Before the

Pennsylvania Public Utility Commission

BUXMONT-ELROY 138/69 kV TRANSMISSION LINE REBUILD PROJECT

ATTACHMENTS IN SUPPORT OF THE

LETTER OF NOTIFICATION

Application Docket No._____

Submitted by: PPL Electric Utilities Corp.

ATTACHMENT 1

BUXMONT – ELROY 138/69 kV TRANSMISSION LINE REBUILD PROJECT NECESSITY STATEMENT

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A. INTRODUCTION

PPL Electric Utilities Corporation (PPL Electric) is requesting Pennsylvania Public Utility Commission (PUC or the Commission) approval to rebuild the approximately 7.8-mile Buxmont-Elroy #1 and #2 69 kilovolt (kV) transmission lines, the approximately 0.25-mile Elroy-Hatfield #1 and #2 138/69 kV transmission lines, the approximately 0.35-mile Elroy #1 and #2 138/69 kV transmission taps, and the approximately 354 feet of the Hatfield #1 and #2 69 kV transmission taps (the Project). The total length of the Project is approximately 8.5 miles. These transmission lines are located in Franconia and Hatfield Townships, Montgomery County, and West Rockhill Townships, Bucks County, Pennsylvania. As explained below, these transmission lines have reached the end of their useful life and must be replaced in order to ensure continued safe and reliable electric service to approximately 17,060 customers. The Project is part of PPL Electric's Asset Optimization Strategy, and involves rebuilding the lines to meet all current design and lightning protection standards.

Subject to the Commission's approval, construction is scheduled to begin in September 2017, to support the Project's in-service date of June 2018. The estimated cost of the Project is $13.3 million.

B. TRANSMISSION SYSTEM PLANNING PROCESS

The nation's interconnected transmission grid serves as the backbone for the safe and reliable delivery of large amounts of electricity from generating stations over substantial distances to customers served by transmission and local distribution systems. It is critically important that this interconnected transmission system (transmission grid) be planned and designed to be highly reliable so that reliable electric service can be provided under all loading conditions and when certain elements of the system are out of service (system contingencies) due to planned or unplanned outages.

System Planning is the process that assures that the transmission system can supply electricity to all customer loads in a manner that is reliable and economical. This System Planning process assures that both the Bulk Electric System (BES)[1] and non-Bulk Electric System (non-BES)[2] are planned and constructed so that:

- They are able to accommodate forecasted system flows during summer and winter peak load.
- They can adequately serve each customer's need with regard to capacity, voltage and reliability for all load levels throughout the daily load cycle.
- They can sustain probable contingencies and disturbances with minimal customer service interruptions.
- They are in conformance with North American Electric Reliability Corporation (NERC), PJM Interconnection, LLC (PJM), and the Transmission Owner's reliability criteria for all normal and emergency operating conditions.

PJM is a Federal Energy Regulatory Commission (FERC)-approved Regional Transmission Organization (RTO) charged with ensuring the reliability of the electric transmission system under its functional control (100 kV and above), and coordinating the movement of electricity in all or parts of 13 states and the District of Columbia, including most of Pennsylvania. In order to ensure reliable transmission service, PJM prepares an annual Regional Transmission Expansion Plan (RTEP)[3] to identify system reinforcements that are required to, among other things, meet the NERC Reliability Standards, PJM reliability planning criteria, and Transmission Owner reliability criteria.

[1] Bulk Electric System (BES) – Includes transmission facilities operated at voltages of 100 kV or higher.

[2] Non-Bulk Electrical System (non-BES) – Includes transmission facilities operated at voltages less than 100 kV.

[3] PJM's RTEP process is currently set forth in Schedule 6 of PJM's Amended and Restated Operating Agreement (Schedule 6). Schedule 6 governs the process by which PJM's members rely on PJM to prepare an annual regional plan for the enhancement and expansion of the transmission facilities to ensure long-term, reliable electric service consistent with established reliability criteria. In addition, Schedule 6 addresses the procedures used to develop the RTEP, the review and approval process for the RTEP, the obligation of transmission owners to build transmission upgrades included in the RTEP, and the process by which interregional transmission upgrades will be developed.

PJM conducts RTEP studies in conjunction with its Transmission Owners and applies NERC, regional, and Transmission Owner reliability criteria to specific conditions on the transmission system. PJM's RTEP is an annual process that encompasses a comprehensive series of detailed analyses to ensure power continues to flow reliably to customers under stringent reliability criteria set by NERC. PJM's manual 14B[4] outlines the RTEP process and reliability criteria used for this process. As set forth in manual 14B, every year PJM performs various reliability tests such as Baseline Thermal, Baseline Voltage, Load Deliverability, Generation Deliverability and Baseline Stability to ensure safe reliable of operation of electric grid.

When the studies show an inability of the transmission system to meet specific reliability criteria under these conditions, PJM opens an RTEP Window in accordance with FERC Order 1000[5] to identify the optimal solution to resolve the criteria violation.

PPL Electric, as a Transmission Owner and member of PJM, undertakes an independent analysis of both its BES transmission facilities, and its non-BES transmission facilities in concert with the PJM RTEP process. PPL Electric identifies all conditions where the future system does not meet the NERC criteria, PJM reliability criteria, or PPL Electric Transmission Owner criteria. In this way, PPL Electric actively participates in the PJM RTEP process, and through this participation PPL Electric provides results of its independent studies to PJM for consideration and inclusion in the PJM RTEP.

Alternatives that can mitigate violations to the reliability criteria are developed and analyzed to ensure that the PPL Electric transmission system meets the reliability criteria. Estimated costs and lead times to implement the reinforcements are prepared. PPL Electric then proposes

[4] PJM Manual 14B is available at http://www.pjm.com/~/media/documents/manuals/m14b.ashx
[5] http://www.ferc.gov/industries/electric/indus-act/trans-plan.asp

solutions to PJM through an RTEP window. If the project is awarded to PPL Electric, it then becomes a baseline RTEP project.

PPL Electric's Transmission Owner criteria address thermal, voltage, short circuit, and stability limits specific to the PPL Electric zone and also ensure compliance with NERC and PJM reliability criteria. These criteria ensure adequate and appropriate levels of electric service to PPL Electric customers in accordance with good utility practices. In addition to these criteria, PPL Electric plans the system according to its own Transmission System Development Standards.

In addition to NERC, PJM, and Transmission Owner criteria-based projects, PPL Electric also initiates projects based on the Transmission System Development Standards. These projects address local load growth, provide load restoration flexibility, and replace poor performing transmission assets in order to provide an advanced level of reliability on the local system.

PPL Electric's Transmission System Development Standards also consider transmission needs to support the development of the distribution system. When the distribution system needs to either expand existing distribution substations with new transformation or install new distribution substations to support local load growth on the distribution system, new transmission facilities are required to accommodate that expansion.

PPL Electric has developed an Asset Optimization Strategy that is incorporated into the Transmission System Development Standards. A significant portion of PPL Electric's system infrastructure is either approaching the end of or has exceeded its expected or useful life. The Asset Optimization Strategy was developed to systematically identify and modernize these aging facilities. The measures used to identify and prioritize the equipment and lines that qualify for this work include, but are not limited to, age, condition, operational issues, maintainability of the equipment, criticality of the equipment or line, line loading, and circuit performance. Once

equipment has been identified and assessed under the above measures, it will be put into the Capital Budget for replacement under the Asset Optimization Strategy.

Projects created to support PPL Electric's Transmission System Development Standards may be presented to PJM stakeholders at either a TEAC or Sub-Regional RTEP meeting and are assigned a Supplemental project number in the RTEP. PJM incorporates these projects into the power flow model which they use to perform various reliability analyses for the RTEP.

As explained below, the proposed Project is necessary to maintain the reliability of the transmission system serving Montgomery and Bucks Counties according to PPL Electric Transmission System Development Standards.

C. DEFINITION OF THE PROBLEM

The existing Buxmont-Elroy #1 and #2 69 kV transmission lines extend approximately 7.8 miles between the Buxmont Substation located in West Rockhill Township, Bucks County, and the tap point with the Elroy Substation located in Hatfield Township, Montgomery County. The double-circuit Buxmont-Elroy #1 and #2 69 kV transmission lines were constructed in the 1950s and are approximately 67 years old.

The Elroy #1 and #2 138/69 kV transmission taps interconnect the Buxmont-Elroy #1 and #2 69 kV lines with the Elroy Substation located in Hatfield Township, Montgomery County. These taps lines extend approximately 0.35 miles from the transmission line right-of-way to the Elroy Substation. The tap lines were constructed in the late 1960s and are approximately 50 years old.

The existing Elroy-Hatfield #1 and #2 138/69 kV transmission lines extend approximately 0.25 miles from the tap point with Elroy Substation to the Hatfield Substation located in Hatfield

Township, Montgomery County. The double-circuit Elroy-Hatfield #1 and #2 138/69 kV transmission lines were constructed in the late 1960s and are approximately 50 years old.

The existing Hatfield #1 and #2 69 kV transmission taps extend approximately 354 feet between Elroy-Hatfield #1 and #2 138/69 kV transmission lines and Hatfield Substation, and are located in Hatfield Township and Franconia Township, Montgomery County. The tap lines were constructed in the late 1960s and are approximately 50 years old.

Collectively, the Buxmont-Elroy #1 and #2 69 kV transmission lines, Elroy-Hatfield #1 and #2 138/69 kV transmission lines, Elroy #1 and #2 138/69 kV transmission taps, and Hatfield #1 and #2 69 kV transmission taps serve approximately 17,060 customers as well as five transmission customers in Bucks and Montgomery Counties. A one-line diagram of the existing system is provided as **Figure 1-1**. A map of the existing facilities is provided as **Figure 1-3**.

PPL Electric has determined that the Buxmont-Elroy #1 and #2 69 kV transmission lines, Elroy-Hatfield #1 and #2 138/69 kV transmission lines, Elroy #1 and #2 138/69 kV transmission taps, and Hatfield #1 and #2 69 kV transmission taps have exceeded their expected life[6] and reached an age and condition such that the facilities must be replaced in order to provide safe and reliable service into the future. These aging transmission lines consist of a mix of old and aging wood pole structures and hardware. PPL Electric analyzed these transmission lines and found deterioration of the structural components, foundations, insulators, line hardware, shield wire, grounding, and signage. Based on this analysis, PPL Electric concluded that the existing Buxmont-Elroy #1 and #2 69 kV transmission lines, Elroy-Hatfield #1 and #2 138/69 kV transmission lines, and Elroy #1 and #2 138/69 kV transmission taps are nearing the end of their useful lives and should be replaced.

[6] Expected life is been defined as the age when a facility exhibits a significant and sustained increase in maintenance costs combined with a higher likelihood of component failure.

D. PROPOSED SOLUTION

PPL Electric evaluated the cost to rehabilitate the Buxmont-Elroy #1 and #2 69 kV transmission lines, the Elroy-Hatfield #1 and #2 138/69 kV lines, Elroy #1 and #2 138/69 kV transmission taps, and Hatfield #1 and #2 69 kV transmission taps, and concluded that the total cost to rehabilitate these lines would be greater than the cost to completely rebuild them within the same right-of-way (ROW). Therefore, the rebuild of these aging and deteriorated transmission lines is the most prudent and cost-effective option. In addition, the proposed rebuilds are consistent with PPL Electric's Asset Optimization Strategy.

The existing Buxmont-Elroy #1 and #2 69 kV transmission lines will be rebuilt for approximately 7.8 miles from the Buxmont Substation to the tap point with the Elroy Substation. In addition, the entire length of the 0.35 mile Elroy #1 and #2 138/69 kV transmission taps between the Buxmont-Elroy #1 and #2 69 kV transmission line right-of-way and the Elroy Substation will be rebuilt. Also, the existing Elroy-Hatfield #1 and #2 138/69 kV transmission lines will be rebuilt for approximately 0.25 miles from the tap point with the Elroy Substation to the Hatfield substation will be rebuilt. Finally, the Hatfield #1 and #2 69 kV transmission taps will be rebuilt for approximately 354 feet between the Elroy-Hatfield #1 and #2 138/69 kV lines and Hatfield Substation.

A one-line diagram and map of the proposed facilities are provided as **Figure 1-2** and **Figure 1-4**, respectively.

The rebuilt transmission lines will each be constructed for future double-circuit 138 kV operation, but will initially be operated as double-circuit 69 kV lines. The existing wood pole structures and hardware will be removed and replaced with modern steel monopole structures. In addition, the existing conductors will be removed and replaced with modern conductors. Each transmission line will be rebuilt within the existing right-of-way and on property owned in fee by

PPL Electric. An engineering description is provided in Attachment 2 and a description of the right-of-way is provided in Attachment 3.

The Project will bring the transmission lines into compliance with current design standards, including increased vertical ground clearance, increased phase spacing for galloping loop consideration, and installation of steel monopole structures for optimal structure longevity and integrity. The Project will also increase the lightning protection of the transmission line to reduce the frequency of momentary outages experienced by customers. Additionally, as a part of the Project, PPL Electric will be installing MOLBAB (motor-operated load break air break) switches that will allow for remote sectionalizing of the transmission system to restore service to customers in instances of sustained outages or during various operational scenarios.

After completion of this Project, customers will experience improved service reliability. The higher line capacity will allow for improved operational flexibility and increased transfer capability, thereby contributing to quicker restoration times and a higher level of reliability for the customers served from these transmission lines. The Project will also allow for future voltage upgrades to the transmission line, which will accommodate additional line loading to meet future customer demand.

The total estimated cost of the Project is approximately $13.3 million.[7] Subject to the Commission's approval, construction is scheduled to begin September 2017 to meet an in-service date of June 2018.

[7] The estimated cost for the proposed Project is an order-of-magnitude estimate developed using averages of recent costs for similar projects and without an in-depth analysis of field investigation. The estimated cost is subject to change as the constructability of the Project, sequence of construction, and other factors that may affect cost are identified and analyzed as the Project progresses. The entire cost for this transmission line Project will be paid by PPL Electric. The costs and cost recovery of this transmission line Project is subject to the regulatory jurisdiction of the Federal Energy Regulatory Commission.

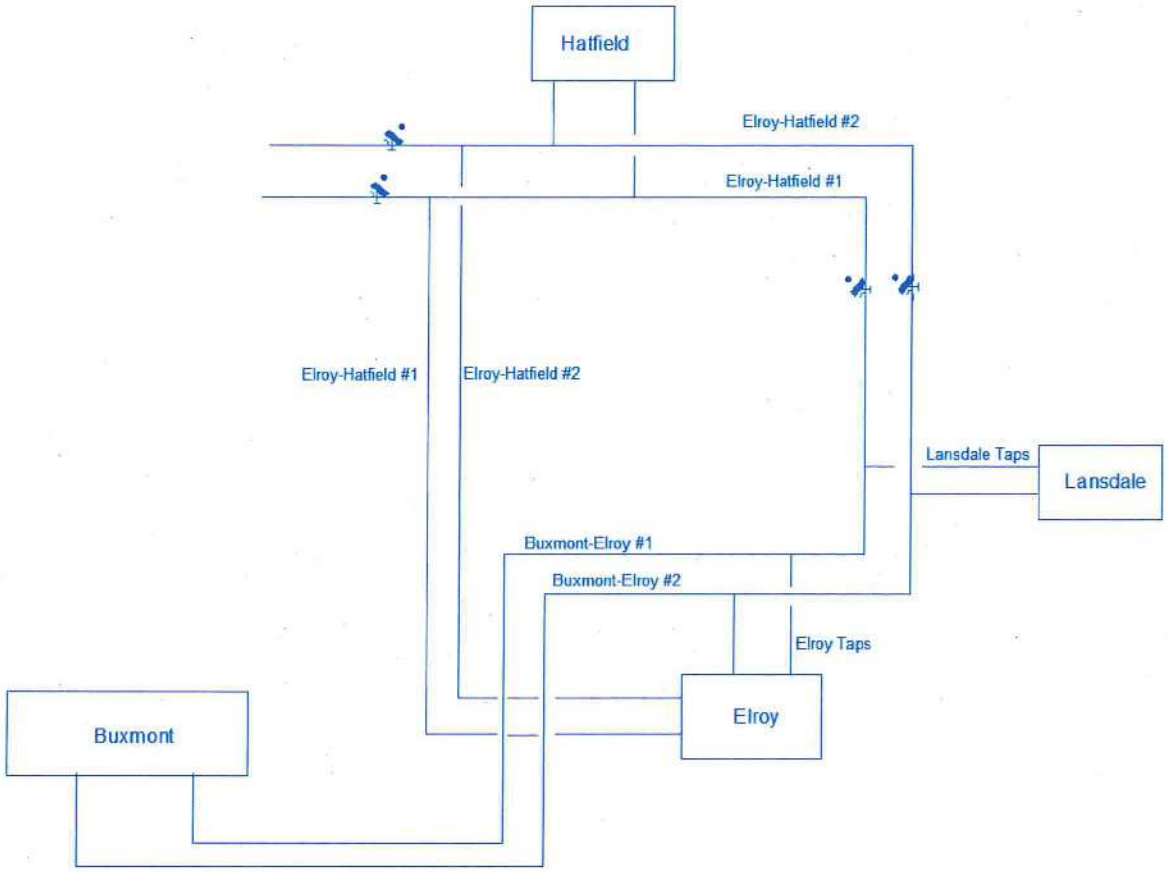


Figure 1-1 - Existing 69 kV Configuration

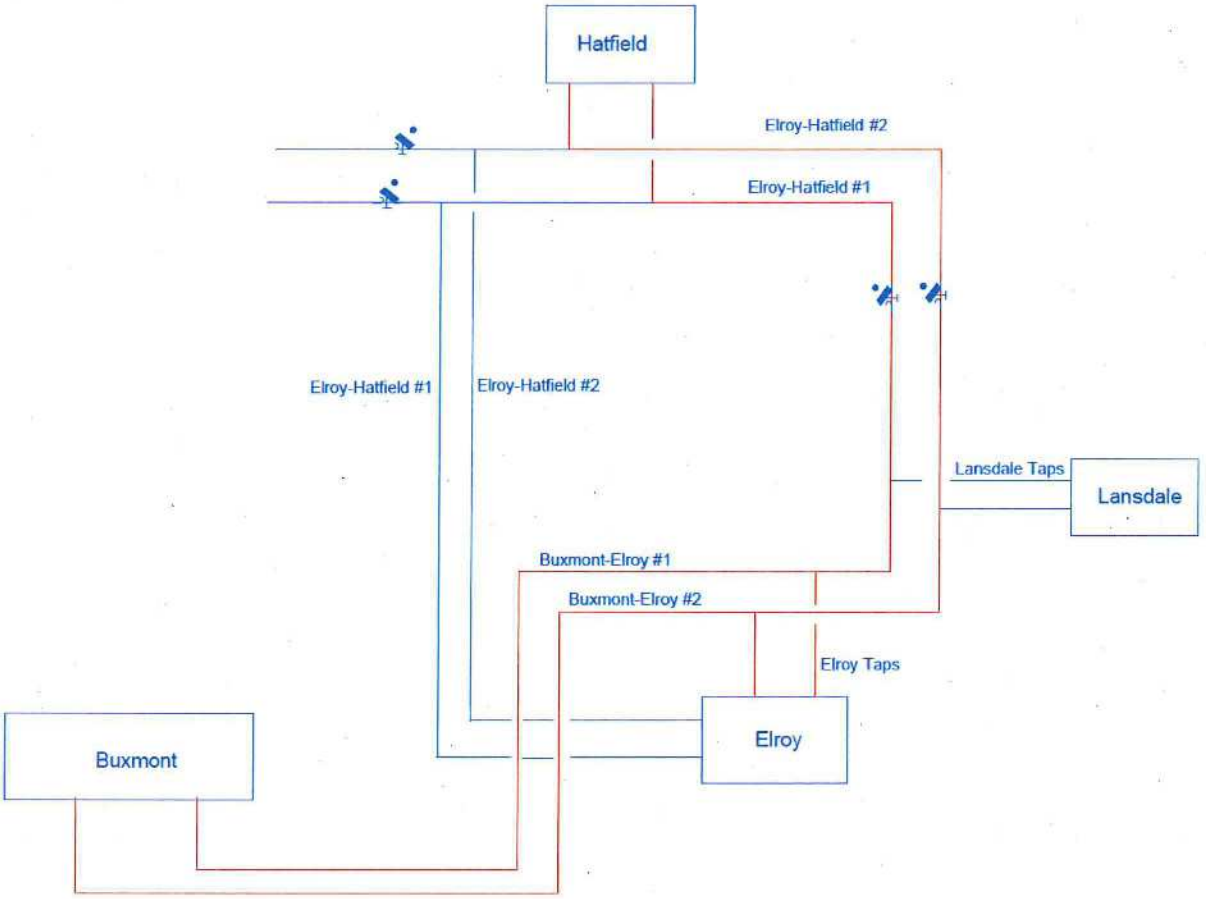
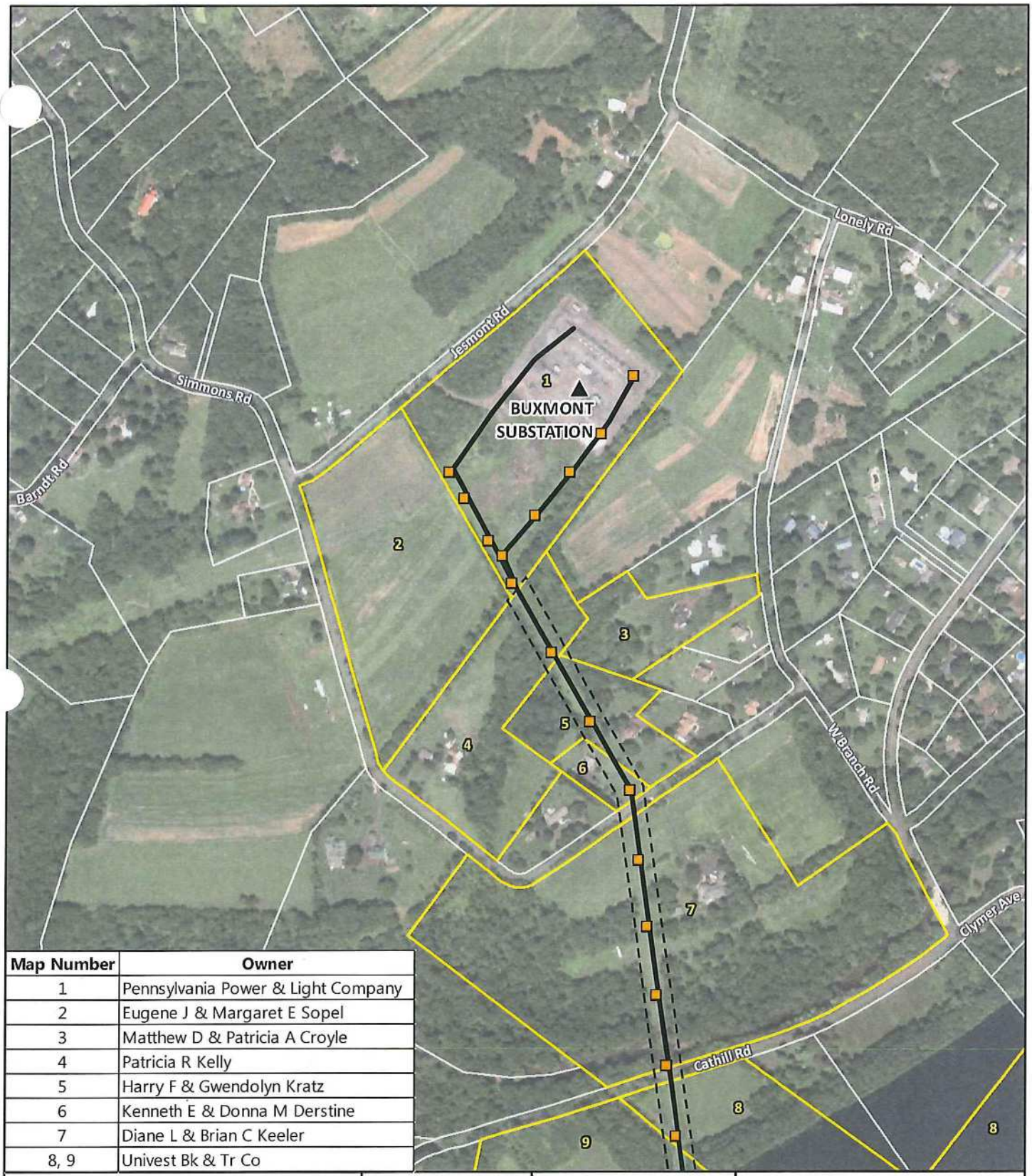


Figure 1-2 - Proposed 138/69 kV Configuration (Blue = Existing Lines, Red = Proposed Rebuilds)

Figure 1-3



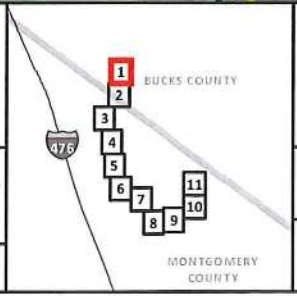
Map Number	Owner
1	Pennsylvania Power & Light Company
2	Eugene J & Margaret E Sopel
3	Matthew D & Patricia A Croyle
4	Patricia R Kelly
5	Harry F & Gwendolyn Kratz
6	Kenneth E & Donna M Derstine
7	Diane L & Brian C Keeler
8, 9	Univest Bk & Tr Co

- Substation
- Existing Structure Location
- Rebuild Centerline
- Existing ROW
- ROW Parcel

N

Coordinate System:
State Plane PA South
NAD 1983

June 08, 2017



Aerial Exhibit Map

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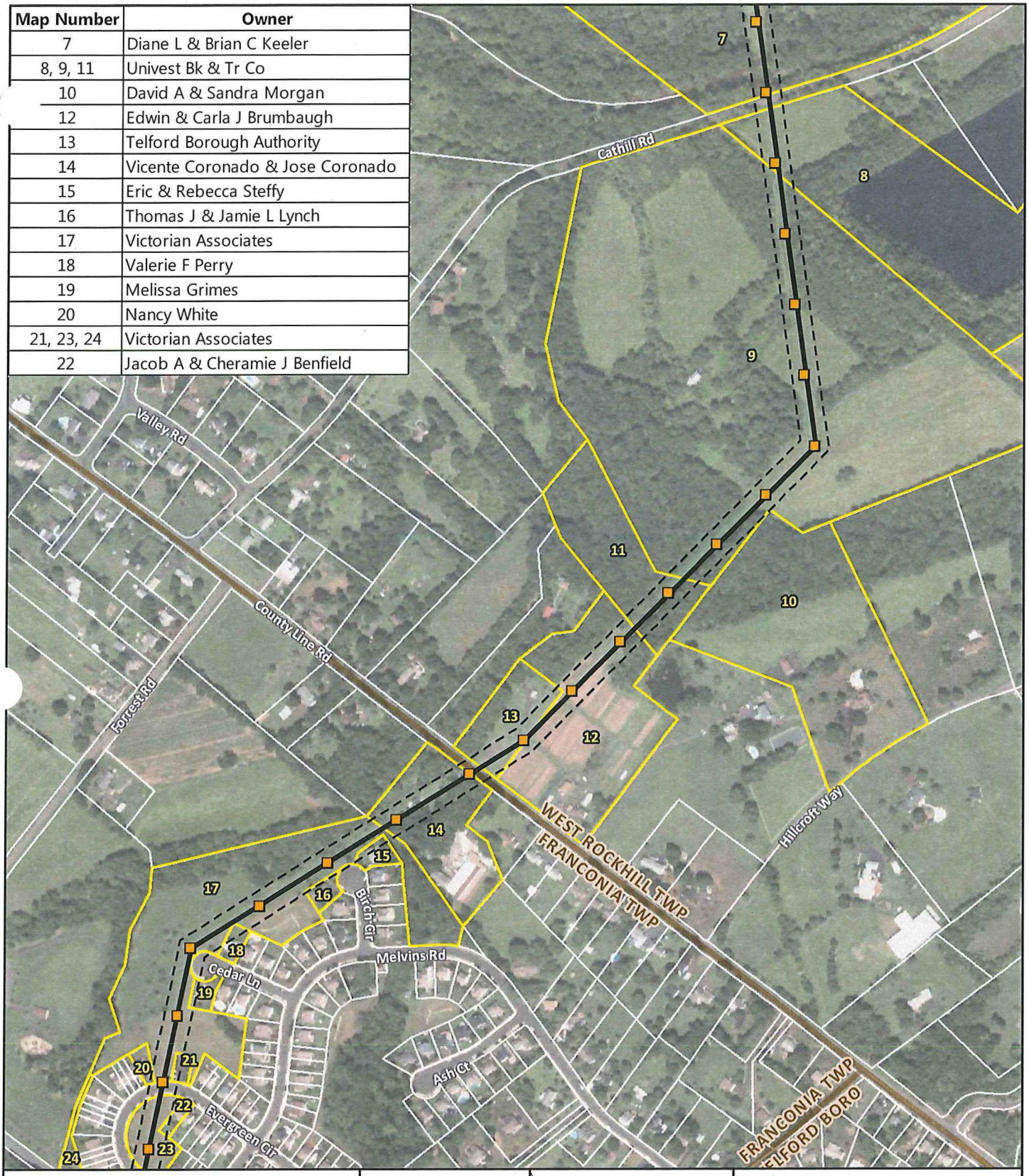
BuxMont - Elroy 138/69 kV
Transmission Line Rebuild Project

ppl
PPL Electric Utilities

0 100 200 400 600
Feet

Map Number	Owner
7	Diane L & Brian C Keeler
8, 9, 11	Univest Bk & Tr Co
10	David A & Sandra Morgan
12	Edwin & Carla J Brumbaugh
13	Telford Borough Authority
14	Vicente Coronado & Jose Coronado
15	Eric & Rebecca Steffy
16	Thomas J & Jamie L Lynch
17	Victorian Associates
18	Valerie F Perry
19	Melissa Grimes
20	Nancy White
21, 23, 24	Victorian Associates
22	Jacob A & Cheramie J Benfield

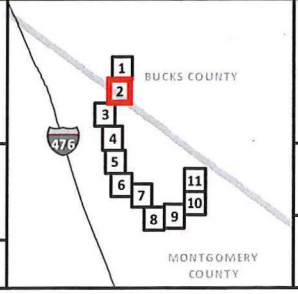


Substation
Existing Structure Location
Rebuild Centerline
Existing ROW
ROW Parcel

N

Coordinate System:
State Plane PA South
NAD 1983

June 08, 2017



Aerial Exhibit Map
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BuxMont - Elroy 138/69 kV
Transmission Line Rebuild Project

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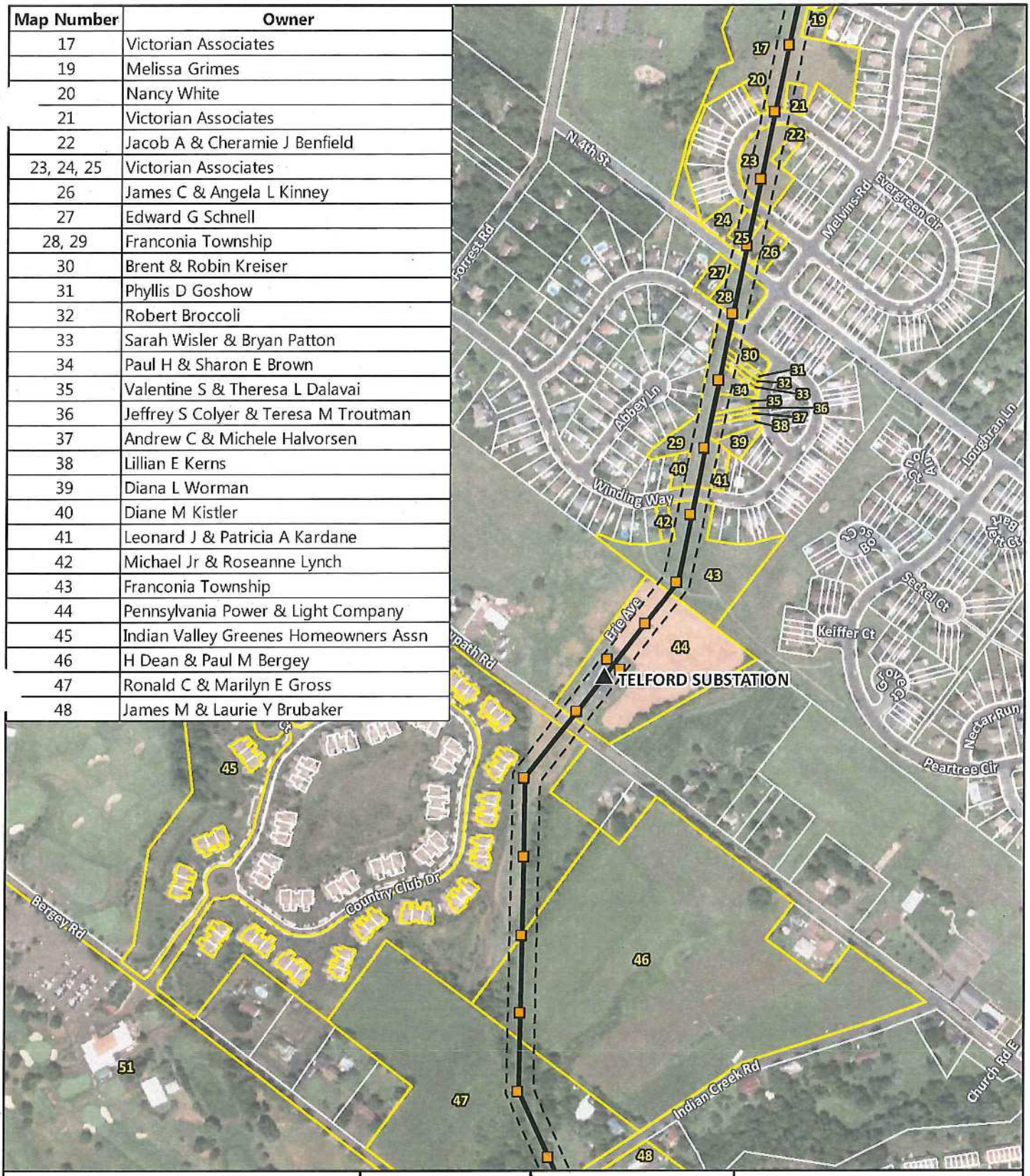
PPL Electric Utilities

0 100 200 400 600
Feet

Map Number	Owner
17	Victorian Associates
19	Melissa Grimes
20	Nancy White
21	Victorian Associates
22	Jacob A & Cheramie J Benfield
23, 24, 25	Victorian Associates
26	James C & Angela L Kinney
27	Edward G Schnell
28, 29	Franconia Township
30	Brent & Robin Kreiser
31	Phyllis D Goshow
32	Robert Broccoli
33	Sarah Wisler & Bryan Patton
34	Paul H & Sharon E Brown
35	Valentine S & Theresa L Dalavai
36	Jeffrey S Colyer & Teresa M Troutman
37	Andrew C & Michele Halvorsen
38	Lillian E Kerns
39	Diana L Worman
40	Diane M Kistler
41	Leonard J & Patricia A Kardane
42	Michael Jr & Roseanne Lynch
43	Franconia Township
44	Pennsylvania Power & Light Company
45	Indian Valley Greenes Homeowners Assn
46	H Dean & Paul M Bergey
47	Ronald C & Marilyn E Gross
48	James M & Laurie Y Brubaker

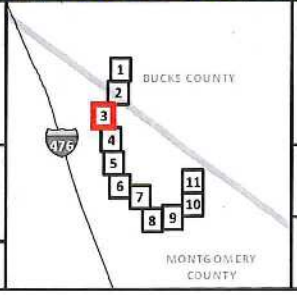


- Substation
- Existing Structure Location
- Rebuild Centerline
- Existing ROW
- ROW Parcel

N

Coordinate System:
State Plane PA South
NAD 1983

June 08, 2017



Aerial Exhibit Map

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BuxMont - Elroy 138/69 kV
Transmission Line Rebuild Project

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PPL Electric Utilities

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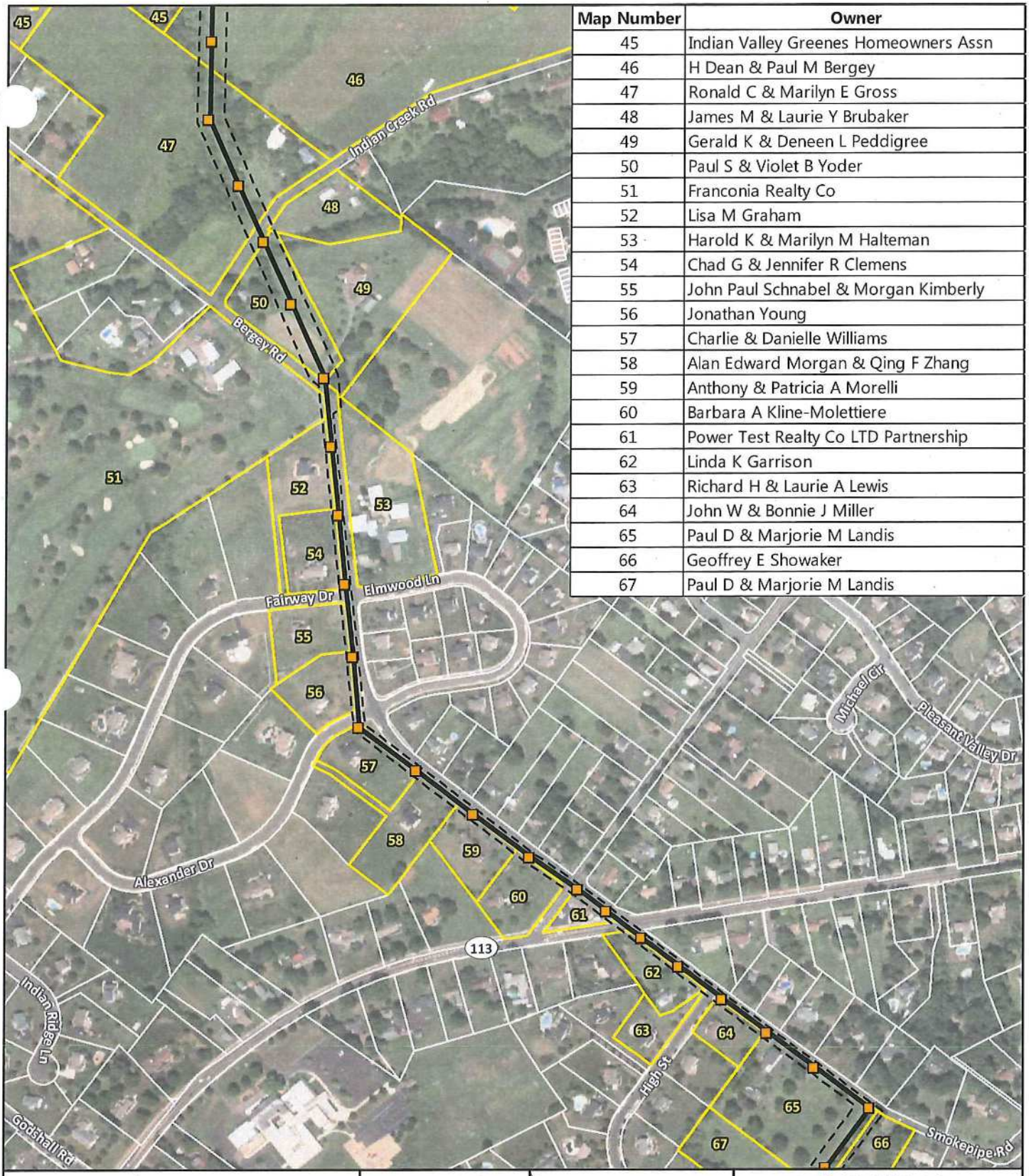
Feet



Map Number	Owner
45	Indian Valley Greenes Homeowners Assn
46	H Dean & Paul M Bergey
47	Ronald C & Marilyn E Gross
48	James M & Laurie Y Brubaker
49	Gerald K & Deneen L Peddigree
50	Paul S & Violet B Yoder
51	Franconia Realty Co
52	Lisa M Graham
53	Harold K & Marilyn M Halteman
54	Chad G & Jennifer R Clemens
55	John Paul Schnabel & Morgan Kimberly
56	Jonathan Young
57	Charlie & Danielle Williams
58	Alan Edward Morgan & Qing F Zhang
59	Anthony & Patricia A Morelli
60	Barbara A Kline-Molettiere
61	Power Test Realty Co LTD Partnership
62	Linda K Garrison
63	Richard H & Laurie A Lewis
64	John W & Bonnie J Miller
65	Paul D & Marjorie M Landis
66	Geoffrey E Showaker
67	Paul D & Marjorie M Landis

- Substation
- Existing Structure Location
- Rebuild Centerline
- Existing ROW
- ROW Parcel

N

Coordinate System:
State Plane PA South
NAD 1983

June 08, 2017

Aerial Exhibit Map

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BuxMont - Elroy 138/69 kV
Transmission Line Rebuild Project

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PPL Electric Utilities

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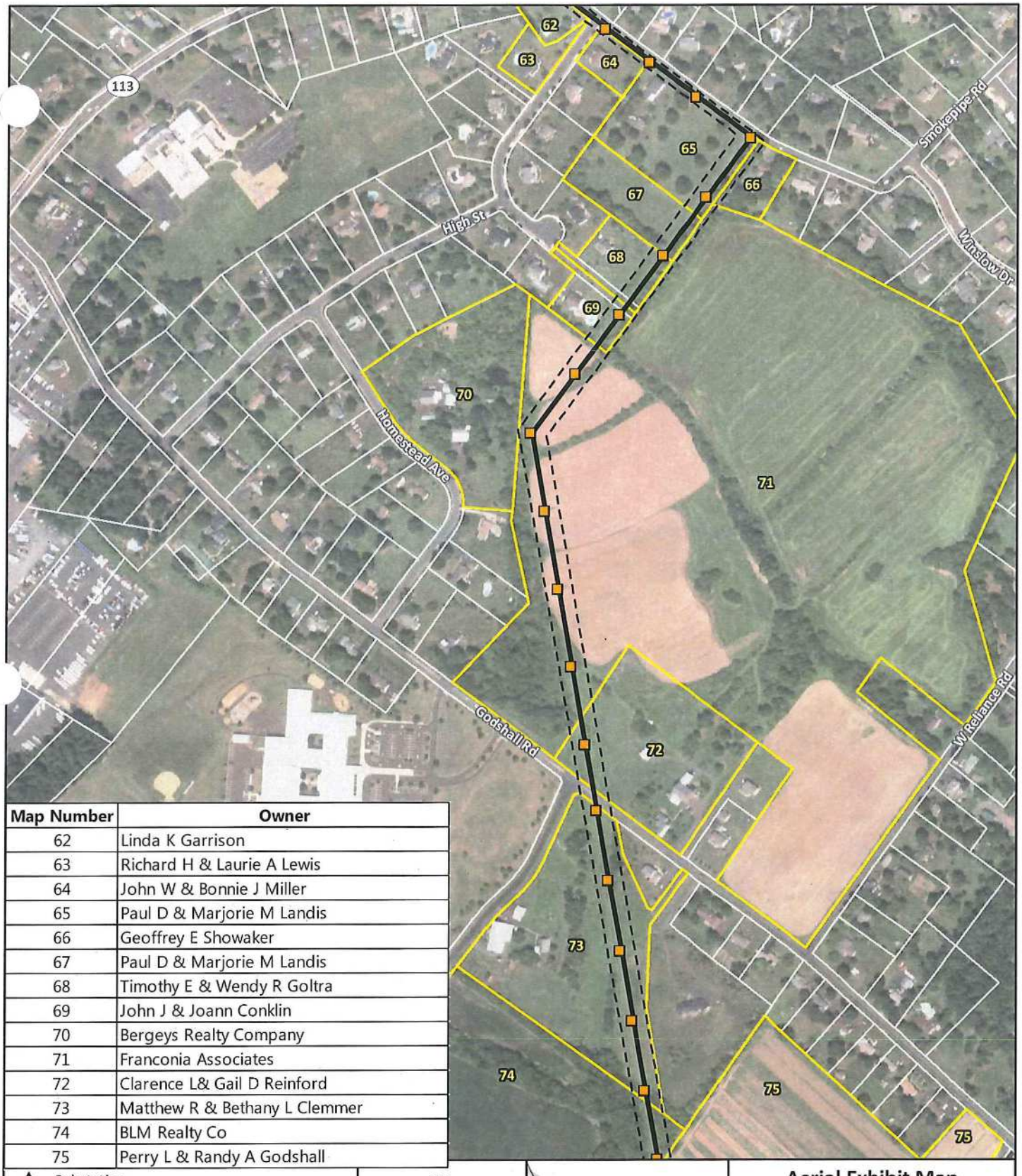
Feet



Map Number	Owner
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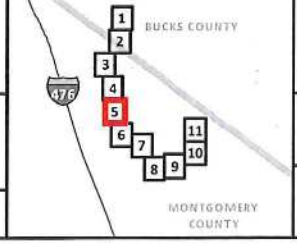
63	Richard H & Laurie A Lewis
64	John W & Bonnie J Miller
65	Paul D & Marjorie M Landis
66	Geoffrey E Showaker
67	Paul D & Marjorie M Landis
68	Timothy E & Wendy R Goltra
69	John J & Joann Conklin
70	Bergeys Realty Company
71	Franconia Associates
72	Clarence L& Gail D Reinford
73	Matthew R & Bethany L Clemmer
74	BLM Realty Co
75	Perry L & Randy A Godshall

- Substation
- Existing Structure Location
- Rebuild Centerline
- Existing ROW
- ROW Parcel

N

Coordinate System:
State Plane PA South
NAD 1983

June 08, 2017



Aerial Exhibit Map

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BuxMont - Elroy 138/69 kV
Transmission Line Rebuild Project

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PPL Electric Utilities

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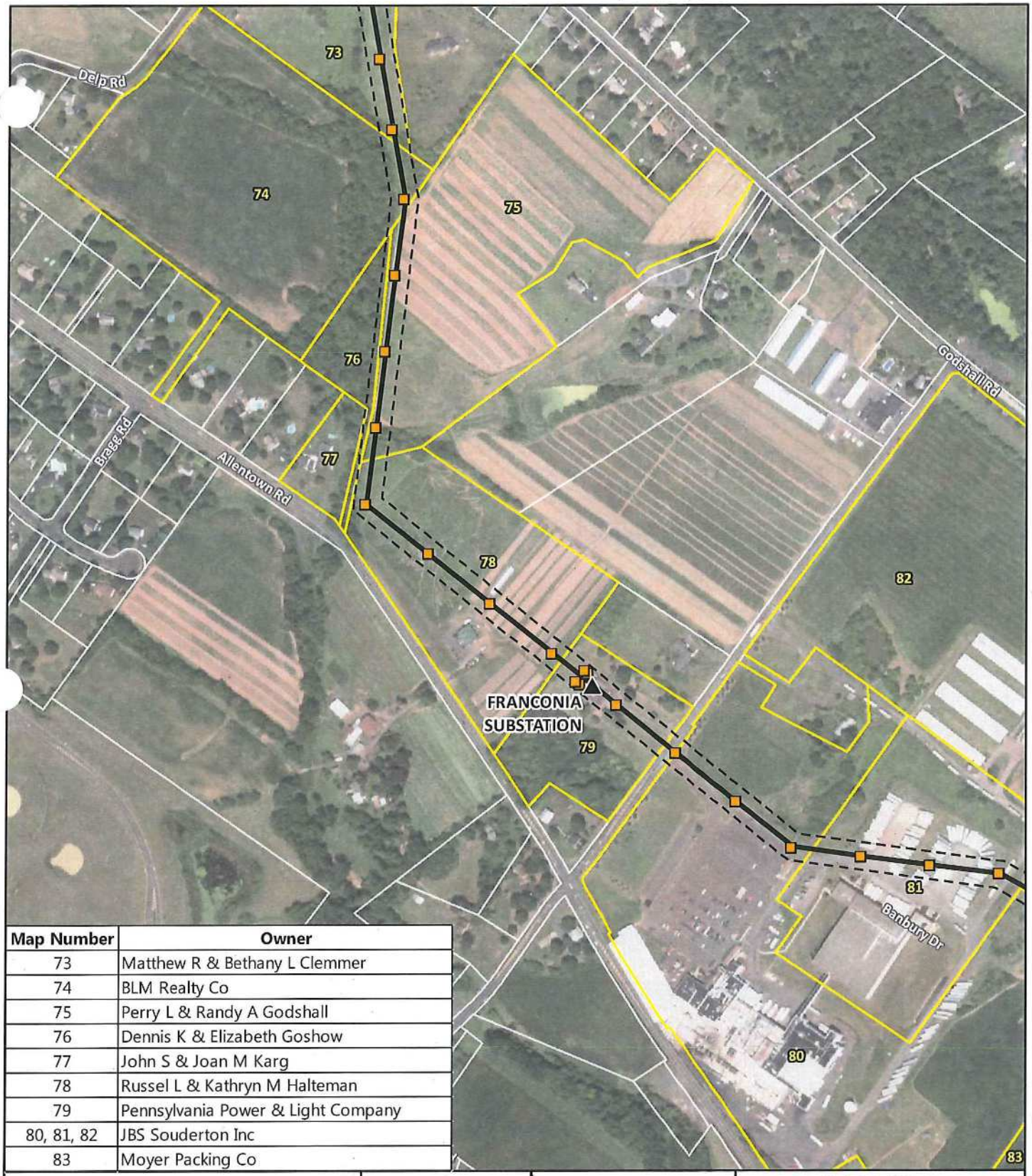


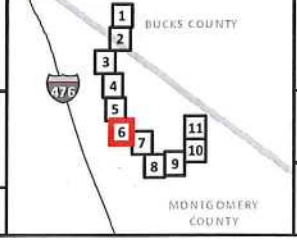
Map Number	Owner
73	Matthew R & Bethany L Clemmer
74	BLM Realty Co
75	Perry L & Randy A Godshall
76	Dennis K & Elizabeth Goshow
77	John S & Joan M Karg
78	Russel L & Kathryn M Halteman
79	Pennsylvania Power & Light Company
80, 81, 82	JBS Souderton Inc
83	Moyer Packing Co

- Substation
- Existing Structure Location
- Rebuild Centerline
- Existing ROW
- ROW Parcel

N

Coordinate System:
State Plane PA South
NAD 1983

June 08, 2017



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Transmission Line Rebuild Project

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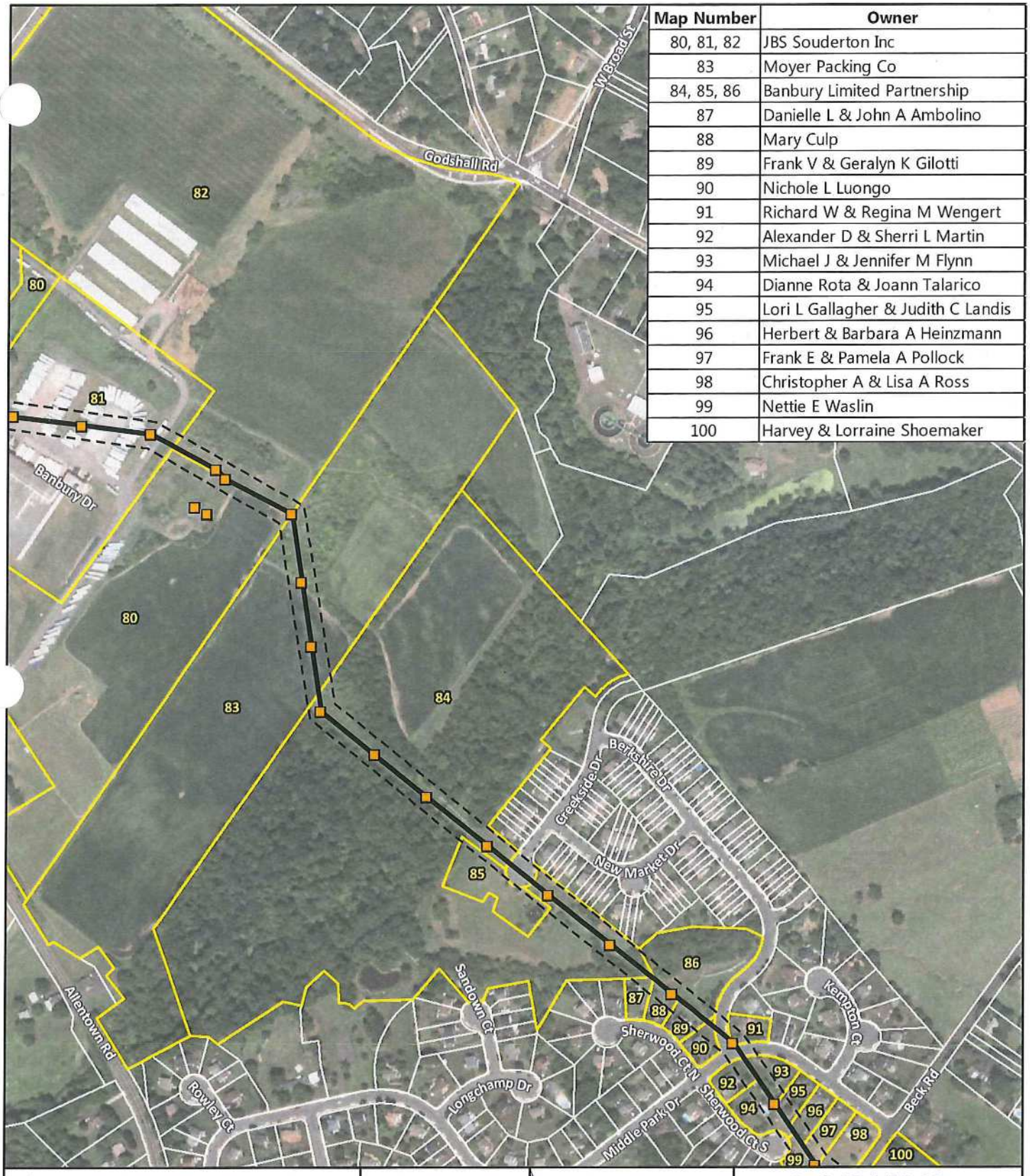


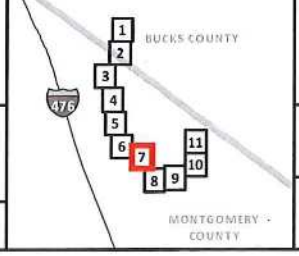
Map Number	Owner
80, 81, 82	JBS Souderton Inc
83	Moyer Packing Co
84, 85, 86	Banbury Limited Partnership
87	Danielle L & John A Ambolino
88	Mary Culp
89	Frank V & Geralyn K Gilotti
90	Nichole L Luongo
91	Richard W & Regina M Wengert
92	Alexander D & Sherri L Martin
93	Michael J & Jennifer M Flynn
94	Dianne Rota & Joann Talarico
95	Lori L Gallagher & Judith C Landis
96	Herbert & Barbara A Heinzmann
97	Frank E & Pamela A Pollock
98	Christopher A & Lisa A Ross
99	Nettie E Waslin
100	Harvey & Lorraine Shoemaker

- Substation
- Existing Structure Location
- Rebuild Centerline
- Existing ROW
- ROW Parcel

N

Coordinate System:
State Plane PA South
NAD 1983

June 08, 2017



Aerial Exhibit Map

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BuxMont - Elroy 138/69 kV
Transmission Line Rebuild Project

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PPL Electric Utilities

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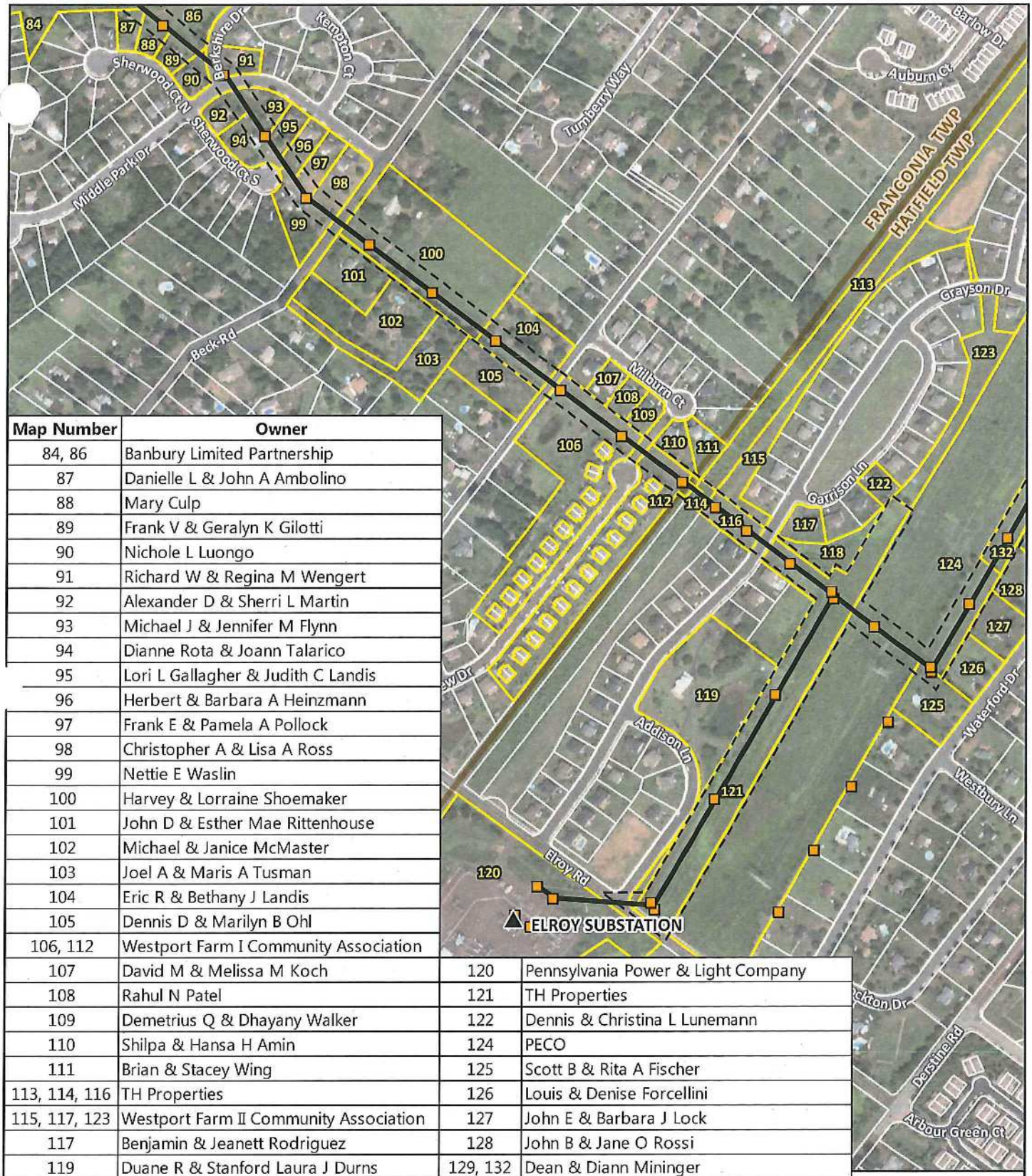

Map Number	Owner
84, 86	Banbury Limited Partnership
87	Danielle L & John A Ambolino
88	Mary Culp
89	Frank V & Geralyn K Gilotti
90	Nichole L Luongo
91	Richard W & Regina M Wengert
92	Alexander D & Sherri L Martin
93	Michael J & Jennifer M Flynn
94	Dianne Rota & Joann Talarico
95	Lori L Gallagher & Judith C Landis
96	Herbert & Barbara A Heinzmann
97	Frank E & Pamela A Pollock
98	Christopher A & Lisa A Ross
99	Nettie E Waslin
100	Harvey & Lorraine Shoemaker
101	John D & Esther Mae Rittenhouse
102	Michael & Janice McMaster
103	Joel A & Maris A Tusman
104	Eric R & Bethany J Landis
105	Dennis D & Marilyn B Ohl
106, 112	Westport Farm I Community Association
107	David M & Melissa M Koch
108	Rahul N Patel
109	Demetrius Q & Dhayany Walker
110	Shilpa & Hansa H Amin
111	Brian & Stacey Wing
113, 114, 116	TH Properties
115, 117, 123	Westport Farm II Community Association
117	Benjamin & Jeanett Rodriguez
119	Duane R & Stanford Laura J Durns
120	Pennsylvania Power & Light Company
121	TH Properties
122	Dennis & Christina L Lunemann
124	PECO
125	Scott B & Rita A Fischer
126	Louis & Denise Forcellini
127	John E & Barbara J Lock
128	John B & Jane O Rossi
129, 132	Dean & Diann Mininger

- Substation
- Existing Structure Location
- Rebuild Centerline
- Existing ROW
- ROW Parcel

N

Coordinate System:
State Plane PA South
NAD 1983

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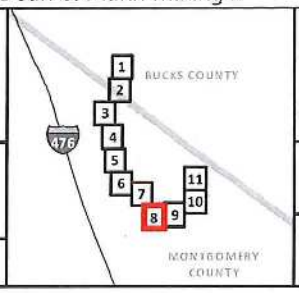

Aerial Exhibit Map

BuxMont - Elroy 138/69 kV
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PPL Electric Utilities

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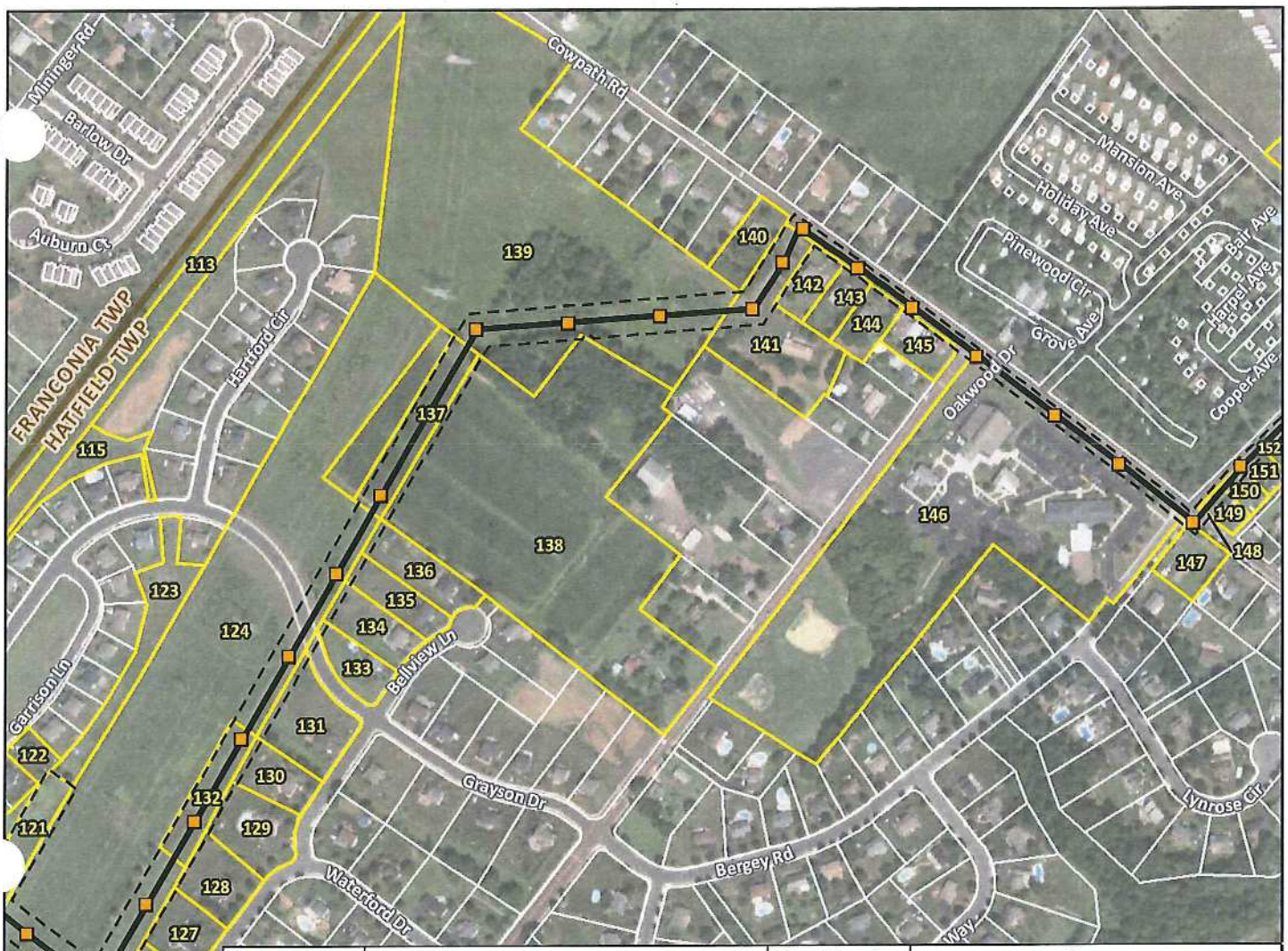
Feet



Map Number	Owner	Map Number	Owner
113, 121	TH Properties	137	Pennsylvania Power & Light Company
115, 118, 123	Westport Farm II Community Association	138	Norman G Moyer
122	Dennis & Christina L Lunemann	139	PECO
124	PECO	140	Kenneth W Schaffer
125	Scott B & Rita A Fischer	141	David S & Elizabeth R Garrett
126	Louis & Denise Forcellini	142	Vinodray N & Shanta V Makadia
127	John E & Barbara J Lock	143	Stephen J & Cheryl Heck
128	John B & Jane O Rossi	144	David T & Shannon T Lamb
129	Dean & Diann Mininger	145	Larry S Laumer
130	Antonino & Serafina Lombardo	146	Archdiocese Of Philadelphia
131	Gennaro Schiano Dicola & Jessica Horne	147	Mich Luu & Quoc Danny
132	Dean & Diann Mininger	148, 149	Willard R & Jeanette V Hartman
133	Scott A & Mary J Higgins	150	Mai Thi Thanh Phan
134	Scott A & Emily A Klein	151	Elisabeth R Ramos
135	Angela & George Bell	152	Robert Lee Kulp
136	Jay Mahapatra & Tanuja Satapathy	153	Thomas R & Adrienne T Weber

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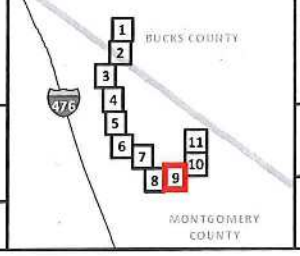

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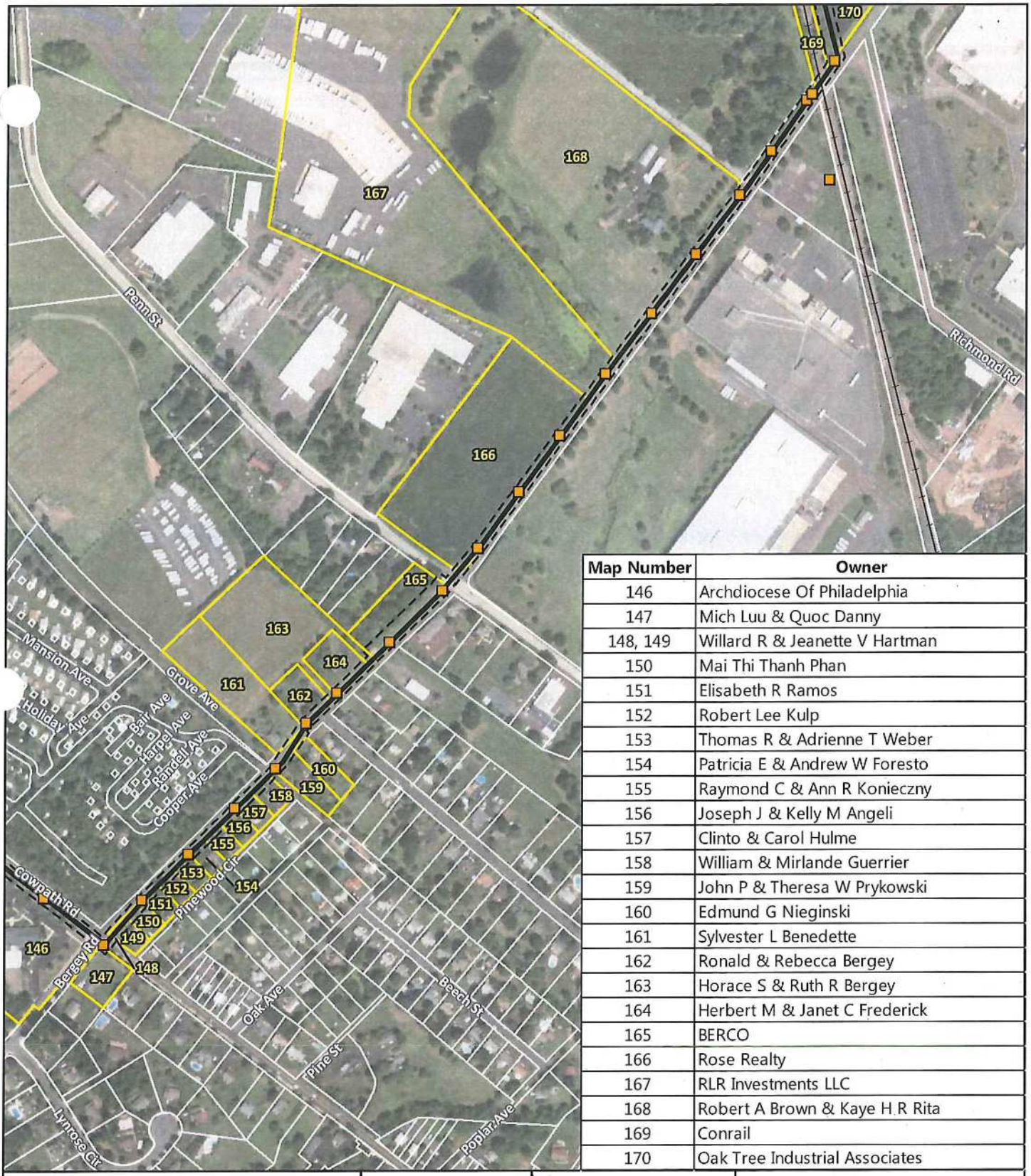

Map Number	Owner
146	Archdiocese Of Philadelphia
147	Mich Luu & Quoc Danny
148, 149	Willard R & Jeanette V Hartman
150	Mai Thi Thanh Phan
151	Elisabeth R Ramos
152	Robert Lee Kulp
153	Thomas R & Adrienne T Weber
154	Patricia E & Andrew W Foresto
155	Raymond C & Ann R Konieczny
156	Joseph J & Kelly M Angeli
157	Clinto & Carol Hulme
158	William & Mirlande Guerrier
159	John P & Theresa W Prykowski
160	Edmund G Nieginski
161	Sylvester L Benedette
162	Ronald & Rebecca Bergey
163	Horace S & Ruth R Bergey
164	Herbert M & Janet C Frederick
165	BERCO
166	Rose Realty
167	RLR Investments LLC
168	Robert A Brown & Kaye H R Rita
169	Conrail
170	Oak Tree Industrial Associates

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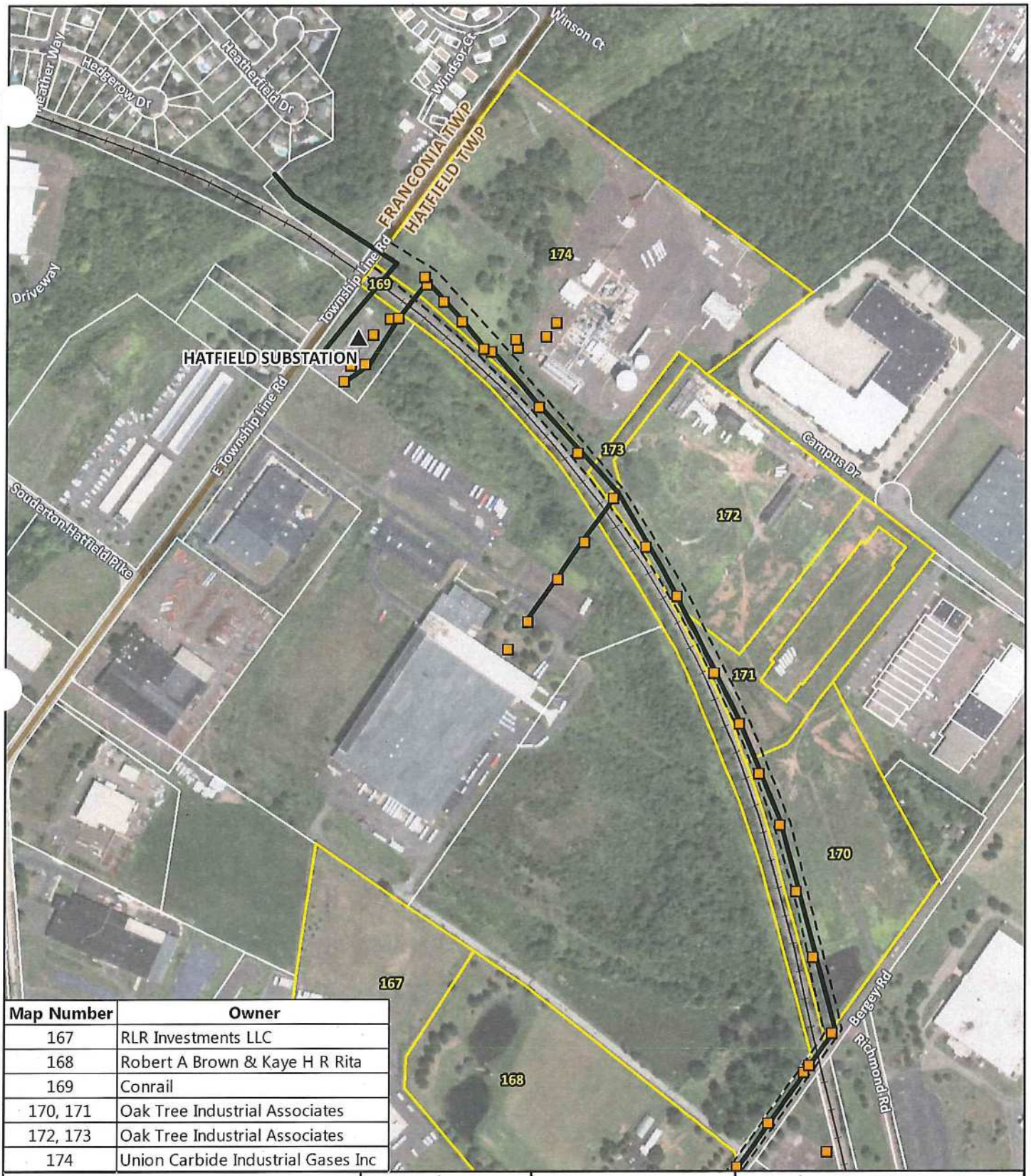

Map Number	Owner
167	RLR Investments LLC
168	Robert A Brown & Kaye H R Rita
169	Conrail
170, 171	Oak Tree Industrial Associates
172, 173	Oak Tree Industrial Associates
174	Union Carbide Industrial Gases Inc

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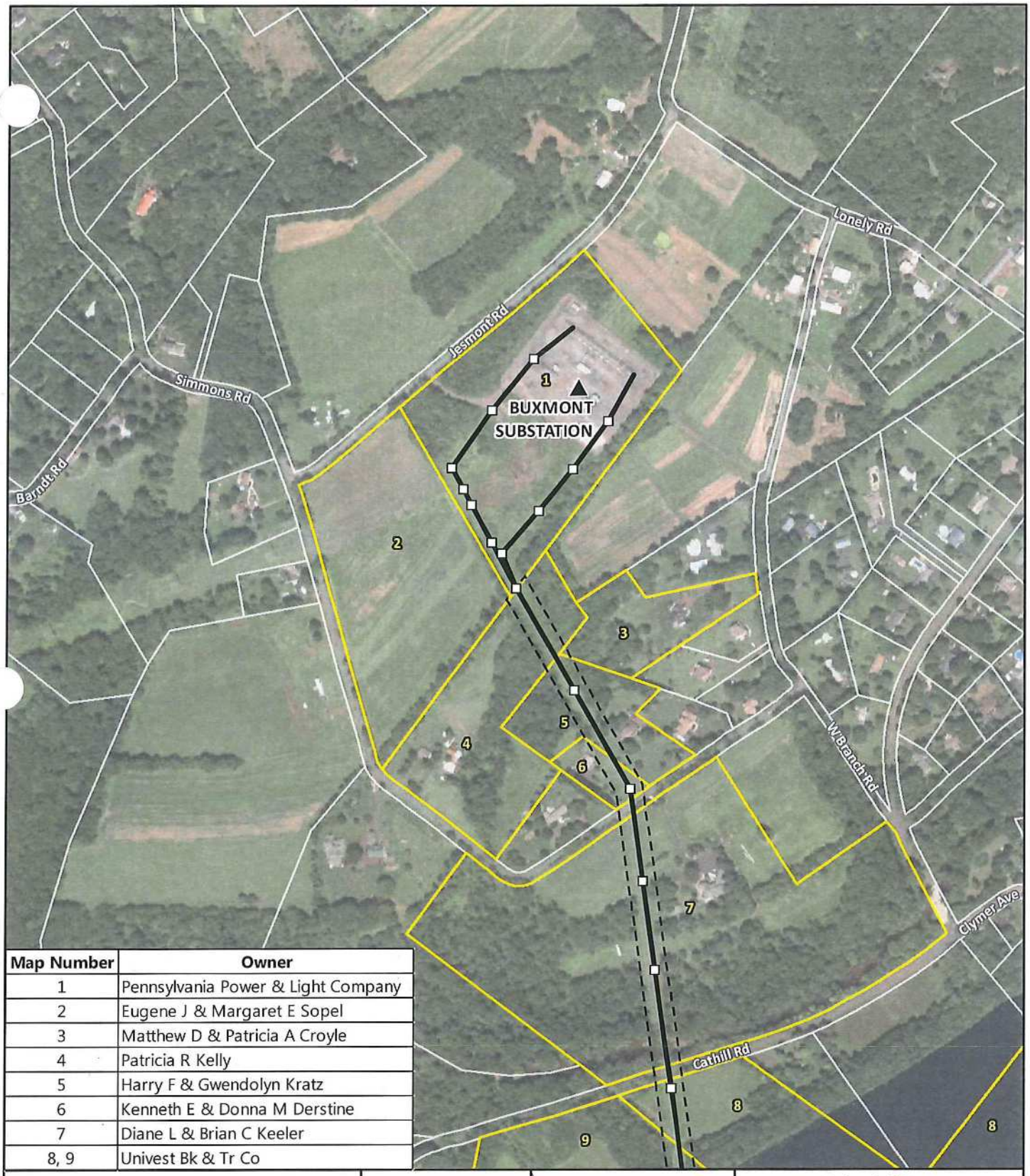
Figure 1-4



Map Number	Owner
1	Pennsylvania Power & Light Company
2	Eugene J & Margaret E Sopel
3	Matthew D & Patricia A Croyle
4	Patricia R Kelly
5	Harry F & Gwendolyn Kratz
6	Kenneth E & Donna M Derstine
7	Diane L & Brian C Keeler
8, 9	Univest Bk & Tr Co

- Substation
- Proposed Structure Location
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- ROW Parcel

N

Coordinate System:
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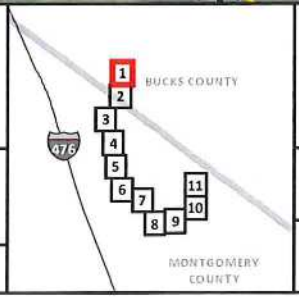

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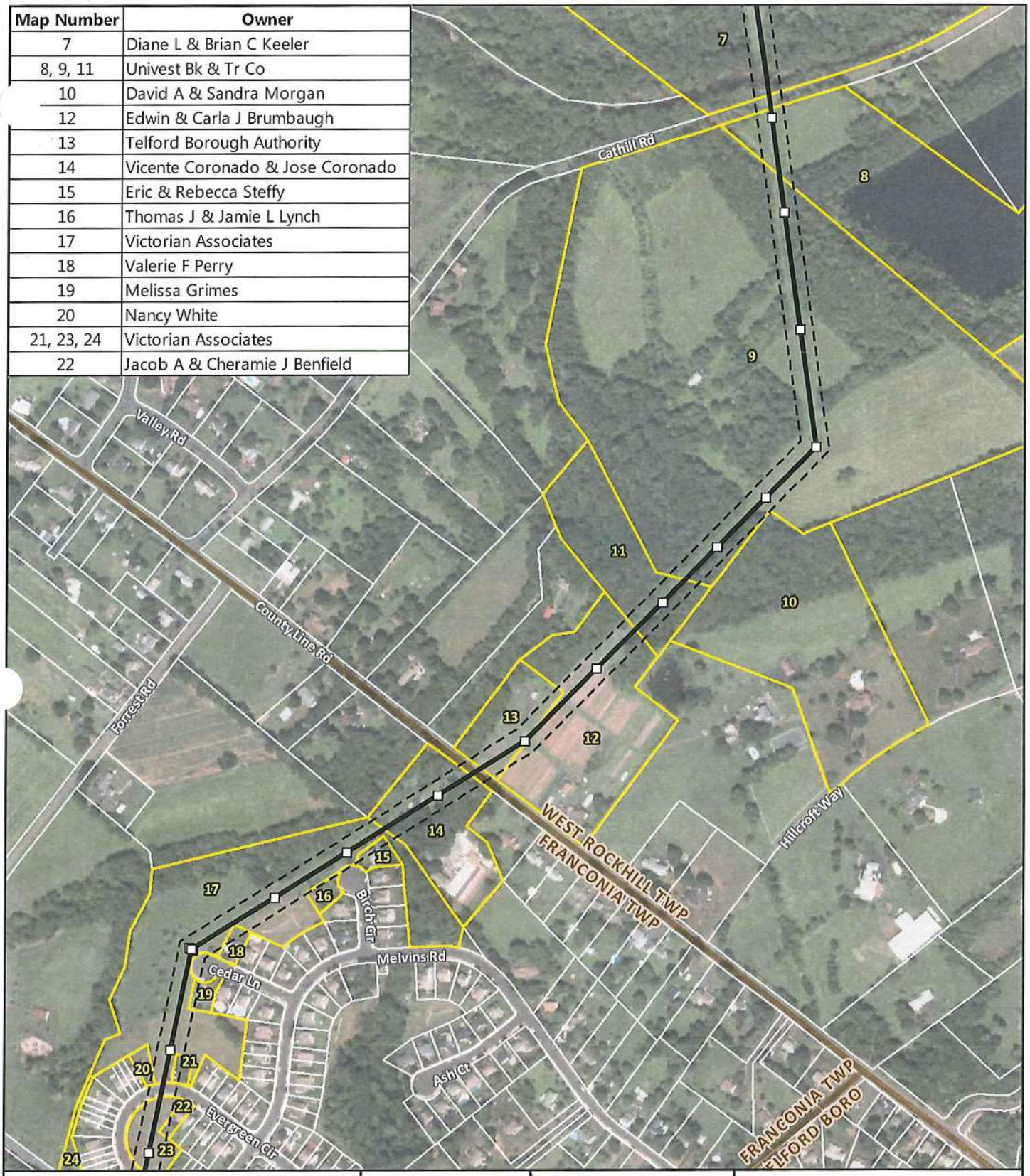
Map Number	Owner
7	Diane L & Brian C Keeler
8, 9, 11	Univest Bk & Tr Co
10	David A & Sandra Morgan
12	Edwin & Carla J Brumbaugh
13	Telford Borough Authority
14	Vicente Coronado & Jose Coronado
15	Eric & Rebecca Steffy
16	Thomas J & Jamie L Lynch
17	Victorian Associates
18	Valerie F Perry
19	Melissa Grimes
20	Nancy White
21, 23, 24	Victorian Associates
22	Jacob A & Cheramie J Benfield



▲ Substation
□ Proposed Structure Location
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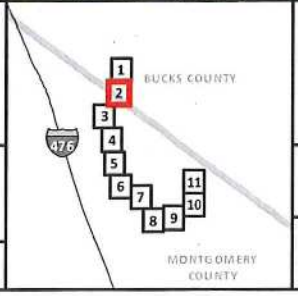

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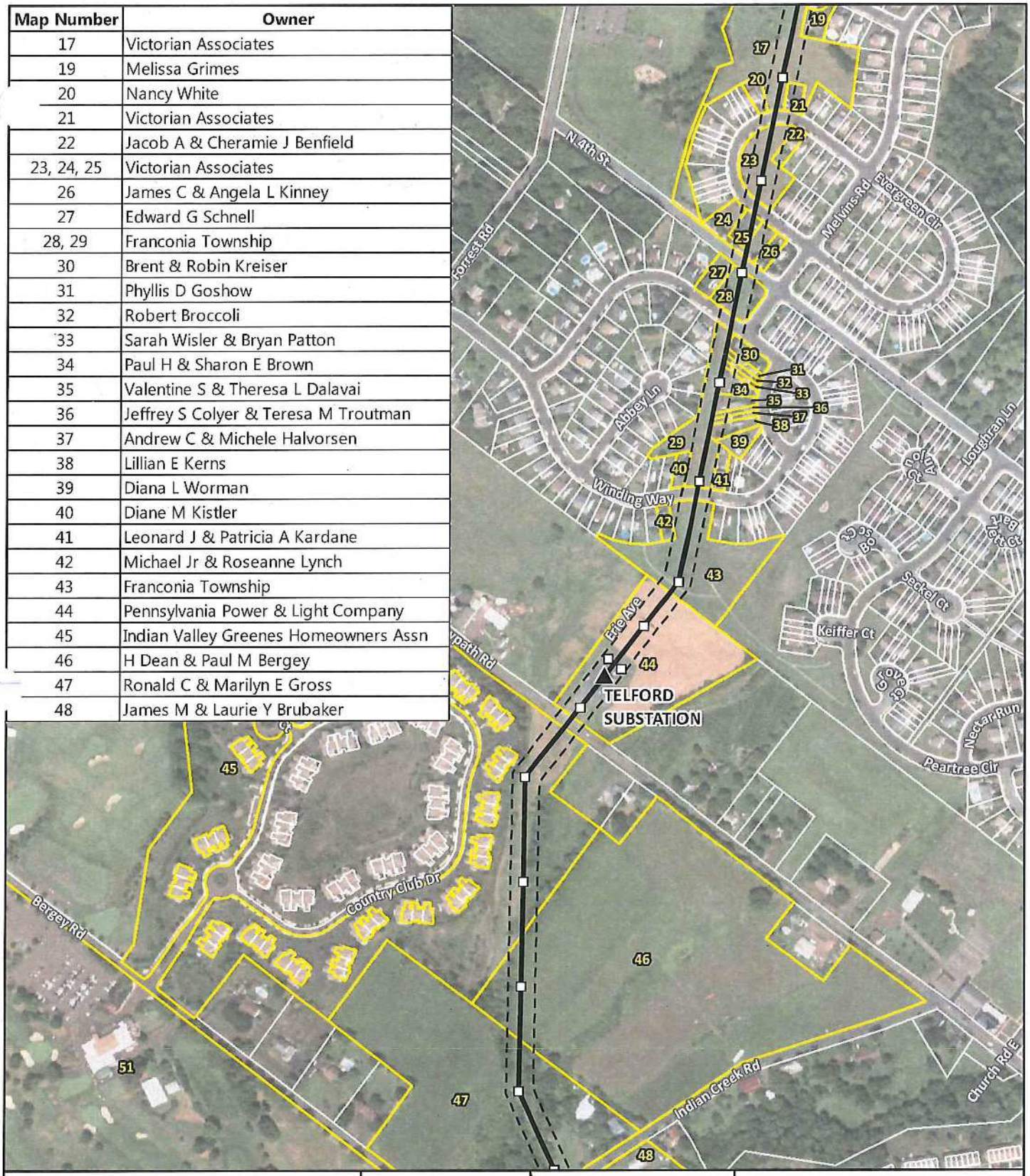
Map Number	Owner
17	Victorian Associates
19	Melissa Grimes
20	Nancy White
21	Victorian Associates
22	Jacob A & Cheramie J Benfield
23, 24, 25	Victorian Associates
26	James C & Angela L Kinney
27	Edward G Schnell
28, 29	Franconia Township
30	Brent & Robin Kreiser
31	Phyllis D Goshow
32	Robert Broccoli
33	Sarah Wisler & Bryan Patton
34	Paul H & Sharon E Brown
35	Valentine S & Theresa L Dalavai
36	Jeffrey S Colyer & Teresa M Troutman
37	Andrew C & Michele Halvorsen
38	Lillian E Kerns
39	Diana L Worman
40	Diane M Kistler
41	Leonard J & Patricia A Kardane
42	Michael Jr & Roseanne Lynch
43	Franconia Township
44	Pennsylvania Power & Light Company
45	Indian Valley Greenes Homeowners Assn
46	H Dean & Paul M Bergey
47	Ronald C & Marilyn E Gross
48	James M & Laurie Y Brubaker



Substation
Proposed Structure Location
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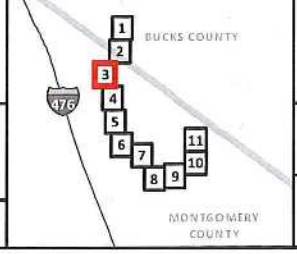

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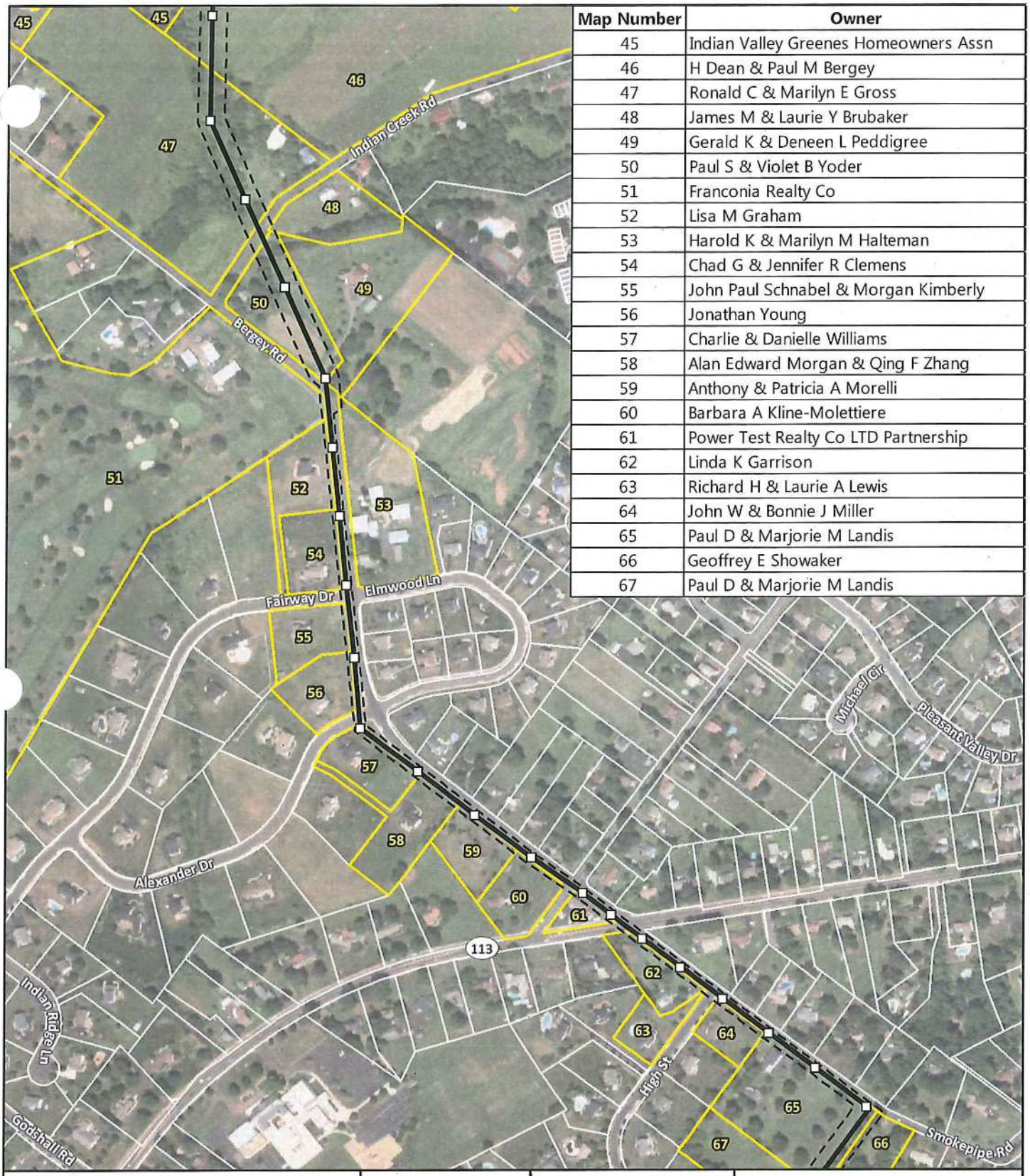

Map Number	Owner
45	Indian Valley Greenes Homeowners Assn
46	H Dean & Paul M Bergey
47	Ronald C & Marilyn E Gross
48	James M & Laurie Y Brubaker
49	Gerald K & Deneen L Peddigree
50	Paul S & Violet B Yoder
51	Franconia Realty Co
52	Lisa M Graham
53	Harold K & Marilyn M Halteman
54	Chad G & Jennifer R Clemens
55	John Paul Schnabel & Morgan Kimberly
56	Jonathan Young
57	Charlie & Danielle Williams
58	Alan Edward Morgan & Qing F Zhang
59	Anthony & Patricia A Morelli
60	Barbara A Kline-Molettiere
61	Power Test Realty Co LTD Partnership
62	Linda K Garrison
63	Richard H & Laurie A Lewis
64	John W & Bonnie J Miller
65	Paul D & Marjorie M Landis
66	Geoffrey E Showaker
67	Paul D & Marjorie M Landis

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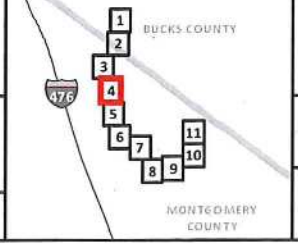

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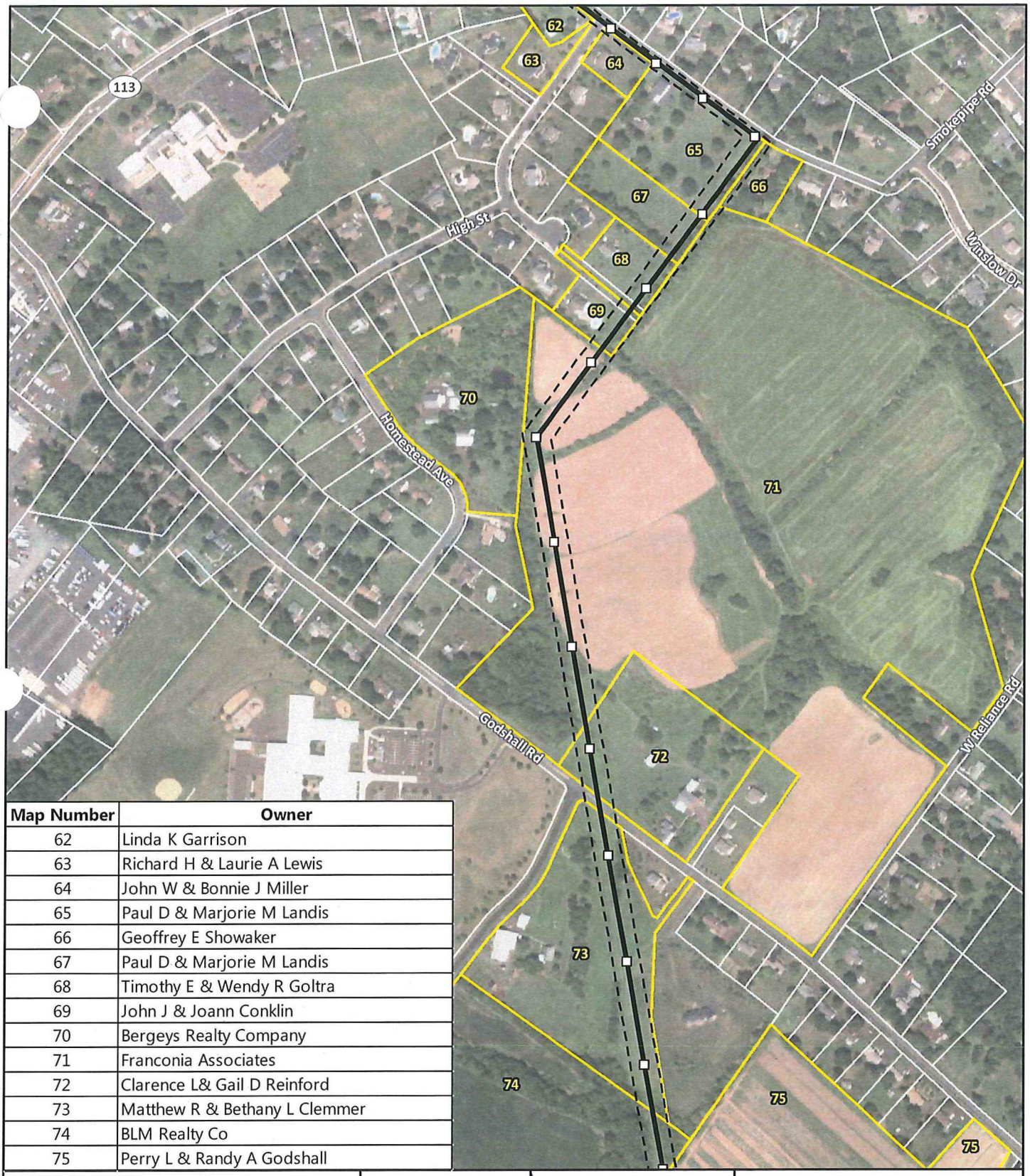

Map Number	Owner
62	Linda K Garrison
63	Richard H & Laurie A Lewis
64	John W & Bonnie J Miller
65	Paul D & Marjorie M Landis
66	Geoffrey E Showaker
67	Paul D & Marjorie M Landis
68	Timothy E & Wendy R Goltra
69	John J & Joann Conklin
70	Bergeys Realty Company
71	Franconia Associates
72	Clarence L& Gail D Reinford
73	Matthew R & Bethany L Clemmer
74	BLM Realty Co
75	Perry L & Randy A Godshall

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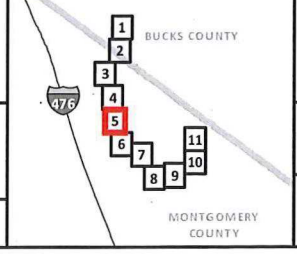

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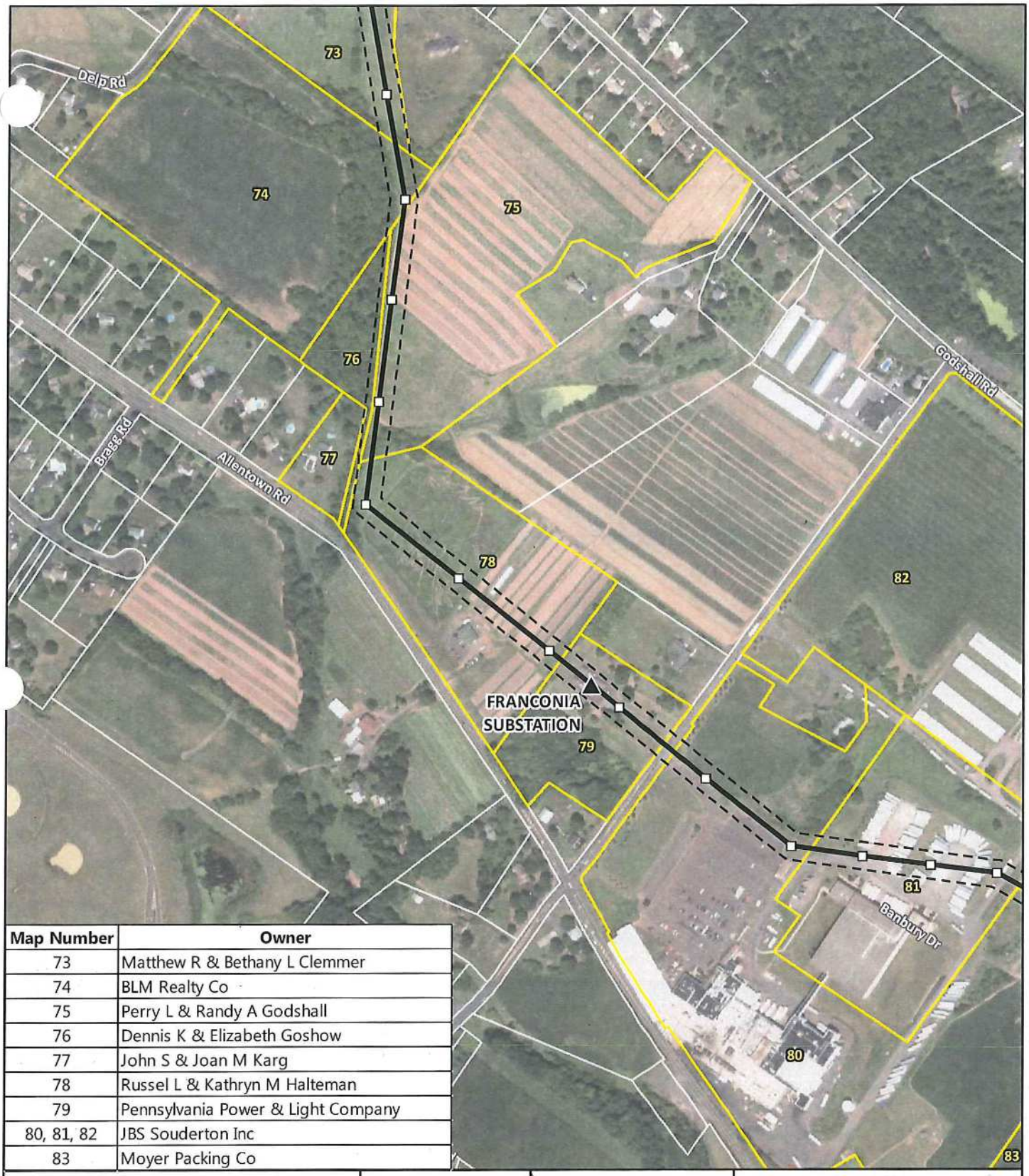

Map Number	Owner
73	Matthew R & Bethany L Clemmer
74	BLM Realty Co
75	Perry L & Randy A Godshall
76	Dennis K & Elizabeth Goshow
77	John S & Joan M Karg
78	Russel L & Kathryn M Halteman
79	Pennsylvania Power & Light Company
80, 81, 82	JBS Souderton Inc
83	Moyer Packing Co

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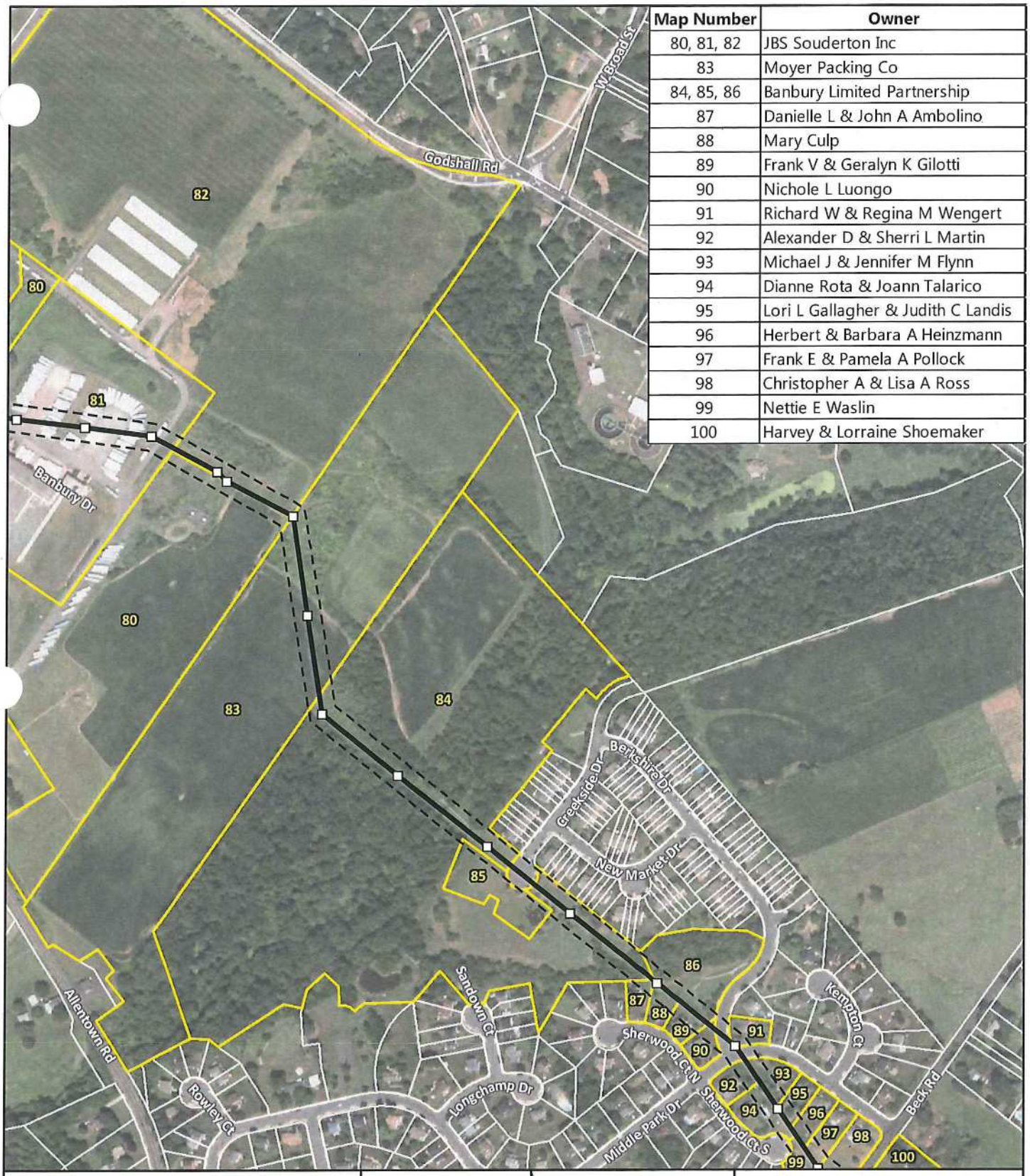

Map Number	Owner
80, 81, 82	JBS Souderton Inc
83	Moyer Packing Co
84, 85, 86	Banbury Limited Partnership
87	Danielle L & John A Ambolino
88	Mary Culp
89	Frank V & Geralyn K Gilotti
90	Nichole L Luongo
91	Richard W & Regina M Wengert
92	Alexander D & Sherri L Martin
93	Michael J & Jennifer M Flynn
94	Dianne Rota & Joann Talarico
95	Lori L Gallagher & Judith C Landis
96	Herbert & Barbara A Heinzmann
97	Frank E & Pamela A Pollock
98	Christopher A & Lisa A Ross
99	Nettie E Waslin
100	Harvey & Lorraine Shoemaker

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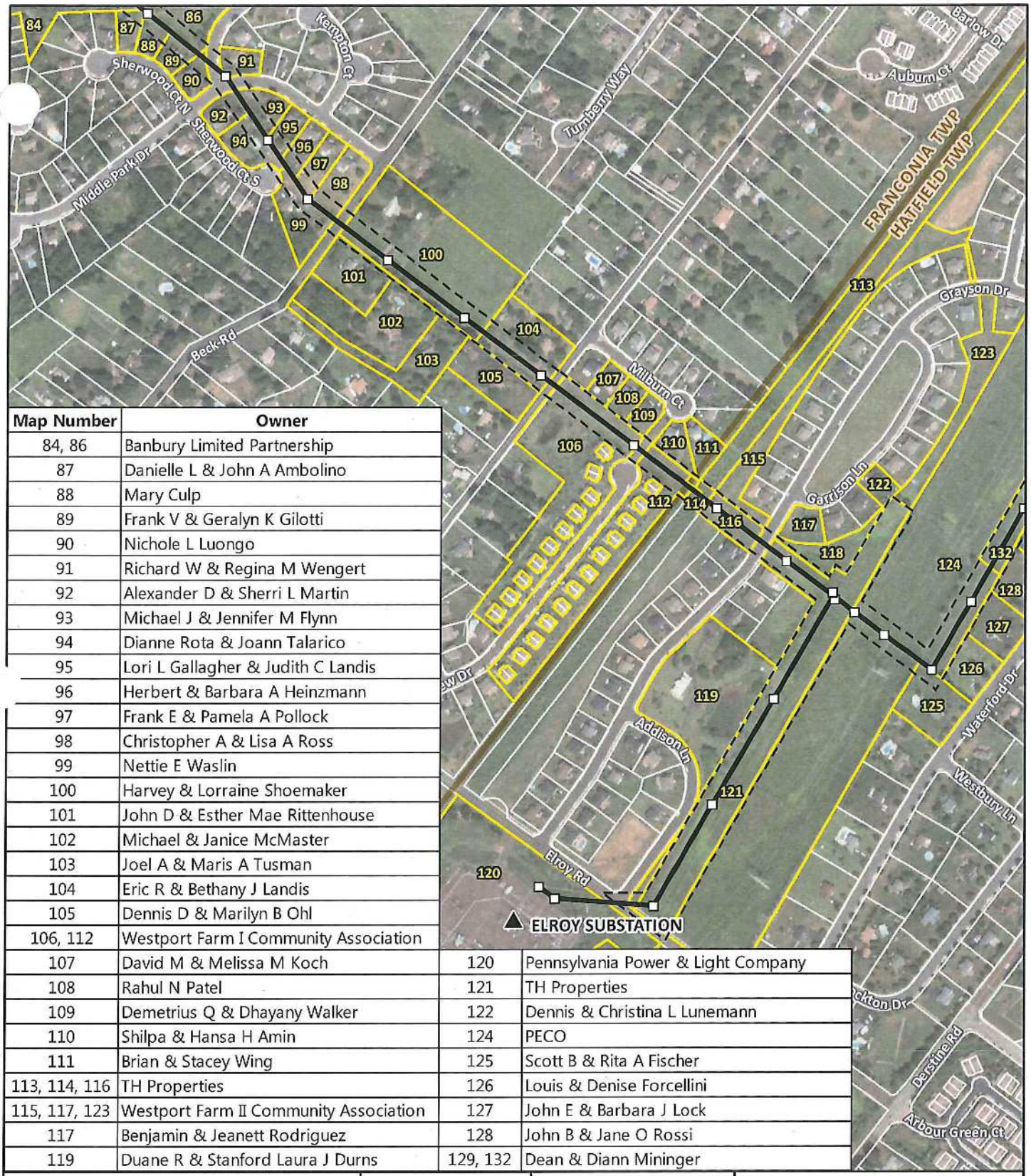

Map Number	Owner
84, 86	Banbury Limited Partnership
87	Danielle L & John A Ambolino
88	Mary Culp
89	Frank V & Geralyn K Gilotti
90	Nichole L Luongo
91	Richard W & Regina M Wengert
92	Alexander D & Sherri L Martin
93	Michael J & Jennifer M Flynn
94	Dianne Rota & Joann Talarico
95	Lori L Gallagher & Judith C Landis
96	Herbert & Barbara A Heinzmann
97	Frank E & Pamela A Pollock
98	Christopher A & Lisa A Ross
99	Nettie E Waslin
100	Harvey & Lorraine Shoemaker
101	John D & Esther Mae Rittenhouse
102	Michael & Janice McMaster
103	Joel A & Maris A Tusman
104	Eric R & Bethany J Landis
105	Dennis D & Marilyn B Ohl
106, 112	Westport Farm I Community Association
107	David M & Melissa M Koch
108	Rahul N Patel
109	Demetrius Q & Dhayany Walker
110	Shilpa & Hansa H Amin
111	Brian & Stacey Wing
113, 114, 116	TH Properties
115, 117, 123	Westport Farm II Community Association
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119	Duane R & Stanford Laura J Durns
120	Pennsylvania Power & Light Company
121	TH Properties
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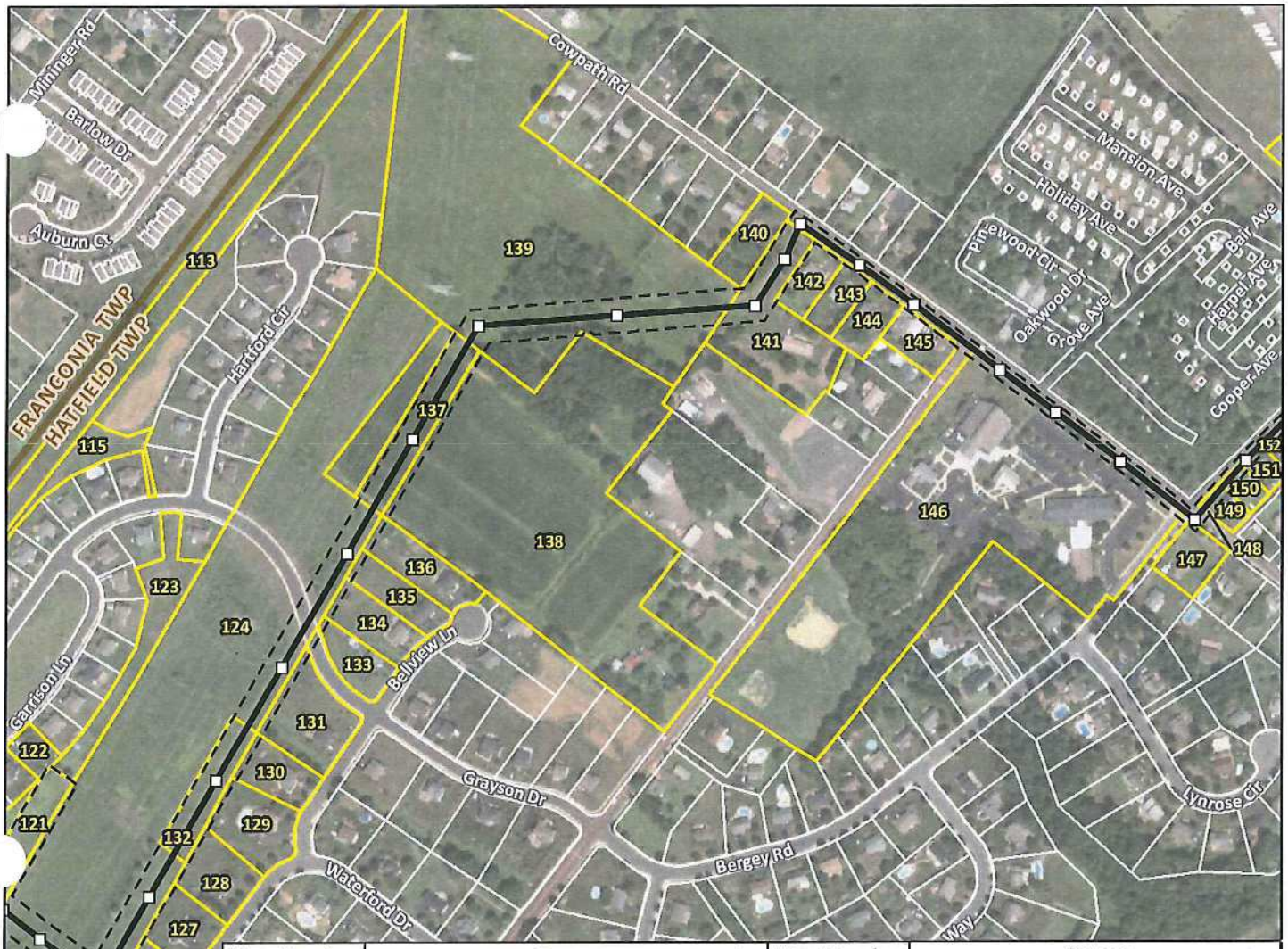

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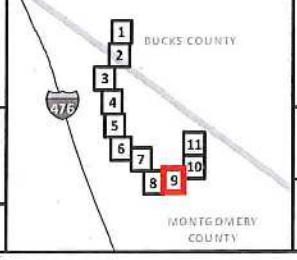

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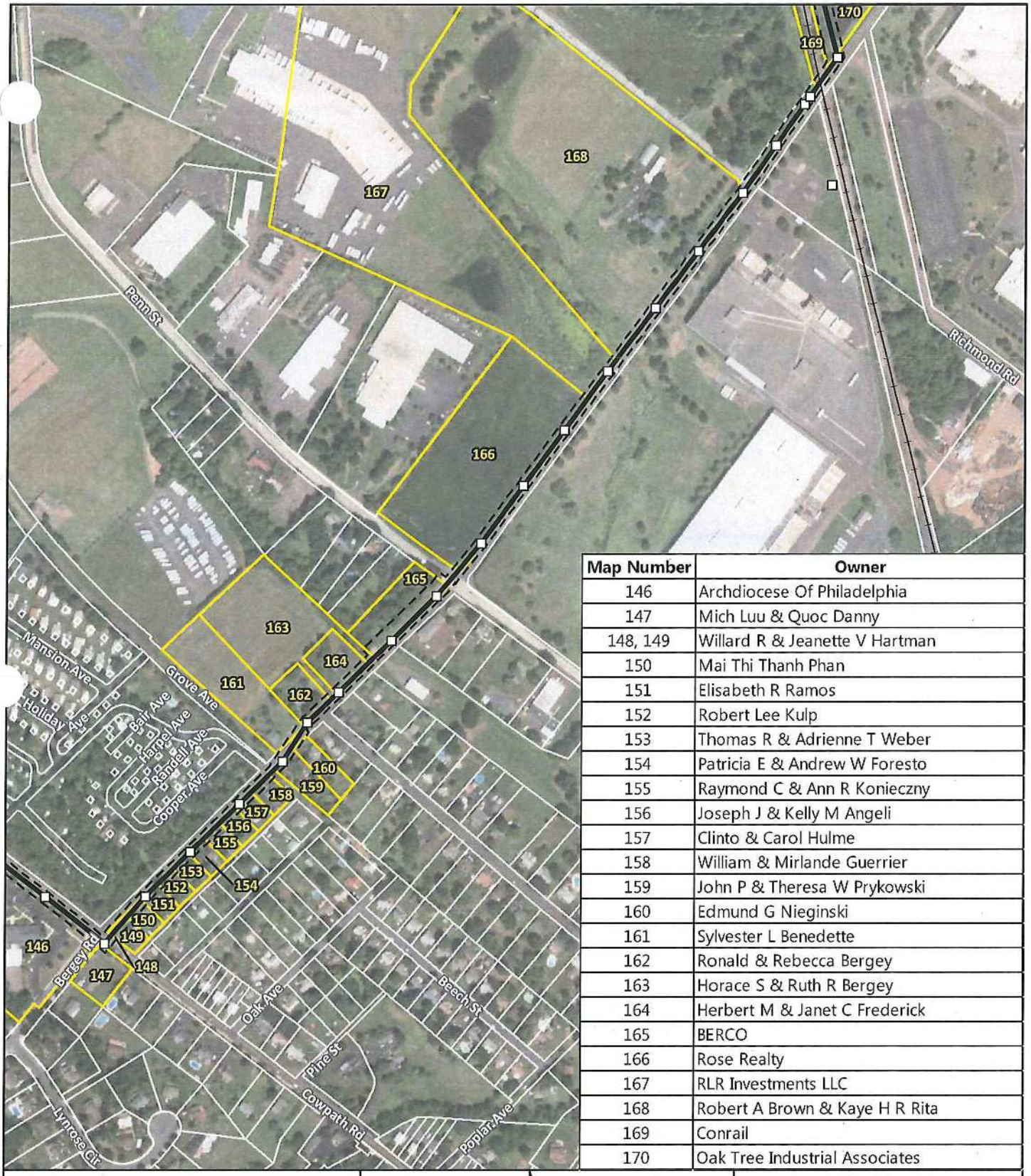

Map Number	Owner
146	Archdiocese Of Philadelphia
147	Mich Luu & Quoc Danny
148, 149	Willard R & Jeanette V Hartman
150	Mai Thi Thanh Phan
151	Elisabeth R Ramos
152	Robert Lee Kulp
153	Thomas R & Adrienne T Weber
154	Patricia E & Andrew W Foresto
155	Raymond C & Ann R Konieczny
156	Joseph J & Kelly M Angeli
157	Clinto & Carol Hulme
158	William & Mirlande Guerrier
159	John P & Theresa W Prykowski
160	Edmund G Nieginski
161	Sylvester L Benedette
162	Ronald & Rebecca Bergey
163	Horace S & Ruth R Bergey
164	Herbert M & Janet C Frederick
165	BERCO
166	Rose Realty
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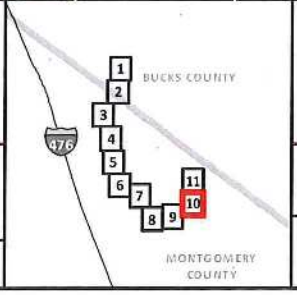

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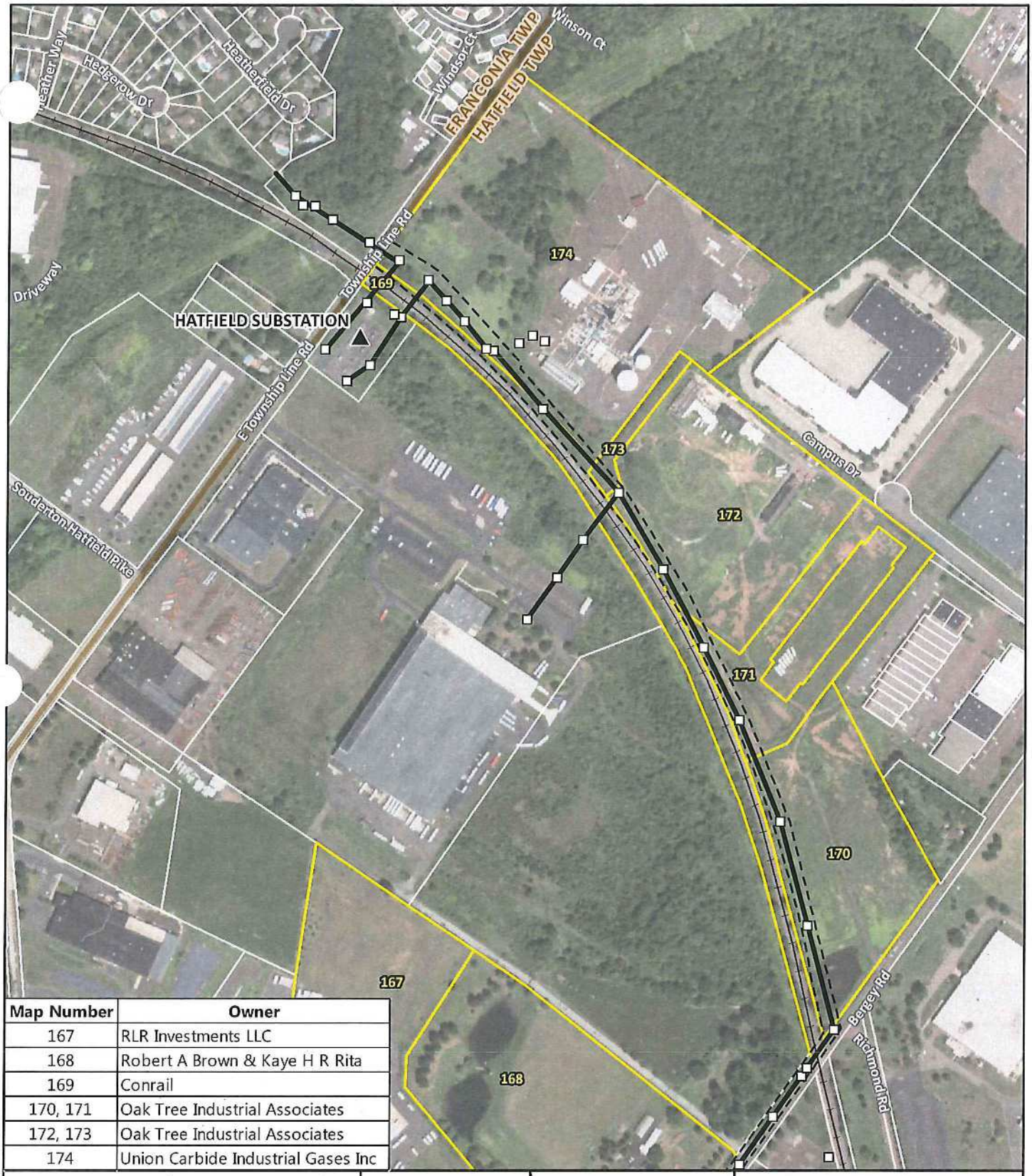

Map Number	Owner
167	RLR Investments LLC
168	Robert A Brown & Kaye H R Rita
169	Conrail
170, 171	Oak Tree Industrial Associates
172, 173	Oak Tree Industrial Associates
174	Union Carbide Industrial Gases Inc

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ATTACHMENT 2

BUXMONT – ELROY 138/69 kV
TRANSMISSION LINE REBUILD
PROJECT ENGINEERING DESCRIPTION

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(Depictions of New Proposed Transmission Structure Types)

A. DESCRIPTION OF THE PROPOSED PROJECT

PPL Electric Utilities Corporation (PPL Electric) is requesting Pennsylvania Public Utility Commission (PUC or the Commission) approval to rebuild approximately 7.8 miles of the existing Buxmont-Elroy #1 and #2 69 kilovolt (kV) transmission lines, approximately 0.25 mile of the existing Elroy-Hatfield #1 and #2 138/69 kV transmission lines, approximately 0.35 mile of the existing Elroy #1 and #2 138/69 kV taps, and approximately 354 feet of the existing Hatfield #1 and #2 69 kV transmission taps. The total length the Project is approximately 8.5 miles. As explained in Attachment 1, these existing transmission lines have reached the end of their useful life and must be replaced in order to ensure continued safe and reliable electric service to approximately 17,060 customers. The Project is part of PPL Electric's Asset Optimization Strategy, and will result in rebuilt transmission lines that meet all current design and lightning protection standards. Specifically, these rebuilt transmission lines will be constructed using with new steel monopoles, high capacity conductors, and two optical ground wires.

As explained in Attachment 1, PPL Electric proposes to rebuild approximately 7.8 miles of the exiting Buxmont-Elroy #1 and #2 69 kV transmission lines between the Buxmont Substation and the tap point with the Elroy Substation. The existing transmission line consists primarily of 170 wood pole structures that range in height from 60 to 105 feet. The existing structures will be removed and replaced with 143 new self-weathering steel structures, the majority of which are monopole structures equipped with steel arms and glass 138 kV insulator assemblies.

PPL Electric also proposes to rebuild approximately 0.25 mile of the existing Elroy-Hatfield #1 and #2 138/69 kV transmission lines between the tap point with the Elroy Substation and the Hatfield Substation. The existing 0.25 mile segment of ROW contains two main transmission lines and two tap lines, which in total consist primarily of 30 wood pole structures that range in height from 60 to 105 feet. The existing transmission and tap line structures will be removed and

replaced with 25 new steel monopole structures equipped with steel arms and glass 138 kV insulator assemblies.

PPL Electric proposes to rebuild approximately 0.35 mile of the existing Elroy #1 and #2 138/69 kV transmission taps between the Buxmont-Elroy #1 and #2 69 kV transmission line right-of-way and the Elroy Substation. The existing transmission line taps consist primarily of six wood pole structures that range in height from 60 to 105 feet. Three of the existing structures will be removed and replaced with three new steel monopole structures equipped with steel arms and glass 138 kV insulator assemblies.

Finally, PPL Electric proposes to rebuild approximately 354 feet of the existing Hatfield #1 and #2 69 kV transmission taps between Elroy-Hatfield #1 and #2 138/69 kV and Hatfield Substation. The existing transmission line consists of 2 wood poles and 1 steel pole. These existing structures will be removed and replaced with three new steel monopoles structures equipped with steel arms and glass 138 kV insulator assemblies.

Overall, the total number of tower structures will decrease from 209 to 174, and will range from 5 to 30 feet taller than existing wood structures. A total of 19 structures will be guyed. The Figures located at the end of Attachment 2 depict the typical structure types that will be used for the Project.

Each of the rebuilt lines will be designed and constructed for 138 kV operation. The rebuilt lines will initially operate at 69 kV until it becomes necessary to increase the operating voltage. For this reason, they will all be designated and described as 138/69 kV.

The rebuilt Buxmont-Elroy #1 and #2 138/69 kV and Elroy-Hatfield #1 and #2 138/69 kV transmission lines will each utilize six power conductors and two overhead ground wires. The

power conductors will consist of 556.5 thousand circular mils (kcmil),[1] 24/7 stranding, ACSR conductors, and the overhead ground wires will consist of dual 0.567-inch diameter 48 fiber count Optical Ground Wires (OPGW).

The rebuilt Elroy #1 & #2 138/69 kV taps and Hatfield #1 & #2 69/138 kV taps will each utilize six power conductors and two overhead ground wires for the rebuilt double-circuit segment. The power conductors for these taps will consist of 795 kcmil, 30/19 stranding, ACSR conductors, and the overhead ground wires will consist of dual 0.567-inch diameter 48 fiber count OPGW.

The rebuilt lines will be designed according to, and will generally exceed, all National Electrical Safety Code (NESC) minimum standards. Design specifications and safety rules practiced by PPL Electric are included in Attachment 4 of this LON.

The entire Project will be located within the existing right-of-way (ROW) and on property owned in fee by PPL Electric. The ROW generally varies from approximately 40 to 100 feet in width. PPL Electric has designed the Project to fit entirely within the existing ROW. In areas with less than 100 feet of ROW, PPL Electric will use horizontal line post insulators and/or use of deadend structures in order to meet NESC standards.

The minimum conductor-to ground clearance will be 31 feet which occurs at a maximum thermal conductor temperature of 125°C (257°F). The design minimum conductor clearances and conductor thermal ratings for the reconstructed lines are shown in Tables 2-1, 2-2, and 2-3 below.

[1] A kcmil is a thousand circular mils. A circular mil is the cross-sectional area of a wire 1 mil in diameter, where 1 kcmil = 0.5067 square millimeters.

Table 2-1: Design for Minimum Conductor Clearances for 556.5 kcmil 24/7 strand ACSR	
Condition	**Transmission Double-Circuit Design Clearance-to-Ground**
Extreme Heavy Ice (1.5" ice at 0°C ambient temperatures)	31 feet
Predicted extreme thermal load (125°C conductor temperatures)	31 feet
Predicted blowout (6 lbs., 16°C, ambient temperature)	31 feet

Table 2-2: Conductor Thermal Rating 556.5 kcmil 24/7 Stranding ACSR at 125°C Maximum Conductor			
Condition	**Ambient Temperature (°C)**	**Wind Speed (ft./sec)**	**Ampacity (Amps)**
Summer Normal	35	0	806
Winter Normal	10	0	929
Summer Emergency	35	2.533	1054
Winter Emergency	10	2.533	1187

Table 2-3: Conductor Thermal Rating 795 kcmil 30/19 Stranding ACSR at 125°C Maximum Conductor			
Condition	**Ambient Temperature (°C)**	**Wind Speed (ft./sec)**	**Ampacity (Amps)**
Summer Normal	35	0	1058
Winter Normal	10	0	1220
Summer Emergency	35	2.533	1350
Winter Emergency	10	2.533	1521

B. MAGNETIC FIELD MANAGEMENT

PPL Electric's Magnetic Field Management Program is applied to new and reconstructed transmission line projects. The company does not believe that the current scientific evidence demonstrates that magnetic fields cause any adverse health efforts or pose a health or safety danger to the public. Nevertheless, PPL Electric has determined, as a matter of policy, to design its new and rebuilt transmission lines to reduce magnetic fields when that can be done at low or no cost and consistent with functional requirements. PPL Electric's Magnetic Field Management Program has been developed to implement that policy decision. To reduce magnetic field exposures, the program generally prescribes the use of a line design with ground clearance that is five feet higher than NESC standards and reverses phasing of new double-circuit lines where it is feasible to do so at low or no cost.

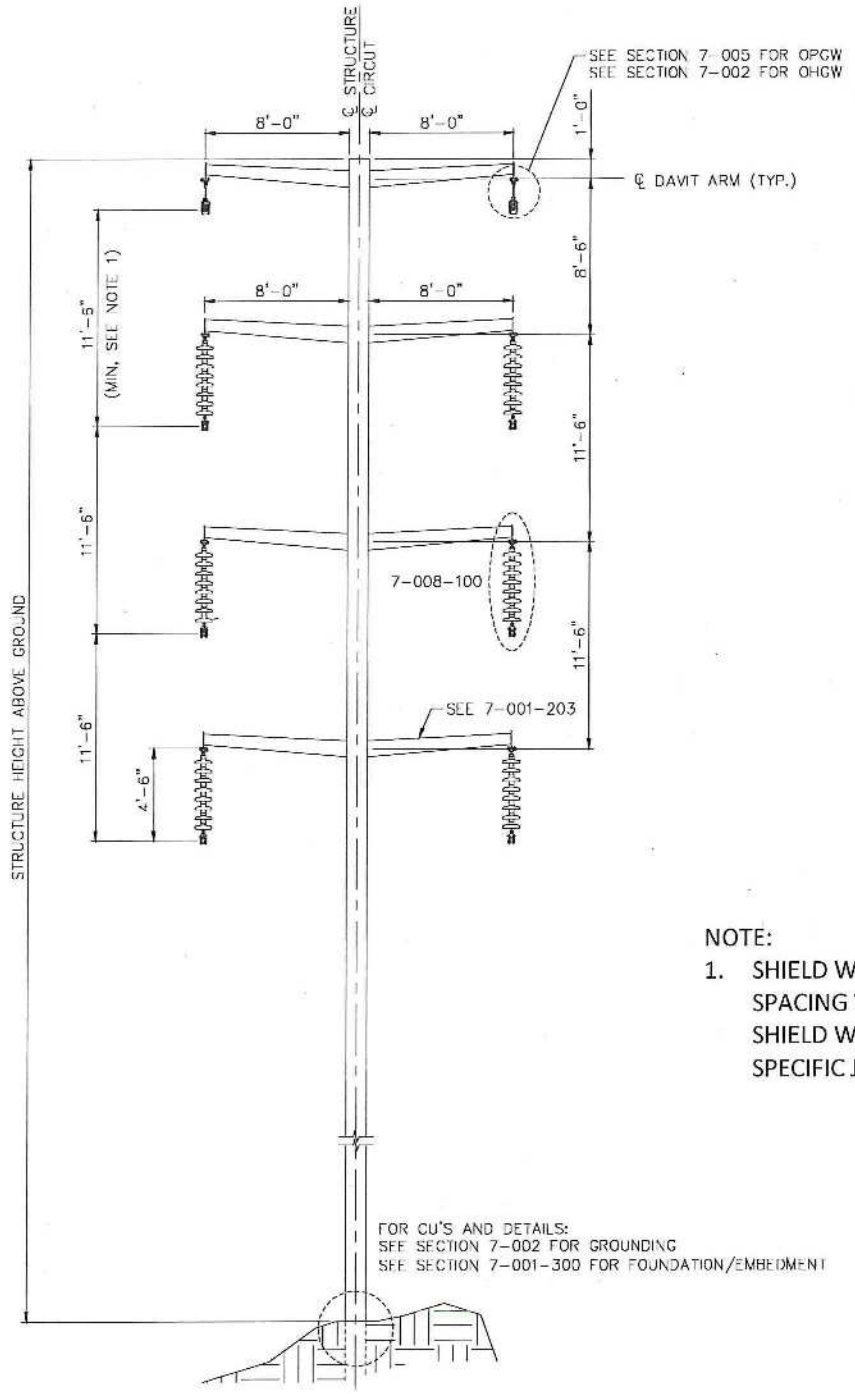
The rebuilt Buxmont-Elroy #1 and #2 138/69 kV transmission lines, Elroy-Hatfield #1 and #2 138/69 kV transmission lines, Elroy #1 and #2 138/69 kV taps, and Hatfield #1 and #2 138/69 kV taps will be designed with clearances that are 10.4 feet higher than NESC standards. These rebuilt double-circuit transmission lines will also be reversed phased.

Figure 2-1 (7-008-001)

PPL Electric Utilities

7-008-001
138kV Double Circuit Steel Pole
0° to 1° Suspension Structure

Revision: 0
Effective Date: 3/18/2016
Sheet **1** of **1**



NOTE:

1. SHIELD WIRE TO CONDUCTOR SPACING VARIES DEPENDING ON SHIELD WIRE SUPPORT ASSEMBLY. SEE SPECIFIC JOB INSTRUCTIONS.

REV	Date	Sponsor	Reviewer	Transmission Construction Standards PPL Electric Utilities Corporation
0	3/18/16	MSD	SDS	
				Approved T. P. Hinson
				Manager Standards

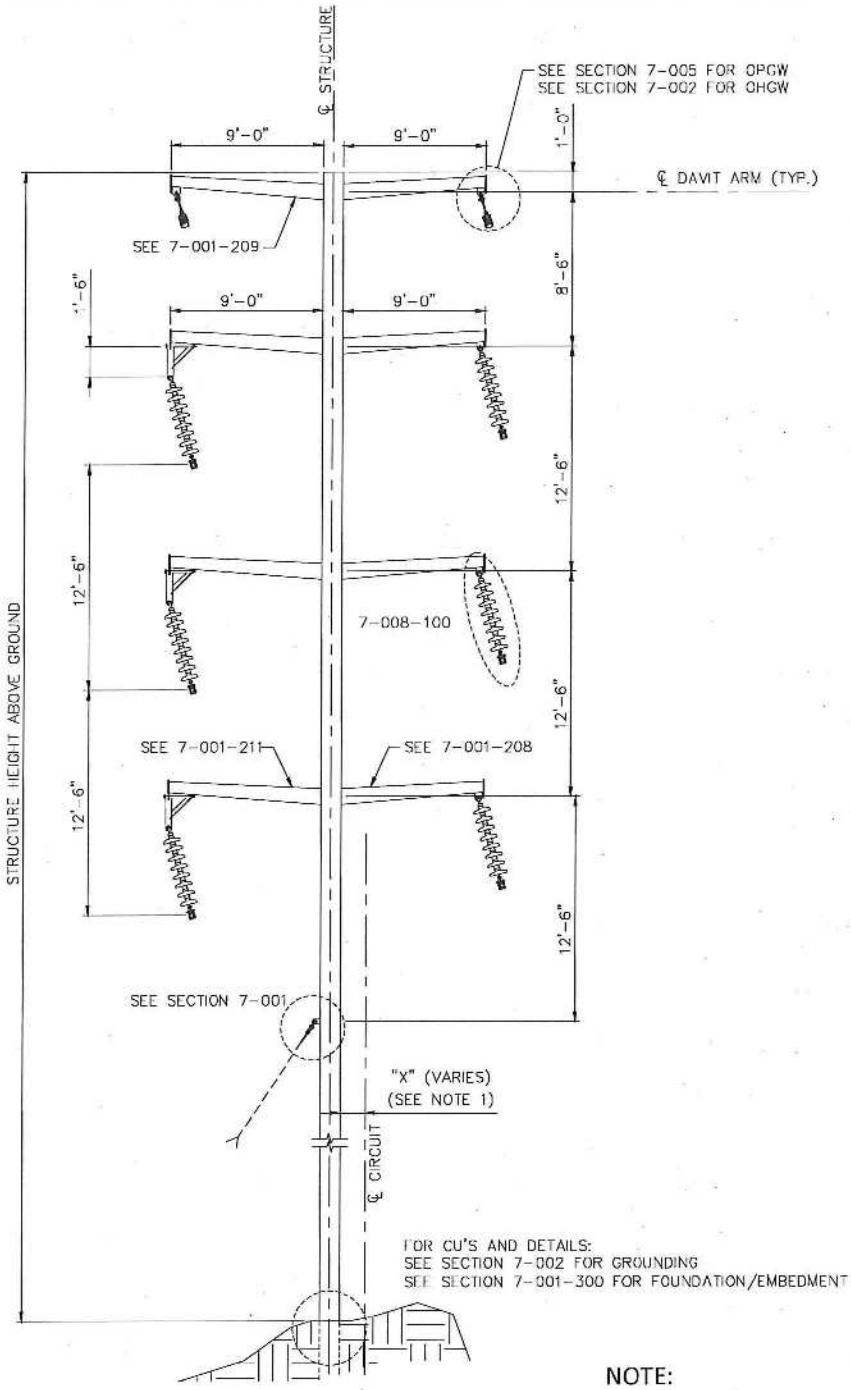
Approved: E154693 Hinson, Todd P

Figure 2-2 (7-008-002)

PPL Electric Utilities

7-008-002
138kV Double Circuit Steel Pole
1°to 10° Angle Suspension Structure

Revision: 0
Effective Date: 3/18/2016
Sheet **1** of **1**



NOTE:
1. SEE SPECIFIC JOB INSTRUCTIONS FOR STRUCTURE LAYOUT DIMENSIONS

REV	Date	Sponsor	Reviewer	Transmission Construction Standards PPL Electric Utilities Corporation
0	3/18/16	MSD	SDS	
				Approved T. P. Hinson
				Manager Standards

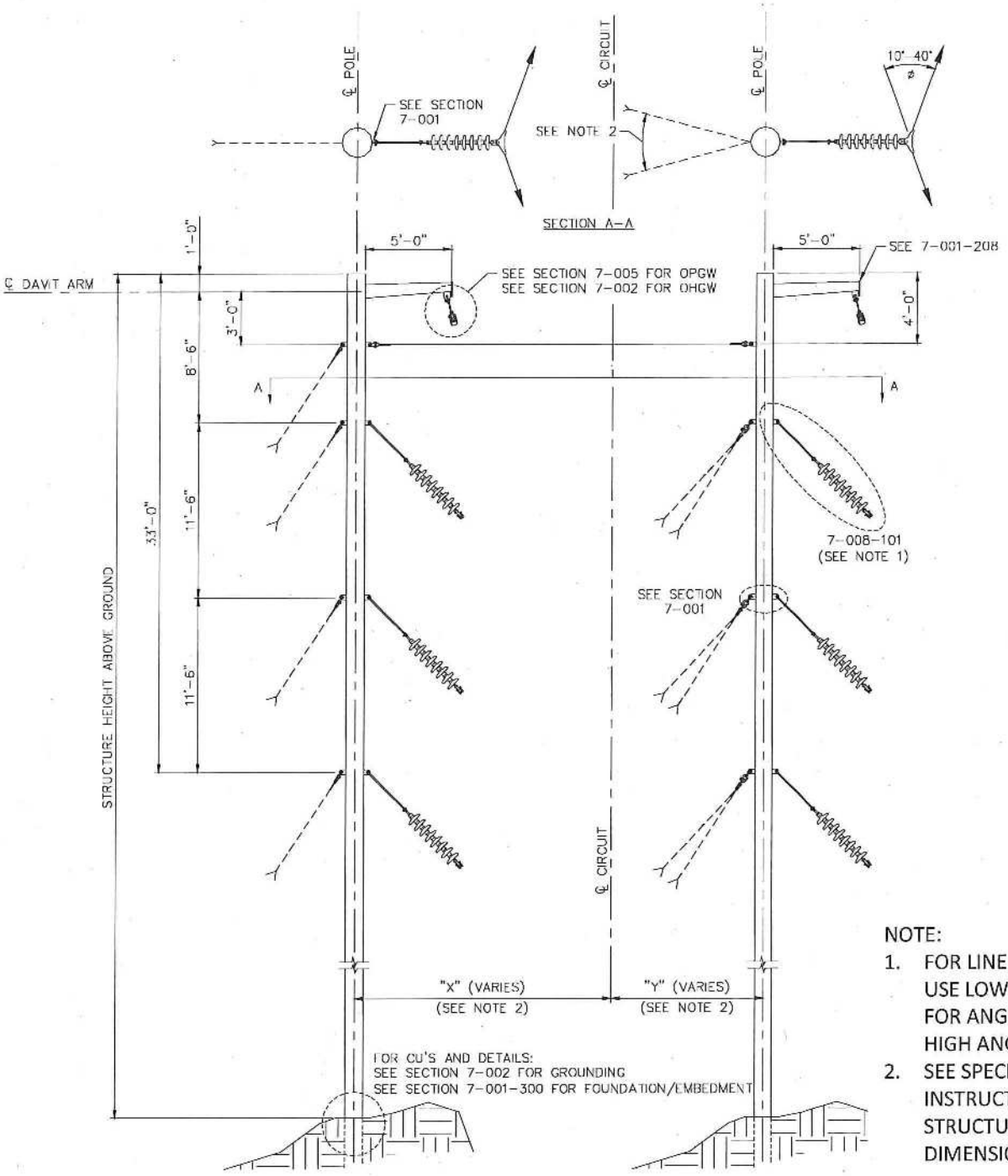
Approved: E154693 Hinson, Todd P

Figure 2-3 (7-008-003)

PPL Electric Utilities

7-008-003
138kV Double Circuit Steel Pole
10° to 40° Angle Suspension Structure

Revision: 0
Effective Date: 3/18/2016
Sheet **1** of **1**



NOTE:

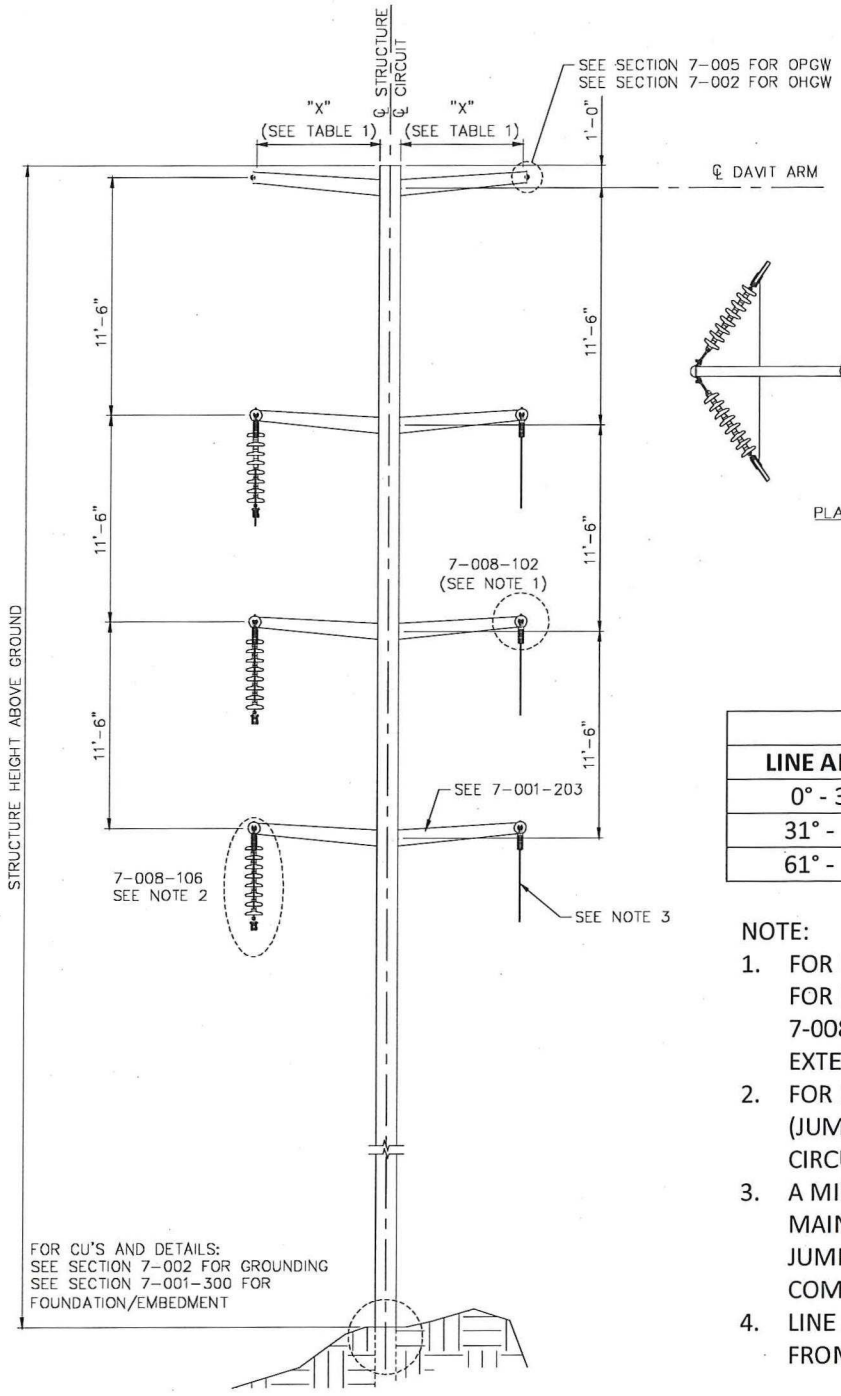
1. FOR LINE ANGLES 10°-30° USE LOW ANGLE ASSEMBLY, FOR ANGLES 31°-40° USE HIGH ANGLE ASSEMBLY.
2. SEE SPECIFIC JOB INSTRUCTIONS FOR STRUCTURE LAYOUT DIMENSIONS.

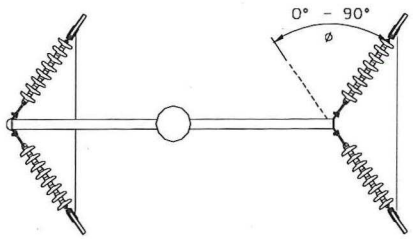
REV	Date	Sponsor	Reviewer	Transmission Construction Standards PPL Electric Utilities Corporation
0	3/18/16	MSD	SDS	
				Approved T. P. Hinson
				Manager Standards

Approved: E154693 Hinson, Todd P

Figure 2-4 (7-008-004)

PPL Electric Utilities	**7-008-004** 138kV Double Circuit Steel Pole 0° to 90° Angle Tension on Arm Structure	Revision: 0 Effective Date: 3/18/2016 Sheet **1** of **1**





PLAN VIEW

TABLE 1	
LINE ANGLE	**DAVIT ARM LENGTH "X"**
0° - 30°	8'-0"
31° - 60°	9'-0"
61° - 90°	11'-0"

NOTE:

1. FOR LINE ANGLES 0°-40° INSTALL 7-008-102. FOR LINE ANGLES GREATER THAN 40° INSTALL 7-008-103 (TENSION ASSEMBLY WITH EXTENSION) ON OUTSIDE CIRCUIT ONLY.
2. FOR LINE ANGLES OVER 10° INSTALL 7-008-106 (JUMPER SUSPENSION ASSEMBLY) ON OUTSIDE CIRCUIT ONLY.
3. A MINIMUM 46 INCH CLEARANCE SHALL BE MAINTAINED FROM ANY POINT ON THE JUMPER TO ALL GROUNDED STRUCTURAL COMPONENTS AND HARDWARE.
4. LINE ANGLE MAY EXCEED 90° WITH APPROVAL FROM PPL ENGINEERING/STANDARDS.

REV	Date	Sponsor	Reviewer	Transmission Construction Standards PPL Electric Utilities Corporation
0	3/18/16	MSD	SDS	
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				Manager Standards

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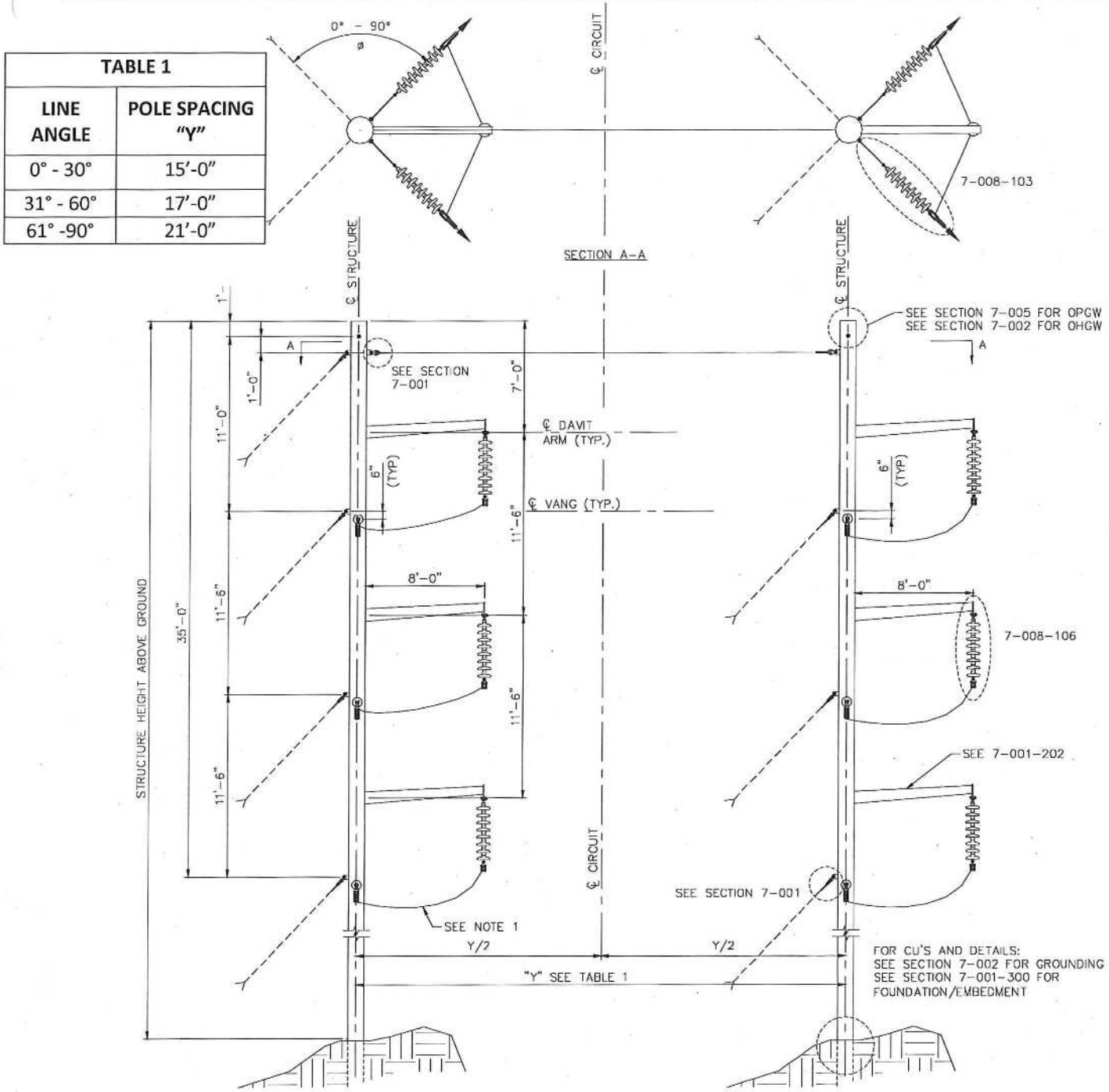
Figure 2-5 (7-008-005)

PPL Electric Utilities

7-008-005
138kV Double Circuit Steel Pole
0° to 90° Angle Tension on Pole Structure

Revision: 0
Effective Date: 3/18/2016
Sheet **1** of **1**

TABLE 1	
LINE ANGLE	**POLE SPACING "Y"**
0° - 30°	15'-0"
31° - 60°	17'-0"
61° -90°	21'-0"



NOTES:

1. A MINIMUM 46 INCH CLEARANCE SHALL BE MAINTAINED FROM ANY POINT ON THE JUMPER TO ANY GROUNDED STRUCTURAL COMPONENTS AND HARDWARE.
2. LINE ANGLE MAY EXCEED 90° WITH APPROVAL FROM PPL ENGINEERING/STANDARDS.

REV	Date	Sponsor	Reviewer	Transmission Construction Standards PPL Electric Utilities Corporation
0	3/18/16	MSD	SDS	
				Approved T. P. Hinson
				Manager Standards

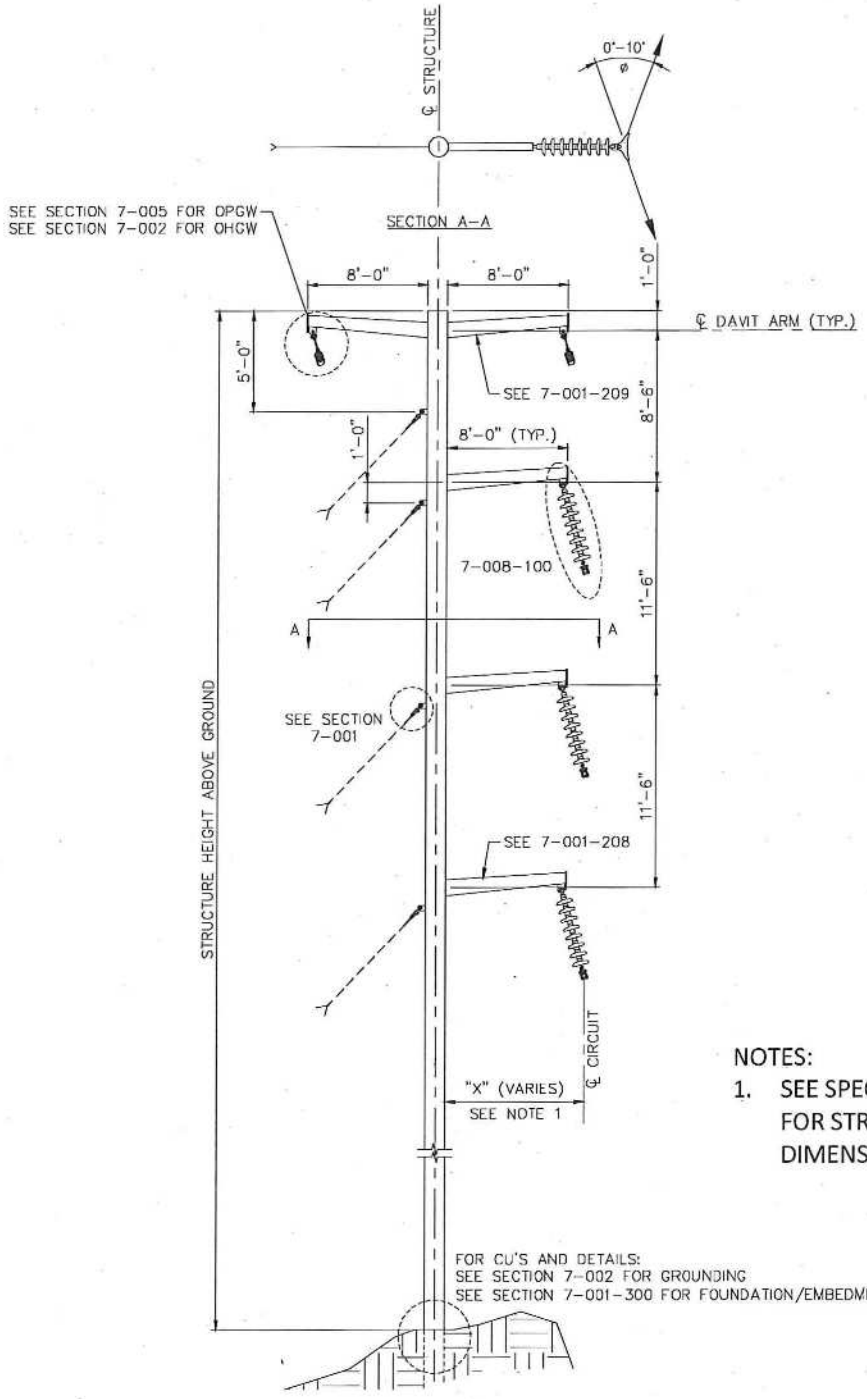
Approved: E154693 Hinson, Todd P

Figure 2-6 (7-008-011)

PPL Electric Utilities

7-008-011
138kV Single Circuit Steel Pole
0° to 10° Angle Suspension Structure

Revision: 0
Effective Date: 3/18/2016
Sheet **1** of **1**



NOTES:

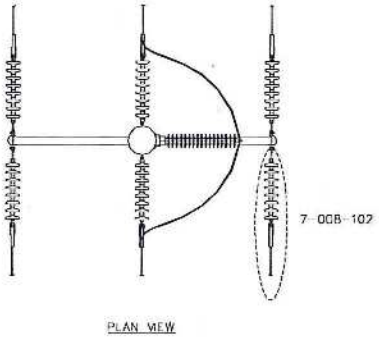
1. SEE SPECIFIC JOB INSTRUCTIONS FOR STRUCTURE LAYOUT DIMENSIONS.

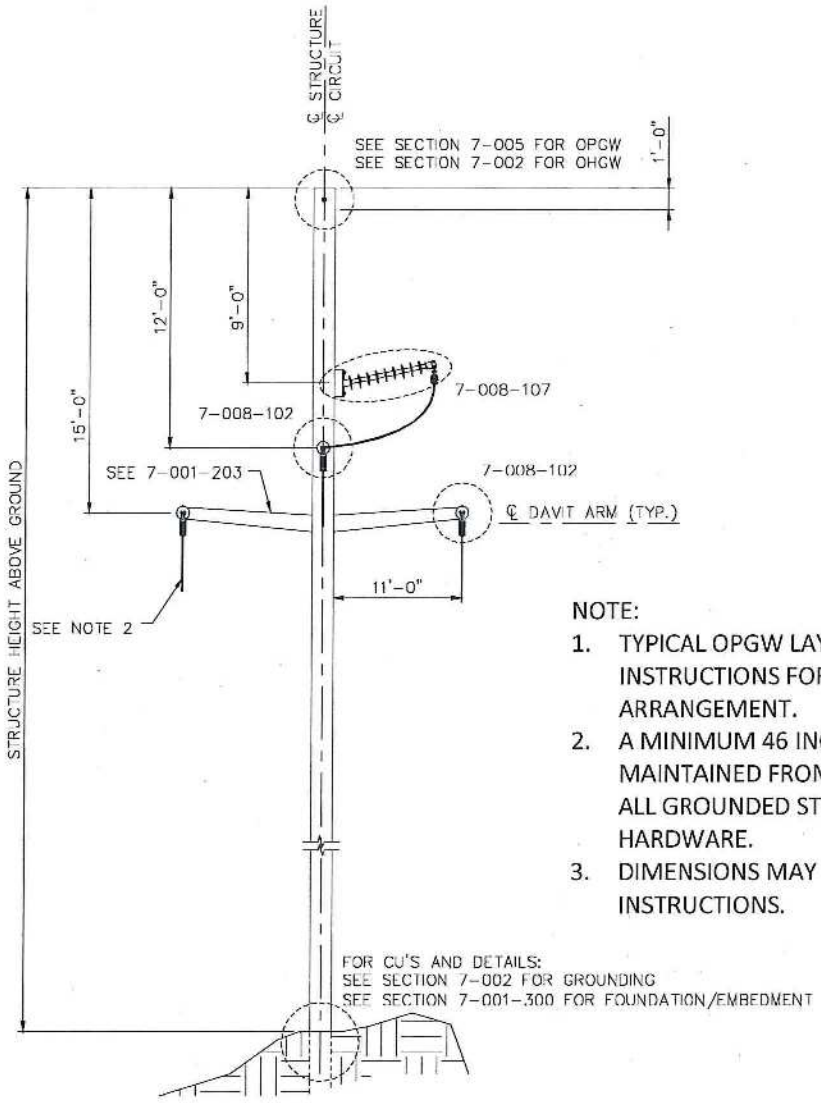
REV	Date	Sponsor	Reviewer	Transmission Construction Standards PPL Electric Utilities Corporation
0	3/18/16	MSD	SDS	
				Approved T. P. Hinson
				Manager Standards

Approved: E154693 Hinson, Todd P

Figure 2-7 (7-008-015)

PPL Electric Utilities	**7-008-015** 138kV Single Circuit Steel Pole Transposition Structure	Revision: 0 Effective Date: 3/18/2016 Sheet **1** of **1**





NOTE:

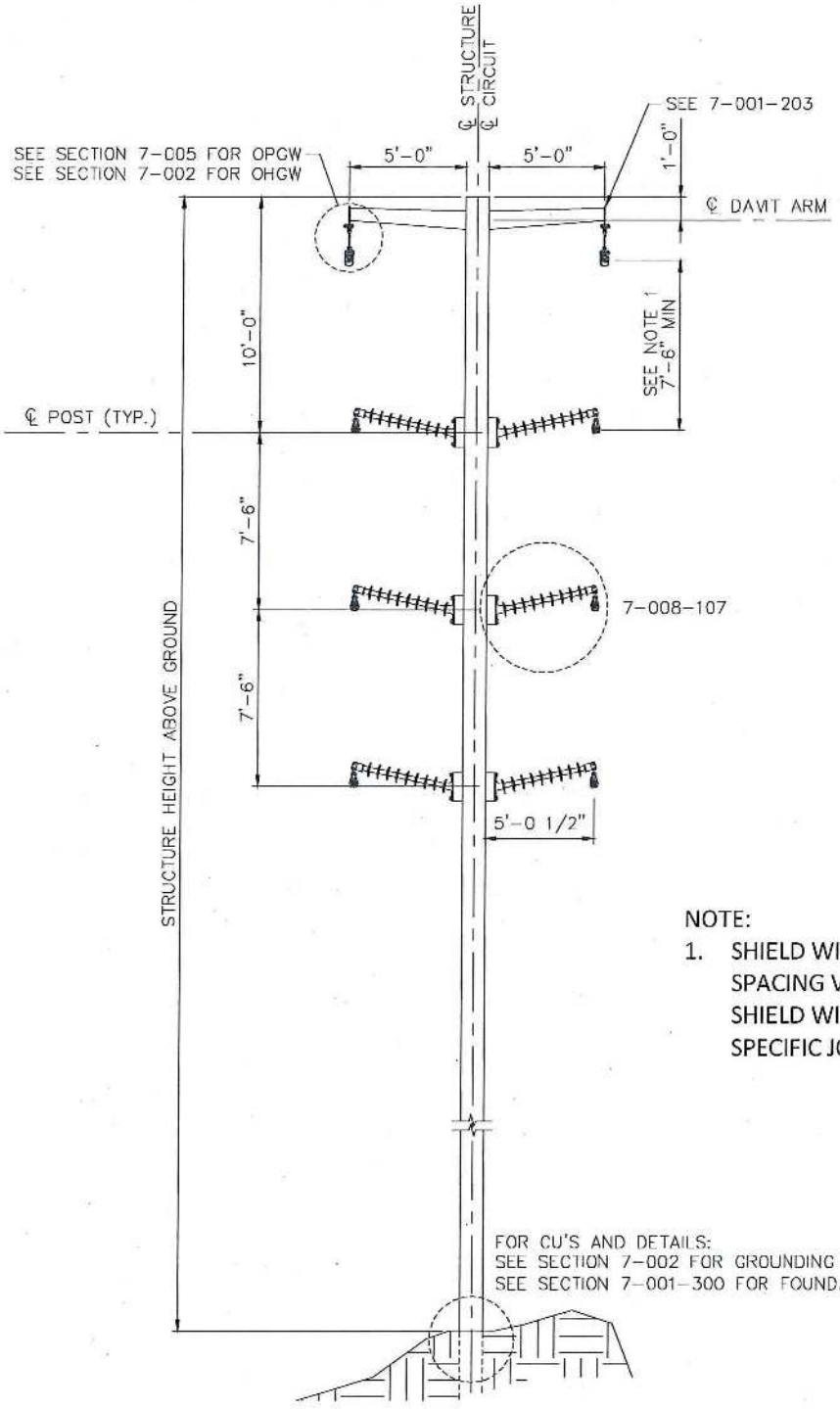
1. TYPICAL OPGW LAYOUT SHOWN. SEE JOB SPECIFIC INSTRUCTIONS FOR STRUCTURE SPECIFIC OPGW ARRANGEMENT.
2. A MINIMUM 46 INCH CLEARANCE SHALL BE MAINTAINED FROM ANY POINT ON THE JUMPER TO ALL GROUNDED STRUCTURAL COMPONENTS AND HARDWARE.
3. DIMENSIONS MAY VARY, SEE JOB SPECIFIC INSTRUCTIONS.

REV	Date	Sponsor	Reviewer	Transmission Construction Standards PPL Electric Utilities Corporation
0	3/18/16	MSD	SDS	
				Approved T. P. Hinson
				Manager Standards

Approved: E154693 Hinson, Todd P

Figure 2-8 (7-008-030)

PPL Electric Utilities	**07-008-030** 138kV Double Circuit Steel Pole 0° to 1° Angle Line Post Structure	Revision: 0 Effective Date: 3/18/2016 Sheet **1** of **1**



NOTE:

1. SHIELD WIRE TO CONDUCTOR SPACING VARIES DEPENDING ON SHIELD WIRE SUPPORT ASSEMBLY. SEE SPECIFIC JOB INSTRUCTIONS.

FOR CU'S AND DETAILS:
SEE SECTION 7-002 FOR GROUNDING
SEE SECTION 7-001-300 FOR FOUNDATION/EMBEDMENT

REV	Date	Sponsor	Reviewer	Transmission Construction Standards PPL Electric Utilities Corporation
0	3/18/16	MSD	SDS	
				Approved T. P. Hinson
				Manager Standards

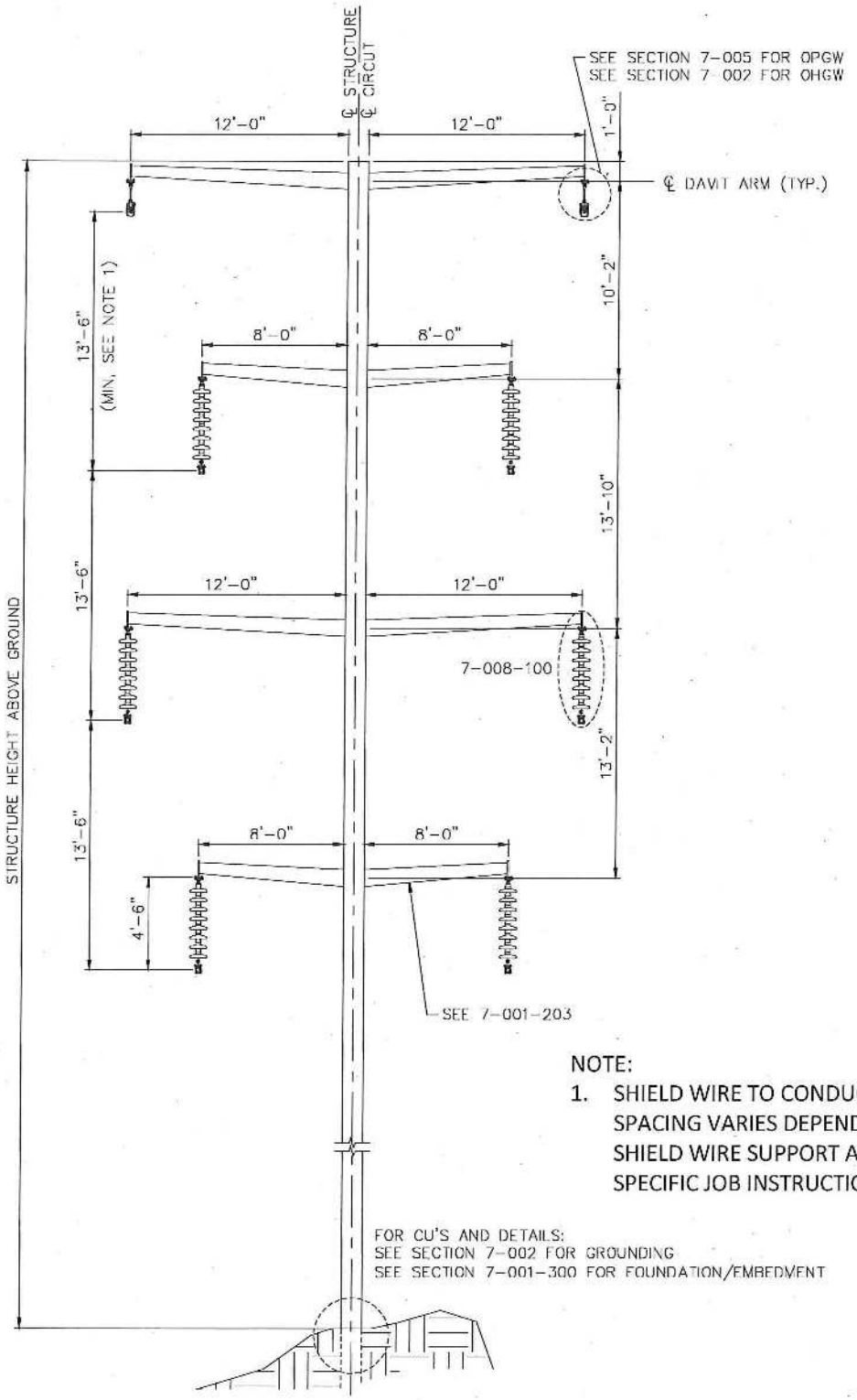
Approved: E154693 Hinson, Todd P

Figure 2-9 (7-008-061)

PPL Electric Utilities

7-008-061
138kV Long Span Double Circuit Steel Pole
0° to 1° Suspension Structure

Revision: 0
Effective Date: 3/18/2016
Sheet **1** of **1**



NOTE:

1. SHIELD WIRE TO CONDUCTOR SPACING VARIES DEPENDING ON SHIELD WIRE SUPPORT ASSEMBLY. SEE SPECIFIC JOB INSTRUCTIONS.

REV	Date	Sponsor	Reviewer	Transmission Construction Standards PPL Electric Utilities Corporation
0	3/18/16	MSD	SDS	
				Approved T. P. Hinson Manager Standards

Approved: E154693 Hinson, Todd P

ATTACHMENT 3

BUXMONT – ELROY 138/69 kV TRANSMISSION LINE REBUILD PROJECT DESCRIPTION OF THE RIGHT OF WAY

TABLE OF CONTENTS

A. INTRODUCTION

PPL Electric Utilities Corporation (PPL Electric) is requesting Pennsylvania Public Utility Commission (PUC or the Commission) approval to rebuild approximately 7.5 miles of the existing Buxmont-Elroy #1 and #2 69 kV transmission lines, approximately 0.25 miles of the existing of the Elroy-Hatfield #1 and #2 138/69 kV transmission lines, approximately 0.35 miles of the existing Elroy #1 and #2 138/69 kV transmission taps, and the approximately 354 feet of the existing Hatfield #1 and #2 69 kV transmission taps (the Project). As explained in Attachment 1, these existing transmission lines have reached the end of their useful life and must be replaced in order to ensure continued safe and reliable electric service to approximately 17,060 customers in Montgomery and Bucks Counties.

Project maps are included as **Figures 1-3** and **1-4** at the end of Attachment 1 of this document.

B. DESCRIPTION OF THE RIGHT-OF-WAY

As explained in Attachment 2, PPL Electric proposes to construct the Project completely within existing transmission line right-of-way (ROW) and on property owned in feed by PPL Electric (i.e., the substation property). The existing ROWs for the Buxmont-Elroy #1 and #2 69 kV transmission lines, Elroy-Hatfield #1 and #2 138/69 kV transmission lines, Elroy #1 and #2 138/69 kV transmission taps, and Hatfield #1 and #2 69 kV transmission taps vary in width from 40 to 100 feet. In areas where the ROW is less than 100 feet, PPL Electric will design the line to be constructed within the existing ROW while maintaining all necessary clearances as explained in Attachment 2. No new or additional ROW is necessary for the construction, operation, or maintenance of the rebuilt transmission lines.

As explained in Attachment 2, the total number of tower structures will decrease from 209 to 174, and will range from five to 30 feet taller than existing wood structures. The new tower structures generally will be placed in close proximity to the location of the existing tower

structures. No new structures will be placed on property that currently does not have an existing structure.

A network of existing access roads will be utilized for constructing the Project where practical and will be supplemented with new access roads where required.

C. LAND USE AND ENVIRONMENTAL

Evaluation of existing land uses in the Project area involved review of the 2011 National Land Cover Data (NLCD) database. Land uses tend to include a patchwork of housing, commerce, farmland, several creeks, and scattered patches of different wetland cover types and upland forest.

Impacts to land uses are anticipated to be minimal because the proposed Project will be constructed entirely within transmission line ROWs. The Project will be accessed during construction through the use of state and secondary roads, but most of the construction will occur within the existing ROW.

State and Conserved Lands

During evaluation for State-owned lands, no impacts were identified along the ROW. The National Conservation Easement Database was reviewed to identify one (1) farm easement, Montgomery County Farmland Conservation Easement 45, which is crossed by the existing ROW. This is a Trust for Public Land, County of Montgomery, Open Space – Farm Easement, and is crossed by the existing ROW for approximately 0.2 mile (1,050 feet). Four existing structures are located in this easement. These existing structures will be removed and replaced with three proposed structures, resulting in a reduction of one structure on the easement. As a result, no additional permanent or excessive soil disturbance is anticipated as a result of the Project.

Airports

G. Rosenberger Airport is located approximately 3.7 miles east of the Project area, Moyer Airport is located 2.7 miles to the east, Pennridge Airport is located 3.5 miles to the northeast, and Perkiomen Valley Airport is located approximately 7.2 miles to the southwest. PPL Electric does not anticipate any interference with airport operations because the Project is located in an area where there are existing electrical facilities and other infrastructure. However, PPL Electric will file any required documentation with the Federal Aviation Administration and the Pennsylvania Department of Transportation, Bureau of Aviation.

Cultural Resources

Due to the Project qualifying for coverage under the General National Pollution Discharge Elimination System (NPDES) Permit and the lack of need to apply for other Federal permits or approval from the U.S. Army Corps of Engineers, the was no requirement for coordinating with the Pennsylvania Historical and Museum Commission (PHMC) during the permitting process. However, PPL Electric will provide information about the Project to the PHMC upon request.

Unique Natural Features

No unique geologic, scenic, or natural areas are located within the Project area.

Soils

Erosion and sedimentation control plans that will minimize the displacement of soils are being developed and will be implemented for the Project. These plans will require approval from the Bucks and Montgomery County Conservation Districts. Review of the General NPDES by the Pennsylvania Department of Environmental Protection (PADEP) will also be required as needed.

Any and all conditions of the NPDES permit will be adhered to as part of the construction process. Therefore, impacts to local soil resources are anticipated to be minimal.

Waterways

The existing transmission lines span four mapped, perennial waterways within the ROW. These include East Branch Perkiomen Creek, Indian Creek, Shippack Creek, and West Branch Neshammy Creek. According to the PADEP, none of these creeks has been assigned a designated classification. However, construction of the Project will be conducted using a state-approved erosion and sedimentation control plan to minimize any effects of stormwater runoff. Also, PPL Electric will obtain any regulatory approvals and permits necessary for the construction of the Project, and will fully comply with any conditions placed on those permits.

Wetlands

Based on review of the U.S. Fish and Wildlife Service's (USFWS) National Wetlands Inventory (NWI), the existing transmission line ROWs cross a number of wetland areas. These systems are classified as palustrine emergent (PEM) and palustrine scrub-shrub (PSS) wetlands. The NWI only provides a general overview of potential wetlands and waterways within an area.

For federal and state permitting purposes, all wetlands and waterways within the Project area were delineated and mapped according to regulatory standards. All of these are classified as PEM and PSS. PPL Electric will avoid and minimize any impacts to wetlands when possible during construction. In addition, PPL Electric will obtain all necessary permits required to construct the Project and will fully comply with any conditions placed on those permits.

100-year Floodplains

The National Flood Hazard Layer (NFHL) for Pennsylvania was obtained through the Pennsylvania Spatial Data Access (PASDA) database and analyzed for the occurrence of 100-year floodplains with the project area and surrounding landscape. The NFHL data incorporates all Flood Insurance Rate Map (FIRM) databases published by the Federal Emergency Management Agency (FEMA), and any Letters of Map Revision (LOMRs) that have been issued against those databases since their publication dates.

The existing transmission line ROWs crosses four separate 100-year floodplain areas. These floodplains are associated with East Branch Perkiomen, Indian, Shippack, and West Branch Neshammy Creeks. PPL Electric will try to minimize impacts to these floodplains by designing the Project with longer spans, and minimizing construction activities in these areas. PPL Electric will coordinate with the PADEP regarding these areas during the permitting phase of the Project.

Vegetation

Vegetation in the vicinity of the Project area has been heavily influenced by agricultural activities and residential and commercial development. As a result, the landscape tends to be a patchwork of housing, commerce, farmland, and scattered patches of forest. The Project area ROW consists of herbaceous and scrub shrub uplands and wetlands, and is generally maintained in this condition.

Very limited vegetation management will be required within the Project area ROW. The existing ROWs are currently maintained in accordance with PPL Electric's Vegetation Management Program. Only minimal vegetation removal is anticipated because the Project is being constructed entirely within PPL Electric ROW, which does not contain tree-sized vegetation due to safety and electrical service reliability purposes. In areas where vegetation management is required, PPL Electric will apply its *Specifications for Transmission Vegetation Management LA-7982* to minimize any potential impacts.

Natural Areas Inventory

Natural areas inventories for Bucks and Montgomery Counties, prepared by the Pennsylvania Natural Heritage Program (PNHP), did not identify any Natural Heritage Sites within the Project area.

Threatened and Endangered Species

A Pennsylvania Natural Diversity Inventory (PNDI) database search request for the Project area was submitted to the Pennsylvania Department of Conservation and Natural Resources (DCNR) and Pennsylvania Fish and Boat Commission (PFBC). The PNDI results revealed suitable habitat and the potential presence of four state-listed plant species, and one federally-listed wildlife species. These included the state-threatened cloud sedge (*Carex haydenii*), the rare brown sedge (*Carex buxbaumii*), the state-endangered slender blue iris (*Iris prismatica*), the state-endangered downy phlox (*Pholox pilosa*), and the federally-threatened bog turtle (*Clemmys muhlenbergii*).

Both the DCNR and PFBC recommended that field habitat assessment surveys be performed for all five species. Field surveys were conducted for the plant species and a survey report was submitted to the DCNR in November 2016. As a result, the DCNR issued a letter stating "no impact is likely," and stated no additional coordination with the DCNR would be required for the project.

Based on coordination with the USFWS and the DCNR, PPL Electric conducted Phase I and Phase II bog turtle habitat surveys. No habitat or individual bog turtles were observed, and the USFWS subsequently issued a letter in September 2016 stating "that the effects of the project are not likely to adversely affect the bog turtle." Therefore, no further PNDI and agency consultations or field surveys are required.

ATTACHMENT 4

BUXMONT – ELROY 138/69 kV TRANSMISSION LINE REBUILD PROJECT PPL ELECTRIC UTILITIES DESIGN CRITERIA AND SAFETY PRACTICES

TABLE OF CONTENTS

List of Tables

A. DESIGN CONSIDERATIONS

The new transmission lines and taps will be designed according to, and generally exceed, all NESC minimum standards. The NESC is a set of rules to safeguard people during the installation, operation, and maintenance of electric power lines. The NESC contains the basic provisions considered necessary for the safety of employees and the public. Although it is not intended as a design specification, its provisions establish minimum design requirements. PPL Electric has developed design specifications and safety rules which meet or surpass all requirements specified by the NESC.

The NESC includes loading requirements and clearances for the design, construction, and operation of power lines. The "loads" on conductors and supporting structures are the mechanical forces that develop from the weight of the conductors, the weight of ice on the conductors, plus wind pressure on the conductors and supporting structures. Loading requirements are the loads on the conductors and structures that are anticipated assuming certain ice and wind conditions. Loading requirements always contain "safety factors" to allow for unknown or unanticipated contingencies. The clearances and loading requirements contained in the NESC were developed to ensure public safety and welfare.

PPL Electric transmission line design standards meet or surpass the NESC standards. For example, the relative order of grades of construction for conductors and supporting structures is B, C, and N; Grade B being the highest. According to the NESC standards, construction Grades B, C, or N may be used for transmission lines (except at crossings of railroad tracks and limited access highways where Grade B construction is specified). However, PPL Electric designs all of its transmission lines for Grade B construction. The use of Grade B design and construction specifies enhancements such as increased safety factors.

Another example is the design parameters utilized to account for ice and wind loadings on the wires and structure. The conductor sags and tensions along with the structure loading used in line designs are the result of various ice and wind combinations, PPL transmission lines are designed to exceed NESC requirements with additional load cases to account for various ice and wind loading conditions not required by NESC. This means that PPL Electric lines are designed to operate safely and reliably during inclement weather even more severe than assumed by the NESC. In addition, PPL Electric transmission lines are designed with more clearance to the ground than required by the NESC. The tables below compare PPL Electric and NESC ground clearances for lines of various voltages.

TABLE 4-1: 69 kV Vertical Clearance to Ground

Surface Underneath Conductors	NESC Standard Clearance	Minimum Conductor Clearances
Roads, streets, alleys	19.2 Ft.	30 Ft.
Other land traversed by vehicles (such as cultivated field, forest, etc.)	19.2 Ft.	30 Ft.
Spaces accessible to pedestrians only	15.2 Ft.	30 Ft.
Railroad tracks	27.2 Ft.	31.5 Ft.

TABLE 4-2: 138 kV Vertical Clearance to Ground

Surface Underneath Conductors	NESC Standard Clearance	Minimum Conductor Clearances
Roads, streets, alleys	20.6 Ft.	31 Ft.
Other land traversed by vehicles (such as cultivated field, forest, etc.)	20.6 Ft.	31 Ft.
Spaces accessible to pedestrians only	16.6 Ft.	31 Ft.
Railroad tracks	28.6 Ft.	35 Ft.

TABLE 4-3: 230 kV Vertical Clearance to Ground

Surface Underneath Conductors	NESC Standard Clearance	Minimum Conductor Clearances
Roads, streets, alleys	22.4 Ft.	33 Ft.
Other land traversed by vehicles (such as cultivated field, forest, etc.)	22.4 Ft.	33 Ft.
Spaces accessible to pedestrians only	18.4 Ft.	33 Ft.
Railroad tracks	30.4 Ft.	35 Ft.

TABLE 4-4: 500 kV Vertical Clearance to Ground

Surface Underneath Conductors	NESC Standard Clearance	Minimum Conductor Clearances
Roads, streets, alleys	28.4 Ft.	40 Ft.
Other land traversed by vehicles (such as cultivated field, forest, etc.)	28.4 Ft.	40 Ft.
Spaces accessible to pedestrians only	24.4 Ft.	40 Ft.
Railroad tracks	36.4 Ft.	53 Ft.

A relay protection system is used to protect the public safety and welfare as well as equipment and the transmission system. Relay protection is installed for all transmission lines to automatically de-energize the line in the unlikely event that the line or supporting structure fails and the line contacts the ground.

B. PERIODIC MAINTENANCE PROGRAM ON ALL TRANSMISSION LINES

To ensure continued public safety and integrity of service, a periodic maintenance and inspection program is implemented for every transmission line. The program is administered through the use of helicopter patrols, with supplemental foot patrols as needed. A number of helicopter patrols are performed on all lines annually depending on voltage level. The two-man helicopter crew flies parallel, to the left, and above the line so that the observer can look for signs of line damage or deterioration and observe clearances between vegetation and conductors. The observations are included in a report that is forwarded to the appropriate department for corrective action.

C. PERSONNEL SAFETY RULES

Overall PPL designs and constructs projects with high regards to public safety and follows or exceeds all codes and requirements.

The following are a few of the PPL Electric safety rules that demonstrate the Company's concern for employee and contractor safety:

- Work procedures have been developed to allow work to be performed on energized facilities in a safe manner. When lines or apparatus are removed from service to be worked on, the Energy Control Process system is applied. This system provides that a red tag must be physically placed on the control handle of the de-energized equipment.

o The red tag may be removed only after proper authorization to energize the equipment.

o Various other tags are used for limited operations and informational purposes.

o Employees or contractors will not apply or remove a tag or change the status of tagged equipment unless authorized.

- Temporary safety grounds are used on de-energized facilities for employee lineman safety during maintenance, construction, or reconstruction work. Safety grounds are wires

connecting the de-energized facility to an electrical ground. If the facility should be energized, the safety grounds will divert the current directly to ground and reduce the likelihood of personal injury.

- Before applying grounds, a test is done to confirm that the line is de-energized. The voltage test device is checked before and after use to assure reliability.
- Poles or structures are inspected and examined for structural integrity before climbing. If there is any reason to believe that a pole is unsafe, it is stabilized before work is performed. Appropriate safety gear in the form of body belts, safety straps, hard hats, gloves, etc., is worn by linemen during line work activity.

D. MAGNETIC FIELD MANAGEMENT PLAN

PPL Electric's Magnetic Field Management Program is applied to new and reconstructed transmission line projects. In order to lower magnetic field exposures, the program generally prescribes the use of a line design that provides ground clearances higher than the required minimum NESC ground clearance, and reverse phasing of new double circuit lines where it is feasible to do so at low or no cost. The implementation of additional modifications to reduce magnetic field levels, are considered, provided those modifications can be made at low or no cost and will not interfere with the operation of the line.