

## BellBendCOLPEm Resource

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**From:** Temple, Jeffrey  
**Sent:** Thursday, October 08, 2009 9:17 AM  
**To:** Jones, Joe A  
**Cc:** BellBendCOL Resource  
**Subject:** FW: BBNPP RAI 47 File Continuation  
**Attachments:** PSP Response Enclosure pgs 41-59.pdf; PSP Response Enclosure pgs 28-40.pdf

[Bell Bend response to ETE RAIs, email # 1. jeff temple](#)

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**From:** Canova, Michael  
**Sent:** Monday, October 05, 2009 12:47 PM  
**To:** Temple, Jeffrey  
**Cc:** Chowdhury, Prosanta  
**Subject:** BBNPP RAI 47 File Continuation

[The rest of the advance copy files for this RAI.](#)

**Hearing Identifier:** BellBend\_COL\_Public  
**Email Number:** 367

**Mail Envelope Properties** (0A64B42AAA8FD4418CE1EB5240A6FED1026AAFE049)

**Subject:** FW: BBNPP RAI 47 File Continuation  
**Sent Date:** 10/8/2009 9:17:08 AM  
**Received Date:** 10/8/2009 9:17:11 AM  
**From:** Temple, Jeffrey

**Created By:** Jeffrey.Temple@nrc.gov

**Recipients:**

"BellBendCOL Resource" <BellBendCOL.Resource@nrc.gov>

Tracking Status: None

"Jones, Joe A" <jojones@sandia.gov>

Tracking Status: None

**Post Office:** HQCLSTR02.nrc.gov

<b>Files</b>	<b>Size</b>	<b>Date &amp; Time</b>
MESSAGE	283	10/8/2009 9:17:11 AM
PSP Response Enclosure pgs 41-59.pdf		1326350
PSP Response Enclosure pgs 28-40.pdf		1883869

**Options**

**Priority:** Standard

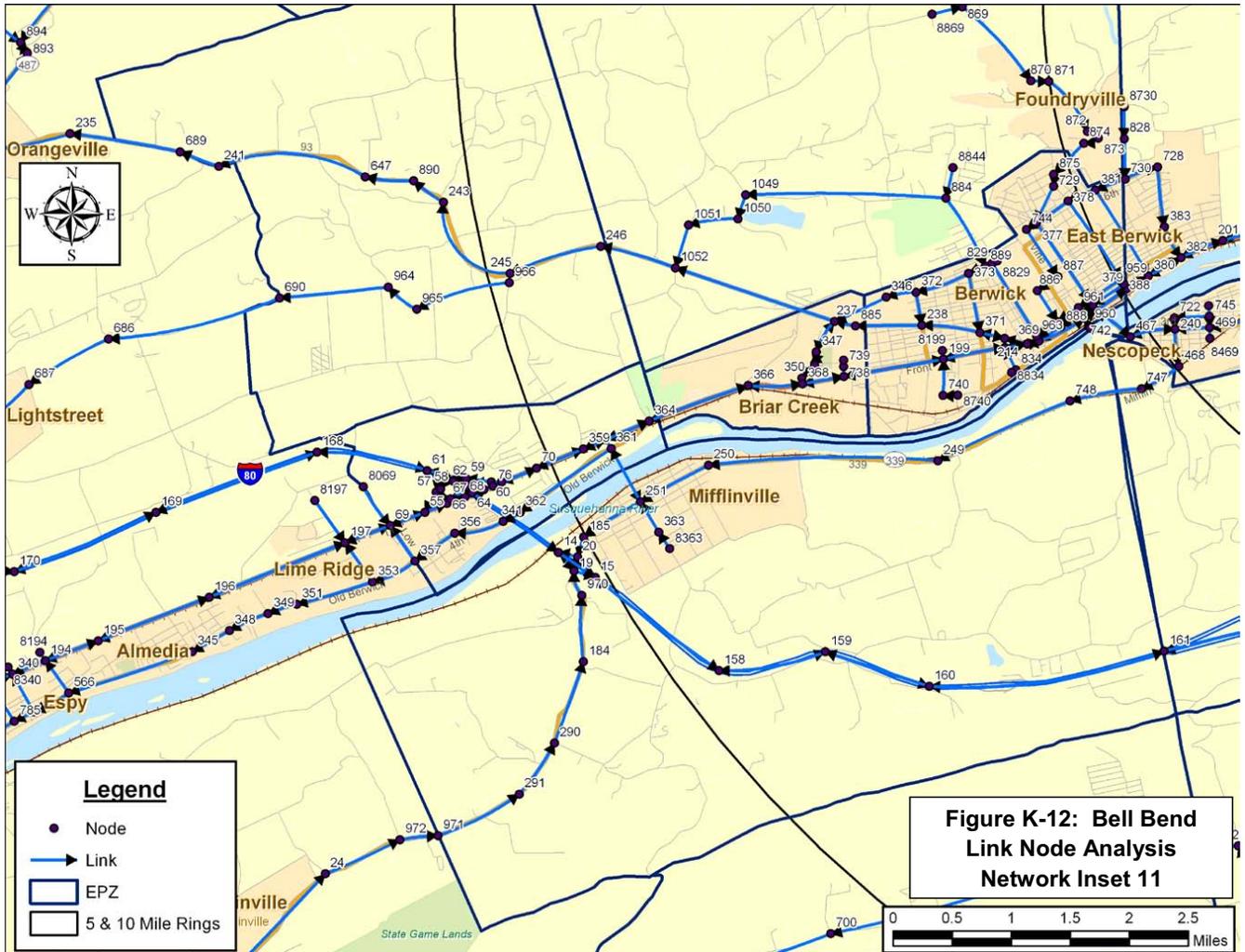
**Return Notification:** No

**Reply Requested:** No

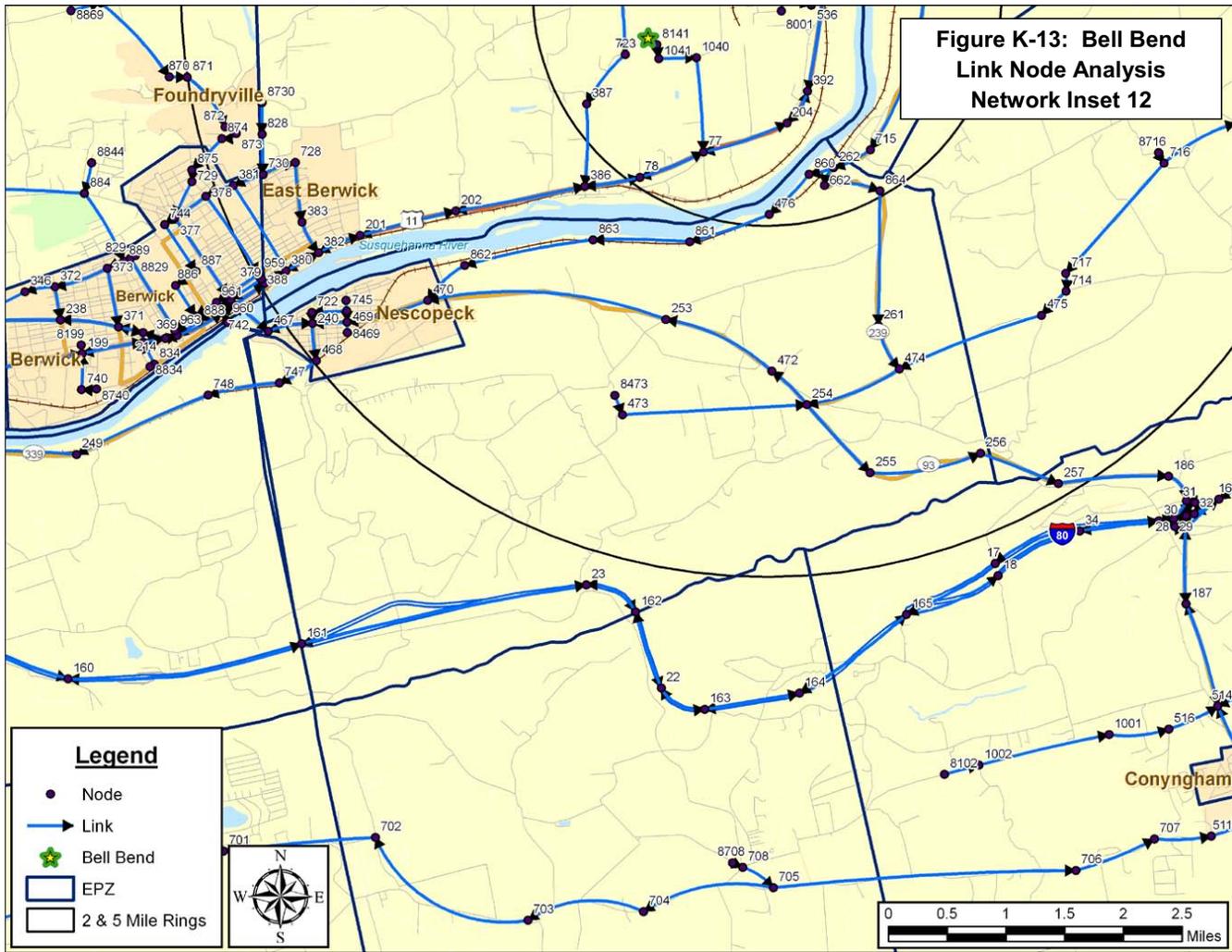
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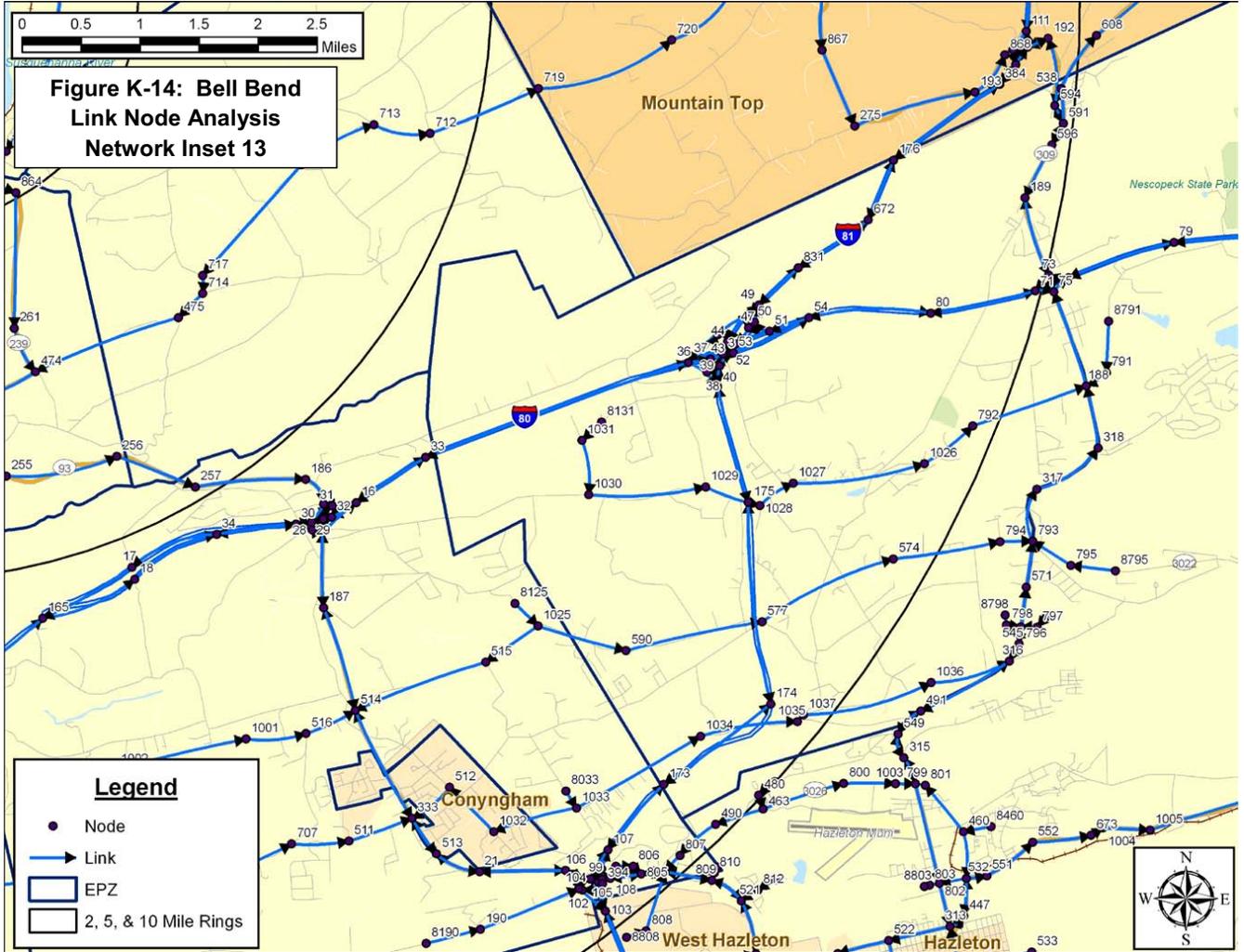
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**Recipients Received:**



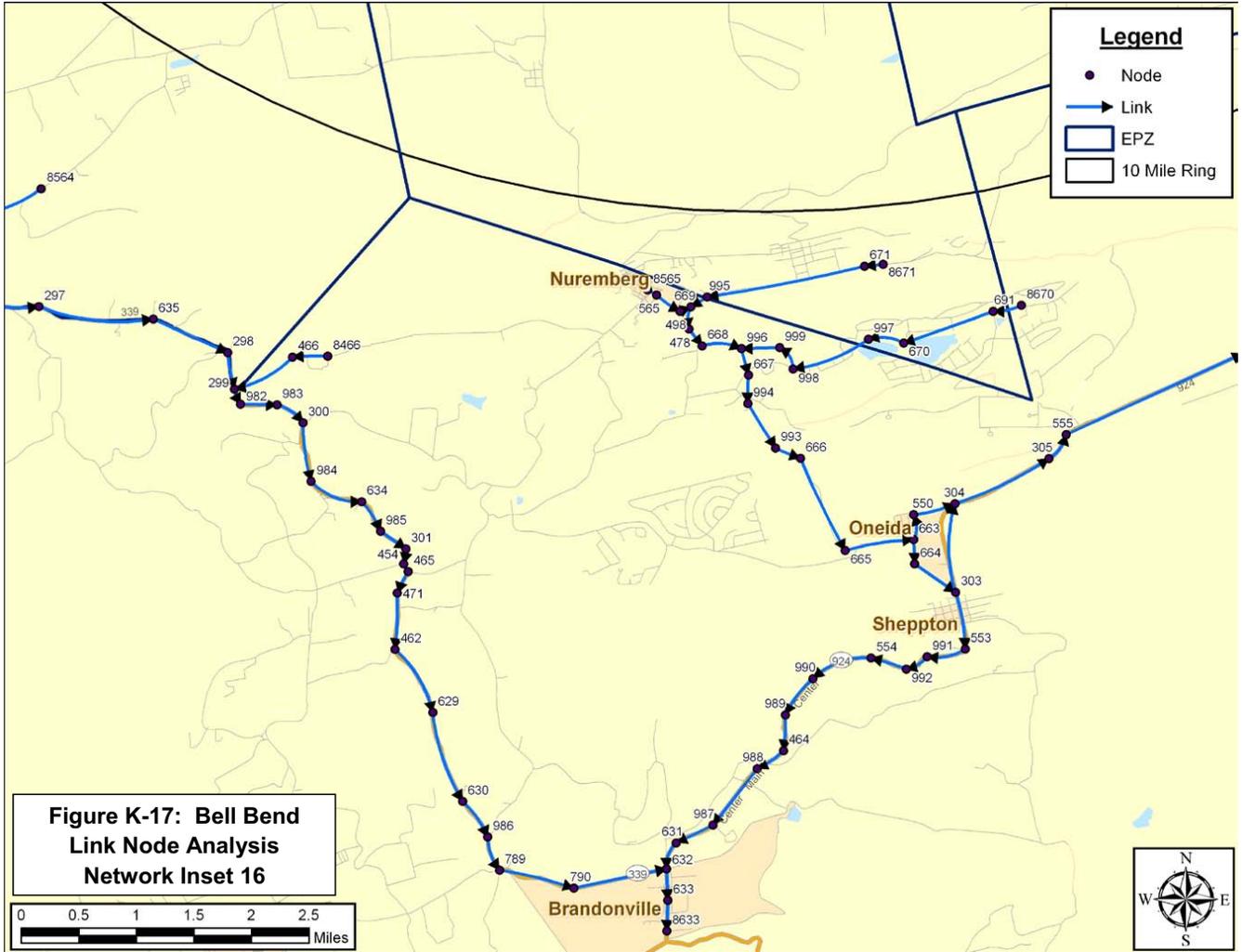
**Figure K-13: Bell Bend Link Node Analysis Network Inset 12**

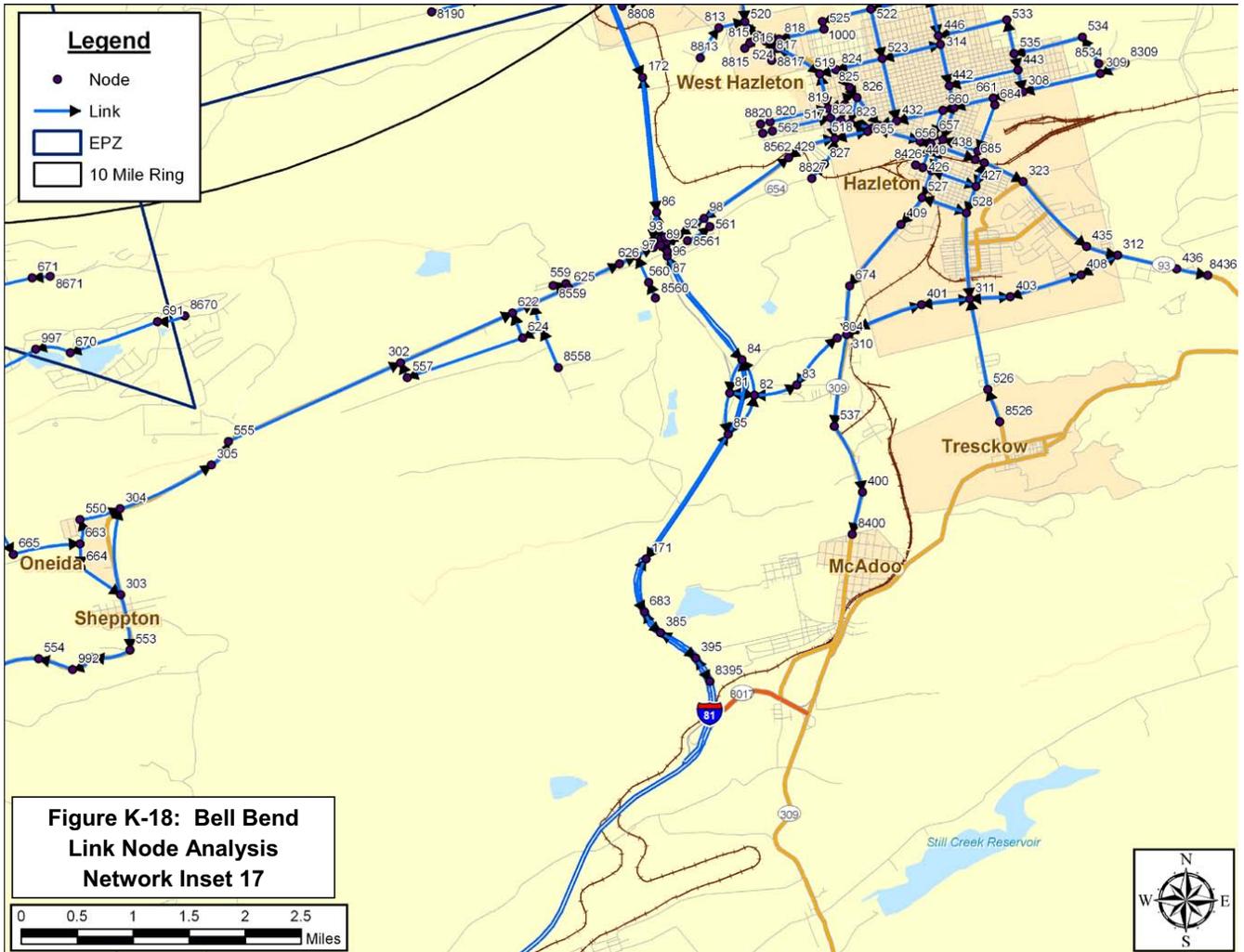


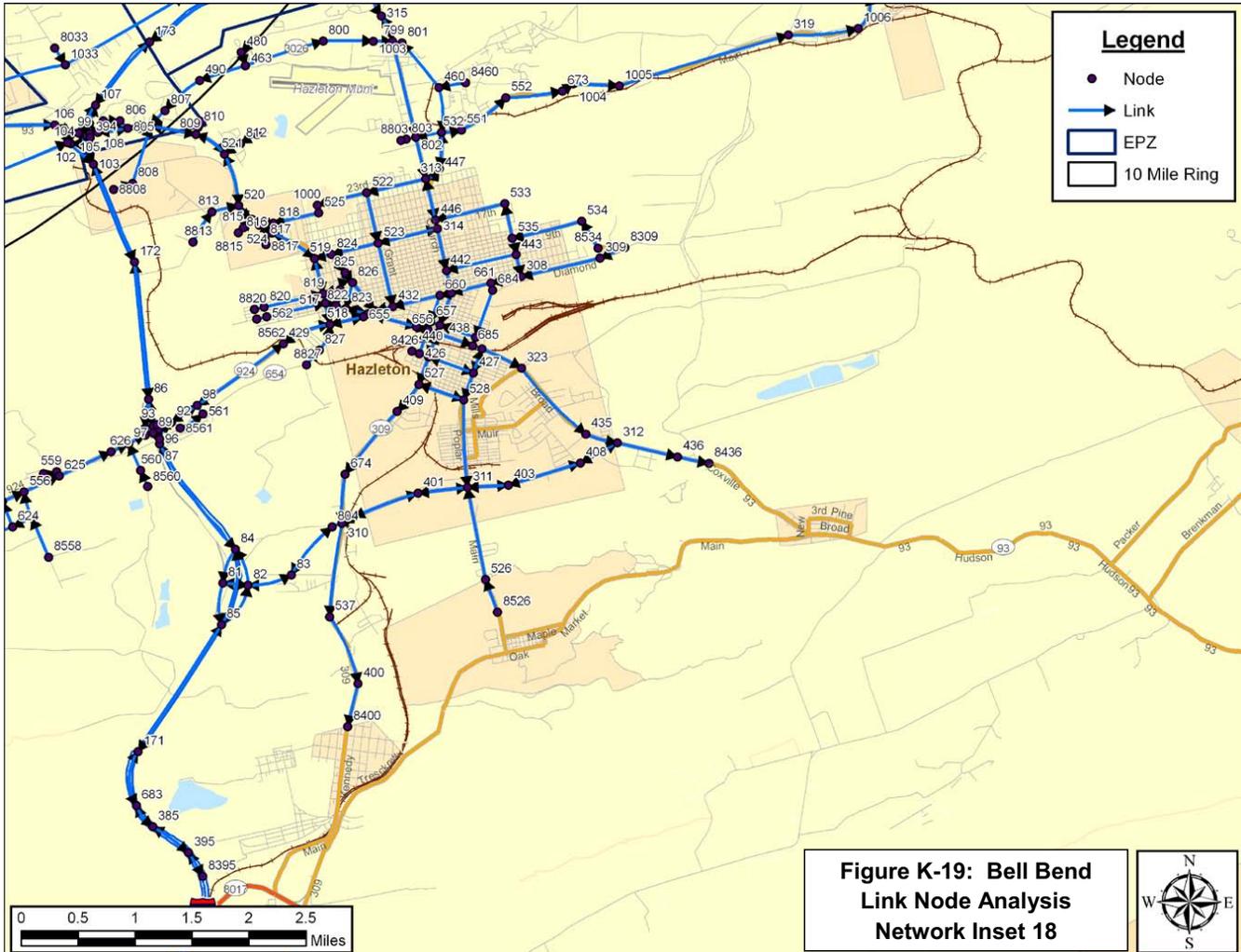












**Figure K-19: Bell Bend  
Link Node Analysis  
Network Inset 18**

**RAI No.:** 47

**Question No.:** 13.03-10 (ETE-9)

**ETE-9: Traffic Capacity, Roadway Segment Characteristics**

Acceptance Criteria: SRP Requirements A and H; Acceptance Criterion 11

Regulatory Basis: 10 CFR 52.79 (a) (21), Section IV of Appendix E to 10 CFR 50

- A. Section 4, "Estimation of Highway Capacity," states that capacity of highway sections is a function of, among other things, percent of heavy trucks. Identify the percent of heavy trucks used in the analysis for evacuation of the general public in a revision to the ETE report.

**Response**

A. It is anticipated that the presence of trucks in the traffic stream prior to the declaration of a general emergency and the advisory to evacuate could be significant. Specifically, the "through" traffic of "external-external trips" traveling through the EPZ along its major highways could include significant commercial traffic. It is assumed that this through traffic will be diverted to paths outside the EPZ after the first one and a half hours following the advisory to evacuate. It is anticipated that the evacuating traffic stream will consist primarily of passenger cars and their equivalents, (i.e., pickup trucks, SUV's, etc.), with few, if any, heavy trucks in the evacuating traffic stream.

As indicated in Exhibits 20-9 and 20-10 of the Highway Capacity Manual, the influence of heavy truck vehicles on the operational characteristics of a traffic stream declines as traffic volume increases. For example, passenger car equivalence for trucks and RV's declines from 1.7 to 1.1 for level terrain as the volume increases from negligible to above 600 passenger cars per hour. Equation 20-4 estimates the "heavy vehicle adjustment factor" which is used in the calculation of level of service (LOS). This adjustment factor is a function of the percentage of heavy vehicles in the traffic stream and the passenger car equivalent factor provided by Exhibits 20-9 and 20-10. For example, if 5% of the traffic stream consists of heavy vehicles and the passenger car equivalent factor is 1.1 for directional volumes exceeding 600 passenger cars per hour, then the heavy vehicle adjustment factor given by equation 20-4 is 0.995. That is, the influence of heavy vehicles in this example is about 0.5%, which has an immaterial affect on traffic operations. The ETE calculations therefore do not consider the presence of heavy vehicles in the traffic stream.

**COLA Impact:**

The following sentences will be added to assumption 4 in Section 2.3 in a future revision of the ETE Report:

The effect of heavy truck traffic on traffic operations during evacuation was determined to be immaterial; therefore, the presence of truck traffic is not expressly considered in calculating ETE. However, the buses used to evacuate transit dependent persons from within the EPZ are represented within the modeling process as being equivalent to two passenger car units in calculating the ETE.

**RAI No.:** 47

**Question No.:** 13.03-11 (ETE-10)

**ETE-10: Analysis of Evacuation Times, Methodology, Transit Dependent**

Acceptance Criteria: SRP Requirements A and H; Acceptance Criterion 11

Regulatory Basis: 10 CFR 52.79 (a) (21), Section IV of Appendix E to 10 CFR 50

- A. In Section 8.4, "Evacuation Time Estimates for Transit-Dependent People," Evacuation of Ambulatory Persons from Special Facilities, the average speed output by the model at 120 minutes is identified as 20.4 mph. A conservative travel distance out of the EPZ is 5 miles, corresponding to a 6 minute travel time. Explain how a 6 minute travel time was determined. Revise the ETE report as needed.
- B. Section 8.4, "Evacuation Time Estimates for Transit-Dependent People," states that bus return to the EPZ for a second wave evacuation would take 20 minutes. However, the average distance from the reception centers to the EPZ boundary is 30 miles. Explain how buses are assumed to travel 30 miles in 20 minutes. Revise the ETE report as needed.
- C. The ETE for special facilities using Emergency Medical Services (EMS) Vehicles is based on a speed of 42.9 mph at 60 minutes into the event. However, there is a mobilization time of 60 minutes and a loading time of 30 minutes for EMS vehicles, for a total of 90 minutes prior to beginning the evacuation. Discuss why the speed at 60 minutes was used instead of the speed at 90 minutes. Revise the ETE report as needed.

**Response**

**A.** The travel time for 5 miles at 20.4 mph is 14 minutes, not 6 minutes. The 6 minutes refers to the travel time to traverse 2 miles to the EPZ boundary. Since the conservative estimate of 5 miles is being used in the example, the travel time will be modified to read 14 minutes.

**B.** It is stated on page 8-7 in the first sentence under "Activity: Bus Returns for Second Wave Evacuation (G→C)," that "the buses assigned to return to the EPZ to perform a 'second wave' evacuation of transit-dependent evacuees will be those buses that evacuated the schools." Therefore, the average of the travel time to the host schools was extracted from Table 8-5. For good weather, this average was 19.9 minutes, and is highlighted at the bottom of Table 8-5A. The host schools are located much closer to the EPZ boundary than the reception centers. The average distance from the host schools to the EPZ boundary, in Table 8-5A is actually 11.2 miles (compared to the average of 30 miles to the reception centers).

C. The average speed output by the model at 90 minutes is the correct speed to use in this example. The correct speed is 33.88 mph, not 42.9 mph, which results in 9 minutes. The ETE report will be revised accordingly.

**COLA Impact:**

1. Update travel time from 6 minutes to 14 minutes, for all instances, in the discussion on page 8-8 as shown below in a future revision of the ETE Study.

Appendix E indicates that the medical facilities are 8.0 miles from the plant, on average. Thus, buses evacuating these facilities will have to travel approximately 2.0 miles to leave the EPZ; conservatively estimate the travel distance out of the EPZ as 5 miles. The average travel speed at 120 minutes (90 minutes mobilization plus 30 minutes loading time, on average) after the advisory to evacuate is 20.4 mph; thus the travel time out of the EPZ for buses evacuating special facilities is ~~6~~14 minutes. Inspection of Table 8-4 indicates that the census ranges from ~~16~~14 to ~~240~~170 patients. It is assumed that those facilities with more than 30 patients, would board multiple buses in parallel. Therefore, the maximum loading time for any facility is 30 minutes. The ETE for Zack's Rock Glen Manor, with 35 ambulatory patients, is provided as an example:

$90 + 30 + \del{6}14 = ~~126~~134 min. or ~~2:40~~15 rounded up to closest 5 minutes.$

2. Update travel speed from 42.9 mph to 33.9 mph, and increase the travel time for 5 and 10 miles to 9 and 18 minutes respectively, everywhere on page 8-9, and remove "up" from next-to-last sentence on page 8-9, in a future revision of the ETE Report, as shown below.

It is estimated that at most 60 minutes will be needed to mobilize ambulances and travel to the medical facilities. Loading time is estimated as 30 minutes. As with the buses transporting ambulatory patients, ambulances travel 5 miles, on average, to leave the EPZ. The average speed output by the model at 1 hour for Region 3, Scenario 6 is ~~42.9~~33.9 mph; thus, travel time out of the EPZ is ~~7~~9 minutes.

The ETE for ambulances is:  $60 + 30 + \del{7}9 = 1:40 (rounded to closest 5 minutes).$

Since the available ambulance resources are not sufficient for the first wave, the evacuation will require a second wave. The closest hospitals outside the EPZ are in Hazelton, Wilkes-Barre and Bloomsburg. The average travel distance to these facilities from the EPZ is estimated to be 5 miles.

The second wave ETE is computed as follows for good weather:

- Ambulance departs EPZ at 1:40 in good weather

- Travel time from EPZ boundary to host facility (5 miles at ~~42.9~~33.9mph): ~~7~~9 minutes
- Ambulance unloads (30 minutes) and driver takes a 10-minute rest: 40 minutes.
- Ambulance returns to facility: ~~14~~18 minutes (10 miles at ~~42.9~~33.9mph).
- Ambulance performs second wave evacuation: 1 hour (30 minutes loading + 10 miles at 23.1mph average speed at 3:10 after ATE)

Second wave ETE for ambulance/EMS vehicles = 1:40+0:~~07~~09+0:40+0:~~14~~18+1:00 = ~~3:45~~3:50 rounded up to nearest 5 minutes.

**RAI No.:** 47

**Question No.:** 13.03-12 (ETE-11)

**ETE-11: Analysis of Evacuation Times, Methodology, Special Facilities**

13.03-12

Acceptance Criteria: SRP Requirements A and H; Acceptance Criterion 11

Regulatory Basis: 10 CFR 52.79 (a) (21), Section IV of Appendix E to 10 CFR 50

- A. Table 8-4 uses the current facility population in determining resources needed to support an evacuation. Discuss the effect on the ETE if special facility peak capacity values are used in the analysis, and include this in a revision to the ETE report, if necessary.
- B. County plans include requirements that teachers take roll once students are loaded onto buses, and some schools have large enrollments, such as Valley Elementary/Middle School, (1,109 students). Information is needed to support a bus loading time of 5 minutes. Discuss the assumptions and logistics for queuing buses, loading students, taking roll, and departing the school in 5 minutes in a revision to the ETE report.

**Response**

**A.** It is assumed that subsequent to the Advisory to Evacuate, offsite agencies will contact the special facilities to ascertain the transportation resources needed and will assign them accordingly. The county emergency plans suggest that as the lead agencies to assign transportation resources to these facilities, they will conduct a census during the emergency to assign resources.

As indicated in the updated Table 8-4 the overall occupancy rate is about 80 percent. The effect of the using peak facility capacity as opposed to the census data would increase number of transportation resource requirements by about 25 percent. This increase could require a two-wave evacuation; these ETE are presented on Page 8-9.

**B.** The evacuation time estimates provided in Tables 8-5 are *average* values. Since an emergency is an unscheduled event it must be expected that buses will be dispatched to the schools as soon as drivers arrive at the depot and are briefed. This protocol is at a sharp variance with normal conditions when dismissal times are known and a convoy of buses descends upon the school at the appropriate times to service all of the students. Consequently it is expected that buses will arrive at the schools as soon as possible; they will be loaded shortly after arrival and then depart to the host facility as quickly as possible. As a result it is not expected that the larger schools will experience long queues of buses lined up and a flood of students flowing towards these buses over a

short time frame. Concern expressed in the comment is certainly legitimate but should not apply during an emergency evacuation.

Given this scenario, it should be expected that some drivers will mobilize more rapidly than others; the buses will arrive over some time frame and the ETE values will of course vary from one bus to another. It is not practical to quantify the range of ETE times for each school; therefore the approach taken is to estimate the average evacuation times based upon conservative estimates of driver mobilization.

The bus loading time of 5 minutes is a representative value *per bus*. The basis for this estimate is Exhibit 27-9 in the HCM. As indicated there, passenger boarding headway is 2.0 sec. on average. Seventy passengers translates to under 2.5 minutes and a factor of 2 yields 5 minutes. A subsequent roll call taken while the bus is in transit does not affect the ETE. The estimate of buses in the ETE report is conservative since no allowance has been made for students picked up by their parents prior to arrival of the buses. Likewise, no allowance was made for high school students who drive their own cars and would not require bus transport. Therefore the number of buses and bus ETE for evacuating school children remain reasonable estimates as presented in Tables 8-5. The ETE report will be revised by adding text after the final paragraph on page 8-5 to describe the expected evacuation process as discussed above.

#### **COLA Impact:**

1. Replace Table 8-4 with the attached table in a future revision of the ETE Report
2. Update the first paragraph under section 8.2 as shown below in a future revision of the ETE Report.

#### **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. The column in Table 8-2 entitled “Bus Runs 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.
- Bus capacity, expressed in students per bus, is set to 70 for primary schools and 50 for middle and high schools.
- Those staff members who do not accompany the students will evacuate in their private vehicles.
- No allowance is made for student absenteeism that is in the neighborhood of 3 percent, daily.

- No allowance was made for high school students who drive their own cars and would not require bus transport
3. Update discussion in last paragraph in page 8-5 as shown below in a future revision of the ETE Report.

Activity: Board Passengers (C→D)

Studies have shown that passengers can board a bus at headways of 2-4 seconds (Ref. HCM Page 27-10). Therefore, for a bus with a maximum capacity of 70 passengers, the total dwell time to service boarding passengers at a single stop (e.g., at a school) is about 5 minutes.

~~Studies have shown that passengers can board a bus at headways of 2-3 seconds per passenger (Ref. HCM2000 Exhibit 27-9 and page 27-36). Therefore, the total dwell time to service passengers boarding a bus to capacity at a single stop (e.g., at a school or at a pickup point) is about 5 minutes, allowing for a slower boarding rate for people carrying luggage (50 persons @ 6 seconds). A loading time of 10 minutes will be used for rain scenarios. For multiple stops along a pick-up route, an allowance must be made for the additional delay associated with stopping and starting at each pick-up point. This additional delay to service passengers expands this estimate of boarding time to 30 minutes in good weather, and 40 minutes in rain.~~

Table 8-4 Special Facility Transit Demand										
Distance (miles)	Direction	Facility Name	Street Address	Municipality	Phone	Capacity	Census	Ambulances Needed	Buses Needed	Vans Needed
<b>LUZERNE COUNTY</b>										
3.8	E	Johnson Personal Care Home	897 Hobbie Rd	Wapwallopen	(570) 379-3673	18	16	0	0	2
5.9	E	Sunny Knoll (Sugarloaf township)	11 Pecora Road	Drums	(570) 788-4448	22	22	10	0	0
7.9	S	Zack's Rock Glen Manor	1894 Tomhicken Rd	Rock Glen	(570) 384-4000	35	35	2	0	2
9.6	NE	Guardian Elder Care Center	147 Old Newport St	Nanticoke	(570) 735-7300	110	91	11	1	16
9.6	SE	Fritzingertown Senior Living Community	1162 South Old Turnpike Rd	Drums	(570) 788-4178	248	170	11	2	5
10.3	NE	Mercy Special Care Hospital	128 W Washington St	Nanticoke	(570) 735-5000	94	94			
10.3	NW	Bonham Nursing Center	477 Bonnieville Rd	Stillwater	(570) 864-3174	77	71	0	0	0
10.4	NE	Northeast Counseling	West Washington St	Nanticoke	(570) 735-7590	18	16	0	0	0
10.4	NE	West Ridge Personal Care Home	541 South Hanover St	Nanticoke	(570) 735-6898	20	14	1	1	0
10.5	E	Butler Valley Manor Home	463 N. Hunter Hwy	Drums	(570) 788-4175	37	36	10	0	5
10.8	NE	Birchwood Nursing Home	395 East Middle Rd	Nanticoke	(570) 735-2973	121	120	2	1	12
10.9	NE	Villa Personal Care	50 N. Walnut St	Nanticoke	(570) 735-8080	68	49	0	1	0
<b>COLUMBIA COUNTY</b>										
4.5	W	Berwick Hospital Center	701 E 16th St	Berwick	(570) 759-5000	101	59	5	2	0
4.5	W	Berwick Retirement Village	801 E 16th St	Berwick	(570) 759-5400	240	162	2	3	5
5.0	WSW	Elmcroft Of Berwick	2050 West Front St	Berwick	(570) 759-3155	76	61	20	0	2
<b>Total</b>						<b>1,285</b>	<b>1,016</b>	<b>74</b>	<b>11</b>	<b>49</b>

**RAI No.:** 47

**Question No.:** 13.03-13 (ETE-12)

**ETE-12: Other Requirements, Confirmation of Evacuation**

Acceptance Criteria: SRP Requirements A and H; Acceptance Criterion 11

Regulatory Basis: 10 CFR 52.79 (a) (21), Section IV of Appendix E to 10 CFR 50

- A. Section 12, "Confirmation Time," provides a time estimate for confirmation of the evacuation; however, the process provided is a suggested alternative. Discuss whether the counties have agreed with the ETE plans for confirmation of evacuation using a telephone survey approach. Revise the ETE report as needed.
- B. Discuss whether the time required to obtain telephone numbers of residents has been included in the time estimate. Revise the ETE report as needed.

**Response**

**A.** Section 12 of the ETE Report provides a recommended methodology for evacuation confirmation to be performed by the EPZ counties. The ETE Report was reviewed by the counties and their comments incorporated into the report. They did not express any comments related to the use of the telephone survey for confirmation time nor any decision made regarding the actual confirmation methodology to be used. The suggested approach can be complemented by dispatching ground based vehicles with public address systems, but this is a state/local planning issue and outside the scope of the ETE. The purpose of including the proposed approach in the ETE was to provide an estimate of the time required to conduct the confirmation, using a method that does not rely on first responded assets. The inclusion of an estimated confirmation time is required by Section V of NUREG-0654, FEMA-REP-1, Rev. 1, App.4, p. 4-10.

**B.** If this method is indeed used by Columbia and Luzerne Counties, it is recommended that a list of telephone numbers within the EPZ be available in their Emergency Operation Center (EOC) at all times. Such a list can be purchased from vendors and archived, and should be periodically updated. As indicated in the third paragraph on Page 12-1, the confirmation process should not begin until 3 hours after the Advisory to Evacuate, to ensure that most households have had enough time to mobilize and to start their evacuation travel. The time required to obtain telephone numbers of residents has been included in the time estimate. Assuming a call list has already been archived, this timeframe will enable telephone operators to arrive at their workplace, access the call list and prepare to make the necessary phone calls.

**COLA Impact:**

The BBNPP COLA will not be revised due to this RAI response.

**RAI No.:** 47

**Question No.:** 13.03-14 (ETE-13)

**ETE-13: Other Requirements, Draft Review**

Acceptance Criteria: SRP Requirements A and H; Acceptance Criterion 11

Regulatory Basis: 10 CFR 52.79 (a) (21), Section IV of Appendix E to 10 CFR 50

Appendix G, "Traffic Management," states that there are likely to be concerns about manpower and equipment shortages. The county and local municipal emergency plans have more traffic control points distributed very differently than the traffic control plan in Appendix G. Discuss whether State and local organizations reviewed the ETE report and provided any comments or concerns. Revise the ETE report as needed.

**Response**

KLD Associates presented a summary of the ETE study, including the proposed methodology and key assumptions, to representatives from PPL Susquehanna LLC, Columbia County, Pennsylvania Emergency Management Agency (PEMA) and UniStar Nuclear on October 9, 2008. Counties were requested to review Sections 3, 7, 8 and Appendices E and G of the ETE Report.

Following the October 9 conference call, the recording was provided to Luzerne County to update them on the ETE as well as allow opportunity to comment.

On October 9, 2008, an e-mail from Columbia County did not raise any questions about Appendix G after reviewing the report. In an e-mail on October 10, 2008, Luzerne County also did not raise any questions or comments on Appendix G. In an e-mail on October 10, 2008, PEMA did not have any comments or questions regarding Appendix G.

County plans will be updated to the future revision of the ETE upon Susquehanna Steam Electric Station's adoption of the future revision of the ETE Report or prior to Bell Bend Nuclear Power Plant operation.

**COLA Impact:**

The BBNPP COLA will not be revised due to this RAI response.

**RAI No.:** 47

**Question No.:** 13.03-9 (ETE-8)

**ETE-8: Traffic Capacity, Evacuation Roadway Network**

Acceptance Criteria: SRP Requirements A and H; Acceptance Criterion 11

Regulatory Basis: 10 CFR 52.79 (a) (21), Section IV of Appendix E to 10 CFR 50

- A. Figure 1-2, "SSES/Bell Bend Link-Node Analysis Network," shows the nodes used in the analysis, but the nodes are not labeled to correspond to Appendix K, "Evacuation Roadway Network Characteristics." Provide a map in a revision to the ETE report that includes legible node numbers that correspond to Appendix K.

**Response**

Due to the scale of Figure 1-2, the node labels and link directional arrows were removed for clarity. Figure 1-2 will be divided into several figures in Appendix K in a future revision of the ETE report, which will show the directional arrows and annotate the nodes within the link-node analysis network. The reference to Figure 1-2 in Section 1.3 will be revised to reference the newly added figures in Appendix K; these newly added figures are attached to this response.

**COLA Impact:**

1. Rename Appendix K to "Evacuation Roadway Network" in a future revision of the ETE Report
2. Update the title of Appendix K on page ii of the Table of Contents in a future revision of the ETE Report
3. The following text will be added to page K-1 in a future revision of the ETE Report:

As discussed in Section 1.3, a computerized link-node analysis network was constructed to model the evacuation 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 18 more detailed figures (Figures K-2 through K-19) 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 June 2008. Table K-1 lists the characteristics of each roadway section modeled in the ETE analysis. Each link is identified by its upstream and downstream node numbers. These node numbers can be cross-referenced to Figures K-1 through K-19 to identify the geographic location of each link.

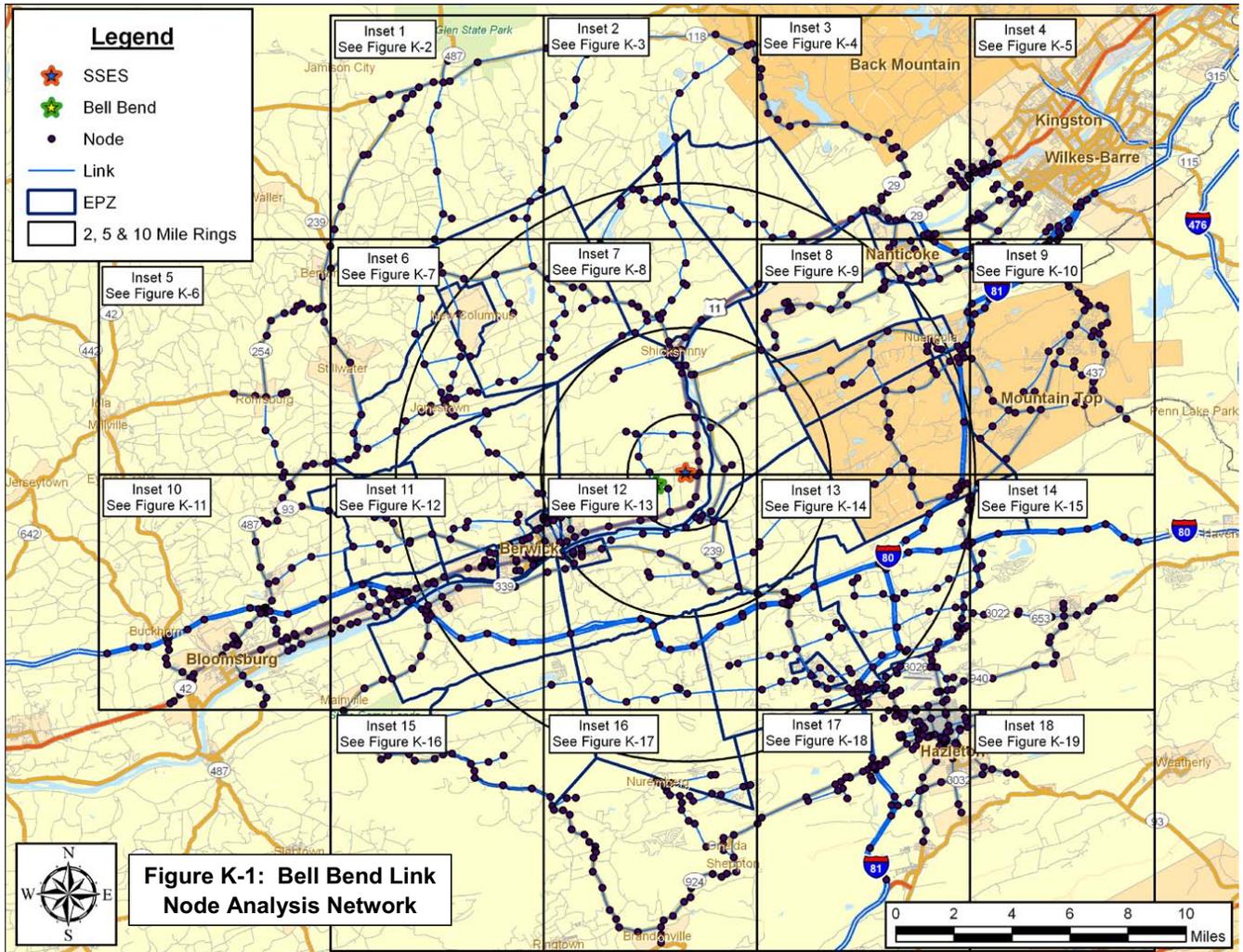
4. Insert new figures K-1 through K-19 into Appendix K in a future revision of the ETE Report.
5. Modify the last paragraph in the subsection, "Field Surveys of the Highway Network" to read in a future revision of the ETE Report:

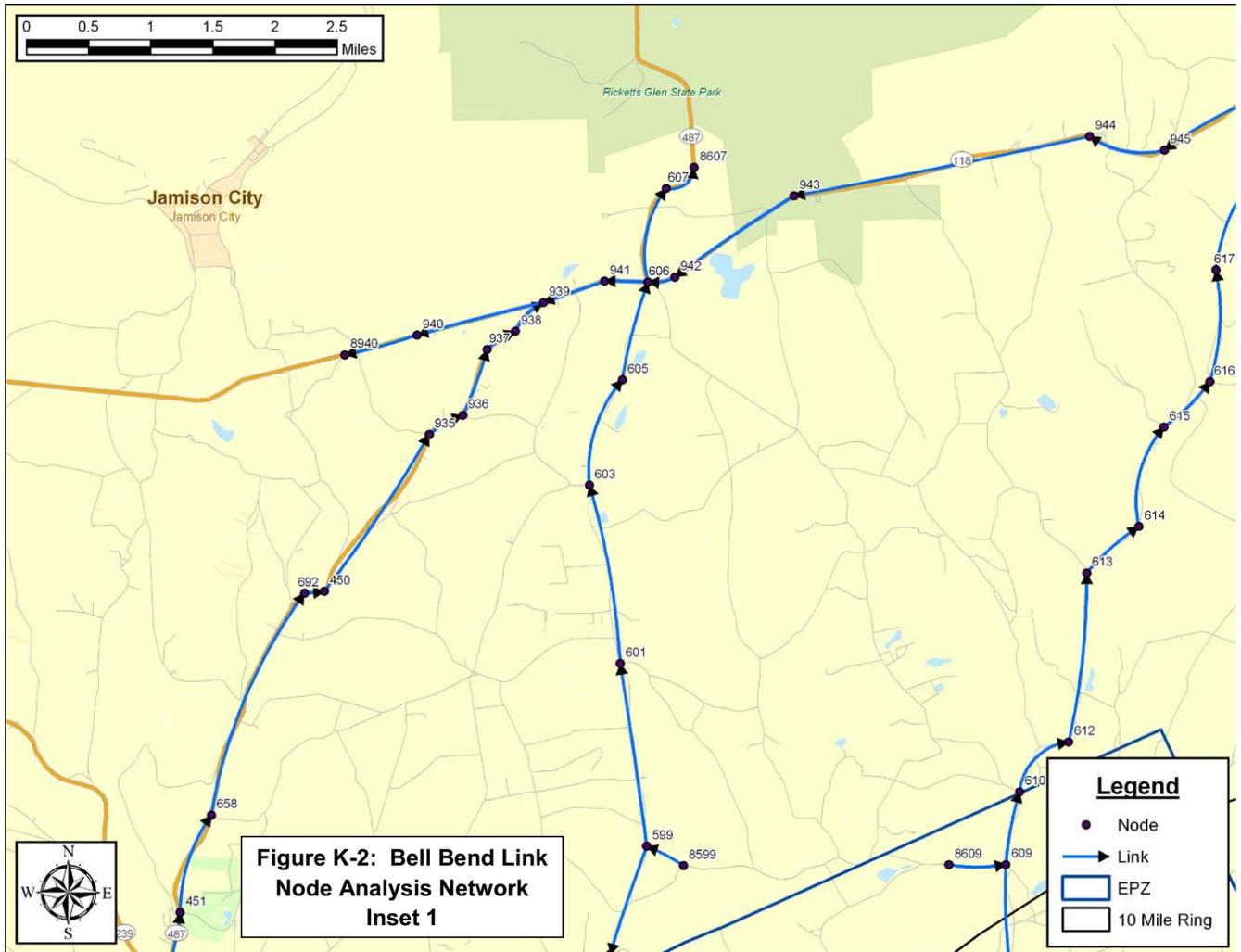
As documented on page 20-3 of the HCM2000, the capacity of a two-lane highway is 1700 passenger cars per hour for each direction of travel. For freeway sections, a value of 2250 vehicles per hour per lane is assigned. The road survey has identified several segments which are characterized by adverse geometrics which are reflected in reduced values for both capacity and speed. These estimates reflect the service volumes for LOS E presented in HCM Exhibit 12-15. These links may be identified by reviewing Appendix K. Link capacity is an input to DYNEV which calculates the ETE. The locations of these sections may be identified by reference to the large-scale map of Figure 1-2 maps in Appendix K which is are discussed below.

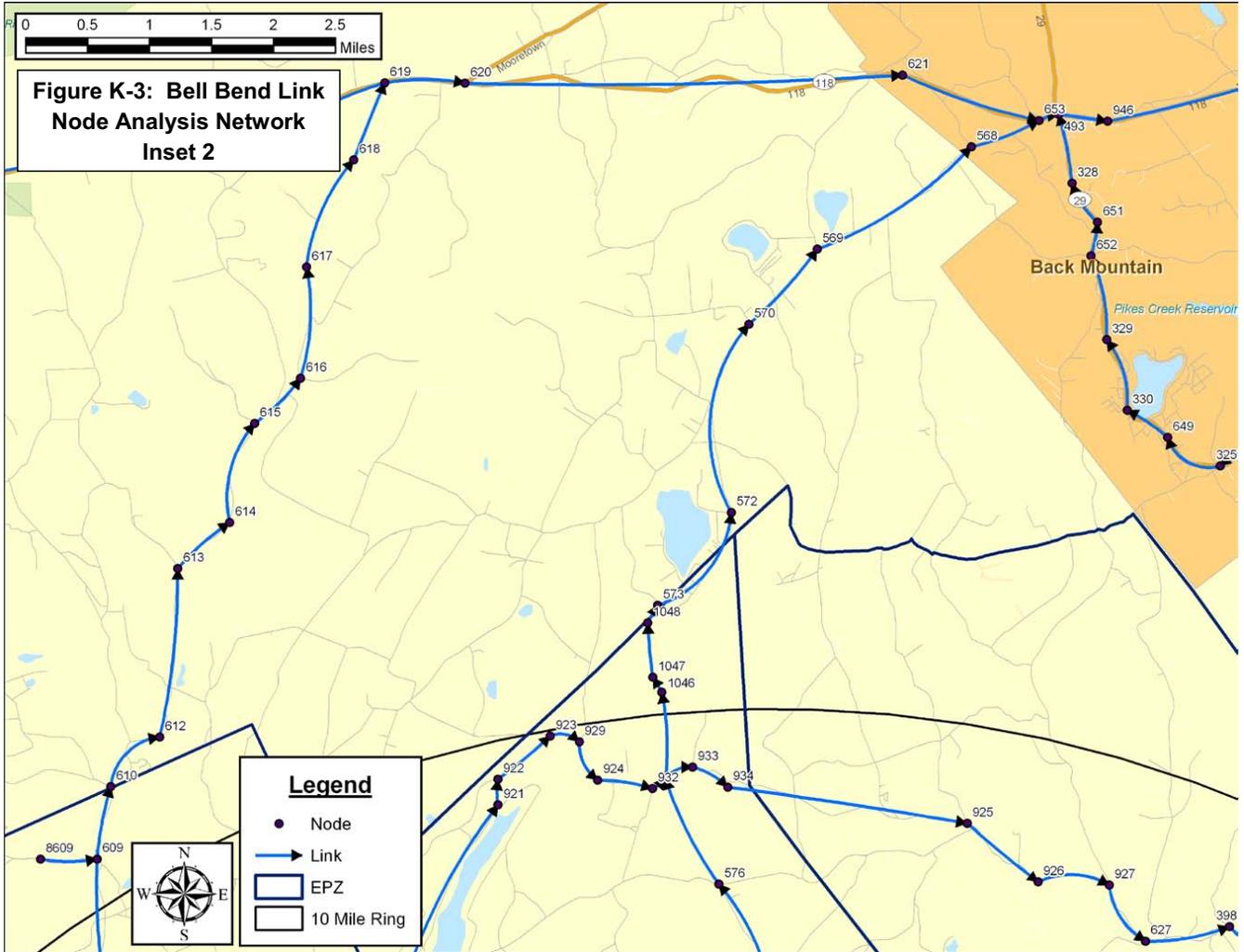
6. Replace the last paragraph on page 1-6 with the following in a future revision of the ETE Report:

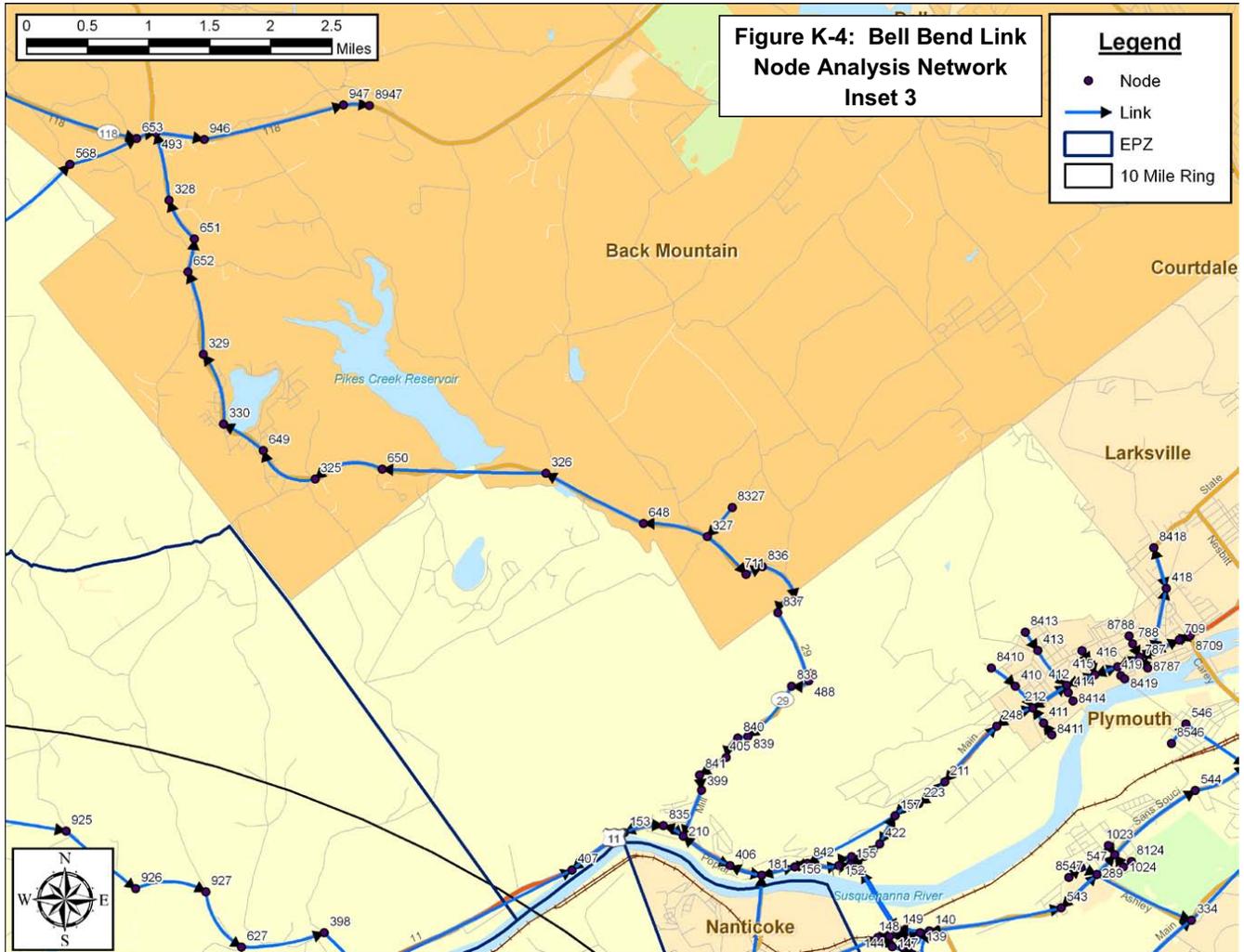
~~Given the scale of Figure 1-2, it is not feasible to identify the links and nodes to enable the reader to relate to the information presented in Appendix K. Therefore, an annotated map is provided in electronic format which can be printed at a suitable scale, if desired.~~

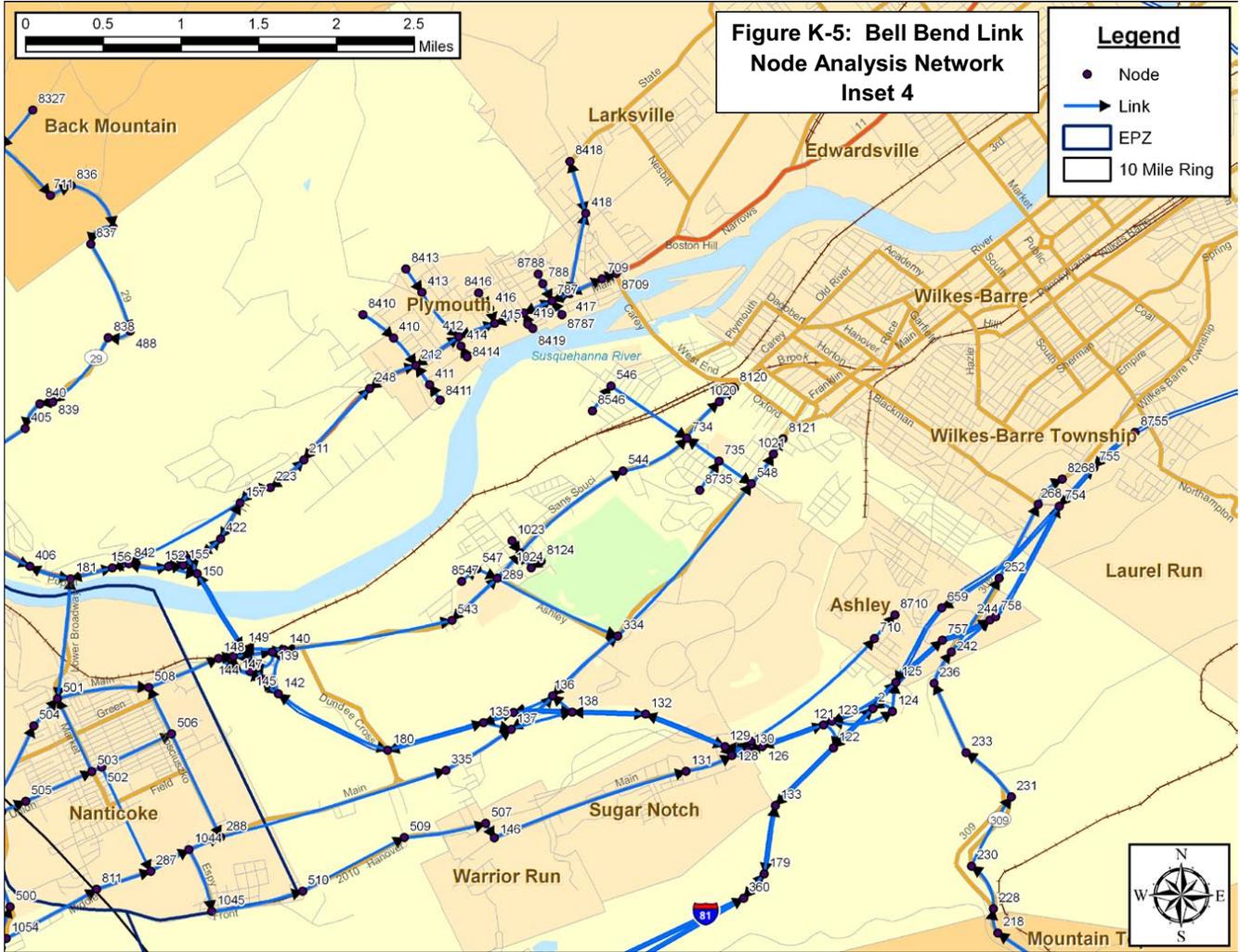
Figure 1-2 presents the link-node analysis network that was constructed to model the evacuation roadway network in the EPZ and Shadow Region. The directional arrows on the links and the node numbers have been removed from Figure 1-2 for clarity. The detailed figures K-2 through K-19, provided in Appendix 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.

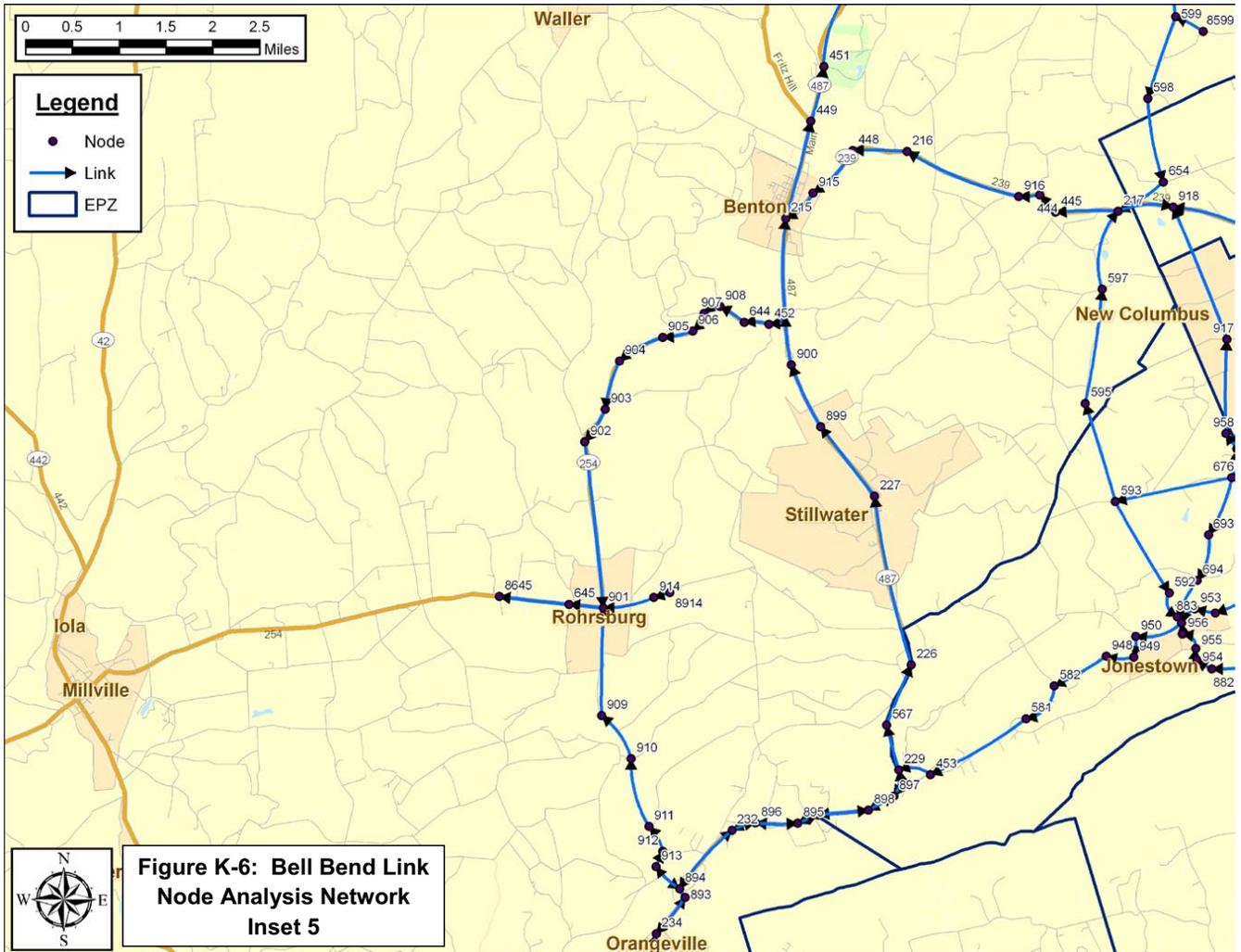


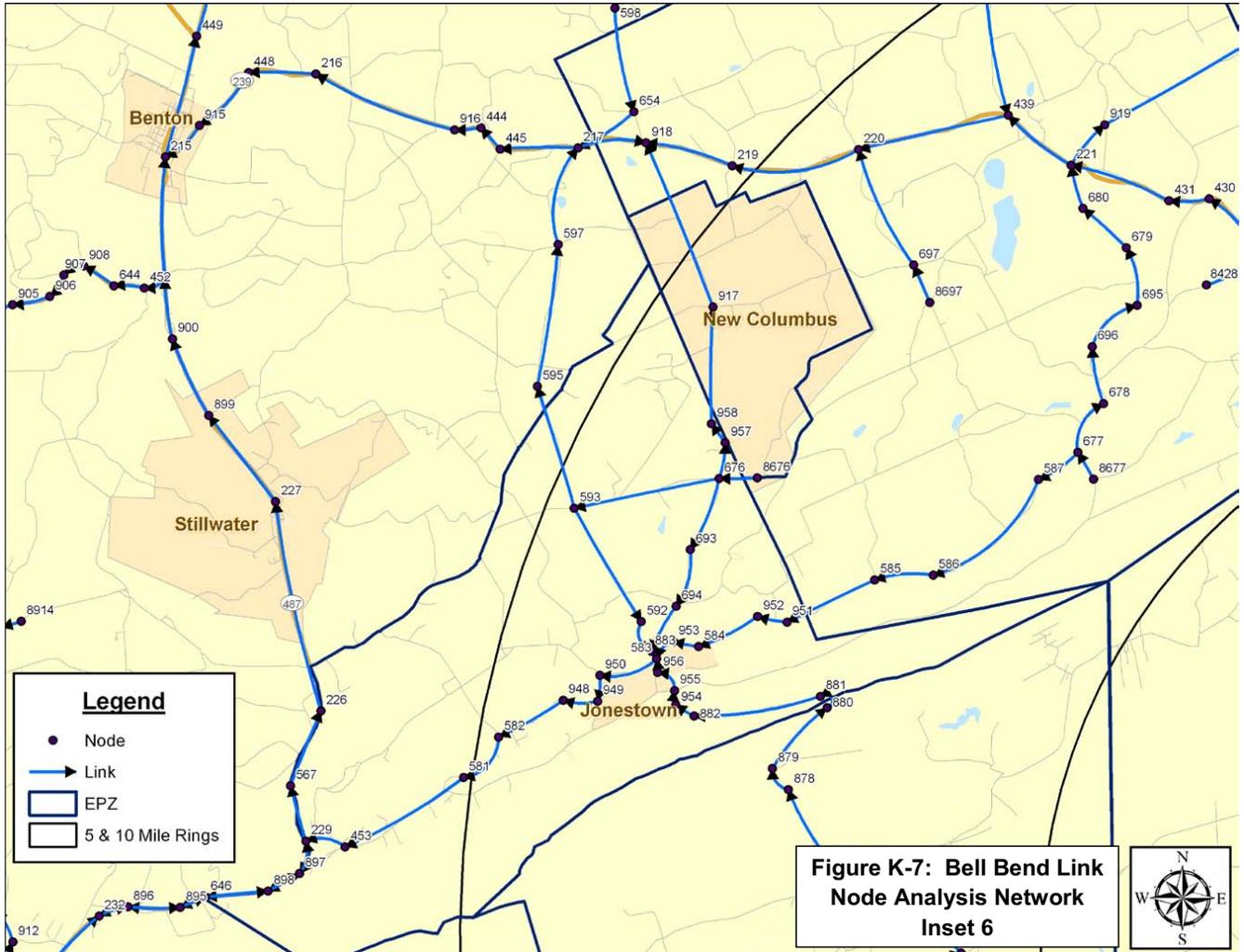












**Figure K-7: Bell Bend Link  
Node Analysis Network  
Inset 6**

**Figure K-8: Bell Bend Link Node Analysis Network Inset 7**

