

A photograph of a SEPTA train crossing a stream restoration structure. The structure is a long, low wall made of large, dark, rectangular stones. The train is white with red and blue stripes and has 'SEPTA' written on its side. The background shows a wooded area with bare trees, suggesting a late autumn or winter setting. The overall image has a dark, muted color palette.

# A NATURE BASED APPROACH FOR RESILIENT INFRASTRUCTURE SEPTA JENKINTOWN STREAM RESTORATION

AUGUST 22, 2023

PRESENTED TO: NATIONAL STREAM RESTORATION CONFERENCE 2023

# AGENDA

PROJECT OVERVIEW

PRELIMINARY FLOOD STUDY AND INVESTIGATIONS

FLOOD MITIGATION APPROACH

CONSTRUCTION CONSIDERATIONS / LESSONS LEARNED

QUESTIONS

Speaking:  
**Tyler Charles, PE**



A photograph of a SEPTA train crossing a bridge over a river. The train is white with red and blue accents. The river is in the foreground, and there are trees and bushes on the banks. The text 'PROJECT OVERVIEW' is overlaid in a white box in the center of the image.

# PROJECT OVERVIEW

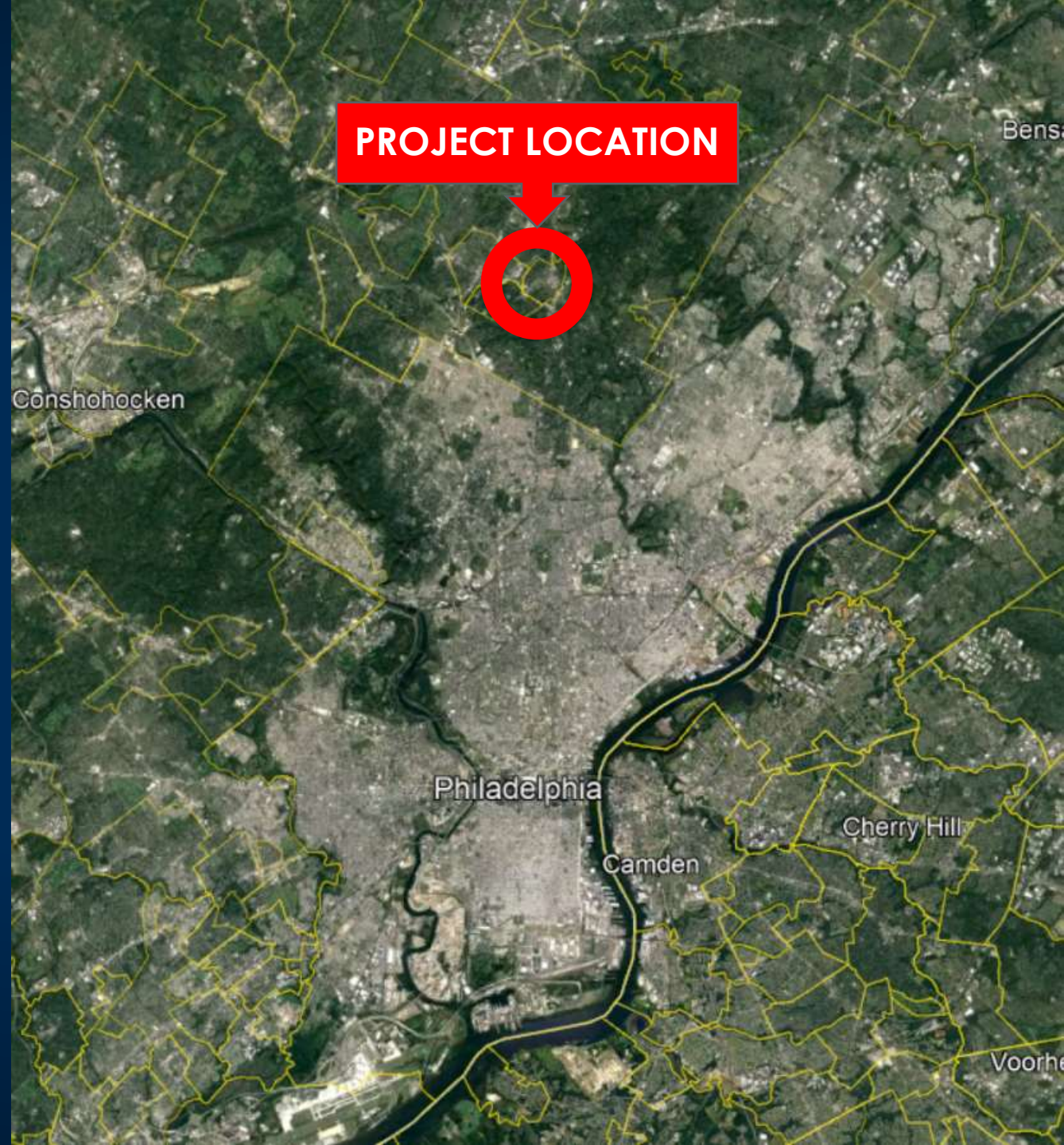


# PROJECT BACKGROUND

- SEPTA Infrastructure Resilience Program
- Project Funded by the FTA Hurricane Sandy Resiliency Grant Program
  - \$20 Million Total Project Cost (~\$15M Construction)
- Provide Infrastructure Protection and Resiliency at Jenkintown/Wyncote Station:
  - Comprehensive Study of Drainage Patterns and Suggested Improvements at Jenkintown/Wyncote Station
  - Design and Construction of New Box Culvert and Detention System at Culvert 10.38.
  - Design and Construction of Reinforcements to Bridge 10.97 and Stabilization of Surrounding Area

# PROJECT LOCATION

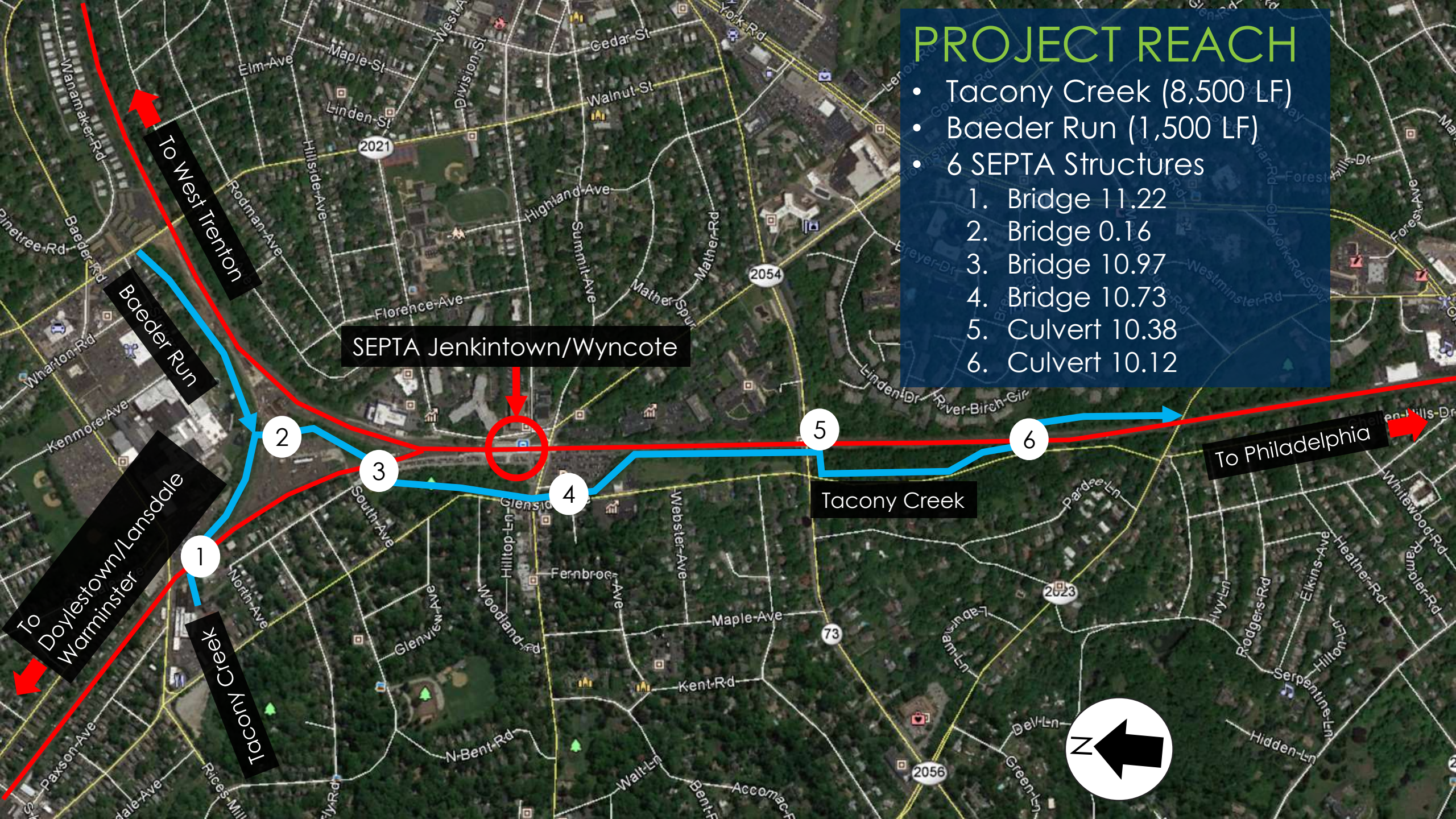
- Southeastern Pennsylvania Transportation Authority (SEPTA) Jenkintown/Wyncote Station
- Located in Abington Twp, Cheltenham Twp and Jenkintown Boro, Montgomery County, PA
- Busiest Station Outside of Philadelphia (6<sup>th</sup> Busiest Overall)
- Frequently Flooded Area
  - Confluence of Tacony Creek and Baeder Run





# PROJECT REACH

- Tacony Creek (8,500 LF)
- Baeder Run (1,500 LF)
- 6 SEPTA Structures
  1. Bridge 11.22
  2. Bridge 0.16
  3. Bridge 10.97
  4. Bridge 10.73
  5. Culvert 10.38
  6. Culvert 10.12



SEPTA Jenkintown/Wyncote

Tacony Creek

To Philadelphia

To West Trenton

To Doylestown/Lansdale Warminster

Baeder Run

Tacony Creek



# EXISTING CONDITIONS



A photograph of a SEPTA train partially submerged in floodwaters. The train is white with red and blue stripes. The water is murky and reaches up to the windows of the train. Bare trees are visible in the background. The text "PRELIMINARY FLOOD STUDY AND INVESTIGATIONS" is overlaid in a white box with green text.

# PRELIMINARY FLOOD STUDY AND INVESTIGATIONS



# PRELIMINARY FLOOD STUDY AND INVESTIGATIONS

- Stream Corridor and Watershed Drainage Investigations
  - 10,000 LF Stream Channel Assessment
  - Watershed and Drainage Studies
  - Structural/Geotechnical Investigations
- Menu of Options
  - (3) Alternatives each location
  - Cost/Benefit Analysis
  - Preferred Alternative Selection
- H&H Modeling
  - HEC-RAS (1D) and TUFLOW (2D) Models
  - Verification of Recommendations
  - Quantitative Benefits
  - Design Efficiency





# MENU OF OPTIONS

## TARGETED BENEFITS



Infrastructure  
Protection



Stream Channel  
Stability



Environmental  
Stewardship



Flood  
Reduction



Stormwater  
Drainage



Reduced  
Maintenance



Stormwater  
Management



Structural  
Stability



Community  
Outreach



# MENU OF OPTIONS

Benefit	Option A	Option B
Infrastructure Protection	●	●
Flood Reduction	◐	○
Reduced Maintenance	●	◐
Structural Stability	●	◐
Stream Channel Stability	●	◐
Stormwater Conveyance	○	○
Stormwater Management	○	○
Community Outreach	●	◐
Environmental Stewardship	○	○
Cost*	1.75M	365K - 670K

\*Cost represents an order of magnitude estimation for earthwork and materials required to implement the proposed improvement; cost does not include any necessary: design, permitting, E&S, ROW purchase, track outages, etc.

●  
Improvement is **well** suited for this benefit

◐  
Improvement is **moderately-well** suited for this benefit

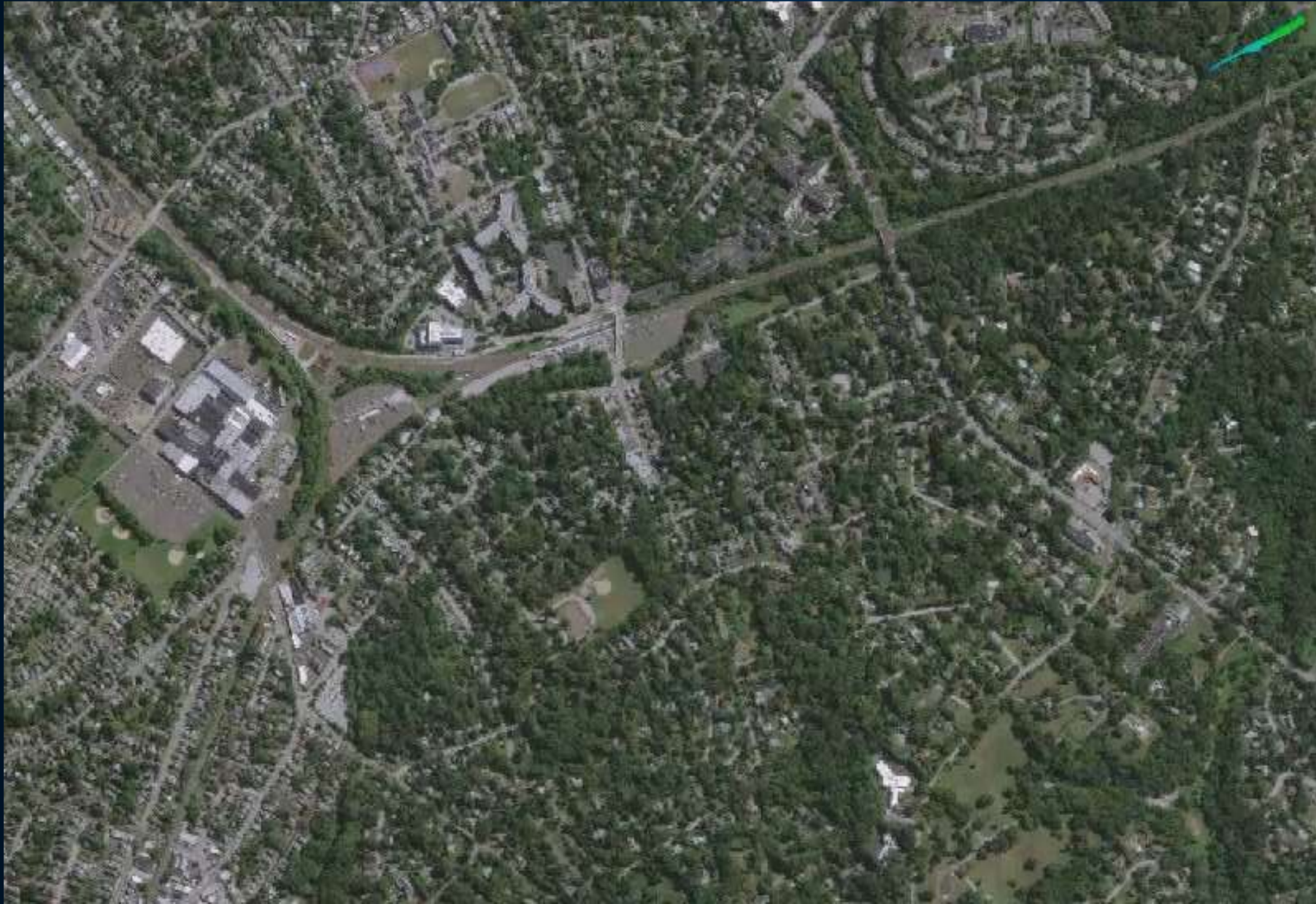
○  
Improvement is **not** suited for this benefit



# MENU OF OPTIONS

Priority	Project	Station	Cost A		Cost B		Cost C		Project	
			Low	High	Low	High	Low	High	Low	High
High	Railroad Embankment Slope Failure	R4: 69+00 to 72+50	350K+		950K	1.4M	-		350K	1.4M
High	Significant Streambank Erosion at...	R4: 73+00 to 75+00	175K		75K		50K		50K	175K
High	Multiple Railroad Embankment Failures	R4: 80+00 to W Church	300K		160K		-		160K	300K
Medium	Scour Along Toe of Stone Retaining...	R3: 38+00 to 39+00	60K		-		-		60K	60K
Medium	Significant Streambank Erosion	R3: 39+50 to 43+00	200K+		1M	1.2M	-		200K+	1.2M
Medium	Significant Streambank Erosion	R3: 45+50 to 48+00	150K		750K	875K	225K		150K	875K
Low	Scour Behind Stone Retaining Wall	R2: 24+00 to 24+75	15K		-		-		15K	15K
Low	Streambank Erosion at Stone Retain...	R2: 24+50	150K	225K	30K		-		30K	225K
Low	Rock Armored Slope Failure	R2: 27+00 to 28+00	25K		50K		-		25K	50K
Low	Significant Scour Behind Stone Retai...	R2: 32+00 to 34+00	45K		100K		-		45K	100K
Low	Streambank Erosion at Bridge Appro...	R2: 34+50	25K		100K		-		25K	100K
Low	Stone Retaining Wall Failure	R4: 77+00 to 79+50	200K	230K	-		-		200K	230K
		<b>Total</b>	11.43M	12.31M	7.93M	9.44M	350K		7.61M	16.99M

# TUFLOW (2D) MODEL





# TUFLOW (2D) MODEL



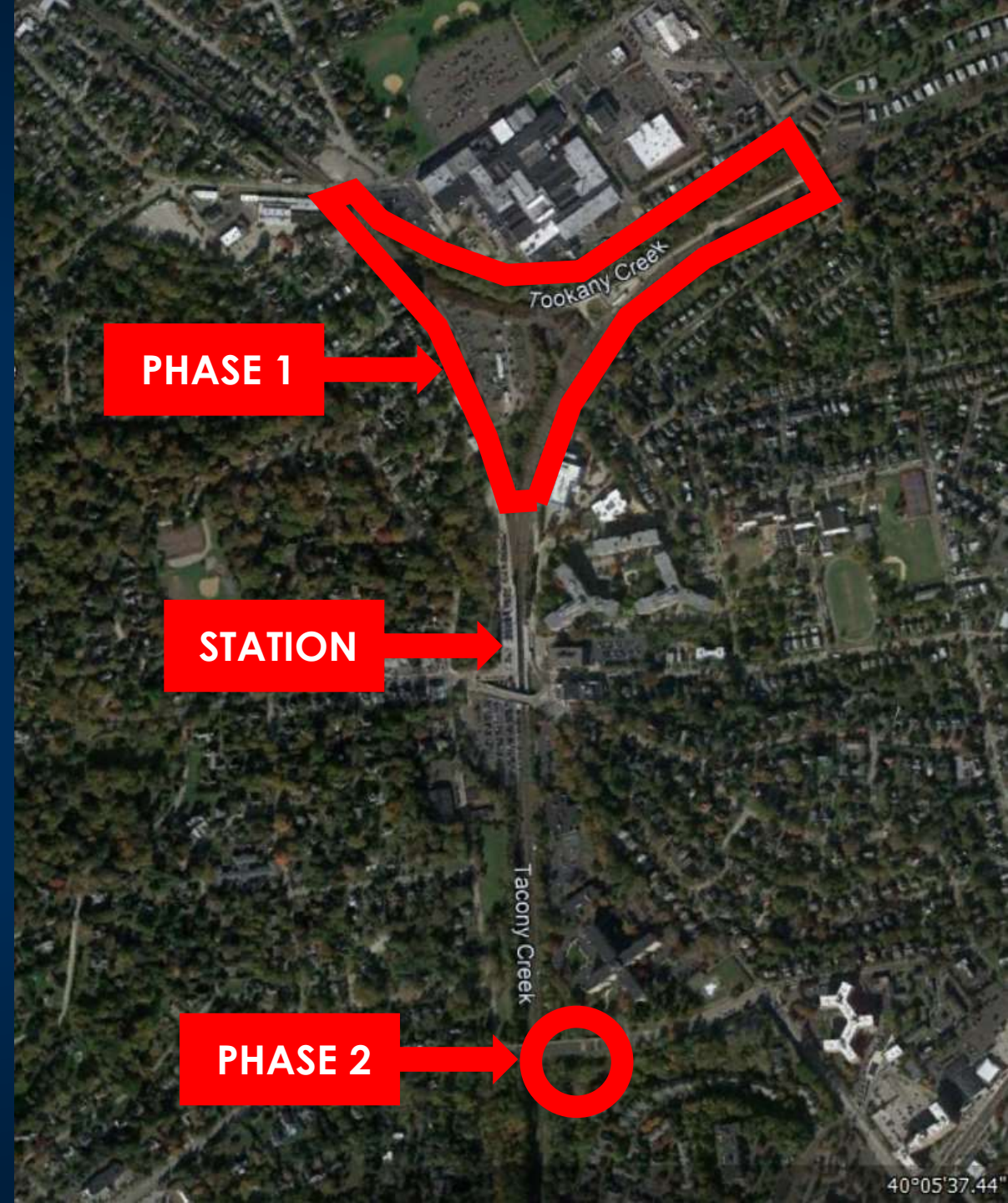
A photograph of a SEPTA train partially submerged in floodwaters. The train is white with red and blue stripes. The water is murky and turbulent. The scene is surrounded by bare trees and a dark, overcast sky. A white rectangular box is overlaid on the center of the image, containing the text 'FLOOD MITIGATION APPROACH' in a bright green, sans-serif font.

# FLOOD MITIGATION APPROACH



# FLOOD MITIGATION APPROACH

- Phase 1: Stream Restoration
- Phase 2: Culvert 10.38 Replacement
- Other Phases
  - 300 LF Stream Restoration at Bridge 11.22
  - Bridge 10.73 Replacement and 800 LF Stream Restoration at SEPTA Parking Lot
  - 1,200 LF Stream Restoration at Washington Lane









# PHASE 1: STREAM RESTORATION



## Baeder Run Stream Restoration

- >1,000 LF Stream and Floodplain Restoration
  - 350 LF Stream Channel Daylighted
- 0.5 Acre of Wetland Creation
- 270,000 CF of Additional Flood Storage

## Baeder Run Flood Overflow Storage Basin

- 90,000 CF of Additional Flood Storage

# PHASE 1: STREAM RESTORATION



## TACONY CREEK STREAM RESTORATION

- >600 LF Stream and Floodplain Restoration
- 0.5 Acre of Wetland Creation
- 210,000 CF of Additional Flood Storage



# PHASE 1: STREAM RESTORATION



## BRIDGE 0.16 REPLACEMENT

- Hydraulically Equivalent Single-Span Opening (CONSPAN) to Eliminate Center Pier (Maintenance Issue)

## BRIDGE 11.22 REHABILITATION

- Stone Repair and Repointing
- Replace Gabion Basket Retaining Walls
- Upstream Hydraulic Control for Tacony Creek

## BRIDGE 10.97 REHABILITATION

- Stone Repair and Repointing
- Downstream Hydraulic Control for Tacony Creek



# PHASE 2: CULVERT 10.38 REPLACEMENT



## CULVERT 10.38 REPLACEMENT

- Track Ballast Blown Out During Tropical Storm Lee (2011)
- Major Track Outage and Service Delays
  - Located Between Philadelphia and Jenkintown Station
  - Interrupting Lansdowne/Doylestown, Westminster and West Trenton Lines
- 6'x8' Concrete Box Culvert to Replace Inefficient (3) Pipe Culvert System





CONSTRUCTION CONSIDERATIONS/  
LESSONS LEARNED

# UNDERGROUND UTILITIES



## CONSTRUCTION CONSIDERATIONS

- Unknown underground utilities
- Confirmation of underground utilities

## LESSONS LEARNED

- Perform exhaustive historical and record drawing review.
- Perform utility test pits for critical areas.



# SOIL TESTING



## CONSTRUCTION CONSIDERATION

- Classification of excavated soils

## LESSON LEARNED

- Ensure soil testing program and specifications are followed.
- Perform pre-construction testing if feasible.



QUESTIONS



# CONTACT US:

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