APPENDIX B

Traffic Assignment Model

APPENDIX B: TRAFFIC ASSIGNMENT MODEL

This section describes the integrated trip assignment and distribution model named TRAD that is expressly designed for use in analyzing evacuation scenarios. This model employs equilibrium traffic assignment principles and is one of the models of the IDYNEV System.

To apply TRAD, the analyst must specify the highway network, link capacity information, the volume of traffic generated at all origin centroids, a set of accessible candidate destination nodes on the periphery of the EPZ for each origin, and the capacity (i.e., "attraction") of each destination node. TRAD calculates the optimal trip distribution and the optimal trip assignment (i.e., routing) of the traffic generated at each origin node, traveling to the associated set of candidate destination nodes, so as to minimize evacuee travel times.

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 their "best" route. The model is designed to identify these "best" routes in a manner that distributes vehicles from origins to destinations and routes them over the highway network, in a consistent and optimal manner.

The approach we adopt is to extend the basic user-equilibrium assignment methodology to embrace the distribution process, as well. Specifically, the analyst assigns a set of candidate destination nodes to each origin node which reflects the general outward-bound direction of travel relative to the location of the power station. The selection of specific destination nodes by travelers from each origin node, and the selection of the connecting paths of travel, are both determined by the integrated model. This determination is subject to specified highway capacity constraints, so as to satisfy the stated objective function. This objective function is the statement of the User Optimization Principle by Wardrop[1].

To accomplish this integration, we leave the equilibrium assignment model intact, changing the form of the objective function. The model creates a "fictional" augmentation of the "real" highway network. This augmentation consists of Pseudo-Links and Pseudo-Nodes, so configured as to permit the extended network to embed an equilibrium Distribution Model within the fabric of the Assignment Model. Additional discussion may be found in NUREG/CR-4873 ("Benchmark Study of the I-DYNEV Evacuation Time

[1] Wardrop, J.G., 1952. Some Theoretical Aspects of Road Traffic Research, *Proceedings, Institute of Civil Engineers*, Part II, Vol. 1, pp. 325-378.

Estimate Computer Code") and 4874 ("The Sensitivity of Evacuation Time Estimates to Changes in Input Parameters for the I-DYNEV Computer Code").

Specification of TRAD Model Inputs

The analyst must specify, for each origin node, the average hourly traffic volume generated, as well as a set of candidate accessible destinations. A destination is "accessible" to traffic originating at an origin node if there is at least one path connecting the origin to the destination node. There must be at least one destination node specified for each origin centroid. The number of trips generated at the origin node, which are distributed to each specified, accessible destination node within this set, is determined by the model in a way that satisfies the network-wide objective function (Wardrop's Principle).

The analyst must also specify the total number of trips which can be accommodated by each destination node. This value reflects the capacities of the road(s) immediately servicing the destination node. We call this number of trips, the "attraction" of the destination node, consistent with conventional practice. Clearly, we require that the total number of trips traveling to a destination, j, from all origin nodes, i, cannot exceed the attraction of destination node, j. By summing over all destination nodes, this constraint also states that the total trips generated at all origin nodes must not exceed the total capacity to accommodate these trips at all of the specified destinations.

In summary, the analyst must specify the total trips generated at each of the origin nodes, the maximum number of trips that can be accommodated by each of the specified destination nodes and the highway network attributes which include the traffic control tactics. The TRAD model includes a function which expresses travel time on each network link in terms of traffic volume and link capacity. This function drives the underlying trip distribution and trip assignment decision-making process. Thus, the TRAD model satisfies the objectives of evacuees to select destination nodes and travel paths to minimize evacuation travel time. As such, this integrated model is classified as a behavioral model.

At the outset, it may appear that we have an intractable problem:

- If TRAD retains the basic assignment algorithm, it must be provided a Trip Table (a matrix defining origin-destination traffic volumes) as input.
- On the other hand, if the distribution model is embedded within the assignment model, rather than preceding it, a Trip Table is not available as input.

The resolution of this problem is as follows:

1. The model constructs an "augmentation" network that allows the user to specify only the volume for each origin node. The allocation of trips from the origin node to each candidate destination node is not specified and will be determined internally by the model.
2. We construct pseudo-links which enforce the specified values of attraction, A_j, for all destination nodes, j, by suitably calibrating the relationship of the travel time vs. volume and capacity.

This augmented network is comprised of three sub-networks:

1. The “real” highway sub-network, which consists of "Class I" Links and Nodes.
2. A sub-network of "Class II" Pseudo-Links which acts as an interface between the highway sub-network and the network augmentation.
3. The sub-network of "Class III" Pseudo-Links and Nodes which comprises the network augmentation described above.

The need for these Class II links will become clear later. The classifications are described below:

Class I Links and Nodes

These links and nodes represent the physical highway network: sections of highway and intersections. Trips generated at each Origin [Centroid] Node are assigned to a specified Class I link via a "connector" link. These connector links are transparent to the user and offer no impedance to the traveler; they represent the aggregation of local streets which service the centroidal generated trips and feed them onto the highway network. The real-world destination nodes are part of this network. The immediate approaches to these destination nodes are Class I links.

Class II Links

These pseudo-links are constructed so as to connect each specified destination node with its Class III Pseudo-Node (P-N) counterpart on a one-to-one basis. The capacities of these Class II links are set equal to the capacities at their respective destination nodes.

Class III Links and Nodes

Class III links and nodes form the augmentation to the basic network. These Pseudo-Links provide paths from the Class II links servicing traffic traveling from the specified set of [real] candidate destination nodes, to the Super-Nodes which collect the

traffic travelling through the specified set of destination nodes associated with each origin node.

Each Class of links provides a different function:

- Class I links represent the physical highway network. As such, each link has a finite capacity, a finite length and an estimated travel time for free-flowing vehicles. The nodes generally represent intersections, interchanges and, possibly, changes in link geometry. The topology of the Class I network represents that of the physical highway system.
- The Class II links represent the interface between the real highway sub-network and the augmentation sub-network. These pseudo-links are needed to represent the specified "attractions" of each destination node, i.e., the maximum number of vehicles that can be accommodated by each destination node. Instead of explicitly assigning a capacity limitation to the destination nodes, we assign this capacity limitation of the Class II Pseudo-Links. This approach is much more suitable, computationally.
- The topology of the network augmentation (i.e., Class III Links and Nodes) is designed so that all traffic from an origin node can only travel to the single "Super-Node" by flowing through its specified set of real destination nodes, thence along the links of the augmented network.

The Class II Pseudo-Links and the network augmentation of Class III Pseudo-Nodes and Links represent logical constructs of fictitious links created internally by the model, which allows the user to specify the identity of all destination nodes in each origin-based set, without specifying the distribution of traffic volumes from the origin to each destination node in that set.

Calculation of Capacities and Impedances

Each class of links exhibits different properties. Specifically, the relationship between travel impedance (which is expressed in terms of travel time) and both volume and capacity will differ:

- For Class I links, the capacity represents the physical limitation of the highway sections. Travel impedance is functionally expressed by relating travel time with respect to the traffic volume-link capacity relationship.
- For Class II links, link capacity represents the maximum number of vehicles that can be accommodated at the [real] destination nodes that form the upstream nodes of each Class II link. Since Class II links are Pseudo-Links, there should be virtually no difference in impedance to traffic along Class II links when the assigned traffic volume on these links is below their respective capacities. That is, the assignment of traffic should not be

influenced by differences in travel impedance on those Class II links where the assigned volumes do not exceed their respective capacities.

- For Class III links, both capacity and impedance have no meaning. Since the Class II links limit the number of vehicles entering the Class III subnetwork at all entry points (i.e., at the Class II Pseudo-Nodes) and since all these links are Pseudo-Links, it follows that the Class III network is, by definition, an uncapacitated network.

Specification of the Objective Function

It is computationally convenient to be able to specify a single impedance (or "cost") function relating the travel time on a link, to its capacity and assigned traffic volume, for all classes of links. To achieve this, we will adopt the following form based on the original "BPR Formula[2]":

$$T = T_o\{\alpha[1+a_1(\frac{v}{c})^{b_1}]+\beta[1+a_2(\frac{v}{c})^{b_2}]\}+I$$

Where, as for the present traffic assignment model in TRAD,

T	=	Link travel time, sec.
T_o	=	Unimpeded link travel time, sec.
V	=	Traffic volume on the link, veh/hr
C	=	Link capacity, veh/hr
a_i,b_i	=	Calibration parameters
α, ß	=	Coefficients defined below
I	=	Impedance term, expressed in seconds, which could represent turning penalties or any other factor which is justified in the user's opinion

The assignment of coefficients varies according to the Class in which a link belongs:

Class	α	ß	T_o
I	1	0	L/U_f
II	0	1	W
III	0	0	1

Here, L is a highway link length and U_f is the free-flow speed of traffic on a highway link. The values of a_1 and b_1, which are applicable only for Class I links, are based on experimental data:

$a_1 = 0.8$ $b_1 = 5.0$

[2] Bureau of Public Roads (1964). Traffic Assignment Manual. U.S. Dept. of Commerce, Urban Planning Division, Washington D.C.

The values of a_2 and b_2, which are applicable for each Class II link, are based upon the absolute requirement that the upstream destination node can service no more traffic than the user-specified value of the maximum "attraction". In addition, these parameters must be chosen so that these Pseudo-Links all offer the same impedance to traffic when their assigned volumes are less than their respective specified maximum attractions.

The weighting factor, W, is computed internally by the software.

Of course, it is still possible for the assignment algorithm within TRAD to distribute more traffic to a destination node than that node can accommodate. (Note that there is no upper-bound constraint in the BPR formula. Of course, when $v/c > 1$, the exponential terms grow very rapidly, degrading operational performance and discouraging trips from accessing those links.) For emergency planning purposes, this is a desirable model feature. Such a result will be flagged by the model to alert the user to the fact that some factor is strongly motivating travelers to move to that destination node, despite its capacity limitations. This factor can take many forms: inadequate highway capacity to other destinations, improper specification of candidate destinations for some of the origins, or some other design inadequacy. The planner can respond by modifying the control tactics, changing the origin-destination distribution pattern, providing more capacity at the overloaded destinations, etc.

APPENDIX C

Traffic Simulation Model: PC-DYNEV

APPENDIX C: TRAFFIC SIMULATION MODEL: PC-DYNEV

A model, named PC-DYNEV, is an adaptation of the TRAFLO Level II simulation model[1], developed by KLD for the Federal Highway Administration (FHWA). Extensions in scope were introduced to expand the model's domain of application to include all types of highway facilities, to represent the evacuation traffic environment and to increase its computational efficiency. This model produces the extensive set of output Measures of Effectiveness (MOE) shown in Table C-1.

The traffic stream is described internally in the form of statistical flow profiles. These profiles, expressed internally as statistical histograms, describe the platoon structure of the traffic stream on each network link. The simulation logic identifies five types of histograms:

- The ENTRY histogram which describes the platoon flow at the upstream end of the subject link. This histogram is simply an aggregation of the appropriate OUTPUT turn-movement-specific histograms of all feeder links.
- The INPUT histograms which describe the platoon flow pattern arriving at the stop line. These are obtained by first disaggregating the ENTRY histogram into turn-movement-specific component ENTRY histograms. Each such component is modified to account for the platoon dispersion which results as traffic traverses the link. The resulting INPUT histograms reflect the specified turn percentages for the subject link.
- The SERVICE histogram which describes the service rates for each turn movement. These service rates reflect the type of control device servicing traffic on this approach; if it is a signal, then this histogram reflects the specified movement-specific signal phasing. A separate model estimates service rates for each turn movement, given that the control is GO.

These data are provided for each network link:

- The QUEUE histograms that describe the time-varying ebb and growth of the queue formation at the stop line. These histograms are derived from the interaction of the respective IN histograms with the SERVICE histograms.
- The OUT histograms that describe the pattern of traffic discharging from the subject link. Each of the IN histograms is transformed into an OUT histogram by the control applied to the subject link. Each of these OUT histograms is added into the (aggregate) ENTRY histogram of its receiving link. This approach provides the model with the ability to identify the characteristics of each turn-movement-specific component of the traffic stream. Each component is serviced at a different saturation flow rate as is

[1] Lieberman, E. et al. 1980. Macroscopic Simulation for Urban Traffic Management: The TRAFLO Model, Volume 3: Analytical Developments for TRAFLO. Federal Highway Administration Report No. FHWA-RD-80-113.

the case in the real world. The logic recognizes when one component of the traffic flow encounters saturation conditions even if the others do not.

Algorithms provide estimates of delay and stops reflecting the interaction of the IN histograms with the SERVICE histograms. The logic also provides for properly treating spillback conditions reflecting queues extending from its host link, into its upstream feeder links.

A valuable feature is the ability to internally generate functions that relate mean speed to density on each link, given user-specified estimates of free-flow speed and saturation service rates for each link. Such relationships are essential in order to simulate traffic operations on freeways and rural roads, where signal control does not exist or where its effect is not the dominant factor in impeding traffic flow.

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

- Topology of the roadway system
- Geometrics of each roadway component
- Channelization of traffic on each roadway component
- Motorist behavior that, in aggregate, determines the operational performance of vehicles in the system
- Specification of the traffic control devices and their operational characteristics
- Traffic volumes entering and leaving the roadway system
- Traffic composition.

To provide an efficient framework for defining these specifications, the physical environment is represented as a network. The unidirectional links of the network generally represent roadway components: either urban streets or freeway segments. The nodes of the network generally represent urban intersections or points along the freeway where a geometric property changes (e.g. a lane drop, change in grade or ramp).

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. Measures of Effectiveness Output by PC-DYNEV	
Measure	**Units**
Travel	Vehicle-Miles and Vehicle-Trips
Moving Time	Vehicle-Minutes
Delay Time	Vehicle-Minutes
Total Travel Time	Vehicle-Minutes
Efficiency: Moving Time/Total Travel Time	Percent
Mean Travel Time per Vehicle	Seconds
Mean Delay per Vehicle	Seconds
Mean Delay per Vehicle-Mile	Seconds/Mile
Mean Speed	Miles/Hour
Mean Occupancy	Vehicles
Mean Saturation	Percent
Vehicle Stops	Percent

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

GEOMETRICS

- Links defined by upstream and downstream node numbers
- Link lengths
- Number of lanes (up to 6)
- Turn pockets
- Grade
- Network topology defined in terms of target nodes for each receiving link

TRAFFIC VOLUMES

- On all entry links and sink/source nodes stratified by vehicle type: auto, car pool, bus, truck
- Link-specific turn movements

TRAFFIC CONTROL SPECIFICATIONS

- Traffic signals: link-specific, turn movement specific
- Signal control treated as fixed time
- 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

- Drivers (vehicle-specific) response mechanisms: free-flow speed, aggressiveness, discharge headway
- Link-specific mean speed for free-flowing (unimpeded) traffic
- Vehicle-type operational characteristics: acceleration, deceleration
- Such factors as bus route designation, bus station location, dwell time, headway, etc.

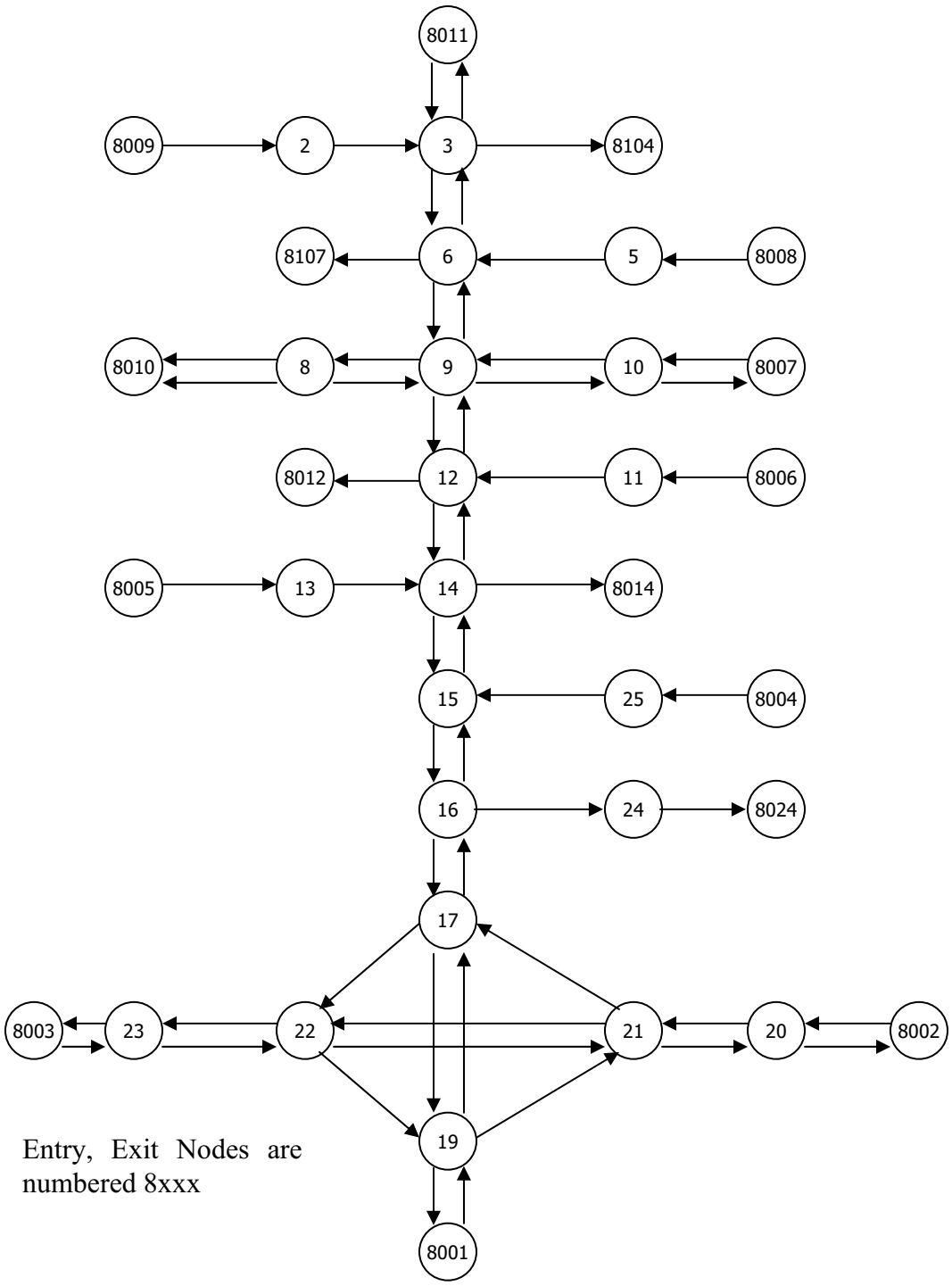


Figure C-1: Representative Analysis Network

APPENDIX D

Detailed Description of Study Procedure

APPENDIX D: DETAILED DESCRIPTION OF STUDY PROCEDURE

This appendix describes the activities that were performed to compute accurate Evacuation Time Estimates (ETE). 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 this flow diagram.

Step 1.
The first activity is to obtain data defining the spatial distribution and demographic characteristics of the population within the Emergency Planning Zone (EPZ). These data were obtained from U.S. Census files and from the results of a telephone survey conducted within the EPZ. Data related to recreational areas, major employers and special facilities were obtained from a variety of sources including existing county and municipality emergency plans, internet searches, and telephone conversations with the facilities.

Step 2.
The next activity is to examine large-scale maps of the EPZ in both hard-copy form and using Geographical Information System (GIS) software. These maps were used to identify the analysis highway network and the access roads from each residential and employment development to the adjoining elements of this network. This information is used to plan a field survey of the highway system and later, to assign generated evacuation trips to the correct destinations at the periphery of the EPZ.

Step 3.
The next step is to conduct a physical survey of the roadway system. The purpose of this survey is to determine the geometric properties of the highway elements, 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 and to make the necessary observations needed to estimate realistic values of roadway capacity. A tablet computer equipped with Global Positioning Satellites (GPS) technology together with video and audio recording equipment are used during the road survey to accurately record the position of traffic control devices and record other roadway data.

Step 4.
With this information, develop the evacuation network representation of the physical roadway system.

Step 5.
With the network created, proceed to estimate the capacities of each link and to locate the origin centroids where trips would be generated during the evacuation process.

Step 6.
With this information at hand, the data were entered into the computer to create the input stream for the TRaffic Assignment and Distribution (TRAD) model. This model was designed to be compatible with the PC-DYNEV traffic simulation model used later in the project; the input stream required for one model is entirely compatible with the input stream required by the other. Using a software system developed by KLD named UNITES, the data entry activity is performed interactively directly on the computer.

Step 7.
The TRAD model contains software that performs diagnostic testing of the input stream. These assist the user in identifying and correcting errors in the input stream.

Step 8.
After creating the input stream, execute the TRAD model to compute evacuating traffic routing patterns consistent with the guidelines of NUREG 0654, Appendix 4. The TRAD model also provides estimates of traffic loading on each highway link as well as rough estimates of operational performance.

Step 9.
Critically examine the statistics produced by the TRAD 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 "hot spots" 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: excess demand; improper routing; a shortfall of capacity; a quantitative error in the way the physical system was represented in the input stream. This examination leads to one of two conclusions:

- The results are as satisfactory as could be expected at this stage of the analysis process; or
- The input stream must be modified accordingly.

This decision requires, of course, the application of the analyst's judgment based upon the results obtained in previous applications of the TRAD model and a comparison of the results of this last case with the previous ones. If the results are satisfactory in the opinion of the analyst, then the process continues with Step 12. Otherwise, proceed to Step 10.

Step 10.
There are many "treatments" available to the user in resolving such problems. These treatments range from decisions to reroute the traffic by 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 or changing the trip table. Such "treatments" take the form of modifications to the original input stream.

Step 11.
As noted above, the changes to the input stream must be implemented to reflect the modifications undertaken in Step 10. At the completion of this activity, the process returns to Step 8 where the TRAD model is again executed.

Step 12.
The output of the TRAD model includes the computed turn movements for each link. These data are required and accessed by the PC-DYNEV simulation model. This step completes the specification of the PC-DYNEV input stream.

Step 13.
After the PC-DYNEV input stream has been debugged, the simulation model is executed to provide detailed estimates, expressed as statistical Measures of Effectiveness (MOE), which describe the detailed performance of traffic operations on each link of the network.

Step 14.
In this step, the detailed output of the simulation model is examined to identify whether problems exist on the network. The results of the simulation model are extremely detailed and far more accurately describe traffic operations than those provided by the TRAD model. Thus, it is possible to identify the cause of any problems by carefully studying the output.

Again, one can implement corrective treatments designed to expedite the flow of traffic on the network in the event that the results are considered to be less efficient than is possible to achieve. If input changes are needed, the analysis process proceeds to Step 15. On the other hand, if the results are satisfactory, then one can decide whether to return to Step 8 to again execute the TRAD model and repeat the whole process, or to accept the simulation results. If there were no changes indicated by the activities of Step 14, because the results were satisfactory, we can then proceed to document them in Step 17. Otherwise, return to Step 8 to determine the effects of the changes implemented in Step 14 on the optimal routing patterns over the network. This determination can be ascertained by executing the TRAD model.

Step 15.
This activity implements the changes in control treatments or in the assignment of destinations associated with one or more origins in order to improve the representation of traffic flow over the network. These treatments can also include the consideration of adding roadway segments to the existing analysis network to improve the representation of the physical system.

Step 16.
Once the treatments have been identified, it is necessary to modify the simulation model input stream accordingly. At the completion of this effort, the procedure returns to Step 13 to execute the simulation model again.

Step 17.
The simulation results are analyzed, tabulated and graphed. The results are then documented, as required.

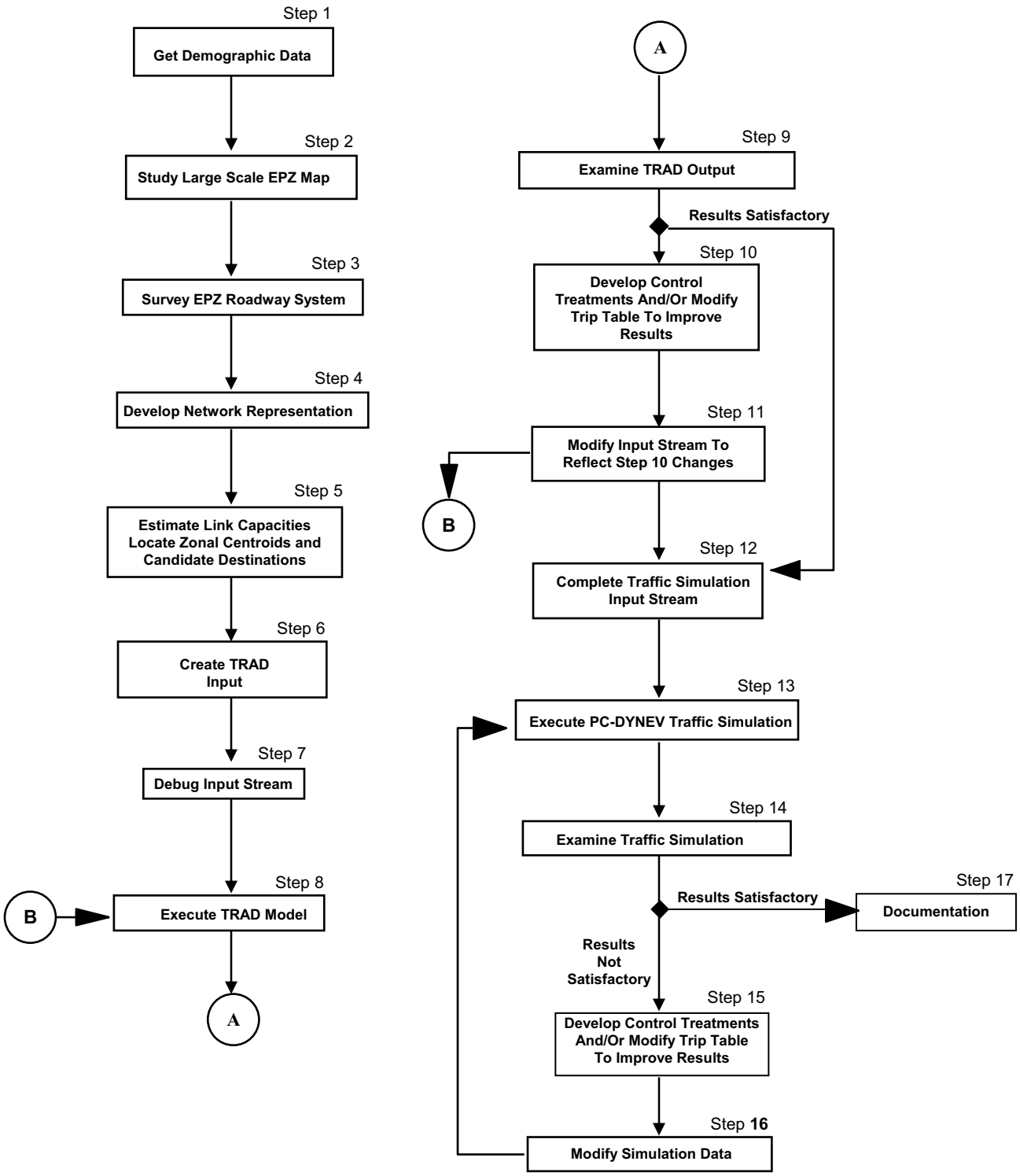


Figure D-1. Flow Diagram of Activities

APPENDIX E

Special Facility Data

APPENDIX E: SPECIAL FACILITY DATA

The following tables list population information for special facilities that are located within the SSES/Bell Bend EPZ. Special facilities are defined as schools, medical care facilities, correctional facilities, and major employers. Transient population data are included in the tables for parks, hotels and motels, hunting, fishing and campgrounds. Each table is grouped by county. The location of the facility is described by its straight-line distance (miles) and direction (magnetic bearing) from the existing SSES site.

SSES EPZ: Schools (Page 1 of 2)							
Distance (miles)	Dir-ection	School Name	Street Address	City/Town	Phone	Student Enrollment	Staff
LUZERNE COUNTY							
4.2	N	Garrison Memorial Elementary School	43 W Vine St	Shickshinny	(570) 542-7001	160	13
4.5	SW	Salem Elementary School	810 E 10th St	Berwick	(570) 759-6400	462	30
6.7	N	Northwest Area High School	243 Thorne Hill Rd	Shickshinny	(570) 542-4126	668	44
7.6	N	Hunlock Creek Elementary School	21 Sunset Lake Rd	Shickshinny	(570) 256-3649	284	19
7.9	SE	Keystone Job Corp High School	P.O.Box 37	Hazleton	(570) 788-0255	600	18
8.0	SE	Valley Elementary/Middle School	79 Rock Glen Rd	Sugarloaf	(570) 788-6044	1109	67
8.3	NW	Huntington Mills Elementary School	417 Shickshinny Lake Rd	Shickshinny	(570) 864-3461	308	18
9.4	SE	Drums Elementary/Middle School	85 S Old Turnpike Rd	Drums	(570) 788-1991	731	39
9.6	NE	K M Smith Elementary School	25 Robert St	Nanticoke	(570) 735-3740	322	16
9.8	E	Rice Elementary School	3700 Church Rd	Mountain Top	(570) 868-3161	790	45
9.9	NE	The Learning Station School	133 Alden St	Nanticoke	(570) 735-7998	42	2
9.9	N	Muhlenburg Christian Academy	362 Hunlock-Harveyville Rd	Hunlock Creek	(570) 256-3378	75	15
10.4	NE	Pope John Paul II Catholic School	518 S Hanover St	Nanticoke	(570) 735-7935	320	16
11.1	NE	GNA Elementary School	601 Kosciuszko St	Nanticoke	(570) 735-1320	443	27
11.1	NE	JFK Elementary School	513 Kosciuszko St	Nanticoke	(570) 735-6450	132	7
11.1	NE	GNA Educational Center	600 E. Union St	Nanticoke	(570) 732-2770	324	18
11.2	NE	Greater Nanticoke High School	425 Kosciuszko St	Nanticoke	(570) 735-7781	953	47
					Sub-total:	**7,723**	**441**

SSES EPZ: Schools (Page 2 of 2)							
COLUMBIA COUNTY							
Distance (miles)	Dir-ection	School Name	Street Address	City/Town	Phone	Student Enrollment	Staff
4.5	SW	Nescopeck Elementary School	315 Dewey St	Nescopeck	(570) 759-6426	276	20
4.6	SW	Berwick Area Middle School	1100 Evergreen Dr	Berwick	(570) 759-6400	897	61
4.7	SW	Berwick Senior High School	1100 Fowler Ave	Berwick	(570) 759-6400	992	74
5.0	SW	Heritage Christian Academy	1112 Butternut St	Berwick	(570) 759-2951	24	5
5.4	SW	Fourteenth Street Elementary School	1401 N Market St	Berwick	(570) 759-6429	214	16
5.4	SW	Mulberry Street Elementary School	Sixth St and Mulberry St	Berwick	(570) 759-4372	88	19
6.0	SW	Holy Family Consolidated School	728 Washington St	Berwick	(570) 752-2021	67	9
6.0	SW	Orange Street Elementary School	845 Orange St	Berwick	(570) 759-6422	386	29
12.5	SW	Beaver Main Elementary School	245 Beaver Valley Rd	Bloomsburg	(570) 784 0309	104	18
					Sub-total:	**3,048**	**251**
					Total:	**13,406**	**1,277**

SSES EPZ: Colleges							
Distance (miles)	Dir-ection	School Name	Street Address	City/Town	Phone	Student Enrollment	Staff
LUZERNE COUNTY							
9.6	SE	Penn State Hazleton	76 University Dr	Hazleton	(570) 450-3000	1232	210
10.7	NE	Luzerne County Community College - Nanticoke	1333 S Prospect St	Nanticoke	(800) 377-5222	1403	375
					Sub-total:	**2,635**	**585**
COLUMBIA COUNTY							
5.3	SW	Luzerne County Community College - Berwick	107 South Market St	Berwick	(570)759-3900	100	6
					Sub-total:	**100**	**6**
					Total:	**2,735**	**591**

Note: There are 475 students residing on campus at Penn State Hazelton. The remaining 757 students and all students at Luzerne County Community College (1403 – Nanticoke, 100 – Berwick) are treated as transients using 1 vehicle per person, resulting in a total of 2260 transient vehicles.

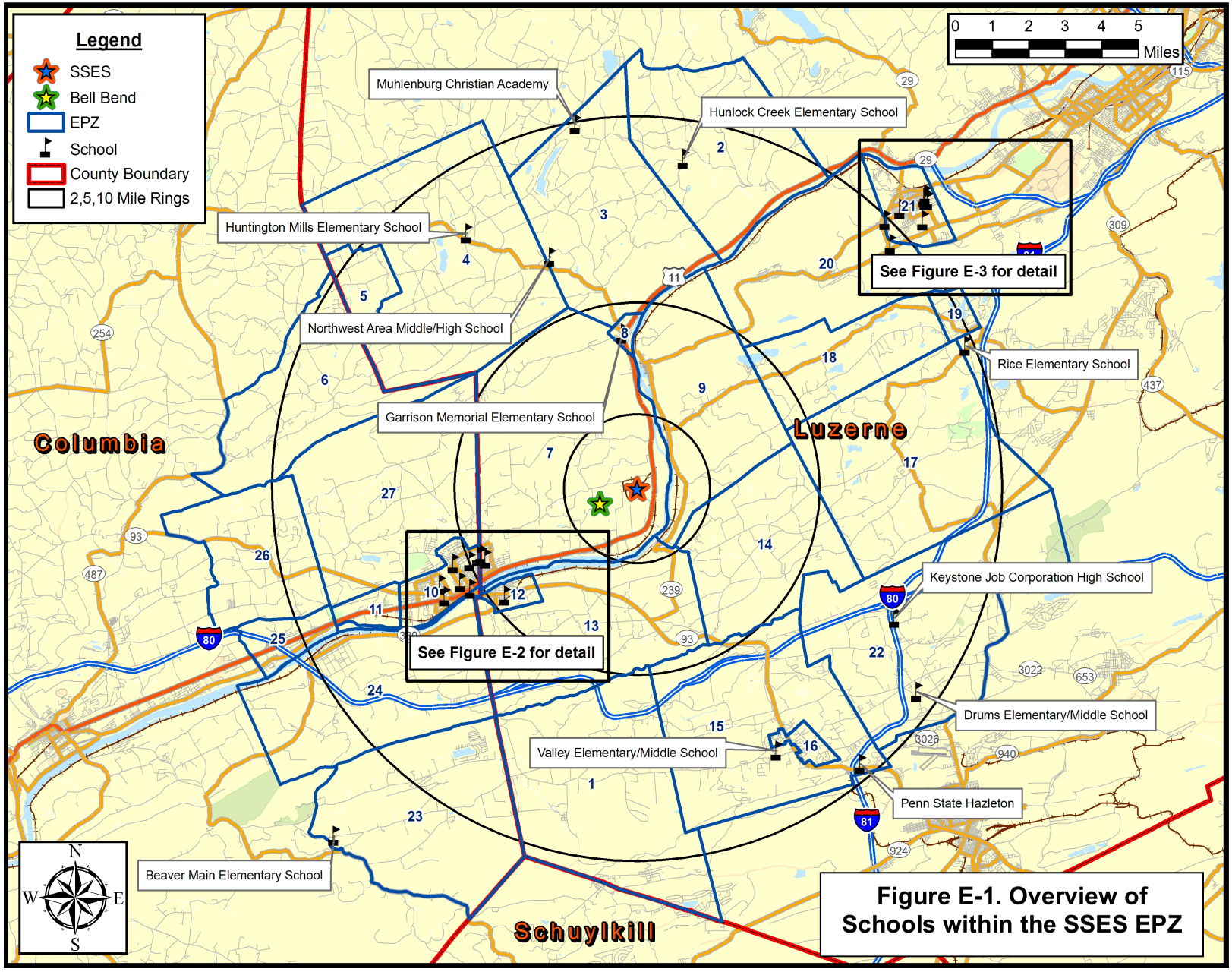
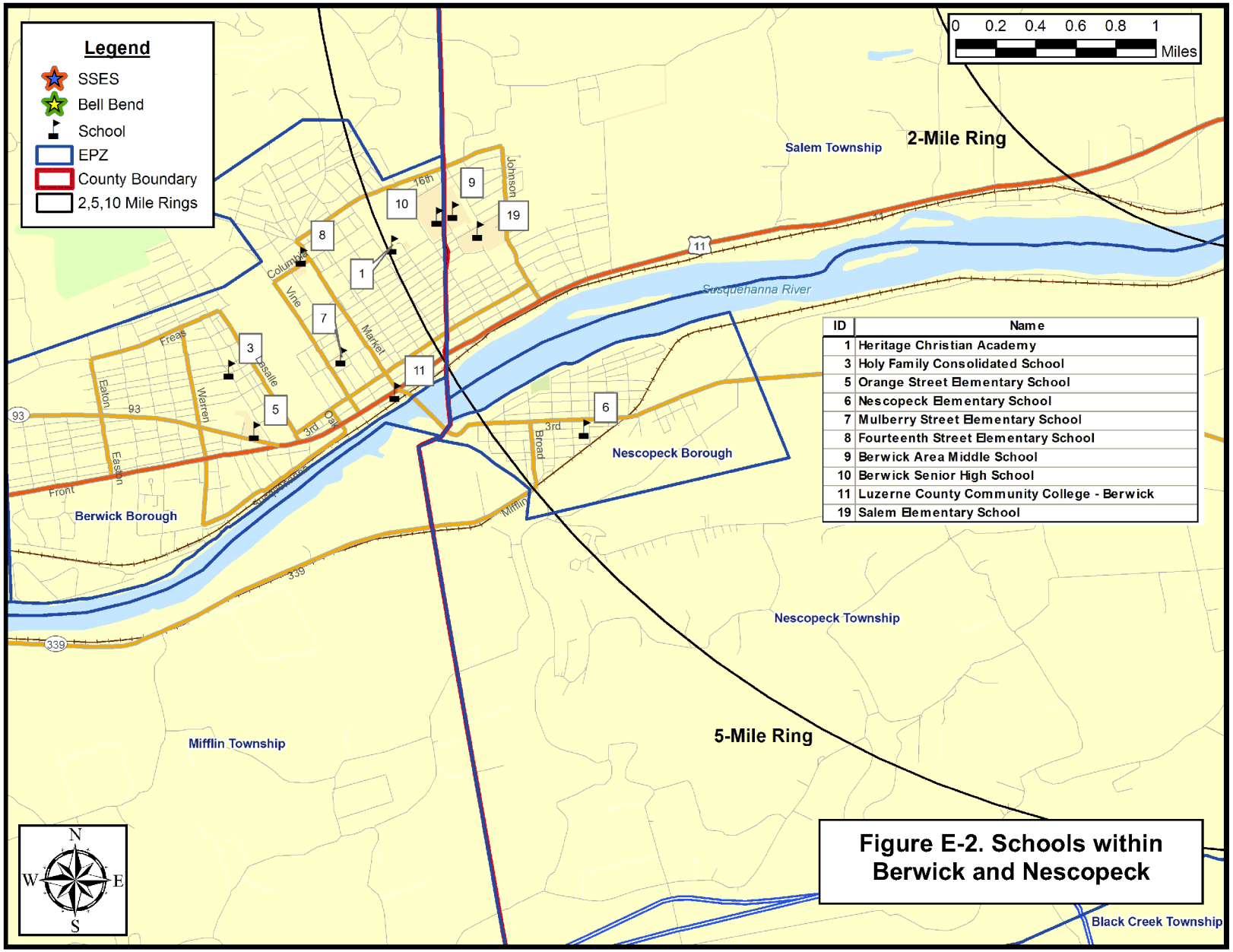


Figure E-1. Overview of Schools within the SSES EPZ



ID	Name
1	Heritage Christian Academy
3	Holy Family Consolidated School
5	Orange Street Elementary School
6	Nescopeck Elementary School
7	Mulberry Street Elementary School
8	Fourteenth Street Elementary School
9	Berwick Area Middle School
10	Berwick Senior High School
11	Luzerne County Community College - Berwick
19	Salem Elementary School

Figure E-2. Schools within Berwick and Nescopeck

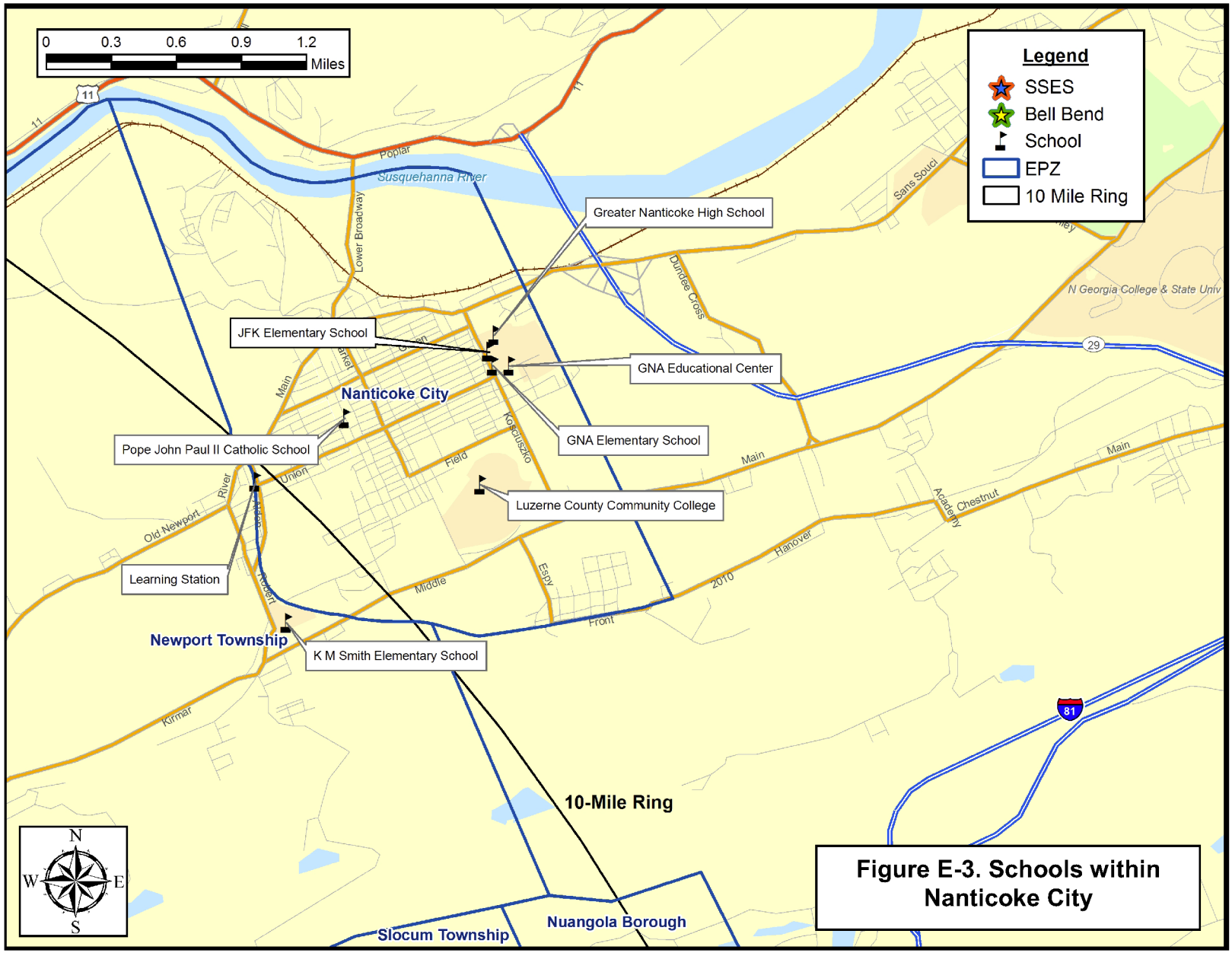


Figure E-3. Schools within Nanticoke City

SSES EPZ: Major Employers							
Distance (miles)	Dir-ection	Name of Facility	Street Address	City/Town	Phone	Total Employees	Employees Commuting into EPZ
LUZERNE COUNTY							
0.0	-	SSES	634 Salem Blvd	Berwick	(866) 832-3312	1247	360
9.6	SE	Penn State Hazelton	76 University Dr	Hazleton	(570) 450-3000	210	210
10.7	NE	Luzerne Community College	1333 S Prospect St	Nanticoke	(800) 377-5222	375	375
COLUMBIA COUNTY							
5.7	SW	Deluxe Homes	499 West Third St	Berwick	866-891-7310	105	25
6.1	SW	Wise Foods, Inc.	228 Rasely St	Berwick	(570) 759-4100	450	106
7.1	SW	Berwick Offray	2015 West Front St	Berwick	(570) 752-5934	1100	260
					Total:	**3,487**	**1,336**

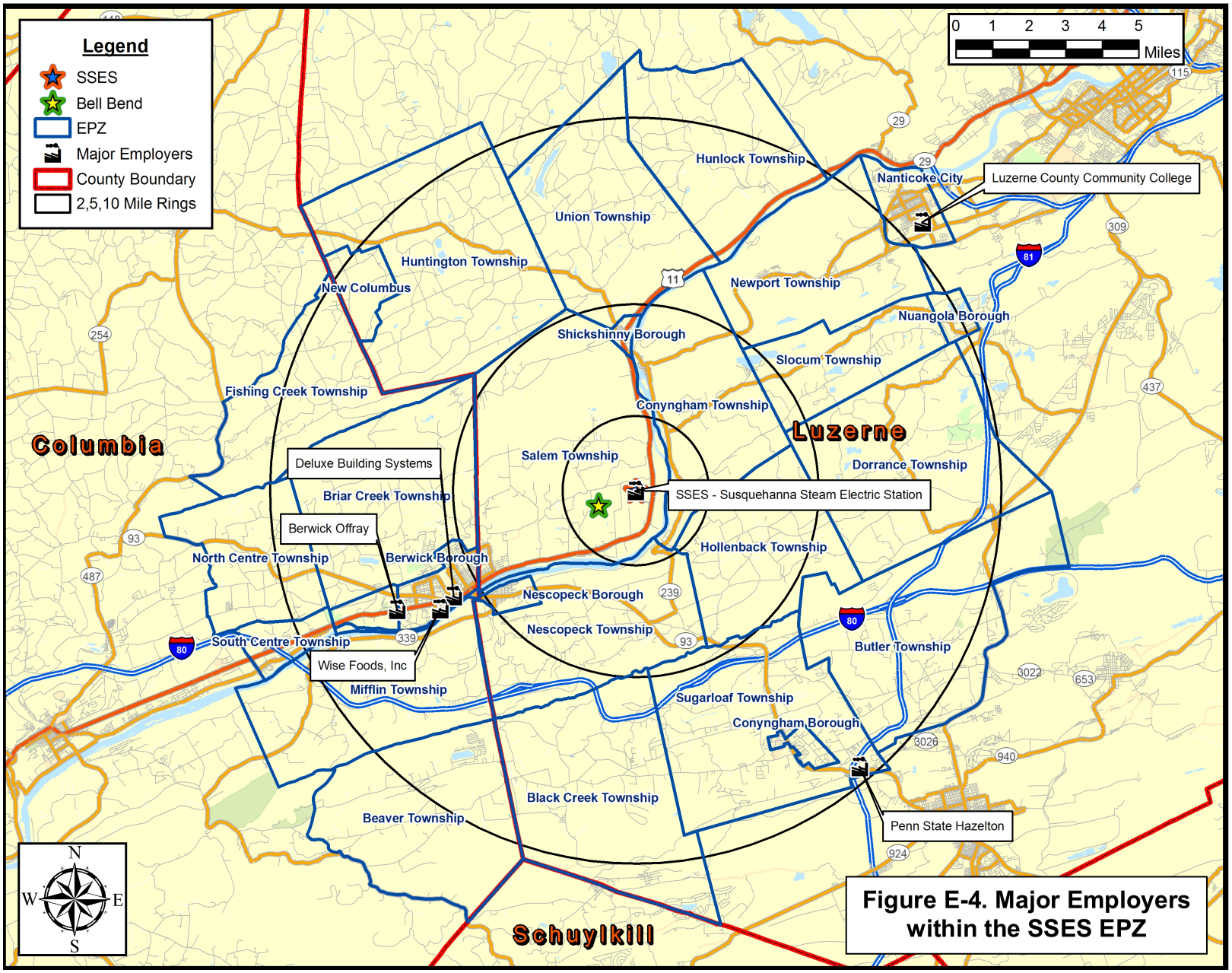


Figure E-4. Major Employers within the SSES EPZ

SSES: Lodging Facilities							
Distance (miles)	Dir-ection	Name of Facility	Street Address	City/Town	Phone	Per-sons	Veh-icles
LUZERNE COUNTY							
5.2	SE	Lookout Motor Lodge	1279 State Route 93	Drums	(570) 788-4131	30	16
5.9	SE	Best Value Inn	1064 State Route 93	Drums	(570) 788-5887	67	34
9.5	SE	Hampton Inn	1 Top of the 80s Rd	Hazleton	(570) 454-3449	197	99
9.8	SE	Fairfield Inn and Suites	1 Woodbine St	Hazleton	(570) 453-0300	91	46
9.9	SE	Forest Hill Inn	3 Forest Hill Rd	Hazleton	(570) 459-2730	64	32
10.0	E	Econo Lodge Hazleton North	10 Woodmere Dr	Drums	(570) 788-4121	67	34
10.1	E	Holiday Inn Express	1 Corporate Dr	Drums	(877) 863-4780	197	99
10.8	SE	Nesco Manor Hotel	214 N Hunter Hwy	Drums	(570) 788-2452	8	4
COLUMBIA COUNTY							
5.2	SW	White Birch Inn B & B	1303 N Market St	Berwick	(570) 759-8251	11	6
8.1	SW	Red Maple Inn	7545 Columbia Blvd	Berwick	(570) 752-6220	52	26
8.7	SW	Super 8 Motel	450 W 3rd St	Mifflinville	(570) 759-6778	110	55
					Total:	**895**	**451**

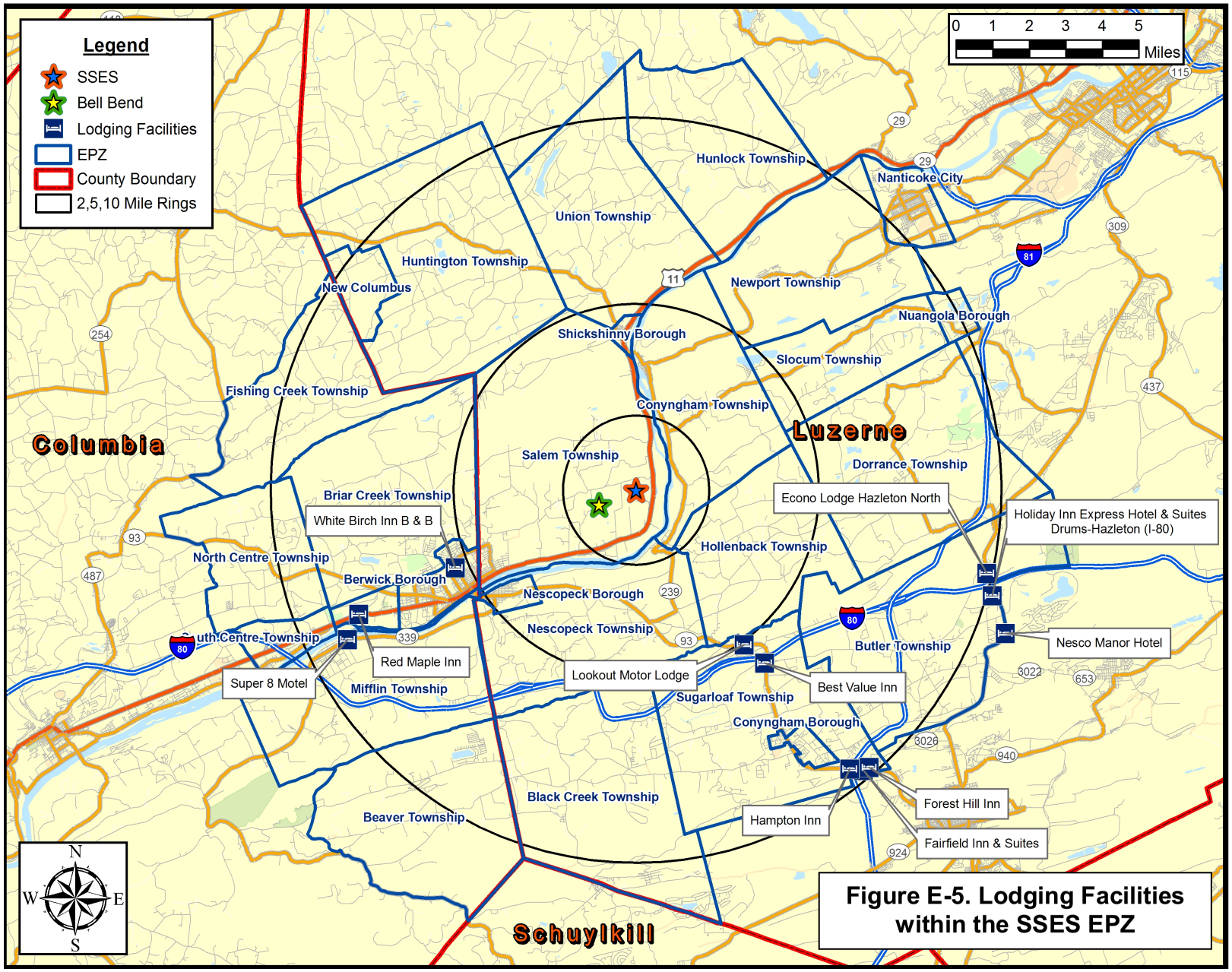


Figure E-5. Lodging Facilities within the SSES EPZ

SSES: CAMPGROUNDS								
Distance (miles)	Dir-ection	Name of Facility	Address	City/Town	Phone	Available Campsites	Per-sons	Total Vehicles
LUZERNE COUNTY								
1.6	E	Council Cup Campground	212 Ruckle Hill Rd	Wapwallopen	(570) 379-2566	250	325	82
4.3	E	Moyers Grove Campground	309 Moyers Grove Rd	Wapwallopen	(570) 379-3375	170	221	56
9.3	N	Hidden New Lake Campground	745 Hunlock-Harveyville Rd	Schickshinny	(570) 256-7383	25	33	9
COLUMBIA COUNTY								
6.2	NW	Camp Louise	195 Hawk Rd	Schickshinny	(570) 759-8236	20	26	7
9.5	NW	Whispering Pines Camping	1557 N Bendertown Rd	Stillwater	(570) 925-6810	60	78	20
					Total:	**525**	**683**	**174**

SSES: STATE PARKS							
Distance (miles)	Dir-ection	Name of Facility	Address	City/Town	Phone	Per-sons	Total Vehicles
LUZERNE COUNTY							
11.7	E	Nescopeck State Park	1137 Honey Hole Road	Drums	(570) 403-2006	98	49
					Total:	98	49

SSES: GOLF COURSES							
Distance (miles)	Dir-ection	Name of Facility	Address	City/Town	Phone	Per-sons	Total Vehicles
LUZERNE COUNTY							
9.2	E	Blue Ridge Trail Golf Club	260 Country Club Drive	Mountain Top	(570) 868-4653	20	20
COLUMBIA COUNTY							
6.4	W	Berwick Golf Club	473 Martzville Road	Berwick	(570) 752-2506	20	20
9.0	SW	Rolling Pines Golf Course	355 Golf Course Road	Berwick	(570) 752-1000	20	20
10.3	SW	Arnolds Golf Course	490B West 3rd Street	Mifflinville	(570) 752-7022	20	20
					Total:	80	80

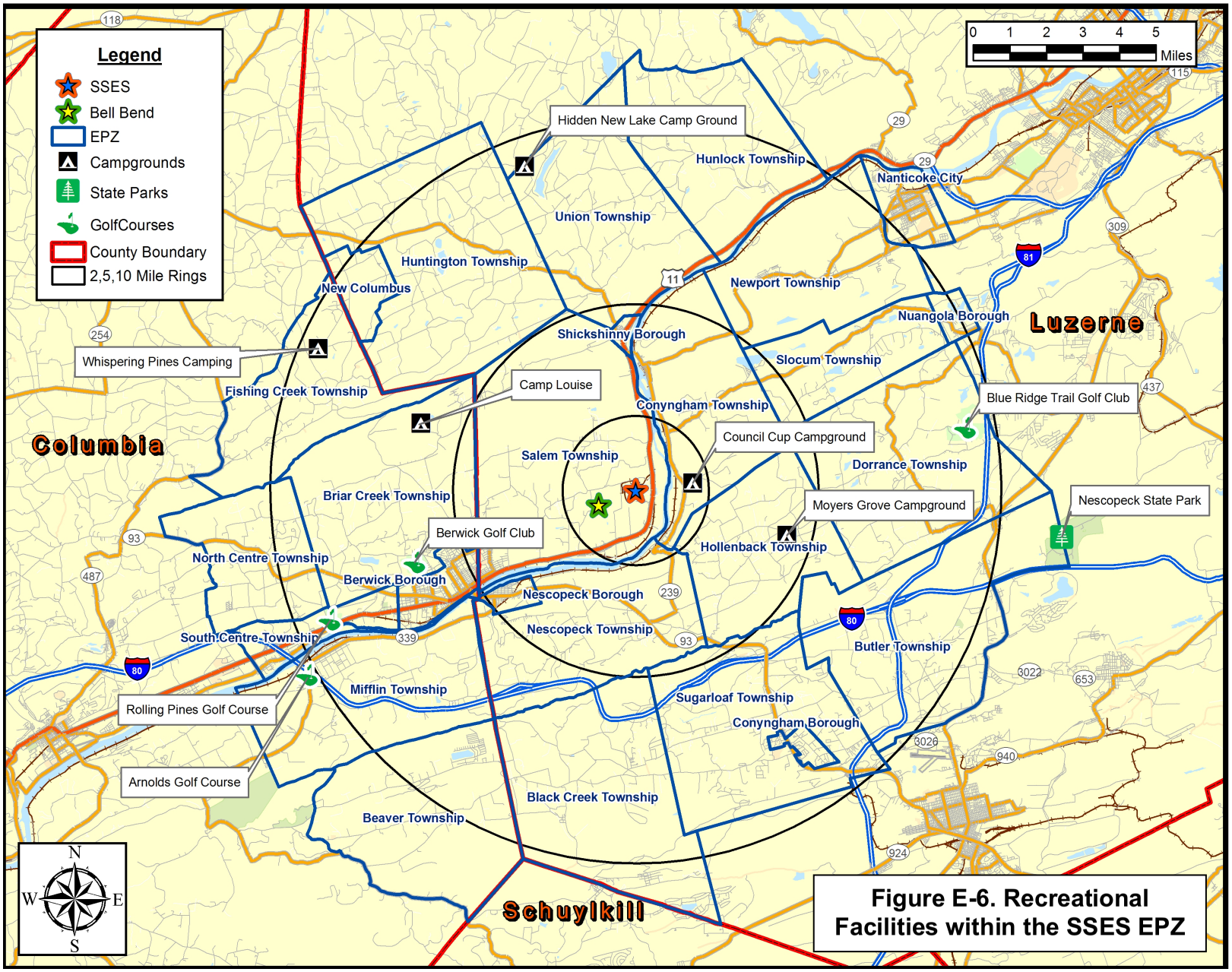


Figure E-6. Recreational Facilities within the SSES EPZ

SSES: HUNTING					
Distance (miles)	Dir-ection	Name of Facility	City/Town	Per-sons	Total Vehicles
LUZERNE COUNTY					
3.5	N	State Game Lands 260	Salem	100	100
COLUMBIA COUNTY					
8.4	W	State Game Lands 55	Fishing Creek	100	100
			Total:	200	200

SSES: FISHING					
Distance (miles)	Dir-ection	Name of Facility	City/Town	Per-sons	Total Vehicles
LUZERNE COUNTY					
4.8	NE	Lily Lake	Schickshinny	40	20
COLUMBIA COUNTY					
7.1	SW	Susquehanna River, North Branch	Berwick	20	10
7.2	W	Briar Creek Lake	Berwick	24	12
			Total	**84**	**42**

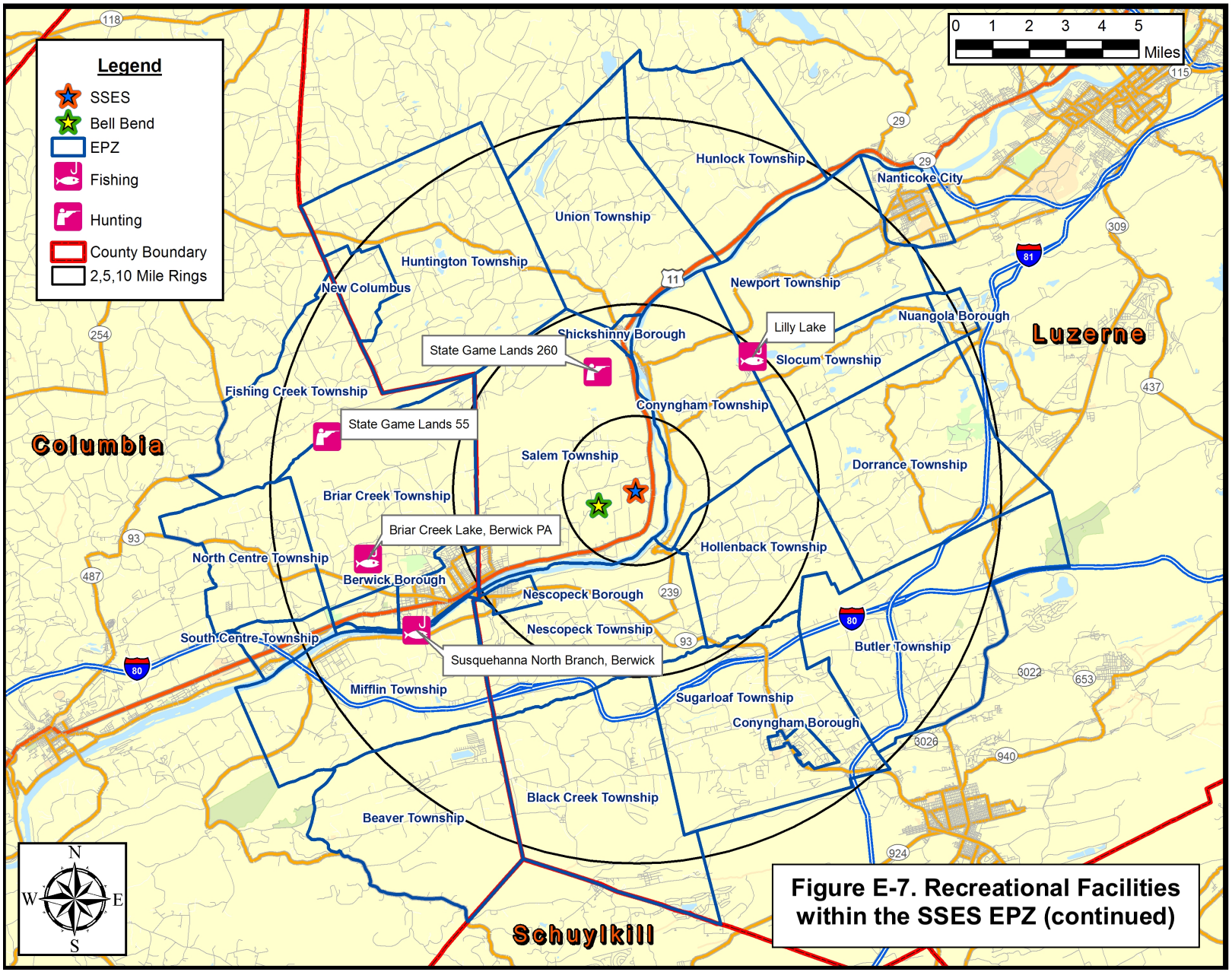


Figure E-7. Recreational Facilities within the SSES EPZ (continued)

SSES EPZ: Medical Facilities & Nursing Homes										
Distance (miles)	Direction	Facility Name	Street Address	City/Town	Phone	Capacity	Census	Ambulances Needed	Buses Needed	Vans Needed
LUZERNE COUNTY										
3.8	E	Johnson Personal Care Home	897 Hobbie Rd	Wapwallopen	(570) 379-3673		18	0	0	2
5.9	SE	Sunny Knoll (Sugarloaf township)	11 Pecora Road	Drums	(570) 788-4448		22	10	0	0
7.9	S	Zack's Rock Glen Manor	1894 Tomhicken Rd	Rock Glen	(570) 384-4000		35	2	0	2
9.6	NE	Guardian Elder Care Center	147 Old Newport St	Nanticoke	(570) 735-7300		110	11	1	16
9.6	SE	Fritzingertown Senior Living Community	1162 South Old Turnpike Rd	Drums	(570) 788-4178		170	11	2	5
10.3	NE	Mercy Special Care Hospital	128 W Washington St	Nanticoke	(570) 735-5000	67				
10.3	NW	Bonham Nursing Center	477 Bonnieville Rd	Stillwater	(570) 864-3174		77	0	0	0
10.4	NE	Northeast Counseling	West Washington St	Nanticoke	(570) 735-7590		16	0	0	0
10.4	NE	West Ridge Personal Care Home	541 South Hanover St	Nanticoke	(570) 735-6898		20	1	1	0
10.5	E	Butler Valley Manor Home	463 N. Hunter Hwy	Drums	(570) 788-4175		37	10	0	5
10.8	NE	Birchwood Nursing Home	395 East Middle Rd	Nanticoke	(570) 735-2973		120	2	1	12
10.9	NE	Villa Personal Care	50 N. Walnut St	Nanticoke	(570) 735-8080		76	0	1	0
COLUMBIA COUNTY										
4.5	W	Berwick Hospital Center	701 E 16th St	Berwick	(570) 759-5000	341				
4.5	W	Berwick Retirement Village	801 E 16th St	Berwick	(570) 759-5400		240	2	3	5
5.0	SW	Elmcroft Of Berwick	2050 West Front St	Berwick	(570) 759-3155					
5.0	SW	Gerringer Boarding Home	39 Village Ln	Berwick	(570) 759-2161					
5.0	SW	Stulbs Personal Care Home	423 East Fifth St	Berwick	(570) 759-3000					
					Total	**408**	**941**	**49**	**9**	**47**

Note: Some of the census data is missing. The county emergency plans provided municipality wide estimates instead.

RISK MUNICIPALITY MEDICAL TRANSPORTATION REQUIREMENTS			
Municipality	**People Requiring Ambulance**	**Total Ambulance Requirement**	**Available Ambulance Resources**
COLUMBIA COUNTY			
Berwick Borough	28	14	14
Beaver Township	2	1	
Briar Creek Borough	2	1	
Briar Creek Township	2	1	
Fishing Creek Township	0	0	
Mifflin Township	2	1	
North Centre Township	0	1	
South Centre Township	0	1	
LUZERNE COUNTY			
Black Creek Township	1	1	1
Butler Township	2	1	4
Conyngham Borough	4	2	0
Conyngham Township	8	4	1
Dorrance Township	6	3	1
Hollenback Township	4	2	1
Hunlock Township	2	1	1
Huntington Township/New Columbus Borough	0	1	0
Nanticoke City	10	5	2
Nescopeck Borough	4	2	2
Nescopeck Township	4	2	0
Newport Township	12	6	1
Nuangola Borough	0	1	0
Salem Township	4	2	0
Shickshinny Borough	4	2	2
Slocum Township	2	1	1
Sugarloaf Township	0	0	1
Union Township	2	1	0
Total	105	57	32

Note: This table is adapted from the county emergency management plans (LUZERNE COUNTY & COLUMBIA COUNTY RADIOLOGICAL EMERGENCY RESPONSE PLAN TO NUCLEAR POWER PLANT INCIDENTS, Change 5, Spring 2006 version)

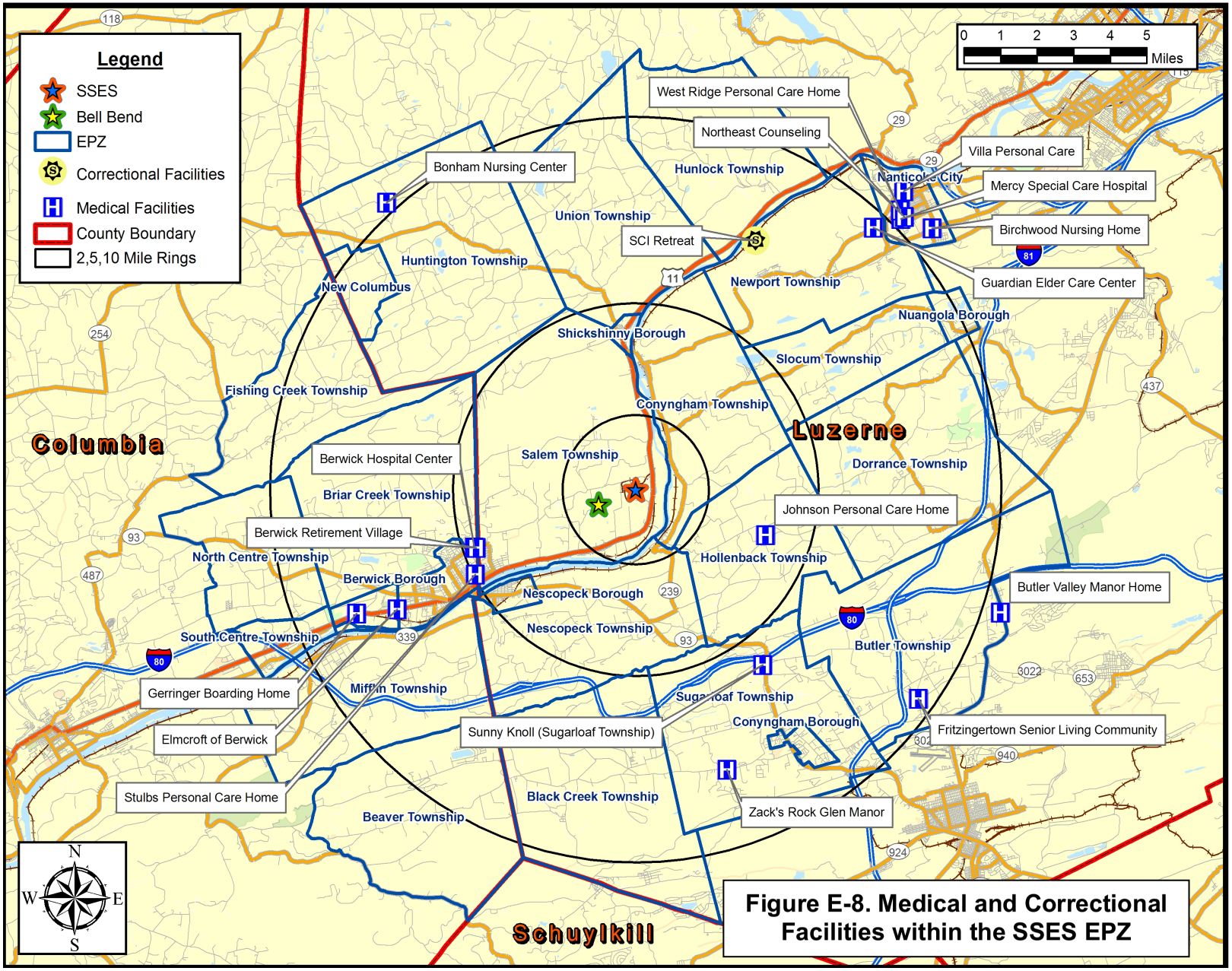


Figure E-8. Medical and Correctional Facilities within the SSES EPZ

APPENDIX F

Telephone Survey

APPENDIX F: TELEPHONE SURVEY

1. INTRODUCTION

The development of evacuation time estimates for the Emergency Planning Zone (EPZ) of the SSES/Bell Bend Nuclear Power Plant requires the identification of travel patterns, car ownership and household size of the population within the EPZ. Demographic information is 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 that must be undertaken prior to evacuating the area. Secondly, the 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 a telephone survey. 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 …?”).

2. SURVEY INSTRUMENT AND SAMPLING PLAN

Attachment A presents the final survey instrument. A draft of the instrument was submitted to PPL, UniStar and the EPZ Counties for comment. Comments were received and the survey instrument was modified accordingly.

Following the completion of the survey instrument, a sampling plan was developed. A sample size of approximately 575 completed survey forms yields results with an acceptable sampling error. The sample must be drawn from the EPZ population. Consequently, a list of EPZ zip codes was developed. This list is shown in Table F-1. Along with each zip code, an estimate of the population in each area was determined, based on average household size provided by Census data. The proportional number of the desired completed survey interviews for each zip code area was identified, as shown in Table F-1.

Table F-1. Survey Sampling Plan
SSES/Bell Bend Telephone Survey
Sampling Plan

Zip Code	EPZ Population in Zip Code[1] (2000)	Households in EPZ	Required Sample
17814	765	282	6
17815	913	358	8
17859	557	219	5
17878	160	64	1
17985	358	128	3
18202	561	52	1
18219	1348	553	12
18222	4263	1403	30
18246	1672	658	14
18249	4243	1616	34
18603	19696	8145	173
18617	2728	835	18
18621	2167	812	17
18622	130	50	1
18631	1278	535	11
18634	13223	5800	123
18635	3359	1362	29
18655	5217	2057	44
18660	1914	710	15
18707	3919	1466	31
Total	**68,471**	**27,105**	**575**
Average Household Size		**2.50**	
Total Sample Required		**575**	

[1] EPZ population estimate based on SSES EPZ boundary definition

The sampling plan used for the telephone survey presented in Table F-1 was based on the SSES EPZ. This EPZ was updated subsequently based on the proposed Bell Bend site. The sample size for this new SSES/Bell Bend EPZ is the same as for the SSES EPZ due to the small change in population of approximately 1.8% (SSES/Bell Bend EPZ population estimate = 69,718, SSES EPZ population estimate = 68,471).

The required sample size for each zipcode is similar for each EPZ; therefore it is assumed that the telephone survey results for the SSES EPZ are applicable for the combined SSES/Bell Bend EPZ.

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.

Household Demographic Results

Household Size

Figure F-1 presents the distribution of household size within the EPZ. The average household contains 2.52 people. The estimated household size (2.50 persons) used to determine the survey sample (Table F-1) was drawn from Census data.

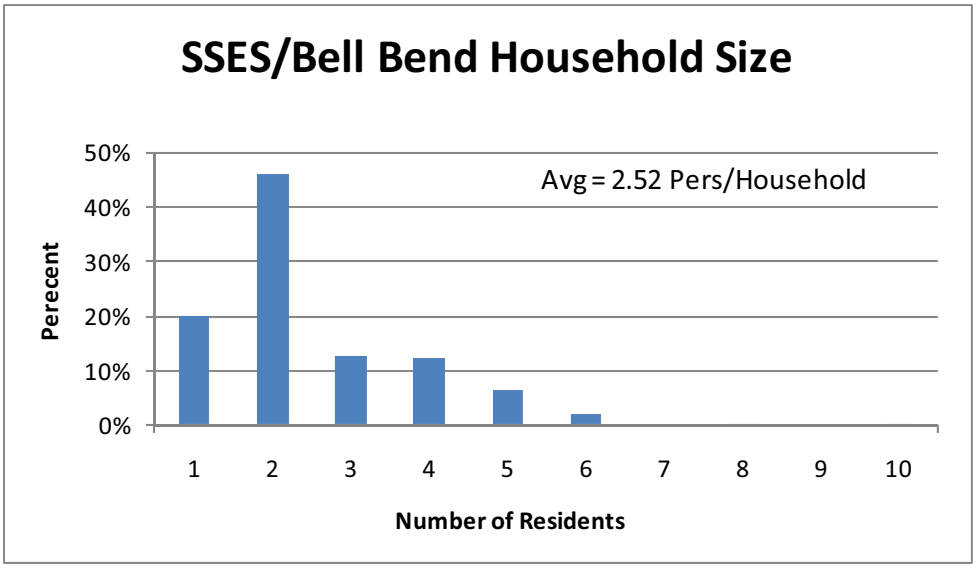


Figure F-1. Household Size in the EPZ

Automobile Ownership

The average number of automobiles per household in the EPZ is 1.91. The distribution of automobile ownership is presented in Figure F-2. Figures F-3 and F-4 present the automobile availability by household size; approximately 5.4 percent of households do not have access to an automobile. The majority of households without access to a car are single person households; nearly all households of 2 or more people have access to at least one vehicle.

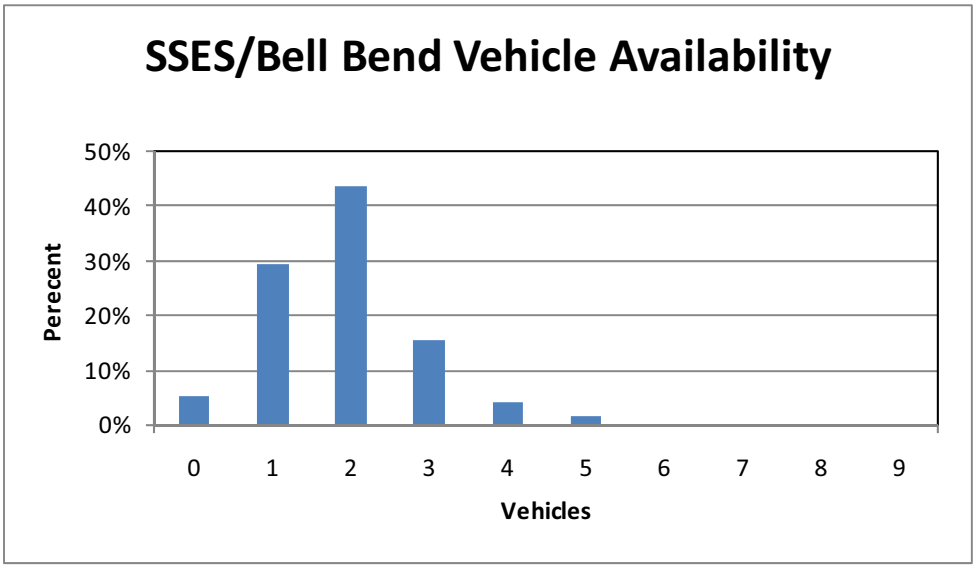


Figure F-2. Household Vehicle Availability

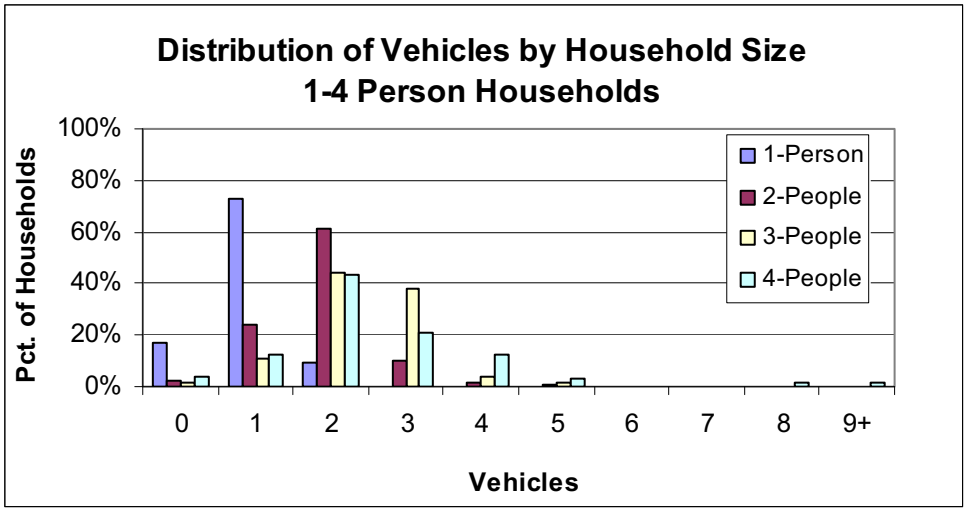


Figure F-3. Vehicle Availability – 1 to 4 Person Households

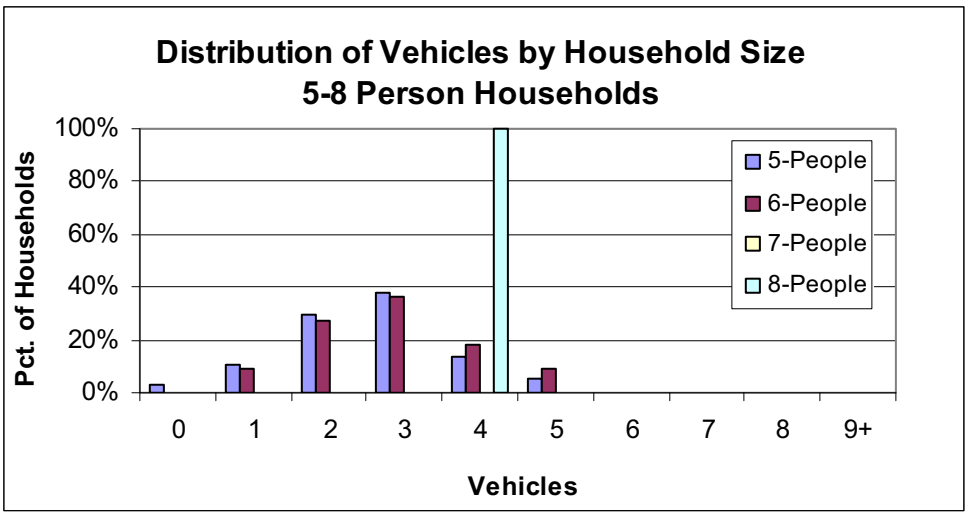


Figure F-4. Vehicle Availability – 5 to 8 Person Households

School Children

The average number of school children per household identified by the survey is 1.47. Figure F-5 presents the distribution of school children.

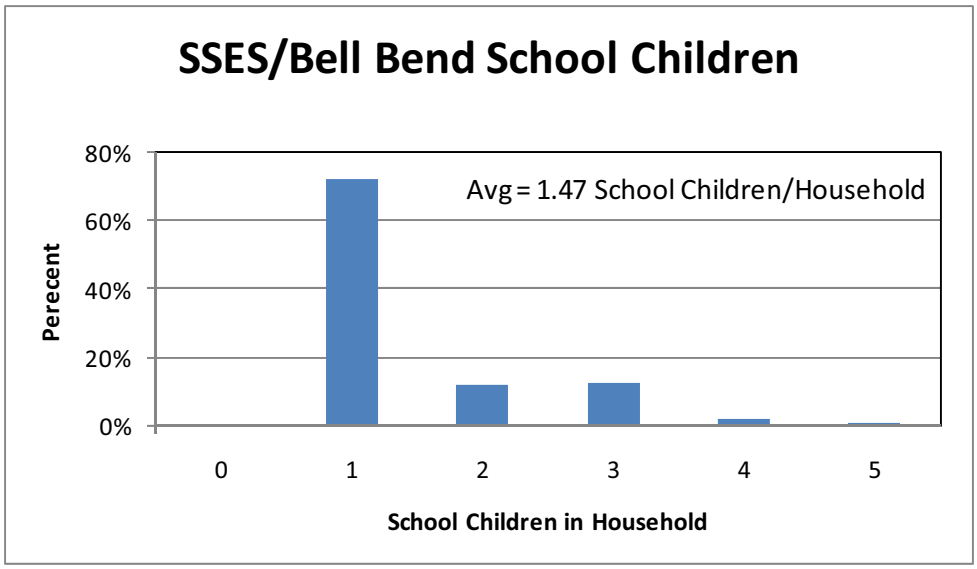


Figure F-5. School Children in Households

Commuters

Figure F-6 presents the distribution of the number of commuters in each household. The data show an average of 0.92 commuters in each household in the EPZ.

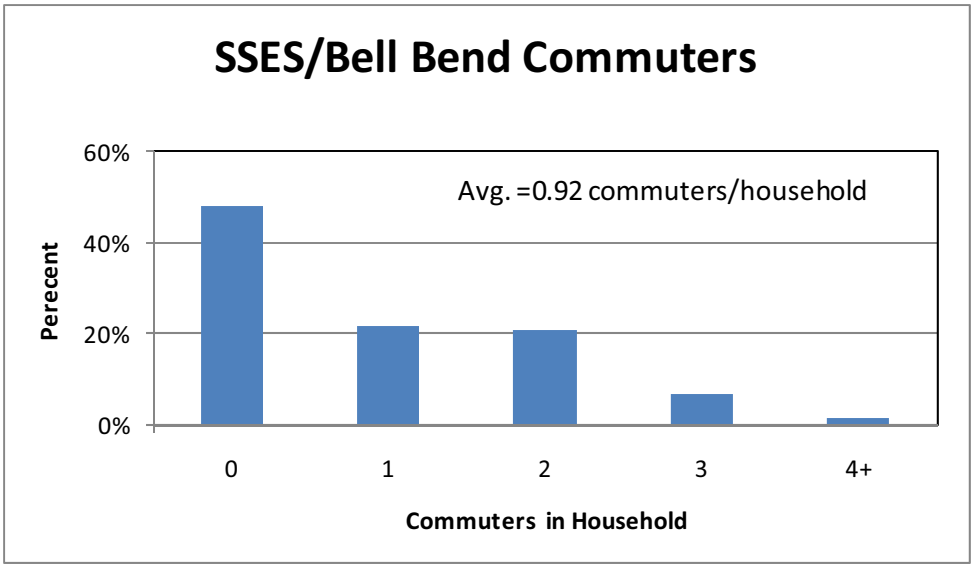


Figure F-6. Commuters in Households in the EPZ

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 or school.

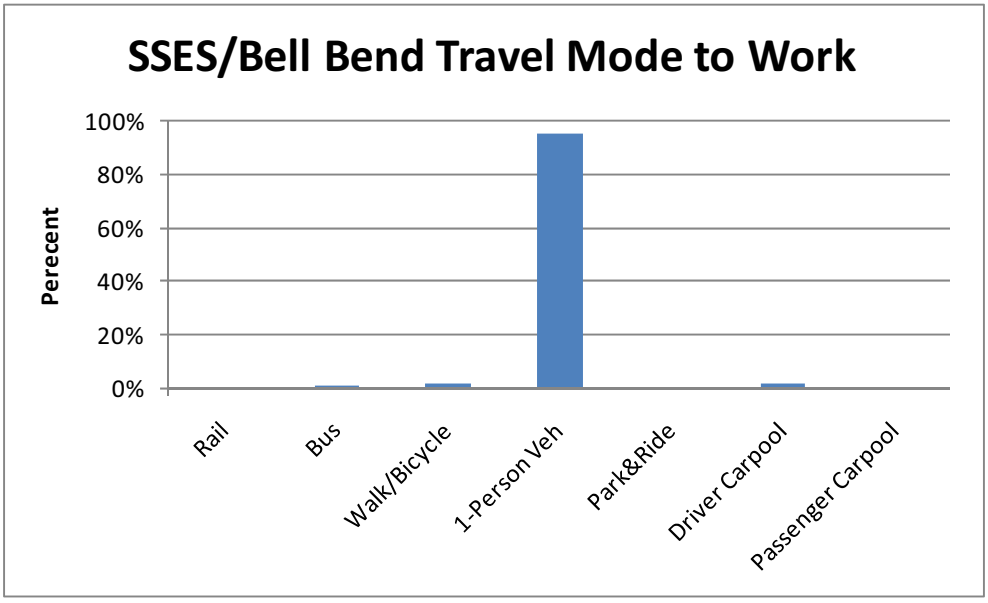


Figure F-7. Modes of Travel to Work by EPZ Residents

Evacuation Response

Several questions were asked which are used to gauge the population's response to an emergency. The first of these asked "How many of the vehicles that are usually available to the household would your family use during an evacuation?" The response is shown in Figure F-8. On average, 1.30 vehicles per household would be used for evacuation purposes.

The second evacuation response question asked was "When the commuters are away from home, is there a vehicle at home that is available for evacuation during any emergency?" Of the survey participants who responded, 58 percent said that there was another vehicle available to evacuate in, while 42 percent answered that there would be no additional vehicle available for evacuation.

The third evacuation response question was "Would your family await the return of other family members prior to evacuating the area?" Of the survey participants who responded, 60 percent said they would await the return of other family members before evacuating and 40 percent indicated that they would not await the return of other family members.

The fourth evacuation response question was "Would you take household pets with you if you were asked to evacuate the area?" As shown in Figure F-9, 54 percent of respondents said they would take their pets; 9 percent would not. The remaining 37 percent of people either did not have a pet, or did not give a definitive answer.

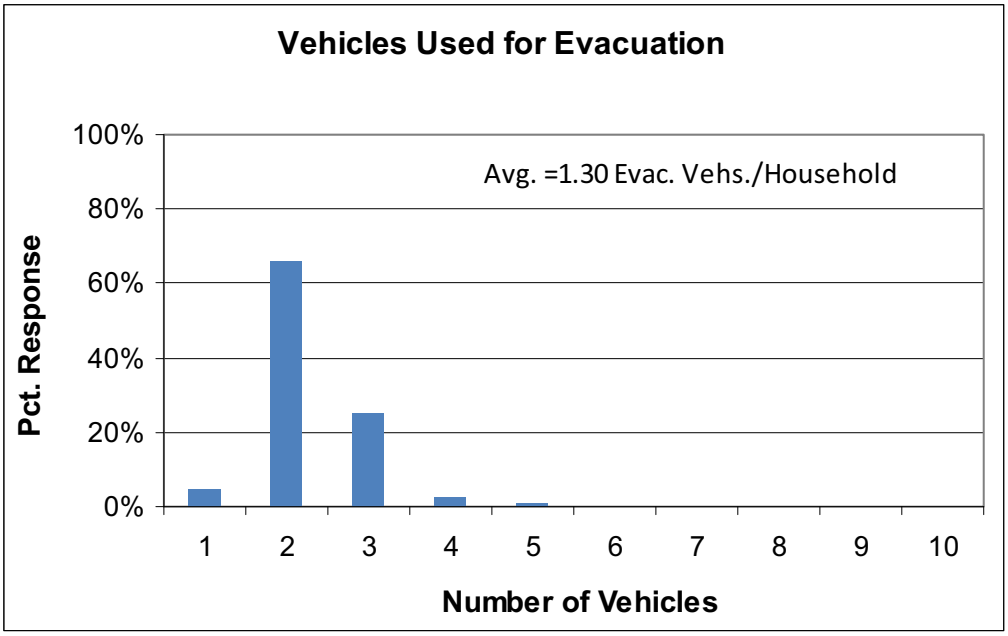


Figure F-8. Number of Vehicles Used for Evacuation

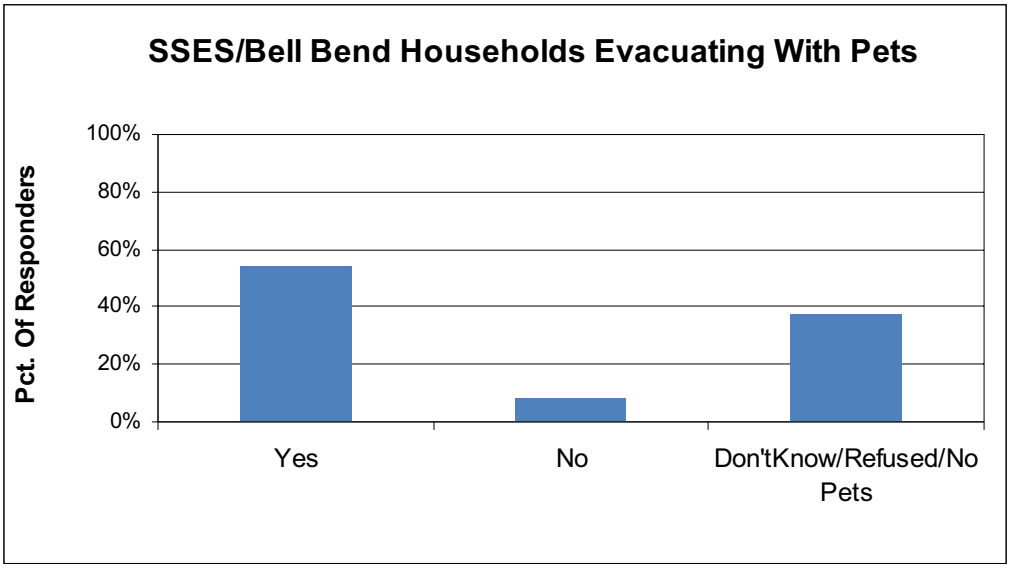


Figure F-9. Households Evacuating With Pets

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.

How long does it take the commuter to complete preparation for leaving work? Figure F-10 presents the cumulative distribution. Sixty seven percent can leave within 15 minutes, over 80 percent within 30 minutes and nearly all within one hour

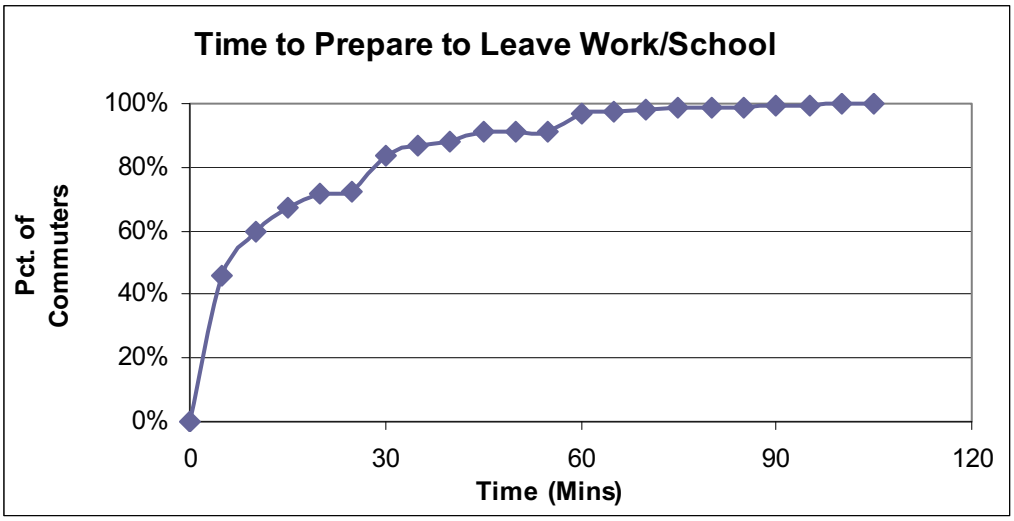


Figure F-10. Time Required to Prepare to Leave Work/School

How long would it take the commuter to travel home?

Figure F-11 presents the work to home travel time. In all cases, over 80 percent of commuters can arrive home within about 30 minutes of leaving work; nearly all within 60 minutes.

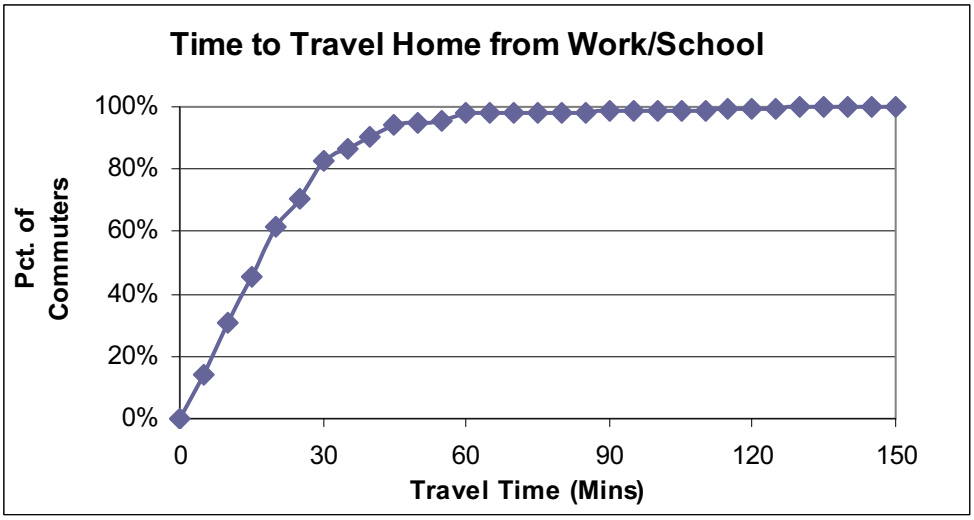


Figure F-11. Work to Home Travel Time

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." Nearly 86 percent of households can be ready to leave home within an hour, nearly all within 2 hours.

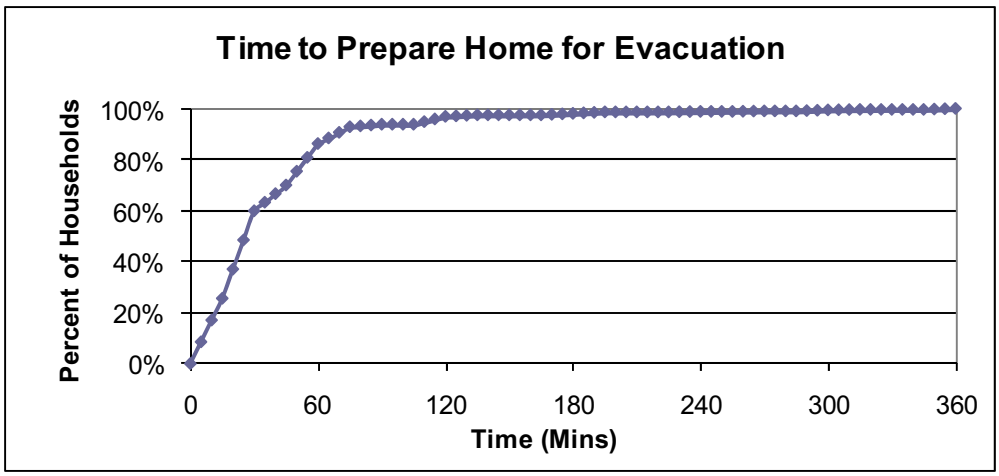


Figure F-12. Time to Prepare Home for Evacuation

How long would it take you to clear 6 to 8 inches of snow?

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 would be necessary to clear a private driveway prior to leaving the home so that the vehicle can access the street. Figure F-13 presents these results. The time distribution for clearing the driveway has a long tail; about 88 percent of driveways are passable within 1 hour. However, the last driveway is cleared 3 hours and 15 minutes after the start of this activity.

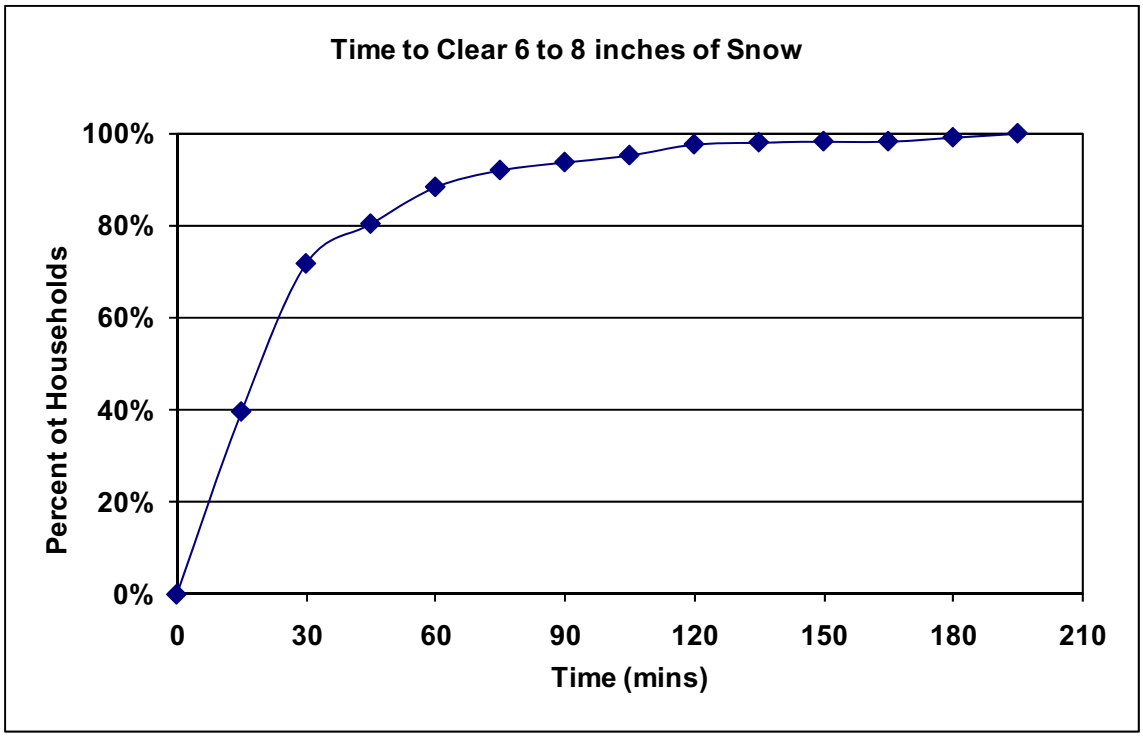


Figure F-13. Time to Clear 6 to 8 Inches of Snow

4. CONCLUSIONS

The telephone survey provides valuable, relevant data that have been used to quantify "mobilization time" which can influence evacuation time estimates.

ATTACHMENT A

Telephone Survey Instrument

Survey Instrument

Hello, my name is _____ and I'm working on a survey being made for [insert marketing firm name] designed to identify local travel patterns in your area. We are conducting the survey to help the county and local municipalities with their evacuation plans for all types of potential events. Your participation in this survey will greatly enhance the county's emergency preparedness program.

COL.1 Unused
COL.2 Unused
COL.3 Unused

Sex **COL. 8**
1 Male
2 Female

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

DO NOT ASK:

1A. Record area code. To Be Determined

COL. 9-11

1B. Record exchange number. To Be Determined

COL. 12-14

---

2. What is your home Zip Code **Col. 15-19**

---

3. In total, how many cars, or other vehicles are usually available to the household? (DO NOT READ ANSWERS.)

COL.20
1 ONE
2 TWO
3 THREE
4 FOUR
5 FIVE
6 SIX
7 SEVEN
8 EIGHT
9 NINE OR MORE
0 ZERO (NONE)
X REFUSED

---

4. How many people usually live in this household? (DO NOT READ ANSWERS.)

COL.21	**COL.22**
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 REFUSED

5. How many children living in this household go to local public, private, or parochial schools? (DO NOT READ ANSWERS.)

COL.23	
0	ZERO
1	ONE
2	TWO
3	THREE
4	FOUR
5	FIVE
6	SIX
7	SEVEN
8	EIGHT
9	NINE OR MORE
X	REFUSED

---

6. How many people in the household commute to a job, or to college, at least 4 times a week?

COL.24		SKIP TO
0	ZERO	Q. 12
1	ONE	Q. 7
2	TWO	Q. 7
3	THREE	Q. 7
4	FOUR OR MORE	Q. 7
5	DON'T KNOW/REFUSED	Q. 12

INTERVIEWER: For each person identified in Question 6, ask Questions 7, 8, 9, and 10.

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

	Commuter #1 COL.25	Commuter #2 COL.26	Commuter #3 COL.27	Commuter #4 COL.28
Rail	1	1	1	1
Bus	2	2	2	2
Walk/Bicycle	3	3	3	3
Driver Car/Van	4	4	4	4
Park & Ride (Car/Rail, Xpress_bus)	5	5	5	5
Driver Carpool-2 or more people	6	6	6	6
Passenger Carpool-2 or more people	7	7	7	7
Taxi	8	8	8	8
Refused	9	9	9	9

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8. What is the name of the city, town or community in which Commuter #1 works or attends school? (REPEAT QUESTION FOR EACH COMMUTER.) (FILL IN ANSWER.)

COMMUTER #1			COMMUTER #2			COMMUTER #3			COMMUTER #4		
	City/Town	State		City/Town	State		City/Town	State		City/Town	State
COL.29	COL.30	COL.31	COL.32	COL.33	COL.34	COL.35	COL.36	COL.37	COL.38	COL.39	COL.40
0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9	9	9	9

9. How long would it take Commuter #1 to travel home from work or college?
(REPEAT QUESTION FOR EACH COMMUTER.) (DO NOT READ ANSWERS.)

COMMUTER #1

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

COMMUTER #2

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

COMMUTER #3

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

COMMUTER #4

COL.47	COL.48
1 5 MINUTES OR LESS	1 46-50 MINUTES
2 6-10 MINUTES	2 51-55 MINUTES
3 11-15 MINUTES	3 56 - 1 HOUR
4 16-20 MINUTES	4 OVER 1 HOUR, BUT LESS THAN 1 HOUR 15 MINUTES
5 21-25 MINUTES	5 BETWEEN 1 HOUR 16 MINUTES AND 1 HOUR 30 MINUTES
6 26-30 MINUTES	6 BETWEEN 1 HOUR 31 MINUTES AND 1 HOUR 45 MINUTES
7 31-35 MINUTES	7 BETWEEN 1 HOUR 46 MINUTES AND 2 HOURS
8 36-40 MINUTES	8 OVER 2 HOURS (SPECIFY _____)
9 41-45 MINUTES	9
	0
	X DON'T KNOW/REFUSED

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

COMMUTER #1

COL. 49	COL.50
1 5 MINUTES OR LESS	1 46-50 MINUTES
2 6-10 MINUTES	2 51-55 MINUTES
3 11-15 MINUTES	3 56 - 1 HOUR
4 16-20 MINUTES	4 OVER 1 HOUR, BUT LESS THAN 1 HOUR 15 MINUTES
5 21-25 MINUTES	5 BETWEEN 1 HOUR 16 MINUTES AND 1 HOUR 30 MINUTES
6 26-30 MINUTES	6 BETWEEN 1 HOUR 31 MINUTES AND 1 HOUR 45 MINUTES
7 31-35 MINUTES	7 BETWEEN 1 HOUR 46 MINUTES AND 2 HOURS
8 36-40 MINUTES	8 OVER 2 HOURS (SPECIFY _____)
9 41-45 MINUTES	9
	0
	X DON'T KNOW/REFUSED

COMMUTER #2

COL.51	COL. 52
1 5 MINUTES OR LESS	1 46-50 MINUTES
2 6-10 MINUTES	2 51-55 MINUTES
3 11-15 MINUTES	3 56 - 1 HOUR
4 16-20 MINUTES	4 OVER 1 HOUR, BUT LESS THAN 1 HOUR 15 MINUTES
5 21-25 MINUTES	5 BETWEEN 1 HOUR 16 MINUTES AND 1 HOUR 30 MINUTES
6 26-30 MINUTES	6 BETWEEN 1 HOUR 31 MINUTES AND 1 HOUR 45 MINUTES
7 31-35 MINUTES	7 BETWEEN 1 HOUR 46 MINUTES AND 2 HOURS
8 36-40 MINUTES	8 OVER 2 HOURS (SPECIFY _____)
9 41-45 MINUTES	9
	0
	X DON'T KNOW/REFUSED

COMMUTER #3

COL. 53	COL. 54
1 5 MINUTES OR LESS	1 46-50 MINUTES
2 6-10 MINUTES	2 51-55 MINUTES
3 11-15 MINUTES	3 56 - 1 HOUR
4 16-20 MINUTES	4 OVER 1 HOUR, BUT LESS THAN 1 HOUR 15 MINUTES
5 21-25 MINUTES	5 BETWEEN 1 HOUR 16 MINUTES AND 1 HOUR 30 MINUTES
6 26-30 MINUTES	6 BETWEEN 1 HOUR 31 MINUTES AND 1 HOUR 45 MINUTES
7 31-35 MINUTES	7 BETWEEN 1 HOUR 46 MINUTES AND 2 HOURS
8 36-40 MINUTES	8 OVER 2 HOURS (SPECIFY _____)
9 41-45 MINUTES	9
	0
	X DON'T KNOW/REFUSED

COMMUTER #4

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

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11. When the commuters are away from home, is there a vehicle at home that is available for evacuation during any emergency?

Col. 57	
1	Yes
2	No
3	Don't Know/Refused

12. Would you await the return of family members prior to evacuating the area?

Col. 58	
1	Yes
2	No

3 Don’t Know/Refused

---

13. How many of the vehicles that are usually available to the household would your family use during an evacuation? (DO NOT READ ANSWERS.)

COL.59
1 ONE
2 TWO
3 THREE
4 FOUR
5 FIVE
6 SIX
7 SEVEN
8 EIGHT
9 NINE OR MORE
0 ZERO (NONE)
X REFUSED

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14. How long would it take the family to pack clothing, secure the house, load the car, and complete preparations prior to evacuating the area? (DO NOT READ ANSWERS.)

COL.60
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

COL.61
1 3 HOURS TO 3 HOURS 15 MINUTES
2 3 HOURS 16 MINUTES TO 3 HOURS 30 MINUTES
3 3 HOURS 31 MINUTES TO 3 HOURS 45 MINUTES
4 3 HOURS 46 MINUTES TO 4 HOURS
5 4 HOURS TO 4 HOURS 15 MINUTES
6 4 HOURS 16 MINUTES TO 4 HOURS 30 MINUTES
7 4 HOURS 31 MINUTES TO 4 HOURS 45 MINUTES
8 4 HOURS 46 MINUTES TO 5 HOURS
9 5 HOURS TO 5 HOURS 15 MINUTES
0 5 HOURS 16 MINUTES TO 5 HOURS 30 MINUTES
X 5 HOURS 31 MINUTES TO 5 HOURS 45 MINUTES
Y 5 HOURS 46 MINUTES TO 6 HOURS

COL.62
1 DON'T KNOW

---

15. How long would it take you to clear 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.63
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

COL.64
1 MORE THAN 3 HOURS
2 DON'T KNOW

16. Would you take household pets with you if you were asked to evacuate the area?

Col. 65	
1	Yes
2	No
3	No Pets
4	Don't Know/Refused

Thank you very much. _____

(TELEPHONE NUMBER CALLED)

If requested:
For Additional information contact:

County	EMA Phone
(In Luzerne County) Luzerne County EMA	570-820-4400
(In Columbia County) PPL	866-832-3312

If there are any questions on who is funding the survey, the response should be:

PPL funded the survey to support and update the evacuation plans of the county and local municipalities. If there are any additional questions please contact PPL at 866-832-3312

ANNEX B

Code of Data Collection Standards With Notes Section

Market Research Association

P.O. Box 230 • Rocky Hill, CT 06067-0230 • 860-257-4008 • Fax: 860-257-3990

Code Approved May 1997

Notes Added September 1999

RESPONSIBILITIES TO RESPONDENTS

Data Collection Companies ...

1. will make factually correct statements to secure cooperation and will honor promises to respondents, whether verbal or written;
2. will not use information to identify respondents without the permission of the respondent, except to those who check the data or are involved in processing the data. If such permission is given, it must be recorded by the interviewer at the time the permission is secured;
3. will respect the respondent's right to withdraw or to refuse to cooperate at any stage of the study and not use any procedure or technique to coerce or imply that cooperation is obligatory;
4. will obtain and document respondent consent when it is known that the name and address or identity of the respondent may be passed to a third party for legal or other purposes, such as audio or video recordings;
5. will obtain permission and document consent of a parent, legal guardian or responsible guardian before interviewing children 12 years old or younger;
6. will give respondents the opportunity to refuse to participate in the research when there is a possibility they may be identifiable even without the use of their name or address (e.g., because of the size of the population being sampled).

Interviewers ...

1. will treat the respondent with respect and not influence him or her through direct or indirect attempts, including the framing of questions and/or a respondent's opinion or attitudes on any issue;
2. will obtain and document permission from a parent, legal guardian or responsible guardian before interviewing children 12 years old or younger. Prior to obtaining permission, the interviewer should divulge the subject matter, length of the interview and other special tasks that will be required.

RESPONSIBILITIES TO CLIENTS

Data Collection Companies ...

1. will ensure that each study is conducted according to the client's exact specifications;
2. will observe confidentiality with all research techniques or methodologies and with information considered confidential or proprietary. Information will not be revealed that could be used to identify clients or respondents without proper authorization;
3. will ensure that companies, their employees and subcontractors involved in data collection take all reasonable precautions so that more than one survey is not conducted in one interview without explicit permission from the Client
4. will report research results accurately and honestly;
5. will not misrepresent themselves as having qualifications, experience, skills or facilities that they do not possess;
6. will refrain from referring to membership in the Marketing Research Association as proof of competence, since the Association does not certify any person's or organization's competency or skill level.

RESPONSIBILITIES TO DATA COLLECTORS

Clients ...

1. will be responsible for providing products and services that are safe and fit or their intended use and disclose/label all product contents;
2. will provide verbal or written instructions;
3. will not ask our members who subcontract research to engage in any activity that is not acceptable as defined in this Code or that is prohibited under any applicable federal, state, local laws, regulations and/or ordinances.

RESPONSIBILITIES TO THE GENERAL PUBLIC AND BUSINESS COMMUNITY

Data Collection Companies ...

1. will not intentionally abuse public confidence in marketing and opinion research;
2. will not represent a non-research activity to be marketing and opinion research, such as:
    - questions whose sole objective is to obtain personal information about respondents, whether for legal, political, private or other purposes,
    - the compilation of lists, registers or data banks of names and addresses for any non-research purposes (e.g., canvassing or fundraising),
    - industrial, commercial or any other form of espionage,
    - the acquisition of information for use by credit rating services or similar organizations,
    - sales or promotional approaches to the respondent,
    - the collection of debts;
3. will make interviewers aware of any special conditions that may be applicable to any minor (18 years old or younger).

These notes are intended to help users of the Code to interpret and apply it in practice. Any questions about how to apply the Code in a specific situation should be addressed to MRA Headquarters.

RESPONSIBILITIES TO RESPONDENTS

Data Collection Companies ...

1. will make factually correct statements to secure cooperation and honor promises to respondents, whether oral or written; *Interviewers will not knowingly provide respondents with information that misrepresents any portion of the interviewing process, such as; length of the interview, scope of task involved, compensation, or intended use of the information collected.*
2. will not use information to identify respondents without the permission of the respondent, except to those who check the data or are involved in processing the data. If such permission is given, it must be recorded by the interviewer at the time the permission is secured; *Respondent information will be linked to data collected only for research purposes such as validation, evaluating data in aggregate based on demographic information, modeling. Providing respondent information is not permissible for any purpose other than legitimate research purposes as mentioned above. If anyone requests respondent identifiable information it will only be provided upon receipt of written declaration of and agreement of some intended use. Such use shall be determined by the provider to qualify as legitimate research use. (i.e. validation, planned recalls, modeling, demographic analysis.) No other use of this information falls within the boundaries of the Code. This applies to all types of respondent sample sources including client supplied lists.*
3. will respect the respondent's right to withdraw or to refuse to cooperate at any stage of the study and not use any procedure or technique to coerce or imply that cooperation is obligatory. *Respondent cooperation is strictly on a voluntary basis. Respondents are entitled to withdraw from an interview at any stage or to refuse to cooperate in a research project. Interviewers should never lead respondents to believe they have no choice in their participation.*
4. will obtain and record respondent consent when it is known that the name and addresses or identity of the respondent may be passed to a third party for legal or other purposes, such as audio or video recordings; *By documenting the respondent's consent for a defined specific use of his/ her name and address we are confirming the respondent realizes we are asking something new of them, i.e., possible participation in another research project.*
5. will obtain permission and document consent of a parent, legal guardian or responsible guardian before interviewing children 12 years old or younger; *Interviewers must take special care when interviewing children or young people. The informed consent of the parent or responsible adult must first be obtained for interviews with children.*
6. will give respondents the opportunity to refuse to participate in the research when there is a possibility they may be identifiable even without the use of their name or address (e.g., because of the size of the population being sampled.) *Respondent cooperation is strictly on a voluntary basis. Respondents are entitled to withdraw from a research project. Company policies and/or interviewer instructions should state the interviewer must give respondents the opportunity to not participate for any reason.*

Interviewers ...

1. will treat the respondent with respect and not influence him or her through direct or indirect attempts, including the framing of questions, a respondent's opinion or attitudes on any issue. *Interviewers cannot ask questions in a way that leads or influences respondents' answers, nor can they provide their own opinions, thoughts or feelings that might bias a respondent and therefore impact the answers they give.*
2. will obtain and document permission of a parent, legal guardian or responsible guardian before interviewing children 12 years old or younger. Prior to obtaining permission, the interviewer should divulge the subject matter, length of interview and other special tasks that will be required. *Interviewers must take special care when interviewing children and young people. The informed consent of the parent or responsible adult must first be obtained for interviews with children. Parents or responsible adults must be told some specifics about the interview process and special tasks, such as audio or video recording, taste testing, respondent fees and special tasks, before permission is obtained.*

RESPONSIBILITIES TO CLIENTS

Data Collection Companies ...

1. will ensure that each study is conducted according to the client's specifications; *Procedures are implemented to conform or verify that client specifications are being followed.*
2. will observe confidentiality with all research techniques or methodologies and with information considered confidential or proprietary. Information will not be revealed that could be used to identify clients or respondents without proper authorization; *Respondent information will be linked to data collected only for research purposes and will not be used for any purpose other than legitimate research. Protect the confidentiality of anything learned about the respondent and/or his or her business.*
3. will ensure that companies, their employees and subcontractors involved in data collection take all reasonable precautions so that no more than one survey is conducted in one interview without explicit permission from the sponsorship company or companies; *Company policies or procedures indicate the practice of conducting more than one survey within an interview is not done without specific permission from the relevant clients.*
4. will report research results accurately and honestly; *Describe how the research was done in enough detail that a skilled researcher could repeat the study; provide data representative of a defined population or activity and enough data to yield projectable results; present the results understandably and fairly, including any results that may seem contradictory or unfavorable.*
5. will not misrepresent themselves as having qualifications, experience, skills or facilities that they do no possess; *If regularly subcontracting data collection, should not infer to clients and prospective clients that they possess this capability "in house"; claim only legitimate academic degrees, clients and other qualifications.*
6. will refrain from referring to membership in the Marketing Research Association as proof of competence, since the Association does not certify any person's or organization's competency or skill level. *MRA does not currently have a certification program for marketing research competency, therefore while members can state their membership in the Association, they cannot claim that this automatically conveys a message of their competency to carry out the marketing research process.*

RESPONSIBILITIES TO DATA COLLECTORS

Clients ...

1. will be responsible for providing products and services that are safe and fit for their intended use and disclose/label all product contents; *It is the client's responsibility to ensure that all test products are in compliance with all safety standards and that all product contents information is provided to the data collectors. Data Collectors should request in writing all pertinent information as well as emergency numbers for respondents and themselves.*
2. will provide oral or written instructions; *To ensure the success of the research, detailed instructions are to be provided prior to the start of any project. These instructions must be written and then confirmed orally for: understanding, ability of the agency to implement and agreement to comply.*
3. will not ask our members who subcontract research to engage in any activity that is not acceptable as defined in this Code or that is prohibited under any applicable federal, state and local laws, regulations and ordinances. *All MRA Members have agreed to comply with the Code as written and thus will not agree to, or ask anyone else to, knowingly violate any of the points of the Code.*

RESPONSIBILITIES TO THE GENERAL PUBLIC AND BUSINESS COMMUNITY

Data Collection Companies ...

1. will not intentionally abuse public confidence in marketing and opinion research; *Marketing research shall be conducted and reported for the sole purpose of providing factual information upon which decisions will be made. At no time is marketing research information to be used to intentionally mislead public opinion. Instances of abuse of public confidence undermine the credibility of our Industry.*
2. will not represent a non-research activity to be marketing and opinion research, such as:
    - questions whose sole objective is to obtain personal information about respondents, whether for legal, political, private or other purposes,
    - the compilation of lists, registers or data banks of names and addresses for any non-research purposes (e.g., canvassing or fundraising),
    - industrial, commercial or any other form of espionage,
    - the acquisition of information for use by credit rating services or similar organizations,
    - sales or promotional approaches to the respondent,