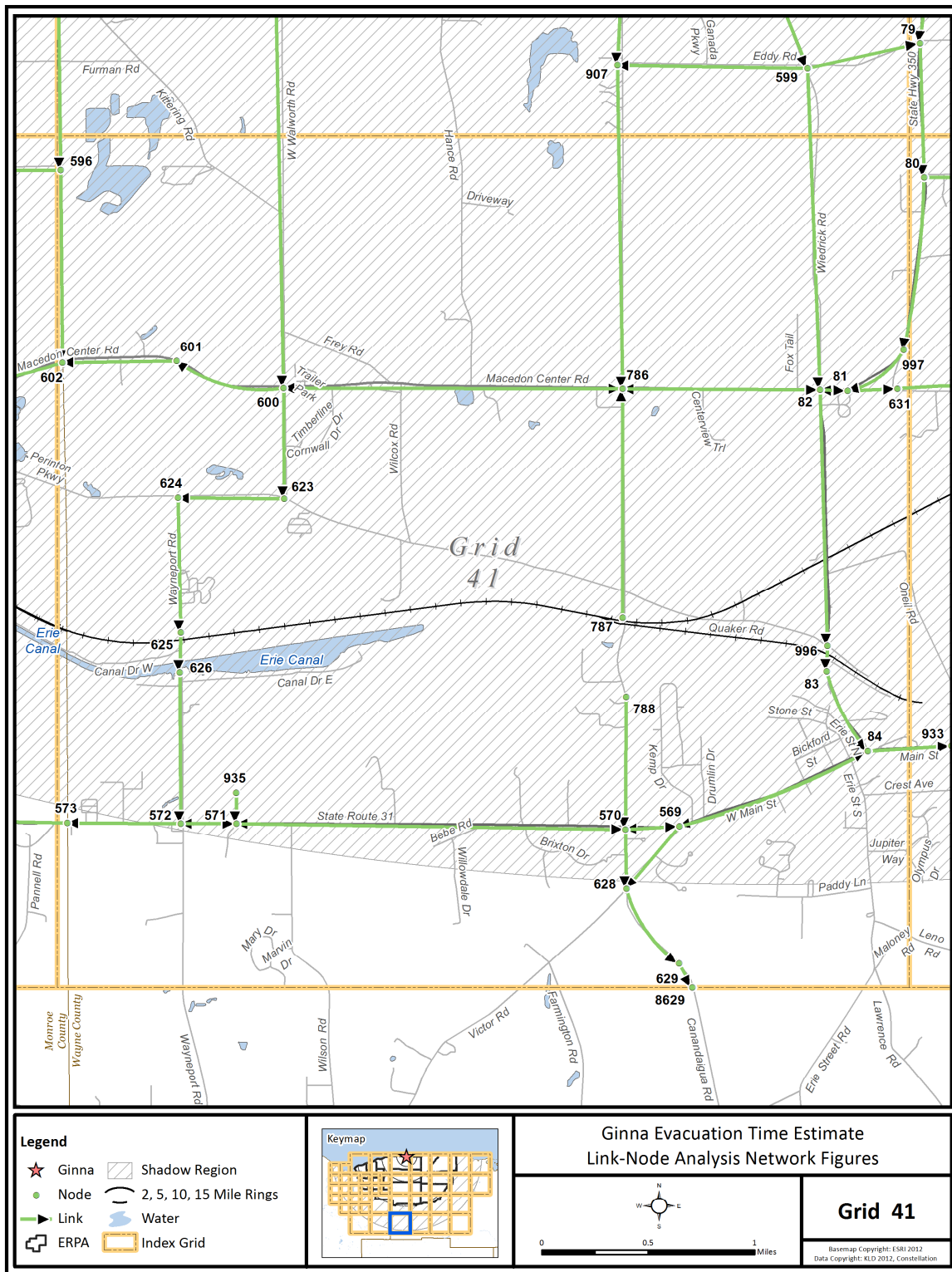
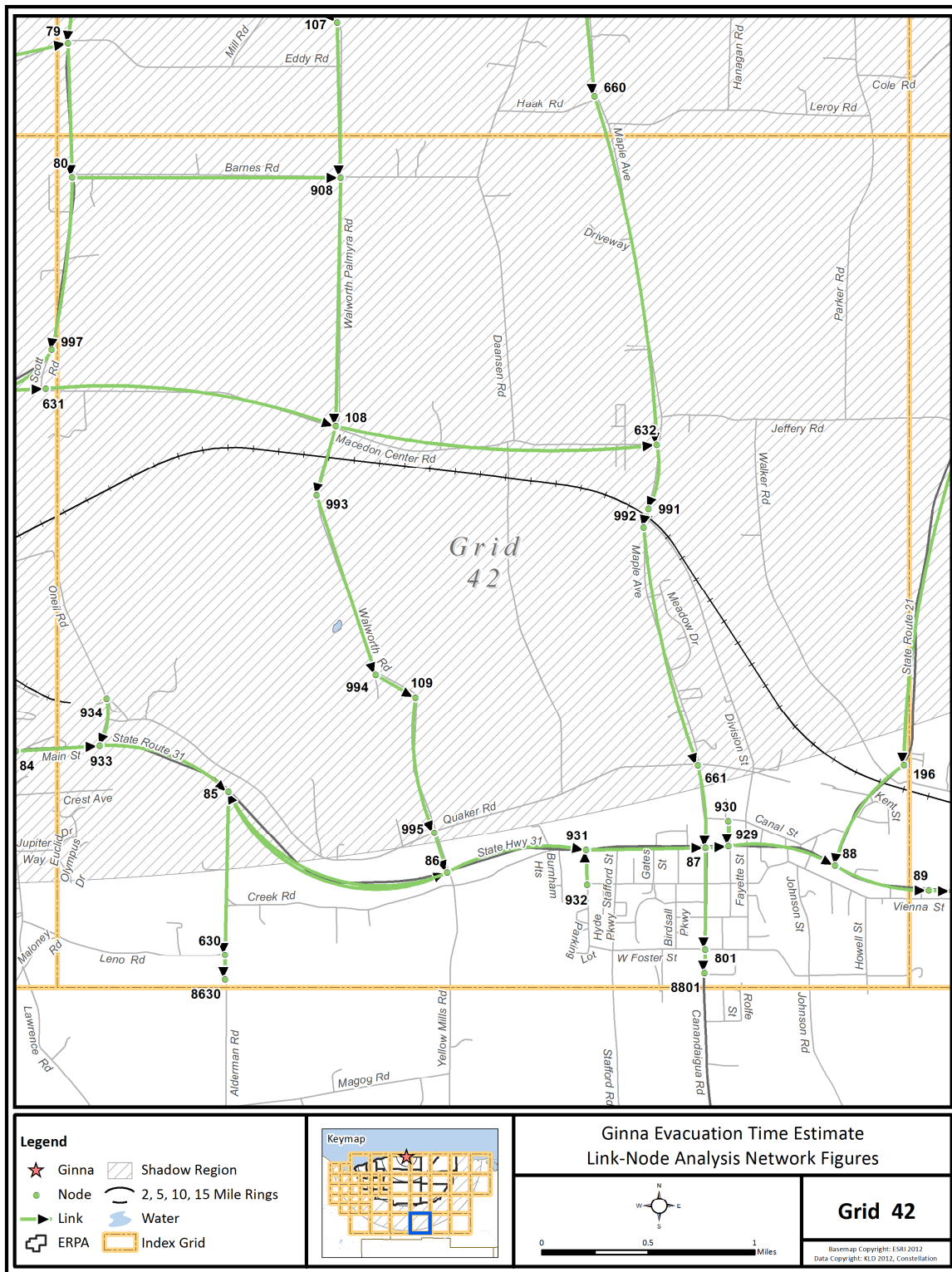


Figure K-42. Link-Node Analysis Network – Grid 41



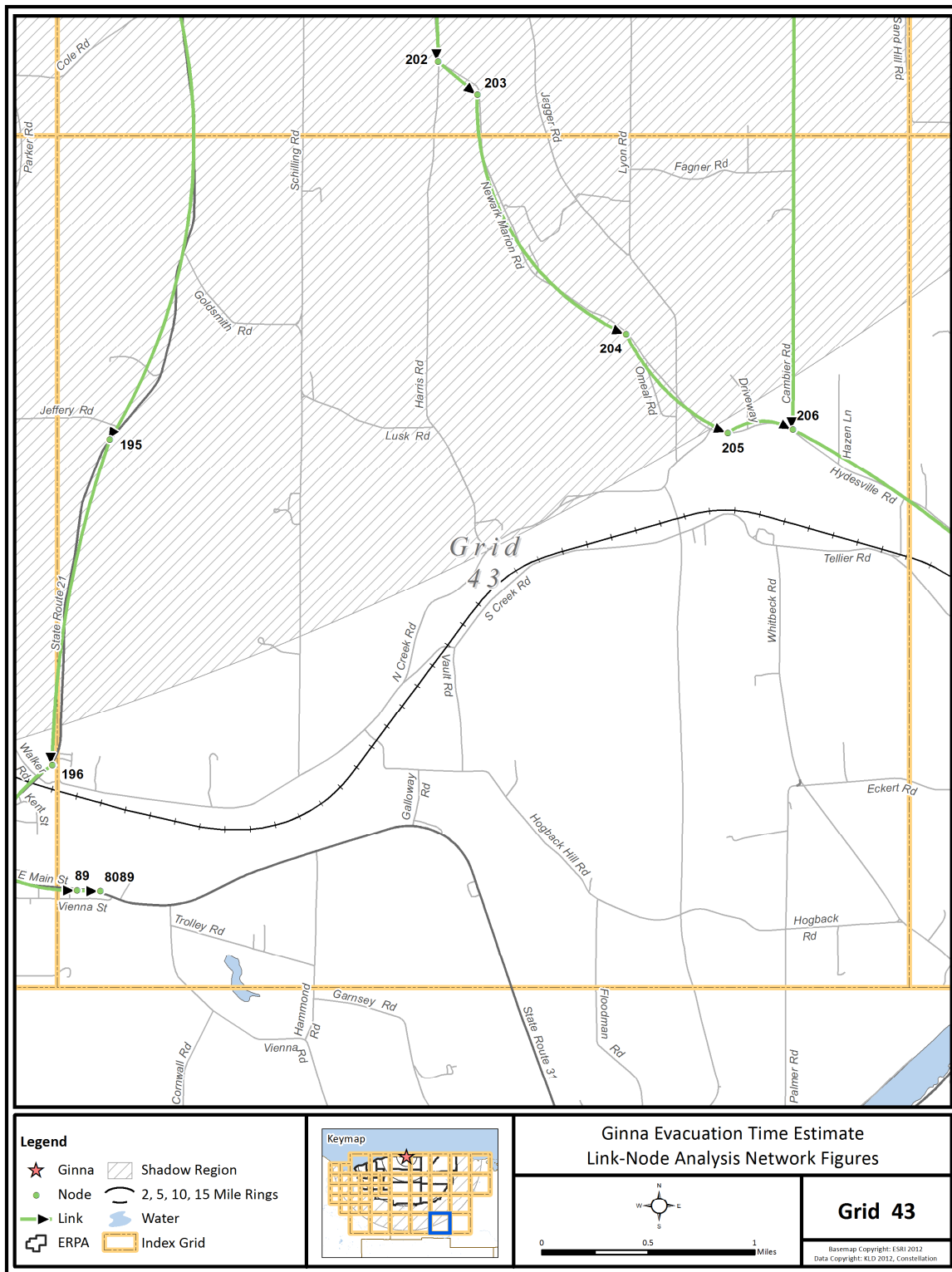


Figure K-44. Link-Node Analysis Network – Grid 43

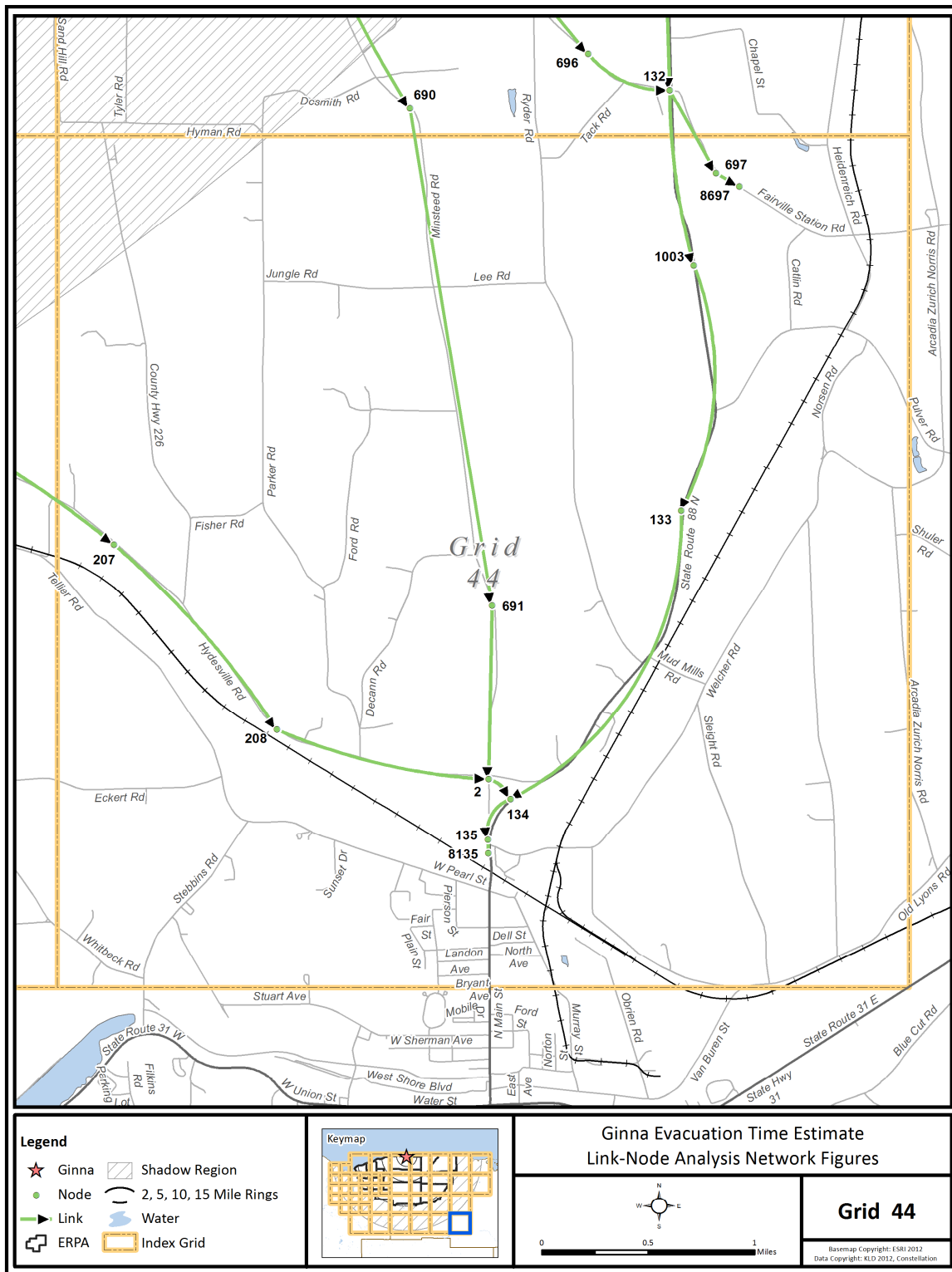


Figure K-45. Link-Node Analysis Network – Grid 44

Table K-1. Evacuation Roadway Network Characteristics

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
1	1	525	ST. PAUL BLVD	COLLECTOR	498	1	12	2	1750	40	1
2	2	134	CO RD 221	COLLECTOR	733	1	12	2	1700	55	44
3	3	953	PLANT DRIVEWAY	COLLECTOR	431	1	12	12	1575	35	5
4	4	5	SR 590	FREEWAY	1942	3	12	12	2250	70	31
5	5	4	SR 590	FREEWAY	1942	3	12	12	2250	70	31
6	5	6	SR 590	FREEWAY	1970	3	12	12	2250	70	31
7	6	5	SR 590	FREEWAY	1970	3	12	12	2250	70	31
8	6	7	SR 590	FREEWAY	1677	2	12	12	2250	70	28
9	6	822	I-490 ON-RAMP	FREEWAY RAMP	1093	2	12	2	1900	55	28
10	7	6	SR 590	FREEWAY	1679	2	12	12	2250	70	28
11	7	825	SR 590	FREEWAY	1325	4	12	12	2250	70	28
12	9	447	SR 590 ON-RAMP FROM BLOSSOM RD	FREEWAY RAMP	861	1	12	2	1750	40	28
13	9	824	SR 590	FREEWAY	1466	3	12	12	2250	70	28
14	9	863	SR 590	FREEWAY	1290	4	12	12	2250	70	28
15	10	11	SR 590	FREEWAY	4714	3	12	12	2250	70	28
16	10	863	SR 590	FREEWAY	1281	3	12	12	2250	70	28
17	11	10	SR 590	FREEWAY	4714	3	12	12	2250	70	28
18	11	12	SR 590	FREEWAY	1494	3	12	12	2250	70	17
19	12	11	SR 590	FREEWAY	1494	3	12	12	2250	70	17
20	12	13	SR 590	FREEWAY	4578	3	12	12	2250	70	17
21	13	12	SR 590	FREEWAY	4578	3	12	12	2250	70	17
22	13	873	SR 590	FREEWAY	2119	3	12	12	2250	70	17
23	14	15	SR 590	FREEWAY	1496	2	12	12	2250	70	11
24	14	66	SR 590 OFF-RAMP TO SR 104	FREEWAY RAMP	1693	2	12	10	1900	55	11

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
25	14	873	SR 590	FREEWAY	981	5	12	12	2250	70	17
26	15	14	SR 590	FREEWAY	1496	3	12	12	2250	70	11
27	15	68	SR 590	MINOR ARTERIAL	1301	1	12	4	1700	55	11
28	15	69	SR 590 OFF-RAMP TO SR 104	FREEWAY RAMP	1696	1	12	12	1700	55	11
29	16	17	SR 104	FREEWAY	6021	3	12	1	2250	65	11
30	16	874	SR 104	FREEWAY	2470	3	12	12	2250	70	11
31	17	16	SR 104	FREEWAY	6021	3	12	1	2250	65	11
32	17	747	SR 104	FREEWAY	3145	3	12	12	2250	70	12
33	18	19	SR 104	FREEWAY	1160	2	12	12	2250	70	13
34	18	418	SR 104 OFF-RAMP TO 5 MILE LINE RD	FREEWAY RAMP	763	1	12	2	1750	45	13
35	18	920	SR 104	FREEWAY	5958	2	12	12	2250	70	13
36	19	18	SR 104	FREEWAY	1160	2	12	12	2250	70	13
37	19	20	SR 104	FREEWAY	5698	2	12	12	2250	70	13
38	20	19	SR 104	FREEWAY	5695	2	12	12	2250	70	13
39	20	21	SR 104	FREEWAY	3840	2	12	12	2250	70	14
40	21	20	SR 104	FREEWAY	3840	2	12	12	2250	70	14
41	21	22	SR 104	FREEWAY	4020	2	12	12	2250	70	14
42	22	21	SR 104	FREEWAY	4015	2	12	12	2250	70	14
43	22	23	SR 104	FREEWAY	5557	2	12	12	2250	70	15
44	22	248	SR 104 OFF-RAMP TO PHILLIPS RD	FREEWAY RAMP	1082	1	12	2	1750	45	14
45	23	22	SR 104	FREEWAY	5567	2	12	12	2250	70	15
46	23	232	SR 104 OFF-RAMP TO SALT RD	FREEWAY RAMP	726	1	12	2	1750	50	15
47	23	749	SR 104	MINOR ARTERIAL	1979	2	12	10	1900	65	15

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
48	24	25	SR 104	MINOR ARTERIAL	3212	2	12	10	1750	65	15
49	24	356	BASKET RD	COLLECTOR	482	1	12	2	1700	40	15
50	24	749	SR 104	MINOR ARTERIAL	2272	2	12	10	1900	65	15
51	25	24	SR 104	MINOR ARTERIAL	3212	2	12	10	1750	65	15
52	25	26	SR 104	MINOR ARTERIAL	2813	2	12	10	1750	65	22
53	25	355	SR 404	MINOR ARTERIAL	153	1	12	2	1700	40	15
54	26	25	SR 104	MINOR ARTERIAL	2813	2	12	10	1750	65	22
55	26	27	SR 104	MINOR ARTERIAL	4864	2	12	10	1750	65	22
56	27	26	SR 104	MINOR ARTERIAL	4864	2	12	10	1750	65	22
57	27	28	SR 104	MINOR ARTERIAL	2404	2	12	10	1750	65	22
58	27	142	LINCOLN RD	COLLECTOR	544	1	12	2	1575	35	22
59	28	27	SR 104	MINOR ARTERIAL	2404	2	12	10	1750	65	22
60	28	29	SR 104	MINOR ARTERIAL	3729	2	12	10	1750	65	22
61	28	340	CO RD 102	COLLECTOR	836	1	12	2	1575	35	22
62	29	28	SR 104	MINOR ARTERIAL	3729	2	12	10	1750	65	22
63	29	30	SR 104	MINOR ARTERIAL	4698	2	12	10	1750	65	5
64	29	93	SLOCUM RD	COLLECTOR	1590	1	12	2	1700	45	22
65	30	29	SR 104	MINOR ARTERIAL	4698	2	12	10	1750	65	5
66	30	31	SR 104	MINOR ARTERIAL	5314	2	12	10	1750	65	5
67	30	74	SR 350	MINOR ARTERIAL	457	1	12	2	1750	40	22
68	31	30	SR 104	MINOR ARTERIAL	5314	2	12	10	1750	65	5
69	31	32	SR 104	MINOR ARTERIAL	1122	2	12	10	1750	65	23
70	32	31	SR 104	MINOR ARTERIAL	1122	2	12	10	1750	65	23
71	32	33	SR 104	MINOR ARTERIAL	4311	2	12	10	1750	65	6
72	32	100	WALWORTH-ONTARIO RD	COLLECTOR	2390	1	12	2	1750	40	23
73	33	32	SR 104	MINOR ARTERIAL	4311	2	12	10	1750	65	6

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
74	33	34	SR 104	MINOR ARTERIAL	3769	2	12	10	1900	65	6
75	34	33	SR 104	MINOR ARTERIAL	3769	2	12	10	1750	65	6
76	34	35	SR 104	MINOR ARTERIAL	3129	2	12	10	1900	65	6
77	34	112	FISHER RD	COLLECTOR	3151	1	12	2	1700	55	23
78	35	34	SR 104	MINOR ARTERIAL	3129	2	12	10	1900	65	6
79	35	36	SR 104	MINOR ARTERIAL	5985	2	12	10	1900	65	6
80	36	35	SR 104	MINOR ARTERIAL	5985	2	12	10	1900	65	6
81	36	37	SR 104	MINOR ARTERIAL	4414	2	12	10	1900	65	7
82	36	114	SALMON CREEK RD	COLLECTOR	3564	1	12	2	1700	55	23
83	37	36	SR 104	MINOR ARTERIAL	4414	2	12	10	1900	65	7
84	37	38	SR 104	MINOR ARTERIAL	3871	2	12	10	1750	65	7
85	37	776	CO RD 116	COLLECTOR	2824	1	12	2	1700	55	7
86	38	37	SR 104	MINOR ARTERIAL	3871	2	12	10	1900	65	7
87	38	39	SR 104	MINOR ARTERIAL	4119	2	12	10	1750	65	7
88	38	186	SR 21	MINOR ARTERIAL	1860	1	12	12	1700	40	7
89	39	38	SR 104	MINOR ARTERIAL	4119	2	12	10	1750	65	7
90	39	118	POUND RD	COLLECTOR	1170	1	12	2	1700	55	7
91	39	928	SR 104	MINOR ARTERIAL	1158	2	12	10	1900	65	7
92	40	119	E TOWNLINE RD	COLLECTOR	1788	1	12	2	1700	55	7
93	40	778	SR 104	MINOR ARTERIAL	1943	1	12	10	1700	60	7
94	40	928	SR 104	MINOR ARTERIAL	6101	1	12	10	1700	65	7
95	41	42	SR 104	MINOR ARTERIAL	4798	1	12	10	1700	60	8
96	41	122	N CENTENARY RD	COLLECTOR	2544	1	12	2	1700	50	8
97	41	793	SR 104	MINOR ARTERIAL	4462	1	12	10	1700	60	8
98	42	41	SR 104	MINOR ARTERIAL	4798	1	12	10	1700	60	8
99	42	43	SR 104	MINOR ARTERIAL	3742	1	12	10	1700	60	8

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
100	43	42	SR 104	MINOR ARTERIAL	3748	1	12	10	1700	60	8
101	43	44	SR 104	MINOR ARTERIAL	4935	1	12	10	1750	60	8
102	43	124	SR 88	MINOR ARTERIAL	599	1	12	2	1750	40	8
103	44	43	SR 104	MINOR ARTERIAL	4950	1	12	10	1700	60	8
104	44	45	SR 104	MINOR ARTERIAL	3947	1	12	10	1700	60	9
105	44	126	MAPLE AVE	COLLECTOR	2600	1	12	2	1750	55	8
106	45	44	SR 104	MINOR ARTERIAL	3961	1	12	10	1750	60	9
107	45	46	SR 104	MINOR ARTERIAL	4663	1	12	10	1750	60	9
108	46	45	SR 104	MINOR ARTERIAL	4663	1	12	10	1700	60	9
109	46	674	RIDGE RD	COLLECTOR	1332	1	12	2	1700	55	9
110	46	675	SR 104	MINOR ARTERIAL	1776	1	12	10	1700	60	26
111	47	48	SR 104	MINOR ARTERIAL	3144	1	12	10	1700	60	26
112	47	675	SR 104	MINOR ARTERIAL	2424	1	12	10	1700	60	26
113	48	47	SR 104	MINOR ARTERIAL	3144	1	12	10	1700	60	26
114	48	49	SR 104	MINOR ARTERIAL	1291	1	12	10	1700	60	26
115	49	48	SR 104	MINOR ARTERIAL	1291	1	12	10	1700	60	26
116	50	51	CULVER RD	COLLECTOR	672	1	12	4	1700	40	2
117	51	52	SEA BREEZE DR	COLLECTOR	3131	1	12	4	1700	50	2
118	51	474	CULVER RD	COLLECTOR	1543	1	12	2	1700	40	2
119	52	515	SEA BREEZE DR TRAFFIC CIRCLE	COLLECTOR	120	1	12	4	900	20	2
120	53	54	SEA BREEZE DR	COLLECTOR	997	1	12	4	1700	50	2
121	54	808	SEA BREEZE DR TRAFFIC CIRCLE	COLLECTOR	177	1	12	4	900	20	11
122	55	56	SEA BREEZE DR	COLLECTOR	2617	1	12	4	1700	50	11
123	56	805	SEA BREEZE DR TRAFFIC CIRCLE	COLLECTOR	180	1	12	4	900	20	11

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
124	57	58	SEA BREEZE DR	COLLECTOR	1641	1	12	4	1700	50	11
125	58	497	SEA BREEZE DR TRAFFIC CIRCLE	COLLECTOR	144	1	12	4	1125	25	11
126	59	60	SR 590	MINOR ARTERIAL	1265	2	12	4	1900	50	11
127	59	498	SR 590 TRAFFIC CIRCLE	MINOR ARTERIAL	150	1	12	4	1125	25	11
128	60	59	SR 590	MINOR ARTERIAL	1265	1	12	4	1700	50	11
129	60	68	SR 590	MINOR ARTERIAL	2029	1	12	4	1700	55	11
130	61	62	SR 104	FREEWAY	641	3	12	12	2250	70	16
131	62	61	SR 104	FREEWAY	641	3	12	12	2250	70	16
132	62	63	SR 104	FREEWAY	3149	3	12	12	2250	70	16
133	63	62	SR 104	FREEWAY	3148	3	12	12	2250	70	16
134	63	64	SR 104	FREEWAY	3969	3	12	12	2250	70	16
135	64	63	SR 104	FREEWAY	3969	3	12	12	2250	70	16
136	64	65	SR 104	FREEWAY	4393	3	12	12	2250	70	16
137	65	64	SR 104	FREEWAY	4392	3	12	12	2250	70	16
138	65	482	SR 104 OFF-RAMP TO CULVER RD	FREEWAY RAMP	1044	1	12	2	1700	40	17
139	65	871	SR 104	FREEWAY	1948	3	12	12	2250	70	17
140	66	871	SR 104	FREEWAY	2266	4	12	12	2250	70	11
141	67	14	SR 104 OFF-RAMP TO SR 590	FREEWAY RAMP	1242	2	12	10	1900	55	17
142	67	69	SR 104 OFF-RAMP TO SR 590	FREEWAY RAMP	2848	2	12	10	1900	55	11
143	68	15	SR 590	FREEWAY RAMP	1301	1	12	4	1700	55	11
144	68	60	SR 590	MINOR ARTERIAL	2029	1	12	4	1700	55	11
145	69	16	SR 104	FREEWAY	2080	3	12	12	2250	70	11

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
146	70	15	SR 104 OFF-RAMP TO SR 590	FREEWAY RAMP	816	2	12	4	1900	55	11
147	70	66	SR 590 OFF-RAMP TO SR 104	FREEWAY RAMP	1184	2	12	10	1900	55	11
148	71	72	ONTARIO CENTER RD	COLLECTOR	5393	1	12	2	1700	55	5
149	71	209	LAKE RD	COLLECTOR	949	1	12	2	1700	55	5
150	71	211	LAKE RD	COLLECTOR	5046	1	12	2	1700	55	5
151	72	73	ONTARIO CENTER RD	COLLECTOR	6646	1	12	2	1750	55	5
152	73	772	KENYON RD	COLLECTOR	5291	1	12	2	1700	55	5
153	73	890	ONTARIO CENTER RD	COLLECTOR	3748	1	12	2	1700	55	5
154	74	30	SR 350	MINOR ARTERIAL	457	1	12	2	1750	40	22
156	74	774	RIDGE RD	COLLECTOR	5534	1	12	2	1700	45	22
157	74	903	SR 350	MINOR ARTERIAL	6579	1	12	2	1700	55	22
158	75	76	SR 350	MINOR ARTERIAL	5653	1	12	2	1700	55	23
159	76	77	SR 350	MINOR ARTERIAL	7201	1	12	2	1750	55	23
160	76	145	PLANK RD	COLLECTOR	14868	1	12	2	1700	55	22
161	77	78	SR 350	MINOR ARTERIAL	9220	1	12	2	1750	55	36
162	77	146	SR 286	MINOR ARTERIAL	13043	1	12	2	1700	55	35
163	78	105	CO RD 205	COLLECTOR	5421	1	12	2	1750	55	36
164	78	782	WALWORTH-PENFIELD RD	COLLECTOR	7980	1	12	2	1700	55	35
165	78	1025	SR 350	MINOR ARTERIAL	2795	1	12	4	1700	60	36
166	79	80	SR 350	MINOR ARTERIAL	3320	1	12	2	1700	60	36
167	80	908	BARNES RD	COLLECTOR	6651	1	12	2	1700	45	42
168	80	997	SR 350	MINOR ARTERIAL	4311	1	12	2	1700	55	42
169	81	82	31F	COLLECTOR	682	1	12	2	1750	55	41

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
170	81	631	MACEDON CENTER RD	COLLECTOR	1236	1	12	2	1700	55	41
171	82	81	31F	COLLECTOR	681	1	12	2	1700	55	41
172	82	786	31F	COLLECTOR	4897	1	12	2	1750	55	41
173	82	996	SR 350	MINOR ARTERIAL	6353	1	12	2	1700	55	41
174	83	84	SR 350	MINOR ARTERIAL	2230	1	12	2	1750	40	41
175	84	569	SR 31	MINOR ARTERIAL	5034	1	12	2	1700	40	41
176	84	933	SR 31	MINOR ARTERIAL	2083	1	12	2	1700	45	42
177	85	86	SR 31	MINOR ARTERIAL	6270	1	12	2	1700	55	42
178	85	630	CO RD 312	COLLECTOR	4056	1	12	2	1700	50	42
179	86	85	SR 31	MINOR ARTERIAL	6265	1	12	2	1700	55	42
180	86	931	SR 31	MINOR ARTERIAL	3547	1	12	2	1750	55	42
181	87	801	SR 21	MINOR ARTERIAL	2524	1	12	2	1700	55	42
182	87	929	SR 31	MINOR ARTERIAL	573	1	12	2	1750	40	42
183	88	89	SR 31	MINOR ARTERIAL	2414	1	12	2	1700	45	42
184	90	91	SLOCUM RD	COLLECTOR	5077	1	12	2	1700	55	5
185	90	338	LAKE RD	COLLECTOR	3701	1	12	2	1700	55	5
186	90	954	LAKE RD	COLLECTOR	2737	1	12	2	1700	55	5
187	91	72	BRICK CHURCH RD	COLLECTOR	5118	1	12	2	1700	55	5
188	91	92	SLOCUM RD	COLLECTOR	6685	1	12	2	1700	55	5
189	92	73	KENYON RD	COLLECTOR	4759	1	12	2	1750	55	5
190	92	889	SLOCUM RD	COLLECTOR	3976	1	12	2	1700	55	5
191	93	29	SLOCUM RD	COLLECTOR	1589	1	12	2	1750	35	22
192	93	94	SLOCUM RD	COLLECTOR	7321	1	12	2	1700	55	22
193	93	340	RIDGE RD	COLLECTOR	3791	1	12	2	1700	50	22
194	93	349	RIDGE RD	COLLECTOR	2490	1	12	2	1700	50	22
195	94	143	WHITNEY RD	COLLECTOR	5947	1	12	2	1700	55	22

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
196	94	904	BUSHWOOD RD	COLLECTOR	2540	1	12	2	1700	45	22
197	95	96	SR 110	MINOR ARTERIAL	4973	1	12	2	1700	50	6
198	95	212	LAKE RD	COLLECTOR	4228	1	12	2	1700	55	6
199	96	97	SR 110	MINOR ARTERIAL	2240	1	12	2	1700	45	6
200	97	98	SR 110	MINOR ARTERIAL	2532	1	12	2	1700	50	6
201	98	99	SR 110	MINOR ARTERIAL	4207	1	12	2	1700	55	6
202	99	637	KENYON RD	COLLECTOR	6061	1	12	0	1700	55	6
203	99	892	SR 110	MINOR ARTERIAL	3319	1	12	2	1700	50	6
204	100	32	WALWORTH-ONTARIO RD	COLLECTOR	2390	1	12	2	1750	40	23
205	100	101	WALWORTH-ONTARIO RD	COLLECTOR	4566	1	12	2	1700	50	23
206	100	112	RIDGE RD	COLLECTOR	8374	1	12	2	1700	50	23
207	101	102	WALWORTH-ONTARIO RD	COLLECTOR	3523	1	12	2	1700	50	23
208	102	103	WALWORTH-ONTARIO RD	COLLECTOR	4147	1	12	2	1700	50	23
209	103	104	WALWORTH-ONTARIO RD	COLLECTOR	15286	1	12	2	1700	55	36
210	103	654	TUMMONDS RD	COLLECTOR	5811	1	12	2	1700	55	23
211	104	105	WALWORTH-ONTARIO RD	COLLECTOR	2802	1	12	2	1750	40	36
212	105	662	WALWORTH-MARION RD	COLLECTOR	2454	1	12	2	1700	50	36
213	105	667	WALWORTH-ONTARIO RD	COLLECTOR	2854	1	12	2	1700	50	36
214	106	107	WALWORTH-ONTARIO RD	COLLECTOR	1562	1	12	2	1700	55	36

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
215	107	908	WALWORTH-ONTARIO RD	COLLECTOR	3835	1	12	2	1700	55	36
216	108	632	MACEDON CENTER RD	COLLECTOR	8006	1	12	2	1700	55	42
217	108	993	WALWORTH-ONTARIO RD	COLLECTOR	1790	1	12	2	1575	35	42
218	109	995	WALWORTH-ONTARIO RD	COLLECTOR	3412	1	12	2	1700	50	42
219	110	640	CO RD 120	COLLECTOR	6485	1	12	2	1700	55	7
220	110	641	CO RD 120	COLLECTOR	3053	1	12	2	1700	55	7
221	111	217	LAKE RD	COLLECTOR	1972	1	12	2	1700	50	7
222	111	640	CO RD 120	COLLECTOR	2840	1	12	2	1700	45	7
223	112	34	FISHER RD	COLLECTOR	3151	1	12	2	1700	50	23
224	112	113	RIDGE RD	COLLECTOR	3916	1	12	2	1700	55	23
225	112	651	CO RD 210	COLLECTOR	3863	1	10	2	1700	55	23
226	113	114	RIDGE RD	COLLECTOR	5368	1	12	2	1700	55	23
227	114	36	SALMON CREEK RD	COLLECTOR	3564	1	12	2	1700	50	23
228	114	776	CO RD 103	COLLECTOR	4624	1	12	2	1700	55	24
229	115	116	CO RD 103	COLLECTOR	2744	1	12	2	1750	45	24
230	116	117	CO RD 103	COLLECTOR	4499	1	12	2	1700	40	24
231	116	186	SR 21	MINOR ARTERIAL	1419	1	12	2	1700	40	24
232	116	187	SR 21	MINOR ARTERIAL	6072	1	12	12	1700	45	24
233	117	118	CO RD 103	COLLECTOR	1265	1	12	2	1700	55	7
234	118	39	POUND RD	COLLECTOR	1164	1	12	2	1750	40	7
235	118	119	CO RD 103	COLLECTOR	6666	1	12	2	1700	55	7
236	119	40	E TOWNLINE RD	COLLECTOR	1788	1	12	2	1700	45	7
237	119	120	CO RD 103	COLLECTOR	3383	1	12	2	1700	55	7

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
238	119	643	E TOWNLINE RD	COLLECTOR	3643	1	12	2	1700	55	24
239	120	121	CO RD 103	COLLECTOR	2908	1	12	2	1700	60	8
240	120	795	TRIPP RD	COLLECTOR	2814	1	12	2	1700	50	25
241	121	122	CO RD 103	COLLECTOR	2745	1	12	2	1700	60	8
242	122	123	CO RD 103	COLLECTOR	4893	1	12	2	1700	55	8
243	123	124	CO RD 103	COLLECTOR	4398	1	12	2	1750	55	8
244	124	43	SR 88	MINOR ARTERIAL	599	1	12	2	1700	40	8
245	124	125	SR 88	MINOR ARTERIAL	2735	1	12	2	1700	40	8
246	125	126	SR 88	MINOR ARTERIAL	1709	1	12	2	1750	40	8
247	125	127	SR 88	MINOR ARTERIAL	3862	1	12	2	1700	40	8
248	126	672	CO RD 103	COLLECTOR	724	1	12	2	1700	40	8
249	127	128	SR 88	MINOR ARTERIAL	9480	1	12	2	1700	55	25
250	128	682	SR 88	MINOR ARTERIAL	2260	1	12	2	1700	65	25
251	128	699	CO RD 241	COLLECTOR	4268	1	12	2	1700	55	25
252	129	130	SR 88	MINOR ARTERIAL	4921	1	12	2	1700	65	25
253	130	131	SR 88	MINOR ARTERIAL	10536	1	12	2	1700	65	38
254	131	132	SR 88	MINOR ARTERIAL	7801	1	12	2	1700	45	38
255	132	697	FAIRVILLE MAPLE RIDGE RD	COLLECTOR	2356	1	12	2	1700	50	38
256	132	1003	SR 88	MINOR ARTERIAL	4391	1	12	2	1700	60	44
257	133	134	SR 88	MINOR ARTERIAL	8666	1	12	2	1700	55	44
258	134	135	SR 88	MINOR ARTERIAL	1179	1	12	2	1700	55	44
259	136	137	CO RD 2	COLLECTOR	5178	1	12	2	1700	60	4
260	136	225	LAKE RD	COLLECTOR	3214	1	12	2	1700	55	4
261	137	138	CO RD 2	COLLECTOR	5301	1	12	2	1700	60	4
262	138	227	SCHLEGEL RD	COLLECTOR	3237	1	12	2	1700	55	4
263	138	886	CO RD 100	COLLECTOR	5962	1	12	2	1700	50	4

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
264	139	351	RIDGE RD	COLLECTOR	578	1	12	2	1700	55	15
265	139	371	COUNTY LINE RD	COLLECTOR	6827	1	12	2	1700	50	15
266	140	371	COUNTY LINE RD	COLLECTOR	424	1	12	2	1700	55	15
267	140	1007	COUNTY LINE RD	COLLECTOR	3515	1	12	2	1700	55	21
268	141	405	HALEY RD	COLLECTOR	597	1	12	2	1700	55	22
269	142	27	LINCOLN RD	COLLECTOR	544	1	12	2	1750	35	22
270	142	143	CO RD 200	COLLECTOR	7947	1	12	2	1700	55	22
271	142	350	RIDGE RD	COLLECTOR	4704	1	12	2	1700	55	22
272	143	94	WHITNEY RD	COLLECTOR	5947	1	12	2	1700	55	22
273	143	140	WHITNEY RD	COLLECTOR	7806	1	12	2	1700	55	22
274	143	144	CO RD 202	COLLECTOR	3641	1	12	2	1700	55	22
275	144	145	CO RD 202	COLLECTOR	3626	1	12	2	1700	55	22
276	144	405	HALEY RD	COLLECTOR	6771	1	12	2	1700	55	22
277	145	76	PLANK RD	COLLECTOR	14868	1	12	2	1700	55	22
278	145	146	CO RD 202	COLLECTOR	7272	1	12	2	1700	55	22
279	145	404	PLANK RD	COLLECTOR	6984	1	12	2	1700	50	22
280	146	77	SR 286	MINOR ARTERIAL	13043	1	12	2	1750	55	35
281	146	147	CO RD 204	COLLECTOR	4049	1	12	2	1700	50	35
282	146	406	SR 286	MINOR ARTERIAL	8178	1	12	2	1700	55	35
283	147	986	CO RD 204	COLLECTOR	1157	1	12	2	1700	45	35
284	148	149	CO RD 204	COLLECTOR	4974	1	12	2	1700	45	35
285	149	150	SR 441	MINOR ARTERIAL	1841	1	12	2	1700	45	35
286	149	782	WALWORTH-PENFIELD RD	COLLECTOR	6931	1	12	2	1700	55	35
287	150	151	SR 441	MINOR ARTERIAL	2907	1	12	2	1700	55	35
288	150	615	W WALWORTH RD	COLLECTOR	2439	1	12	2	1700	50	35
289	151	152	SR 441	MINOR ARTERIAL	2838	1	12	2	1750	50	35

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
290	152	619	SR 441	MINOR ARTERIAL	538	1	12	2	1700	50	34
291	153	154	SR 441	MINOR ARTERIAL	3306	1	12	2	1700	55	34
292	153	598	CARTER RD	COLLECTOR	8060	1	12	2	1700	55	34
293	154	155	SR 441	MINOR ARTERIAL	4394	1	12	2	1700	55	34
294	155	156	SR 441	MINOR ARTERIAL	1083	2	12	2	1750	55	34
295	156	157	SR 441	MINOR ARTERIAL	2404	2	12	2	1750	55	34
296	156	280	WATSON RD	COLLECTOR	2354	1	12	2	1700	50	34
297	157	272	SR 250	MINOR ARTERIAL	1240	2	12	2	1750	55	34
298	157	911	SR 441	MINOR ARTERIAL	1520	2	12	2	1750	50	34
299	158	592	BAIRD RD	COLLECTOR	2622	1	12	2	1700	55	33
300	158	918	SR 441	MINOR ARTERIAL	1336	2	12	2	1750	55	33
301	159	160	SR 441	MINOR ARTERIAL	2367	2	12	2	1900	55	33
302	159	425	5 MILE LINE RD	COLLECTOR	3196	1	12	2	1750	50	33
303	160	161	SR 441	MINOR ARTERIAL	1912	2	12	2	1900	65	33
304	160	972	PENFIELD RD	COLLECTOR	2236	1	12	2	1700	55	33
305	161	162	SR 441	MINOR ARTERIAL	1562	2	12	2	1900	55	32
306	161	428	SR 441 OFF-RAMP TO SR 153	FREEWAY RAMP	871	1	12	2	1750	45	32
307	162	163	SR 441	MINOR ARTERIAL	2998	2	12	2	1750	55	32
308	163	813	SR 441	MINOR ARTERIAL	2118	2	12	2	1900	55	32
309	164	817	SR 441	MAJOR ARTERIAL	765	3	12	2	1750	55	32
310	165	166	SR 441	MINOR ARTERIAL	485	2	12	2	1750	40	32
311	165	176	I-490 ON-RAMP FROM SR 441	FREEWAY RAMP	730	1	12	2	1700	45	32
312	166	165	SR 441	MINOR ARTERIAL	485	1	12	2	1750	40	32
313	166	167	SR 441	MINOR ARTERIAL	905	2	12	2	1750	40	32

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
314	166	177	I-490 ON-RAMP FROM SR 441	FREEWAY RAMP	736	1	12	2	1700	45	32
315	167	166	SR 441	MINOR ARTERIAL	905	2	12	2	1750	40	32
316	167	441	EAST AVE	MINOR ARTERIAL	4376	2	12	2	1750	45	31
317	167	848	SR 96	MINOR ARTERIAL	487	2	12	2	1750	45	32
318	167	1024	ELMWOOD AVE	COLLECTOR	311	2	12	2	1900	40	32
319	169	170	I-490	FREEWAY	812	3	12	12	2250	70	28
320	170	169	I-490	FREEWAY	812	4	12	12	2250	70	28
321	170	171	I-490	FREEWAY	862	4	12	12	2250	70	28
322	170	836	I-490 OFF-RAMP TO S WINTON RD	FREEWAY RAMP	479	1	12	2	1900	45	28
323	171	170	I-490	FREEWAY	862	4	12	12	2250	70	28
324	171	172	I-490	FREEWAY	1440	3	12	12	2250	70	28
325	171	823	SR 590 ON-RAMP	FREEWAY RAMP	778	2	12	2	1900	55	28
326	172	171	I-490	FREEWAY	1440	3	12	12	2250	70	28
327	172	173	I-490	FREEWAY	698	3	12	12	2250	70	28
328	173	172	I-490	FREEWAY	698	4	12	12	2250	70	28
329	173	174	I-490	FREEWAY	1471	3	12	12	2250	70	28
330	174	173	I-490	FREEWAY	1473	3	12	12	2250	70	28
331	174	175	I-490	FREEWAY	1193	3	12	12	2250	70	28
332	174	826	SR 590 ON-RAMP	FREEWAY RAMP	774	2	12	2	1900	50	28
333	175	174	I-490	FREEWAY	1193	4	12	12	2250	70	28
334	175	176	I-490	FREEWAY	4583	3	12	12	2250	70	32
335	175	440	I-490 OFF-RAMP TO PENFIELD RD	FREEWAY RAMP	660	1	12	2	1750	45	31
336	176	166	I-490 OFF-RAMP TO SR 441	FREEWAY RAMP	555	1	12	2	1750	55	32

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
337	176	175	I-490	FREEWAY	4583	3	12	12	2250	70	32
338	176	177	I-490	FREEWAY	1277	3	12	12	2250	70	32
339	177	165	I-490 OFF-RAMP TO SR 441	FREEWAY RAMP	691	1	12	2	1750	55	32
340	177	176	I-490	FREEWAY	1281	3	12	12	2250	70	32
341	177	178	I-490	FREEWAY	2038	3	12	12	2250	70	32
342	178	177	I-490	FREEWAY	2037	3	12	12	2250	70	32
343	178	179	I-490	FREEWAY	2332	3	12	12	2250	70	32
344	179	178	I-490	FREEWAY	2333	3	12	12	2250	70	32
345	179	180	I-490	FREEWAY	1668	3	12	12	2250	70	32
346	180	179	I-490	FREEWAY	1672	3	12	12	2250	70	32
347	180	549	I-490	FREEWAY	2289	4	12	12	2250	70	32
348	181	549	I-490	FREEWAY	1176	3	12	12	2250	70	39
349	181	553	I-490 OFF-RAMP TO 31F	FREEWAY RAMP	877	2	12	2	1750	45	39
350	181	988	I-490	FREEWAY	3440	3	12	12	2250	70	39
351	182	183	I-490	FREEWAY	2991	2	12	12	2250	70	39
352	182	988	I-490	FREEWAY	4012	2	12	12	2250	70	39
353	183	182	I-490	FREEWAY	2987	2	12	12	2250	70	39
354	183	184	I-490	FREEWAY	2975	2	12	12	2250	70	39
355	184	183	I-490	FREEWAY	2980	2	12	12	2250	70	39
356	184	185	I-490	FREEWAY	2308	2	12	12	2250	70	39
357	185	184	I-490	FREEWAY	2308	2	12	12	2250	70	39
358	186	38	SR 21	MINOR ARTERIAL	1859	1	12	2	1750	40	7
359	186	116	SR 21	MINOR ARTERIAL	1419	1	12	12	1750	55	24
360	187	188	SR 21	MINOR ARTERIAL	3570	1	12	12	1700	55	24
361	188	189	SR 21	MINOR ARTERIAL	7960	1	12	12	1700	55	24

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
362	189	190	SR 21	MINOR ARTERIAL	7961	1	12	2	1700	50	37
363	190	191	SR 21	MINOR ARTERIAL	2770	1	12	2	1700	45	37
364	190	197	N MAIN ST	COLLECTOR	1352	1	12	2	1700	45	37
365	191	192	SR 21	MINOR ARTERIAL	2221	1	12	2	1750	45	37
366	192	193	SR 21	MINOR ARTERIAL	3180	1	12	2	1700	45	37
367	192	199	BUFFALO ST	COLLECTOR	2191	1	12	2	1750	45	37
368	193	194	SR 21	MINOR ARTERIAL	6499	1	12	2	1700	60	37
369	194	195	SR 21	MINOR ARTERIAL	10982	1	12	12	1700	60	43
370	195	196	SR 21	MINOR ARTERIAL	8215	1	12	12	1700	55	43
371	196	88	SR 21	MINOR ARTERIAL	3064	1	12	12	1750	50	42
372	197	198	N MAIN ST	COLLECTOR	2346	1	10	2	1575	35	37
373	197	649	E WILLIAMSON RD	COLLECTOR	4840	1	12	2	1700	60	37
374	198	199	N MAIN ST	COLLECTOR	1865	1	10	2	1750	35	37
375	199	200	CO RD 216	COLLECTOR	478	1	12	2	1700	40	37
376	200	193	CO RD 216	COLLECTOR	2307	1	12	2	1700	45	37
377	200	201	MILL ST	COLLECTOR	2090	1	12	2	1700	45	37
378	201	202	NEWARK RD	COLLECTOR	7454	1	12	2	1700	55	37
379	202	203	NEWARK MARION RD	COLLECTOR	1272	1	12	2	1700	50	37
380	203	204	NEWARK MARION RD	COLLECTOR	7310	1	12	2	1700	55	43
381	204	205	NEWARK MARION RD	COLLECTOR	3562	1	12	2	1700	55	43
382	205	206	CO RD 221	COLLECTOR	1675	1	12	2	1700	55	43
383	206	207	CO RD 221	COLLECTOR	5153	1	12	2	1700	55	43
384	207	208	CO RD 221	COLLECTOR	6121	1	12	2	1700	55	44
385	208	2	CO RD 221	COLLECTOR	5411	1	12	2	1700	55	44
386	209	71	LAKE RD	COLLECTOR	947	1	12	2	1750	55	5
387	209	954	LAKE RD	COLLECTOR	1428	1	12	2	1700	55	5

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
388	210	71	PLANT DRIVEWAY	COLLECTOR	1480	1	12	2	1750	40	5
389	210	209	PLANT DRIVEWAY	COLLECTOR	965	1	12	2	1700	40	5
390	211	95	LAKE RD	COLLECTOR	5217	1	12	2	1700	55	6
391	211	773	KNICKERBOCKER RD	COLLECTOR	7417	1	12	2	1700	50	6
392	212	213	LAKE RD	COLLECTOR	6143	1	12	2	1700	55	6
393	212	636	FISHER RD	COLLECTOR	3869	1	12	2	1700	50	6
394	213	214	LAKE RD	COLLECTOR	4172	1	12	2	1700	55	6
395	213	789	STONEY LONESOME RD	COLLECTOR	14281	1	12	2	1700	55	6
396	214	215	LAKE RD	COLLECTOR	4128	1	12	2	1700	55	7
397	215	216	LAKE RD	COLLECTOR	3503	1	12	2	1700	45	7
398	216	111	LAKE RD	COLLECTOR	1511	1	12	2	1575	35	7
399	216	790	HAMILTON RD	COLLECTOR	1304	1	12	2	1750	45	7
400	217	218	LAKE RD	COLLECTOR	4274	1	12	2	1700	55	7
401	218	219	LAKE RD	COLLECTOR	4368	1	12	2	1700	55	7
402	219	220	LAKE RD	COLLECTOR	1665	1	12	2	1700	55	7
403	219	642	E TOWNLINE RD	COLLECTOR	12152	1	12	2	1700	50	7
404	220	221	LAKE RD	COLLECTOR	6587	1	12	2	1700	55	8
405	221	222	LAKE RD	COLLECTOR	3255	1	12	2	1700	55	8
406	221	683	N CENTENARY RD	COLLECTOR	8874	1	12	2	1700	45	8
407	222	223	LAKE RD	COLLECTOR	5706	1	12	2	1700	55	8
408	223	224	LAKE RD	COLLECTOR	5233	1	12	2	1700	55	8
409	224	44	MAPLE AVE	COLLECTOR	7522	1	12	2	1750	55	8
410	224	668	LAKE RD	COLLECTOR	3166	1	12	2	1700	55	8
411	225	226	BASKET RD	COLLECTOR	5956	1	12	2	1700	55	4
412	225	228	LAKE RD	COLLECTOR	3411	1	12	2	1700	55	4
413	226	227	BASKET RD	COLLECTOR	4290	1	12	2	1700	55	4

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
414	227	230	SCHLEGEL RD	COLLECTOR	3406	1	12	2	1700	55	4
415	227	885	BASKET RD	COLLECTOR	6150	1	12	2	1700	55	4
416	228	229	SALT RD	COLLECTOR	5625	1	12	2	1700	50	4
417	228	239	LAKE RD	COLLECTOR	5232	1	12	2	1700	50	4
418	229	230	SALT RD	COLLECTOR	4362	1	12	2	1700	50	4
419	230	242	SCHLEGEL RD	COLLECTOR	5032	1	12	2	1700	55	4
420	230	760	SALT RD	COLLECTOR	5271	1	12	2	1700	50	4
421	231	23	SR 104 ON-RAMP FROM SALT RD	FREEWAY RAMP	718	1	12	2	1700	50	15
422	231	232	SALT RD	MINOR ARTERIAL	401	2	12	2	1750	30	15
423	232	231	SALT RD	MINOR ARTERIAL	401	1	12	2	1750	30	15
424	232	233	SALT RD	MINOR ARTERIAL	465	2	12	2	1750	35	15
425	233	232	SALT RD	MINOR ARTERIAL	465	2	12	2	1750	35	15
426	233	234	SALT RD	COLLECTOR	5241	1	12	2	1700	50	15
427	233	357	SR 404	MINOR ARTERIAL	2968	1	12	2	1700	50	15
428	234	235	SALT RD	COLLECTOR	3847	1	12	2	1700	50	15
429	234	334	STATE RD	COLLECTOR	2946	1	12	2	1700	55	15
430	235	236	SALT RD	COLLECTOR	4241	1	12	2	1700	50	21
431	236	237	SALT RD	COLLECTOR	8088	1	10	1	1700	55	21
432	236	335	PLANK RD	COLLECTOR	3009	1	12	2	1700	50	21
433	237	238	SALT RD	COLLECTOR	2551	1	10	1	1750	55	34
434	237	336	SR 286	MINOR ARTERIAL	3145	1	12	2	1700	50	34
435	238	153	SALT RD	COLLECTOR	7965	1	10	1	1750	55	34
436	238	337	SWEET CORNERS RD	COLLECTOR	3230	1	10	2	1750	50	34
437	239	240	PHILLIPS RD	COLLECTOR	3232	1	12	2	1700	55	4
438	239	251	LAKE RD	COLLECTOR	3867	1	12	2	1700	55	4
439	240	241	PHILLIPS RD	COLLECTOR	2198	1	12	2	1700	55	4

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
440	241	242	PHILLIPS RD	COLLECTOR	3589	1	12	2	1700	55	4
441	242	243	PHILLIPS RD	COLLECTOR	2968	1	12	2	1750	55	4
442	242	256	SCHLEGEL RD	COLLECTOR	2487	1	12	2	1750	50	4
443	243	244	PHILLIPS RD	COLLECTOR	2367	1	12	2	1750	55	4
444	243	950	KLEM RD	COLLECTOR	2087	1	12	2	1700	55	4
445	244	245	PHILLIPS RD	COLLECTOR	1263	1	12	2	1700	55	14
446	244	884	CHIYODA DR	COLLECTOR	1596	1	12	2	1700	40	14
447	245	246	PHILLIPS RD	COLLECTOR	962	1	12	2	1750	55	14
448	246	247	PHILLIPS RD	MINOR ARTERIAL	350	2	12	2	1900	40	14
449	246	883	ORCHARD RD	MINOR ARTERIAL	1595	2	12	2	1750	55	14
450	247	248	PHILLIPS RD	COLLECTOR	448	1	12	2	1750	40	14
451	247	902	SR 104 ON-RAMP FROM PHILLIPS RD	FREEWAY RAMP	591	2	12	2	1900	45	14
452	248	247	PHILLIPS RD	COLLECTOR	448	1	12	2	1700	40	14
453	248	1002	PHILLIPS RD	COLLECTOR	988	1	12	2	1700	55	14
454	249	264	SR 404	MINOR ARTERIAL	3064	1	12	2	1750	50	14
455	249	1001	PHILLIPS RD	MINOR ARTERIAL	2007	2	12	2	1900	50	14
456	249	1002	PHILLIPS RD	MINOR ARTERIAL	346	2	12	2	1900	40	14
457	250	266	STATE RD	COLLECTOR	3238	1	12	2	1750	50	14
458	251	252	SR 250	MINOR ARTERIAL	1260	1	12	2	1700	50	4
459	251	287	LAKE RD	COLLECTOR	3564	1	12	2	1700	55	4
460	252	253	SR 250	MINOR ARTERIAL	865	1	12	2	1700	50	4
461	253	254	SR 250	MINOR ARTERIAL	3260	1	12	2	1700	50	4
462	254	255	SR 250	MINOR ARTERIAL	2118	1	12	2	1700	50	4
463	255	256	SR 250	MINOR ARTERIAL	1386	1	12	2	1750	50	4
464	256	257	SR 250	MINOR ARTERIAL	2594	1	12	2	1700	50	4
465	257	258	SR 250	MINOR ARTERIAL	388	2	12	2	1750	50	4

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
466	258	259	SR 250	MINOR ARTERIAL	367	2	12	2	1900	50	4
467	258	951	KLEM RD	MINOR ARTERIAL	389	2	12	2	1900	50	4
468	259	260	SR 250	MINOR ARTERIAL	2212	1	12	2	1700	50	4
469	260	261	SR 250	MINOR ARTERIAL	2099	1	12	2	1750	50	14
470	261	926	SR 250	MINOR ARTERIAL	978	1	12	2	1575	35	14
471	262	263	SR 250	MINOR ARTERIAL	346	2	12	2	1750	35	14
472	262	757	SR 104 SERVICE RD	MINOR ARTERIAL	1075	2	12	2	1900	55	14
473	263	262	SR 250	MINOR ARTERIAL	346	1	12	2	1750	35	14
474	263	927	SR 250	MINOR ARTERIAL	332	2	12	2	1900	35	14
475	264	358	SR 404	MINOR ARTERIAL	2072	1	12	2	1750	40	14
476	264	770	SR 250	MINOR ARTERIAL	1153	1	12	2	1750	40	14
477	264	927	SR 250	MINOR ARTERIAL	844	1	12	2	1700	40	14
478	265	266	SR 250	MINOR ARTERIAL	2368	1	12	2	1750	50	14
479	266	267	SR 250	MINOR ARTERIAL	6313	1	12	2	1750	50	20
480	266	372	STATE RD	COLLECTOR	3701	1	12	2	1700	50	20
481	267	268	SR 250	MINOR ARTERIAL	5380	1	12	2	1700	55	20
482	267	400	PLANK RD	COLLECTOR	1611	1	12	2	1700	50	20
483	268	269	SR 250	MINOR ARTERIAL	2560	1	12	2	1750	55	34
484	268	999	PENFIELD CENTER RD	COLLECTOR	4155	1	12	2	1700	50	34
485	269	270	SR 250	MINOR ARTERIAL	2747	1	12	2	1700	55	34
486	269	408	SR 286	MINOR ARTERIAL	4839	1	12	2	1700	50	34
487	270	271	SR 250	MINOR ARTERIAL	4698	1	12	2	1750	55	34
488	271	910	SR 250	MINOR ARTERIAL	2153	1	12	2	1700	50	34
489	271	1022	WHALEN RD	COLLECTOR	2375	1	12	2	1700	50	34
490	272	157	SR 250	MINOR ARTERIAL	1240	1	12	2	1750	50	34
491	272	273	SR 250	MINOR ARTERIAL	6895	1	12	4	1750	55	34

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
492	273	274	SR 250	MINOR ARTERIAL	1254	1	12	2	1750	35	40
493	273	594	WHITNEY RD W	COLLECTOR	5809	1	12	2	1750	50	39
494	274	275	SR 250	MINOR ARTERIAL	1769	1	12	2	1750	30	40
495	274	282	HIGH ST	COLLECTOR	2676	1	12	2	1750	45	40
496	275	276	SR 250	MINOR ARTERIAL	591	1	12	2	1750	35	40
497	276	565	31F	COLLECTOR	2238	1	12	2	1700	55	40
498	276	947	SR 250	MINOR ARTERIAL	2904	1	12	2	1750	40	40
499	277	567	SR 250	MINOR ARTERIAL	990	2	12	2	1900	50	40
500	277	944	AYRAULT RD	MINOR ARTERIAL	632	2	12	2	1900	45	40
501	278	580	SR 31	MINOR ARTERIAL	487	2	12	2	1750	55	40
502	278	937	SR 250	MINOR ARTERIAL	379	2	12	2	1900	40	40
503	280	156	WATSON RD	COLLECTOR	2354	1	12	2	1750	50	34
504	280	281	WATSON RD	COLLECTOR	5797	1	12	2	1750	50	34
505	281	273	WHITNEY RD E	COLLECTOR	2571	1	12	2	1750	50	40
506	281	282	TURK HILL RD	COLLECTOR	1908	1	12	2	1750	55	40
507	282	274	HIGH ST	COLLECTOR	2676	1	12	2	1750	45	40
508	282	283	TURK HILL RD	COLLECTOR	2283	1	12	2	1750	50	40
509	283	284	TURK HILL RD	COLLECTOR	564	1	12	2	1700	50	40
510	283	566	31F	COLLECTOR	1041	1	12	2	1700	50	40
511	284	945	TURK HILL RD	COLLECTOR	4810	1	12	2	1750	40	40
512	285	943	AYRAULT RD	COLLECTOR	1807	1	12	2	1700	45	40
513	285	955	TURK HILL RD	MINOR ARTERIAL	326	2	12	2	1900	40	40
514	286	579	SR 31	MINOR ARTERIAL	1976	2	12	2	1750	55	40
515	287	288	HOLT RD	COLLECTOR	7706	1	12	2	1700	50	4
516	287	342	LAKE RD	COLLECTOR	3591	1	12	2	1700	45	4
517	288	289	HOLT RD	COLLECTOR	3134	1	12	2	1750	50	4

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
518	288	952	SHOEMAKER RD	COLLECTOR	3960	1	12	2	1700	55	3
519	289	295	KLEM RD	COLLECTOR	3925	1	12	2	1750	50	3
520	289	923	HOLT RD	COLLECTOR	4909	1	12	2	1700	45	14
521	290	291	HOLT RD	MINOR ARTERIAL	494	2	12	2	1750	40	14
522	290	755	SR 104 SERVICE RD	MINOR ARTERIAL	494	2	12	2	1900	55	14
523	291	290	HOLT RD	COLLECTOR	494	1	12	2	1750	40	14
524	291	292	HOLT RD	MINOR ARTERIAL	526	2	12	2	1750	45	14
525	292	291	HOLT RD	MINOR ARTERIAL	526	2	12	2	1750	45	14
526	292	293	HOLT RD	MINOR ARTERIAL	496	2	12	2	1750	45	14
527	293	292	HOLT RD	MINOR ARTERIAL	496	2	12	2	1750	45	14
528	293	294	HOLT RD	MINOR ARTERIAL	592	1	12	2	1750	45	14
529	294	293	HOLT RD	MINOR ARTERIAL	592	2	12	2	1750	45	14
530	294	359	SR 404	MINOR ARTERIAL	1325	1	12	2	1750	45	14
531	295	296	HARD RD	COLLECTOR	4600	1	12	2	1700	50	13
532	295	303	KLEM RD	COLLECTOR	1756	1	12	2	1700	55	3
533	296	416	PUBLISHERS PKWY	COLLECTOR	3859	1	12	2	1750	40	13
534	296	922	HARD RD	COLLECTOR	986	1	12	2	1700	45	13
535	297	751	HARD RD	MINOR ARTERIAL	362	2	12	2	1750	40	13
536	297	753	SR 104 SERVICE RD	MINOR ARTERIAL	2667	2	12	2	1900	55	13
537	298	299	HARD RD	COLLECTOR	809	1	12	2	1750	45	13
538	298	751	HARD RD	COLLECTOR	1028	1	12	2	1750	45	13
539	299	298	HARD RD	COLLECTOR	809	1	12	2	1750	45	13
540	299	360	SR 404	MINOR ARTERIAL	980	1	12	2	1750	45	13
541	299	635	SHOECRAFT RD	COLLECTOR	627	1	12	2	1700	50	13
542	300	301	WHITING RD	COLLECTOR	3671	1	12	2	1700	55	3
543	300	343	LAKE RD	COLLECTOR	4408	1	12	2	1700	45	3

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
544	301	302	WHITING RD	COLLECTOR	3286	1	12	2	1700	55	3
545	302	303	WHITING RD	COLLECTOR	2329	1	12	2	1700	55	3
546	302	348	SHOEMAKER RD	COLLECTOR	3195	1	12	2	1700	55	3
547	303	304	KLEM RD	COLLECTOR	957	1	12	2	1700	55	3
548	304	305	KLEM RD	COLLECTOR	1116	1	12	2	1700	55	3
549	305	306	KLEM RD	COLLECTOR	1798	1	12	2	1700	55	3
550	305	416	5 MILE LINE RD	COLLECTOR	4333	1	12	2	1750	50	13
551	306	307	KLEM RD	COLLECTOR	1278	1	12	2	1700	55	3
552	307	308	KLEM RD	COLLECTOR	1100	1	12	2	1700	55	3
553	307	369	GRAVEL RD	COLLECTOR	2613	1	12	2	1700	50	3
554	308	309	KLEM RD	COLLECTOR	743	1	12	2	1700	55	3
555	309	310	KLEM RD	COLLECTOR	597	1	12	2	1700	55	3
556	310	311	KLEM RD	COLLECTOR	1644	1	12	2	1700	55	3
557	311	312	KLEM RD	COLLECTOR	1727	1	12	2	1700	55	3
558	312	313	BAY RD	MINOR ARTERIAL	3073	2	12	2	1900	50	3
559	313	314	BAY RD	MINOR ARTERIAL	3079	2	12	2	1750	50	12
560	314	17	SR 104 ON-RAMP FROM BAY RD	FREEWAY RAMP	2138	1	12	2	1700	55	12
561	314	315	BAY RD	MINOR ARTERIAL	723	2	12	2	1750	55	12
562	315	314	BAY RD	COLLECTOR	723	1	12	2	1750	55	12
563	315	316	BAY RD	MINOR ARTERIAL	2566	2	12	2	1750	50	12
564	316	315	BAY RD	MINOR ARTERIAL	2563	2	12	2	1750	50	12
565	316	978	BAY RD	COLLECTOR	4972	1	12	2	1750	45	12
566	317	318	CREEK ST	COLLECTOR	2720	1	12	2	1750	45	18
567	317	377	SR 404	MINOR ARTERIAL	2870	2	12	2	1750	50	18
568	318	319	CREEK ST	COLLECTOR	3613	1	12	2	1700	50	18
569	318	377	PLANK RD	COLLECTOR	1504	1	12	2	1750	55	18

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
570	319	320	CREEK ST	COLLECTOR	861	1	12	2	1700	50	18
571	320	321	CREEK ST	COLLECTOR	6108	1	12	2	1750	50	29
572	321	322	SR 286	MINOR ARTERIAL	2754	2	12	2	1900	55	29
573	321	443	BLOSSOM RD	COLLECTOR	1910	1	12	2	1700	50	29
574	322	323	SR 286	MINOR ARTERIAL	3463	2	12	2	1900	55	29
575	323	324	SR 286	MINOR ARTERIAL	2748	2	12	2	1750	40	28
576	323	444	N LANDING RD	COLLECTOR	2999	1	12	2	1700	55	29
577	324	325	BANCROFT BLVD	MINOR ARTERIAL	484	2	12	2	1900	40	28
578	325	330	BANCROFT BLVD	MINOR ARTERIAL	269	2	12	2	1900	55	28
579	325	331	SR 590 ON-RAMP FROM BANCROFT BLVD	FREEWAY RAMP	385	1	12	2	1575	35	28
580	326	327	BANCROFT BLVD	COLLECTOR	1536	1	12	2	1900	40	28
581	326	330	BANCROFT BLVD	MINOR ARTERIAL	619	1	12	2	1900	40	28
582	327	326	BANCROFT BLVD	COLLECTOR	1536	1	12	2	1900	40	28
583	327	450	N WHINTON RD	COLLECTOR	1701	1	12	2	1900	40	28
584	327	866	ATLANTIC AVE	COLLECTOR	3835	1	12	2	1700	40	28
585	328	329	ATLANTIC AVE	COLLECTOR	1209	1	12	2	1700	40	28
586	330	326	BANCROFT BLVD	MINOR ARTERIAL	619	1	12	2	1900	40	28
587	330	331	SR 590 ON-RAMP FROM BANCROFT BLVD	FREEWAY RAMP	256	1	12	2	1575	35	28
588	331	10	SR 590 ON-RAMP FROM BANCROFT BLVD	FREEWAY RAMP	739	1	12	2	1575	35	28
589	331	330	SR 590 ON-RAMP FROM BANCROFT BLVD	FREEWAY RAMP	256	1	12	2	1900	35	28

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
590	332	50	CULVER RD	COLLECTOR	5710	1	12	4	1575	35	3
591	332	333	BAY RD	MINOR ARTERIAL	1517	2	12	2	1900	50	3
592	333	312	BAY RD	MINOR ARTERIAL	2474	2	12	2	1900	50	3
593	334	250	STATE RD	COLLECTOR	2037	1	12	2	1750	45	14
594	334	335	HARRIS RD	COLLECTOR	8029	1	12	2	1700	50	21
595	335	336	HARRIS RD	COLLECTOR	8033	1	12	2	1700	50	21
596	335	401	PLANK RD	COLLECTOR	2600	1	12	2	1700	50	20
597	336	269	SR 286	MINOR ARTERIAL	5172	1	12	2	1750	50	34
598	336	337	HARRIS RD	COLLECTOR	2577	1	12	2	1750	50	34
599	337	154	HARRIS RD	COLLECTOR	8519	1	10	1	1700	50	34
600	337	270	SWEET CORNERS RD	COLLECTOR	5626	1	10	2	1700	50	34
601	338	341	LAKE RD	COLLECTOR	4453	1	12	2	1700	55	5
602	338	781	CO RD 102	COLLECTOR	5395	1	12	2	1700	55	5
603	339	138	BERG RD	COLLECTOR	9971	1	12	2	1700	55	5
604	339	888	CO RD 102	COLLECTOR	4774	1	12	2	1700	55	5
605	340	28	CO RD 102	COLLECTOR	836	1	12	2	1750	35	22
606	340	142	RIDGE RD	COLLECTOR	2378	1	12	2	1700	55	22
607	341	136	LAKE RD	COLLECTOR	5493	1	12	2	1700	55	5
608	342	300	LAKE RD	COLLECTOR	2457	1	12	2	1700	45	3
609	343	344	LAKE RD	COLLECTOR	1159	1	12	2	1700	40	3
610	344	345	LAKE RD	COLLECTOR	3200	1	12	2	1700	40	3
611	345	346	LAKE RD	COLLECTOR	3242	1	12	2	1700	40	3
612	346	347	LAKE RD	COLLECTOR	1254	1	12	2	1700	40	3
613	347	332	LAKE RD	COLLECTOR	1235	1	12	2	1700	40	3
614	348	306	VAN ALSTYNE RD	COLLECTOR	2120	1	12	2	1700	55	3
615	349	74	RIDGE RD	COLLECTOR	2449	1	12	2	1750	45	22

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
616	349	93	RIDGE RD	COLLECTOR	2488	1	12	2	1700	50	22
617	350	139	RIDGE RD	COLLECTOR	2986	1	12	2	1700	50	22
618	351	352	RIDGE RD	COLLECTOR	1995	1	12	2	1700	55	15
619	351	354	COUNTY LINE RD	COLLECTOR	227	1	12	2	1350	30	15
620	352	356	SR 404	MINOR ARTERIAL	652	1	12	2	1700	55	15
621	353	352	SR 404	MINOR ARTERIAL	479	1	12	2	1700	50	15
622	354	353	SR 404	MINOR ARTERIAL	1694	1	12	2	1700	55	15
623	354	355	SR 404	MINOR ARTERIAL	540	1	12	2	1700	40	15
624	355	25	SR 404	MINOR ARTERIAL	153	1	12	2	1750	35	15
625	355	354	SR 404	MINOR ARTERIAL	540	1	12	2	1700	55	15
626	356	24	BASKET RD	COLLECTOR	482	1	12	2	1750	55	15
627	356	233	SR 404	MINOR ARTERIAL	3609	1	12	2	1750	55	15
628	357	249	SR 404	MINOR ARTERIAL	2361	1	12	2	1750	50	14
629	358	766	SR 404	MINOR ARTERIAL	1437	1	12	2	1750	45	14
630	359	299	SR 404	MINOR ARTERIAL	2540	1	12	2	1750	45	13
631	360	361	SR 404	MINOR ARTERIAL	1260	1	12	2	1750	45	13
632	361	362	SR 404	MINOR ARTERIAL	1619	1	12	2	1750	45	13
633	362	363	SR 404	MINOR ARTERIAL	2731	1	12	2	1750	50	13
634	362	419	5 MILE LINE RD	COLLECTOR	2154	1	12	2	1750	45	13
635	362	422	5 MILE LINE RD	COLLECTOR	3836	1	12	2	1700	45	13
636	363	364	SR 404	MINOR ARTERIAL	1979	1	12	2	1750	50	13
637	363	433	HATCH RD	COLLECTOR	2711	1	12	2	1700	50	13
638	364	365	RIDGE RD	COLLECTOR	1091	1	12	2	1750	50	12
639	364	366	SR 404	MINOR ARTERIAL	1984	1	12	2	1700	45	12
640	365	316	RIDGE RD	COLLECTOR	4564	1	12	2	1750	55	12
641	365	364	RIDGE RD	COLLECTOR	1091	1	12	2	1750	50	12

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
642	365	366	GRAVEL RD	COLLECTOR	1497	1	12	2	1700	45	12
643	366	367	SR 404	MINOR ARTERIAL	3188	2	12	2	1750	50	18
644	367	368	SR 404	MINOR ARTERIAL	471	2	12	2	1750	50	18
645	368	317	SR 404	MINOR ARTERIAL	667	2	12	2	1750	50	18
646	369	370	GRAVEL RD	COLLECTOR	3208	1	12	2	1700	50	13
647	370	1018	GRAVEL RD	COLLECTOR	1881	1	12	2	1700	50	13
648	371	140	COUNTY LINE RD	COLLECTOR	424	1	12	2	1700	55	15
649	371	234	STATE RD	COLLECTOR	6762	1	12	2	1700	55	15
650	372	373	STATE RD	COLLECTOR	6176	1	12	2	1700	50	20
651	372	399	JACKSON RD	COLLECTOR	2593	1	12	2	1700	55	20
652	373	374	STATE RD	COLLECTOR	2431	1	12	2	1700	50	19
653	373	396	SHOECRAFT RD	COLLECTOR	1423	1	12	2	1700	50	19
654	374	375	PLANK RD	COLLECTOR	1264	1	12	2	1750	50	19
655	375	376	PLANK RD	COLLECTOR	2659	1	12	2	1700	50	19
656	375	411	5 MILE LINE RD	COLLECTOR	10510	1	12	2	1750	55	30
657	376	318	PLANK RD	COLLECTOR	4692	1	12	2	1750	50	18
658	376	434	SCRIBNER RD	COLLECTOR	5342	1	12	2	1700	55	19
659	377	378	SR 404	MINOR ARTERIAL	2652	2	12	4	1900	55	18
660	378	379	SR 404	MINOR ARTERIAL	3070	2	12	4	1900	55	18
661	379	380	SR 404	MINOR ARTERIAL	2371	2	12	4	1900	50	18
662	380	381	SR 404	MINOR ARTERIAL	1922	2	12	4	1750	50	17
663	381	382	SR 404	MINOR ARTERIAL	833	2	12	2	1750	45	17
664	381	455	N WHINTON RD	COLLECTOR	1997	1	12	2	1700	40	17
665	382	383	SR 404	MINOR ARTERIAL	577	2	12	2	1750	40	17
666	383	12	590 ON-RAMP FROM SR 404	FREEWAY RAMP	955	1	12	2	1700	45	17
667	383	384	SR 404	MINOR ARTERIAL	400	2	12	2	1750	40	17

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
668	384	383	SR 404	MINOR ARTERIAL	400	1	12	2	1750	40	17
669	384	385	SR 404	MINOR ARTERIAL	1290	2	12	2	1750	40	17
670	385	384	SR 404	MINOR ARTERIAL	1290	2	12	2	1750	40	17
671	385	386	SR 404	MINOR ARTERIAL	1998	2	12	2	1900	40	17
672	385	462	SHELFORD RD	COLLECTOR	1910	1	12	0	1700	40	17
673	386	387	CLIFFORD AVE	COLLECTOR	826	1	12	2	1900	40	17
674	386	459	CULVER RD	COLLECTOR	1921	1	12	2	1900	40	17
675	386	483	CULVER RD	COLLECTOR	1502	1	12	2	1900	40	17
676	387	388	CLIFFORD AVE	COLLECTOR	2006	1	12	2	1900	40	17
677	388	389	CLIFFORD AVE	COLLECTOR	2206	1	12	2	1900	40	17
678	389	390	CLIFFORD AVE	COLLECTOR	1554	1	12	2	1900	40	16
679	390	391	CLIFFORD AVE	COLLECTOR	738	1	12	2	1900	40	16
680	391	392	CLIFFORD AVE	COLLECTOR	1718	1	12	2	1900	40	16
681	392	393	CLIFFORD AVE	COLLECTOR	845	1	12	2	1700	40	16
682	394	391	COLEMAN TERRACE	COLLECTOR	915	1	12	2	1900	40	16
683	395	390	6TH ST	COLLECTOR	911	1	12	2	1900	40	16
684	396	374	PLANK RD	COLLECTOR	2015	1	12	2	1700	50	19
685	397	396	PLANK RD	COLLECTOR	2500	1	12	2	1700	50	19
686	398	397	PLANK RD	COLLECTOR	2550	1	12	2	1700	50	20
687	398	999	JACKSON RD	COLLECTOR	5531	1	12	2	1700	50	20
688	399	398	JACKSON RD	COLLECTOR	2256	1	12	2	1700	50	20
689	400	398	PLANK RD	COLLECTOR	1792	1	12	2	1700	50	20
690	401	267	PLANK RD	COLLECTOR	2461	1	12	2	1750	50	20
691	402	236	PLANK RD	COLLECTOR	3315	1	12	2	1700	50	21
692	403	402	PLANK RD	COLLECTOR	3559	1	12	2	1700	50	21
693	404	403	PLANK RD	COLLECTOR	1153	1	12	2	1700	50	22

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
694	404	406	COUNTY LINE RD	COLLECTOR	7373	1	12	2	1700	50	22
695	405	404	COUNTY LINE RD	COLLECTOR	3588	1	12	2	1700	50	22
696	406	407	SR 286	MINOR ARTERIAL	1690	1	12	2	1700	55	35
697	406	982	COUNTY LINE RD	COLLECTOR	5850	1	12	2	1700	50	35
698	407	1020	SR 286	MINOR ARTERIAL	4944	1	12	2	1700	55	34
699	408	409	SR 286	MINOR ARTERIAL	3543	1	12	2	1700	50	30
700	408	1022	JACKSON RD	COLLECTOR	7050	1	12	2	1700	50	34
701	409	410	SR 286	MINOR ARTERIAL	3092	1	12	2	1700	50	30
702	409	590	BAIRD RD	COLLECTOR	6611	1	12	2	1700	55	30
703	410	411	SR 286	MINOR ARTERIAL	1371	1	12	2	1750	50	30
704	411	412	SR 286	MINOR ARTERIAL	2572	1	12	2	1750	55	30
705	411	423	5 MILE LINE RD	COLLECTOR	4049	1	12	2	1750	55	30
706	412	413	SR 286	MINOR ARTERIAL	2119	1	12	2	1700	55	30
707	413	414	SR 286	MINOR ARTERIAL	414	2	12	2	1750	55	29
708	414	415	SR 286	MINOR ARTERIAL	1991	2	12	2	1750	55	29
709	415	321	SR 286	MINOR ARTERIAL	1015	2	12	2	1750	55	29
710	415	971	PANORAMA TRAIL	COLLECTOR	1654	1	12	4	1575	35	29
711	416	296	PUBLISHERS PKWY	COLLECTOR	3859	1	12	2	1700	40	13
712	416	921	5 MILE LINE RD	COLLECTOR	1107	1	12	2	1700	50	13
713	417	18	SR 104 ON-RAMP FROM 5 MILE LINE RD	FREEWAY RAMP	737	1	12	2	1700	45	13
714	417	418	5 MILE LINE RD	MINOR ARTERIAL	302	2	12	2	1750	40	13
715	418	417	5 MILE LINE RD	COLLECTOR	302	1	12	2	1750	40	13
716	418	981	5 MILE LINE RD	MINOR ARTERIAL	443	2	12	2	1900	40	13
717	419	362	5 MILE LINE RD	COLLECTOR	2154	1	12	2	1750	45	13
718	419	981	5 MILE LINE RD	COLLECTOR	526	1	12	2	1700	40	13

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
719	420	419	DRIVEWAY	COLLECTOR	415	1	12	2	1750	35	13
720	421	298	DRIVEWAY	COLLECTOR	623	2	12	2	1750	45	13
721	422	375	5 MILE LINE RD	COLLECTOR	4468	1	12	2	1750	50	19
722	423	424	5 MILE LINE RD	COLLECTOR	2224	1	12	2	1750	55	30
723	424	159	5 MILE LINE RD	COLLECTOR	2288	1	12	2	1750	55	33
724	425	432	E LINDEN AVE	COLLECTOR	626	1	12	2	1750	50	33
725	425	595	WHITNEY RD	COLLECTOR	2609	1	12	2	1700	50	33
726	426	435	PENFIELD RD	MINOR ARTERIAL	1027	2	12	2	1750	50	32
727	426	968	PANORAMA TRAIL	MINOR ARTERIAL	519	2	12	2	1750	45	32
728	427	970	PANORAMA TRAIL	COLLECTOR	3153	1	12	2	1700	50	32
729	428	162	SR 441 ON-RAMP FROM PANORAMA TRAIL	FREEWAY RAMP	747	1	12	2	1700	45	32
730	428	429	PANORAMA TRAIL	MINOR ARTERIAL	320	2	12	2	1750	55	32
731	429	428	PANORAMA TRAIL	COLLECTOR	320	1	12	2	1750	55	32
732	429	430	SR 153	MINOR ARTERIAL	2696	2	12	2	1900	55	33
733	430	429	SR 153	MINOR ARTERIAL	2696	2	12	2	1750	55	33
734	430	431	SR 153	MINOR ARTERIAL	1694	2	12	2	1750	50	33
735	431	539	LINDEN AVE	COLLECTOR	4978	1	12	2	1700	50	32
736	431	540	SR 153	MINOR ARTERIAL	907	2	12	2	1750	40	33
737	432	431	E LINDEN AVE	COLLECTOR	2327	1	12	2	1750	45	33
738	432	589	BLUFF DR	COLLECTOR	923	1	12	2	1700	45	33
739	433	363	HATCH RD	COLLECTOR	2711	1	12	2	1750	50	13
740	433	376	HATCH RD	COLLECTOR	5228	1	12	2	1700	50	19
741	434	412	SCRIBNER RD	COLLECTOR	5201	1	12	2	1750	55	30
742	435	436	PENFIELD RD	MINOR ARTERIAL	584	2	12	2	1900	50	32
743	436	437	PENFIELD RD	COLLECTOR	4838	1	12	2	1700	50	32

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
744	437	438	PENFIELD RD	COLLECTOR	3862	1	12	2	1750	50	32
745	438	439	PENFIELD RD	COLLECTOR	1506	1	12	2	1700	50	31
746	439	175	I-490 ON-RAMP FROM PENFIELD RD	FREEWAY RAMP	927	1	12	2	1700	45	31
747	439	440	PENFIELD RD	MINOR ARTERIAL	373	2	12	2	1750	55	31
748	440	441	PENFIELD RD	MINOR ARTERIAL	736	2	12	2	1750	40	31
749	441	167	EAST AVE	MINOR ARTERIAL	4375	2	12	2	1750	45	31
750	441	442	EAST AVE	MINOR ARTERIAL	352	2	12	2	1750	40	31
751	442	441	EAST AVE	MINOR ARTERIAL	352	2	12	2	1750	40	31
752	442	741	CLOVER ST	COLLECTOR	318	1	12	2	1750	40	31
753	442	830	EAST AVE	MINOR ARTERIAL	2318	2	12	2	1750	40	28
754	443	321	BLOSSOM RD	COLLECTOR	1910	1	12	2	1750	50	29
755	443	990	BLOSSOM RD	COLLECTOR	1151	1	12	2	1700	40	29
756	444	445	BLOSSOM RD	COLLECTOR	1819	1	12	2	1750	45	29
757	444	536	N LANDING RD	COLLECTOR	2470	1	12	2	1750	45	29
758	445	858	BLOSSOM RD	COLLECTOR	890	1	12	2	1700	45	28
759	446	447	BLOSSOM RD	MINOR ARTERIAL	386	2	12	2	1750	40	28
760	447	857	SR 590 OFF-RAMP TO BLOSSOM RD	FREEWAY RAMP	1020	1	12	2	1700	45	28
761	447	862	BLOSSOM RD	MINOR ARTERIAL	596	2	12	2	1900	40	28
762	448	449	BLOSSOM RD	COLLECTOR	1866	1	12	2	1900	40	28
763	449	451	N WHINTON RD	MINOR ARTERIAL	249	2	12	2	1900	40	28
764	450	861	N WHINTON RD	COLLECTOR	929	1	12	2	1700	40	28
765	451	452	N WHINTON RD	MINOR ARTERIAL	927	2	10	2	1900	40	28
766	452	453	N WHINTON RD	MINOR ARTERIAL	390	2	12	2	1900	45	28
767	452	832	UNIVERSITY AVE	MINOR ARTERIAL	875	2	12	2	1900	45	28
768	453	454	N WHINTON RD	MINOR ARTERIAL	156	2	12	2	1900	40	28

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
769	453	833	EAST AVE	MINOR ARTERIAL	888	2	12	2	1900	40	28
770	454	170	I-490 ON-RAMP FROM S WINTON RD	FREEWAY RAMP	575	1	12	2	1700	55	28
771	454	836	S WINTON RD	MINOR ARTERIAL	326	2	12	2	1900	45	28
772	455	381	N WHINTON RD	COLLECTOR	1997	1	12	2	1750	40	17
773	455	456	N WHINTON RD	COLLECTOR	4794	1	12	2	1900	40	28
774	455	1012	CULVER PKWY	COLLECTOR	964	1	12	2	1700	40	17
775	456	326	MERCHANTS RD	COLLECTOR	1437	1	12	2	1900	40	28
776	456	457	N WHINTON RD	COLLECTOR	416	1	12	2	1900	40	28
777	457	327	N WHINTON RD	COLLECTOR	635	1	12	2	1900	40	28
778	458	456	MERCHANTS RD	COLLECTOR	2644	1	10	2	1900	35	28
779	458	1009	WISCONSIN ST	COLLECTOR	381	1	12	2	1700	40	28
780	459	867	CULVER RD	COLLECTOR	195	1	12	2	1900	40	17
781	460	328	CULVER RD	COLLECTOR	1297	1	12	2	1900	40	28
782	461	865	E MAIN ST	COLLECTOR	1096	1	12	2	1900	40	28
783	462	385	SHELFORD RD	COLLECTOR	1910	1	12	0	1750	40	17
784	462	458	SHELFORD RD	COLLECTOR	2964	1	12	0	1900	40	17
785	462	459	CULVER PKWY	COLLECTOR	2197	1	12	2	1900	40	17
786	463	464	NORTON ST	COLLECTOR	252	1	12	2	1700	45	17
787	463	467	NORTON ST	COLLECTOR	1966	1	12	2	1750	45	17
788	464	13	SR 590 ON-RAMP FROM NORTON ST	FREEWAY RAMP	469	1	12	2	1700	50	17
789	464	463	NORTON ST	COLLECTOR	252	1	12	2	1700	45	17
790	465	464	BAYVIEW RD	COLLECTOR	481	1	12	2	1700	40	17
791	466	465	BAYVIEW RD	COLLECTOR	591	1	12	2	1700	40	17
792	467	463	NORTON ST	COLLECTOR	1966	1	12	2	1700	45	17
793	467	469	NORTON ST	COLLECTOR	2117	1	12	2	1900	45	17

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
794	468	467	PARDEE RD	COLLECTOR	1503	1	12	2	1750	40	17
795	469	470	NORTON ST	COLLECTOR	2601	1	12	2	1900	45	17
796	469	483	CULVER RD	COLLECTOR	2994	1	12	2	1900	40	17
797	469	872	CULVER RD	COLLECTOR	1005	1	12	2	1700	45	17
798	470	471	NORTON ST	COLLECTOR	1486	1	12	2	1900	45	16
799	471	472	NORTON ST	COLLECTOR	2089	1	12	2	1900	45	16
800	471	484	N GOODMAN ST	COLLECTOR	2252	1	12	2	1900	45	16
801	471	508	N GOODMAN ST	COLLECTOR	599	1	12	2	1750	45	16
802	472	473	PORTLAND AVE	COLLECTOR	1063	1	12	2	1700	40	16
803	472	509	PORTLAND AVE	MINOR ARTERIAL	2205	2	12	2	1900	40	16
804	473	392	PORTLAND AVE	COLLECTOR	3832	1	12	2	1900	40	16
805	473	472	PORTLAND AVE	COLLECTOR	1063	1	12	2	1900	40	16
806	474	475	CULVER RD	COLLECTOR	2644	1	12	2	1750	40	2
807	475	476	CULVER RD	COLLECTOR	1529	1	12	2	1700	40	2
808	475	516	SWEET FERN RD	COLLECTOR	1543	1	12	2	1700	45	2
809	476	477	CULVER RD	COLLECTOR	3544	1	12	2	1700	40	11
810	477	478	CULVER RD	COLLECTOR	1787	1	12	2	1900	40	11
811	477	805	SENECA RD	COLLECTOR	2740	1	12	2	1700	40	11
812	478	479	CULVER RD	COLLECTOR	1694	1	12	2	1900	40	11
813	478	497	TITUS AVE	COLLECTOR	2681	1	12	2	1700	40	11
814	478	499	TITUS AVE	COLLECTOR	1057	1	12	2	1700	45	11
815	479	876	CULVER RD	COLLECTOR	1057	1	12	2	1700	40	11
816	480	481	CULVER RD	MINOR ARTERIAL	2445	2	12	2	1900	45	11
817	480	493	E RIDGE RD	MINOR ARTERIAL	1551	2	12	2	1750	45	11
818	481	482	CULVER RD	MINOR ARTERIAL	401	2	12	2	1900	45	17
819	481	726	SR 104 SERVICE RD	MINOR ARTERIAL	290	2	12	2	1900	40	11

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
820	482	481	CULVER RD	COLLECTOR	401	1	12	2	1900	45	17
821	482	872	CULVER RD	MINOR ARTERIAL	1742	2	12	2	1900	45	17
822	483	387	WOODMAN PK	COLLECTOR	1263	1	12	2	1900	40	17
823	483	469	CULVER RD	COLLECTOR	2994	1	12	2	1900	40	17
824	483	485	WARING RD	COLLECTOR	1219	1	12	2	1900	40	17
825	484	389	N GOODMAN ST	COLLECTOR	2022	1	12	2	1900	40	16
826	485	470	WARING RD	COLLECTOR	2784	1	12	2	1900	40	17
827	485	486	NORTHLAND AVE	COLLECTOR	1222	1	12	2	1700	40	17
828	486	388	LYCEUM ST	COLLECTOR	2166	1	12	2	1900	40	17
829	486	484	NORTHLAND AVE	COLLECTOR	2089	1	12	2	1900	40	17
830	486	485	NORTHLAND AVE	COLLECTOR	1222	1	12	2	1900	40	17
831	487	488	E RIDGE RD	COLLECTOR	1319	1	12	2	1700	55	11
832	488	489	E RIDGE RD	COLLECTOR	303	1	12	2	1700	55	11
833	489	68	SR 590 ON-RAMP FROM E RIDGE RD	FREEWAY RAMP	684	1	12	2	1700	50	11
834	489	490	E RIDGE RD	COLLECTOR	1594	1	12	2	1750	45	11
835	490	491	E RIDGE RD	COLLECTOR	560	1	12	2	1750	45	11
836	491	492	E RIDGE RD	MINOR ARTERIAL	575	2	12	2	1750	45	11
837	492	480	E RIDGE RD	MINOR ARTERIAL	707	2	12	2	1900	45	11
838	493	494	E RIDGE RD	MINOR ARTERIAL	774	2	12	2	1750	45	11
839	494	495	E RIDGE RD	MINOR ARTERIAL	1969	2	12	2	1750	45	10
840	495	504	N GOODMAN ST	MINOR ARTERIAL	424	2	12	2	1750	45	10
841	495	1015	E RIDGE RD	MINOR ARTERIAL	706	2	12	2	1750	45	10
842	496	511	PORTLAND AVE	MINOR ARTERIAL	700	2	12	2	1900	40	10
843	496	717	E RIDGE RD	MINOR ARTERIAL	763	2	12	2	1750	45	10
844	497	59	SEA BREEZE DR TRAFFIC CIRCLE	COLLECTOR	121	1	12	4	1125	25	11

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
845	497	478	TITUS AVE	COLLECTOR	2681	1	12	2	1900	40	11
846	498	58	TITUS AVE EXT TRAFFIC CIRCLE	COLLECTOR	109	1	12	4	1125	25	11
847	499	500	TITUS AVE	COLLECTOR	4332	1	12	2	1750	45	11
848	500	501	TITUS AVE	COLLECTOR	1406	1	12	2	1750	45	10
849	500	503	KINGS HWY S	COLLECTOR	2993	1	12	2	1700	40	10
850	501	512	PORTLAND AVE	COLLECTOR	4349	1	12	2	1700	40	10
851	501	514	TITUS AVE	COLLECTOR	3386	1	12	2	1750	45	10
852	502	500	KINGS HWY N	COLLECTOR	2918	1	12	2	1750	35	10
853	503	495	KINGS HWY S	MINOR ARTERIAL	1544	2	12	2	1750	40	10
854	504	505	N GOODMAN ST	MINOR ARTERIAL	445	2	12	2	1750	45	10
855	505	506	N GOODMAN ST	MINOR ARTERIAL	331	2	12	2	1750	45	16
856	505	724	SR 104 SERVICE RD	MINOR ARTERIAL	757	2	12	2	1900	55	10
857	506	505	N GOODMAN ST	MINOR ARTERIAL	331	1	12	2	1750	45	16
858	506	507	N GOODMAN ST	MINOR ARTERIAL	652	2	12	2	1900	45	16
859	507	506	N GOODMAN ST	MINOR ARTERIAL	652	2	12	2	1750	45	16
860	507	508	N GOODMAN ST	COLLECTOR	1733	1	12	2	1750	45	16
861	508	471	N GOODMAN ST	COLLECTOR	599	1	12	2	1900	45	16
862	508	507	N GOODMAN ST	COLLECTOR	1733	1	12	2	1700	45	16
863	509	472	PORTLAND AVE	MINOR ARTERIAL	2205	2	12	2	1900	40	16
864	509	510	PORTLAND AVE	MINOR ARTERIAL	479	2	12	2	1900	40	16
865	510	509	PORTLAND AVE	MINOR ARTERIAL	479	2	12	2	1900	40	16
866	510	511	PORTLAND AVE	MINOR ARTERIAL	322	1	12	2	1900	40	16
867	511	510	PORTLAND AVE	MINOR ARTERIAL	322	2	12	2	1900	40	16
868	511	723	SR 104 SERVICE RD	MINOR ARTERIAL	2244	2	12	2	1900	55	16
869	512	496	PORTLAND AVE	MINOR ARTERIAL	563	2	12	2	1750	40	10
870	513	501	OAKVIEW DR	COLLECTOR	3745	1	12	2	1750	40	10

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
871	514	702	TITUS AVE	COLLECTOR	699	1	12	2	1750	45	10
872	515	53	SEA BREEZE DR TRAFFIC CIRCLE	COLLECTOR	127	1	12	4	900	20	2
873	515	475	DURAND BLVD	COLLECTOR	568	1	12	2	1750	40	2
874	516	517	SWEET FERN RD	COLLECTOR	1182	1	12	2	1700	40	2
875	517	518	PINE VALLEY RD	COLLECTOR	1357	1	12	2	1700	50	2
876	518	519	LAKE SHORE BLVD	COLLECTOR	1338	1	12	2	1700	45	2
877	519	520	LAKE SHORE BLVD	COLLECTOR	2692	1	12	2	1700	50	2
878	520	521	LAKE SHORE BLVD	COLLECTOR	2880	1	12	2	1700	50	2
879	521	522	LAKE SHORE BLVD	COLLECTOR	395	1	12	2	1700	50	1
880	522	523	LAKE SHORE BLVD	COLLECTOR	4665	1	12	2	1700	45	1
881	523	1	LAKE SHORE BLVD	COLLECTOR	710	1	12	2	1750	45	1
882	524	520	KINGS HWY N	COLLECTOR	1399	1	12	2	1575	35	2
883	525	527	PATTONWOOD DR	COLLECTOR	2312	1	12	2	1750	40	1
884	526	525	ST. PAUL BLVD	COLLECTOR	1565	1	12	2	1750	40	1
885	527	528	PATTONWOOD DR	MINOR ARTERIAL	664	2	12	2	1750	40	1
886	528	529	PATTONWOOD DR	MINOR ARTERIAL	1123	2	12	2	1900	40	1
887	530	531	THOMAS AVE	COLLECTOR	4173	1	12	2	1700	40	1
888	530	532	ST PAUL BLVD	MINOR ARTERIAL	1602	2	10	4	1900	45	1
889	531	528	THOMAS AVE	COLLECTOR	3495	1	12	2	1750	40	1
890	532	530	ST PAUL BLVD	COLLECTOR	1602	1	10	4	1750	45	1
891	532	703	ST PAUL BLVD	MINOR ARTERIAL	1313	2	10	4	1900	45	10
892	533	532	PINEGROVE AVE	COLLECTOR	1705	1	12	2	1700	40	1
893	534	1	ST PAUL BLVD	COLLECTOR	2790	1	12	2	1750	45	1
894	534	881	ST PAUL BLVD	COLLECTOR	2614	1	12	2	1700	45	1
895	535	534	COLEBROOK DR	COLLECTOR	690	1	12	2	1750	40	1
896	536	438	N LANDING RD	COLLECTOR	1812	1	12	2	1750	45	29

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
897	537	445	CLOVER ST	COLLECTOR	1172	1	12	2	1750	40	28
898	538	445	CLOVER ST	COLLECTOR	2606	1	12	2	1750	40	28
899	539	163	LINDEN AVE	COLLECTOR	1031	1	12	2	1750	45	32
900	540	541	SR 153	MINOR ARTERIAL	1081	2	12	2	1750	40	33
901	541	542	SR 153	MINOR ARTERIAL	2582	1	12	2	1700	50	32
902	541	546	W COMMERCIAL ST	MINOR ARTERIAL	2454	2	12	2	1750	50	32
903	542	543	SR 153	MINOR ARTERIAL	790	1	12	2	1750	45	39
904	543	544	SR 153	MINOR ARTERIAL	1298	1	12	2	1700	50	39
905	543	552	31F	MINOR ARTERIAL	882	2	12	2	1750	55	39
906	545	541	W COMMERCIAL ST	COLLECTOR	723	1	12	2	1750	35	33
907	546	547	W COMMERCIAL ST	MINOR ARTERIAL	1626	2	12	2	1900	55	32
908	547	548	I-490 ON-RAMP FROM W COMMERCIAL ST	FREEWAY RAMP	1038	1	12	2	1700	55	32
909	547	556	I-490 ACCESS RD	FREEWAY RAMP	611	1	12	2	1700	55	32
910	548	550	I-490 ON-RAMP FROM W COMMERCIAL ST	FREEWAY RAMP	593	1	12	2	1700	40	32
911	549	180	I-490	FREEWAY	2293	3	12	12	2250	70	32
912	549	181	I-490	FREEWAY	1176	3	12	12	2250	70	39
913	550	180	I-490 ON-RAMP FROM W COMMERCIAL ST	FREEWAY RAMP	542	1	12	2	1700	40	32
914	551	546	ROOSEVELT RD	COLLECTOR	862	1	12	2	1750	50	32
915	551	552	ROOSEVELT RD	COLLECTOR	2093	1	12	2	1750	40	32
916	552	553	31F	MINOR ARTERIAL	1030	2	12	2	1750	50	39
917	553	554	31F	MINOR ARTERIAL	1141	2	12	2	1900	45	32

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
918	553	557	I-490 ACCESS RD	MINOR ARTERIAL	1827	2	12	2	1900	55	32
919	554	181	I-490 ON-RAMP FROM 31F	FREEWAY RAMP	1700	1	12	2	1700	45	32
920	554	553	31F	MINOR ARTERIAL	1141	1	12	2	1750	45	32
921	554	844	31F	MINOR ARTERIAL	675	2	12	2	1750	45	32
922	555	561	31F	MINOR ARTERIAL	633	2	12	2	1750	50	39
923	555	588	MARSH RD	COLLECTOR	3669	1	12	2	1700	45	39
924	556	558	I-490 ACCESS RD	COLLECTOR	1071	1	12	2	1700	50	32
925	557	556	I-490 ACCESS RD	COLLECTOR	803	1	12	2	1700	55	32
926	558	179	I-490 ON-RAMP	FREEWAY RAMP	773	1	12	2	1700	45	32
927	559	543	31F	MINOR ARTERIAL	1511	2	12	2	1750	50	39
928	560	559	31F	MINOR ARTERIAL	1596	2	12	2	1750	50	39
929	561	560	31F	MINOR ARTERIAL	1729	2	12	2	1750	55	39
930	562	555	31F	MINOR ARTERIAL	3300	2	12	2	1750	50	39
931	563	562	31F	MINOR ARTERIAL	709	2	12	2	1750	50	39
932	563	957	31F	MAJOR ARTERIAL	566	2	12	2	1900	50	39
933	564	956	JEFFERSON AVE	COLLECTOR	813	1	12	2	1700	40	39
934	564	957	31F	MINOR ARTERIAL	546	1	12	2	1700	50	39
935	565	564	31F	COLLECTOR	3187	1	12	2	1750	50	39
936	566	276	31F	COLLECTOR	1573	1	12	2	1750	50	40
937	566	283	31F	COLLECTOR	1042	1	12	2	1750	50	40
938	567	939	SR 250	MINOR ARTERIAL	1680	1	12	2	1700	50	40
939	568	277	SR 250	MINOR ARTERIAL	959	2	12	2	1750	40	40
940	569	84	SR 31	MINOR ARTERIAL	5036	1	12	2	1750	40	41
941	569	570	SR 31	MINOR ARTERIAL	1338	1	12	2	1750	50	41
942	569	628	VICTOR RD	COLLECTOR	2035	1	12	2	1700	50	41
943	570	569	SR 31	MINOR ARTERIAL	1338	1	12	2	1700	50	41

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
944	570	571	SR 31	MINOR ARTERIAL	9645	1	12	8	1750	50	41
945	570	628	CANANDAIGUA RD	COLLECTOR	1479	1	12	2	1700	50	41
946	571	570	SR 31	MINOR ARTERIAL	9645	1	12	8	1750	50	41
947	571	572	SR 31	MINOR ARTERIAL	1377	1	12	2	1750	50	41
948	572	571	SR 31	MINOR ARTERIAL	1377	1	12	2	1750	50	41
949	572	573	SR 31	MINOR ARTERIAL	2819	1	12	2	1700	55	41
950	573	574	SR 31	MINOR ARTERIAL	5417	1	12	2	1700	55	40
951	574	575	SR 31	MINOR ARTERIAL	1295	1	12	2	1750	55	40
952	575	576	SR 31	MINOR ARTERIAL	2793	1	12	2	1750	50	40
953	575	627	VICTOR RD	COLLECTOR	2914	1	12	2	1700	50	40
954	576	575	SR 31	MINOR ARTERIAL	2792	1	12	2	1750	50	40
955	576	577	SR 31	MINOR ARTERIAL	4759	1	12	2	1700	50	40
956	577	578	SR 31	MINOR ARTERIAL	1061	1	12	2	1700	55	40
957	578	286	SR 31	MINOR ARTERIAL	1188	2	12	2	1750	55	40
958	579	278	SR 31	MINOR ARTERIAL	782	2	12	2	1750	55	40
959	580	581	SR 31	MINOR ARTERIAL	970	2	12	2	1750	55	40
960	581	582	SR 31	MINOR ARTERIAL	3787	2	12	2	1750	55	39
961	582	583	SR 31	MINOR ARTERIAL	4558	2	12	2	1750	55	39
962	582	942	KREAG RD	COLLECTOR	1115	1	12	2	1700	40	39
963	583	584	SR 31	MINOR ARTERIAL	1874	2	12	2	1900	55	39
964	584	585	SR 31	MINOR ARTERIAL	616	2	12	2	1900	50	39
965	585	744	I-490 ON-RAMP FROM SR 31	FREEWAY RAMP	592	1	12	2	1700	40	39
966	585	987	SR 31	MINOR ARTERIAL	240	2	12	2	1900	45	39
967	586	587	SR 31	MINOR ARTERIAL	1622	1	12	2	1700	45	39
968	586	987	SR 31	MINOR ARTERIAL	1966	1	12	2	1700	45	39
969	588	586	MARSH RD	COLLECTOR	5006	1	12	2	1750	45	39

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
970	589	432	BLUFF DR	COLLECTOR	922	1	12	2	1750	45	33
971	589	960	S LINCOLN RD	COLLECTOR	2528	1	12	2	1750	40	33
972	590	158	BAIRD RD	COLLECTOR	4025	1	12	2	1750	55	33
973	590	423	WHALEN RD	COLLECTOR	3194	1	12	2	1750	50	30
974	591	271	WHALEN RD	COLLECTOR	1691	1	12	2	1750	55	34
975	592	593	BAIRD RD	COLLECTOR	813	1	12	2	1700	55	33
976	593	594	BAIRD RD	COLLECTOR	4721	1	12	2	1750	55	33
977	594	563	BAIRD RD	COLLECTOR	2855	1	12	2	1750	40	39
978	595	425	WHITNEY RD	COLLECTOR	2617	1	12	2	1750	50	33
979	595	594	WHITNEY RD	COLLECTOR	2775	1	12	2	1750	50	33
980	596	597	WHITNEY RD E	COLLECTOR	6588	1	12	2	1700	50	40
981	596	602	MONROE-WAYNE COUNTY LINE RD	COLLECTOR	4773	1	12	0	1700	55	41
982	597	598	WHITNEY RD E	COLLECTOR	1275	1	12	2	1700	50	40
983	597	603	HOWELL RD	COLLECTOR	5247	1	12	2	1700	55	40
984	598	281	WHITNEY RD E	COLLECTOR	7975	1	12	2	1750	50	40
985	599	79	EDDY RD	COLLECTOR	2852	1	12	2	1700	50	35
986	599	82	WIEKRICK RD	COLLECTOR	7974	1	12	2	1750	55	41
987	599	907	EDDY RD	COLLECTOR	4713	1	12	2	1700	50	35
988	600	601	31F	COLLECTOR	2790	1	12	2	1700	50	41
989	600	623	W WALWORTH RD	COLLECTOR	2758	1	12	2	1700	50	41
990	600	786	31F	COLLECTOR	8408	1	12	2	1750	55	41
991	601	602	31F	COLLECTOR	2827	1	12	2	1700	50	41
992	602	621	31F	COLLECTOR	5388	1	12	2	1700	55	40
993	603	604	31F	COLLECTOR	1563	1	12	2	1750	55	40
994	604	605	31F	COLLECTOR	4092	1	12	2	1700	55	40
995	604	612	LYNDON RD	COLLECTOR	2219	1	12	4	1700	50	40

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
996	605	282	31F	COLLECTOR	4997	1	12	2	1750	55	40
997	606	583	AYRAULT RD	COLLECTOR	4050	1	12	2	1750	45	39
998	606	607	AYRAULT RD	COLLECTOR	1358	1	12	2	1700	45	39
999	607	582	KREAG RD	COLLECTOR	2108	1	12	2	1750	40	39
1000	607	606	AYRAULT RD	COLLECTOR	1358	1	12	2	1750	45	39
1001	608	285	AYRAULT RD	COLLECTOR	4906	1	12	2	1750	50	40
1002	609	608	DRIVEWAY	COLLECTOR	1130	1	12	2	1750	40	40
1003	610	614	AYRAULT RD	COLLECTOR	1432	1	12	2	1700	40	40
1004	611	574	ALDRICH RD	COLLECTOR	5449	1	12	2	1700	40	40
1005	611	610	AYRAULT RD	COLLECTOR	2628	1	12	2	1700	40	40
1006	612	613	LYNDON RD	COLLECTOR	548	1	10	4	1700	50	40
1007	613	610	LYNDON RD	COLLECTOR	2643	1	12	4	1700	50	40
1008	614	576	MASON RD	COLLECTOR	5441	1	12	2	1750	40	40
1009	614	608	AYRAULT RD	COLLECTOR	1709	1	12	2	1750	40	40
1010	615	600	W WALWORTH RD	COLLECTOR	12415	1	12	2	1700	50	41
1011	615	616	GANANDA PKWY	COLLECTOR	1953	1	12	2	1700	50	35
1012	616	618	GANANDA PKWY	COLLECTOR	2545	1	12	2	1700	50	35
1013	617	615	GANANDA PKWY	COLLECTOR	1976	1	12	2	1700	55	35
1014	618	152	GANANDA PKWY	COLLECTOR	1142	1	12	2	1750	45	35
1015	619	620	MONROE-WAYNE COUNTY LINE RD	COLLECTOR	1331	1	12	2	1700	45	34
1016	619	984	SR 441	MINOR ARTERIAL	607	1	12	2	1700	55	34
1017	620	596	MONROE-WAYNE COUNTY LINE RD	COLLECTOR	6843	1	12	0	1700	50	35
1018	621	603	31F	COLLECTOR	1350	1	12	2	1700	55	40
1019	622	621	PERINTON PKWY	COLLECTOR	1901	1	12	2	1700	45	40
1020	623	624	QUAKER RD	COLLECTOR	2638	1	12	2	1700	55	41

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
1021	624	625	CO RD 206	COLLECTOR	3332	1	12	2	1700	50	41
1022	625	626	CO RD 206	COLLECTOR	984	1	12	2	1125	25	41
1023	626	572	CO RD 206	COLLECTOR	3737	1	12	2	1750	50	41
1024	627	575	VICTOR RD	COLLECTOR	2914	1	12	2	1750	50	40
1025	628	629	CANANDAIGUA RD	COLLECTOR	2296	1	12	2	1700	50	41
1026	631	108	MACEDON CENTER RD	COLLECTOR	7296	1	12	2	1700	55	42
1027	632	991	CO RD 210	COLLECTOR	1629	1	12	2	1700	50	42
1028	633	243	CARACUS DR	COLLECTOR	1130	1	12	2	1750	40	4
1029	633	758	RESENDE RD	COLLECTOR	2216	1	12	2	1750	40	4
1030	634	289	KLEM RD	COLLECTOR	1322	1	12	2	1750	55	4
1031	635	299	SHOECRAFT RD	COLLECTOR	628	1	12	2	1750	50	13
1032	635	373	SHOECRAFT RD	COLLECTOR	7649	1	12	2	1700	50	19
1033	636	637	FISHER RD	COLLECTOR	9444	1	12	2	1700	55	6
1034	637	789	CO RD 113	COLLECTOR	6105	1	12	0	1700	55	6
1035	637	893	FISHER RD	COLLECTOR	3052	1	12	2	1700	55	6
1036	638	777	WOODS RD	COLLECTOR	4409	1	12	0	1700	55	7
1037	638	894	SALMON CREEK RD	COLLECTOR	2710	1	12	2	1700	55	6
1038	639	638	SALMON CREEK RD	COLLECTOR	2253	1	12	2	1700	50	6
1039	640	110	CO RD 120	COLLECTOR	6486	1	12	2	1700	55	7
1040	640	111	CO RD 120	COLLECTOR	2846	1	12	2	1700	45	7
1041	640	790	HAMILTON RD	COLLECTOR	844	1	12	2	1750	45	7
1042	641	896	CO RD 120	COLLECTOR	4460	1	12	2	1700	50	7
1043	641	897	POUND RD	COLLECTOR	5824	1	12	2	1700	55	7
1044	642	898	E TOWNLINE RD	COLLECTOR	4572	1	12	2	1700	50	7
1045	643	644	E TOWNLINE RD	COLLECTOR	7866	1	12	2	1700	55	24
1046	644	645	E WILLIAMSON RD	COLLECTOR	1649	1	12	2	1700	50	24

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
1047	645	646	E WILLIAMSON RD	COLLECTOR	2167	1	12	2	1700	50	24
1048	646	647	E WILLIAMSON RD	COLLECTOR	4934	1	12	2	1700	55	24
1049	646	1006	BEAM HILL RD	COLLECTOR	1318	1	12	2	1700	55	24
1050	647	648	E WILLIAMSON RD	COLLECTOR	3888	1	12	2	1700	55	24
1051	648	649	E WILLIAMSON RD	COLLECTOR	5152	1	12	2	1700	50	37
1052	649	650	E WILLIAMSON RD	COLLECTOR	1304	1	12	2	1700	55	37
1053	650	692	SKINNER RD	COLLECTOR	7123	1	12	2	1700	55	37
1054	651	652	CO RD 210	COLLECTOR	3069	1	10	2	1700	55	23
1055	652	653	CO RD 210	COLLECTOR	1477	1	10	2	1700	55	23
1056	653	654	CO RD 210	COLLECTOR	3768	1	10	2	1700	55	23
1057	654	655	CO RD 210	COLLECTOR	2680	1	10	2	1700	55	23
1058	655	656	CO RD 210	COLLECTOR	492	1	12	2	1350	30	23
1059	656	657	CO RD 210	COLLECTOR	6097	1	10	2	1700	45	23
1060	657	658	CO RD 210	COLLECTOR	5540	1	10	2	1700	45	36
1061	658	659	CO RD 210	COLLECTOR	3141	1	10	2	1700	45	36
1062	659	664	WALWORTH-MARION RD	COLLECTOR	2216	1	12	2	1700	55	36
1063	659	1026	CO RD 210	COLLECTOR	2711	1	12	2	1700	55	36
1064	660	632	CO RD 210	COLLECTOR	8799	1	12	2	1700	55	42
1065	661	87	CO RD 210	COLLECTOR	2053	1	12	2	1750	40	42
1066	662	663	WALWORTH-MARION RD	COLLECTOR	2995	1	12	2	1700	55	36
1067	663	659	WALWORTH-MARION RD	COLLECTOR	1100	1	12	2	1700	55	36
1068	664	665	WALWORTH-MARION RD	COLLECTOR	5151	1	12	2	1700	55	36

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
1069	665	666	WALWORTH-MARION RD	COLLECTOR	2888	1	12	2	1700	50	36
1070	666	796	WALWORTH-MARION RD	COLLECTOR	3209	1	12	2	1700	50	37
1071	667	106	WALWORTH-ONTARIO RD	COLLECTOR	3222	1	12	2	1700	55	36
1072	668	669	LAKE RD	COLLECTOR	5337	1	12	2	1700	55	9
1073	669	670	LAKE RD	COLLECTOR	4907	1	12	2	1700	55	9
1074	670	671	LAKE RD	COLLECTOR	1806	1	12	2	1700	55	9
1075	672	45	CO RD 103	COLLECTOR	2529	1	12	2	1700	45	9
1076	672	673	RIDGE RD	COLLECTOR	4514	1	12	2	1700	55	9
1077	673	46	RIDGE RD	COLLECTOR	2198	1	12	2	1750	55	9
1078	674	675	BURLEE RD	COLLECTOR	789	1	12	2	1700	40	26
1079	674	677	RIDGE RD	COLLECTOR	2746	1	12	2	1700	55	26
1080	675	46	SR 104	MINOR ARTERIAL	1777	1	12	10	1750	60	26
1081	675	47	SR 104	MINOR ARTERIAL	2417	1	12	10	1700	60	26
1082	676	674	KELLY RD	COLLECTOR	3625	1	12	2	1700	55	9
1083	677	47	BARCLAY RD	COLLECTOR	788	1	12	2	1700	40	26
1084	677	678	RIDGE RD	COLLECTOR	2817	1	12	2	1700	55	26
1085	678	48	CO RD 140	COLLECTOR	791	1	12	2	1700	40	26
1086	678	679	RIDGE RD	COLLECTOR	1599	1	12	2	1700	55	26
1087	680	675	BURLEE RD	COLLECTOR	911	1	12	2	1700	40	26
1088	681	47	BARCLAY RD	COLLECTOR	1915	1	12	2	1700	40	26
1089	682	129	SR 88	MINOR ARTERIAL	6800	1	12	2	1700	65	25
1090	683	899	N CENTENARY RD	COLLECTOR	3922	1	12	2	1700	45	8
1091	684	1005	CO RD 215	COLLECTOR	2927	1	12	2	1700	55	24
1092	685	686	CO RD 215	COLLECTOR	2457	1	12	2	1700	55	38

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
1093	686	687	MINSTEED RD	COLLECTOR	7346	1	12	2	1700	55	38
1094	687	688	MINSTEED RD	COLLECTOR	3130	1	12	2	1700	55	38
1095	687	694	MARTIN RD	COLLECTOR	3178	1	12	2	1700	55	38
1096	688	689	MINSTEED RD	COLLECTOR	1619	1	12	2	1700	50	38
1097	689	690	MINSTEED RD	COLLECTOR	9221	1	12	2	1700	55	38
1098	690	691	MINSTEED RD	COLLECTOR	12488	1	12	2	1700	55	44
1099	691	2	MINSTEED RD	COLLECTOR	4297	1	12	2	1700	55	44
1100	692	693	SKINNER RD	COLLECTOR	526	1	12	2	1575	35	37
1101	693	687	SKINNER RD	COLLECTOR	4228	1	12	2	1700	55	38
1102	694	695	MARTIN RD	COLLECTOR	1726	1	12	2	1700	45	38
1103	695	696	FAIRVILLE MAPLE RIDGE RD	COLLECTOR	11495	1	12	2	1700	55	38
1104	696	132	FAIRVILLE MAPLE RIDGE RD	COLLECTOR	2250	1	12	2	1700	55	38
1105	698	128	JOY RD	COLLECTOR	5104	1	12	2	1700	55	25
1106	699	700	CO RD 241	COLLECTOR	2665	1	12	2	1700	55	26
1107	700	701	CO RD 241	COLLECTOR	4393	1	12	2	1700	55	26
1108	702	708	HUDSON AVE	MINOR ARTERIAL	766	2	12	2	1750	45	10
1109	703	704	COOPER RD	COLLECTOR	1438	1	10	4	1750	45	10
1110	704	705	COOPER RD	COLLECTOR	863	1	10	4	1750	45	10
1111	705	514	COOPER RD	COLLECTOR	1995	1	10	4	1750	45	10
1112	706	704	DRIVEWAY	COLLECTOR	304	1	12	2	1750	40	10
1113	707	705	DRIVEWAY	COLLECTOR	266	1	12	2	1750	40	10
1114	708	709	HUDSON AVE	MINOR ARTERIAL	480	2	12	2	1750	45	10
1115	709	710	HUDSON AVE	MINOR ARTERIAL	1220	2	12	2	1750	45	10
1116	710	711	HUDSON AVE	MINOR ARTERIAL	2801	2	12	2	1750	45	10
1117	711	712	HUDSON AVE	MINOR ARTERIAL	867	2	12	2	1900	45	16

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
1118	712	713	HUDSON AVE	COLLECTOR	539	1	12	2	1900	45	16
1119	713	879	SR 104 SERVICE RD	MINOR ARTERIAL	1245	2	12	2	1900	55	16
1120	714	708	DRIVEWAY	COLLECTOR	313	1	12	2	1750	45	10
1121	715	709	DRAKE DR	COLLECTOR	449	1	12	2	1750	40	10
1122	716	710	BROOKVIEW DR	COLLECTOR	1069	1	12	2	1750	40	10
1123	717	718	E RIDGE RD	MINOR ARTERIAL	677	2	12	2	1750	45	10
1124	718	719	E RIDGE RD	MINOR ARTERIAL	620	2	12	2	1750	45	10
1125	719	711	E RIDGE RD	COLLECTOR	2100	1	12	2	1750	45	10
1126	719	723	CARTER ST	COLLECTOR	1235	1	12	2	1900	40	16
1127	720	717	DRIVEWAY	COLLECTOR	405	1	12	2	1750	35	10
1128	721	718	DRIVEWAY	COLLECTOR	352	1	12	2	1750	35	10
1129	722	719	STATON LN	COLLECTOR	2253	1	12	2	1750	40	10
1130	723	880	SR 104 SERVICE RD	MINOR ARTERIAL	335	2	12	2	1900	55	16
1131	724	64	SR 104 ON-RAMP	FREEWAY RAMP	619	1	12	2	1700	45	16
1132	724	511	SR 104 SERVICE RD	MINOR ARTERIAL	1341	2	12	2	1900	55	16
1133	726	65	SR 104 ON-RAMP	FREEWAY RAMP	753	1	12	2	1700	45	17
1134	726	505	SR 104 SERVICE RD	MINOR ARTERIAL	3814	2	12	2	1750	55	11
1135	727	506	SR 104 SERVICE RD	COLLECTOR	291	1	12	2	1750	40	16
1136	728	510	SR 104 SERVICE RD	MINOR ARTERIAL	348	2	12	2	1750	35	16
1137	729	509	DRIVEWAY	COLLECTOR	405	1	12	2	1900	35	16
1138	730	508	REYNOLDS AVE	COLLECTOR	1242	1	12	2	1750	40	16
1139	731	382	590 OFF-RAMP TO SR 404	FREEWAY RAMP	288	2	12	2	1750	40	17
1140	732	383	590 OFF-RAMP TO SR 404	FREEWAY RAMP	378	1	12	2	1750	40	17
1141	733	490	FOREST AVE	COLLECTOR	1250	1	12	2	1750	35	11
1142	734	491	DRIVEWAY	COLLECTOR	257	1	12	2	1750	35	11

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
1143	735	492	DRIVEWAY	COLLECTOR	238	2	12	2	1750	35	11
1144	736	493	BROWN ROAD	COLLECTOR	2543	1	12	2	1750	40	11
1145	737	494	ARROW DR	COLLECTOR	233	1	12	2	1750	35	11
1146	738	448	CROYDON RD	COLLECTOR	1944	1	12	2	1900	40	28
1147	739	448	BOBRICH DR	COLLECTOR	625	1	12	2	1900	40	28
1148	740	442	CLOVER ST	COLLECTOR	1108	1	12	2	1750	40	28
1149	741	742	HIGHLAND AVE	COLLECTOR	3030	1	12	2	1900	40	31
1150	741	842	CLOVER ST	COLLECTOR	4109	1	12	2	1750	40	31
1151	742	741	HIGHLAND AVE	COLLECTOR	3030	1	12	2	1750	40	31
1152	742	743	HIGHLAND AVE	COLLECTOR	386	1	12	2	1700	40	31
1153	743	5	SR 590 ON-RAMP FROM HIGHLAND AVE	FREEWAY RAMP	729	1	12	2	1700	45	31
1154	743	838	HIGHLAND AVE	COLLECTOR	1690	1	12	0	1900	45	31
1155	744	184	I-490 ON-RAMP FROM SR 31	FREEWAY RAMP	675	1	12	2	1700	45	39
1156	745	315	SR 104 OFF-RAMP TO BAY RD	FREEWAY RAMP	578	1	12	2	1750	45	12
1157	746	261	ORCHARD RD	COLLECTOR	2578	1	12	2	1750	50	14
1158	747	17	SR 104	FREEWAY	3145	3	12	12	2250	70	12
1159	747	314	SR 104 OFF-RAMP TO BAY RD	FREEWAY RAMP	1026	1	12	2	1750	45	12
1160	747	920	SR 104	FREEWAY	3099	3	12	12	2250	70	12
1161	748	246	SAN JOSE DR	MINOR ARTERIAL	1425	2	12	2	1750	55	14
1162	748	750	SAN JOSE DR	COLLECTOR	3713	1	12	2	1700	55	15
1163	749	23	SR 104	MINOR ARTERIAL	1979	2	12	10	1900	65	15
1164	749	24	SR 104	MINOR ARTERIAL	2271	2	12	10	1750	65	15

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
1165	749	231	SR 104 OFF-RAMP TO SALT RD	FREEWAY RAMP	1265	1	12	2	1750	50	15
1166	750	231	SALT RD	MINOR ARTERIAL	509	2	12	2	1750	30	15
1167	750	748	SAN JOSE DR	COLLECTOR	3713	1	12	2	1700	55	15
1168	751	297	HARD RD	COLLECTOR	362	1	12	2	1750	40	13
1169	751	298	HARD RD	COLLECTOR	1028	1	12	2	1750	45	13
1170	752	751	SR 104 SERVICE RD	MINOR ARTERIAL	313	2	12	2	1750	50	13
1171	753	19	SR 104 ON-RAMP	FREEWAY RAMP	600	1	12	2	1700	55	13
1172	753	417	SR 104 SERVICE RD	MINOR ARTERIAL	1020	2	12	2	1900	50	13
1173	754	291	SR 104 SERVICE RD	MINOR ARTERIAL	647	2	12	2	1750	55	14
1174	755	20	SR 104 ON-RAMP	FREEWAY RAMP	1036	1	12	2	1700	55	14
1175	755	297	SR 104 SERVICE RD	MINOR ARTERIAL	3456	2	12	2	1750	55	13
1176	756	263	SR 104 SERVICE RD	MINOR ARTERIAL	687	1	12	2	1750	50	14
1177	757	21	SR 104 ON-RAMP	FREEWAY RAMP	983	1	12	2	1700	55	14
1178	757	290	SR 104 SERVICE RD	MINOR ARTERIAL	3307	2	12	2	1750	55	14
1179	758	244	MITCHELDEAN DR	COLLECTOR	1420	1	12	2	1750	40	14
1180	758	748	EUSTON RD	COLLECTOR	2196	1	12	2	1700	40	15
1181	758	760	MITCHELDEAN DR	COLLECTOR	3656	1	12	2	1700	40	15
1182	759	262	SR 104 OFF-RAMP	FREEWAY RAMP	537	2	12	2	1750	50	14
1183	760	750	SALT RD	COLLECTOR	1645	1	12	2	1700	45	15
1184	760	758	MITCHELDEAN DR	COLLECTOR	3656	1	12	2	1750	40	15
1185	761	361	DRIVEWAY	COLLECTOR	522	1	12	2	1750	35	13
1186	762	359	DRIVEWAY	COLLECTOR	329	1	12	2	1750	35	14
1187	763	359	WEBSTER COMMONS BLVD	COLLECTOR	1014	1	12	2	1750	35	14
1188	764	360	DRIVEWAY	COLLECTOR	226	1	12	2	1750	35	13
1189	765	358	BARRETT DR	COLLECTOR	1048	1	12	2	1750	40	14

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
1190	766	294	SR 404	MINOR ARTERIAL	917	1	12	2	1750	45	14
1191	766	767	JACKSON RD	COLLECTOR	2635	1	12	2	1700	50	14
1192	767	372	JACKSON RD	COLLECTOR	2847	1	12	2	1700	50	14
1193	768	766	RACHEL DR	COLLECTOR	1104	1	12	2	1750	45	14
1194	769	770	SANFORD ST	COLLECTOR	1485	1	12	2	1750	35	14
1195	770	264	SR 250	MINOR ARTERIAL	1153	1	12	2	1750	40	14
1196	770	265	SR 250	MINOR ARTERIAL	1222	1	12	2	1700	40	14
1197	771	887	DEAN PKWY	COLLECTOR	1723	1	12	2	1700	55	5
1198	772	99	KENYON RD	COLLECTOR	3024	1	12	2	1700	50	6
1199	772	891	KNICKERBOCKER RD	COLLECTOR	2916	1	12	2	1700	55	6
1200	773	772	KNICKERBOCKER RD	COLLECTOR	4689	1	12	2	1700	50	6
1201	774	31	KNICKERBOCKER RD	COLLECTOR	2059	1	12	2	1750	40	23
1202	774	100	RIDGE RD	COLLECTOR	972	1	12	2	1750	45	23
1203	775	33	CORTLAND DR	COLLECTOR	783	1	12	2	1750	35	6
1204	776	37	CO RD 116	COLLECTOR	2824	1	12	2	1700	50	7
1205	776	115	CO RD 103	COLLECTOR	1591	1	12	2	1700	50	24
1206	777	895	CO RD 116	COLLECTOR	2297	1	12	2	1700	55	7
1207	778	40	SR 104	MINOR ARTERIAL	1935	1	12	10	1700	60	7
1208	778	793	SR 104	MINOR ARTERIAL	2524	1	12	10	1700	60	8
1209	779	686	JOY RD	COLLECTOR	3577	1	12	2	1700	55	25
1210	780	699	CO RD 236	COLLECTOR	6793	1	12	2	1700	55	26
1211	781	137	BOSTON RD	COLLECTOR	9972	1	12	2	1700	55	5
1212	781	339	CO RD 102	COLLECTOR	5349	1	12	2	1700	55	5
1213	782	78	WALWORTH-PENFIELD RD	COLLECTOR	7979	1	12	2	1750	55	35
1214	782	149	WALWORTH-PENFIELD RD	COLLECTOR	6931	1	12	2	1700	55	35

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
1215	782	783	CANANDAIGUA RD	COLLECTOR	4450	1	12	2	1700	60	35
1216	783	784	CANANDAIGUA RD	COLLECTOR	1416	1	12	2	1700	50	35
1217	784	785	GANANDA PKWY	COLLECTOR	4359	1	12	2	1700	50	35
1218	784	907	CANANDAIGUA RD	COLLECTOR	2486	1	12	2	1700	55	35
1219	785	617	GANANDA PKWY	COLLECTOR	2603	1	12	2	1700	50	35
1220	785	784	GANANDA PKWY	COLLECTOR	4359	1	12	2	1700	50	35
1221	786	82	31F	COLLECTOR	4897	1	12	2	1750	55	41
1222	786	600	31F	COLLECTOR	8407	1	12	2	1700	55	41
1223	787	786	CANANDAIGUA RD	COLLECTOR	5677	1	12	2	1750	50	41
1224	788	570	CANANDAIGUA RD	COLLECTOR	3280	1	12	2	1750	55	41
1225	789	638	CO RD 113	COLLECTOR	3046	1	12	0	1700	55	6
1226	790	216	HAMILTON RD	COLLECTOR	1304	1	12	2	1700	45	7
1227	790	640	HAMILTON RD	COLLECTOR	844	1	12	2	1700	45	7
1228	791	790	SALMON CREEK RD	COLLECTOR	4882	1	12	2	1750	45	7
1229	792	793	REDMAN RD	COLLECTOR	2600	1	12	2	1700	40	8
1230	793	41	SR 104	MINOR ARTERIAL	4453	1	12	10	1700	60	8
1231	793	778	SR 104	MINOR ARTERIAL	2523	1	12	10	1700	60	8
1232	794	644	PODGER RD	COLLECTOR	2579	1	12	0	1700	55	24
1233	795	794	TRIPP RD	COLLECTOR	9023	1	12	2	1700	50	25
1234	796	192	WALWORTH-MARION RD	COLLECTOR	919	1	12	2	1750	45	37
1235	797	796	DEAN RD	COLLECTOR	3726	1	12	2	1700	55	37
1236	798	998	DEAN RD	COLLECTOR	1010	1	12	2	1700	50	37
1237	799	798	EDDY RIDGE RD	COLLECTOR	10623	1	12	2	1700	55	24
1238	800	206	FAGNER RD	COLLECTOR	12395	1	12	2	1700	55	43
1239	802	498	TITUS AVENUE EXTENSION	COLLECTOR	645	1	12	2	1575	35	11

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
1240	803	804	SENECA RD	COLLECTOR	1016	1	12	2	1575	35	11
1241	804	56	SENECA RD TRAFFIC CIRCLE	COLLECTOR	96	1	12	4	900	20	11
1242	805	57	SEA BREEZE DR TRAFFIC CIRCLE	COLLECTOR	112	1	12	4	900	20	11
1243	805	477	SENECA RD	COLLECTOR	2740	1	12	2	1700	40	11
1244	806	807	POINT PLEASANT RD	COLLECTOR	747	1	12	2	1575	35	11
1245	807	54	POINT PLEASANT RD TRAFFIC CIRCLE	COLLECTOR	157	1	12	2	900	20	11
1246	808	55	SEA BREEZE DR TRAFFIC CIRCLE	COLLECTOR	129	1	12	4	900	20	11
1247	808	476	POINT PLEASANT RD	COLLECTOR	1098	1	12	2	1700	40	11
1248	809	810	DURAND BLVD	COLLECTOR	384	1	12	2	1575	35	2
1249	810	52	DURAND BLVD TRAFFIC CIRCLE	COLLECTOR	101	1	12	2	900	20	2
1250	811	381	WINTON RD N	COLLECTOR	2049	1	12	2	1750	40	17
1251	812	459	BAY ST	COLLECTOR	2194	1	12	2	1900	40	17
1252	813	843	SR 441	MINOR ARTERIAL	1232	2	12	2	1900	55	32
1253	814	163	LINDEN AVE	COLLECTOR	185	1	12	2	1750	55	32
1254	815	164	LINDEN AVE	COLLECTOR	685	1	12	2	1750	55	32
1255	816	164	LINDEN OAKS	COLLECTOR	237	1	12	2	1750	55	32
1256	817	165	SR 441	MAJOR ARTERIAL	744	3	12	2	1750	40	32
1257	818	817	ASTOR DR	COLLECTOR	298	1	12	2	1750	35	32
1258	819	817	GLEN RD	COLLECTOR	714	1	12	2	1750	35	32
1259	820	429	SR 441 OFF-RAMP TO SR 153	FREEWAY RAMP	321	1	12	2	1750	45	32
1260	821	742	E HIGHLAND DR	COLLECTOR	1577	1	12	2	1900	45	28

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
1261	821	830	E HIGHLAND DR	COLLECTOR	1208	1	12	2	1750	45	28
1262	822	171	I-490 ON-RAMP	FREEWAY RAMP	1138	1	12	2	1700	55	28
1263	822	172	I-490 ON-RAMP	FREEWAY RAMP	526	1	12	2	1700	55	28
1264	823	6	SR 590 ON-RAMP	FREEWAY RAMP	1106	1	12	2	1700	55	28
1265	823	7	SR 590 ON-RAMP	FREEWAY RAMP	1135	2	12	2	1900	55	28
1266	824	9	SR 590	FREEWAY	1466	3	12	12	2250	70	28
1267	824	446	SR 590 ON-RAMP FROM BLOSSOM RD	FREEWAY RAMP	773	1	12	2	1750	40	28
1268	824	828	SR 590	FREEWAY	1407	2	12	12	2250	70	28
1269	824	857	SR 590	FREEWAY	404	2	12	12	2250	70	28
1270	825	824	SR 590	FREEWAY	1345	4	12	12	2250	70	28
1271	826	7	SR 590 ON-RAMP	FREEWAY RAMP	1281	1	12	2	1700	55	28
1272	826	825	SR 590 ON-RAMP	FREEWAY RAMP	583	1	12	2	1700	50	28
1273	828	173	I-490 ON-RAMP	FREEWAY RAMP	917	1	12	2	1700	55	28
1274	828	829	I-490 ON-RAMP	FREEWAY RAMP	940	1	12	2	1700	55	28
1275	829	174	I-490 ON-RAMP	FREEWAY RAMP	735	2	12	2	1900	55	28
1276	830	821	E HIGHLAND DR	COLLECTOR	1203	1	12	2	1700	45	28
1277	830	829	I-490 ON-RAMP	FREEWAY RAMP	740	1	12	2	1700	45	28
1278	830	831	EAST AVE	MINOR ARTERIAL	998	2	12	2	1900	45	28
1279	831	830	EAST AVE	MINOR ARTERIAL	998	2	12	2	1750	45	28
1280	831	832	EAST AVE	MINOR ARTERIAL	717	2	12	2	1900	45	28
1281	832	453	EAST AVE	MINOR ARTERIAL	836	2	12	2	1900	45	28
1282	832	831	EAST AVE	MINOR ARTERIAL	717	2	12	2	1900	45	28
1283	833	855	EAST AVE	MINOR ARTERIAL	226	2	12	2	1900	40	28
1284	834	452	UNIVERSITY AVE	MINOR ARTERIAL	911	2	12	2	1900	45	28
1285	834	833	PROBERT ST	COLLECTOR	373	1	12	2	1900	40	28
1286	836	854	S WINTON RD	MINOR ARTERIAL	212	2	12	2	1900	45	28

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
1287	837	838	SWINTON RD	COLLECTOR	2471	1	12	2	1900	45	28
1288	838	839	SWINTON RD	COLLECTOR	913	1	12	2	1700	45	31
1289	838	841	HIGHLAND AVE	COLLECTOR	1041	1	12	0	1700	45	31
1290	840	837	HILLSIDE AVE	COLLECTOR	994	1	12	2	1900	45	28
1291	842	168	CLOVER ST	COLLECTOR	1106	1	12	2	1700	40	31
1292	843	164	SR 441	MAJOR ARTERIAL	580	3	12	2	1750	55	32
1293	844	554	31F	MINOR ARTERIAL	675	2	12	2	1900	45	32
1294	844	845	31F	MINOR ARTERIAL	1960	2	12	2	1750	45	32
1295	845	844	31F	MINOR ARTERIAL	1961	2	12	2	1750	45	32
1296	845	846	SR 96	MINOR ARTERIAL	1376	2	12	2	1750	45	32
1297	846	845	SR 96	MINOR ARTERIAL	1376	2	12	2	1750	45	32
1298	846	847	SR 96	MINOR ARTERIAL	2457	2	12	2	1750	45	32
1299	847	846	SR 96	MINOR ARTERIAL	2457	2	12	2	1750	45	32
1300	847	848	SR 96	MINOR ARTERIAL	868	2	12	2	1750	45	32
1301	848	167	SR 96	MINOR ARTERIAL	487	2	12	2	1750	45	32
1302	848	847	SR 96	MINOR ARTERIAL	868	2	12	2	1750	45	32
1303	849	844	FAIRPORT RD	COLLECTOR	714	1	12	2	1750	40	32
1304	850	845	EAST AVE	COLLECTOR	2077	1	12	2	1750	40	32
1305	851	846	KILBORN AVE	COLLECTOR	398	1	12	2	1750	45	32
1306	852	847	KNOLLYWOOD DR	COLLECTOR	704	1	12	2	1750	40	32
1307	853	848	ALLINS CREEK RD	COLLECTOR	1234	1	12	2	1750	40	32
1308	854	837	SWINTON RD	COLLECTOR	209	1	12	2	1900	45	28
1309	855	835	EAST AVE	COLLECTOR	531	1	12	2	1700	40	28
1310	856	831	ROCKWOOD ST	MINOR ARTERIAL	387	2	12	2	1900	35	28
1311	857	1023	SR 590	FREEWAY	800	3	12	2	2250	70	28
1312	858	446	BLOSSOM RD	MINOR ARTERIAL	177	2	12	2	1750	40	28

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
1313	859	451	GALE TERRACE	COLLECTOR	625	1	12	2	1900	40	28
1314	860	450	JUNIPER ST	COLLECTOR	768	1	12	2	1900	40	28
1315	861	449	N WHINTON RD	MINOR ARTERIAL	347	2	12	2	1900	40	28
1316	862	448	BLOSSOM RD	COLLECTOR	871	1	12	2	1900	40	28
1317	863	9	SR 590	FREEWAY	1287	3	12	12	2250	70	28
1318	863	10	SR 590	FREEWAY	1262	3	12	12	2250	70	28
1319	863	324	SR 590 OFF-RAMP TO BANCROFT BLVD	FREEWAY RAMP	1026	1	12	2	1750	50	28
1320	864	457	E MAIN ST	COLLECTOR	1362	1	12	2	1900	40	28
1321	864	461	E MAIN ST	COLLECTOR	1324	1	12	2	1900	40	28
1322	865	460	E MAIN ST	COLLECTOR	1161	1	12	2	1900	40	28
1323	866	328	ATLANTIC AVE	COLLECTOR	1195	1	12	2	1900	40	28
1324	866	865	OHIO ST	COLLECTOR	1267	1	12	2	1900	40	28
1325	867	1010	CULVER RD	COLLECTOR	2016	1	12	2	1900	40	17
1326	868	458	MERCHANTS RD	COLLECTOR	1501	1	12	2	1900	40	28
1327	868	867	MERCHANTS RD	COLLECTOR	1300	1	12	2	1900	40	17
1328	869	386	DEERFIELD DR	COLLECTOR	1277	1	12	2	1900	30	17
1329	870	384	HELENDAL RD	COLLECTOR	3199	1	12	2	1750	40	17
1330	870	463	HELENDAL RD	COLLECTOR	1057	1	12	2	1700	40	17
1331	871	65	SR 104	FREEWAY	1936	3	12	12	2250	70	17
1332	871	67	SR 104	FREEWAY	2016	4	12	12	2250	70	17
1333	872	469	CULVER RD	COLLECTOR	1003	1	12	2	1900	45	17
1334	872	482	CULVER RD	MINOR ARTERIAL	1740	2	12	2	1900	45	17
1335	873	13	SR 590	FREEWAY	2119	3	12	12	2250	70	17
1336	873	14	SR 590	FREEWAY	981	4	12	12	2250	70	17
1337	874	70	SR 104	FREEWAY	809	4	12	12	2250	70	11
1338	875	479	WORTHINGTON RD	COLLECTOR	1337	1	12	2	1900	40	11

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
1339	876	480	CULVER RD	MINOR ARTERIAL	352	2	12	2	1900	40	11
1340	877	504	DRIVEWAY	COLLECTOR	413	1	12	2	1750	35	10
1341	878	712	DRIVEWAY	COLLECTOR	528	1	12	2	1900	35	16
1342	879	62	SR 104 ON-RAMP	FREEWAY RAMP	813	1	12	2	1700	50	16
1343	880	63	SR 104 ON-RAMP	FREEWAY RAMP	674	1	12	2	1700	50	16
1344	880	713	SR 104 SERVICE RD	MINOR ARTERIAL	1728	2	12	2	1900	55	16
1345	881	530	ST PAUL BLVD	MINOR ARTERIAL	826	2	12	2	1750	45	1
1346	881	534	ST PAUL BLVD	COLLECTOR	2612	1	12	2	1750	45	1
1347	882	527	DRIVEWAY	COLLECTOR	330	1	12	2	1750	40	1
1348	883	261	ORCHARD RD	MINOR ARTERIAL	1304	1	12	2	1750	50	14
1349	884	883	PANAMA RD	COLLECTOR	2034	1	12	2	1750	40	14
1350	885	24	BASKET RD	COLLECTOR	612	1	12	2	1750	30	15
1351	886	25	CO RD 100	COLLECTOR	300	1	12	2	1750	30	15
1352	887	26	DEAN PKWY	COLLECTOR	793	1	12	2	1750	30	22
1353	888	28	CO RD 102	COLLECTOR	531	1	12	2	1750	30	5
1354	889	29	SLOCUM RD	COLLECTOR	442	1	12	2	1750	30	5
1355	890	30	ONTARIO CENTER RD	COLLECTOR	673	1	12	2	1750	35	5
1356	891	31	KNICKERBOCKER RD	COLLECTOR	1528	1	12	2	1750	40	6
1357	892	32	SR 110	MINOR ARTERIAL	2041	1	12	2	1750	40	6
1358	893	34	FISHER RD	COLLECTOR	593	1	12	2	1575	35	6
1359	894	36	SALMON CREEK RD	COLLECTOR	502	1	12	2	1350	30	6
1360	895	37	CO RD 116	COLLECTOR	595	1	12	2	1350	30	7
1361	896	38	CO RD 120	COLLECTOR	1041	1	12	2	1750	35	7
1362	897	39	POUND RD	COLLECTOR	532	1	12	2	1750	30	7
1363	898	40	E TOWNLINE RD	COLLECTOR	821	1	12	2	1350	30	7
1364	899	41	N CENTENARY RD	COLLECTOR	760	1	12	2	1350	30	8

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
1365	900	677	NORTH RD	COLLECTOR	10457	1	12	2	1700	55	9
1366	901	122	S CENTENARY RD	COLLECTOR	2217	1	12	2	1700	50	25
1367	902	22	SR 104 ON-RAMP FROM PHILLIPS RD	FREEWAY RAMP	651	1	12	2	1700	55	14
1368	903	75	SR 350	MINOR ARTERIAL	4024	1	12	2	1700	55	22
1369	903	101	PADDY LN	COLLECTOR	5761	1	12	2	1700	50	23
1370	904	905	BUSHWOOD RD	COLLECTOR	1775	1	12	2	1700	45	22
1371	905	75	HENNESSEY RD	COLLECTOR	3191	1	12	2	1700	45	22
1372	906	599	WIEDRICK RD	COLLECTOR	2375	1	12	2	1700	45	35
1373	907	786	CANANDAIGUA RD	COLLECTOR	8020	1	12	2	1750	55	41
1374	908	108	WALWORTH-ONTARIO RD	COLLECTOR	6154	1	12	2	1700	55	42
1375	909	272	ST CAMILLUS WAY	COLLECTOR	1177	1	12	2	1750	40	34
1376	910	157	SR 250	MINOR ARTERIAL	1666	2	12	2	1750	55	34
1377	911	914	SR 441	MINOR ARTERIAL	1056	2	12	2	1750	50	34
1378	912	911	HARRIS WHALEN PARK RD	COLLECTOR	1517	1	12	2	1750	40	34
1379	913	911	DRIVEWAY	COLLECTOR	357	2	12	2	1750	35	34
1380	914	158	SR 441	MINOR ARTERIAL	3473	2	12	2	1750	50	33
1381	915	914	WILLOW POND WAY	COLLECTOR	1577	1	12	2	1750	45	34
1382	916	604	ROSSCOMMON CRESCENT	COLLECTOR	2056	1	12	2	1750	40	40
1383	917	275	DRIVEWAY	COLLECTOR	463	1	12	2	1750	35	40
1384	918	159	SR 441	MINOR ARTERIAL	1940	2	12	2	1750	50	33
1385	919	918	HILLCREST DR	COLLECTOR	451	1	12	2	1750	35	33
1386	920	18	SR 104	FREEWAY	5952	2	12	12	2250	70	13
1387	920	747	SR 104	FREEWAY	3094	2	12	12	2250	70	12

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
1388	921	417	5 MILE LINE RD	MINOR ARTERIAL	393	2	12	2	1750	40	13
1389	922	297	HARD RD	MINOR ARTERIAL	275	2	12	2	1750	45	13
1390	923	290	HOLT RD	MINOR ARTERIAL	371	2	12	2	1750	40	14
1391	924	292	DRIVEWAY	COLLECTOR	372	2	12	2	1750	35	14
1392	925	293	DRIVEWAY	COLLECTOR	390	2	12	2	1750	35	14
1393	926	262	SR 250	MINOR ARTERIAL	233	2	12	2	1750	35	14
1394	927	263	SR 250	MINOR ARTERIAL	331	2	12	2	1750	35	14
1395	927	264	SR 250	MINOR ARTERIAL	843	1	12	2	1750	40	14
1396	928	39	SR 104	MINOR ARTERIAL	1157	2	12	10	1750	65	7
1397	928	40	SR 104	MINOR ARTERIAL	6100	1	12	10	1700	65	7
1398	929	88	SR 31	MINOR ARTERIAL	2720	1	12	2	1750	40	42
1399	930	929	WILLIAM ST	COLLECTOR	629	1	12	2	1750	35	42
1400	931	87	SR 31	MINOR ARTERIAL	2966	1	12	2	1750	40	42
1401	932	931	HYDE PKWY	COLLECTOR	867	1	12	2	1750	35	42
1402	933	85	SR 31	MINOR ARTERIAL	3454	1	12	2	1700	55	42
1403	934	933	O'NEIL RD	COLLECTOR	1200	1	12	2	1125	25	42
1404	935	571	DRIVEWAY	COLLECTOR	762	2	12	2	1750	35	41
1405	936	579	COURTNEY DR	COLLECTOR	402	1	12	2	1750	35	40
1406	937	279	SR 250	MINOR ARTERIAL	1583	1	12	2	1700	40	40
1407	938	278	SR 250	MINOR ARTERIAL	592	2	12	2	1750	40	40
1408	939	938	SR 250	MINOR ARTERIAL	536	2	12	2	1750	50	40
1409	940	580	DRIVEWAY	COLLECTOR	511	1	12	2	1750	35	40
1410	940	938	DRIVEWAY	COLLECTOR	455	1	12	2	1750	35	40
1411	941	581	VALLEY CREEK DR	COLLECTOR	865	1	12	2	1750	35	40
1412	943	277	AYRAULT RD	MINOR ARTERIAL	782	2	12	2	1750	45	40
1413	944	607	AYRAULT RD	COLLECTOR	3436	1	12	2	1700	45	40

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
1414	945	285	TURK HILL RD	COLLECTOR	1112	1	12	2	1750	40	40
1415	946	945	DRIVEWAY	COLLECTOR	332	1	12	2	1750	35	40
1416	947	568	SR 250	MINOR ARTERIAL	3198	1	12	2	1700	45	40
1417	948	947	PARK CIRCLE DR	COLLECTOR	977	1	12	2	1750	35	40
1418	949	947	HULBERT LN	COLLECTOR	3064	1	12	2	1750	35	40
1419	950	258	KLEM RD	MAJOR ARTERIAL	397	2	12	2	1750	50	4
1420	951	634	KLEM RD	COLLECTOR	3246	1	12	2	1700	55	4
1421	952	295	HARD RD	COLLECTOR	2522	1	12	2	1750	50	3
1422	952	302	SHOEMAKER RD	COLLECTOR	1788	1	12	2	1700	55	3
1423	953	210	PLANT DRIVEWAY	COLLECTOR	355	1	12	12	1575	35	5
1424	953	954	PLANT DRIVEWAY	COLLECTOR	2088	1	12	2	1700	40	5
1425	954	90	LAKE RD	COLLECTOR	2737	1	12	2	1700	55	5
1426	954	209	LAKE RD	COLLECTOR	1428	1	12	2	1700	55	5
1427	955	286	TURK HILL RD	COLLECTOR	3571	1	12	2	1750	40	40
1428	956	564	JEFFERSON AVE	COLLECTOR	813	1	12	2	1750	40	39
1429	956	606	JEFFERSON AVE	COLLECTOR	7308	1	12	2	1750	40	39
1430	957	563	31F	MINOR ARTERIAL	565	2	12	2	1750	50	39
1431	957	564	31F	MAJOR ARTERIAL	546	1	12	2	1750	50	39
1432	958	562	DRIVEWAY	COLLECTOR	227	1	12	2	1750	35	39
1433	959	561	LAKE CRESCENT DR	COLLECTOR	314	1	12	2	1750	30	39
1434	960	555	S LINCOLN RD	COLLECTOR	3255	1	12	2	1750	35	39
1435	961	960	E COMMERCIAL ST	COLLECTOR	794	1	12	2	1750	35	33
1436	962	960	E COMMERCIAL ST	COLLECTOR	786	1	12	2	1750	35	33
1437	963	560	WEST AVE	COLLECTOR	2176	1	12	2	1750	35	39
1438	964	559	DRIVEWAY	COLLECTOR	297	1	12	2	1750	35	39
1439	965	540	DESPATCH DR	COLLECTOR	2034	1	12	2	1750	40	33

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
1440	966	428	PANORAMA TRAIL	MINOR ARTERIAL	716	2	12	2	1750	55	32
1441	967	966	PANORAMA CREEK DR	COLLECTOR	1162	1	12	2	1750	35	32
1442	968	966	PANORAMA TRAIL	MINOR ARTERIAL	849	2	12	2	1750	45	32
1443	969	968	DRIVEWAY	COLLECTOR	222	1	12	2	1750	35	32
1444	970	426	PANORAMA TRAIL	MINOR ARTERIAL	518	2	12	2	1750	45	33
1445	971	415	PANORAMA TRAIL	COLLECTOR	1662	1	10	0	1750	35	29
1446	971	427	PANORAMA TRAIL	COLLECTOR	3046	1	10	0	1575	35	29
1447	972	426	PENFIELD RD	MINOR ARTERIAL	422	2	12	2	1750	50	33
1448	973	435	DRIVEWAY	COLLECTOR	220	1	12	2	1750	35	32
1449	974	414	QUALTROUGH RD	COLLECTOR	5207	1	12	2	1750	50	29
1450	975	414	CLARCK RD	COLLECTOR	2254	1	12	2	1750	45	29
1451	976	368	DRIVEWAY	COLLECTOR	345	1	12	2	1750	35	18
1452	977	367	DRIVEWAY	COLLECTOR	290	1	12	2	1750	35	18
1453	978	317	BAY RD	COLLECTOR	1347	1	12	2	1750	40	18
1454	979	978	KIDD CASTLE WAY	COLLECTOR	1356	1	12	2	1750	35	18
1455	980	316	GLEN EDYTH RD	COLLECTOR	174	1	12	2	1750	30	12
1456	981	418	5 MILE LINE RD	MINOR ARTERIAL	441	2	12	2	1750	40	13
1457	981	419	5 MILE LINE RD	COLLECTOR	525	1	12	2	1750	40	13
1458	982	985	BILLS RD	COLLECTOR	1949	1	12	2	1700	50	35
1459	983	984	WATSON HUBERT RD	COLLECTOR	5178	1	12	2	1700	50	34
1460	984	1019	SR 441	MINOR ARTERIAL	4205	1	12	2	1750	55	34
1461	985	983	BILLS RD	COLLECTOR	103	1	12	2	1125	25	34
1462	986	148	CO RD 204	COLLECTOR	234	1	12	2	1125	25	35
1463	987	585	SR 31	MINOR ARTERIAL	238	1	12	2	1700	45	39
1464	987	586	SR 31	MINOR ARTERIAL	1964	1	12	2	1750	45	39
1465	988	181	I-490	FREEWAY	3439	3	12	12	2250	70	39

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
1466	988	182	I-490	FREEWAY	4012	2	12	12	2250	70	39
1467	989	536	FOREST HILLS RD	COLLECTOR	646	1	12	2	1750	40	29
1468	990	444	BLOSSOM RD	COLLECTOR	4169	1	12	2	1700	50	29
1469	991	992	CO RD 210	COLLECTOR	471	1	12	2	1350	30	42
1470	992	661	CO RD 210	COLLECTOR	6055	1	12	2	1700	50	42
1471	993	994	WALWORTH-ONTARIO RD	COLLECTOR	4672	1	12	2	1700	60	42
1472	994	109	WALWORTH-ONTARIO RD	COLLECTOR	1131	1	12	2	1575	35	42
1473	995	86	WALWORTH-ONTARIO RD	COLLECTOR	1041	1	12	2	1350	30	42
1474	996	83	SR 350	MINOR ARTERIAL	627	1	12	2	1700	40	41
1475	997	81	SR 350	MINOR ARTERIAL	1744	1	12	2	1700	45	41
1476	997	631	SCOTT RD	COLLECTOR	973	1	12	2	1700	45	41
1477	998	797	DEAN RD	COLLECTOR	105	1	12	2	1350	30	37
1478	999	408	JACKSON RD	COLLECTOR	2776	1	12	2	1700	50	34
1479	1000	424	DRIVEWAY	COLLECTOR	663	1	12	2	1750	35	33
1480	1001	250	PHILLIPS RD	COLLECTOR	2358	1	12	2	1750	50	14
1481	1002	248	PHILLIPS RD	MINOR ARTERIAL	988	2	12	2	1750	40	14
1482	1002	249	PHILLIPS RD	MINOR ARTERIAL	347	2	12	2	1750	50	14
1483	1003	133	SR 88	MINOR ARTERIAL	6245	1	12	2	1700	60	44
1484	1004	685	CO RD 215	COLLECTOR	264	1	12	2	1350	30	38
1485	1005	1004	CO RD 215	COLLECTOR	3688	1	12	2	1700	55	25
1486	1006	684	BEAM HILL RD	COLLECTOR	1442	1	12	2	1700	55	24
1487	1007	141	COUNTY LINE RD	COLLECTOR	206	1	12	2	1350	30	21
1488	1008	460	CULVER RD	COLLECTOR	1624	1	12	2	1900	40	28
1489	1009	461	WISCONSIN ST	COLLECTOR	1212	1	12	2	1900	40	28

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
1490	1009	1008	GARSON AVE	COLLECTOR	2004	1	12	2	1900	35	28
1491	1010	1008	CULVER RD	COLLECTOR	736	1	12	2	1900	40	28
1492	1011	1010	PARCELLS AVE	COLLECTOR	945	1	12	2	1900	35	28
1493	1012	384	HELENDAL RD	COLLECTOR	1800	1	12	2	1750	40	17
1494	1012	462	CULVER PKWY	COLLECTOR	1871	1	12	2	1700	40	17
1495	1013	702	TITUS AVE	COLLECTOR	334	1	12	2	1750	40	10
1496	1014	530	SAGAMORE CIR	COLLECTOR	285	1	12	2	1750	30	1
1497	1015	496	E RIDGE RD	MINOR ARTERIAL	1445	2	12	2	1750	45	10
1498	1016	1015	DRIVEWAY	COLLECTOR	171	1	12	2	1750	35	10
1499	1017	481	SR 104 OFF-RAMP TO CULVER RD	FREEWAY RAMP	306	2	12	2	1900	40	11
1500	1018	365	GRAVEL RD	COLLECTOR	2192	1	12	2	1750	50	12
1501	1019	153	SR 441	MINOR ARTERIAL	2026	1	12	2	1750	55	34
1502	1020	237	SR 286	MINOR ARTERIAL	1964	1	12	2	1700	55	34
1503	1020	1021	GLORIA DR	COLLECTOR	2547	1	10	1	1750	55	34
1504	1021	238	SWEET CORNERS RD	COLLECTOR	1999	1	10	2	1750	50	34
1505	1021	1019	GLORIA DR	COLLECTOR	7936	1	10	1	1750	55	34
1506	1022	590	WHALEN RD	COLLECTOR	3709	1	12	2	1700	50	30
1507	1023	7	SR 590	FREEWAY	1341	2	12	2	2250	70	28
1508	1024	842	ELMWOOD AVE	COLLECTOR	4513	1	12	2	1750	40	31
1509	1025	79	SR 350	MINOR ARTERIAL	4984	1	12	4	1700	60	36
1510	1026	660	CO RD 210	COLLECTOR	6861	1	12	2	1700	55	36
1511	8004	4	SR 590	FREEWAY	388	3	12	12	2250	70	31
1512	8049	49	SR 104	MINOR ARTERIAL	624	1	12	10	1700	60	26
1513	8061	61	SR 104	FREEWAY	494	3	12	12	2250	70	16
1514	8185	185	I-490	FREEWAY	626	2	12	12	2250	70	39

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
Exit Link	135	8135	SR 88	MINOR ARTERIAL	340	1	12	2	1700	55	44
Exit Link	49	8049	SR 104	MINOR ARTERIAL	624	1	12	10	1700	60	26
Exit Link	89	8089	SR 31	MINOR ARTERIAL	580	1	12	2	1700	45	43
Exit Link	544	8544	SR 153	MINOR ARTERIAL	523	1	12	2	1700	50	39
Exit Link	801	8801	SR 21	MINOR ARTERIAL	591	1	12	2	1700	55	42
Exit Link	279	8279	SR 250	MINOR ARTERIAL	372	1	12	2	1700	40	40
Exit Link	587	8587	SR 31	MINOR ARTERIAL	413	1	12	2	1700	45	39
Exit Link	4	8004	SR 590	FREEWAY	388	3	12	12	2250	70	31
Exit Link	61	8061	SR 104	FREEWAY	494	3	12	12	2250	70	16
Exit Link	185	8185	I-490	FREEWAY	626	2	12	12	2250	70	39
Exit Link	168	8168	CLOVER ST	COLLECTOR	318	1	12	2	1700	40	31
Exit Link	169	8189	I-490	FREEWAY	460	4	12	12	2250	70	28
Exit Link	529	8529	PATTONWOOD DR	MINOR ARTERIAL	192	2	12	2	1900	40	1
Exit Link	697	8697	FAIRVILLE MAPLE RIDGE RD	COLLECTOR	665	1	12	2	1700	50	44

Link #	Up-Stream Node	Down-Stream Node	Roadway Name	Roadway Type	Length (ft.)	No. of Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Saturation Flow Rate (pcphpl)	Free Flow Speed (mph)	Grid Number
Exit Link	701	8701	CO RD 241	COLLECTOR	837	1	12	2	1700	55	26
Exit Link	835	8835	EAST AVE	COLLECTOR	221	1	12	2	1700	40	28
Exit Link	839	8839	S WINTON RD	COLLECTOR	309	1	12	2	1700	45	31
Exit Link	841	8841	HIGHLAND AVE	COLLECTOR	282	1	12	0	1700	45	31
Exit Link	942	8942	KREAG RD	COLLECTOR	356	1	12	2	1700	40	39
Exit Link	329	8329	ATLANTIC AVE	COLLECTOR	467	1	12	2	1700	40	27
Exit Link	393	8393	CLIFFORD AVE	COLLECTOR	232	1	12	2	1700	40	16
Exit Link	627	8627	VICTOR RD	COLLECTOR	964	1	12	2	1700	50	40
Exit Link	629	8629	CANANDAIGUA RD	COLLECTOR	682	1	12	2	1700	50	41
Exit Link	630	8630	CO RD 312	COLLECTOR	615	1	12	2	1700	50	42
Exit Link	671	8671	LAKE RD	COLLECTOR	478	1	12	2	1700	55	9
Exit Link	679	8679	RIDGE RD	COLLECTOR	530	1	12	2	1700	55	26

Table K-2. Nodes in the Link-Node Analysis Network which are Controlled

Node	X Coordinate (ft)	Y Coordinate (ft)	Control Type	Grid Map Number
1	550109	1184807	Actuated	1
2	683328	1118583	Stop	44
24	605906	1175248	Actuated	15
25	609098	1175603	Actuated	15
26	611869	1176088	Actuated	22
27	616723	1176403	Actuated	22
28	619125	1176504	Actuated	22
29	622844	1176775	Actuated	5
30	627542	1176835	TCP - Actuated	5
31	632855	1176730	Actuated	23
32	633977	1176726	TCP - Actuated	23
33	638185	1177665	Actuated	6
34	641948	1177875	Stop	6
36	651042	1178463	Stop	6
37	655453	1178627	Stop	7
38	659323	1178537	TCP - Actuated	7
39	663372	1179290	Actuated	7
40	670628	1179471	Stop	7
41	679500	1180386	Stop	8
43	687950	1180785	Stop	8
44	692596	1182109	TCP - Actuated	8
45	695917	1180030	Stop	9
46	699534	1177088	TCP - Actuated	9
47	702939	1174691	Stop	26
48	705819	1173430	Stop	26
52	564102	1177434	Yield	2
54	563927	1176297	Yield	11
56	563483	1173507	Yield	11
58	562563	1171900	Yield	11
59	562589	1171757	Yield	11
71	627762	1193289	TCP - Actuated	5
72	627820	1187896	Stop	5
73	627541	1181256	TCP - Actuated	5
74	627518	1176379	TCP - Actuated	22
75	630144	1166127	Stop	22
76	632103	1160831	Stop	23
77	631688	1153751	TCP - Actuated	36

Node	X Coordinate (ft)	Y Coordinate (ft)	Control Type	Grid Map Number
78	630830	1144581	TCP - Actuated	36
79	630660	1136814	Stop	36
82	628188	1128231	Actuated	41
84	629366	1119277	Actuated	41
86	640057	1116263	Stop	42
87	646466	1116879	Actuated	42
88	649681	1116437	Actuated	42
90	622662	1192954	TCP - No Control	5
92	622782	1181193	TCP - No Control	5
93	622872	1175186	Stop	22
94	622842	1167865	Stop	22
95	637824	1194558	TCP - No Control	6
99	635856	1181297	Stop	6
100	633612	1174364	Pretimed	23
101	634601	1170049	Stop	23
105	636251	1144560	TCP - Actuated	36
108	637294	1127330	Stop	42
111	660987	1196305	Stop	7
112	641921	1174724	Stop	23
114	651030	1174899	Stop	23
116	659489	1175287	TCP - Actuated	24
118	663964	1178354	Stop	7
119	670554	1177685	Stop	7
122	679542	1177842	Stop	8
124	688406	1180397	TCP - Actuated	8
126	692705	1179516	Actuated	8
128	691596	1166188	Stop	25
132	687820	1135657	Stop	38
134	683872	1118095	Stop	44
136	609045	1192344	TCP - No Control	4
137	609085	1187166	Stop	4
138	609064	1181865	Stop	4
140	609089	1167936	Stop	15
142	616749	1175860	Stop	22
143	616895	1167915	Stop	22

Node	X Coordinate (ft)	Y Coordinate (ft)	Control Type	Grid Map Number
145	617236	1160741	Stop	22
146	618646	1153607	Stop	35
147	618688	1149558	Stop	35
149	615919	1144584	Stop	35
152	609462	1141831	Actuated	35
153	602088	1141718	Actuated	34
154	598825	1141255	Stop	34
156	593600	1141798	Actuated	34
157	591197	1141846	TCP - Actuated	34
158	585152	1142080	Actuated	33
159	581954	1141697	Actuated	33
163	573627	1139325	Actuated	32
164	570127	1140466	Actuated	32
165	569124	1141500	Actuated	32
166	568639	1141493	Actuated	32
167	567778	1141266	Actuated	32
192	656567	1146828	TCP - Actuated	37
193	656877	1143663	Stop	37
199	658542	1145878	Pretimed	37
206	669757	1127247	Stop	43
209	626813	1193274	Stop	5
216	659715	1195574	Stop	7
224	692182	1189620	TCP - No Control	8
227	605830	1182010	Stop	4
230	602425	1181938	Stop	4
231	602485	1174513	TCP - Actuated	15
232	602494	1174112	TCP - Actuated	15
233	602498	1173647	TCP - Actuated	15
234	602328	1168409	Stop	15
236	602255	1160322	Stop	21
237	602156	1152234	Stop	34
238	602144	1149683	TCP - Actuated	34
242	597394	1181862	Stop	4
243	597430	1178895	Actuated	4
244	597394	1176528	Actuated	14
246	597420	1174305	TCP - Actuated	14
248	597418	1173507	Actuated	14

Node	X Coordinate (ft)	Y Coordinate (ft)	Control Type	Grid Map Number
249	597414	1172173	TCP - Actuated	14
250	597441	1167808	Actuated	14
251	593563	1190316	TCP - No Control	4
256	594907	1181882	TCP - Actuated	4
258	594946	1178900	Actuated	4
261	594522	1174262	Actuated	14
262	594444	1173054	TCP - Actuated	14
263	594428	1172709	TCP - Actuated	14
264	594417	1171534	Actuated	14
266	594367	1166792	Actuated	14
267	594187	1160482	Actuated	20
269	593845	1152550	TCP - Actuated	34
270	593290	1149909	Stop	34
271	591326	1145642	Actuated	34
272	591146	1140607	Actuated	34
273	590952	1133715	Actuated	40
274	590922	1132461	Actuated	40
275	590862	1130693	Actuated	40
276	590832	1130103	Actuated	40
277	590821	1123046	Actuated	40
278	590650	1119457	Actuated	40
281	593522	1133647	Actuated	40
282	593499	1131739	Actuated	40
283	593252	1129474	Actuated	40
285	593410	1123055	Actuated	40
286	593392	1119158	Actuated	40
289	590076	1178303	Actuated	4
290	590065	1173023	Actuated	14
291	590065	1172530	Actuated	14
292	590068	1172003	Actuated	14
293	590048	1171508	Actuated	14
294	590048	1170915	Actuated	14
295	586151	1178376	Actuated	3
297	586150	1172516	Actuated	13
298	586192	1171127	Actuated	13
299	586231	1170319	Actuated	13
302	584409	1180697	Stop	3

Node	X Coordinate (ft)	Y Coordinate (ft)	Control Type	Grid Map Number
303	584395	1178368	Stop	3
306	580526	1178282	Stop	3
312	573473	1178417	Stop	3
314	571683	1172587	TCP - Actuated	12
315	571733	1171866	TCP - Actuated	12
316	572295	1169393	Actuated	12
317	574710	1163572	TCP - Actuated	18
318	575112	1160886	Actuated	18
321	574072	1150461	Actuated	29
324	565428	1151913	Actuated	28
326	564057	1151858	Actuated	28
327	562524	1151772	Actuated	28
328	557495	1151640	Actuated	28
330	564676	1151875	Actuated	28
331	564663	1152130	Yield	28
332	571899	1181931	TCP - No Control	3
335	599247	1160377	Stop	21
336	599013	1152348	Stop	34
337	598915	1149773	TCP - Actuated	34
340	619119	1175668	Stop	22
348	581241	1180278	Stop	3
352	606566	1174901	Stop	15
354	608552	1175419	Stop	15
355	609092	1175451	Stop	15
356	605928	1174766	Stop	15
358	592364	1171258	Actuated	14
359	588729	1170782	Actuated	14
360	585280	1170084	Actuated	13
361	584094	1169658	Actuated	13
362	582588	1169064	Actuated	13
363	579877	1168765	Actuated	13
364	577898	1168740	Actuated	13
365	576837	1168991	Actuated	12
367	575113	1164635	Actuated	18
368	574959	1164190	Actuated	18
372	590894	1165514	Stop	20
373	585750	1162139	Stop	19

Node	X Coordinate (ft)	Y Coordinate (ft)	Control Type	Grid Map Number
374	583725	1160793	Stop	19
375	582462	1160761	TCP - Actuated	19
377	573609	1160921	Actuated	18
381	565508	1159024	Actuated	17
382	564675	1159016	TCP - Actuated	17
383	564099	1158984	Actuated	17
384	563699	1158974	Actuated	17
385	562410	1158935	Actuated	17
386	560413	1158861	Actuated	17
387	559588	1158839	Actuated	17
388	557584	1158765	Actuated	17
389	555378	1158750	Actuated	16
390	553826	1158678	Actuated	16
391	553088	1158697	Actuated	16
392	551372	1158617	Actuated	16
396	585739	1160716	Stop	19
398	590789	1160667	Stop	20
404	610251	1160716	Stop	22
406	610472	1153347	Stop	35
411	582179	1150255	Actuated	30
412	579607	1150284	Actuated	30
414	577076	1150371	Actuated	29
415	575085	1150396	Actuated	29
416	582325	1173968	Actuated	13
417	582470	1172479	Actuated	13
418	582494	1172178	Actuated	13
419	582617	1171218	Actuated	13
423	582077	1146207	Actuated	30
424	582007	1143985	Actuated	33
425	581916	1138501	Actuated	33
426	577612	1142902	Actuated	33
428	576900	1141056	Actuated	32
429	577053	1140776	Actuated	32
431	579069	1137721	Actuated	33
432	581320	1138308	Actuated	33
434	579726	1155484	Stop	30
435	576760	1143476	Actuated	32
438	567599	1144727	Actuated	32

Node	X Coordinate (ft)	Y Coordinate (ft)	Control Type	Grid Map Number
440	565722	1144668	Actuated	31
441	564987	1144628	Actuated	31
442	564756	1144894	Actuated	31
444	568000	1148933	Stop	29
445	566182	1148894	Actuated	28
446	565115	1148908	Actuated	28
447	564730	1148927	Actuated	28
448	563263	1148958	Actuated	28
449	561398	1149015	Actuated	28
450	561889	1150194	Actuated	28
451	561316	1148780	Actuated	28
452	560974	1147918	Actuated	28
453	560827	1147557	Actuated	28
456	562924	1152743	Actuated	28
457	562785	1152351	Actuated	28
458	560837	1154361	Actuated	28
459	559712	1157073	Actuated	17
460	557974	1152845	Actuated	28
461	560230	1152897	Actuated	28
462	561909	1157092	Stop	17
463	563550	1163210	Stop	17
464	563787	1163138	Yield	17
467	561585	1163196	Actuated	17
469	559471	1163093	Actuated	17
470	556871	1163051	Actuated	17
471	555385	1163017	Actuated	16
472	553297	1162965	Actuated	16
475	563430	1177483	Actuated	2
476	562707	1176142	Stop	11
477	560584	1173305	Stop	11
478	559792	1171702	Actuated	11
479	559282	1170088	Actuated	11
480	559302	1168680	Actuated	11
481	559393	1166237	Actuated	11
482	559374	1165837	Actuated	17
483	559576	1160102	Actuated	17
484	555440	1160766	Actuated	16
485	558743	1160992	Actuated	17

Node	X Coordinate (ft)	Y Coordinate (ft)	Control Type	Grid Map Number
486	557523	1160931	Stop	17
490	561079	1169053	Actuated	11
491	560519	1169046	Actuated	11
492	559950	1168963	Actuated	11
493	557836	1168174	Actuated	11
494	557124	1167872	Actuated	11
495	555274	1167198	Actuated	10
496	553190	1166667	Actuated	10
498	562670	1171883	Yield	11
500	554422	1171626	Actuated	10
501	553018	1171575	Actuated	10
504	555288	1166774	Actuated	10
505	555293	1166329	Actuated	10
506	555274	1165999	Actuated	16
508	555378	1163615	Actuated	16
509	553274	1165170	Actuated	16
510	553230	1165647	Actuated	16
511	553242	1165969	Actuated	16
514	549633	1171500	Actuated	10
520	557979	1181644	Stop	2
525	550098	1185305	Actuated	1
527	547786	1185247	Actuated	1
528	547135	1185119	Actuated	1
530	549447	1178678	Actuated	1
532	549403	1177089	Stop	1
534	549552	1182108	Actuated	1
536	567842	1146475	Actuated	29
540	578582	1136955	Actuated	33
541	577996	1136046	Actuated	33
543	575477	1133864	Actuated	39
546	575706	1136925	Actuated	32
552	574649	1134167	Actuated	39
553	573752	1134675	Actuated	32
555	580513	1131738	Actuated	39
559	576847	1133227	Actuated	39
560	578326	1132627	Actuated	39
561	579922	1131962	Actuated	39
562	583801	1131545	Actuated	39

Node	X Coordinate (ft)	Y Coordinate (ft)	Control Type	Grid Map Number
563	584509	1131516	Actuated	39
564	585578	1131212	Actuated	39
570	623358	1117346	Actuated	41
571	613714	1117488	Actuated	41
572	612337	1117489	Actuated	41
574	604102	1117616	Stop	40
575	602808	1117590	Actuated	40
576	600016	1117623	Actuated	40
579	591426	1119355	Actuated	40
580	590174	1119560	Actuated	40
581	589257	1119862	Actuated	40
582	585724	1121226	Actuated	39
583	581383	1122612	Actuated	39
586	576895	1123882	Actuated	39
590	585269	1146104	Stop	30
594	585193	1134288	Actuated	39
598	601497	1133680	Stop	40
599	627875	1136199	Stop	35
600	614883	1128276	Stop	41
602	609400	1128907	Stop	41
603	602735	1128414	Stop	40
604	601174	1128344	Actuated	40
606	585395	1123093	Actuated	39
608	598316	1123064	Actuated	40
610	601457	1123064	Stop	40
615	614638	1140689	Stop	35
621	604071	1128378	Stop	40
623	614903	1125518	Stop	41
628	623384	1115867	Stop	41
631	630103	1128258	Stop	41
632	645258	1126868	Stop	42
637	641913	1181520	Stop	6
638	651064	1181675	Stop	6
640	660378	1193531	Stop	7
644	670270	1166181	Stop	24
649	665142	1149639	Stop	37
654	641886	1162548	Stop	23
659	642766	1145036	Stop	36

Node	X Coordinate (ft)	Y Coordinate (ft)	Control Type	Grid Map Number
674	700828	1176773	Stop	9
675	700890	1175986	Stop	26
677	703221	1175427	Stop	26
686	676711	1155365	Stop	38
687	676822	1148021	Stop	38
695	681341	1146972	Stop	38
699	695843	1166307	Stop	26
702	548936	1171452	Actuated	10
704	549565	1174358	Actuated	10
705	549588	1173495	Actuated	10
708	548944	1170686	Actuated	10
709	548970	1170207	Actuated	10
710	549001	1168987	Actuated	10
711	549062	1166187	Actuated	16
712	549084	1165320	Actuated	16
713	549106	1164781	Actuated	16
717	552429	1166623	Actuated	10
718	551753	1166575	Actuated	10
719	551138	1166500	Actuated	10
723	551111	1165265	Actuated	16
741	564633	1144600	Actuated	31
742	561604	1144516	Actuated	31
748	598838	1174448	Stop	15
749	603749	1174559	TCP - No Control	15
750	602506	1175022	Stop	15
751	586150	1172154	Actuated	13
758	598809	1176644	Actuated	15
760	602465	1176667	Stop	15
766	590956	1170995	Actuated	14
770	594383	1170382	Actuated	14
772	632832	1181174	Stop	6
776	655428	1175804	Stop	24
777	655470	1181520	Stop	7
784	623289	1138758	Stop	35
786	623291	1128252	Actuated	41
789	648013	1181788	Stop	6
790	660110	1194332	TCP - Actuated	7

Node	X Coordinate (ft)	Y Coordinate (ft)	Control Type	Grid Map Number
793	675047	1180095	Stop	8
794	672849	1166191	Stop	25
796	655648	1146833	Stop	37
798	654310	1150687	Stop	37
804	563557	1173446	Yield	11
805	563321	1173428	Yield	11
807	564022	1176172	Yield	11
810	564159	1177350	Yield	2
817	569764	1141140	Actuated	32
830	562963	1146362	Actuated	28
831	562320	1147126	Actuated	28
832	561639	1147349	Actuated	28
833	559994	1147865	Actuated	28
836	560630	1147118	Actuated	28
837	560462	1146732	Actuated	28
838	559529	1144444	Actuated	31
842	563010	1140853	Actuated	31
844	572330	1135806	Actuated	32
845	570901	1137141	Actuated	32
846	570083	1138247	Actuated	32
847	568471	1140101	Actuated	32
848	568030	1140849	Actuated	32
865	559135	1152861	Actuated	28
867	559637	1156893	Actuated	17
883	595825	1174319	Actuated	14
903	628841	1169935	Stop	22
905	625427	1166061	Stop	22
907	623163	1136275	Stop	35
908	637415	1133485	Stop	42
911	589679	1141917	Actuated	34
914	588624	1141967	Actuated	34
918	583819	1142171	Actuated	33
929	647037	1116917	Actuated	42
931	643508	1116825	Actuated	42
933	631445	1119403	Stop	42
938	590664	1120048	Actuated	40
945	593415	1124166	Actuated	40
947	590780	1127199	Actuated	40

Node	X Coordinate (ft)	Y Coordinate (ft)	Control Type	Grid Map Number
954	625385	1193227	Stop	5
960	580926	1134963	Actuated	33
966	576859	1141759	Actuated	32
968	577326	1142469	Actuated	32
978	574072	1164757	Actuated	18
982	610233	1147502	Stop	35
984	608318	1141784	Stop	34
999	589765	1155300	Stop	34
1008	558588	1154349	Actuated	28
1009	560575	1154084	Stop	28
1010	558850	1155037	Actuated	28
1012	563779	1157176	Stop	17
1015	554591	1167021	Actuated	10
1021	604143	1149677	TCP - No Control	34

¹Coordinates are in the North American Datum of 1983 Central New York Plane Zone

APPENDIX L

ERPA Boundaries

L. ERPA BOUNDARIES

ERPA M-1 County: Monroe

Defined as the area within the following boundary: The section of the Town of Webster bounded on the north by Lake Ontario, on the east by the Monroe-Wayne County Line, to Route 104 on the south; to Salt Road north to Schlegel Road west to Route 250, north to Lake Ontario.

ERPA M-2 County: Monroe

Defined as the area within the following boundary: The section of the Town of Webster and the Town of Penfield bounded on the north by Route 104, on the east by the Monroe-Wayne County Line, on the south by Plank Road and on the west by Salt Road.

ERPA M-3 County: Monroe

Defined as the area within the following boundary: The section of the Town of Webster bounded on the north by Schlegel Road, on the east by Salt Road, on the south by Route 104 and on the west by Route 250.

ERPA M-4 County: Monroe

Defined as the area within the following boundary: The section of the town of Webster and the Town of Penfield bounded on the north by Route 104, on the east by Salt Road, on the south by Plank Road, and on the west by both Jackson and Holt Roads.

ERPA M-5 County: Monroe

Defined as the area within the following boundary: The section of the Town of Penfield bounded on the north by Plank Road, on the east by the Monroe-Wayne County Line, on the south by Sweets Corners Road, and on the west by Route 250, Penfield Center Road and Jackson Road to Plank Road.

ERPA M-6 County: Monroe

Defined as the area within the following boundary: The section of the Town of Webster bounded on the north by Lake Ontario, on the east by Route 250, on the south by Route 104, and on the west by Hard, Klem, and Whiting Roads.

ERPA M-7 County: Monroe

Defined as the area within the following boundary: The section of the Town of Webster and the Town of Penfield bounded on the north by Route 104, on the east by Plank Road, and on the west by Hatch Road to Ridge Road to Gravel Road.

- ERPA M-8 County: Monroe
Defined as the area within the following boundary: The section of the Town of Webster bounded on the north by Lake Ontario, on the east by Whiting Road, on the south by Klem Road, and on the west by Bay Road.
- ERPA M-9 County: Monroe
Defined as the area within the following boundary: The section of the Town of Webster bounded on the north by Klem Road, on the east by Hard Road, on the south by Route 104, and on the west by Maple Drive.
- ERPA W-1 County: Wayne
Defined as the area within the following boundary: The section of the Town of Ontario north of Berg Road and Kenyon Road.
- ERPA W-2 County: Wayne
Defined as the area within the following boundary: The section of the Town of Ontario south of Berg Road and Kenyon Road.
- ERPA W-3 County: Wayne
Defined as the area within the following boundary: The northwest section of the Town of Williamson west of Salmon Creek Road and north of Old Ridge Road.
- ERPA W-4 County: Wayne
Defined as the area within the following boundary: The northeast section of the Town of Williamson east of Salmon Creek Road and north of the Ontario Midland Railroad (along Route 104), and the Town of Sodus west of North Centenary Road and north of the Ontario Midland Railroad (along Route 104).
- ERPA W-5 County: Wayne
Defined as the area within the following boundary: The Town of Williamson south of the Ontario Midland Railroad (along Route 104), and a small part of the Town of Sodus south of the Ontario Midland Railroad and west of Richardson Road.
- ERPA W-6 County: Wayne
Defined as the area within the following boundary: The northwest portion of the Town of Marion north of Walworth-Marion Road and west of Marion-East Williamson Road.
- ERPA W-7 County: Wayne
Defined as the area within the following boundary: All the Town of Walworth north of Route 441 and Penfield-Walworth Road including the Hamlet of Walworth.

APPENDIX M

Evacuation Sensitivity Studies

M. EVACUATION SENSITIVITY STUDIES

This appendix presents the results of a series of sensitivity analyses. These analyses are designed to identify the sensitivity of the ETE to changes in some base evacuation conditions.

M.1 Effect of Changes in Trip Generation Times

A sensitivity study was performed to determine whether changes in the estimated trip generation time have an effect on the ETE for the entire EPZ. Specifically, if the tail of the mobilization distribution were truncated (i.e., if those who responded most slowly to the Advisory to Evacuate, could be persuaded to respond much more rapidly), how would the ETE be affected? The case considered was Scenario 1, Region 3; a summer, midweek, midday, good weather evacuation of the entire EPZ. Table M-1 presents the results of this study.

Table M-1. Evacuation Time Estimates for Trip Generation Sensitivity Study

Trip Generation Period	Evacuation Time Estimate for Entire EPZ	
	90 th Percentile	100 th Percentile
1 Hours 45 Minutes	2:10	3:10
2 Hours 45 Minutes	2:15	3:10
3 Hours 45 Minutes (Base)	2:15	3:55

As discussed in Section 7.3, traffic congestion persists within the EPZ for about 3 hours. As such, the ETE for the 100th percentiles are affected by differences in trip generation time greater than 3 hours. The 90th percentile ETE are not sensitive to truncating the tail of the mobilization time distribution.

M.2 Effect of Changes in the Number of People in the Shadow Region Who Relocate

A sensitivity study was conducted to determine the effect on ETE of changes in the percentage of people who decide to relocate from the Shadow Region. The case considered was Scenario 1, Region 3; a summer, midweek, midday, good weather evacuation for the entire EPZ. The movement of people in the Shadow Region has the potential to impede vehicles evacuating from an Evacuation Region within the EPZ. Refer to Sections 3.2 and 7.1 for additional information on population within the shadow region.

Table M-2 presents the evacuation time estimates for each of the cases considered. The results show that the ETE is not impacted by shadow evacuation from 0% to 20%. Tripling the shadow percentage increases the ETE by 5 minutes for the 90th percentile – not a significant change. Note, the telephone survey results presented in Appendix F indicate that 25% of households would elect to evacuate if advised to shelter, only 5% off from the base assumption of 20% non-compliance suggested in NUREG/CR-7002.

Table M-2. Evacuation Time Estimates for Shadow Sensitivity Study

Percent Shadow Evacuation	Evacuating Shadow Vehicles	Evacuation Time Estimate for Entire EPZ	
		90 th Percentile	100 th Percentile
0	0	2:15	3:55
20 (Base)	19,524	2:15	3:55
25 (Survey)	24,405	2:15	3:55
60	58,572	2:20	3:55

M.3 Effect of Changes in EPZ Resident Population

A sensitivity study was conducted to determine the effect on ETE of changes in the resident population within the EPZ. As population in the EPZ changes over time, the time required to evacuate the public may increase, decrease, or remain the same. Since the ETE is related to the demand to capacity ratio present within the EPZ, changes in population will cause the demand side of the equation to change. The sensitivity study was conducted using the following planning assumptions:

1. The change in population within the EPZ was treated parametrically. The percent population change was varied between $\pm 30\%$. Changes in population were applied to permanent residents only (as per federal guidance), in both the EPZ area and the Shadow Region.
2. The transportation infrastructure remained fixed; the presence of new roads or highway capacity improvements were not considered.
3. The study was performed for the 2-Mile Region (R01), the 5-Mile Region (R02) and the entire EPZ (R03).
4. The good weather scenario which yielded the highest ETE values was selected as the case to be considered in this sensitivity study (Scenario 1).

Table M-3 presents the results of the sensitivity study. Section IV of Appendix E to 10 CFR Part 50, and NUREG/CR-7002, Section 5.4, require licensees to provide an updated ETE analysis to the NRC when a population increase within the EPZ causes ETE values (for the 2-Mile Region, 5-Mile Region or entire EPZ) to increase by 25 percent or 30 minutes, whichever is less.

Those percent population changes which result in ETE changes greater than 30 minutes or 25% are highlighted in red below – a 51% increase or 87% decrease in the EPZ population. CENG will have to estimate the EPZ population on an annual basis. If the EPZ population increases by 51% or more, or decreases by 87% or more, an updated ETE analysis will be needed.

Table M-3. ETE Variation with Population Change

Resident & Shadow Population	Population Change				Base	Population Change		
	Base	10%	25%	51%		-10%	-25%	-87%
	79,884	87,872	99,855	120,625	79,884	71,896	59,913	10,385
ETE for 90 th Percentile								
Region	Base	Population Change			Base	Population Change		
		10%	25%	51%		-10%	-25%	-87%
2-MILE	1:50	1:50	1:50	1:50	1:50	1:50	1:50	1:35
5-MILE	2:00	2:00	2:00	2:00	2:00	1:50	1:50	1:40
FULL EPZ	2:15	2:15	2:30	2:45	2:15	2:10	2:00	1:45
ETE for 100 th Percentile								
Region	Base	Population Change			Base	Population Change		
		10%	25%	51%		-10%	-25%	-87%
2-MILE	3:45	3:45	3:45	3:45	3:45	3:45	3:45	3:45
5-MILE	3:50	3:50	3:50	3:50	3:50	3:50	3:50	3:50
FULL EPZ	3:55	3:55	3:55	4:10	3:55	3:55	3:55	3:55

APPENDIX N

ETE Criteria Checklist

N. ETE CRITERIA CHECKLIST

Table N-1. ETE Review Criteria Checklist

NRC Review Criteria		Criterion Addressed in ETE Analysis	Comments
1.0 Introduction			
a.	The emergency planning zone (EPZ) and surrounding area should be described.	Yes	Section 1
b.	A map should be included that identifies primary features of the site, including major roadways, significant topographical features, boundaries of counties, and population centers within the EPZ.	Yes	Figure 1-1
c.	A comparison of the current and previous ETE should be provided and includes similar information as identified in Table 1-1, "ETE Comparison," of NUREG/CR-7002.	Yes	Table 1-3
1.1 Approach			
a.	A discussion of the approach and level of detail obtained during the field survey of the roadway network should be provided.	Yes	Section 1.3
b.	Sources of demographic data for schools, special facilities, large employers, and special events should be identified.	Yes	Section 2.1 Section 3
c.	Discussion should be presented on use of traffic control plans in the analysis.	Yes	Section 1.3, Section 2.2, Section 9, Appendix G
d.	Traffic simulation models used for the analyses should be identified by name and version.	Yes	Section 1.3, Table 1-3, Appendix B, Appendix C

NRC Review Criteria		Criterion Addressed in ETE Analysis	Comments
e.	Methods used to address data uncertainties should be described.	Yes	Sections 2 and 3 Section 5, Appendix F
1.2 Assumptions			
a.	The planning basis for the ETE includes the assumption that the evacuation should be ordered promptly and no early protective actions have been implemented.	Yes	Section 2.3 – Assumption 1 Section 5.1
b.	Assumptions consistent with Table 1-2, “General Assumptions,” of NUREG/CR-7002 should be provided and include the basis to support their use.	Yes	Sections 2.2, 2.3
1.3 Scenario Development			
a.	The ten scenarios in Table 1-3, Evacuation Scenarios, should be developed for the ETE analysis, or a reason should be provided for use of other scenarios.	Yes	Tables 2-1, 6-2
1.3.1 Staged Evacuation			
a.	A discussion should be provided on the approach used in development of a staged evacuation.	Yes	Sections 5.4.2, 7.2
1.4 Evacuation Planning Areas			
a.	A map of EPZ with emergency response planning areas (ERPAs) should be included.	Yes	Figure 6-1
b.	A table should be provided identifying the ERPAs considered for each ETE calculation by downwind direction in each sector.	Yes	Table 6-1, Table 7-5

NRC Review Criteria	Criterion Addressed in ETE Analysis	Comments
c. A table similar to Table 1-4, "Evacuation Areas for a Staged Evacuation Keyhole," of NUREG/CR-7002 should be provided and includes the complete evacuation of the 2, 5, and 10 mile areas and for the 2 mile area/5 mile keyhole evacuations.	Yes	Table 6-1, Table 7-5
2.0 Demand Estimation		
a. Demand estimation should be developed for the four population groups, including permanent residents of the EPZ, transients, special facilities, and schools.	Yes	Section 3, Section 8, Appendix E
2.1 Permanent Residents and Transient Population		
a. The US Census should be the source of the population values, or another credible source should be provided.	Yes	Section 3.1
b. Population values should be adjusted as necessary for growth to reflect population estimates to the year of the ETE.	Yes	2010 used as the base year for analysis. No growth of population necessary.
c. A sector diagram should be included, similar to Figure 2-1, "Population by Sector," of NUREG/CR-7002, showing the population distribution for permanent residents.	Yes	Figure 3-2
2.1.1 Permanent Residents with Vehicles		
a. The persons per vehicle value should be between 1 and 2 or justification should be provided for other values.	Yes	1.92 persons per vehicle – Table 1-3
b. Major employers should be listed.	Yes	Section 3.4, Appendix E
2.1.2 Transient Population		

NRC Review Criteria	Criterion Addressed in ETE Analysis	Comments
a. A list of facilities which attract transient populations should be included, and peak and average attendance for these facilities should be listed. The source of information used to develop attendance values should be provided.	Yes	Sections 3.3, 3.4, Appendix E
b. The average population during the season should be used, itemized and totaled for each scenario.	Yes	Tables 3-4, 3-5 and Appendix E itemize the transient population and employee estimates. These estimates are multiplied by the scenario specific percentages provided in Table 6-3 to estimate transient population by scenario.
c. The percent of permanent residents assumed to be at facilities should be estimated.	Yes	Sections 3.3, 3.4
d. The number of people per vehicle should be provided. Numbers may vary by scenario, and if so, discussion on why values vary should be provided.	Yes	Sections 3.3, 3.4
e. A sector diagram should be included, similar to Figure 2-1 of NUREG/CR-7002, showing the population distribution for the transient population.	Yes	Figure 3-6 – transients Figure 3-8 – employees
2.2 Transit Dependent Permanent Residents		
a. The methodology used to determine the number of transit dependent residents should be discussed.	Yes	Section 8.1, Table 8-1
b. Transportation resources needed to evacuate this group should be quantified.	Yes	Section 8.1, Tables 8-5, 8-10
c. The county/local evacuation plans for transit dependent residents should be used in the analysis.	Yes	Sections 8.1, 8.4, Table 8-10

NRC Review Criteria	Criterion Addressed in ETE Analysis	Comments
d. The methodology used to determine the number of people with disabilities and those with access and functional needs who may need assistance and do not reside in special facilities should be provided. Data from local/county registration programs should be used in the estimate, but should not be the only set of data.	Yes	Section 8.5
e. Capacities should be provided for all types of transportation resources. Bus seating capacity of 50% should be used or justification should be provided for higher values.	Yes	Section 2.3 – Assumption 10 Sections 3.5, 8.1, 8.2, 8.3
f. An estimate of this population should be provided and information should be provided that the existing registration programs were used in developing the estimate.	Yes	Table 8-1 – transit dependents Section 8.5 – special needs
g. A summary table of the total number of buses, ambulances, or other transport needed to support evacuation should be provided and the quantification of resources should be detailed enough to assure double counting has not occurred.	Yes	Section 8.4 – page 8-6 Table 8-5
2.3 Special Facility Residents		
a. A list of special facilities, including the type of facility, location, and average population should be provided. Special facility staff should be included in the total special facility population.	Yes	Table E-3, Table 8-4
b. A discussion should be provided on how special facility data was obtained.	Yes	Section 8.3

NRC Review Criteria		Criterion Addressed in ETE Analysis	Comments
c.	The number of wheelchair and bed-bound individuals should be provided.	Yes	Section 3.5, Table E-3, Table 8-4
d.	An estimate of the number and capacity of vehicles needed to support the evacuation of the facility should be provided.	Yes	Section 8.3 Tables 8-4, 8-5
e.	The logistics for mobilizing specially trained staff (e.g., medical support or security support for prisons, jails, and other correctional facilities) should be discussed when appropriate.	Yes	Section 3.5, Section 8.4
2.4 Schools			
a.	A list of schools including name, location, student population, and transportation resources required to support the evacuation, should be provided. The source of this information should be provided.	Yes	Table 8-2, Table E-1, Table E-2 Section 8.2
b.	Transportation resources for elementary and middle schools should be based on 100% of the school capacity.	Yes	Table 8-2
c.	The estimate of high school students who will use their personal vehicle to evacuate should be provided and a basis for the values used should be discussed.	Yes	Section 8.2
d.	The need for return trips should be identified if necessary.	Yes	Figure 8-1 Section 8.4, page 8-9 Tables 8-7 through 8-9
2.5.1 Special Events			

NRC Review Criteria		Criterion Addressed in ETE Analysis	Comments
a.	A complete list of special events should be provided and includes information on the population, estimated duration, and season of the event.	Yes	Section 3.7
b.	The special event that encompasses the peak transient population should be analyzed in the ETE.	Yes	Section 3.7
c.	The percent of permanent residents attending the event should be estimated.	Yes	Section 3.7
2.5.2 Shadow Evacuation			
a.	A shadow evacuation of 20 percent should be included for areas outside the evacuation area extending to 15 miles from the NPP.	Yes	Section 2.2 – Assumption 5 Figure 2-1 Section 3.2
b.	Population estimates for the shadow evacuation in the 10 to 15 mile area beyond the EPZ are provided by sector.	Yes	Section 3.2 Figure 3-4 Table 3-3
c.	The loading of the shadow evacuation onto the roadway network should be consistent with the trip generation time generated for the permanent resident population.	Yes	Section 5 – Table 5-9 (footnote)
2.5.3 Background and Pass Through Traffic			
a.	The volume of background traffic and pass through traffic is based on the average daytime traffic. Values may be reduced for nighttime scenarios.	Yes	Section 3.6 Table 3-6 Section 6 Table 6-3

NRC Review Criteria		Criterion Addressed in ETE Analysis	Comments
b.	Pass through traffic is assumed to have stopped entering the EPZ about two hours after the initial notification.	Yes	Section 2.3 – Assumption 5 Section 3.6
2.6 Summary of Demand Estimation			
a.	A summary table should be provided that identifies the total populations and total vehicles used in analysis for permanent residents, transients, transit dependent residents, special facilities, schools, shadow population, and pass-through demand used in each scenario.	Yes	Section 3.8 Tables 3-7, 3-8
3.0 Roadway Capacity			
a.	The method(s) used to assess roadway capacity should be discussed.	Yes	Section 4
3.1 Roadway Characteristics			
a.	A field survey of key routes within the EPZ has been conducted.	Yes	Section 1.3
b.	Information should be provided describing the extent of the survey, and types of information gathered and used in the analysis.	Yes	Section 1.3
c.	A table similar to that in Appendix A, “Roadway Characteristics,” of NUREG/CR-7002 should be provided.	Yes	Appendix K, Table K-1
d.	Calculations for a representative roadway segment should be provided.	Yes	Section 4

NRC Review Criteria	Criterion Addressed in ETE Analysis	Comments
e. A legible map of the roadway system that identifies node numbers and segments used to develop the ETE should be provided and should be similar to Figure 3-1, "Roadway Network Identifying Nodes and Segments," of NUREG/CR-7002.	Yes	Appendix K
3.2 Capacity Analysis		
a. The approach used to calculate the roadway capacity for the transportation network should be described in detail and identifies factors that should be expressly used in the modeling.	Yes	Section 4
b. The capacity analysis identifies where field information should be used in the ETE calculation.	Yes	Section 1.3, Section 4
3.3 Intersection Control		
a. A list of intersections should be provided that includes the total number of intersections modeled that are unsignalized, signalized, or manned by response personnel.	Yes	Appendix K, Table K-2
b. Characteristics for the 10 highest volume intersections within the EPZ are provided including the location, signal cycle length, and turn lane queue capacity.	Yes	Table J-1
c. Discussion should be provided on how signal cycle time is used in the calculations.	Yes	Section 4.1, Appendix C.
3.4 Adverse Weather		
a. The adverse weather condition should be identified and the effects of adverse weather on mobilization time should be considered.	Yes	Table 2-1, Section 2.3 – Assumption 9 Mobilization time – Table 2-2, Section 5.3

NRC Review Criteria	Criterion Addressed in ETE Analysis	Comments
b. The speed and capacity reduction factors identified in Table 3-1, "Weather Capacity Factors," of NUREG/CR-7002 should be used or a basis should be provided for other values.	Yes	Table 2-2 – based on HCM 2010. The factors provided in Table 3-1 of NUREG/CR-7002 are from HCM 2000.
c. The study identifies assumptions for snow removal on streets and driveways, when applicable.	Yes	Section 5.3, Appendix F Section F.3.3
4.0 Development of Evacuation Times		
4.1 Trip Generation Time		
a. The process used to develop trip generation times should be identified.	Yes	Section 5
b. When telephone surveys are used, the scope of the survey, area of survey, number of participants, and statistical relevance should be provided.	Yes	Appendix F
c. Data obtained from telephone surveys should be summarized.	Yes	Appendix F
d. The trip generation time for each population group should be developed from site specific information.	Yes	Section 5, Appendix F
4.1.1 Permanent Residents and Transient Population		

NRC Review Criteria	Criterion Addressed in ETE Analysis	Comments
<p>a. Permanent residents are assumed to evacuate from their homes but are not assumed to be at home at all times. Trip generation time includes the assumption that a percentage of residents will need to return home prior to evacuating.</p>	Yes	<p>Section 5 discusses trip generation for households with and without returning commuters. Table 6-3 presents the percentage of households with returning commuters and the percentage of households either without returning commuters or with no commuters. Appendix F presents the percent households who will await the return of commuters.</p>
<p>b. Discussion should be provided on the time and method used to notify transients. The trip generation time discusses any difficulties notifying persons in hard to reach areas such as on lakes or in campgrounds.</p>	Yes	<p>Section 5 Section 5.4.3 - Waterways</p>
<p>c. The trip generation time accounts for transients potentially returning to hotels prior to evacuating.</p>	Yes	Section 5, Figure 5-1
<p>d. Effect of public transportation resources used during special events where a large number of transients should be expected should be considered.</p>	Yes	Section 3.7
<p>e. The trip generation time for the transient population should be integrated and loaded onto the transportation network with the general public.</p>	Yes	Section 5, Table 5-9
4.1.2 Transit Dependent Residents		

NRC Review Criteria	Criterion Addressed in ETE Analysis	Comments
a. If available, existing plans and bus routes should be used in the ETE analysis. If new plans should be developed with the ETE, they have been agreed upon by the responsible authorities.	Yes	Section 8.3, Table 8-10
b. Discussion should be included on the means of evacuating ambulatory and non-ambulatory residents.	Yes	Sections 8.4 and 8.5
c. The number, location, and availability of buses, and other resources needed to support the demand estimation should be provided.	Yes	Sections 8.4 and 8.5, Table 8-5
d. Logistical details, such as the time to obtain buses, brief drivers, and initiate the bus route should be provided.	Yes	Section 8.4, Figure 8-1
e. Discussion should identify the time estimated for transit dependent residents to prepare and travel to a bus pickup point, and describes the expected means of travel to the pickup point.	Yes	Section 8.4, page 8-7
f. The number of bus stops and time needed to load passengers should be discussed.	Yes	Section 8.4
g. A map of bus routes should be included.	Yes	Figures 8-2 and 8-3
h. The trip generation time for non-ambulatory persons includes the time to mobilize ambulances or special vehicles, time to drive to the home of residents, loading time, and time to drive out of the EPZ should be provided.	Yes	Section 8.5
i. Information should be provided to supports analysis of return trips, if necessary.	Yes	Sections 8.4, 8.5 Figure 8-1 Tables 8-11 through 8-13

NRC Review Criteria		Criterion Addressed in ETE Analysis	Comments
4.1.3 Special Facilities			
a.	Information on evacuation logistics and mobilization times should be provided.	Yes	Section 8.4, Tables 8-14 through 8-16
b.	Discussion should be provided on the inbound and outbound speeds.	Yes	Section 8.4
c.	The number of wheelchair and bed-bounds individuals should be provided, and the logistics of evacuating these residents should be discussed.	Yes	Section 8.3, 8.4, Table 8-4
d.	Time for loading of residents should be provided	Yes	Sections 8.4,
e.	Information should be provided that indicates whether the evacuation can be completed in a single trip or if additional trips should be needed.	Yes	Section 8.4, Table 8-4
f.	If return trips should be needed, the destination of vehicles should be provided.	Yes	Sections 8.4
g.	Discussion should be provided on whether special facility residents are expected to pass through the reception center prior to being evacuated to their final destination.	Yes	Section 8.4
h.	Supporting information should be provided to quantify the time elements for the return trips.	Yes	Section 8.4, Tables 8-14 through 8-16.
4.1.4 Schools			
a.	Information on evacuation logistics and mobilization time should be provided.	Yes	Section 8.4

NRC Review Criteria	Criterion Addressed in ETE Analysis	Comments
b. Discussion should be provided on the inbound and outbound speeds.	Yes	School bus speeds are presented in Tables 8-7 through 8-9. Section 8.4 - Outbound speeds are defined as the minimum of the evacuation route speed and the State school bus speed limit. Inbound speeds are limited to the State school bus speed limit.
c. Time for loading of students should be provided.	Yes	Section 8.4 Tables 8-7 through 8-9
d. Information should be provided that indicates whether the evacuation can be completed in a single trip or if additional trips are needed.	Yes	Section 8.4 – page 8-6 Table 8-5
e. If return trips are needed, the destination of school buses should be provided.	Yes	Table 8-3 - Destinations are the Receiving Location and Reception Centers
f. If used, reception centers should be identified. Discussion should be provided on whether students are expected to pass through the reception center prior to being evacuated to their final destination.	Yes	Section 8 Introduction. Table 8-3. Students are evacuated to receiving locations or reception centers where they will be picked up by parents or guardians.
g. Supporting information should be provided to quantify the time elements for the return trips.	Yes	Tables 8-7, 8-8 and 8-9 provide time needed to arrive at pick-up points/reception centers, which can be used to compute a second wave evacuation
4.2 ETE Modeling		

NRC Review Criteria		Criterion Addressed in ETE Analysis	Comments
a.	General information about the model should be provided and demonstrates its use in ETE studies.	Yes	DYNEV II (Ver. 4.0.8.0). Section 1.3, Table 1-3, Appendix B, Appendix C
b.	If a traffic simulation model is not used to conduct the ETE calculation, sufficient detail should be provided to validate the analytical approach used. All criteria elements should have been met, as appropriate.	No	Not applicable as a traffic simulation model was used
4.2.1 Traffic Simulation Model Input			
a.	Traffic simulation model assumptions and a representative set of model inputs should be provided.	Yes	Appendices B and C describe the simulation model assumptions and algorithms Table J-2
b.	A glossary of terms should be provided for the key performance measures and parameters used in the analysis.	Yes	Appendix A Tables C-1, C-2
4.2.2 Traffic Simulation Model Output			
a.	A discussion regarding whether the traffic simulation model used must be in equilibration prior to calculating the ETE should be provided.	Yes	Appendix B

NRC Review Criteria	Criterion Addressed in ETE Analysis	Comments
b. The minimum following model outputs should be provided to support review: <ol style="list-style-type: none"> 1. Total volume and percent by hour at each EPZ exit node. 2. Network wide average travel time. 3. Longest queue length for the 10 intersections with the highest traffic volume. 4. Total vehicles exiting the network. 5. A plot that provides both the mobilization curve and evacuation curve identifying the cumulative percentage of evacuees who have mobilized and exited the EPZ. 6. Average speed for each major evacuation route that exits the EPZ. 	Yes	<ol style="list-style-type: none"> 1. Table J-5. 2. Table J-3. 3. Table J-1. 4. Table J-3. 5. Figures J-1 through J-14 (one plot for each scenario considered). 6. Table J-4. Network wide average speed also provided in Table J-3.
c. Color coded roadway maps should be provided for various times (i.e., at 2, 4, 6 hrs., etc.) during a full EPZ evacuation scenario, identifying areas where long queues exist including level of service (LOS) "E" and LOS "F" conditions, if they occur.	Yes	Figures 7-3 through 7-7
4.3 Evacuation Time Estimates for the General Public		
a. The ETE should include the time to evacuate 90% and 100% of the total permanent resident and transient population	Yes	Tables 7-1, 7-2

NRC Review Criteria	Criterion Addressed in ETE Analysis	Comments
b. The ETE for 100% of the general public should include all members of the general public. Any reductions or truncated data should be explained.	Yes	Section 5.4 – truncating survey data to eliminate statistical outliers Table 7-2 – 100 th percentile ETE for general public
c. Tables should be provided for the 90 and 100 percent ETEs similar to Table 4-3, “ETEs for Staged Evacuation Keyhole,” of NUREG/CR-7002.	Yes	Tables 7-3, 7-4
d. ETEs should be provided for the 100 percent evacuation of special facilities, transit dependent, and school populations.	Yes	Sections 8.4 through 8.6 Tables 8-7 through 8-9 Tables 8-11 through 8-13 Tables 8-14 through 8-16
5.0 Other Considerations		
5.1 Development of Traffic Control Plans		
a. Information that responsible authorities have approved the traffic control plan used in the analysis should be provided.	Yes	Section 9, Appendix G
b. A discussion of adjustments or additions to the traffic control plan that affect the ETE should be provided.	Yes	Section 9, Appendix G
5.2 Enhancements in Evacuation Time		
a. The results of assessments for improvement of evacuation time should be provided.	Yes	Section 13, Appendix M
b. A statement or discussion regarding presentation of enhancements to local authorities should be provided.	Yes	Section 13
5.3 State and Local Review		

NRC Review Criteria		Criterion Addressed in ETE Analysis	Comments
a.	A list of agencies contacted and the extent of interaction with these agencies should be discussed.	Yes	Table 1-1
b.	Information should be provided on any unresolved issues that may affect the ETE.	Yes	No issues were determined after review with the offsite agencies.
5.4 Reviews and Updates			
a.	A discussion of when an updated ETE analysis is required to be performed and submitted to the NRC.	Yes	Appendix M, Section M.3
5.5 Reception Centers and Congregate Care Center			
a.	A map of congregate care centers and reception centers should be provided.	Yes	Figure 10-1
b.	If return trips are required, assumptions used to estimate return times for buses should be provided.	Yes	Sections 8.4 discusses a multi-wave evacuation procedure. Figure 8-1
c.	It should be clearly stated if it is assumed that passengers are left at the reception center and are taken by separate buses to the congregate care center.	Yes	Section 2.3 – Assumption 7h Section 10

Technical Reviewer _____

Date _____

Supervisory Review _____

Date _____