

# Perkasie Solar RFI System Planning Report

ANALYSIS AND RECOMMENDATIONS

PROPOSED DATA CENTER

**CONTENTS**

Executive Summary ..... 2

Background ..... 4

Engineering Assumptions ..... 5

Site-by-Site Evaluation..... 6

    Revivals Parking Lot ..... 6

    S. 7th Street Borough Parking Lot ..... 9

    Menlo Parking Lot ..... 12

    Lenape Parking Lot ..... 15

    Landfill Site..... 18

PPL Intertie Protection Relaying (IPR) Cabinet Implementation ..... 23

Federal Incentives ..... 25

Comparative Summary Table..... 26

Overall Recommendations..... 27

Recommended Next Engineering Steps..... 28

Appendix A — Conceptual Utility layouts..... 29

Appendix B — Conceptual Site Photovoltaic Layouts..... 35

    Revivals Parking Lot ..... 35

    South 7<sup>th</sup> Street Parking Lot ..... 36

    Menlo Park Parking Lot..... 37

    Lenape Park Parking Lot..... 38

    Landfill Site..... 39

## EXECUTIVE SUMMARY

The Borough of Perkasia is evaluating multiple distributed behind-the-meter (BTM) solar photovoltaic (PV) installations located on municipally owned properties, including four parking canopy sites and one capped landfill site. The Borough owns and operates its electrical infrastructure, creating flexibility in the implementation of utility-side distribution extensions and interconnection facilities.

This memorandum provides a planning-level engineering evaluation of probable interconnection approaches, conceptual inverter sizing, recommended service voltages, utility infrastructure impacts, and preliminary interconnection costs.

Based on a review of the conceptual site layouts included in the RFI appendices, the evaluated projects are estimated to be approximately the following sizes. These estimates are intentionally conservative and generally biased toward the higher end of the anticipated range.

Site	Estimated DC Size	Estimated AC Size
<b>Revivals Parking Lot</b>	240 kWdc	200 kWac
<b>S 7<sup>th</sup> St Parking Lot</b>	240 kWdc	200 kWac
<b>Menlo Parking Lot</b>	240 kWdc	200 kWac
<b>Lenape Parking Lot</b>	690 kWdc	500 kWac
<b>Landfill Site</b>	1500 kWdc	1100 kWac
<b>Total Portfolio</b>	<b>2.91 MWdc</b>	<b>2.20 MWac</b>

Key engineering conclusions include:

- All parking canopy sites should interconnect at 480V three-phase despite some RFI references to possible 240V service.
- Dedicated production services are recommended at all sites.
- The landfill project may justify medium-voltage primary interconnection depending upon final inverter aggregation and distance to existing infrastructure.
- IEEE 1547-compliant inverter functions will be required for all systems.
- Based upon the anticipated aggregate generation size, it is expected that PPL will require an interconnection study and installation of an Intertie Protections Relaying (IPR) cabinet at the Borough's substation.
- The landfill project presents materially higher geotechnical and constructability risk than the parking canopy sites.
- To preserve eligibility under the current federal tax credit guidance, the project team may need to satisfy IRS safe harbor requirements by incurring or paying at least 5% of the total eligible project cost prior to the

applicable deadline. In practice, this often requires procurement of major equipment or construction materials before the deadline date.

- Typical costing for the solar installations are featured below purely as a rule-of-thumb reference when evaluating the solar vendor responses to the RFI:
  - Roof-mount: \$1.40-\$1.80 per watt
  - Ground-mount: \$1.50-\$1.90 per watt
  - Canopy-Mount: \$2.50-\$5.00 per watt

The aggregate planning-level utility interconnection cost range for all projects combined is estimated at approximately

Cost Summary Table	
Revivals Parking Lot	\$231,680.48
S 7 <sup>th</sup> St Parking Lot	\$232,945.43
Menlo Parking Lot	\$222,545.48
Lenape Parking Lot	\$294,525.48
Landfill Site	\$320,005.48
20% Contingency	\$260,340.47
PPL IPR Cabinet	\$300,000.00
<b>Total</b>	<b>\$1,862,042.79</b>

These costs exclude PV modules, canopy structures, landfill remediation, and major civil/site development beyond electrical interconnection scope.

## BACKGROUND

The Borough issued a Request for Information (RFI) for distributed solar installations at the following locations:

1. Revivals Parking Lot
2. S. 7th Street Borough Parking Lot
3. Menlo Parking Lot
4. Lenape Parking Lot
5. Landfill Site

The parking lot installations are envisioned as solar canopies while the landfill project is anticipated as a ballast-mounted ground-mount solar installation on a capped landfill.

The Borough requested conceptual evaluation of:

- Feasible interconnection approaches
- Service voltage selection
- Distribution extension requirements
- Planning-level utility costs
- Operational and protection concerns

This report is intended solely for planning purposes and is not a substitute for formal utility interconnection studies, load flow analysis, grounding studies, or protection coordination studies.

**ENGINEERING ASSUMPTIONS**

The following assumptions were utilized in this conceptual evaluation.

**Solar Design Assumptions**

Parameter	Assumption
<b>Module Rating</b>	625Wdc bifacial modules
<b>Module Efficiency</b>	~22%
<b>Canopy Packing Factor</b>	70–78% usable coverage
<b>Landfill Packing Factor</b>	82–88% usable coverage
<b>Inverter Efficiency</b>	98.5%
<b>Inverter Loading Ratio (ILR)</b>	1.20 - 1.40
<b>Utility Voltage</b>	Radial municipal distribution system
<b>Service Voltage Options</b>	240V 1Ø, 208V 3Ø, 480V 3Ø, 13.2kV 3Ø
<b>Applicable Standards</b>	IEEE 1547, NEC 705, UL 1741SB

**Electrical Planning Assumptions**

Because detailed distribution data was unavailable, the following assumptions were made:

- PPL, the upstream investor-owned utility, will require installation of their standard IPR cabinet and accompanying instrumentation.
- Existing feeder thermal capacity is rated for 400A normal/600A emergency.
- All systems are normally connected in a radial configuration.
- For the purpose of estimating utility interconnection costs, the conceptual site layouts included in the RFI appendices were evaluated conservatively and generally sized toward the upper end of the anticipated range.

## SITE-BY-SITE EVALUATION

### REVIVALS PARKING LOT

The Revivals site consists of two primary canopy rows with partial southern shading from adjacent trees identified in the RFI.

#### Estimated Solar Size

Parameter	Estimated Value
Approximate Module Count	426
Estimated DC Capacity	243.81 kWdc
Estimated AC Capacity	200 kWac
ILR	1.20

#### Conceptual Inverter Configuration

- (4) 50 kW string inverters
- 480V three-phase output
- Central AC combiner with utility-visible disconnect

#### Recommended Service Voltage: 480V Three-Phase

Although the RFI identifies possible 240V service, 240V single-phase interconnection is not recommended at this system size.

Estimated full-load output current: 241A (@ 480V-3Ø)

Equivalent current at 240V single phase would exceed 625A, resulting in larger conductor sizing and voltage drop concerns.

#### Utility Interconnection Approach

Recommended configuration:

- Intersperse a new pole on the existing three-phase overhead line on Cedar Ridge Ct.
- Install fused cut-outs and riser to new, dedicated 300kVA pad-mounted transformer
- New 300kVA pad-mounted transformer to feed dedicated 480V production service
- Dedicated meter/disconnect pedestal
- Utility lockable, NEMA 3R AC disconnect

### **Distribution Concerns**

This site likely presents low interconnection complexity due to modest generation size. Potential impacts include:

- Daytime voltage rise
- Nuisance fuse operations under backfeed conditions
- Anti-islanding coordination
- IEEE 1547 volt-var and volt-watt settings required

### **Key Risks**

- Tree shading impacts
- Parking canopy foundation conflicts
- Conduit routing limitations

		DATE PREPARED	05-28-2026	SHEET	1 of 1
ACTIVITY AND LOCATION PERKASIE BOROUGH, PA		CONSTRUCTION CONTRACT NO.		PROJECT NUMBER	
PROJECT TITLE SOLAR RFI - REVIVALS PARKING LOT		ESTIMATED BY <b>UTILITY ENGINEERS, PC</b>		CATEGORY CODE NUMBER	
		STATUS OF DESIGN BUDGETARY		JOB ORDER NUMBER	
		PED	30%	100%	FINAL OTHER:

ITEM DESCRIPTION	QUANTITY		MATERIAL COST		LABOR COST		ENGINEERING ESTIMATE	
	NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
<b>COST ESTIMATE - BOROUGH</b>								
Pole - 45', Class 2	1	EA	\$800	\$800.00	\$10,000	\$10,000.00	\$10,800.00	\$10,800.00
1/0 AWG Cu 15 kV EPR Shielded Cable	180	FT	\$18.50	\$3,330.00	\$18.00	\$3,240.00	\$36.50	\$6,570.00
15KV, 100A Elbows - #2 AWG	3	EA	\$250	\$750.00	\$200	\$600.00	\$450.00	\$1,350.00
4/0 AWG Bare CU - Ground Ring	1	EA	\$500	\$500.00	\$750	\$750.00	\$1,250.00	\$1,250.00
15KV Elbow Lightning Arrestor	3	EA	\$600	\$1,800.00	\$400	\$1,200.00	\$1,000.00	\$3,000.00
Load Break Fuse Cutouts, 200 Amp	3	EA	\$500	\$1,500.00	\$800	\$2,400.00	\$1,300.00	\$3,900.00
Fuse Links	3	EA	\$50	\$150.00	\$200	\$600.00	\$250.00	\$750.00
3Ø Termination Bracket	1	EA	\$400	\$400.00	\$300	\$300.00	\$700.00	\$700.00
3Ø LA & Fuse Cut Out Bracket	1	EA	\$400	\$400.00	\$300	\$300.00	\$700.00	\$700.00
Fiberglass Crossarms	7	EA	\$400	\$2,800.00	\$500	\$3,500.00	\$900.00	\$6,300.00
Polymer Insulators	6	EA	\$100	\$600.00	\$200	\$1,200.00	\$300.00	\$1,800.00
Polymer Deadend Insulators	3	EA	\$150	\$450.00	\$300	\$900.00	\$450.00	\$1,350.00
Pole Grounds	2	EA	\$300	\$600.00	\$400	\$800.00	\$700.00	\$1,400.00
Miscellaneous Pole Hardware	1	LS	\$1,500	\$1,500.00	\$2,000	\$2,000.00	\$3,500.00	\$3,500.00
300 KVA Padmounted Transformer - 13200/7600 -480/277V	1	EA	\$50,000	\$50,000.00	\$8,000	\$8,000.00	\$58,000.00	\$58,000.00
Restoration/Civil Work	1	LS	\$25,000	\$25,000.00	\$25,000	\$25,000.00	\$50,000.00	\$50,000.00
Miscellaneous	1	LS	\$8,395	\$8,395.28	\$3,655	\$3,655.20	\$12,050.48	\$12,050.48
<b>TOTAL COST ESTIMATE - BOROUGH</b>				<b>\$98,975.28</b>		<b>\$64,445.20</b>		<b>\$163,420.48</b>
<b>COST ESTIMATE - CUSTOMER</b>								
Transformer Vault	1	EA	\$15,000	\$15,000.00	\$10,000	\$10,000.00	\$25,000.00	\$25,000.00
4" RNC-Sch 40 PCV	20	FT	\$12.00	\$240.00	\$100.00	\$2,000.00	\$112.00	\$2,240.00
(3) Sets 600 kcmil Cu THHN/THWN-2	40	FT	\$18.00	\$720.00	\$10.00	\$400.00	\$28.00	\$1,120.00
Low Voltage Service Pedestal	1	EA	\$10,000	\$10,000.00	\$2,400	\$2,400.00	\$12,400.00	\$12,400.00
4' x 4' CT Cabinet	1	EA	\$7,500	\$7,500.00	\$2,400	\$2,400.00	\$9,900.00	\$9,900.00
NEMA 3R Fused Disconnect	1	EA	\$8,000	\$8,000.00	\$2,400	\$1,200.00	\$10,400.00	\$10,400.00
Protective Bollards	6	EA	\$200	\$1,200.00	\$1,000	\$6,000.00	\$1,200.00	\$7,200.00
<b>TOTAL COST ESTIMATE - CUSTOMER</b>				<b>\$42,660.00</b>		<b>\$24,400.00</b>		<b>\$68,260.00</b>
<b>TOTAL COST ESTIMATES</b>				<b>\$141,635.28</b>		<b>\$88,845.20</b>		<b>\$231,680.48</b>

### S. 7TH STREET BOROUGH PARKING LOT

This site appears constrained by existing parking circulation and ADA parking retention requirements.

#### Estimated Solar Size

Parameter	Estimated Value
Approximate Module Count	390
Estimated DC Capacity	243.75 kWdc
Estimated AC Capacity	200 kWac
ILR	1.20

#### Conceptual Inverter Configuration

- (4) 50 kW string inverters
- 480V three-phase output
- Central AC combiner with utility-visible disconnect

#### Recommended Service Voltage: 480V Three-Phase

Although the RFI identifies possible 240V service, 240V single-phase interconnection is not recommended at this system size.

Estimated full-load output current: 241A

Equivalent current at 240V single phase would exceed 625A, resulting in larger conductor sizing and voltage drop concerns.

#### Utility Interconnection Approach

Recommended configuration:

- Add crossarm and cross street via overhead feeder
- Add a new terminal pole on the parking lot side of South 7<sup>th</sup> Street
- Install fused cut-outs and riser to new, dedicated 300kVA pad-mounted transformer
- New 300kVA pad-mounted transformer to feed dedicated 480V production service
- Dedicated meter/disconnect pedestal
- Utility lockable AC disconnect
- Secondary interconnection preferred

### **Distribution Concerns**

This site likely presents low interconnection complexity due to modest generation size.

- Daytime voltage rise
- Nuisance fuse operations under backfeed conditions
- Anti-islanding coordination
- IEEE 1547 volt-var and volt-watt settings required

### **Key Risks**

- Urban utility congestion
- Parking spot preservation
- Canopy structural clearance constraints

		DATE PREPARED	05-28-2026	SHEET	1 of 1
ACTIVITY AND LOCATION PERKASIE BOROUGH, PA		CONSTRUCTION CONTRACT NO.		PROJECT NUMBER	
PROJECT TITLE SOLAR RFI - 7TH STREET BOROUGH PARKING LOT		ESTIMATED BY <b>UTILITY ENGINEERS, PC</b>		CATEGORY CODE NUMBER	
		STATUS OF DESIGN BUDGETARY		JOB ORDER NUMBER	
		PED	30%	100%	FINAL OTHER:

ITEM DESCRIPTION	QUANTITY		MATERIAL COST		LABOR COST		ENGINEERING ESTIMATE	
	NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
<b>COST ESTIMATE - BOROUGH</b>								
Pole - 45', Class 2	1	EA	\$800	\$800.00	\$10,000	\$10,000.00	\$10,800.00	\$10,800.00
1/0 AWG Cu 15 kV EPR Shielded Cable	180	FT	\$18.50	\$3,330.00	\$12.00	\$2,160.00	\$30.50	\$5,490.00
4/0 AWG ACSR Neutral Conductor (60 ft run)	60	FT	\$3.00	\$180.00	\$6.00	\$360.00	\$9.00	\$540.00
#2 AWG CU 15KV URD Conductor	60	FT	\$12.00	\$720.00	\$18.00	\$1,080.00	\$30.00	\$1,800.00
15KV, 100A Elbows - #2 AWG	3	EA	\$250	\$750.00	\$200	\$600.00	\$450.00	\$1,350.00
4/0 AWG Bare CU - Ground Ring	1	EA	\$500	\$500.00	\$750	\$750.00	\$1,250.00	\$1,250.00
15KV Elbow Lightning Arrestor	3	EA	\$600	\$1,800.00	\$400	\$1,200.00	\$1,000.00	\$3,000.00
Load Break Fuse Cutouts, 200 Amp	3	EA	\$500	\$1,500.00	\$800	\$2,400.00	\$1,300.00	\$3,900.00
Fuse Links	3	EA	\$50	\$150.00	\$200	\$600.00	\$250.00	\$750.00
3Ø Termination Bracket	1	EA	\$400	\$400.00	\$300	\$300.00	\$700.00	\$700.00
3Ø LA & Fuse Cut Out Bracket	1	EA	\$400	\$400.00	\$300	\$300.00	\$700.00	\$700.00
Fiberglass Crossarms	7	EA	\$400	\$2,800.00	\$500	\$3,500.00	\$900.00	\$6,300.00
Polymer Insulators	6	EA	\$100	\$600.00	\$200	\$1,200.00	\$300.00	\$1,800.00
Polymer Deadend Insulators	3	EA	\$150	\$450.00	\$300	\$900.00	\$450.00	\$1,350.00
Pole Grounds	2	EA	\$300	\$600.00	\$400	\$800.00	\$700.00	\$1,400.00
Miscellaneous Pole Hardware	1	LS	\$1,500	\$1,500.00	\$2,000	\$2,000.00	\$3,500.00	\$3,500.00
300 KVA Padmounted Transformer - 13200/7600 -480/277V	1	EA	\$50,000	\$50,000.00	\$8,000	\$8,000.00	\$58,000.00	\$58,000.00
Restoration/Civil Work	1	LS	\$25,000	\$25,000.00	\$25,000	\$25,000.00	\$50,000.00	\$50,000.00
Miscellaneous	1	LS	\$8,398	\$8,397.53	\$3,658	\$3,657.90	\$12,055.43	\$12,055.43
<b>TOTAL COST ESTIMATE - BOROUGH</b>				<b>\$99,877.53</b>		<b>\$64,807.90</b>		<b>\$164,685.43</b>
<b>COST ESTIMATE - CUSTOMER</b>								
Transformer Vault	1	EA	\$15,000	\$15,000.00	\$10,000	\$10,000.00	\$25,000.00	\$25,000.00
4" RNC-Sch 40 PCV	20	FT	\$12.00	\$240.00	\$100.00	\$2,000.00	\$112.00	\$2,240.00
(3) Sets 600 kcmil Cu THHN/THWN-2	40	FT	\$18.00	\$720.00	\$10.00	\$400.00	\$28.00	\$1,120.00
Low Voltage Service Pedestal	1	EA	\$10,000	\$10,000.00	\$2,400	\$2,400.00	\$12,400.00	\$12,400.00
4' x 4' CT Cabinet	1	EA	\$7,500	\$7,500.00	\$2,400	\$2,400.00	\$9,900.00	\$9,900.00
NEMA 3R Fused Disconnect	1	EA	\$8,000	\$8,000.00	\$2,400	\$1,200.00	\$10,400.00	\$10,400.00
Protective Bollards	6	EA	\$200	\$1,200.00	\$1,000	\$6,000.00	\$1,200.00	\$7,200.00
<b>TOTAL COST ESTIMATE - CUSTOMER</b>				<b>\$42,660.00</b>		<b>\$24,400.00</b>		<b>\$68,260.00</b>
<b>TOTAL COST ESTIMATES</b>				<b>\$142,537.53</b>		<b>\$89,207.90</b>		<b>\$232,945.43</b>

## MENLO PARKING LOT

The Menlo site is a relatively linear canopy configuration with apparent proximity to existing facilities.

### Estimated Solar Size

Parameter	Estimated Value
Approximate Module Count	426
Estimated DC Capacity	266.25 kWdc
Estimated AC Capacity	200 kWac
ILR	1.30

### Conceptual Inverter Configuration

- (4) 50 kW string inverters
- 480V three-phase output
- Central AC combiner with utility-visible disconnect

### Recommended Service Voltage: 480V Three-Phase

Although the RFI identifies possible 240V service, 240V single-phase interconnection is not recommended at this system size.

Estimated full-load output current: 241A

Equivalent current at 240V single phase would exceed 625A, resulting in larger conductor sizing and voltage drop concerns.

### Utility Interconnection Approach

Recommended configuration:

- Intersperse a new pole on the existing three-phase overhead line on Arthur Ave.
- Install fused cut-outs and riser to new, dedicated 300kVA pad-mounted transformer
- New 300kVA pad-mounted transformer to feed dedicated 480V production service
- Dedicated meter/disconnect pedestal
- Utility lockable AC disconnect
- Secondary interconnection preferred

### **Distribution Considerations**

This site likely presents low interconnection complexity due to modest generation size.

Potential concerns:

- Daytime voltage rise
- Nuisance fuse operations under backfeed conditions
- Anti-islanding coordination
- IEEE 1547 volt-var and volt-watt settings required

### **Key Risks**

- Limited staging area
- Existing underground utilities
- Canopy constructability near existing buildings

		DATE PREPARED	05-28-2026	SHEET	1 of 1
ACTIVITY AND LOCATION PERKASIE BOROUGH, PA		CONSTRUCTION CONTRACT NO.		PROJECT NUMBER	
PROJECT TITLE SOLAR RFI - MENLO PARKING LOT		ESTIMATED BY <b>UTILITY ENGINEERS, PC</b>		CATEGORY CODE NUMBER	
		STATUS OF DESIGN BUDGETARY		JOB ORDER NUMBER	
		PED	30%	100%	FINAL OTHER:

ITEM DESCRIPTION	QUANTITY		MATERIAL COST		LABOR COST		ENGINEERING ESTIMATE	
	NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
<b>COST ESTIMATE - BOROUGH</b>								
1/0 AWG Cu 15 kV EPR Shielded Cable	270	FT	\$18.50	\$4,995.00	\$18.00	\$4,860.00	\$36.50	\$9,855.00
15KV, 100A Elbows - #2 AWG	3	EA	\$250	\$750.00	\$200	\$600.00	\$450.00	\$1,350.00
4/0 AWG Bare CU - Ground Ring	1	EA	\$500	\$500.00	\$750	\$750.00	\$1,250.00	\$1,250.00
15KV Elbow Lightning Arrestor	3	EA	\$600	\$1,800.00	\$400	\$1,200.00	\$1,000.00	\$3,000.00
Load Break Fuse Cutouts, 200 Amp	3	EA	\$500	\$1,500.00	\$800	\$2,400.00	\$1,300.00	\$3,900.00
Fuse Links	3	EA	\$50	\$150.00	\$200	\$600.00	\$250.00	\$750.00
3Ø Termination Bracket	1	EA	\$400	\$400.00	\$300	\$300.00	\$700.00	\$700.00
3Ø LA & Fuse Cut Out Bracket	1	EA	\$400	\$400.00	\$300	\$300.00	\$700.00	\$700.00
Fiberglass Crossarms	7	EA	\$400	\$2,800.00	\$500	\$3,500.00	\$900.00	\$6,300.00
Polymer Insulators	6	EA	\$100	\$600.00	\$200	\$1,200.00	\$300.00	\$1,800.00
Polymer Deadend Insulators	3	EA	\$150	\$450.00	\$300	\$900.00	\$450.00	\$1,350.00
Pole Grounds	2	EA	\$300	\$600.00	\$400	\$800.00	\$700.00	\$1,400.00
Miscellaneous Pole Hardware	1	LS	\$1,500	\$1,500.00	\$2,000	\$2,000.00	\$3,500.00	\$3,500.00
300 KVA Padmounted Transformer - 13200/7600 -480/277V	1	EA	\$50,000	\$50,000.00	\$8,000	\$8,000.00	\$58,000.00	\$58,000.00
Restoration/Civil Work	1	LS	\$25,000	\$25,000.00	\$25,000	\$25,000.00	\$50,000.00	\$50,000.00
Miscellaneous	1	LS	\$8,275	\$8,275.28	\$2,155	\$2,155.20	\$10,430.48	\$10,430.48
<b>TOTAL COST ESTIMATE - BOROUGH</b>				<b>\$99,720.28</b>		<b>\$54,565.20</b>		<b>\$154,285.48</b>
<b>COST ESTIMATE - CUSTOMER</b>								
Transformer Vault	1	EA	\$15,000	\$15,000.00	\$10,000	\$10,000.00	\$25,000.00	\$25,000.00
4" RNC-Sch 40 PCV	20	FT	\$12.00	\$240.00	\$100.00	\$2,000.00	\$112.00	\$2,240.00
(3) Sets 600 kcmil Cu THHN/THWN-2	40	FT	\$18.00	\$720.00	\$10.00	\$400.00	\$28.00	\$1,120.00
Low Voltage Service Pedestal	1	EA	\$10,000	\$10,000.00	\$2,400	\$2,400.00	\$12,400.00	\$12,400.00
4' x 4' CT Cabinet	1	EA	\$7,500	\$7,500.00	\$2,400	\$2,400.00	\$9,900.00	\$9,900.00
NEMA 3R Fused Disconnect	1	EA	\$8,000	\$8,000.00	\$2,400	\$1,200.00	\$10,400.00	\$10,400.00
Protective Bollards	6	EA	\$200	\$1,200.00	\$1,000	\$6,000.00	\$1,200.00	\$7,200.00
<b>TOTAL COST ESTIMATE - CUSTOMER</b>				<b>\$42,660.00</b>		<b>\$24,400.00</b>		<b>\$68,260.00</b>
<b>TOTAL COST ESTIMATES</b>				<b>\$142,380.28</b>		<b>\$78,965.20</b>		<b>\$222,545.48</b>

## LENAPE PARKING LOT

The Lenape site is the largest canopy project and is identified as being partially within a flood zone.

### Estimated Solar Size

Parameter	Estimated Value
Approximate Module Count	1,106
Estimated DC Capacity	691.25 kWdc
Estimated AC Capacity	500 kWac
ILR	1.36

### Conceptual Inverter Configuration

- (5) 100 kW string inverters
- 480V three-phase output
- Central AC combiner with utility-visible disconnect

### Recommended Service Voltage: 480V Three-Phase

Although the RFI identifies possible 240V service, 240V single-phase interconnection is not recommended at this system size.

Estimated full-load output current: 602A

Equivalent current at 240V single phase would exceed 2,000A, resulting in larger conductor sizing and voltage drop concerns.

### Utility Interconnection Approach

Recommended configuration:

- Install recloser and riser on existing pole on Constitution Ave.
- Install new underground feeder to new, dedicated 500kVA pad-mounted transformer
- New 500kVA pad-mounted transformer to feed dedicated 480V production service
- Dedicated meter/disconnect pedestal
- Utility lockable AC disconnect
- Secondary interconnection preferred

### **Distribution Impacts**

This site is large enough to create measurable feeder voltage impacts during light-load conditions.

Detailed study will likely require:

- Feeder voltage review
- Daytime voltage rise
- Nuisance fuse operations under backfeed conditions
- Anti-islanding coordination
- IEEE 1547 volt-var and volt-watt settings required

### **Key Risks**

- Floodplain permitting
- Equipment elevation requirements

ACTIVITY AND LOCATION PERKASIE BOROUGH, PA		CONSTRUCTION CONTRACT NO.	DATE PREPARED 05-28-2026	SHEET 1 of 1
PROJECT TITLE SOLAR RFI - LENAPE PARKING LOT		ESTIMATED BY <b>UTILITY ENGINEERS, PC</b>	PROJECT NUMBER	
		STATUS OF DESIGN BUDGETARY	CATEGORY CODE NUMBER	
		PED 30% 100% FINAL OTHER:	JOB ORDER NUMBER	

ITEM DESCRIPTION	QUANTITY		MATERIAL COST		LABOR COST		ENGINEERING ESTIMATE	
	NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
<b>COST ESTIMATE - BOROUGH</b>								
15kV Pole-Mounted Recloser	1	EA	\$28,000	\$28,000.00	\$8,000	\$8,000.00	\$36,000.00	\$36,000.00
1/0 AWG Cu 15 kV EPR Shielded Cable	810	FT	\$18.50	\$14,985.00	\$18.00	\$14,580.00	\$36.50	\$29,565.00
15KV, 100A Elbows - #2 AWG	3	EA	\$250	\$750.00	\$200	\$600.00	\$450.00	\$1,350.00
4/0 AWG Bare CU - Ground Ring	1	EA	\$500	\$500.00	\$750	\$750.00	\$1,250.00	\$1,250.00
15KV Elbow Lightning Arrestor	3	EA	\$600	\$1,800.00	\$400	\$1,200.00	\$1,000.00	\$3,000.00
Load Break Fuse Cutouts, 200 Amp	3	EA	\$500	\$1,500.00	\$800	\$2,400.00	\$1,300.00	\$3,900.00
Fuse Links	3	EA	\$50	\$150.00	\$200	\$600.00	\$250.00	\$750.00
3Ø Termination Bracket	1	EA	\$400	\$400.00	\$300	\$300.00	\$700.00	\$700.00
3Ø LA & Fuse Cut Out Bracket	1	EA	\$400	\$400.00	\$300	\$300.00	\$700.00	\$700.00
Fiberglass Crossarms	7	EA	\$400	\$2,800.00	\$500	\$3,500.00	\$900.00	\$6,300.00
Polymer Insulators	6	EA	\$100	\$600.00	\$200	\$1,200.00	\$300.00	\$1,800.00
Polymer Deadend Insulators	3	EA	\$150	\$450.00	\$300	\$900.00	\$450.00	\$1,350.00
Pole Grounds	2	EA	\$300	\$600.00	\$400	\$800.00	\$700.00	\$1,400.00
Miscellaneous Pole Hardware	1	LS	\$1,500	\$1,500.00	\$2,000	\$2,000.00	\$3,500.00	\$3,500.00
500 KVA Padmounted Transformer - 13200/7600 -480/277V	1	EA	\$55,000	\$55,000.00	\$8,000	\$8,000.00	\$63,000.00	\$63,000.00
Restoration/Civil Work	1	LS	\$25,000	\$25,000.00	\$25,000	\$25,000.00	\$50,000.00	\$50,000.00
Miscellaneous	1	LS	\$13,225	\$13,225.28	\$3,355	\$3,355.20	\$16,580.48	\$16,580.48
<b>TOTAL COST ESTIMATE - BOROUGH</b>				<b>\$147,660.28</b>		<b>\$73,485.20</b>		<b>\$221,145.48</b>
<b>COST ESTIMATE - CUSTOMER</b>								
Transformer Vault	1	EA	\$15,000	\$15,000.00	\$10,000	\$10,000.00	\$25,000.00	\$25,000.00
4" RNC-Sch 40 PCV	20	FT	\$12.00	\$240.00	\$100.00	\$2,000.00	\$112.00	\$2,240.00
(3) Sets 600 kcmil Cu THHN/THWN-2	80	FT	\$18.00	\$1,440.00	\$10.00	\$800.00	\$28.00	\$2,240.00
Low Voltage Service Pedestal	1	EA	\$10,000	\$10,000.00	\$2,400	\$2,400.00	\$12,400.00	\$12,400.00
4' x 4' CT Cabinet	1	EA	\$7,500	\$7,500.00	\$2,400	\$2,400.00	\$9,900.00	\$9,900.00
NEMA 3R Fused Disconnect	1	EA	\$12,000	\$12,000.00	\$2,400	\$1,200.00	\$14,400.00	\$14,400.00
Protective Bollards	6	EA	\$200	\$1,200.00	\$1,000	\$6,000.00	\$1,200.00	\$7,200.00
<b>TOTAL COST ESTIMATE - CUSTOMER</b>				<b>\$47,380.00</b>		<b>\$24,800.00</b>		<b>\$73,380.00</b>
<b>TOTAL COST ESTIMATES</b>				<b>\$195,040.28</b>		<b>\$98,285.20</b>		<b>\$294,525.48</b>

## LANDFILL SITE

The landfill site is the largest and most operationally complex installation.

### Estimated Solar Size

Parameter	Estimated Value
Approximate Module Count	2,385
Estimated DC Capacity	1,490.63 kWdc
Estimated AC Capacity	1,100 kWac
ILR	1.36

### Conceptual Inverter Configuration

- (10) 110 kW string inverter blocks
- 480V inverter collection system
- Pad-mounted collector transformer

### Recommended Service Voltage: 480V Three-Phase

While the RFI references 480V service, a project of this magnitude may benefit from medium-voltage aggregation depending on the final site layout.

Estimated 480V output current: 1,325A

At this current magnitude:

- Secondary conductor costs may become substantial
- Voltage drop becomes difficult to manage
- Secondary equipment size increases materially
- Protection coordination becomes more difficult

Recommended configuration:

- 480V inverter collection
- Step-up transformer to utility primary voltage
- Primary metering and utility recloser visibility

### **Utility Interconnection Approach**

Recommended configuration:

- Install recloser and riser on existing pole on Constitution Ave.
- Install new underground feeder to new, dedicated 500kVA pad-mounted transformer
- New 1500kVA pad-mounted transformer to feed dedicated 480V production service
- Dedicated meter/disconnect pedestal
- Utility lockable AC disconnect
- Secondary interconnection preferred

### **Distribution Impacts**

The landfill project is large enough to potentially create:

- Significant reverse power flow
- Feeder minimum load concerns
- Voltage regulator interaction
- Feeder protection coordination changes
- Substation backfeed concerns

Detailed utility studies will almost certainly be required.

Transfer trip may become necessary depending upon feeder topology and aggregate distributed generation penetration.

The aggregate distributed generation capacity proposed under this RFI is significant relative to the size and loading characteristics of the Borough's municipal distribution system. While the individual parking canopy projects are modest in size, the combined portfolio of approximately 2.2 MWac and specifically the Landfill load may create measurable operational impacts on the Borough's distribution feeders and upstream utility interconnection depending upon feeder topology, existing load profiles, and coincident generation conditions.

At high solar production and low feeder loading conditions, reverse power flow may occur on portions of the distribution system. Reverse power conditions can impact utility voltage regulation equipment, feeder protection coordination, regulator control schemes, and substation operations. Detailed feeder analysis should therefore be completed prior to final design and procurement activities.

Potential hosting capacity concerns include:

- Daytime feeder voltage rise
- Reverse power flow through feeder regulators (voltage regulator hunting)
- Reduced coordination margins for fuse schemes
- Sympathetic or nuisance fuse operations under backfeed conditions
- Increased fault current contribution from inverter-based resources
- Feeder minimum load concerns
- Substation transformer reverse power limitations

Particular attention should be given to the Lenape and Landfill projects due to their larger generation capacities. The Landfill project, in particular, may be large enough to create sustained reverse power flow toward the substation during light-load periods. Depending upon the final feeder configuration and aggregate DER penetration on the affected circuits, additional utility protection measures may become necessary, including directional relaying, supervisory control and data acquisition (SCADA) visibility, or transfer-trip schemes.

Because final inverter system sizing and detailed feeder modeling data was unavailable during this conceptual evaluation, no formal hosting capacity study, load flow analysis, or time-series evaluation was performed as part of this report. Consequently, the recommendations contained herein should be considered planning-level guidance only.

Prior to final interconnection approval, the following engineering evaluations are recommended:

- Feeder load flow analysis under minimum and peak loading conditions
- Time-series voltage analysis during maximum solar production
- Feeder protection coordination review
- Voltage regulator review
- Short-circuit and inverter fault contribution analysis
- Evaluation of aggregate DER penetration on affected circuits
- Utility operational review with PPL regarding upstream transmission interconnection requirements

Implementation of IEEE 1547 inverter functionality, including volt-var, volt-watt, frequency-watt, and ride-through capabilities, is strongly recommended to mitigate potential feeder impacts and improve overall system stability.

**Key Risks**

- Landfill cap penetration restrictions
- Ballast loading limitations
- Methane vent coordination
- Differential settlement
- Stormwater erosion
- Environmental permitting
- Geotechnical uncertainty

ACTIVITY AND LOCATION PERKASIE BOROUGH, PA		CONSTRUCTION CONTRACT NO.	DATE PREPARED 05-28-2026	SHEET 1 of 1
PROJECT TITLE SOLAR RFI - LANDFILL SITE		ESTIMATED BY <b>UTILITY ENGINEERS, PC</b>	PROJECT NUMBER	
		STATUS OF DESIGN BUDGETARY	CATEGORY CODE NUMBER	
		PED 30% 100% FINAL OTHER:	JOB ORDER NUMBER	

ITEM DESCRIPTION	QUANTITY		MATERIAL COST		LABOR COST		ENGINEERING ESTIMATE	
	NUMBER	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
<b>COST ESTIMATE - BOROUGH</b>								
15kV Pole-Mounted Recloser	1	EA	\$28,000	\$28,000.00	\$8,000	\$8,000.00	\$36,000.00	\$36,000.00
1/0 AWG Cu 15 kV EPR Shielded Cable	450	FT	\$18.50	\$8,325.00	\$18.00	\$8,100.00	\$36.50	\$16,425.00
15KV, 100A Elbows - #2 AWG	3	EA	\$250	\$750.00	\$200	\$600.00	\$450.00	\$1,350.00
4/0 AWG Bare CU - Ground Ring	1	EA	\$500	\$500.00	\$750	\$750.00	\$1,250.00	\$1,250.00
15KV Elbow Lightning Arrestor	3	EA	\$600	\$1,800.00	\$400	\$1,200.00	\$1,000.00	\$3,000.00
Load Break Fuse Cutouts, 200 Amp	3	EA	\$500	\$1,500.00	\$800	\$2,400.00	\$1,300.00	\$3,900.00
Fuse Links	3	EA	\$50	\$150.00	\$200	\$600.00	\$250.00	\$750.00
3Ø Termination Bracket	1	EA	\$400	\$400.00	\$300	\$300.00	\$700.00	\$700.00
3Ø LA & Fuse Cut Out Bracket	1	EA	\$400	\$400.00	\$300	\$300.00	\$700.00	\$700.00
Fiberglass Crossarms	7	EA	\$400	\$2,800.00	\$500	\$3,500.00	\$900.00	\$6,300.00
Polymer Insulators	6	EA	\$100	\$600.00	\$200	\$1,200.00	\$300.00	\$1,800.00
Polymer Deadend Insulators	3	EA	\$150	\$450.00	\$300	\$900.00	\$450.00	\$1,350.00
Pole Grounds	2	EA	\$300	\$600.00	\$400	\$800.00	\$700.00	\$1,400.00
Miscellaneous Pole Hardware	1	LS	\$1,500	\$1,500.00	\$2,000	\$2,000.00	\$3,500.00	\$3,500.00
1500 KVA Padmounted Transformer - 13200/7600 -480/277V	1	EA	\$65,000	\$65,000.00	\$8,000	\$8,000.00	\$73,000.00	\$73,000.00
Restoration/Civil Work	1	LS	\$25,000	\$25,000.00	\$25,000	\$25,000.00	\$50,000.00	\$50,000.00
Miscellaneous	1	LS	\$14,725	\$14,725.28	\$3,355	\$3,355.20	\$18,080.48	\$18,080.48
<b>TOTAL COST ESTIMATE - BOROUGH</b>				<b>\$152,500.28</b>		<b>\$67,005.20</b>		<b>\$219,505.48</b>
<b>COST ESTIMATE - CUSTOMER</b>								
Transformer Vault	1	EA	\$15,000	\$15,000.00	\$10,000	\$10,000.00	\$25,000.00	\$25,000.00
4" RNC-Sch 40 PCV	20	FT	\$12.00	\$240.00	\$100.00	\$2,000.00	\$112.00	\$2,240.00
(3) Sets 600 kcmil Cu THHN/THWN-2	320	FT	\$18.00	\$5,760.00	\$10.00	\$3,200.00	\$28.00	\$8,960.00
Low Voltage Service Pedestal	1	EA	\$20,000	\$20,000.00	\$4,800	\$4,800.00	\$24,800.00	\$24,800.00
4' x 4' CT Cabinet	1	EA	\$7,500	\$7,500.00	\$2,400	\$2,400.00	\$9,900.00	\$9,900.00
NEMA 3R Fused Disconnect	1	EA	\$20,000	\$20,000.00	\$2,400	\$1,200.00	\$22,400.00	\$22,400.00
Protective Bollards	6	EA	\$200	\$1,200.00	\$1,000	\$6,000.00	\$1,200.00	\$7,200.00
<b>TOTAL COST ESTIMATE - CUSTOMER</b>				<b>\$69,700.00</b>		<b>\$29,600.00</b>		<b>\$100,500.00</b>
<b>TOTAL COST ESTIMATES</b>				<b>\$222,200.28</b>		<b>\$96,605.20</b>		<b>\$320,005.48</b>

## PPL INTERTIE PROTECTION RELAYING (IPR) CABINET IMPLEMENTATION

PPL Electric Utilities will evaluate the proposed solar installations on an aggregate basis where the systems electrically interconnect through the same point of common coupling. Although the projects may be constructed as separate arrays, PPL generally considers the combined export capability when determining interconnection requirements, study scope, protection requirements, and system impacts.

Once aggregate capacity reaches the multi-megawatt range, the interconnection process typically becomes more involved. Systems above approximately 1.5 MW can trigger additional utility review requirements, including detailed impact studies, transfer trip considerations, and utility relay/protection upgrades.

Based upon the anticipated aggregate generation size, it is expected that PPL will require installation of an Intertie Protections Relaying (IPR) cabinet at the Borough's substation. Installation of the IPR cabinet typically involves dedicated instrumentation, protective relaying, and transfer trip equipment.

Although the Borough owns and operates its municipal distribution system, PPL retains operational and reliability interests associated with reverse power flow, islanding prevention, feeder protection coordination, and upstream transmission system impacts. Accordingly, PPL may require installation of utility-visible protective relaying and associated instrumentation as a condition of interconnection approval.

At the planning level, this report assumes that one or more PPL-standard IPR cabinets may be required depending upon:

- Final project size
- Point(s) of common coupling
- Feeder topology

The exact configuration and quantity of required IPR equipment cannot be determined without formal utility interconnection review and coordination with PPL engineering personnel.

Potential IPR work would include:

- Installation of dedicated PTs on the substation structure
- Utility-visible protective relaying
- Voltage and frequency supervision
- Reverse power detection
- Transfer-trip receive/transmit functionality
- Supervisory tripping of DER interconnection devices
- Lockable utility access provisions

- Depending upon final interconnection architecture, the utility may also require fiber optic or leased-line communications

The larger Lenape and Landfill projects are the most likely candidates for enhanced utility protection requirements due to their generation capacity and potential feeder impact. The Landfill project, in particular, may require additional protection coordination measures if reverse power flow toward the substation becomes possible during minimum-load operating conditions.

For budgeting purposes, this report includes a conceptual allowance for PPL IPR cabinet implementation. Formal interconnection studies and direct coordination with PPL will ultimately determine the final protection architecture and associated implementation costs.

## FEDERAL INCENTIVES

To preserve eligibility under the current federal tax credit guidance, the project team may need to satisfy IRS safe harbor requirements by incurring or paying at least 5% of the total eligible project cost prior to the applicable deadline. In practice, this often requires procurement of major equipment or construction materials before the deadline date.

Not all early-stage project costs necessarily qualify toward the 5% threshold. Certain soft costs, including preliminary engineering, feasibility studies, and development activities, may not qualify as eligible safe harbor expenditures in the same manner as physical equipment, manufactured components, or construction materials. Tax counsel should confirm the treatment of specific expenditures.

At this stage, it is unlikely that the interconnection process with PPL will be sufficiently advanced to provide complete certainty regarding final utility requirements, upgrade scope, or interconnection approval prior to the safe harbor deadline.

COMPARATIVE SUMMARY TABLE

Site	kWdc	kWac	Recommended Voltage	Transformer	Estimated Cost
<b>Revivals</b>	240	200	480V 3Ø	300 kVA	\$240k
<b>Borough Lot</b>	240	200	480V 3Ø	300 kVA	\$240k
<b>Menlo</b>	265	200	480V 3Ø	300 kVA	\$230k
<b>Lenape</b>	690	500	480V 3Ø	500 kVA	\$300k
<b>Landfill</b>	1490	1,100	480V 3Ø	1,500 kVA	\$320k

## OVERALL RECOMMENDATIONS

The following overall utility engineering recommendations are advised:

1. Utilize dedicated production services at all sites.
2. Standardize on 480V three-phase inverter output architecture.
3. Avoid 240V interconnections except for very small ancillary systems.
4. Perform detailed feeder hosting capacity evaluation prior to final design.
5. Conduct formal protection coordination study for the Lenape and Landfill projects.
6. Utilize utility-visible lockable AC disconnects at all sites.
7. Implement IEEE 1547 inverter functionality including:
  - Volt-var
  - Frequency-watt
  - Ride-through
  - Anti-islanding
8. Consider utility SCADA visibility for the landfill project.
9. Utilize pad-mounted transformers for operational maintainability.

## RECOMMENDED NEXT ENGINEERING STEPS

The following engineering activities are recommended prior to procurement:

### **Utility System Evaluation**

- Initial contact with PPL
- Feeder load analysis
- Fault current analysis
- Protection coordination review

### **Site Engineering**

- Topographic survey
- Utility locating
- Geotechnical investigation
- Floodplain review
- Landfill geotechnical evaluation

### **Solar Design Development**

- Detailed array layouts
- Structural analysis
- Inverter selection
- Collection system design
- Grounding design

### **Interconnection Engineering**

- Preliminary one-line diagrams
- Relay philosophy development
- Utility metering design
- Utility operational review

APPENDIX A — CONCEPTUAL UTILITY LAYOUTS

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**UTILITY ENGINEERS, PC**  
62 WEST UNION STREET, KINGSTON, PA 18704  
TELE: (570) 788-2211

PROJECT NAME:  
BOROUGH OF PERKASIE - SOLAR RFI

PROJECT NUMBER: UGI26.01

DRAWN BY: SL/RG

CHECKED BY: KS/NB

DRAWING NAME:  
REVIVALS PARKING LOT

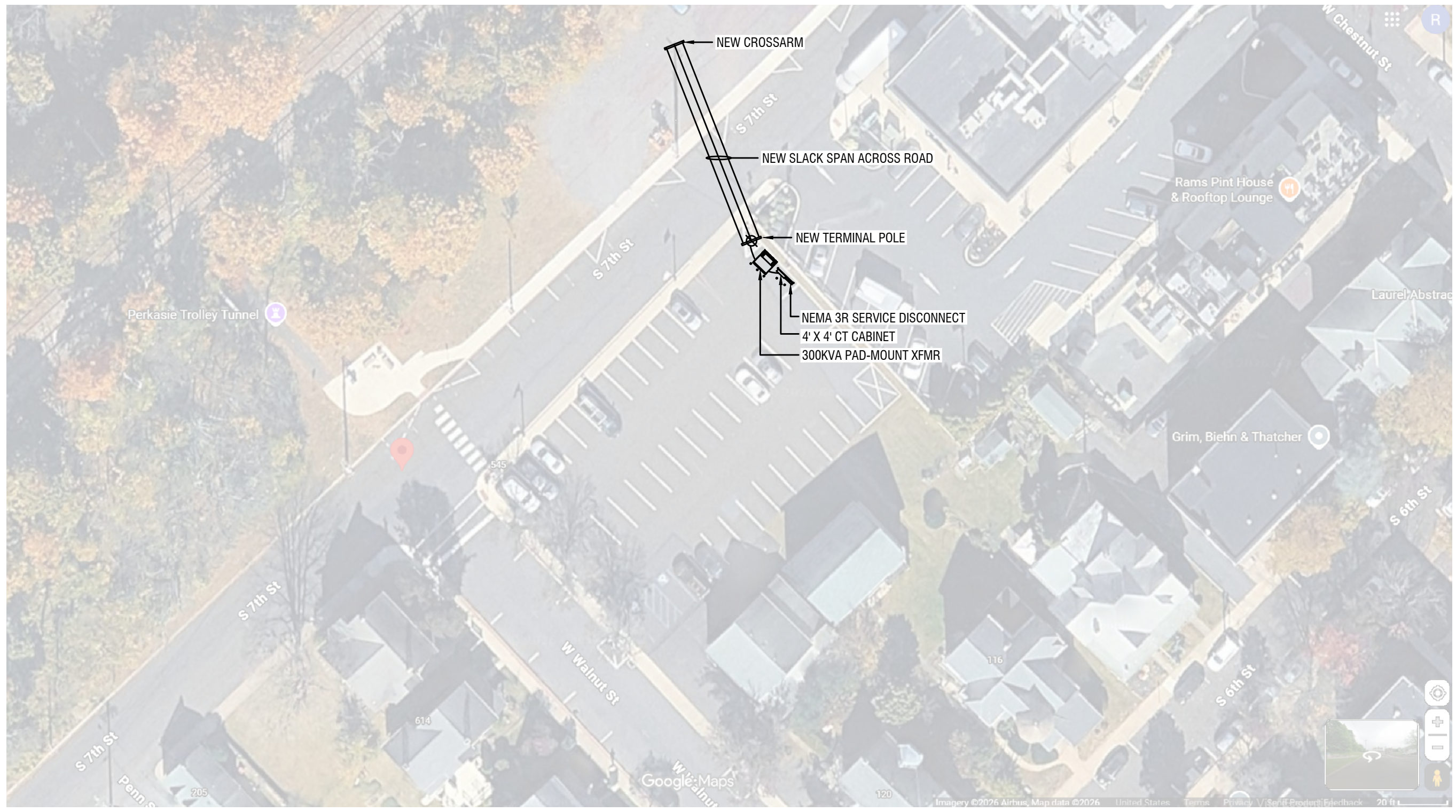
DRAWING No.  
**E001**

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**UTILITY ENGINEERS, PC**  
 62 WEST UNION STREET, KINGSTON, PA 18704  
 TELE: (570) 788-2211

PROJECT NAME:  
 BOROUGH OF PERKASIE - SOLAR RFI  
 PROJECT NUMBER: UGI26.01  
 DRAWN BY: SL/RG  
 CHECKED BY: KS/NB

DRAWING NAME:  
 SOUTH 7TH STREET PARKING LOT  
 DRAWING No.  
**E002**

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**UTILITY ENGINEERS, PC**  
 62 WEST UNION STREET, KINGSTON, PA 18704  
 TELE: (570) 788-2211

PROJECT NAME:  
 BOROUGH OF PERKASIE - SOLAR RFI

PROJECT NUMBER: UGI26.01

DRAWN BY: SL/RG

CHECKED BY: KS/NB

DRAWING NAME:  
 MENLO PARK PARKING LOT

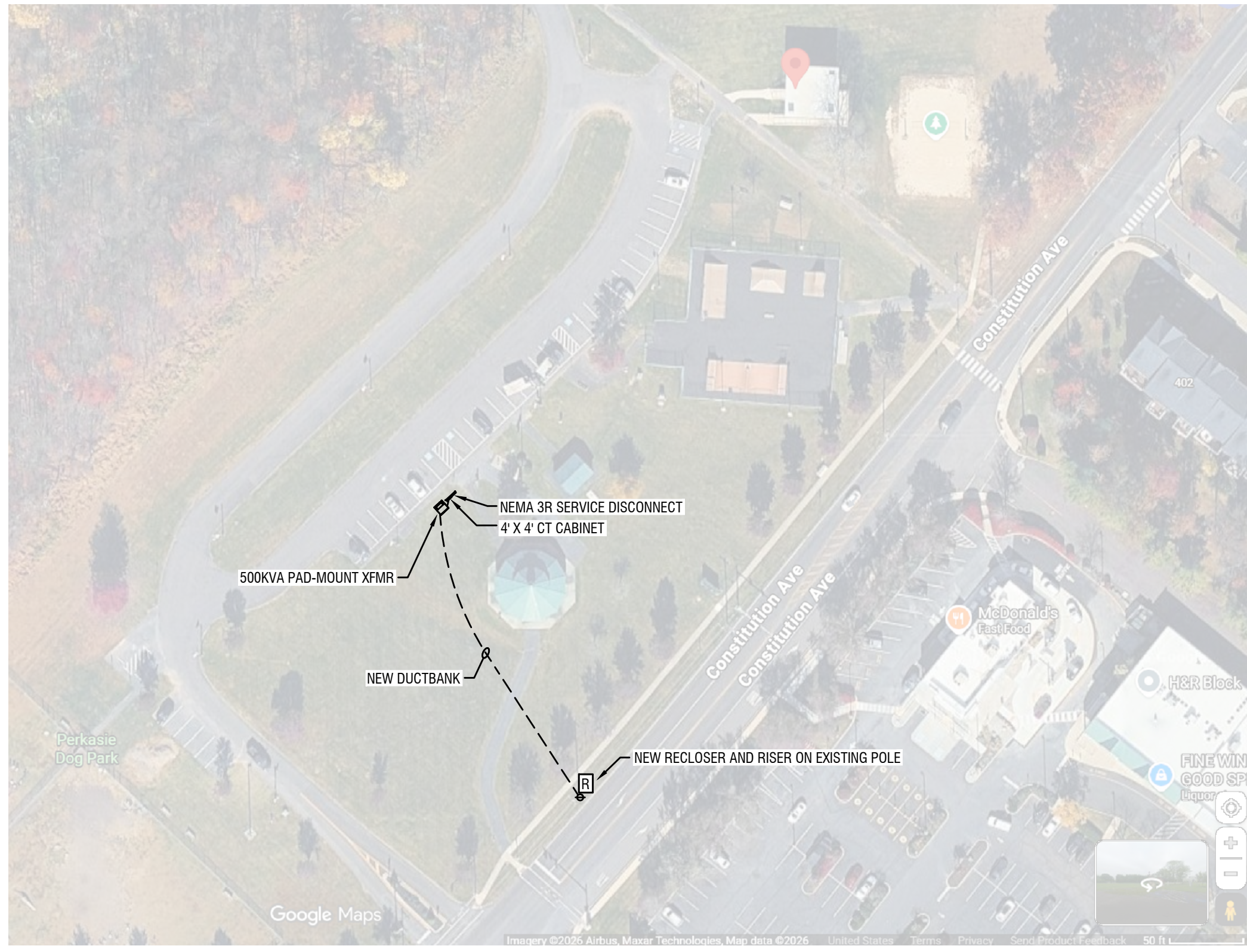
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**UTILITY ENGINEERS, PC**  
 62 WEST UNION STREET, KINGSTON, PA 18704  
 TELE: (570) 788-2211

PROJECT NAME:  
 BOROUGH OF PERKASIE - SOLAR RFI  
 PROJECT NUMBER: UGI26.01  
 DRAWN BY: SL/RG  
 CHECKED BY: KS/NB

DRAWING NAME:  
 LENAPE PARK PARKING LOT  
 DRAWING No.  
**E004**

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**UTILITY ENGINEERS, PC**  
 62 WEST UNION STREET, KINGSTON, PA 18704  
 TELE: (570) 788-2211

PROJECT NAME:  
 BOROUGH OF PERKASIE - SOLAR RFI  
 PROJECT NUMBER: UGI26.01  
 DRAWN BY: SL/RG  
 CHECKED BY: KS/NB

DRAWING NAME:  
 LANDFILL SITE  
 DRAWING No.  
**E005**

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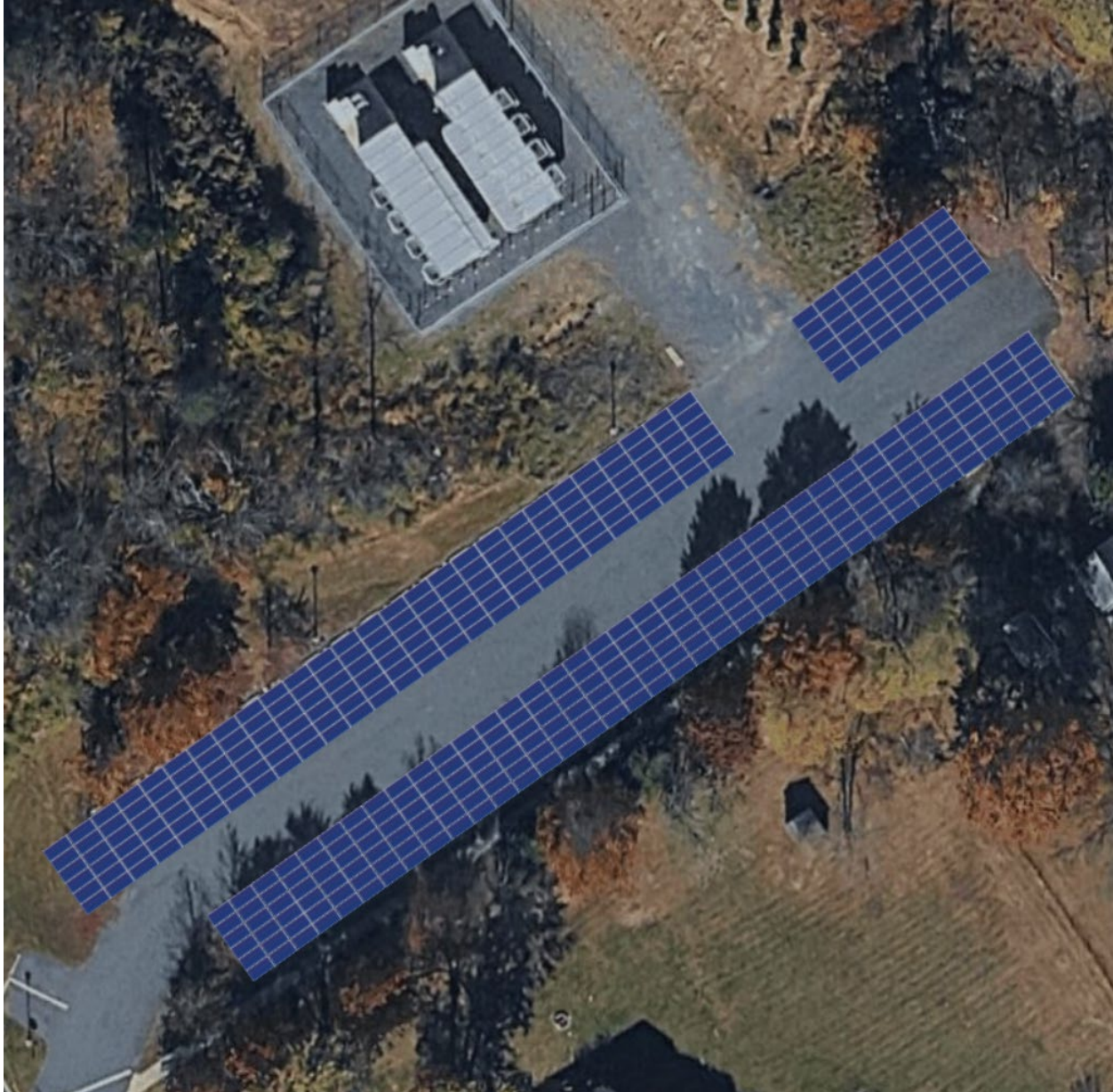
J

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## APPENDIX B — CONCEPTUAL SITE PHOTOVOLTAIC LAYOUTS

Conceptual photovoltaic layouts were prepared for the purpose of informing this analysis. The layouts are conservative in nature; that is, they attempt to maximize the solar systems in order to produce conservative utility equipment sizing.

### REVIVALS PARKING LOT



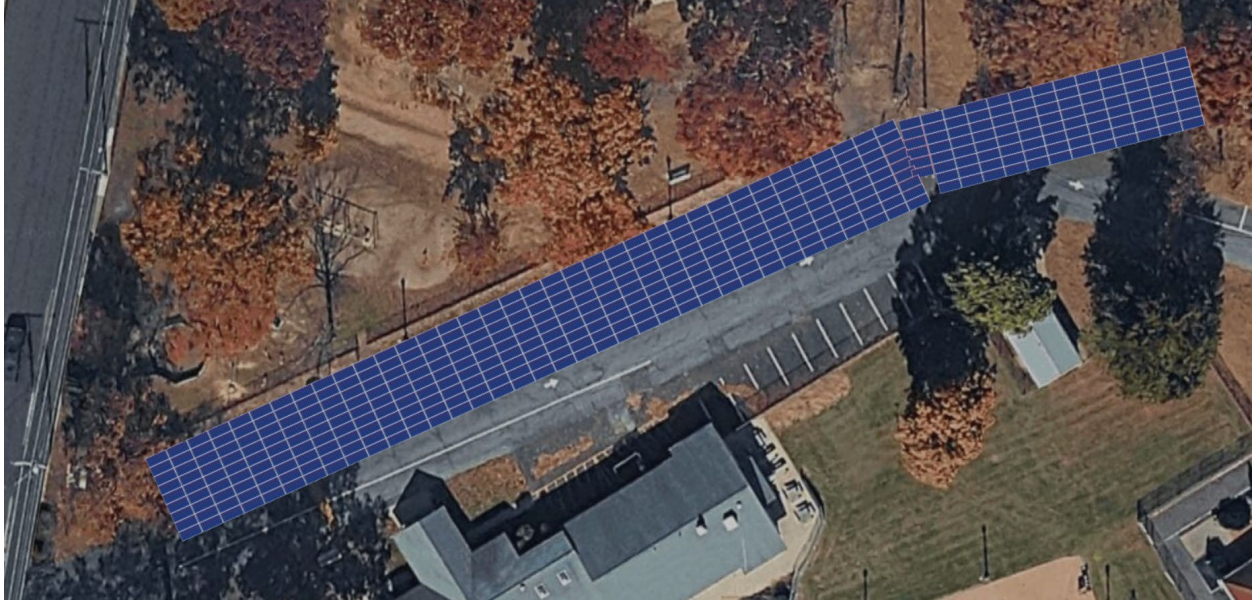
Revivals Parking Lot – 426 modules – 625W/module – 220kW worth of inverters

SOUTH 7<sup>TH</sup> STREET PARKING LOT



South 7<sup>th</sup> Street Parking Lot – 390 PV Modules – 625W/module – 243kWDC total – 200kW worth of inverters

MENLO PARK PARKING LOT



Menlo Park Parking Lot – 426 PV Modules – 625W/module – 261.7kWDC total – 200kW worth of inverters

LENAPE PARK PARKING LOT



Lenape Park Parking Lot – 1106 Modules – 625W/module – 691.25kW DC – 500kW worth of inverters

LANDFILL SITE



Landfill Site – 2385 Modules – 625W/module – 1490.63kW DC – 1100kW worth of inverters