Large Filing Separator Sheet

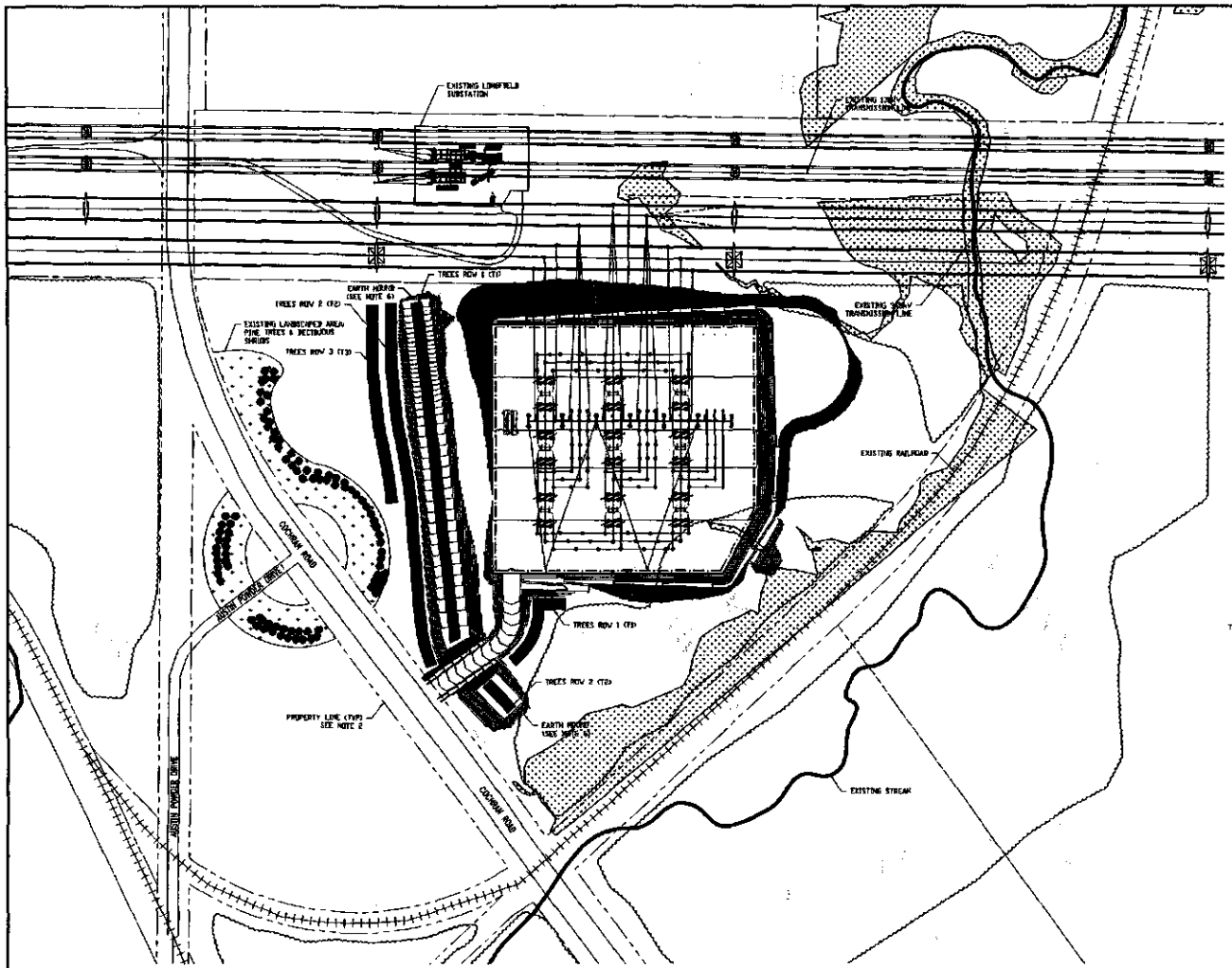
Case Number: 12-1727-EL-BSB

File Date: 2/13/2012

Section: 2 of 4

Number of Pages: 200

Description of Document: Exhibit

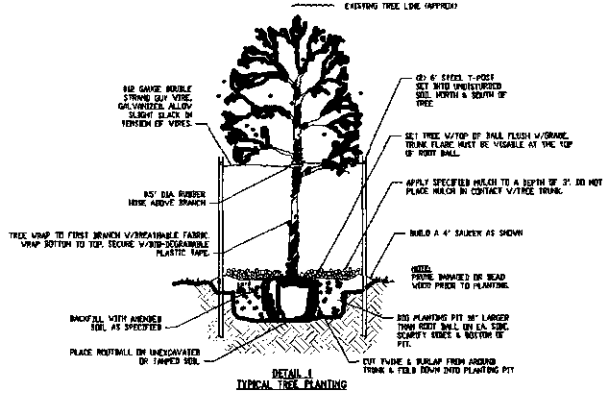


NOTES:

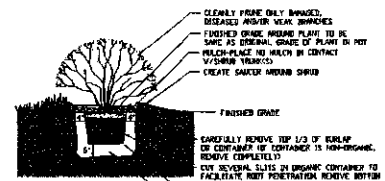
1. EXISTING CONTOUR DATA FROM USGS TOPOGRAPHIC MAPPING SERVICES. MAJOR CONTOURS ONLY SHOWN (5' INTERVALS).
2. PROPERTY LINES, ROADWAYS AND STREAMS SHOWN FROM AVAILABLE PUBLIC GIS INFORMATION.
3. RE-SEED DISTURBED SLOPES NOT RECEIVING CRUSHED ROCK SURFACING AS SPECIFIED.
4. LANDSCAPING PLAN IS PRELIMINARY. LOCATIONS OF PLANTINGS TO BE FINALIZED WITH FINAL SITE LAYOUT AND DESIGN.
5. SITE WORK AND NEW CONTOURS SHOWN ARE BASED ON PRELIMINARY INFORMATION AND WILL CHANGE WITH FINAL SITE LAYOUT AND DESIGN. STORMWATER MANAGEMENT PROVISIONS (DITCHES, RETENTION BASINS, ETC.) ARE SHOWN AS PRELIMINARY.
6. TREES (AS SHOWN) TO BE PLANTED ON EARTH MOUNDING EXCESS CUT MATERIAL MAY BE USED FOR MOUNDING APPROXIMATE LOCATIONS SHOWN.
7. NO GEOTECHNICAL INFORMATION AVAILABLE AND PRELIMINARY SITE LAYOUT DOES NOT CONSIDER FINDINGS OF SUCH REPORT.
8. NO ENVIRONMENTAL STUDIES AVAILABLE AND PRELIMINARY SITE LAYOUT DOES NOT CONSIDER POTENTIAL IMPACTS TO WETLANDS OR OTHER CULTURAL RESOURCES.

LEGEND:

- EXISTING MAJOR CONTOUR
- PROPOSED FENCE
- PROPERTY LINE
- RAILROAD
- SHRUBS
- TREES
- EXISTING TREE LINE (APPROX)



DETAIL 1
TYPICAL TREE PLANTING



SPECIFICATIONS:
1. TOPSOIL MIX AS SPECIFIED
2. WATER THOROUGHLY AFTER INSTALLATION.
3. EXCAVATE ENTIRE SHRUB BED AS SHOWN ON PROJECT DRAWINGS.

NOTES:
1. INSTALLATION TO BE COMPLETED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.

DETAIL 2
TYPICAL SHRUB PLANTING

LANDSCAPE PLANT SCHEDULE:

TREES

KEY	QUANTITY	BOTANICAL NAME	COMMON NAME	POT	SIZE	COMMENTS	MATURE HEIGHT/SPREAD
VT	16/19	Pinus strobus	EASTERN WHITEPINE	B & B	8'-10'	30'-35' O.C. SPACING	75-100'/30-75'
NS	13/13	Picea abies	NORWAY SPRUCE	B & B	8'-10'	30'-35' O.C. SPACING	60-80'/25-30'
AV	12/24	Thuja occidentalis	AMERICAN ARBORVITAE	B & B	8'-10'	30'-35' O.C. SPACING	50-70'/20-30'
JC	12/24	Juniperus virginiana	RED CEDAR	B & B	6'-8'	20'-25' O.C. SPACING	50'-70'/20'-30'
RM	15/21	Acer rubrum	RED MAPLE	B & B	8'-10'	30'-35' O.C. SPACING	60'-90'/40'-70'
SM	13/18	Acer saccharum	SUGAR MAPLE	B & B	8'-10'	30'-35' O.C. SPACING	75'-100'/50'-70'
FG	13/21	Cornus florida var. rubra	PINK FLOWERING DOGWOOD	B & B	6'-8'	20'-25' O.C. SPACING	30'-50'/20'-30'
RO	12/21	Quercus rubra	NORTHERN RED OAK	B & B	8'-10'	30'-35' O.C. SPACING	70'-100'/70'-80'

SHRUBS

KEY	QUANTITY	BOTANICAL NAME	COMMON NAME	POT	SIZE	COMMENTS	MATURE HEIGHT/SPREAD
CY	31/200	Taxus cuspidata	CANADA YEW	B & B	30"-36"	6' O.C. SPACING	2'-6'/3'-6'
HI	32/32	Corylus americana	HAZELNUT	B & B	30"-36"	6' O.C. SPACING	5'-12'/3'-5'
BC	32/32	Aronia melanocarpa	BLACK CHOKECHERRY	B & B	30"-36"	6' O.C. SPACING	5'-8'/3'-6'
CD	32/32	Cornus racemosa	GRAY DOGWOOD	B & B	30"-36"	6' O.C. SPACING	6'-15'/12'-18'
BM	32/32	Viburnum prunifolium	BLACKHAW	B & B	30"-36"	10' O.C. SPACING	12'-15'/8'-10'
CA	32/32	Malus sp.	CRABAPPLE	B & B	30"-36"	10' O.C. SPACING	15'-20'/12'-20'

SEEDING SCHEDULE:

TYPE 1 MIX – CUT AND EMBANKMENT FILL AREAS

BOTANICAL NAME	COMMON NAME	RATE OF PURE LIVE SEED (PLS) PER ACRE
Poa pratensis	KENTUCKY BLUEGRASS	20 LBS
Festuca rubra	CREEPING RED FESCUE	20 LBS
Lolium perenne	PERENNIAL RYEGRASS	25 LBS
Trifolium pratense	RED CLOVER	2 LBS
Lolium multiflorum	ANNUAL RYEGRASS	20 LBS

TYPE 2 MIX – SWALES/CHANNEL AREAS

BOTANICAL NAME	COMMON NAME	RATE OF PURE LIVE SEED (PLS) PER ACRE
Poa pratensis	KENTUCKY BLUEGRASS	20 LBS
Festuca rubra	CREEPING RED FESCUE	20 LBS
Lolium perenne	PERENNIAL RYEGRASS	25 LBS
Agrostis stolonifera	CARESS CREEPING BENTGRASS	10 LBS
Trifolium repens	WHITE CLOVER	2 LBS
Lolium multiflorum	ANNUAL RYEGRASS	20 LBS

NORTH

0 50' 100' 200
SCALE IN FEET

FirstEnergy
Energy Delivery Technical Services

GLENVILLOW
PRELIMINARY LANDSCAPING & GRADING PLAN

Preliminary earthwork quantities associated with site development on the Preferred Site are estimated to be approximately 110,000 cubic yards cut and approximately 25,000 cubic yards of fill. No geotechnical investigations have been performed at the site to determine if the excavated material will be suitable for fill. Efforts will be made during detailed design to utilize excess material on-site to provide additional berms/mounds for landscaping and other design features.

The topography on the Alternate Site is moderate to steep, with flat areas in the floodplain and forested area adjacent to the existing ROW. Site-specific grading and excavation plans for the Alternate Site have not been developed but would be prepared in the event the Alternate Site is Certificated by the Board.[3] Excavation and site preparation on the Alternate Site would be expected to be generally similar to that for the Preferred Site.

(c) Access Roads and Trenches

One access road approximately 320 feet in length and 20 feet in width is proposed from Cochran Road to the new switching substation on the Preferred Site. Access roads and a detailed site layout were not developed for the Alternate Site but will be prepared in the event the Alternate Site is Certificated by the Board.

(d) Stringing of Cable

Stringing of cable associated with the Project is primarily associated with construction of the transmission line connections to the substation. The transmission lines that will connect to the Project are described in a separate LON submitted to the Board in Case No. 12-1726-EL-BLN. Conductor installation for these transmission lines will be accomplished using the tension stringing method. Lightweight guy cables or ropes will be fed through the stringing sheaves of the sections of line that require stringing. Conductors will then be pulled through under sufficient tension to keep the conductor "in the air." This protects the conductor from surface damage.

Temporary guard or clearance poles will be used as a safety precaution at locations where the conductors could create a hazard to either crew members or the general public. The locations

[3] On October 12, 2012, ASTI filed a request with the Board for a waiver of the need to submit fully developed engineering information for the Alternate Site.

and heights of clearance poles will be such that the conductors are held clear of power and communication circuits, vehicular traffic, and other structures. The stringing operation will be under the observation of crew members at all times. The observers will be in radio and/or visual contact with the operator of the stringing equipment.

(e) Post Construction Reclamation

As work proceeds, the construction area will be kept clean of all rubbish and debris resulting from the work. Refuse and cleared vegetation will be properly disposed of in an approved landfill or other appropriate location. The area will be landscaped in accordance with the landscaping plan prepared as part of this Project (see Figure 4-2). A site-specific landscaping plan was not prepared for the Alternate Site; post-construction reclamation would occur in a manner similar to that of the Preferred Site.

(2) Layout for Associated Facilities

(a) Map of Associated Facilities

Figure 4-2 shows the preliminary engineering layout of the switching substation site. This figure shows the property boundary, general routes of the associated 345 kV transmission lines, fenced area of the substation, and general arrangement of the substation equipment. A site-specific engineering layout plan was not prepared for the Alternate Site; it is expected that the general layout would be similar to that of the Preferred Site.

(i) Final Grades After Construction

The Preferred Site is generally gently rolling. Some grading will be required to construct the Project, as shown in Figure 4-2. Grading will be conducted in accordance with the Stormwater Pollution Prevention Plan ("SWPPP") and associated erosion control plan submitted for the Project and the National Pollutant Discharge Elimination System ("NPDES") permit that will be obtained prior to construction.

(ii) Location of Major Structures and Buildings

A prefabricated control building approximately 26 feet by 40 feet will be installed. Proposed structures and equipment are identified in Figure 4-2 and described in Section C, Substation Equipment.

(iii) Fenced-in or Secured Areas

Based on preliminary site design, the proposed fence line will be 465 feet by 490 feet.

(iv) Overall Dimensions

The overall dimensions of the proposed substation facility on the Preferred Site, including the fenced area, equipment, and graveled area, will be approximately 475 feet by 500 feet, as shown in Figure 4-2. The proposed facility will be located on a parcel approximately 24.8 acres in size. A substation on the Alternate Site would be located on a parcel approximately 23 acres in size. Although a detailed site plan for the Alternate Site was not developed, it is expected to be similar in size to that of the Preferred Site.

(b) Reasons for Proposed Layout and Unusual Features

There are no unusual features associated with construction of the Project.

(c) Future Modification Plans

FirstEnergy's planning engineers, on behalf of ATSI, generally forecast future transmission projects in a five-year planning window. They currently have no plans for future modifications of the proposed Glenwillow Transmission Switching Substation during this planning window.

(C) TRANSMISSION EQUIPMENT

(1) Electric Transmission Line Data

Details regarding the 345 kV electric transmission lines to Glenwillow Transmission Switching Substation are provided in a separate LON submitted to the Board in Case No. 12-1726-EL-BLN.

(2) Electric Transmission Substation Data

The equipment and facilities described below will be installed within the fenced area of the switching substation.

(a) Breakers

There will be five (5) 345 kV breakers installed at the switching station. These breakers are SF_6 gas insulated, dead tank breakers.

(b) Switchgear

No switchgear will be installed at the proposed Glenwillow Transmission Switching Substation.

(c) Bus Arrangement and Structures

The Project will be initially installed as a five (5) position Ring Bus; expandable to a three (3) bay breaker and a half with six line terminations. Equipment support steel structures will be designed using structural tubing and/or folded plate tapered tubular structures. There will be one five (5) bay 345 kV A-Frame dead-end expandable to a future sixth bay. All yard structures will be ASTM A36, ASTM A500, or ASTM A572 steel hot-dip galvanized for corrosion protection. The high bus throughout the yard will be approximately 34 feet in height.

(d) Transformers

No transformers will be installed.

(e) Control Buildings

A prefabricated control building approximately 26 feet by 40 feet will be installed.

(f) Other Major Equipment

Other equipment, as used, may include surge arresters, CVTs, line traps, and disconnect switches.

(3) Gas Transmission Line Data

This section is not applicable as the proposed Project does not install gas transmission facilities.

(4) Gas Transmission Facilities

This section is not applicable as the proposed Project does not install gas transmission facilities.

(D) ENVIRONMENTAL AND AVIATION COMPLIANCE INFORMATION

(1) List and Discussion of Permits Required

The Applicant anticipates submitting a Notice of Intent ("NOI") for coverage under the Ohio Environmental Protection Agency ("EPA") General NPDES Permit for Discharges Association with Construction Activity ("General NPDES Permit"). A U.S. Army Corps of Engineers Nationwide Permit-12 is likely to be required to permit the minor wetland impacts associated with Project construction. No other permits are anticipated to be required.

(2) Description, Quantification, Characterization, Removal and Disposal of Construction Debris

As work proceeds, the site will be kept clean of all rubbish and debris resulting from the work. Debris associated with construction of the proposed switching substation is expected to consist of conductor scrap, construction material packaging, including cartons, insulator crates, conductor reels and wrapping, and used storm water erosion control materials. Clearance poles, conductor reels, and other materials with salvage value will be removed from the construction area for reuse or salvage. It is estimated that less than 200 cubic yards of construction debris will be generated from the Project. Construction debris will be disposed of in accordance with state and federal requirements in an Ohio EPA approved landfill or other appropriately licensed and operated facility.

(3) Storm Water and Erosion Controls during Construction and Restoration of Soils, Wetlands, and Streams Disturbed as a Result of Construction of the Facility

A SWPPP will be prepared and incorporated into the Construction Plans and Specifications, and shall be made available on site during construction of the Project, as required by Ohio EPA under the General NPDES Permit. The SWPPP will include the following General Conditions, at a minimum, as required by Ohio EPA.

(a) Erosion and Sediment Controls

Implementation of erosion and sediment control practices shall conform to the Ohio Department of Natural Resources Rainwater and Land Development Manual (2006); the General NPDES Permit, and any erosion and sediment control practices and standards required by the County. Streams and wetlands are not expected to be impacted. Grubbing activities will not be required.

Silt Fencing: Installation of silt fencing and/or other appropriate best management practices ("BMPs") for erosion control are expected to be needed within and adjacent to the fenced-in area, access road, and temporary soil stockpiles. Silt fencing and other BMPs will be installed and monitored in accordance with the Project SWPPP and the conditions of the General NPDES Permit.

All silt fences shall be placed as close to the contour as possible so that water will not concentrate at low points in the fence and so that small swales or depressions which may carry concentrated flows to the silt fence are dissipated along its length. Silt fence shall be placed so that eight inches of cloth are below the ground surface. Excess material shall lie at the bottom of the six-inch deep trench and the trench shall be backfilled and compacted.

Silt fence shall allow runoff to pass only as diffuse flow through the geotextile fabric. If runoff overtops the silt fence, flows under or around the ends, one of the following shall be performed, as appropriate: (1) the layout of the silt fence shall be changed, (2) accumulated sediment shall be removed, or (3) other practices shall be installed. Fence posts shall be a minimum of 32 inches in height made by 2" x 2" hardwood of sound quality. Silt fence fabric shall be ODOT Type C geotextile fabric or equivalent.

Soil Stabilization: Any disturbed areas that are expected to remain unworked for more than 21 days shall be stabilized with seed and mulched no later than 7 days after the last construction in that area.

Maintenance / Inspection: All erosion and sediment control practices shall be inspected at least once every seven days and within 24 hours after any storm event greater than 0.5 inches of rain per 24-hour period.

All BMPs shall be maintained in good working order. If a repair is necessary, ATSI will endeavor to initiate such a repair within one business day of report. Silt fencing will be inspected for depth of sediment, for tears, for assurance fabric is securely attached to the fence posts, and to assure that the fence posts are firmly in the ground. Seeded areas will be inspected for evidence of bare spots or washouts. Permanent records of the maintenance and inspection must be maintained throughout the construction period. Records shall include, at a minimum, the name of the Inspector, major observations, date of inspection, certification of compliance, and corrective measures taken.

(b) Materials Management

All materials stored on-site shall be kept in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure. Products shall be kept in their original containers with the original manufacturer's label. Manufacturer's recommendations for proper use and disposal will be followed. Material Safety Data Sheets ("MSDS") will be retained and available on-site at all times.

(4) Plans for Disposition of Contaminated Soil and Hazardous Materials Generated or Encountered During Construction

The following General Conditions will also be included in the SWPPP to address disposition of contaminated soil and hazardous materials generated or encountered during construction:

(a) Spill Prevention

1. All on-site vehicles will be monitored for leaks and receive regular preventative maintenance to reduce the chance of leakage. Petroleum products will be stored in tightly sealed containers and clearly labeled.
2. Secondary containment shall be provided for all on-site fuel storage tanks.
3. All sanitary waste will be collected in portable units and emptied regularly by a licensed sanitary waste management contractor, as required by local regulations.
4. All spills will be cleaned up immediately after discovery. Manufacturer's recommended methods for spill cleanup will be followed. Materials and equipment necessary for spill cleanup will be kept in a designated storage area on-site.
5. Spills will be reported to the appropriate government agency as required.
6. Any suspected hazardous materials encountered during construction shall be reported to the ATSI Environmental Department.

(5) Height of Tallest Anticipated Above Ground Structures and Construction Equipment within the Vicinity of Airports and Landing Strips

The height of the tallest proposed above ground structure and construction equipment is expected to be approximately 100 feet. According to the FAA's Office of Aeronautical Information Services, no FAA facilities are located within 0.5 mile of the Preferred and Alternate sites.

(6) Construction During Excessively Dusty or Excessively Muddy Soil Conditions

(a) Dust Control

The fenced-in portion of the site will be graded and covered in gravel. Dust nuisance resulting from Site activities will be minimized by the site gravel, water trucks, and other appropriate measures as necessary.

(b) Excessive Muddy Soil Conditions

Access entrances are established and maintained to a condition which will prevent tracking or flowing of sediment onto public rights of way. All sediment spilled, dropped, washed, or tracked onto public right of ways shall be removed immediately.

4906-15-05 FINANCIAL DATA

SECTION SUMMARY

This section of the Application provides information on the current and proposed ownership status of the proposed Glenwillow Transmission Switching Substation Project and estimated costs for the proposed Project.

(A) OWNERSHIP

American Transmission Systems, Incorporated ("ATSI") will construct, own, operate, and maintain the proposed transmission lines and equipment related to the Glenwillow Transmission Switching Substation Project at the proposed Preferred or Alternate Site. ATSI owns the existing 345 kV and 138 kV equipment that presently traverse the proposed sites. ATSI will also own the proposed Bruce Mansfield – Glenwillow 345 kV Transmission Line proposed in OPSB Case Number 12-1726-EL-BLN.

The Preferred Site is located on a property parcel currently owned by First Industrial Limited Partnership. ATSI signed a purchase agreement with the owner of the Preferred Site on September 28, 2012. No new or additional land rights are required. The Alternate Site is owned by Milstein Land Group, LLC. While the Alternate Site was not actively listed for sale, the landowner was willing to consider selling the property.

(B) ELECTRIC CAPITAL COST

Estimates of applicable intangible and capital costs for the proposed Glenwillow Transmission Switching Substation Project are identified in Table 5-1.

(C) GAS CAPITAL COST

This section is not applicable as the Applicant does not propose to construct, own or operate any natural gas transmission lines or facilities as part of or in conjunction with the proposed Project.

Table 5-1: Estimates of Applicable Intangible and Capital Costs			
FERC Account Number	Description	Preferred Site	Alternate Site
350	Land and Land Rights	$3,200,000	$3,200,000
353	Substation Equipment	$14,975,000	$14,975,000
	TOTAL	**$18,175,000**	**$18,175,000**

4906-15-06 SOCIOECONOMIC AND LAND USE IMPACT ANALYSIS

(A) SECTION SUMMARY

This section of the Application provides data on land use within 1,000 feet of the Preferred and Alternate Site of the proposed Glenwillow Transmission Switching Substation Project (the "Project"), including data collected from published information and on-site investigations. The Preferred and Alternate sites are both located on vacant parcels classified as Commercial Vacant Land and zoned by the Village of Glenwillow as Industrial District A. This section also provides descriptions of the anticipated impacts of constructing the Project, the public interaction program for the Project, information on health, safety, and aesthetic aspects of the Project, and data on noise associated with constructing and operating the Project.

(B) SOCIOECONOMIC CHARACTERISTICS

A study of the general socioeconomic characteristics of the Glenwillow Switching Substation Project area was conducted as part of this Application. The study is summarized below and was based on review of available U. S. Census Bureau data and materials available from state and local governmental agencies.

The Glenwillow Switching Substation Project Preferred Site and the areas within 1,000 feet are located in the Village of Glenwillow, Cuyahoga County, Ohio. The Glenwillow Switching Substation Project Alternate Site is located in the Village of Glenwillow, Cuyahoga County, Ohio, and areas within 1,000 feet of the Alternate Site are located in the Village of Glenwillow and the City of Solon, Cuyahoga County. The socioeconomic characteristics are summarized in the following discussion.

The U.S. Census Bureau reported that the population of Cuyahoga County in 2010 was 1,280,122, an 8.8-percent increase since the 2000 Census. The Village of Glenwillow saw an increase in population between 2000 and 2010. Its population grew from 449 persons in 2000 to 923 in 2010, a 105.5-percent increase. According to the Census, the average household in Cuyahoga County consisted of 2.29 persons and the estimated median household income of Cuyahoga County was $43,603 in 2010. Based on review of available U. S. Census Bureau data

and materials from state and local governmental agencies, the population of the City of Solon in 2000 was 21,802 residents and in 2010 was 23,328 residents, yielding a 7.1% increase in the 10-year period. The average household size is approximately 2.78 individuals. The median household income is approximately $96,965.

Based on review of aerial photography, Cuyahoga County Auditor data and field reconnaissance, four residences were identified within 1,000 feet of the Preferred Site's property boundary, but not within 1,000 feet of the proposed fence line of the substation. No residents were identified within 100 feet of the Preferred Site. No residences were identified within 100 or 1,000 feet of the Alternate Site.

Construction at the Preferred and Alternate site will not require the removal of any residential structures, and no individuals will be required to relocate.

(1) Proposed Routing Alignments and Turning Points

The proposed alignments of the 345 kV transmission lines that will connect to the Glenwillow Transmission Switching Substation at the Preferred Site will be provided as part of a separate Letter of Notification ("LON") to be submitted to Ohio Power Siting Board ("OPSB").

(2) Substations

A map at 1:700-scale, including the Preferred and Alternate sites, as well as lands and features within 1,000 feet of both sites, is presented as Figure 4-1.

Preferred Site: The Preferred Site is located on an irregular shaped parcel east of the intersection of Austin Powder Drive and Cochran Drive. The parcel is approximately 24.8 acres in size and classified by Cuyahoga County as Commercial Vacant Land and zoned by the Village of Glenwillow as Industrial District A. All of the adjacent properties are also zoned for industrial use and include the Longfield 138 kV Substation, the Dirt Devil Headquarters, and a vacant forested property to the north (the Alternate Site); the Wheeling & Lake Erie Railway and a vacant forested property to the east; and Cochran Road and vacant lots to the south and west.

Alternate Site: The Alternate Site is accessed from Beaver Meadow Parkway, north of the Preferred Site on an adjacent irregular shaped parcel located on the northern side of the existing 345 kV transmission lines. The parcel is approximately 23 acres in size and classified by Cuyahoga County as Commercial Vacant Land and zoned by the Village of Glenwillow as Industrial District A. The Alternate Site borders the Solon Police Department gun range and the City of Solon Wastewater Treatment Facility to the north and east; a vacant forested property to the east; vacant lots to the south (including the Preferred Site), and the Dirt Devil Headquarters to the west. If the Alternate site is approved, ATSI would need to acquire approximately 400 to 800 feet of new, 150-foot-wide transmission ROW through the half-moon shaped adjacent parcel to the east in order to connect the existing Eastlake – Juniper and Perry – Inland 345 kV transmission lines into the new substation. The adjacent parcel is approximately 23.9 acres in size and also classified as Commercial Vacant Land and zoned by the Village of Glenwillow as Industrial District A.

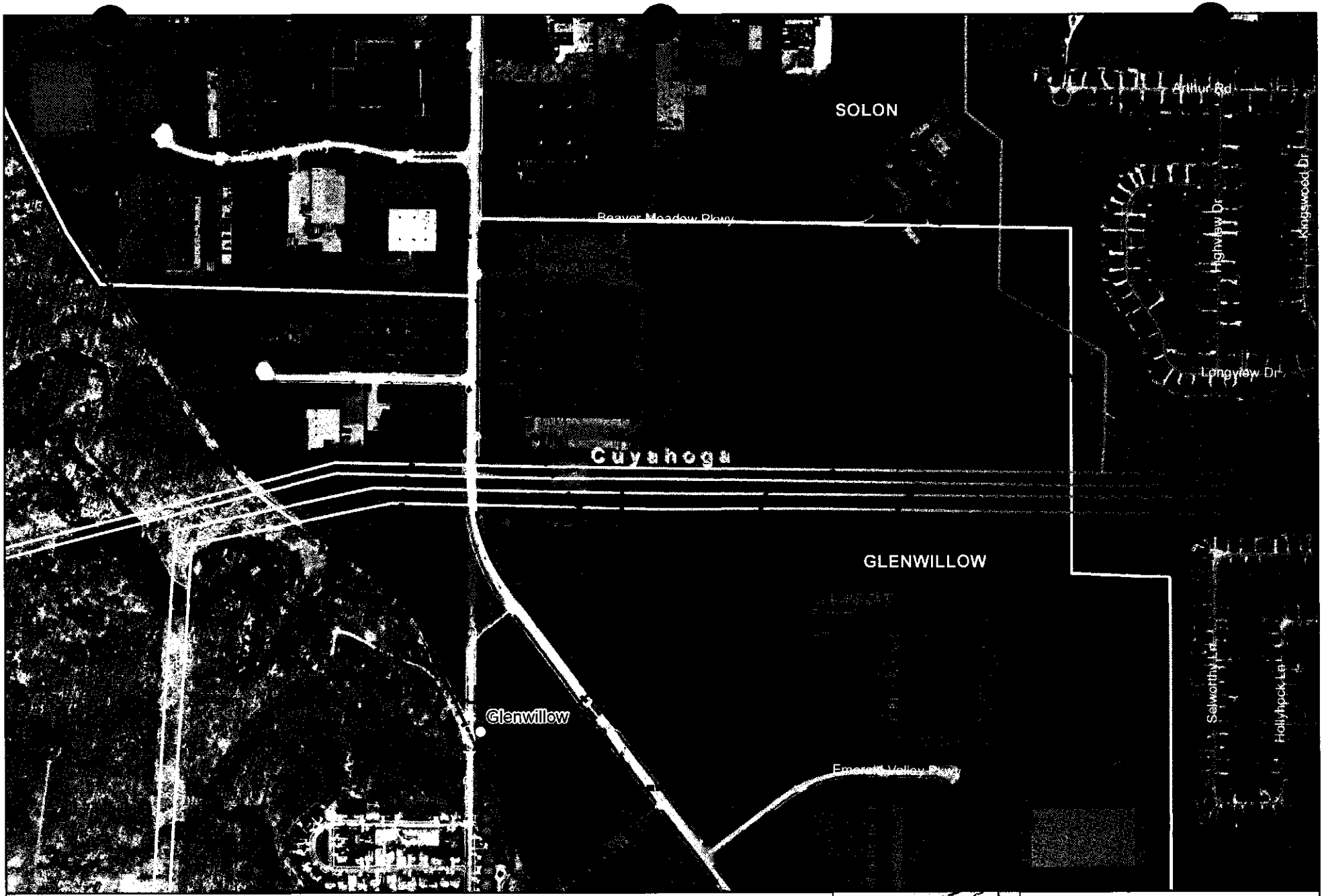
(3) General Land Use

General land uses in the vicinity of the Preferred and Alternate sites are shown on Figure 6-1.

(a) Residential

Preferred Site: The areas that directly border the Preferred Site are industrial properties. Four residences were identified within 1,000 feet and no residences were identified within 100 feet of the Preferred Site boundaries. Three of the residences within 1,000 feet of the Site are located southwest of the Site within the Village Center along North Village Lane. The third residential area is Stratford Commons, which is a nursing-home facility associated with the Kindred Transitional Care and Rehabilitation Center located at the corner of Cochran Road and Tinkers Court. None of these residents are located within 100 feet or 1,000 feet of the proposed fence line.

Alternate Site: The areas to the north, west, and south of the Alternate Site are primarily industrial. No residences were identified within 100 feet or 1,000 feet of the Alternate Site boundaries. The closest residential areas are located immediately to the east of the adjacent



Legend

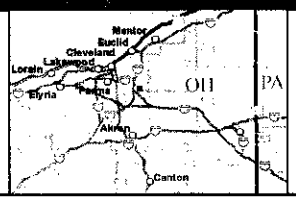
- Populated Place
- Preferred Site Parcel
- Alternate Site Parcel
- Potential Substation Fenceline
- 1,000 Ft Buffer
- Railroad
- Existing Transmission
- Municipality Boundary
- Architectural Site
- Archaeological Site

Land Use

- Commercial
- Industrial
- Residential
- Public Use

N W E S

0 500 1,000 Feet



Glenwillow 345 kV Switching Substation
Figure 6-1: Land Use Map

ATSI®
American Transmission Systems, Inc.
a subsidiary of FirstEnergy Corp.

half-moon shaped parcel on the opposite side of the Wheeling & Lake Erie Railway along Longview Drive.

(b) Commercial

No commercial facilities were identified within 1,000 feet of the Preferred or Alternate sites.

(c) Industrial

Preferred Site: All of the properties adjacent to the Preferred Site are zoned for industrial use. Five industrial facilities are located within 1,000 feet of the Preferred Site. None of these facilities are located within 100 feet. The adjacent site to the north operates as the Dirt Devil Headquarters. Sites west of Cochran Road include Custom Products Corporation and Genesis Plastic Technologies. HD Supply is located east of the Site along Emerald Valley Parkway and another industrial building is located south of the Preferred Site along Cochran Road. Of these, two facilities (Dirt Devil and Custom Products) are located within 1,000 feet of the proposed fence line.

Alternate Site: Seven industrial facilities are located within 1,000 feet of the Alternate Site. None of these facilities are located within 100 feet. Three of these buildings are associated with the City of Solon Wastewater Treatment Plant ("WWTP") located adjacent to the Alternate Site to the north. The Dirt Devil Headquarters is located adjacent to the west. HD Supply is located to the south along Emerald Parkway. The Kennametal industrial facility is located north of the Alternate Site along Beaver Meadow Parkway and the Tameran Graphics Systems property is located along Solon Industrial Parkway. Of these, five buildings or facilities (WWTP buildings, Dirt Devil and Tameran) are located within 1,000 feet of the proposed fence line.

(d) Cultural

Data for known cultural resource landmarks shown on Figure 4-1 were obtained through the Ohio Historic Preservation Office's ("OHPO") Online Mapping System.

Preferred Site: Two previously recorded archaeological sites were identified within 1,000 feet of the Preferred Site. One site, identified as Site No. CU0240, is located within the parcel

boundaries of the Preferred Site outside of the proposed fence line adjacent to the proposed access road. Archeological investigations were conducted on the Preferred Site in 1980 and again in 1999 as part of the cultural resources studies for the Emerald Business Park. The Ohio Archeological Inventory form for the investigation indicates that one flint core was found within the first 15 centimeters (cm) below the surface of the ground. The surveyor recommended further investigation based on the site location. The second site, CU0248, is located approximately 375 feet east of the Preferred Site parcel boundaries. One large flake and one shatter fragment was located on the surface during the survey. Test units did not reveal additional cultural material. Based on the sparse remains recovered, the surveyor did not recommend further investigation.

In addition, the Phase I Literature Review and Cultural Resource Survey for the Proposed Emerald Valley Business Park[1] indicated that neither site was identified during fieldwork. Further, both sites appear to have been destroyed. According to the report, Site CU0240 has been destroyed by topsoil removal in that area and CU0248 (referred to as site CU0245 in the report) was destroyed by construction of a farm pond. Based on discussion with the Ohio Historic Preservation Office ("OHPO") on October 15, 2012, neither of the archaeological sites have been evaluated or determined eligible for listing on the National Register of Historic Places ("NRHP") at this time. Based on the conclusions from the 1999 report, no additional field surveys are anticipated at this location. However, LBG will continue to consult with the Ohio Historic Preservation Office ("OHPO") to further assess the site for potential cultural resources as determined appropriate.

No NRHP structures, districts or cemeteries were identified within 1,000 feet of the Preferred Site. The closest NRHP-listed site is located approximately 2 miles west of the Preferred and Alternate sites. One Ohio Historic Inventory ("OHI") structure was identified within 1,000 feet. This resource has not been evaluated for the NRHP, and based on current aerial imagery, the resource may no longer be extant. One previous cultural resource survey area, which included a survey for both architecture and archaeology, was conducted within 1,000 feet of the Preferred

[1] Whitman L. and Mustain C. 1999. Phase I Literature Review and Cultural Resource Survey for the Proposed Emerald Business Park in the Village of Glenwillow, Cuyahoga County, Ohio.

Site. The cultural resource survey area is not located within 1,000 feet of the proposed fence line.

Alternate Site: No previously recorded archaeological sites, architectural resources listed on the NRHP, unevaluated architectural resources, Historic Districts, or cemeteries are located within 1,000 feet of the Alternate Site. No previous cultural resources survey areas are located within 1,000 feet of the Alternate Site.

(e) Agricultural

No agricultural land was identified within 1,000 feet of the Preferred or Alternate sites.

(f) Recreational

Preferred Site: The Independent Order of Odd Fellows ("IOOF") Prokop Velky Lodge 708 and Fresh Air Camp and Glenwillow Park are located within 1,000 feet of the Preferred Site. This camp is located west of the Site on Austin Powder Drive and approximately 560 feet from the Site. The IOOF facility is an area for use by members, neighbors, and friends of the IOOF Lodge 708. Glenwillow Park is located approximately 670 feet southwest of the Site along Austin Powder Drive. This community park is approximately 38 acres in size and is mostly undeveloped with the exception of a parking lot and picnic shelter.

A proposed bicycle/walking trail, the Metroparks Connection Trail, is identified in the Glenwillow Master Plan (2009) and is located approximately 600 feet west of the Site adjacent to the western side of the Wheeling & Lake Erie Railway. Other recreational uses located more than 1,000 feet from the Site include the Donald Norman Payne Recreation Complex located at the corner of Austin Powder Drive and Pettibone Road. The Recreation Complex is approximately 15 acres in size and includes soccer fields, baseball diamonds, parking and a pavilion. None of these areas are located within 1,000 feet of the proposed fence line.

Alternate Site: No recreational areas were identified within 1,000 feet of the Alternate Site.

(g) Institutional

Preferred Site: One institutional land use is located within 1,000 feet of the Preferred Site. The Kindred Transitional Care and Rehabilitation Center located at the corner of Cochran Road and Tinkers Court. The Kindred Facility is a 105-bed nursing and rehabilitation center that offers a full range of nursing and medical care, including short-term rehabilitation services and long-term skilled care. The Kindred Facility is not located within 1,000 feet of the proposed fence line. No schools, churches, hospitals, or other institutional land uses were identified within 1,000 feet of the Preferred Site.

Alternate Site: One institutional land use is located within 1,000 feet of the Alternate Site. The City of Solon Police Department Firing Range is located adjacent to and approximately 100 feet north of the Alternate Site, and is within 1,000 feet of the proposed fence line. No schools, churches, hospitals, or other institutional land uses were identified within 1,000 feet of the Alternate Site.

(4) Transportation Corridors

Preferred Site: The closest major roadway to the Preferred Site is US Interstate 271, located approximately 3.1 miles to the southwest. The Wheeling & Lake Erie Railway borders the Site to the east. This railroad is also located approximately 525 feet west of the Site boundary.

Alternate Site: The closest major roadway to the Alternate Site is also US Interstate 271, located approximately 3.7 miles to the southwest. The Wheeling & Lake Erie Railway borders the Site to the east.

(5) Existing Utility Corridors

ATSI plans to connect the existing Eastlake – Juniper and Inland – Perry 345 kV transmission lines and the proposed Bruce Mansfield – Glenwillow 345 kV Transmission Line into the new Glenwillow Transmission Switching Substation. The existing Eastlake – Juniper and Inland – Perry 345 kV transmission lines presently traverse the northern boundary of the Preferred Site. The existing 345 kV lines traverse the southern boundary of the Alternate Site. As part of the Project, the existing alignments will be modified to enter the new Glenwillow Transmission

Switching Substation, as shown in Figure 4-2. The realignments were filed as a LON with the OPSB under Case No. 12-1726-EL-BLN. The proposed Bruce Mansfield – Glenwillow 345 kV Transmission Line will enter the Preferred or Alternate site from the north. In addition, the Mayfield – Northfield #1 & #2 138 kV transmission lines and the Longfield 138 kV Substation are located adjacent to the existing 345 kV lines to the north. No changes to the 138 kV lines are required for this Project. The alignments of existing transmission lines are shown on Figure 4-2.

(6) Noise Sensitive Areas

Noise sensitive areas generally consist of residences and institutional uses (e.g., schools, daycares, churches, cemeteries and hospitals).

Preferred Site: Noise sensitive areas in the vicinity of the Preferred Site include the Kindred Rehabilitation Facility located approximately 935 feet northwest of the Site; the IOOF Lodge and Camp located approximately 575 feet west of the Site; and residential development within the Village Center, which is located southwest of the Site and includes four residences within 1,000 feet of the Site. An assessment of noise impact during construction and operation of the substation is provided in Section 4906-15-06 (G).

Alternate Site: No noise sensitive areas are located within 1,000 feet of the Alternate Site. The closest sensitive receptor includes residential properties located approximately 1,100 feet east of the parcel boundary.

(7) Agricultural Land (Agricultural District Land)

LBG contacted the Cuyahoga County Auditor to obtain information on agricultural district land. LBG was informed that no agricultural district land currently exists within the Village of Glenwillow. The information was received via telephone from Cuyahoga County on July 11, 2012, and confirmed again via telephone on October 11, 2012. The provided data fulfills the requirement of OAC 4906-15-06 (B)(7) which states this data must be collected not more than 60 days prior to submittal. No agricultural district land parcels were identified within 1,000 feet of the Preferred or Alternate Site.

(C) LAND USE IMPACTS OF THE PROPOSED PROJECT

(1) Number of Residential Structures

Preferred Site: Based on review of Cuyahoga County Auditor parcel data and aerial photography supplemented by a field reconnaissance, four residences were identified within 1,000 feet of the Preferred Site.

Alternate Site: Based on review of Cuyahoga County Auditor parcel data and aerial photography supplemented by a field reconnaissance, no residences were identified within 1,000 feet of the Alternate Site.

(2) Impact of Construction

(a) Residential

No residences or residential zoned land are located on or within 100 feet of the Preferred or Alternate Site. No residences will be removed in order to construct the proposed Project. Only four residences are located within 1,000 feet of the Preferred Site and no residences are located within 1,000 feet of the Alternate Site. It is expected that some incremental increase in noise will be audible during some portions of construction in the switching substation site. However, the current ambient noise levels associated with existing uses in the area, including the active Wheeling & Lake Erie Railway, the existing Solon Police Department firing range, the Solon Wastewater Treatment Plant, and industrial businesses, as well as the presence of adjacent woodlands and the distance to the residences, are likely to minimize overall noise impacts during construction.

(b) Commercial

No adverse impacts to commercial land uses are anticipated as a result of the Project.

(c) Industrial

No adverse impacts to industrial land uses are anticipated as a result of the Project. It is expected that some incremental increase in noise will be audible during some portions of construction in

the switching substation site. However, the current ambient noise levels associated with existing uses in the area, including the active Wheeling & Lake Erie Railway, the existing Solon Police Department firing range, the Solon Wastewater Treatment Plant, and industrial businesses, as well as the presence of adjacent woodlands and the distance to the residences, are likely to minimize overall noise impacts during construction.

(d) Cultural

No adverse impacts to cultural land use areas are anticipated as a result of the Project. ATSI submitted a letter to the OHPO on June 1, 2012, describing the Project and requesting information on potential survey requests. To date, no response to the letter has been received. However, a meeting was held with the OHPO on September 11, 2012, to discuss the Bruce Mansfield – Glenwillow 345 kV Transmission Line and the Glenwillow Transmission Switching Substation Project. ATSI is in the process of developing a cultural resource plan for the Project and will continue to consult with the OHPO to determine if any historic architecture surveys are requested in the Project area or if any archaeological surveys are required on site.

(e) Agricultural

No adverse impacts to agricultural land uses are anticipated as a result of the Project.

(f) Recreational

No adverse impacts to recreational land uses are anticipated as a result of the Project. Two recreational facilities are located within 1,000 feet of the Preferred Site: the IOOF day camp and Glenwillow Park. It is expected that some incremental increase in noise will be audible during some portions of construction in the switching substation site. As discussed previously, however, the current ambient noise levels as well as adjacent woodland buffers and the distance from any recreational facilities will help to minimize overall noise impacts during construction.

(g) Institutional

No adverse impacts to institutional land uses are anticipated as a result of the Project. One institutional land use, the Kindred Transitional Care and Rehabilitation Center rehabilitation

facility, is located within 1,000 feet of the Preferred Site. It is expected that some incremental increase in noise will be audible during some portions of construction in the switching substation site. However, the current ambient noise levels combined with the woodlands and distance from this facility will help to minimize overall noise impacts during construction.

(3) Impact of Operation and Maintenance

(a) Residential

Operation and maintenance of the switching substation will have minimal impact on surrounding residences. The closest residential properties to the Preferred Site are separated by two roadways, the Wheeling & Lake Erie Railway and a forested area surrounding Tinker Creek and Beaver Meadows Creek. The slight, if any, background noise from the switching substation equipment will be minimized by the distance to residences. Based on the distance of the residential properties from the Preferred Site, existing natural barriers (e.g., forested areas, trees, and topography), nearby buildings, and the proposed landscaping plan detailed in Figure 4-2, visual impacts should be minimal. Additional information on visual impacts is provided in Part (E)(3) of this Section.

(b) Commercial

Impacts to commercial land uses associated with operation and maintenance of the Project at the Preferred Site are not anticipated.

(c) Industrial

The Dirt Devil Headquarters facility is located adjacent to the Preferred Site to the north. Any ambient noise generated by the operation and maintenance of the Project is not anticipated to impact this facility or any other industrial facilities in the vicinity. Additional information on visual impacts is provided in Part (E)(3) of this Section.

(d) Cultural

No impacts to cultural resources as a result of operation and maintenance of the Project are anticipated. ATSI will continue to consult with the OHPO to determine if any historic

architecture surveys are requested in the Project area or if any archeological surveys are required on site and will comply with any mitigation measures, if necessary.

(e) Agricultural

Impacts to agricultural tracts associated with operation and maintenance of the Project are not anticipated.

(f) Recreational

Impacts to recreational land uses associated with operation and maintenance of the Project are not anticipated. The IOOF Lodge and Camp are located within 1,000 feet of the Preferred Site to the west. An existing roadway, the Wheeling & Lake Erie Railway, and a forested buffer area are located in between the Preferred Site and the camp. No adverse noise impacts on users of these or other local recreational facilities during operation or maintenance of the Project.

(g) Institutional

The Kindred Transitional Care and Rehabilitation Center is the only institutional facility within 1,000 feet of the Preferred Site. The Kindred facility is located on the western side of Cochran Road and will have a partial view of the new switching station. The facility presently has a view of the existing 345 kV transmission lines and the Longfield Substation. The proposed landscaping plan will reduce the visual impacts of the switching station. Based on the distance from the Preferred Site, the existing conditions, and the proposed landscaping plan, no impacts to institutional land uses associated with operation and maintenance of the Project are anticipated.

(4) Mitigation Procedures

The Glenwillow Transmission Switching Substation will be fenced and secure to prevent public entry. Appropriate warning signs, as required, will be posted. ATSI worked with the developer of the Emerald Valley Business Park to prepare a landscaping plan for the Glenwillow Transmission Switching Substation. The landscaping plan will involve planting various shrubs and trees, primarily along the western site boundary adjacent to Cochran Road. The shrub species may consist of eastern white pine (*Pinus strobus*), Norway spruce (*Picea abies*), arbor vitae (*Thuja*

accidentalis), red cedar (*Juniperus virginiana*), red maple (*Acer rubrum*), sugar maple (*Acer saccharum*), pink flowering dogwood (*Cornus florida var. rubra*), and northern red oak (*Quercus rubra*). The tree species may consist of Canada yew (*Taxus Canadensis*), hazelnut (*Corylus Americana*), black chokecherry (*Aronla melanocarpa*), gray dogwood (*Cornus racemosa*), blackhaw (*Vilournum prunifolium*), and crabapple (*Maius sp.*). The landscaping plan will also preserve the existing landscaped area of pine trees and deciduous shrubs along Cochran Road. The preliminary landscaping plan is detailed on Figure 4-2.

(a) Residential

Noise impacts associated with construction, operation, and maintenance of the Project at the Preferred Site are expected to be minimal. Noise impacts on nearby residences or residential neighborhoods will be mitigated by constructing primarily during daytime hours. Tinkers Creek and its floodplain presently act as a natural buffer between residential development in the vicinity east of the Wheeling & Lake Erie Railway and industrial development to the west (Glenwillow Master Plan, 2009). The proposed landscaping plan detailed in Figure 4-2 will further minimize impacts to residents.

(b) Commercial

No commercial facilities are expected to be impacted by the Project. Therefore, no mitigation is proposed for commercial properties.

(c) Industrial

No industrial sites are expected to be impacted by the Project. The proposed landscaping plan will reduce the visual impacts of the switching substation. No mitigation is proposed for industrial properties.

(d) Cultural

No cultural land use areas are expected to be impacted by the Project. Therefore, no mitigation is proposed for cultural land use areas.

(e) Agricultural

No agricultural land use areas are expected to be impacted by the Project. Therefore, no mitigation is proposed for agricultural land use areas.

(f) Recreational

No recreational areas are expected to be impacted by the Project. The closest recreational area, the IOOF lodge and camp, is located on the west side of the Wheeling & Lake Erie Railway. The railroad and Tinkers Creek provide a buffer from the Preferred Site. Therefore, no mitigation is proposed for recreational areas.

(g) Institutional

Other than a partial view of the new switching station from the Kindred Transitional Care and Rehabilitation Center, no institutions are expected to be impacted by the Project. The proposed landscaping plan and primarily daytime-only construction hours will help to minimize any impacts on this facility. No additional mitigation is proposed.

(D) PUBLIC INTERACTION INFORMATION

(1) Counties, Townships, Cities and Villages within 1,000 feet of the Site Alternatives

Counties, townships, cities, and villages within 1,000 feet of the Preferred Site include Cuyahoga County and the Village of Glenwillow. The City of Solon is also located within 1,000 feet of the Alternate Site.

(2) Public Officials Contacted

ATSI's area manager has contacted local officials to discuss the Glenwillow Transmission Switching Substation Project. Appendix 6-1 provides a list of the local public officials, including their office addresses and office telephone numbers, who will be served a copy of this Application.

(3) Public Information Programs

To keep the public informed of the Glenwillow Switching Substation and associated Bruce – Mansfield 345 kV Transmission Line Project, ATSI implemented a public information program. In June 2012, ATSI issued public notices regarding the Project. The public notices were distributed to the Lisbon Morning Journal, Youngstown Vindicator, Warren Tribune Chronicle, Ravenna Record Courier, Aurora Advocate, Hudson Hub, Northfield News Leader, Streetsboro Gateway News, Twinsburg Bulletin, Cleveland Plain Dealer – East Zone, Chagrin Valley-Solon Times, Akron Beacon Journal and Beaver County Times. Copies of the public notice can be found in Appendix 6-2 of this Application.

During the week of June 18-21, 2012, one public information meeting was held in Pennsylvania and four public information meetings were held in Ohio, including one meeting in Macedonia near the Village of Glenwillow. At each meeting, attendees received a project factsheet, information on the OPSB Process, comment cards and area project map. The public information meetings provided an opportunity for residents and other interested parties to review project information displays and discuss the Project with FirstEnergy/ATSI and LBG representatives. The factsheet contained a brief statement on project need, a description of the siting process, and a preliminary project timeline. The public meetings were organized in an open house format and consisted of several adjacent stations that identified the Projects processes: a Welcome station was designated at the entrance for attendees to sign-in, a Project Need station provided an overall summary and explained the planning process, a Route Selection station detailed the siting process and included aerial maps showing the potential route network and parcel boundaries, a Right-of-Way station explained the easement process, an Environmental station explained consultations with State, Federal and Local agencies, an Engineering and Construction station highlighted engineering and substations, and an OPSB Process station explained the application process and how to stay informed.

On June 18, 2012, a meeting was held at East Palestine Elementary School on Grant Street in East Palestine, Ohio. Seven members of the public attended this meeting. The next meeting was held on June 19, 2012, at Mahoning County Career and Technical Center on Palmyra Road in Canfield, Ohio. Six members of the public attended this meeting. The following meeting was

held on June 20, 2012, at Maplewood Career Center on State Route 88 in Ravenna, Ohio. Nine members of the public attended this meeting. The final meeting was held on June 21, 2012, at Nordonia High School on Bedford Road in Macedonia, Ohio. Twenty-three members of the public attended this meeting.

A total of 10 comment cards were completed during the public information meetings. Comments generally discussed use of existing transmission ROW, EMF, vegetation maintenance, property values, the proposed switching station location, or attendees requested copies of maps. ATSI reviewed these comments and followed up as appropriate to answer any outstanding questions. ASTI's Area Manager will advise local officials of features and the status of the proposed transmission line Project as necessary.

(4) Liability Compensation

ATSI currently self-insures against primary general liability and property damage exposure, as well as primary liability exposure in connection with its automobile operations. ATSI purchases excess public liability and property damage insurance covering indemnity to at least $25,000,000 in excess of $10,000,000. This insurance is on a claim first-made basis and is arranged under a broad form that includes automobile and contractual liability. Present coverage is arranged with AEGIS renewable on a year-to-year basis.

(5) Serving the Public Interest

The proposed Glenwillow Transmission Switching Substation Project will serve the public interest by helping to ensure reliable electric service throughout the extended Project Area. A more detailed discussion of the need for the proposed Project and how it will serve the public interest is included in Section 4906-02 of this Application.

(6) Tax Revenues

The Preferred and Alternate sites for the Glenwillow Transmission Switching Substation Project are located within the Village of Glenwillow in Cuyahoga County, Ohio. ATSI will pay property taxes on utility facilities in this County. The approximate annual property taxes, based

on the 2012 tax rates, associated with installing the proposed Project in the first year after completion is $184,600.

(7) Impact on Regional Development

The proposed Project is necessary to ensure electricity system reliability in the Project Area. As a reliable electric system has a positive impact on quality of life and regional development, the Project is anticipated to have a positive impact on regional development. A more detailed discussion of the need for the Glenwillow Transmission Switching Substation Project and how it will impact regional development is included in Section 4906-02 of this Application.

(E) HEALTH AND SAFETY

(1) Compliance with Safety Regulations

The construction and operation of the Project will comply with the requirements specified in the National Electrical Safety Code ("NESC"), the Public Utilities Commission of Ohio ("PUCO"), and will meet all applicable safety standards established by the Occupational Health and Safety Administration ("OSHA").

(2) Electric and Magnetic Fields

The following calculations provide an approximation of the magnetic and electric fields ("EMF") strengths associated with installing the proposed Glenwillow Switching Station Project at the Preferred Site. This includes the transmission lines as they cross the substation fence. The 345 kV transmission lines that will connect to the project are the existing Inland – Perry 345 kV Transmission Line, the existing Eastlake – Juniper 345 kV Transmission Line, and the proposed Bruce Mansfield – Glenwillow 345 kV Transmission Line. The calculations are based on a model of the substation with the electric fields and magnetic fields calculated along the proposed substation fence line perimeter, including the transmission lines where they cross the substation fence line at the locations shown on Figure 4-2. The EMF calculations were performed using the Electric Power Research Institute ("EPRI") EMF Workstation 2009 program software.

On October 12, 2012, ASTI filed a request with the Board for a waiver of the need to submit fully developed engineering and EMF information for the Alternate Site. EMF calculations for the Alternate Site should be similar to the Preferred Site. However, as engineering design was not completed for the Alternate Site, EMF calculations are not included in this Application.

Factors that affect the level of magnetic and electric fields include the variance in the footprint of the facility, daily and projected long-term transmission line and substation loading, operating voltage, contingency operations, phase configuration, direction of current flows, conductor sag, ground elevation, unbalance conditions, and other nearby magnetic field sources or conductors of neutral current including water mains, metallic fences, and railroad tracks. Electric field computations assume that shrubs, trees, buildings, and other objects are not in proximity to the facilities, as they produce significant shielding effects. Other transmission or distribution facilities in the vicinity of the line may also affect the calculated fields. For example, a double-circuit loop configuration, with current flows in opposite directions, results in a partial reduction (cancellation) of the magnetic field levels. The model and calculations include a number of assumptions including the following:

- Current flows are assumed in the direction expected under normal system operating conditions.
- The location of transmission line poles, attached conductors and static wire, and line phasing are based on preliminary engineering layouts.
- Calculated field levels assume a reference point approximately 3 feet (1 meter) above ground.

Three loading conditions were modeled for the substation and are based on the transmission line loadings for: (1) normal maximum loading, (2) emergency line loading, and (3) the winter normal conductor rating. The normal maximum loading represents the routine maximum load at which the transmission line would be operated. Daily current load levels would fluctuate below this level. The emergency maximum loading represents the maximum current flow in the transmission line under unusual circumstances and only for a short period of time. The winter

normal conductor rating represents the maximum current flow that the conductor used on the Glenwillow project can withstand during winter conditions.

The transmission line loadings used in the calculations are presented in Table 6-1. The model is based on both the significant substation equipment and the connecting 345 kV transmission lines. The model was used to approximate the electric and magnetic field strengths at the centerline of the transmission lines where they pass over the substation fence as well as around the entire perimeter of the substation fence.

Table 6-1: Transmission Line Loadings

Line Name	Normal Loading (Amps)	Emergency Loading (Amps)	Winter Conductor Rating (Amps)
Inland – Glenwillow 345 kV	771	910	2,955
Bruce Mansfield – Glenwillow 345 kV	989	997	2,955
Glenwillow –Juniper 345 kV	228	822	2,955
Eastlake – Glenwillow 345 kV	216	287	2,955
Glenwillow – Perry 345 kV	*213	*296	2,955

*During normal loading the Glenwillow – Perry 345 kV Transmission Line power flow is from Perry to Glenwillow; during emergency loading the power flow is from Glenwillow to Perry.

(a) Calculated Electric and Magnetic Field Levels

The field strengths were calculated at the fence, starting at the southwest corner of the existing substation and continuing in a clockwise direction until arriving back at the southwest corner. The minimum and maximum calculated electric and magnetic field values around the perimeter of the substation fence are shown in Table 6-2. Graphical depictions of the results are shown in Figures 6-2 through 6-5.

Table 6-2 Modeled EMF Calculations

Type of Field Modeled	Maximum	Minimum
Electric Field	2.27 kV/m	0.003 kV/m
Magnetic Field, Normal Load	73.44 mG	0.29 mG
Magnetic Field, Emergency Load	75.34 mG	0.04 mG
Magnetic Field, Winter Rating	265.88 mG	0.51 mG

(b) State of EMF Knowledge

Electric and magnetic fields are naturally occurring in the environment and can be found in the Earth's interior and in the human body. They are generated essentially anywhere where there is a flow of electricity, including electrical appliances and power equipment. Electric fields are associated with the voltage of the source; magnetic fields are associated with the flow of current in a wire. The strength of these fields decreases rapidly with distance from the source. EMFs associated with electricity use are not disruptive to cells like x-rays or ultraviolet rays from the sun. EMF fields are thought to be too weak to break molecules or chemical bonds in cells. Scientists have conducted extensive research over the past two decades to determine whether EMFs are associated with adverse health effects and at this time there is no firm basis to conclude that EMFs from transmission lines cause adverse health effects. A number of independent scientific panels have reviewed the research and have stated that there is no basis to conclude that EMFs cause adverse health effects nor has it been shown that levels in everyday life are harmful.

Recent Developments

As a part of the National Energy Policy Act of 1992, the Electric and Magnetic Fields Research and Public Information Dissemination ("EMF RAPID") program was initiated under the National EMF Research Program. The culmination of this five-year effort resulted in a final RAPID Working Group report, which was released for public review in August 1998. The Director of the National Institute of Environmental Health Sciences ("NIEHS") then prepared a final report to Congress after receiving public comments. The NIEHS Director's final report, released to Congress on May 4, 1999, concluded that extremely low frequency electric and magnetic fields

ELF-EMF exposure cannot be recognized at this time as entirely safe because of weak scientific evidence that exposure may pose a leukemia hazard. The Director further stated that the conclusion of this report is insufficient to warrant aggressive regulatory concern.

Sources for Additional Information

The following websites sponsored by federal agencies or other organizations provide additional information on EMF:

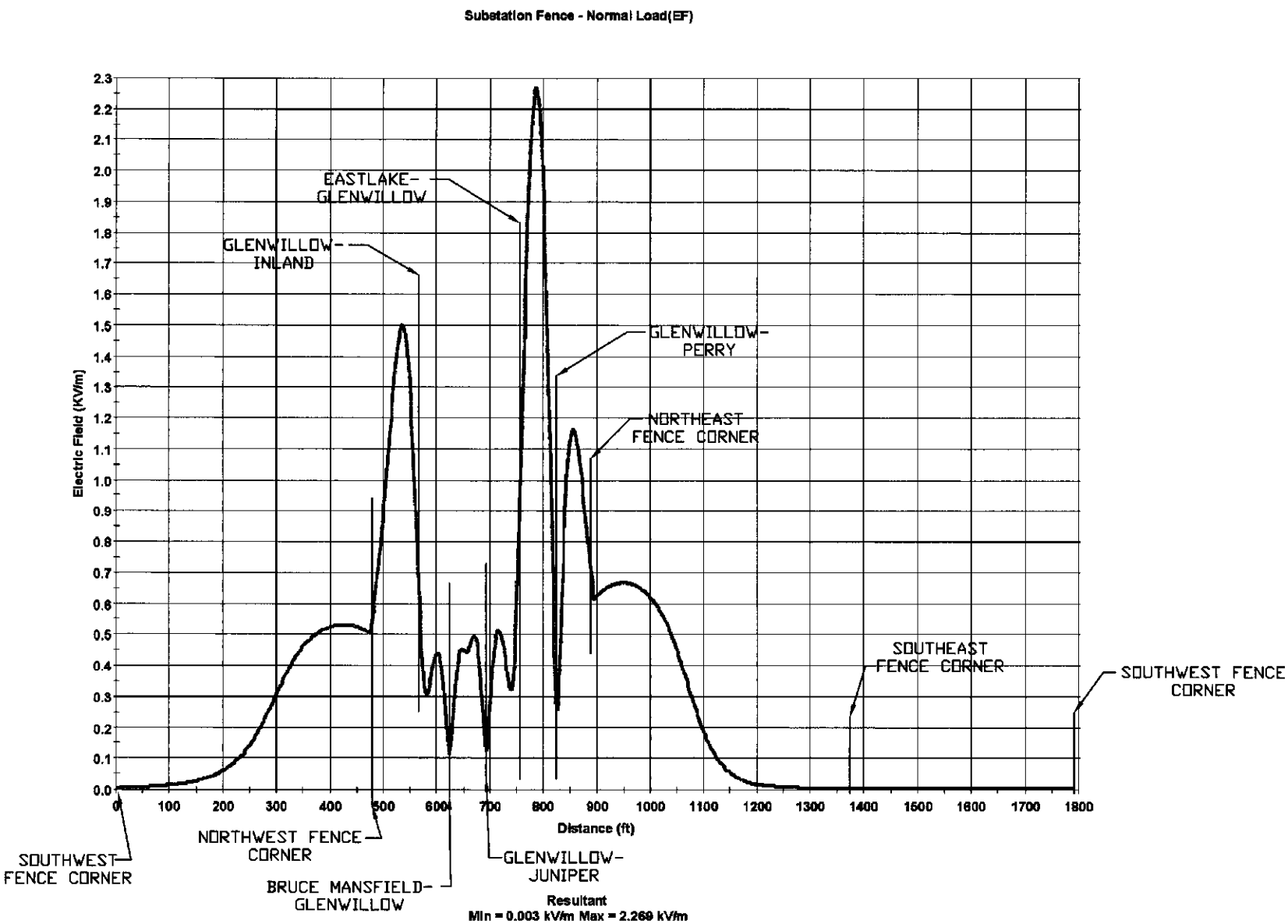
- Centers for Disease Control/National Institute for Occupational Safety and Health: http://www.cdc.gov/niosh/topics/emf/
- National Institute of Environmental Health Sciences (NIEHS): http://www.niehs.nih.gov/health/topics/agents/emf/

(c) ATSI's Considerations to Reduce EMF

In general the higher EMF levels are associated with the transmission lines as they enter or exit the substation. Detailed descriptions of the transmission lines associated with the Project are included in an LON submitted to the Board in Case No. 12-1726-EL-BLN.

(d) Procedures for Addressing EMF Inquiries

Information on EMF was made available at the public information meetings held for the Project. This information discusses the basics of electric magnetic field theory, scientific research activities and EMF levels in everyday life. Appendix 6-3 contains copies of this information.



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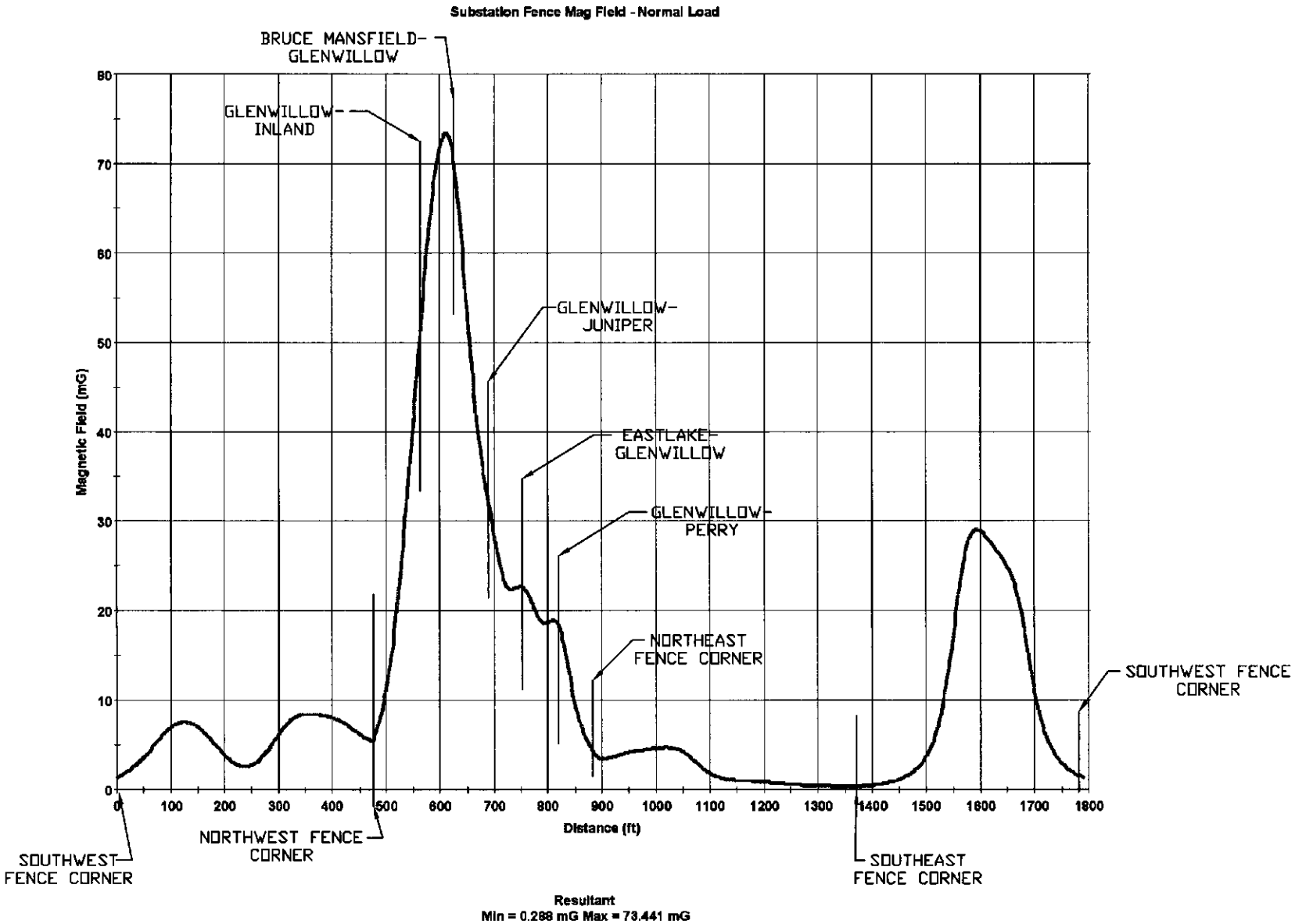
SUBSTATION ELECTRIC FIELD

FIGURE 06-2



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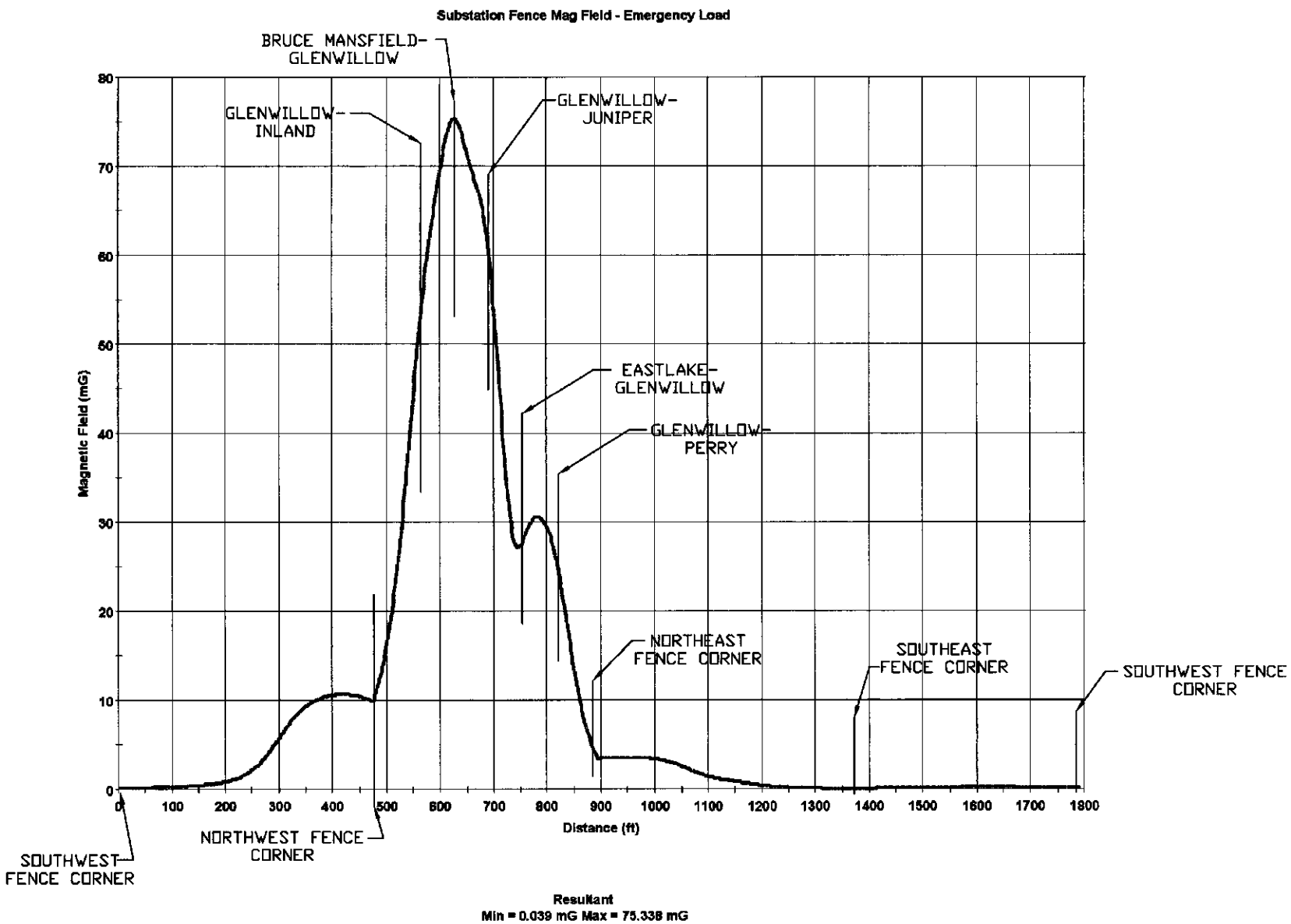
SUBSTATION MAGNETIC FIELD
NORMAL LOAD

FIGURE 06-3



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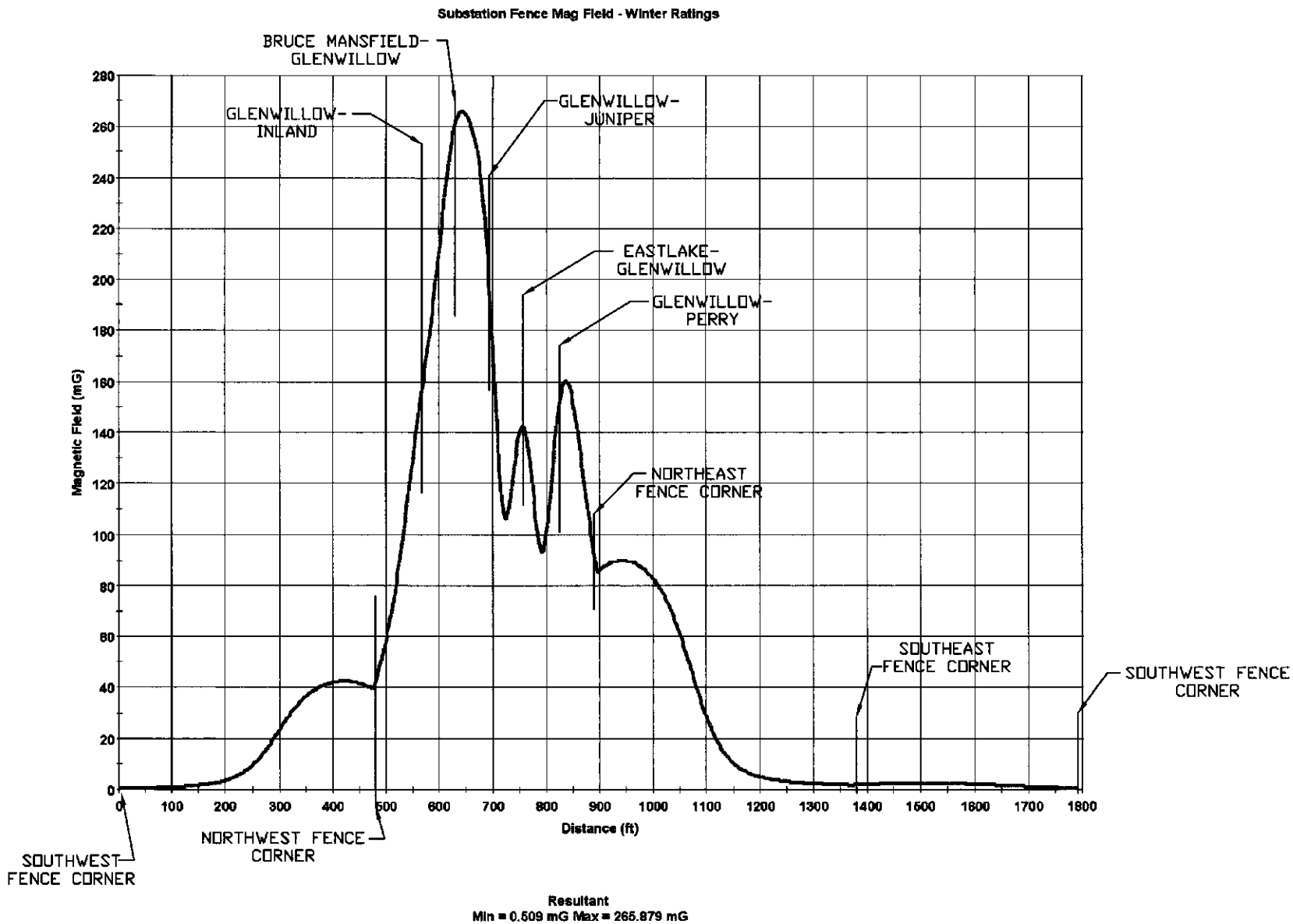
SUBSTATION MAGNETIC FIELD
EMERGENCY LOAD

FIGURE 06-4



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SUBSTATION MAGNETIC FIELD
WINTER LOAD

FIGURE 06-5

(3) Aesthetic Impact

Construction of a new switching substation can result in aesthetic impacts to residents, commuters and travelers, employees, and recreational users. Changes in the landscape surrounding homes and neighborhoods can be particularly sensitive. Land use in the vicinity of the Project Area consists of a mixture of industrial land, residential land, and recreational land. The topography of the Preferred and Alternate sites and vicinity are generally gently rolling, with steeper slopes adjacent to Tinkers Creek and higher elevations generally located in the northwestern portion of the Project Area. Varying topography and tall vegetation are natural elements that help to reduce visibility of substation and transmission line projects.

Scenic integrity refers to the degree of intactness and wholeness of the landscape character. New transmission and substation facilities are more likely to "blend-in" with surroundings where existing facilities exist and would not change the integrity of the landscape. Existing transmission lines traverse both the Preferred and Alternate sites, and the Longfield Substation is located in between the sites. Although the Glenwillow Transmission Switching Substation will change the current conditions, the Preferred and Alternate sites are located in an industrial area in the vicinity of existing transmission and substation infrastructure. In addition, ATSI has worked closely with the developer of the Emerald Valley Business Park to locate the fenced area and develop a landscaping plan that minimizes visual impacts for the Preferred Site.

(a) Views of the Proposed Facility

Many factors influence the visual impact of the Project. The viewer is one of these factors, not only who is viewing the switching substation but their expectations, activities, and frequency of viewing the substation. Four types of viewers were identified within the Project Area.

Local residents. Local residents are those people who live in the vicinity of the Glenwillow Transmission Switching Substation. Residents may view the switching substation from their yards or homes, while driving on local roads, or during other activities in their daily lives. The sensitivity of local residents to the visual impact of the switching substation may be mitigated by exposure to existing transmission lines and other developed features already within the viewshed such as roads, railroads, and industrial sites. Local residents

can be highly sensitive to changes in the landscape that can be viewed from their homes and neighborhoods.

Commuters and travelers. Commuters and travelers are people who may travel by the Glenwillow Transmission Switching Substation on their way to other destinations. They may view the switching substation on a regular basis or only occasionally. The visual perception of the switching substation for commuters and travelers is anticipated to be relatively low because they are typically moving and have a relatively short duration of visual exposure to the line. Drivers tend to be occupied with traffic and navigation and are to a much lesser degree concerned with off-road views. Passengers would have a greater occasion for off-road views.

Employees. Employees who work at local businesses, primarily in industrial areas in the vicinity of the Glenwillow Transmission Switching Substation, will experience the switching substation as they commute and potentially from their place of employment. They may view the switching substation from the parking lot as they enter their place of business or from inside the building. Workers may not have views to the outside and will be focused on their work rather than views of the landscape. Due to limited views and focus, employees are not anticipated to have high sensitivity to the Glenwillow Transmission Switching Substation near their place of work.

Recreational users and tourists. Recreational users include local residents and tourists involved in recreational activities; at state and local parks; trails; golf courses; and natural areas. The closest recreational facility is the IOOF lodge and day camp and visitors may pass the Glenwillow Transmission Switching Station on their route to this and other nearby recreation areas. For recreational users, scenery may be an important part of their experience as their activities may include attentiveness to views of the landscape for a long period of time. Such viewers also may have a high appreciation for visual quality and high sensitivity to visual change.

Preferred Site: The majority of the Preferred Site consists of open field (Figure 6-6). The eastern parcel boundary is forested and landscaping trees have been planted along a portion of the western parcel boundary. Site topography is gently rolling and gradually sloping upwards

toward the beginning of the forested area to the east. Topography within the forested area slopes steeply back down toward the Wheeling & Lake Erie Railway tracks. The substation fence line will be sited to minimize any tree removal. The Preferred Site is presently traversed by the Eastlake – Juniper, Inland – Perry, and Harding – Perry 345 kV transmission lines. In addition, the Mayfield – Northfield 138 kV Transmission Line and the Longfield Substation border the parcel to the north. The existing towers are taller than the tree line and are likely visible from many areas in the Project vicinity. The switching substation structures will be of similar height and are not likely to expand views of the structures to additional areas. These existing transmission lines are presently visible from points along Cochran Road (Figure 6-7).

Figure 6-6. Photo of the Preferred Site from Cochran Road looking northeast.

Figure 6-7. Photo of the Preferred Site from the western side of Cochran Road looking northeast.

No residential properties or other sensitive receptors are located adjacent to the Preferred or Alternate sites. The closest residential properties are located approximately 900 feet southwest of the Preferred Site boundaries and over 1,200 feet southwest of the proposed fence line. Additionally, these residents are generally screened from view of the Preferred Site by existing forested land. The closest recreational facility is the IOOF lodge and day camp located west of the Preferred Site. The IOOF facility is located in a forested area on the opposite side of the Wheeling & Lake Erie Railway. The existing forested area is expected to serve as a buffer that limits views of the Glenwillow Transmission Switching Substation. Adjacent industrial properties will have the closest view of the proposed switching substation. The existing transmission lines located on and to the north of the Preferred Site are presently visible from these industrial properties.

Alternate Site: The majority of the Alternate Site consists of forested land (Figures 6-8 and 6-9). The topography is moderate to steep, with flat areas in the floodplain and forested area adjacent to the existing ROW. Preliminary design was not completed for the Alternate Site, but the fence line would likely be located in the center of the site. In addition to clearing the site for the

substation, several hundred feet of 150-foot-wide ROW would need to be acquired through the adjacent parcel (Site A) to bring transmission line connections to the Alternate Site.

The Alternate Site is bordered by industrial properties, including the City of Solon firing range and WWTP and the Dirt Devil Headquarters. The existing 345 kV transmission lines are located adjacent to the site to the south and an electric distribution line originating from the Longfield Substation bisects the site. The structures associated with the switching substation would be taller than the existing tree line. Significant tree clearing would likely be required to construct the Glenwillow Transmission Switching Substation on the Alternate Site, thus removing a natural visual barrier. A landscaping plan was not developed for the Alternate Site. The closest residential properties are located just over 1,000 feet east of the Alternate Site. These residences would likely be over 1,500 feet from the fence line. Additionally, these residents are generally screened from view of the Preferred Site by existing forested land and would likely continue to be screened following construction. The existing forested area is expected to serve as a buffer that limits views of the Glenwillow Transmission Switching Substation. Adjacent industrial properties will have the closest view of the proposed switching substation.

(b) Structure Design Features

Project features are dictated primarily by the necessary equipment and engineering limitations. The proposed arrangement of the Glenwillow Transmission Switching Substation Project equipment is provided as Figure 4-2.

Figure 6-8. Photo of the Alternate Substation Site in the distance from the Dirt Devil Headquarters parking lot looking southeast.

Figure 6-9. Photo of the habitat present on the Alternate Site.

(c) Facility Effect on Site and Surrounding Area

The evaluation and selection of the Preferred and Alternate sites took into consideration the potential aesthetic impacts of the proposed facilities. Compatible land use and proximity to existing transmission infrastructure was considered during the Site Selection Study. The Routing Team avoided passing within 1,000 feet of visually sensitive areas such as residences, recreational areas and institutional land uses to the extent possible. The majority of residents within the closest residential neighborhood will not be able to see views of the switching substation from ground level. Houses located on the edge of the forested area may have limited views of the switching station from ground level or windows and elevated deck areas. This view will be screened by the existing forested area, but may be slightly more visible during the winter months. Photo 6-10 is a view of the closest residential area from the western side of Cochran Road and Photo 6-11 is a view from the closest residence in this area looking northwest at the Preferred Site.

Both the Preferred and Alternate sites are located in areas zoned for industrial use. Switching substations are more compatible with industrial uses than commercial, residential, or recreational uses. Offices within the Dirt Devil Headquarters with south-facing windows will have the most prominent view of the switching station. However, this facility presently has views of the existing 345 kV transmission lines and the Longfield Substation. The Kindred facility is located northwest of the Preferred Site on the western side of Cochran Road and will have a partial view of the new switching station. The facility presently has a view of the existing 345 kV transmission lines and the Longfield Substation, as shown in Figure 6-12. The proposed landscaping plan will reduce the visual impacts of the switching station.

Figure 6-10. Photo taken from the western side of Cochran Road looking southwest at the closest residential area.

Figure 6-11. Photo taken from the closest residence looking northwest toward the Preferred Site.

Figure 6-12. View looking southeast toward the Preferred Site from the Kindred entrance.

The extent of existing buildings, streets, railroads, utility poles, and other infrastructure in the vicinity of the Project will result in rapidly diminishing impacts at viewpoints farther from the substation.

(d) Visual Impact Minimization

As stated previously, ATSI worked closely with the adjacent business park developer to prepare a landscaping plan to minimize impacts to adjacent properties. The landscaping plan will involve planting various shrubs and trees, primarily along the western site boundary adjacent to Cochran Road. The shrub species may consist of eastern white pine, Norway spruce, arbor vitae, red cedar, red maple, sugar maple, pink flowering dogwood, and northern red oak. The tree species may consist of Canada yew, hazelnut, black chokecherry, gray dogwood, blackhaw, and crabapple. The landscaping plan will also preserve the existing landscaped area of pine trees and deciduous shrubs along Cochran Road. In addition, a vegetated berm will be constructed adjacent to Cochran Road to further minimize visual impacts. The preliminary landscaping plan is detailed on Figure 4-2. An artist's rendering of the Glenwillow Transmission Switching Substation with an approximation of

the planned landscaping is shown in Figure 6-13. The actual landscaping may vary depending on final engineering and site conditions. Figure 6-13 is provided to show approximate changes to the visual landscape associated with construction of the Project. It is not intended to be an exact photosimulation of the site. The proposed landscaping plan will provide additional visual buffer from Cochran Road.

Figure 6-13. Artist's rending of the Glenwillow 345 kV Switching Substation with existing landscaping.

(4) Estimate of Radio and Television Interference

No radio or television interference is expected to occur from the operation of the proposed substation or transmission line connections on either the Preferred or Alternate sites. During the operation of transmission lines and to a lesser extent substation equipment, gas-type discharges (corona) have the potential to result in the type of electromagnetic influence that could cause radio or television interference. The Glenwillow Switching Substation will have transmission line and equipment operating at 345 kV. Radio frequency noise measurements made in the last quarter of 1978 (Cohen and Dipell, 1978) demonstrated that radio frequency and television

interference noise associated with the operation of 345 kV electric transmission lines is also minimal.

The potential for radio frequency noise levels from transmission lines during heavy rain is greater than the fair weather noise level. However, the quality of radio reception under typical heavy rain conditions is affected more by atmospheric conditions than by operation of transmission lines. The likely source of gas-type discharges that would be causing radio and television interference would be a localized effect primarily from defective hardware (from ball and socket hardware in insulators, hardware to hardware, line to hardware, and similar hardware) that may be easily detected. Once detected, the hardware either may be repaired or replaced, thus eliminating the interference source.

(F) CULTURAL IMPACTS OF THE PROPOSED PROJECT

(1) Archaeological Resources and Correspondence with Agency

Data for known cultural resources, as shown on Figure 6-1, were obtained from the OHPO Online Mapping System. As mentioned previously, two previously recorded archaeological sites were identified within 1,000 feet of the Preferred Site, including one site, CU0240, located within the parcel boundaries. No recorded archaeological sites were identified within 1,000 feet of the Alternate Site. One OHI structure was identified within 1,000 feet of the Preferred Site and no structures were identified within 1,000 feet of the Alternate Site. This resource has not been evaluated for the NRHP and, based on current aerial imagery, the resource may no longer be extant. One previous cultural resource survey area, which included a survey for both architecture and archaeology, was conducted within 1,000 feet of the Preferred Site. No cultural resource surveys were conducted within 1,000 feet of the Alternate Site.

(2) Construction Impacts on Cultural Resources

Site No. CU0240 was identified during archeological investigations on the Preferred Site in 1980 and reassessed in 1999 as part of the cultural resources studies for the Emerald Business Park. The Ohio Archeological Inventory form for the investigation indicates that one flint core was found within the first 15 centimeters (cm) below the surface of the ground. The surveyor

recommended further investigation based on the site location. Based on discussion with the OHPO on October 15, 2012, CU0240 has not been evaluated or determined eligible for listing on the NRHP at this time. Further, the 1999 report indicated that CU0240 was not identified during field surveys and was likely destroyed by topsoil removal in the area. No impacts to the offsite archaeological site located within 1,000 feet of the Preferred Site are anticipated, as no construction activities will occur east of the railroad and no further investigation was recommended for the site. LBG will continue to consult with the OHPO to further assess the site for potential cultural resources as determined appropriate.

ATSI submitted a letter regarding the Project to OHPO on June 1, 2012. ATSI met with OHPO on September 11, 2012 and will continue to consult with the OHPO regarding potential cultural resource impacts and conduct surveys if deemed necessary.

(3) Operation and Maintenance Impacts on Cultural Resources

Substation maintenance operations will be generally limited to infrequent inspections. Therefore no impacts on historic properties are anticipated during operation and maintenance.

(4) Mitigation Procedures

Presently no cultural resource mitigation procedures are planned for construction of the proposed Glenwillow Transmission Switching Substation. ATSI will continue to consult with OHPO to determine if any surveys or NRHP evaluations are necessary. If any historic property is impacted, ATSI will work with the OHPO to avoid, minimize, or mitigate any impacts.

(G) NOISE

(1) Construction

(a) Dynamiting or blasting activities

No dynamiting or blasting is anticipated.

(b) Operation of earth moving or excavating equipment

The noise associated with construction equipment for the Project will cause a temporary increase in noise in the areas of construction. The type of construction activities and equipment used will influence the temporary sound level increase. The types of equipment operated during construction could be used at various times and for varying durations. Noise associated with the construction activities would have a temporary impact on the residences and businesses adjacent to those activities. There could be times when the nearby residents would experience sounds that are considered loud. These sounds, however, would be temporary in nature.

(c) Driving of piles

Driving of piles is not anticipated.

(d) Erection of structures

Structures will be erected by vehicle-mounted cranes.

(e) Truck traffic

Beyond construction equipment access and pole and hardware equipment delivery, no other additional truck traffic is anticipated for the Project.

(f) Installation of equipment

The equipment will be installed using standard practices and equipment.

(2) Operation and Maintenance

Operation of the new switching substation equipment will produce audible noise in the immediate vicinity of the facility. The facility will be located in an area zoned for industrial use and will not be adjacent to any residential properties. Based on existing land use in the area, including other industrial properties, existing roads, the active Wheeling & Lake Erie Railway, and the presence of adjacent forested areas, the operation of the Project at the Preferred Site is not expected to increase noise at nearby residences and other sensitive areas. Similar uses are located in the vicinity of the Alternate Site, including existing industrial uses, the Solon Wastewater Treatment Plant, the Solon Police Department Firing Range, existing roads and

railways, and the presence of adjacent forested areas. Therefore, operation of the Project at the Alternate Site also would not be expected to increase noise at nearby residences and other sensitive areas. It is anticipated that noise-sensitive areas will not be significantly affected by the maintenance or operation of the Project.

(3) Mitigation Procedures

Mitigation procedures will include properly maintained construction equipment with mufflers, construction primarily during daylight hours, and noise-related procedures done according to OSHA requirements. No additional noise mitigation is expected as noise impacts will be limited to construction equipment and will be temporary in nature.

(H) OTHER SIGNIFICANT ISSUES

There are no other significant socioeconomic or land use impact issues anticipated beyond those addressed elsewhere in this Application.

4906-15-07 ECOLOGICAL IMPACT ANALYSIS

SECTION SUMMARY

This section of the Application provides a summary of the studies that have been made regarding the ecological impact of the proposed Glenwillow Transmission Switching Substation Project (the "Project"). The Preferred and Alternate sites are undeveloped industrial properties. The Preferred Site is generally clear of trees and may have been graded in the past for future development. The Alternate Site is primarily forested. If the Alternate Site is selected, ATSI will need to acquire transmission ROW through the adjacent parcel to the east. Therefore, ATSI conducted field wetland delineation and habitat assessments on the Preferred and Alternate sites as well as on the adjacent parcel. Information is based on published data within 1,000 feet and field evaluation studies conducted on the properties.

(A) SUMMARY OF ECOLOGICAL IMPACT STUDIES

ATSI conducted field wetland delineation and Indiana bat habitat assessments as part of this Application. The field survey was supplemented by review of aerial photography, United States Geologic Survey ("USGS") maps, United States Fish and Wildlife Service ("USFWS") National Wetlands Inventory ("NWI") maps, and U.S. Department of Agriculture ("USDA") Natural Resource Conservation Service ("NRCS") soil survey maps covering the area within 1,000 feet of the Project. Additional information regarding potential threatened and endangered species in the Project vicinity was obtained from consultation with the Ohio Department of Natural Resources, Division of Wildlife ("ODNR-DOW") Ohio Biodiversity Database and the USFWS.

The Louis Berger Group, Inc. ("LBG") environmental scientists conducted field reconnaissance to confirm the occurrence and quality of wetlands and streams within the parcel boundaries for the Preferred and Alternate sites as well as the half-moon shaped parcel adjacent to and east of the Alternate Site. A habitat assessment was conducted by Pittsburgh Wildlife & Environmental ("PWE") to document the existing habitat and note the suitability of the sites for Indiana bat (*Myotis sodalis*) habitat. Environmental scientists also noted the presence of other ecological conditions on the sites during the field reconnaissance (e.g., trees, mammals, birds, etc.). Any such observations are discussed in this section where applicable.

(B) ECOLOGICAL FEATURES

A map at a scale of 1:700 illustrating areas within 1,000 feet of the Preferred and Alternate sites is presented as Figure 4-1. Features within 1,000 feet of the Preferred and Alternate sites were derived from published data, including responses from ODNR and USFWS, and, where possible, supplemented by the field survey. Figure 4-1 also depicts delineated features on each site.

(1) Route Alignments

No transmission line routes are being proposed in this Application.

(2) Substations

The proposed location for the Preferred and Alternate sites can be seen on Figure 4-1. The Preferred Site is located on an irregular shaped parcel approximately 24.8 acres in size and located east of the intersection of Cochran Road and Austin Powder Drive. ATSI is in the process of purchasing the property. Adjacent properties include the Longfield 138 kV Substation owned by Cleveland Electric Illuminating Company ("CEI"), the Dirt Devil Headquarters, and a vacant forested property to the north and northeast (the Alternate Site); the Wheeling and Lake Erie Railroad and a vacant forested property to the east; and Cochran Road and vacant lots to the south and west.

The Alternate Site is located on an adjacent irregular shaped parcel located north of the existing 345 kV transmission lines west of the Wheeling and Lake Erie Railroad tracks. The parcel is approximately 23 acres in size. Milstein Land Group, LLC currently owns this property. The Alternate Site is bordered by the Solon Police Department gun range and the City of Solon Wastewater Treatment Facility to the north; the Wheeling and Lake Erie Railroad and a vacant forested lot to the east (i.e., the half-moon shaped parcel previously discussed); vacant lots (including the previously considered Alternative Site 4) and commercial buildings (HD Supply) to the south; and the Dirt Devil Headquarters to the west.

(3) All Areas Currently Not Developed For Agricultural, Residential, Commercial, Industrial, Institutional, or Cultural Purposes, Including

(a) Streams and Drainage Channels

Stream evaluations were conducted within the Preferred and Alternate sites, including Site A (the half-moon parcel). Streams identified on and in the near vicinity of the Preferred and Alternate routes are mapped at 1:700 scale on Figure 4-1 and 1:200 scale on Figure 1 in Appendix 7-1. Streams with drainage areas greater than 1 square mile were assessed using the Ohio Environmental Protection Agency's ("Ohio EPA's") Qualitative Habitat Evaluation Index ("QHEI") method. Within the QHEI scoring convention, streams are classified based on their drainage area. QHEI streams that drain an area greater than 20 square miles are classified as "large streams," and streams that drain an area less than 20 square miles are classified as "headwater streams." QHEI-classified streams then receive a narrative rating based upon their score. The narrative rating gives a general indication of aquatic assemblages that may be found at any given site. Five narrative ratings scale the 100 point scoring system: "Very Poor" streams have a QHEI score less than 30; "Poor" streams have a QHEI score between 30 and 42; "Fair" streams have a QHEI score between 43 and 54; "Good" streams have a QHEI score between 55 and 69; and "Excellent" streams have a QHEI score greater than or equal to 70.

Streams with a drainage basin less than 1 square mile were evaluated using the Ohio EPA's Headwater Habitat Evaluation Index ("HHEI") method. The HHEI is a rapid field assessment method for physical habitat that can be used to appraise the biological potential of most Primary Headwater Habitat ("PHWH") streams. Headwater streams are considered by Ohio EPA guidance to be first- and second-order streams, meaning streams that have no upstream tributaries (or "branches") and those that have only first-order tributaries, respectively. Headwater streams are scored on the basis of channel substrate composition, bankfull width, and maximum pool depth. Assessed areas result in a score (0 to 100) that is converted to a specific PHWH stream class. Streams that are scored from 0 to 29.9 are typically grouped into "Class 1 PHWH Streams," 30 to 69.9 are "Class 2 PHWH Streams," and 70 to 100 are "Class 3 PHWH Streams." There is flexibility in the scoring system to allow for anthropogenic alterations to the natural channel. Such alterations will result in a "Modified" qualifier for the stream and can allow a stream to score relatively high while actually belonging in a lower class, and vice-versa.

Two streams, both tributaries of Tinkers Creek, were delineated on the Preferred Site, totaling approximately 1,110 linear feet. One stream (Beaver Meadows Creek) is a perennial stream characterized by the QHEI method as Excellent and the second stream is intermittent and characterized as a Modified Class II PHWH stream. Neither stream is located within the proposed switching station fence line. Both streams are located in the northwest corner of the parcel and will likely be outside of the construction area.

Three streams were delineated on the Alternate Site, totaling approximately 4,132 linear feet. Of these, two are perennial streams, one characterized as Excellent (Beaver Meadows Creek) and the other characterized as Good. The third delineated stream is intermittent and characterized as a Modified Class II PHWH. Five streams were delineated on Site A, totaling approximately 1,612 linear feet. One stream is perennial and characterized as Good quality and the remaining four streams are ephemeral and characterized as Class I PHWH.

Table 7-1 identifies key attributes for each stream. The Ohio EPA has established water use designation for streams throughout Ohio as outlined in the Ohio Administrative Code ("OAC"), OAC-3745-1-07. Of the streams delineated on the Preferred and Alternate sites, only one, Beaver Meadows Creek, has an aquatic use designation (warmwater habitat). Potential impacts to these streams are described in subsequent sections. Streams and drainage channels mapped within 1,000 feet of the Preferred and Alternate sites are shown on Figure 4-1. Two streams were depicted on the USGS topographic maps within 1,000 feet of the Preferred Site fence line: Tinkers Creek and two unnamed tributaries to Tinkers Creek. One unnamed tributary was mapped within 1,000 feet of the Alternate Site fence line.

Tinkers Creek is located approximately 0.1 mile west of the Preferred Site and approximately 0.3 mile southwest of the Alternate Site. All of the wetland and stream features delineated on the Preferred and Alternate sites are hydrologically connected to Tinkers Creek. Tinkers Creek is the largest tributary to the Cuyahoga River and has a drainage area of approximately 96.4 square miles. According to the most recent Lower Cuyahoga River Watershed Total Maximum Daily Load ("TMDL") Report[1], upstream wastewater treatment plants ("WWTPs") impact water flow in the

[1] Ohio EPA Division of Surface Water. 2003. Total Maximum Daily Loads for the Lower Cuyahoga River.

Table 7-1: Delineated Streams within the Preferred and Alternate Sites

Flag Series	Water Body	Flow Regime	Form Used	Score	Class or Narrative Description	Bankfull Width (feet)	Length within Preferred Site (feet)[1]	Length within Alternate Site (feet)	Length within Site A (feet)
CFBL	Beaver Meadows Creek	Perennial	QHEI	78	Excellent	41	453	2,026	0
CFBM	UNT to Tinker Creek	Perennial	QHEI	68.5	Good	31	0	1,036	1,036
CFBN	UNT to Tinkers Creek	Ephemeral	HHEI	18	Class I PHWH	1	0	0	53
CFBS	UNT to Tinkers Creek	Intermittent	HHEI	30	Modified Class II PHWH	3.3	657	0	0
CFBU	UNT to Tinkers Creek	Intermittent	HHEI	41	Modified Class II PHWH	3.3	0	1,070	0
TSDL	UNT to Tinkers Creek	Ephemeral	HHEI	17	Class I PHWH	2	0	0	272
TSDM	UNT to Tinkers Creek	Ephemeral	HHEI	17	Class I PHWH	1.7	0	0	168
TSDO	UNT to Tinkers Creek	Ephemeral	HHEI	18	Class I PHWH	1.7	0	0	83
						Total	1,110	4,132	1,612

[1]Based on preliminary engineering, neither stream is anticipated to be located within the Preferred Site construction limits. Fully developed engineering information was not developed for the Alternate Site; however, Beaver Meadows Creek would need to be spanned in order to connect the existing 345 kV lines into the new substation if the Alternate Site were developed. In addition, an unnamed tributary to Beaver Meadows Creek would likely have to be crossed in order to construct an access road from Beaver Meadow Parkway.

lower portion of the creek. The headwaters of Tinkers Creek support fair quality fish communities, but further downstream the fish communities are poor due to influences from several WWTPs.

(b) Lakes, Ponds, and Reservoirs

No lakes, ponds or reservoirs were delineated onsite or found within 1,000 feet of either site based on USGS topographic maps and aerial photography.

(c) Marshes, Swamps, and Other Wetlands

Wetlands are defined as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation (hydrophytic) typically adapted for life in saturated (hydric) soil conditions.

Prior to conducting field delineation, LBG environmental scientists conducted a desktop study of available resources. USFWS NWI maps and NRCS soil survey and hydric soil lists for Cuyahoga County, Ohio were reviewed for areas within 1,000 feet of the Preferred and Alternate sites. NWI areas are shown on Figure 4-1. Three NWI areas were mapped within 1,000 feet of the Preferred Site fence line. None of these areas are located within 100 feet of the fence line. The NWI areas include Tinkers Creek to the west; an unnamed tributary of Tinkers Creek to the south and east; and a palustrine forested/shrub scrub (PFO1/SS1C) wetland adjacent to the unnamed tributary to Tinkers Creek to the east. Two NWI areas were mapped within 1,000 feet of the Alternate Site fence line, one of which is located within 100 feet of the fence line. The NWI area within 100 feet includes the same PFO1/SSIC wetland located near the Preferred Site. The NWI area within 1,000 feet includes an unnamed tributary to Tinkers Creek. Onsite features were delineated in accordance to the U.S. Army Corps of Engineers ("USACE") *1987 Wetland Delineation Manual* (1987 Manual) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (Version 2.0)* (*Regional Supplement*).

The Ohio Rapid Assessment Method v5.0 ("ORAM") was developed to determine the relative ecological quality and level of disturbance of a particular wetland. Wetlands are scored on the basis of hydrology, upland buffer, habitat alteration, special wetland communities, and vegetation communities. Each of these subject areas is further divided into subcategories under

ORAM v5.0 resulting in a score that describes the wetland using a range from 0 (low quality and high disturbance) to 100 (high quality and low disturbance). Wetlands scored from 0 to 29.9 are grouped into "Category 1," 30 to 59.9 are "Category 2," and 60 to 100 are "Category 3." Transitional zones exist between "Categories 1 and 2" from 30 to 34.9 and between "Categories 2 and 3" from 60 to 64.9. However, according to the Ohio EPA, if the wetland score falls into the transitional range, it must be given the higher Category unless scientific data can prove it should be in a lower Category (Mack 2001[2]).

LBG wetland scientists delineated the Preferred and Alternate sites, including the parcel adjacent to the Alternate Site (Site A). Calculations for delineated wetlands on all three sites are presented in Table 7-2. The results are as follows:

Preferred Site: Three wetlands, totaling approximately 2.85 acres, were delineated within the Preferred Site. One wetland is a palustrine forested/emergent ("PFO/PEM") wetland and the other two wetlands are palustrine emergent ("PEM"). All three wetlands are classified as Category 2 wetlands. No Category 3 wetlands were observed onsite.

Alternate Site: Four wetlands, totaling approximately 2.53 acres, were delineated within the Alternate Site. Three features are PEM wetlands and the other feature is a PFO/PEM wetland. All four wetlands are classified as Category 2 wetlands. No Category 3 wetlands were observed on site. Eleven wetlands, totaling approximately 2.78 acres, were delineated within Site A. One feature is PEM, seven features are palustrine forested ("PFO") and three features are palustrine shrub scrub/emergent ("PSS/PEM"). All eleven wetlands are classified as Category 2 wetlands. No Category 3 wetlands were observed onsite.

Delineated wetlands within the Preferred and Alternate sites are mapped on Figure 4-1, and in more detail on Figure 1 in Appendix 7-1.

[2] Mack, John J. 2001. *Ohio Rapid Assessment Method for Wetlands v. 5.0, User's Manual and Scoring Forms. Ohio EPA Technical Report WET/2001-1.* Ohio Environmental Protection Agency, Division of Surface Water, 401/Wetland Ecology Unit, Columbus, Ohio.

Table 7-2. Delineated Wetlands within the Preferred and Alternate Sites					
Cowardin Wetland Type	**Number of Wetlands**	**Category 1**	**Category 2**	**Category 3**	**Acreage within Site Boundary**
Preferred Site					
PEM	2	0	2	0	1.51
PFO/PEM	1	0	1	0	1.34
Alternate Site					
PEM	3	2	1	0	1.25
PFO/PEM	1	0	1	0	1.28
Site A					
PEM	1	0	1	0	0.2
PFO	7	0	7	0	1.29
PSS/PEM	3	0	3	0	1.29
Preferred Site Total	**3**	**0**	**3**	**0**	**2.85**
Alternate Site Total	**4**	**2**	**2**	**0**	**2.53**
Site A Total	**11**	**0**	**11**	**0**	**2.78**

(d) Woody and Herbaceous Vegetation Land

The Preferred and Alternate sites are located on undeveloped, industrial sites within the Village of Glenwillow, Cuyahoga County, Ohio, as shown on Figure 4-1. Approximately 5 acres of the Preferred Site is forested and approximately 16.7 acres of the Alternate Site is forested. As discussed in the construction impacts section below, minimal tree clearing is anticipated for the Preferred Site, while more substantial tree clearing would be required on the Alternate Site. A habitat description for the Preferred and Alternate sites is provided in section 4906-15-07(E).

(e) Locations of Threatened and Endangered Species

Correspondence has been sent to USFWS, ODNR-DOW, and ODNR-Department of Natural Areas and Preserves ("DNAP") requesting their comments regarding the Project and its

potential, if any, to impact species of concern. Responses received to date are discussed in section 4906-15-07(F).

(4) Soil Associations in the Corridor

According to the USDA soils data[3], the Mahoning-Ellsworth (s6130) is the only soil association located on the Alternate Site. Figure 4-1 shows the soil associations in the project vicinity. No soil conditions were found that would potentially limit construction of the proposed Project.

(C) IMPACTS OF ALTERNATIVE ROUTES ON WATERBODIES

(1) Construction Impact

ATSI does not anticipate any impact to streams, lakes, ponds, or reservoirs during construction activities. Based on preliminary engineering, neither stream delineated within the Preferred Site is anticipated to be located within construction limits. Fully developed engineering information was not developed for the Alternate Site; however, Beaver Meadows Creek would need to be spanned in order to connect the existing 345 kV lines into the new substation if the Alternate Site were developed. In addition, an unnamed tributary to Beaver Meadows Creek would likely have to be crossed in order to construct an access road from Beaver Meadow Parkway.

(2) Operation and Maintenance Impact

Once the new switching substation is in operation, ATSI does not anticipate any significant impact to streams or drainage channels. No lakes, ponds, or reservoirs should be affected by the operation or maintenance of the Site.

(3) Mitigation Procedures

A Storm Water Pollution Prevention Plan ("SWPPP") and associated construction Best Management Practices ("BMPs") will be implemented during installation of the Project in accordance with the Ohio EPA General National Pollutant Discharge Elimination System ("NPDES") Permit for Construction Storm Water Discharges. The SWPPP will detail

[3] U.S. Department of Agriculture [USDA], Web Soil Mapper, 2012. Available online: http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

appropriate erosion and sediment controls and site stabilization measures to be implemented throughout construction.

(D) WETLANDS IMPACT

(1) Construction Impact

Two wetlands may be impacted during construction activities at the Preferred Site. Based on the preliminary switching substation layout, approximately 1,673 square feet of wetland CFBR may be impacted, with approximately 558 square feet located within the fenced area. Approximately 1,071 square feet of wetland CFBS may be impacted by associated grading activities north of the fenced area. Both wetlands are ORAM category 2 wetlands, and the total area of wetland loss is expected to be less than 0.1 acre. Temporary impacts are expected to be minimal. No streams are anticipated to be impacted during construction activities. All other onsite streams and wetlands will be avoided, and protected through BMPs. ATSI will obtain any necessary permits to address construction activities within wetlands through the USACE and the Ohio EPA, as needed and in accordance with Sections 404/401 of the Clean Water Act.

Although engineering was not fully developed for the Alternate Site, impacts to wetland features would be likely based on the extent of delineated features and their location in relation to likely access roads and transmission ROW. These impacts would likely exceed the anticipated impacts to the Preferred Site.

(2) Operation and Maintenance Impact

Once the new switching substation is in operation, ATSI does not anticipate any significant impact to streams, wetlands, or drainage channels. No lakes, ponds, or reservoirs should be affected by the operation or maintenance of the Project Site.

(3) Mitigation Procedures

Any mitigation related to construction activities within wetlands is expected to be addressed as a part of Section 404/401 permitting through USACE and Ohio EPA. It is anticipated that the wetland impacts referenced herein will be authorized under Nationwide Permit. Construction

plans will include details on restoration of temporary impacts to pre-project conditions. ATSI will consult with USACE to determine if mitigation will be required for the permanent impacts.

(E) VEGETATION IMPACT

The following discussion describes the potential impacts on woody and herbaceous vegetation at the Preferred and Alternate switching substation sites. The Preferred and Alternate sites (including Site A) are characterized by field habitat, and by forest and woodland habitat. Wetland habitat exists within the forest and woodland areas of the Preferred and Alternate sites. All three sites are located adjacent to each other in an area that is heavily developed with both commercial and industrial uses. Habitat descriptions applicable to the three sites and details on the expected impacts of construction are provided below and in Table 7-3.

Table 7-3. Approximate Vegetation Impacts at the Preferred and Alternate Switching Station Sites

Substation Site	Fields (acreage)	Forests and Woodlands (acreage)	Wetlands (acreage)
Preferred	10	0.9	0.04
Alternate	0	>12	Unknown

The Preferred Site is approximately 24.8 acres in size and is primarily cleared and characterized as field habitat, with a small section of forest. Field plant communities are at the earliest stages of re-colonization following disturbance. The field areas within the Preferred Site and adjacent areas include grasses, forbs, and occasional shrubs. Reed canary grass (*Phalaris arundinacea*) is a dominant grass found in the fields within the flood plain of Tinkers Creek. The fields at higher elevation are dominated primarily by velvet grass (*Holcus lanatus*) and fescue species (*Festuca* spp).

Approximately 5 acres of trees occur along the southern and eastern border of the Preferred Site. The forest within this area is dominated by black cherry (*Prunus serotina*), red maple (*Acer rubrum*), shagbark hickory (*Carya ovata*), American beech (*Fagus grandfolia*), ash (*Fraxinus* spp.), and sycamore (*Platanus occidentalis*). A few black walnut (*Juglans nigra*) and locust

(*Robinia pseudoacacia, Gleditsia triacanthos*) trees were also noted in this area. Tree height ranged from 60 to 85 feet and tree diameter at breast height ("DBH") ranged from 8 to 30 inches with an average of 18 inches. There is little to no understory within this area.[4]

The Alternate Site is approximately 23 acres in size and is almost completely forested with a tributary to Tinker's Creek traversing the eastern portion of the property. The forest within this area is dominated by tulip tree (*Liriodendron tulipifera*), sycamore, maple, cottonwood (*Populus deltoides*), black cherry, and elm (*Ulmus* spp.). A couple areas within this location contained stands of silky dogwood (*Cornus amomum*) and hawthorn (*Crataegus* spp.). Tree height ranged from 60 to 75 feet and DBH ranged from 8 to 24 inches with an average of 14 inches. There is a mix of thick understory and open understory within this area.

The adjacent parcel to the Alternate Site ("Site A") is approximately 24 acres and is completely forested. The forest within this area is dominated by shagbark hickory, cottonwood, red maple, black cherry, and American beech. A few ash, elm, and sycamore trees were also noted within this area. Tree height ranged from 75 to 85 feet and DBH ranged from 12 to 30 inches with an average of 20 inches. There is little to no understory within this area.

(1) Construction Impact

The potential impacts on woody and herbaceous vegetation at the Preferred Site would be minimal because the majority of the parcel is cleared and the parcel is zoned for industrial use. ATSI anticipates that approximately 0.9 acre of trees will need to be removed for construction of the Glenwillow Transmission Switching Substation at the Preferred Site. Approximately 0.25 acre of tree clearing is anticipated within the proposed fenced area. The remaining 0.65 acre of tree clearing is anticipated in areas that will require grading. Although fully developed engineering information is not available for the Alternate Site, ATSI would anticipate approximately 6 acres of tree clearing for the proposed fence line and an additional 6 acres or more for grading and site access. Anticipated impacts to vegetation are provided in Table 7-3.

[4] Habitat information is based on a 2012 Habitat Assessment Report for the Preferred and Alternate Sites prepared by Pittsburgh Wildlife & Environmental, Inc.

The potential impacts on woody and herbaceous vegetation at the Alternate Site would be more significant as this site is a predominately forested area. The fenced area of the proposed switching substation will be approximately 480 feet by 495 feet; therefore, at least 5.5 acres of vegetation would need to be cleared at the Alternate Site for the fenced area alone. Additional clearing would be required for construction access, access roads, and transmission line ROW. If the Alternate Site is selected, additional tree clearing would be required through a portion of Site A to accommodate a portion of the transmission ROW into the substation. The ROW would be 150 feet in width through this area.

Some of the vegetative waste (such as tree limbs and trunks) that is generated during the construction may be harvested and removed from the Site. The balance of the vegetative waste is expected to be chipped and disposed of appropriately, although some vegetative waste materials may be used on site for erosion control.

(2) Operation and Maintenance Impact

During operation of the switching substation, the impacts on vegetated land should be minor. Undeveloped land not disturbed by construction should retain its current vegetation composition and continue successional development at a normal rate. Any periodic mowing or cutting at the substation site or along access roads is not expected to result in a significant environmental impact to the vegetation.

(3) Mitigation Procedures

As part of the sediment and erosion control measures and BMPs that will be contained in the SWPPP, disturbed areas will be seeded with an appropriate native seed mix (Type 1 Mix). The Type I Mix consists of Kentucky bluegrass (*Poa pratensis*), creeping red fescue (*Festuca rubra*), perennial ryegrass (*Lolium perenne*), red clover (*Trifolium pratense*), and annual ryegrass (*Lollum multiflorum*).

ATSI worked with the developer of the Emerald Valley Business Park to prepare a landscaping plan for the Glenwillow Transmission Switching Substation. The landscaping plan will involve planting various shrubs and trees, primarily along the western site boundary adjacent to Cochran Road. The shrub species may consist of eastern white pine (*Pinus strobus*), Norway spruce (*Picea abies*), arbor

vitae (*Thuja accidentalis*), red cedar (*Juniperus virginiana*), red maple (*Acer rubrum*), sugar maple (*Acer saccharum*), pink flowering dogwood (*Cornus florida var. rubra*), and northern red oak (*Quercus rubra*). The tree species may consist of Canada yew (*Taxus Canadensis*), hazelnut (*Corylus Americana*), black chokecherry (*Aronla melanocarpa*), gray dogwood (*Cornus racemosa*), blackhaw (*Vilournum prunifolium*), and crabapple (*Maius sp.*). The landscaping plan will also preserve the exiting landscaped area of pine trees and deciduous shrubs along Cochran Road. The preliminary landscaping plan is detailed on Figure 4-2.

(F) COMMERCIAL, RECREATIONAL, AND THREATENED/ENDANGERED SPECIES IMPACTS

The Preferred and Alternate sites are located in a commercial/industrial setting on vacant parcels zoned as industrial. The sites do have potential habitat for wildlife species. Lists of commercial and recreational species were obtained from the ODNR-DOW annual hunting and trapping regulations.[5] Species information was obtained from the ODNR-DOW online species guide.[6]

Details on the expected impacts of construction, operation and maintenance, and mitigation procedures can be found following the commercial, recreational, and protected species descriptions.

(1) Construction

Commercial Species: The commercially important wildlife species within or near the Project Area consist of those hunted or trapped for fur or other byproducts. It is likely that during construction some species of wildlife could leave the Project Area due to noise and human activity. However, because the species that use the Preferred and Alternate sites are likely to be habitat generalists, they have plentiful habitat available nearby the sites and population numbers are unlikely to be affected. Commercial species that are likely to use the Preferred and Alternate sites include the following:

> Beaver (*Castor canadensis*): Beavers occur in forested ponds, lakes, and rivers with the highest abundance being found in the eastern and western portions of Ohio. Beavers living along a river make burrows with an underwater entrance in the riverbank, while those in

[5] ODNR–DOW Ohio Hunting and Trapping Regulations 2012-2013.
[6] ODNR-DOW A to Z Species Guide.

streams, lakes and ponds usually build dams that generally incorporate a lodge. Based on the habitat present at the substation sites, there are select locations along the stream where beavers could possibly inhabit. Field surveyors observed signs of beaver activity during surveys.

Coyote (*Canis latrans*): Historically coyotes prefer open territory, but in Ohio they have adapted to various habitat types. The coyote is a highly adaptable species that does not avoid developed areas and has thrived in the midst of human expansion. This species was observed during field surveys of the Preferred and Alternate sites.

Long-tailed weasel (*Mustela frenata*): The long-tailed weasel is found throughout the state of Ohio in areas adjacent to rivers, lakes, streams, or marshes, where they feed on small mammals. The long-tailed weasel is very adaptable; therefore, it is possible that this species occurs in stream habitat within the Preferred and Alternate sites.

Muskrat (*Ondatra zibethicus*): The muskrat is abundant throughout Ohio. It creates a burrow in the shallow water of ponds or lakes and also in hollows in the banks of streams and rivers. The muskrat is the most extensively trapped fur-bearer in the State of Ohio. This species was observed during field surveys of the Preferred and Alternate sites.

Raccoon (*Procyon lotor*): The raccoon is abundant and widespread in Ohio, even in many suburban areas. Raccoons are found principally in wooded areas with large trees and abundant water nearby. This species was observed during field surveys of the Preferred and Alternate sites.

Red fox (*Vulpes vulpes*): The red fox occurs throughout Ohio and is most prevalent in areas of maximum interspersion of woodland, cropland, brush, pastures, and edges of open areas that provide suitable hunting ground. Although this species was not observed during field surveys, it possibly occurs near the Preferred and Alternate sites.

Striped skunk (*Mephitis mephitis*): Striped skunks are highly adaptable and occupy a wide variety of habitats in Ohio from rural areas to suburban areas. They are most abundant in rural Ohio where there are farms with fencerows, forest edges, and old fields. These

mammals are common statewide. This species was not observed during field surveys, but it likely exists near the sites.

Virginia opossum (*Didelphis virginiana*): Opossums are found in every county of Ohio, but are slightly more abundant in southern Ohio. They are highly adaptable to a variety of habitat types, but their preferred habitat is an area interspersed with woods, wetlands, and farmland. The den is usually situated in a wooded area near water. This species was observed during field surveys of the Preferred and Alternate sites.

Recreational Species: Recreational terrestrial species consist of those hunted as game. It is likely that during construction some species of wildlife could leave the Project Area due to noise and human activity. However, because the species that use the Preferred and Alternate sites are likely to be habitat generalists, they have plentiful habitat available nearby the sites and population numbers are unlikely to be affected. Because none of the streams in either the Preferred or Alternate sites would be affected by construction, fish species would not be impacted. Recreational species that could inhabit areas within or near the proposed substation sites include the following:

Fowl

American crow (*Corvus brachyrhynchos*): The American crow is found in all 88 counties in Ohio, but are most numerous in the more heavily forested farmland of southeastern Ohio. They thrive in habitats with open fields, where they feed, and trees, where they nest and roost. This species was observed during field surveys of the Preferred and Alternate sites.

Canada goose (*Branta canadensis*): The Canada goose is commonly found throughout Ohio, both as a resident and migrant. Several large lakes and marshy areas in Ohio have permanent flocks of thousands of geese. Canada geese were observed near the Preferred and Alternate sites during field surveys.

Mourning dove (*Zenaida macroura*): Mourning doves regularly reside near rural and suburban residences, nesting in shrubbery and shade trees while finding plentiful sources of food on residential lawns and bird feeders. They are also numerous rural farmlands where they forage in cultivated fields and nest along fencerows and the edges of woodlots. This species was observed during field surveys of the Preferred and Alternate sites.

Hooded merganser (*Lophodytes cucullatus*): The hooded merganser can be found in forested wetlands and along streams and rivers. Although this species was not observed during field surveys, it could occur near the Preferred and Alternate sites.

Various duck species: Various duck species can be found in Ohio, although such species generally appear exclusively during fall and spring migration. The American black duck (*Anas rubripes*), redhead (*Aythya americana*), greater scaup (*Aythya marila*), lesser scaup (*Aythya affinis*), canvasback (*Aythya valisineria*), and northern pintail (*Anas acuta*) are typically only found in Ohio during migration and could be found near the Preferred and Alternate sites at that time. The wood duck (*Aix sponsa*) is a duck species that resides and migrates through Ohio. The wood duck prefers mature riparian corridors along streams; quiet backwaters of lakes and ponds bordered by large trees; and secluded wooded swamps as ample areas to raise young. They feed on acorns, berries, and grapes on the forest floor. This species was not observed during field surveys; however, it could occur in stream habitat within the Preferred and Alternate sites.

Mammals

Eastern cottontail rabbit (*Sylvilagus floridanus*): The Eastern cottontail rabbit is abundant throughout Ohio in both rural and urban areas. It prefers open areas bordered by thickets or brush areas. An ideal open area would be an old field with tall grass. Because habitat for this species is found at the Preferred and Alternate sites,; therefore, it is likely that rabbits observed during field surveys of those sites were eastern cottontail rabbits.

Gray and fox squirrels (*Sciurus carolinensis* and *S. niger*): These tree squirrel species occur throughout the State of Ohio. The fox squirrel is primarily an inhabitant of small, typically isolated woodlots. They make use of hickory, oak, beech, black walnut, maple, elm, and buckeye trees for food and shelter and were not observed at the Preferred or Alternate sites. Gray squirrels predominate in the oak-hickory forests of eastern and southern Ohio, but are also common in urban and suburban parks. It is likely that gray squirrels inhabit or could inhabit locations within or near both sites.

White-tailed deer (*Odocoileus virginianus*): White-tailed deer occur throughout Ohio. Deer are a very adaptable species that can be found in almost all habitats throughout Ohio. They

prefer an area with diverse food and cover types, including mixed-aged timber stands. Ideal habitat is a mixture of forest, brushland, and cropland in blocks of 1-2 square miles (ODNR-DOW n.d.)[7]. This species was observed during field surveys of the Preferred and Alternate sites.

Woodchuck (*Marmota monax*): The woodchuck or groundhog is a common ground squirrel found throughout Ohio, but the species is particularly prevalent in the sandy gravel soil of east-central Ohio. Woodchucks prefer open grasslands, pastures, and woodlands where it is easy to spot predators. This species was observed during field surveys of the Preferred and Alternate sites.

Game Fish: Based upon the nature of Tinkers Creek, various game fish could inhabit the tributary traversing the Preferred and Alternate sites; however, the tributary is shallow and not ideal habitat for many species of fish. A list of potential game fish was obtained from Cuyahoga Valley National Park[8], and ODNR-DOW[9]. Species information was obtained from the ODNR-DOW A to Z Species Guide online[6].

Bluegill sunfish (*Lepomis macrochirus*): Bluegill sunfish are one of the most common species in Ohio and can be found throughout the state in nearly every stream and waterbody. Their preferred habitat is clear lakes and ponds with some rooted vegetation. This species is likely to occur in the stream that traverses the Preferred and Alternate sites.

Green sunfish (*Lepomis cyanellus*): Green sunfish are common throughout Ohio and can be found in most lakes, reservoirs, and streams. Unlike most other sunfish species, they are tolerant of turbid (murky) water. They appear to have no preference for a particular bottom type, but are usually associated with some type of structure such as brush piles, logs, or rocks. This species may occur in the stream that traverses the Preferred and Alternate sites.

Longear sunfish (*Lepomis megalotis*): Longear sunfish require streams having moderate gradients, clean substrates composed of sand, gravels, and cobbles, and low water

[7] Ohio DNR – DOW. n.d. Life History Notes: White-tailed Deer. Publication 101 (R503), located at: http://ohiodnr.com/Portals/9/pdf/pub101.pdf.
[8] Cuyahoga Valley National Park, located at: http://www.nps.gov/cuva/planyourvisit/fishing.htm.
[9] Ohio DNR-DOW, located at: http://ohiodnr.com/tabid/4414/Default.aspx.

turbidities. The largest populations are currently found in the smaller headwater streams and in those moderate-sized streams having clear waters and clean silt-free substrates. This species may occur in the stream that traverses the Preferred and Alternate sites.

Protected Species: Based on information provided by USFWS in its June 20, 2012 letter to LBG, the proposed switching substation sites are within the range of one federally listed species that may be affected by the Project: the endangered Indiana bat (*Myotis sodalis*). LBG conducted additional consultation with USFWS regarding the Indiana bat and as a result of that consultation USFWS submitted a second letter dated July 25, 2012, detailing Indiana bat survey requirements and restrictions. This letter indicated the following:

In areas within the buffer around the suspected hibernaculum in Liberty Park and the female capture near Cuyahoga Valley National Park (north and west of Page Road):

- No mist net surveys are required west and north of Page Street in Streetsboro.
- ATSI would need to perform habitat assessments for all areas within this buffer where trees would need to be cut for the Project.
- All such habitat assessments will be submitted to USFWS for review.
- For identified potential maternity roost trees that ATSI proposes to cut, habitat assessments must contain the following; the coordinates of the tree, a description of the tree characteristics (size, amount of pealing bark, solar exposure, etc.), photographs of the tree, and a description of available roosting habitat in the vicinity of the tree.
- Based on the information in the habitat assessment, emergence surveys may be necessary to determine if bats are utilizing the potential roost trees. Emergence surveys may only be conducted between the dates of May 15 and August 15, when the presence of maternity colonies could be detected.
- Should an emergence survey detect bats using a potential roost tree, the USFWS must be consulted to determine if further surveys will be necessary or if an incidental take permit will be necessary.

As discussed previously, PWE was retained by LBG to complete an onsite Indiana bat habitat assessment for each of the three potential substation parcels. PWE completed the assessment on July 16, 2012, and determined each tree's potential to provide a suitable primary roost habitat for the Indiana bat. A typical primary roost is located under exfoliating bark of a dead hickory, ash, elm, maple, oak, or poplar, although any tree that retains large, thick slabs of peeling bark probably is suitable. The average diameter of maternity roost trees is 18 inches and the average diameter of roosts used by adult males is 13 inches. The height of the tree is typically greater than 10 feet. Primary roosts usually receive direct sunlight for more than half the day. The tree is typically within canopy gaps in a forest, in a fence line, or along a wooded edge. Primary roosts usually are not found in the middle of extensive open fields but often are within 50 feet of a forest edge. Primary roosts usually are in trees that are in early-to-mid stages of decay (USFWS 2007)[10].

Both the Preferred and Alternate sites contain potential roosting and foraging habitat for the Indiana bat. The forested portion of the Preferred Site contains one potential primary and five potential secondary roost trees, as well as potential foraging habitat. However, impacts of construction at the Preferred Site are expected to be minimal because less than 1 acre of tree removal will be required. The Alternate Site contains a significant amount of potential primary (eight total) and secondary (12 total) roost trees, as well as large diameter shagbark hickories that could also provide suitable maternity roosts. The Alternate Site also contains potential foraging habitat for the Indiana bat. Therefore, impacts are expected to be more significant if the Alternate Site is selected. If the Alternate Site is selected, further coordination with USFWS will be necessary.

Based on information provided by ODNR-DOW in its August 8, 2012 letter to LBG, the following species could be affected by construction of the proposed substation if their habitat is impacted: the state endangered Indiana bat, which is discussed above; two state endangered birds, the king rail (*Rallus elegans*) and yellow-bellied sapsucker (*Sphyrapicus varius*); and one state endangered dragonfly, the Canada darner (*Aeshna Canadensis*). ODNR-DOW mentioned several other species that are known to occur in Cuyahoga County; however, none of these

[10] USFWS. 2007. Indiana Bat (Myotis sodalis) Draft Recovery Plan: First Revision. April 2007. Accessed online at: http://www.fws.gov/midwest/endangered/mammals/inba/pdf/inba_fnldrftrecpln_apr07.pdf. Accessed August 29, 2012.

species are likely to inhabit areas within or immediately adjacent to the Preferred and Alternate sites.

ODNR-DOW states that the yellow-bellied sapsucker is known to occur in Cuyahoga County. Yellow-bellied sapsuckers occupy wet deciduous forests or the margins of bogs where yellow birch, beech and aspen are prevalent. ODNR-DOW states that if tree removal is proposed in this type of habitat, tree removal must not occur during the species' nesting period of May 1 to July 1. If no tree removal is proposed, the project is not likely to impact this species. Although tree clearing will be required at both the Preferred and the Alternate sites, it is unlikely that suitable habitat for this species exists in this area. Therefore, the Project is not expected to adversely affect the yellow-bellied sapsucker; however, if suitable habitat is identified and tree clearing is required, the Applicant will adhere to the timing restriction and/or consult with ODNR-DOW further.

ODNR-DOW states that the king rail is known to occur in Cuyahoga County. Nests for this species are deep bowls constructed out of grass and usually hidden very well in marsh vegetation. In Ohio, most breeding pairs occupy marshes dominated by cattails and other tall emergent vegetation, preferably wetlands larger than 50 acres. However, they have also nested in buttonbush swamps, wet meadows, marshy pools in swamp forests, and brushy tangles in swampy meadows[11]. King rails prefer permanently flooded wetlands where water depths are generally less than six inches, although they are not averse to swimming across deep water channels[11]. If this type of habitat will be impacted, construction must be avoided in this habitat during the species' nesting period of May 1 to August 1; however, no king rail habitat is found on either the Preferred, Alternate, or Site A substation sites.

ODNR-DOW states that the Project is within the range of the Canada darner in Cuyahoga County. ODNR-DOW states that wetland impacts must be avoided in order to avoid potential impacts to these dragonfly species. Construction of the Preferred Site would impact a minimal amount of wetlands; the Alternate Site, however, is likely to require a greater amount of wetland disturbance. The Applicant will consult with ODNR-DOW further regarding wetland impacts and any further measures necessary to protect this species.

[11] Ohio Ornithological Society, 2012. Ohio Breeding Bird Atlas, King Rail information webpage. http://www.ohiobirds.org/obba2/pdfs/species/KingRail.pdf Accessed September 7, 2012.

ODNR, in an email dated September 18, 2012, requested that construction crews be careful with heavy equipment near sensitive resources such as wetlands to avoid creating ruts, altering hydrology etc. and to clear as little vegetation as possible near areas with known rare plant records. There are no rare plant records within 1,000 feet of either the Preferred or Alternate sites. No plant surveys were requested.

(2) Operation and Maintenance Impact

During operation and maintenance of the switching substation, any impact on protected wildlife that may be present is likely to be minor. The majority of the Preferred Site is cleared and zoned for industrial use. While a large portion of the Alternate Site will need to be cleared, the undeveloped land not disturbed by construction will retain its current vegetation composition. Periodic maintenance at the site, and along the transmission line corridors adjacent to the site, is not expected to result in a significant impact to the local wildlife. Operational impact to local wildlife is also expected to be negligible given the quantity of additional comparable habitat adjacent to the Project Area.

(3) Mitigation Procedures

The Applicants will continue to consult with USFWS and ODNR regarding special status species in the Project Area and any mitigation measures that may be warranted, such as time of year restrictions on tree clearing.

(G) SLOPES AND ERODIBLE SOILS

(1) Construction Impact

Approximately 5.9 acres of both the Preferred and Alternate sites have slopes greater than 12 percent. Maps of slopes exceeding 12 percent (as calculated from the USGS Digital Elevation Model of the area) are provided on Figure 4-1. The majority of steep slopes on the Preferred Site are located along the eastern site boundary adjacent to Beaver Meadows Creek. As shown in Figure 4-2, substation design avoids areas of steep slope to the maximum extent practical, while also considering the placement of landscaping species in the western portion of the site. An erosion and sedimentation control plan will be developed for the Preferred Site, which will

identify BMPs to protect areas of steep slope. Proposed grading is also shown on Figure 4-2. If the Alternate Site was selected, impacts to steep slopes would likely be greater, as the steep slopes are located throughout the site and significant tree clearing and grading would be required to accommodate the substation.

(2) Operation and Maintenance Impact

Once the switching substation equipment is in place and operating, no impacts or erosion hazards are expected.

(3) Mitigation Procedures

No special construction impact mitigation procedures are anticipated beyond those required under the Construction Storm Water NPDES permit, and detailed in the SWPPP. As discussed previously, the SWPPP will detail appropriate erosion and sediment controls and site stabilization measures to be implemented throughout construction.

(H) OTHER ISSUES

No other issues are anticipated.

First Energy Generator Deactivation Request - January 2012

Deactivation Study Results and Required Upgrades – April 25, 2012

General

PJM received a notice on January 26, 2012 from FirstEnergy of its intent to deactivate through retirement the following generating units by not later than September 1, 2012:

Armstrong 1	172 MW
Armstrong 2	171 MW
Ashtabula 5	244 MW
Bay Shore 2	138 MW
Bay Shore 3	172 MW
Bay Shore 4	215 MW
Eastlake 1	132 MW
Eastlake 2	132 MW
Eastlake 3	132 MW
Eastlake 4	240 MW
Eastlake 5	597 MW
Lake Shore 18	245 MW
R. Paul Smith 3	28 MW
R. Paul Smith 4	87 MW

Reliability Analysis:

PJM Interconnection Analysis (and affected Transmission Owners) performed a study of the Transmission System and found significant reliability concerns resulting from the deactivation of these generating units. In all, more than 190 reliability violations were identified in this deactivation analysis. A summary of the reliability impacts resulting from the proposed Deactivations include:

1. **N-1 Common Mode Voltage Violations:**
   - Ten low voltage violations on the 138 kV system

2. **N-1-1 Thermal Violations:**
   - Six 138 kV thermal violations in the Allegheny Power zone
   - Thirty 138 kV and 345kV thermal violations in the ATSI zone
   - Two 230 / 115 kV thermal violations (transformers) in the PenElec zone
   - Ten 138 kV thermal violations in the AEP zone

3. **N-1-1 Voltage Violations:**
   - Ninety-two low voltage violations in the ATSI zone

4. **Generator Deliverability Violations:**

- Twenty-six 138 kV and 345 kV overloaded facilities in the ATZI zone.
- One 138 kV overload facility in the Allegheny Power zone.
- Seven 115 kV and 345 kV overloaded facilities in the PenElec zone.
- Eight 345 kV and 138 kV overloads in the AEP zone.

5. **Load Deliverability Violations:**
   - One voltage collapse violation observed in the ATSI zone
   - One 345 kV overload on an AEP / ATSI facility

Study Results and Required Upgrades:

The following generating units will be deactivated on September 1, 2012:

Armstrong 1
Armstrong 2
Bay Shore 2
Bay Shore 3
Bay Shore 4
Eastlake 4 Note: will be converted to synchronous condenser (expected completion Dec. 1, 2013)
Eastlake 5 Note: will be converted to synchronous condenser (expected completion June 1, 2013)
R. Paul Smith 3
R. Paul Smith 4

The following generating units will continue to operate as upgrades to the transmission system are constructed:

Ashtabula 5
Eastlake 1
Eastlake 2
Eastlake 3
Lake Shore 18

Required transmission upgrades and expected completion date:

ATSI zone:
- Install a 50 MVAR capacitor bank at the Maclean 138 kV station 6/1/2013
- Install a 345/138 kV transformer at the Inland Q-11 station 6/1/2013
- Install a 138 kV circuit breaker at the Inland Q-11 station 6/1/2013
- Upgrade terminal equipment on the Avon – Crestwood 138 kV line 6/1/2013
- Eastlake unit 5 to be converted to synchronous condenser 6/1/2013
- Eastlake unit 4 to be converted to synchronous condenser 12/1/2013
- Eastlake units 1, 2 and 3 to be converted to synchronous condensers 6/1/2015
- Lakeshore unit 18 to be converted to synchronous condenser 6/1/2015

- Loop the Chamberlin - Mansfield 345 kV line into the Hanna 345 kV substation (existing baseline upgrade b1283) 6/1/2014 (advanced from 6/2015)
- Build new Hayes 345/138 kV substation with new 138 kV lines to: Greenfield #1, Greenfield #2, and Avery (existing baseline upgrade b1281) 6/1/2014 (advanced from 6/2015)
- Build Beaver - Hayes - Davis Besse #2 345 kV line (existing base line upgrade b1282) 6/1/2014 (advanced from 6/2015)
- Re-conductor the Galion – Leaside 138 kV line 6/1/2014
- Re-conductor the Galion – GM Mansfield – Ontario - Cairns 138 kV line 6/1/2014
- Install a 2nd 345/138 kV transformer at the Allen Junction station 6/1/2014
- Install a 2nd 345/138 kV transformer at the Bay Shore station 6/1/2014
- Create a new Northfield Area 345 kV switching station by looping in the Eastlake – Juniper 345 kV line and the Perry - Inland 345 kV line 6/1/2015
- Build a new Mansfield - Northfield Area 345 kV line 6/1/2015
- Create a new Harmon 345/138/69 kV substation by looping in the Star – South Canton 345 kV line 6/1/2015
- Build a new Harmon – Brookside + Harmon - Longview 138 kV line 6/1/2015
- Create a new Five Points Area 345/138 kV substation by looping in the Lemoyne – Midway 345 kV line 6/1/2015
- Install a 50 MVAR capacitor at Hayes 138 kV 6/1/2015
- Install a 138/69 kV transformer at the Avery station 6/1/2015
- Increase design temperature limitation on the Avery – Hayes 138 kV line by raising the existing structures 6/1/2015
- Reconductor Cloverdale - Harmon #2 and #3 138kV lines and Terminal upgrades 6/1/2015
- Change the transformer tap settings on the Maclean 138/69 kV transformers 6/1/2015
- Upgrade the Richland – Naomi 138 kV line 6/1/2015
- ATSI-AEP 138kV Substation on / near territory border and 138kV from new substation to Longview 6/1/2016, working on potential operating procedure to mitigate impacts until this upgrade complete
- Build new Allen Jct - Midway - Lemonye 345kV line 6/1/2016, but operating procedure in place to mitigate impacts until this upgrade complete
- Build a new Leroy Center 345/138 kV substation by looping in the Perry – Harding 345 kV line 6/1/2016, but operating procedure in place to mitigate impacts until this upgrade complete
- Place a portion of the 138 kV Leroy Center 345/138 kV project into service by summer 2015 6/1/2015
- Reconductor the Barberton – West Akron 138 kV line 6/1/2016, but operating procedure in place to mitigate impacts until this upgrade complete

<u>AP zone</u>:

- Replace breaker risers at Marlowe 138 kV and wave traps at Marlowe 138 kV and Bedington 138 kV 6/1/2013
- Replace line trap at Stonewall on the Stephenson 138 kV line terminal (existing base line upgrade b1902) 6/1/2013
- Loop the Homer City-Handsome Lake 345 kV line into the Armstrong substation and install a 345/138 kV transformer at Armstrong 6/1/2014
- Change the CT ratio at Millville 6/1/2015

- Install a new Buckhannon – Weston 138 kV line 6/1/2016, but operating procedure in place to mitigate impacts until this upgrade complete

PenElec zone:

- Construct Four Mile Junction 230/115 kV substation (existing baseline upgrade b1609) 6/1/2014
- Construct a 115 kV ring bus at Claysburg Substation 6/1/2015
- Reconductor Eclipse substation 115 kV bus 6/1/2013
- Install second 230/115 kV autotransformer at Johnstown 6/1/2015

AEP zone:

- Reconductor AEP portion of South Canton – Star 345 kV line and upgrade terminal equipment at South Canton (existing base line upgrade b1812) 12/31/2013
- Advance baseline upgrade b1901 (Rebuild the Ohio Central – West Trinway (4.84 miles) section of the Academia – Ohio Central 138 kV circuit. Upgrade the Ohio Central riser, Ohio Central switch and the West Trinway riser) 6/1/2015
- Advance baseline upgrade b1868 (Perform a sag study on the 05E LIMA – New Liberty 138 kV line) 6/1/2015
- Advance the rebuild portion of the baseline upgrade b1819 (Rebuild the Robinson Park - Sorenson 138 kV line corridor as a 345 kV double circuit line with one side operated at 345 kV and one side at 138 kV) 6/1/2015
- Advance 2016 baseline project b1733 (Perform a sag study of the Bluff Point - Jay 138 kV line.) Upgrade breaker, wavetrap, and risers at the terminal ends). 12/1/2014
- Perform a sag study on the Brues – West Bellaire 138 kV line 12/1/2014
- Advance Baseline project b1865 (Perform a Sag study on the Kanawha – Carbondale 138 KV line) 12/1/2014
- Sag study of the Dequine - Meadowlake 345 kV line #1 12/1/2013
- Sag study of the Dequine - Meadowlake 345 kV line #2 12/1/2013
- Advance baseline project b1868 (Perform sag study of the East Lima – New Liberty 138kV line) 12/1/2014
- Establish a new 765/345 interconnection at Sporn. Install a 765/345 kV transformer at Mountaineer and build ¾ mile of 345 kV to Sporn. 6/1/2015
- Perform a sag study on the Grant Tap – Deer Creek 138 kV line and replace bus and risers at Deer Creek station 12/1/2014
- Advance baseline project b1436 (Perform a sag study on the Sorenson - Illinois Road 138kV line). Replace bus and risers at Illinois Road. 12/1/2014
- Perform a sag study on the Kammer – Ormet 138 kV line 12/1/2012
- Perform a sag study of the Maddox- Convoy 345 kV line 12/1/2013
- Perform a sag study of the Maddox – T130 345 kV line 12/1/2013
- Perform a sag study of the Meadowlake - Olive 345 kV 12/1/2013
- Perform a sag study on the Milan - Harper 138 kV line and replace bus and switches at Milan Switch station 12/1/2014
- Advance baseline project b1871 (Perform a sag study on the Ohio Central – West Coshocton 138KV line). 12/1/2014
- Perform a sag study of the R-049 - Tillma 138 kV line 12/1/2013
- Advance 2016 Baseline project B1734 (Perform a sag study of Randoph - Hodgins 138 kV line. Upgrade terminal equipment). 12/1/2014

- South Canton – Harmon 345 kV line - advance baseline project b1812 (rebuild AEP portion of line). Also upgrades risers, wavetrap and bus work at South Canton station. 6/1/2015
- Perform a sag study of the Tillma - Dawkins 138 kV line 12/1/2013
- Advance baseline project b1738 (Perform a sag study of the Wolf Creek - Layman 138 kV line. Upgrade terminal equipment including a 138 kV breaker and wavetrap). 12/1/2014
- Advance baseline project b1883 (Switch the breaker position of transformer #1 and SW Lima at East Lima 345 kV bus). 12/1/2014
- Terminate Transformer #2 at SW Lima in a bay position 12/1/2014
- Perform a sag study on the Brookside - Howard 138 kV line and replace bus and risers at AEP Howard station 12/1/2014

Transmission Expansion Advisory Committee

April 27, 2012

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Issues Tracking

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Issues Tracking

- Open Issues
  - None
- New Issues

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Generation Deactivation Notification (Retirements) Update

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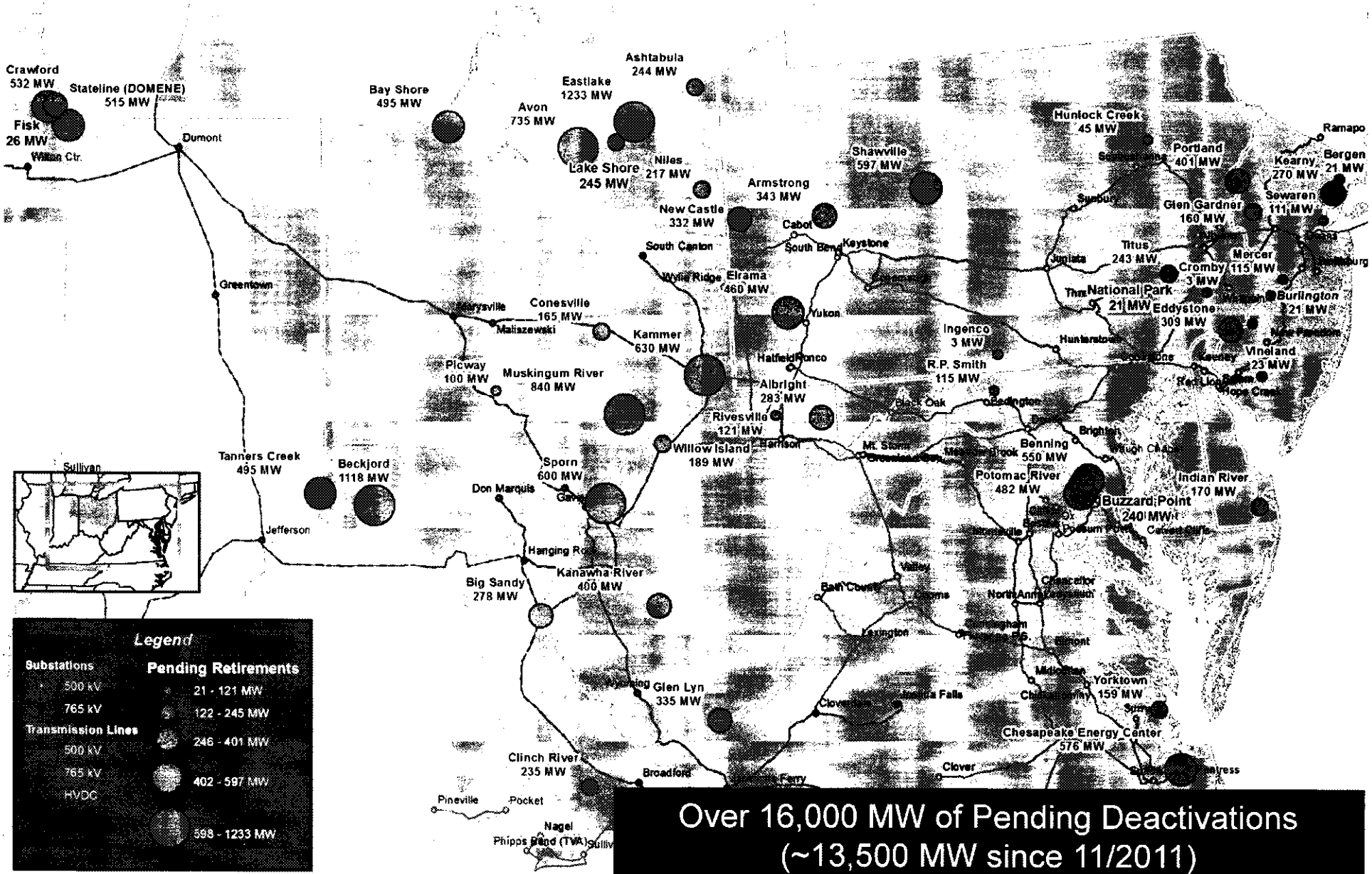
All Pending Generator Deactivations



Over 16,000 MW of Pending Deactivations
(~13,500 MW since 11/2011)

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Deactivation Status

Chesapeake 1 & 2, Yorktown 1	DOM	12/31/2014	Reliability Analysis complete. Impacts identified. Upgrades expected to be completed by June 2015.
Chesapeake 3 & 4	DOM	12/31/2015	Reliability Analysis complete. Impacts identified. Upgrades expected to be completed by June 2016.
Bergen 3; Burlington 8; National Park 1; Mercer 3; Sewaren 6	PSEG	6/1/2015	Reliability Analysis Complete. Impacts identified and expected to be resolved in three - four years. Working with affected TO to finalize upgrade schedule.
Armstrong 1 & 2; Ashtabula 5; Bayshore 2-4; Eastlake 1-5; Lake Shore 18; R Paul Smith 3 & 4;	AP	9/1/2012	Reliability analysis complete. Impacts identified and expected to be resolved by June 2016. Further refinement of the reliability analysis, required upgrades, and generator deactivation schedule continues.
Walter C Beckjord 1	DEOK	5/1/2012	Reliability Analysis complete - no impacts identified.
Walter C Beckjord 2-6	DEOK	4/1/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2014
Albright 1-3; Rivesville 5 & 6; Willow Island 1 & 2	APS	9/1/2012	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by May 2013
New Castle 3-5; New Castle Diesels A & B	ATSI	4/16/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2015

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Deactivation Status

Portland 1 & 2; Glen Gardner CT 1-8	MetEd	1/7/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2016
Elrama 1-4	DUQ	6/1/2012	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2014
Shawville 1-4; Titus 1-3	PenElec	4/16/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2016
Niles 1 & 2	ATSI	6/1/2012	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2014
Fisk Street 19, Crawford 7 & 8	ComEd	12/31/2012	Reliability Analysis Complete. No impacts identified.
Conesville 3	AEP	12/31/2012	Reliability Analysis Underway
Big Sandy 1; Clinch River 3; Glen Lyn 5 & 6; Kammer 1-3; Kanawha River 1 & 2; Muskingum River 1-4; Pickway 5; Sporn 1-4; Tanner Creek 1-3	AEP	6/1/2015	Reliability Analysis Underway

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Deactivation Status

Avon Lake 7 & 9	ATSI	4/16/2015	Reliability Analysis Underway
Sewaren 1-4	PSEG	6/1/2015	Reliability Analysis Underway. PSEG also contemplating re-use of Capacity Rights for a new generation project
Cedar 1 & 2; Deepwater 1 & 6; Missouri Ave CT B, C & D	AE	5/31/2015	Reliability Analysis Underway

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Chesapeake #1-4 & Yorktown #1 Deactivation

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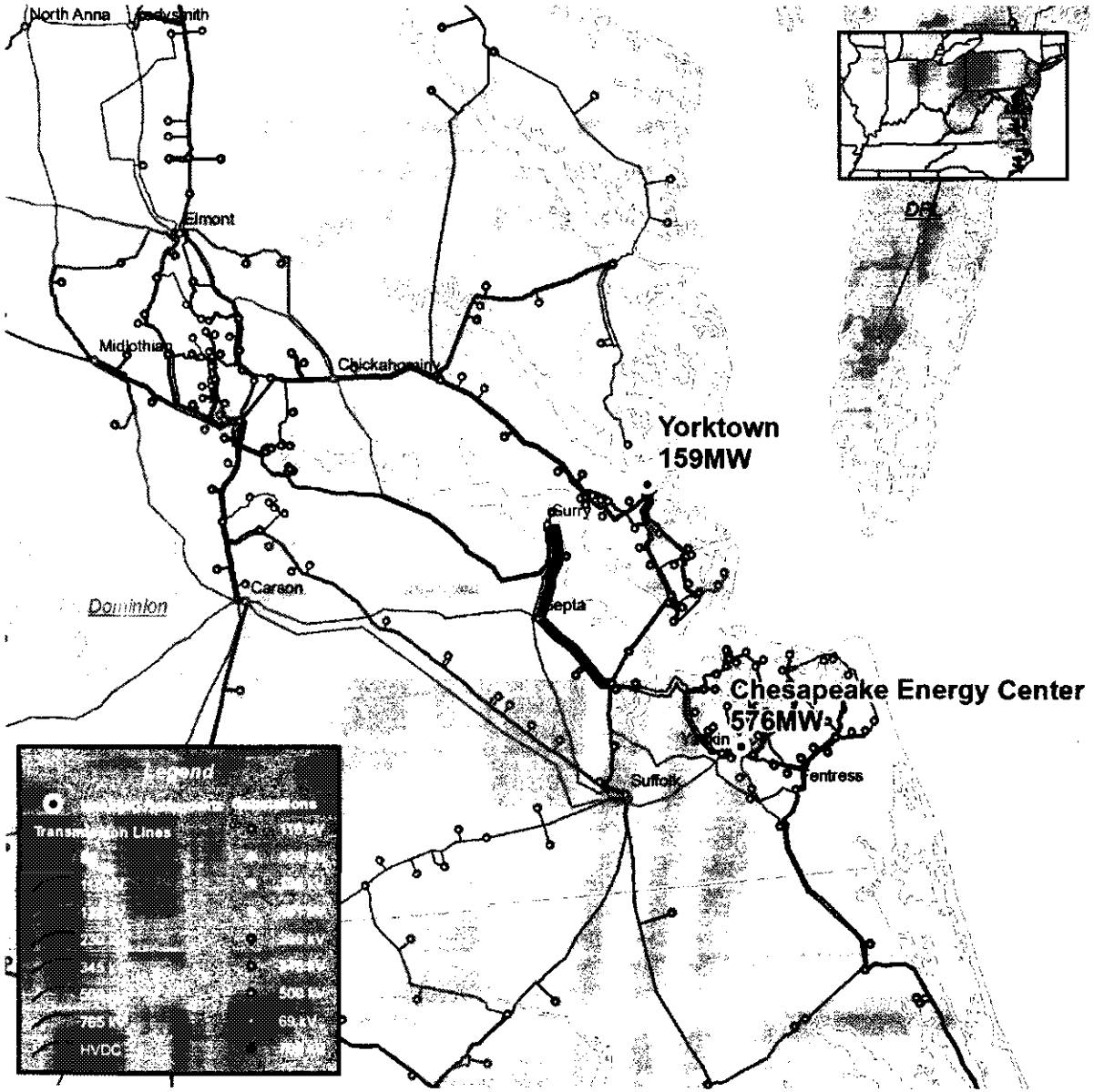
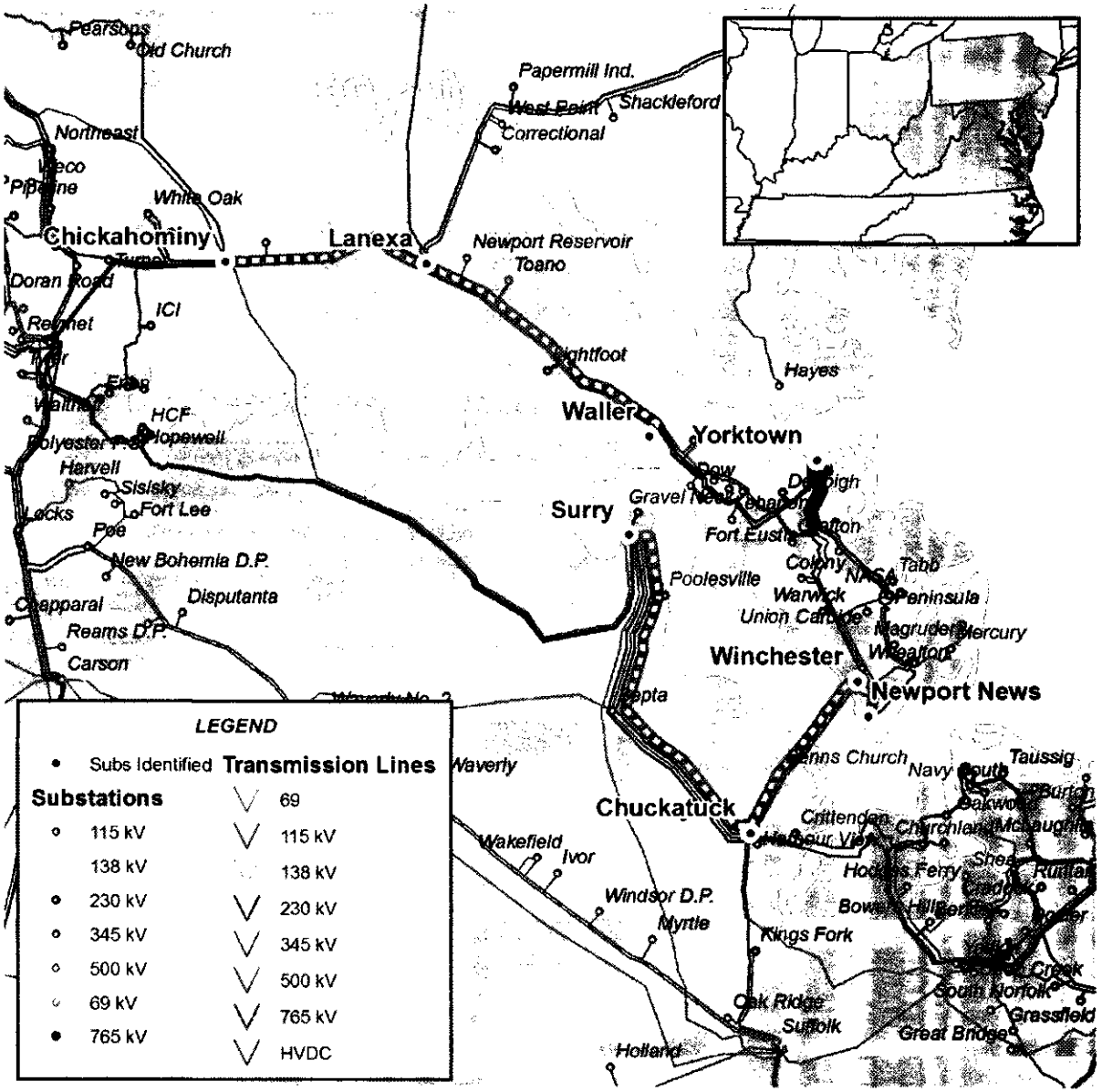
Chesapeake and Yorktown Deactivation Notifications

- Deactivation Notifications:
  - Chesapeake Units 1-2 & Yorktown 1
    - 381 MW
    - Requested Retirement Date: December 31, 2014
  - Chesapeake 3&4
    - 354 MW
    - Requested Retirement Date: December 31, 2015



Dominion Transmission Zone
James River Crossing Alternatives

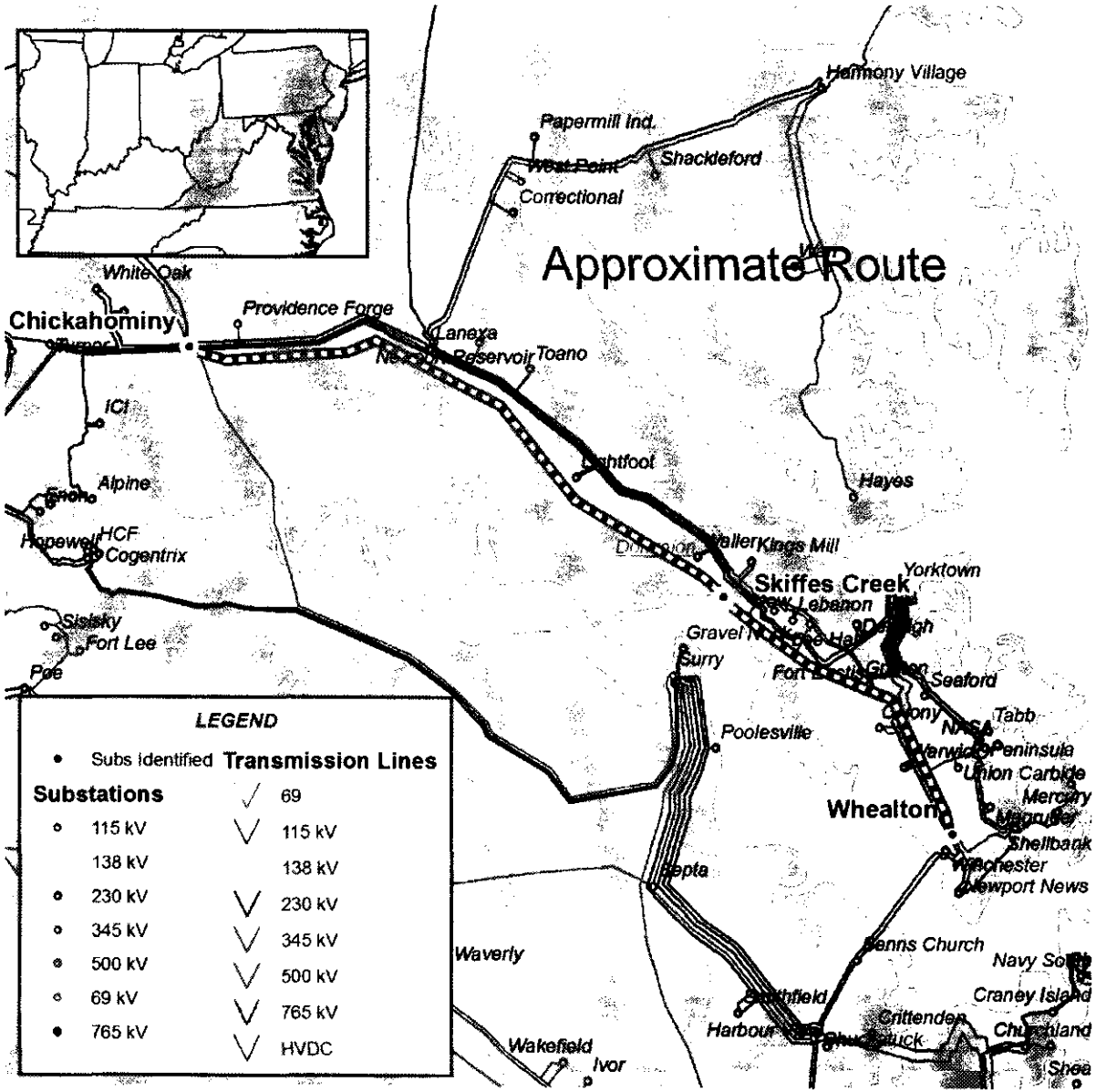
- Dominion Criteria – critical system conditions of Yorktown #3 outage
- N-1 Thermal Overloads (All conductor limits)
  - Chuckatuck – Newport News 230 kV is overloaded for the loss of Surry – Winchester 230 kV
  - Surry - Winchester 230 kV is overloaded for the loss of Chuckatuck – Newport News 230 kV
  - Lanexa – Waller 230 kV is overloaded for the loss of Chickahominy – Waller 230 kV
- James River Crossing Double Circuit Towerline overloads (All conductor limits)
  - Chickahominy – Waller 230 kV, Lanexa – Waller 230 kV, and Yorktown – Whealton 230 kV
- Also, voltage collapse for the James River Crossing Double Circuit Towerline outage
- Several solution alternatives evaluated



Chickahominy 500 kV Alternative

- Dominion Proposed Solution
- Chickahominy to Skiffes Creek 500 kV Line $116 M
  - (38 miles total, already Dominion owned)
- Chickahominy 500 kV Station 500 kV Breakers $4.6 M
- Skiffes Creek 500-230 kV Tx and Switching Station $42.4 M
- New Skiffes Creek - Whealton 230 kV Line $46.4 M
- Whealton 230 kV Breakers $2.1 M
- Yorktown 230 kV Work $0.2 M
- Lanexa 115 kV Work $0.13M
- Surry 230 kV Work $0.13 M
- Kings Mill, Peninmen, Toano, Waller, Warwick $ 0.03 M

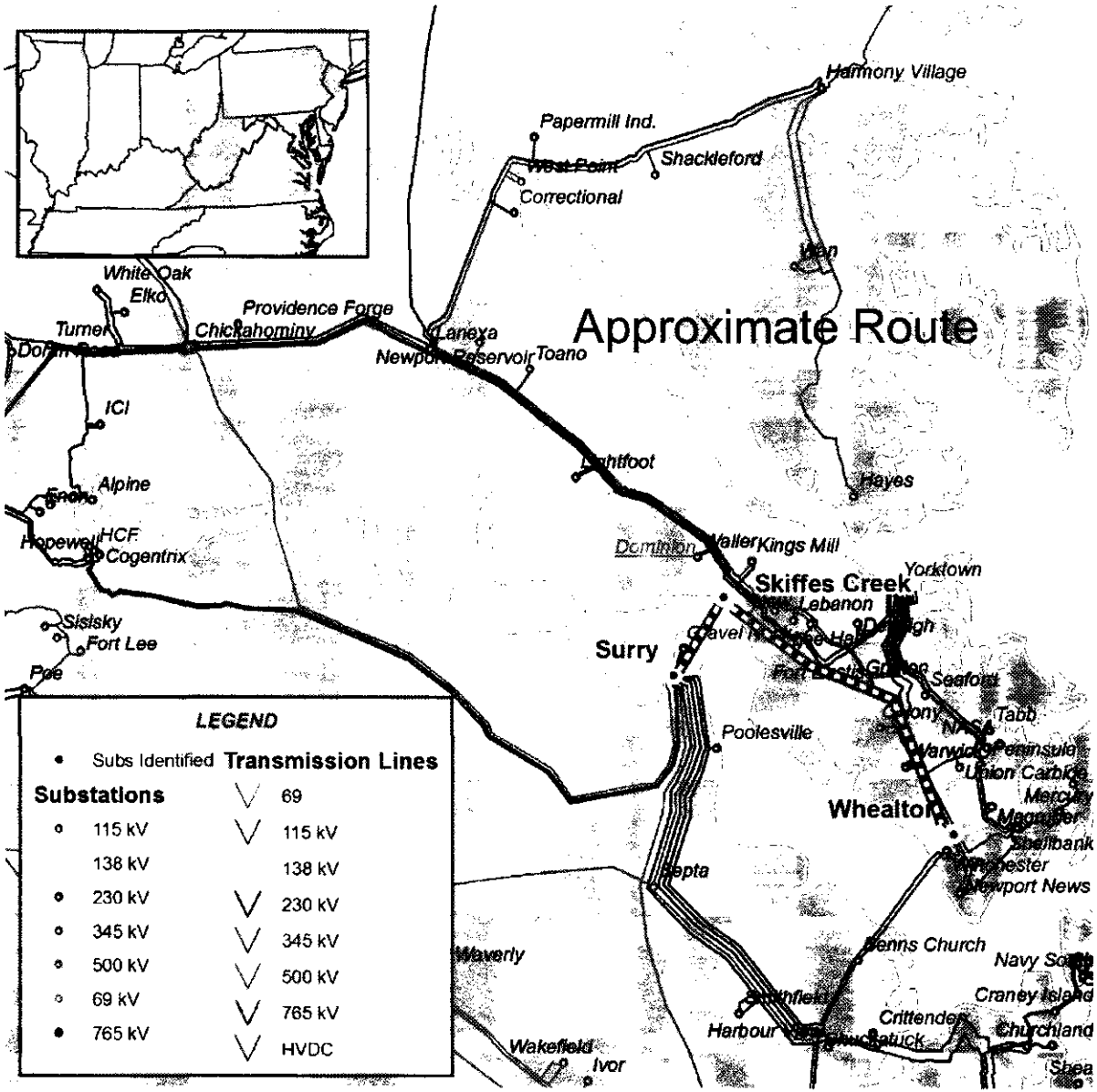
- Estimated project cost: $211.99 M



Surry 500 kV Alternative

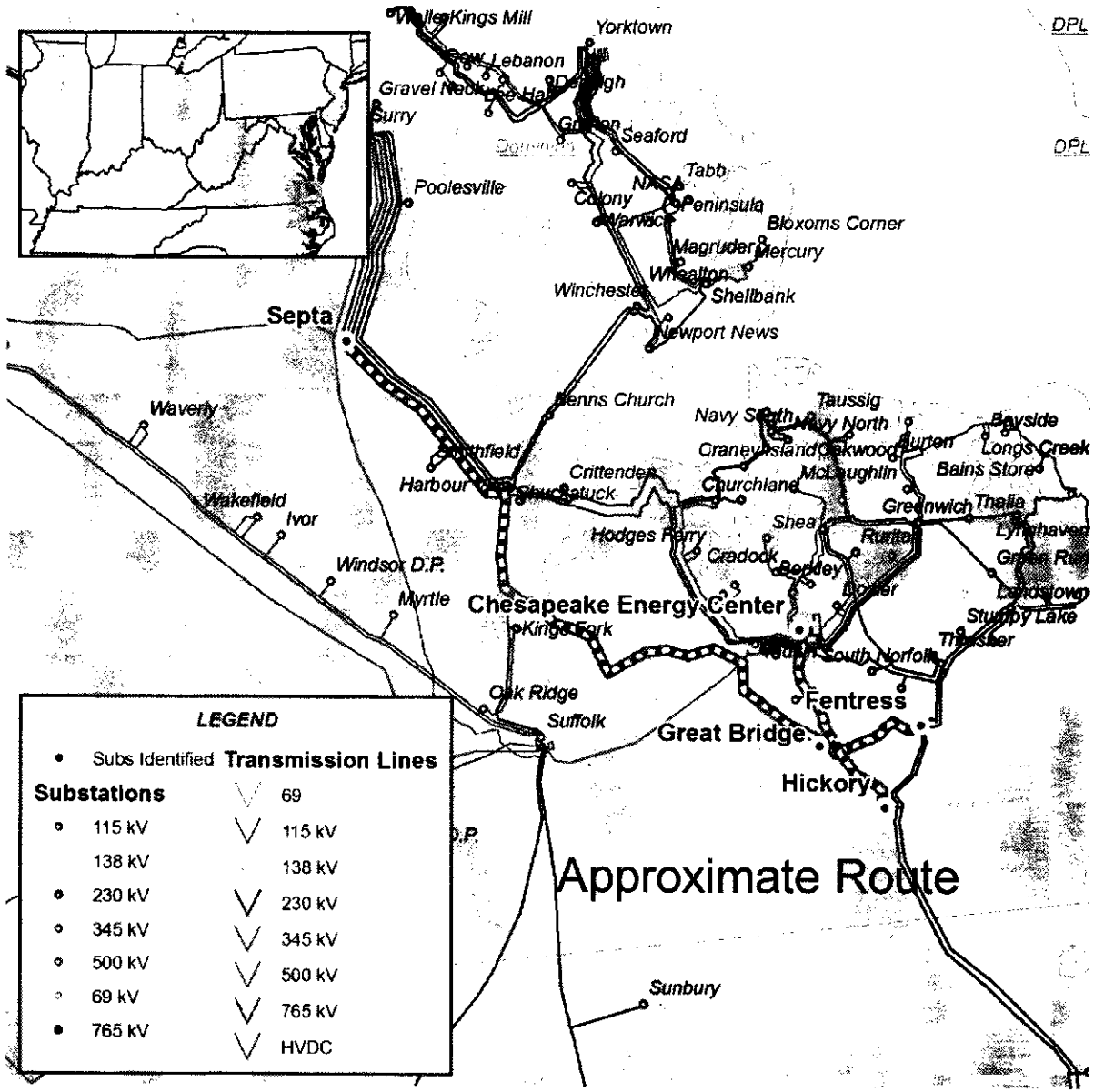
- Dominion Proposed Solution
- Surry to Skiffes Creek 500 kV Line $58.3 M
  - 7.7 miles total (3 miles already existing Dominion ROW)
- Surry 500 kV Station Work $1.5 M
- Skiffes Creek 500-230 kV Tx and Switching Station $42.4 M
- New Skiffes Creek - Whealton 230 kV Line $46.4 M
- Whealton 230 kV Breakers $2.1 M
- Yorktown 230 kV Work $0.2 M
- Lanexa 115 kV Work $0.13M
- Surry 230 kV Work $0.13 M
- Kings Mill, Peninmen, Toano, Waller, Warwick $ 0.03 M

- Estimated project cost: $151.19 M



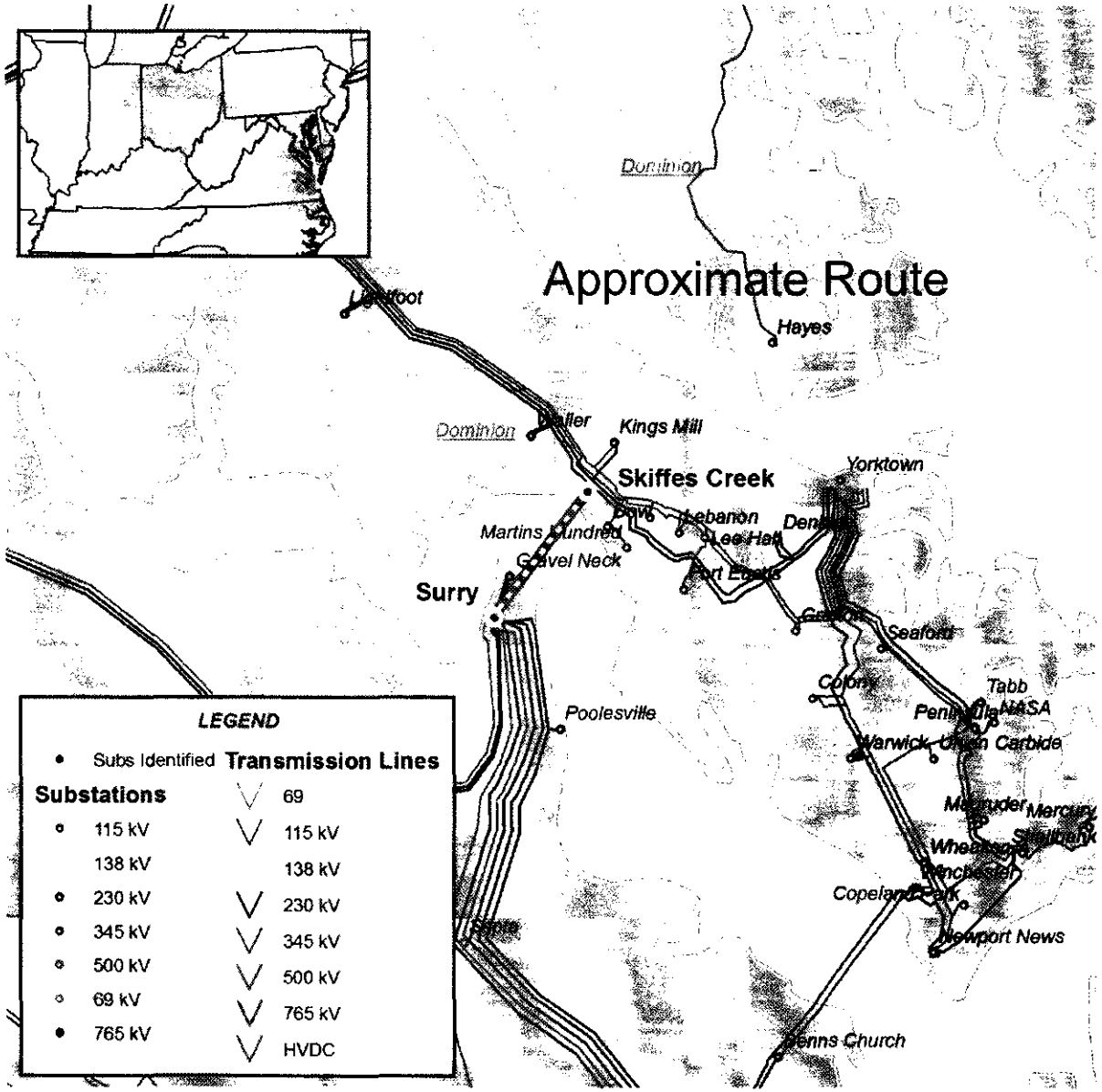
Great Bridge & Surry 230 kV Alternative

- LS Power / Northeast Transmission Development Proposed
- Build a new Great Bridge 500 kV substation (3 breaker ring bus) along existing Fentress-Septa 500 kV circuit.
- Build a new Great Bridge 115 kV substation at the intersection of the Fentress-Septa 500 kV circuit and the Hickory-Great Bridge 115 kV circuit.
- Install a new Great Bridge 500/115 kV transformer.
- Reconductor Great Bridge-Chesapeake 115 kV with high temperature conductor.
- Install a second Yorktown 230/115 kV transformer.
- New Surry-Skiffes Creek single circuit 230 kV line in series with a PAR at Surry.
- $99 M for Surry – Skiffes Creek 230 kV plus the cost of the Great Bridge and Yorktown area work



Surry 230 kV Partial Alternative

- 230 kV Alternative to the 500 kV portions of the Chickahominy 500 kV and Surry 500 kV proposals
- Construct a New Surry - Skiffes Creek single circuit 230 kV line $84 M
  - Total length approximately 7.33 miles
  - ~3 miles underground/underwater
- Construct a Phase Angle Regulator in series with Surry – Skiffes Creek 230 kV at Surry $15 M
- Estimated project cost: $99 M



Alternative Performance Comparison

- Great Bridge & Surry 230 kV Alternative
  - Does not address several key criteria violations
- Analytical focus on other three alternatives
  - Chickahominy 500 kV Alternative
  - Surry 500 kV Alternative
  - Surry 230 kV Partial Alternative

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Alternative Performance Comparison

- Chickahominy 500 kV Alternative, Surry 500 kV Alternative and Surry 230 kV Partial Alternative performance in the near term
  - All solved the applicable criteria violations
    - N-1-1
    - Generator Deliverability
    - Load Deliverability
    - Dominion Critical Condition criteria
  - Surry 230 kV Partial Alternative solution acceptable in near term but with small margin on thermal limits

- Sensitivity of at-risk generation (Yorktown #2)
  - Surry 230 kV Partial Alternative demonstrates a thermal overload of Lanexa – Waller 230 kV and the proposed Phase Angle Regulator
  - No performance issues for Chickahominy 500 kV and Surry 500 kV

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Alternative Cost Comparison

- Proposed Alternative to Dominion 500 kV scope of work
  - Surry 500 kV scope of work
    - Surry to Skiffes Creek 500 kV Line (7 miles overhead) $58.3 M
    - Surry 500 kV Station Work $1.5 M
    - Skiffes Creek 500-230 kV Tx and Switching Station $25 M
    - **Total Surry 500 kV alternative and associated work: $84.8 M as estimated by Dominion**
  - Surry 230 kV scope of work
    - New Surry to Skiffes Creek 230 kV Line (4 miles overhead / 3 miles underwater) $84 M
    - Install new 230 kV Phase Angle Regulator (PAR) in series with the new Surry to Skiffes Creek 230 kV $15 M
    - **Total Surry 230 kV alternative and associated work: $99 M as estimated by LS Power**

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Proposed Solution Considerations

Chickahominy 500 kV

- ROW
  - Dominion Owned
- Siting process / timeline
- Estimated cost: $134.8

Surry 500 kV

- ROW
  - mostly Dominion Owned
- Siting process / timeline
- Estimated cost: $84.8 M

Surry 230 kV Partial

- ROW
  - Expansion limitations at Surry 230 kV
- Phase Angle Regulator
  - Siting
  - Added operational complexity of a PAR
- Siting process / timeline
- Estimated cost: $99 M

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Proposed Solution

- Recommended solution:
  - Surry 500 kV alternative
- Assign construction responsibility to Dominion

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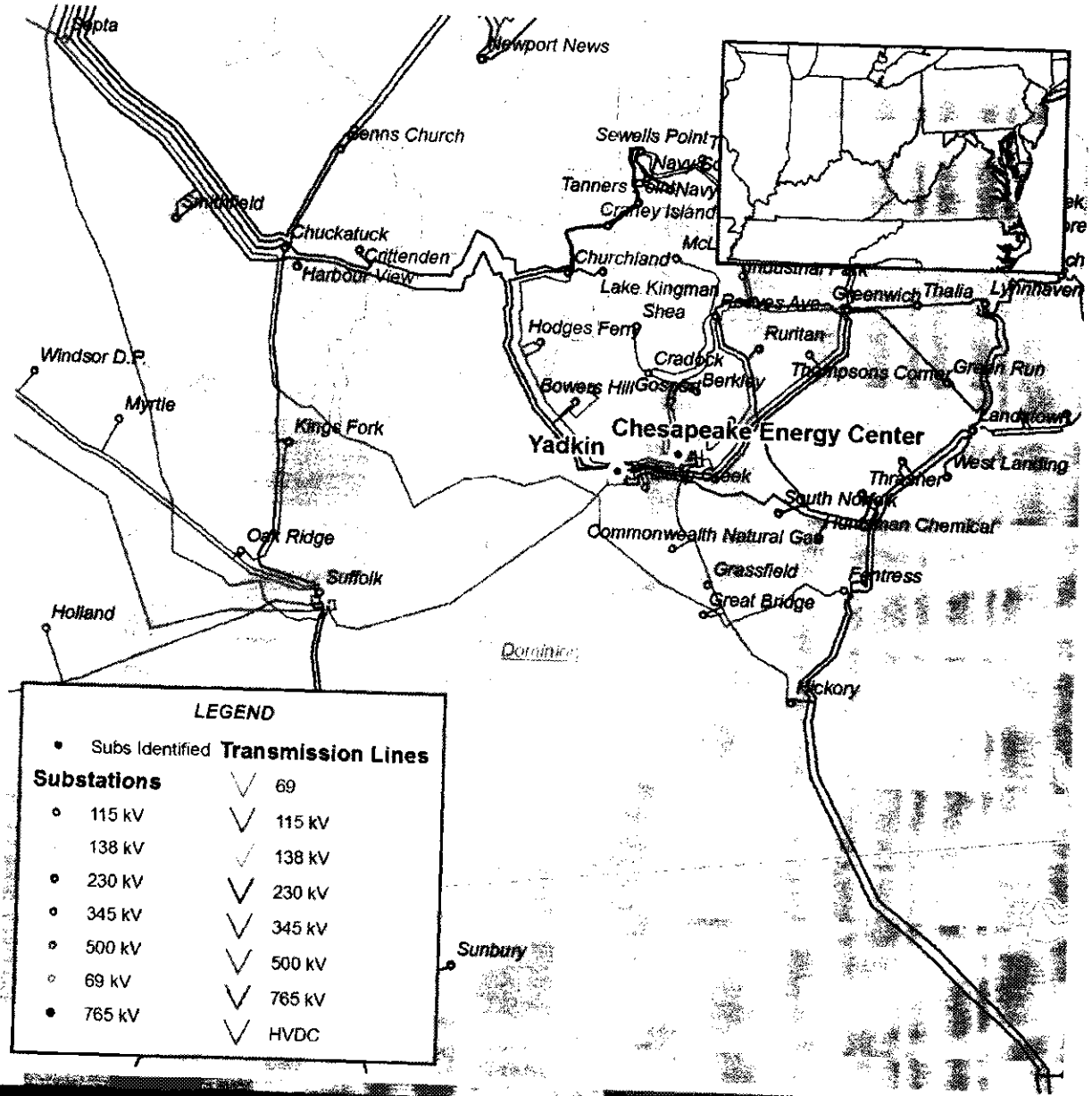
Additional Required Dominion Transmission Zone Upgrade

- Dominion Criteria – critical system condition of Surry #2 outage
  - Yadkin – Chesapeake 115 kV is over its emergency rating for the loss of the Chesapeake 230/115 kV TX
  - The Yadkin 230/115 kV transformer is over its emergency rating for the loss of Yadkin – Chesapeake – Greenwich 230 kV
  - The Chesapeake 230/115 kV transformer is over its emergency rating for the loss of the Yadkin – Chesapeake – Greenwich 115 kV circuit or the Yadkin 230/115 kV TX #1
  - Each Yadkin 500/230 kV Transformer is overloaded for the loss of the parallel transformer
- At Yadkin 500 kV, Install six 500 kV breakers and a third 500/230 kV TX at Yadkin
- Install a 2nd 230/115 kV TX at Yadkin
- Install a 2nd 230/115 kV TX at Chesapeake
- Uprate Yadkin – Chesapeake 115 kV
- Estimated Project Cost: $45 M
- Projected in-service date: 6/1/2016



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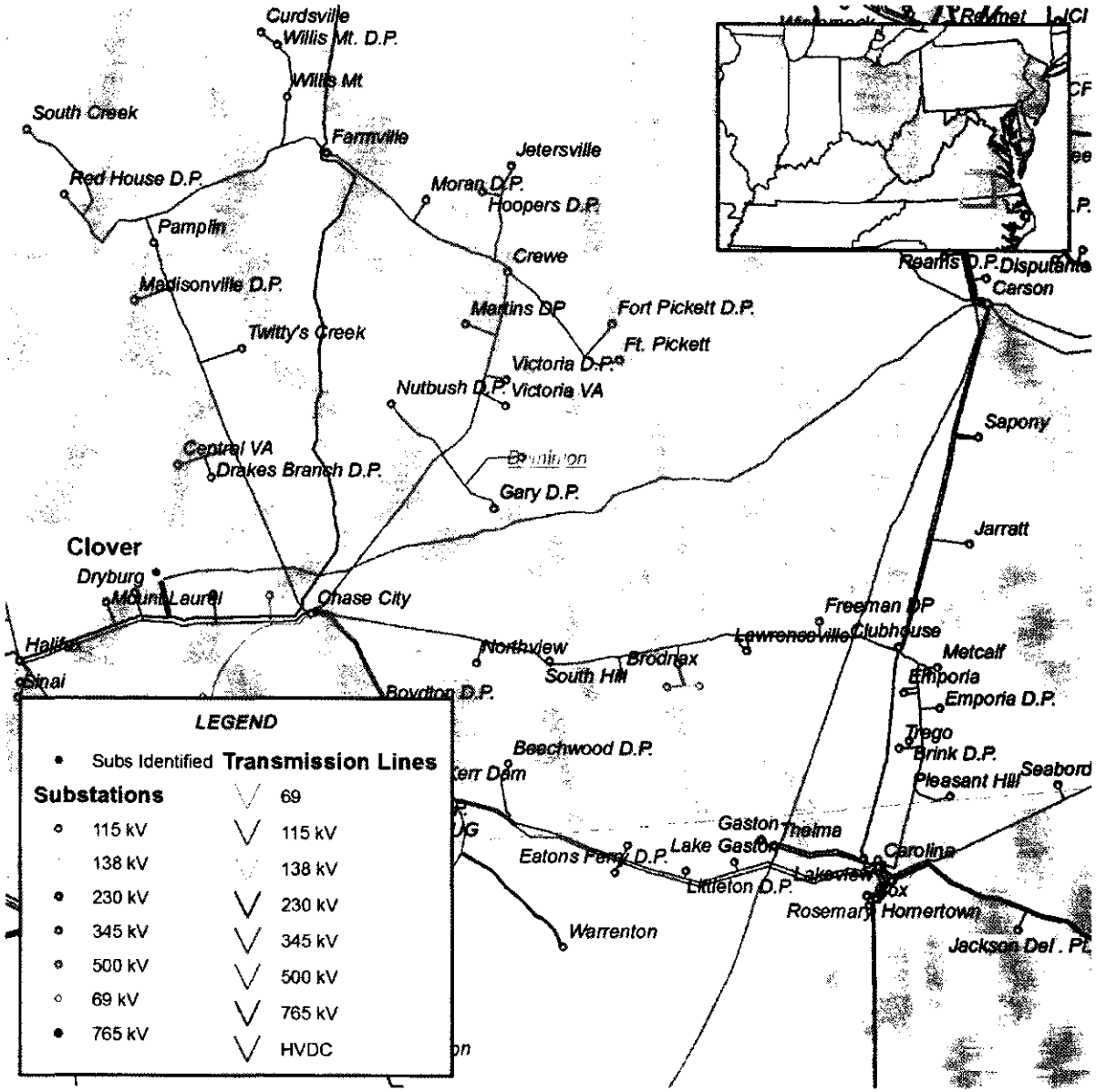
Additional Required Dominion Transmission Zone Upgrade

- Dominion Criteria – critical system conditions of Yorktown #3 or Surry #2 outage
- The loss of the Clover 500/230 TX #2 overloads Clover 500/230 kV TX #1
- Install a 3rd 500/230 kV TX at Clover
- Estimated Project Cost: $16 M
- Projected in-service date: 6/1/2016



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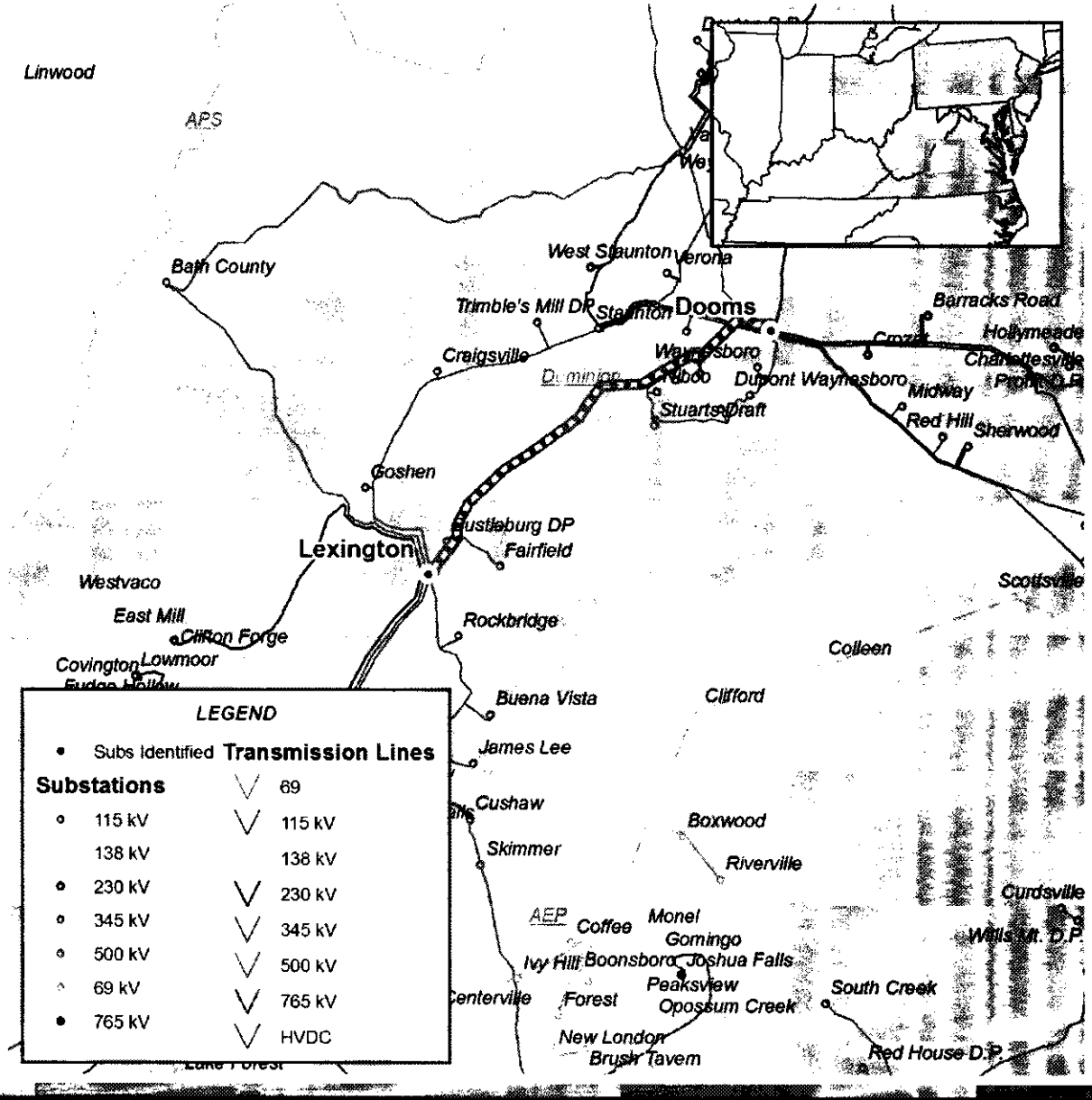
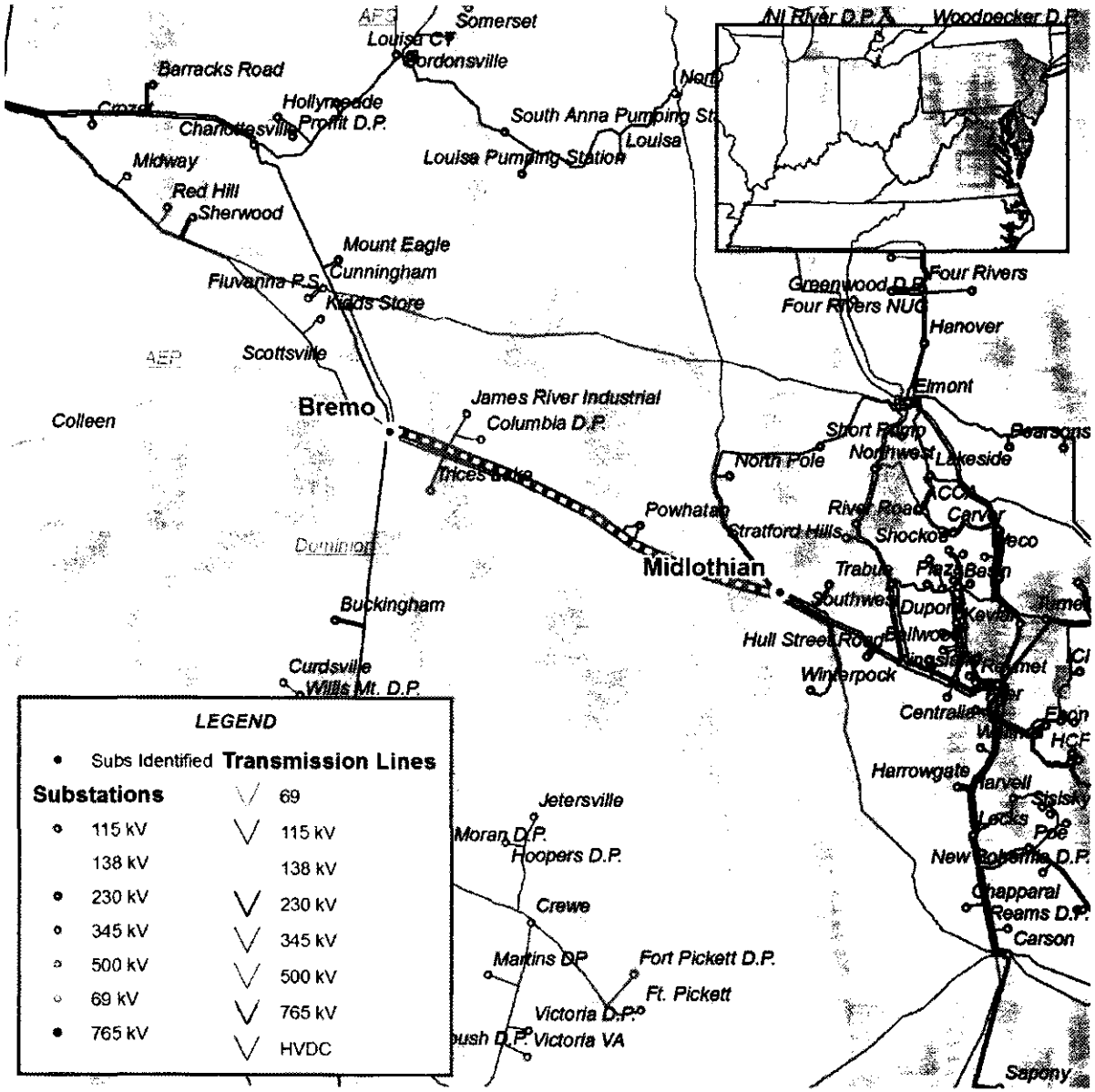
Additional Required Dominion Transmission Zone Upgrade

- Dominion Criteria – critical system conditions of Yorktown #3 or Surry #2 outage
- The loss of Bath – Valley 500 kV overloads Dooms – Lexington 500 kV
- Rebuild Lexington – Dooms 500 kV
  - 40 miles
- Estimated Project Cost: $120 M
- Projected in-service date: 6/1/2016



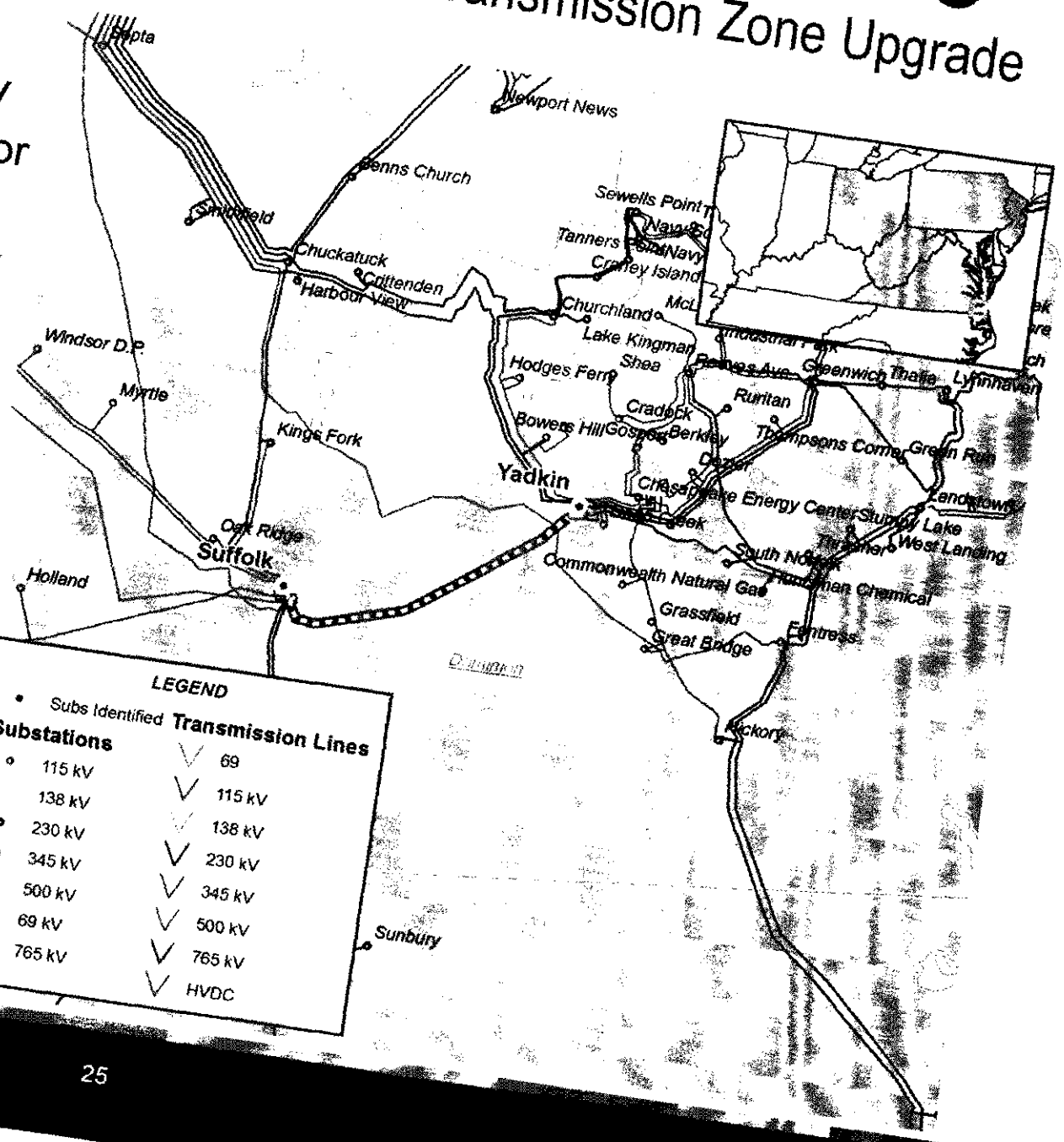
Additional Required Dominion Transmission Zone Upgrade

- Dominion Criteria – critical system conditions of Yorktown #3 or Surry #2 outage
- Bremo – Midlothian 230 kV is overloaded for the loss of Elmont – Cunningham 230 kV
- Uprate Bremo – Midlothian 230 kV to its maximum operating temperature
- Estimated Project Cost: $10 M
- Projected in-service date: 6/1/2016



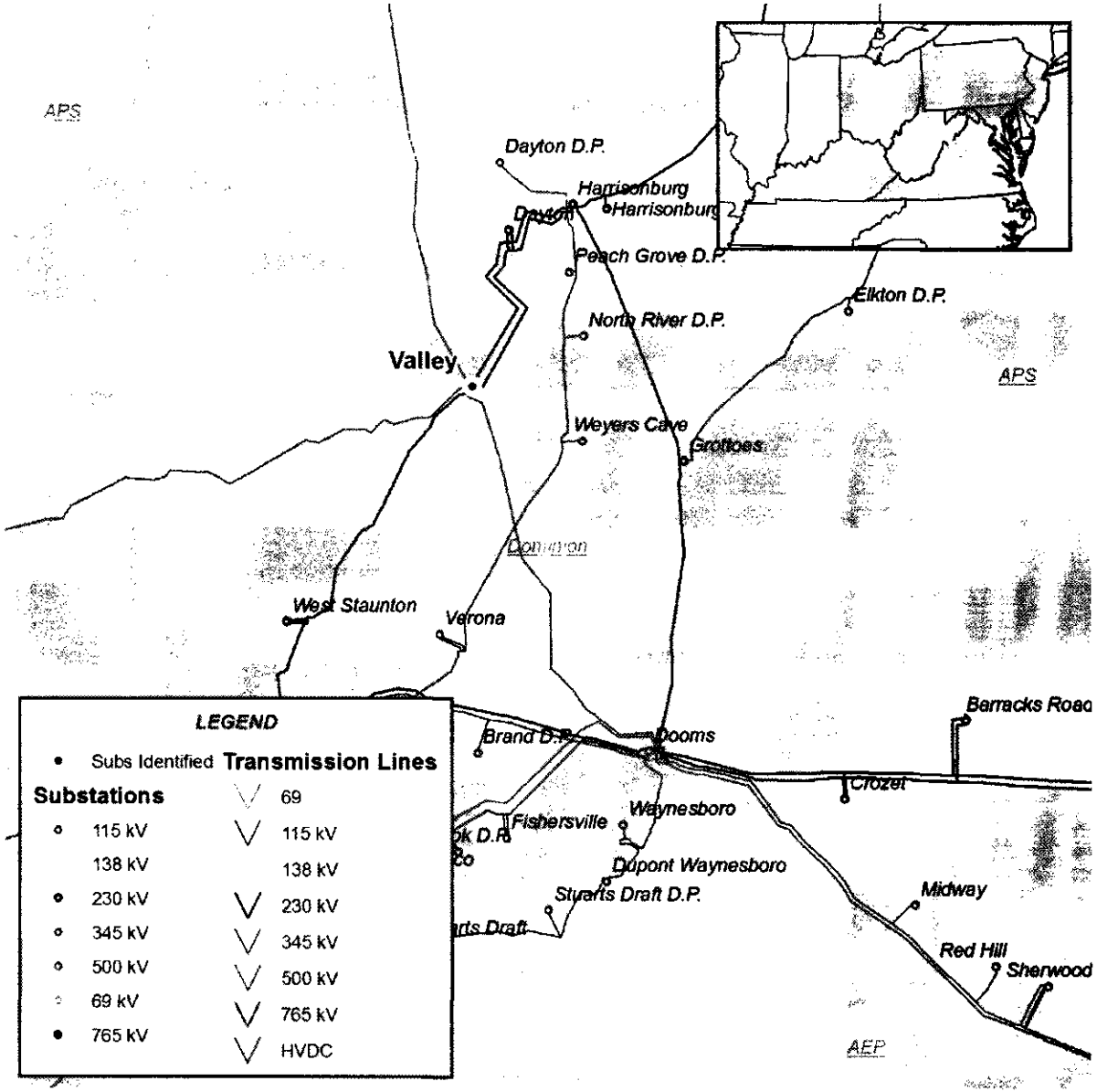
Additional Required Dominion Transmission Zone Upgrade

- N-1-1 Thermal Violation
- Huntsman – Thrasher 230 kV is over its emergency rating for the loss of the Suffolk – Yadkin 500 kV and Fentress – Septa 500 kV lines
- Build a Suffolk – Yadkin 230 kV line (14 miles)
  - Install two 230 kV breakers at both Suffolk and Yadkin Substation to interconnect
  - Primarily along existing towers
- Estimated Project Cost: $40 M
- Projected in-service date: 6/1/2016



Additional Required Dominion Transmission Zone Upgrade

- N-1-1 Thermal Violation
- The Valley 500/230 kV TX is thermally overloaded for the loss of Dooms – Valley 500 kV and Dooms – Lexington 500 kV
- Add a second Valley 500/230 kV TX
- Estimated Project Cost: $16 M
- Projected in-service date: 6/1/2016



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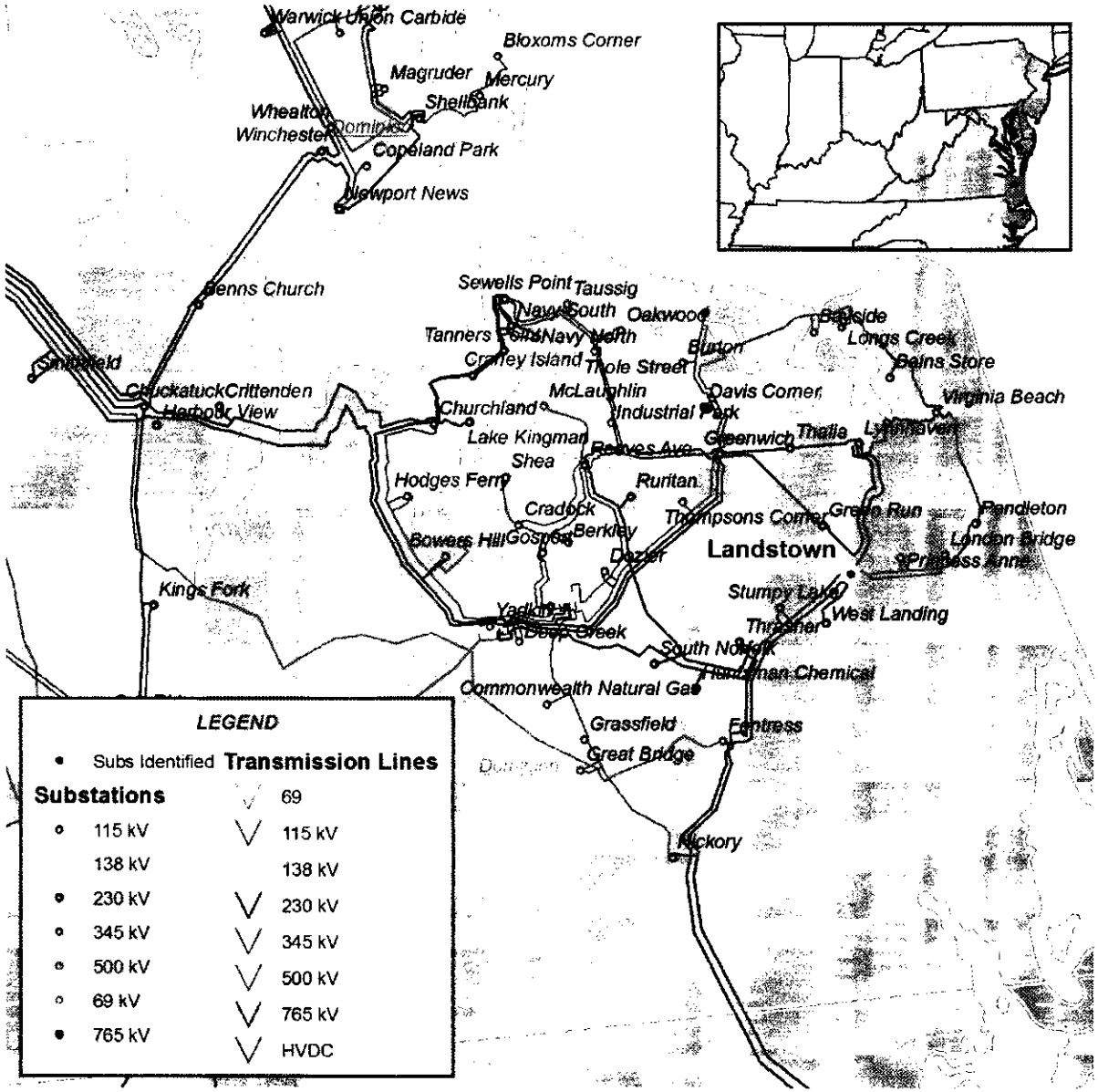
Additional Required Dominion Transmission Zone Upgrade

- N-1-1 Voltage Violation
- Voltage collapse in the VA Beach area for the loss of Suffolk – Yadkin 500 kV and Yadkin – Fentress 500 kV
- Install a 500 MVAR SVC at Landstown 230 kV
  - May need to split into two smaller SVCs
- Estimated Project Cost: $60 M
- Projected in-service date: 6/1/2016



FES Retirement Notifications

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ATSI/AP (FES) Deactivations – Status and Next Steps

Armstrong 1, & 2

Ashtabula 5

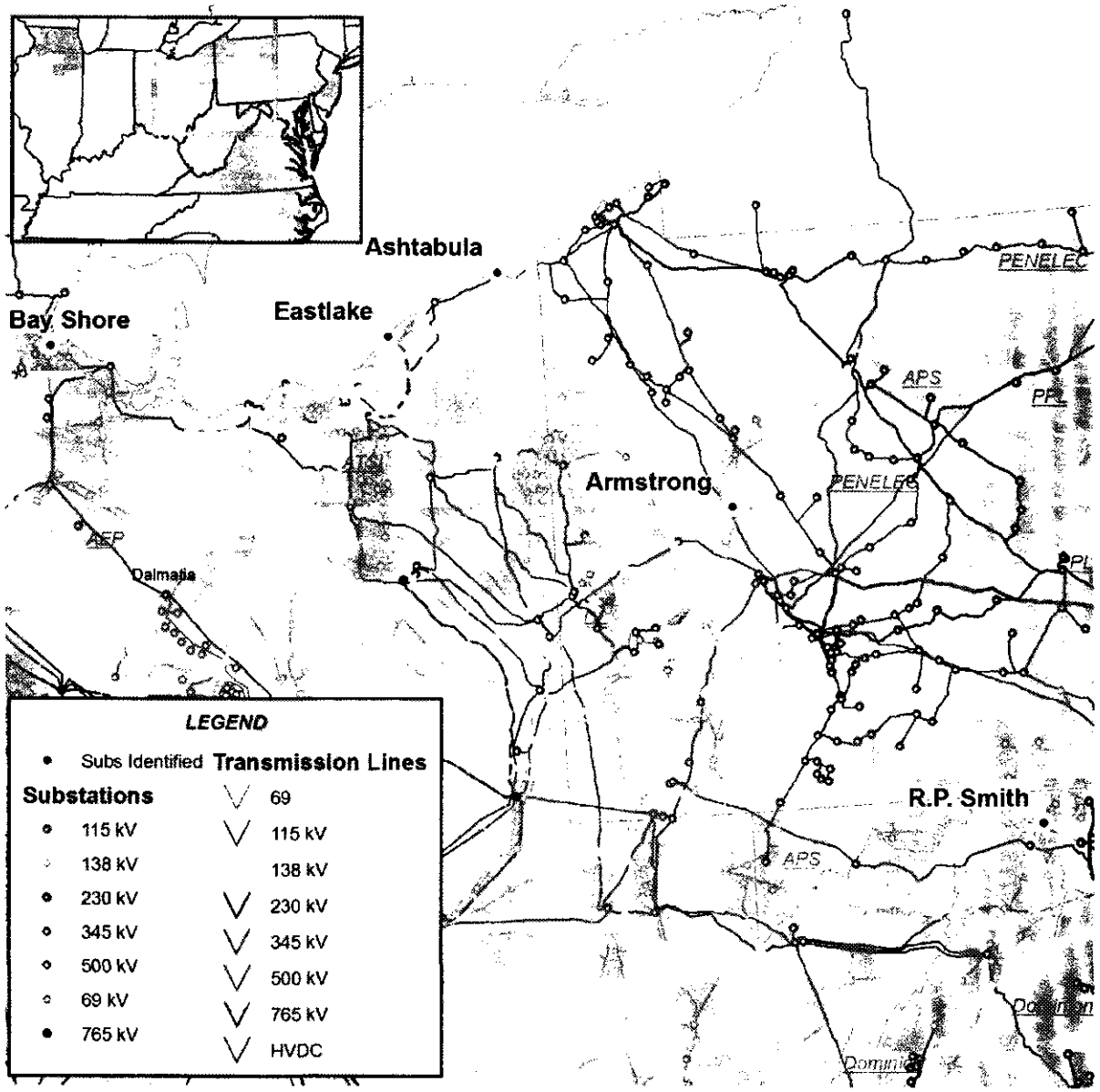
Bay Shore 2, 3, & 4

Eastlake 1, 2, 3, 4, & 5

Lake Shore 18

R Paul Smith 3 & 4

Requested deactivation date: 9/1/2012



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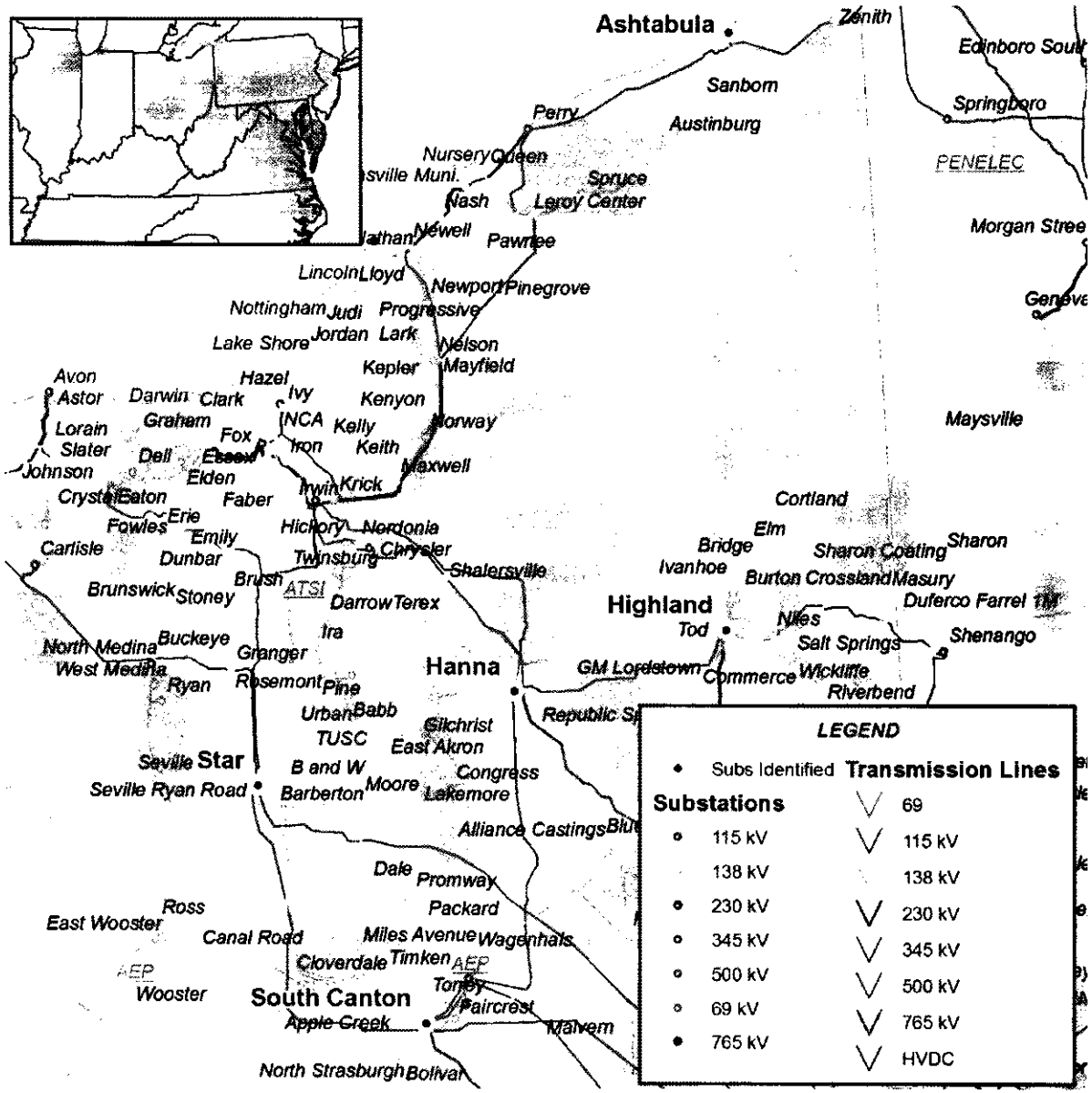
ATSI Transmission Zone Violations

- Criteria violations
  - N-1 Common Mode Voltage Study
  - N-1-1 Voltage
  - N-1-1 Thermal
  - Generation Deliverability
  - Load Deliverability
- Multiple 138kV bus voltage magnitude and voltage drop violations
- Multiple 138kV thermal violations
- Ashtabula 345/138kV transformer thermal violation
- Star 345/138kV transformer #1 thermal violation
- Hanna 345/138kV transformer thermal violation
- Highland – G689 345 kV line thermal violation
- South Canton - Star 345 kV line thermal violation (AEP-ATSI)



Proposed Alternative Solution

- New single circuit 345kV in Ohio from Conesville to Star substations
- Proposed to relieve
  - Various N-1-1 Thermal and Voltage violations
  - Various Generation Deliverability violations
  - Load Deliverability violation (South Canton-Star 345kV)
- No specific route identified in order to evaluate ROW considerations

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Alternative Evolution

- (22) N-1-1 violations relieved
- (7) Generation Deliverability violations relieved
- South Canto-Star 345kV Load Deliverability violation not relieved
- (16) New Generation Deliverability violations created with addition of proposed solution
- (3) New N-1-1 violations created with addition of proposed solution
- Submitted project would need additional system reinforcement in order to address all constraints for FES deactivations

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Alternative Evolution Summary

- Proposed Solution does not relieve the need for any other proposed solutions needed to address violations
- Proposed Solution would be an additional project and not replace any previously identified solutions to address effects of FES retirements
- Given our evaluation PJM will not pursue this reinforcement as part of the required upgrades associated with the FES retirements

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Current status of 2013 assumptions

- Assumed RMR for 2013
  - Ashtabula 5, Eastlake 1, Eastlake 2, Eastlake 3, Lake Shore 18
- System Topology Assumption
  - **ATSI**:
    - Install a 50 MVAR capacitor bank at the Maclean 138 kV station. Projected in-service date is 6/1/2013.
    - Install a 345/138 kV transformer at the Inland Q-11 station. Projected in-service date is 6/1/2013.
    - Install a 138 kV circuit breaker at the Inland Q-11 station. Projected in-service date is 6/1/2013.
    - Upgrade terminal equipment on the Avon – Crestwood 138 kV line. Projected in-service date is 6/1/2013.
  - **AP**:
    - Replace breaker risers at Marlowe 138 kV and wave traps at Marlowe 138 kV and Bedington 138 kV to increase the rating on the Marlowe – Bedington 138 kV line #1 (PJM proposed baseline upgrade b1837)(new ratings will be 267/352 MVA SN/SE). The expected in-service date is 6/1/2013.
- Remaining violations identified may be mitigated by generation re-dispatch in real time with Operations monitoring all the identified contingencies, including the NERC Category 'C' contingencies.

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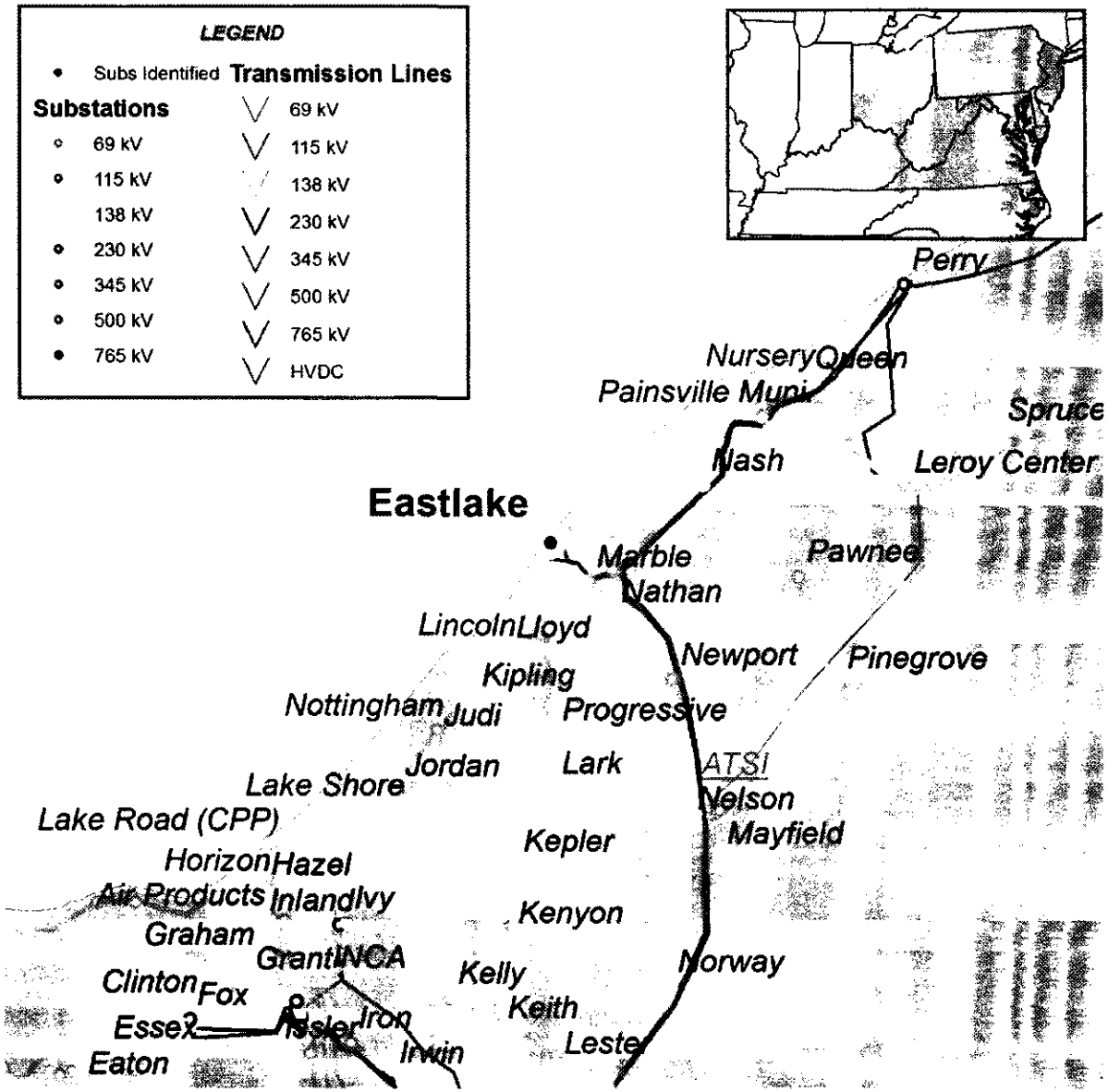
ATSI/AP (FES) Deactivations – Assumptions

- ATSI Load Deliverability Voltage Sample Case would not converge and did not permit solving initial load flow to begin study without the following assumptions.
- Conversion of synchronous condensers needed to maintain an N-1 voltage-secure case.
- Most severe contingency: loss of Hanna – Juniper 345 kV line.
  - Eastlake units 1-5 converted to synchronous condensers
  - Eastlake unit 5 projected to be converted to a synchronous condenser by 6/1/2013.
  - Eastlake unit 4 projected to be converted to synchronous condensers by 12/1/2013.
  - Eastlake units 1, 2 and 3 projected to be converted to synchronous condensers by 6/1/2015.



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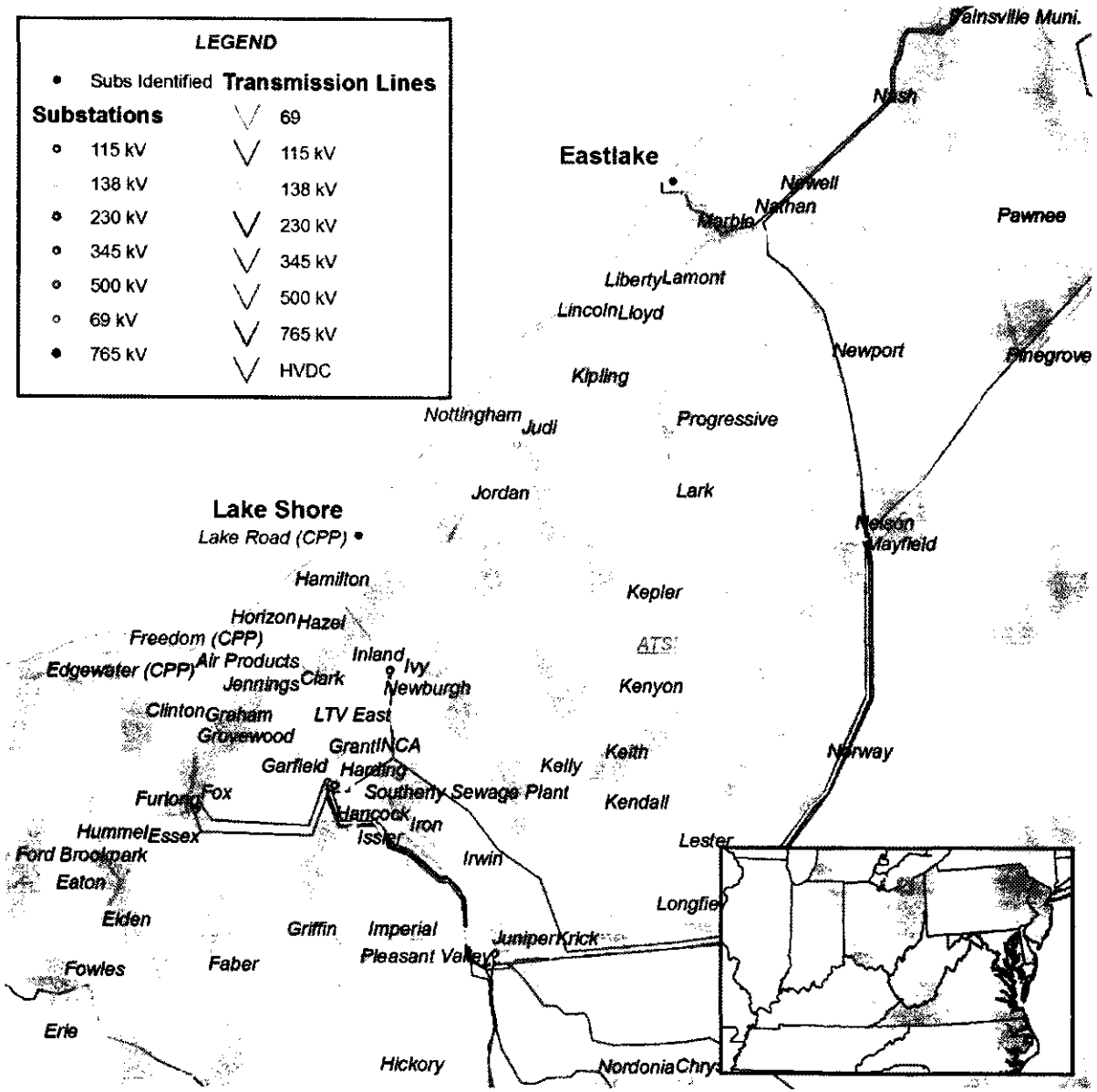
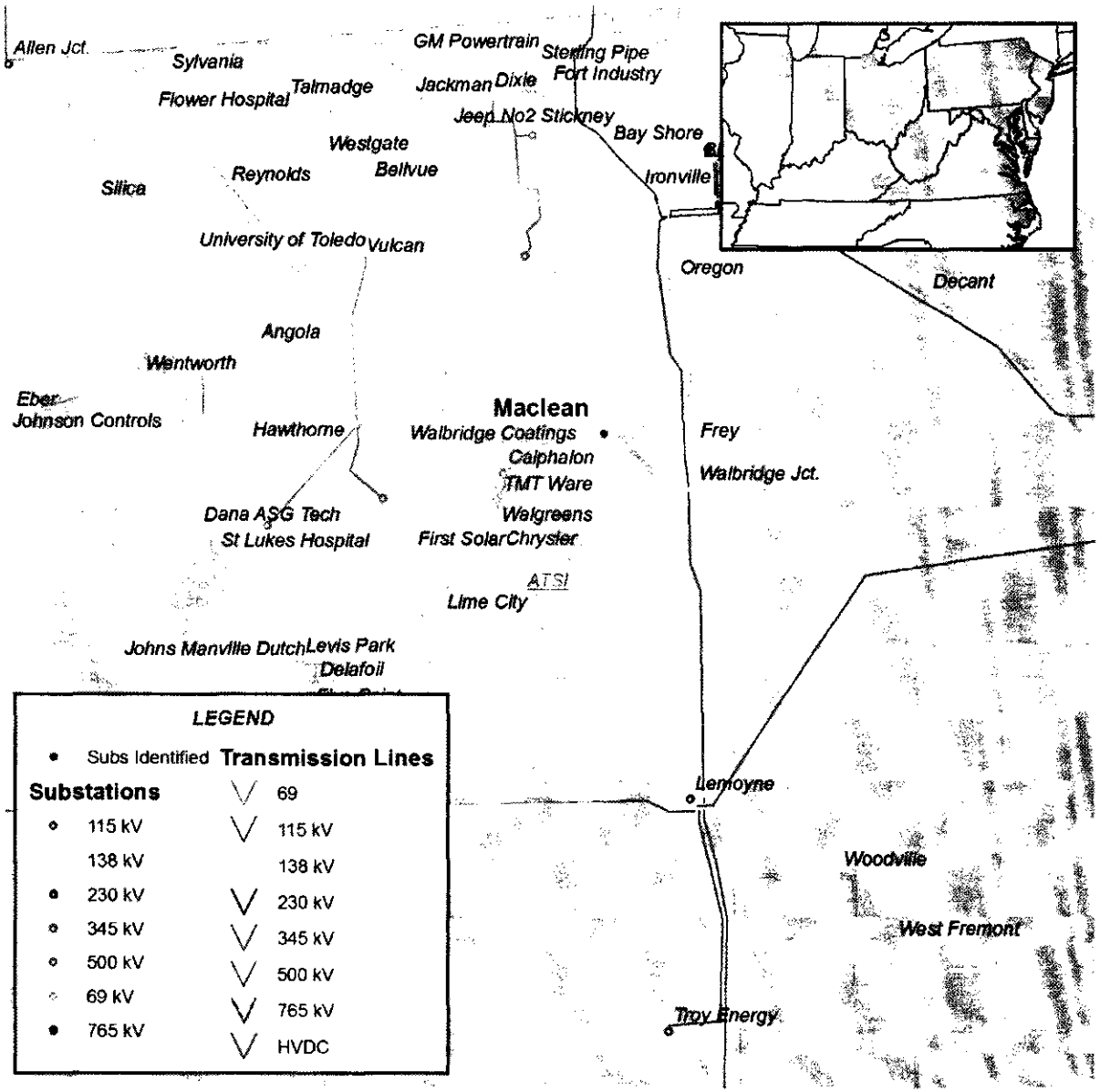
ATSI Transmission Zone Reinforcement

- Convert Eastlake units 1, 2, 3, 4 and 5, and Lakeshore unit 18 to a synchronous condenser
- Estimated Project Cost: $120M
- Projected in-service date for Eastlake 5 is 6/1/2013
- Projected in-service date for Eastlake 4 is 12/1/2013
- Projected in-service date for Eastlake 1-3 is 6/1/2015
- Projected in-service date for Lakeshore 18 is 6/1/2015



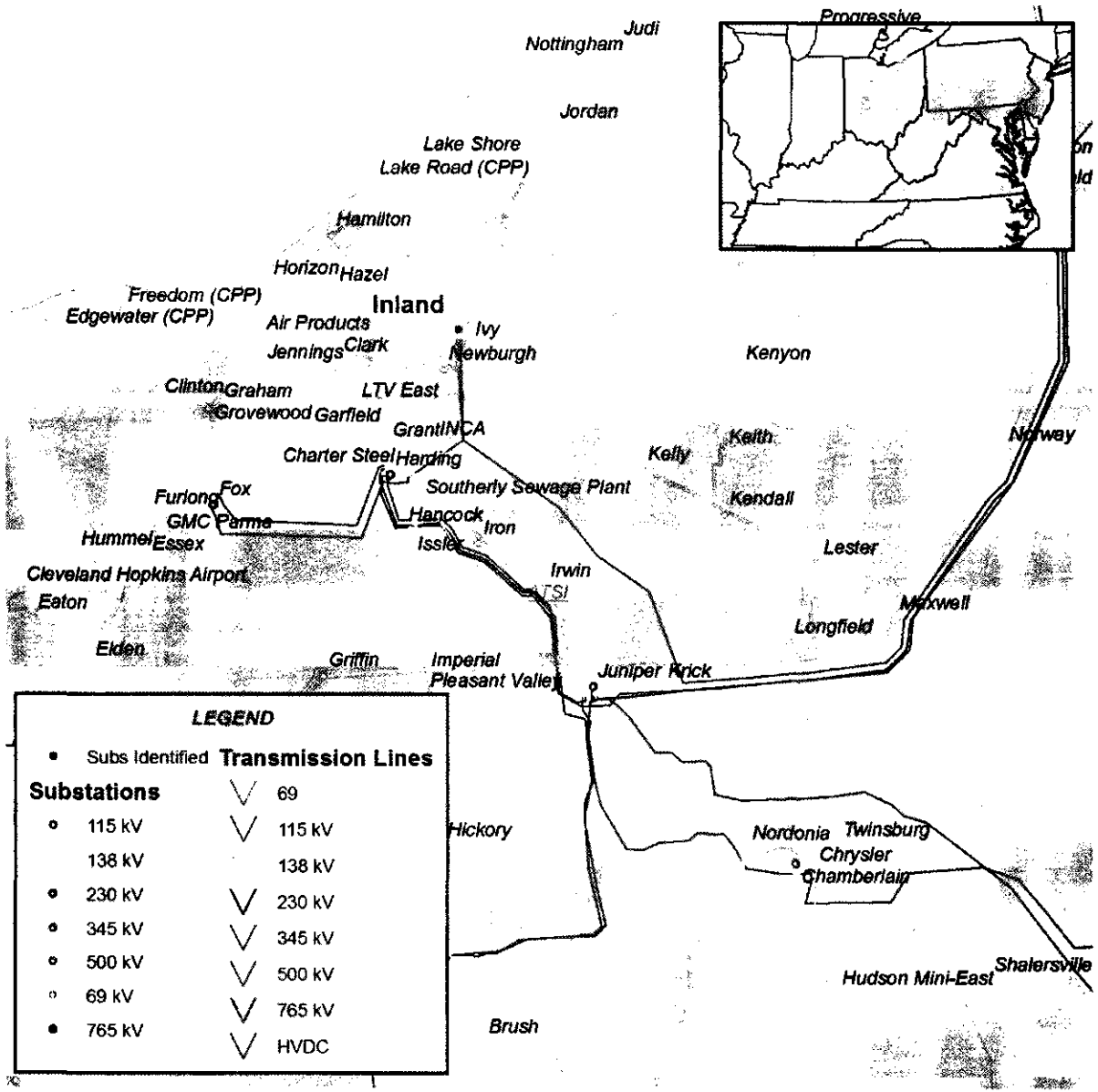
ATSI Transmission Zone Reinforcement

- N-1-1 Voltage Magnitude: (most severe) Lemoyne-Midway 345kV + Lemoyne-Maclean 138kV (91%)
- Install a 50 MVAR capacitor bank at the Maclean 138 kV station.
- Estimated Project Cost: $3M
- Projected in-service date: 6/1/2013.



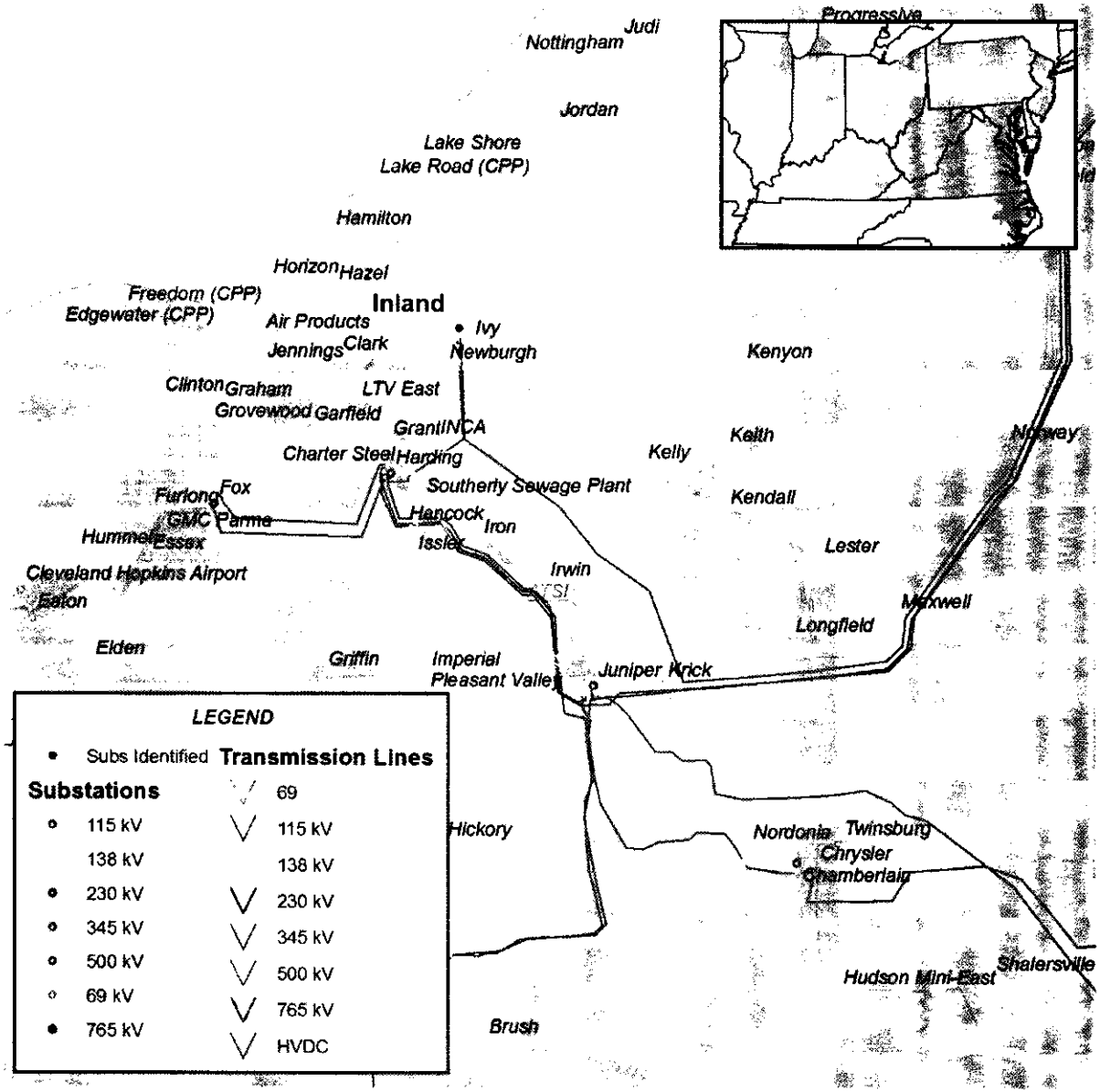
ATSI Transmission Zone Reinforcement

- Common Mode Outage Procedure: Eastlake 345kV breaker failure results in Ashtabula 345-138kV Transformer overload at 105%
- Install a 345/138 kV transformer at the Inland Q-11 station.
- Estimated Project Cost: $7.2M
- Projected in-service date: 6/1/2013.



ATSI Transmission Zone Reinforcement

- Common Mode Outage Procedure: Inland-Ivy Q-11 138kV + Inland-Ivy Q-14 Common Tower Outage results in 116% overload on Clinton-Ridge Q-12 138kV
- Install a 138 kV circuit breaker at the Inland Q-11 station.
- Estimated Project Cost: $0.9M
- Projected in-service date: 6/1/2013.



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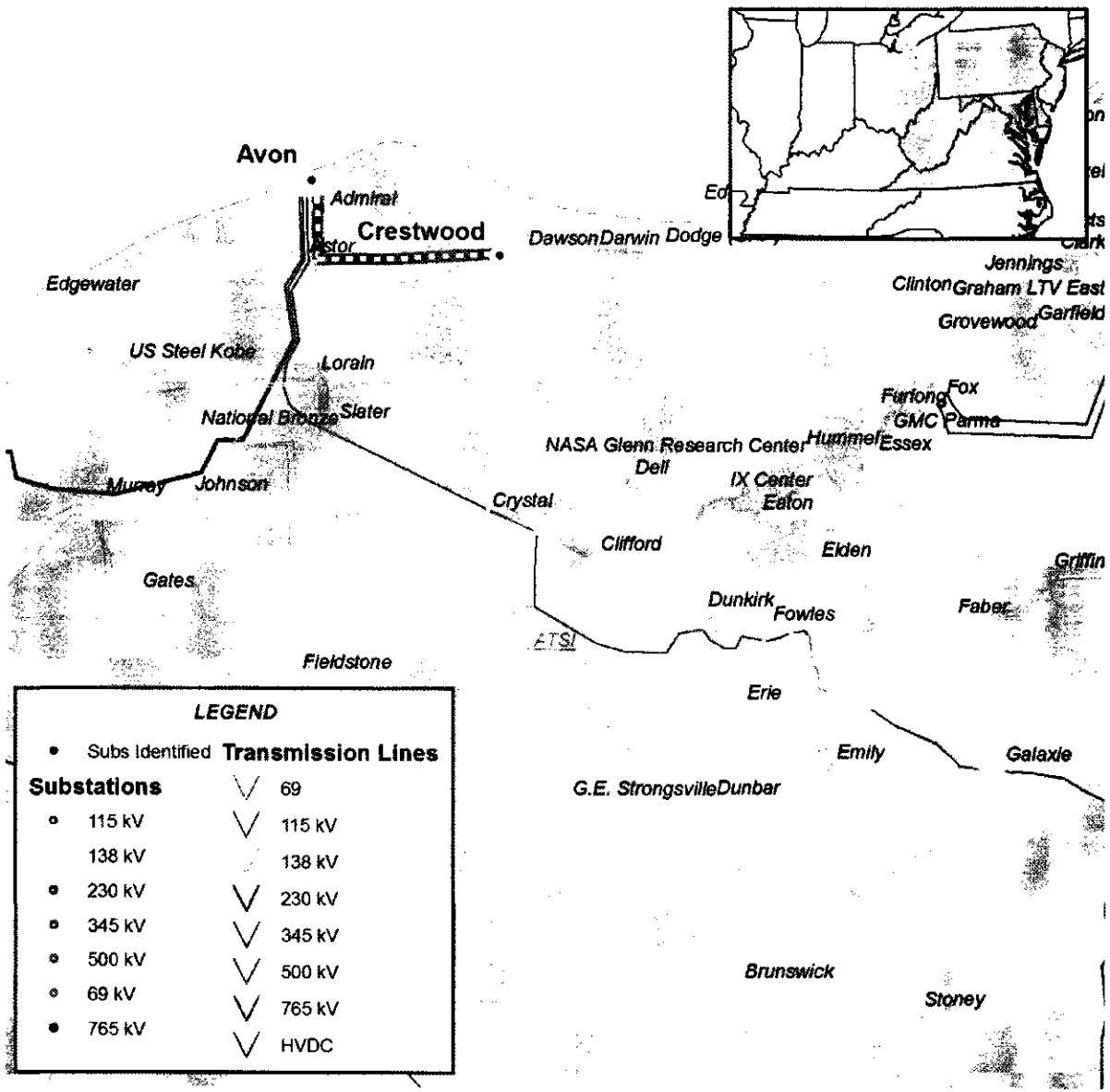
ATSI Transmission Zone Reinforcement

- Generator Deliverability: Avon-Fowles Q-2 138kV + Avon-Fowles Q-3 138kV Common Tower Outage results in 107% overload on Avon-Crestwood Q-1 138kV line section
- Upgrade terminal equipment on the Avon – Crestwood 138 kV line.
- Estimated Project Cost: $0.3M
- Projected in-service date: 6/1/2013.



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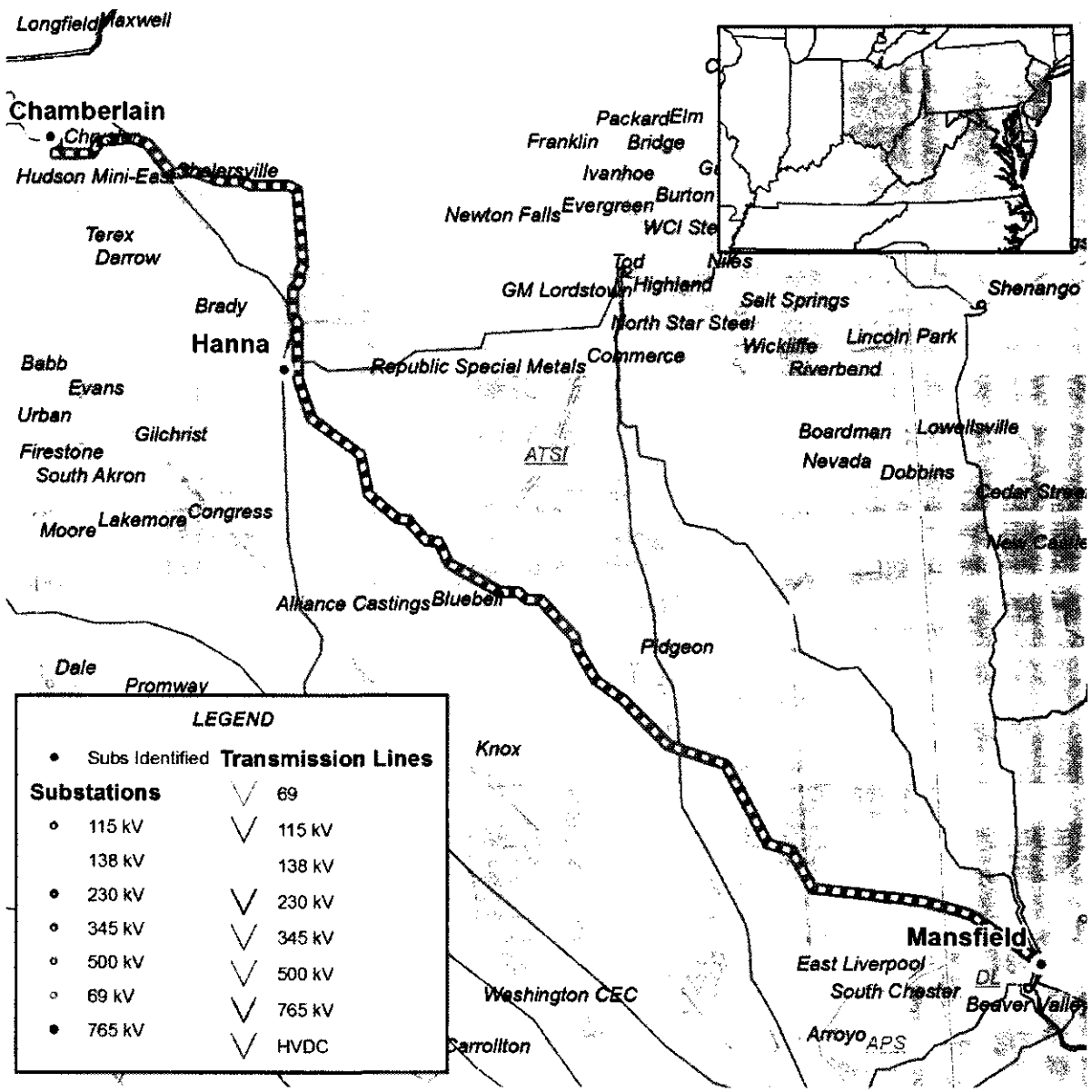
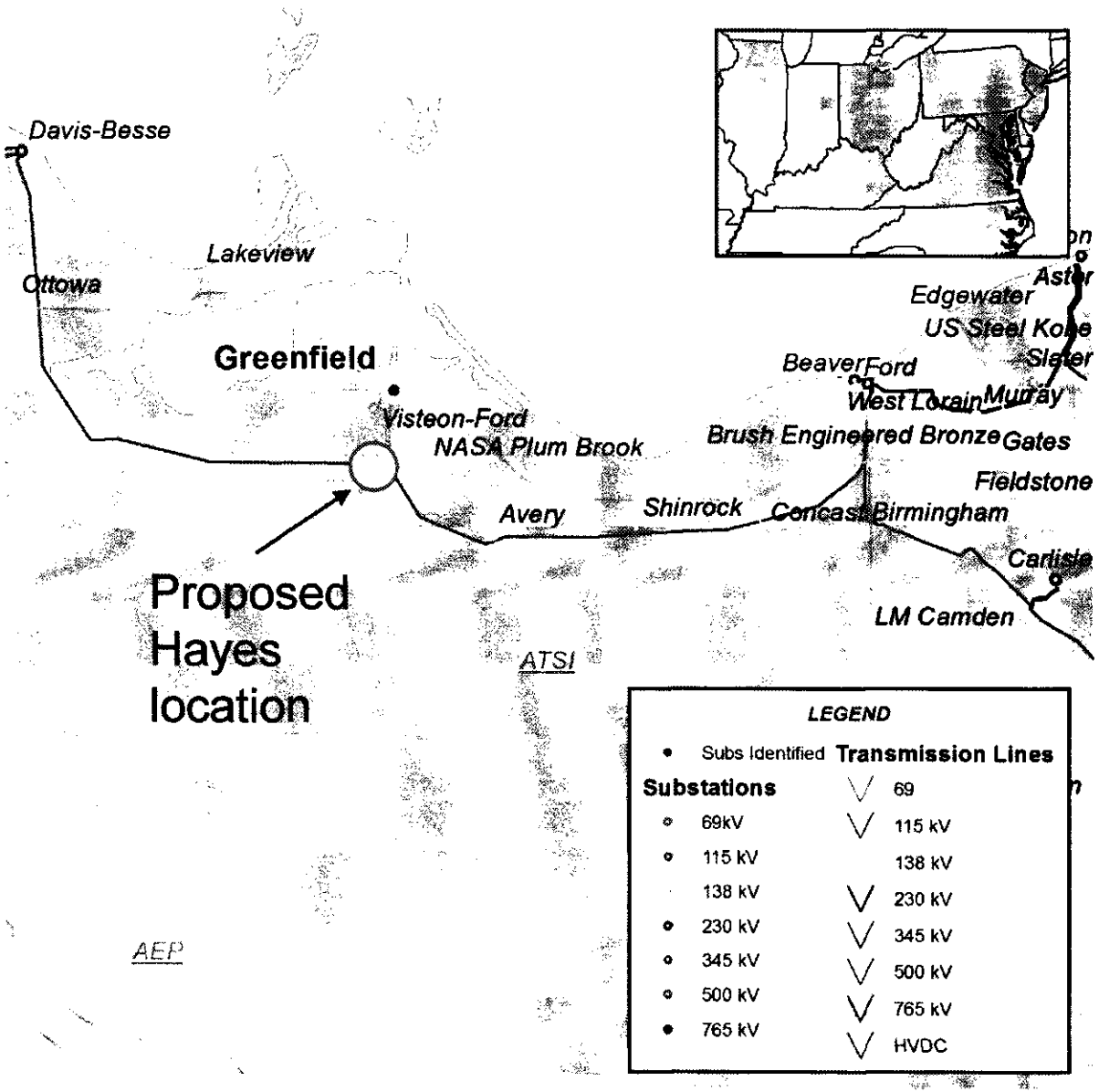
ATSI Transmission Zone Reinforcement

- Common Mode Outage Procedure: Hanna 345kV B106 breaker Failure results in 105% overload on Hanna 345-138kV TR #1
- Loop the Chamberlin - Mansfield 345 kV line into the Hanna 345 kV substation (existing base line upgrade b1283)
- Estimated Project Cost: $8.1M
- Projected in-service date: 6/1/2014 (Advance from 6/1/2015)



ATSI Transmission Zone Reinforcement

- Generator Deliverability: Loss of Beaver-Davis Besse 345kV results in 128% thermal overloads on Lakeview-Ottawa 138kV + Greefield-Lakeview 138kV lines
- Build new Hayes 345/138 kV substation with new 138 kV lines to: Greenfield #1, Greenfield #2, and Avery (existing baseline upgrade b1281)
- Cost estimate:$24.5M
- Projected in-service date: 6/1/2014 (Advance from 6/1/2015)



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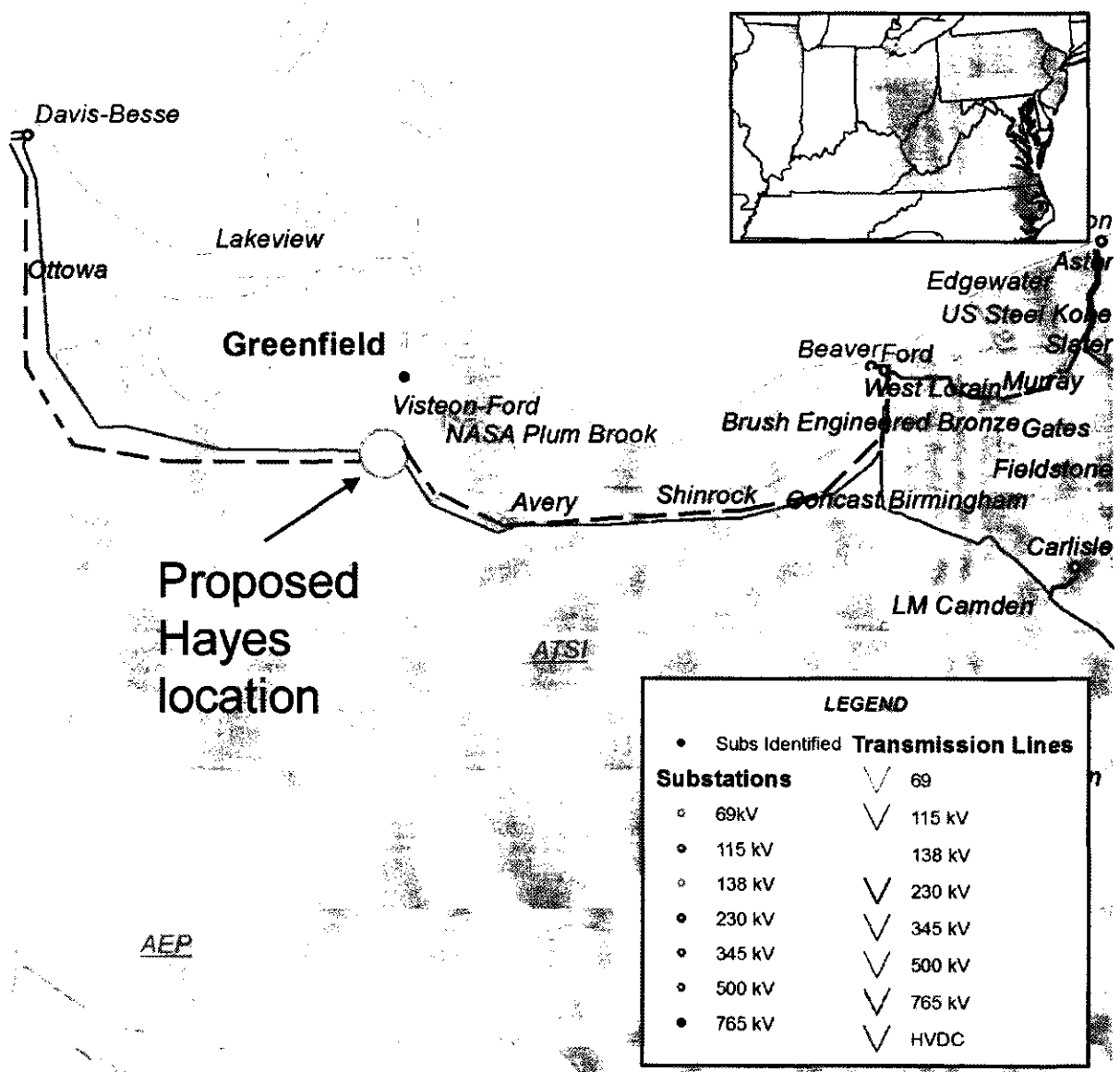
ATSI Transmission Zone Reinforcement

- Generator Deliverability: Loss of Beaver-Davis Besse 345kV results in 128% thermal overloads on Lakeview-Ottawa 138kV + Greefield-Lakeview 138kV lines
- Build Beaver - Hayes - Davis Besse #2 345 kV line (existing base line upgrade b1282)
- Estimated Project Cost: $20.1
- Projected in-service date: 6/1/2014 (Advance from 6/1/2015)



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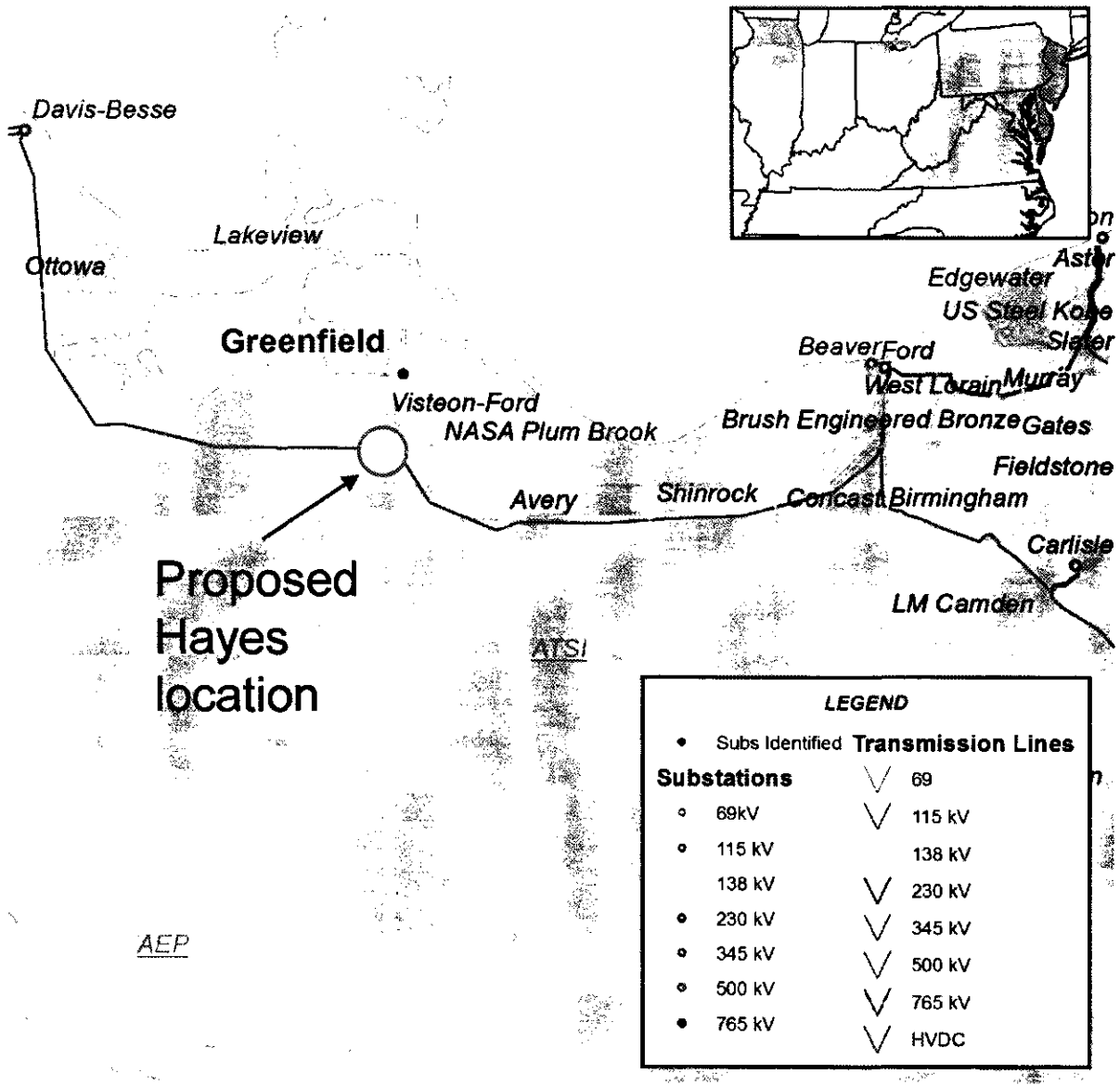
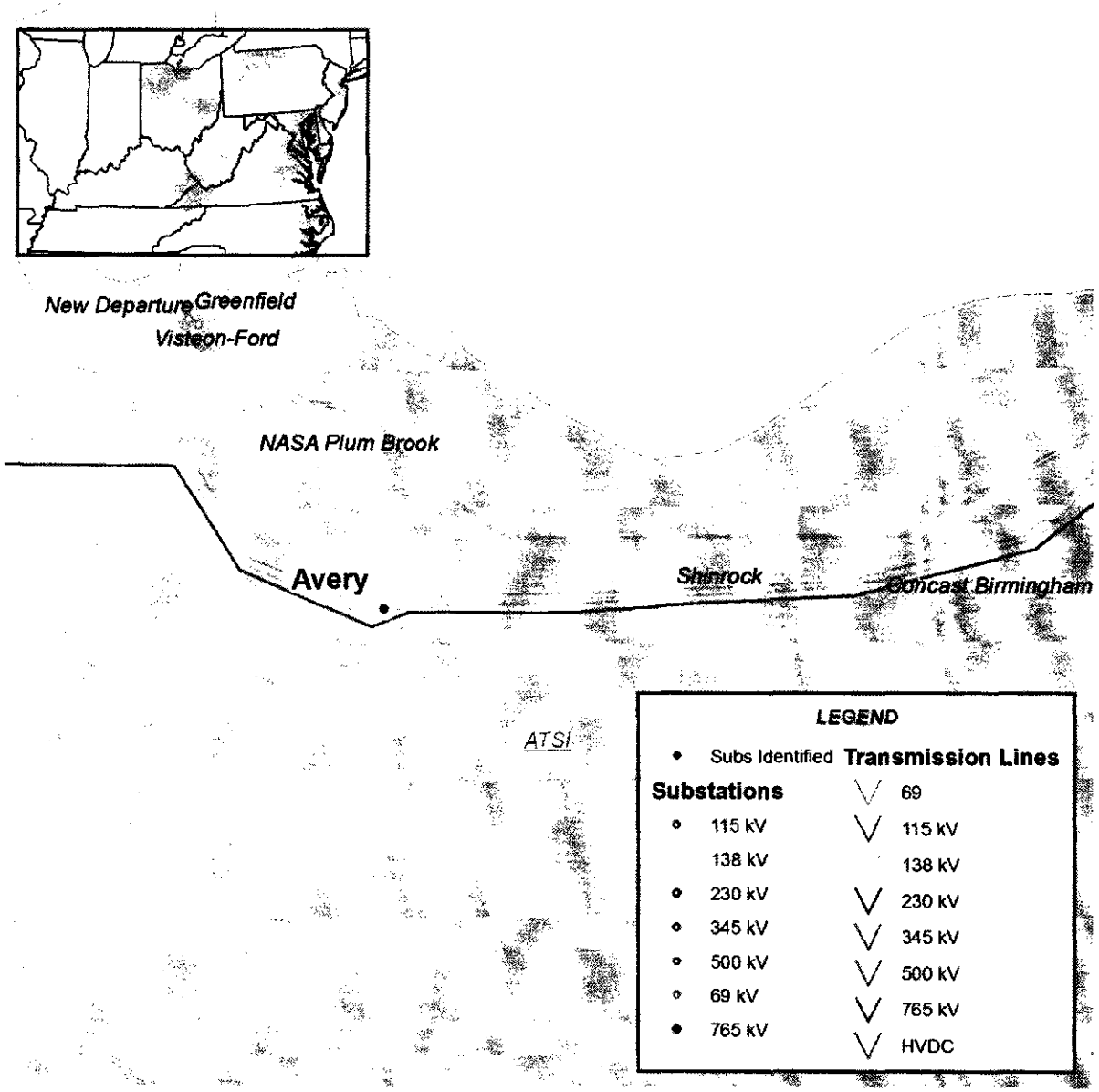
ATSI Transmission Zone Reinforcement

- Addition to scope of Hayes 345-138kV Sub project due to N-1-1 LV 90% for loss of Hayes 345-138kV TR + Ottawa-Lakeview 138kV
- Install a 50 MVAR capacitor at Hayes 138 kV.
- Estimated Project Cost: $1.5M
- Projected in-service date: 6/1/2015.



ATSI Transmission Zone Reinforcement

- Needed in conjunction with Hayes 345-138kV Sub project due to Common Mode outage (Greenfield 138kV Bus) 135% OL on Avery 138-69kV
- Install a 138/69 kV transformer at the Avery station.
- Estimated Project Cost: $3.2M
- Projected in-service date: 6/1/2015.



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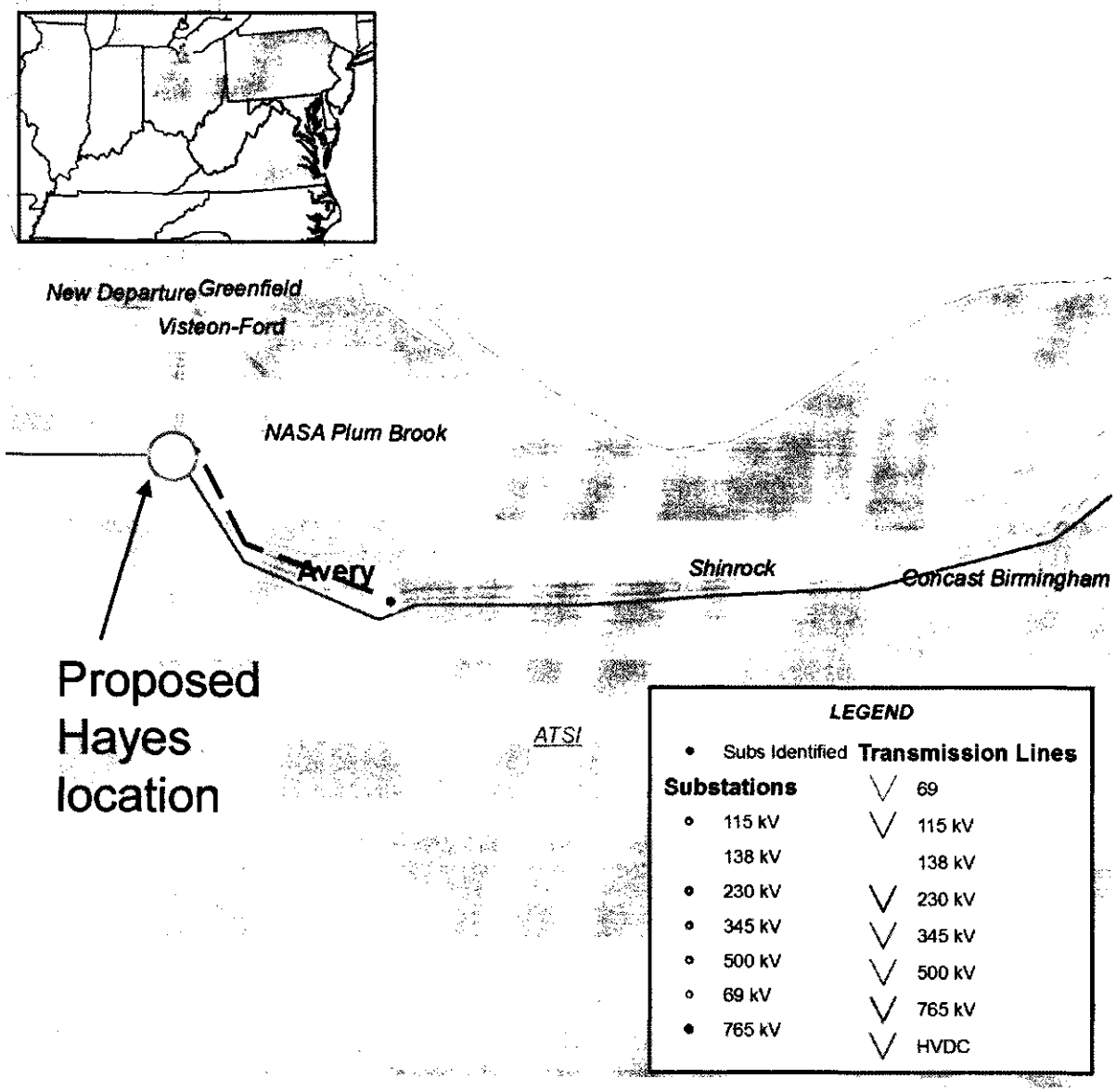
ATSI Transmission Zone Reinforcement

- Needed in conjunction with Hayes 345-138kV Sub project due to Common Mode outage (Greenfield 138kV Bus) 105% overload on Avery-Hayes 138kV
- Increase design temperature limitation on the Avery – Hayes 138 kV line by raising the existing structures. New ratings will be 224/282 MVA (SN/SE)
- Estimated Project Cost: $0.13M
- Projected in-service date: 6/1/2015



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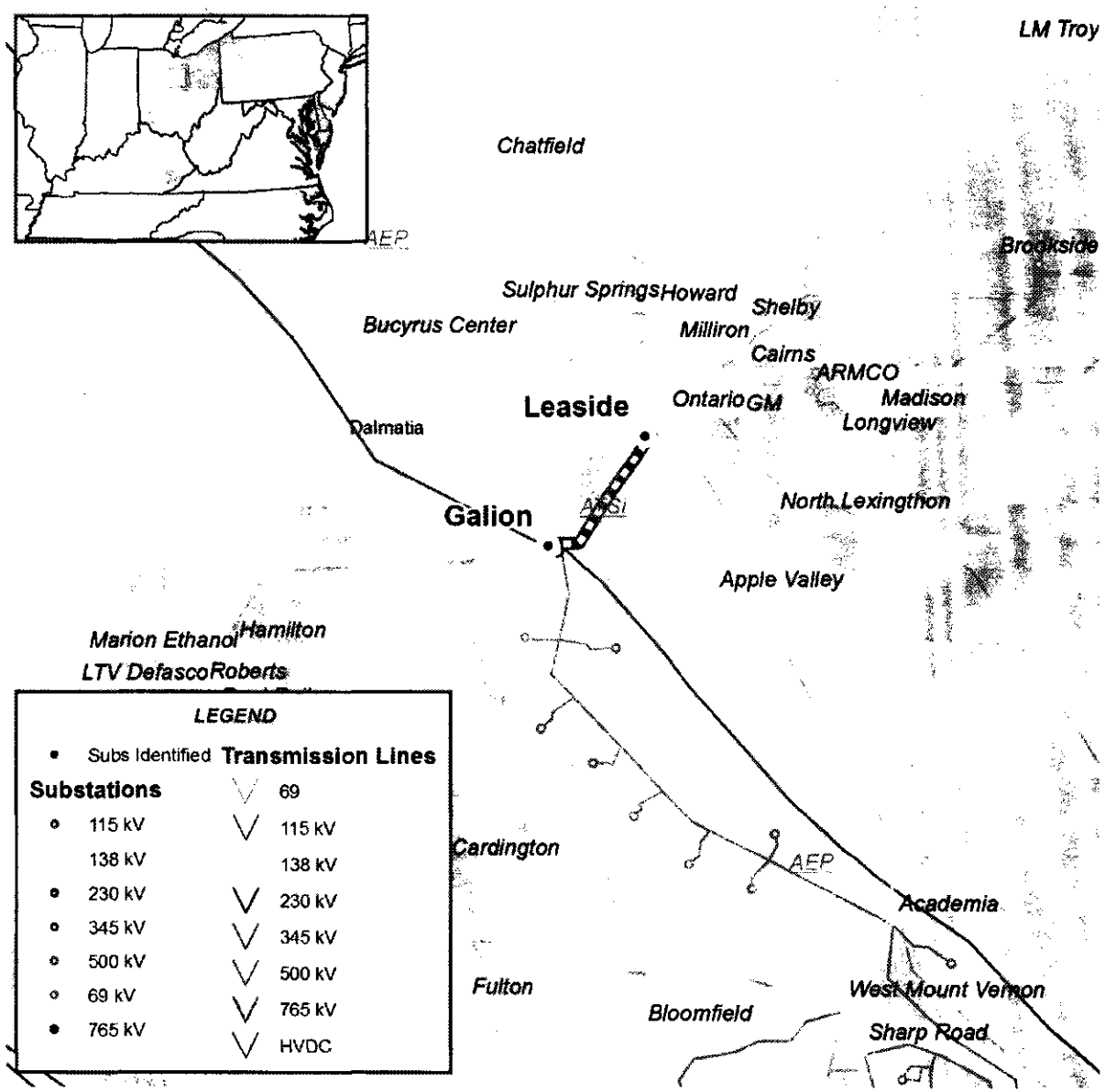
ATSI Transmission Zone Reinforcement

- Common Mode Outage Procedure: Galion 138kV breaker 54 Failure results in 111% overload on Galion-Leaside 138kV
- Re-conductor the Galion – Leaside 138 kV line with 336 ACSS.
- Estimated Project Cost: $4.9M
- Projected in-service date: 6/1/2014.



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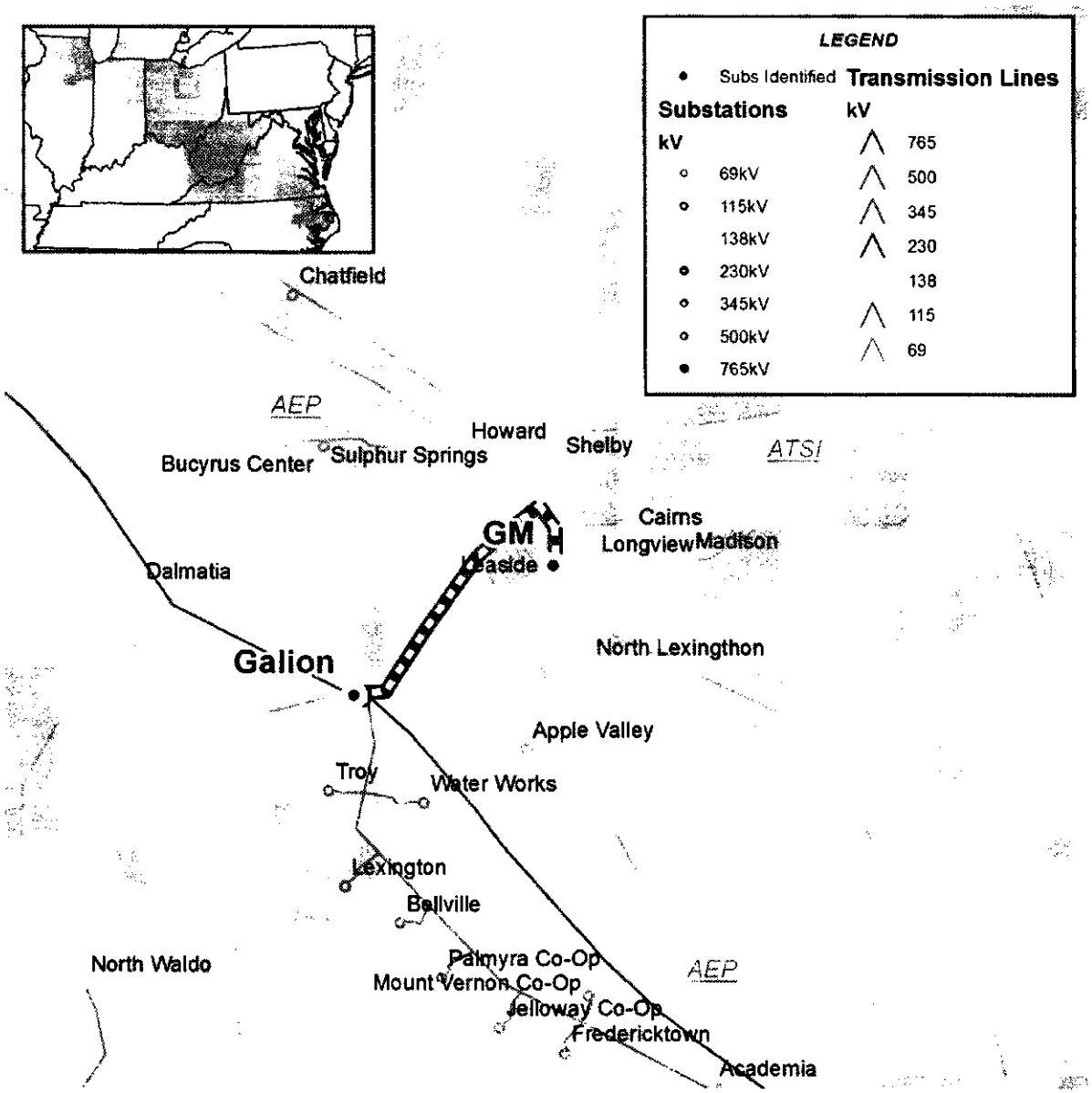
ATSI Transmission Zone Reinforcement

- Generator Deliverability: Brookside-Howard 138kV + Brookside-Leaside 138kV Common Tower Outage results in 107% overload on Galion-GM-Ontario-Cairns 138kV line sections
- Re-conductor the Galion – GM Mansfield – Ontario - Cairns 138 kV line with 477 ACSS.
- Estimated Project Cost: $9.8M
- Projected in-service date: 6/1/2014.



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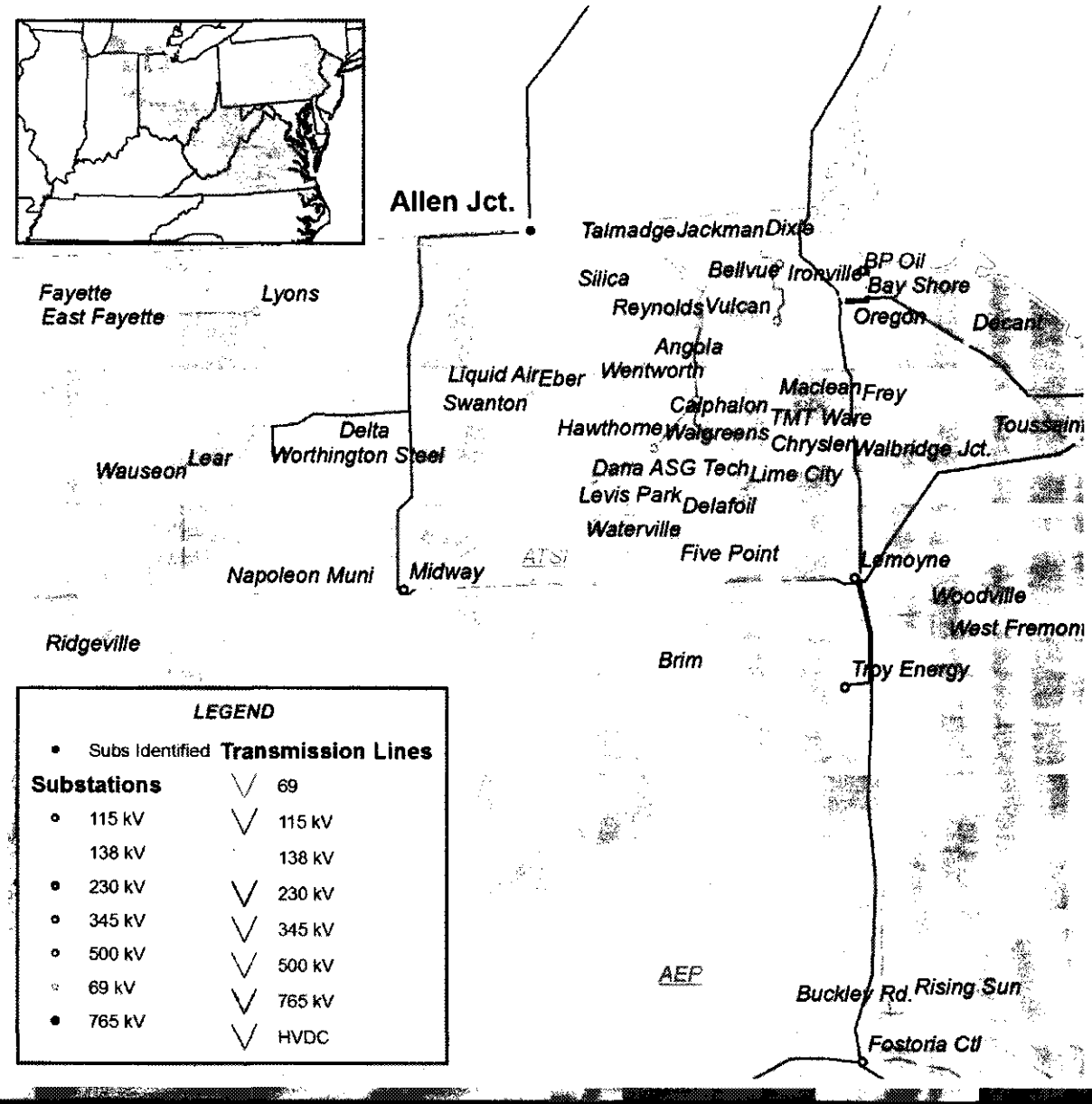
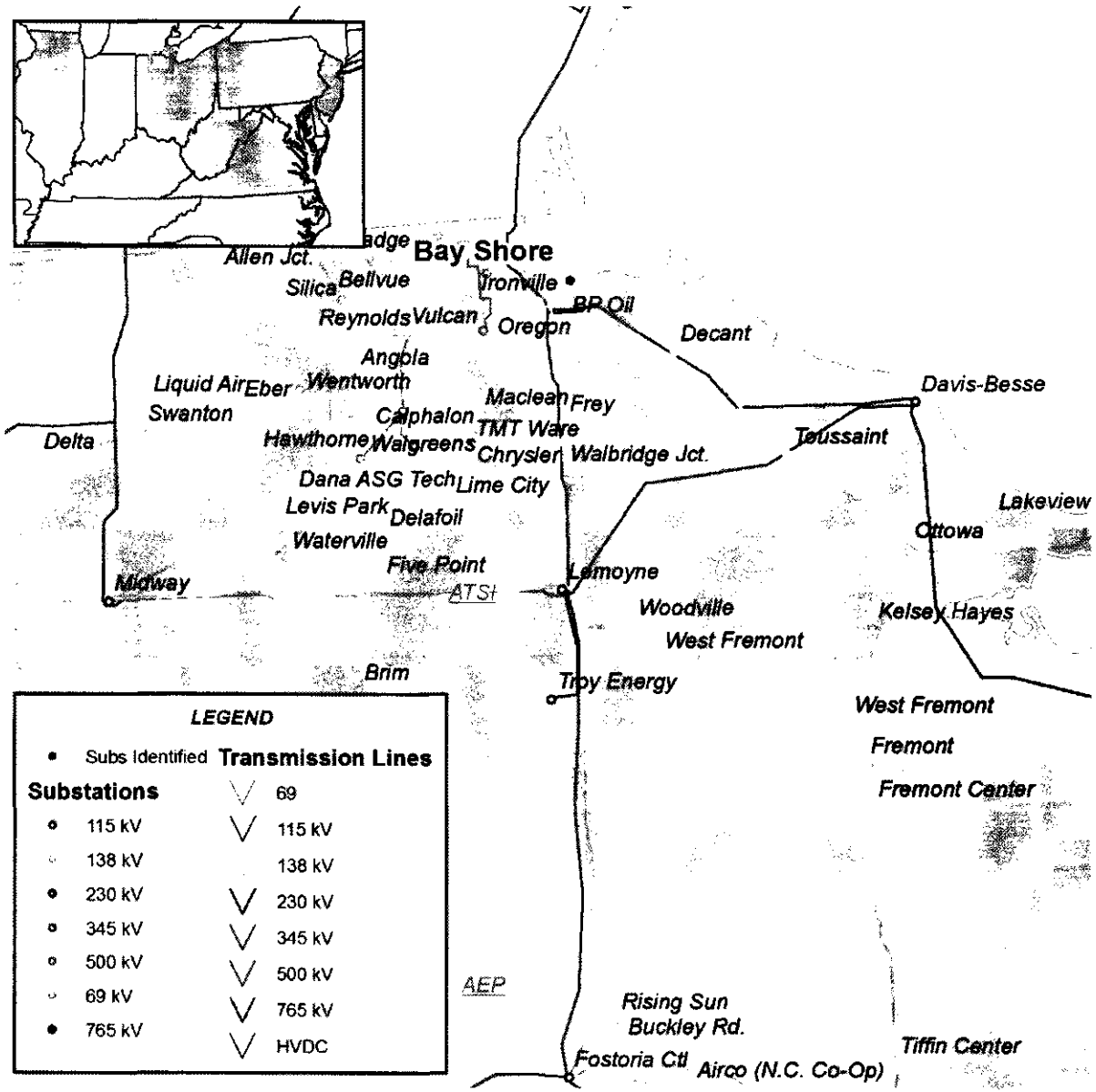
ATSI Transmission Zone Reinforcement

- N-1-1 Thermal: Loss of Allen Junction 345-138kV TR + Bayshore 345-138kV TR results in 110% OL on Eber-Liquid Air 138kV line section
- Install a 2nd 345/138 kV transformer at the Allen Junction station.
- Estimated Project Cost: $7.2M
- Projected in-service date: 6/1/2014.



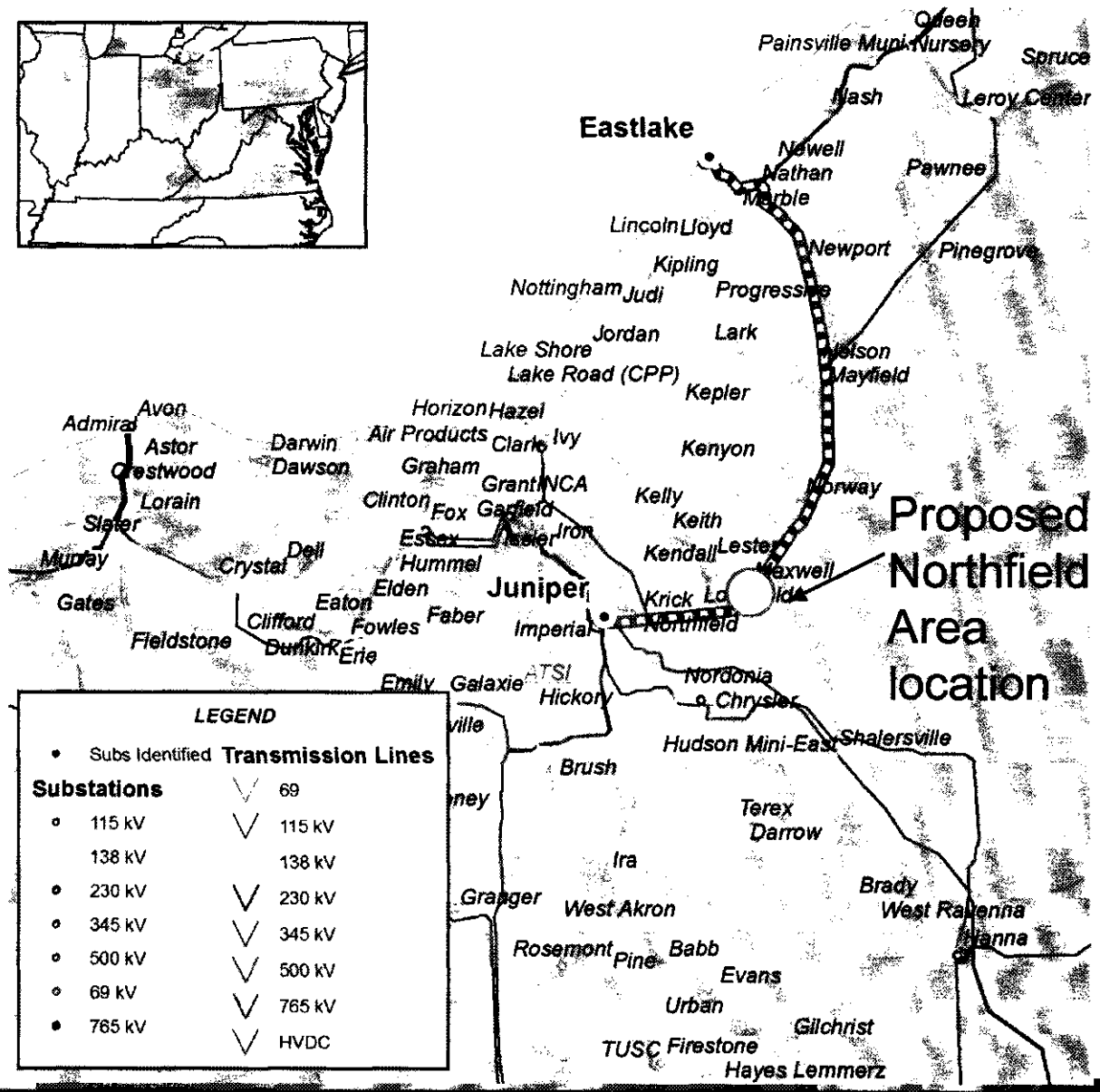
ATSI Transmission Zone Reinforcement

- N-1-1 Voltage Magnitude: Bayshore 345-138kV Transformer + Lemoyne-Maclean 138kV results in low voltage (90%) at Maclean
- Install a 2nd 345/138 kV transformer at the Bayshore station.
- Estimated Project Cost: $7.2M
- Projected in-service date: 6/1/2014.



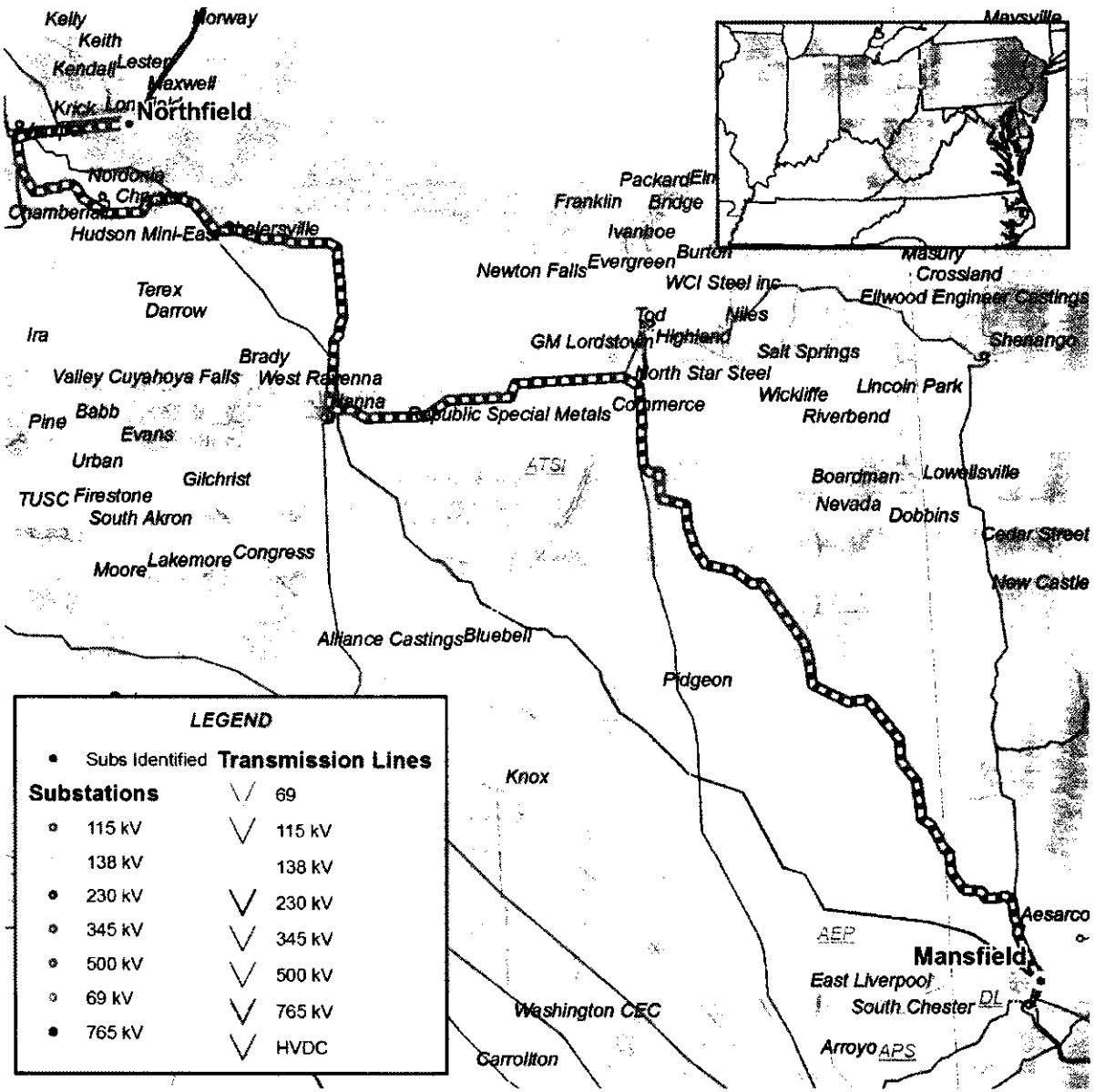
ATSI Transmission Zone Reinforcement

- FE voltage stability criteria violation.
- Create a new Northfield Area 345 kV switching station by looping in the Eastlake – Juniper 345 kV line and the Perry - Inland 345 kV line.
- Estimated Project Cost: $37.5M
- Projected in-service date: 6/1/2015.



ATSI Transmission Zone Reinforcement

- FE voltage stability criteria violation.
- Build a new Mansfield - Northfield Area 345 kV line.
- Estimated Project Cost: $184.5M
- Projected in-service date: 6/1/2015.



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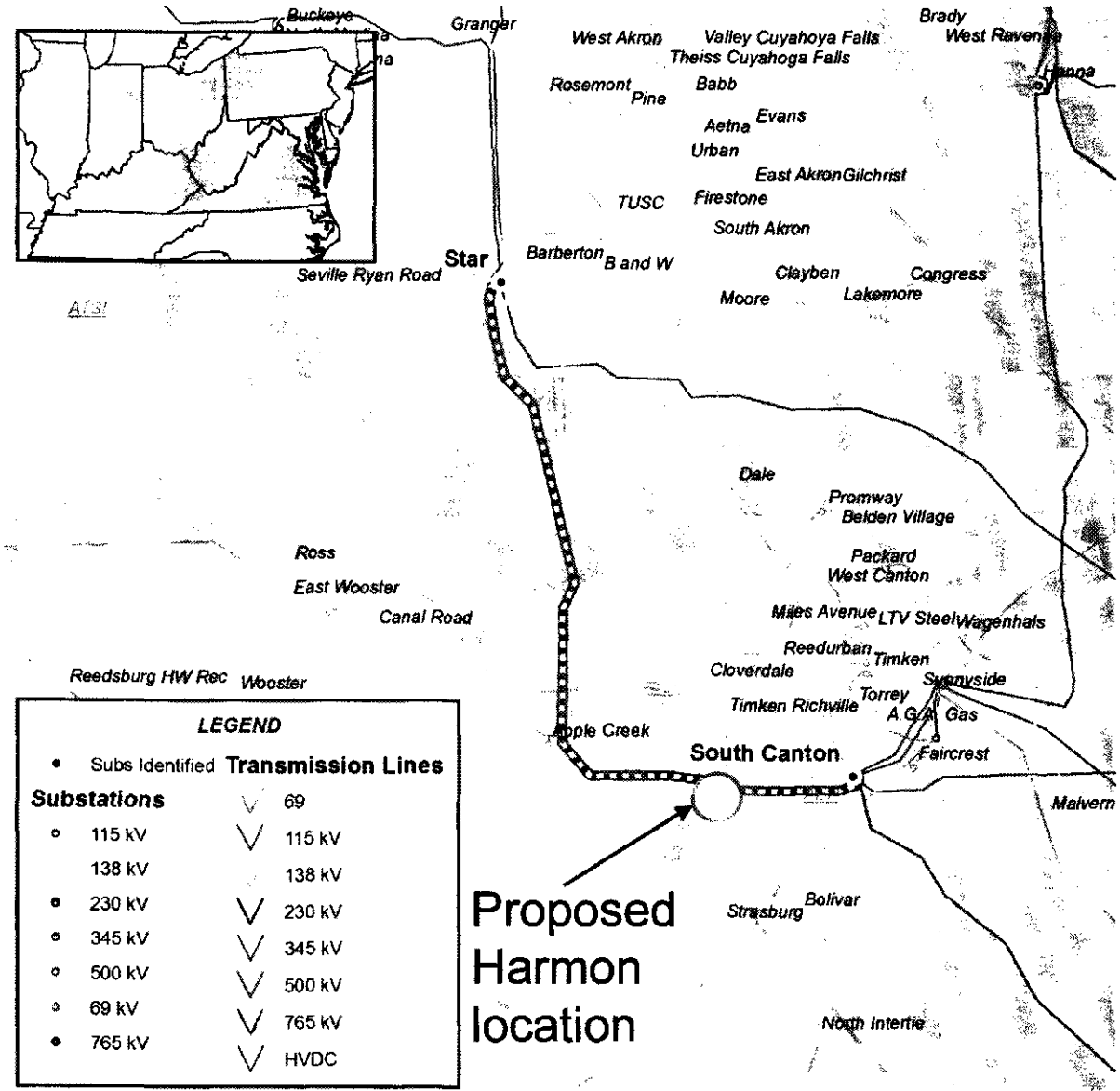
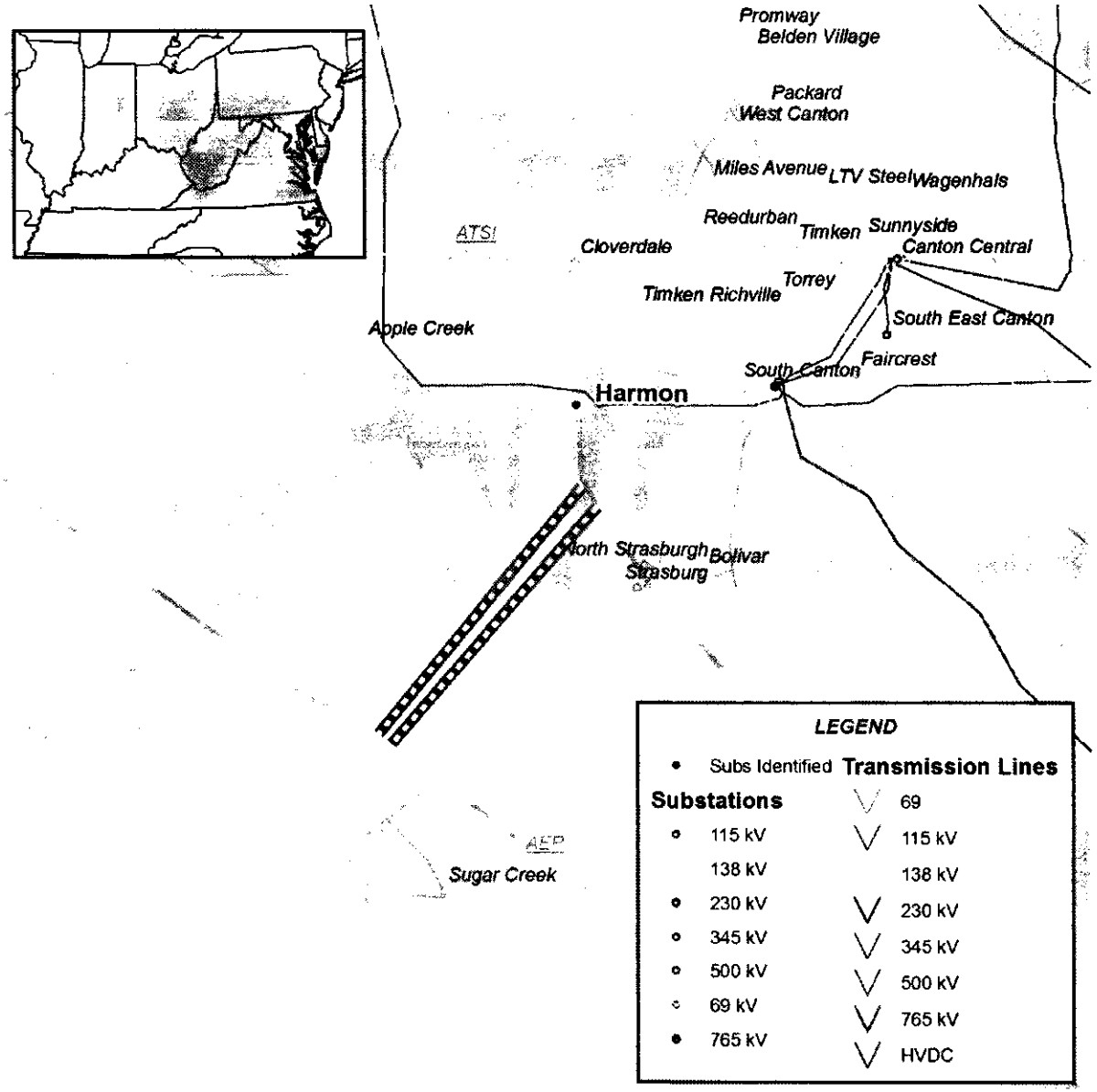
ATSI Transmission Zone Reinforcement

- Common Mode Outage Procedure: Star 345kV B-12 breaker Failure, Star B-8 138kV breaker Failure, Barberton-Star 138kV + Cloverdale-Star 138kV TWL, results in thermal overloads on Star 345-138kV TR #1 101%, Star-Barberton #1 106%, and Star-Barberton #2 103%
- Create a new Harmon 345/138/69 kV substation by looping in the Star – South Canton 345 kV line.
- Estimated Project Cost: $46M
- Projected in-service date: 6/1/2015.



ATSI Transmission Zone Reinforcement

- Common Mode Outage Procedure: Galion 138kV breaker Failure, Brookside-Howard 138kV + Brookside-Leaside 138kV Common Tower Outage results in thermal overloads on Galion-Leaside 112%, and Galion-GM 101%
- Build a new Harmon – Brookside + Harmon - Longview 138 kV line
- Estimated Project Cost: $9.2M
- Projected in-service date: 6/1/2015.



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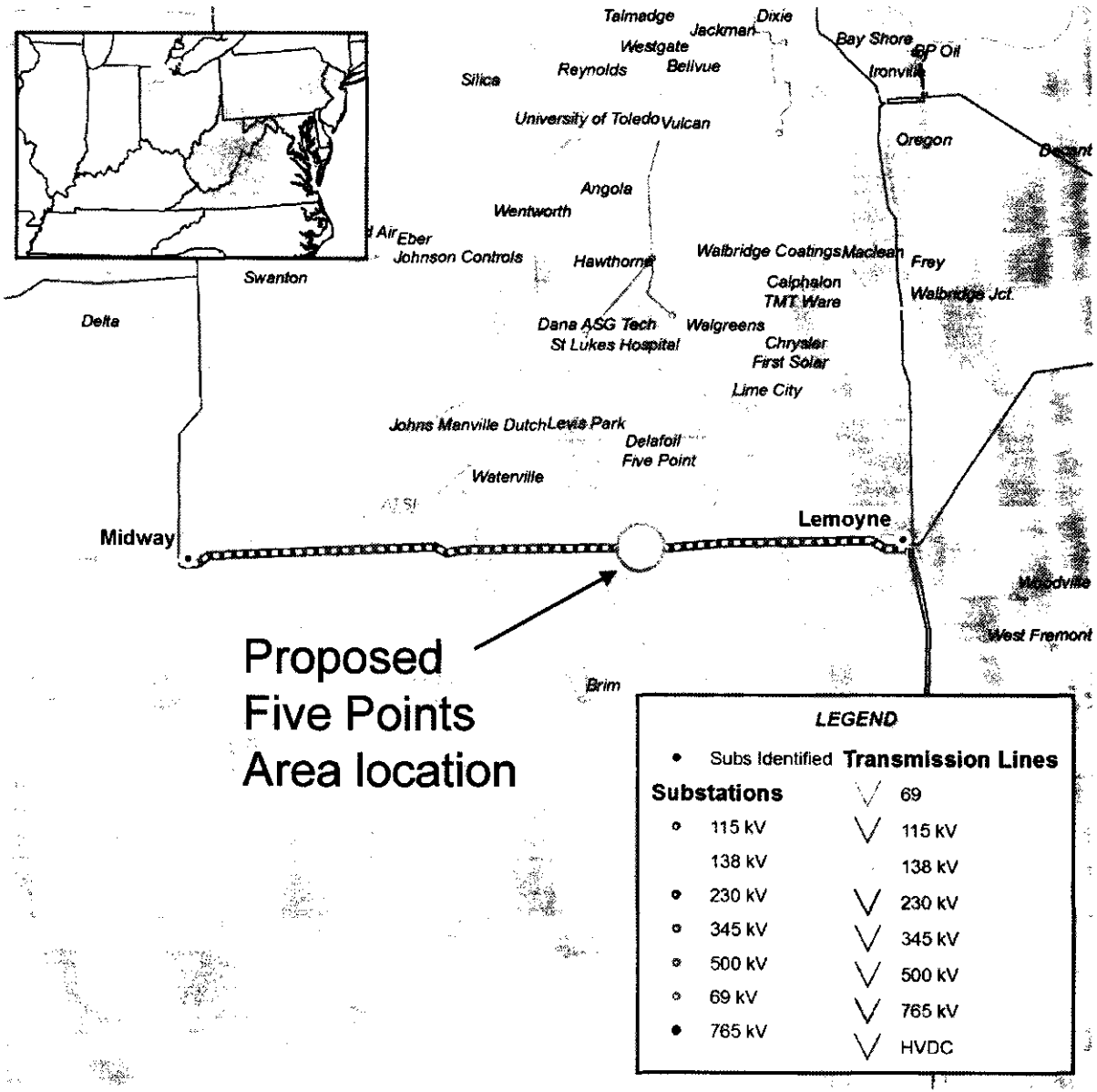
ATSI Transmission Zone Reinforcement

- N-1-1 Voltage Magnitude: Loss of Bayshore 345-138kV TR + Lemoyne-Maclean 138kV results in Low Voltage at Maclean 138kV 90%
- Create a new Five Points Area 345/138 kV substation by looping in the Lemoyne – Midway 345 kV line.
- Estimated Project Cost: $30M
- Projected in-service date: 6/1/2015.



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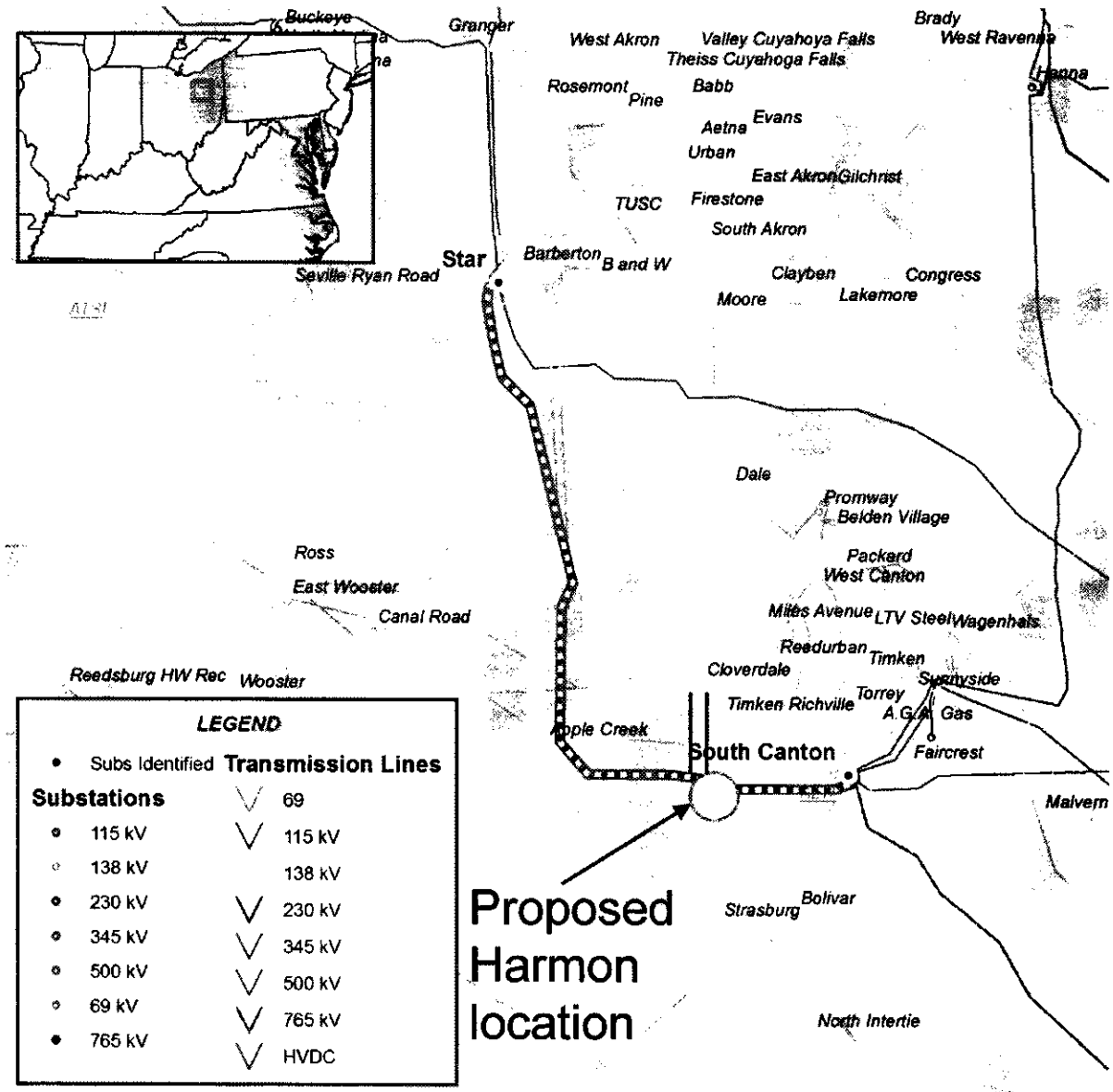
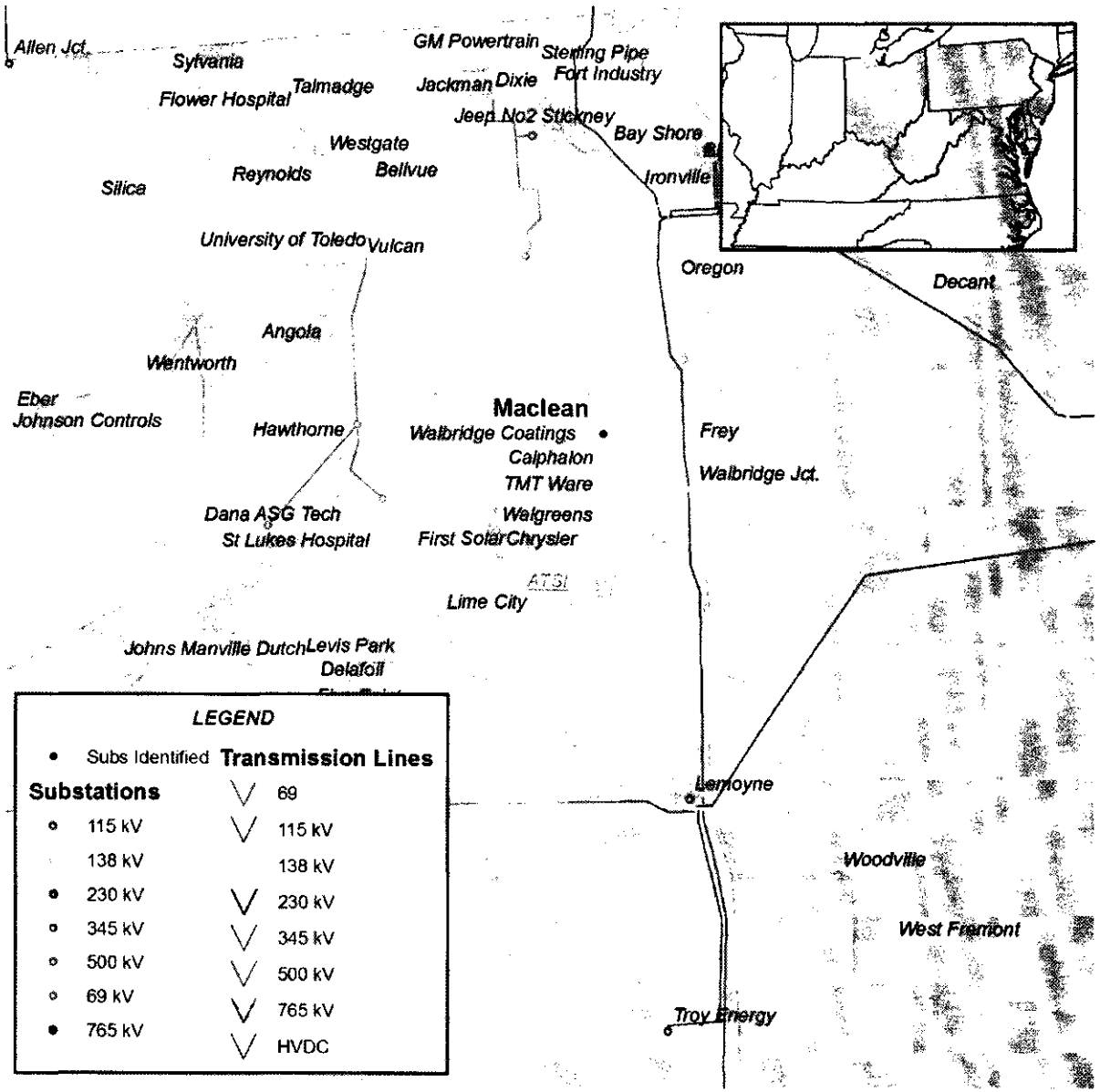
ATSI Transmission Zone Reinforcement

- N-1-1 Thermal for loss of one of the Cloverdale-Harmon 138kV lines + Harmon-Star 345kV line results in 115% OL on the remaining Cloverdale-Harmon 138kV line
- Reconductor Cloverdale - Harmon #2 and #3 138kV lines with 795 ACSS or greater conductor 6 miles total + Terminal upgrades. New Ratings 295 SN / 375 SE
- Estimated Project Cost: $3.6M
- Projected in-service date: 6/1/2015



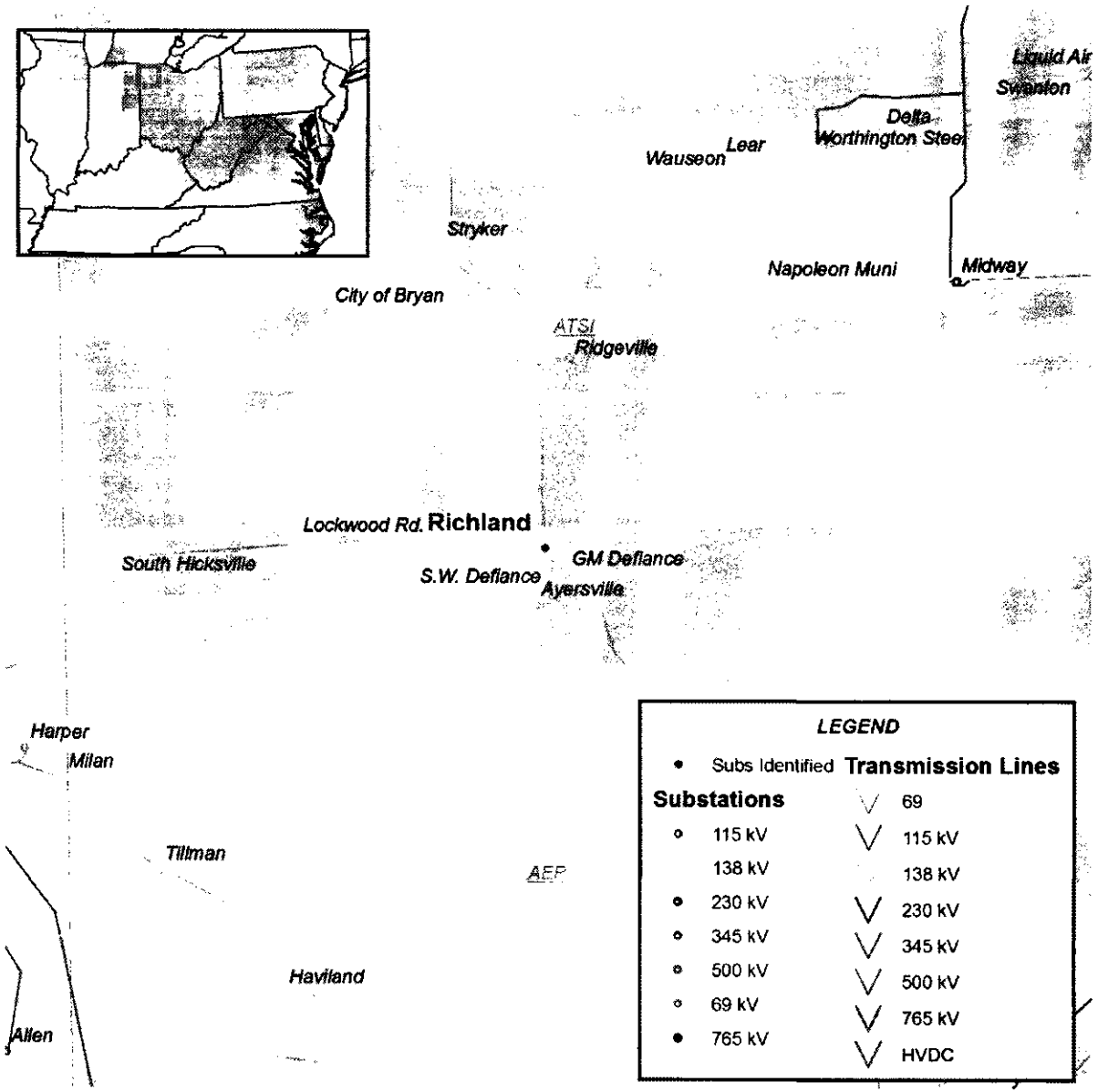
ATSI Transmission Zone Reinforcement

- N-1-1 Voltage Magnitude: (most severe) Lemoyne-Midway 345kV + Lemoyne-Maclean 138kV (91%)
- Change the transformer tap settings on the Maclean 138/69 kV transformers
- Estimated Project Cost: $0.05M
- Projected in-service date: 6/1/2015



ATSI Transmission Zone Reinforcement

- Generator Deliverability: Loss of Richland N bus to Richland J bus section results in 108% overload on Richland-Naomi 138kV line
- Replace 336.4 ACSR SCCIR at Richland to upgrade the Richland – Naomi 138 kV line. New Ratings 161 SN / 191 SE
- Estimated Project Cost: $0.04M
- Projected in-service date: 6/1/2015



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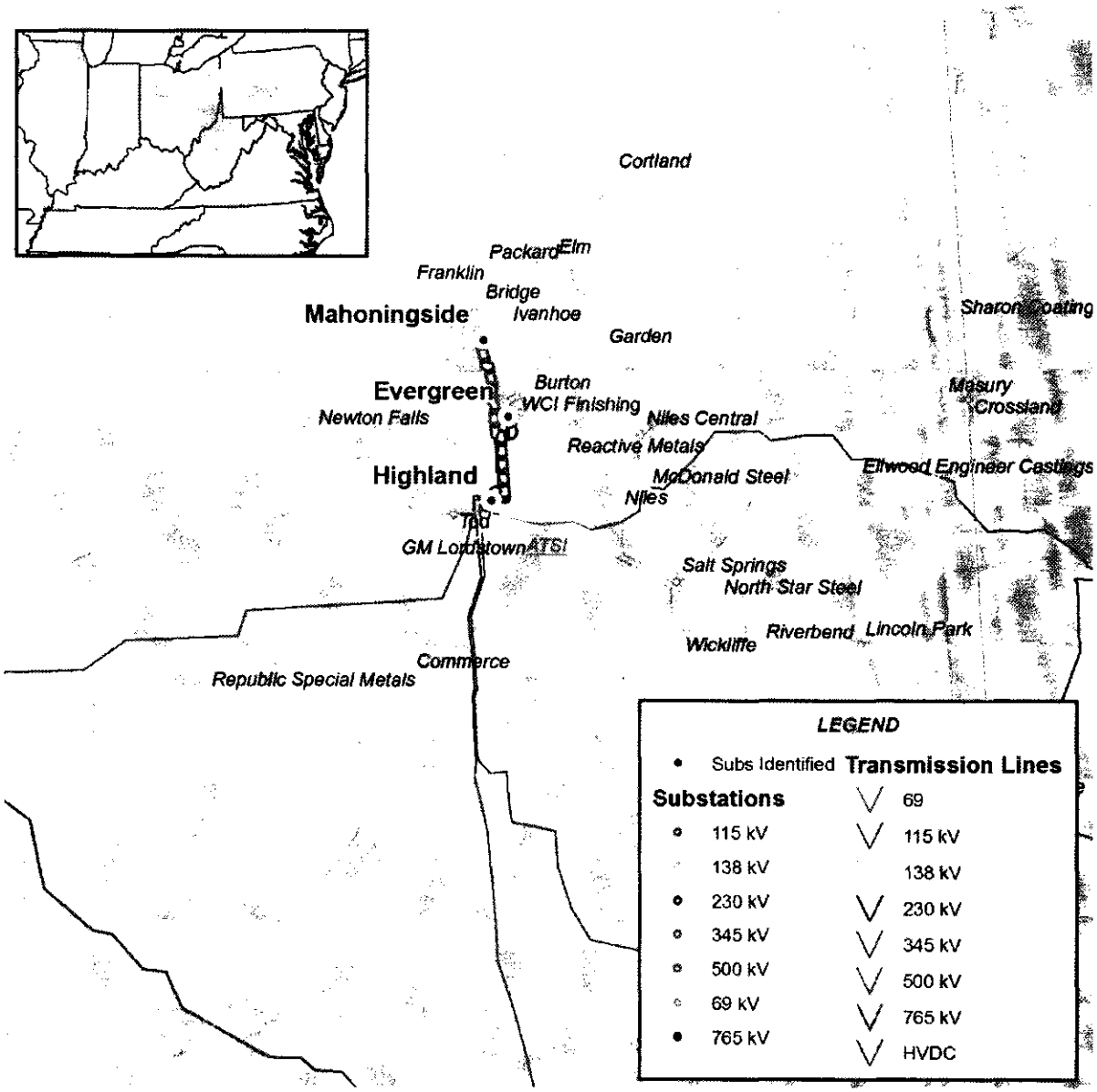
ATSI Transmission Zone Reinforcement

- N-1-1 Thermal (most severe) loss of Highland-Mahoningside 138kV + Evergreen-Highland #2 138kV results in 117% OL on Evergreen-Highland #1 138kV
- Build a new 345-138kV Substation at Niles. Requires 1.2 mile 345kV loop into substation of the Highland – Shenango 345 kV line. Requires new 345-138kV transformer. Project also increased short circuit levels to benefit power quality due to multiple EAF loads in the area.
- Estimated Project Cost: $32M
- Projected in-service date: 6/1/2015



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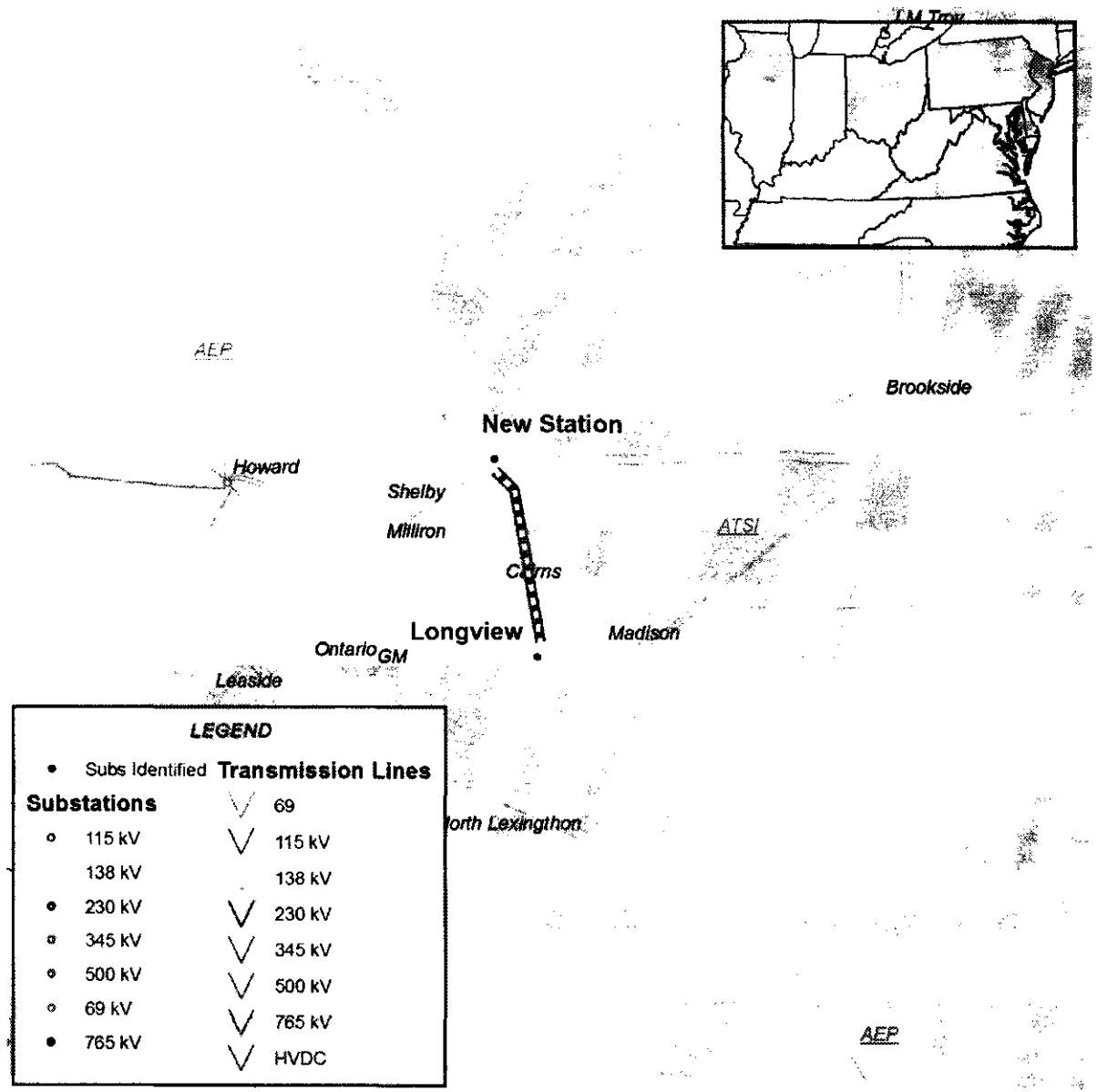
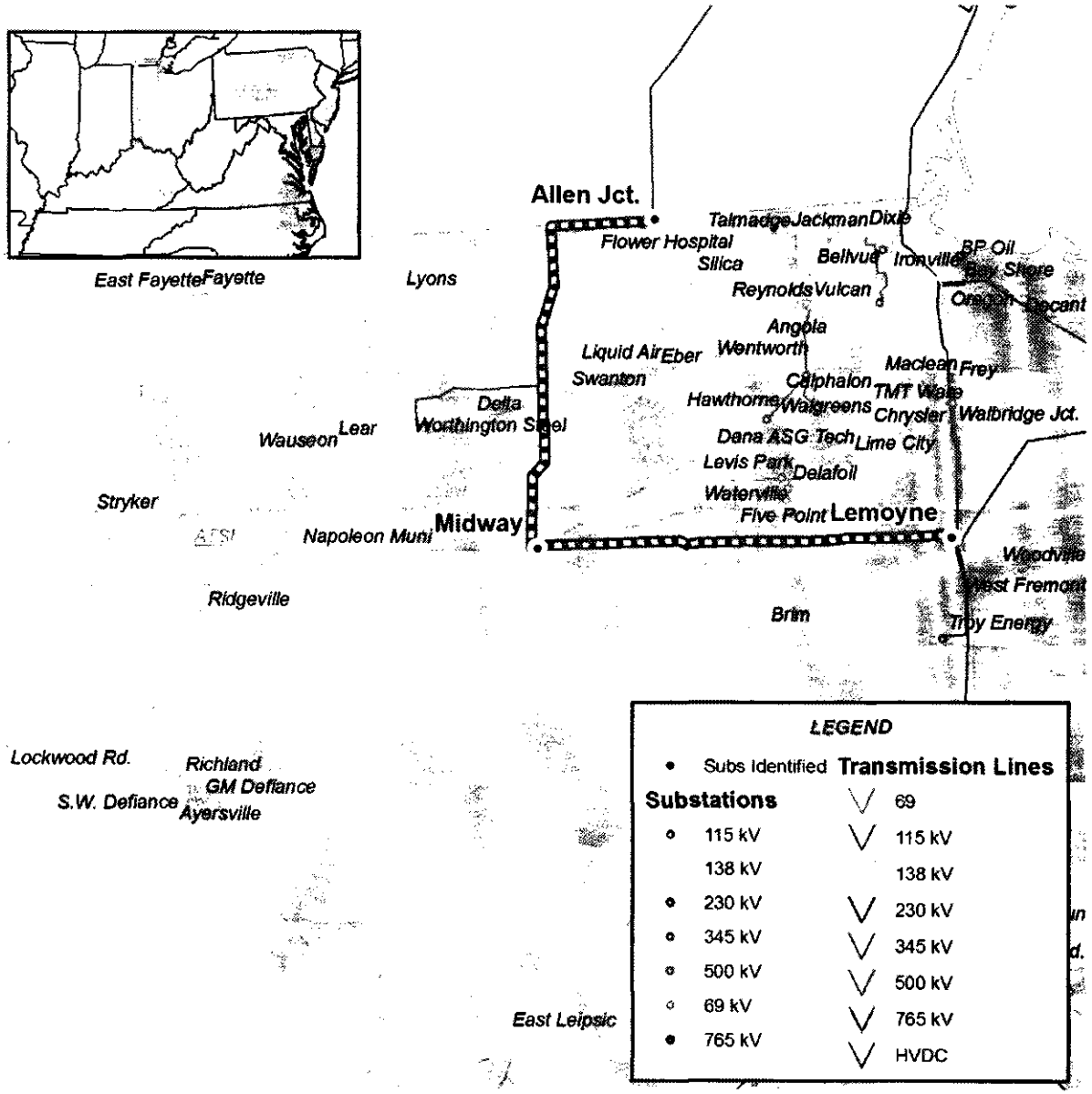
ATSI Transmission Zone Reinforcement

- Generator Deliverability: Galion-Leaside 138kV + Galion-GM 138kV Common Tower Outage results in 115% overload on Brookside-Howard 138kV line
- Build a new 138kV Substation near AEP / ATSI border + 138kV from new substation to Longview approx. 8 miles.
- Estimated Project Cost: $17.7M
- Proposed in-service date: 2016



ATSI Transmission Zone Reinforcement

- N-1-1 Thermal: Loss of Allen Junction-Lulu 345kV + Lemoyne-FivePoints 345kV results in 102% overload on Lemoyne-BG Tap 138kV
- Build new Allen Jct - Midway - Lemonye 345kV line (48 miles of open tower position)
- Estimated Project Cost: $86.3M
- Proposed in-service date: 6/1/2016



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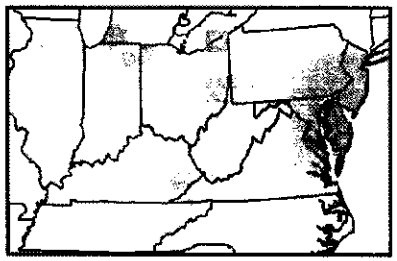
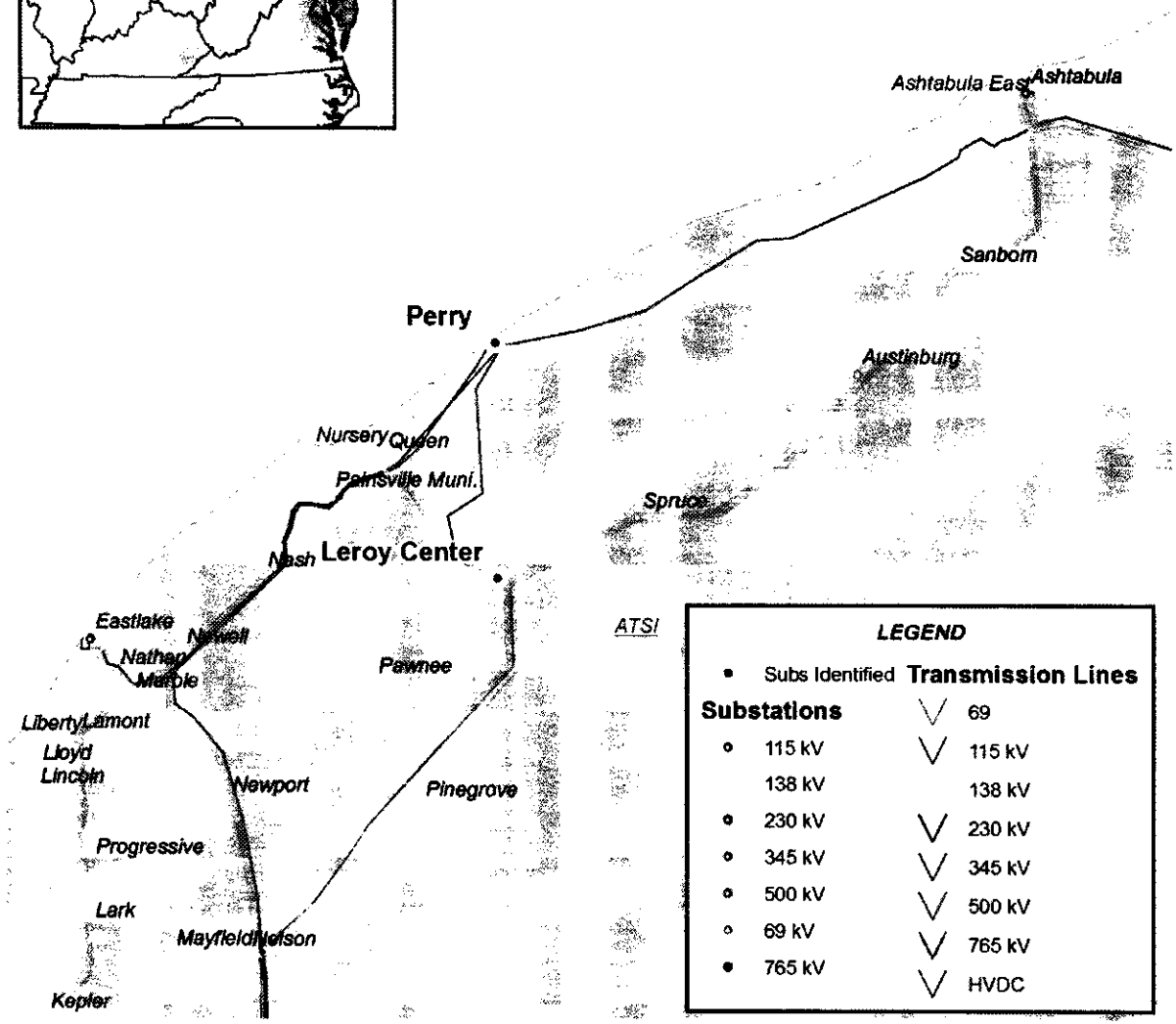
ATSI Transmission Zone Reinforcement

- ***Mitigate Voltage Stability Criteria Issues in the Cleveland Area***
- Build a new Leroy Center 345/138 kV substation by looping in the Perry – Harding 345 kV line.
- Estimated Project Cost: $46 M
- Projected in-service date: 6/1/2016.





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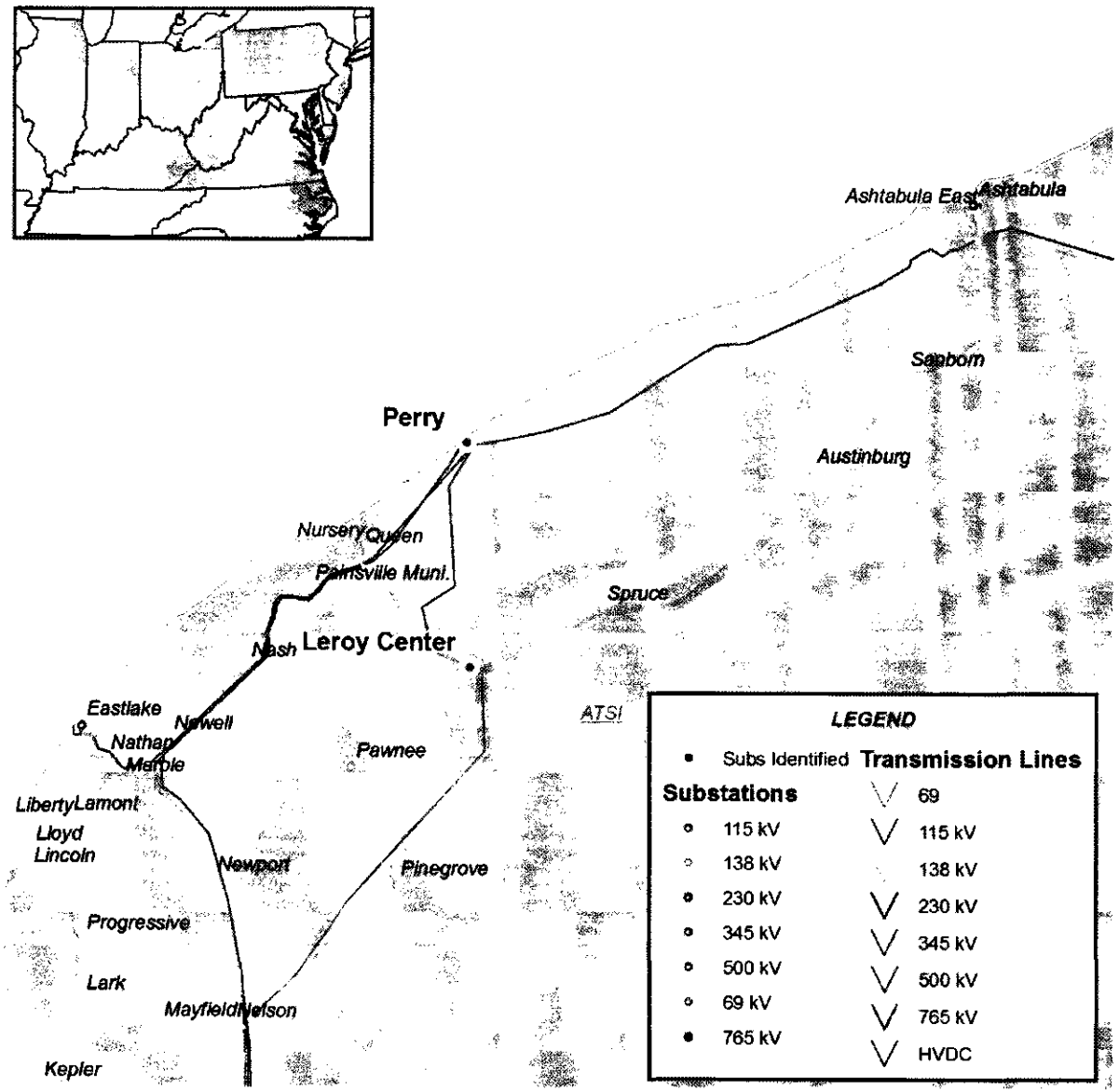
ATSI Transmission Zone Reinforcement

- Place a portion of the 138 kV Leroy Center 345/138 kV project into service by summer 2015 to alleviate the identified N-1-1 issues in the Mayfield to Ashtabula area. This project basically allows closing in the normally open Eastlake - Leroy Center 138kV lines (Q-12 and Q-11).
- Estimated Project Cost: $3.3 M
- Projected in-service date: 6/1/2015.



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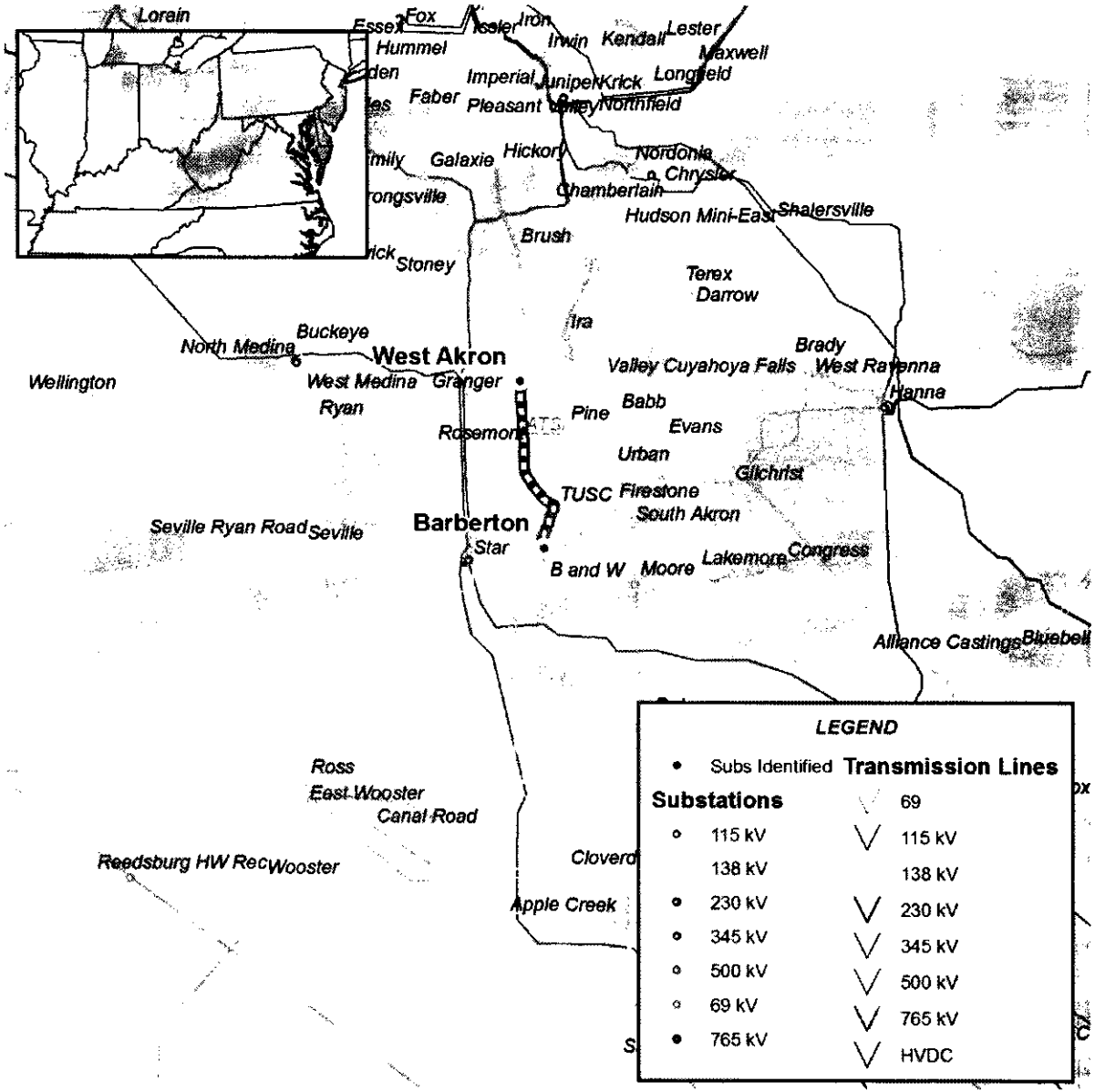
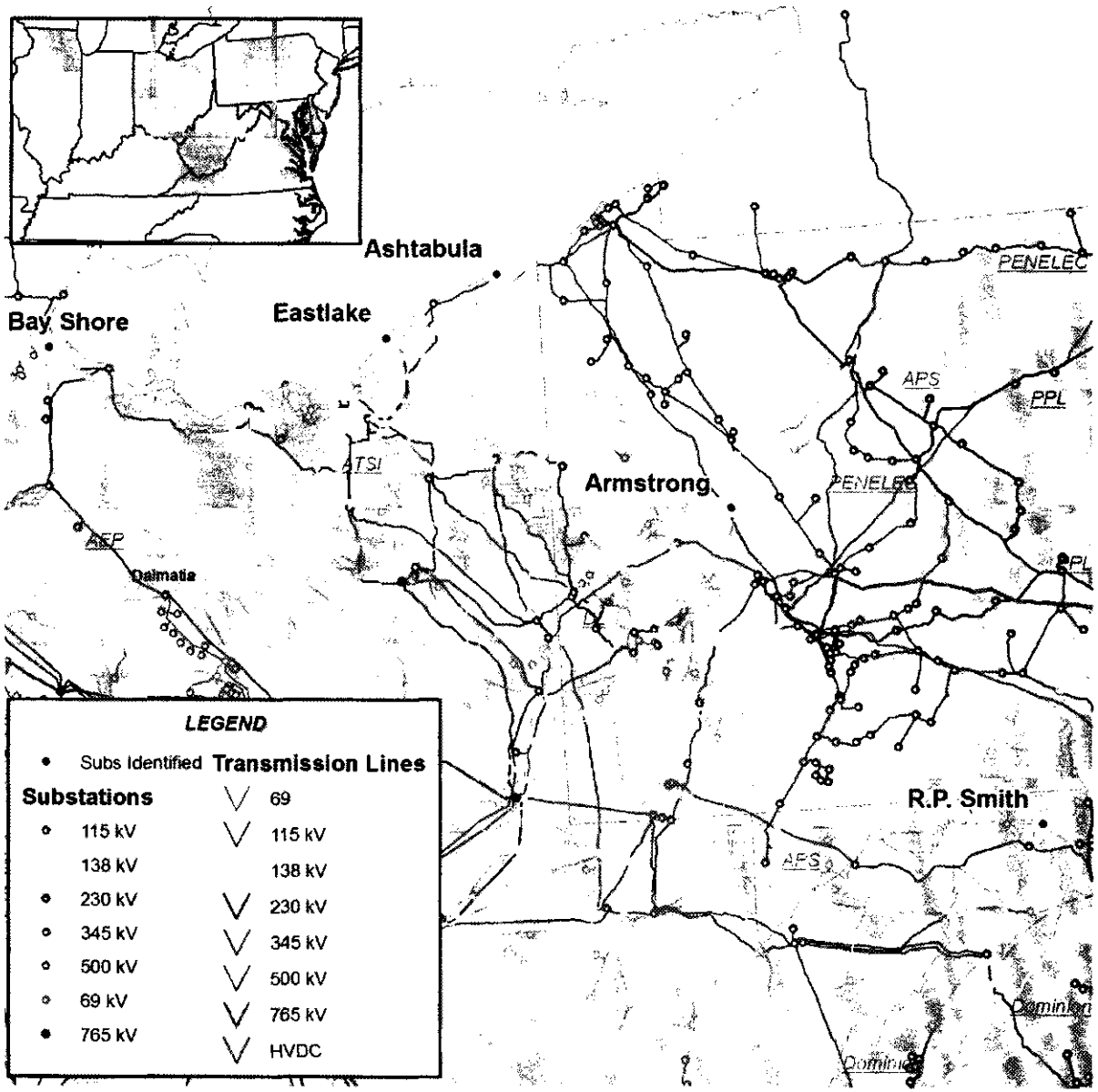
ATSI Transmission Zone Reinforcement

- The Barberton – West Akron 138 kV line is loaded to 105.9% of its normal rating for N-1-1: Loss of the Star – Wadsworth 138 kV line + BASECASE.
- Reconductor the Barberton – West Akron 138 kV line with 477 ACSS or greater (7.3 miles) + Terminal upgrades at Barberton.
- Estimated Project Cost: $4.23 M
- Projected in-service date: 6/1/2016.



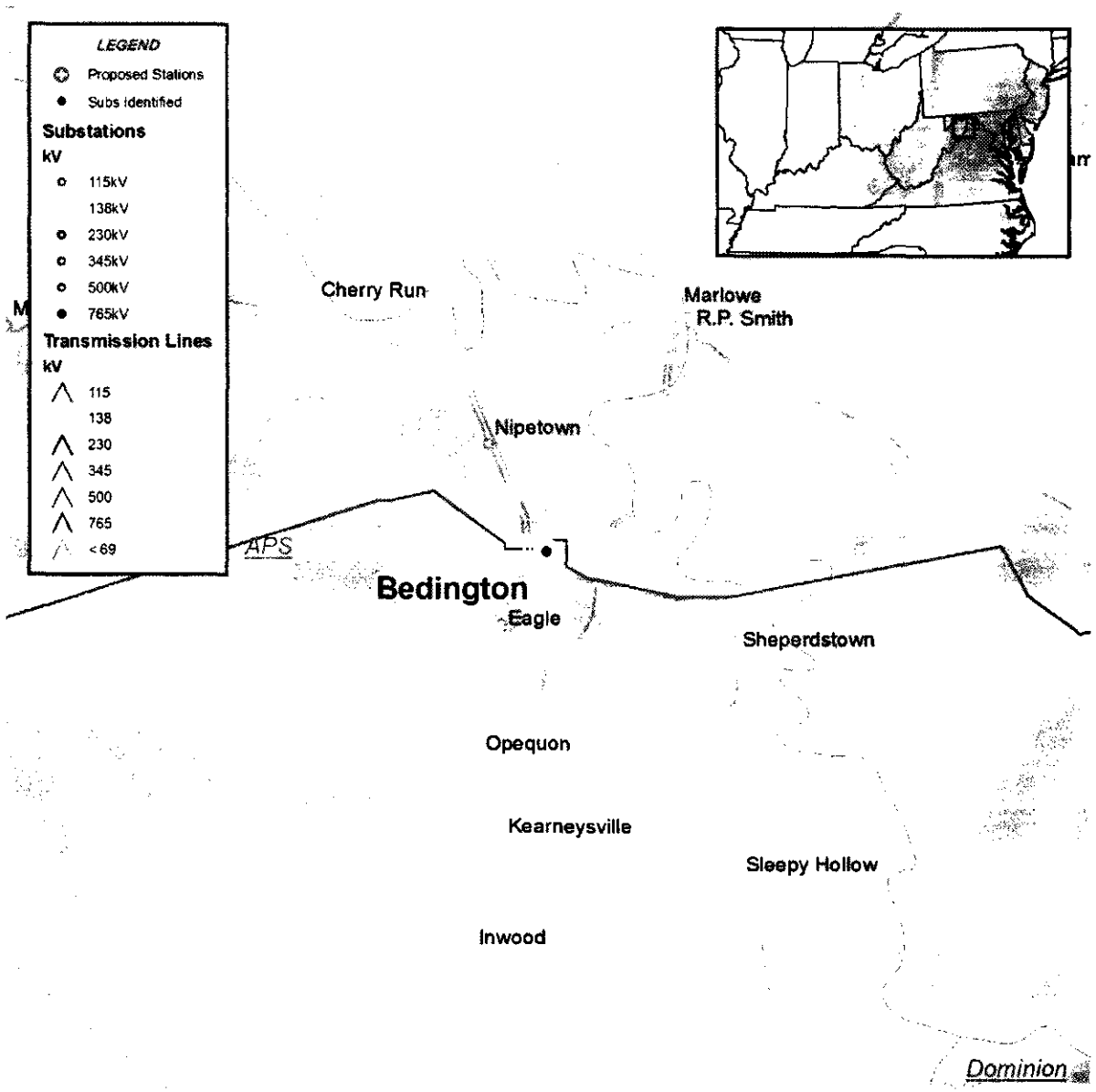
AP Transmission Zone Violations

- Criteria violations
  - N-1-1 Thermal
  - Generation Deliverability
- Multiple 138kV thermal violations
- Required upgrades are shown on the following slides



AP Transmission Zone Reinforcement

- Replace breaker risers and wave traps at Marlowe 138 kV. Replace wave traps at Bedington 138 kV (existing base line upgrade b1837)
- Cost Estimate $0.6M
- Expected in-service date is 6/1/2013.



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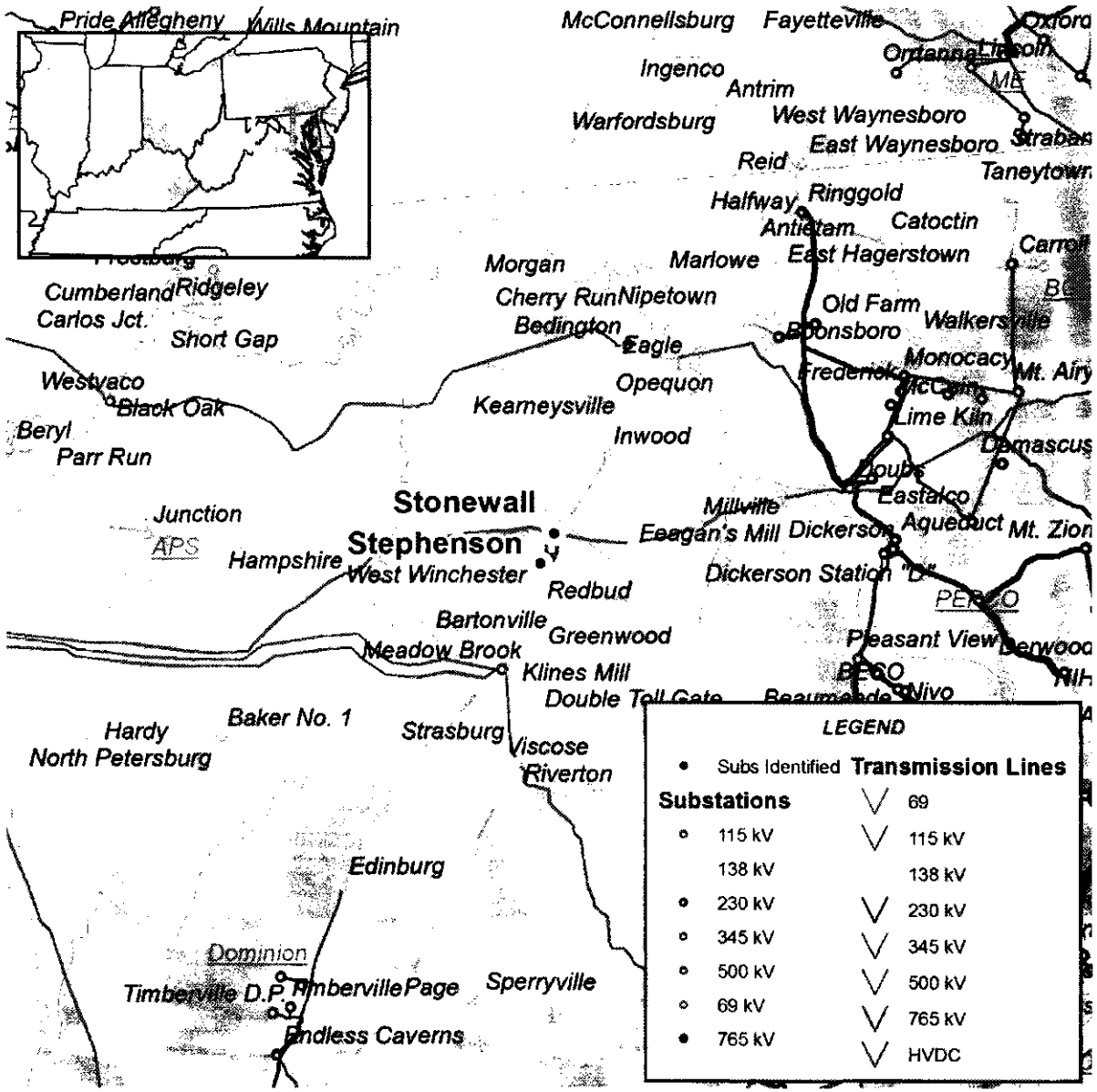
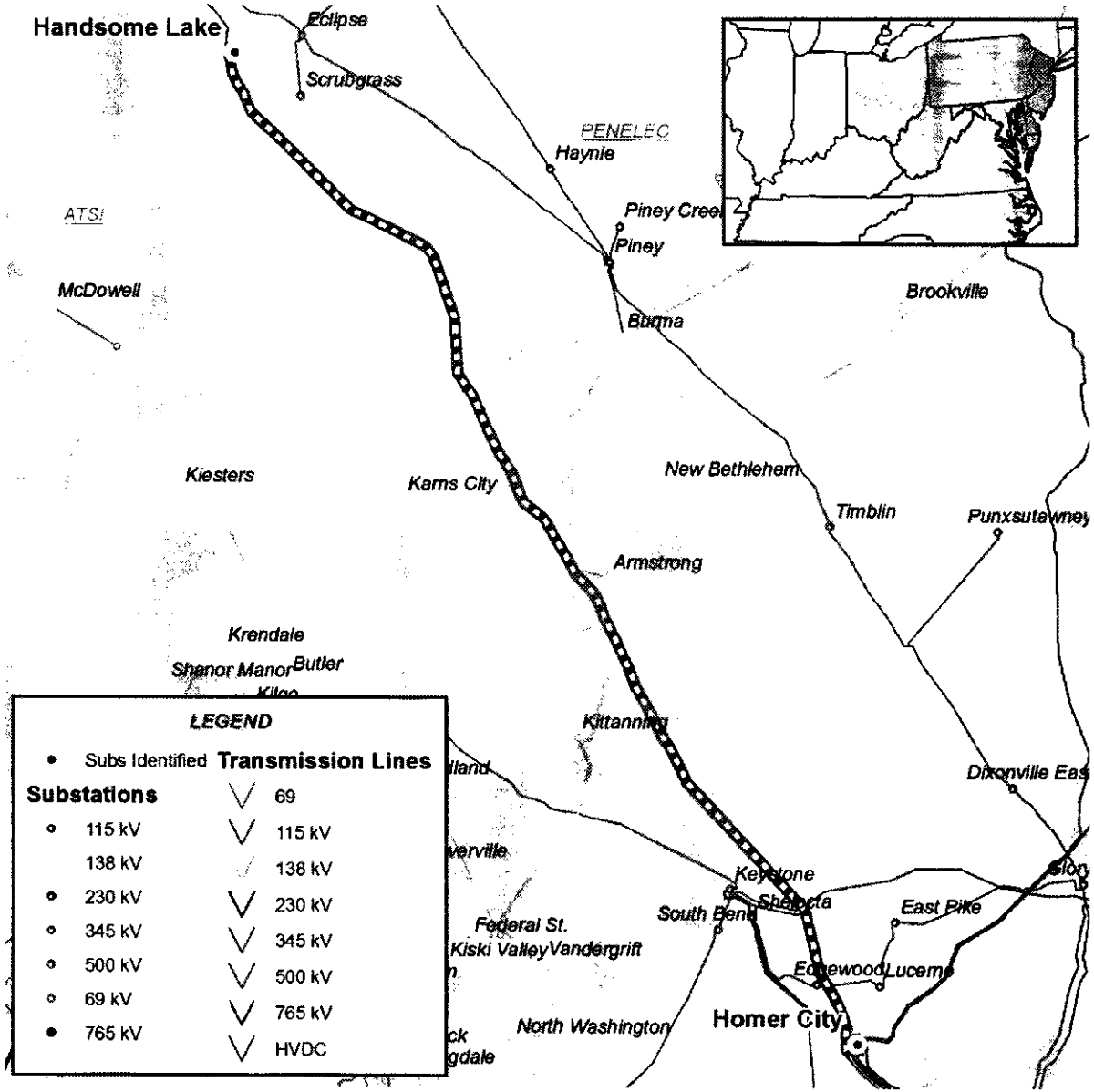
FES (APS) Deactivations

- Replace line trap at Stonewall on the Stephenson 138 kV line terminal (existing base line upgrade b1902)
- Estimated Project Cost: $0.075M
- Projected in-service date: 6/1/2013



AP Transmission Zone Reinforcement

- The Shaffers Corner-Springdale 138 kV line loads to 129.8% of its emergency rating (297 MVA) for the loss of the Cabot – Woodland 138 kV line + loss of Allegheny Ludlum 4 Junction - Springdale 138 kV line.
- Loop the Homer City-Handsome Lake 345 kV line into the Armstrong substation and install a 345/138 kV transformer at Armstrong.
- Estimated Project Cost: $27.8M
- Projected in-service date 6/1/2014



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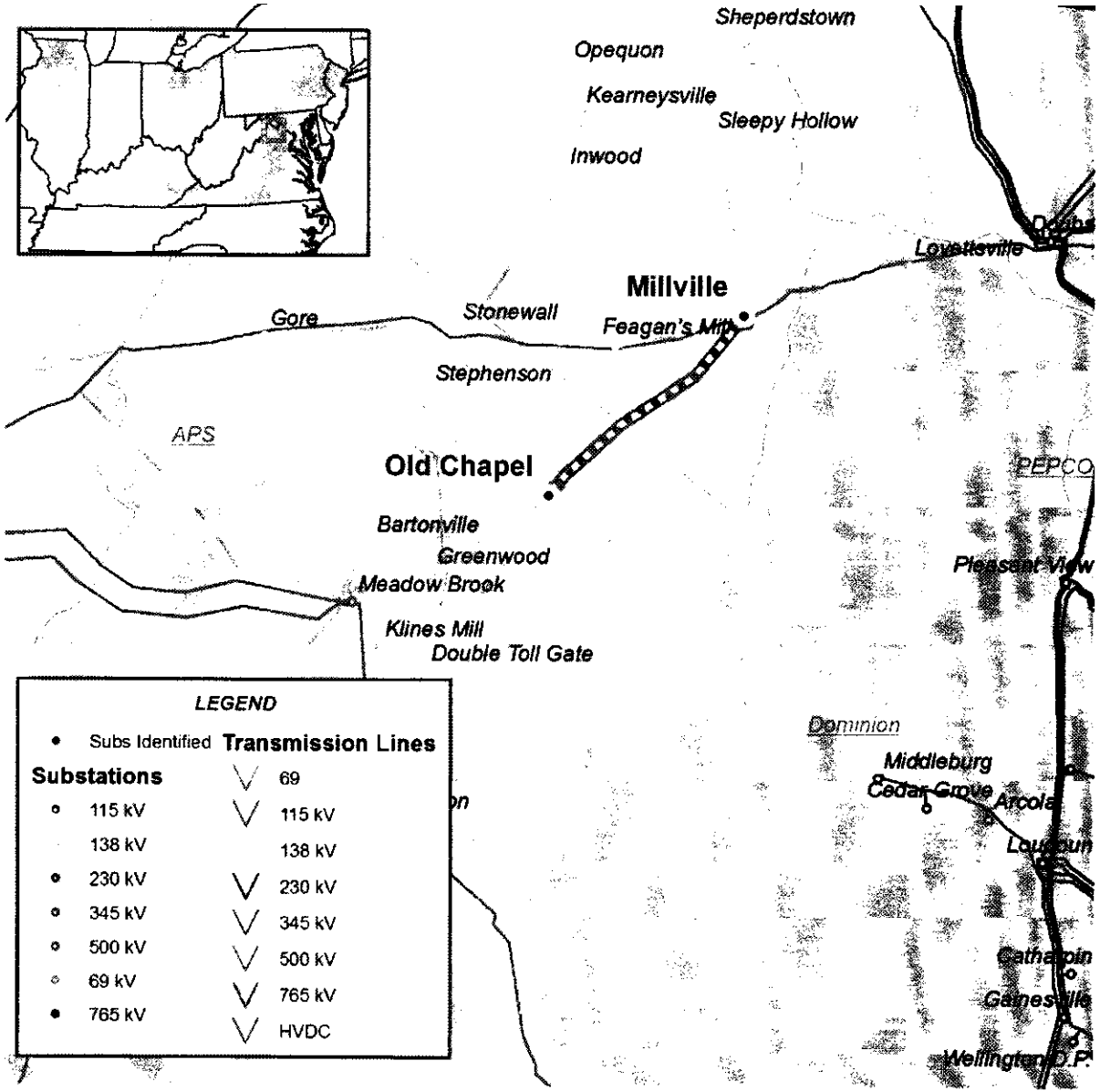
AP Transmission Zone Reinforcement

- The Millville – Old Chapel 138 kV line is overloaded at 120.5% (214 MVA) for the N-1-1 loss of the Loudoun – Meadowbrook 500 kV line + the loss of Morrisville – Front Royal 500 kV line.
- Change the CT ratio at Millville to improve the Millville – Old Chapel 138 kV line ratings.
- Estimated Project Cost: $0.05M
- Projected in-service date: 6/1/2015.



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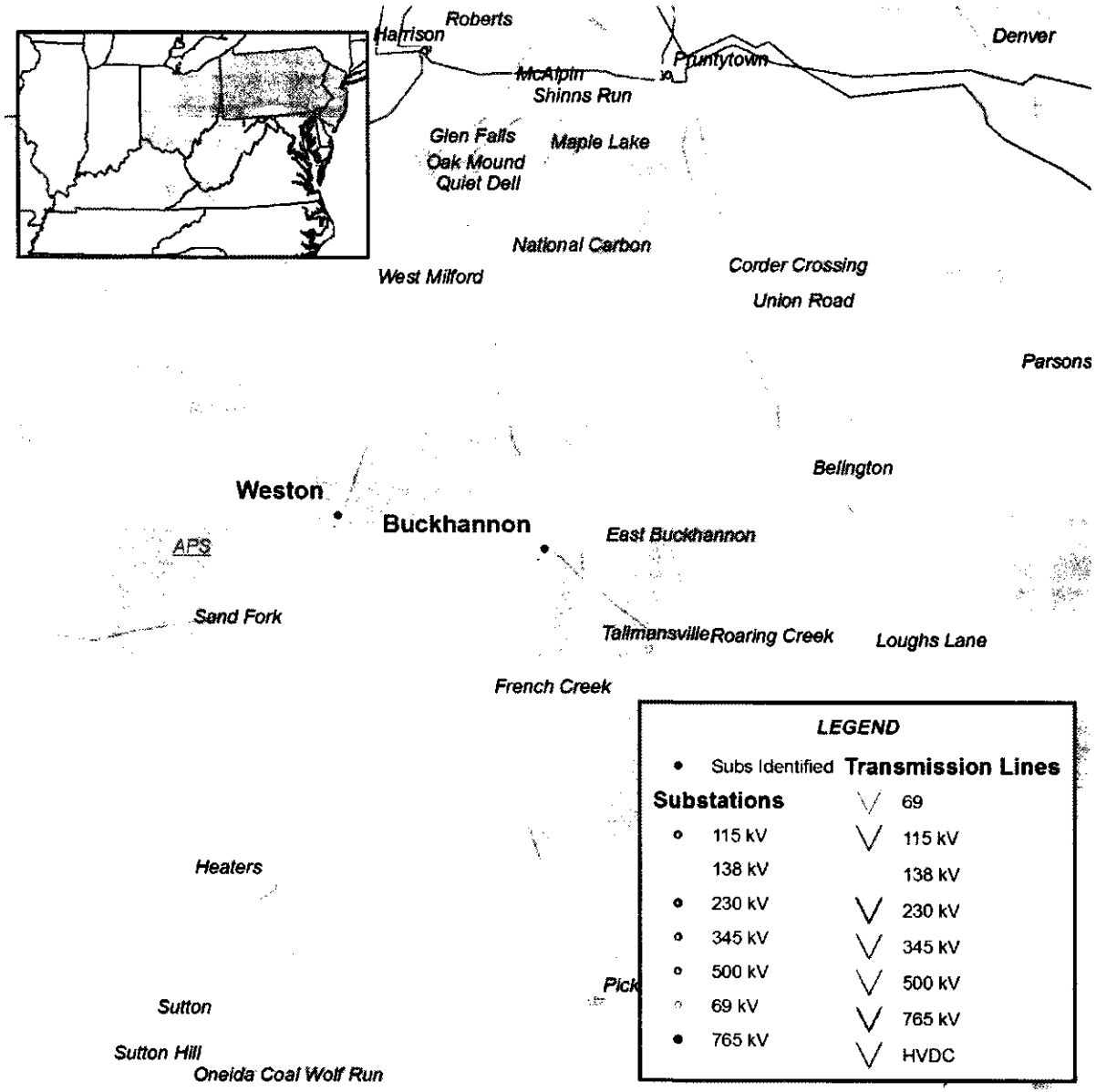
AP Transmission Zone Reinforcement

- The Goff Run 138 kV bus voltage drop is 17.18% for the loss of Glen Falls – Oakmound 138 kV line followed by loss of Maple Lake - Pruntytown 138 kV line.
- Install a new Buckhannon – Weston 138 kV line (b1840).
- Estimated Project Cost: $17.5M
- Projected in-service date: 6/1/2016.



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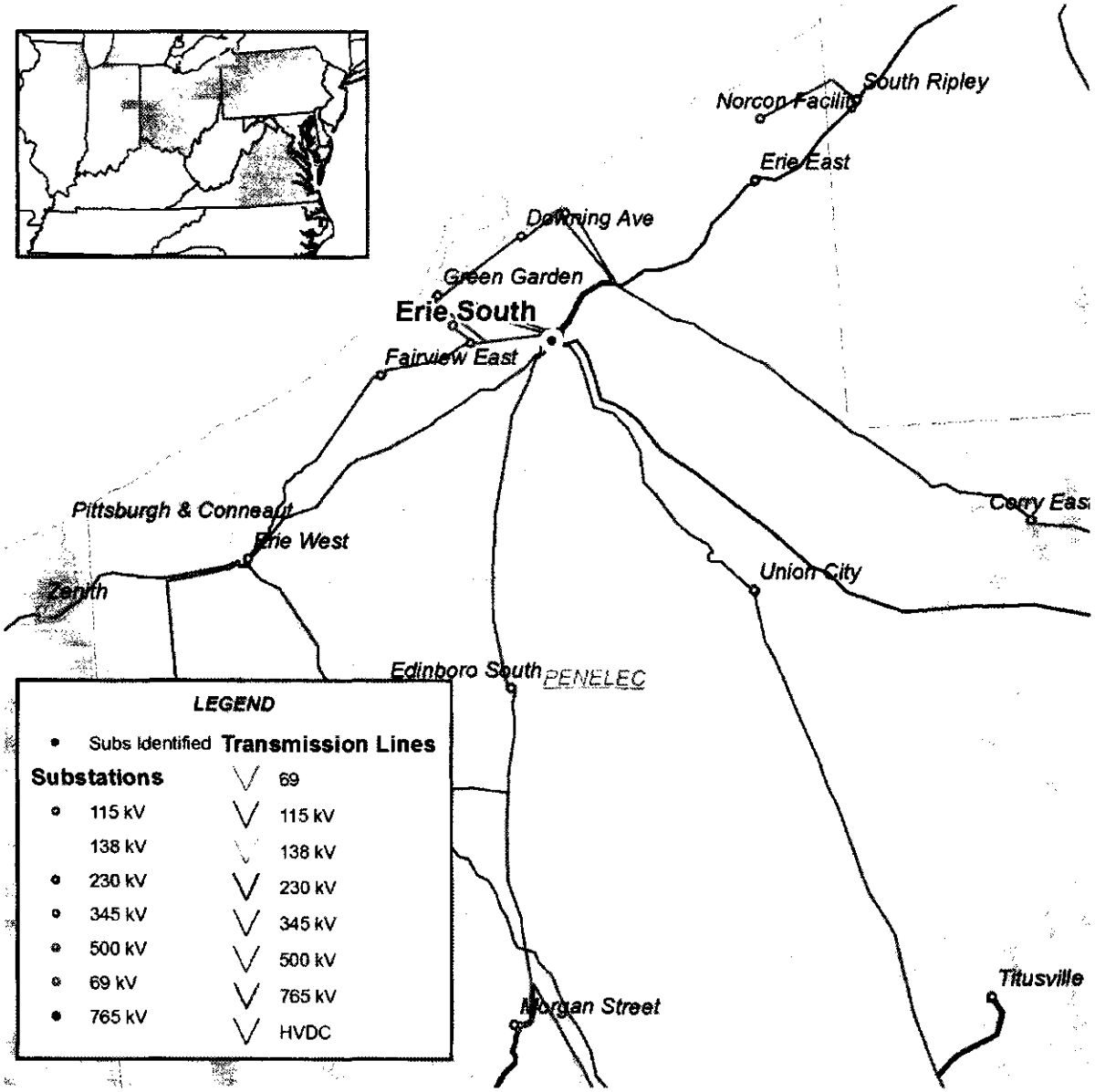
PN Transmission Zone Violations

- Criteria violations
  - Generator Deliverability
  - N-1-1 Thermal
- Erie South 230/115kV transformer #1
- Erie South 230/115kV transformer #6
- Eclipse – Clark Summit 115 kV line
- Seward 230/115 kV transformer #9
- Upgrades are shown on the following slides



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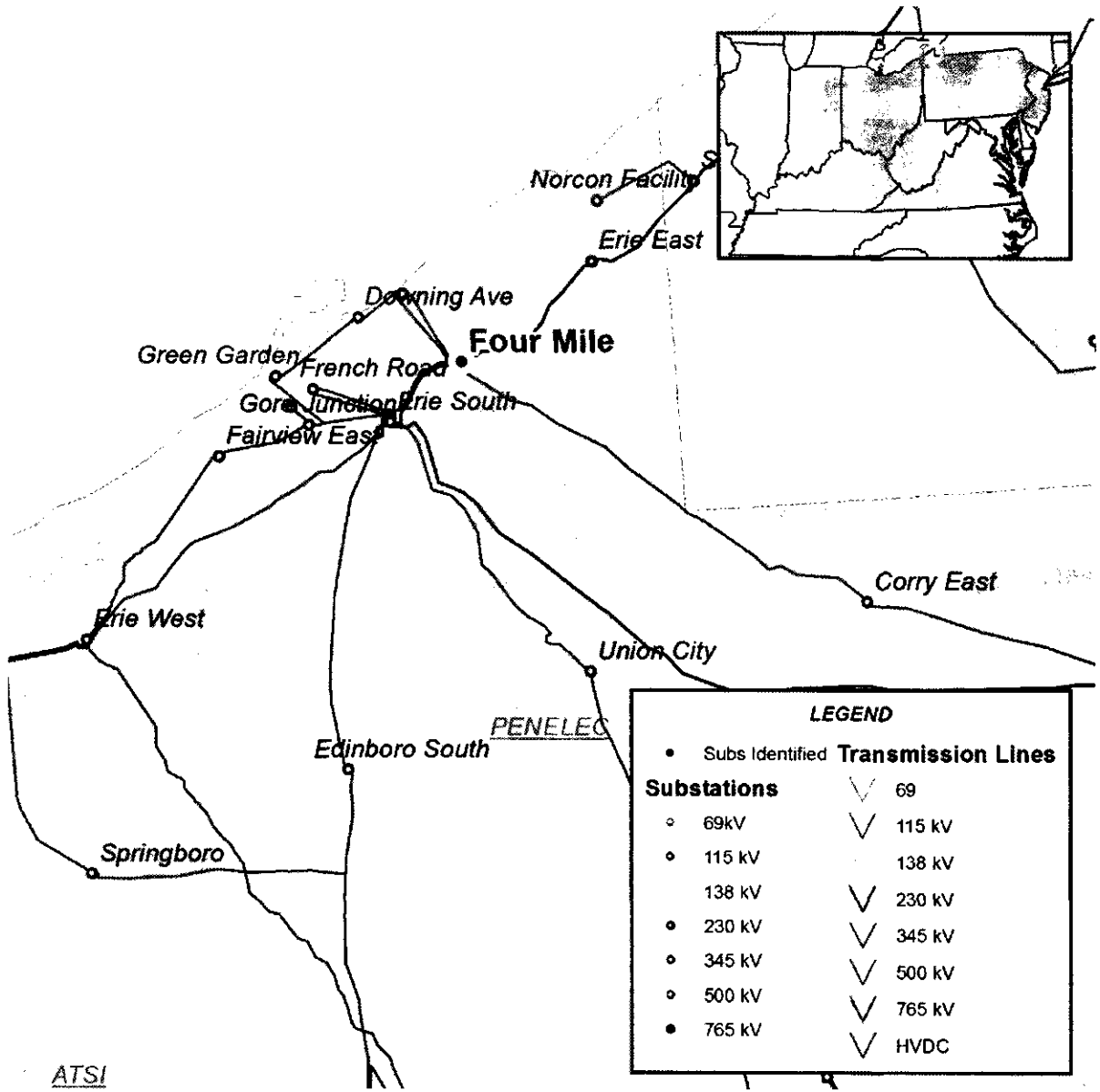
PN Transmission Zone Reinforcement

- Construct Four Mile Junction 230/115 kV substation (existing base line upgrade b1609)
- Estimated Project Cost: $17.9M
- Projected in-service date: 6/1/2014



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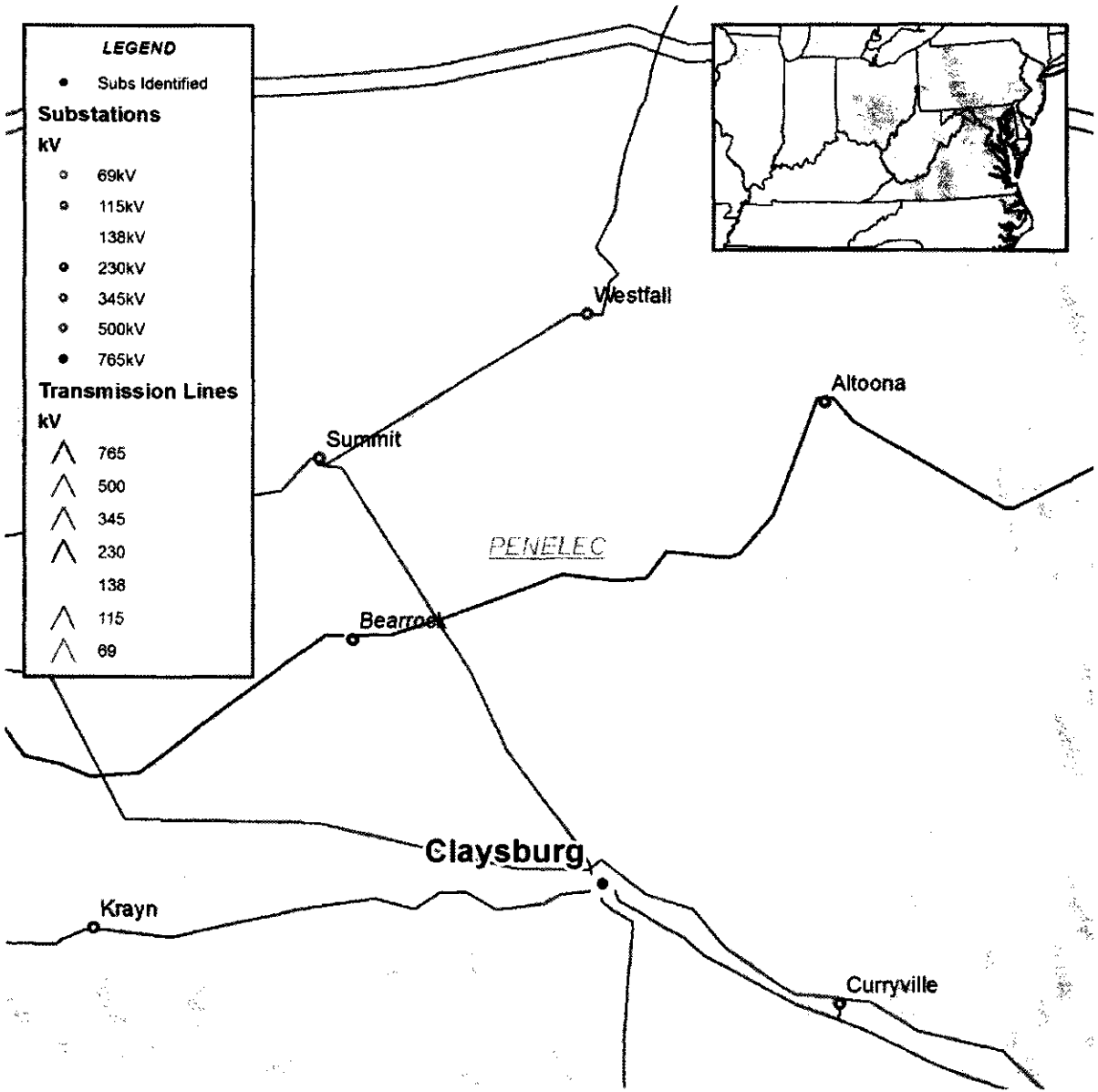
PN Transmission Zone Reinforcement

- Stuck breaker contingency loss of Claysburg bus, Curryville bus, and Osterburg East 115/23 kV transformer causes a voltage collapse.
- Construct a 115 kV ring bus at Claysburg Substation. Bedford North and Saxton lines will no longer share a common breaker.
- Estimated Project Cost: $5.25 M
- Projected in-service date: 6/1/2015.



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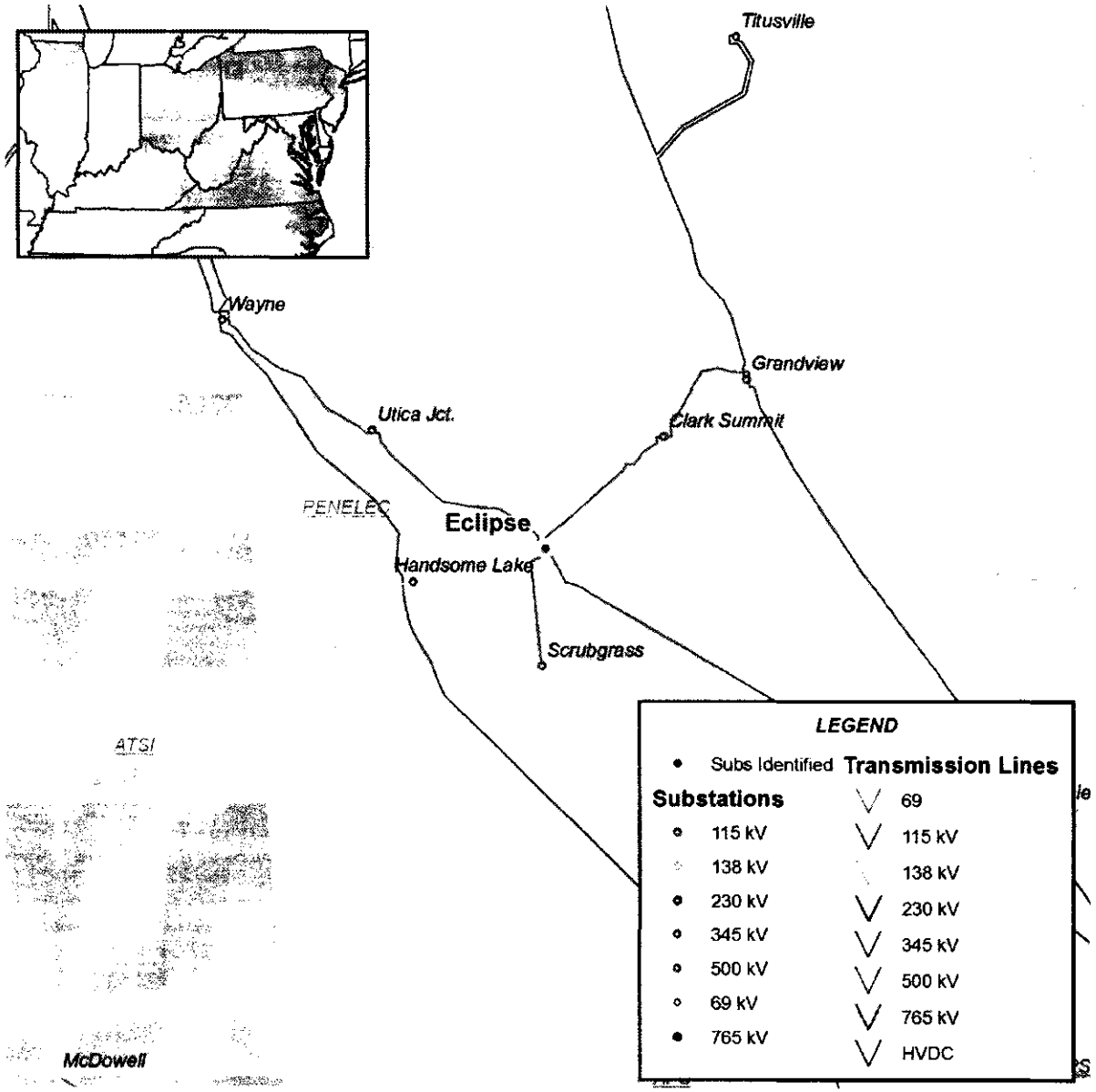
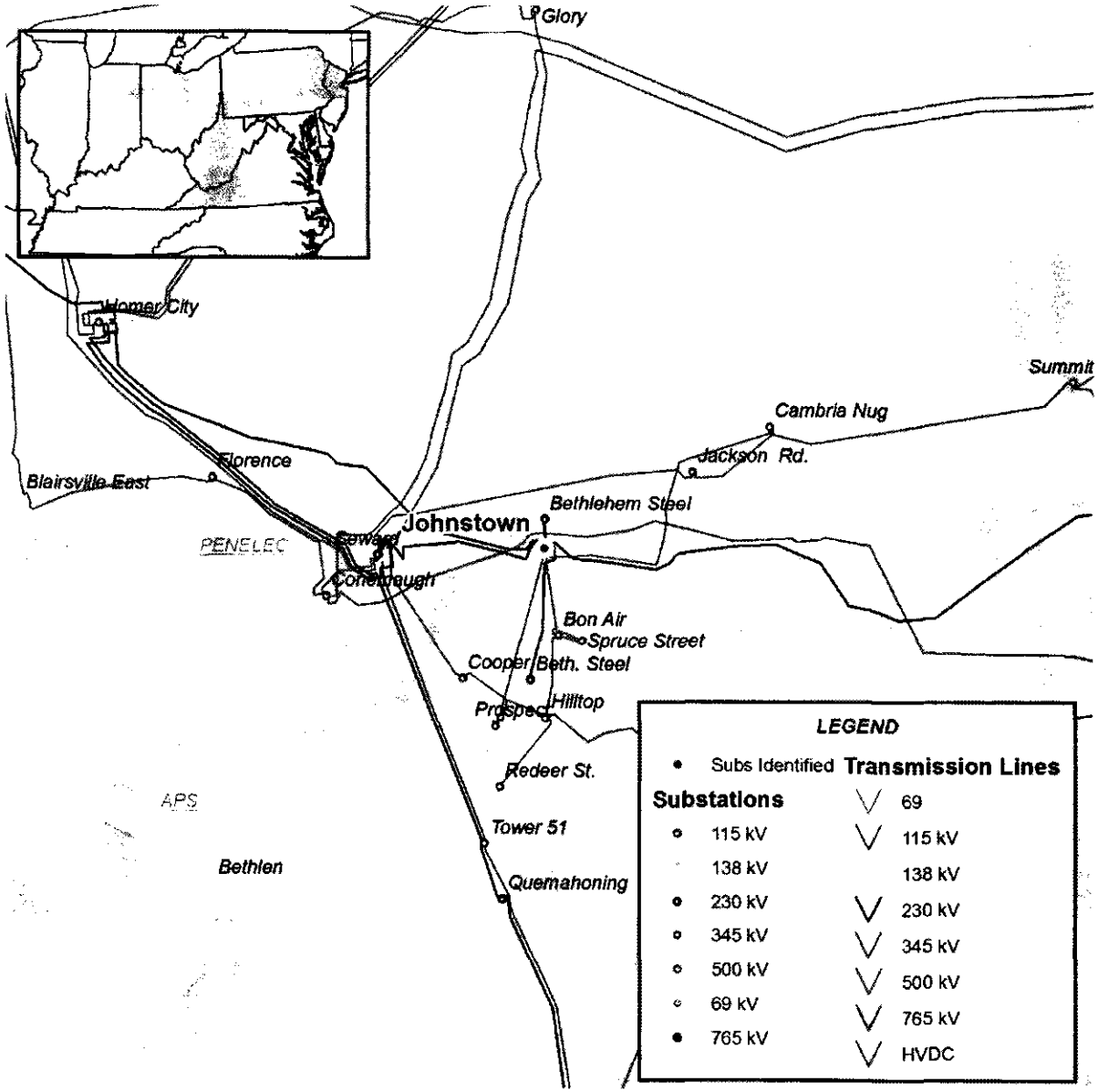
PN Transmission Zone Reinforcement

- The Eclipse - Clark Summit 115 kV line is overloaded to 109.7% of Rate A (101 MVA) fro the loss of Piney – Haynie 115 kV line + Basecase.
- Reconductor Eclipse substation 115 kV bus with 1033 kcmil conductor.
- Estimated Project Cost: $150 K
- Projected in-service date: 6/1/2013.



PN Transmission Zone Reinforcement

- The Seward 230/115 kV transformer #9 is loaded to 103.2% if its emergency rating (300 MVA) for the N-1-1 loss of the Seward 230/115 kV transformer #11 followed by loss of Johnstown 230 kV and Bar Tech 230 kV buses.
- Install second 230/115 kV autotransformer at Johnstown.
- Estimated Project Cost: $4.5 M
- Projected in-service date: 6/1/2015.



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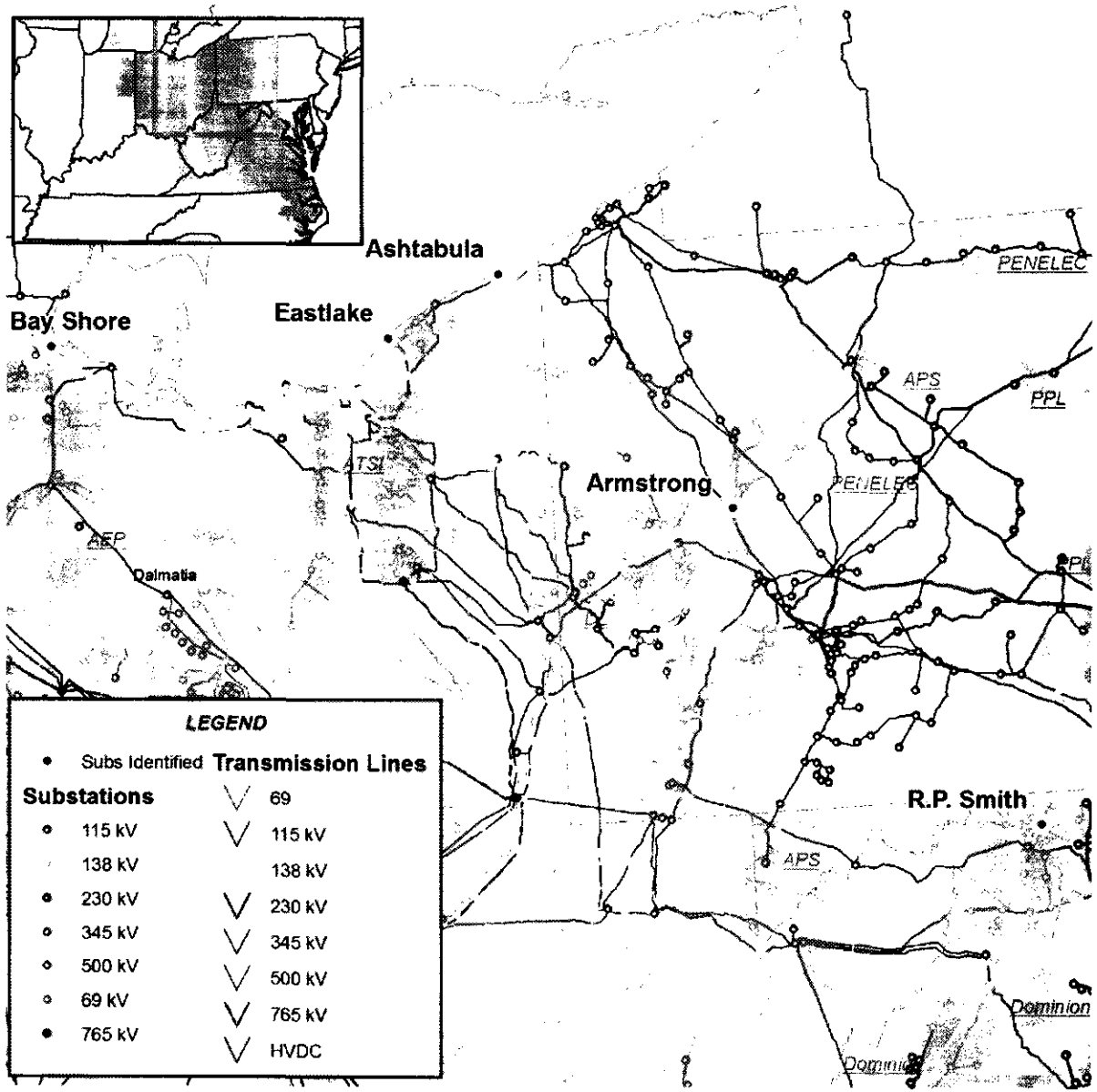
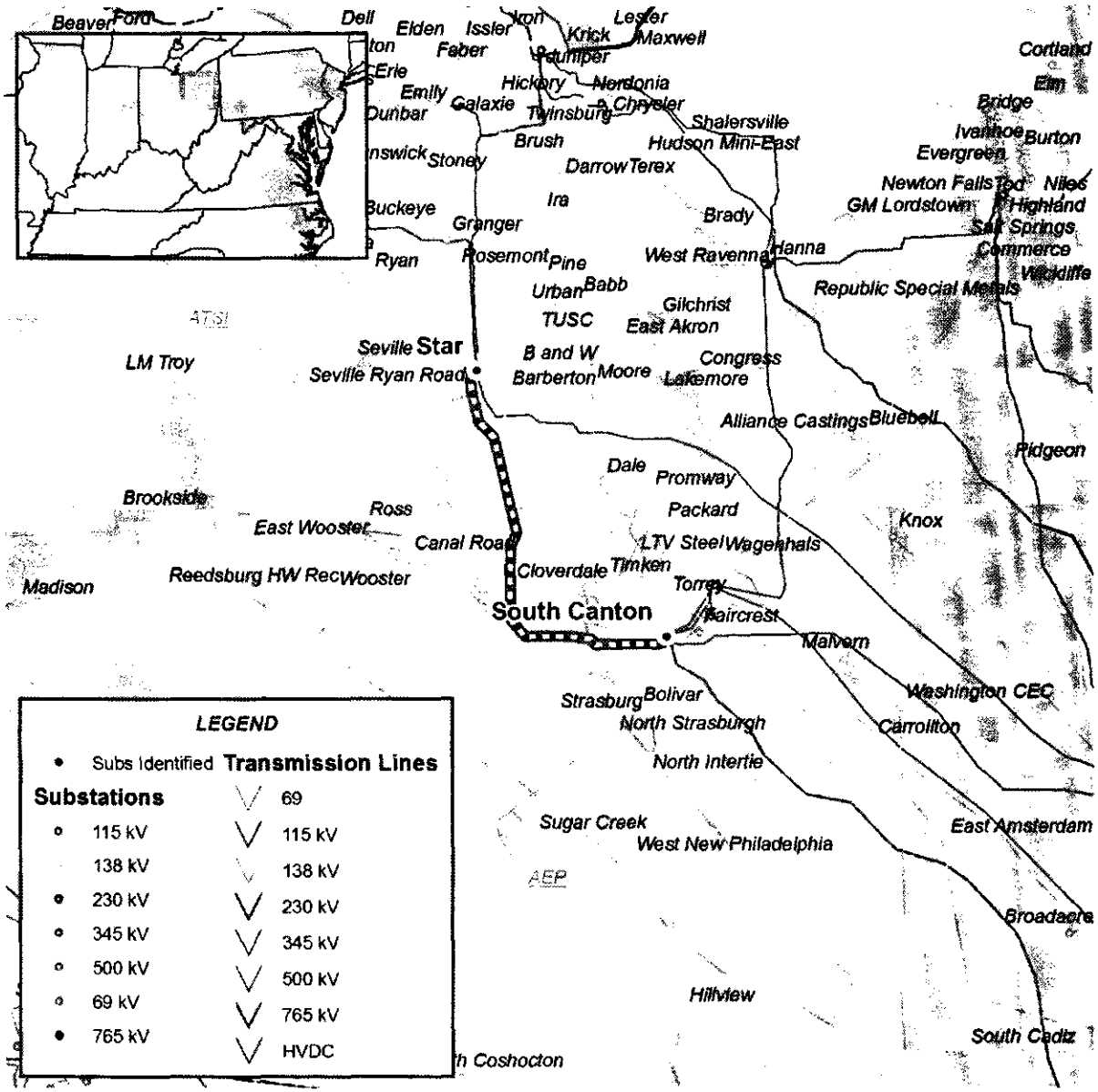
AEP Transmission Zone Violations

- Criteria violations
  - N-1-1 Thermal
  - Generation Deliverability
  - Load Deliverability
- Multiple 138kV thermal violations
- Kammer-West Bellaire 345kV line thermal violation
- South Canton - Star 345 kV line thermal violation (AEP-ATSI)
- Upgrades are shown on the following slides



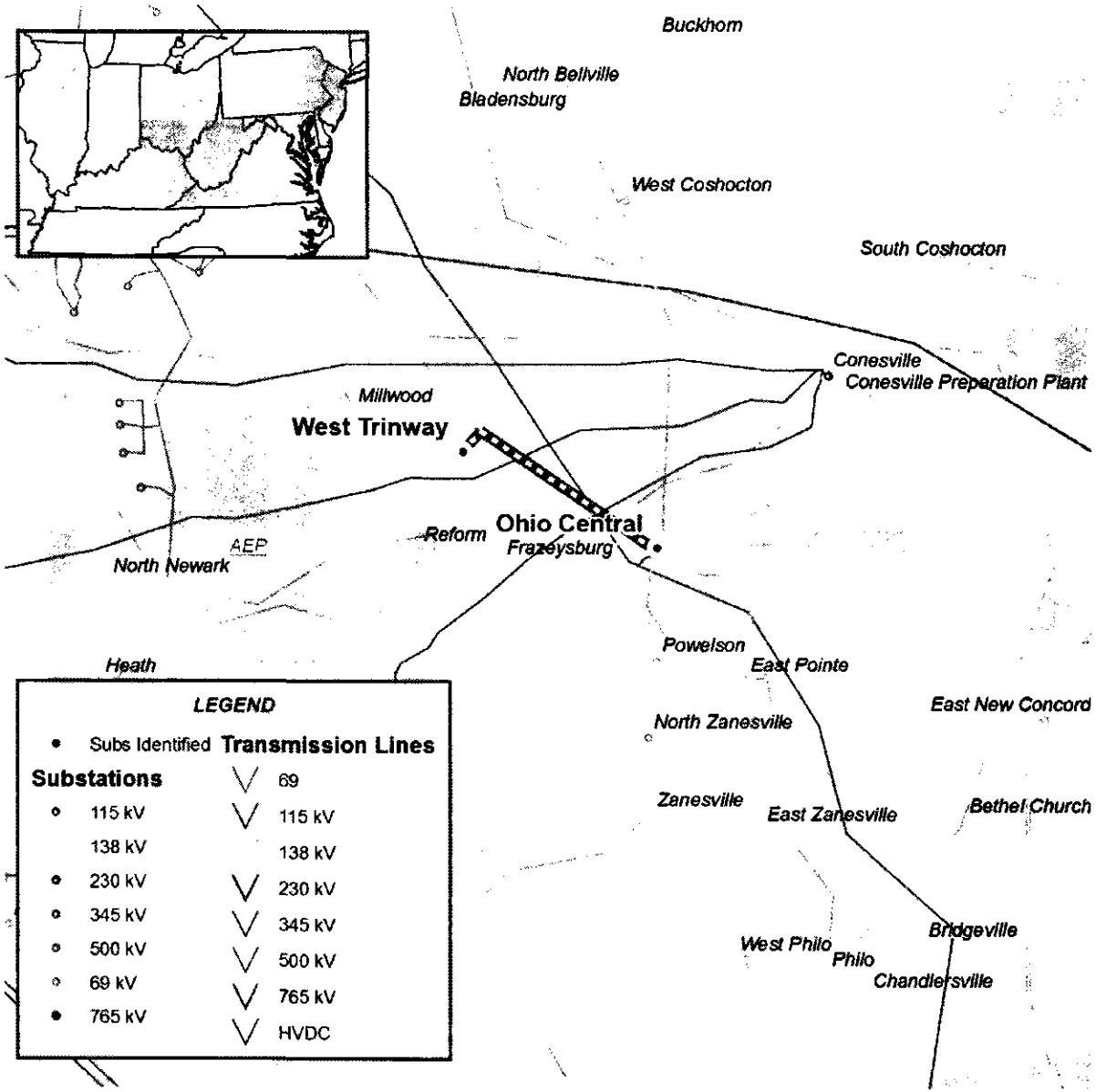
AEP Transmission Zone Reinforcement

- Reconductor AEP portion of South Canton – Star 345 kV line and upgrade terminal equipment at South Canton (existing base line upgrade b1812)
- Estimated Project Cost: $0.8M
- Projected in-service date: 12/31/2013



AEP Transmission Zone Reinforcement

- Ohio Central – West Trinway138 kV line loads to 102.1% of its emergency rating (205 MVA) for the single contingency loss of Sharp Road 138 kV bus.
- Advance 2016 baseline upgrade b1901 (Rebuild the Ohio Central – West Trinway (4.84 miles) section of the Academia – Ohio Central 138 kV circuit. Upgrade the Ohio Central riser, Ohio Central switch and the West Trinway riser) to 2015.
- Estimated Project Cost: $4.8 M
- New Projected in-service date: 6/1/2015.



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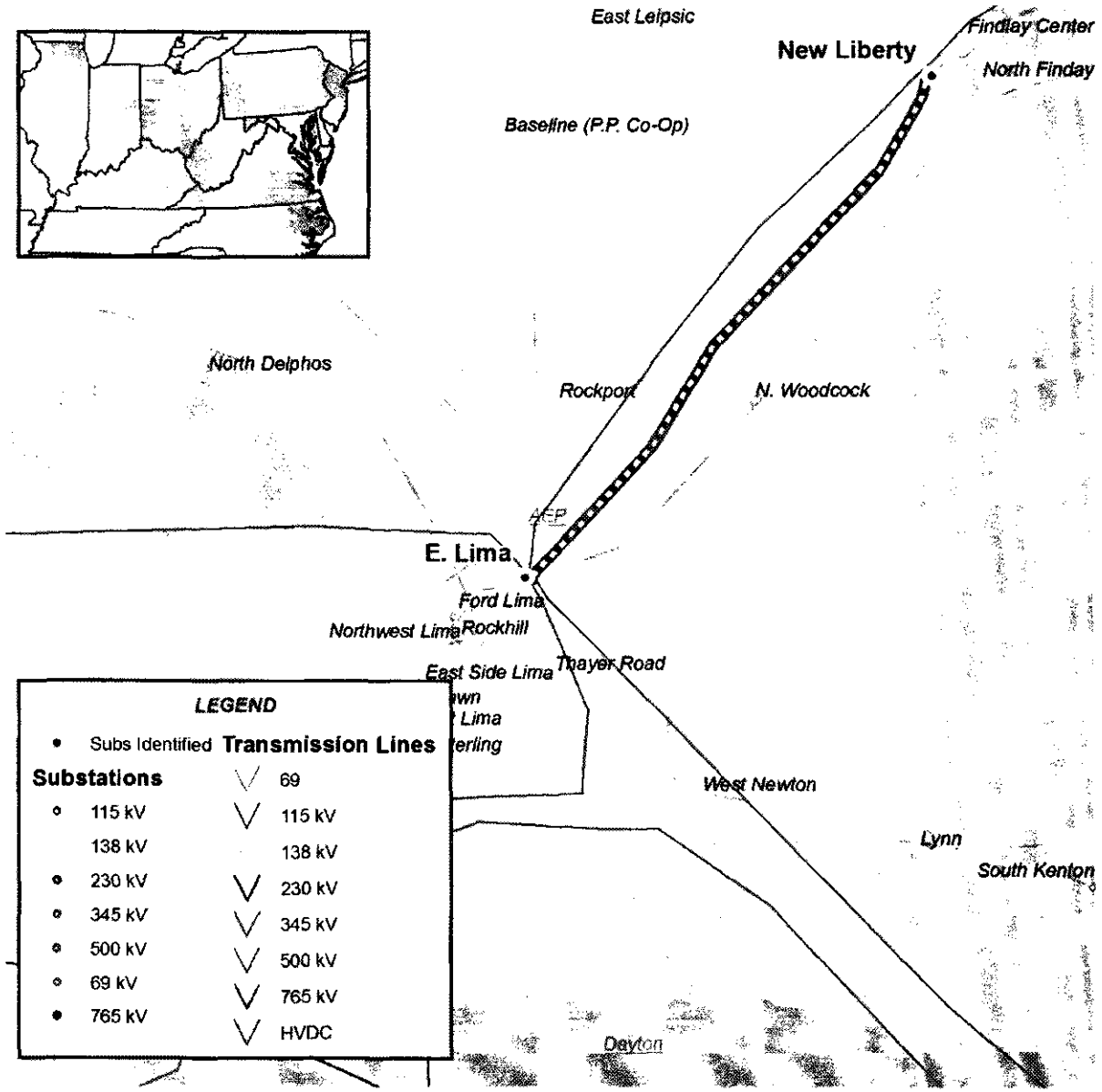
AEP Transmission Zone Reinforcement

- The East Lima – New Liberty138 kV line loads to 108.6% of its emergency rating (150 MVA) for the single contingency loss of Findlay 138 kV bus and Northeast Findlay 138 kV bus.
- Advance 2016 baseline upgrade b1868 (Perform a sag study on the 05E LIMA – New Liberty 138 kV line) to 2015.
- Estimated Project Cost: $100 K
- New Projected in-service date: 6/1/2015.



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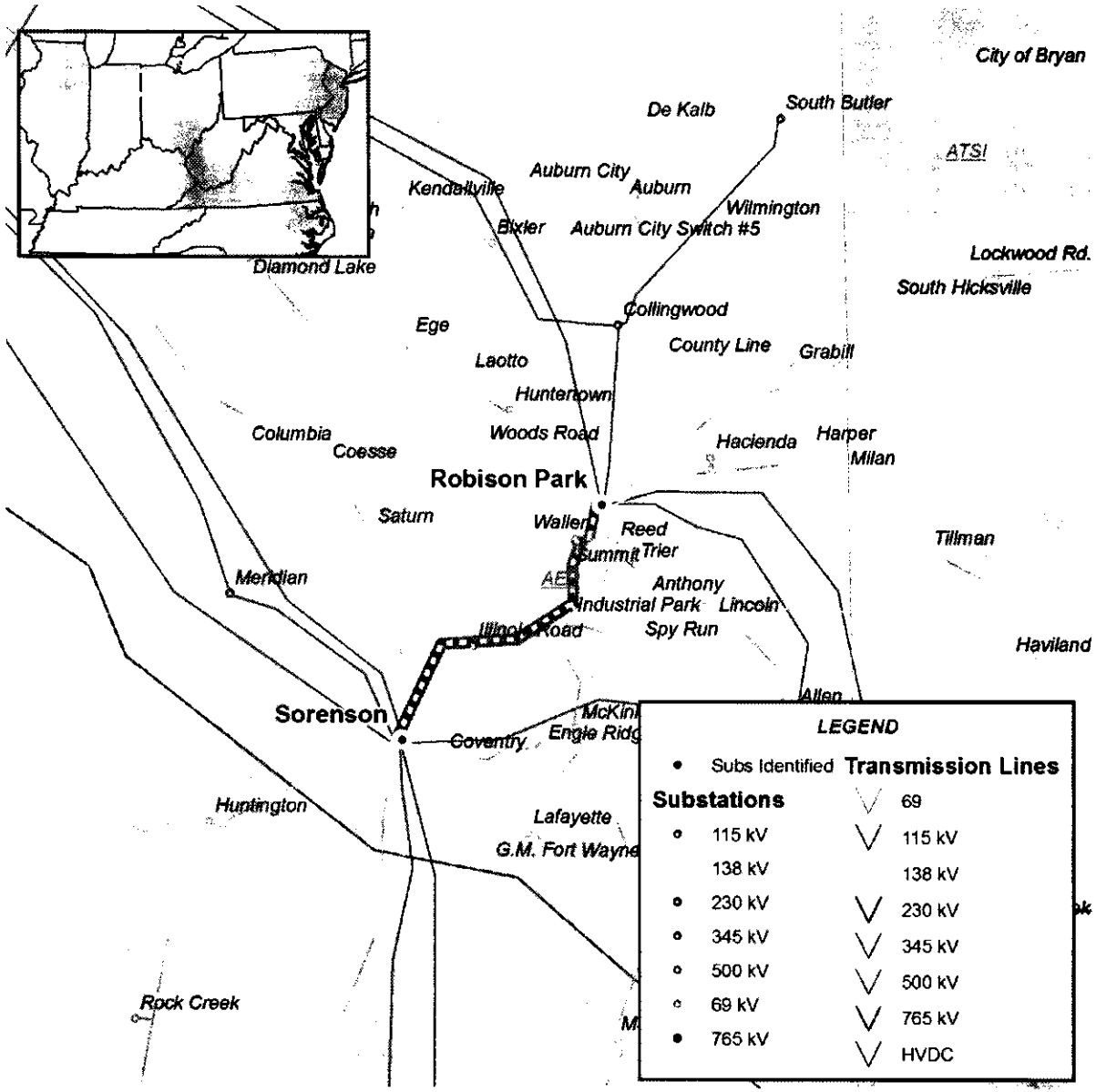
AEP Transmission Zone Reinforcement

- Advance the rebuild portion of the 2016 baseline upgrade b1819 (Rebuild the Robinson Park - Sorenson 138 kV line corridor as a 345 kV double circuit line with one side operated at 345 kV and one side at 138 kV) to 2015.
- Estimated Project Cost: $45M
- New Projected in-service date: 6/1/2015.



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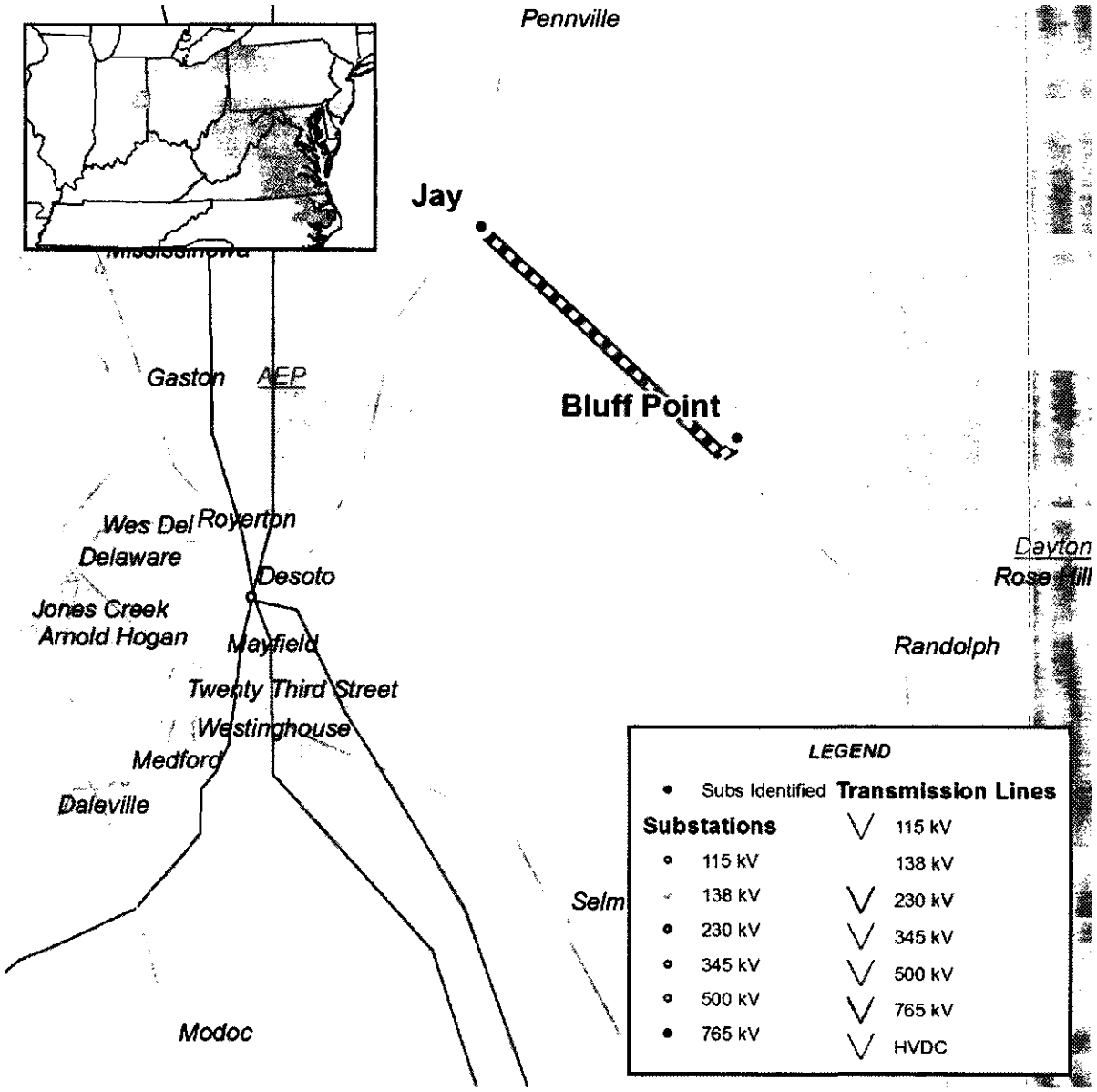
AEP Transmission Zone Reinforcement

- Advance 2016 baseline project B1733 (Perform a sag study of the Bluff Point - Jay 138 kV line. Upgrade breaker, wavetrap, and risers at the terminal ends).
- Expected cost is $2,000,000.
- Projected in-service is 12/01/2014.



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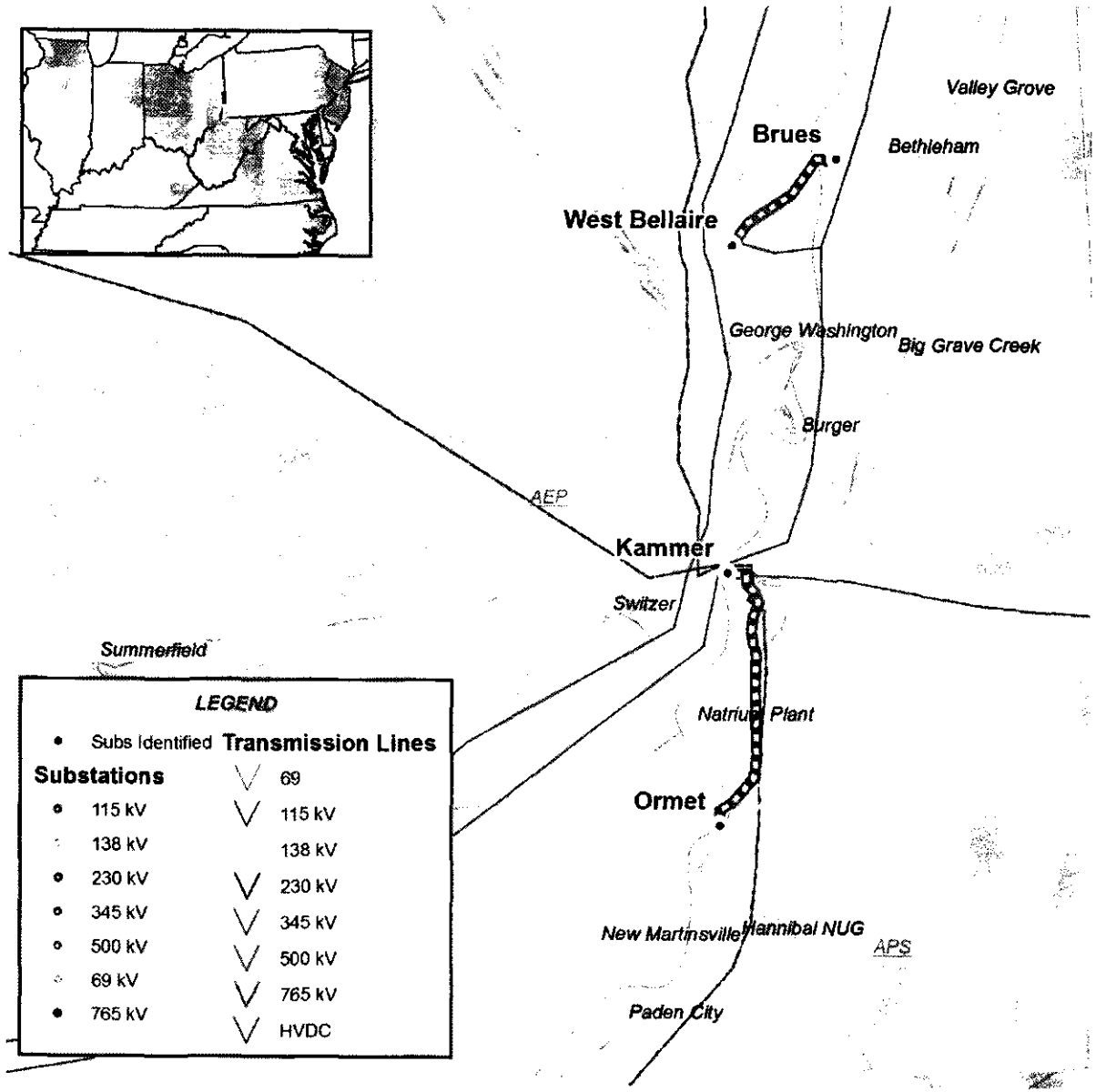
AEP Transmission Zone Reinforcement

- Brues – West Bellaire 138 kV line loads to 105.5% for N-1-1: Loss of Tidd - Cardinal 138 kV line, followed by loss of Kammer 345/138 kV transformer.
- Perform a sag study on the Brues – West Bellaire 138 kV line.
- Expected cost is $25,000.
- Projected in-service is 12/01/2014.



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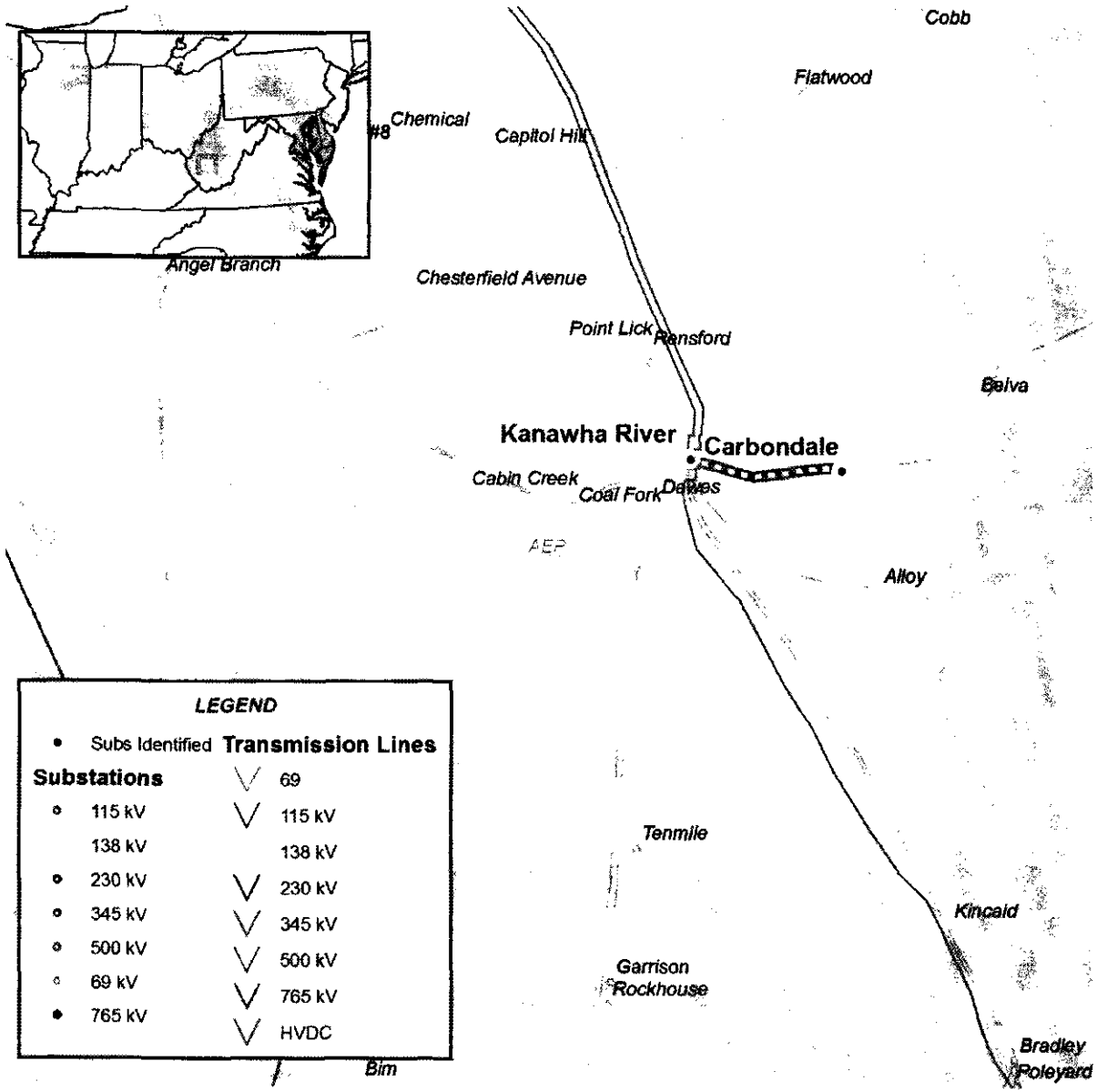
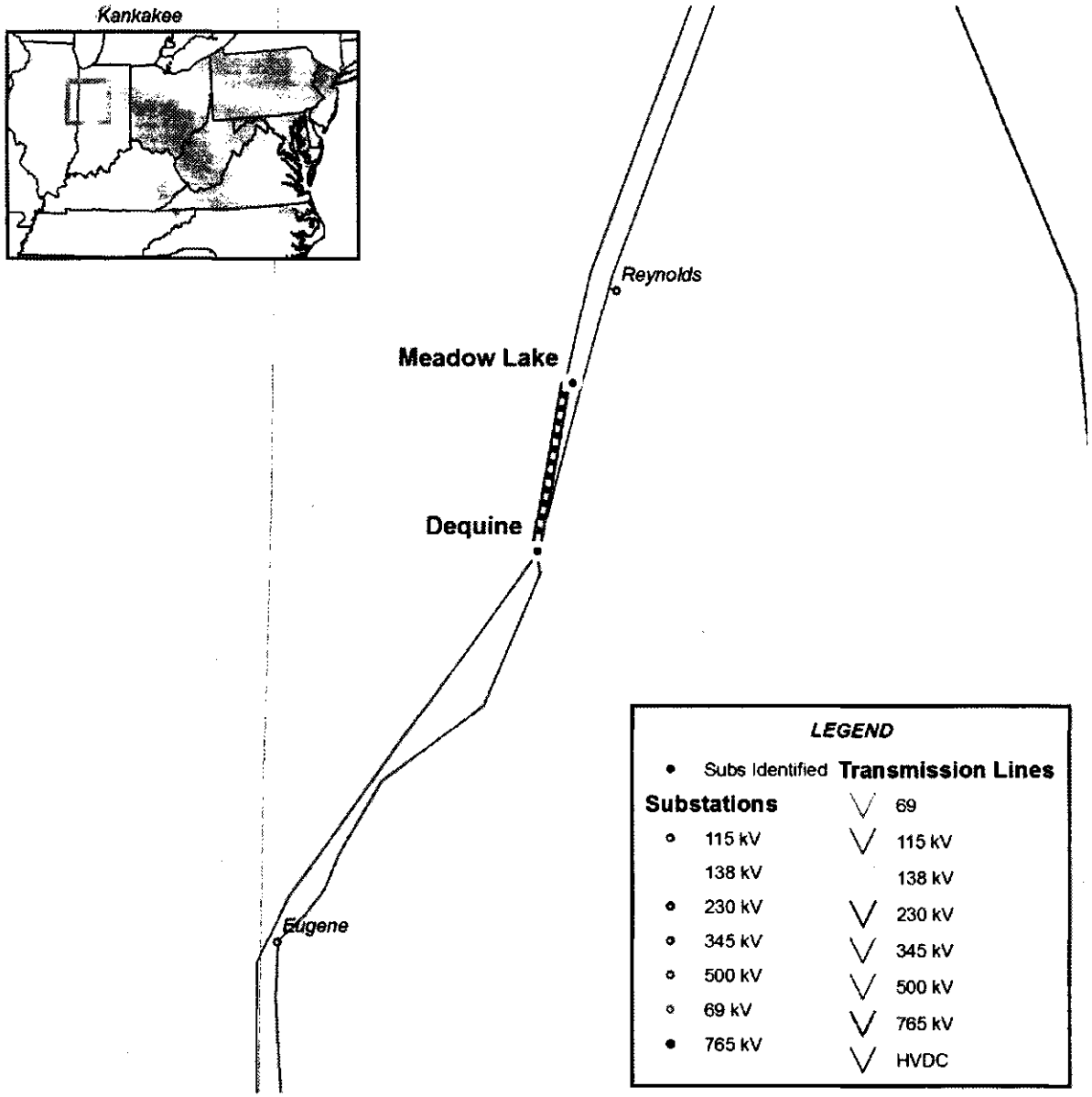
AEP Transmission Zone Reinforcement

- Kanawha – Carbondale 138 KV line loads to 101% of Rate B for N-1-1 Loss of Hatfield – Black Oak 500 kV line, followed by loss of Mountaineer – Belmont 765 kV line.
- Advance 2016 Baseline project B1865 (Perform a Sag study on the Kanawha – Carbondale 138 KV line to see if any remedial action needed to reach the new ratings of 251/335MVA).
- Expected cost is $70,000.
- Projected in-service is 12/01/2014.



AEP Transmission Zone Reinforcement

- The Dequine - Meadowlake 345 kV line #1 is loaded to 119.32% of its emergency rating (971 MVA) for the stuck breaker contingency loss of Westwood 345 kV bus and loss of Dequine - MEADOW LAKE 345 kV line #2.
- A sag study of the Dequine - Meadowlake 345 kV line #1 line may improve the emergency rating to 1400 MVA.
- Expected cost is $10,000.
- Projected in-service is 12/01/2013.



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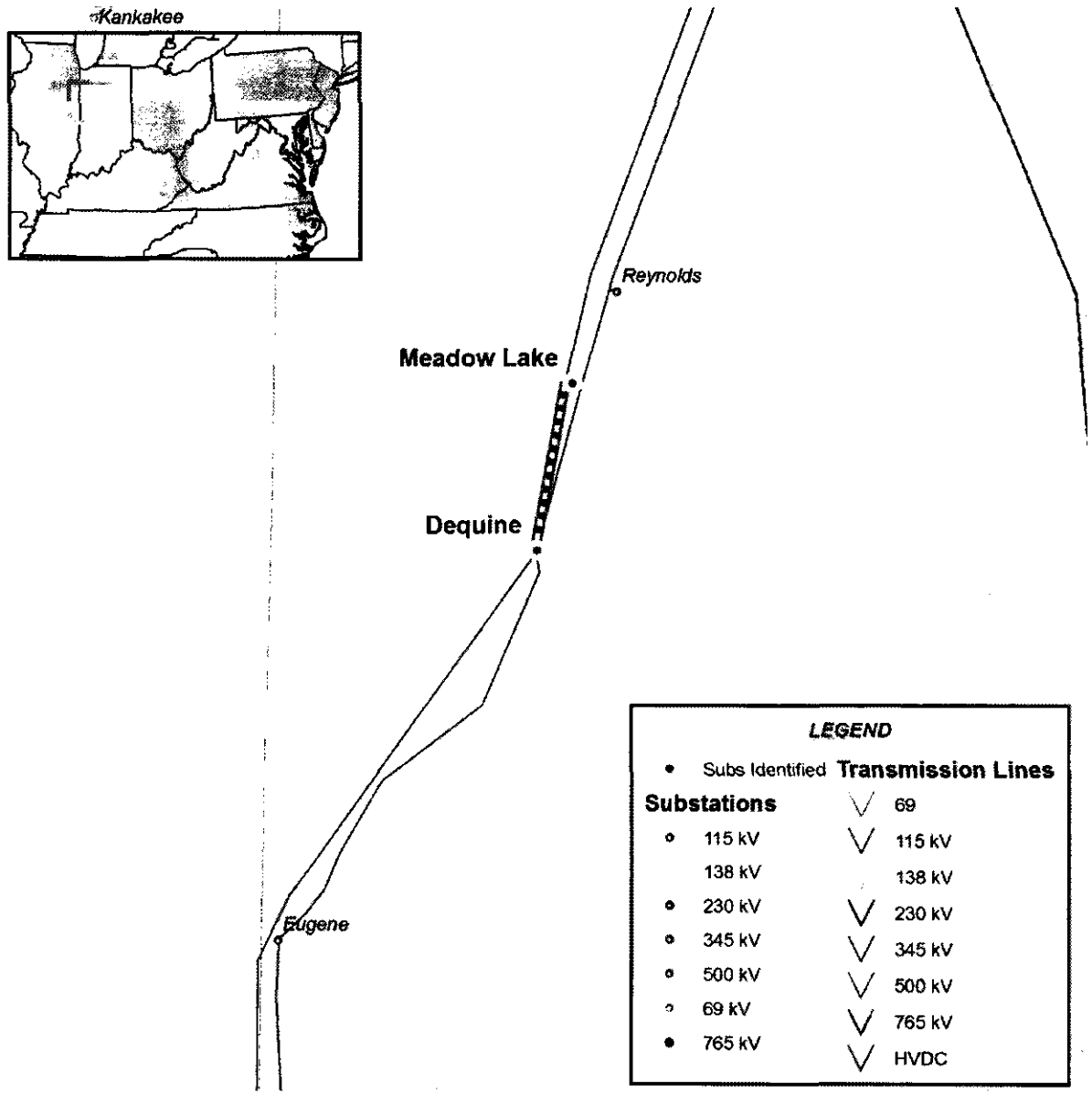
AEP Transmission Zone Reinforcement

- The Dequine - Meadowlake 345 kV line #2 is loaded to 119.32% of its emergency rating (971 MVA) for the stuck breaker contingency loss of Westwood 345 kV bus and loss of Dequine - MEADOW LAKE 345 kV line #1.
- A sag study of the Dequine - Meadowlake 345 kV line #2 line may improve the emergency rating to 1400 MVA.
- Expected cost is $10,000.
- Projected in-service is 12/01/2013.



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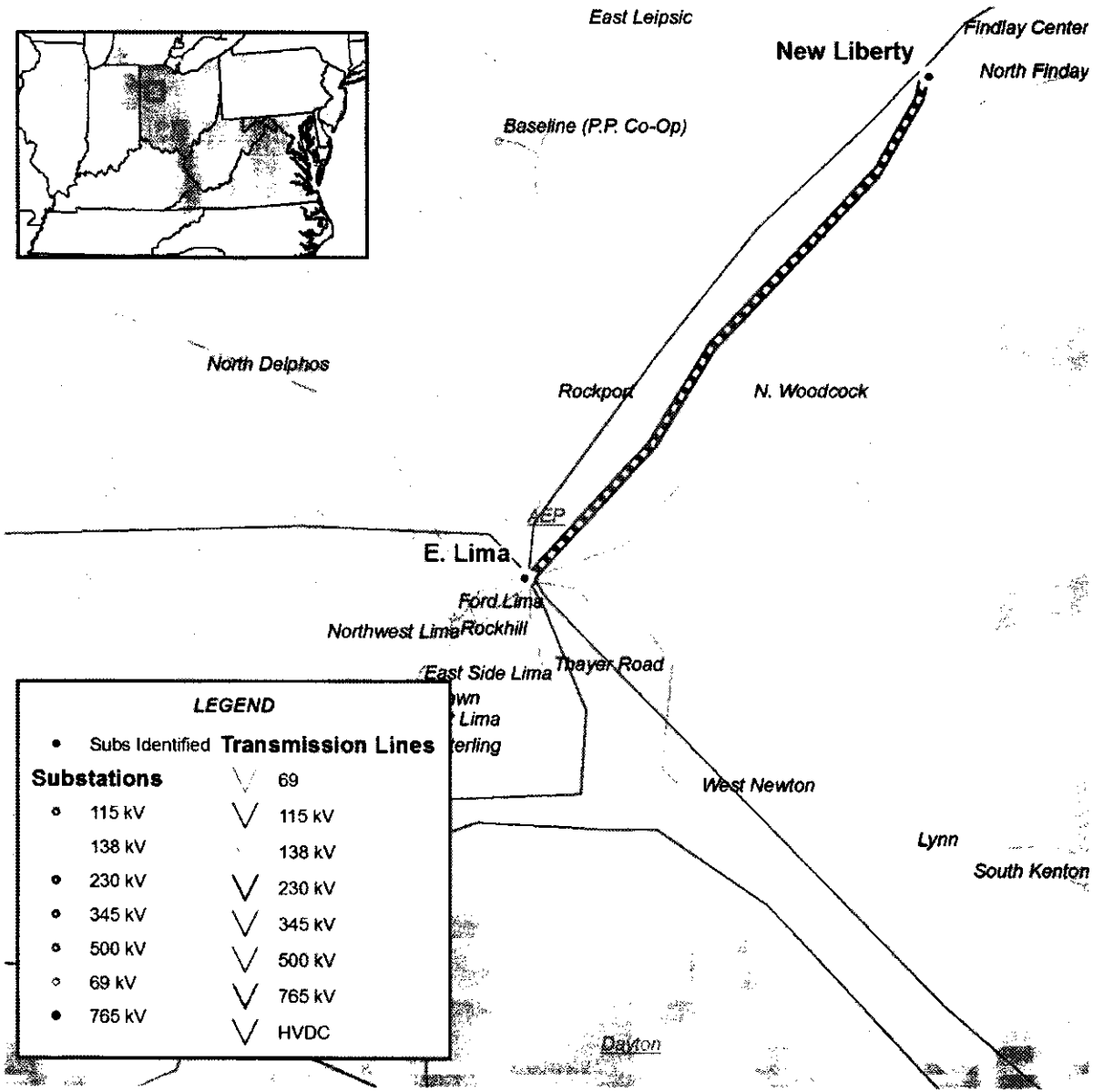
AEP Transmission Zone Reinforcement

- East Lima – New Liberty 138kV line loads to 112.01% of rate B for N-1-1: Loss of Findlay 138 kV bus and NE Findlay 138 kV bus followed by loss of North Woodcock 138 kV bus.
- Advance 2016 Baseline project B1868 (Perform sag study of the East Lima – New Liberty 138kV line to see if any remedial action needed to reach the new SE rating of 219MVA).
- Estimated Project Cost: $100K
- Projected in-service is 12/01/2014.



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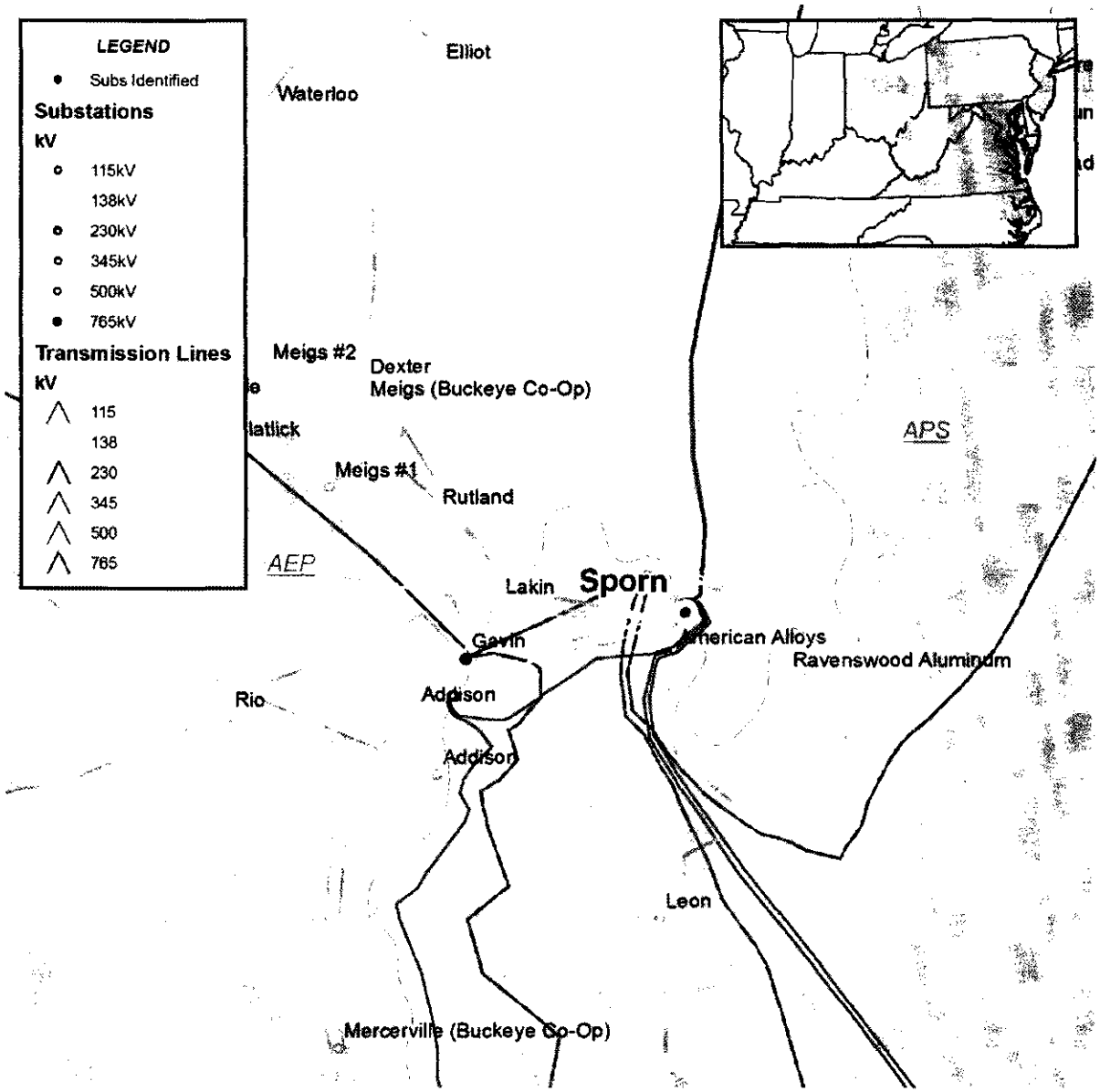
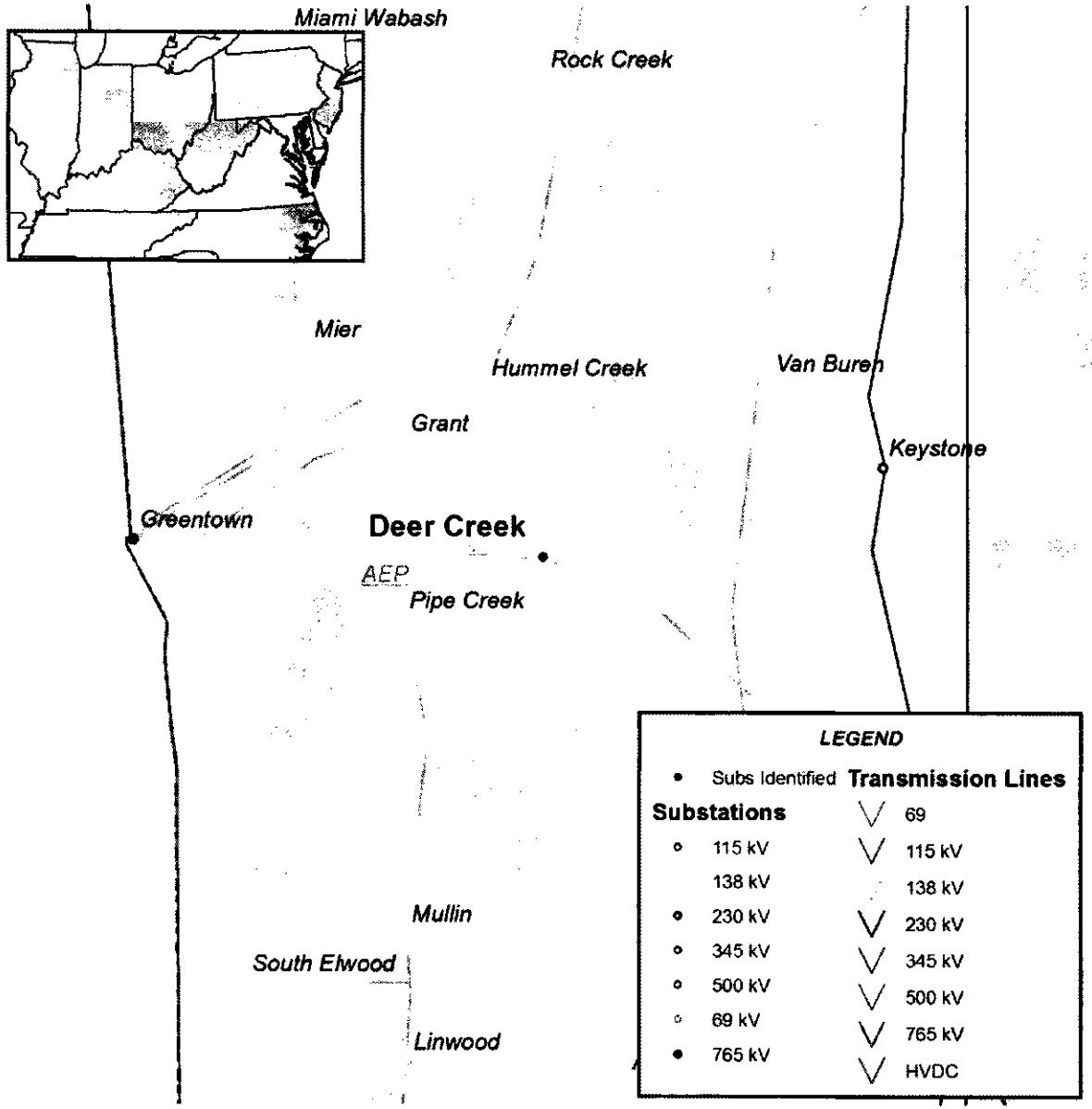
AEP Transmission Zone Reinforcement

- The Mountain – Belmont 765 kV line is loaded to 108.45% for the stuck breaker contingency loss of Marysville – Sorenson 765 kV line and Marysville – Flatlick 765 kV line.
- Establish a new 765/345 interconnection at Sporn. Sporn is located approximately ¾ mile away from Mountaineer 765 kV station. Install a 765/345 kV transformer at Mountaineer and build ¾ mile of 345 kV to Sporn.
- Estimated Project Cost: $65 M
- Projected in-service is 6/01/2015.



AEP Transmission Zone Reinforcement

- The Grant Tap – Deer Creek 138 kV line is loaded to 115.87% of its emergency rating (223 MVA) for the stuck breaker contingency loss of Greentown 138 kV bus and Dumont - Greentown 765 kV line.
- Perform a sag study on the Grant Tap – Deer Creek 138 kV line and replace bus and risers at Deer Creek station.
- Estimated Project Cost: $300 K
- Projected in-service is 12/01/2014.



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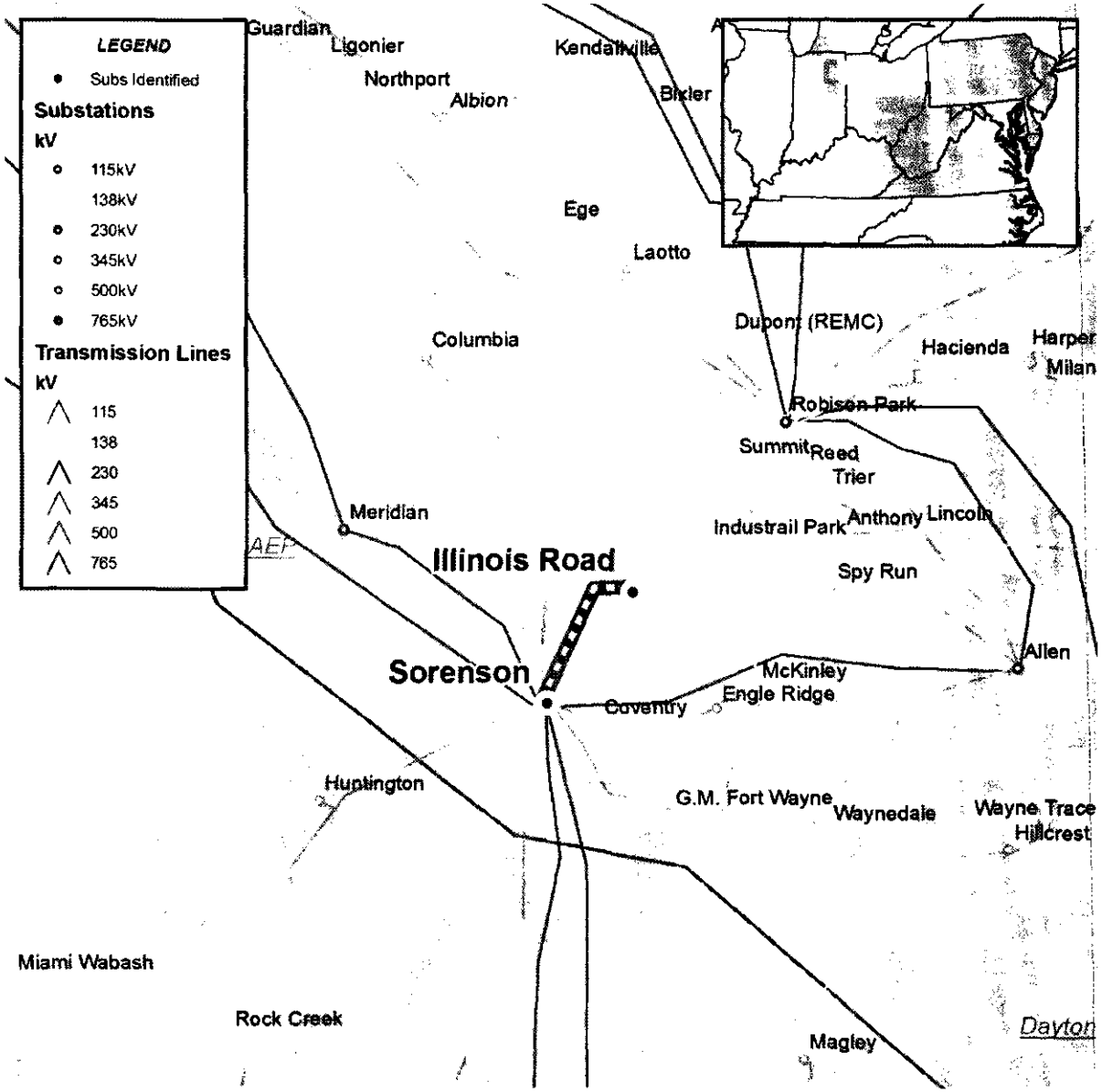
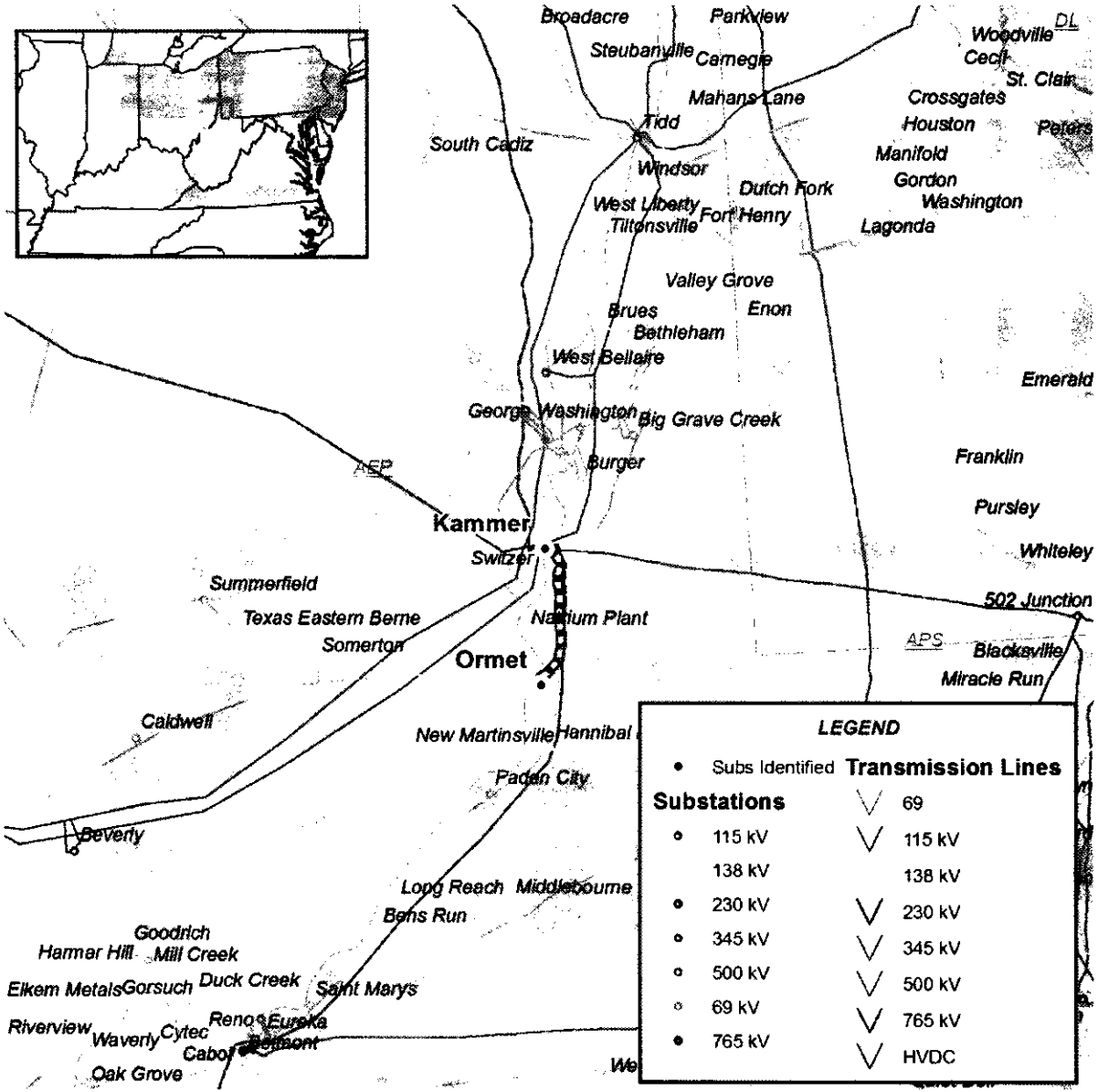
AEP Transmission Zone Reinforcement

- Sorenson - Illinois Road 138kV loads to 102.7% of Rate A for N-1-1: Loss of Allen – Sorenson 345 kV line and Allen 345/138 kV transformer + BASE CASE
- Advance Baseline project B1436 (Perform a sag study on the Sorenson - Illinois Road 138kV line to increase the emergency MOT for this line. Replace bus and risers at Illinois Road).
- Estimated Project Cost: $20 K
- Projected in-service is 12/01/2014.



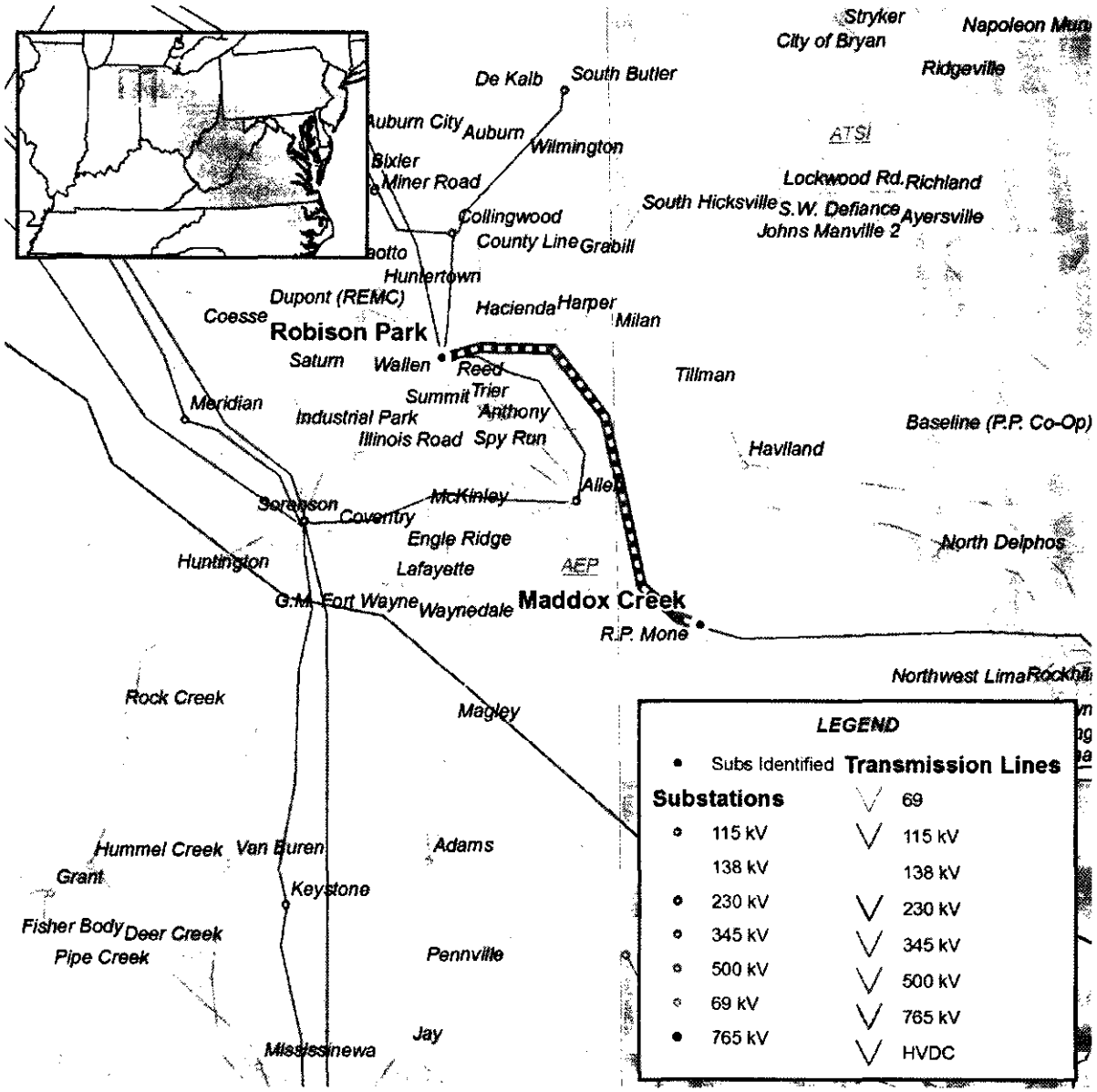
AEP Transmission Zone Reinforcement

- The Kammer – Ormet 138 kV line is loaded to 100.1% of its emergency rating (296 MVA) for tower contingency loss of West Bellaire – Tidd 345 kV line and West Bellaire – Kammer 345 kV line.
- Perform a sag study on the Kammer – Ormet 138 kV line of the conductor section.
- Estimated Project Cost: $100K
- Projected in-service is 12/01/2012.



AEP Transmission Zone Reinforcement

- The Maddox - Convoy 345 kV line is loaded to 109.01% of its emergency rating (897 MVA) for the stuck breaker contingency loss of SW Lima – E Lima 345 kV line and SW Lima 345/138 kV transformer #2.
- Perform a sag study of the Maddox- Convoy 345 kV line to improve the emergency rating to 1400 MVA.
- Estimated Project Cost: $30 K
- Projected in-service is 12/01/2013.



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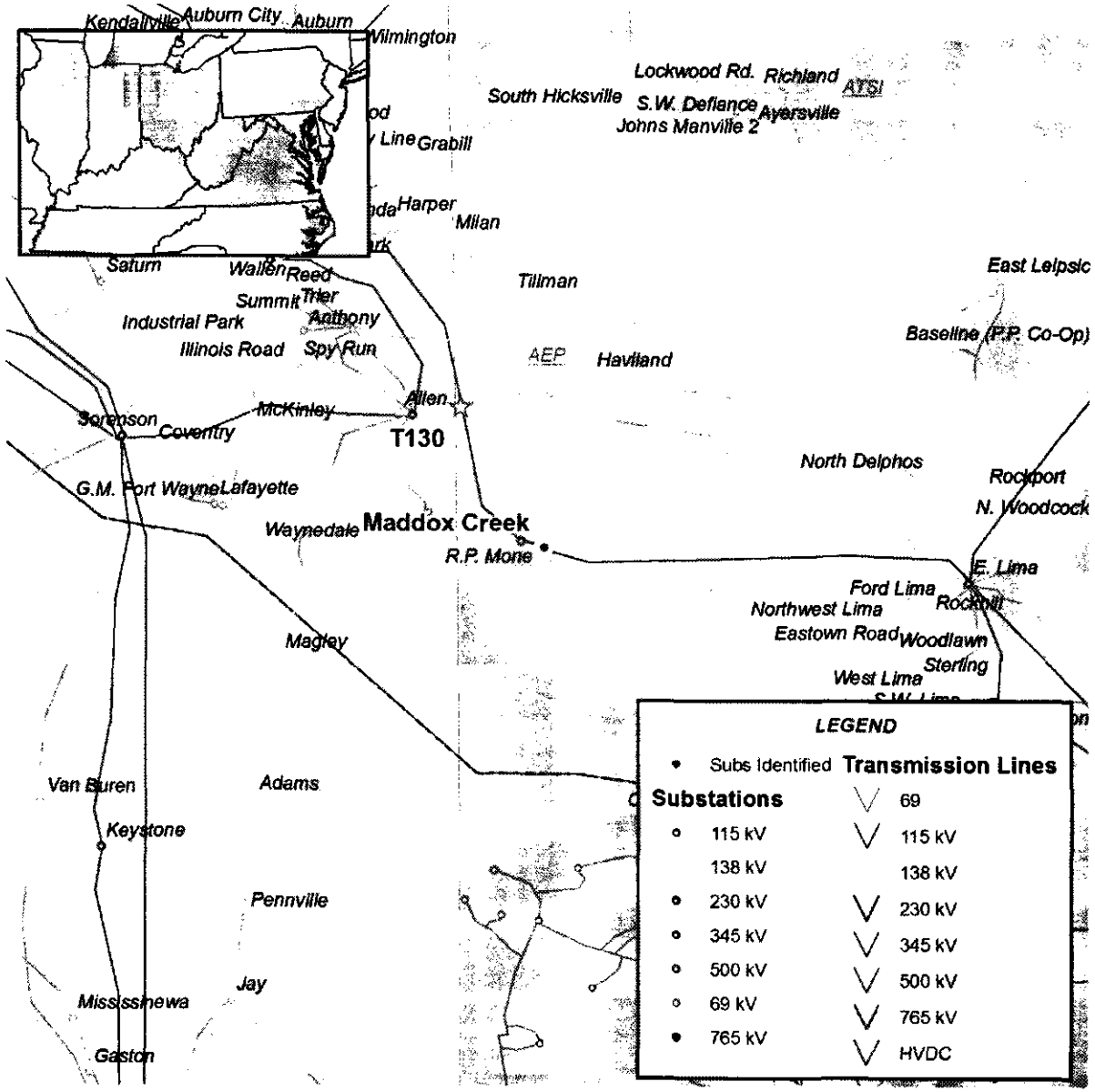
AEP Transmission Zone Reinforcement

- The Maddox – T130 345 kV line is loaded to 121.81% of its emergency rating (897 MVA) for the tower contingency loss of the Allen – Sorenson 345 kV line and Convoy – Robison Park 345 kV line.
- Perform a sag study of the Maddox – T130 345 kV line to improve the emergency rating to 1400 MVA.
- Estimated Project Cost: $30 K
- Projected in-service is 12/01/2013.



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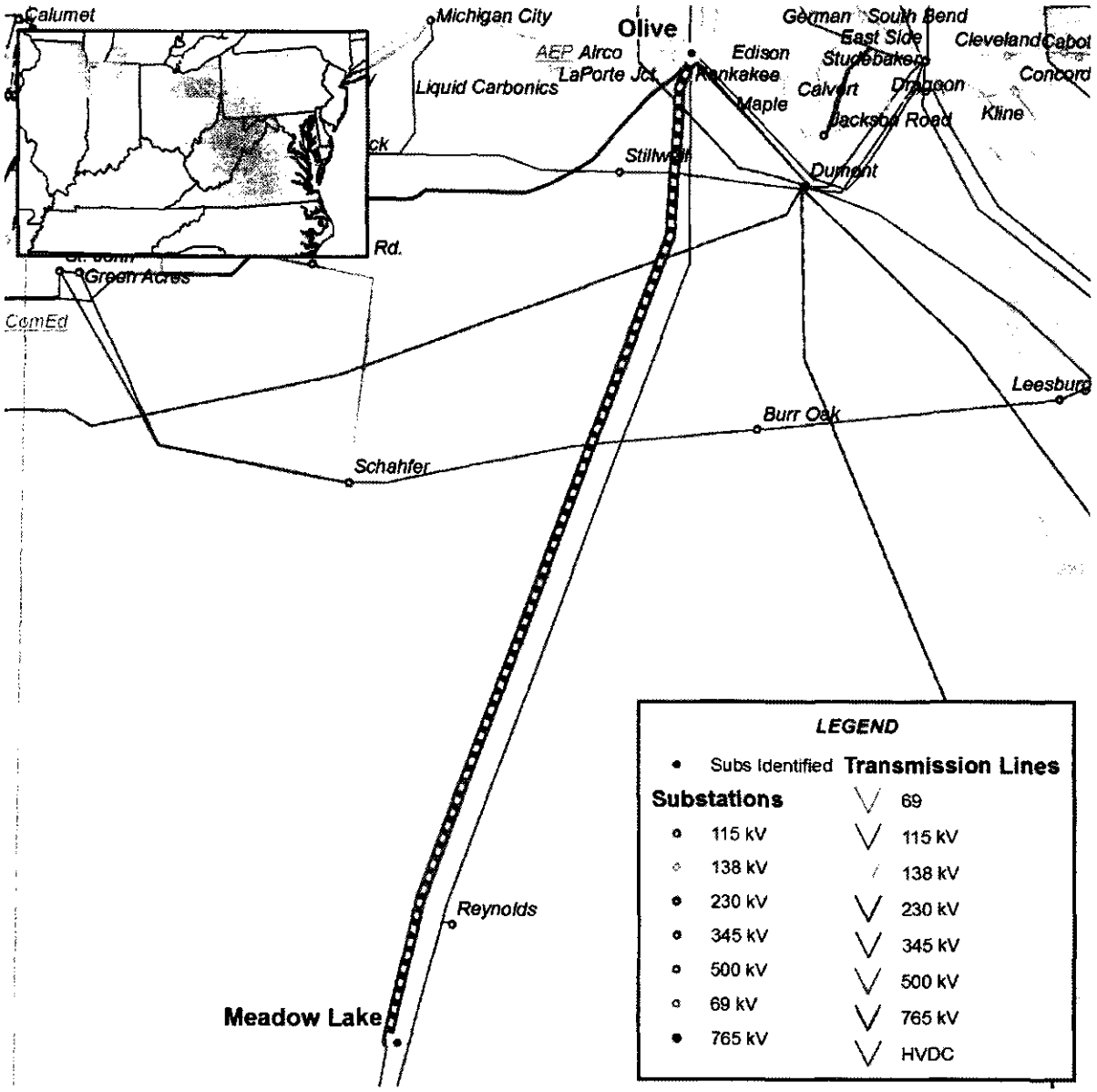
AEP Transmission Zone Reinforcement

- The Meadowlake – Olive 345 kV line is loaded to 103.1% of its emergency rating (971 MVA) for the bus contingency loss of the Reynolds 345 kV bus.
- Perform a sag study of the Meadowlake - Olive 345 kV line to improve the emergency rating to 1400 MVA.
- Estimated Project Cost: $60 K
- Projected in-service is 12/01/2013.



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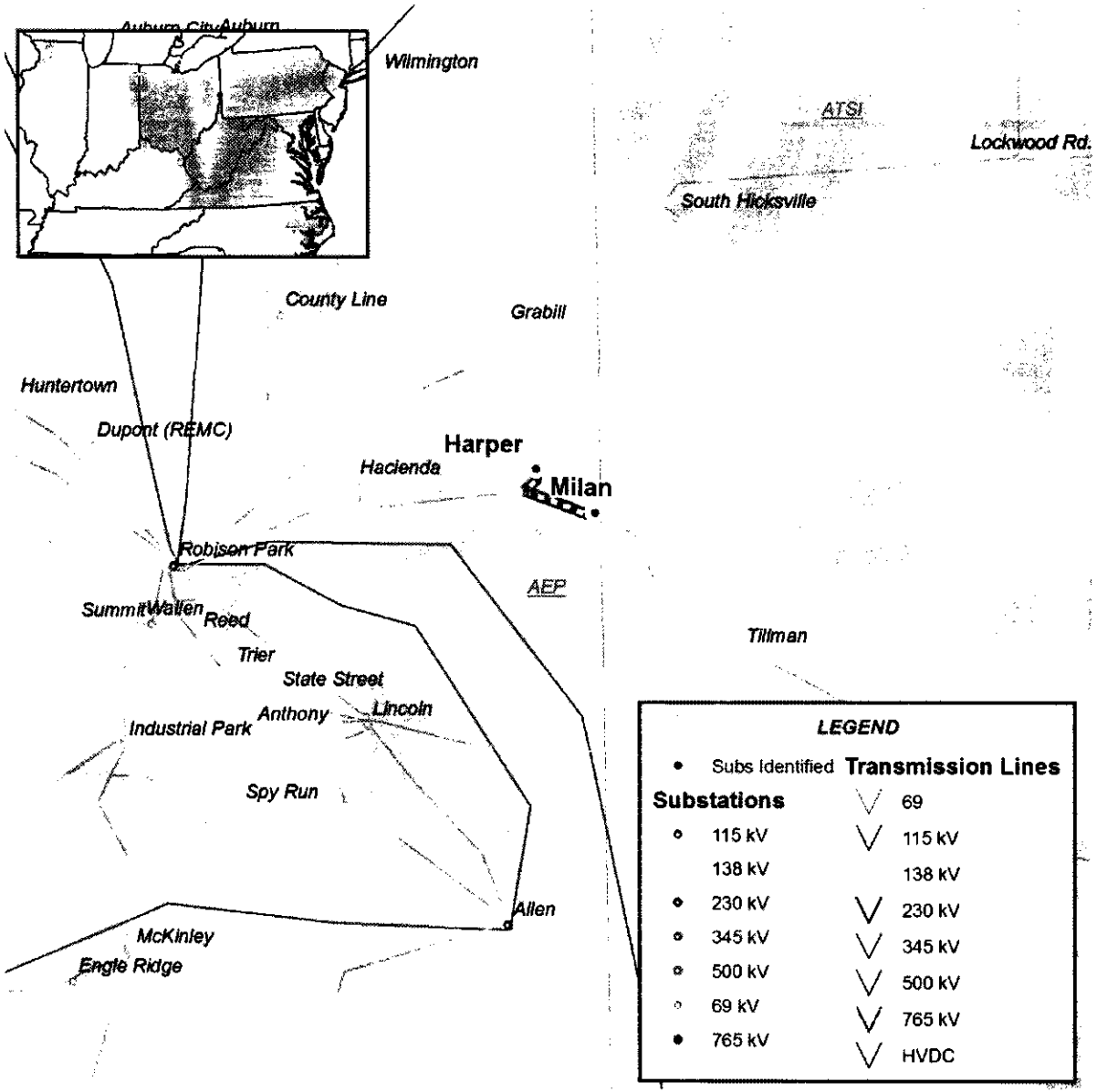
AEP Transmission Zone Reinforcement

- The Milan – Harper 138 kV line is loaded to 100.57% of its emergency rating (183 MVA) for the tower contingency loss of East Side – N Delphos 138 kV line and East Side – Sterling 138 kV line.
- Perform a sag study on the Milan - Harper 138 kV line and replace bus and switches at Milan Switch station.
- Estimated Project Cost: $350 K
- Projected in-service is 12/01/2014.



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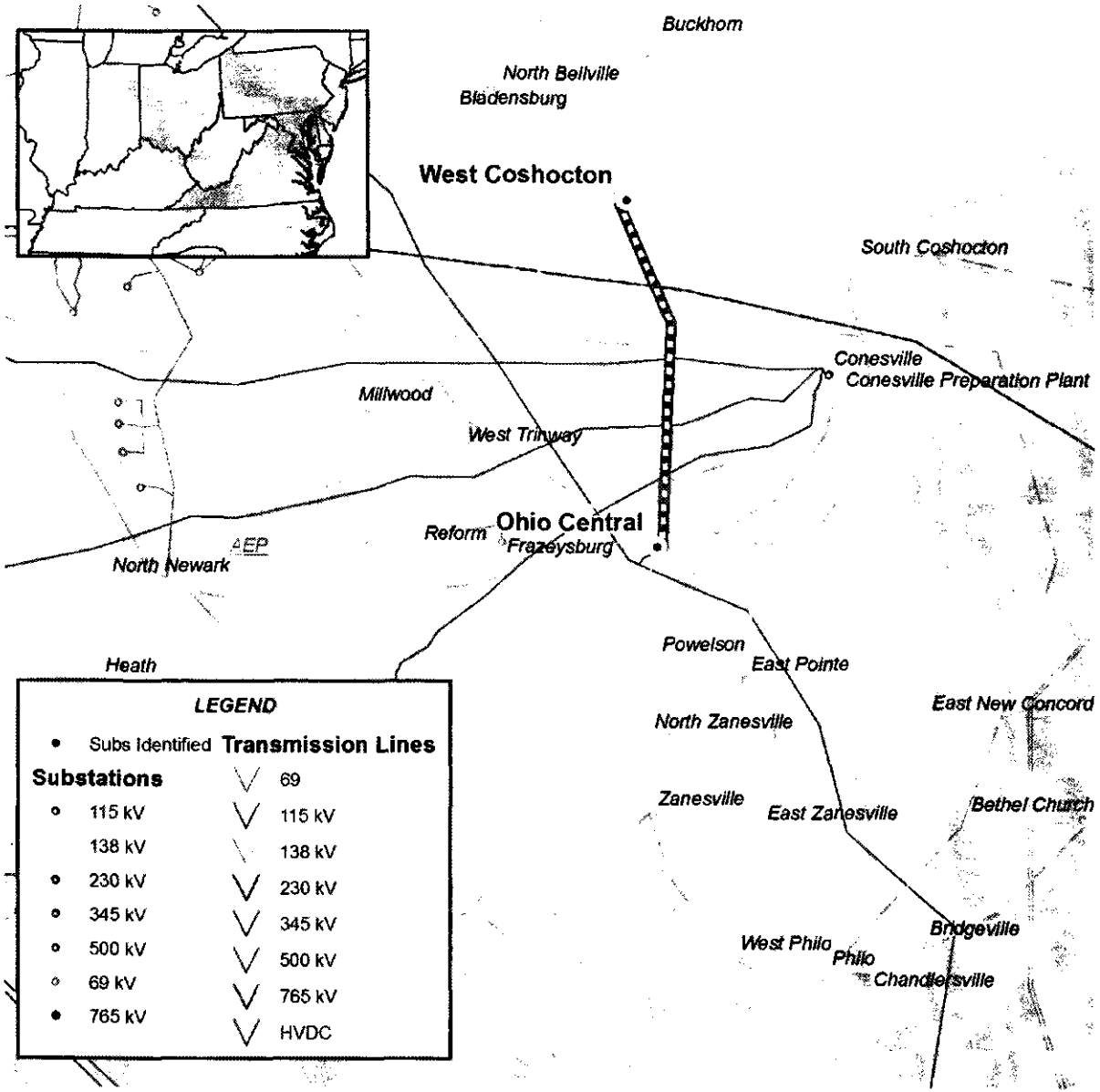
AEP Transmission Zone Reinforcement

- Advance 2016 Baseline project B1871 (Perform a sag study on the Ohio Central – West Coshocton 138KV line).
- Estimated Project Cost: $75 K
- Projected in-service is 12/01/2014.



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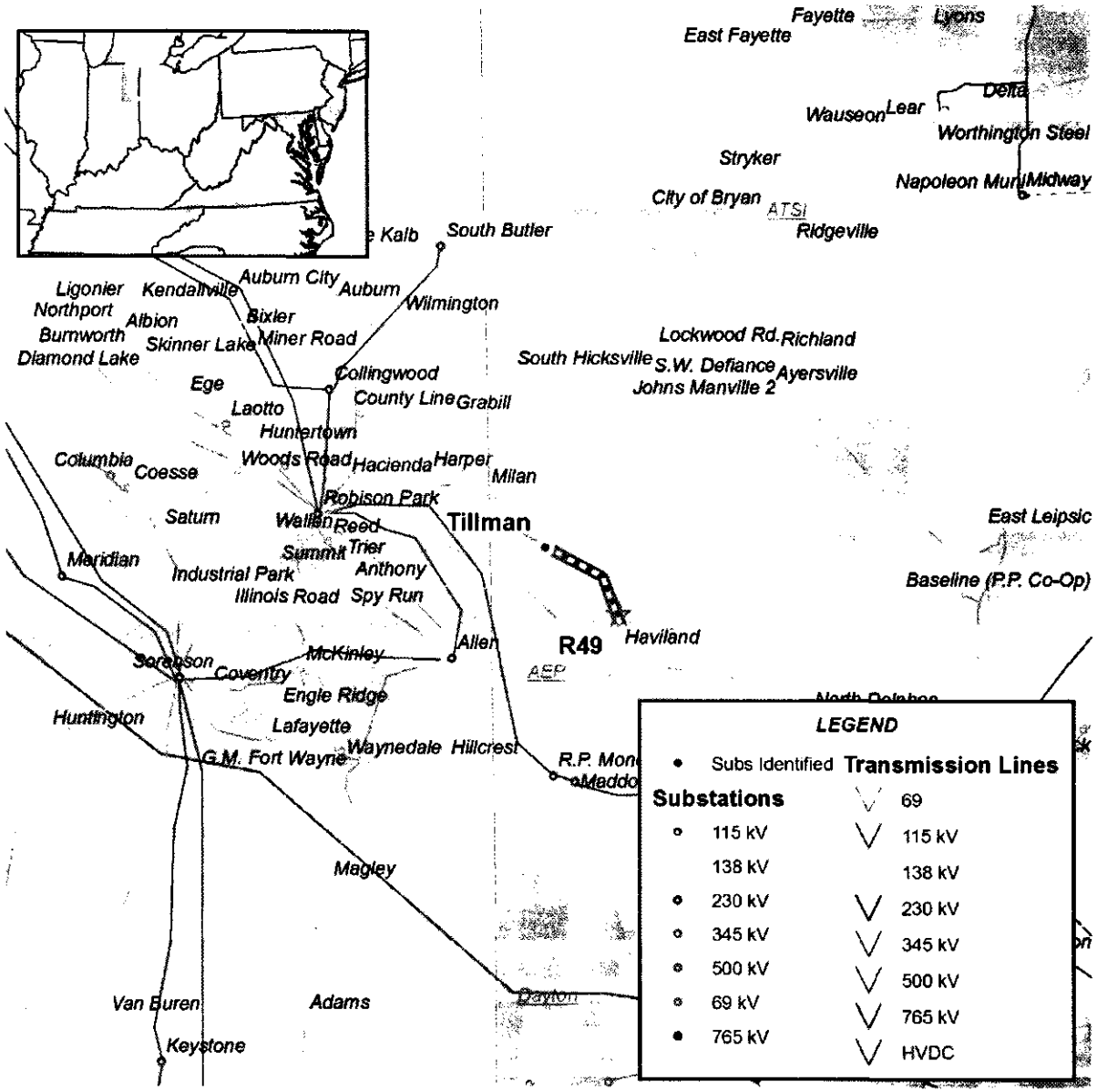
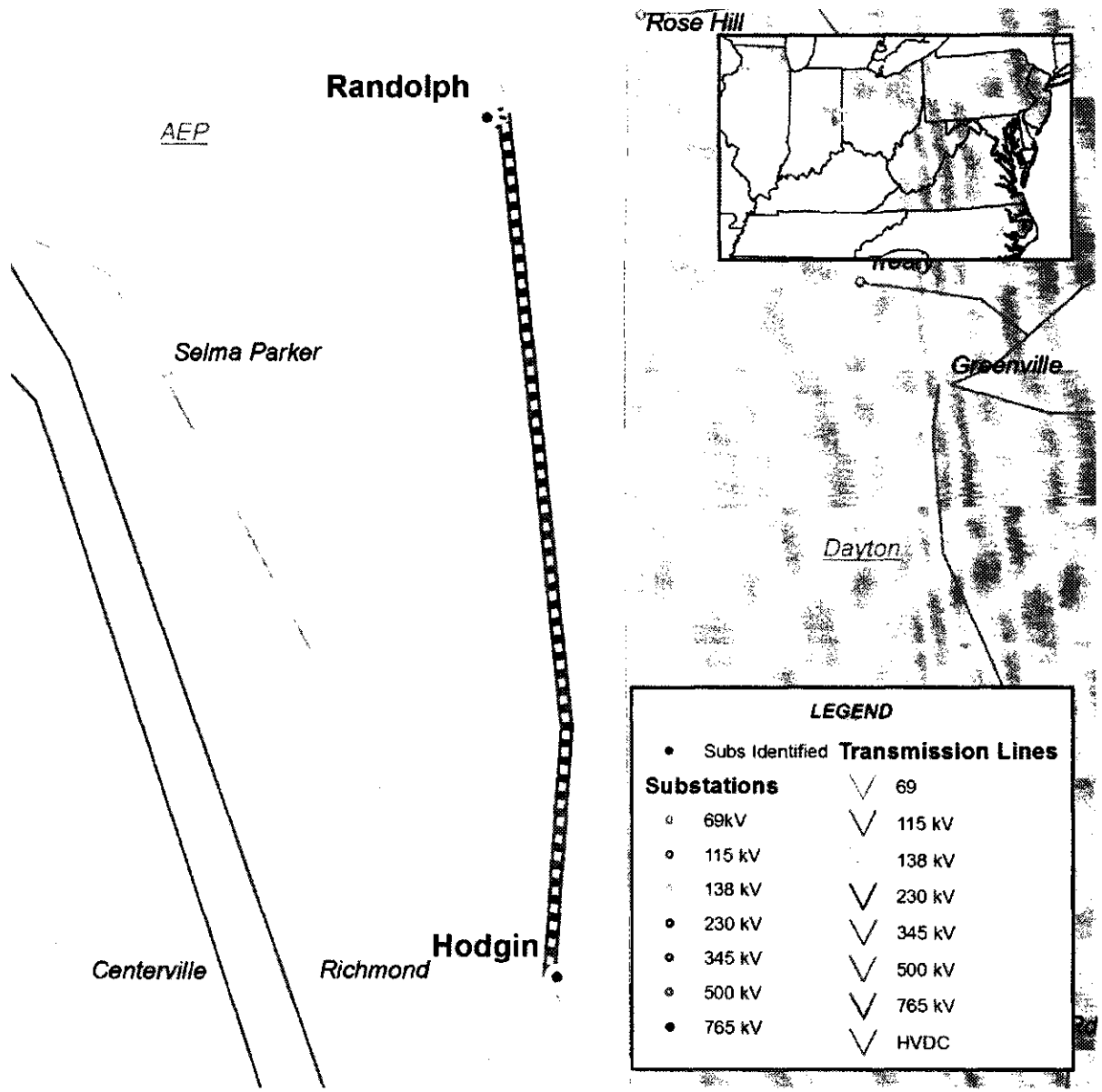
AEP Transmission Zone Reinforcement

- The R-049 - Tillman138 kV line is loaded to 131.8% of its emergency rating (167 MVA) for the tower contingency loss of East Side – N Delphos 138 kV line and East Side – Sterling 138 kV line.
- A sag study of the R-049 - Tillman 138 kV line may improve the emergency rating to 245 MVA.
- Estimated Project Cost: $25 K
- Projected in-service is 12/01/2013.



AEP Transmission Zone Reinforcement

- Advance 2016 Baseline project B1734 (Perform a sag study of Randoph - Hodgins 138 kV line. Upgrade terminal equipment).
- Estimated Project Cost: $20 K
- Projected in-service is 12/01/2014.



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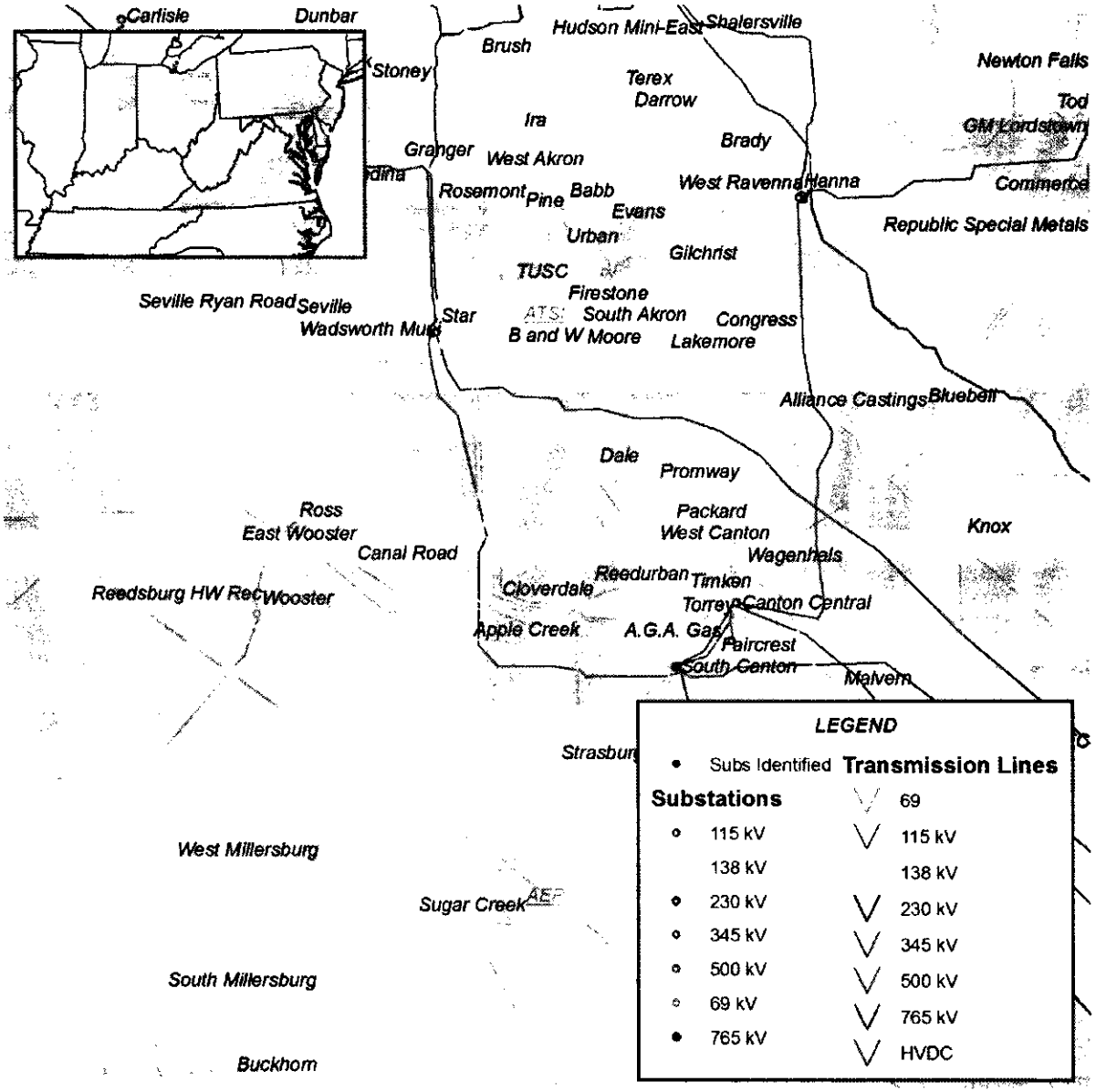
AEP Transmission Zone Reinforcement

- South Canton – Harmon 345 kV line Advance 2016 Baseline project B1812 (rebuild AEP portion of line). Also upgrades risers, wavetrap and bus work at South Canton station. Expected rating is 1800 MVA S/N and 1800 MVA S/E.
- Estimated Project Cost: $2 M
- Projected in-service is 6/1/2015.



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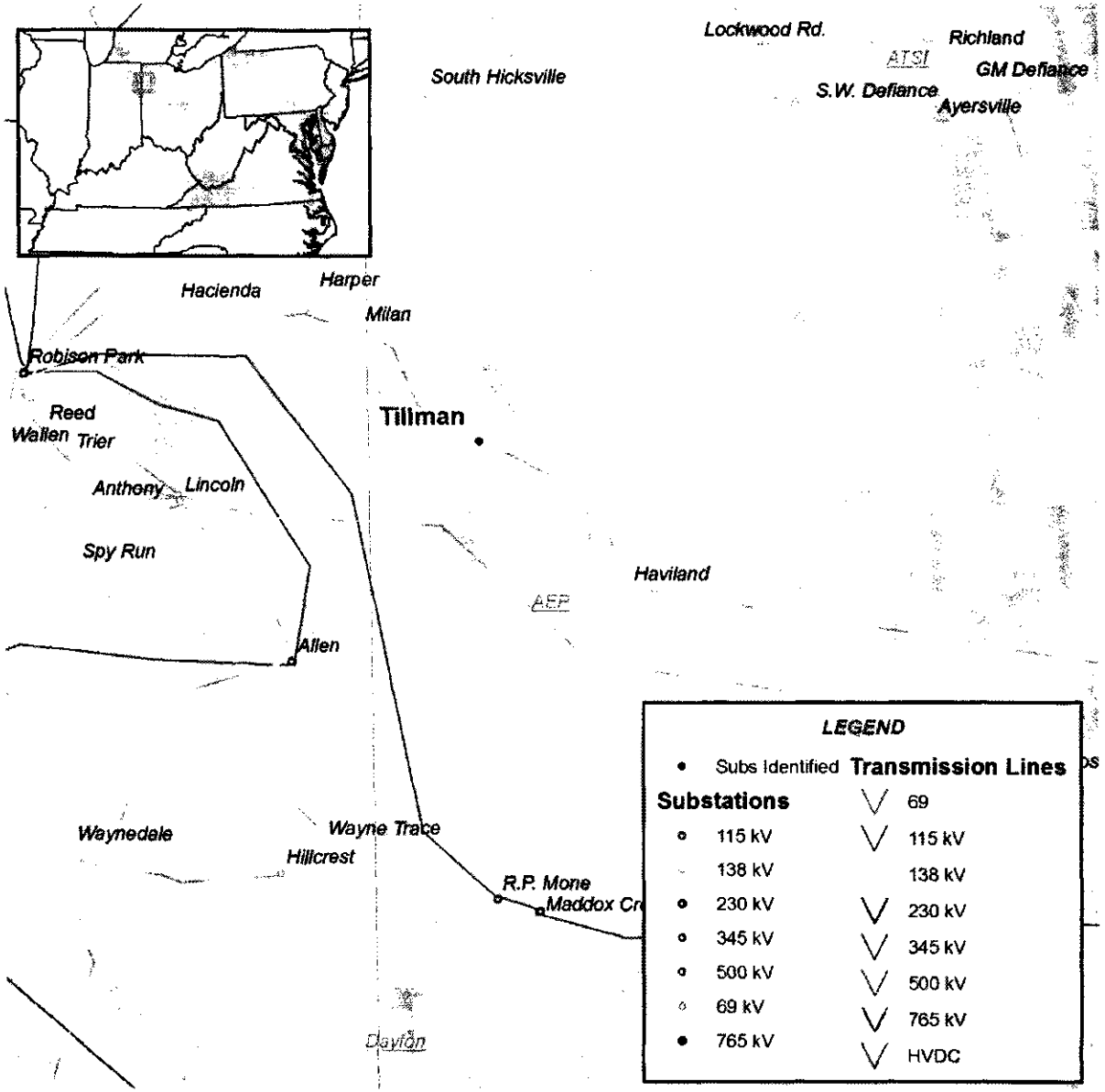
AEP Transmission Zone Reinforcement

- The Tillman - Dawkins138 kV line is loaded to 122.39% of its emergency rating (167 MVA) for the tower contingency loss of East Side – N Delphos 138 kV line and East Side – Sterling 138 kV line.
- A sag study of the Tillman - Dawkins 138 kV line may improve the emergency rating to 245 MVA.
- Estimated Project Cost: $25 K
- Projected in-service is 12/01/2013.



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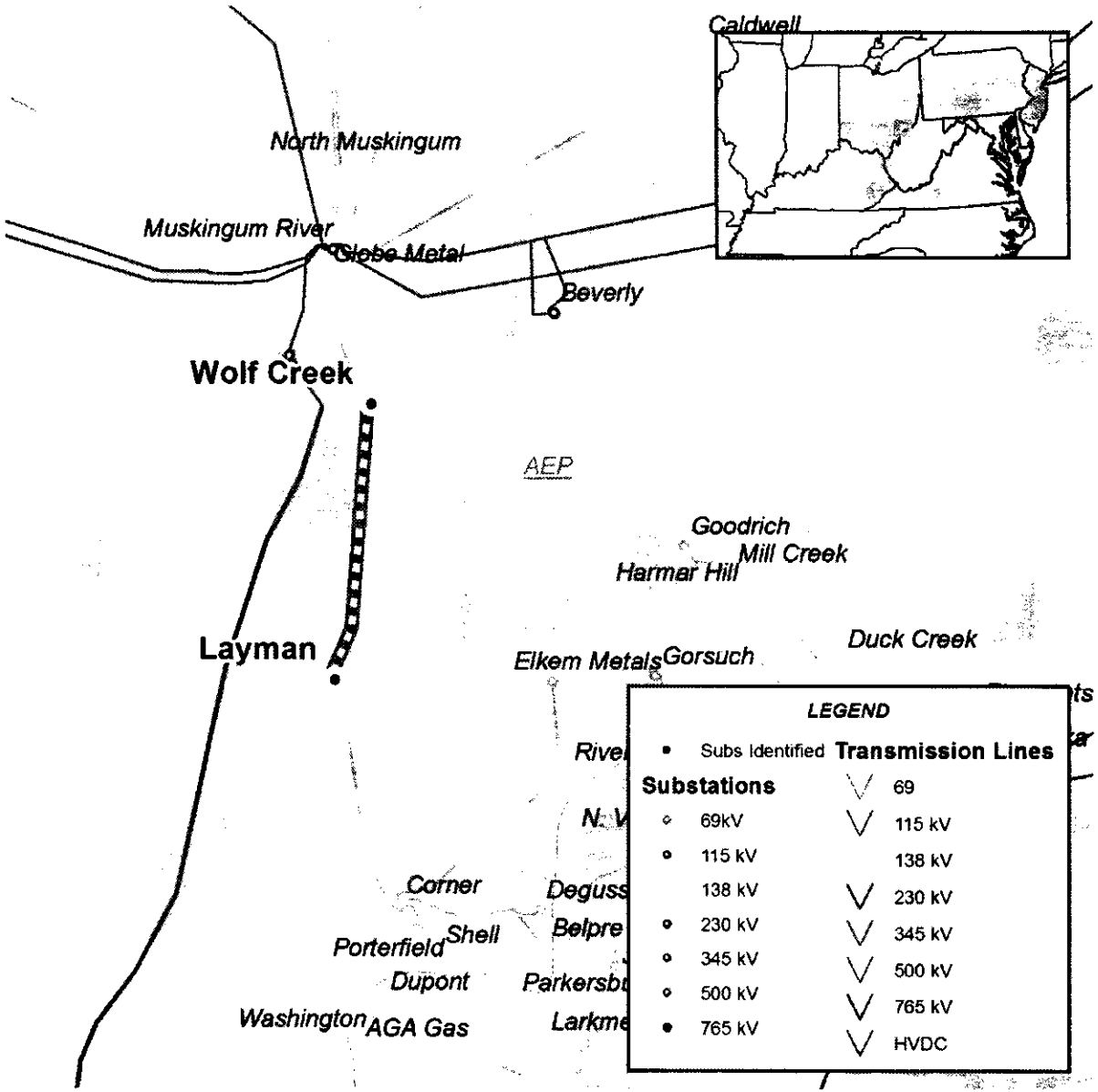
AEP Transmission Zone Reinforcement

- Advance 2016 Baseline project B1738 (Perform a sag study of the Wolf Creek - Layman 138 kV line. Upgrade terminal equipment including a 138 kV breaker and wavetrap).
- Estimated Project Cost: $2 M
- Projected in-service is 12/01/2014.



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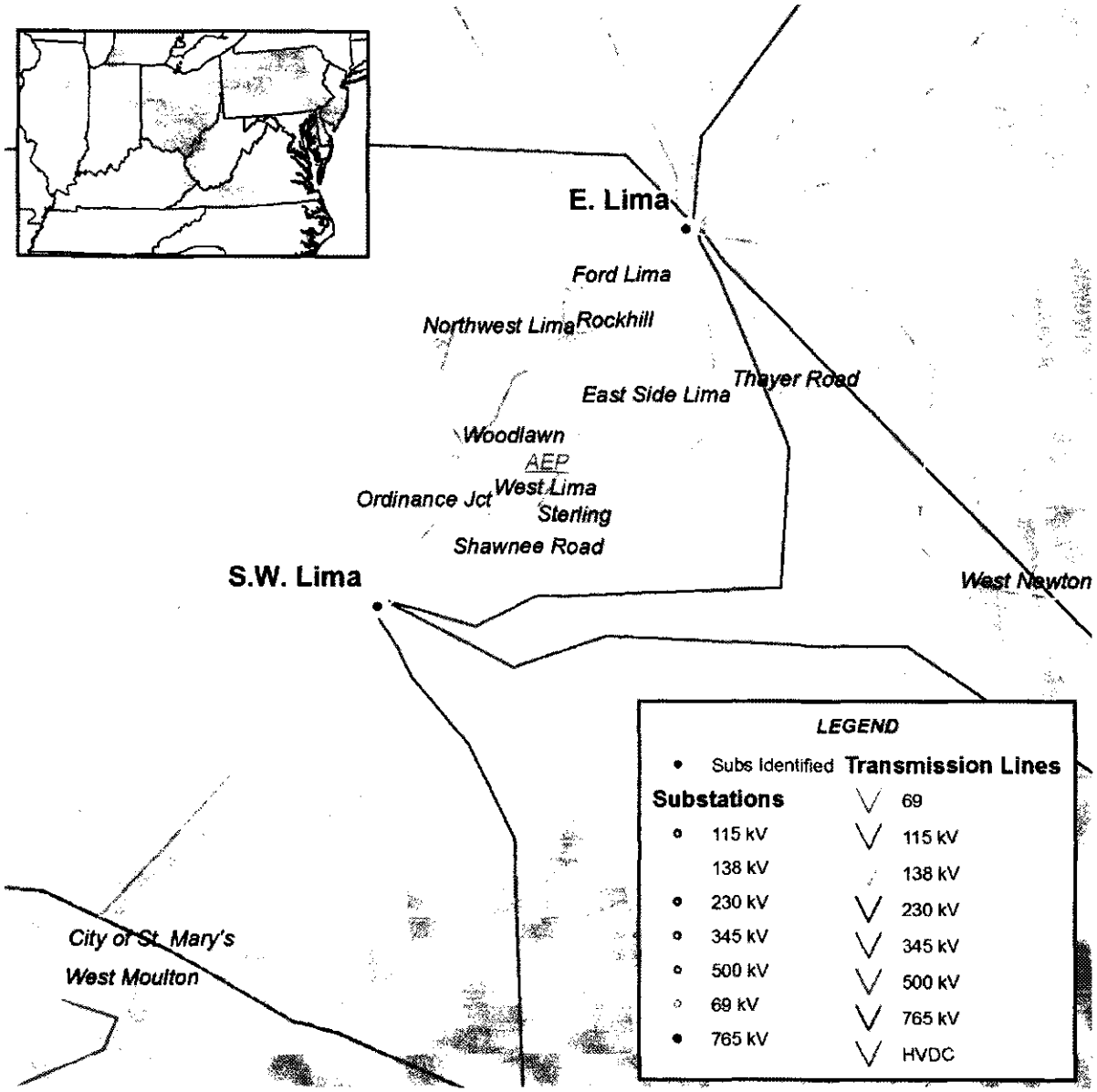
AEP Transmission Zone Reinforcement

- Advance 2016 Baseline project B1883 (Switch the breaker position of transformer #1 and SW Lima at East Lima 345 kV bus).
- Estimated Project Cost: $1 M
- Projected in-service is 6/01/2014.



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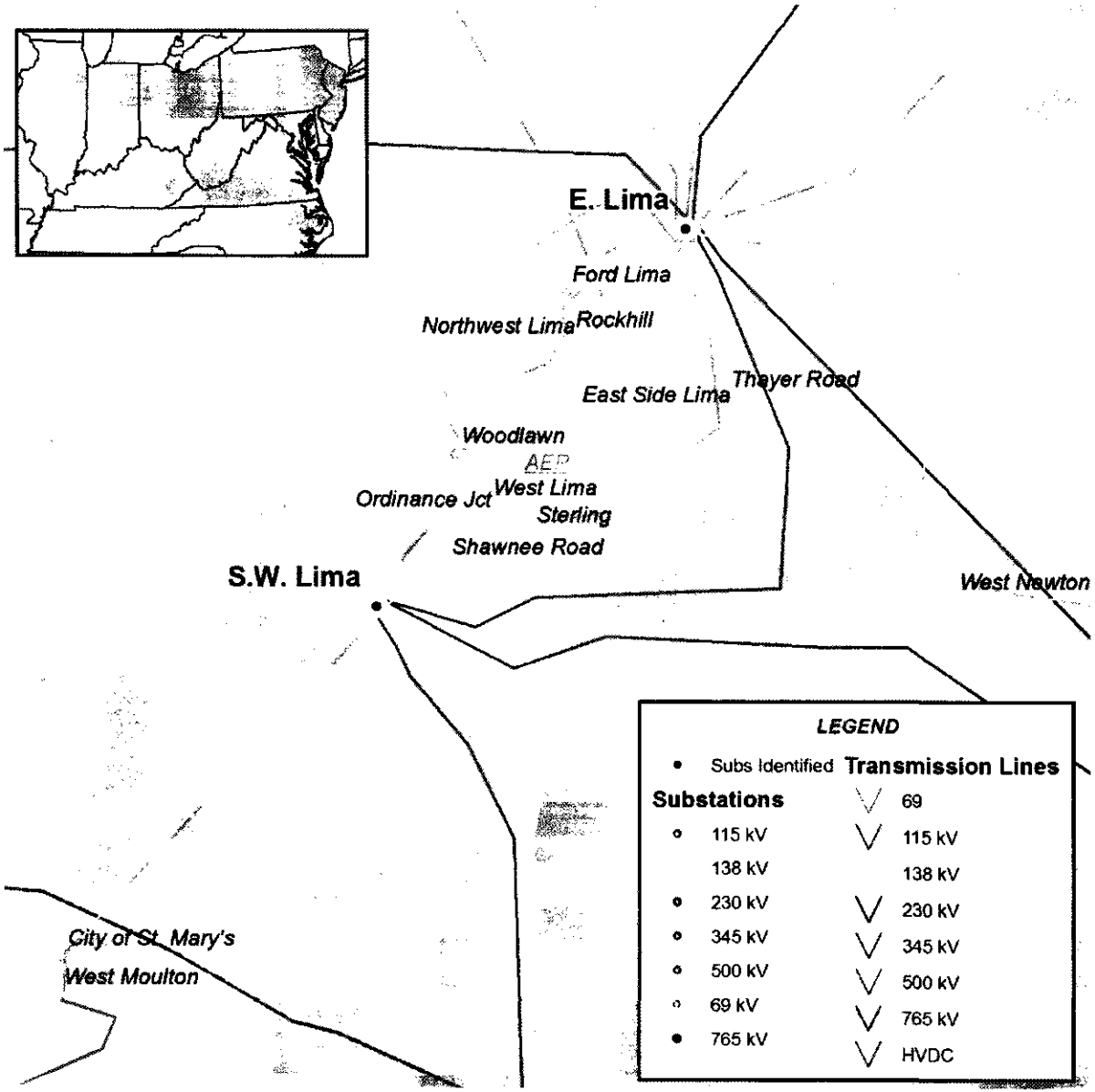
AEP Transmission Zone Reinforcement

- The SW Lima 345/138 kV transformer loads to 103.04% of its emergency rating (551 MVA) for the stuck breaker contingency loss of SW Lima – E Lima 345 kV line and SW Lima 345/138 kV transformer #2.
- Terminate Transformer #2 at SW Lima in a new bay position. Today a breaker failure results in outage of Transformer #2 and SW Lima – East Lima 345 kV line. As a result two facilities are lost due to a common mode outage. Improve the switching will change this contingency to an N-1-1 event.
- Estimated Project Cost: $5 M
- Projected in-service is 12/01/2014.



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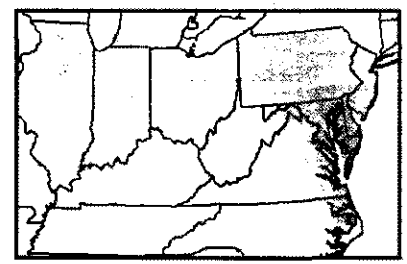
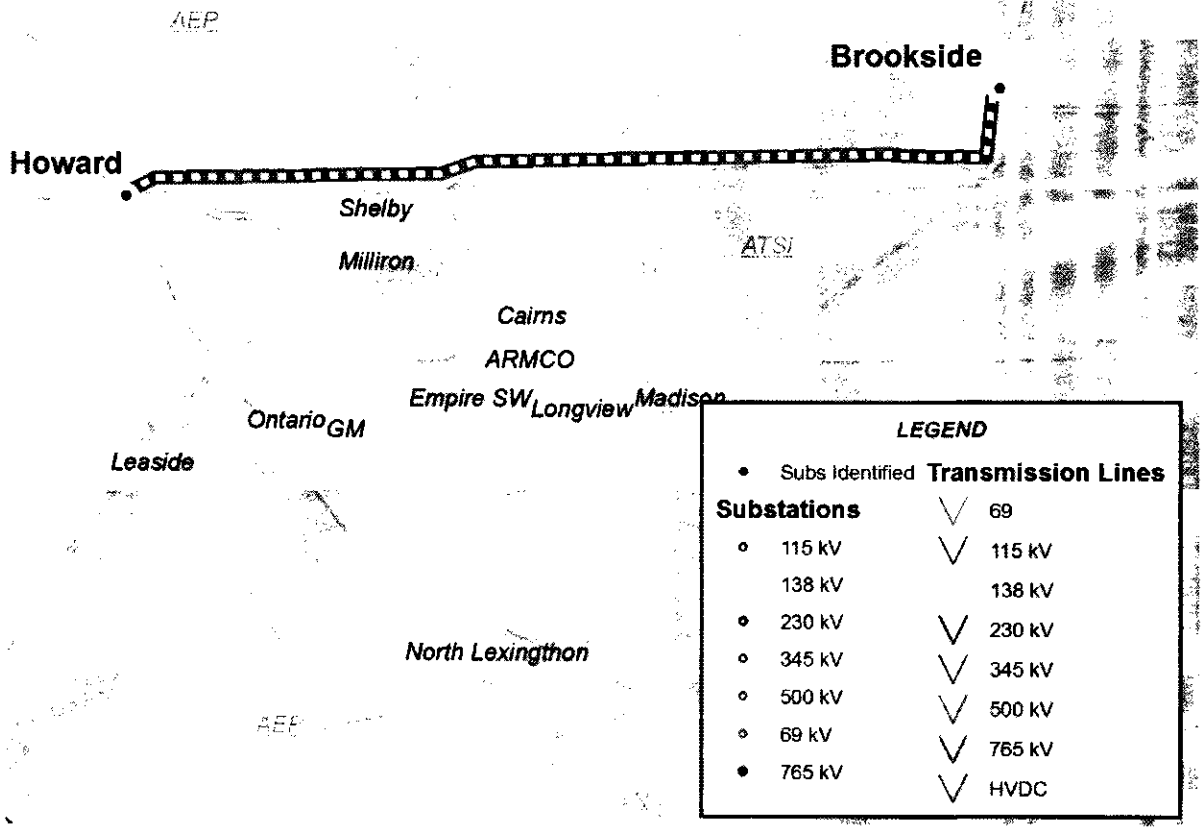
AEP Transmission Zone Reinforcement

- The Brookside - Howard 138 kV line loads to 114.96% of its emergency rating (173 MVA) for the tower contingency loss of the Galion – Leeside 138 kV line and Galion – General Motors Corp 138 kV line.
- Perform a sag study on the Brookside - Howard 138 kV line and replace bus and risers at AEP Howard station.
- Estimated Project Cost: $500 K
- Projected in-service is 12/01/2014.





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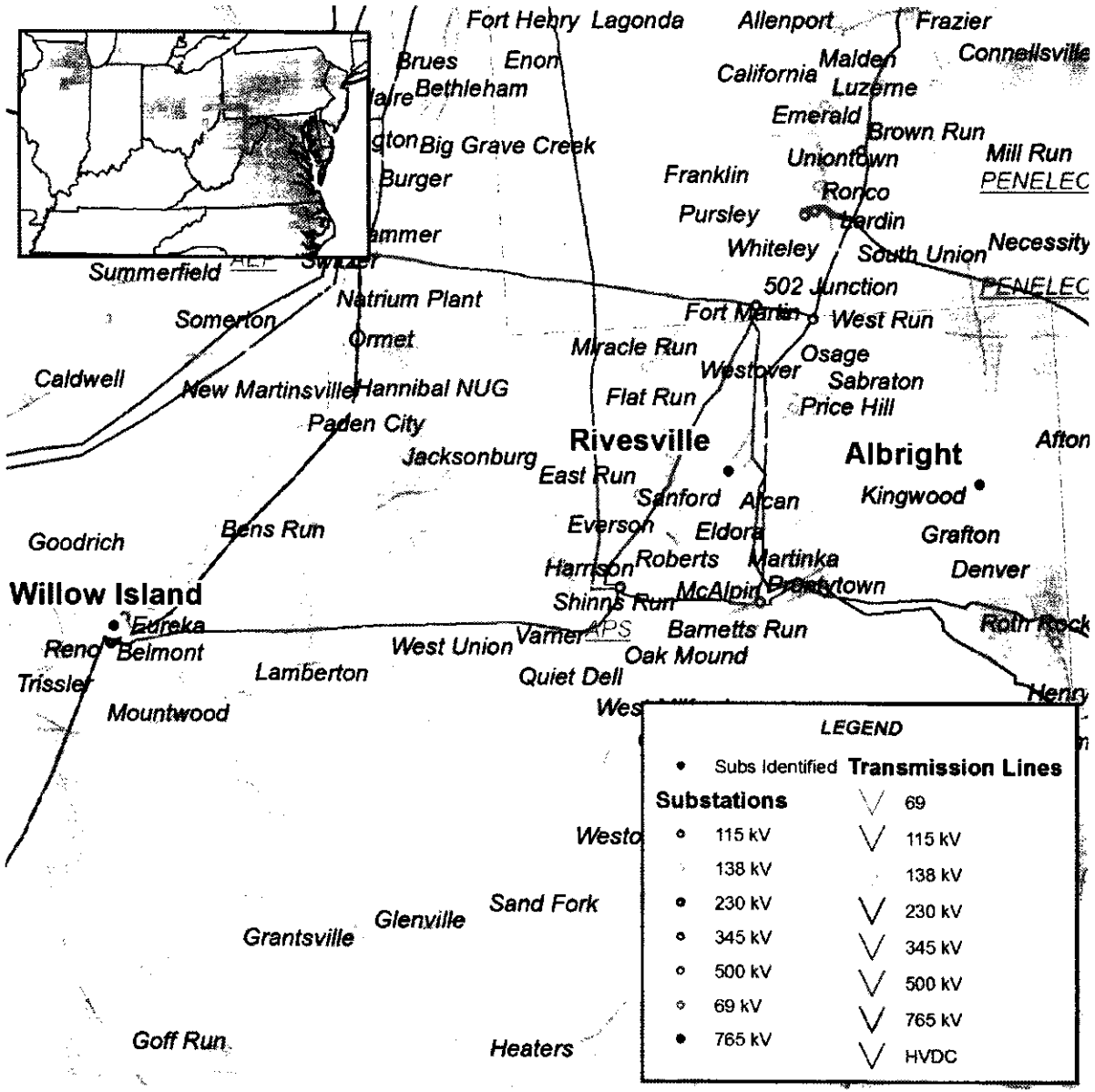
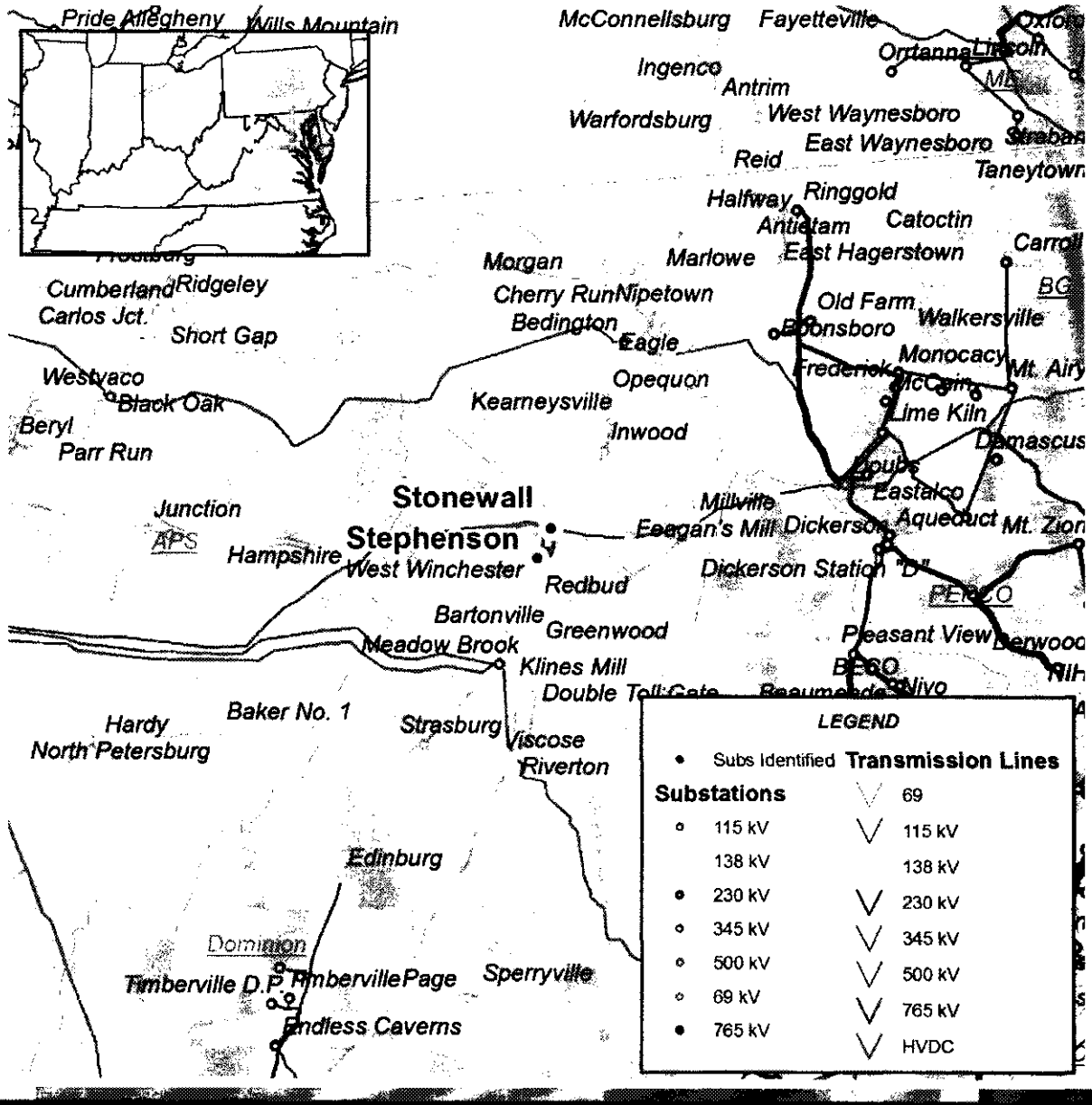
FES (APS) Deactivations

- Albright 1, 2, & 3; Rivesville 5 & 6; Willow Island 1 & 2
- Requested deactivation date: 9/1/2012



FES (APS) Deactivations

- These deactivations aggravate the loadings on the Stonewall – Stephenson 138 kV line previously identified for Armstrong 1 & 2;Ashtabula 5; Bayshore 2-4; Eastlake 1-5; Lake Shore 18; R Paul Smith 3 & 4
- Replace line trap at Stonewall on the Stephenson 138 kV line terminal (existing base line upgrade b1902)
- Estimated Project Cost: $0.075M
- Projected in-service date: 6/1/2013



GenOn Deactivations

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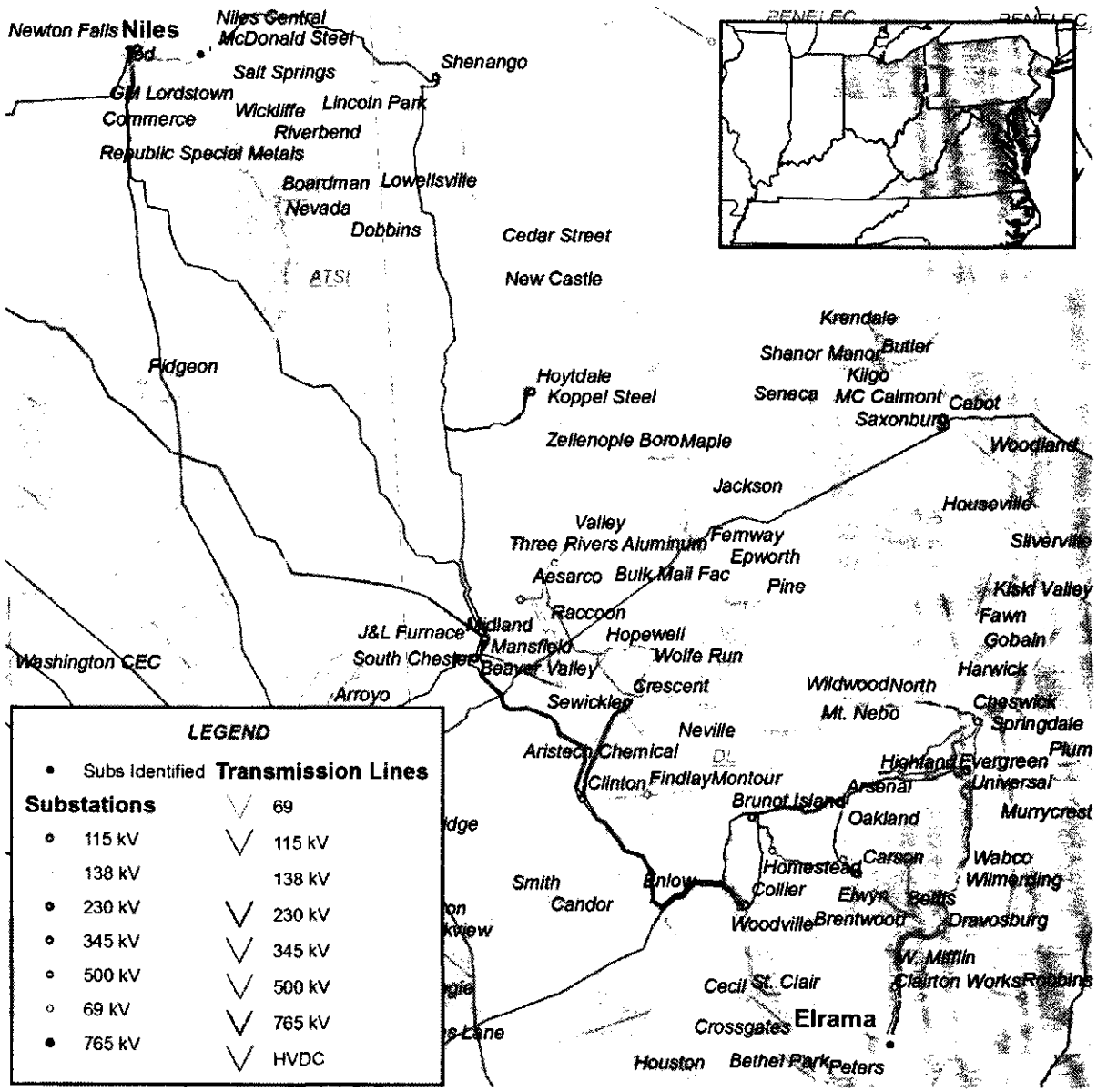
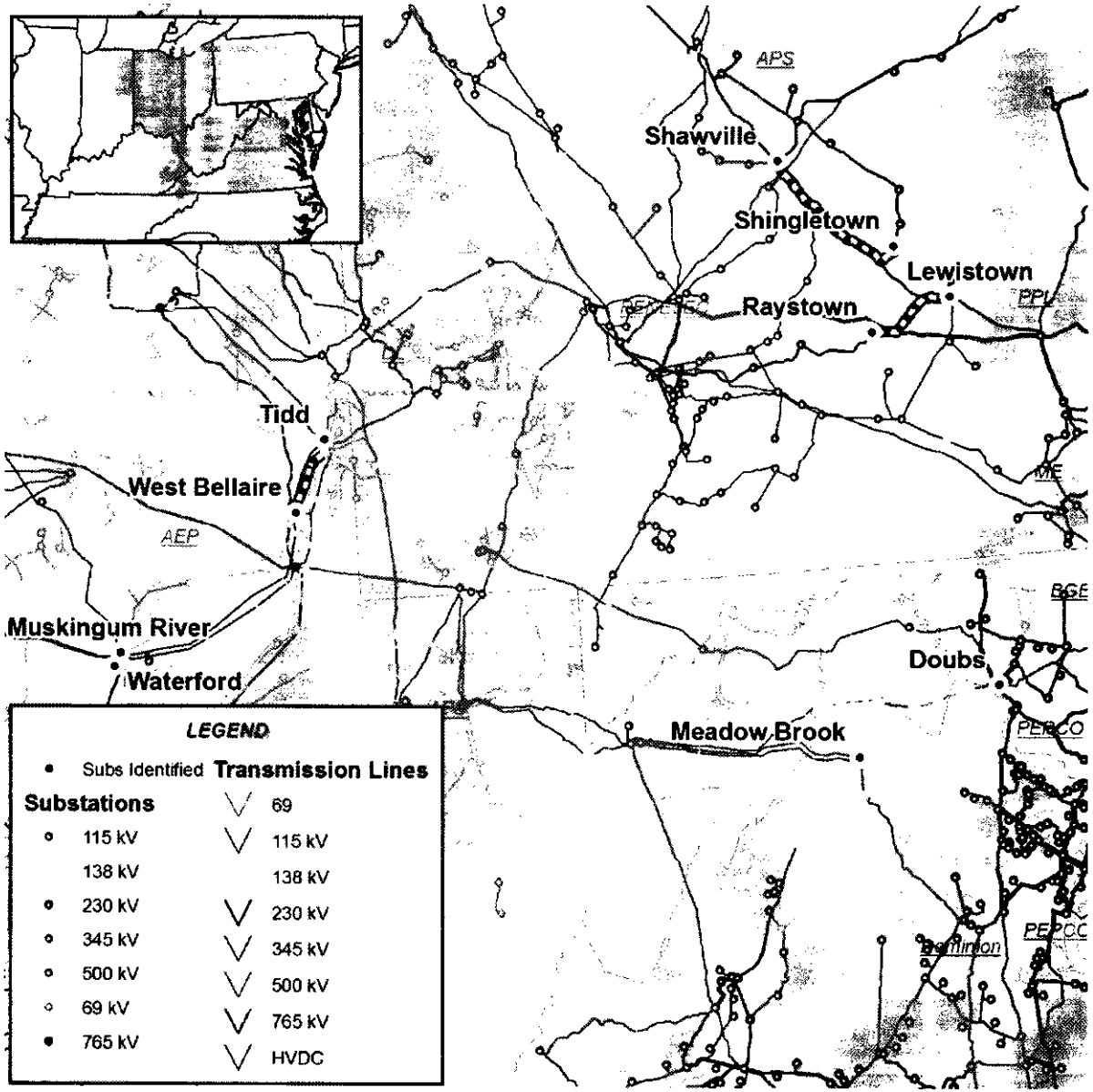
GenOn Deactivations

- Niles 1 & 2; Elrama 1, 2, 3 & 4
- Requested deactivation date: 6/1/2012



GenOn Deactivations

- Criteria violations
  - N-1 Voltage
  - N-1 Thermal
  - N-1-1 Voltage Magnitude and Drop
  - N-1-1 Thermal
  - Generation Deliverability
- Multiple 138kV thermal and voltage violations
- Meadow Brook & Doubs 500kV low voltage
- Waterford-Muskingum River 345kV thermal
- West Bellaire-Tidd 345kV thermal
- Raystown-Lewistown 230kV thermal
- Shawville-Shingleton 230kV thermal
- Required upgrades shown on the following slides



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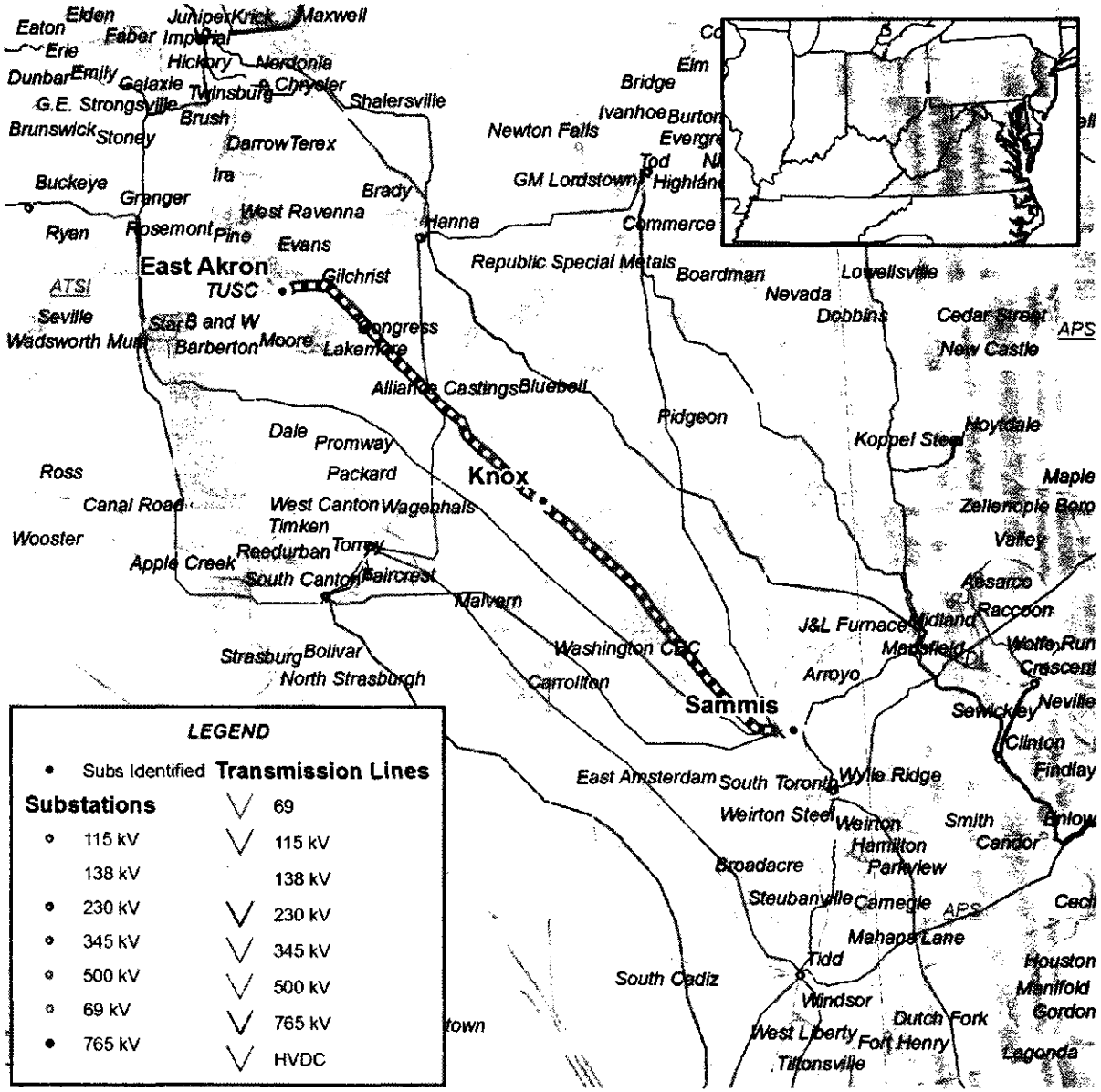
ATSI Transmission Zone Reinforcement

- Loop in E. Akron-Sammis 138kV line and Expand Knox substation to 6 breaker ring bus (existing b1692)
- Cost estimate : $3.7M
- Projected in-service date: 6/1/2013



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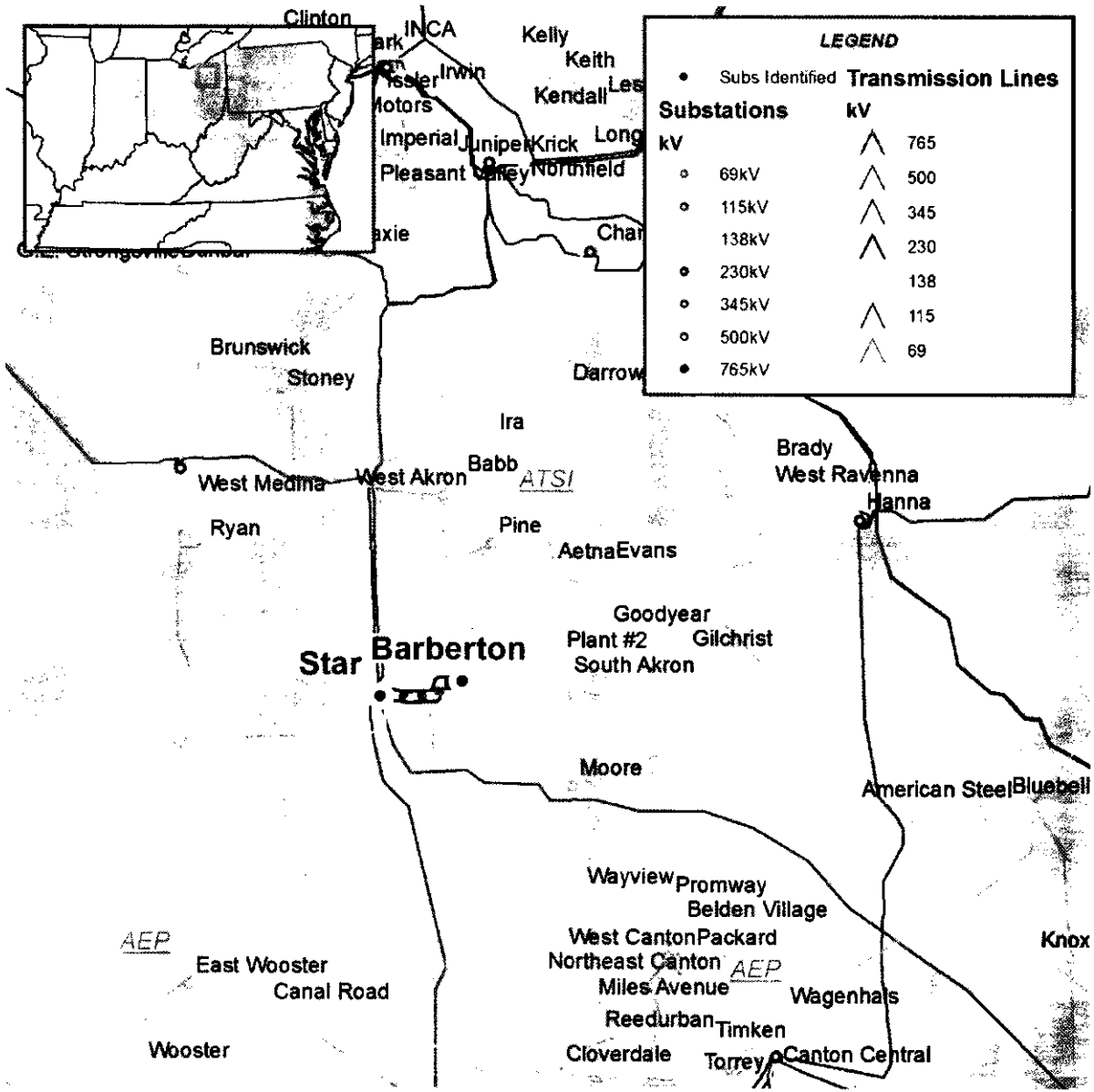
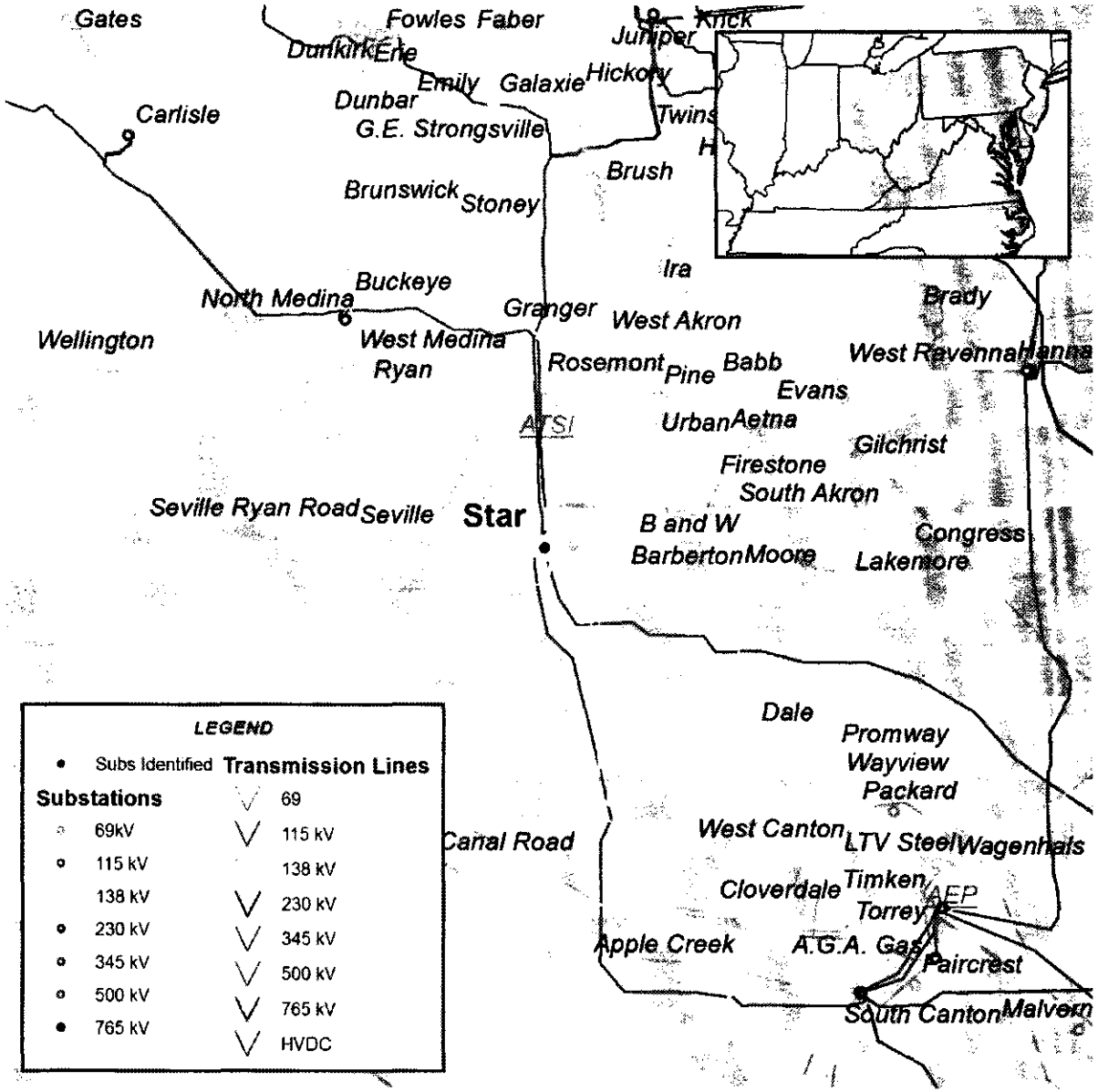
ATSI Transmission Zone Reinforcement

- N-1-1: The Barberton - Star 138kV line loads to 104.3% of its rating of 206 MVA for the single contingency loss of Star – Cloverdale 138 kV line followed by the loss of Star – Barberton 138 kV line #2.
- Replace Barberton - Star 138 kV #1 wavetrap, CFZ relay, and line exit conductor at Barberton (existing upgrade b1285)
- Estimated Project Cost: $0.08M
- Projected in-service date: 6/1/2012



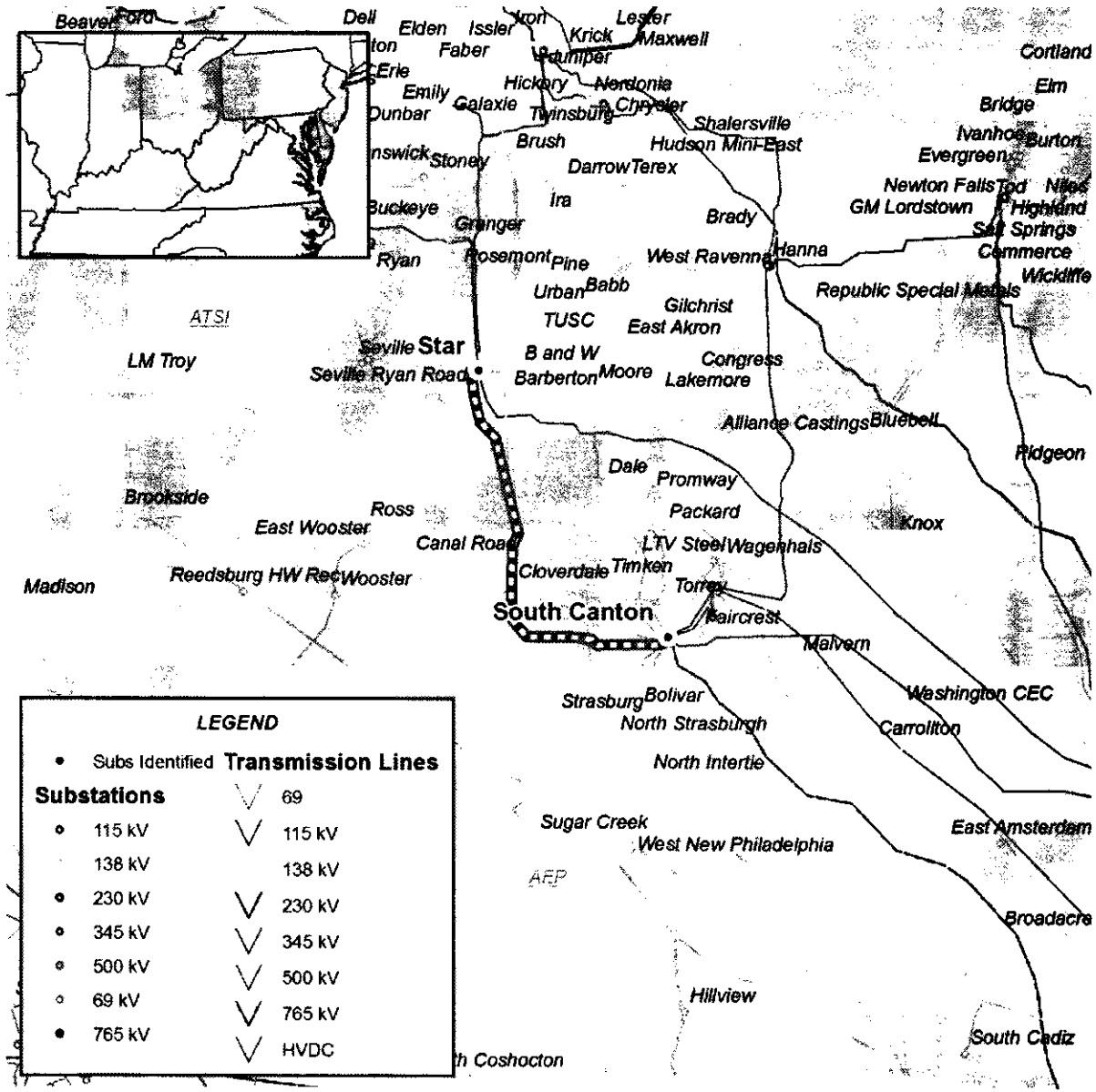
ATSI Transmission Zone Reinforcement

- Replace the Star 345/138 kV #3 transformer with a larger transformer (existing base line upgrade b1693)
- Estimated Project Cost: $5M
- Projected in-service date: 6/1/2013



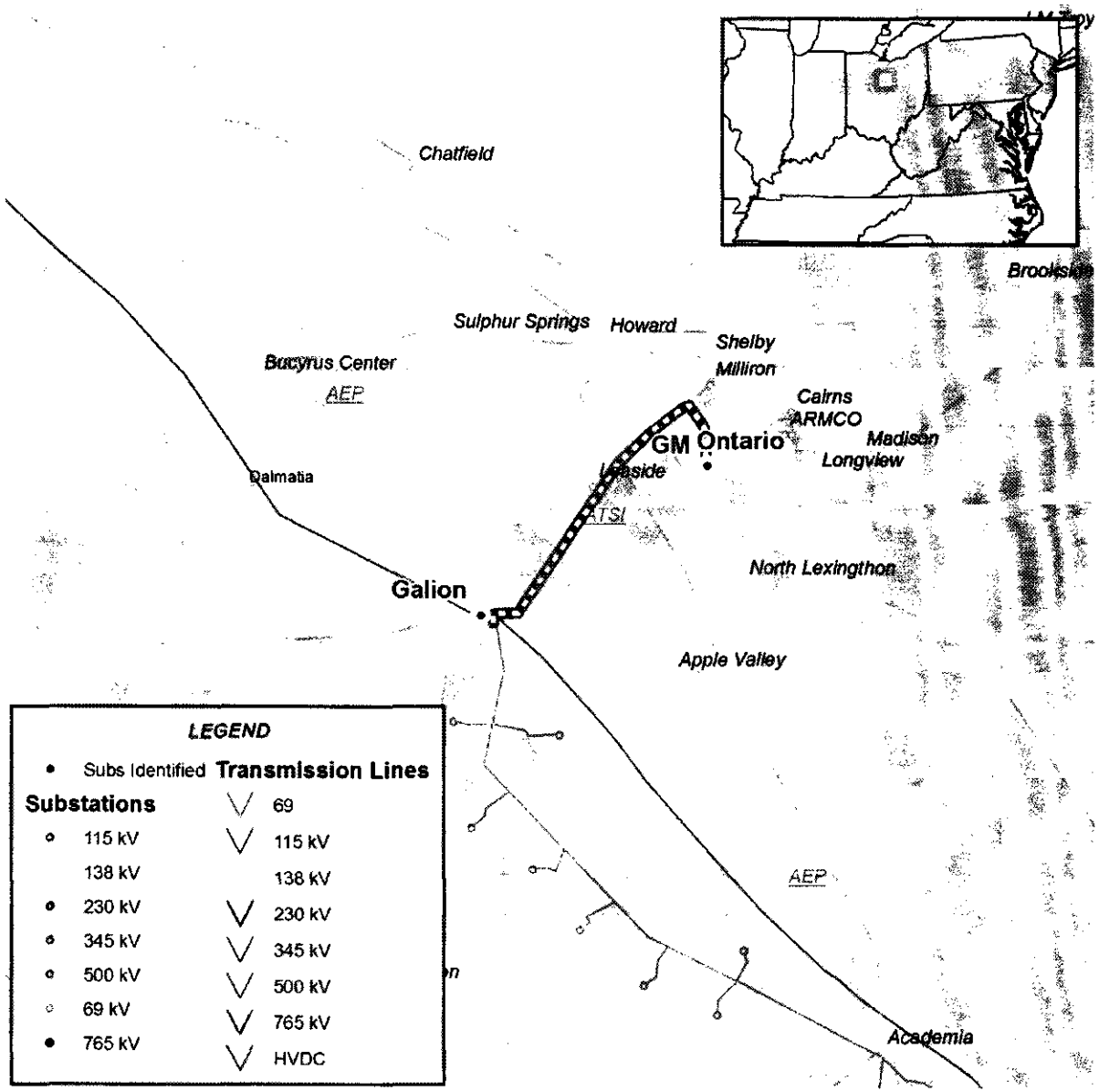
ATSI Transmission Zone Reinforcement

- Previously identified for Armstrong 1 & 2;Ashtabula 5; Bayshore 2-4; Eastlake 1-5; Lake Shore 18; R Paul Smith 3 & 4
- Common Mode Outage Procedure: Star 345kV B-12 breaker Failure, Star B-8 138kV breaker Failure, Barberton-Star 138kV + Cloverdale-Star 138kV TWL, results in thermal overloads on Star 345-138kV TR #1 101%, Star-Barberton #1 106%, and Star-Barberton #2 103%
- Create a new Harmon 345/138/69 kV substation by looping in the Star – South Canton 345 kV line
- Estimated Project Cost: $46M
- Projected in-service date: 6/1/2015



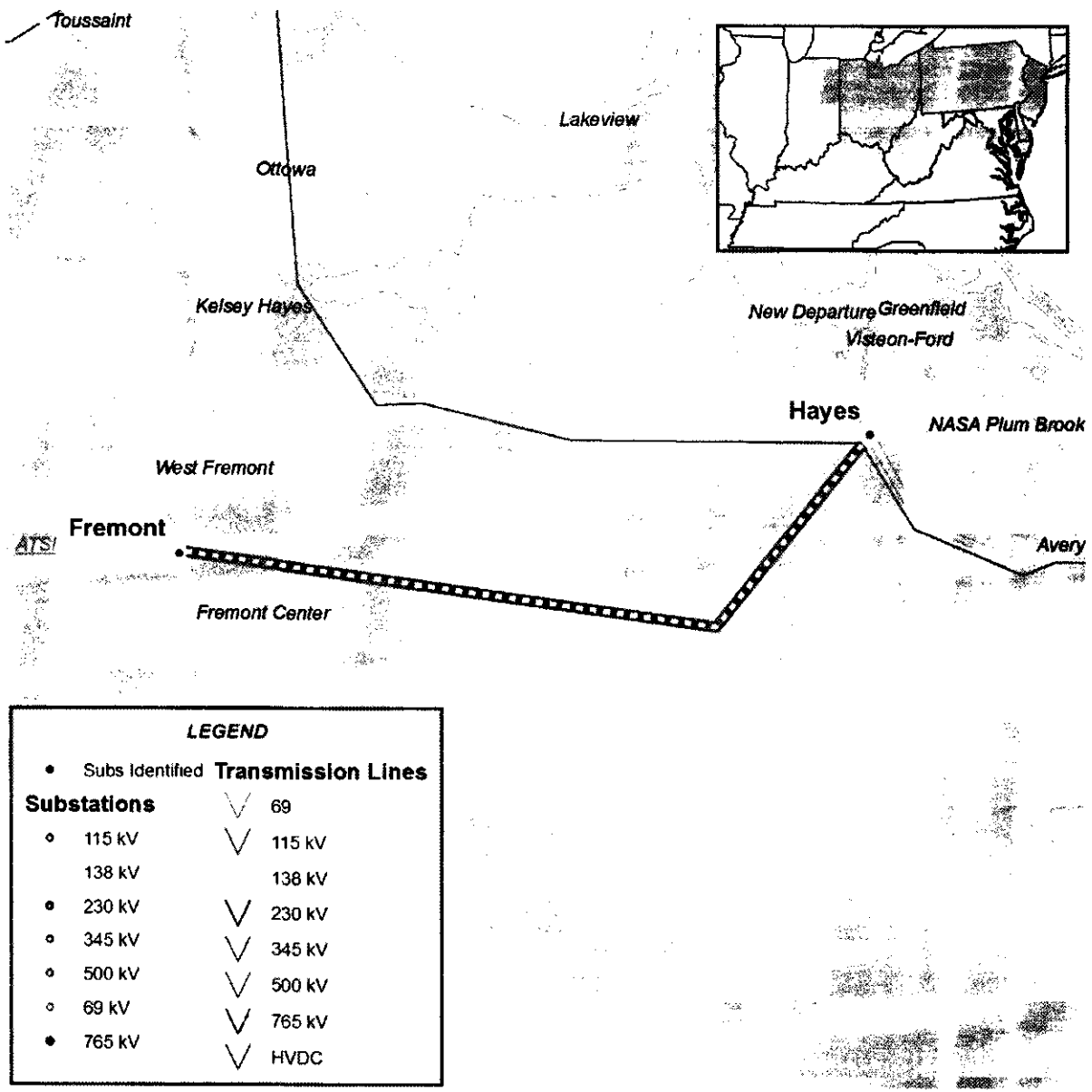
ATSI Transmission Zone Reinforcement

- The Galion - Gen. Motors Corp Cpc Group ckt 1 138/138kV line loads to 105.88% of its rating of 225 MVA for the tower contingency loss of Brookside – Howard 138 kV line and Brookside – Milliron 138 kV line.
- Galion - Gen. Motors Corp Cpc Group - Ontario line: Remove loop to Gen. Motors Corp Cpc Group substation (existing base line upgrade b1585)
- Estimated Project Cost: $0.05M
- Projected in-service date: 6/1/2012 (Advance from 6/1/2016)



ATSI Transmission Zone Reinforcement

- The Ottawa – Lakeview 138 kV line is loaded to 123.66% for the tower contingency loss of DAVIS BESSE-BEAVER and DAVIS BESSE-HAYES 345 KV lines.
- The Lakeview - Greenfield 138 kV line is loaded to 118.08% for the tower contingency loss of DAVIS BESSE-BEAVER and DAVIS BESSE-HAYES 345 KV lines.
- Build a new West Fremont-Groton-Hayes 138kV line
- Estimated Project Cost: $45M
- Projected in-service date: 6/1/2018
- Short term: Existing Operating Procedure to open Lakeview-Greenfield from 6/1/2012 through 6/1/2018



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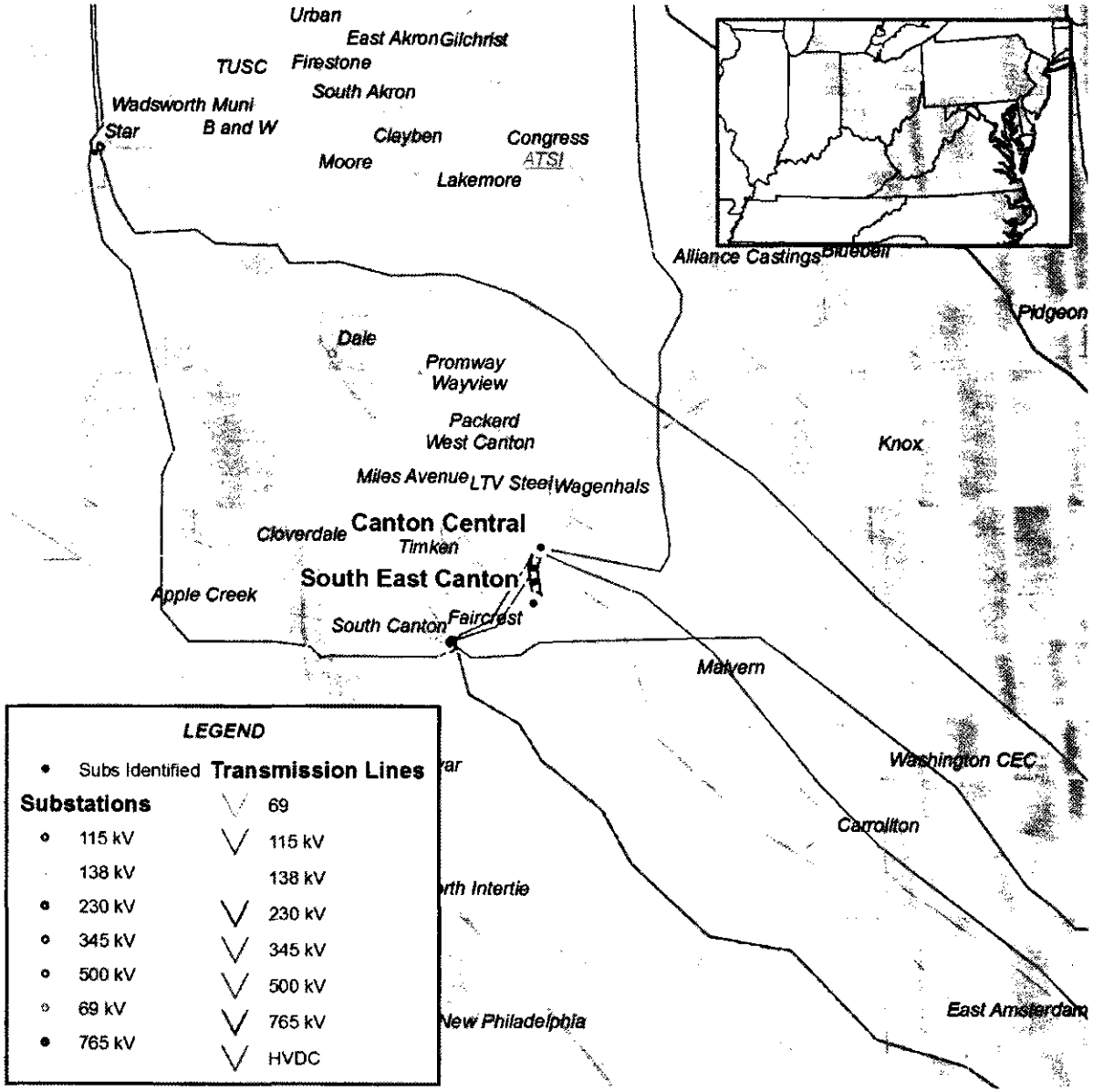
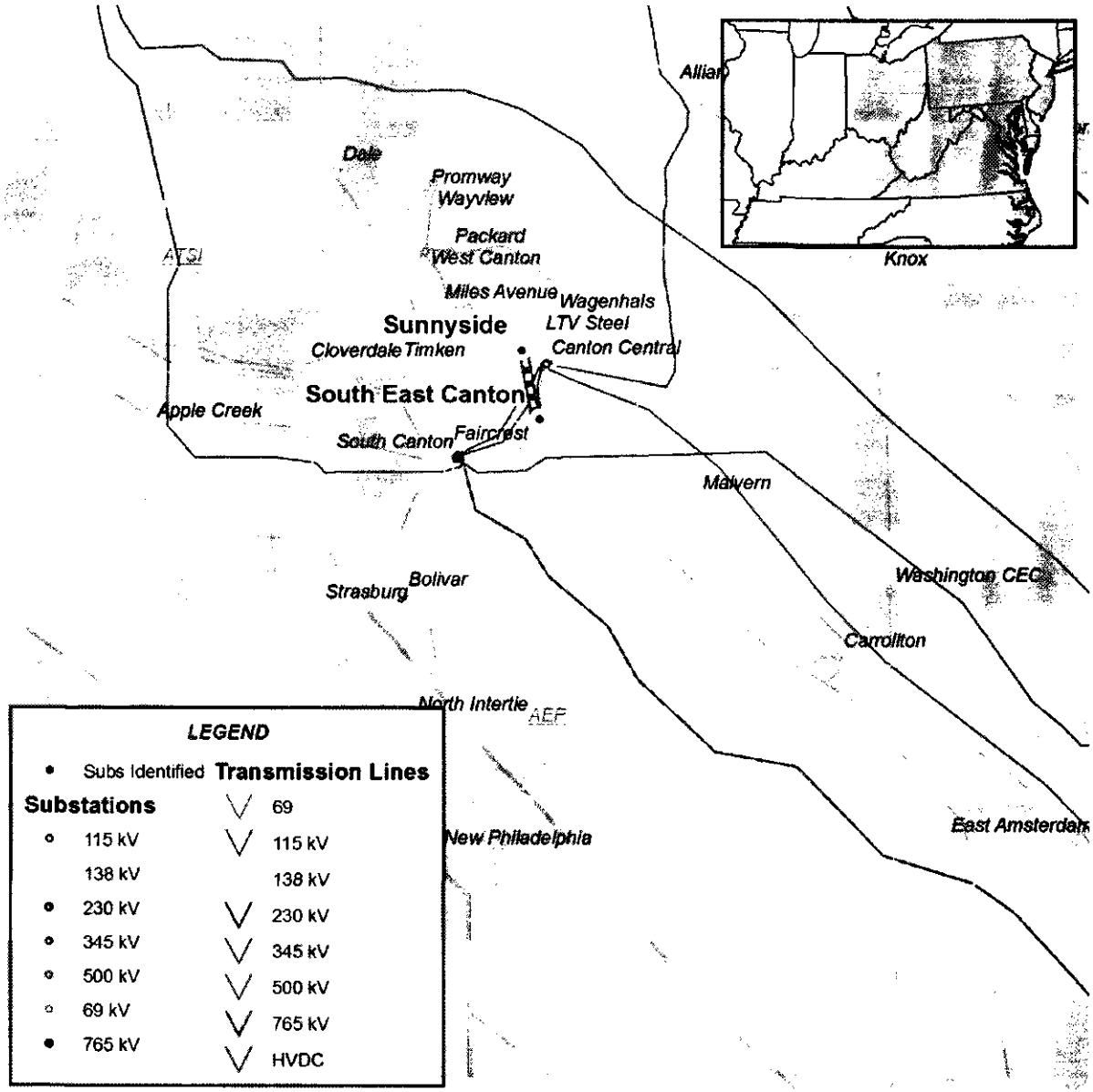
AEP Transmission Zone Reinforcement

- The Canton Central - Southeast Canton 138kV line loads to 173.5% of its rating of 296 for the single contingency loss of Canton Central 345/138 kV transformer #12 followed by the loss of S.Canton – Torrey 138 kV line and SE Canton – Sunnyside 138 kV line
- Sag Study on 7.2 miles SE Canton-Canton Central 138kV ckt.
- Estimated Project Cost: $0.3M
- Projected in-service date: 12/1/2012



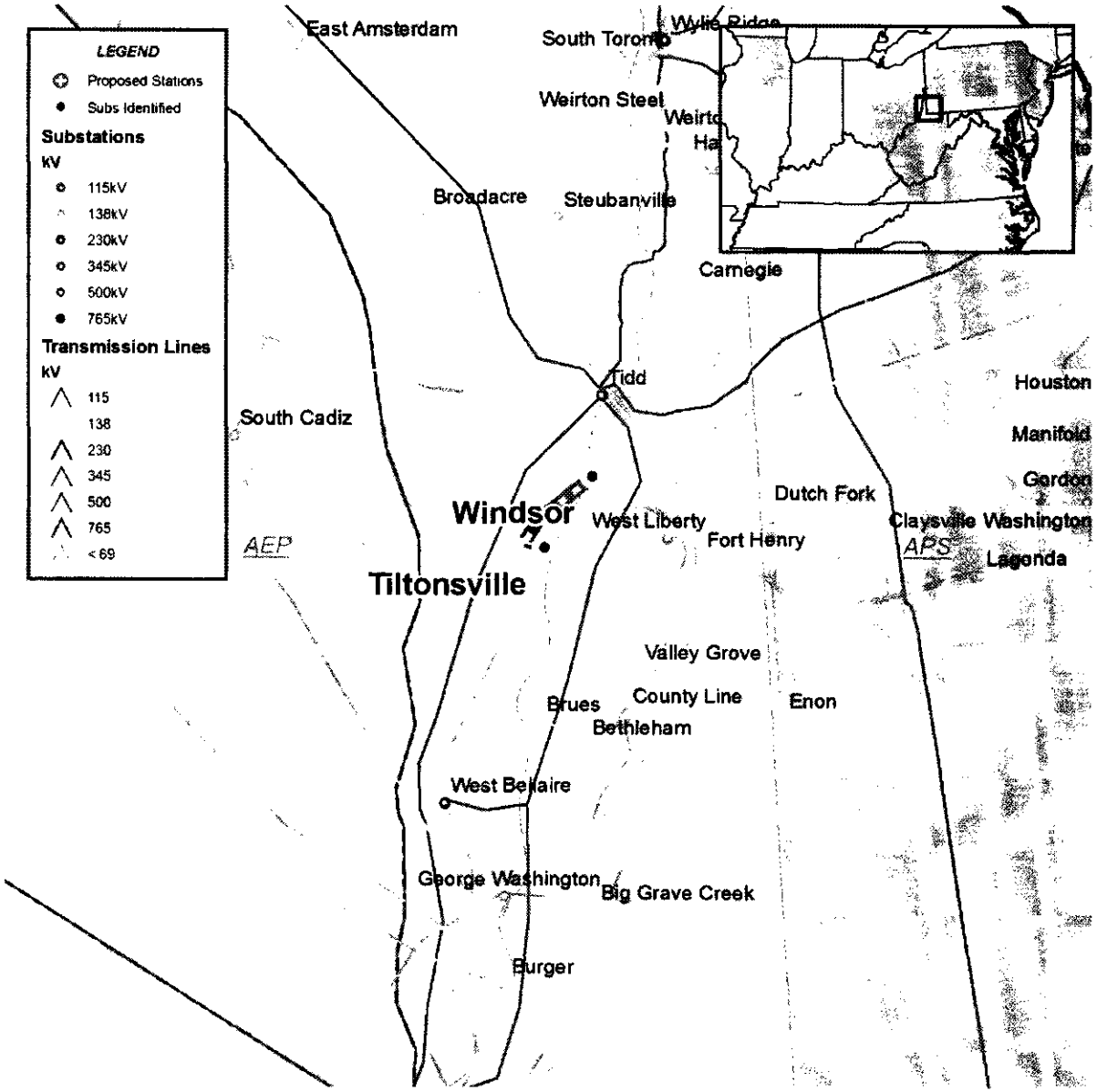
AEP Transmission Zone Reinforcement

- The Southeast Canton - Sunnyside 138kV line loads to 113.4% of its rating of 296 for the single contingency loss of Canton Central – SE Canton 138 kV line followed by the loss of S.Canton – Torrey 138 kV line.
- Sag study on the Southeast Canton – Sunnyside 138kV line
- Estimated Project Cost: $0.25M
- Projected in-service date: 12/1/2012



AEP Transmission Zone Reinforcement

- The Tiltonsville - Windsor ckt 1 138/138kV line loads to 137.3% of its rating of 205 MVA for the stuck breaker contingency loss of Kammer – S.Canton 765 kV line, Kammer 765/500 kV transformer, S.Canton 765/345 kV transformer, Kammer – 502 Junction 500 kV line, and S.Canton 345/138 kV transformer #4.
- Sag study on the Tiltonsville - Windsor 138 kV circuit (existing base line upgrade b1457)
- Estimated Project Cost: $.02M
- Projected in-service date: 12/1/2012



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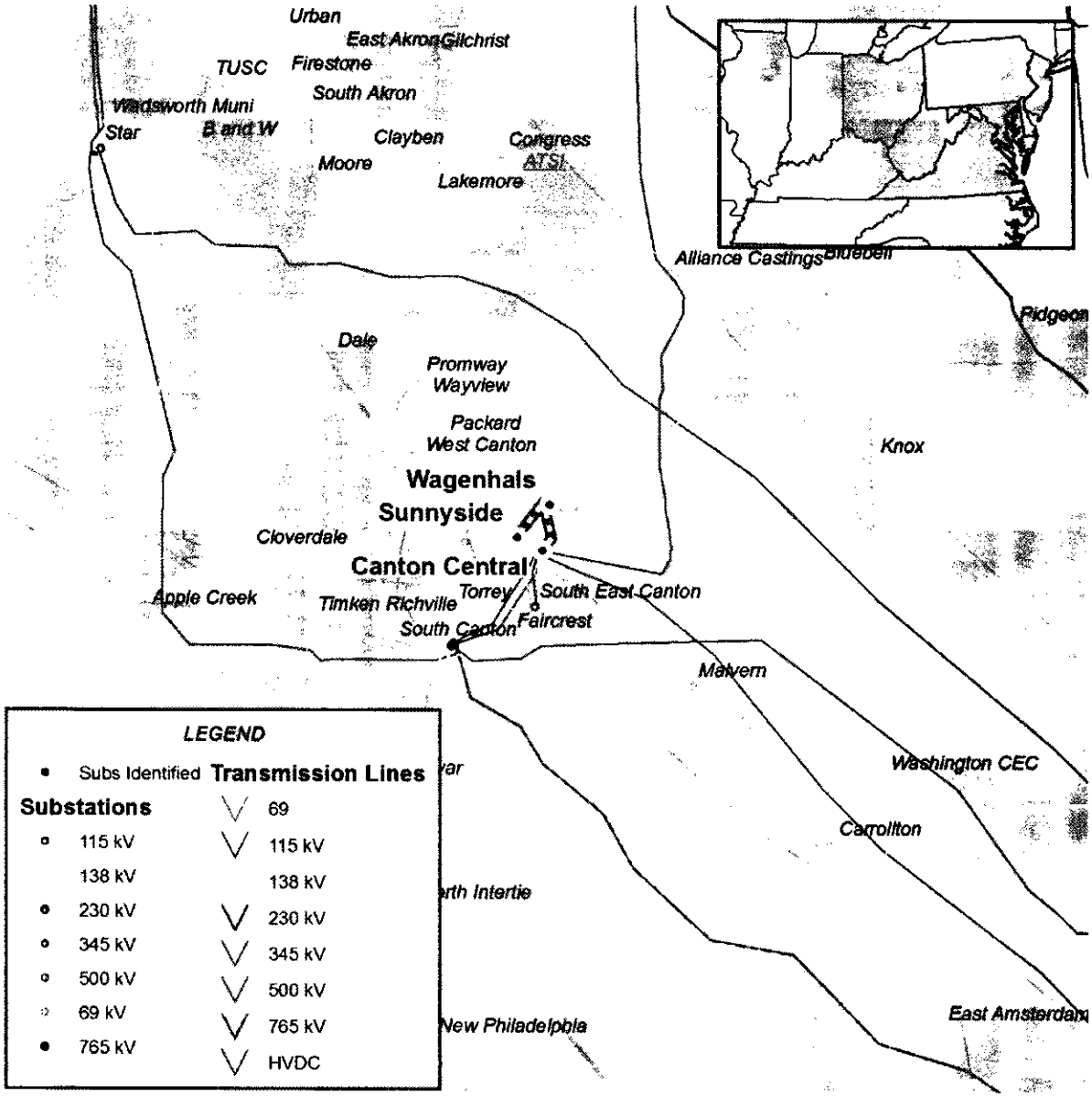
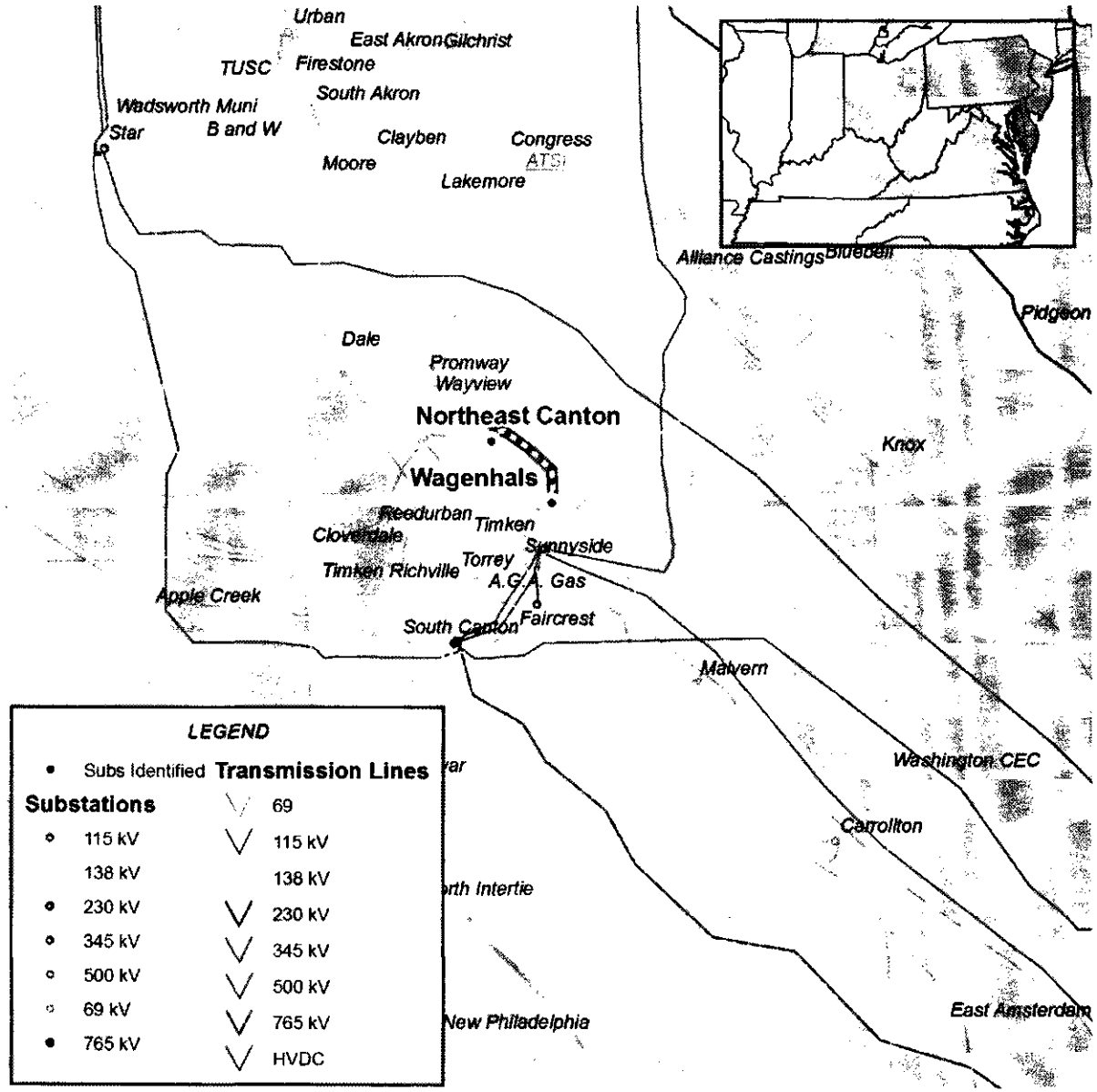
AEP Transmission Zone Reinforcement

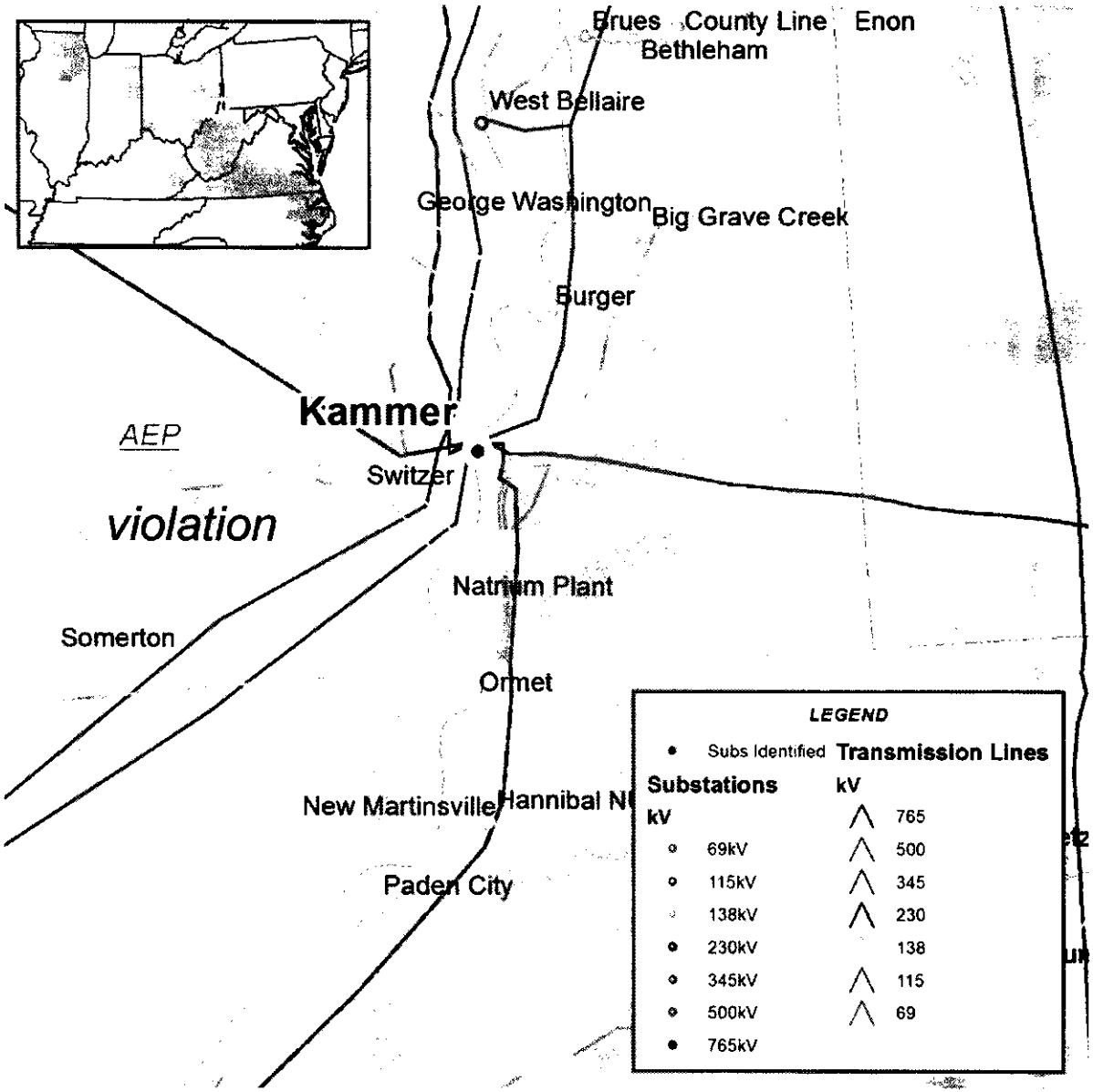
- The Canton Central - Wagenhals 138kV line loads to 148.1% of its rating of 296 for the single contingency loss of S.Canton – Torrey 138 kV line and SE Canton – Sunnyside 138 kV line followed by the loss of Canton Central – Wagenhals 138 kV line.
- Sag study on the Sunnyside - Canton Central - Wagenhals 138kV line (existing base line upgrade b1455)
- Estimated Project Cost: $.032M
- Projected in-service date: 12/1/2012



AEP Transmission Zone Reinforcement

- The Northeast Canton - Wagenhals 138kV line loads to 110.9% of its rating of 205 for the single contingency loss of the S.Canton 345/138 kV transformer #1 followed by loss of the Negley – Reedurban 138 kV line and Negley – Torrey 138 kV line.
- Sag study on the North East Canton - Wagenhals 138kV circuit (existing base line upgrade b1500)
- Estimated Project Cost: $.02M
- Projected in-service date: 12/1/2012



AEP Transmission Zone Reinforcement

- The Belmont #1 765/500kV transformer overloads to 117.11% for the stuck breaker contingency loss of Kammer – S.Canton 765 kV line, Kammer 765/500 kV transformer, S.Canton 765/345 kV transformer, Kammer – 502 Junction 500 kV line, and S.Canton 345/138 kV transformer #4.
- Add four 765 kV breakers at Kammer remove stuck breaker contingency which causes several violations.
- Estimated Project Cost: $30M
- Projected in-service date: 6/1/2015