Eastwick
Flood Risk Management Feasibility Study

Philadelphia, Pennsylvania

Draft Integrated Feasibility Report & Environmental Assessment

Planning Appendices

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Eastwick
Continuing Authorities Program Section 205
Flood Risk Management Feasibility Study

Philadelphia, Pennsylvania

Appendix A

Environmental and Cultural Support Documents including Pertinent Correspondence

August 2023

U.S. ARMY CORPS OF
ENGINEERS
PHILADELPHIA DISTRICT

ENVIRONMENTAL AND CULTURAL TECHNICAL APPENDIX

EASTWICK, PHILADELPHIA, PA

CAP 205

FEASIBILITY STUDY

JULY 2023

U.S. Army Corps of Engineers
Philadelphia District

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Appendix A1: Wetland Delineation

Eastwick Wetland Delineation Summary and Notes
18 May 2023

Summary

A wetland delineation was completed on May 18, 2023 to confirm potential wetlands between 77th and 78th Streets along Cobbs Creek. Results of the wetland delineation indicate that a small forested wetland occurs in this location (Figure 1).

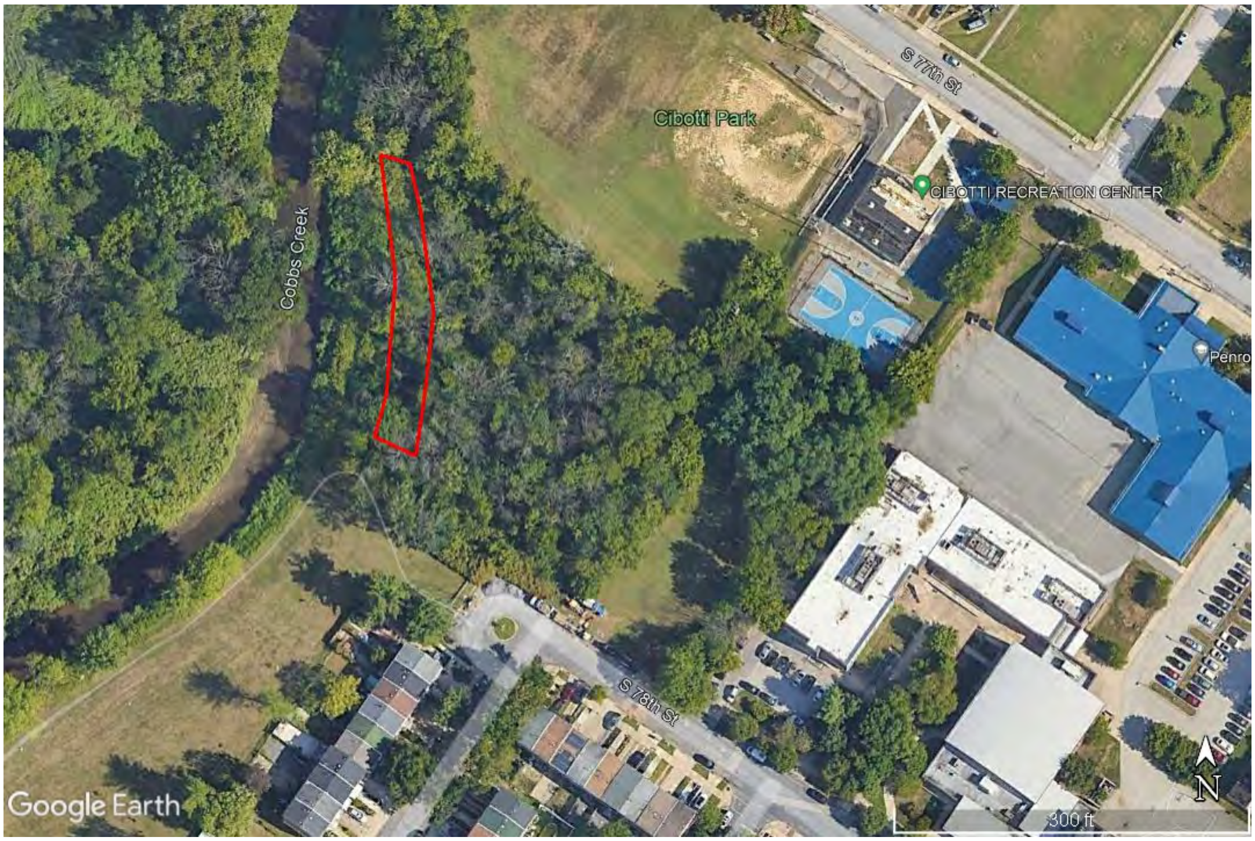

Figure 1. Forested Wetland Between 77th and 78th Streets along Cobbs Creek (Red Polygon)

The levee will be constructed through Clearview Landfill Area C, which contains habitat planted in 2022 and wetlands associated with the Clearview Landfill stormwater system. While no delineation was conducted at the Clearview Landfill, the extent of the wetlands at the landfill restoration site were estimated (Figure 2). It is assumed that within five years these wetlands will develop into forested wetlands.

Figure 2. Estimated Areal Extent of Wetlands in the Clearview Landfill Restoration Area C (Yellow Polygons)

Site Overview (Northern Wetland)

The study area is a forested riparian area adjacent to Cobbs Creek. The area generally slopes downward toward Cobbs Creek in a series of floodplain terraces. The overall plant community is dominated by box elder maple and green ash. Japanese knotweed has invaded much of the understory.

Data Points (see Figure 3 for data points)

DP 1 (Upland): Photos one through ten were taken at the bottom of a slope on the east side of the boundary. The vegetation was dominated by boxelder maple (Acer negundo, FA C) in the tree layer, and Japanese knotweed (*Reynoutria japonica*, UPL) in the herbaceous layer. No further herbaceous plants were observed due to knotweed invasion. Does not appear to be a place where water sits. Toe of slope here is about 50’ east of the tree line.

DP 2 (Upland): Downslope of DP 1, upslope of DP 3. Dominant tree canopy is box elder maple (*Acer negundo*, FAC), dominant herbaceous layer is lesser celandine (*Ficaria verna*, FAC), catchweed bedstraw (*Galium aparine*, FACU), stinging nettle *(Urtica dioica*, FAC), border privet (*Ligustrum japonicum*, FAC).

DP 3 (*Wetland)* Photos 11-12 were taken in a potential wetland area. Dotted knotweed (*Persicaria punctata*, OBL) dominates the herbaceous layer along with purslane speedwell (*Veronica peregrina*, FAC), and no trees within the feature but the dominant species within 30 feet are green ash (*Fraxinus pennsylvanica*, FACW, some living, some dead) and box elder maple (*Acer negundo*, FAC). Japanese knotweed (*Reynoutria japonica*, UPL) is present in the herbaceous layer, but much sparser than adjacent uphill areas. Water stained leaves, relatively sparse vegetation.

DP 4 (Wetland): low lying area seems to be running in a narrow strip parallel to the creek. At this location the herbaceous layer is a monoculture of Japanese knot weed (*Reynoutria japonica*, UPL). The dominant tree species is boxelder maple (Acer negundo, FAC), another dominant tree species is green ash (*Fraxinus pennsylvanica*, FACW), which is dead. It appears that the soil's are moist, despite no rain occurring in recent days suggesting that water may pond in this area for a sufficient amount of time to create hydric soils. It's hard to tell because of the knotweed, but it looks like wrack may accumulate in this area as well.

DP 5 (Upland): this area is at the top of the bank of the creek and runs in a narrow strip of about 15 to 20 feet immediately parallel to the creek. This area is dominated by herbaceous plants, including smooth meadow grass (*Poa pratensis*, FACU), soft rush (Juncus effusus, OBL), and mugwort (*Artemisia douglasiana*, not listed). Toward the creek is dominated by sycamore (*Platanus occidentalis*, FACW), and Japanese knot weed (*Reynoutria japonica*, UPL). Toward the woods is dominated by knotweed and box elder maple. This area is immediately upslope of the potential wetland strip.

DP 6 (Upland): Upland area between ball field and wetland strip. Dominant herbaceous species is Japanese knot weed (*Reynoutria japonica*, UPL). Dominant trees are mulberry *(Morus spp*., FACU). Wetland strip seems to find its upper limit immediately downslope of here.

DP 7 (Upland): Isolated depression containing wrack accumulation and almost completely devoid of vegetation. The only plant growing in the depression is lesser celandine (*Ficaria verna*, FAC). Japanese knot weed (*Reynoutria japonica*, UPL) is located at the edge of the depressional area, as well as box elder maple (*Acer negundo*, FAC).

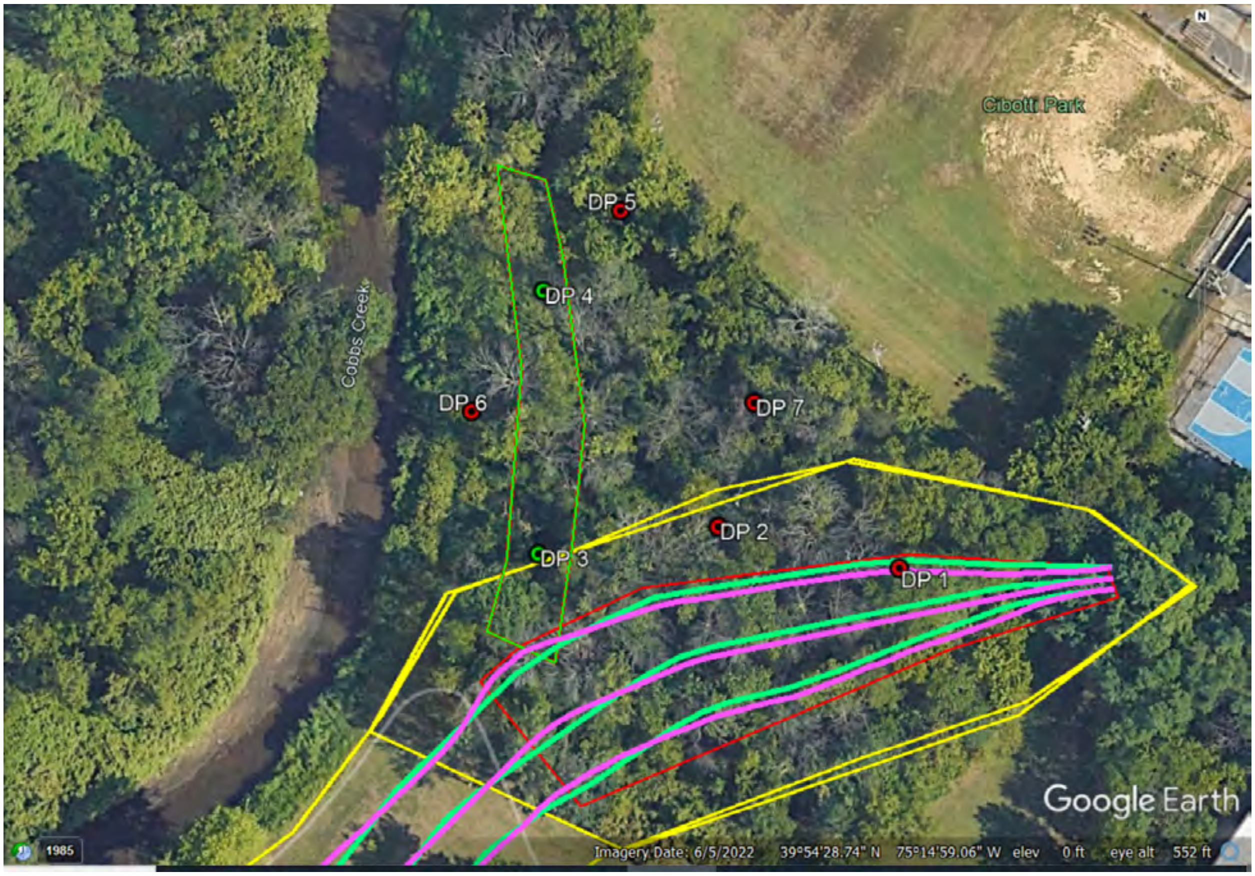

Figure 3. Data points used for wetland delineation at the northern wetland.

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Atlantic and Gulf Coastal Plain Region** See ERDC/EL TR-10-20; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp: 11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: Eastwick CAP City/County: Philadelphia Sampling Date: 5-18-23
Applicant/Owner: State: PA Sampling Point: DP-1
Investigator(s): Rachel Ward, Valerie Whalon Section, Township, Range:
Landform (hillside, terrace, etc.): terrace Local relief (concave, convex, none) convex Slope (%): 1
Subregion (LRR or MLRA): LRR S, MLRA 149A Lat: 39.907776° Long: -75.249487° Datum:
Soil Map Unit Name: Urban Land NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil x, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes x No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc

Hydrophytic Vegetation Present?	Yes ___ No X	**Is the Sampled Area within a Wetland?** **Yes** ___ **No** X
Hydric Soil Present?	Yes ___ No ___	
Wetland Hydrology Present?	Yes ___ No X	

Remarks:
Soils were not investigated as the entire delineation area is known to contain soils contaminated with hazardous materials. The area was historically used as some form of landfill or waste disposal area. Some surface evidence was observed (bricks, etc.). Procedures for problematic situations were used throughout the delineation. Only vegetation and hydrology indicators observable at or above the soil surface were investigated.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Aquatic Fauna (B13)
___ Marl Deposits (B15) **(LRR U)**
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres on Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

___ Surface Soil Cracks (B6)
___ Sparsely Vegetated Concave Surface (B8)
___ Drainage Patterns (B10)
___ Moss Trim Lines (B16)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Sphagnum Moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ___	No x	Depth (inches): ___
Water Table Present?	Yes ___	No ___	Depth (inches): ___
Saturation Present? (includes capillary fringe)	Yes ___	No ___	Depth (inches): ___

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Five Strata) – Use scientific names of plants. Sampling Point: DP-1

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer negundo*	90	Yes	FAC
2.			
3.			
4.			
5.			
6.			
	90	=Total Cover	
50% of total cover: 45		20% of total cover: 18	
Sapling Stratum (Plot size: 20)			
1. *reynoutria japonica*			
2.			
3.			
4.			
5.			
6.			
		=Total Cover	
50% of total cover:		20% of total cover:	
Shrub Stratum (Plot size: 20)			
1.			
2.			
3.			
4.			
5.			
6.			
		=Total Cover	
50% of total cover:		20% of total cover:	
Herb Stratum (Plot size: 20)			
1. *Reynoutria japonica*	80	Yes	UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	80	=Total Cover	
50% of total cover: 40		20% of total cover: 16	
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	90	x 3 =	270
FACU species	0	x 4 =	0
UPL species	80	x 5 =	400
Column Totals	170 (A)		670 (B)

Prevalence Index = B/A = 3.94

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Five Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

Shrub - Woody Plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.

Woody Vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: (If observed, list morphological adaptations below.)

VEGETATION (Four Strata – Use scientific names of plants.

Sampling Point: DP-1

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	=Total Cover		
50% of total cover:		20% of total cover:	

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	=Total Cover		
50% of total cover:		20% of total cover:	

Herb Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	=Total Cover		
50% of total cover:		20% of total cover:	

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ____ (A)

Total Number of Dominant Species Across All Strata: ____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ____ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals	(A)		(B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: (If observed, list morphological adaptations below.)

SOIL

Sampling Point: DP-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Organic Bodies (A6) **(LRR P, T, U)**
___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
___ Muck Presence (A8) **(LRR U)**
___ 1 cm Muck (A9) **(LRR P, T)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Coast Prairie Redox (A16) (**MLRA 150A**
___ Sandy Mucky Mineral (S1) **(LRR O, S)**
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7) **(LRR P, S, T, U)**
___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
___ Thin Dark Surface (S9) **(LRR S, T, U)**
___ Barrier Islands 1 cm Muck (S12) **(MLRA 153B, 153D)**
___ Loamy Mucky Mineral (F1) **(LRR O)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Marl (F10) **(LRR U)**
___ Depleted Ochric (F11) **(MLRA 151)**
___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
___ Umbric Surface (F13) **(LRR P, T, U)**
___ Delta Ochric (F17) **(MLRA 151)**
___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
___ Anomalous Bright Floodplain Soils (F20) **(MLRA 149A, 153C, 153D)**
___ Very Shallow Dark Surface (F22) **(MLRA 138, 152A in FL, 154)**

Indicators for Problematic Hydric Soils[3]:

___ 1 cm Muck (A9) **(LRR O)**
___ 2 cm Muck (A10) **(LRR S)**
___ Coast Prairie Redox (A16) **(outside MLRA 150A)**
___ Reduced Vertic (F18) **(outside MLRA 150A, 150B)**
___ Piedmont Floodplain Soils (F19) **(LRR P, T)**
___ Anomalous Bright Floodplain Soils (F20) **(MLRA 153B)**
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (F22) **(outside MLRA 138, 152A in FL, 154)**
___ Barrier Islands Low Chroma Matrix (TS7) **(MLRA 153B, 153D)**
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______________

Depth (inches): ______________

Hydric Soil Present? Yes _____ **No** _____

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Atlantic and Gulf Coastal Plain Region** See ERDC/EL TR-10-20; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp: 11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: Eastwick CAP City/County: Philadelphia Sampling Date: 5-18-23

Applicant/Owner: ______ State: PA Sampling Point: DP-2

Investigator(s): Rachel Ward, Valerie Whalon Section, Township, Range: ______

Landform (hillside, terrace, etc.): terrace Local relief (concave, convex, none) convex Slope (%): 5

Subregion (LRR or MLRA): LRR S, MLRA 149A Lat: 39.907963° Long: -75.249732° Datum: ______

Soil Map Unit Name: Urban Land NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)

Are Vegetation ___ , Soil x , or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes x No ___

Are Vegetation ___ , Soil ___ , or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc

Hydrophytic Vegetation Present?	Yes X No X	**Is the Sampled Area within a Wetland?** **Yes** ___ **No** X
Hydric Soil Present?	Yes ___ No ___	
Wetland Hydrology Present?	Yes ___ No X	

Remarks:
Soils were not investigated as the entire delineation area is known to contain soils contaminated with hazardous materials. The area was historically used as some form of landfill or waste disposal area. Some surface evidence was observed (bricks, etc.). Procedures for problematic situations were used throughout the delineation. Only vegetation and hydrology indicators observable at or above the soil surface were investigated.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Aquatic Fauna (B13)
___ Marl Deposits (B15) **(LRR U)**
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres on Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

___ Surface Soil Cracks (B6)
___ Sparsely Vegetated Concave Surface (B8)
___ Drainage Patterns (B10)
___ Moss Trim Lines (B16)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Sphagnum Moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present? Yes ___ No x Depth (inches): ___
Water Table Present? Yes ___ No ___ Depth (inches): ___
Saturation Present? Yes ___ No ___ Depth (inches): ___
(includes capillary fringe)

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Five Strata) – Use scientific names of plants.

Sampling Point: DP-2

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer negundo*	60	Yes	FAC
2.			
3.			
4.			
5.			
6.			
	60	=Total Cover	
50% of total cover: 30		20% of total cover: 12	

Sapling Stratum (Plot size: 20)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Shrub Stratum (Plot size: 20)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Ligustrum japonicum*	10	Yes	FAC
2. *reynoutria japonica*			
3.			
4.			
5.			
6.			
	10	=Total Cover	
50% of total cover: 5		20% of total cover: 2	

Herb Stratum (Plot size: 20)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Ficaria verna*	30	Yes	FAC
2. *Galium aparine*	30	Yes	FACU
3. *Urtica dioica*	30	Yes	FAC
4. *Reynoutria japonica*	30	Yes	UPL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	120	=Total Cover	
50% of total cover: 60		20% of total cover: 24	

Woody Vine Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66.7% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	130	x 3 =	390
FACU species	30	x 4 =	120
UPL species	30	x 5 =	150
Column Totals	190 (A)		660 (B)

Prevalence Index = B/A = 3.47

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Five Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

Shrub - Woody Plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.

Woody Vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? **Yes** X **No** X

Remarks: (If observed, list morphological adaptations below.)

VEGETATION (Four Strata – Use scientific names of plants. Sampling Point: DP-2

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	=Total Cover		
50% of total cover:		20% of total cover:	
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	=Total Cover		
50% of total cover:		20% of total cover:	
Herb Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	=Total Cover		
50% of total cover:		20% of total cover:	
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ____ (A)

Total Number of Dominant Species Across All Strata: ____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ____ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals	(A)		(B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** ____

Remarks: (If observed, list morphological adaptations below.)

SOIL

Sampling Point: DP-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Organic Bodies (A6) **(LRR P, T, U)**
___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
___ Muck Presence (A8) **(LRR U)**
___ 1 cm Muck (A9) **(LRR P, T)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Coast Prairie Redox (A16) (**MLRA 150A**
___ Sandy Mucky Mineral (S1) **(LRR O, S)**
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7) **(LRR P, S, T, U)**
___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
___ Thin Dark Surface (S9) **(LRR S, T, U)**
___ Barrier Islands 1 cm Muck (S12) **(MLRA 153B, 153D)**
___ Loamy Mucky Mineral (F1) **(LRR O)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Marl (F10) **(LRR U)**
___ Depleted Ochric (F11) **(MLRA 151)**
___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
___ Umbric Surface (F13) **(LRR P, T, U)**
___ Delta Ochric (F17) **(MLRA 151)**
___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
___ Anomalous Bright Floodplain Soils (F20) **(MLRA 149A, 153C, 153D)**
___ Very Shallow Dark Surface (F22) **(MLRA 138, 152A in FL, 154)**

Indicators for Problematic Hydric Soils[3]:

___ 1 cm Muck (A9) **(LRR O)**
___ 2 cm Muck (A10) **(LRR S)**
___ Coast Prairie Redox (A16) **(outside MLRA 150A)**
___ Reduced Vertic (F18) **(outside MLRA 150A, 150B)**
___ Piedmont Floodplain Soils (F19) **(LRR P, T)**
___ Anomalous Bright Floodplain Soils (F20) **(MLRA 153B)**
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (F22) **(outside MLRA 138, 152A in FL, 154)**
___ Barrier Islands Low Chroma Matrix (TS7) **(MLRA 153B, 153D)**
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______________

Depth (inches): ______________

Hydric Soil Present? Yes _____ No _____

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Atlantic and Gulf Coastal Plain Region
See ERDC/EL TR-10-20; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Eastwick CAP City/County: Philadelphia Sampling Date: 5-18-23
Applicant/Owner: ______ State: PA Sampling Point: DP-3
Investigator(s): Rachel Ward, Valerie Whalon Section, Township, Range: ______
Landform (hillside, terrace, etc.): terrace Local relief (concave, convex, none) cocave Slope (%): 1
Subregion (LRR or MLRA): LRR S, MLRA 149A Lat: 39.907889° Long: -75.249894° Datum: ______
Soil Map Unit Name: Urban Land NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil x, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes x No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc

Hydrophytic Vegetation Present?	Yes X No ___	**Is the Sampled Area within a Wetland?** **Yes** X **No** ___
Hydric Soil Present?	Yes ___ No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks:
Soils were not investigated as the entire delineation area is known to contain soils contaminated with hazardous materials. The area was historically used as some form of landfill or waste disposal area. Some surface evidence was observed (bricks, etc.). Procedures for problematic situations were used throughout the delineation. Only vegetation and hydrology indicators observable at or above the soil surface were investigated.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)	___ Aquatic Fauna (B13)
___ High Water Table (A2)	___ Marl Deposits (B15) **(LRR U)**
___ Saturation (A3)	___ Hydrogen Sulfide Odor (C1)
___ Water Marks (B1)	___ Oxidized Rhizospheres on Living Roots (C3)
___ Sediment Deposits (B2)	___ Presence of Reduced Iron (C4)
___ Drift Deposits (B3)	___ Recent Iron Reduction in Tilled Soils (C6)
___ Algal Mat or Crust (B4)	___ Thin Muck Surface (C7)
___ Iron Deposits (B5)	___ Other (Explain in Remarks)
___ Inundation Visible on Aerial Imagery (B7)	
x Water-Stained Leaves (B9)	

Secondary Indicators (minimum of two required)

___ Surface Soil Cracks (B6)
x Sparsely Vegetated Concave Surface (B8)
___ Drainage Patterns (B10)
___ Moss Trim Lines (B16)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
x Geomorphic Position (D2)
___ Shallow Aquitard (D3)
X FAC-Neutral Test (D5)
___ Sphagnum Moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ___	No x	Depth (inches): ___
Water Table Present?	Yes ___	No ___	Depth (inches): ___
Saturation Present? (includes capillary fringe)	Yes ___	No ___	Depth (inches): ___

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Five Strata) – Use scientific names of plants. Sampling Point: DP-3

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer negundo*	15	Yes	FAC
2. *Fraxinus pennsylvanica*	25	Yes	FACW
3.			
4.			
5.			
6.			
	40	=Total Cover	
50% of total cover: 20		20% of total cover: 8	
Sapling Stratum (Plot size: 20)			
1.			
2.			
3.			
4.			
5.			
6.			
		=Total Cover	
50% of total cover:		20% of total cover:	
Shrub Stratum (Plot size: 20)			
1.			
2.			
3.			
4.			
5.			
6.			
		=Total Cover	
50% of total cover:		20% of total cover:	
Herb Stratum (Plot size: 20)			
1. *Persicaria punctata*	20	Yes	OBL
2. *Veronica peregrina*	20	Yes	FAC
3. *Reynoutria japonica*	25	Yes	UPL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	65	=Total Cover	
50% of total cover: 33		20% of total cover: 13	
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 80.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	20	x 1 =	20
FACW species	25	x 2 =	50
FAC species	35	x 3 =	105
FACU species	0	x 4 =	0
UPL species	25	x 5 =	125
Column Totals	105 (A)		300 (B)

Prevalence Index = B/A = 2.86

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Five Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

Shrub - Woody Plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.

Woody Vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: (If observed, list morphological adaptations below.)

VEGETATION (Four Strata – Use scientific names of plants.

Sampling Point: DP-3

Tree Stratum (Plot size: ______)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	=Total Cover		
50% of total cover:		20% of total cover:	

Sapling/Shrub Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	=Total Cover		
50% of total cover:		20% of total cover:	

Herb Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	=Total Cover		
50% of total cover:		20% of total cover:	

Woody Vine Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ______ (A)

Total Number of Dominant Species Across All Strata: ______ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ______ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals	(A)		(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** ___

Remarks: (If observed, list morphological adaptations below.)

SOIL

Sampling Point: DP-3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Organic Bodies (A6) **(LRR P, T, U)**
___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
___ Muck Presence (A8) **(LRR U)**
___ 1 cm Muck (A9) **(LRR P, T)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Coast Prairie Redox (A16) (**MLRA 150A**
___ Sandy Mucky Mineral (S1) **(LRR O, S)**
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7) **(LRR P, S, T, U)**
___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
___ Thin Dark Surface (S9) **(LRR S, T, U)**
___ Barrier Islands 1 cm Muck (S12) **(MLRA 153B, 153D)**
___ Loamy Mucky Mineral (F1) **(LRR O)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Marl (F10) **(LRR U)**
___ Depleted Ochric (F11) **(MLRA 151)**
___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
___ Umbric Surface (F13) **(LRR P, T, U)**
___ Delta Ochric (F17) **(MLRA 151)**
___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
___ Anomalous Bright Floodplain Soils (F20) **(MLRA 149A, 153C, 153D)**
___ Very Shallow Dark Surface (F22) **(MLRA 138, 152A in FL, 154)**

Indicators for Problematic Hydric Soils[3]:

___ 1 cm Muck (A9) **(LRR O)**
___ 2 cm Muck (A10) **(LRR S)**
___ Coast Prairie Redox (A16) **(outside MLRA 150A)**
___ Reduced Vertic (F18) **(outside MLRA 150A, 150B)**
___ Piedmont Floodplain Soils (F19) **(LRR P, T)**
___ Anomalous Bright Floodplain Soils (F20) **(MLRA 153B)**
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (F22) **(outside MLRA 138, 152A in FL, 154)**
___ Barrier Islands Low Chroma Matrix (TS7) **(MLRA 153B, 153D)**
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? **Yes** ___ **No** ___

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Atlantic and Gulf Coastal Plain Region** See ERDC/EL TR-10-20; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp: 11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: Eastwick CAP City/County: Philadelphia Sampling Date: 5-18-23

Applicant/Owner: ______ State: PA Sampling Point: DP-4

Investigator(s): Rachel Ward, Valerie Whalon Section, Township, Range: ______

Landform (hillside, terrace, etc.): terrace Local relief (concave, convex, none) cocave Slope (%): 1

Subregion (LRR or MLRA): LRR S, MLRA 149A Lat: 39.908151° Long: -75.249890° Datum: ______

Soil Map Unit Name: Urban Land NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil x, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes x No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc

Hydrophytic Vegetation Present?	Yes X No ___	**Is the Sampled Area within a Wetland?** **Yes** ___ **No** ___
Hydric Soil Present?	Yes 0 No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks:
Soils were not investigated as the entire delineation area is known to contain soils contaminated with hazardous materials. The area was historically used as some form of landfill or waste disposal area. Some surface evidence was observed (bricks, etc.). Procedures for problematic situations were used throughout the delineation. Only vegetation and hydrology indicators observable at or above the soil surface were investigated.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)	___ Aquatic Fauna (B13)	
___ High Water Table (A2)	___ Marl Deposits (B15) **(LRR U)**	
___ Saturation (A3)	___ Hydrogen Sulfide Odor (C1)	
___ Water Marks (B1)	___ Oxidized Rhizospheres on Living Roots (C3)	
___ Sediment Deposits (B2)	___ Presence of Reduced Iron (C4)	
X Drift Deposits (B3)	___ Recent Iron Reduction in Tilled Soils (C6)	
___ Algal Mat or Crust (B4)	___ Thin Muck Surface (C7)	
___ Iron Deposits (B5)	___ Other (Explain in Remarks)	
___ Inundation Visible on Aerial Imagery (B7)		
X Water-Stained Leaves (B9)		

Secondary Indicators (minimum of two required)

___ Surface Soil Cracks (B6)
___ Sparsely Vegetated Concave Surface (B8)
___ Drainage Patterns (B10)
___ Moss Trim Lines (B16)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
X Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Sphagnum Moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ___	No x	Depth (inches): ___
Water Table Present?	Yes ___	No ___	Depth (inches): ___
Saturation Present? (includes capillary fringe)	Yes ___	No ___	Depth (inches): ___

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Five Strata) – Use scientific names of plants. Sampling Point: DP-4

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer negundo*	40	Yes	FAC
2. *Fraxinus pennsylvanica*	40	Yes	FACW
3.			
4.			
5.			
6.			
	80	=Total Cover	
50% of total cover: 40		20% of total cover: 16	
Sapling Stratum (Plot size: 20)			
1.			
2.			
3.			
4.			
5.			
6.			
		=Total Cover	
50% of total cover:		20% of total cover:	
Shrub Stratum (Plot size: 20)			
1.			
2.			
3.			
4.			
5.			
6.			
		=Total Cover	
50% of total cover:		20% of total cover:	
Herb Stratum (Plot size: 20)			
1. *Reynoutria japonica*	100	Yes	UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100	=Total Cover	
50% of total cover: 50		20% of total cover: 20	
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66.7% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	40	x 2 =	80
FAC species	40	x 3 =	120
FACU species	0	x 4 =	0
UPL species	100	x 5 =	500
Column Totals	180 (A)		700 (B)

Prevalence Index = B/A = 3.89

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Five Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

Shrub - Woody Plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.

Woody Vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: (If observed, list morphological adaptations below.)

VEGETATION (Four Strata – Use scientific names of plants.

Sampling Point: DP-4

Tree Stratum (Plot size: ______)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	=Total Cover		
50% of total cover:		20% of total cover:	

Sapling/Shrub Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	=Total Cover		
50% of total cover:		20% of total cover:	

Herb Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	=Total Cover		
50% of total cover:		20% of total cover:	

Woody Vine Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ______ (A)

Total Number of Dominant Species Across All Strata: ______ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ______ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals	(A)	(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** ____

Remarks: (If observed, list morphological adaptations below.)

SOIL

Sampling Point: DP-4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) **(MLRA 150A**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Barrier Islands 1 cm Muck (S12) **(MLRA 153B, 153D)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 149A, 153C, 153D)**
- ___ Very Shallow Dark Surface (F22) **(MLRA 138, 152A in FL, 154)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Coast Prairie Redox (A16) **(outside MLRA 150A)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, T)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22) **(outside MLRA 138, 152A in FL, 154)**
- ___ Barrier Islands Low Chroma Matrix (TS7) **(MLRA 153B, 153D)**
- x Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** ____ **No** ____

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Atlantic and Gulf Coastal Plain Region** See ERDC/EL TR-10-20; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp: 11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: Eastwick CAP City/County: Philadelphia Sampling Date: 5-18-23

Applicant/Owner: State: PA Sampling Point: DP-5

Investigator(s): Rachel Ward, Valerie Whalon Section, Township, Range:

Landform (hillside, terrace, etc.): hillside Local relief (concave, convex, none) convex Slope (%): 1

Subregion (LRR or MLRA): LRR S, MLRA 149A Lat: 39.908340° Long: -75.249786° Datum:

Soil Map Unit Name: Urban Land NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil x, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes x No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc

Hydrophytic Vegetation Present?	Yes X No ___	**Is the Sampled Area within a Wetland?**	**Yes** ___ **No** X
Hydric Soil Present?	Yes ___ No ___		
Wetland Hydrology Present?	Yes ___ No X		

Remarks:
Soils were not investigated as the entire delineation area is known to contain soils contaminated with hazardous materials. The area was historically used as some form of landfill or waste disposal area. Some surface evidence was observed (bricks, etc.). Procedures for problematic situations were used throughout the delineation. Only vegetation and hydrology indicators observable at or above the soil surface were investigated.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15) **(LRR U)**
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum Moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ___	No x	Depth (inches): ___
Water Table Present?	Yes ___	No ___	Depth (inches): ___
Saturation Present? (includes capillary fringe)	Yes ___	No ___	Depth (inches): ___

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Five Strata) – Use scientific names of plants.

Sampling Point: DP-5

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer negundo*	15	Yes	FAC
2.			
3.			
4.			
5.			
6.			
	15	=Total Cover	
50% of total cover: 8		20% of total cover:	3

Sapling Stratum (Plot size: 20)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Shrub Stratum (Plot size: 20)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Platanus occidentalis*	15	Yes	FACW
2. *Salix lucida*	10	Yes	FACW
3.			
4.			
5.			
6.			
	25	=Total Cover	
50% of total cover: 13		20% of total cover:	5

Herb Stratum (Plot size: 20)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Reynoutria japonica*	40	Yes	UPL
2. *Poa pratensis*	30	Yes	FACU
3. *Juncus effusus*	15	No	OBL
4. *Artemisia douglasiana*	20	No	UPL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	105	=Total Cover	
50% of total cover: 53		20% of total cover:	21

Woody Vine Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 60.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	15	x 1 =	15
FACW species	25	x 2 =	50
FAC species	15	x 3 =	45
FACU species	30	x 4 =	120
UPL species	60	x 5 =	300
Column Totals	145 (A)		530 (B)

Prevalence Index = B/A = 3.66

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Five Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

Shrub - Woody Plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.

Woody Vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: (If observed, list morphological adaptations below.)

VEGETATION (Four Strata – Use scientific names of plants. Sampling Point: DP-5

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	=Total Cover		
50% of total cover:		20% of total cover:	
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	=Total Cover		
50% of total cover:		20% of total cover:	
Herb Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	=Total Cover		
50% of total cover:		20% of total cover:	
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ____ (A)

Total Number of Dominant Species Across All Strata: ____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ____ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals	(A)		(B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** ____

Remarks: (If observed, list morphological adaptations below.)

SOIL

Sampling Point: DP-5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Organic Bodies (A6) **(LRR P, T, U)**
___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
___ Muck Presence (A8) **(LRR U)**
___ 1 cm Muck (A9) **(LRR P, T)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Coast Prairie Redox (A16) (**MLRA 150A**
___ Sandy Mucky Mineral (S1) **(LRR O, S)**
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7) **(LRR P, S, T, U)**
___ Polyvalue Below Surface (S8)
(LRR S, T, U)

___ Thin Dark Surface (S9) **(LRR S, T, U)**
___ Barrier Islands 1 cm Muck (S12)
(MLRA 153B, 153D)
___ Loamy Mucky Mineral (F1) **(LRR O)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Marl (F10) **(LRR U)**
___ Depleted Ochric (F11) **(MLRA 151)**
___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
___ Umbric Surface (F13) **(LRR P, T, U)**
___ Delta Ochric (F17) **(MLRA 151)**
___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
___ Anomalous Bright Floodplain Soils (F20)
(MLRA 149A, 153C, 153D)
___ Very Shallow Dark Surface (F22)
(MLRA 138, 152A in FL, 154)

Indicators for Problematic Hydric Soils[3]:

___ 1 cm Muck (A9) **(LRR O)**
___ 2 cm Muck (A10) **(LRR S)**
___ Coast Prairie Redox (A16)
(outside MLRA 150A)
___ Reduced Vertic (F18)
(outside MLRA 150A, 150B)
___ Piedmont Floodplain Soils (F19) **(LRR P, T)**
___ Anomalous Bright Floodplain Soils (F20)
(MLRA 153B)
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (F22)
(outside MLRA 138, 152A in FL, 154)
___ Barrier Islands Low Chroma Matrix (TS7)
(MLRA 153B, 153D)
x Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):
Type: ___
Depth (inches): ___

Hydric Soil Present? **Yes** ___ **No** ___

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Atlantic and Gulf Coastal Plain Region** See ERDC/EL TR-10-20; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp: 11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: Eastwick CAP City/County: Philadelphia Sampling Date: 5-18-23

Applicant/Owner: ______ State: PA Sampling Point: DP-6

Investigator(s): Rachel Ward, Valerie Whalon Section, Township, Range: ______

Landform (hillside, terrace, etc.): hillside Local relief (concave, convex, none) convex Slope (%): 1

Subregion (LRR or MLRA): LRR S, MLRA 149A Lat: 39.908340° Long: -75.249786° Datum: ______

Soil Map Unit Name: Urban Land NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil x, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes x No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc

Hydrophytic Vegetation Present?	Yes ___ No X	**Is the Sampled Area within a Wetland?**	**Yes** ___ **No** X
Hydric Soil Present?	Yes ___ No ___		
Wetland Hydrology Present?	Yes ___ No X		

Remarks:
Soils were not investigated as the entire delineation area is known to contain soils contaminated with hazardous materials. The area was historically used as some form of landfill or waste disposal area. Some surface evidence was observed (bricks, etc.). Procedures for problematic situations were used throughout the delineation. Only vegetation and hydrology indicators observable at or above the soil surface were investigated.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)	___ Aquatic Fauna (B13)	
___ High Water Table (A2)	___ Marl Deposits (B15) **(LRR U)**	
___ Saturation (A3)	___ Hydrogen Sulfide Odor (C1)	
___ Water Marks (B1)	___ Oxidized Rhizospheres on Living Roots (C3)	
___ Sediment Deposits (B2)	___ Presence of Reduced Iron (C4)	
___ Drift Deposits (B3)	___ Recent Iron Reduction in Tilled Soils (C6)	
___ Algal Mat or Crust (B4)	___ Thin Muck Surface (C7)	
___ Iron Deposits (B5)	___ Other (Explain in Remarks)	
___ Inundation Visible on Aerial Imagery (B7)		
___ Water-Stained Leaves (B9)		

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum Moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ___	No x	Depth (inches): ___
Water Table Present?	Yes ___	No ___	Depth (inches): ___
Saturation Present? (includes capillary fringe)	Yes ___	No ___	Depth (inches): ___

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Five Strata) – Use scientific names of plants.

Sampling Point: DP-6

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *morus rubra*	40	Yes	FACU
2.			
3.			
4.			
5.			
6.			
	40	=Total Cover	
50% of total cover: 20		20% of total cover: 8	

Sapling Stratum (Plot size: 20)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Shrub Stratum (Plot size: 20)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Herb Stratum (Plot size: 20)	Absolute % Cover	Dominant Species?	Indicator Status
1. *reynoutria japonica*	90	Yes	UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	90	=Total Cover	
50% of total cover: 45		20% of total cover: 18	

Woody Vine Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	40	x 4 =	160
UPL species	90	x 5 =	450
Column Totals	130 (A)		610 (B)

Prevalence Index = B/A = 4.69

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Five Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

Shrub - Woody Plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.

Woody Vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes ___ No X

Remarks: (If observed, list morphological adaptations below.)

VEGETATION (Four Strata – Use scientific names of plants.

Sampling Point: DP-6

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	=Total Cover		
50% of total cover:		20% of total cover:	
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	=Total Cover		
50% of total cover:		20% of total cover:	
Herb Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	=Total Cover		
50% of total cover:		20% of total cover:	
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ______ (A)

Total Number of Dominant Species Across All Strata: ______ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ______ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals	(A)		(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** X

Remarks: (If observed, list morphological adaptations below.)

SOIL

Sampling Point: DP-6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Organic Bodies (A6) **(LRR P, T, U)**
- ___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ___ Muck Presence (A8) **(LRR U)**
- ___ 1 cm Muck (A9) **(LRR P, T)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Coast Prairie Redox (A16) **(MLRA 150A)**
- ___ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR P, S, T, U)**
- ___ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ___ Thin Dark Surface (S9) **(LRR S, T, U)**
- ___ Barrier Islands 1 cm Muck (S12) **(MLRA 153B, 153D)**
- ___ Loamy Mucky Mineral (F1) **(LRR O)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) **(LRR U)**
- ___ Depleted Ochric (F11) **(MLRA 151)**
- ___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ___ Umbric Surface (F13) **(LRR P, T, U)**
- ___ Delta Ochric (F17) **(MLRA 151)**
- ___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 149A, 153C, 153D)**
- ___ Very Shallow Dark Surface (F22) **(MLRA 138, 152A in FL, 154)**

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR O)**
- ___ 2 cm Muck (A10) **(LRR S)**
- ___ Coast Prairie Redox (A16) **(outside MLRA 150A)**
- ___ Reduced Vertic (F18) **(outside MLRA 150A, 150B)**
- ___ Piedmont Floodplain Soils (F19) **(LRR P, T)**
- ___ Anomalous Bright Floodplain Soils (F20) **(MLRA 153B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22) **(outside MLRA 138, 152A in FL, 154)**
- ___ Barrier Islands Low Chroma Matrix (TS7) **(MLRA 153B, 153D)**
- x Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes ___ **No** ___

Remarks:

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Atlantic and Gulf Coastal Plain Region** See ERDC/EL TR-10-20; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp: 11/30/2024* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: Eastwick CAP City/County: Philadelphia Sampling Date: 5-18-23

Applicant/Owner: ______ State: PA Sampling Point: DP-7

Investigator(s): Rachel Ward, Valerie Whalon Section, Township, Range: ______

Landform (hillside, terrace, etc.): terrace Local relief (concave, convex, none) concave Slope (%): 2

Subregion (LRR or MLRA): LRR S, MLRA 149A Lat: 39.908078° Long: -75.249503° Datum: ______

Soil Map Unit Name: Urban Land NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil x, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes x No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc

Hydrophytic Vegetation Present?	Yes ___ No X	**Is the Sampled Area within a Wetland?**	**Yes** ___ **No** X
Hydric Soil Present?	Yes ___ No ___		
Wetland Hydrology Present?	Yes X No ___		

Remarks:
Soils were not investigated as the entire delineation area is known to contain soils contaminated with hazardous materials. The area was historically used as some form of landfill or waste disposal area. Some surface evidence was observed (bricks, etc.). Procedures for problematic situations were used throughout the delineation. Only vegetation and hydrology indicators observable at or above the soil surface were investigated.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)	___ Aquatic Fauna (B13)	
___ High Water Table (A2)	___ Marl Deposits (B15) **(LRR U)**	
___ Saturation (A3)	___ Hydrogen Sulfide Odor (C1)	
___ Water Marks (B1)	___ Oxidized Rhizospheres on Living Roots (C3)	
___ Sediment Deposits (B2)	___ Presence of Reduced Iron (C4)	
X Drift Deposits (B3)	___ Recent Iron Reduction in Tilled Soils (C6)	
___ Algal Mat or Crust (B4)	___ Thin Muck Surface (C7)	
___ Iron Deposits (B5)	___ Other (Explain in Remarks)	
___ Inundation Visible on Aerial Imagery (B7)		
___ Water-Stained Leaves (B9)		

Secondary Indicators (minimum of two required)

___ Surface Soil Cracks (B6)
X Sparsely Vegetated Concave Surface (B8)
___ Drainage Patterns (B10)
___ Moss Trim Lines (B16)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
X Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Sphagnum Moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ___	No x	Depth (inches): ___
Water Table Present?	Yes ___	No ___	Depth (inches): ___
Saturation Present? (includes capillary fringe)	Yes ___	No ___	Depth (inches): ___

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Five Strata) – Use scientific names of plants.

Sampling Point: DP-7

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer negundo*	30	Yes	FAC
2.			
3.			
4.			
5.			
6.			
	30 =Total Cover		
50% of total cover: 15		20% of total cover: 6	

Sapling Stratum (Plot size: 20)			
1.			
2.			
3.			
4.			
5.			
6.			
	=Total Cover		
50% of total cover:		20% of total cover:	

Shrub Stratum (Plot size: 20)			
1.			
2.			
3.			
4.			
5.			
6.			
	=Total Cover		
50% of total cover:		20% of total cover:	

Herb Stratum (Plot size: 20)			
1. *Reynoutria japonica*	10	Yes	UPL
2. *Ficaria verna*	20	Yes	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	30 =Total Cover		
50% of total cover: 15		20% of total cover: 6	

Woody Vine Stratum (Plot size: 10)			
1. *Vitis aestivalis*	10	Yes	FACU
2.			
3.			
4.			
5.			
	10 =Total Cover		
50% of total cover: 5		20% of total cover: 2	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	50	x 3 =	150
FACU species	10	x 4 =	40
UPL species	10	x 5 =	50
Column Totals	70 (A)		240 (B)

Prevalence Index = B/A = 3.43

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Five Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

Shrub - Woody Plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.

Woody Vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: (If observed, list morphological adaptations below.)

VEGETATION (Four Strata – Use scientific names of plants. Sampling Point: DP-7

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	=Total Cover		
50% of total cover:		20% of total cover:	

Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	=Total Cover		
50% of total cover:		20% of total cover:	

Herb Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	=Total Cover		
50% of total cover:		20% of total cover:	

Woody Vine Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ____ (A)

Total Number of Dominant Species Across All Strata: ____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ____ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals	(A)		(B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** X

Remarks: (If observed, list morphological adaptations below.)

SOIL

Sampling Point: DP-7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Organic Bodies (A6) **(LRR P, T, U)**
___ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
___ Muck Presence (A8) **(LRR U)**
___ 1 cm Muck (A9) **(LRR P, T)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Coast Prairie Redox (A16) (**MLRA 150A**
___ Sandy Mucky Mineral (S1) **(LRR O, S)**
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7) **(LRR P, S, T, U)**
___ Polyvalue Below Surface (S8) **(LRR S, T, U)**

___ Thin Dark Surface (S9) **(LRR S, T, U)**
___ Barrier Islands 1 cm Muck (S12) **(MLRA 153B, 153D)**
___ Loamy Mucky Mineral (F1) **(LRR O)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Marl (F10) **(LRR U)**
___ Depleted Ochric (F11) **(MLRA 151)**
___ Iron-Manganese Masses (F12) **(LRR O, P, T)**
___ Umbric Surface (F13) **(LRR P, T, U)**
___ Delta Ochric (F17) **(MLRA 151)**
___ Reduced Vertic (F18) **(MLRA 150A, 150B)**
___ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
___ Anomalous Bright Floodplain Soils (F20) **(MLRA 149A, 153C, 153D)**
___ Very Shallow Dark Surface (F22) **(MLRA 138, 152A in FL, 154)**

Indicators for Problematic Hydric Soils[3]:

___ 1 cm Muck (A9) **(LRR O)**
___ 2 cm Muck (A10) **(LRR S)**
___ Coast Prairie Redox (A16) **(outside MLRA 150A)**
___ Reduced Vertic (F18) **(outside MLRA 150A, 150B)**
___ Piedmont Floodplain Soils (F19) **(LRR P, T)**
___ Anomalous Bright Floodplain Soils (F20) **(MLRA 153B)**
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (F22) **(outside MLRA 138, 152A in FL, 154)**
___ Barrier Islands Low Chroma Matrix (TS7) **(MLRA 153B, 153D)**
x Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? **Yes** ____ **No** ____

Remarks:

CLEAN WATER ACT SECTION 404 (b)(1) EVALUATION
U.S. ARMY CORPS OF ENGINEERS (USACE)

PROJECT: Eastwick, Philadelphia, PA, Flood Risk Management Study, Section 205 of the Water Resources Development Act

PROJECT MANAGER: Jay Smith Phone: (215) 656-6579

FORM COMPLETED BY: Valerie Whalon Phone: (215) 656-0620

PROJECT DESCRIPTION:

The U.S. Army Corps of Engineers (USACE), in partnership with the Philadelphia Water Department, proposes to construct a levee to manage flooding from Cobbs Creek during high streamflow events in the Eastwick neighborhood of Philadelphia (i.e., the tentatively selected plan). The 1300-foot levee would be located along the left bank of Cobbs Creek within the city-owned Eastwick Regional Park and Clearview Landfill. The levee design was modeled to be effective to reduce flooding up to and including the 0.2% AEP (Annual Exceedance Probability) (500-year floodplain). A variety of alternatives were considered during the formulation of a tentatively selected plan, which are described in the IFR/EA.

1. Review of Compliance (Section 230.10(a)-(d)).

		YES	NO
a.	The discharge represents the least environmentally damaging practicable alternative and if in a special aquatic site, the activity associated with the discharge must have direct access or proximity to, or be located in the aquatic ecosystem to fulfill its basic purpose.	| X |	| |
b.	The activity does not appear to: 1) violate applicable state water quality standards or effluent standards prohibited under Section 307 of the CWA; 2) jeopardize the existence of Federally listed threatened and endangered species or their critical habitat; and 3) violate requirements of any Federally designated marine sanctuary	| X |	| |
c.	The activity will not cause or contribute to significant degradation of waters of the U.S. including adverse effects on human health, life stages of organisms dependent on the aquatic ecosystem, ecosystem diversity, productivity and stability, and recreational, aesthetic, and economic values	| X |	| |
d.	Appropriate and practicable steps have been taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem	| X |	| |

2. Technical Evaluation Factors (Subparts C-F).

a. Potential Impacts on Physical and Chemical Characteristics of the Aquatic Ecosystem (Subpart C) (Sec. 230.20-230.25).

		Not Significant	Significant	N/A
1)	Substrate.	| X |	| |	| |
2)	Suspended particulates/turbidity.	| |	| |	| X |
3)	Water.	| X |	| |	| |
4)	Current patterns and water circulation.	| |	| |	| X |
5)	Normal water fluctuations.	| X |	| |	| |
6)	Salinity gradients.	| |	| |	| X |

b. Potential Impacts on Biological Characteristics of the Aquatic Ecosystem (Subpart D)(Sec. 230.30-230.32).

		Not Significant	Significant	N/A
1)	Threatened and endangered species.	| X |	| |	| |
2)	Fish, crustaceans, mollusks and other aquatic organisms in the food web.	| X |	| |	| |
3)	Other wildlife.	| X |	| |	| |

c. Potential Impacts on Special Aquatic Sites (Subpart E)(Sec. 230.40-230.45).

		Not Significant	Significant	N/A
1)	Sanctuaries and refuges.	| |	| |	| X |
2)	Wetlands.	| X |	| |	| |
3)	Mud flats.	| X |	| |	| |
4)	Vegetated shallows.	| X |	| |	| |
5)	Coral reefs.	| |	| |	| X |
6)	Riffle and pool complexes.	| |	| |	| X |

d. Potential Effects on Human Use Characteristics (Subpart F)(Sec 230.50-230.45)

		Not Significant	Significant	N/A
1)	Municipal and private water supplies.	| |	| |	| X |
2)	Recreational and commercial fisheries.	| |	| |	| X |
3)	Water-related recreation.	| |	| |	| X |
4)	Aesthetics.	| X |	| |	| |
5)	Parks, national and historic monuments, national seashore, wilderness areas, research sites, and similar preserves.	| |	| |	| X |

3. Evaluation and Testing (Subpart G) (Sec. 230.60-230.61)

a. The following information has been considered in evaluating the biological availability of possible contaminants in dredged or fill material. (Check only those appropriate.)

1)	Physical characteristics.........................	| |
2)	Hydro-geography in relation to known or anticipated sources of contaminants..............	| |
3)	Results from previous testing of the material or similar material in the vicinity of the project ..	| |
4)	Known, significant sources of persistent pesticides from land runoff or percolation	| |
5)	Spill records for petroleum products or designated hazardous substances (Section 311 of CWA)	| |

6)	Public records of significant introduction of contaminants from industries, municipalities, or other sources	| |
7)	Known existence of substantial material deposits of substances which could be released in harmful quantities to the aquatic environment by man-induced discharge activities	| |
8)	Other sources (specify): A clean source for fill material will be required. .	| X |
List appropriate references.		

b. An evaluation of the appropriate information in 3a above indicates that there is reason to believe the proposed dredge or fill material is not a carrier of contaminants, or that levels of contaminants are substantively similar at extraction and disposal sites and not likely to require constraints. The material meets the testing exclusion criteria.

Contractor will be required to provide proof of clean fill.	**YES**	**NO**
	| X |	| |

4. Disposal Site Delineation (Section 230.11(f)).

a. The following factors, as appropriate, have been considered in evaluating the disposal site. NOT APPLICABLE

1)	Depth of water at disposal site	| |
2)	Current velocity, direction, and variability at the disposal site	| |
3)	Degree of turbulence	| |
4)	Water column stratification	| |
5)	Discharge vessel speed and direction	| |
6)	Rate of discharge	| |
7)	Dredged material characteristics (constituents, amount, and type of material, settling velocities)	| |
8)	Number of discharges per unit of time	| |
9)	Other factors affecting rates and patterns of mixing (specify)	| |
List appropriate references:		

b. An evaluation of the appropriate factors in 4a above indicates that the disposal site and/or size of mixing zone are acceptable.

No disposal site required	**YES**	**NO**
	| X |	| |

5. Actions To Minimize Adverse Effects (Subpart H)(Sec. 230.70-230.77).

All appropriate and practicable steps have been taken, through application of recommendation of Section 230.70-230.77 to ensure minimal adverse effects of the proposed discharge.	YES	NO
	| X |	| |

List actions taken:

a. As levee design proceeds, the alignment will avoid the wetlands, if possible. If wetlands need to be impacted, the impacts will be mitigated.
b. Erosion and sediment control BMPs and sound construction practices will be used to avoid unintentional fill and other water quality impacts.

6. Factual Determination (Section 230.11).

A review of appropriate information as identified in items 2 - 5 above indicates that there is minimal potential for short or long term environmental effects of the proposed discharge as related to:

		YES	NO
a.	Physical substrate (review sections 2a, 3, 4, and 5 above).	| X |	| |
b.	Water circulation, fluctuation and salinity (review sections 2a, 3, 4, and 5).	| X |	| |
c.	Suspended particulates/turbidity (review sections 2a, 3, 4, and 5).	| X |	| |
d.	Contaminant availability (review sections 2a, 3, and 4).	| X |	| |
e.	Aquatic ecosystem structure, function and organisms(review sections 2b and c, 3, and 5)	| X |	| |
f.	Proposed disposal site (review sections 2, 4, and 5).	| X |	| |
g.	Cumulative effects on the aquatic ecosystem.	| X |	| |
h.	Secondary effects on the aquatic ecosystem.	| X |	| |

7. Findings of Compliance or non-compliance. (Sec. 230.12)

The proposed disposal site for discharge of dredged or fill material complies with the Section 404(b)(1) guidelines ...	YES	NO
	| X |	| |

Eastwick, Philadelphia County, Pennsylvania
Flood Risk Management Study
Continuing Authorities Program Section 205

Mitigation, Monitoring, and Adaptive Management Plan

1. Policy and Guidance

In accordance with Section 2036(a) of the Water Resources Development Act of 2007 and reference, a monitoring and adaptive management plan must be developed for all mitigation plans and will be included in the final feasibility report and/or National Environmental Policy Act document. The monitoring and adaptive management plan is developed in consultation with the non-Federal sponsor during plan formulation to monitor the ecological success for each mitigation measure. This monitoring and adaptive management plan shall include a description of the monitoring activities, the criteria for success, and the estimated cost and duration of the monitoring as well as specify that monitoring will continue until such time as the Secretary determines that the success criteria have been met. The adaptive management plan must be appropriately scoped to the scale of the project and will be limited to only the area of mitigation unless the non-Federal sponsor and the District Commander mutually agree otherwise.

The following documents provide distinct U.S. Army Corps of Engineers (USACE) policy and guidance that are pertinent to the formulation of the project and developing this monitoring and adaptive management plan:

a. USACE Commanding General Memorandum, dated 8 March 2019, Subject: Mitigation Planning and Adaptive Management.

b. Appendix C (Environmental Evaluation and Compliance) of ER 1105-2-100, the Planning Guidance Notebook.

c. USACE Chief of Planning Memorandum, dated 31 August 2009, Subject: Implementation Guidance for Section 2036 (a) of the Water Resources Development Act of 2007 (WRDA 07) -- Mitigation for Fish and Wildlife and Wetlands Losses.

2. Background

As per ER 1105-2-100, mitigation for wetlands “shall be accomplished through appropriate actions taken to avoid, minimize, and compensate for unavoidable losses as required to clearly demonstrate efforts made to meet the administration's goal of no net loss of wetlands.”

The project has the potential to fill up to 0.1 acres of forested wetlands and 0.4 acres of U.S. Environmental Protection Agency (EPA) constructed forested wetlands. Impacts on wetlands would be avoided and minimized to the maximum extent possible. Impacts that cannot be avoided would be mitigated. Approximately, 0.2 acres of EPA restored habitat would be removed and would require mitigation.

Due to the small scale of the mitigation effort and standard mitigation ratios used for wetlands, an incremental cost analysis was not completed for this effort. A ratio of 1:2 was used for forested wetlands. It is estimated that 1 acre of non-tidal forested wetlands would be required for mitigation. A ratio of 1:1 was used for restored forest habitat. It is estimated that 0.2 acres of forest habitat would be required for mitigation. See Table 1.

Table 1. Mitigation for Impacts on Forested Wetland and Constructed Forest Habitat

	Impact	Mitigation Ratio	Required Mitigation
Forested Freshwater Wetlands	0.1	2	0.2
EPA Constructed Wetland	0.4	2	0.8
EPA Constructed Habitat	0.2	1	0.2

The following mitigation objectives are applicable to wetland and habitat mitigation for construction site impacts:

a. Wetland mitigation would be consistent with the mitigation requirements under 404(b)(1) of the Clean Water Act (40 CFR 230 Subpart J).

b. Meet the long-term targeted cover and survivability percentages for vegetative cover types based on documented vegetation and growth at the site;

c. Minimize invasive species encroachment in the site restoration through monitoring and adaptive management practices; and

d. Document lessons learned and apply adaptive management for subsequent projects.

3. Mitigation Plan

The proposed mitigation plan for impacts to wetlands is to purchase mitigation bank credits for forested non-tidal, freshwater wetlands. All wetland impacts in the Pennsylvania Coastal Zone would require coastal zone mitigation bank credits. Because the project footprint is located at the edge of the Pennsylvania Coastal Zone, this would be determined during the design phase of the project. This plan assumes that the appropriate mitigation bank credits would be available at the when construction of the project moves forward. The project partners would have no additional responsibilities for impacts to forested wetlands once mitigation bank credits are purchased.

The proposed mitigation for EPA-constructed forested habitat is the creation of forested habitat onsite at the Clearview Landfill. The plan will include planting native trees and shrubs planted in a defined area adjacent to the Cobbs Creek (Figure 1). This location is appropriate for a floodplain forest. A native floodplain ground cover grass seed mix shall be used on all disturbed areas. During the growing season May - September remove and eliminate invasive plants with cutting and spraying operations. Onsite mitigation would be coordinated with the EPA. Table 1 provides the planting plan for the mitigation of 0.2 acre (8,712) of forested habitat.

Figure 1. Proposed Location to Mitigate for Impacts to EPA-Constructed Forested Habitat

Table 1
Mitigation Area (0.2 acres) Planting Plan

COMMON NAME	SCIENTIFIC NAME	Size (sq ft)	Percent Composition of Plantings	Spacing On Center (ft)	Plants (#) OR Seeds (lbs)	FORM
Red maple	*Acer rubrum*	8,172	50%	12	30	balled and burlapped
Shagbark hickory	*Carya ovate*	8,172	25%	12	15	balled and burlapped
Silver maple	*Acer saccharinum*	8,172	20%	12	12	balled and burlapped
Sweet pignut hickory	*Carya ovalis*	8,172	5%	12	3	balled and burlapped
Arrowwood viburnum	*Viburnum dentatum*	8,172	25% shrub layer	6	45	#1 container
Silky dogwood	*Cornus amomum*	8,172	25% shrub layer	6	45	#1 container
Winterberry holly	*Ilex verticillata*	8,172	25% shrub layer	6	45	#1 container
Spicebush	*Lindera benzoin*	8,172	25% shrub layer	6	45	#1 container
Ernst floodplain seed mix ERNMX-154 or similar		8,172	100%	NA	4	Seed
Grain rye cover crop or similar		8,172	100%	NA	6	Seed

Planting Plan Assumptions

1. Twelve-foot on center spacing for trees and 6-foot on center spacing for shrubs.
2. 20lbs floodplain seed mix per acre with 30lbs grain rye per acre cover crop.
3. Individual tree and shrub pricing similar across species so actual number of specific species planted will not significantly impact cost (Burlap species shown separately)
4. Installation assumes the use of a tractor and post hole digger for larger sized containers and burlap plants. Shrub species will be planted manually.
5. Surface land disturbance in mitigation area will be minimal.

4. Monitoring

The purpose of the monitoring the created habitat is to verify success as defined in terms of the mitigation objectives and criteria developed to measure success and to identify when and what adaptive management actions should be taken. Monitoring activities include visual observations using transects or other methods to estimate vegetative cover types and proportions during the growing season to document percent cover and growth. There will be a 1, 3 and 5-year monitoring cycle for tree and shrub survival, herbaceous cover and invasive species management following the initial plantings. As project partners, USACE and the City of Philadelphia would be responsible for the monitoring.

5. Performance Measures and Success Criteria

Success will be described in terms of percent native plant survival in planted areas of the mitigation site and the minimization of invasive plant species based on a 1/3/5 year monitoring cycle. Year one success will be achieved if following the first year of growth there is a 90 percent survival rate for woody tree and shrub species planted at the mitigation site. Year 3 success will be achieved if there is an 80 percent survival rate for woody tree and shrub species along with an 80 percent coverage of native herbaceous vegetation and less than 5 percent coverage of invasive species as determined by visual transect surveys or other methods. Year 5 success will be achieved if the site maintains an 80 percent survival rate for woody tree and shrub species along with an 80 percent coverage of native herbaceous vegetation and less than 5-10 percent coverage of invasive species as determined by visual transect surveys or other approved assessment methods.

6. Adaptive Management Triggers

During any point in the monitoring cycle, adaptive management will be triggered if monitoring results show there is less than the required survival rate for woody species in the growing season of planted species at the site and/or there is greater than 5 percent invasive species present starting in year 3 of monitoring.

7. Adaptive Management Actions

Adaptive management would include:

- supplementing plants to replace the loss of planted native vegetation to achieve desired composition, survivability percentage, and/or percent coverage
- modify species utilized for the mitigation if necessary based on species loss composition
- manual and/or herbicide eradication of invasive species may be required if its coverage is greater than 5 percent.

8. Mitigation, Monitoring, and Adaptive Management Costs

Total estimated cost for monitoring is $390,000 (Table 2). This includes visual or other survey methods in Years 1, 3, and 5. Cost of mitigation, monitoring, and adaptive management will be shared between the USACE and the City of Philadelphia at the same percentage as the project, with 65 percent of the cost from Federal funds and 35 percent non-Federal.

Table 2
Terrestrial Mitigation, Monitoring, and Adaptive Management Costs (2022 Cost Levels)

Activity	Costs
Mitigation Bank for Forested Wetlands	**$200,000**
Mitigation (construction)	**$40,000**
Monitoring (3 years)	**$75,000**
Adaptive Management (5 years)	**$25,000**
Total	**$390,000**

Appendix A2: IPAC and PNDI Reports and Consultation Packages

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pennsylvania Ecological Services Field Office
110 Radnor Road Suite 101
State College, PA 16801-7987
Phone: (814) 234-4090 Fax: (814) 234-0748

In Reply Refer To: July 25, 2023
Project Code: 2023-0084408
Project Name: Eastwick Flood Risk Management Study

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts see https://www.fws.gov/birds/policies-and-regulations.php.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures see https://www.fws.gov/birds/bird-enthusiasts/threats-to-birds.php.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/birds/policies-and-regulations/executive-orders/e0-13186.php.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds
- Wetlands

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Pennsylvania Ecological Services Field Office
110 Radnor Road Suite 101
State College, PA 16801-7987
(814) 234-4090

PROJECT SUMMARY

Project Code: 2023-0084408
Project Name: Eastwick Flood Risk Management Study
Project Type: Flooding
Project Description: To address flooding in the Eastwick neighborhood of Philadelphia, the USACE, in partnership with the Philadelphia Water Department, proposes to construct a levee along the left bank of Cobbs Creek. The levee would be located within the city-owned Eastwick Regional Park and Clearview Landfill. The length of the levee would be approximately 1,300 feet. The levee was laid out such that the inner toe is at least 50 feet away from the nearest structure. The levee design was modeled to be effective up to and including the 0.2% AEP (Annual Exceedance Probability) (500-year floodplain).

Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@39.906322,-75.25200167597129,14z

Counties: Delaware and Philadelphia counties, Pennsylvania

ENDANGERED SPECIES ACT SPECIES

There is a total of 3 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 1 of these species should be considered only under certain conditions.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Endangered
Tricolored Bat *Perimyotis subflavus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

INSECTS

NAME	STATUS
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. This species only needs to be considered under the following conditions: ▪ The monarch is a candidate species and not yet listed or proposed for listing. There are generally no section 7 requirements for candidate species (FAQ found here: https://www.fws.gov/savethemonarch/FAQ-Section7.html). Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

USFWS NATIONAL WILDLIFE REFUGE LANDS AND FISH HATCHERIES

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

MIGRATORY BIRDS

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

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1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
American Oystercatcher *Haematopus palliatus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8935	Breeds Apr 15 to Aug 31
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Oct 15 to Aug 31

NAME	BREEDING SEASON
Black Skimmer *Rynchops niger* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/5234	Breeds May 20 to Sep 15
Black-billed Cuckoo *Coccyzus erythropthalmus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9399	Breeds May 15 to Oct 10
Blue-winged Warbler *Vermivora pinus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds May 1 to Jun 30
Bobolink *Dolichonyx oryzivorus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Jul 31
Canada Warbler *Cardellina canadensis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Aug 10
Cerulean Warbler *Dendroica cerulea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/2974	Breeds Apr 29 to Jul 20
Chimney Swift *Chaetura pelagica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Mar 15 to Aug 25
Eastern Whip-poor-will *Antrostomus vociferus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Aug 20
Golden Eagle *Aquila chrysaetos* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds elsewhere
Gull-billed Tern *Gelochelidon nilotica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9501	Breeds May 1 to Jul 31
Hudsonian Godwit *Limosa haemastica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere

NAME	BREEDING SEASON
Kentucky Warbler *Oporornis formosus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 20
King Rail *Rallus elegans* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8936	Breeds May 1 to Sep 5
Lesser Yellowlegs *Tringa flavipes* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Long-eared Owl *asio otus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3631	Breeds Mar 1 to Jul 15
Prairie Warbler *Dendroica discolor* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Jul 31
Prothonotary Warbler *Protonotaria citrea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 1 to Jul 31
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10
Ruddy Turnstone *Arenaria interpres morinella* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Rusty Blackbird *Euphagus carolinus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Short-billed Dowitcher *Limnodromus griseus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9480	Breeds elsewhere
Willet *Tringa semipalmata* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 5
Wood Thrush *Hylocichla mustelina* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

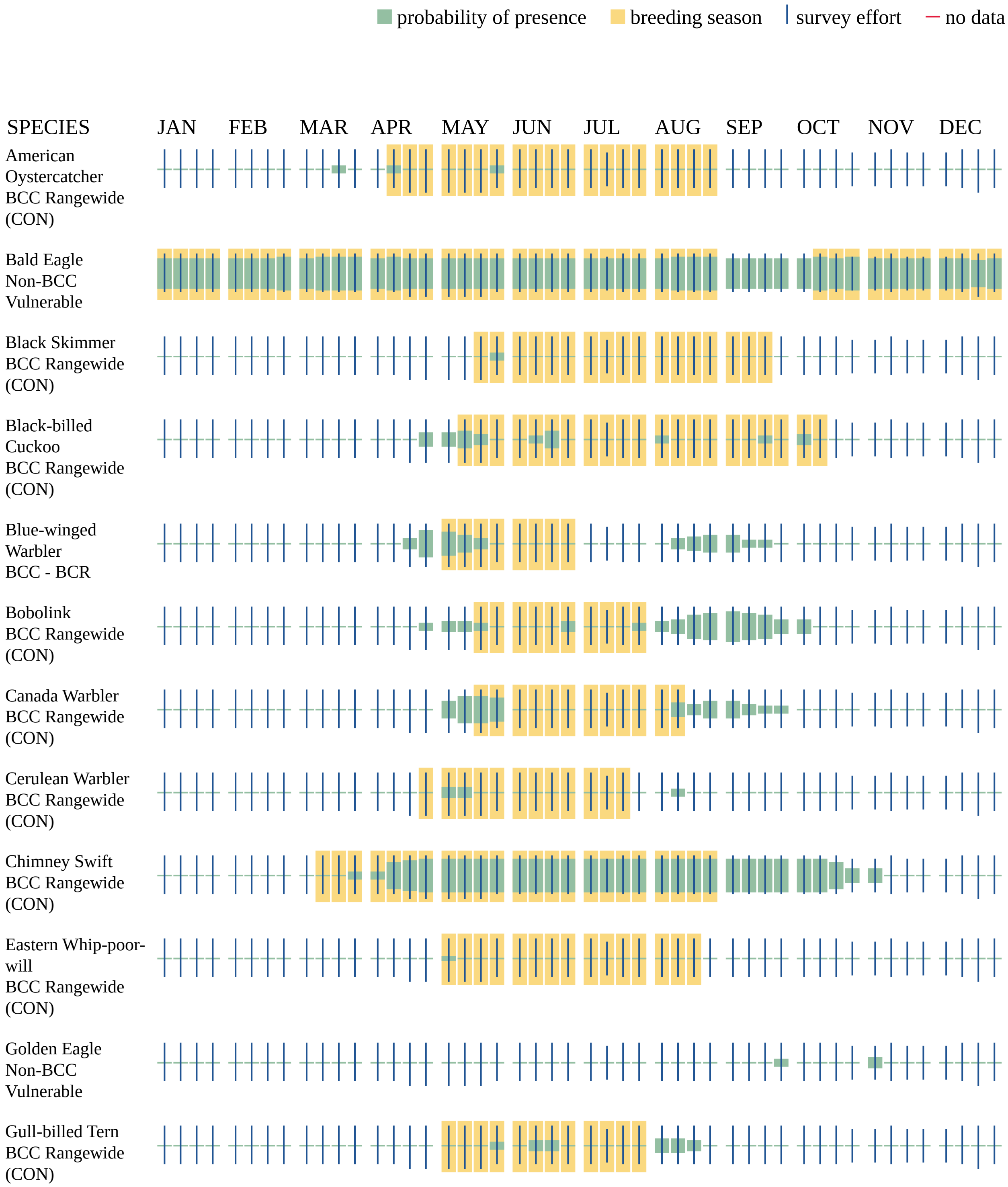
Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds

- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

MIGRATORY BIRDS FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the RAIL Tool and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?
Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects
For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?
If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report
The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be

aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

WETLANDS

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

THERE ARE NO WETLANDS WITHIN YOUR PROJECT AREA.

IPAC USER CONTACT INFORMATION

Agency:	Army Corps of Engineers
Name:	Valerie Whalon
Address:	U.S. Army Corps of Engineers, Planning Division
Address Line 2:	1650 Arch Street
City:	Philadelphia
State:	PA
Zip:	19103-2004
Email	valerie.m.whalon@usace.army.mil
Phone:	3024236420

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pennsylvania Ecological Services Field Office
110 Radnor Road Suite 101
State College, PA 16801-7987
Phone: (814) 234-4090 Fax: (814) 234-0748

In Reply Refer To: August 10, 2023
Project code: 2023-0084408
Project Name: Eastwick Flood Risk Management Study

Federal Nexus: yes
Federal Action Agency (if applicable): Army Corps of Engineers

Subject: Federal agency coordination under the Endangered Species Act, Section 7 for 'Eastwick Flood Risk Management Study'

Dear Valerie Whalon:

This letter records your determination using the Information for Planning and Consultation (IPaC) system provided to the U.S. Fish and Wildlife Service (Service) on August 10, 2023, for 'Eastwick Flood Risk Management Study' (here forward, Project). This project has been assigned Project Code 2023-0084408 and all future correspondence should clearly reference this number. **Please carefully review this letter. Your Endangered Species Act (Act) requirements may not be complete.**

Ensuring Accurate Determinations When Using IPaC

The Service developed the IPaC system and associated species' determination keys in accordance with the Endangered Species Act of 1973 (ESA; 87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.) and based on a standing analysis. All information submitted by the Project proponent into the IPaC must accurately represent the full scope and details of the Project. Failure to accurately represent or implement the Project as detailed in IPaC or the Northern Long-eared Bat Rangewide Determination Key (DKey), invalidates this letter.

Determination for the Northern Long-Eared Bat

Based upon your IPaC submission and a standing analysis completed by the Service, your project has reached the determination of “May Affect, Not Likely to Adversely Affect” the northern long-eared bat. Unless the Service advises you within 15 days of the date of this letter that your IPaC-assisted determination was incorrect, this letter verifies that consultation on the Action is complete and no further action is necessary unless either of the following occurs:

- new information reveals effects of the action that may affect the northern long-eared bat in a manner or to an extent not previously considered; or,
- the identified action is subsequently modified in a manner that causes an effect to the northern long-eared bat that was not considered when completing the determination key.

15-Day Review Period

As indicated above, the Service will notify you within 15 calendar days if we determine that this proposed Action does not meet the criteria for a “may affect, not likely to adversely affect” (NLAA) determination for the northern long-eared bat. If we do not notify you within that timeframe, you may proceed with the Action under the terms of the NLAA concurrence provided here. This verification period allows the identified Ecological Services Field Office to apply local knowledge to evaluation of the Action, as we may identify a small subset of actions having impacts that we did not anticipate when developing the key. In such cases, the identified Ecological Services Field Office may request additional information to verify the effects determination reached through the Northern Long-eared Bat DKey.

Other Species and Critical Habitat that May be Present in the Action Area

The IPaC-assisted determination for the northern long-eared bat does not apply to the following ESA-protected species and/or critical habitat that also may occur in your Action area:

- Monarch Butterfly *Danaus plexippus* Candidate
- Tricolored Bat *Perimyotis subflavus* Proposed Endangered

You may coordinate with our Office to determine whether the Action may affect the species and/or critical habitat listed above. Note that reinitiation of consultation would be necessary if a new species is listed or critical habitat designated that may be affected by the identified action before it is complete.

If you have any questions regarding this letter or need further assistance, please contact the Pennsylvania Ecological Services Field Office and reference Project Code 2023-0084408 associated with this Project.

Action Description

You provided to IPaC the following name and description for the subject Action.

1. Name

Eastwick Flood Risk Management Study

2. Description

The following description was provided for the project 'Eastwick Flood Risk Management Study':

> To address flooding in the Eastwick neighborhood of Philadelphia, the USACE, in partnership with the Philadelphia Water Department, proposes to construct a levee along the left bank of Cobbs Creek. The levee would be located within the city-owned Eastwick Regional Park and Clearview Landfill. The length of the levee would be approximately 1,300 feet. The levee was laid out such that the inner toe is at least 50 feet away from the nearest structure. The levee design was modeled to be effective up to and including the 0.2% AEP (Annual Exceedance Probability) (500-year floodplain).

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@39.90634475,-75.25196773609315,14z

DETERMINATION KEY RESULT

Based on the answers provided, the proposed Action is consistent with a determination of “may affect, but not likely to adversely affect” for the Endangered northern long-eared bat (*Myotis septentrionalis*).

QUALIFICATION INTERVIEW

1. Does the proposed project include, or is it reasonably certain to cause, intentional take of the northern long-eared bat or any other listed species?

   Note: Intentional take is defined as take that is the intended result of a project. Intentional take could refer to research, direct species management, surveys, and/or studies that include intentional handling/encountering, harassment, collection, or capturing of any individual of a federally listed threatened, endangered or proposed species?

   No
2. Do you have post-white nose syndrome occurrence data that indicates that northern long-eared bats (NLEB) are likely to be present in the action area?

   Bat occurrence data may include identification of NLEBs in hibernacula, capture of NLEBs, tracking of NLEBs to roost trees, or confirmed acoustic detections. With this question, we are looking for data that, for some reason, may have not yet been made available to U.S. Fish and Wildlife Service.

   No
3. Does any component of the action involve construction or operation of wind turbines?

   Note: For federal actions, answer ‘yes’ if the construction or operation of wind power facilities is either (1) part of the federal action or (2) would not occur but for a federal agency action (federal permit, funding, etc.).

   No
4. Is the proposed action authorized, permitted, licensed, funded, or being carried out by a Federal agency in whole or in part?

   Yes
5. Is the Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), or Federal Transit Administration (FTA) funding or authorizing the proposed action, in whole or in part?

   No

6. Are you an employee of the federal action agency or have you been officially designated in writing by the agency as its designated non-federal representative for the purposes of Endangered Species Act Section 7 informal consultation per 50 CFR § 402.08?

   Note: This key may be used for federal actions and for non-federal actions to facilitate section 7 consultation and to help determine whether an incidental take permit may be needed, respectively. This question is for information purposes only.

   Yes
7. Is the lead federal action agency the Environmental Protection Agency (EPA) or Federal Communications Commission (FCC)? Is the Environmental Protection Agency (EPA) or Federal Communications Commission (FCC) funding or authorizing the proposed action, in whole or in part?

   No
8. Is the lead federal action agency the Federal Energy Regulatory Commission (FERC)?

   No
9. Have you determined that your proposed action will have no effect on the northern long-eared bat? Remember to consider the effects of any activities that would not occur but for the proposed action.

   If you think that the northern long-eared bat may be affected by your project or if you would like assistance in deciding, answer "No" below and continue through the key. If you have determined that the northern long-eared bat does not occur in your project's action area and/or that your project will have no effects whatsoever on the species despite the potential for it to occur in the action area, you may make a "no effect" determination for the northern long-eared bat.

   Note: Federal agencies (or their designated non-federal representatives) must consult with USFWS on federal agency actions that may affect listed species [50 CFR 402.14(a)]. Consultation is not required for actions that will not affect listed species or critical habitat. Therefore, this determination key will not provide a consistency or verification letter for actions that will not affect listed species. If you believe that the northern long-eared bat may be affected by your project or if you would like assistance in deciding, please answer "No" and continue through the key. Remember that this key addresses only effects to the northern long-eared bat. Consultation with USFWS would be required if your action may affect another listed species or critical habitat. The definition of Effects of the Action can be found here: https://www.fws.gov/media/northern-long-eared-bat-assisted-determination-key-selected-definitions

   No

10. Have you contacted the appropriate agency to determine if your action is near any known northern long-eared bat hibernacula?

    Note: A document with links to Natural Heritage Inventory databases and other state-specific sources of information on the locations of northern long-eared bat hibernacula is available here. Location information for northern long-eared bat hibernacula is generally kept in state natural heritage inventory databases – the availability of this data varies by state. Many states provide online access to their data, either directly by providing maps or by providing the opportunity to make a data request. In some cases, to protect those resources, access to the information may be limited.

    Yes
11. Is any portion of the action area within 0.5-mile radius of any known northern long-eared bat hibernacula? If unsure, contact your local Ecological Services Field Office.

    No
12. Does the action area contain any caves (or associated sinkholes, fissures, or other karst features), mines, rocky outcroppings, or tunnels that could provide habitat for hibernating northern long-eared bats?

    No
13. Does the action area contain or occur within 0.5 miles of (1) talus or (2) anthropogenic or naturally formed rock crevices in rocky outcrops, rock faces or cliffs?

    No
14. Is suitable summer habitat for the northern long-eared bat present within 1000 feet of project activities?
    (If unsure, answer "Yes.")

    Note: If there are trees within the action area that are of a sufficient size to be potential roosts for bats (i.e., live trees and/or snags ≥3 inches (12.7 centimeter) dbh), answer "Yes". If unsure, additional information defining suitable summer habitat for the northern long-eared bat can be found at: https://www.fws.gov/media/northern-long-eared-bat-assisted-determination-key-selected-definitions

    Yes
15. Will the action cause effects to a bridge?

    No
16. Will the action result in effects to a culvert or tunnel?

    No

17. Does the action include the intentional exclusion of northern long-eared bats from a building or structure?

    Note: Exclusion is conducted to deny bats' entry or reentry into a building. To be effective and to avoid harming bats, it should be done according to established standards. If your action includes bat exclusion and you are unsure whether northern long-eared bats are present, answer "Yes." Answer "No" if there are no signs of bat use in the building/structure. If unsure, contact your local U.S. Fish and Wildlife Services Ecological Services Field Office to help assess whether northern long-eared bats may be present. Contact a Nuisance Wildlife Control Operator (NWCO) for help in how to exclude bats from a structure safely without causing harm to the bats (to find a NWCO certified in bat standards, search the Internet using the search term "National Wildlife Control Operators Association bats"). Also see the White-Nose Syndrome Response Team's guide for bat control in structures

    No

18. Does the action involve removal, modification, or maintenance of a human-made structure (barn, house, or other building) **known or suspected to contain roosting bats?**

    No

19. Will the action cause construction of one or more new roads open to the public?

    For federal actions, answer 'yes' when the construction or operation of these facilities is either (1) part of the federal action or (2) would not occur but for an action taken by a federal agency (federal permit, funding, etc.).

    No

20. Will the action include or cause any construction or other activity that is reasonably certain to increase average daily traffic on one or more existing roads?

    Note: For federal actions, answer 'yes' when the construction or operation of these facilities is either (1) part of the federal action or (2) would not occur but for an action taken by a federal agency (federal permit, funding, etc.). .

    No

21. Will the action include or cause any construction or other activity that is reasonably certain to increase the number of travel lanes on an existing thoroughfare?

    For federal actions, answer 'yes' when the construction or operation of these facilities is either (1) part of the federal action or (2) would not occur but for an action taken by a federal agency (federal permit, funding, etc.).

    No

22. Will the proposed action involve the creation of a new water-borne contaminant source (e.g., leachate pond pits containing chemicals that are not NSF/ANSI 60 compliant)?

    No

23. Will the proposed action involve the creation of a new point source discharge from a facility other than a water treatment plant or storm water system?

    No

24. Will the action include drilling or blasting?

    No

25. Will the action involve military training (e.g., smoke operations, obscurant operations, exploding munitions, artillery fire, range use, helicopter or fixed wing aircraft use)?

    No

26. Will the proposed action involve the use of herbicides or pesticides other than herbicides (e.g., fungicides, insecticides, or rodenticides)?

    Yes

27. Will the action result in herbicide use that may affect suitable summer habitat for the northern long-eared bat?

    Note: Additional information defining suitable summer habitat for the northern long-eared bat can be found at: https://www.fws.gov/media/northern-long-eared-bat-assisted-determination-key-selected-definitions

    No

28. Will the action include or cause the application or drift of pesticides other than herbicides (e.g., fungicides, insecticides, or rodenticides) into forested areas that are suitable summer habitat for the northern long-eared bat? Answer "Yes" if the application may result in transport (e.g., in water) or aerial drift of the pesticide into forested areas that are suitable summer habitat for the northern long-eared bat.

    Note: Additional information defining suitable summer habitat for the northern long-eared bat can be found at: https://www.fws.gov/media/northern-long-eared-bat-assisted-determination-key-selected-definitions

    No

29. Will the action include or cause activities that are reasonably certain to cause chronic nighttime noise in suitable summer habitat for the northern long-eared bat? Chronic noise is noise that is continuous or occurs repeatedly again and again for a long time.

    Note: Additional information defining suitable summer habitat for the northern long-eared bat can be found at: https://www.fws.gov/media/northern-long-eared-bat-assisted-determination-key-selected-definitions

    No

30. Does the action include, or is it reasonably certain to cause, the use of artificial lighting within 1000 feet of suitable northern long-eared bat roosting habitat?

    Note: Additional information defining suitable roosting habitat for the northern long-eared bat can be found at: https://www.fws.gov/media/northern-long-eared-bat-assisted-determination-key-selected-definitions

    No

31. Will the action include tree cutting or other means of knocking down or bringing down trees, tree topping, or tree trimming?

    Yes

32. Have you contacted the appropriate agency to determine if the action area overlaps with a known northern long-eared bat conservation buffer / known summer habitat (3-mile buffers around northern long-eared bat captures or detections; 1.5 mile buffer around known roosts)) or spring staging/fall swarming buffer (within 5 miles of known hibernacula)?

    Note: A web page with links to state Natural Heritage Inventory databases and other sources of information on the locations of northern long-eared bat roost trees can be found here. Location information for northern long-eared bat maternity roost trees and swarming areas is generally kept in state natural heritage inventory databases – the availability of this data varies state-by-state. Many states provide online access to their data, either directly by providing maps or by providing the opportunity to make a data request. In some cases, to protect those resources, access to the information may be limited. If you'd like to assume presence of northern long-eared bats, answer "No".

    Yes
33. Does the action area overlap with a known spring staging/fall swarming buffer (within 5 miles of known hibernacula)?

    No
34. Does the action area overlap with a known northern long-eared bat conservation buffer (3-mile buffer around northern long-eared bat captures or detections; 1.5-mile buffer around known roost trees)?

    No
35. Has a presence/probable absence summer bat survey targeting the northern long-eared bat following the Service's Range-wide Indiana Bat and Northern Long-Eared Bat Survey Guidelines been conducted within the project area? If unsure, answer "No."

    No
36. Does the action include emergency cutting or trimming of hazard trees in order to remove an imminent threat to human safety or property? See hazard tree note at the bottom of the key for text that will be added to response letters

    Note: A "hazard tree" is a tree that is an immediate threat to lives, public health and safety, or improved property and has a diameter breast height of six inches or greater.

    No
37. Are any of the trees proposed for cutting or other means of knocking down, bringing down, topping, or trimming suitable for northern long-eared bat roosting (i.e., live trees and/or snags ≥3 inches dbh that have exfoliating bark, cracks, crevices, and/or cavities)?

    Yes

38. [Semantic] Does your project intersect a known sensitive area for the northern long-eared bat?

    Note: The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your state agency or USFWS field office

    Automatically answered
    No

39. Will all tree cutting/trimming or other knocking or bringing down of trees be restricted to the inactive season for the northern long-eared bat?

    Note: Inactive Season dates for summer habitat outside of staging and swarming areas can be found here: https://www.fws.gov/media/inactive-season-dates-swarming-and-staging-areas.

    Yes

40. Will the action cause trees to be cut, knocked down, or otherwise brought down across an area greater than 10 acres?

    No

41. Will the action cause trees to be cut, knocked down, or otherwise brought down in a way that would fragment a forested connection (e.g., tree line) between two or more forest patches of at least 5 acres?

    The forest patches may consist of entirely contiguous forest or multiple forested areas that are separated by less than 1000' of non-forested area. A project will fragment a forested connection if it creates an unforested gap of greater than 1000'.

    No

42. Will the action result in the use of prescribed fire?

    No

43. Will the action cause noises that are louder than ambient baseline noises within the action area?

    No

PROJECT QUESTIONNAIRE

Enter the extent of the action area (in acres) from which trees will be removed - round up to the nearest tenth of an acre. For this question, include the entire area where tree removal will take place, even if some live or dead trees will be left standing.

1.1

In what extent of the area (in acres) will trees be cut, knocked down, or trimmed during the inactive (hibernation) season for northern long-eared bat? **Note:** Inactive Season dates for spring staging/fall swarming areas can be found here: https://www.fws.gov/media/inactive-season-dates-swarming-and-staging-areas

1.1

In what extent of the area (in acres) will trees be cut, knocked down, or trimmed during the active (non-hibernation) season for northern long-eared bat? **Note:** Inactive Season dates for spring staging/fall swarming areas can be found here: https://www.fws.gov/media/inactive-season-dates-swarming-and-staging-areas

0

Will all potential northern long-eared bat (NLEB) roost trees (trees ≥3 inches diameter at breast height, dbh) be cut, knocked, or brought down from any portion of the action area greater than or equal to 0.1 acre? If all NLEB roost trees will be removed from multiple areas, select ‘Yes’ if the cumulative extent of those areas meets or exceeds 0.1 acre.

Yes

Enter the extent of the action area (in acres) from which all potential NLEB roost trees will be removed. If all NLEB roost trees will be removed from multiple areas, entire the total extent of those areas. Round up to the nearest tenth of an acre.

1.1

For the area from which all potential northern long-eared bat (NLEB) roost trees will be removed, on how many acres (round to the nearest tenth of an acre) will trees be allowed to regrow? Enter ‘0’ if the entire area from which all potential NLEB roost trees are removed will be developed or otherwise converted to non-forest for the foreseeable future.

0.5

Will any snags (standing dead trees) ≥3 inches dbh be left standing in the area(s) in which all northern long-eared bat roost trees will be cut, knocked down, or otherwise brought down?

No

Will all project activities by completed by April 1, 2024?

No

IPAC USER CONTACT INFORMATION

Agency: Army Corps of Engineers
Name: Valerie Whalon
Address: U.S. Army Corps of Engineers, Planning Division
Address Line 2: 1650 Arch Street
City: Philadelphia
State: PA
Zip: 19103-2004
Email valerie.m.whalon@usace.army.mil
Phone: 2156560620

1. PROJECT INFORMATION

Project Name: **Eastwick**
Date of Review: **8/14/2023 11:36:10 AM**
Project Category: **In-stream / Riverine Activities and Projects, Levees and similar flood control structures (construction, modification, maintenance)**
Project Area: **9.35 acres**
County(s): **Delaware; Philadelphia**
Township/Municipality(s): **DARBY TOWNSHIP; PHILADELPHIA**
ZIP Code:
Quadrangle Name(s): **LANSDOWNE; PHILADELPHIA**
Watersheds HUC 8: **Lower Delaware**
Watersheds HUC 12: **Cobbs Creek; Darby Creek**
Decimal Degrees: **39.906252, -75.251553**
Degrees Minutes Seconds: **39° 54' 22.5082" N, 75° 15' 5.5901" W**

2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
PA Department of Conservation and Natural Resources	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
PA Fish and Boat Commission	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate there may be potential impacts to threatened and endangered and/or special concern species and resources within the project area. If the response above indicates "No Further Review Required" no additional communication with the respective agency is required. If the response is "Further Review Required" or "See Agency Response," refer to the appropriate agency comments below. Please see the DEP Information Section of this receipt if a PA Department of Environmental Protection Permit is required.

Eastwick

Buffered Project Boundary

Project Boundary

Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community

Eastwick

Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for two years** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt. The jursidictional agencies **strongly advise against** conducting surveys for the species listed on the receipt prior to consultation with the agencies.

PA Game Commission

RESPONSE:

Further review of this project is necessary to resolve the potential impact(s). Please send project information to this agency for review (see WHAT TO SEND).

PGC Species: (Note: The Pennsylvania Conservation Explorer tool is a primary screening tool, and a desktop review may reveal more or fewer species than what is listed below.)

Scientific Name	Common Name	Current Status
Cistothorus palustris	Marsh Wren	Special Concern Species*
Ixobrychus exilis	Least Bittern	Endangered

PA Department of Conservation and Natural Resources

RESPONSE:

Further review of this project is necessary to resolve the potential impact(s). Please send project information to this agency for review (see WHAT TO SEND).

DCNR Species: (Note: The Pennsylvania Conservation Explorer tool is a primary screening tool, and a desktop review may reveal more or fewer species than what is listed below. After desktop review, if a botanical survey is required by DCNR, we recommend the DCNR Botanical Survey Protocols, available here: https://conservationexplorer.dcnr.pa.gov/content/survey-protocols)

Scientific Name	Common Name	Current Status	Proposed Status	Survey Window
Amaranthus cannabinus	Waterhemp Ragweed	Special Concern Species*	Special Concern Species*	Flowers July - September

PA Fish and Boat Commission

RESPONSE:

Further review of this project is necessary to resolve the potential impact(s). Please send project information to this agency for review (see WHAT TO SEND).

PFBC Species: (Note: The Pennsylvania Conservation Explorer tool is a primary screening tool, and a desktop review may reveal more or fewer species than what is listed below.)

Scientific Name	Common Name	Current Status
Sensitive Species**		Endangered

Scientific Name	Common Name	Current Status
Sensitive Species**		Endangered
Sensitive Species**		Endangered
Sensitive Species**		Endangered
Sensitive Species**		Threatened

U.S. Fish and Wildlife Service
RESPONSE:

No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq. is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

* Special Concern Species or Resource - Plant or animal species classified as rare, tentatively undetermined or candidate as well as other taxa of conservation concern, significant natural communities, special concern populations (plants or animals) and unique geologic features.
** Sensitive Species - Species identified by the jurisdictional agency as collectible, having economic value, or being susceptible to decline as a result of visitation.

WHAT TO SEND TO JURISDICTIONAL AGENCIES

If project information was requested by one or more of the agencies above, upload* or email the following information to the agency(s) (see AGENCY CONTACT INFORMATION). Instructions for uploading project materials can be found here. This option provides the applicant with the convenience of sending project materials to a single location accessible to all three state agencies (but not USFWS).
*If information was requested by USFWS, applicants must email, or mail, project information to IR1_ESPenn@fws.gov to initiate a review. USFWS will not accept uploaded project materials.

Check-list of Minimum Materials to be submitted:
__X__Project narrative with a description of the overall project, the work to be performed, current physical characteristics of the site and acreage to be impacted.
__X__A map with the project boundary and/or a basic site plan(particularly showing the relationship of the project to the physical features such as wetlands, streams, ponds, rock outcrops, etc.)
In addition to the materials listed above, USFWS REQUIRES the following
__X__**SIGNED** copy of a Final Project Environmental Review Receipt

The inclusion of the following information may expedite the review process.
__X__Color photos keyed to the basic site plan (i.e. showing on the site plan where and in what direction each photo was taken and the date of the photos)
__X__Information about the presence and location of wetlands in the project area, and how this was determined (e.g., by a qualified wetlands biologist), if wetlands are present in the project area, provide project plans showing the location of all project features, as well as wetlands and streams.

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. Two review options are available to permit applicants for handling PNDI coordination in conjunction with DEP's permit review process involving either T&E Species or species of special concern. Under sequential review, the permit applicant performs a PNDI screening and completes all coordination with the appropriate jurisdictional agencies prior to submitting the permit application. The applicant will include with its application, both a PNDI receipt and/or a clearance letter from the jurisdictional agency if the PNDI Receipt shows a Potential Impact to a species or the applicant chooses to obtain letters directly from the jurisdictional agencies. Under concurrent review, DEP, where feasible, will allow technical review of the permit to occur concurrently with the T&E species consultation with the jurisdictional agency. The applicant must still supply a copy of the PNDI Receipt with its permit application. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. The applicant and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at https://conservationexplorer.dcnr.pa.gov/content/resources.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a preliminary screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552
Harrisburg, PA 17105-8552
Email: RA-HeritageReview@pa.gov

U.S. Fish and Wildlife Service
Pennsylvania Field Office
Endangered Species Section
110 Radnor Rd; Suite 101
State College, PA 16801
Email: IR1_ESPenn@fws.gov
NO Faxes Please

PA Fish and Boat Commission
Division of Environmental Services
595 E. Rolling Ridge Dr., Bellefonte, PA 16823
Email: RA-FBPACENOTIFY@pa.gov

PA Game Commission
Bureau of Wildlife Management
Division of Environmental Review
2001 Elmerton Avenue, Harrisburg, PA 17110-9797
Email: RA-PGC_PNDI@pa.gov
NO Faxes Please

7. PROJECT CONTACT INFORMATION

Name: Valerie Whalon
Company/Business Name: U.S. Army Corps of Engineers, Planning Division, 4th Floor
Address: 1650 Arch Street
City, State, Zip: Philadelphia, PA 19103-2004
Phone:(215) 656-0620 Fax:( )
Email: valerie.m.whalon@usace.army.mil

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

Valerie Whalon
applicant/project proponent signature

8/14/2023
date

Eastwick, Philadelphia County, Pennsylvania Flood Risk Management Continuing Authorities Program Section 205

Background Information

The U.S. Army Corps of Engineers (USACE) Philadelphia District (NAP) is preparing a draft integrated feasibility report and environmental assessment (IFR/EA) for a Flood Risk Management Study ("study") for the Eastwick section of Philadelphia, Pennsylvania. The purpose of the study is to investigate and identify technically sound, economically justified, and environmentally acceptable flood risk management (FRM) solutions for Eastwick. The authority for this project is the Continuing Authorities Program (CAP) Section 205 of the Flood Control Act of 1948 (P.L. 80-858), as amended.

Eastwick is an urban residential neighborhood located in the southwest corner of the City of Philadelphia (19153 zip code), Philadelphia County, Pennsylvania (Figure 1). The overall study area is highlighted in yellow while the location of the specific study recommendation is identified by the star symbol. As indicated by both the White House Council on Environmental Quality USACE Climate and Economic Justice Screening Tool (CEJST) and the US Environmental Protection Agency (USEPA) Environmental Justice Screening and Mapping Tool (EJScreen), Eastwick is an economically disadvantaged and environmental justice community.

Figure 1: Eastwick FRM Study Area

The draft IFR/EA will be released for concurrent review to the general public, stakeholders and governmental agencies for review and comment. A public meeting will be held to share and discuss the status of the study during the concurrent comment review period for the draft report. Comments will be addressed in the Final IFR/EA where specifics of the tentatively selected plan (TSP) will be optimized. Given the sensitivity of the induced flooding, additional analyses will be conducted under separate authority or in partnership with stakeholder efforts based on Draft Report concurrent (Public, stakeholder and USACE Agency Technical Review (ATR)) comment content. These analyses will help to best manage risk associated with the TSP associated with induced flooding and complementary measures. Additional risk associated flooding from the Schuylkill and Delaware Rivers are not specifically addressed by CAP study and will require additional partnership or potentially a separate study authority to address.

The goal of the Eastwick FRM Study is to manage the study area's current risk from flooding, while contributing to National Economic Development (NED) consistent with protecting the Nation's environment, in accordance with national environmental statutes, applicable executive orders, and other Federal planning requirements.

In support of this goal, the planning objective of this study is to manage flood risk to people, property and infrastructure associated with Cobbs Creek floodwaters flowing between the high elevation points of the Clearview Landfill and S. 78th Street into the Eastwick neighborhood study area between the years 2030 to 2080.

An additional planning objective may consider the inclusion of complementary measures to address other floodwaters/residual flooding in the study area. This inclusion will be based on the comments that are received on the Draft Report.

Structural measures including levees and floodwalls and nonstructural measures including structure elevation, floodproofing, and acquisition/buyout were considered. In addition, elements from regional local planning initiatives such as Floodplain Management Plans were considered in the formulation of alternatives and development of the TSP.

Proposed Action/Tentatively Selected Plan

The USACE, in partnership with the Philadelphia Water Department (PWD), proposes to construct a levee along the left bank of Cobbs Creek within the city-owned Eastwick Regional Park and Clearview Landfill (Figure 2). The levee typical section includes a crest elevation of +24.7 ft (NAVD88) with a 10-ft wide crest and 2H:1V riprap side slope on the creek side and 3H:1V grass side slope on the community side. The height of the levee above existing grade is approximately 15 ft. The length of the levee would be approximately 1,370 feet. The levee was laid out such that the inner toe is at least 50 feet away from the nearest structure. The plan also assumes that the distance from the outer toe of the levee to the left bank of Cobbs Creek is also covered with grass. The preliminary levee design crest was sufficient to pass the 1% AEP (100-year) flooding without overtopping. The TSP presents an opportunity to provide Federal benefits in a disadvantaged community as Eastwick classifies as an environmental justice community per USACE guidance.

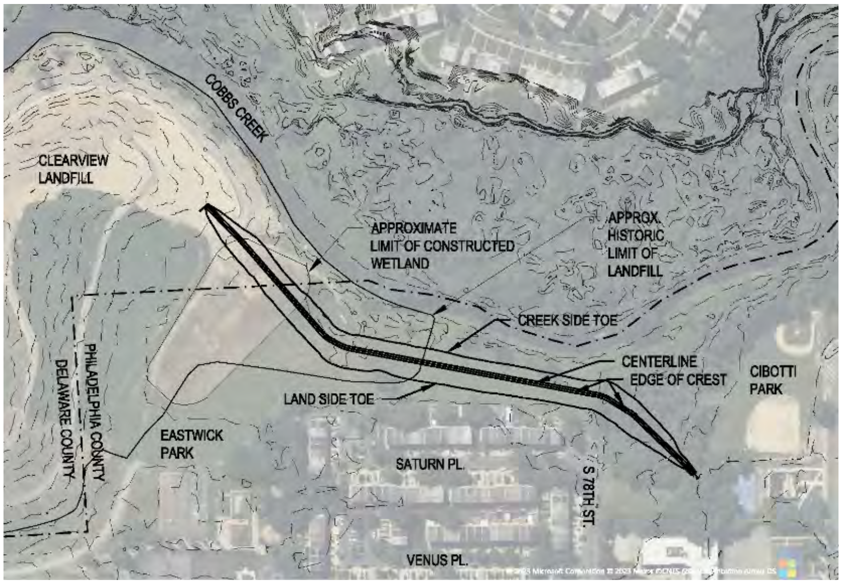


Figure 2. General Layout of Tentatively Selected Plan

The TSP transits the city-owned Eastwick Regional Park and terminates near the Eastwick Recreation Center. As a result, the TSP would have impacts on parks and recreation particularly on the creek side of the levee, but the landward side of the levee would offer new recreational opportunities.

The TSP will be further designed and optimized and ultimately become the Recommended Plan in the Final IFR/EA. Comments from the public, stakeholders and Federal and non-Federal agencies during the draft IFR/EA concurrent review period will be considered and addressed towards the development of the Recommended Plan.
Pennsylvania State Protected Species

Potential Impacts on State Protected Species

Pennsylvania Fish and Boat Commission (PAFB) Aquatic Species of Concern
No inwater work is proposed, therefore, no direct effects on aquatic species (including the PAFB fish species of concern) are expected. No time of year construction restrictions would be required to avoid impacts on sensitive diadromous species. No impacts on aquatic species are expected as a result of induced flooding. Erosion and sediment control BMPs and sound construction practices would be used avoid indirect effects on aquatic species, including the PAFB fish species of concern.

Pennsylvania State-listed Threatened and Endangered Species
No direct or indirect impacts on least bittern and marsh wren are expected as a result of the construction of the TSP. Both birds nest in the grasses and reeds of marsh habitat, which does not occur within the TSP impact footprint. This habitat occurs downstream, in the area where the TSP would induce minor temporary increases water surface elevations during extreme storm events. This would have no effect on these species which are adapted to fluctuating water levels and nest which is in an area that already experiences flooding during storm events.

No impacts on waterhemp ragweed are expected as a result of the TSP.

Eastwick Wetland Delineation Report
18 May 2023

Summary

A wetland delineation was completed on May 18, 2023 to confirm potential wetlands between 77th and 78th Streets along Cobbs Creek. Results of the wetland delineation indicate that a small forested wetland occurs in this location (Figure 1).

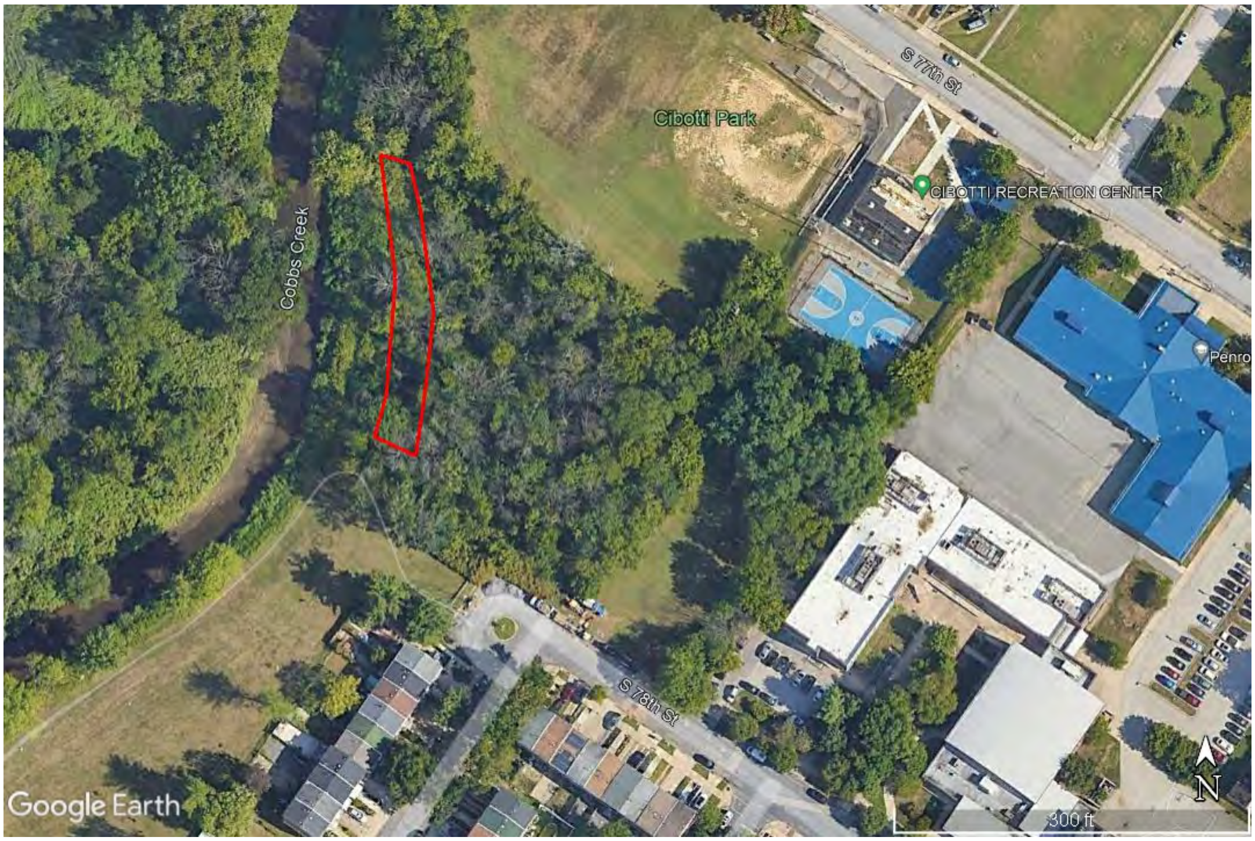


Figure 1. Forested Wetland Between 77th and 78th Streets along Cobbs Creek (Red Polygon)

The levee will be constructed through Clearview Landfill Area C, which contains habitat planted in 2022 and wetlands associated with the Clearview Landfill stormwater system. While no delineation was conducted at the Clearview Landfill, the extent of the wetlands at the landfill restoration site were estimated (Figure 2). It is assumed that within five years these wetlands will develop into forested wetlands.

Figure 2. Estimated Areal Extent of Wetlands in the Clearview Landfill Restoration Area C (Yellow Polygons)

Site Overview (Northern Wetland)

The study area is a forested riparian area adjacent to Cobbs Creek. The area generally slopes downward toward Cobbs Creek in a series of floodplain terraces. The overall plant community is dominated by box elder maple and green ash. Japanese knotweed has invaded much of the understory.

Data Points (see Figure 3 for data points)

DP 1 (Upland): Photos one through ten were taken at the bottom of a slope on the east side of the boundary. The vegetation was dominated by boxelder maple (Acer negundo, FA C) in the tree layer, and Japanese knotweed (*Reynoutria japonica*, UPL) in the herbaceous layer. No further herbaceous plants were observed due to knotweed invasion. Does not appear to be a place where water sits. Toe of slope here is about 50' east of the tree line.

DP 2 (Upland): Downslope of DP 1, upslope of DP 3. Dominant tree canopy is box elder maple (*Acer negundo*, FAC), dominant herbaceous layer is lesser celandine (*Ficaria verna*, FAC), catchweed bedstraw (*Galium aparine*, FACU), stinging nettle *(Urtica dioica*, FAC), border privet (*Ligustrum japonicum*, FAC).

DP 3 (*Wetland)* Photos 11-12 were taken in a potential wetland area. Dotted knotweed (*Persicaria punctata*, OBL) dominates the herbaceous layer along with purslane speedwell (*Veronica peregrina*, FAC), and no trees within the feature but the dominant species within 30 feet are green ash (*Fraxinus pennsylvanica*, FACW, some living, some dead) and box elder maple (*Acer negundo*, FAC). Japanese knotweed (*Reynoutria japonica*, UPL) is present in the herbaceous layer, but much sparser than adjacent uphill areas. Water stained leaves, relatively sparse vegetation.

DP 4 (Wetland): low lying area seems to be running in a narrow strip parallel to the creek. At this location the herbaceous layer is a monoculture of Japanese knot weed (*Reynoutria japonica*, UPL). The dominant tree species is boxelder maple (Acer negundo, FAC), another dominant tree species is green ash (*Fraxinus pennsylvanica*, FACW), which is dead. It appears that the soil's are moist, despite no rain occurring in recent days suggesting that water may pond in this area for a sufficient amount of time to create hydric soils. It's hard to tell because of the knotweed, but it looks like wrack may accumulate in this area as well.

DP 5 (Upland): this area is at the top of the bank of the creek and runs in a narrow strip of about 15 to 20 feet immediately parallel to the creek. This area is dominated by herbaceous plants, including smooth meadow grass (*Poa pratensis*, FACU), soft rush (Juncus effusus, OBL), and mugwort (*Artemisia douglasiana*, not listed). Toward the creek is dominated by sycamore (*Platanus occidentalis*, FACW), and Japanese knot weed (*Reynoutria japonica*, UPL). Toward the woods is dominated by knotweed and box elder maple. This area is immediately upslope of the potential wetland strip.

DP 6 (Upland): Upland area between ball field and wetland strip. Dominant herbaceous species is Japanese knot weed (*Reynoutria japonica*, UPL). Dominant trees are mulberry *(Morus spp*., FACU). Wetland strip seems to find its upper limit immediately downslope of here.

DP 7 (Upland): Isolated depression containing wrack accumulation and almost completely devoid of vegetation. The only plant growing in the depression is lesser celandine (*Ficaria verna*, FAC). Japanese knot weed (*Reynoutria japonica*, UPL) is located at the edge of the depressional area, as well as box elder maple (*Acer negundo*, FAC).

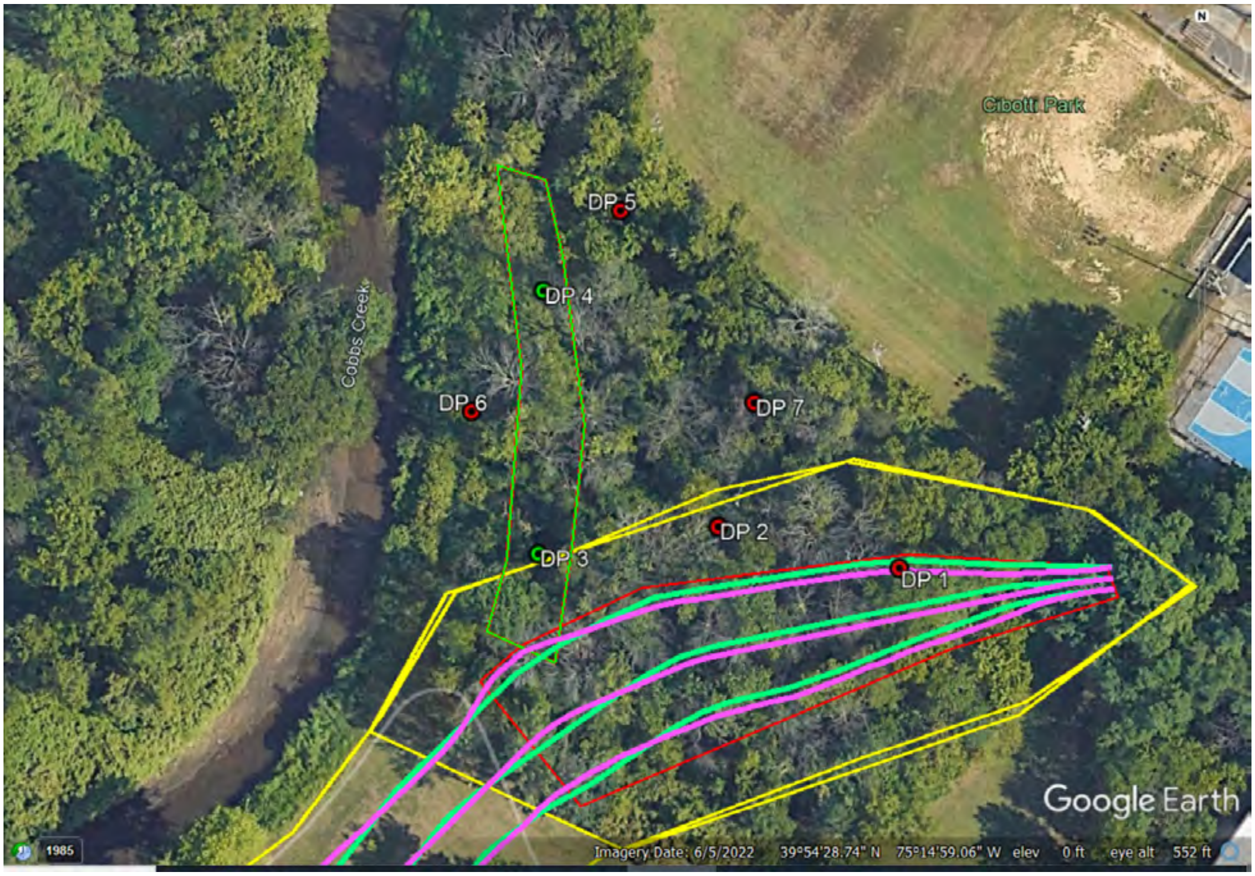


Figure 3. Data points used for wetland delineation at the northern wetland.

Eastwick, Philadelphia County,
Pennsylvania
Flood Risk Management
Continuing Authorities Program Section 205

Representative Photographs from the Eastwick

Approximate Locations of Representative Photographs from the Eastwick Study Area

Photograph 1. Northern Forested Area


Photograph 2. Northern forested Area

Photograph 3. Northern Forested Area

Photograph 4. Northern Forested Area (shot of knotweed)

Photograph 5. EPA Constructed Habitat

Photograph 6. EPA Constructed Wetland


Photograph 7. EPA Constructed Wetland

Appendix A3: Cultural Resources

Pennsylvania Historical & Museum Commission

PROJECT REVIEW FORM

Request to Initiate SHPO Consultation on State and Federal Undertakings

SHPO USE ONLY	Reviewers: ______/______
DATE RECEIVED:	DATE DUE:
ER NUMBER:	HRSF: ☐

REV: 03/2020

SECTION A: PROJECT NAME & LOCATION

Is this a new submittal? (●) YES ( ) NO **OR** ( ) **This is additional information for ER Number:**

Project Name: Eastwick Flood Risk Managment Feasibility — County: Philadelphia — Municipality: City of Eastwick

Project Address: Clearview Landfill — City/State/ Zip:

SECTION B: CONTACT INFORMATION & MAILING ADDRESS

Name: Nicole Cooper Minnichbach
Company: US Army Corps of Engineers, Philadelphia District
Street/PO Box: 100 Penn Square East, CENAP-PL-E
City/State/Zip: Philadelphia, PA 19107
Phone: (215) 656-6556
Fax:
Email: nicole.c.minnichbach@usace.army.
Email cc:

SECTION C: PROJECT DESCRIPTION

This project is located on: (check all that apply) ☐ Federal property ☐ State property ☑ Municipal property ☐ Private property

List all federal and state agencies and programs providing funds, permits, licenses.

Agency Type	Agency/Program/Permit Name	Project/Permit/Tracking Number (if applicable)
State & Federal	Philadelphia Water Department	

Proposed Work – Attach project description, scope of work, site plans, and/or drawings

Project includes (check all that apply): ☐ Construction ☐ Demolition ☑ Rehabilitation ☐ Disposition

Total acres of project area: less than 1 — Total acres of earth disturbance: less than or

Are there any buildings or structures within the project area? (●) Yes ( ) No — Approximate age of buildings: <50

Does this project involve properties listed in or eligible for the National Register of Historic Places, or locally designated? Inventory here: https://gis.penndot.gov/crgis — Yes ( ) No (●) Unsure ( )

Name ______________________

Key Number ______________________

Please email this form and pdf attachments to: RA-PH-PASHPO-ER@pa.gov

Or, please print and mail completed form and all attachments to:

PHMC- PA State Historic Preservation Office
400 North Street
Commonwealth Keystone Building, 2nd Floor
Harrisburg, PA 17120-0093

Attachments – Please include the following information with this form

- ☑ **Map –** 7.5' USGS quad, streetmap, or parcel map showing the project's Area of Potential Effect
- ☑ **Description/Scope of Work–** Narrative description of the project, including any ground disturbance and previous land use, and any potential to impact historic resources
- ☑ **Site Plans/Drawings –** Indicate location and age of buildings, any proposed improvements, and past and present land use
- ☐ **Photographs –** Digital photographs of all buildings and structures on the project site, keyed to a site plan. For projects affecting buildings older than 50 years old use the Abbreviated HRSF

SHPO DETERMINATION (SHPO USE ONLY)

- ☐ There are **NO HISTORIC PROPERTIES** in the Area of Potential Effect
- ☐ The project will have **NO EFFECT** on historic properties
- ☐ The project will have **NO ADVERSE EFFECTS** on historic properties: ______________________ Key# __________
- ☐ The project will have **NO ADVERSE EFFECTS WITH CONDITIONS** (see attached)
- ☐ **SHPO REQUESTS ADDITIONAL INFORMATION** (see attached)

DIVISION CHIEF, ENVIRONMENTAL REVIEW: — **DATE:** __________

SHPO REVIEWER: __________

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
100 PENN SQUARE EAST, 7th FLOOR WANAMAKER BUILDING
PHILADELPHIA, PENNSYLVANIA 19107-3390

October 2, 2020

Environmental Resources Branch

Ms. Andrea L. MacDonald
Deputy State Historic Preservation Officer
Pennsylvania Historical and Museum Commission
Bureau for Historic Preservation
Commonwealth Keystone Building, 2nd Floor
400 North Street
Harrisburg, PA 17120-0093

Dear Ms. MacDonald:

In accordance with the National Environmental Policy Act of 1969, as amended, the U.S. Army Corps of Engineers (USACE) Philadelphia District, in partnership with the Philadelphia Water Department (PWD), is initiating the scoping phase of a feasibility study to investigate alternatives for flood risk management improvements in the neighborhood of Eastwick, which is located at the confluence of Darby and Cobbs Creeks in Philadelphia, Pennsylvania. This notice serves as the initiation of the scoping process as outlined in 33 CFR Part 230.12 for any potential project or action proposed in this study. This feasibility study is being conducted under the authority of Section 205 of the Continuing Authorities Program (CAP) which provides for small Civil Works projects to address Flood Risk Management. The Flood Control Act of 1948 (PL 80-858), as amended, authorizes Federal participation to plan, design, and construct small flood risk management projects.

The Flood Risk Management study area includes much of the Eastwick Neighborhood along Cobbs and Darby Creek (Attachment 1). This area was identified in a Federal Interest Determination (FID) document prepared by the USACE in 2018 titled “Eastwick, Philadelphia County, Pennsylvania Continuing Authorities Program (Section 205) Flood Risk Management (P2# 451948)”. The USACE concluded that there are feasible opportunities to address flooding in the Eastwick Neighborhood. The feasibility study will investigate several alternatives to address the problems and needs related to flooding in the study area.

Structural alternatives under consideration include levees and floodwalls. Levees are earthen embankments with an impervious core constructed along a waterway, while floodwalls are vertical structures typically constructed with steel or concrete as cantilevered I-Walls. These structural alternatives are being considered along Eastwick Park (Philadelphia and Delaware Counties), where overflows from Cobbs Creek enter the neighborhoods. Non-structural solutions are being evaluated for flood-prone areas where structural solutions are not feasible. Non-structural solutions fall into four groups: Acquisition/Relocation; Building Retrofitting (flood proofing, elevating, ring levees); Enhanced Flood Warnings (evacuation planning and emergency response systems); and Land Use Management (zoning, undeveloped land preservation).

The Area of Potential Effect (APE) includes the Levee/Floodwall limits of disturbance as well as any buildings or other structures designated for non-structural solutions (Attachment 2).

A previous investigation assessed most of the APE for the levee/floodwall alternatives. The report is entitled, *Phase I Archaeological Survey Report, Remedial Investigation and Feasibility Study, Lower Darby Creek Area Site, Operable Unit 1 – Clearview Landfill, Delaware and Philadelphia Counties, Pennsylvania* prepared for the US Environmental Protection Agency by TetraTech NUS, Inc. and dated March 2011 (Attachment 3).

As stated in the report, much of the proposed levee/floodwall construction footprint lies within the original boundaries of the Clearview Landfill. During the mid-1970s, in order to facilitate the construction of the Eastwick Residential Neighborhood, the waste from the Philadelphia portion of the landfill was stripped and placed within the Delaware County portion of the landfill. The Philadelphia portion was then graded and covered with clean fill. It is within this section of the landfill where the USACE has proposed the construction of the levee/floodwall structure. There are currently three potential levee locations and three potential floodwall locations within the APE (Attachment 4).

The houses proposed for the non-structural solutions are a block of rowhomes that were constructed in the mid to late 1970s and do not meet the 50-year-old criteria. The 1971 aerial shows that the homes had not yet been constructed (Attachment 5).

The levee/floodwall portion of the APE has been so extensively modified that little likelihood exists for the proposed project to impact a historic property, and the non-structural alternative homes are not considered to be historic properties. We request your concurrence in our conclusion that the proposed action will have *No Effect* on historic properties eligible for or listed on the National Register of Historic Places in compliance with 36 CFR 800.4(d)(1). Should further analyses result in changes to the APE, we will reinitiate coordination with your office.

Thank you for your cooperation in this review process. If you have any questions concerning our review or if we can be of further assistance, please contact Ms. Nicole Minnichbach, Cultural Resource Specialist at (215) 656-6556, or mobile (215) 834-1065 or via email Nicole.C.Minnichbach@usace.army.mil.

Sincerely,

FOR Peter R. Blum, P.E.
Chief, Planning Division

Enclosures

Attachment 1 – Eastwick Flood Risk Management Study Area

COLWYN
EPA Evapotrans Cap
(limits of remediation)
Levee/
Floodwall
Non
Structural
EASTWICK
Colwyn
Henderson Dr
S 4th St
Apple St
S 3rd St
Colwyn Ave
Pine St
Peach Rd
S 2nd St
Aribet Pl
Peach St
Bayard Ave
Hook Rd
Industrial Dr
Ulena St
Rosella St
Arcola St
Rosella Pl
Claymont St
S 76th St
S 75th St
Dickens Ave
Este Ave
Saturn Pl
Venus Pl
Mars Pl
Mercury Pl
Angelo Pl
Buist Ave
S 82nd St
S 83rd St
S 84th St
Apollo Pl
S 80th St
S 78th St
S 77th St
Caesar Pl
Cheiron Pl

FINAL
PHASE I ARCHAEOLOGICAL SURVEY REPORT

March 2011

Remedial Investigation and Feasibility Study (RI/FS)
Lower Darby Creek Area (LDCA) Site
Operable Unit 1 (OU1) – Clearview Landfill
Delaware and Philadelphia Counties, Pennsylvania

Work Assignment No. 023-RICO-D366
Remedial Action Contract (RAC) Number EP-S3-07-04

Prepared for:

U.S. Environmental Protection Agency
Region III
Philadelphia, PA

Prepared by:

Tetra Tech NUS, Inc.

ABSTRACT

The Clearview Landfill is located in Philadelphia and Delaware Counties, Pennsylvania and encompasses an aerial extent of 76 acres (31 hectares) on the eastern bank of Darby and Cobbs Creek. In June 2001, the Clearview Landfill, which is Operable Unit 1 (OU-1) of the Lower Darby Creek Area (LDCA) site, was placed on the final National Priorities List (NPL) because of the potential release of hazardous substances into the nearby surface water endangering the local environment. The United States Environmental Protection Agency (EPA) Region III is currently conducting a Remedial Investigation and Feasibility Study (RI/FS) at the Clearview Landfill to assess the extent of the contamination and develop appropriate remedial measures. No remedial action has been proposed.

In December 2010, Tetra Tech conducted a Phase IA archaeological literature review and field reconnaissance for the Clearview Landfill. The purpose of the investigation was to identify and evaluate potential cultural resources that might be affected by future remedial activities.

Information obtained in the course of public meetings held for the project suggested that two historic resources, potentially eligible for listing in the National Register of Historic Places, may be located near the southern boundary of the Clearview Landfill. These resources include a tunnel for the transportation of slaves and a graveyard dating back to the 18th century.

Extensive review of historic maps, aerial photographs, and city/county records revealed that the graveyard has existed until 1930 when the City of Philadelphia extended Buist Avenue to 84th Street. The graveyard location is now covered by an abandoned portion of Buist Avenue near 84th Street. No remedial action is currently proposed in the vicinity of the graveyard.

By nature of its intended use, the purported tunnel leading from a house located on the corner of Chelwynde Avenue along 84th Street to Darby Creek was not found on any published historic maps. While the location of structures on the hand-drawn map can be verified using aerial photographs and historic maps, no further evidence has been found regarding the tunnel location. Aerial photographs show the destruction of the structure on 84th Street and Chelwynde Avenue to have occurred at some point before 1970. 84th Street was also rerouted over the area of the tunnel during bridge reconstruction in the 1970s. City of Philadelphia survey plans in 1970 show the widening of 84th Street disturbed the area where a segment of the tunnel was depicted on the hand-drawn map. Urbanization of the area has significantly disturbed the potential location of the tunnel; thus installation of the proposed monitoring wells that will be installed as part of the RI would have no effect on any archaeological sites or historic resources.

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APPENDICES

LIST OF FIGURES

LIST OF PHOTOGRAPHS

1.0 INTRODUCTION

The Clearview Landfill is located in Philadelphia and Delaware Counties, Pennsylvania, and encompasses an aerial extent of 76 acres (31 hectares) on the eastern bank of Darby and Cobbs Creeks (Figure 1-1). The Clearview Landfill began operating in the 1950s and was privately owned and operated, without a permit, by the Clearview Land Development Corporation. By the time the landfill ceased operations in the 1970s, portions of the landfill had encroached into Philadelphia County. The Clearview Landfill was used for the disposal of municipal and industrial waste originating from the city of Philadelphia and Delaware County. No records exist documenting the specific types and volumes of waste accepted at the landfill.

In June 2001, the Clearview Landfill, which is Operable Unit 1 (OU-1) of the Lower Darby Creek Area (LDCA) site, was placed on the final National Priorities List (NPL) because of the potential release of hazardous substances into the nearby surface water endangering the local environment. The United States Environmental Protection Agency (EPA) Region III is currently conducting a Remedial Investigation and Feasibility Study (RI/FS) at the Clearview Landfill to assess the extent of the contamination and develop appropriate remedial measures. At present the project is still in the RI/FS stage, and no remedial action has been proposed.

To determine the nature and extent of groundwater contamination originating from Clearview Landfill, EPA is currently planning to install several pairs (shallow and deep) of monitoring wells, one of which is proposed to be place on the south side of 84th Street near Darby Creek. The well-pair would be installed outside of the historic footprint of the landfill on property owned and operated by the United States Fish and Wildlife Service (USFWS). The shallow well will be up to 50 feet (15 meters) deep, and the deep well will extend as deep as 150 feet (46 meters). For the deep well, a 10-inch air rotary or air percussion drilling technique will be used to install and grout a 6-inch ID steel casing up to 50 feet (15 meters) below ground surface; then the 6-inch air rotary drilling technique will be used to drill an additional 100 feet (46 meters) below the bottom of the steel casing. This borehole will be used to install and grout a 4-inch (10-centimeter) ID PVC permanent well. The shallow borehole will be drilled similarly, but with a 6-inch air rotary and a temporary casing. A 2-inch ID PVC permanent well will be installed and grouted in this borehole. USFWS has consented to the installation of the wells provided EPA obtains the necessary permits and complies with all state and federal environmental regulations.

Cultural resources investigations were performed to determine if historic cultural resource are present on or near the Clearview Landfill, and to ensure the RI activities at the site are in compliance with the National Historic Preservation Act (NHPA) of 1966 [16 U.S.C. § 470 et seq.].

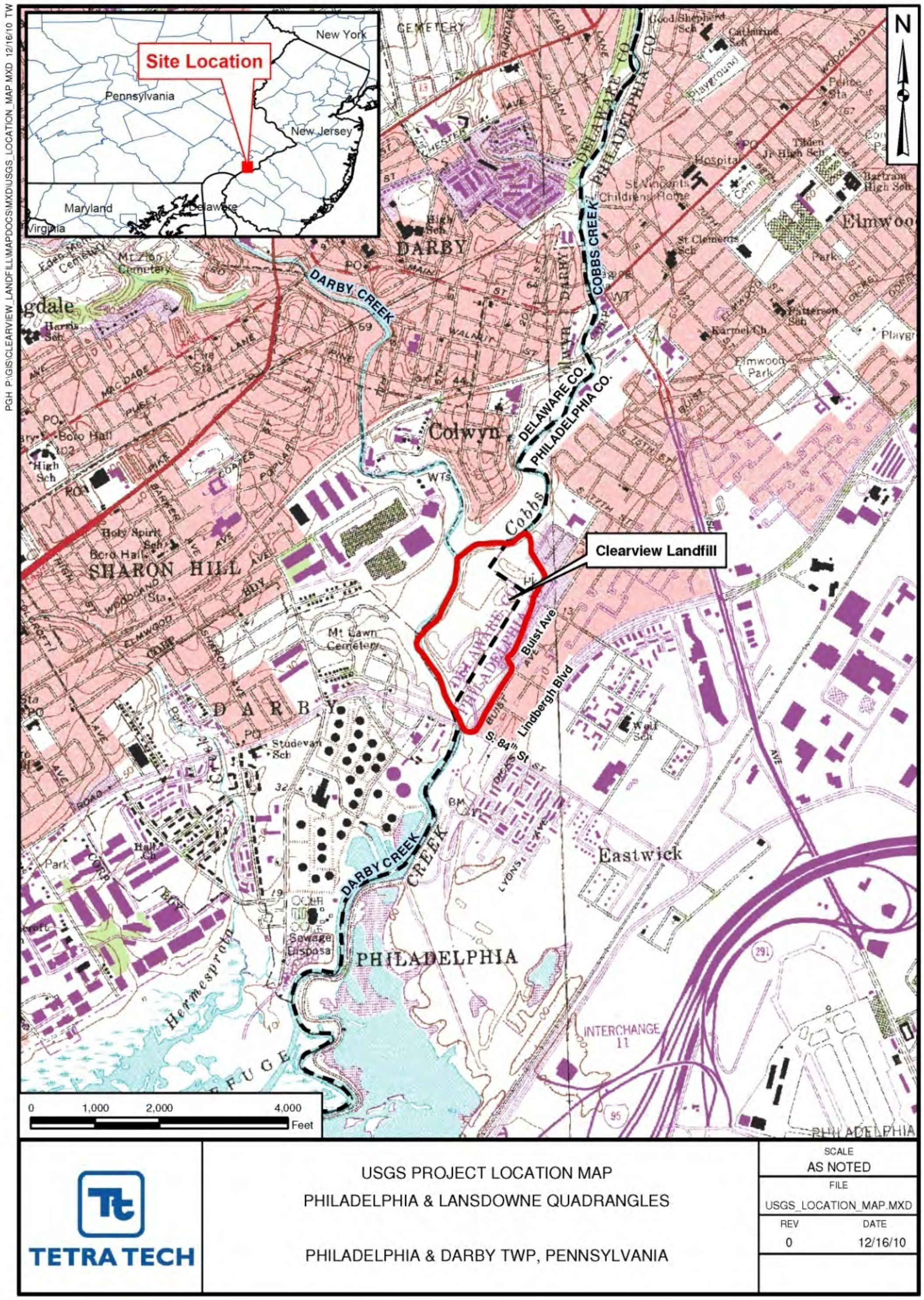

Figure 1-1. Project Location Map

In the course of public meetings held for the project, EPA received information in the form of a hand-drawn map that suggested a tunnel, possibly related to the transportation of slaves via the Underground Railroad, was present near the southern boundary of the landfill property. The map also depicted a graveyard near the southeastern boundary of the landfill property.

In light of the information received, EPA as the lead federal agency responsible for the investigation and cleanup of the Clearview Landfill contracted with Tetra Tech NUS, Inc (Tetra Tech) to conduct a Phase IA cultural resources literature review to identify and evaluate cultural resources that might be affected by future remediation activities and the currently proposed monitoring activities.

The goals of the Phase IA literature review are to:

- Establish the Area of Potential Effect (APE) for currently proposed monitoring activities and future remedial actions.
- Provide background information on the environmental setting, prehistory, and history of the project area and region.
- Describe any previous cultural resource studies and types of known resources in the APE.
- Provide a preliminary discussion of the effects of potential remedial alternatives on previously identified archaeological and architectural resources.
- Outline possible steps that may be taken by EPA as the Section 106 process progresses.

1.1 Area of Potential Effect for Proposed Monitoring Wells

The APE for the proposed monitoring wells is located just east of Darby Creek on a 0.6-acre (0.24 hectare) tract bordering 84th Street (Figure 1-2).

1.2 Area of Potential Effect for Future Remedial Activities

The historic footprint of the Clearview Landfill occupies 76 acres (31 hectares) along the eastern bank of Darby and Cobbs Creeks, extending east to Buist Avenue and south to 84th Street (Figure 1-2). The administrative boundary of the Clearview Landfill is not clearly defined because former landfilling operations, which initially began on a Delaware County land parcel, spilled over onto property located within Philadelphia County (the city of Philadelphia) limits. During the mid-1970s when development began on the Eastwick residential neighborhood, a considerable amount of waste was excavated and moved from the city of Philadelphia portion of the site to the Delaware County portion, where excavated materials were subsequently placed, graded, and partially covered with fill. As a result, the present areal extent of the Clearview Landfill lies almost entirely within Delaware County.

Cross sections of the landfill deposits constructed from monitoring well logs indicate that significant disturbance from past grading and filling activities has eliminated the potential for the preservation of cultural deposits over much of the landform (Figures 1-3 to 1-10). As a result of these activities, the APE for buried cultural deposits has been effectively reduced to 3.7 acres (3.1 hectares) at the southern end of the historic footprint (Figure 1-2). Only cross section A-A' shows relatively little disturbance to the underlying surface (Figures 1-3 and 1-4).

Cross sections B-B', C-C', D-D', and E-E' run west to east from Darby Creek to the Eastwick neighborhood (Figures 1-3, 1-5 thru 1-8). These cross sections show landfill deposits extending well below the channel bottom of Darby Creek extending into Quaternary deposits of the Trenton Formation. The landfill deposits taper to the east where they merge laterally with the previously graded parcel on which the Eastwick neighborhood was built. Significant disturbance has occurred effectively eliminating the potential for the preservation of buried archaeological deposits

Cross section F-F' runs north-south through the center of the landfill and likewise shows significant disturbance to the underlying surface (Figure1-9).

Cross section G-G' runs parallel to Darby Creek along the floodplain and shows landfill deposits extending well below the channel bottom of Darby Creek, particularly at the southern end of the transect (Figure 1-10). The floodplain has been significantly disturbed, effectively eliminating the potential for the preservation of buried archaeological deposits.

Figure 1-2. Area of Potential Effect for Cultural Resources

Figure 1-3. Cross Section Location Map

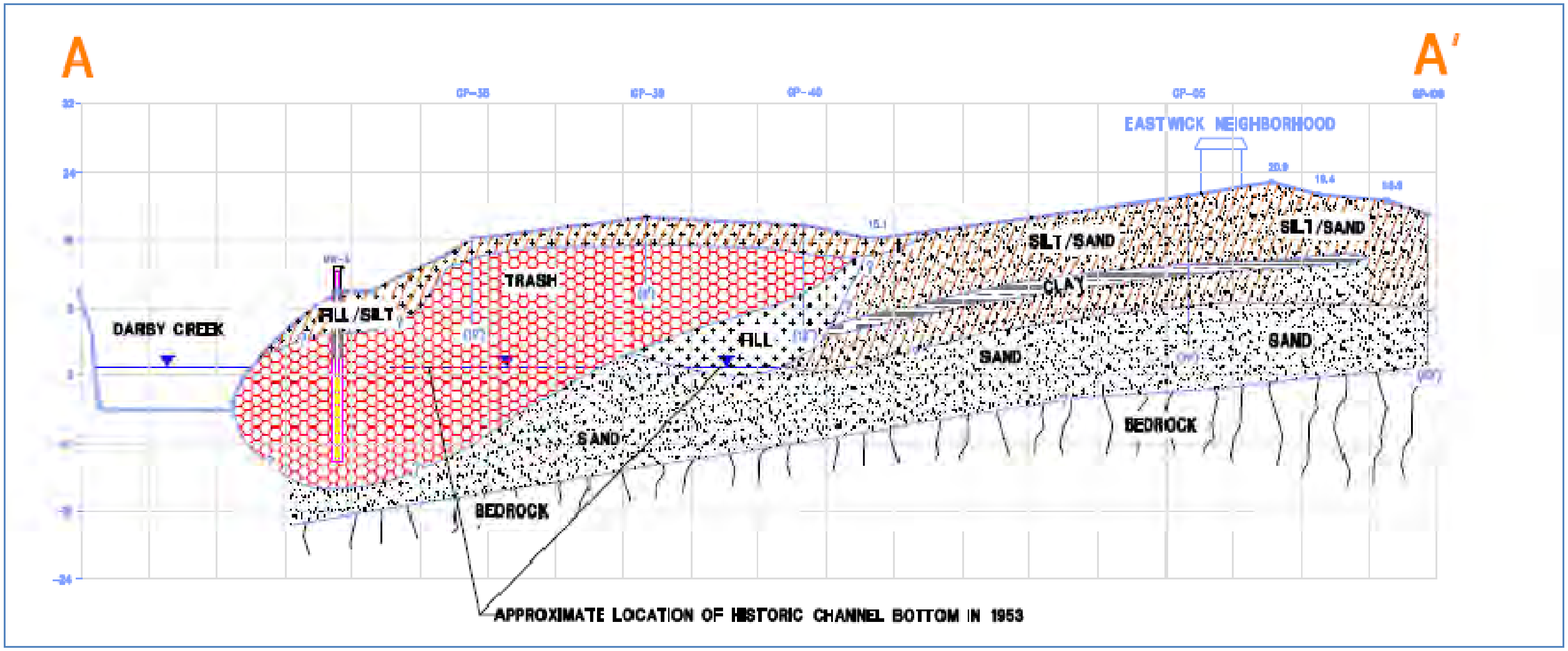

Figure 1-4. Cross Section A-A'

VERTICAL SCALE: 1"=24'
HORIZONTAL SCALE: 1"=240'
VERTICAL EXAGGERATION: 10

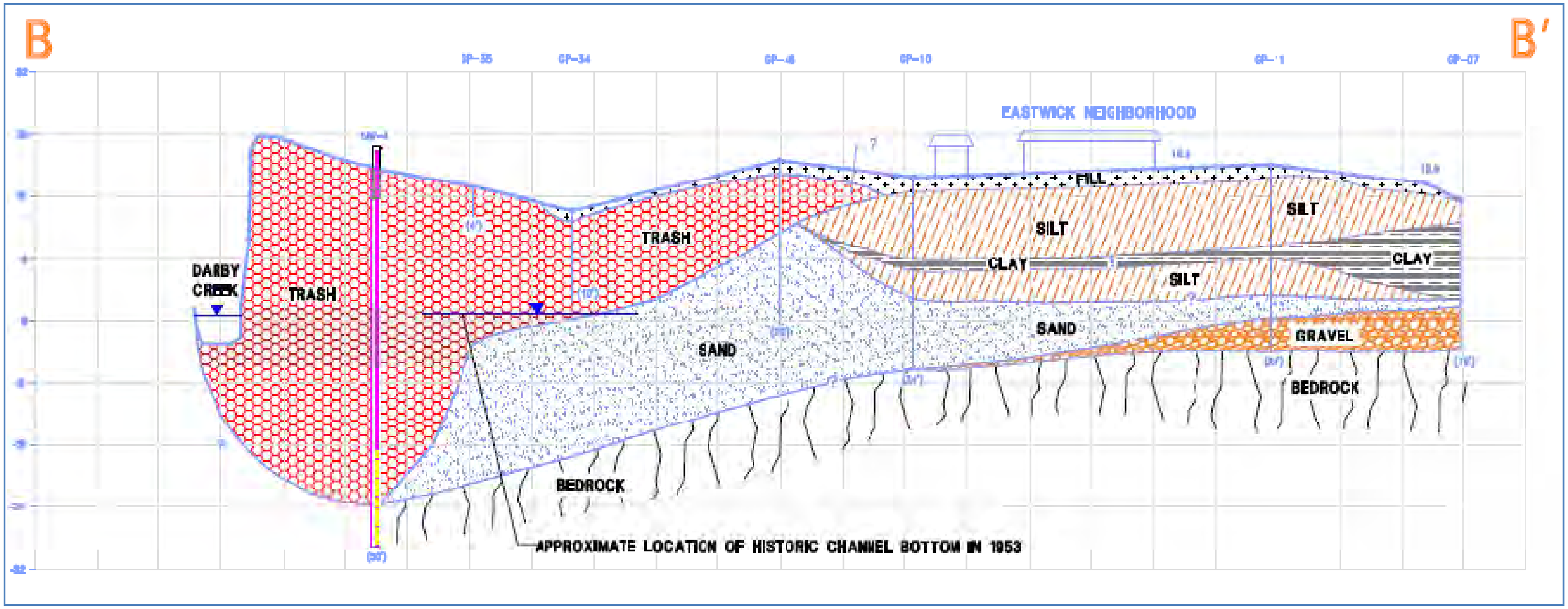

Figure 1-5. Cross Section B-B'

VERTICAL SCALE: 1"=24'
HORIZONTAL SCALE: 1"=240'
VERTICAL EXAGGERATION: 10

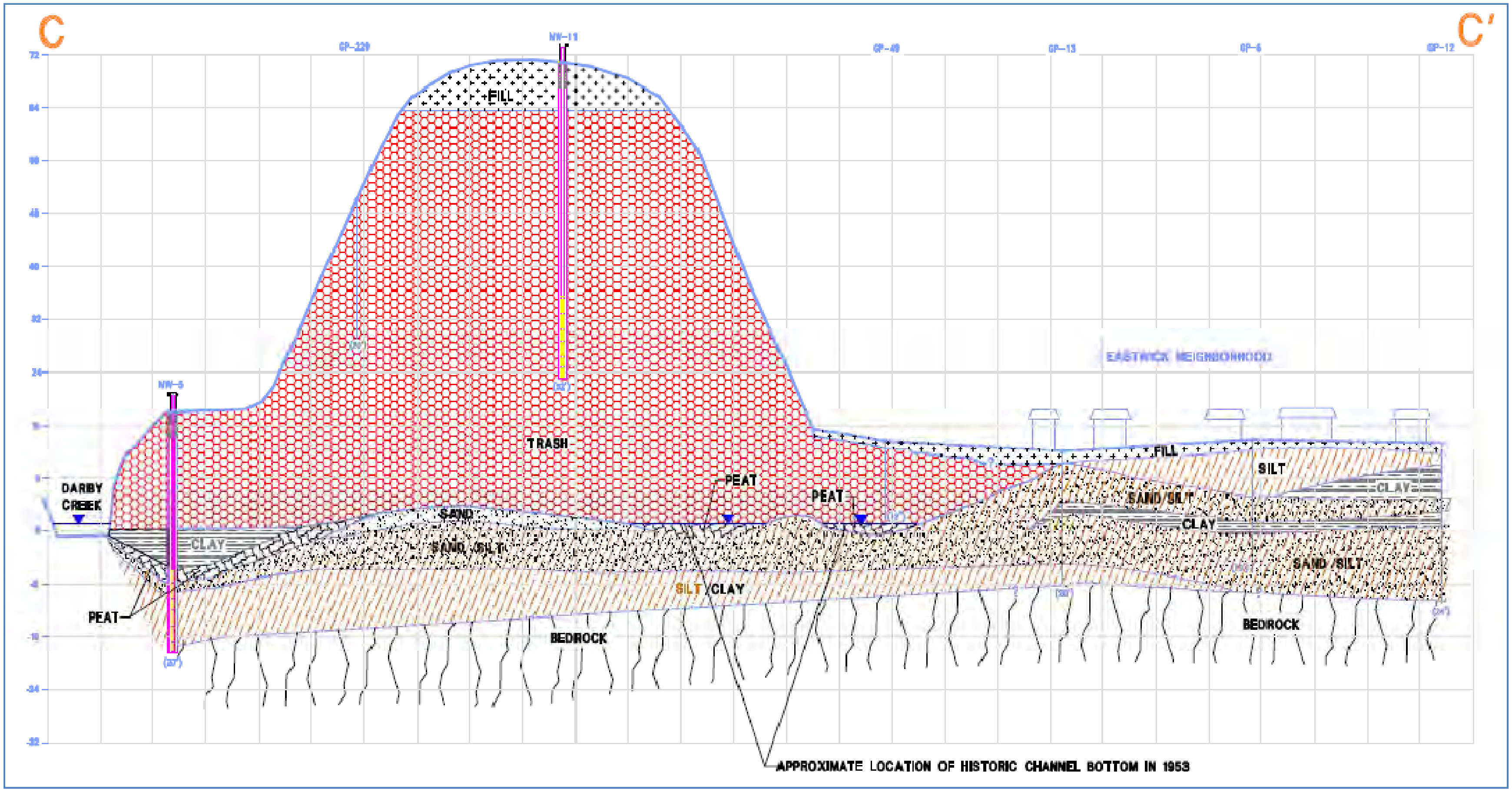

Figure 1-6. Cross Section C-C'

VERTICAL SCALE: 1"=24'
HORIZONTAL SCALE: 1"=240'
VERTICAL EXAGGERATION: 10

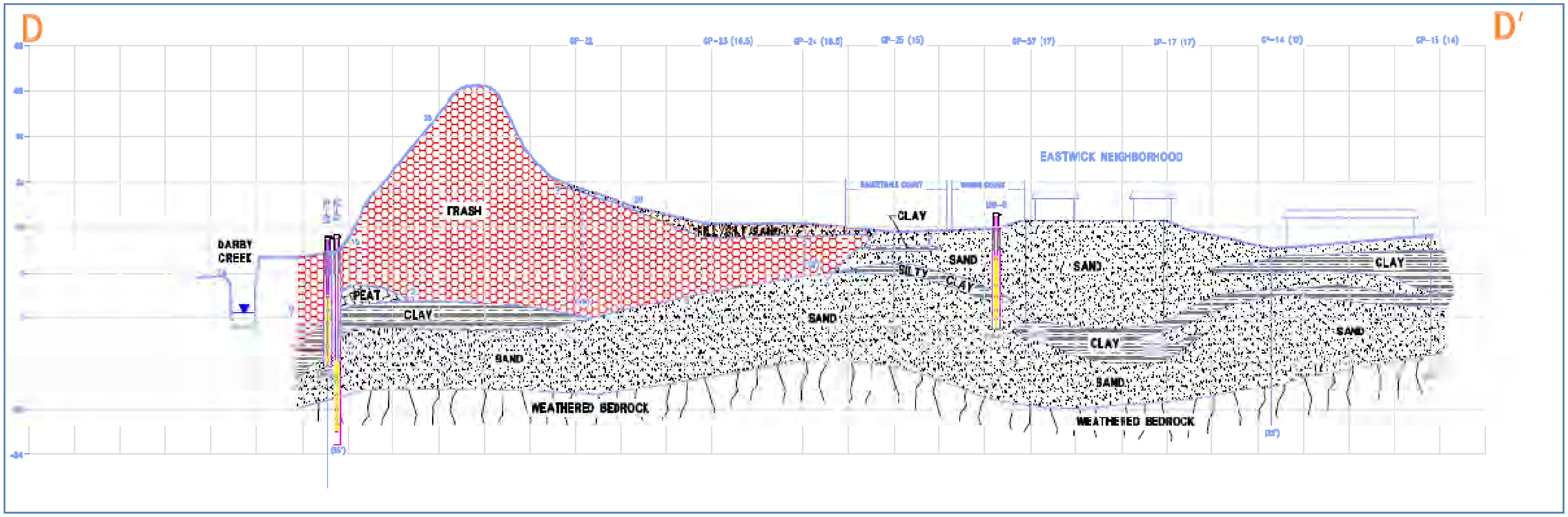

Figure 1-7. Cross Section D-D'

VERTICAL SCALE: 1"=24'
HORIZONTAL SCALE: 1"=240'
VERTICAL EXAGGERATION: 10

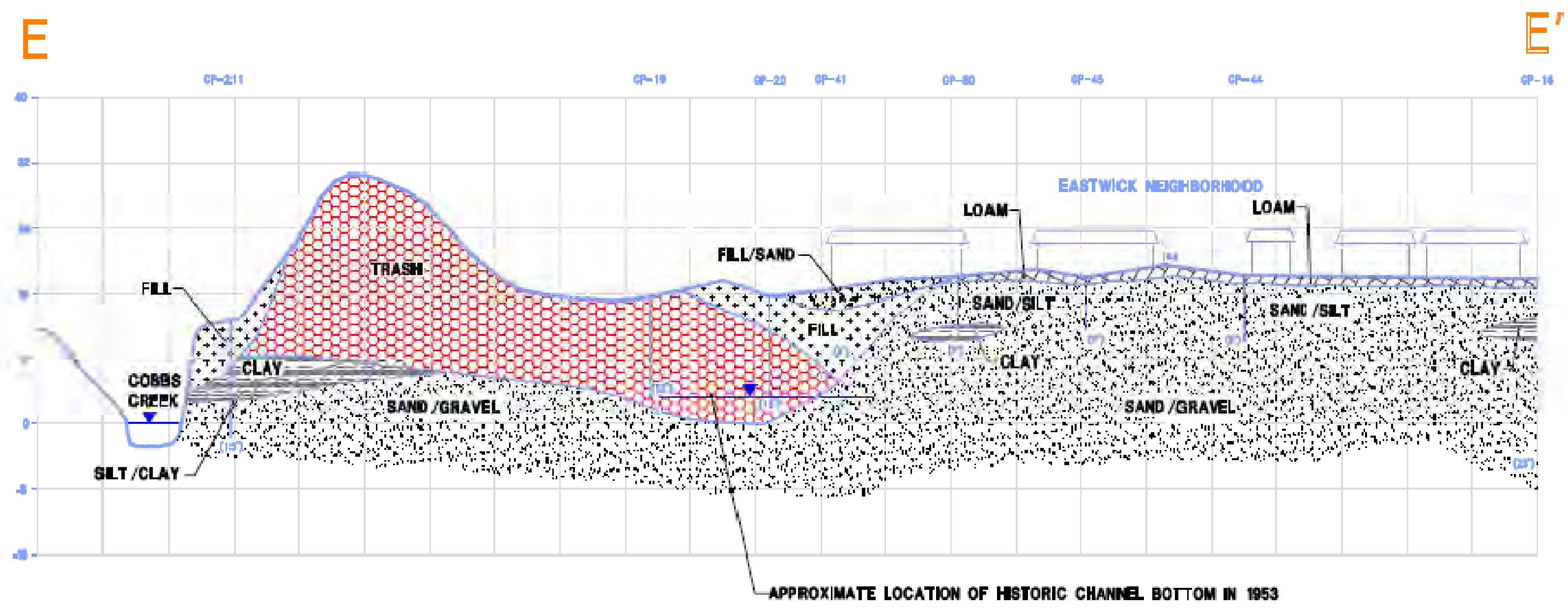

Figure 1-8. Cross Section E-E'

VERTICAL SCALE: 1"=24'
HORIZONTAL SCALE: 1"=240'
VERTICAL EXAGGERATION: 10

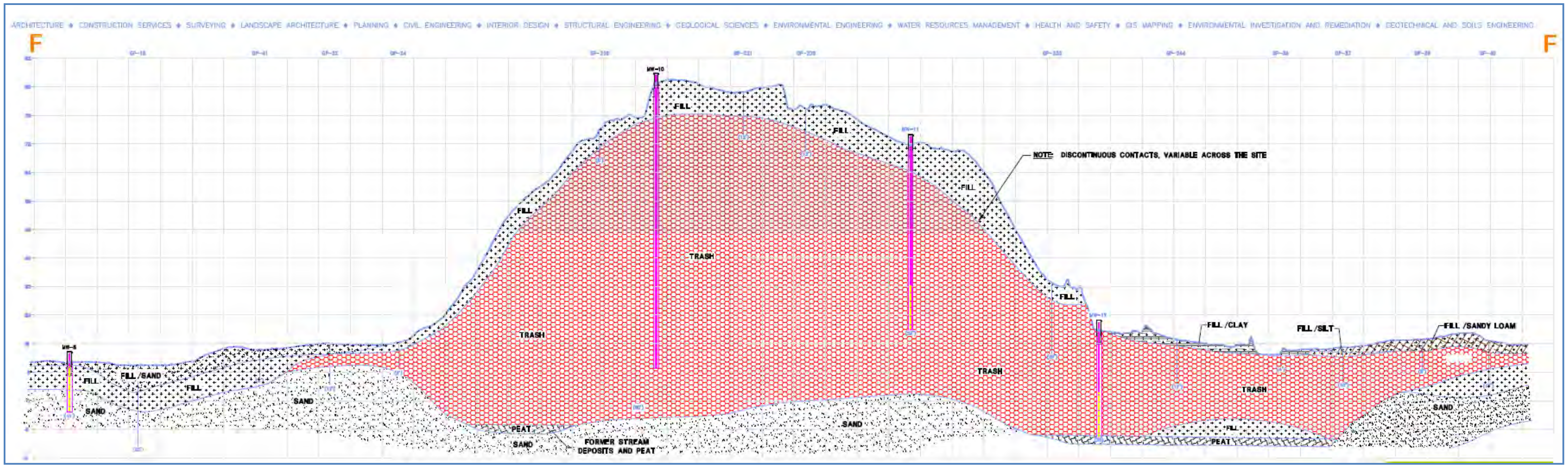

Figure 1-9. Cross Section F-F'

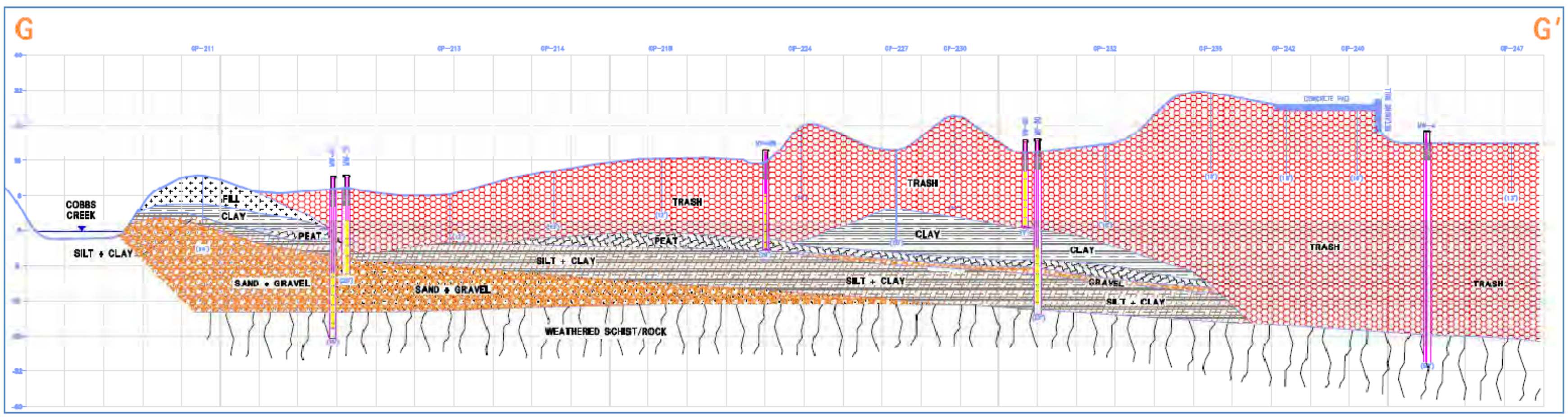

Figure 1-10. Cross Section G-G'

VERTICAL SCALE: 1"=24'
HORIZONTAL SCALE: 1"=240'
VERTICAL EXAGGERATION: 10

2.0 ENVIRONMENTAL SETTING

2.1 PHYSIOGRAPHY AND GEOLOGY

The Clearview Landfill lies in the Lowland and Intermediate Upland Section of the Atlantic Coastal Plain Physiographic Province (PADCNR 2010). Clearview Landfill itself is the most prominent surface feature in the area rising nearly 80 feet (24 meters) above the flat coastal plain surface. The project site is underlain by the Trenton Gravel Quaternary formation composed of pale gray to reddish brown very gravelly sand interstratified with clay and silt beds (Berg 1980).

The landfill lies in the Delaware River Terraces and Uplands zone (Zone 63a) of the Middle Atlantic Coastal Plain Ecoregion (Level IV). In general, the Level IV Ecoregion is narrow, marshy, nearly level-to-rolling lowland adjacent to the Delaware River estuary and Delaware Bay that extends from southeastern Pennsylvania to southeastern Delaware. It is characterized by low, nearly level terraces; an ocean modified climate; a long growing season; freshwater inter-tidal marshes; saltwater marshes; and small, sluggish, meandering streams. Low lying areas are commonly saturated or flooded during the growing season. Saline marsh deposits dominate, and alluvial and estuarine sand and silt are also widespread. These deposits are underlain by unconsolidated and easily eroded Quaternary gravels, sands, and silts. Elevations are less than 60 feet, and local relief is less than 35 feet. Streams have low gradients and are tidally influenced (USEPA, 2003). Note that the Delaware River is saline up to approximately river mile 93 (near the Walt Whitman Bridge) from the mouth of the Delaware River near the Atlantic Ocean.

2.2 SOILS

Soils in the vicinity of the Clearview Landfill have been heavily disturbed through many years of urban land use and are generally described as "Made Land" by the U. S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). Surficial geology in the area is generally unconsolidated sedimentary deposits that consist of gravelly sand with some interbedded clay and silt. In addition, part of the area has been extensively filled with fine-grained sediment, dredge spoils, and flood deposits.

2.3 DRAINAGE

Surface water features associated with the site consist of streams and marsh areas. Streams in the area include Darby, Cobbs, and Hermesprota Creeks. The main stem of Darby Creek originates in Easttown

Township, Chester County and is joined by a number of tributaries as it flows downstream. Cobbs Creek, the major tributary of Darby Creek, converges with Darby Creek north of Clearview Landfill. Darby Creek is then joined by Hermesprota Creek near marsh area in John Heinz NWR at Tinicum. Water from Darby Creek and the marsh ultimately flows into the Delaware River. The confluence of Darby Creek and the Delaware River is approximately 3.5 miles downstream of Clearview Landfill. An impoundment and tidal wetlands exist within the John Heinz NWR.

Tidal influence exists throughout the lower portion of Darby Creek and upstream as far as Clearview Landfill. On average, Darby Creek is tidal up to the confluence of Darby Creek and Cobb Creek, located near the northern portion of the landfill, but the extent of tidal influence changes depending on climate conditions.

3.0 CULTURAL CONTEXT

3.1 PREHISTORIC CONTEXT

3.1.1 Early Prehistoric Occupation (16,000-12,000 BP)

It is generally accepted that humans migrated across the Bering Strait from Asia into North America during the Late Pleistocene when a large amount of the world's water was locked in glacial ice and sea level was much lower than today; however, the date of entry of the first humans into the Americas is the subject of continuing debate. There is strong evidence from sites such as the Meadowcroft Rock Shelter in western Pennsylvania (Adovasio 1993), and Cactus Hill in Virginia (McAvoy and McAvoy 1997) of human presence in North America as early as 16,000 to15,000 BP (years before present). Evidence from Monte Verde in South America suggests occupation as early as 14,500 (Dillehay et al. 2008). To date no such evidence exists for the Delaware Valley. The absence of evidence for early occupation likely stems from climatic shifts and rising sea levels beginning near the end of the Pleistocene and continuing well into the Holocene.

The Pleistocene Epoch witnessed a series of cold periods and associated "ice ages," the most recent of which terminated approximately 14,000 to 12,000 years ago. One of the most dramatic effects of these "ice ages" was the lowering of ocean levels worldwide as rainwater was frozen and trapped in glaciers and continental ice sheets. Milliman and Emery (1968) argued on the basis of 80 radiocarbon samples taken along the Atlantic continental shelf that sea levels 30,000 to 35,000 years ago were close to those at present. Sea levels dropped subsequently as much as 130 meters during the final glaciation c.16,000 years ago. Along the Atlantic coast, ocean beaches lay at the edge of the modern continental shelf, perhaps 100 kilometers east of the current New Jersey coastline. Belknap and Kraft (1977) questioned the maximum depth of sea level drop, but agreed with the overall temporal trends.

Climatic patterns have changed on regional and continental scales during the Holocene Epoch, which began at the end of the Pleistocene ca.12,000 -10,000 years BP. Sea levels have continued to rise as a result of the release of water from melting ice sheets. As the sea level rose, it began to transgress, or cover, the land mass of the "Continental Shelf" (the modern submerged Atlantic continental shelf) to the west. The Late Pleistocene-Holocene marine transgression, or sea level rise, began c.14,000 years ago and proceeded rapidly until c.7,000 years ago (Milliman and Emery 1968; Kraft and Belknap 1983). Custer (1994) suggested the slowing of sea level rise did not occur until c. 5,000 BP.

3.1.2 Paleoindian (12,000-10,500 BP)

There are a large number of sites characterized by fluted points (e.g., Clovis, Crowfield, Cumberland, Folsom) considered by many to represent the earliest widespread immigration into the Americas from Asia. Traditional scenarios generally suggest that Paleoindian groups associated with fluted Clovis points first occupied the Northeastern United States between 12,000 and 11,000 years ago. However, this widespread distribution of Clovis sites throughout the Americas may represent the spread of fluted technology through earlier aboriginal groups rather than a mass exodus from Asia that appeared simultaneously throughout the Americas.

Evidence of occupation following 12,000 B.P. is strong in the eastern United States. Large sites comprised of numerous clusters of artifacts are found on ridge tops, and include the Shoop site in central Pennsylvania (Witthoft 1952), Bull Brook in Massachusetts (Grimes 1979; Jordan 1960), Debert in central Nova Scotia (MacDonald 1968), and Vail in west-central Maine (Gramly 1982). These sites may represent single occupations involving large bands or short-term, redundant occupations by small groups. Paleoindian sites are often associated with high-quality jasper or chert use for stone toolmaking. These sites include the Williamson Site (McCary 1951; Bentall and McCary 1973), West Athens Hill (Funk 1967), and the Thunderbird site complex in northern Virginia (Gardner 1974, 1977). Although rare, Paleoindian sites have also been found in stratified deposits. Such sites include the Wallis Site on the Susquehanna River (Miller 2000), the Shawnee-Minisink Site on the Delaware River (McNett 1985a), and the Meadowcroft Rockshelter (Adovasio and Carlisle 1986).

The Paleoindian occupants of the area would have shared the region with a rich fauna. The mammoth, oriented to more open habitats, disappeared from the area prior to the arrival of humans. A few forest mastodons may have been contemporaries of the earliest Paleoindians. Therefore, the image of Paleoindians as hunters of megafauna requires some revision (Meltzer 1993; Custer 1994). Paleoindians were probably small nomadic groups of hunter gatherers who relied on indigenous flora and fauna for their survival. They hunted whatever animals were available and gathered various plants, seeds, and berries to supplement their diet. Deer and caribou would have been common inhabitants of the Early Holocene forest, as well as a range of smaller fauna. The proximity of stream and riverine habitats would have supported aquatic resources, both animal and plant in nature. Therefore the subsistence settlement base of these groups appears to have focused on foraging with a hunting emphasis. They followed herd animals, such as elk, and made seasonal rounds throughout a wide but limited geographic range, exploiting a variety of natural resources along the way (Dragoo 1976, Lepper 1988).

3.1.3 Early Archaic (10,500-8,000 BP)

The transition from the terminal Pleistocene to the emerging Holocene interglacial has been correlated by Watts (1983) with the appearance of oak (*Quercus*) and hemlock (*Tsuga*) in the pollen spectrum c.10,000 - 9,500 BP. These environmental changes are frequently correlated with the transition to a deciduous forest and the emergence of the prehistoric cultural period referred to as the Archaic. The transition from the Paleoindian period to the Early Archaic period is marked by gradual technological and societal change brought about by the changing environmental conditions and an increase in population (Lepper 2005). The warming trend that began during the terminal Late Pleistocene/Holocene continued during the Early Archaic. Precipitation increased and seasonality became more marked, at least by 9,000 B.P. The arboreal vegetation that was initially dominated by conifers, gave way to a deciduous forest. The warming trend and associated transition to a deciduous forest resulted in the extinction of several larger game animals. As the variety of game animals changed, so did projectile point styles. Corner notched projectile points began to appear in the archaeological record. Heavier ground stone tools such as axes, and adzes began to appear suggesting an increase in woodworking activity, possibly to fashion dug out canoes (Lepper 2005).

In terms of material culture projectile point styles became more diverse. The earliest subphase is characterized by corner-notched points such as Palmer and Kirk. Kirk and Palmer corner-notched points in the eastern United States date to ca. 8,900 to 9,500 years BP. However, much later dates, ranging from 7,050 to 7,520 years BP, have been reported for Kirk corner-notched points from Sheep Rock Shelter in central Pennsylvania (Michels and Smith 1967) and Harry's Farm on the Delaware River (Kraft 1975). The subsequent phase of the Early Archaic is characterized by side-notched points with ground notches, including Thebes and Kessel. The final stage is characterized by Kirk stemmed and other stemmed points. However, a Kirk-like stemmed point was found at Harry's Farm in a stratum dated to 7,380"120 B.P.

Corner-notched points similar to Kirks were found at Shawnee Minisink in contexts that McNett (1985b:106) dates to 6000-5000 BC (ca. 7,000 - 8,000 B.P.), almost a thousand years later than the dates for Kirk corner-notched. The Shawnee Minisink type, given the name Abbott, differs from Kirk primarily in that the width of the base is markedly less than the width of the blade. The points designated Kirk corner-notched at Sheep Rock are more similar to the Abbott form and are close to the Abbott points in age (see Michels and Smith 1967:683). Similar points were also found at the Rocklein Site, approximately 65 km upriver from Shawnee Minisink (Dumont and Dumont 1979; McNett 1985b). These points were associated with a radiocarbon date of 7,520"120 B.P.

3.1.4 Middle Archaic (8,000-6,000 BP)

Sites attributed to the Middle Archaic are relatively rare in the eastern United States. Custer (1994) has argued that a shift from oak-hemlock to oak-hickory forests (Atlantic to Sub-Boreal phases) ca. 5,000 BP may be correlated with the cultural changes perceived as the Late Archaic. The oak-hickory forests had a higher carrying capacity that resulted in an expanded number of habitable areas. Rudolph (Johnson et al. 1996) has argued that the depiction of the Sub-Boreal phase as the warmest and driest period of the Holocene may be inaccurate. Johnson suggested that the Xerothermic maximum may have occurred c.6,500 - 6,000 BP during the predominantly moist Atlantic phase. By placing the boundary of the Middle-Late Archaic at 6,000 BP, he therefore places less importance than does Custer upon environmental changes associated with the expansion of oak-hickory forests.

In contrast to the predominance of multi-purpose tools found in Early Archaic contexts, Middle Archaic artifact assemblages reveal the gradual development of specialized technology, including an increase in the variety in tool types and the evolution of a ground stone tool technology (Stewart and Cavallo 1991). The repeated occurrence of adzes and axes in the archaeological record indicates the importance of heavy woodworking (Stewart and Cavallo 1991). The addition of formal plant processing tools such as grinding stones, mullers, and mortars and pestles to the toolkit represents technological means of reducing the time and energy costs of food processing. The use of polished netsinkers and spearthrower weights also indicate the importance of tool technology in subsistence tasks.

Because of the relatively low site density, Middle Archaic settlement patterns are not well understood. Although sites in some areas in the Middle Atlantic region occur in a wider range of topographic settings in the Middle Archaic, Weed's (2002) site data analysis for western Pennsylvania indicates a continuation of the Early Archaic focus on benches and terraces along streams. Most sites are small camps or habitation loci. Middle Archaic features generally consist of hearths and fire-cracked rock clusters. Middle Archaic camps at Site 36PE16 were similar in function to the Early Archaic camps (Miller et al. 2007). However, a biface cache was identified, suggesting a cyclical foraging pattern.

Little evidence regarding the Middle Archaic diet is available. Stanly-like points were recovered near a cluster of features containing carbonized nutshell and surrounded by tools for processing nutmeats at the Rockelein Site (Dumont and Dumont 1979). Charred nutshells were associated with features of the Middle Archaic at Area D of Abbott Farm (Stewart and Cavallo 1991). Both sites are on the Delaware River. It is likely that Middle Archaic hunter-gatherers exploited a variety of nuts, berries, tubers, and faunal resources.

3.1.5 Late Archaic (6,000-4,000 BP)

During the Late Archaic, the number of archaeological sites increased over earlier periods throughout the Eastern US. Although this increase was, in part, because of the increased visibility of sites, population increase is also believed to have taken place. A consequence of this population increase would have been a decrease in foraging territory available to each band. Several facts support this conclusion. First, a variety of specialized tools have been recovered from archaeological contexts, suggesting technological innovations to efficiently exploit a wider variety of locally available resources. Second, lithic materials exhibit a wider variety of types and qualities than in earlier periods, suggesting an increased use of local lithic materials (Kinsey 1971; Snethkamp et al. 1981). Finally, dietary data from the northeastern United States suggest that populations added wild seeds to their diet late in the Archaic period and began selecting larger seeds to increase the resource base. Archaeological data from the Bald Eagle Creek drainage in Centre County, Pennsylvania indicates that Late Archaic populations utilized a wider variety of topographic settings than did earlier populations (Graetzer 1986), consistent with the hypothesized increase in the range of wild food resources exploited during this period.

The trends toward use of a wider variety of resources, increasing population density, and increasing sedentism involved gradual shifts in settlement patterns. Rather than moving from resource locality to resource locality on a frequent basis, populations are assumed to have established base camps in productive localities and to have made logistical forays to procure specific, localized resources (Binford 1980; Custer and Wallace 1982). Site types resulting from this procurement strategy would include base camps and special-purpose camps. Base camps were probably occupied longer than during earlier periods. Special-purpose camps would result from a number of procurement activities, including hunting, nut gathering and processing, and the like. Assuming that hunter-gatherers optimized their returns from foraging, both of these site types would be located in areas containing the greatest abundance of high quality food resources.

Two Late Archaic traditions are represented in eastern Pennsylvania—the Laurentian Tradition and the Narrow Stemmed Point Tradition (Turnbaugh 1977). The Narrow Stemmed Point Tradition is widely distributed in the northeastern U.S., known in the Piedmont Province and the Delaware River Valley as the Piedmont Tradition and in New York State as the Lamoka Tradition. Individual artifacts related to this tradition, including narrow-stemmed points, drills, pestles, celts, mullers, milling stones, and atlatl weights, commonly occur in the Delaware River Valley and have been termed the Delaware Valley Archaic complex (Kinsey 1971, 1972). The complex is characterized by straight, contracting, or expanding stemmed points termed Lackawaxen, which are usually fashioned of shale or argillaceous shale.

3.1.6 Transitional (4,000-3,000 BP)

Transitional period sites are recognized on the basis of distinctive technological changes. Among these was the heavy use of rhyolite, a lithic material whose source is in the Blue Ridge Province of Cumberland, York, Franklin, and Adams Counties, Pennsylvania. A number of quarry sites are known, consisting of conical shaped pits ranging from 6' to 12' in diameter (Stewart 1987). Use of rhyolite began during the Early Archaic and extended throughout prehistory. While jasper predominates in the Piedmont of the Delaware Valley, rhyolite was used to the near exclusion of other lithic materials in the Piedmont of the Susquehanna Valley (Stewart 1987). Stewart relates the increased use of rhyolite to increases in population density and decreases in foraging territories that resulted in an increased focus on locally available materials. While this explanation is appropriate for the region surrounding the rhyolite quarries, it does not explain the increase in rhyolite use across much of eastern and central Pennsylvania during the Transitional period. One hypothesis is that the wide distribution of rhyolite reflects increases in trade and exchange (Snethkamp et al. 1981).

A second technological change associated with the Transitional period was the manufacture and use of both steatite (soapstone) vessels and plain, thick ceramics. Steatite was used in the manufacture of bowls that were able to withstand the application of high temperatures used in cooking. Known quarry sites occur in northeastern Maryland and southeastern Pennsylvania (Ward and Custer 1988). The material was apparently widely traded and occurs on Transitional period sites throughout Pennsylvania. Crushed steatite was also used as temper in early ceramics, as was fiber. Steatite-tempered ceramics classified as Marcy Creek sometimes co-occur with steatite bowls (Kinsey 1972; McCann 1962; Weed and Wenstrom 1992). Fiber-tempered pottery also occurs in small quantities on some Transitional period sites. The use of steatite bowls and pottery, both of which would add to the energetic costs of mobility, likely indicates that a threshold of increasing sedentism was passed, whereby the advantages of these durable vessels outweighed the disadvantages incurred during the less frequent settlement relocations.

A third characteristic of the period was the manufacture of projectile points known as broadspears and classified as Lehigh, Koens-Crispen, and Snook Kill, as well as Perkiomen and Susquehanna broadspears. Perkiomen broadspears are obtusely pointed, frequently asymmetrical points usually manufactured from Pennsylvania jasper. These points are generally restricted to the Schuylkill River drainage (Witthoft 1953). Lehigh, Koens-Crispen, and Snook Kill points are similar to each other in form and are distinguished by differences in raw material. Geographical variations in the distribution of these points have also been noted (Snethkamp et al. 1981).

Transitional period components with features have been identified at sites along the Delaware River, including the Brodhead-Heller Site, the Miller Field Site, and the Sandts Eddy Site (Bergman et al. 1994; Kinsey 1972; Kraft 1970). Eight pit features and fourteen hearths were found in association with the Perkiomen and Orient occupations at the Miller Field Site (Kraft 1970). Concentrations of fire-cracked rock were also a frequent occurrence at the site. Nineteen postmolds were found originating in the Transitional period levels; however, no clear pattern was discernible. The identification of pit features that may have functioned for storage and the presence of postmolds indicate that sedentism had increased by the Transitional period. The use of steatite bowls, costly to transport, also supports the conclusion of reduced mobility.

The Transitional period component at Sandts Eddy produced Perkiomen bifaces and five Orient fishtails. Unlike the Early Archaic component, jasper was the predominant lithic material in both finished bifaces and debitage. The component was interpreted as a small encampment (Bergman et al. 1994). Transitional period components have been identified at numerous other stratified sites on the Delaware River including Miller Field (Kraft 1970), Zimmerman, Peters-Albrecht, and Brodhead-Heller (Kinsey 1972), and Rocklein (Dumont and Dumont 1979).

3.1.7 Early Woodland (3,000-2,000 BP)

The Woodland period is marked by the widespread use of ceramics and by the beginnings of cultigen use in eastern United States. Several Early Woodland sites have been identified in the eastern Pennsylvania region; however, sites from this period are relatively rare. This situation may be due in part to the fact that few projectile point types have been associated with the Early Woodland. Also, ceramics are not commonly preserved on the ground surface, and so are not often found in settlement surveys.

Point types associated with the Early Woodland period of the Delaware Valley include Meadowood and Hellgrammite. Meadowood are side-notched points defined as the characteristic type of the Point Peninsula complex, identified in New York State (Ritchie 1971). Hellgramite points are serrated bifaces associated with the Early Woodland in the Susquehanna River Valley. It was the dominant point type at Williamson Site, located on the Delaware River floodplain in Hunterdon County, New Jersey (Hummer 1994). In addition to these two diagnostic types, the use of generalized stemmed and side-notched points extended into the Early Woodland.

Ceramics diagnostic of the Early Woodland of the Delaware River Valley include Marcey Creek, Vinette I, and Brodhead Net-Marked. Marcey Creek is a steatite-tempered ware with a plain exterior and smoothed interior. Vinette I is tempered with chert or other crushed quartz and has interior and exterior cordmarking. Brodhead Net-Marked has markings over the exterior and most of the interior surfaces (Kinsey 1972). The Early Woodland ceramics are generally thick and friable. Marcey Creek ceramics were likely in use as early as 1200 B.C. at the Miller Field Site, where they are found with Orient fishtail points.

Three cultural complexes have been defined in the Delaware River Valley. The Bushkill Complex is centered in the upper portion of the valley and extends into the Middle Woodland (Kinsey 1972); the Williamson Complex is in the middle portion (Custer 1996); and the Black Rock Complex, which also extends into the Middle Woodland period, is found in the lower valley (Kingsley et al. 1990). All three complexes have generally similar settlement patterns involving riverine base camps and interior sites, including rock shelters and lithic scatters that represent short-term, special-purpose forays (Custer 1996).

Subsistence data show a continuation of hunting and gathering as the main procurement strategy. As discussed above, squash was present on sites in the Mid-Atlantic region well before the Early Woodland (Fritz 1999). Early Woodland maize was identified in the Kirk Mound, an Adena mound on the Ohio River (Wymer 1992). Possible maize pollen and phytoliths were found in an Early Woodland feature at Coco Station in West Virginia (Voight et al.1998). However, directly dated maize is no earlier than the Middle Woodland (2000 B.P.; Fritz 1999). No evidence of cultigens dating to the Early Woodland has been found in the Delaware River drainage.

Custer and Wallace (1982) group the Early and Middle Woodland periods of the Piedmont Uplands into a category with the Late Archaic. In contrast, Kingsley et al. (1990) note a break in settlement patterns in the Early and Middle Woodland periods of the Schuylkill River Valley, marked primarily by a decrease in the number of sites.

A Meadowood component was identified at the stratified Faucett site, located on the lowest terrace of the Delaware River floodplain (Kinsey 1972, 1975). The component contained a large hearth and artifacts including Meadowood points, over 400 sherds of Exterior Corded/Interior Smoothed pottery, and a broad flat gorget. A radiocarbon sample associated with the component produced a date of 750 BC +/- 100 years (Kinsey 1972:191). The Early Woodland component at the Williamson site revealed 45 features including food processing features, a cache of jasper cores, a lithic workshop, and fire-cracked rock clusters (Hummer 1994). Nutshell was the predominant botanical material recovered from the features; no cultigens were found. The site was interpreted as a multi-purpose residential base camp occupied on a multi-season basis (Hummer 1994).

3.1.8 Middle Woodland (2,000-1,600 BP)

The Middle Woodland period represents a continuation of many of the trends that characterize the Early Woodland, including an increase in sedentism and in the intensity of plant food procurement and processing.

A great variety of ceramics occured in the lower Delaware Valley during the Middle Woodland, including Mockley ceramics, which are shell-tempered and net-impressed, as well Abbott Zoned Incised and Net Impressed types from the Abbott Farm area (Stewart 1990). Jack's Reef ceramics are characterized by cordmarked surfaces with decorations such as rocker stamping and punctates. Vinette I and Brodhead Net-Marked ceramics continue from the Early Woodland into the early Middle Woodland.

Projectile point types include Fox Creek, basal-notched, and Jack's Reef pentagonal and corner-notched types. Argillite was commonly used for points and other bifaces with chert and jasper used for expedient tools (Stewart 1990). The Middle and Late Woodland are periods of the most intensive use of cobble cores, both prepared and expedient, and their by-products (Stewart 1987b).

Stewart (1982) notes a number of trends for the Delaware River valley, including increased feature variety and quantity, increases in the occurrences of cache blades, the occurrence of ceramic storage vessels, and increases in ceramic vessel size, all of which suggest an increase in sedentism and in the production of food surplus. Evidence of above-ground and pithouses has been identified at Middle Woodland sites (Custer 1996). However, the major habitation sites on the floodplains that characterize the Late Woodland period of the Lower and Middle Delaware Valley are not yet present (Stewart 1990). Transient camps and small procurement and processing sites were also important during this period (Custer 1996).

Custer (1996) interprets the presence of argillite and rhyolite at Early and Middle Woodland sites distant from their sources as evidence of exchange networks that increased in intensity after A.D. 200 (Stewart 1989). These systems appear to have collapsed by the Late Woodland period (Stewart 1989). Extra-regional exchange of materials was limited, and Stewart (1989) sees no evidence for formal trade relationships with the Hopewell complex.

3.1.9 Late Woodland (1,600 BP-900 BP)

Settlement patterns for the Late Woodland of southeastern Pennsylvania show a marked shift to longer term occupations and larger aggregations of individuals. Hamlets and villages were located near good agricultural soils. Temporary special-purpose sites such as hunting camps were also a part of the settlement system.

Social organization likely involved changes that were responses to increased population density and an agricultural food base. Societies that cross-cut kinship units and increased solidarity among the village members likely existed. Land was probably held in common by lineage members. The presence of stockaded villages suggests warfare became a necessary response to political and/or economic conflicts.

Stewart (1989, 1990) notes a paucity of evidence for trade and exchange throughout the Middle Atlantic after AD 1200, which may result from decreased subsistence risk resulting from the addition of agricultural produce to the resource base.

Several major Late Woodland sites have been investigated along the Delaware River, including the Overpeck and Byram sites. These sites included a variety of features and some evidence for maize agriculture. However, the use of wild plant foods continued, and in the Piedmont little change in settlement pattern from the Middle Woodland period was apparent (Stewart et al. 1986).

Small village-based groups in the Delaware River Valley included the Lenni Lenape, or Delaware Indians, who were subjugated by the more powerful Iroquois during the late 17th century. The Susquehannock, who appeared in the region by A.D. 1580, occupied the lower Susquehanna River Valley to the west (Jennings 1978). The Schuylkill Valley was apparently not a focus of settlement for either the Delaware or the Susquehannock however (Kingsley et al. 1990), and appears to have been a buffer zone between the two groups (Hunter 1983).

3.2 HISTORIC CONTEXT

3.2.1 New Sweden

By the mid-17th century, the Realm of Sweden had grown to be one of Europe's great powers and was in the midst of what would become to be known as the "Age of Greatness" (Rivera 1995). It was at this time that Swedish rule extended over its greatest territorial area encompassing what is now Finland, Estonia, Sweden, and parts of Norway, Russia, Latvia, Germany, and Poland. In order to support this growth and expand their influence even further, the Kingdom of Sweden and its aristocracy helped fund the New Sweden Company. This new venture was designed to start a colony in the New World in order to capitalize on the fur trading and tobacco industries. Led by Peter Minuit, a German born Dutchman and founder of New Amsterdam, the two New Sweden Company ships, the Kalmar Nyckel and the Fågel Grip sailed into the Bay of Delaware in March of 1638 (Rivera 1995). This company immediately set to work creating treaties with the local Lenape communities and building Fort Christina, named after the Queen of Sweden, at the location of what would become the city of Wilmington, Delaware. This was the first permanent European settlement in the Delaware Valley.

Over the next seventeen years, eleven more ships would succeed in crossing the Atlantic bringing over 600 Finnish and Swedish immigrants into New Sweden. These new immigrants would settle across an area of what would become Pennsylvania, Delaware, New Jersey, and Maryland. Moving upstream on the Delaware River, forts were built on Tinicum Island and near present day Salem, New Jersey. Despite this early success, the colony of New Sweden remained vulnerable to the whims of the political environment in Europe. As the Kingdom of Sweden entered into the Second Northern War in the Baltic, the colony of New Sweden was left unsupported. In the fall of 1655, the Dutch moved an army into the Delaware Valley and quickly captured the Swedish Forts. The colony of New Sweden was incorporated into the New Netherland colonies only to be taken by the English just 9 years later after the English takeover of the Dutch colonies (Johnson 1911).

3.2.2 Penn's Woods

Admiral Sir William Penn was a naval officer under the command of Oliver Cromwell, whose most notable achievement was the capture of the island of Jamaica for Britain. Upon the death of Cromwell in 1658, King Charles II assumed power in 1660 after the restoration of the English monarchy. Admiral Sir William Penn lent a large sum of money to Charles II soon after he took power. This debt was then passed down to Admiral Penn's son, William Penn. By 1680, this debt had grown to £16,000. William petitioned Charles II to repay the debt in the form of a land grant in the New World. Through his influence in the court, William Penn got his petition approved and was thus given his land grant in 1681. It was Penn who suggested the name Sylvania for the new colony, while the King added Penn as a prefix to honor the Admiral Sir William Penn (Thomas 1913).

Soon after the granting of the Charter, Penn set out to lay out the city of Philadelphia. Basing his city near the confluence of the Schuylkill and Delaware Rivers, the first grid extended approximately two miles by one mile in size. Around this same time, Darby Township was gaining settlement, and was recognized as a permanent settlement by 1684. Darby Township gained its name from Derby, England, the original home of many of the early settlers. The boundaries of Darby Township were originally formed by Cobb's Creek to the east and Muckiniattas Creek to the west (Jordan 1914).

By the end of the 17th century, Philadelphia was a successful and growing town with an estimated population around 2000 people. The people were mostly subsistence farmers and traders with a small but growing shipping economy (Dunn and Dunn 1982). Through the 18th century, Philadelphia would continue to grow in size and wealth, becoming one of the most important cities in the New World and a focal point in the war between England and the Colonies (Bronner 1982; Thayer 1982).

3.2.3 The Revolutionary War

The history of the revolutionary war in southeastern Pennsylvania is largely tied to British General William Howe's efforts to capture the city of Philadelphia in what became known as the "Philadelphia Campaign".

A brief account of the campaign is given here, adapted from information compiled by the Independence Hall Association of Philadelphia (IHA 2009).

In late July of 1777, Howe sailed up the Chesapeake Bay and landed 17,000 men at the head of the Elk River in Maryland in preparation for a march on Philadelphia. American General Washington moved the American forces under his command from Wilmington, Delaware to a position between the head of the Elk River and Philadelphia. After several feints and deceptions that lasted more than a month, the American Army took up a position at Chadd's Ford, Pennsylvania on the Brandywine River between Howe's forces and Philadelphia. The Battle of the Brandywine began on the morning of September 11th and ended later that evening with the Americans retreating to Chester. The British had actually suffered more casualties, but had gained ground toward their objective of Philadelphia.

Five days after the defeat at the Brandywine, the armies clashed again near the falls of the Schuylkill River. This battle resulted in few casualties as heavy clouds set in just after the shooting began and a torrential downpour wetted the paper musket cartridges preventing either side from inflicting much damage. The bulk of the American Army retreated to Reading Furnace to replenish their ammunition. General Anthony Wayne was left behind with the objective of harassing the British rear. Howe learned of Wayne's position and ambushed the unprepared Wayne on September 21st killing 53 and wounding 40, while losing none, in what was known as the Paoli massacre. Wayne was able to retreat and gather his troops near West Chester.

After Paoli, the British moved to Valley Forge forcing Washington to choose between defending his supply base at Reading or the city of Philadelphia. Washington opted for Reading, and the British were left with a clear path to Philadelphia. Lord Cornwallis led selected units (approximately one-quarter) of the British Army into Philadelphia on September 26th, but the bulk of the forces were left at Germantown five miles to the north. Washington launched an elaborate four pronged attack on Howe's forces at Germantown on October 4th, but was repelled after heavy losses on both sides and forced to retreat to White Marsh.

The British remained in Philadelphia, but the surrounding countryside was controlled by Washington. Howe had to defeat the American forts on the Delaware River in order to supply the City. The American defense was strongest at Fort Mifflin. Howe besieged the fort and finally conquered it after three weeks of fighting. The bulk of the Continental Army was still at White Marsh, but winter was nearing and Washington opted to move his army to Valley Forge, while the British remained comfortable in Philadelphia. Unsatisfied with Howe's efforts to quell the rebellion before winter set in, the British recalled Howe to England and replaced him with General Henry Clinton. This afforded Washington the time to winter at Valley Forge and for a French alliance to be formed. Fear of the French alliance caused the British to abandon Philadelphia in late June of 1778.

3.2.4 Darby Township

Darby Township is located in the southeast portion of Delaware County, Pennsylvania. The governing municipal district originally included Upper and Lower Darby as a single township. This area was one of the earliest settlements after William Penn acquired title to what would become the state of Pennsylvania on March 4, 1681, from England's King Charles II (Independence Hall Association 2010). Darby Township is a distinct municipality from the nearby and similarly named Darby Borough. Darby Township has a total area of 1.4 square miles (3.7 km²), of which 0.70% is water (United States Gazetteer Files: 2000 and 1990). Today the Township consists of two separate non-contiguous territories—Darby Township and Upper Darby Township, under one municipal government. Upper Darby Township was settled by Quakers and formed out of a split from Darby Township on August 30, 1736 (DiFilippo 1992). In 1789, Upper Darby was one of the several municipalities that voted to secede from Chester County and form a new county; hence Delaware County was established with the seat at Chester City. The APE is located in Darby Township, the southeasterly of the two territories.

The United States' textile industry that had begun in New England was beginning to spread out into the Delaware Valley and beyond. (DiFilippo 1992). The abundance of creeks and streams in the area favored the development of mills, and it was here that the first mills in Pennsylvania could be found. Upper Darby has the Kakarikonk, Mill, or Cobbs Creek as its eastern boundary, and the Muckruton or Darby Creek traversing the southwestern end of the Township to Tuscarora Mills at Garrettford Road, and thence that stream constitutes its western boundary. This geographic location gave the district much prominence in colonial times, because of the many mill-seats and water-powers located within the territory. The budding textile trade dramatically increased the population of the area, and the Upper Darby area grew more rapidly in population than any locality within the limits of present day Delaware County (Ashmead 1884). The growth rate of the Township increased around the time of 1830 when textile making moved from private homes to newly erected mills. Before this time, the spinning of yarn and weaving it into cloth was performed by women at home to satisfy the needs of their families. In approximately 1830, a few of the first mills were converted to spin the yarn that was, in turn, sold to individuals who spun their own cloth. Roughly ten years later the mills had developed an integrated methodology to enable on-site spinning of yarn from raw materials, weaving, finishing and dying of the cloth for sale. This progression marked the beginning of the large and prosperous textile manufacturing industry in Darby Township that soon spread to Philadelphia and lasted until the mid-1900s. In 1832 there were eleven cotton-mills, employing 600 hands, primarily women and children of English, Irish and Scottish immigrant families, using a total of 19,500 spindles (DiFilippo 1992). There were three cottonweaving mills, employing 480 hands and 400 power-looms; two cotton-spinning mills, employing 120 hands; and eight woolen-mills, with 350 hands; the entire yearly production being a total of approximately $950,000 USD (DiFilippo 1992). The new industry spurred the constant stream of emigration that resulting in the population boom of Delaware County. In 1800 the population of Upper Darby was approximately 800 residents; by 1890 it had increased to nearly 5,000 permanent residents. (DiFilippo 1992)

3.2.5 Underground Railroad (~1700s-1865)

Reflecting its Quaker beginnings, Darby Township was active in the antislavery movement and many homes in the area became stops along the Underground Railroad. Because of Darby Township's geographical location, presence of a large population of sympathetic Quakers, free African Americans and other supporters, the Township developed into an active center for the movements of the Underground Railroad. Considered by the colonies to be an enlightened city, Philadelphia became a hotbed of antislavery sentiment despite the opposition from many of the City's elite because of the dependence on the slave driven economy of the South to fund the manufacturing boom in the North. The Darby Township area is located near the main roadway coming north from the southern pro-slavery states and is within close proximity to the Maryland state line. Access to navigable waterways also contributed to Darby Township's active participation in the smuggling of slaves through the area. Antislavery sentiment in Darby Township is recorded as early as 1715 when four prominent Quaker men, John Wright, Nicholas Fairlamb, John Blunston and Caleb Pusey, publically opposed the "importing, buying or selling" of slaves before their Quarterly Meeting. The Darby Friends Meetinghouse, the first of three buildings originally established in 1682, served as a unifying meeting place for the members of the Darby community that were committed to maintaining the clandestine and decentralized network of families that illegally aided the escape of African slaves to freedom (Haigis 2008). The Fugitive Slave Act imposed stiff legal penalties on anyone found to be assisting freedom seekers, giving the Underground Railroad its clandestine flavor, and likely helping to explain scarcity of documentation. Thomas Garrett, born on August 21, 1789, in Upper Darby Township, is one of the most prominent figures in the history of the Underground Railroad. He has been called one of Pennsylvania and Delaware's greatest humanitarians and is credited with helping more than 2,700 slaves escape to freedom in a 40-year career as a Station Master; one who provides safe hiding and guidance to runaway slaves (Abdur-Rahim, et al 2002). Garrett relocated to Quaker Hill in Wilmington, Delaware sometime after 1830 with his second wife and family and maintained a hardware business there. The physical location of Wilmington served as the political crossroads between the north and south, and it remains unknown whether Mr. Garrett intentionally chose this location to aid his abolitionist ambitions, or if such ambitions were the result of his geographical location. Garrett soon became known in anti-slavery circles as a great "station master" on the eastern line of the Underground Railroad (Picket 2007). William Still was also a formidable anti-slavery activist in the Darby Township area. A free African American man, Still worked in the Philadelphia

Anti-Slavery Offices where he quickly rose to become a well known “station master”. Mr. Still documented detailed record of slaves' experiences and often could reunite families in “free states”. Still is the author of the classic book *The Underground Railroad* and worked with Garrett and others as part of the Philadelphia Vigilance Committee. He is buried in Eden Cemetery near Darby Township (Pickett 2007; Haigis 2008).

3.2.6 Early to Mid 19th Century

When Delaware County split from Chester County in 1789, the seat of local government was retained in Upland/Chester. As the interior developed, complaints grew concerning the distance to the county seat; it was finally moved to Media, Pennsylvania in 1850 with the Delaware County Courthouse being constructed in 1889 (County of Delaware Courthouse and Government Center 2008).

The 19th century brought continued prosperity and cultural advancement to the City. In 1805 the first permanent bridge over the Schuylkill River connected Philadelphia with the fertile farmland of the interior. In the 1820s and 1830s, seaport and rail access made Philadelphia the manufacturing capital of the United States, as well as one of its premier financial centers. Cultural progress continued also with the establishment of public education and the creation of cultural and fine arts institutions (Cities of the World-City Data 2008). Many major landowners on the river sold off their farms and purchased property near the new county seat in Media, Pennsylvania, thus opening the riverfront to major industrial development. From 1845 onward the riverfront became a heavy industry magnet. Several shipyards built vessels for international buyers and locomotives from Baldwin and other works were exported worldwide. In the middle of the century, the Pennsylvania Railroad's Main Line was built through Radnor Township in the northern part of Delaware County. Later the Baltimore, Ohio and Reading Railroads, traveling from north and south, were built through the southeastern part of the county. Between 1870 and the turn of the century, nineteen boroughs were established, largely along the path of these railroads. West Chester Pike, constructed of planks and stones, provided a route for farmers to transport their milk and produce to Philadelphia. Resort hotels were built around Media and Newtown Square as parts of the County became vacation areas (County of Delaware; Courthouse and Government Center 2008). Although the national capital had moved to Washington D.C., Philadelphia remained the national center for the minting of money, shipbuilding, and weapons production (Cities of the World-City Data 2008).

3.2.7 The Civil War (1861-1865)

In population and railroad mileage, the North was twice the size of the South. Although acts of secession began earlier, the Civil War officially began with the attack on Fort Sumter, South Carolina on April 12, 1861. The Republican governor of Pennsylvania, Andrew Gregg Curtin, heeded Lincoln's call for militia and initially called forth fifteen regiments for military service (Sher 2000). More than fifty infantry and cavalry regiments would be recruited from Philadelphia over the course of the war (Weigley 1982).

The war brought its own economic compensation to Philadelphia. Soon after the onset of the war, Philadelphia became a significant military tactical city in the North, providing an invaluable source of goods and services including troops, money, weapons, transport equipment, medical care, and supplies for the Union armies (Cities of the World-City Data 2008). Philadelphia's Schuylkill Arsenal was the Union Army's main source of uniforms. Hundreds of workers in Philadelphia, primarily women, made parts of the Union uniforms in their homes; the uniforms were then assembled at the Arsenal (Weigley 1982). The Frankford Arsenal manufactured munitions, and the Sharp and Rankin's factory made breech-loading rifles for the soldiers. The Philadelphia Navy Yard employed 3,000 men, constructed eleven warships and outfitted many more. Philadelphia's private shipyards, such as William Cramp and Sons, also constructed many ships including the USS *New Ironsides* (Weigley 1982). Philadelphia was also the location of the two largest military hospitals in the United States—Mower Hospital, providing 4,000 beds, and Satterlee Hospital, with 3,124 beds. Philadelphia also had civilian hospitals that would care for Union soldiers in times of particular need. In total, approximately 157,000 soldiers and sailors were treated in Philadelphia hospitals (Weigley 1982).

Before the war, Philadelphia's economic connections with the South made many of the wealthy citizens of Philadelphia sympathetic to the South's grievances. However, once the reality of war became apparent, many Philadelphians shifted their opinions to support the Union cause and the war against the Confederate States of America.

In 1863 the Confederate army descended upon the city of Harrisburg during General Robert E. Lee's Gettysburg Campaign, and Philadelphia fell under threat of Confederate invasion. Pennsylvania governor, Andrew G. Curtain and Philadelphia Major Alexander Henry rallied city volunteers to build entrenchments to defend Philadelphia. The Confederate Army was turned back at Wrightsville, Pennsylvania and again at the Battle of Gettysburg; both battles included regiments native to Philadelphia. The battle at Wrightsville ended with the Union army burning the Columbia-Wrightsville Bridge over the Susquehanna River, thus preventing Confederate advancement. Philadelphia's Twentieth Emergency Regiment and First City Troop were among the Union fighters at Wrightsville, and the First City Troop, again, along with Philadelphia's Twenty-Third Infantry Regiment, at the Battle of Hoke's Run in West Virginia (Weigley 1982). Other local soldiers to participate in the war effort included the Philadelphia Brigade, 118th Pennsylvania Infantry and eleven United States African American Troops that were organized in Philadelphia. Two regiments from Upper Darby Township took part in the fighting, and one, the 106th Regime, was involved in the Battle of Antietam (Upper Darby Township 2000). Thousands of Philadelphia's natives lost their lives fighting in the Civil War Battle of Gettysburg in 1863 (Cities of the World-City Data 2008). Throughout the course of the war between 89,000 and 90,000 Philadelphians were documented as enlisted. However, these numbers include re-enlistments and do not include African American soldiers from Philadelphia whose enlistment numbers are not accurately known (Weigley 1982; Gayley 1998).

The primary legacy of the Civil War in Philadelphia was public support of the Republican Party. Unpopular before the war because of their anti-slavery position, the Republican Party gained a great deal of support in Philadelphia, which would lead the creation of a political stronghold that would dominate city politics for nearly one hundred years (Weigley 1982; Avery 1999).

3.2.8 Industrialization Era, Circa 1860-Circa 1940

The 20th century saw a population explosion in Upper Darby and Darby Township. In 1907 the Philadelphia Rapid Transit Company recognized the growth potential in the Township and extended the elevated line to 69th Street and Market Street in Upper Darby Township. This area became a transportation hub; subway and elevated trains from Philadelphia connected with the trolley cars of Delaware County, which served the communities of West Chester, Sharon Hill, Ardmore and Media. After World War I there was considerable residential development in Upper Darby, Drexel Hill, Havertown and Springfield, which continued after World War II in the communities of Westbrook Park, Upper Darby Township and Marple Township (Delaware Co. Courthouse 2008).

At the turn of the 20th century, a third of Delaware County's population lived in Chester, and the waterfront area became a powerful industrial complex, contributing significantly to the needs of the country during both World Wars. On the waterfront were Sun Shipbuilding and Drydock Company, the oil refineries, The Baldwin Locomotive Works, The Ford Motor Company assembly plant, Westinghouse Electric Company, The American Viscose Company, which housed the world's first synthetic fiber plant and Scott Paper. The development of the 69th Street shopping district in the 1920s by John McClatchy made Upper Darby the second busiest shopping area in the region. Only center city Philadelphia surpassed it. The construction of the 69th Street Terminal made the Township a major transportation hub for Philadelphia and the western suburbs (Delaware Co. Courthouse 2008).

The general population of Philadelphia was also prospering at the turn of the century. The City boasted the greatest home ownership rate of any city in the world. During World War I (1914–18), Philadelphia was home to the largest shipbuilding plant in existence at that time. City population doubled from one to two million between 1900 and 1930 and included a large number of African Americans citizens. Immigration to Philadelphia, already heavy before the Civil War (1861–65), continued in the last decades of the century. New arrivals from Italy and Eastern Europe joined the large number of Irish immigrants who had arrived earlier and helped to maintain Philadelphia's position as the nation's manufacturing capital, with a varied manufacturing base that ranged from sugar refining to hat manufacturing. By 1878

Philadelphia had become a pioneer in the establishment of modern utilities, claiming the first residential and professional electric lighting as well as the first telephone exchange. The Great Depression of the 1930s signaled the end of Philadelphia's predominance as a manufacturing center; however, the City's economy rebounded with the onset of World War II, which lasted from 1939–1945 (Cities of the World-City Data 2008).

3.2.9 The Modern Era 1940-Present

Similar to many other major industrial centers, Philadelphia saw its economic prosperity and population growth significantly undermined during the latter half of the 20th century, largely as a result of the decline of its traditional manufacturing base and a general flight to burgeoning suburbs (Federal Reserve Bank of Philadelphia 2008). The suburb of Upper Darby Township in the 1960s is an example of such, as its population grew to the 7th most populous municipality in Pennsylvania, eclipsing Harrisburg, Chester, and Bethlehem. Post 1950, Upper Darby and Darby Township continue to witness population growth as more and more families move out of the city and into the suburbs. Delaware County is now the fourth most populous county in the state even though it has the third smallest land mass. Continued growth is projected for Delaware County's economy as educational institutions, medical facilities and advanced technology, such as the Boeing Vertol V-22, are manufactured in Delaware County (Delaware Co. Courthouse 2008).

The population of the city of Philadelphia peaked at more than two million residents in 1950, and then began to decline. Revitalization and gentrification of Philadelphia's downtown areas began in the 1960s and continues today. Much of the development is focused in the Center City and University City areas of Philadelphia. After many of the old manufacturers and businesses either left Philadelphia or closed, the City's available commercial space began attracting service businesses and subsequently has began to more aggressively market itself as a tourist destination. Historic areas such as Independence National Historical Park located in Old City and Society Hill were resuscitated during the reformist mayoral era of the 1950s-1980s and are now among the most desirable living areas of Center City. This has slowed the City's 40-year population decline after losing nearly one-quarter of its population (Avery 1999; Guttoso 2005).

With the onset of the economic recession, Philadelphia has been fortunate to experience a more shallow recession than the average market around the nation. Its housing market had less overbuilding and thus experienced a shallower downturn in prices. Also a large part of this favorable situation is an industrial structure that favors those industries that have remained afloat during this economic cycle. Philadelphia's many large educational institutions and healthcare providers have provided a buffer for the metropolitan area. Even several of Philadelphia's large financial institutions have weathered the downturn better than many elsewhere. Philadelphia's eventual recovery, however, will be slowed by its very gradual pace of population growth. Steady population, also characterized by higher income households moving out and being replaced by lower income international migrants, does not provide active growth momentum. Additionally, the shallowness of the downturn in Philadelphia will mean less accumulation of demand that can be released upon markets during the recovery process. Overall, Philadelphia's industrial mix does suggest moderate, stable growth with well-paying occupations in the forecast. Philadelphia has successfully navigated its post-industrial transformation and is well positioned for positive growth in the local and global economy (PNC 2010).

4.0 RESEARCH DESIGN

4.1 BACKGROUND RESEARCH METHODS

Background research on the cultural and environmental setting of the project area was conducted to develop both historic and pre-contact contexts from which to locate actual and/or potential site locations within the APE. This background research was conducted employing multiple avenues of research. The Pennsylvania Archaeological Site Survey files were reviewed to identify previously recorded archaeological sites in the vicinity of the APE. Local histories, historic property registers and courthouse records were reviewed in order to identify the major historic trends and themes contributing to the project area's historic development. Historic maps, atlases, and aerial photographs were utilized to reveal land tenure and ownership patterns, and to identify structures and facilities that may once have been present within the APE, but are no longer extant. Local informants were also interviewed to gather information that may have eluded documentation in the historic record.

4.2 FIELD METHODS

Tetra Tech conducted an initial site visit to assess details of the local topography and environment that would have affected the formation and preservation of archaeological sites. The extent of level areas, minor topographic features (e.g., slight rises, depressions, slopes, etc.) that might have influenced land use, modern vegetation patterns, the extent of alluvial and colluvial deposition and erosion, and the presence of other significant environmental and historic features (e.g., rock outcrops, springs, mounds, rock walls, foundations etc.) were noted and photo documented.

5.0 RESULTS

5.1 RESULTS OF BACKGROUND RESEARCH

A search of the Pennsylvania Archaeological Site Survey files revealed no previously recorded cultural resources located in or near the boundaries of the Clearview Landfill. However, in the course of public meetings held for the project, EPA received information in the form of a hand-drawn map that suggested a tunnel possibly related to the transportation of slaves via the Underground Railroad was present near the southern boundary of the landfill property (Figure 5-1). The map also depicted a cemetery near the southern boundary of the landfill property. The map was introduced by Mr. [redacted] of the Sons of the American Revolution (SAR) on behalf of Mrs. [redacted] [redacted] Beginning in the 1970s, Mrs. [redacted] a descendent of Revolutionary War Soldier Joseph Merrion, has been trying to locate the Elliott Family Burial Ground. Mrs. [redacted] believes Joseph Merrion was buried in the Elliott Family Burial Ground and that the graveyard in the map drawn by [redacted] is the Elliott Family Burying Ground.

The map drawn in 1987 by Mr. [redacted] a former resident of the Eastwick neighborhood, shows the location of a graveyard between 83rd and 84th Streets, and between Old Cox's Lane and Darby Creek (Figure 5-1). This map also illustrates a tunnel running from a house on the corner of 84th Street and Chelwynde Avenue to the edge of Darby Creek (Figure 5-1).

Tetra Tech and a representative of EPA met Mrs. [redacted] Mr. [redacted], and Mr. [redacted] on December 9, 2010. As mentioned above, Mr. [redacted] is a member of the SAR, and Mr. [redacted] is a local historian and member of the Sons of Confederate Veterans. During this meeting, Mrs. [redacted] allowed Tetra Tech to review her research files. Mrs. [redacted] also recounted her conversations with local residents regarding the existence of the graveyard. According to Mrs. [redacted], the former residents of the Eastwick neighborhood believed the graveyard was located behind a gas station near the corner of Buist Ave, and 84th Street. A review of the 1962 Land Use Map of Philadelphia shows the location of a Gas Station on Buist Avenue (Figure 5-2). Mrs. [redacted] believes the current location of the Burial Ground to be under the entrance to the Clearview Landfill. It was during her conversations with local residents that the existence of the tunnel for hiding runaway slaves was also brought to light.

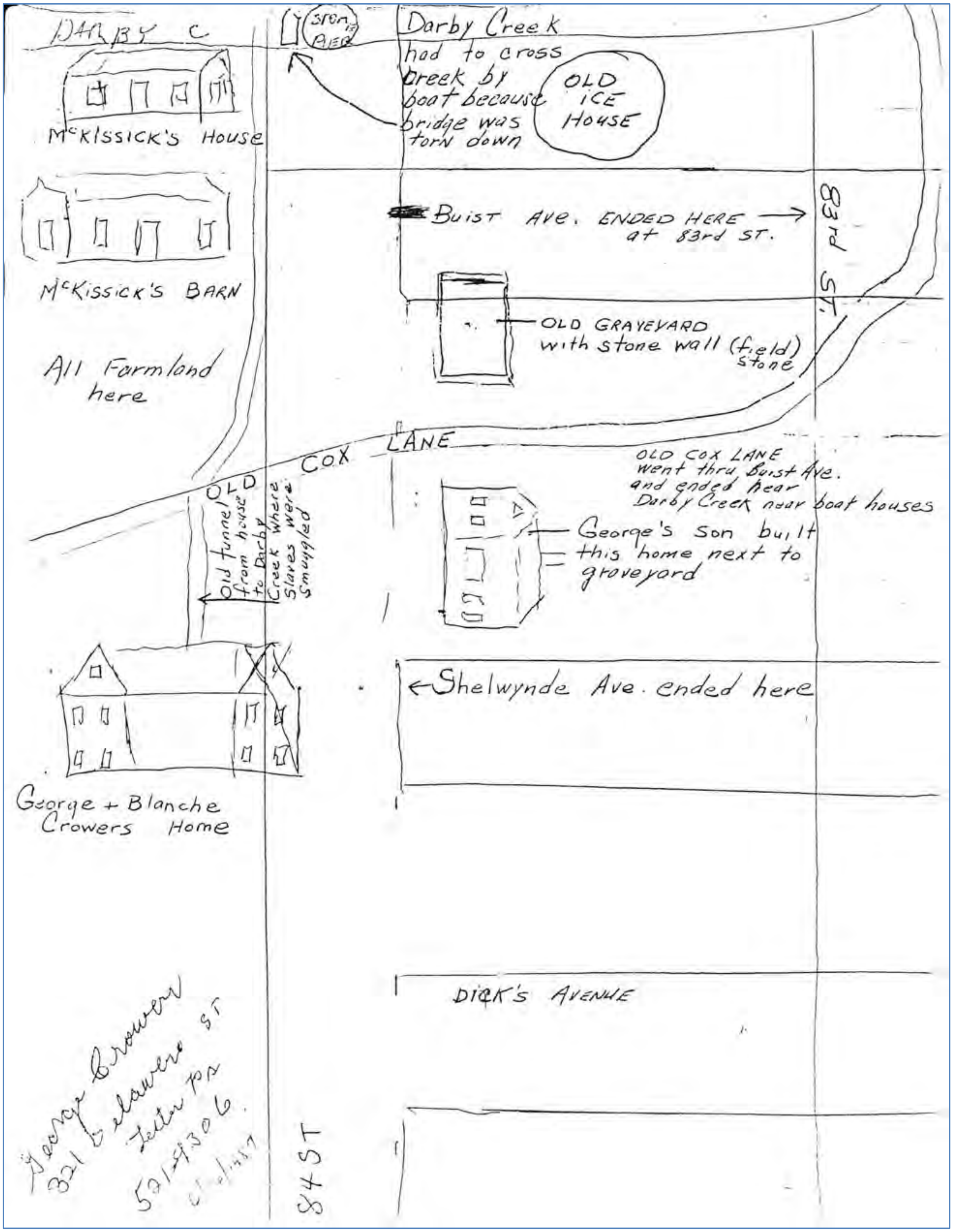

Figure 5-1. Hand-Drawn Map showing Locations of Burial Ground and Slave Tunnel

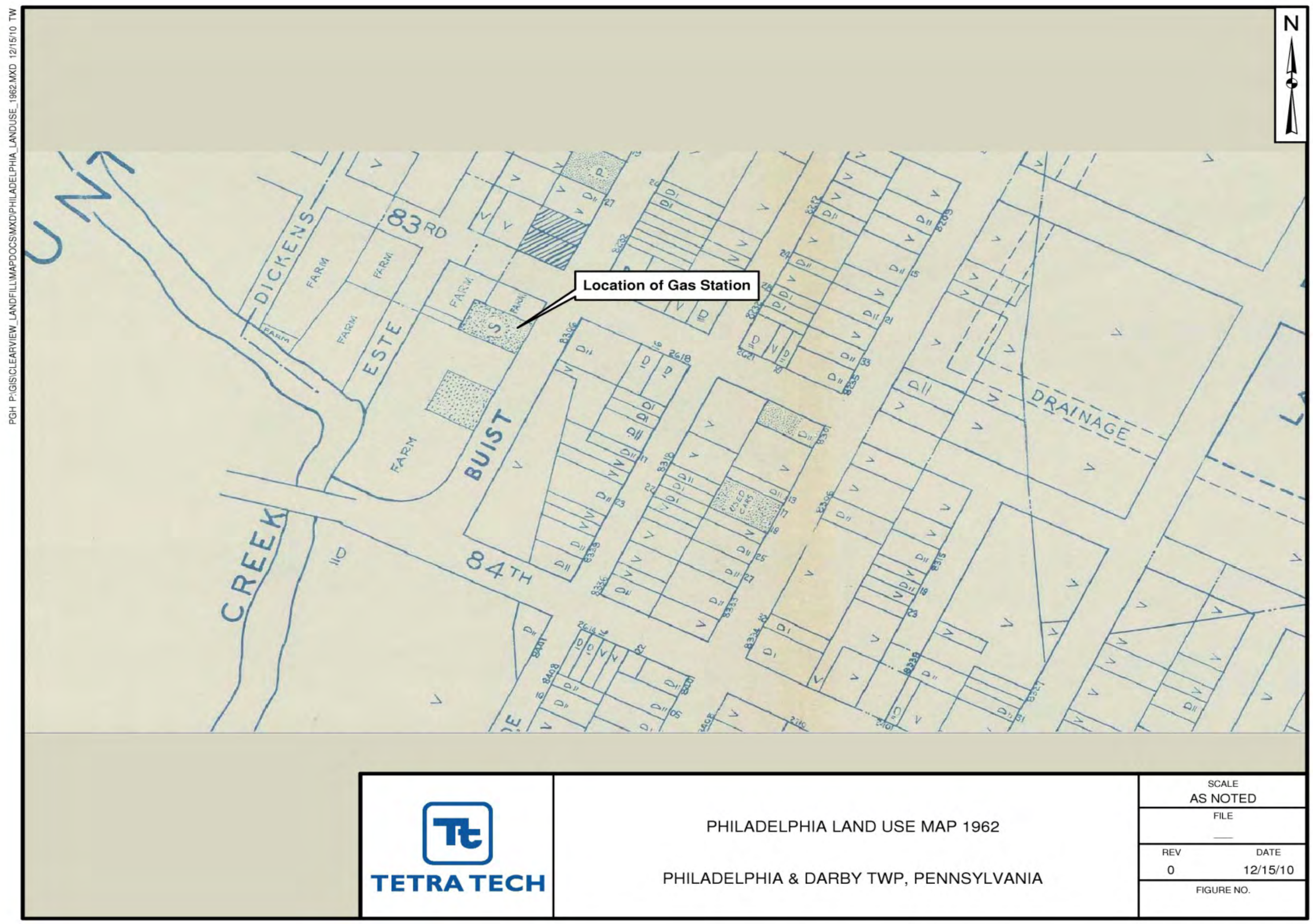

Figure 5-2. 1962 Land Use Map of Philadelphia showing Location of Gas Station on Buist Avenue (Philadelphia 1962)

5.1.1 Genealogical Research

On February 20, 1763, Christopher Elliott married Ruth Merrion, the sister of Joseph Merrion and ancestor of Mrs.[redacted] In 1787, Christopher Elliott died and in his will requested that funds from his estate be used to build a stone wall around the family burial ground (Elliott 1787). It is also stated in this will that his father, Enoch Elliott, and his uncle, Peter Elliott, had also willed funds for the construction of a stone wall for the Family Burial Ground. Upon his death in 1803, Joseph Merrion requested in his will to be buried in the Elliotts Burying Ground in Kingsessing. It is not known exactly where each member of the Elliott family was living at the end of the 18th century, but a map from 1808 (Hills 1808) showing the city of Philadelphia and its surroundings list Elliotts as the landholders of a series of parcels along Darby and Cobbs Creeks including the area where 84th Street presently crosses Darby Creek (Figure 5-3). There is nothing marking the location for a Burying Ground on this map. The Federal Census from 1790 and 1800 list both Christopher's son Isaac and his brother Benjamin as residents of Darby Township, but the location of their residences are not specified (Darby 1790; 1800).

5.1.2 Review of Historic Maps, Aerial Photographs and City Records

The "Hills" map of 1808 is currently the only map that places the Elliotts living in the vicinity of the APE. On maps throughout the rest of the century, landowners listed in or near the APE include J. Cox and members of the Hoffman and Maloney families (See Appendix A for list of Historic Maps). The "Baist" map published in 1886, depicting the 24th and 27th Wards of Philadelphia, shows a framed structure near the intersection of Buist Avenue and 84th Street (Figure 5-5). The same authors show a stone or brick framed structure at this same location in the 1888 Atlas of the City of Philadelphia (Figure 5-4) but subsequent maps from 1889 and 1895 by Baist show nothing at this location.

The 1910 Atlas of the City of Philadelphia (Bromley and Bromley) is marked with the word "GRAVE" at the intersection of Buist Avenue and 84th Street (Figure 5-6). While the street grid is shown in place in the map, Buist Avenue had yet to be constructed between 83rd and 84th Streets in 1910. The graveyard appears again in 1914 when the city of Philadelphia surveyed 84th Street between Chelwynde Avenue and Darby Creek (Figure 5-7). This survey map marks a square graveyard slightly less than 250 square feet in size at what was planned to be the corner of 84th Street and Buist Avenue. In 1916 Bromely's Atlas of West Philadelphia shows the grave marker at 84th Street and Buist Avenue.

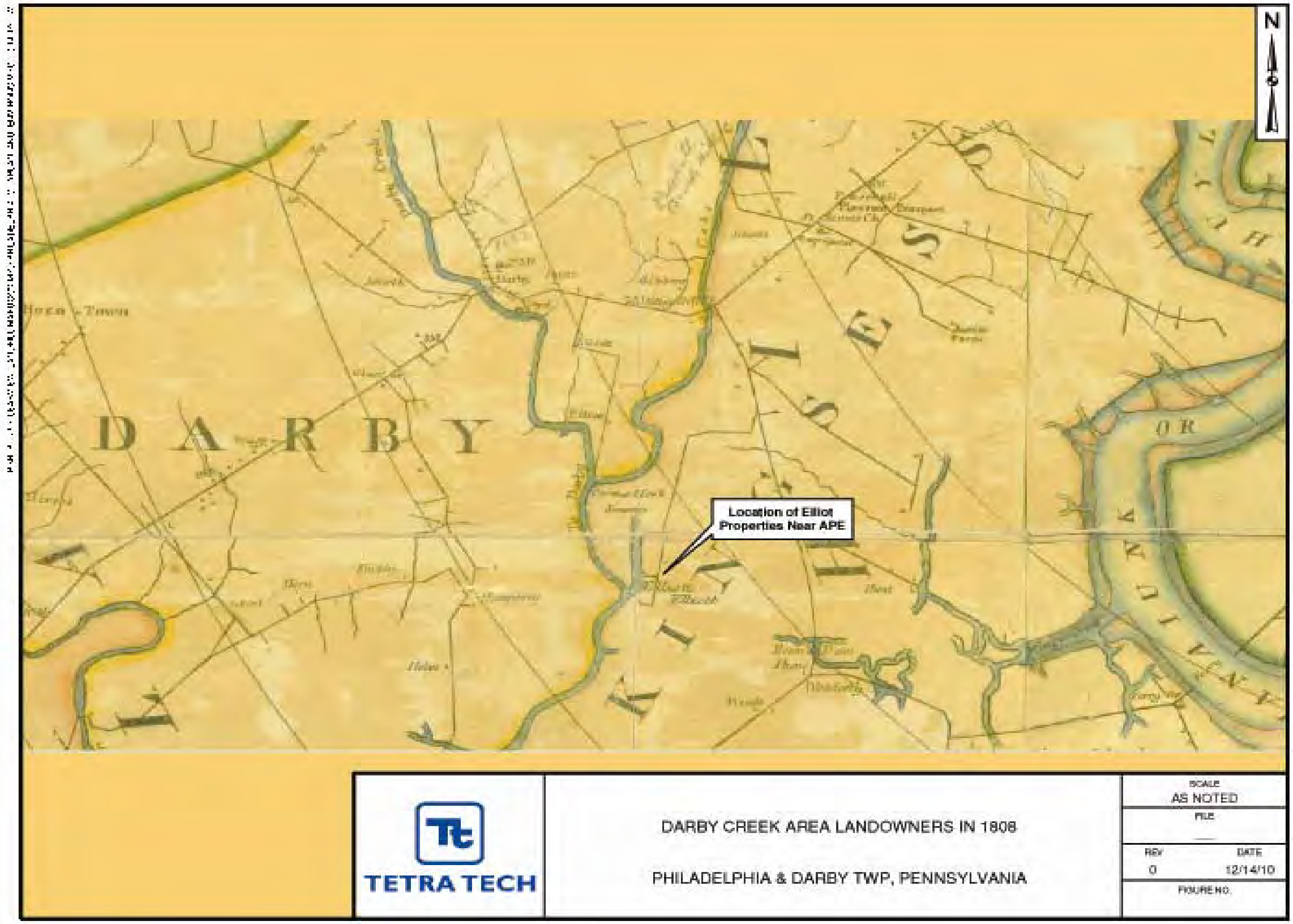

Figure 5-3. Darby Creek Area Landowners showing Elliott Family Properties (Hills 1808)

Figure 5-4. Location of Structures around Intersection of 84th Street and Buist Avenue (Baist 1886)

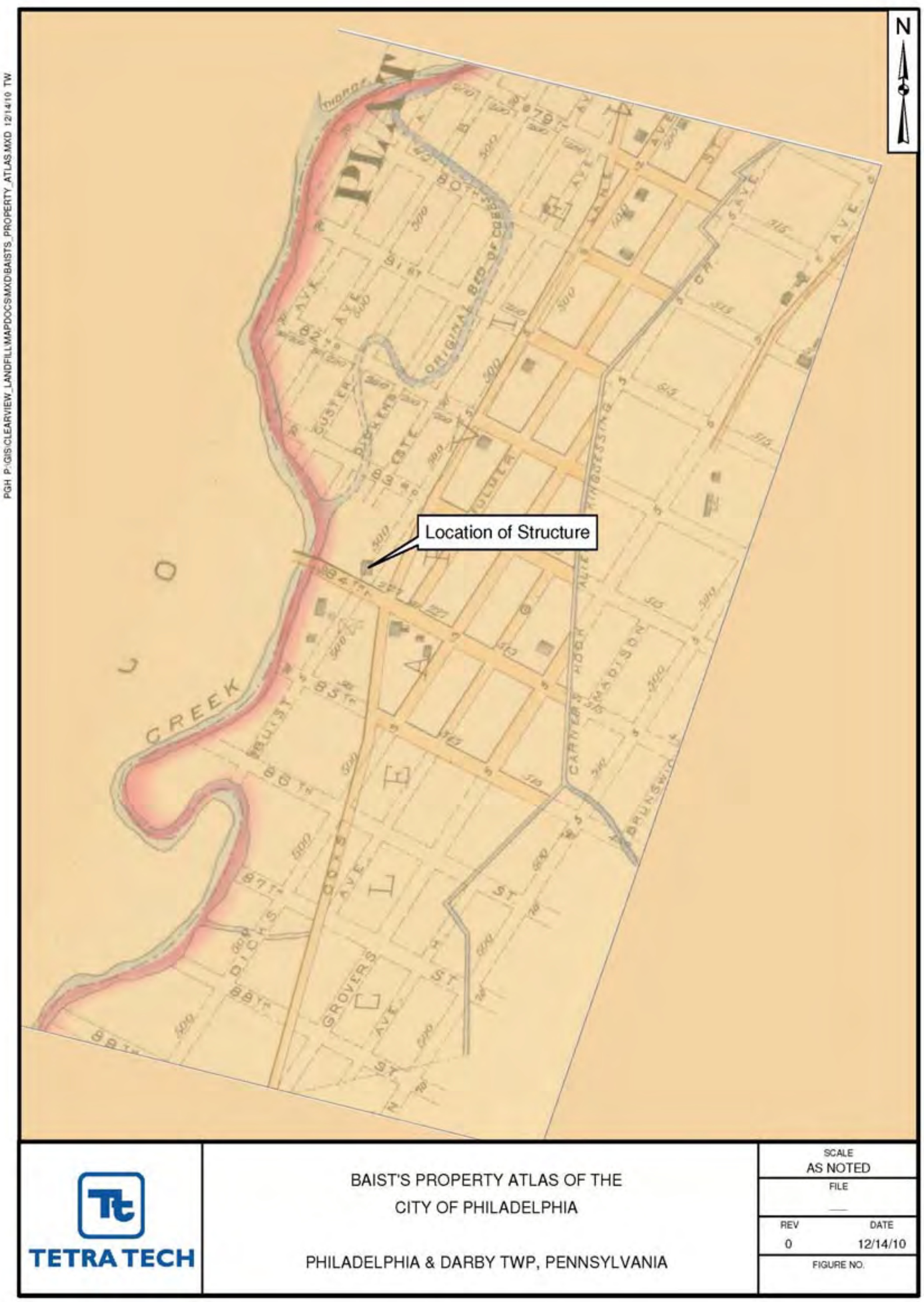

Figure 5-5. Map showing Brick or Stone Structure at Intersection of 84th Street and Buist Avenue (Baist 1888)

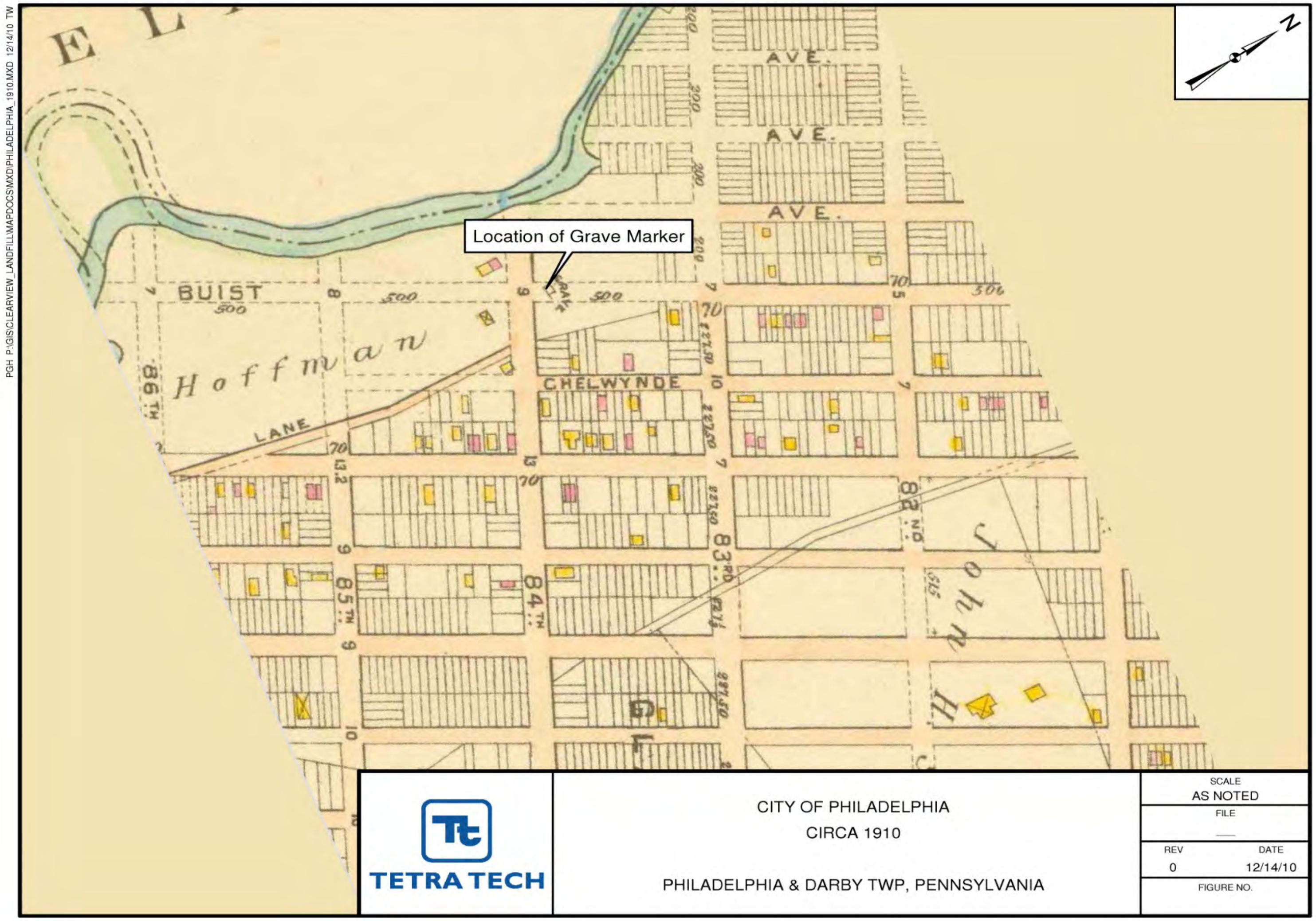

Figure 5-6. 1910 Survey Map of Philadelphia showing Location of Grave Marker at 84th Street and Buist Avenue (Bromley and Bromley 1910)

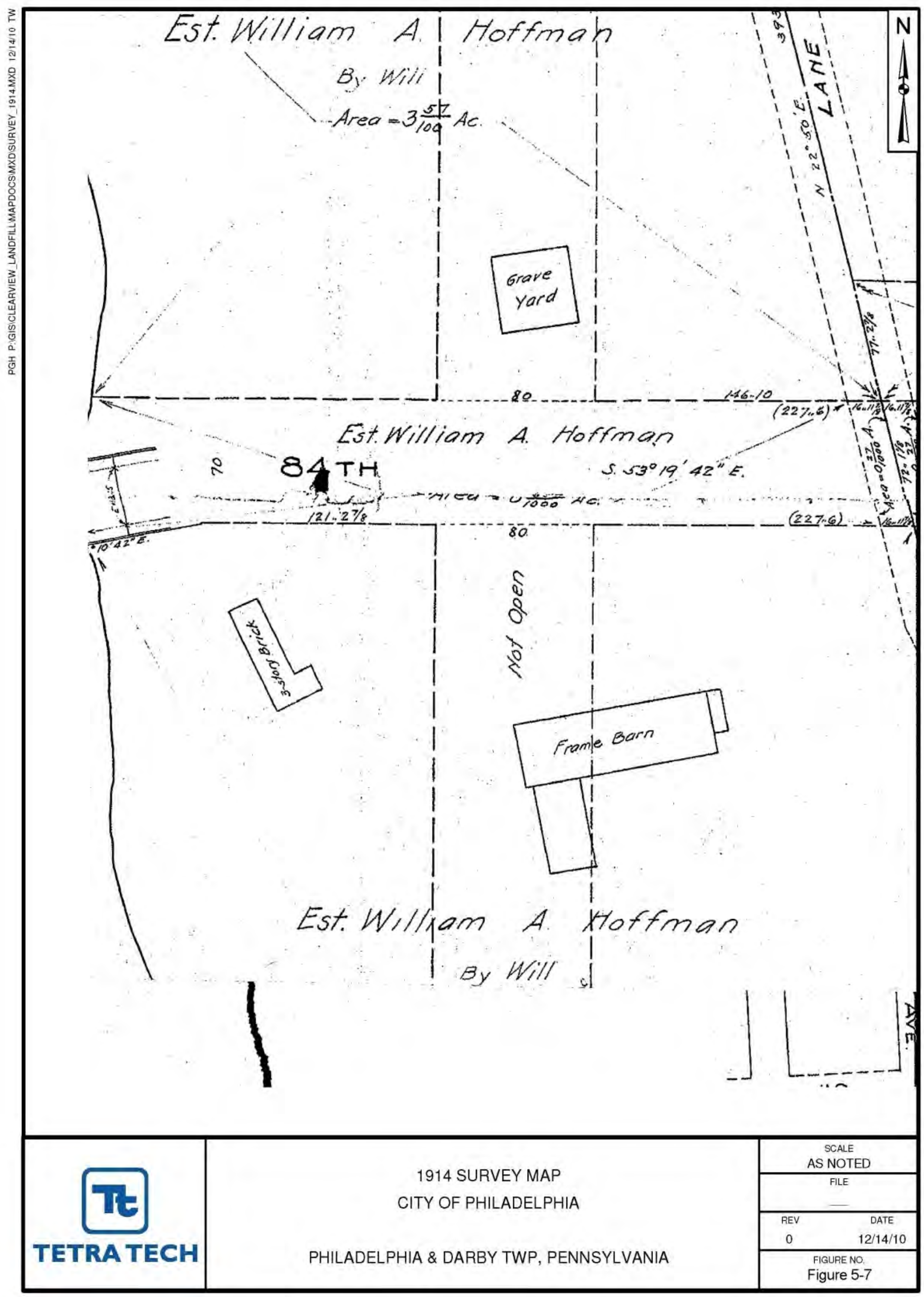

Figure 5-7. Graveyard mapped at 84th Street and Buist Avenue from 1914 (Philadelphia)

On February 18, 1927, a deed of dedication was signed by members of the Hoffman family to the city of Philadelphia giving the City ownership of an 80-foot wide stretch of land between 83rd Street and 84th Street for the extension of Buist Avenue (See Appendix B). It is within this stretch of roadway that the graveyard was surveyed by the City in 1914 (Figure 5-7). The deed of dedication does not contain any mention of a family burial ground. A 1928 aerial image (Regional Planning Federation 1928) of the area shows that Buist Avenue between 83rd and 84th Streets has not yet been constructed (Figure 5-8). The image is not clear enough to determine the presence or absence of a cemetery at 84th Street and Buist Avenue. In the 1930 aerial image (Dallin Aerial Survey 1930) it can be clearly seen that Buist Avenue has been constructed directly through the area marked on the 1910 and 1916 Bromley maps and the 1914 survey map as containing a graveyard (Figure 5-9).

Charles R. Barker compiled a handwritten manuscript documenting the cemeteries of Philadelphia. Self-published in 1943, Barker recorded his visit to the Elliott Family Burial Ground at 84th Street and Buist Avenue.

"This ground was finally obliterated in 1928 (On October 9, 1928, I made a journey to the site and found only some hatches of long grass, but was told by a nearby resident that the ground had never contained any tombstones – CRB)" (Barker 1943).

A search for records pertaining to street construction undertaken at the city of Philadelphia's Planning Commission, the Philadelphia Redevelopment Authority, and the city of Philadelphia's Streets Department found no records documenting the type or level of disturbance created from the construction of Buist Avenue between 83rd and 84th Streets.

The best record of disturbances pertaining to the location of the graveyard is a series of aerial photos taken between 1953 and 1983 (Figures 5-10 to 5-17). These eight photographs taken at varying increments of time show the growth of the Clearview Landfill and the Eastwick neighborhood. By 1973 an access road had been constructed from the corner of Buist Avenue and 84th Street leading northwest into the Landfill area (Figure 5-15). By this time the city of Philadelphia had vacated Buist Avenue between 83rd and 84th Streets by creating a cul de sac at the end of Buist Avenue just south of 83rd Street. The series of aerial photographs show a large amount of disturbance in the area between Buist Avenue and Darby Creek, including large areas marked as graded and filled. These aerial photos, along with the City street plan of 1970, show that the alignment of 84th Street was altered and widened to a degree that it sits closer to the location of the graveyard as mapped in 1910 and 1914 (Figure 5-18).

No records were found that documented the excavation or reinterment of a cemetery from the area around Buist Avenue and 84th Street. The cemetery is neither listed on the National Register of Historic

Places nor on the Pennsylvania Register of Historic Places. The Philadelphia Board of Health has no records associated with the Elliott Burial Ground or of a cemetery at 84th Street and Buist Avenue. The Cemetery Trust Dockets were searched at the Philadelphia Orphans Court, and a file has been recorded for the Estate of Mary R. Elliott; however, this file could not be located to determine its potential association with the Elliott Family Burial Ground. No other records matched the names of any of the families listed as landowners of the property after the Elliotts.

Figure 5-8. 1928 Aerial Photograph of Clearview Landfill Area before Construction of Buist Avenue between 83rd and 84th Street (Regional Planning Federation 1928)

Figure 5-9. 1930 Aerial Photograph of Clearview Landfill Area after Construction of Buist Avenue between 83rd and 84th Streets (Dallin Aerial Survey 1930)

Figure 5-10. Aerial Photograph of Clearview Landfill from March 11, 1953

Figure 5-11. Aerial Photograph of Clearview Landfill from June 7, 1958

Figure 5-12. Aerial Photograph of Clearview Landfill from May 19, 1964

Figure 5-13. Aerial Photograph of Clearview Landfill from April 1, 1965

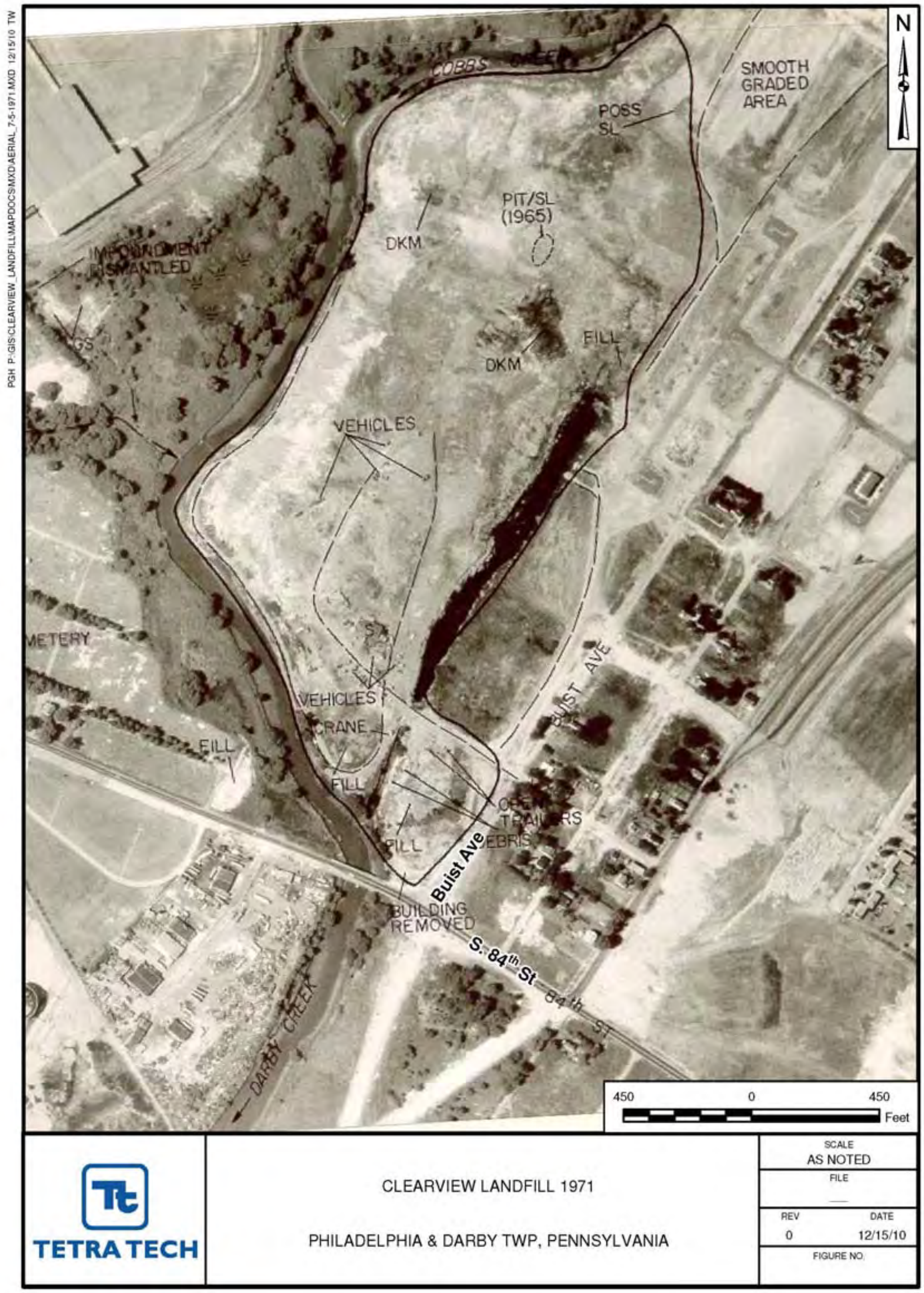

Figure 5-14. Aerial Photograph of Clearview Landfill from July 5, 1971 after Removal of Structures South of 84th Street

Figure 5-15. Aerial Photograph of Clearview Landfill from March13, 1973

Figure 5-16. Aerial Photograph of Clearview Landfill from March 28, 1975 showing 84th Street Rerouted over Potential Location of Tunnel

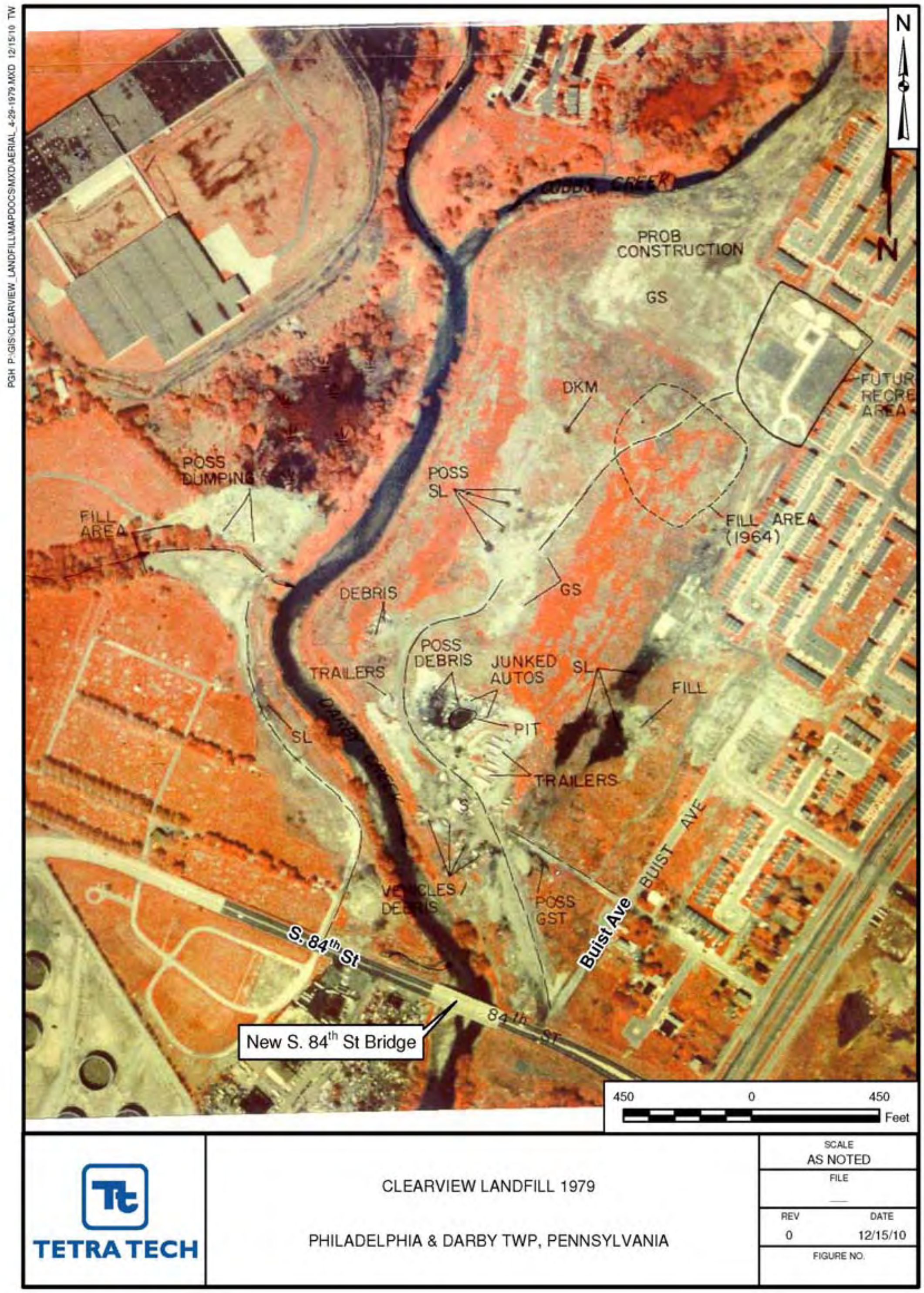

Figure 5-17. Aerial Photograph of Clearview Landfill from April 29, 1979 with Present Day Alignment of 84th Street

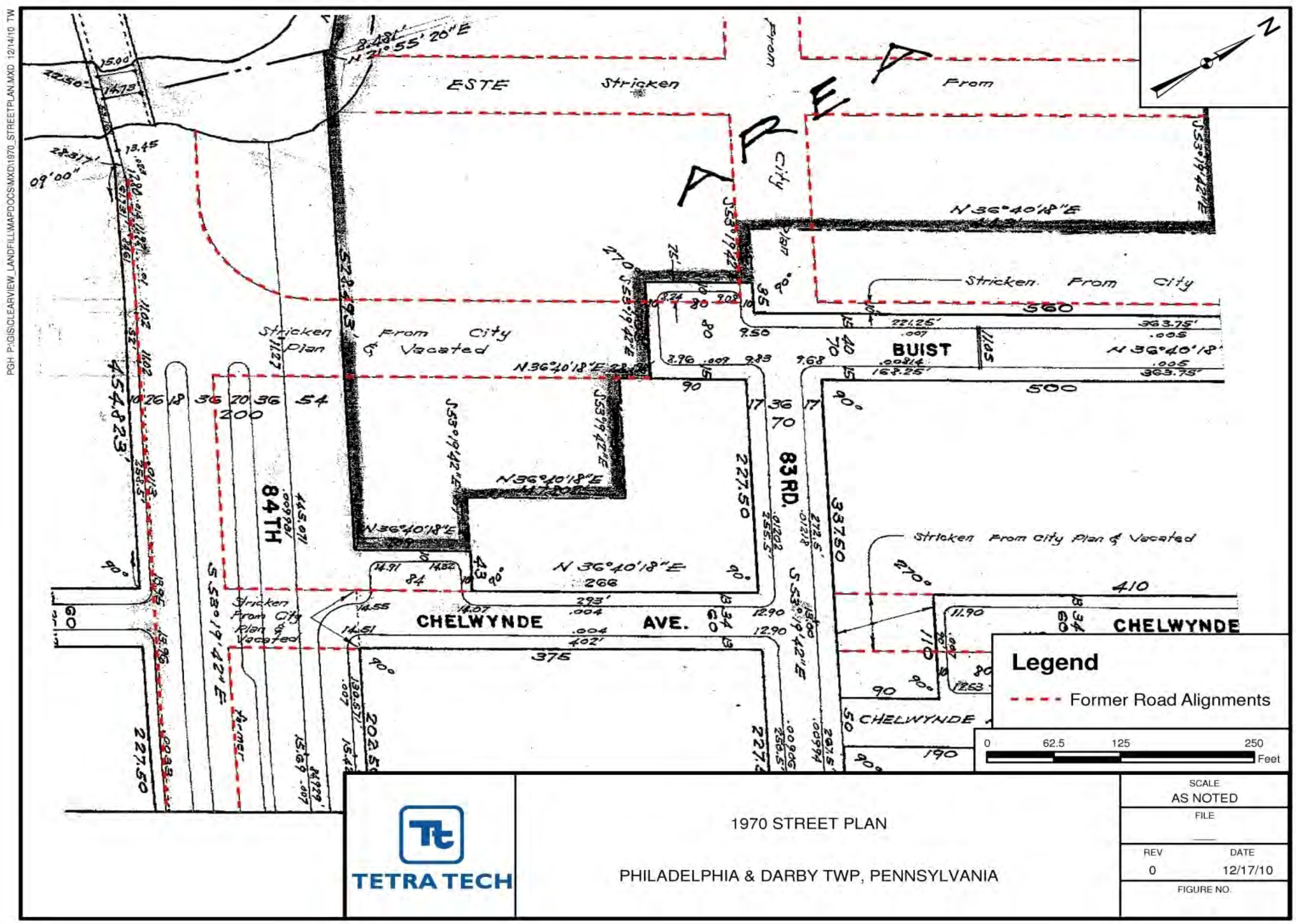

Figure 5-18. 1970 Survey Map of Proposed Improvements to 84th Street and Surrounding Roads (McPhillips 1970)

5.1.3 Slave Tunnel

By nature of its intended use, the tunnel leading from the house located on the corner of Chelwynde Avenue and 84th Street to Darby Creek was not expected to be found on any historic maps. The only lines of evidence that have been found regarding this tunnel are from the map drawn by [redacted], and from conversations [redacted] had with former residents of the Eastwick neighborhood during her search for the Elliott Burial Ground. While the location of structures on the hand-drawn map can be verified with aerial photographs and historic mapping, no further evidence has been found regarding the tunnel location. Aerial photography shows the destruction of the building on 84th Street and Chelwynde Avenue to have occurred at some point before 1970 (Figure 5-14). 84th Street was also rerouted over the area of the tunnel during bridge reconstruction in the 1970s Figure 5-16). The city plan from 1970 also shows the alteration and widening of 84th Street away from where a portion of the slave tunnel was drawn on the map in Figure 5-1 (Figure 5-18).

5.2 RESULTS OF FIELD RECONAISSANCE

Tetra Tech visited the location of the Elliott Burial Ground and the purported Slave Tunnel on December 9, 2010. The APE between 83rd and 84th Streets is generally overgrown with small trees and light underbrush (Photo 5-1). The concrete road surface of the abandoned portion of Buist Avenue can still be seen running the entire distance between 83rd and 84th Streets, and is partially covered by grass, small undergrowth, fallen leaves and debris (Photo 5-2). Small piles of concrete rubble and building materials can be found near the present terminus of Buist Avenue (Photo 5-3). 84th Street has been elevated approximately 3 feet above the level of the abandoned portion of Buist Avenue (Photo 5-4). There was no evidence of any surface features that would indicate the presence of a cemetery or any other cultural resources in this area.

The APE south of 84th Street initially slopes southward from 84th Street because of the construction of the road berm (Photo 5-5). The APE is generally a rolling field with young trees, tall grasses, and underbrush (Photo 5-6). There were no surface features present to indicate the presence of the former structures once present within this portion of the APE, and no evidence of a tunnel could be found along the banks of Darby Creek. The construction of a storm water drainage system now sits in the area where the hand-drawn map indicates the tunnel meets Darby Creek (Photo 5-7).

Photograph 5-1. Facing northeast from 84th Street toward Buist Avenue

Photograph 5-2. Facing north showing overgrown portion of Old Buist Avenue between 83rd and 84th Streets

Photograph 5-3. Facing northeast showing rubble piles near Buist Avenue cul de sac

Photograph 5-4. Facing east showing slope from rod berm along 84th Street

Photograph 5-5. Facing east showing APE south of 84th Street

Photograph 5-6. Facing west showing overview of APE South of 84th Street

Photograph 5-7. Facing north showing drainage culvert along Darby Creek

5.3 SUMMARY AND CONCLUSIONS

Background research identified two historic resources near the southern boundary of the Clearview Landfill. Evidence for the existence of a tunnel for the transportation of slaves, and a graveyard that dated to the 18th century came in the form of a hand-drawn map presented to EPA in the course of public meetings associated with the project (Figure 5-1).

5.3.1 Slave Tunnel

The APE for the proposed monitoring wells is located just east of Darby Creek on a 0.6-acre (0.24 hectare) tract bordering the south side of 84th Street (Figure 1-2). The potential location of the tunnel as depicted on the map drawn by [redacted] (Figure 5-1) intersects the APE. By nature of its intended use, the tunnel leading from the house located on the corner of Chelwynde Avenue along 84th Street to Darby Creek was not found on any published historic map. Lines of evidence regarding this tunnel stem from the map drawn by [redacted] (Figure 5-1), and from conversations [redacted] had with former residents of the Eastwick neighborhood during her search for the Elliott family graveyard. While the location of structures on the hand-drawn map can be verified using aerial photographs and historic maps, no further evidence has been found regarding the tunnel location. Darby Township was a center of Underground Railroad activity, but aerial photographs show the destruction of the structure on 84th Street and Chelwynde Avenue to have occurred at some point before 1970 (Figure 5-14). 84th Street was also rerouted over the area of the tunnel during bridge reconstruction in the 1970s (Figure 5-16). The city plan from 1970 shows that the widening of 84th Street disturbed the area where a segment of the slave tunnel was depicted on the hand-drawn map (Figure 5-18). A drainage culvert was also added that would have further disturbed the potential tunnel location (Photograph 5-7).

Based on the evidence gathered, activities related to the widening of 84th Street and the replacement of the bridge over Darby Creek have disturbed the potential location of the tunnel. As such, installation of the proposed monitoring wells would have no effect on any archaeological sites or historic resources. As a precaution, it is recommended that the well-pair be installed 50 feet (15 meters) south of the existing road edge.

5.3.2 Elliott's Graveyard

Cross sections of the landfill deposits constructed from monitoring wells indicate that significant disturbance from past grading and filling activities have eliminated the potential for the preservation of cultural deposits over much of the area identified as the historic footprint of the landfill (Figures 1-3 to 1-10). As a result of these activities, the area of potential effect (APE) for buried cultural deposits has been effectively reduced to 3.7 acres (3.1 hectares) at the southern end of the historic footprint (Figure 1-2).

The location of Elliott's graveyard has been traced via published maps to the abandoned portion of Buist Avenue near its intersection with 84th Street. This area lies near the periphery of the APE. In the 1930 aerial image (Dallin Aerial Survey 1930) it can be clearly seen that construction of Buist Avenue has disturbed the area marked on the 1910 and 1916 Bromley maps, and the 1914 survey map as containing the graveyard (Figure 5-7). Using data from published historic maps and overlaying the position of the graveyard on current mapping confirms that Elliott's graveyard lies under the abandoned portion of Buist Avenue near its intersection with 84th Street (Figure 5-19, 5-20).

To date no remedial activity has been proposed by EPA in this portion of the APE. EPA acknowledges that future remedial action may occur in this area, and that these actions may require additional archaeological investigation.

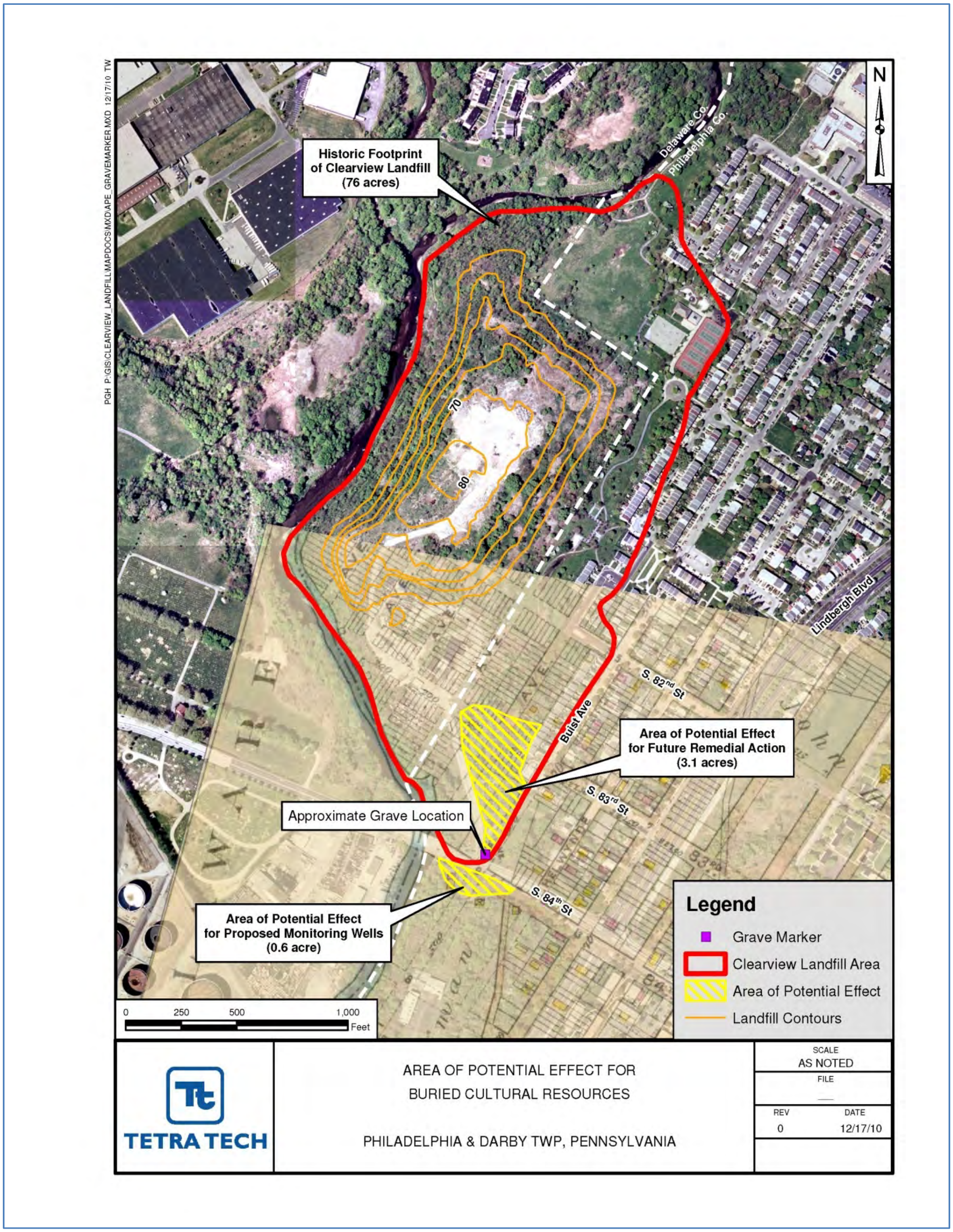

Figure 5-19. Bromley and Bromley 1910 overlaid on 2002 Aerial Photograph

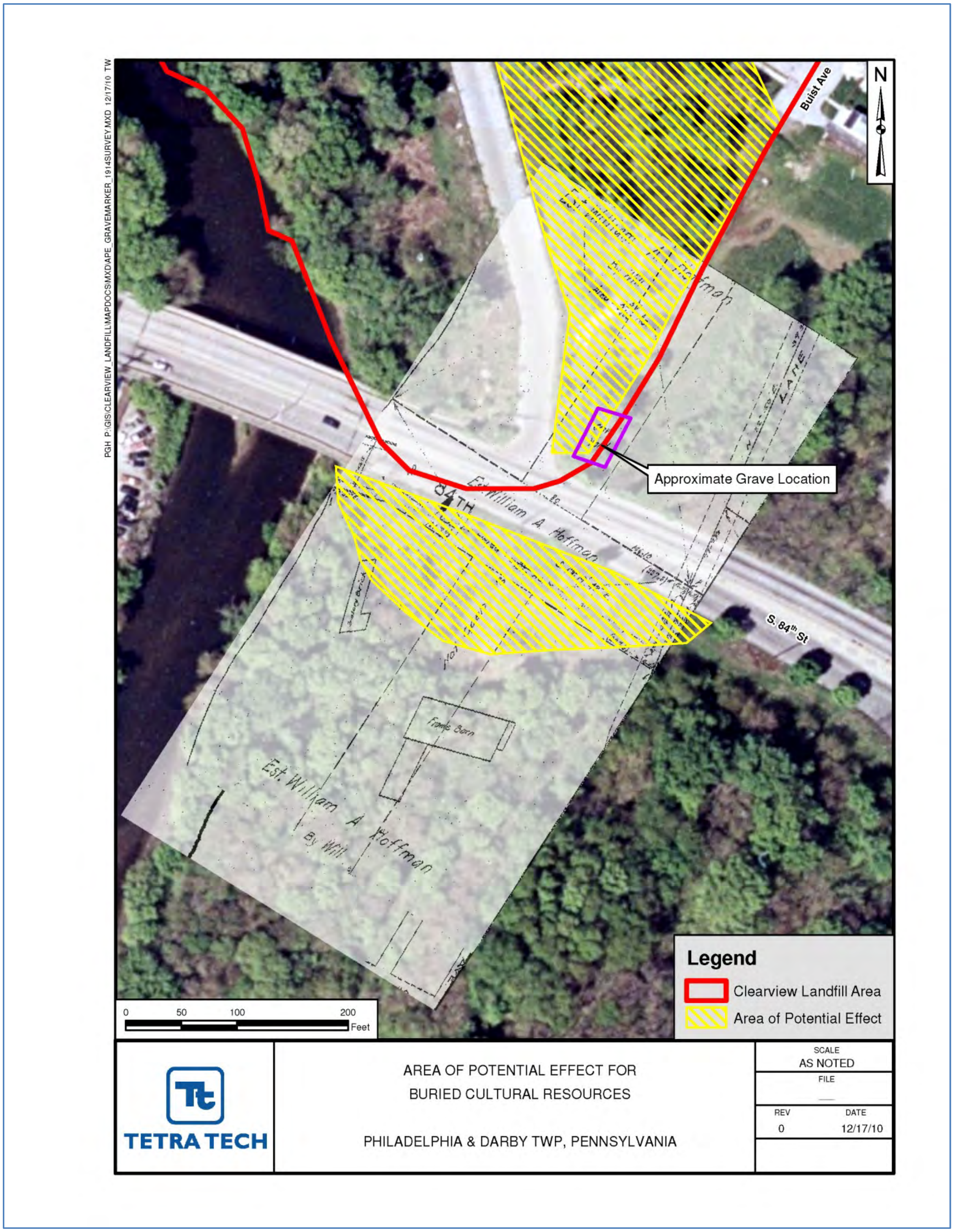

Figure 5-20. City of Philadelphia Surveyed Plan 1914 over 2002 Aerial Photograph

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APPENDIX A

List of Maps

Maps listed in Chronological Order

1752 A Map of Philadelphia and Parts Adjacent. With a Perspective view of the State House. By N. Scull and G. Heap

1808 A Plan of the City of Philadelphia and Environs. Surveyed by John Hills. Self-Published. http://www.philageohistory.org/rdic-images/view-image.cfm/HSF.D2G1.A

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1862 Mp of the Early Settlements of Delaware County, Pennsylvania. From George Smith's *History of Delaware County*. Published by Henry P. Ashnead.

1862 A Complete Atlas of the City of Philadelphia, Section 9. By Samuel L. Smedley. Published by J.B.Lippincott & Co. Philadelphia, PA.
http://www.philageohistory.org/rdic-images/view-image.cfm/SMD1860.Phila.014.Section09

1865 Barnes Map of the Whole Incorporated City of Philadelphia From Actual Surveys and Official Records by Ernest Hexamer. Published by R.L. Barnes. Philadelphia.
http://www.philageohistory.org/rdic-images/view-image.cfm/RLB1865.Phila.007.Stitched

1867 Barnes Map of the Whole Incorporated City of Philadelphia From Actual Surveys and Official Records by Ernest Hexamer, Plate 3. Published by R.L. Barnes. Philadelphia.
http://www.philageohistory.org/rdic-images/view-image.cfm/RLB1867.Phila.004.Plate3

1872 Atlas of West Philadelphia including the 24th and 27th Wards of the City of Philadelphia. G.M. Hopkins & Co. Philadelphia.

1876 Map of Philadelphia. From Official Records, Private Plans, and Actual Surveys. Based upon Plans Deposited in the Department of Surveys. Surveyed and Published by G.M. Hopkins. Philadelphia.
http://www.philageohistory.org/rdic-images/view-image.cfm/GMH1876.Phila.005.Stitched

1877 Atlas of Philadelphia and Environs. Surveyed and Published by G.M. Hopkins. Philadelphia.
http://www.philageohistory.org/rdic-images/view-image.cfm/GMH1877.PhilaEnvirons.015.Pages22-23

1878 Atlas of the 24th and 27th Wards, West Philadelphia. Surveyed and Published under the Direction of J.B. Scott. Philadelphia.
http://www.philageohistory.org/rdic-images/view-image.cfm/SCT1878.PhilaWards24_27.031.Plate_5

1882 Map of the Township of Darby Showing Early Grants and Patents

1886 Atlas of West Philadelphia 24th and 27th Wards. Plate 32. By William G. Baist. Published by J.L. Smith. Philadelphia.
http://www.philageohistory.org/rdic-images/view-image.cfm/BST1886.WPhila.036.Plate32

1888 Baist's Atlas of the City of Philadelphia, Pennsylvania, Complete in One Volume, Plate 3. Compiled and Published by G. William Baist. Philadelphia.
http://www.philageohistory.org/rdic-images/view-image.cfm/BST1888.Phila.010.Plate03

1889 Baist's Map of Philadelphia and Environs. Compiled and Published by G. William Baist. Philadelphia.
http://www.philageohistory.org/rdic-images/view-image.cfm/BST1889.PhilaEnvirons.006.Stitched

1892 Atlas of the City of Philadelphia by Wards. Ward 27. Published by J.E. Schiedt, Draughtsman.
http://www.philageohistory.org/rdic-images/view-image.cfm/JES1892.Phila.027.Ward_27

1895 Baist's Property Atlas of the City and County of Philadelphia Pennsylvania, Complete in One Volume. Plan 13. Compiled and Published by G. William Baist. Philadelphia.
http://www.philageohistory.org/rdic-images/view-image.cfm/BST1895.Phila.015.Plan13

1895 Atlas of the City of Philadelphia Complete in One Volume. Plate 26. By George w. and Walter S. Bromley. Published by G.W. Bromley and Co. Philadelphia.
http://www.philageohistory.org/rdic-images/view-image.cfm/bromley1895-plate26

1897 Baist's Map Showing the Development of the City and Suburbs of Philadelphia, Plate 4. Author and Published by G. William Baist. Philadelphia.
http://www.philageohistory.org/rdic-images/view-image.cfm/BST1897.Phila_Suburbs.004.Plate4

1901 Atlas of the City of Philadelphia Complete in One Volume. Plate 26. By George w. and Walter S. Bromley. Published by G.W. Bromley and Co. Philadelphia.
http://www.philageohistory.org/rdic-images/view-image.cfm/BRM1901.Phila.030.Plate26

1910 Atlas of the 40th Ward of the City of Philadelphia, Plate 25. Compiled and Published by Elvino V. Smith, Philadelphia.
http://www.philageohistory.org/rdic-images/view-image.cfm/EVS1910.PhilaWard40.029.Plate_25

1910 Atlas of the City of Philadelphia Complete in One Volume. Plate 26. By George w. and Walter S. Bromley. Published by G.W. Bromley and Co. Philadelphia.
http://www.philageohistory.org/rdic-images/view-image.cfm/BRM1910.Phila.028.Plate26

1913 The City of Philadelphia. Published by J.L. Smith. Philadelphia.
http://www.philageohistory.org/rdic-images/view-image.cfm/JLS1913.PhilaRevised.009.Stitched

1914 Plan of Eighty Forth St from Chelwynde Ave to Darby Creek. Fortieth Ward, Philadelphia. City of Philadelphia Streets Department.

1916 Atlas of Philadelphia: West Philadelphia, Plate 26 Published by G.W. Bromley. Philadelphia http://www.philageohistory.org/rdic-images/view-image.cfm/BRM1916.WestPhila.010.Plate_26

1919 Insurance Map and Real Estate Atlas, Delaware County Pennsylvania Volume 1, Plate 73. Sanborn Map Company, New York, New York.

1927 Insurance Map of Philadelphia Pennsylvania Volume 25, Plates 2428, 2437, 2438 and, 2445. Sanborn Map Co. New York, New York.

1927 Atlas of the City of Philadelphia, Wards 24, 2, 34, 40, 44, and 46. West Philadelphia, Plate 39. By George W. and Walter S. Bromley. Published by G.W. Bromley and Co. Philadelphia. http://www.philageohistory.org/rdic-images/view-image.cfm/BRM1927.WestPhila.042.Plate_39

1942 Land Use Map of Philadelphia, Plate 1-4. Plans and Registry, Division Bureau of Engineering, Surveys and Zoning, Department of Public Works. http://www.philageohistory.org/rdic-images/view-image.cfm/LUM1942.1-4

1962 Land Use Map of Philadelphia, Plate 1-4. Plans and Registry, Division Bureau of Engineering, Surveys and Zoning, Department of Public Works. http://www.philageohistory.org/rdic-images/view-image.cfm/LUM1962.1-4

1970 Plan Revising Line and Grades on a Portion of City Plan No. 293. 40th Ward, Philadelphia. By James W. McPhillips, Chief Engineer and Surveyor. City of Philadelphia Streets Department.

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APPENDIX B

Deed of Dedication

7th District Filed 3.3.1927

702343

Deed of Dedication

SELLERS HOFFMAN ET UX ET AL.

TO

The City of Philadelphia

for portion of bed of Buist Ave. (80' wide) between 83rd Street and 84th Street.

in the Fortieth Ward.

Approved as to form

Assistant City Solicitor.

P. GAFFNEY
City Solicitor

Per

Asst. City Solicitor.

Approved by Board of Surveyors

March 7 1927

Chief Engineer and Surveyor.

MAR 25 1927

Recorded in the office for Recording of Deeds in and for the City and County of Philadelphia in Deed Book
No. 2629 page 123 &c.

Witness my hand and Seal of Office this TWENTY FIFTH
day of Anno Domini 1927

JAMES M. HAZLETT,
Recorder of Deeds,

Deputy Recorder.

Form 114

This Indenture, MADE the Eighteenth day of February in the year of our Lord one thousand nine hundred and twenty seven (19 27) **Between** SELLERS HOFFMAN and KATHARINE T., his wife, WILLIAM A. HOFFMAN and MARY A. his wife, and KATHERINE HOFFMAN STINSON, widow,

of the first part (grantors), and THE CITY OF PHILADELPHIA of the second part (grantee).

Witnesseth, That the said grantors,

for and in consideration as well of the advantage to them accruing as for divers other considerations affecting the public welfare which they seek to advance have granted bargained sold aliened enfeoffed released and confirmed and by these presents do grant bargain sell alien enfeoff release and confirm unto the said THE CITY OF PHILADELPHIA, its successors and assigns, All that certain lot or piece of ground situate in the Fortieth ward of the City of Philadelphia, BEGINNING at a point, the intersection of the southeast side of Buist avenue (80 feet wide) and the former Northeast side of Eighty fourth street (70 feet wide) thence extending Northeastward along the southeast side of Buist avenue three hundred and eighty one feet nine and five eighths inches to a point, thence extending North fifty three degrees 27 minutes West eighty feet to a point, in the Northwest side of Buist avenue, thence extending southwest along the Northwest side of Buist avenue Two hundred and eighty one feet seven and five eighths inches to a point; thence extending Northwestward on a curved line bearing to the right with a radius of One hundred feet, the distance of One hundred and fifty seven feet one inch to a point in the Northeast side of Eighty fourth street; thence extending southeastward along the Northeast side of said 84th street, 180 feet to a point in the southeast side of Buist avenue and place of beginning. BEING a portion of the bed of Buist avenue (80' wide) between 83rd and 84th street.

To have and to hold the said lot or piece of ground above described unto the said THE CITY OF PHILADELPHIA, its successors and assigns to and for the only proper use and behoof of the said THE CITY OF PHILADELPHIA, its successors and assigns forever as and for a public street or highway and for no other use or purpose whatsoever and to the same extent and with the same effect as if the said street had been opened by a Decree of the Court of Quarter Sessions of the Peace for the County of Philadelphia after proceedings duly had for that purpose under and in pursuance of the Road Laws of the Commonwealth of Pennsylvania

And the said grantors for themselves, their heirs, executors and administrators do by these presents covenant promise and agree to and with the said THE CITY OF PHILADELPHIA, its successors and assigns that neither the said grantors nor their heirs shall nor will at any time hereafter ask demand recover or receive of or from the said THE CITY OF PHILADELPHIA, its successors or assigns any sum or sums of money as and for damages for or by reason of the physical grading of the said street to the grade as now established by the Board of Surveyors of the said THE CITY OF PHILADELPHIA, and if such grade shall not be established at the day of the date of these presents that neither the said grantors nor their heirs shall nor will at any time thereafter ask demand recover or receive any such damages by reason of the physical grading of the said street to conform to the grade as first thereafter established or confirmed by the said the Board of Surveyors of the said THE CITY OF PHILADELPHIA.

And the said grantors for themselves, their heirs, executors and administrators do by these presents further covenant, promise and agree to and with THE CITY OF PHILADELPHIA, its successors and assigns that the said lot of ground above described unto the said THE CITY OF PHILADELPHIA, its successor and assigns against them the said grantors their heirs and against all and every person or persons whomsoever lawfully claiming or to claim the same, or any part thereof, by from or under him, her, , them, or any of them shall and will warrant and forever defend.

In Witness Whereof the said grantors, have hereunto set their hands and seals. Dated the day and year first above written.

Sealed and Delivered
in the presence of us:

Edward Wolff
Jane C. Lynch

Sellers Hoffman
Katharine S. Hoffman
William A. Hoffman
Mary A. Hoffman
Katharine Hoffman Stinson

On the 19th day of February Anno Domini 19 27 Before me the subscriber, a Notary Public in and for the Commonwealth of Pennsylvania, residing in the City of Philadelphia,

personally came the above named Sellers Hoffman and Katharine T., his wife, William A. Hoffman and Mary A., his wife, and Katherine Hoffman Stinson, Widow,

and in due form of law acknowledged the above Indenture to be their and each of their — act and deed and desired the same might be recorded as such.

Witness my hand and official seal.

Jane C. Lynch
Notary Public
My Commission expires
March 6, 1927.

BUREAU OF SURVEYS
DEPARTMENT OF PUBLIC WORKS
CITY OF PHILADELPHIA

OFFICE OF 7th DISTRICT

March 7th, 1927. 192

To the Chief Engineer and Surveyor:

Referring to Deed No. 8006 dedicating portion of the bed of Buist Avenue, between 83rd Street and 84th Street.

I submit the following report:

The description in the deed is correct.
The grantors are the registered owners of the portion dedicated and also the abutting owners.
The street is not graded.
There are no municipal improvements in the bed of the street.
The street is on the confirmed City Plan of the width dedicated.

Amos B. Engle
Surveyor and Regulator 7th *District*

APPENDIX C

Resume of Principal Investigator

JAMES T. MARINE

CULTURAL RESOURCES SPECIALIST ENVIRONMENTAL Scientist V

(PRINCIPAL INVESTIGATOR / GEOMORPHOLOGIST)

PITTSBURGH, PENNSYLVANIA

EDUCATION:

MS / Geology / University of Pittsburgh 1997

BS / Business Management / University of Pittsburgh 1988

CERTIFICATIONS/ REGISTRATIONS

Registered Professional Archaeologist RPA ID # 15794

TRAINING:

30 Hour OSHA General Construction	7/09	
40 Hour OSHA HAZWOPER	6/26/02	refreshed yearly
Excavation Safety Subpart P	05/21/02	refreshed every 2 years
Permitted Confined Space Entry	04/04/08	refreshed every 2 years

EXPERIENCE SUMMARY:

Mr. Marine is a registered professional archaeologist with over 20 years of experience. Over the last 10 years Mr. Marine has served as a Principal Investigator managing and supervising archaeological investigations in support of NEPA compliance for clients such as the United States Department of Energy, the Army Corps of Engineers, the Pennsylvania Department of Transportation, the Pennsylvania Turnpike Commission, the Georgia Department of Transportation, the West Virginia Division of Highways, and other public and private clients throughout the mid-Atlantic and southeast.

Mr. Marine received his MS in Geology from the University of Pittsburgh in 1997 where he specialized in geomorphology and sedimentology. In addition to his archaeological background, Mr. Marine is an accredited geomorphologist and has investigated several stratified sites in deep alluvial settings.

PROJECT EXPERIENCE:

Principal Investigator: Phase I Archaeological Survey of the Clearview Landfill, City of Philadelphia and Delaware Counties, Pennsylvania. United States Environmental Protection Agency Region III. **2010**.

Geomorphologist: Phase IA Geomoprhological Reconnaissance for the proposed Lackawanna River Floodwall, Duryea Borough, Luzerne County, Pennsylvania. Pennsylvania Department of Environmental Protection. **2010**

Principal Investigator: Phase I Archaeological Survey for the Wetland Mitigation Site at State Game Lands 232, Blaine Township, Washington County Pennsylvania**.** MarkWest Liberty Midstream LLC, **2010**

Principal Investigator: Documentation of the Removal of the Gray's Reef Beacon Tower. As Mitigation for the MOA Michigan SHPO and the USCG. Emmet, County Michigan, **2010**

Principal Investigator: Phase I Archaeological Survey, Kelly Township Act 537 Waste Water Treatment Plant, Union County Pennsylvania **2010**

Principal Investigator: Phase I Archaeological Survey, Tenaska Midstream LLC. Northern West Virginia Natural Gas Gathering Pipeline, Preston County, West Virginia **2010 ongoing**

Principal Investigator/Geomorphologist: Phase IA I and II Archaeological Reconnaissance and Phase I Archaeological Survey for the East End Sewer Separation Project. Borough of Steelton, Dauphin County Pennsylvania **2009-2010**

Principal Investigator/Geomorphologist: Phase IA and IB Archaeological Survey, Texas Energy LLC and United States Department of Energy Environmental Impact Statement for the Texas Energy Syngas Facility Beaumont, Texas. United States Department of Energy. **2009.**

Geomorphologist: Phase IA Archaeological Reconnaissance for the proposed Millerstown Community Park, Greenwood Township, Perry County Pennsylvania. **2009**

Geomorphologist: SR 2045 Wetland Mitigation Project, Upper Saucon Twp., Lehigh County, PA. Pennsylvania Department of Transportation. **2009**

Principal Investigator/Geomorphologist: Phase I Archaeological Survey, Total Reconstruction Project, Milepost 31-38, North Park Mitigation Site, Pine Township, Allegheny County, PA, Pennsylvania Turnpike Commission. This project consisted of geomorphological and archaeological investigations for wetland replacement that would mitigate impacts from the proposed widening of I-76 between mileposts 31-38. **2008-2009**

Principal Investigator: Phase I Archaeological Survey for the Green Valley Middle School Project, Lower Heidelberg Twp., Berks County, PA. Wilson School District. **2008**

Principal Investigator/Geomorphologist: Phase I Archaeological Survey, Act 537, Sewage Facilities Plan, Manor Township, Lancaster County, PA. Lancaster Area Sewer Authority. This project consisted of a geomorphological investigation and a Phase I archaeological survey of 1070 meters of sewer line on the floodplain of the West Branch of Little Conestoga Creek. **2008**

Geomorphologist: Geomorphological Investigations for the Columbia River park Improvement Project, Columbia Borough, Lancaster County, PA. **2008**

Geomorphologist: Geomorphological Investigations for the Hulton Bridge Replacement Project, Oakmont Borough, Allegheny County, PA. Pennsylvania Department of Transportation. **2008.**

Principal Investigator/Geomorphologist Phase I and II Archaeological Investigations for the Corder Bridge Floodplain Study and Bridge Replacement, Calhoun County, West Virginia WVDOH. The studies were conducted for stream channel improvements on the Henry Fork of the Little Kanawha River. **2008**

Geomorphologist: Geomorphological Investigations for the SR 3023 and SR4014 bridge replacements over Quitaphilla and Swatara Creek, Lebanon County, PA. Pennsylvania Department of Transportation. **2008.**

Geomorphologist: Geomorphological Investigations for the SR 3001 (Emmitsburg Road) Bridge Replacement, Adams County PA. Pennsylvania Department of Transportation. **2008.**

Principal Investigator/Geomorphologist: Phase I and II Archaeological Investigation CR 191 Ogeechee River Main Bridge Replacement, Sites (9JS91) and (9JS92), Jenkins County, Georgia, Georgia Department of Transportation**. 2007-2008.**

Field Director/Geomorphologist: Phase I and II Archaeological Investigation Site (9Mg56), Morgan County Georgia, Georgia Department of Transportation, Seven Islands Road at Big Indian Creek Bridge Replacement**. 2007-2008.**

Geomorphologist: Geomorphological Investigations at the Mount Zion Road Bridge Replacement Project, Bethel Twp., Lebanon County, PA. Pennsylvania Department of Transportation. **2007.**

Geomorphologist: Geomorphological Investigations at SR 0230 Bridge Replacement over Little Chickies Creek, Lancaster County, PA. Pennsylvania Department of Transportation. **2007.**

Geomorphologist: Geomorphological Investigations at SR 4008 Bridge Replacement Project over Little Chickies Creek, Lancaster County, PA. Pennsylvania Department of Transportation. **2007.**

Geomorphologist: Geomorphological Investigations at the SR 2045 (Monterey Road) Bridge Replacement, Lancaster County PA. Pennsylvania Department of Transportation. **2007.**

Geomorphologist: Geomorphological Investigations at Helen's Way Residential Subdivision Project, Conestoga Twp, Lancaster County, PA. Public Archaeology laboratory of Elizabethtown College. **2007**

Geomorphologist: Geomorphological Investigations at the SR0030 Bridge Replacement Project over Pequea Creek, Lancaster County PA. Pennsylvania Department of Transportation. **2007.**

Principal Investigator: Phase I archaeological survey for the proposed widening of a 5-mile segment of SR 13 and Memorial Park Drive Hall County, Georgia, Georgia Department of Transportation. **2007.**

Field Director/Geomorphologist: Phase I archaeological survey for the proposed widening of a 5-mile segment of SR 151, Catoosa County, Georgia, Georgia Department of Transportation. **2007.**

Principal Investigator/Geomorphologist: Phase I archaeological survey for the proposed widening of a 6.5-mile segment of SR 20 Cherokee County, Georgia, Georgia Department of Transportation **2007.**

Principal Investigator/Geomorphologist: Geomorphological Investigations at the Dog Bite Stream Restoration Site Mitchell County, North Carolina, Conducted a Phase IA geomorphological assessment of landforms within the project area. **2007.**

Principal Investigator/Geomorphologist/Field Director: Phase I Archaeological Investigations Sites 18HO275-18HO276, 18HO277, 18HO278, 18HO279, Howard County Maryland, Howard County Department of Public Works, Little Patuxent Parallel Sewer Study. **2007.**

Geomorphologist: Geomorphological Investigations at Fort Augusta, Northumberland County, Sunbury PA, for the Kutztown University Field School, Public Archaeology Research Center. **2006.**

Principal Investigator/Geomorphologist: Phase I and II Archaeological Investigations at the Mill Creek Site (36Bu347), Bucks County, PA, PA Turnpike Commission..I-95/I-276 Interchange Project. **2006-2008.**

Geomorphologist: Geomorphological Investigations for the Coplay Bridge Replacement Project, Northampton and Lehigh, Counties PA, Pennsylvania Department of Transportation. **2006.**

Geomorphologist: Geomorphological Investigations for the SR0087 Bridge Replacement Project, Forkston Twp., Wyoming County , PA. Pennsylvania Department of Transportation. **2006**

Geomorphologist: Geomorphological Investigations for the SR 0434 Bridge Replacement Project, Section 472 over Balliard Creek, Lackawaxen Twp., Pike Coumty PA. Pennsylvania Department of Transportation. **2006**

Geomorphologist: Geomorphological Investigations for the SR 0858 Bridge Replacement Project, Susquehanna County, PA. Pennsylvania Department of Transportation. **2006.**

Geomorphologist: Geomorphological Investigations for the SR 3033, Section 570, Wyalusing Creek Bridge, Replacement Project, Susquehanna County, PA. Pennsylvania Department of Transportation. **2006.**

Principal Investigator: Phase 1A Archaeological Investigations for improvements to SR 0072 Section 024**,** Manheim Borough, Lancaster County, Pennsylvania. Pennsylvania Department of Transportation. **2005.**

Geomorphologist/Field Director: Phase III Data Recovery and Geomorphological Investigations at Calver Island, Site 36DA89, Susquehanna River Bridge Replacement, Dauphin County. Pennsylvania. Pennsylvania Turnpike Commission. **2003-2006.**

Principal Investigator: Phase I Archaeological and Geomorphological Investigations in association with replacement of Wooddale Covered Bridge Replacement**.** New Castle County, Delaware, Delaware Department of Transportation**. 2005.**

Principal Investigator/Geomorphologist: Geomorphological Investigations at proposed Maplewood Estates adjacent to Kings Jasper Quarry. Systematic trenching study to characterize weathering profile of deeply weathered saprolite containing jasper nodules. Lower Milford Township, Lehigh County, Pennsylvania.. Pennsylvania Historical Museum Commission. **2005**

Geomorphologist/Field Director: Phase II, and III Archaeological Data Recovery at The Irwin Site 36CD102. SR 0879, Section A01, Lick Run Bridge Replacement Project, Clearfield County, Pennsylvania Department of Transportation. **2003-2005**

Assistant Principal Investigator/Field Director Leetsdale Phase III Data Recovery of site 36AL480 Concrete Casting Facility/Braddock Dam Fabrication, Allegheny County, PA, US Army Corps of Engineers Pittsburgh District. **2003-2004**

Field Director, Geomorphologist: Phase III Data Recovery of sites 36PE16, 36PE60, 36PE61, 36JU93, 36JU95. SR 0011/0015, Section 008, Transportation Improvement Project, Perry and Juniata Counties, Pennsylvania Department of Transportation District 8-0. **2000-2002**

Geomorphologist/Field Director: Phase I Archaeological Survey SR 0068, Section 350, East Brady Bridge Replacement over Allegheny River, Armstrong & Clarion Counties, Pennsylvania Department of Transportation District 10-0. **2000-2001**

Principal Investigator/Geomorphologist: Phase I Archaeological Survey and Geomorphological Assessment, of proposed Elderly Housing Site, Benton Elderly Housing Project, Columbia County PA., Columbia County Housing Corporation**. 2001, 2005**

Field Director: Phase II significance evaluation of sites 46LG1 56, 157, 158, 159, 160, 161, 162, 163, 164. Phase III Data recovery of site 46LG164. West Virginia Route 10, Man to Logan, Logan County West Virginia West Virginia Department of Highways**. 1999-2002**

PROFESSIONAL AFFILIATIONS:

Society of Pennsylvania Archaeologists
Pennsylvania Archaeological Council

200' 100' 0 200'

SCALE IN FEET

ELEV. = 24.7'
LENGTH = 1398LF

SHEET NUMBER
RE-001

EASTWICK TOWNSHIP
PENNSYLVANIA

EASTWICK
CAP 205 FEASIBILITY STUDY

REAL ESTATE INTEREST DIAGRAM
LEVEE - ALIGNMENT 1

DWN BY:	DES BY:	PROJ. DATE:
ADD	ADD	27 JUL 2020
CKD BY:	REVIEWED BY:	DRAWING SCALE
DCL	GMG	AS SHOWN

US Army Corps
of Engineers ®
Philadelphia District

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SCALE IN FEET

ELEV. = 24.7'
LENGTH = 1358LF

SHEET NUMBER
RE-002

EASTWICK TOWNSHIP
PENNSYLVANIA

EASTWICK
CAP 205 FEASIBILITY STUDY

REAL ESTATE INTEREST DIAGRAM
LEVEE - ALIGNMENT 2

DWN BY:	DES BY:	PROJ. DATE:
ADD	ADD	27 JUL 2020
CKD BY:	REVIEWED BY:	DRAWING SCALE
DCL	GMG	AS SHOWN

US Army Corps of Engineers ®
Philadelphia District

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SCALE IN FEET

ELEV. = 24.7'
LENGTH = 1483LF

SHEET NUMBER
RE-003

EASTWICK TOWNSHIP
PENNSYLVANIA

EASTWICK
CAP 205 FEASIBILITY STUDY

REAL ESTATE INTEREST DIAGRAM
LEVEE - ALIGNMENT 3

DWN BY:	DES BY:	PROJ. DATE:
ADD	ADD	27 JUL 2020
CKD BY:	REVIEWED BY:	DRAWING SCALE
DCL	GMG	AS SHOWN

US Army Corps
of Engineers ®
Philadelphia District

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SCALE IN FEET

ELEV. = 24.7'
LENGTH = 1402LF

SHEET NUMBER
RE-004

EASTWICK TOWNSHIP
PENNSYLVANIA

EASTWICK
CAP 205 FEASIBILITY STUDY

REAL ESTATE INTEREST DIAGRAM
FLOODWALL - ALIGNMENT 1

DWN BY:	DES BY:	PROJ. DATE:
ADD	ADD	27 JUL 2020
CKD BY:	REVIEWED BY:	DRAWING SCALE
DCL	GMG	AS SHOWN

US Army Corps of Engineers ®
Philadelphia District

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SCALE IN FEET

ELEV. = 24.7'

LENGTH = 1361LF

SHEET NUMBER

RE-005

EASTWICK TOWNSHIP
PENNSYLVANIA

EASTWICK
CAP 205 FEASIBILITY STUDY

REAL ESTATE INTEREST DIAGRAM
FLOODWALL - ALIGNMENT 2

DWN BY:	DES BY:	PROJ. DATE:
ADD	ADD	27 JUL 2020
CKD BY:	REVIEWED BY:	DRAWING SCALE
DCL	GMG	AS SHOWN

US Army Corps
of Engineers ®
Philadelphia District

ELEV. = 24.7'
LENGTH = 1476LF

SHEET NUMBER
RE-006

EASTWICK TOWNSHIP
PENNSYLVANIA

EASTWICK
CAP 205 FEASIBILITY STUDY

REAL ESTATE INTEREST DIAGRAM
FLOODWALL - ALIGNMENT 3

DWN BY:	DES BY:	PROJ. DATE:
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DCL	GMG	AS SHOWN

US Army Corps of Engineers ®
Philadelphia District

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Attachment 5 – 1971 Aerial. The homes selected for proposed non-structural solutions have not been constructed

Pennsylvania Historical & Museum Commission

PROJECT REVIEW FORM

Request to Initiate SHPO Consultation on State and Federal Undertakings

SHPO USE ONLY	Reviewers: MS / ED
DATE RECEIVED: 10/6/20	DATE DUE: 11/4/20
ER NUMBER: 2021-0038-101-A	HRSF: ☐

REV: 03/2020

SECTION A: PROJECT NAME & LOCATION

Is this a new submittal? (●) YES ( ) NO **OR** ( ) **This is additional information for ER Number:**

Project Name: Eastwick Flood Risk Managment Feasibility | County: Philadelphia | Municipality: City of Eastwick

Project Address: Clearview Landfill | City/State/ Zip:

SECTION B: CONTACT INFORMATION & MAILING ADDRESS

Name	Nicole Cooper Minnichbach	Phone	(215) 656-6556
Company	US Army Corps of Engineers, Philadelphia District	Fax	
Street/PO Box	100 Penn Square East, CENAP-PL-E	Email	nicole.c.minnichbach@usace.army
City/State/Zip	Philadelphia, PA 19107	Email cc:	

SECTION C: PROJECT DESCRIPTION

This project is located on: (check all that apply) ☐ Federal property ☐ State property ☑ Municipal property ☐ Private property

List all federal and state agencies and programs providing funds, permits, licenses.	**Agency Type**	**Agency/Program/Permit Name**	**Project/Permit/Tracking Number (if applicable)**
	State & Federal	Philadelphia Water Department	

Proposed Work – Attach project description, scope of work, site plans, and/or drawings

Project includes (check all that apply): ☐ Construction ☐ Demolition ☑ Rehabilitation ☐ Disposition

Total acres of project area: less than 1 | Total acres of earth disturbance: less than or

Are there any buildings or structures within the project area? (●) Yes ( ) No | Approximate age of buildings: <50

Does this project involve properties listed in or eligible for the National Register of Historic Places, or locally designated? Inventory here: https://gis.penndot.gov/crgis	Yes	No	Unsure	
	( )	(●)	( )	Name ______ Key Number ______

Please email this form and pdf attachments to: RA-PH-PASHPO-ER@pa.gov

Or, please print and mail completed form and all attachments to:

PHMC- PA State Historic Preservation Office
400 North Street
Commonwealth Keystone Building, 2nd Floor
Harrisburg, PA 17120-0093

Attachments – Please include the following information with this form

- ☑ **Map –** 7.5' USGS quad, streetmap, or parcel map showing the project's Area of Potential Effect
- ☑ **Description/Scope of Work–** Narrative description of the project, including any ground disturbance and previous land use, and any potential to impact historic resources
- ☑ **Site Plans/Drawings –** Indicate location and age of buildings, any proposed improvements, and past and present land use
- ☐ **Photographs –** Digital photographs of all buildings and structures on the project site, keyed to a site plan. For projects affecting buildings older than 50 years old use the Abbreviated HRSF

SHPO DETERMINATION (SHPO USE ONLY)

- ☐ There are **NO HISTORIC PROPERTIES** in the Area of Potential Effect
- ☑ The project will have **NO EFFECT** on historic properties
- ☐ The project will have **NO ADVERSE EFFECTS** on historic properties: ______ Key# ______
- ☐ The project will have **NO ADVERSE EFFECTS WITH CONDITIONS** (see attached)
- ☐ **SHPO REQUESTS ADDITIONAL INFORMATION** (see attached)

DIVISION CHIEF, ENVIRONMENTAL REVIEW: [signature]

DATE: 11/2/20

SHPO REVIEWER: ed

From:	Minnichbach, Nicole C CIV USARMY CENAP (USA)
To:	Brett Barnes (thpo@estoo.net); Darren Bonaparte; Erin Paden; Jesse Bergevin; Nathan Allison (nathan.allison@mohican-nsn.gov); Paul Lepsch (paul.lepsch@sni.org); Temple University Archaeology
Cc:	Dohm, Joel V CIV USARMY CENAP (USA); Brandreth, Mary E CIV USARMY CENAP (USA)
Subject:	Request for Review - Eastwick Flood Risk Management Study, Philadelphia and Delaware Counties, Pennsylvania
Date:	Tuesday, October 6, 2020 1:11:00 PM
Attachments:	Attachment 1.pdf Attachment 2.pdf Attachment 4.pdf Attachment 5.pdf

Dear THPO/Section 106 Reviewers:

In accordance with the National Environmental Policy Act of 1969, as amended, the U.S. Army Corps of Engineers (the Corps) Philadelphia District, in partnership with the Philadelphia Water Department (PWD), is initiating the scoping phase of a feasibility study to investigate alternatives for flood risk management improvements in the neighborhood of Eastwick, which is located at the confluence of Darby and Cobbs Creeks in Philadelphia, Pennsylvania. This notice serves as the initiation of the scoping process as outlined in 33 CFR Part 230.12 for any potential project or action proposed in this study. This feasibility study is being conducted under the authority of Section 205 of the Continuing Authorities Program (CAP) which provides for small Civil Works projects to address Flood Risk Management. The Flood Control Act of 1948 (PL 80-858), as amended, authorizes Federal participation to plan, design, and construct small flood risk management projects.

The Flood Risk Management study area includes much of the Eastwick Neighborhood along Cobbs and Darby Creek (Attachment 1). This area was identified in a Federal Interest Determination (FID) document prepared by the Corps in 2018 titled “Eastwick, Philadelphia County, Pennsylvania Continuing Authorities Program (Section 205) Flood Risk Management (P2# 451948)”. The Corps concluded that there are feasible opportunities to address flooding in the Eastwick Neighborhood. The feasibility study will investigate several alternatives to address the problems and needs related to flooding in the study area.

Structural alternatives under consideration include levees and floodwalls. Levees are earthen embankments with an impervious core constructed along a waterway, while floodwalls are vertical structures typically constructed with steel or concrete as cantilevered I-Walls. These structural alternatives are being considered along Eastwick Park (Philadelphia and Delaware Counties), where overflows from Cobbs Creek enter the neighborhoods. Non-structural solutions are being evaluated for flood-prone areas where structural solutions are not feasible. Non-structural solutions fall into four groups: Acquisition/Relocation; Building Retrofitting (flood proofing, elevating, ring levees); Enhanced Flood Warnings (evacuation planning and emergency response systems); and Land Use Management (zoning, undeveloped land preservation).

The Area of Potential Effect (APE) includes the Levee/Floodwall limits of disturbance as well as any buildings or other structures designated for non-structural solutions (Attachment 2).

A previous investigation assessed most of the APE for the levee/floodwall alternatives. The report is entitled, *Phase I Archaeological Survey Report, Remedial Investigation and Feasibility Study, Lower Darby Creek Area Site, Operable Unit 1 – Clearview Landfill, Delaware and Philadelphia Counties, Pennsylvania* prepared for the US Environmental Protection Agency by TetraTech NUS, Inc. and dated March 2011. The report was supposed to be Attachment 3, but it was too large to send on this transmittal. If you would like a copy of the report please let me know and I will figure out a way to reduce its size and email it to you.

As stated in the report, much of the proposed levee/floodwall construction footprint lies within the original boundaries of the Clearview Landfill. During the mid-1970s, in order to facilitate the construction of the Eastwick Residential Neighborhood, the waste from the Philadelphia portion of the landfill was stripped and placed within the Delaware County portion of the landfill. The Philadelphia portion was then graded and covered with clean fill. It is within this section of the landfill where the USACE has proposed the construction of the levee/floodwall structure. There are currently three potential levee locations and three potential floodwall locations within the APE (Attachment 4).

The houses proposed for the non-structural solutions are a block of rowhomes that were constructed in the mid to late 1970s and do not meet the 50-year-old criteria. The 1971 aerial shows that the homes had not yet been constructed (Attachment 5).

The levee/floodwall portion of the APE has been so extensively modified that little likelihood exists for the proposed project to impact a historic property, and the non-structural alternative homes are not considered to be historic properties. We request your concurrence in our conclusion that the proposed action will have *No Effect* on historic properties eligible for or listed on the National Register of Historic Places in compliance with 36 CFR 800.4(d)(1). Should further analyses result in changes to the APE, we will reinitiate coordination with your office.

Thank you for your cooperation in this review process. If you have any questions concerning our review or if we can be of further assistance, please contact me at (215) 656-6556, or mobile (215) 834-1065 or via email Nicole.C.Minnichbach@usace.army.mil.

Respectfully,

Nicole Cooper Minnichbach
Cultural Resource Specialist and Tribal Liaison
CENAP-PL-E
100 Penn Square East
Philadelphia, PA 19107
(O) 215-656-6556

(M) 215-834-1065

The Delaware Nation
Historic Preservation Department
31064 State Highway 281
Anadarko, OK 73005
Phone (405)247-2448

November 13, 2020

To Whom It May Concern:

The Delaware Nation Historic Preservation Department received correspondence regarding the following referenced project(s).

Project(s): **Eastwick Flood Risk Management Study, Philadelphia and Delaware Counties, Pennsylvania**

Our office is committed to protecting tribal heritage, culture and religion with particular concern for archaeological sites potentially containing burials and associated funerary objects.

The Lenape people occupied the area indicated in your letter prior to European contact until their eventual removal to our present locations. According to our files, the location of the proposed project does not endanger cultural, or religious sites of interest to the Delaware Nation. **Please continue with the project as planned** keeping in mind during construction should an archaeological site or artifacts inadvertently be uncovered, all construction and ground disturbing activities should immediately be halted until the appropriate state agencies, as well as this office, are notified (within 24 hours), and a proper archaeological assessment can be made.

Please note the Delaware Nation, the Delaware Tribe of Indians, and the Stockbridge Munsee Band of Mohican Indians are the only Federally Recognized Delaware/Lenape entities in the United States and consultation must be made only with designated staff of these three tribes. We appreciate your cooperation in contacting the Delaware Nation Historic Preservation Office to conduct proper Section 106 consultation. Should you have any questions, feel free to contact our offices at 405-247-2448 ext. 1403.

Erin N. Paden

Erin Paden
Director of Historic Preservation
Delaware Nation
31064 State Highway 281
Anadarko, OK 73005
Ph. 405-247-2448 ext. 1403
epaden@delawarenation-nsn.gov

Appendix A4: Clean Air Act Assessment

General Conformity Review and Emission Inventory
Eastwick Levee Construction, Philadelphia, PA

Table 1. Project Emission Sources and Estimated Power

Hp-hr = Hp*LF* total equipment hrs of operation

Load Factor (LF) represents the average percentage of rated horsepower used during a source's operational profiles.
LF is based on data from similar USACE studies.

Hp is based on data from similar USACE studies and equipment specifications.

Total equipment hours of operations is based on the equipment hours from the cost estimate quantities and summed by equipment.

Description	Load	Horsepowner (Hp)	Total Equipment Hours	Hp-Hours
CHAIN SAW, 36"-60" (91CM-150CM) GUIDE BAR GENERIC EQUIPMENT MS880 MAGNUM	0.57	8.6	189.82	930.52
COMPACTOR, RAMMER, 13" (330MM) X 13" (330MM) SHOE, 3,550 LBS (15.8 KN) IMPACT GENERIC EQUIPMENT DS 70	0.57	4.2	17.47	41.82
COMPACTOR, ROLLER, VIBRATORY, 25.6"W X 15.7"DIA, DOUBLE SMOOTH DRUMS, WALK BEHIND, 4,950 LBS IMPACT COMPACTION AMERICA (BOMAG) BW 65H	0.57	11	127.81	801.40
CRANE, HYDRAULIC, SELF-PROPELLED, YARD, 10.5 TON (9.5 MT), 32' (9.8 M) BOOM, 4X4 GENERIC EQUIPMENT YB4411	0.43	100	0.55	23.76
CRANES, HYDRAULIC, SELF-PROPELLED, ROUGH TERRAIN, 30 TON, 95' BOOM, 4X4 GROVE CRANES (MANITOWOC) RT530E-2	0.43	164	597.33	42,123.95
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, 150 TON, 240' BOOM, LIFTING (7 TRUCK LOADS FOR MOB/DMOB) LINK-BELT CONSTRUCTION EQUIPMENT CO. 238 HSL	0.43	270	470.67	54,644.40
DUMP TRUCK, HIGHWAY, 58,000 LBS GVW, 6 AXLES (3 RETRACTABLE), WITH REAR 16 - 18 CY DUMP BODY NO SPECIFIC MANUFACTURER 6X4 58KGVW DSL	0.8	520	1,368.83	569,434.32
GRADER, MOTOR, ARTICULATED, 6X4, 14' BLADE W/5 RIPPER/SCARIFIERS CATERPILLAR INC. (MACHINE DIVISION) 140-M3	0.61	200	31.95	3,898.34
HYDRAULIC EXCAVATOR, CRAWLER, 109,300 LBS (50 MT), 3.37 CY (2.58 M3) BUCKET, 30.17' (9.2 M) MAX DIGGING DEPTH GENERIC EQUIPMENT CX490D	0.57	362	131.19	27,069.79
HYDRAULIC EXCAVATOR, CRAWLER, 55,000 LB (24,948 KG), 1.50 CY (1.2 M3) BUCKET, 23.3' (7.1 M) MAX DIGGING DEPTH GENERIC EQUIPMENT 325F	0.57	164	182.30	17,041.01
HYDRAULIC EXCAVATOR, CRAWLER, 59,300 LBS, 1.22 CY BUCKET, 23' 1" MAX DIGGING DEPTH KOBELCO AMERICA INC. SK260 SRLC-10	0.57	178	10.74	1,089.68
HYDRAULIC EXCAVATOR, CRAWLER, 83,703 LBS (38 MT), 2.01 CY (1.54 M3) BUCKET, 22' 11" (7.0 M) MAX DIGGING DEPTH GENERIC EQUIPMENT 335 L CR	0.57	273	145.11	22,580.12
LOADER / BACKHOE, WHEEL, 1.0 CY (0.76 M3) FRONT END BUCKET, 24" (61 CM) DIP, 6.2 CF (0.18 M3), 14.5' (4.4 M) DIGGING DEPTH, 4X2 GENERIC EQUIPMENT 416F	0.68	97	14.24	939.27
LOADER, FRONT END, WHEEL, 2.0 CY (1.5 M3) BUCKET, ARTICULATED, GENERIC EQUIPMENT 914M	0.68	11	106.88	799.46
PILE HAMMER ACCESSORIES, PILE LEADS, SWING, 8" X 32" X 84' INTERNATIONAL CONSTRUCTION EQUIPMENT,INC SWING 8" X 32"	0.75	50	470.67	17,650.00
PILE HAMMER, DRIVER/EXTRACTOR, VIBRATORY, 53 TON FORCE DRIVE (ADD CRANE) MKT MANUFACTURING, INC. V5E W/ HP185	0.75	185	470.67	65,305.00
PRESSURE WASHER, LOW PRESSURE, COLD WATER, 3K PSI (20.7 MPA), 4.8 GPM (18.2 LPM) GENERIC EQUIPMENT 3000 PSI, 3 GPM	0.57	5.8	255.63	845.11
PUMP HOSE, DISCH, 6" DIA X 50' WITH COUPLING (PER SECTION)GORMAN-RUPP COMPANY C376-90	0.57	0	208.00	-
PUMP, WATER, CENTRIFUGAL, DEWATERING, WHEEL, 6" (15 CM) DIA, 1,825 GPM (6.9 M3M) @ 40' (12.2 M) HEAD (ADD HOSES) GENERIC EQUIPMENT 16C2-F4L	0.74	73.7	52.00	2,835.98
ROLLER, STATIC, SELF-PROPELLED, PNEUMATIC, 12T (10.9 MT), 68" (1.7 M) WIDE, 9 TIRE, ASPHALT COMPACTOR GENERIC EQUIPMENT BW11RH-5	0.56	74.3	33.08	1,376.46
ROLLER, VIBRATORY, SELF-PROPELLED, SINGLE DRUM, PAD FOOT, 7 TON (6.4 MT), 66" (1.7 M) WIDE, SOIL COMPACTOR GENERIC EQUIPMENT CD8	0.56	73	1.12	45.79

TRACTOR, AGRICULTURAL, WHEEL, 40-55 HP (30-41 KW), 4X4, PTO, 3 POINT HITCH GENERIC EQUIPMENT 5045D	0.64	40	127.81	3,272.05
TRACTOR, CRAWLER (DOZER), 101-135 HP (75-101 KW), POWERSHIFT, W/ UNIVERSAL BLADE GENERIC EQUIPMENT 1150M	0.64	135	341.10	29,470.88
TRACTOR, CRAWLER (DOZER), 104 HP, LOW GROUND PRESSURE, W/3.06 CY POWER ANGLE BLADE (ADD ATTACHMENTS) CATERPILLAR INC. (MACHINE DIVISION) D5K2 LGP	0.64	104	7.07	470.71
TRACTOR, CRAWLER (DOZER), 104 HP, W/2.86 CY STRAIGHT BLADE (ADD ATTACHMENTS) CATERPILLAR INC. (MACHINE DIVISION) D5K2 XL	0.64	104	315.92	21,027.42
TRENCHER, CHAIN TYPE CUTTER, 48" (1.2 M) DEPTH x 16" (406 MM) WIDTH, 2WD, WALK-BEHIND GENERIC EQUIPMENT C16X	0.57	16	55.20	503.42
TRUCK OPTIONS, WATER TANK, 2,000 GAL (ADD 28,000 GVW TRUCK) ROSCO, A LeeBoy COMPANY DS 2000	0	0	127.81	-
TRUCK TRAILER, END DUMP, 25 CY, 30 TON (ADD TOWING TRUCK) NO SPECIFIC MANUFACTURER 25CY END DUMP TRLR	0	0	16.91	-
TRUCK TRAILER, LOWBOY, 80 T (72.6 MT), 4 AXLE (ADD TOWING TRUCK) GENERIC EQUIPMENT 80T LOWBOY TRAILER	0	0	40.00	-
TRUCK TRAILER, WATER TANKER, 5,000 GAL (18.9 KL)(ADD TOWING TRUCK) GENERIC EQUIPMENT 5K GAL, WATER TRLR EP	0	0	252.69	-
TRUCK, HIGHWAY, 16,000 LBS GVW, 2 AXLE, 4X2 (CHASSIS ONLY-ADD OPTIONS) NO SPECIFIC MANUFACTURER 4X2 16KGVW DSL	0.57	200	127.81	14,570.84
TRUCK, HIGHWAY, 75 KGVW (34.0 MT), 3 AXLE, 6X4 (CHASSIS ONLY-ADD OPTIONS) GENERIC EQUIPMENT 6X4 75KGVW DSL	0.57	764	40.00	17,419.20
CRANE, HYDRAULIC, SELF-PROPELLED, ROUGH TERRAIN, 25 TON (23 MT), 70' (21.3 M) BOOM, 4X4 GENERIC EQUIPMENT RT530E-2	0.43	164	6.00	423.12
			6,344.39	916,633.82

Table 2. Emission Estimates

Emissions (g) = Power Demand (Hp-hr) * Emission Factor (g/Hp-hr)

Emissions (tons) = Emissions (g) * (1 ton/907200 g)

NOx

NOx Emissions Factor for Off-Road Construction Equipment is 9.20 g/Hp-hr

NOx Emissions (tons) = (916,633.82 Hp-hr) * (9.20 g/Hp-hr) * (1 ton/907200 g)

NOx Emissions = 9.3 tons

VOC

VOC Emissions Factor for Off-Road Construction Equipment is 1.30 g/Hp-hr

VOC Emissions (tons) = (916,633.82 Hp-hr) * (1.30 g/Hp-hr) * (1 ton/907200 g)

VOC Emissions = 1.31 tons

PM 2.5

PM2.5 Emissions Factor for Off-Road Construction Equipment is 0.40 g/Hp-hr

PM 2.5 Emissions (tons) = (916,633.82 Hp-hr) * (0.40 g/Hp-hr) * (1 ton/907200 g)

PM 2.5 Emissions = 0.40 tons

General Conformity Review and Emission Inventory
Eastwick Levee Construction, Philadelphia, PA

Table 3. Pollutant Emissions from Employee Vehicles

Assumptions: Average trip distance (1 way) is 30 miles.
Every member of the work crew drives their own vehicle.
Work crew comprised of 20 people.
Work crew works 230 days.
Average NOx vehicle emission factor is 0.96 g/mile.
Average VOC vehicle emission factor is 0.84 g/mile.
Average PM 2.5 vehicle emission factor is 0.40 g/mile.

NOx

20 workers * 2 trips/day * 230 days * 30 miles/trip * 0.96 g of NOx/mile
Total NOx resulting from employee vehicles = 0.29 tons.

VOC

20 workers * 2 trips/day * 230 days * 30 miles/trip * 0.84 g of VOC/mile
Total VOC resulting from employee vehicles = 0.26 tons.

PM 2.5

20 workers * 2 trips/day * 230 days * 30 miles/trip * 0.40 g of PM 2.5/mile
Total PM 2.5 resulting from employee vehicles = 0.12 tons.

Appendix A5: Coastal Zone Management Act Consistency Determination

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
COMPACTS AND COMMISSIONS OFFICE

pennsylvania
COASTAL RESOURCES MANAGEMENT

COASTAL ZONE MANAGEMENT ACT
FEDERAL CONSISTENCY FORM

This document provides the Pennsylvania Coastal Resources Management Program (CRM) with a Federal Consistency Determination or Certification for activities regulated under the Coastal Zone Management Act of 1972, 16 U.S.C. § 1456, as amended, and NOAA's Federal Consistency Regulations, 15 C.F.R. Part 930. Federal agencies and other applicants for federal consistency are not required to use this form; it is provided to applicants to facilitate the submission of a Consistency Determination or Consistency Certification.

I. Project/Activity Title and Reference Number:

Title:	Eastwick, Philadelphia, PA, Flood Risk Management Study, Section 205 of the Water Resources Development Act
Ref. No.	USACE Project Number: 451948

II. Applicant Contact Information:

Contact Name/Title: Jay Smith, Project Manager

Mailing Address: U.S. Army Corps of Engineers (USACE) - Philadelphia District, 1650 Arch Street

City/State: Philadelphia, PA , ______ Zip Code: 19103 Telephone #: (215) 656-6579

E-mail: jay.b.smith@usace.army.mil Mobile #: ( ) Fax #: ( )

Applicant Organization (Subpart D, E, or F activities only, see Section III): USACE

Federal Agency (acting, permitting, or funding agency): USACE

Contractor (if applicable): TBD

Acting on behalf of: ☐ Federal Agency ☐ Applicant for federal authorization or funding

III. Federal Consistency Category:

☒ Federal Agency Activity or Development Project
(15 C.F.R. Part 930, Subpart C)

☐ Federal License or Permit Activity
(15 C.F.R. Part 930, Subpart D)
Auth. Type: ______

☐ Outer Continental Shelf Activity
(15 C.F.R. Part 930, Subpart E)

☐ Federal Financial Assistance to State or Local Governments (15 C.F.R. Part 930, Subpart F)

☐ Federal Activity with Interstate Coastal Effects
(*For this category, you should also select the applicable Subpart (C, D, E, or F) from above*)
(15 C.F.R. Part 930, Subpart I)

IV. Detailed Project Description (attach additional sheets if necessary):

The U.S. Army Corps of Engineers (USACE), in partnership with the Philadelphia Water Department, proposes to construct a levee to manage flooding from Cobbs Creek during high streamflow events in the Eastwick neighborhood of Philadelphia (i.e., the tentatively selected plan [TSP]/proposed project). The 1300-foot levee would be located along the left bank of Cobbs Creek within the city-owned Eastwick Regional Park and Clearview Landfill. The proposed project will be constructed partially within the Pennsylvania Coastal Zone. The levee design was modeled to be effective to reduce flooding up to and including the 0.2% AEP (Annual Exceedance Probability) (500-year floodplain). A variety of alternatives were considered during the formulation of a tentatively selected plan, which are described in the draft Integrated Feasibility Resources/Environmental Assessment (IFR/EA) for additional detail.

V. General Analysis of Coastal Effects (attach additional sheets if necessary):

Placement of a levee along Cobbs Creek is efficient in eliminating modeled flows through the Eastwick neighborhood. This has the effect of pushing more flow downstream because that flow is no longer leaving Cobbs Creek. More flow downstream leads to marginal water surface elevation (WSEL) increases (i.e., induced flooding). Additionally, placement of a levee cuts off a portion of the adjacent floodplain, where floodwaters cannot spread out. This constriction leads to marginal WSEL increases upstream. Generally, WSEL increases dissipate with distance from the potential levee. A life safety analysis has been performed which identifies that there is not a measurable life safety risk associated with the TSP. The TSP alternative will be optimized prior to the Final Feasibility Report. detailed comprehensive benefits analyses, induced flooding, complementary measures to avoid or minimize induced flooding, and levee tie-in into the Clearview Landfill will be further investigated. Negative direct or indirect effects on coastal hazards, fisheries, public access, recreation, historic properties or other coastal uses are not expected. Impacts to wetlands will be avoided to the maximum extent practicable. Impacts on wetlands that can not be avoided would be mitigated with compensatory mitigation. See the IFR/EA for additional detail.

VI. Detailed Analysis of Consistency with CRM Enforceable Policies:

(Refer to Appendix A of the instructions to this form. Attach additional sheets and documentation, if necessary.)

Policy Area 1: Coastal Hazard Areas — NA ☐

The propose project is consistent with the enforceable policies on Coastal Hazard Areas. Construction of the proposed levee would protect people and property in floodplains from the dangers and damages of flooding. A life safety analysis has been performed which identifies that there is not a measurable life safety risk associated with the TSP.

Policy Area 2: Dredging and Spoil Disposal — NA ☒

Policy Area 3: Fisheries Management

NA ☐

The proposed project is consistent with enforceable policies on Fisheries Management. Construction of the proposed levee would not result in direct effects on water quality. BMPs and sound construction practices would be employed to avoid indirect effects on water quality and erosion and sedimentation. Additionally, a Clean Water Act Section 401 water quality certification would and erosion and sediment control permit.

Policy Area 4: Wetlands

NA ☐

The proposed project is consistent with the enforceable policies on Wetlands. Direct and indirect effects associated with the proposed action would avoid impacts on wetlands to the maximum extent practicable. If wetland impacts can not be avoided they will be mitigated. Yes. Induced flooding associated with the proposed action is not expected to impact wetlands. Induced flooding would be temporary and minor and wetlands. Additionally, complimentary measures would be developed to reduce the flooding to the maximum extent practicable.

Policy Area 5: Public Access for Recreation

NA ☐

The proposed project is consistent with enforceable policies on public access for recreation. Complimentary measures are being considered to incorporate the proposed levee with other recreational uses at the Eastwick Regional Park.

Policy Area 6: Historical Sites and Structures

NA ☐

The proposed project is consistent with enforceable policies on historic sites and structures. The levee portion of the area of potential effect (APE) has been so extensively modified that little likelihood exists for the proposed project to impact a historic property.The USACE has determined that the proposed undertaking will have
No Effect on historic properties eligible for or listed on the National Register of Historic Places in compliance with 36 CFR 800.4(d)(1). The Pennsylvania State Historic Preservation Office (PASHPO), in their correspondence dated November 2, 2020, are in concurrence with this determination.

Policy Area 7: Port Activities

NA ☒

Policy Area 8: Energy Facility Siting

NA ☒

Policy Area 9: Intergovernmental Coordination NA ☐

The proposed action will be consistent with the Clean Water Act. The proposed action will be consistent with the Clean Air Act. Yes. The proposed action is being coordinated with multiple stakeholders, including multiple local, state, and federal agencies. Additionally, Philadelphia Water Department is the local sponsor for the study and represents local interests.

Policy Area 10: Public Involvement NA ☐

The proposed action is being coordinated with multiple stakeholders, including multiple local, state, and federal agencies. The Draft Environmental Assessment will be available for public review. X

Policy Area 11: Ocean (Great Lakes) Resources NA ☒

VI. Certification and Signature (Check one and sign below):

☒ **FEDERAL AGENCY CONSISTENCY DETERMINATION.** Based upon the information, data, and analysis included herein, the federal agency, or its contracted agent, listed in (I) above, finds that this proposed activity is consistent to the maximum extent practicable with the enforceable policies of the Pennsylvania Coastal Resources Management Program. (Federal agencies or their contractors, only.)

OR

☐ **FEDERAL AGENCY NEGATIVE DETERMINATION.** Based upon the information, data, and analysis included herein, the federal agency, or its contracted agent, listed in (I) above, finds that this proposed activity will not have any reasonably foreseeable effects on Pennsylvania's coastal uses or resources (Negative Determination) and is therefore consistent with the enforceable policies of the Pennsylvania Coastal Resources Management Program. (Federal agencies or their contractors, only.)

OR

☐ **NON-FEDERAL APPLICANT'S CONSISTENCY CERTIFICATION.** Based upon the information, data, and analysis included herein, the non-federal applicant for a federal license or permit or state or local government agency applying for federal funding, listed in (I) above, finds that this proposed activity is fully consistent with the enforceable policies of the Pennsylvania Coastal Resources Management Program. (Applicants for federal licenses, permits, or funding, or their contractors, only.)

Signature:	Valerie Whalon		
Printed Name:	Valerie Whalon	Date:	8/15/2023

Pursuant to 15 C.F.R. Part 930, the Pennsylvania Coastal Resources Management Program must provide its concurrence with or objection to this consistency determination or consistency certification in accordance with the deadlines listed below. Concurrence will be presumed if the state's response is not received within the allowable timeframe.

Federal Consistency Review Deadlines:

Federal Activity or Development Project (15 C.F.R. Part 930, Subpart C)	60 days, 75 days with extension. Additional extensions at Federal agency discretion. State and federal agency may agree to alternative time frames. (15 C.F.R. § 930.41)
Federal License or Permit (15 C.F.R. Part 930, Subpart D)	6 months with mandatory 3-month notification. State and applicant may agree to stay the 6-month review period. (15 C.F.R. § 930.63)
Outer Continental Shelf Activity (15 C.F.R. Part 930, Subpart E)	6 months with mandatory 3-month notification. State and person may agree to stay the 6-month review period. (15 C.F.R. § 930.78)
Federal Financial Assistance to State or Local Governments (15 C.F.R. Part 930, Subpart F)	30 days from CRM-receipt of this determination. (15 C.F.R. § 930.98)

OFFICIAL USE ONLY:

Reviewed By:	Fed Con ID:	Date Received: __/__/____
Announced in *The Pennsylvania Bulletin*: __/__/____	Comments Received: ☐ NO ☐ YES *[attach comments]*	
☐ Concurrence	☐ Objection *[attach details]*	

Appendix A6: Scoping Correspondence

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
100 PENN SQUARE EAST, 7th FLOOR WANAMAKER BUILDING
PHILADELPHIA, PENNSYLVANIA 19107-3390

September 30, 2020

Environmental Resources Branch

Dear Colleague:

In accordance with the National Environmental Policy Act of 1969, as amended, the U.S. Army Corps of Engineers (USACE) Philadelphia District, in partnership with the Philadelphia Water Department (PWD), is initiating the scoping phase of a feasibility study to investigate alternatives for flood risk management improvements in the neighborhood of Eastwick, which is located at the confluence of Darby and Cobbs Creeks in Philadelphia, Pennsylvania. This notice serves as the initiation of the scoping process as outlined in 33 CFR Part 230.12 for any potential project or action proposed in this study. This feasibility study is being conducted under the authority of Section 205 of the Continuing Authorities Program (CAP) which provides for small Civil Works projects to address Flood Risk Management. The Flood Control Act of 1948 (PL 80-858), as amended, authorizes Federal participation to plan, design, and construct small flood risk management projects.

The Flood Risk Management study area includes much of the Eastwick Neighborhood along Cobbs and Darby Creek (see Figure 1, Enclosure 1). This area was identified in a Federal Interest Determination (FID) document prepared by the USACE in 2018 titled "Eastwick, Philadelphia County, Pennsylvania Continuing Authorities Program (Section 205) Flood Risk Management (P2# 451948)". The USACE concluded that there are feasible opportunities to address flooding in the Eastwick Neighborhood. The feasibility study will investigate several alternatives to address the problems and needs related to flooding in the study area.

Structural alternatives under consideration include levees and floodwalls. Levees are earthen embankments with an impervious core constructed along a waterway, while floodwalls are vertical structures typically constructed with steel or concrete as cantilevered I-Walls. These structural alternatives are being considered along Eastwick Park, where overflows from Cobbs Creek enter the neighborhood. Non-structural solutions are being evaluated for flood-prone areas where structural solutions are not feasible. Non-structural solutions fall into four groups: Acquisition/Relocation; Building Retrofitting (flood proofing, elevating, ring levees); Enhanced Flood Warnings (evacuation planning and emergency response systems); and Land Use Management (zoning, undeveloped land preservation). The general locations where the project alternatives are being considered are depicted in Figure 2 of Enclosure 1.

By this e-mail, we are inviting your agency/organization to participate in the scoping of this study. Please provide any relevant information within your agency's purview, and any comments or concerns that may have an impact on this study by October 30, 2020.

Please direct your response and your NEPA scoping comments to Ms. Rachel Ward of the Environmental Resources Branch via email at Rachel.J.Ward@usace.army.mil. If you have any questions regarding this study or the alternative plans, please contact Joel Dohm, who is the Project Manager for this study, via email at Joel.V.Dohm@USACE.army.mil or by phone at (215) 656-6185.

Sincerely,

FOR Peter R. Blum P.E.
Chief, Planning Division

Enclosures

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

October 29, 2020

Ms. Rachel Ward
U.S. Army Corps of Engineers
Environmental Resources Branch
Philadelphia District
100 Penn Square East, 7th Floor Wanamaker Building
Philadelphia, PA 19107

RE: EA Scoping for the Eastwick Flood Study along Cobbs and Darby Creek

Dear Ms. Ward:

The U.S. Environmental Protection Agency (EPA) is responding to the public notice, dated September 30, 2020 from the U.S. Army Corps of Engineers (USACE) for the Eastwick Flood Study along Cobbs and Darby Creek. In accordance with the National Environmental Policy Act (NEPA), Section 309 of the Clean Air Act and the Council on Environmental Quality (CEQ) regulations implementing NEPA (40 CFR 1500-1508), EPA is providing comments for your consideration in the development of the Environmental Assessment (EA).

The USACE Eastwick Study Area includes the Clearview Landfill which is part of the larger Lower Darby Creek Area (LDCA) Superfund site. The study is proposing various alternatives to reduce flood risk. Alternatives include structural alternatives such as levees or vertical flood walls as well as non-structural solutions such as acquisition/relocation, building retrofitting, enhanced flood warnings, and land use management.

During discussions, meetings, and public events, USACE representatives have discussed the possibility of a flood wall or levee that would intersect the Clearview Landfill. While EPA is not opposed to this concept, significant consideration and ongoing coordination with EPA and the Pennsylvania Department of Environmental Protection will be necessary to ensure that a levee/floodwall (or any other flood mitigation activities) does not threaten integrity of the Superfund cleanup or result in an uncontrolled release of hazardous substances, pollutants or contaminants.

Additional detailed comments are attached. We ask that you consider our comments in this letter and the enclosure during the development of the EA. If you have any questions, please feel free to contact me at 215-814-2775 or by email at witman.timothy@epa.gov.

Sincerely,

Timothy Witman
Office of Communities Tribes & Environmental Assessment

Enclosure
Detailed Comments for Scoping
Eastwick Flood Study along Cobbs and Darby Creek

EPA has the following recommendations for consideration in the development of the EA:

Purpose and Need

A clear purpose and need statement is important for the study to establish the appropriate range of alternatives and help identify alternatives that meet project objectives. Likewise, background information regarding the existing flood conditions near the site, flood conditions within the Eastwick Study Area and potential flood conditions within the larger drainage area are critical to understanding the proposal.

Alternatives Analysis

An important element of the NEPA process is the evaluation of alternatives. Such an analysis discusses the ability of each alternative to meet the project's purpose and need, contains a discussion of the specific constraints and provides a rationale for alternatives not carried forward. EPA recognizes that a suite of structural and non-structural alternatives may be proposed and suggests that a thorough evaluation of a range of offsite and onsite alternatives is appropriate. We propose that combinations of alternatives be evaluated that support the purpose and need.

Environmental Impacts - Background/Site Characterization

We recommend early coordination with applicable agencies and providing agencies preliminary methodologies, results, and/or environmental reports to ensure that any concerns are addressed early in the process. EPA would be pleased to participate in early review of data and analysis, field visits, and project discussions.

Surface Water Resources

The EA would benefit from a narrative discussion of the specific temporary and permanent impacts to biological, physical, and/or chemical characteristics of aquatic ecosystems. The study should document potential effects such as impacts to wetland or stream hydrology from the construction of the structural or non-structural alternatives. Alternatives should evaluate impacts to stream hydrology and sediment transport not only in relation to the Clearview Landfill remedy, but also adjacent streambanks and known contaminated sediments adjacent to and downstream of the Clearview Landfill.

Any levee or floodwall or other work in the floodplain must consider potential impacts to the 100-year floodplain. EPA also recommends evaluating potential impacts/effectiveness of any flood mitigation efforts related to sea level rise, storm surges, etc.

Wetlands and Streams, Clean Water Act Section 404

For the impact assessment, wetlands should be delineated according to the 1987 Corps of Engineers Wetlands Delineation Manual and the Regional Supplement. Any streams on or adjacent to the site should also be mapped.

As part of the Clean Water Act Section 404 (CWA 404) permit process for the study, we suggest the project team consider requirements anticipated for permitting. Please consider the following comments on aquatic resources assessment, avoidance, minimization, and compensatory mitigation from the EPA Region III Water Division, Wetlands Branch, as the project moves through the NEPA process to permitting:

Aquatic Resource Assessment
We recommend that a baseline assessment on the quality and function of the onsite aquatic resources be completed. Baseline information is important in not only assessing the impacted resources but also in identifying avoidance and minimization opportunities, assessing secondary and cumulative impacts, and evaluating appropriate mitigation for unavoidable impacts.

Avoidance and Minimization
EPA recognizes that the EA will provide information about the alternatives considered for the proposal. EPA recommends that information on alternatives try to address considerations needed to identify the least environmentally damaging practicable alternative (LEDPA) determination for a CWA Section 404 permit, per the CWA 404 (b)1 Guidelines (CWA Guidelines). If the least environmentally damaging alternative is not the preferred alternative, EPA recommends the EA demonstrate why the less damaging alternative is not practicable. In addition, EPA recommends the EA include an evaluation of practicable project layout design and implementation options to assure that opportunities to avoid and minimize aquatic resource impacts, including water quality and ecosystem impacts, have been fully vetted.

Direct, Secondary, and Cumulative Impacts to the Watershed
As indicated in the CWA Guidelines, the review of the project should consider both the secondary and cumulative effects as a result of this project. We recommend that the EA include an evaluation of secondary effects to the watershed including adjacent resources such as the John Heinz at Tinicum United States Fish and Wildlife Service Wildlife Refuge. EPA recommends identifying the potential secondary impacts, evaluating alternatives to minimize those impacts, and consider whether additional mitigation may be necessary to offset those impacts.

Compensatory Mitigation
Once it is determined that all appropriate and practicable steps to avoid and minimize adverse impacts have been taken, compensatory mitigation should then be considered. EPA recommends the EA include a mitigation statement or narrative that describes how the proposal will adequately compensate for unavoidable permanent and/or temporary impact to waters.

Utilities
The EA would benefit from a discussion of any utilities and related resources that will be required for the project and associated effects.

Hazardous Materials
EPA has assessed the aquatic portions of the LDCA Superfund site. Contaminated sediments are present in numerous locations throughout the John Heinz National Wildlife Refuge. Potential impacts to these areas, and all areas of LDCA Superfund site, should be considered by the USACE.

The Folcroft Landfill (also known as Hay Island) is another source area that is part of the LDCA Superfund site. Remediation alternatives for Folcroft are currently being evaluated in a Feasibility Study. Potential impacts to Folcroft and other potential source areas upstream (Industrial Drive properties) and downstream (Norwood Landfill) should be considered as part of any flood mitigation project.

EPA would be pleased to work with the USACE to provide available information on extent of contamination and approaches to avoid interference with cleanup activities.

Invasive Species
The EA study would benefit from an evaluation of the project's potential for dispersal or removal of invasive species in uplands and wetlands during both construction and operation. We recommend that a plan to address invasive species managment be prepared.

Cultural Resources
We recommend consultation with the State Historic Preservation Office throughout the planning process and documentation of any potential impacts to historic resources.

Environmental Justice
We recommend that an assessment be conducted to identify whether areas of potential environmental justice (EJ) concern are present and may be disproportionately impacted by project activities. This assessment should inform appropriate outreach to identified communities to assure that communication regarding project development reaches citizens in an appropriate way and feedback from the identified communities is fully considered.

Several agencies, including CEQ, discuss EJ review methodologies. EPA's EJ screening tool, EJSCREEN, can be utilized to collect preliminary screening-level information. It can be accessed at: https://www.epa.gov/ejscreen. EJSCREEN provides information on the census block group level. A census block group is a geographical unit used by the United States Census Bureau (Bureau) and is the smallest geographical unit for which the Bureau publishes sample data. An assessment at this level can help to identify whether low-income and/or minority communities may be disproportionately impacted by the activities described in the study. Specific, consideration should be given to the block group(s) which contain the communities most impacted by the project activities. Additionally, please consider referring to "Promising Practices for EJ Methodologies in NEPA Reviews": https://www.epa.gov/environmentaljustic/ej-iwg-promising-practices-ej-methodologies-nepa-reviews.

EPA would be pleased to work with the USACE on EJ analysis.

Socioeconomic Impacts
The EA would benefit from a discussion of the community and socioeconomic impacts of the project, including the number of people, employees and/or jobs impacted as a result of the project. EPA also recommends addressing the decrease or increase of people, employees, and jobs in relation to its effect on the tax base, local housing, job markets, schools, utilities, businesses, property values, etc.

Community Impacts
We suggest developing an outreach and communication plan for affected community members. We would encourage ongoing community engagement and involvement to address concerns that may arise from the proposal.

Pennsylvania Fish & Boat Commission

Bureau of Fisheries
Division of Environmental Services
595 E Rolling Ridge Drive
Bellefonte, PA 16823
(814) 359-5228

30 October 2020

Ms. Rachel Ward
Department of the Army
Philadelphia District, Corps of Engineers
100 Penn Square East, 7th Floor Wanamaker Building
Philadelphia, Pennsylvania 19107-3390

RE: Eastwick Flood Risk Mitigation Study, NEPA Scoping Comments

Dear Ms. Ward:

The Pennsylvania Fish and Boat Commission (PFBC) appreciates the opportunity to provide comments pertaining to the scoping phase of a feasibility study to investigate alternatives for flood risk management improvements in the Eastwick neighborhood near Philadelphia, Pennsylvania. The study is located near the confluence of Darby and Cobbs Creeks, tributaries to the Delaware River. We have conducted a cursory review of potential aquatic resource impacts in this vicinity and offer the following comments to avoid and minimize impacts to species and their habitat under PFBC jurisdiction. The species listed below are protected under the Endangered Species Act of 1973, the Pennsylvania Fish and Boat Code (Title 58, Chapter 75), and/or listed as a Species of Greatest Conservation Need (SGCN) in the PA State Wildlife Action Plan.

Proposed alternatives for the feasibility analysis have the potential to impact a suite of diadromous fish species or their habitat and state protected herpetofauna. As such, we recommend the pursuit of nonstructural alternatives that will minimize potential impacts to state protected species or their habitat. Structural alternatives have the potential to directly impact aquatic species due to construction in the floodplain or stream channel or indirect impacts through hydromodification. If structural alternatives are pursued, we recommend strict adherence to best management practices (BMPs) for erosion and sedimentation (E&S) controls and construction practices that will avoid water quality impacts.

It is difficult to provide specific comments on aquatic resource impacts given the various alternatives proposed and limited information for those alternatives. If specific alternatives are pursued, we suggest a more thorough environmental assessment to determine specific impacts due to the proposed alternatives. Structural alternatives have the potential to adversely impact aquatic species while some nonstructural alternatives (i.e. acquisition) have the potential to benefit aquatic species. When specific alternatives are pursued, we will better be able to characterize the impacts/benefits and provide more specific comments. If alternatives are proposed that impact aquatic species, efforts may be taken to minimize those impacts via time of year construction restrictions or other mitigation measures.

Species of concern under PFBC jurisdiction include the following fish species: Atlantic Sturgeon, *Acipenser oxyrinchus* (Federal and PA Endangered), Hickory Shad, *Alosa mediocris* (PA Endangered), American Eel, *Anguilla rostrata* (SGCN), American Shad, *Alosa sapidissima* (SGCN), Blueback Herring, *Alosa aestivalis* (SGCN) and Alewife, *Alosa pseudoharengus* (SGCN). Time of year construction restrictions and adherence to E&S BMPs and sound construction practices should minimize most impacts to fish species of concern. In addition, Coastal Plain Leopard Frog complex, *Lithobates sphenocephalus/L. kauffeldi* (PA Endangered) and Northern Red-bellied Cooter, *Pseudemys rubriventris* (PA Threatened), are known in the vicinity of the project area. Instream and riparian construction activities have the potential to directly impact these species or their habitat. Specific alternatives would have to be further assessed to determine the level of impact to these species.

As the scope of this study comes into focus, we appreciate your consideration of these comments from PFBC. If you have any questions or would like to discuss these comments further please don't hesitate to contact me via email, belorson@pa.gov, or by phone, (814) 359-5228.

Sincerely,

Benjamin D. Lorson
Watershed Analysis Section Chief
Pennsylvania Fish and Boat Commission

Whalon, Valerie M CIV USARMY CENAP (USA)

From: Ward, Rachel J CIV USARMY CENAP (US)
Sent: Wednesday, November 4, 2020 2:42 PM
To: Lorson, Benjamin
Cc: Smiles, Heather A; Kuhn, Kristopher; Porta, Michael; Grabowski, Tyler; Urban, Chris; Gipe, Kathy; Fischer, Douglas; Lech, Gregory; Good, Clayton
Subject: RE: Eastwick Flood Risk Management Study, NEPA Scoping comments from PFBC

Dear Mr. Lorson,

Thank you for providing a description of the resources under your agency's purview located in the vicinity of Eastwick, as well as some initial recommendations to minimize impacts. We anticipate reaching a tentatively selected plan this winter and will publish the draft Environmental Analysis afterwards. I will be sure to send you a link to the document if you wish to make comments once we have more project details.

Thanks again for your review and comments.

Sincerely,
Rachel Ward
Biologist
USACE Philadelphia District
(215) 656-6733

From: Lorson, Benjamin <belorson@pa.gov>
Sent: Friday, October 30, 2020 12:00 PM
To: Ward, Rachel J CIV USARMY CENAP (US) <Rachel.J.Ward@usace.army.mil>
Cc: Smiles, Heather A <hsmiles@pa.gov>; Kuhn, Kristopher <kkuhn@pa.gov>; Porta, Michael <mporta@pa.gov>; Grabowski, Tyler <tgrabowski@pa.gov>; Urban, Chris <curban@pa.gov>; Gipe, Kathy <c-kgipe@pa.gov>; Fischer, Douglas <doufischer@pa.gov>; Lech, Gregory <glech@pa.gov>; Good, Clayton <clgood@pa.gov>
Subject: [Non-DoD Source] Eastwick Flood Risk Management Study, NEPA Scoping comments from PFBC

Dear Ms. Ward,

Please see the attached letter containing PA Fish and Boat Commission comments pertaining to the Eastwick Flood Risk Management Study located in the vicinity of Cobbs Creek's confluence with Darby Creek near Philadelphia, PA. We appreciate the opportunity to comment on potential impacts to PFBC jurisdictional species. If you have any questions or would like to further discuss these comments please don't hesitate to call or email at your convenience.

Thanks,

Benjamin D Lorson
Watershed Analysis Section Chief
Pennsylvania Fish and Boat Commission
595 E Rolling Ridge Drive, Bellefonte, PA 16823
(814) 470-5274 (Cell)
(814) 359-5228 (Office – PLEASE note new number)
belorson@pa.gov

From: Ward, Rachel J CIV USARMY CENAP (US) <Rachel.J.Ward@usace.army.mil>
Sent: Friday, October 2, 2020 3:54 PM
To: Shiels, Andrew <ashiels@pa.gov>
Subject: [External] Eastwick Flood Risk Management Study, NEPA Scoping Request

ATTENTION: *This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.*

Good Afternoon,

I am contacting you to initiate NEPA scoping for a flood risk management study located in the Eastwick neighborhood of Philadelphia, Pennsylvania. As part of this study, the US Army Corps of Engineers will evaluate the potential environmental impacts of feasible alternative plans for flood risk management improvements in the study area.

We look forward to your input and participation in this project. Please read the attached letter and respond to me via email within 30 days with any comments or concerns that may have an impact on this study.

If you have any questions regarding this study or the alternative plans, please contact Joel Dohm, who is the Project Manager for this study, via email at Joel.V.Dohm@USACE.army.mil or by phone at (215) 656-6185.

Sincerely,
Rachel Ward
Biologist
US Army Corps of Engineers

Whalon, Valerie M CIV USARMY CENAP (USA)

From: Ward, Rachel J CIV USARMY CENAP (US)
Sent: Thursday, October 8, 2020 8:56 AM
To: Joshua Lippert
Subject: RE: Eastwick Flood Risk Management Study, NEPA Scoping Request

Hi Josh – Sorry for the delay! It's been a busy few days. Are you available to talk today? Does 11am work?

Thanks,
Rachel

From: Joshua Lippert <Joshua.Lippert@Phila.gov>
Sent: Tuesday, October 6, 2020 7:51 AM
To: Ward, Rachel J CIV USARMY CENAP (US) <Rachel.J.Ward@usace.army.mil>
Subject: [Non-DoD Source] Re: Eastwick Flood Risk Management Study, NEPA Scoping Request

Hi Rachel,

I offer as Joel has updated the group but the materials you provided gave more insight on potential solutions. I know I have more questions than answers.

Happy to talk today.

Thanks,

Josh Lippert, APA, ASLA, CFM
Floodplain Manager
Licenses & Inspections
City of Philadelphia
Municipal Services Building
1401 JFK Boulevard, 11th Floor
Philadelphia, PA 19102
Work From Home

Please check out our new Floodplain Management Web Page:
Blockedhttp://www.phila.gov/li/Pages/FloodplainManagement.aspx

Disclaimer: The above comments are advisory, and all permitting is subject to a full review upon formal permit submission to the City of Philadelphia. Design professionals are responsible to understand all adopted City of Philadelphia codes to submit complete and accurate applications that are signed and sealed by a PA Design Professional (when projects require a design professional, see Department of Licensee and Inspections website for details).

From: Ward, Rachel J CIV USARMY CENAP (US) <Rachel.J.Ward@usace.army.mil>
Sent: Friday, October 2, 2020 5:56 PM
To: Joshua Lippert <Joshua.Lippert@Phila.gov>
Subject: RE: Eastwick Flood Risk Management Study, NEPA Scoping Request

Hi Josh,

Thank you for offering that to us. I think that sounds like a good idea. I will speak with the project manager about that on Monday and get back to you.

Thanks again,
Rachel

From: Joshua Lippert <Joshua.Lippert@Phila.gov>
Sent: Friday, October 2, 2020 4:57 PM
To: Ward, Rachel J CIV USARMY CENAP (US) <Rachel.J.Ward@usace.army.mil>
Subject: [Non-DoD Source] Re: Eastwick Flood Risk Management Study, NEPA Scoping Request

Hi Rachel,

Did you and your team want to present this to our Flood Risk Management Task Force? We could hold a special session that could help in a coordinated feedback and review process.

Please let me know if you'd like to discuss further.

Thanks,

Josh Lippert, APA, ASLA, CFM
Floodplain Manager
Licenses & Inspections
City of Philadelphia
Municipal Services Building
1401 JFK Boulevard, 11th Floor
Philadelphia, PA 19102
Work From Home

Please check out our new Floodplain Management Web Page:
BlockedBlockedhttp://www.phila.gov/li/Pages/FloodplainManagement.aspx

Disclaimer: The above comments are advisory, and all permitting is subject to a full review upon formal permit submission to the City of Philadelphia.   Design professionals are responsible to understand all adopted City of Philadelphia codes to submit complete and accurate applications that are signed and sealed by a PA Design Professional (when projects require a design professional, see Department of Licensee and Inspections website for details).

From: Ward, Rachel J CIV USARMY CENAP (US) <Rachel.J.Ward@usace.army.mil>
Sent: Friday, October 2, 2020 3:56 PM
To: Joshua Lippert <Joshua.Lippert@Phila.gov>
Subject: Eastwick Flood Risk Management Study, NEPA Scoping Request

External Email Notice. This email comes from outside of City government. Do not click on links or open attachments unless you recognize the sender.

Good Afternoon,

I am contacting you to initiate NEPA scoping for a flood risk management study located in the Eastwick neighborhood of Philadelphia, Pennsylvania. As part of this study, the US Army Corps of Engineers will evaluate the potential environmental impacts of feasible alternative plans for flood risk management improvements in the study area.

We look forward to your input and participation in this project. Please read the attached letter and respond to me via email within 30 days with any comments or concerns that may have an impact on this study.

If you have any questions regarding this study or the alternative plans, please contact Joel Dohm, who is the Project Manager for this study, via email at Joel.V.Dohm@USACE.army.mil or by phone at (215) 656-6185.

Sincerely,
Rachel Ward
Biologist
US Army Corps of Engineers

From:	Ward, Rachel J CIV USARMY CENAP (US)
To:	Peter B Johnsen - NOAA Federal
Cc:	Keith Hanson - NOAA Federal
Subject:	RE: [Non-DoD Source] Re: Eastwick Flood Risk Management Study, NEPA Scoping Request
Date:	Thursday, October 8, 2020 10:44:00 AM

Thank you Peter! That is helpful. I will let you know if we modify the project area or determine that there are pathways to expose listed species to stressors caused by the project.

Thanks again,
Rachel

From: Peter B Johnsen - NOAA Federal <peter.b.johnsen@noaa.gov>
Sent: Wednesday, October 7, 2020 9:06 AM
To: Ward, Rachel J CIV USARMY CENAP (US) <Rachel.J.Ward@usace.army.mil>
Cc: Keith Hanson - NOAA Federal <keith.hanson@noaa.gov>
Subject: [Non-DoD Source] Re: Eastwick Flood Risk Management Study, NEPA Scoping Request

Dear Rachel,

We provide the following information on protected resources under our jurisdiction in response to your request for relevant information during the scoping phase of a feasibility study to investigate alternatives for flood risk management improvements in the neighborhood of Eastwick. The project is located at the confluence of Darby and Cobbs Creeks in Philadelphia, Pennsylvania. For the future, you can find information about the temporal and spatial distribution of listed species and life stages on our interactive Section 7 mapper. The mapper can be found on our website at URL Blockedhttps://www.greateratlantic.fisheries.noaa.gov/protected/section7/listing/index.html.

Based on the project location and the information you provided us, neither federally listed or proposed listed species nor designated or proposed critical habitat under our jurisdiction are known to exist on the site of the above referenced proposed project or in its vicinity. As such, no further coordination on this activity with the NMFS Protected Resources Division is necessary at this time. Should you modify the project area or determine that there are pathways to expose listed species to stressors caused by the project or new information become available that changes the basis for this determination, further coordination should be pursued. Please contact me by phone (978-282-8416) or by email (peter.b.johnsen@noaa.gov) should you have any questions regarding these comments.

For information about other NMFS trust resources, please contact Keith Hanson with our Habitat Conservation Division by phone at (410) 573-4559 or by email (Keith.Hanson@noaa.gov).

Sincerely,

Peter

On Fri, Oct 2, 2020 at 3:53 PM Ward, Rachel J CIV USARMY CENAP (US) <Rachel.J.Ward@usace.army.mil> wrote:

Good Afternoon,

I am contacting you to initiate NEPA scoping for a flood risk management study located in the Eastwick neighborhood of Philadelphia, Pennsylvania. As part of this study, the US Army Corps of Engineers will evaluate the potential environmental impacts of feasible alternative plans for flood risk management improvements in the study area.

We look forward to your input and participation in this project. Please read the attached letter and respond to me via email within 30 days with any comments or concerns that may have an impact on this study.

If you have any questions regarding this study or the alternative plans, please contact Joel Dohm, who is the Project Manager for this study, via email at Joel.V.Dohm@USACE.army.mil or by phone at (215) 656-6185.

Sincerely,

Rachel Ward

Biologist

US Army Corps of Engineers

--

Peter B. Johnsen
Fisheries Biologist (section 7)
Greater Atlantic Region Fisheries Office
National Marine Fisheries Service
55 Great Republic Drive
Gloucester, MA 01930
Phone: 978-282-8416
email: peter.b.johnsen@noaa.gov

Please submit all requests for consultation and technical assistance using nmfs.gar.esa.section7@noaa.gov.

Presence of species and critical habitat: Use our online interactive section 7 mapper to determine presence of listed species and critical habitat at and near your project area: Blockedhttps://www.fisheries.noaa.gov/resource/map/greater-atlantic-region-esa-section-7-mapper.

For ESA Section 7 guidance and updates on listed species presence and critical habitat analysis please see: Blockedhttps://www.fisheries.noaa.gov/new-england-mid-atlantic/consultations/section-7-consultations-greater-atlantic-region

Appendix A7: Notice of Availability of Draft Integrated Feasibility Report/Environmental Assessment

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, PHILADELPHIA DISTRICT
1650 ARCH STREET
PHILADELPHIA PA 19103-2004

August 31, 2023

Environmental Resources Branch

Ms. Barbara Rudnick, NEPA Team Leader
U.S. Environmental Protection Agency
Region 3, Air Emissions
US EPA Region 3
Four Penn Center
1600 John F. Kennedy Blvd.
Philadelphia, PA 19103-2029
rudnick.barbara@epa.gov

Dear Ms. Rudnick:

This letter is to notify you that the U.S. Army Corps of Engineers (USACE), Philadelphia District has prepared a draft integrated feasibility report and environmental assessment (IFR/EA) titled "Eastwick, Philadelphia County, Pennsylvania, Flood Risk Management, Continuing Authorities Program, Section 205 of the Flood Control Act of 1948, as amended". We are requesting your review of this document in accordance with Section 102 of the National Environmental Policy Act (NEPA).

The USACE, in partnership with the Philadelphia Water Department, proposes to construct a levee to manage flooding from Cobbs Creek during high streamflow events in the Eastwick neighborhood of Philadelphia (i.e., the tentatively selected plan). The 1300-foot long levee would be located along the left bank of Cobbs Creek within the city-owned Eastwick Regional Park and Clearview Landfill. The levee design was modeled to be effective to reduce flooding up to and including the 1% AEP (Annual Exceedance Probability) (100-year floodplain). A variety of alternatives were considered during the formulation of a tentatively selected plan, which are described in the IFR/EA.

The draft IFR/EA was prepared in accordance with NEPA regulations, the Council on Environmental Quality's regulations for implementing NEPA and *U.S. Army Corps of Engineers Procedures for Implementing NEPA, Engineering Regulation (ER) 200-2-2.* The EA evaluates existing environmental, cultural, and socio-economic conditions in the study area, and the effects of the project on existing resources in the immediate and surrounding areas.

The IFR/EA can be downloaded from our District website: http://www.nap.usace.army.mil/Missions/CivilWorks/PublicNoticesReports.aspx

Pursuant to NEPA, the USACE requests your review and comment on the draft IFR/EA within 30 days of the date of this letter. Steps proposed to be taken in order to reduce potential adverse impacts to natural resources are presented in the report. All necessary permits and approvals will be obtained prior to construction.

If you have any questions please contact Ms. Valerie Whalon, Biologist, Environmental Resources Branch at (215-656-0620) valerie.m.whalon@usace.army.mil. Thank you for your attention to this matter.

Sincerely,

LEARY.ADRIAN.1384973384

Digitally signed by LEARY.ADRIAN.1384973384
Date: 2023.08.25 09:26:36 -04'00'

FOR Peter R. Blum, P.E.
Chief, Planning Division

cc: Gregory Becoat, EPA
becoat.gregory@epa.gov
Joshua Barber, EPA
barber.joshua@epa.gov

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, PHILADELPHIA DISTRICT
1650 ARCH STREET
PHILADELPHIA PA 19103-2004

August 31, 2023

Environmental Resources Branch

Mr. Lamar Gore
Refuge Manager
John Heinz National Wildlife Refuge at Tinicum
8601 Lindbergh Blvd.
Philadelphia, PA 19153
lamar_gore@fws.gov

Dear Mr. Gore,

This letter is to notify you that the U.S. Army Corps of Engineers (USACE), Philadelphia District has prepared a draft integrated feasibility report and environmental assessment (IFR/EA) titled “Eastwick, Philadelphia County, Pennsylvania, Flood Risk Management, Continuing Authorities Program, Section 205 of the Flood Control Act of 1948, as amended”. We are requesting your review of this document in accordance with Section 102 of the National Environmental Policy Act (NEPA).

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The IFR/EA can be downloaded from our District website:
http://www.nap.usace.army.mil/Missions/CivilWorks/PublicNoticesReports.aspx

Pursuant to NEPA, the USACE requests your review and comment on the draft IFR/EA within 30 days of the date of this letter. Steps proposed to be taken in order to reduce potential adverse impacts to natural resources are presented in the report. We are consulting with the USFWS Pennsylvania Field Office in accordance with Section 7 of the Endangered Species Act and the Fish and Wildlife Coordination Act. Steps proposed to be taken in order to reduce potential adverse impacts to natural resources are presented in the report. All necessary permits and approvals will be obtained prior to construction.

If you have any questions please contact Ms. Valerie Whalon, Biologist, Environmental Resources Branch at (215-656-0620) valerie.m.whalon@usace.army.mil. Thank you for your attention to this matter.

Sincerely,

LEARY.ADRIAN.13
84973384

Digitally signed by
LEARY.ADRIAN.1384973384
Date: 2023.08.25 09:27:33 -04'00'

FOR Peter R. Blum, P.E.
Chief, Planning Division

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, PHILADELPHIA DISTRICT
1650 ARCH STREET
PHILADELPHIA PA 19103-2004

August 31, 2023

Environmental Resources Branch

Mr. Rick McCorkle
U.S. Fish and Wildlife Service
Pennsylvania Field Office
110 Radnor Rd; Suite 101
State College, PA 16801
richard_mccorkle@fws.gov
IR1_ESPenn@fws.gov

Dear Mr. McCorkle:

This letter is to notify you that the U.S. Army Corps of Engineers (USACE), Philadelphia District has prepared a draft integrated feasibility report and environmental assessment (IFR/EA) titled “Eastwick, Philadelphia County, Pennsylvania, Flood Risk Management, Continuing Authorities Program, Section 205 of the Flood Control Act of 1948, as amended”. We are requesting your review of this document in accordance with Section 102 of the National Environmental Policy Act (NEPA).

The USACE, in partnership with the Philadelphia Water Department, proposes to construct a levee to manage flooding from Cobbs Creek during high streamflow events in the Eastwick neighborhood of Philadelphia (i.e., the tentatively selected plan). The 1300-foot long levee would be located along the left bank of Cobbs Creek within the city-owned Eastwick Regional Park and Clearview Landfill. The levee design was modeled to be effective to reduce flooding up to and including the 1% AEP (Annual Exceedance Probability) (100-year floodplain). A variety of alternatives were considered during the formulation of a tentatively selected plan, which are described in the IFR/EA.

The draft IFR/EA was prepared in accordance with NEPA regulations, the Council on Environmental Quality’s regulations for implementing NEPA and *U.S. Army Corps of Engineers Procedures for Implementing NEPA, Engineering Regulation (ER) 200-2-2.* The EA evaluates existing environmental, cultural, and socio-economic conditions in the study area, and the effects of the project on existing resources in the immediate and surrounding areas.

The IFR/EA can be downloaded from our District website:

http://www.nap.usace.army.mil/Missions/CivilWorks/PublicNoticesReports.aspx

Based on our use of the Information and Planning for Conservation (IPAC) database and the Northern Long-eared (*Myotis septentrionalis*) Bat Rangewide Determination Key (Project Code 2023-0084408), we have determined that the project may affect, but is not like to adversely affect (NLAA) the northern long-eared bat (see enclosures and Section 8.4.4 of the draft IFR/EA). We have also determined that the project will not affect tri-colored bats.

To avoid direct impacts on northern long-eared bats, tree removal would be conducted during the bat inactive season from November 15 through March 31. Construction would occur during daylight hours, which would help to avoid impacts on nighttime foraging. Additionally, Pennsylvania Natural Diversity Inventory (PNDI) records indicate no known impacts to threatened and endangered species and/or special concern species and resources within the project area.

Pursuant to NEPA and in accordance with the Fish and Wildlife Coordination Act (FWCA), the USACE requests your review and comment on the draft IFR/EA within 30 days of the date of this letter. We also request your concurrence on the NLAA determination generated by IPAC on August 10, 2023. Steps proposed to be taken in order to reduce potential adverse impacts to natural resources are presented in the report. All necessary permits and approvals issued will be obtained prior to construction.

If you have any questions please contact Ms. Valerie Whalon, Biologist, Environmental Resources Branch at (215-656-0620) valerie.m.whalon@usace.army.mil. Thank you for your attention to this matter.

Sincerely,

LEARY.ADRIAN.1384973384
Digitally signed by LEARY.ADRIAN.1384973384
Date: 2023.08.25 09:28:08 -04'00'

FOR Peter R. Blum, P.E.
Chief, Planning Division

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, PHILADELPHIA DISTRICT
1650 ARCH STREET
PHILADELPHIA PA 19103-2004

August 31, 2023

Environmental Resources Branch

Ms. Jennifer Anderson
Assistant Regional Administrator
Greater Atlantic Region Fisheries Office
National Marine Fisheries Service
55 Great Republic Drive
Gloucester, MA 01930
jennifer.anderson@noaa.gov

Dear Ms. Anderson:

This letter is to notify you that the U.S. Army Corps of Engineers (USACE), Philadelphia District has prepared a draft integrated feasibility report and environmental assessment (IFR/EA) titled "Eastwick, Philadelphia County, Pennsylvania, Flood Risk Management, Continuing Authorities Program, Section 205 of the Flood Control Act of 1948, as amended". We are requesting your review of this document in accordance with Section 102 of the National Environmental Policy Act (NEPA).

The USACE, in partnership with the Philadelphia Water Department, proposes to construct a levee to manage flooding from Cobbs Creek during high streamflow events in the Eastwick neighborhood of Philadelphia (i.e., the tentatively selected plan). The 1300-foot long levee would be located along the left bank of Cobbs Creek within the city-owned Eastwick Regional Park and Clearview Landfill. The levee design was modeled to be effective to reduce flooding up to and including the 1% AEP (Annual Exceedance Probability) (100-year floodplain). A variety of alternatives were considered during the formulation of a tentatively selected plan, which are described in the IFR/EA.

The draft IFR/EA was prepared in accordance with NEPA regulations, the Council on Environmental Quality's regulations for implementing NEPA and *U.S. Army Corps of Engineers Procedures for Implementing NEPA, Engineering Regulation (ER) 200-2-2.* The EA evaluates existing environmental, cultural, and socio-economic conditions in the study area, and the effects of the project on existing resources in the immediate and surrounding areas.

The IFR/EA can be downloaded from our District website: http://www.nap.usace.army.mil/Missions/CivilWorks/PublicNoticesReports.aspx

Construction of the levee is proposed near Cobbs Creek, upstream of the area where shortnose sturgeon (*Acipenser brevirostrum*) and Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) are expected to occur. No in-stream work would be associated with the proposed action and best management practices would be used to avoid indirect effects to aquatic habitat. Based on this information and the supporting documentation in the IFR/EA the USACE has determined that the proposed action would have no effect on threatened or endangered species under the jurisdiction of the National Marine Fisheries Service (NMFS). Therefore, no Endangered Species Act Section 7 consultation with NMFS is required.

Pursuant to NEPA, the USACE requests your review and comment on the draft IFR/EA within 30 days of the date of this letter. Steps proposed to be taken in order to reduce potential adverse impacts to natural resources are presented in the report. All necessary permits and approvals will be obtained prior to construction.

If you have any questions please contact Ms. Valerie Whalon, Biologist, Environmental Resources Branch at (215-656-0620) valerie.m.whalon@usace.army.mil. Thank you for your attention to this matter.

Sincerely,

LEARY.ADRIAN.1384973384 Digitally signed by LEARY.ADRIAN.1384973384 Date: 2023.08.25 09:28:32 -04'00'

FOR Peter R. Blum, P.E.
Chief, Planning Division

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, PHILADELPHIA DISTRICT
1650 ARCH STREET
PHILADELPHIA PA 19103-2004

August 31, 2023

Environmental Resources Branch

Ms. Karen Greene, Fishery Biologist
Habitat Conservation Division
National Marine Fisheries Service
Sandy Hook Laboratory
74 Magruder Road
Highlands, NJ 07732
karen.greene@noaa.gov

Dear Ms. Greene:

This letter is to notify you that the U.S. Army Corps of Engineers (USACE), Philadelphia District has prepared a draft integrated feasibility report and environmental assessment (IFR/EA) titled "Eastwick, Philadelphia County, Pennsylvania, Flood Risk Management, Continuing Authorities Program, Section 205 of the Flood Control Act of 1948, as amended". We are requesting your review of this document in accordance with Section 102 of the National Environmental Policy Act (NEPA).

The USACE, in partnership with the Philadelphia Water Department, proposes to construct a levee to manage flooding from Cobbs Creek during high streamflow events in the Eastwick neighborhood of Philadelphia (i.e., the tentatively selected plan). The 1300-foot long levee would be located along the left bank of Cobbs Creek within the city-owned Eastwick Regional Park and Clearview Landfill. The levee design was modeled to be effective to reduce flooding up to and including the 1% AEP (Annual Exceedance Probability) (100-year floodplain). A variety of alternatives were considered during the formulation of a tentatively selected plan, which are described in the IFR/EA.

The draft IFR/EA was prepared in accordance with NEPA regulations, the Council on Environmental Quality's regulations for implementing NEPA and *U.S. Army Corps of Engineers Procedures for Implementing NEPA, Engineering Regulation (ER) 200-2-2.* The EA evaluates existing environmental, cultural, and socio-economic conditions in the study area, and the effects of the project on existing resources in the immediate and surrounding areas.

The IFR/EA can be downloaded from our District website: http://www.nap.usace.army.mil/Missions/CivilWorks/PublicNoticesReports.aspx

Construction of the levee is proposed along Cobbs Creek, approximately 6 miles upstream of its confluence with the Delaware River, in tidal freshwater habitat. No in-stream work would be associated with the proposed action and best management practices would be used to avoid indirect effects on aquatic habitat. The proposed action would have no effect on essential fish habitat (EFH). Therefore, EFH consultation with National Marine Fisheries Service under the Magnuson Stevens Fishery Conservation and Management Act (MSA) is not required.

Pursuant to NEPA, the USACE requests your review and comment on the draft IFR/EA within 30 days of the date of this letter. Steps proposed to be taken in order to reduce potential adverse impacts to natural resources are presented in the report. All necessary permits and approvals will be obtained prior to construction.

If you have any questions please contact Ms. Valerie Whalon, Biologist, Environmental Resources Branch at (215-656-0620) valerie.m.whalon@usace.army.mil. Thank you for your attention to this matter.

Sincerely,

LEARY.ADRIAN.1384973384

Digitally signed by LEARY.ADRIAN.1384973384
Date: 2023.08.25 09:28:55 -04'00'

FOR Peter R. Blum, P.E.
Chief, Planning Division

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, PHILADELPHIA DISTRICT
1650 ARCH STREET
PHILADELPHIA PA 19103-2004

August 31, 2023

Environmental Resources Branch

Federal Consistency Coordinator
Pennsylvania Department of Environmental Protection
Compacts and Commissions Office
P.O. Box 8465
400 Market Street, 10th Floor
Harrisburg, PA 17105-8465
RA-Fed_Consistency@pa.gov

Dear Federal Consistency Coordinator:

This letter is to notify you that the U.S. Army Corps of Engineers (USACE), Philadelphia District has prepared a draft integrated feasibility report and environmental assessment (IFR/EA) titled “Eastwick, Philadelphia County, Pennsylvania, Flood Risk Management, Continuing Authorities Program, Section 205 of the Flood Control Act of 1948, as amended”. We are requesting your review of this document in accordance with Section 102 of the National Environmental Policy Act (NEPA). We are also requesting your concurrence with our Federal Consistency determination that the proposed action is consistent with the Pennsylvania Coastal Resources Management Program, in accordance with Section 307 of the Coastal Zone Management Act (16 U.S.C. § 1456) (CZMA) and the National Oceanic and Atmospheric Administration regulations at 15 C.F.R. Part 930 Subpart C (Consistency for Federal Agency Activities).

The USACE, in partnership with the Philadelphia Water Department, proposes to construct a levee to manage flooding from Cobbs Creek during high streamflow events in the Eastwick neighborhood of Philadelphia (i.e., the tentatively selected plan). The 1300-foot long levee would be located along the left bank of Cobbs Creek within the city-owned Eastwick Regional Park and Clearview Landfill. The levee design was modeled to be effective to reduce flooding up to and including the 1% AEP (Annual Exceedance Probability) (100-year floodplain). A variety of alternatives were considered during the formulation of a tentatively selected plan, which are described in the IFR/EA.

The draft IFR/EA was prepared in accordance with NEPA regulations, the Council on Environmental Quality's regulations for implementing NEPA and *U.S. Army Corps of Engineers Procedures for Implementing NEPA, Engineering Regulation (ER) 200-2-2.* The EA evaluates existing environmental, cultural, and socio-economic conditions in the study area, and the effects of the project on existing resources in the immediate and surrounding areas.

The IFR/EA can be downloaded from our District website: http://www.nap.usace.army.mil/Missions/CivilWorks/PublicNoticesReports.aspx

Pursuant to NEPA, the USACE requests your review and comment on the draft IFR/EA within 30 days of the date of this letter. Steps proposed to be taken in order to reduce potential adverse impacts to natural resources are presented in the report. All necessary permits and approvals will be obtained prior to construction.

This is a federal activity and portions of the proposed action would occur within and have the potential to affect the Pennsylvania Coastal Zone of the Delaware Estuary. Therefore, within 60 days of receipt of this letter, we also request your concurrence with our determination that the proposed action is consistent with the enforceable polices of the Pennsylvania Coastal Resources Management Program. In compliance with 15 C.F.R. Part 930 regulations, a Pennsylvania Coastal Resource Management standard form for federal consistency submissions is provided as an enclosure.

Please review this information and provide any comments and your determination of Coastal Zone Consistency. If you have any questions please contact Ms. Valerie Whalon, Biologist, Environmental Resources Branch at (215-656-0620) valerie.m.whalon@usace.army.mil. Thank you for your attention to this matter.

Sincerely,

LEARY.ADRIAN.138497
3384

Digitally signed by
LEARY.ADRIAN.1384973384
Date: 2023.08.25 09:29:22 -04'00'

FOR Peter R. Blum, P.E.
Chief, Planning Division

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, PHILADELPHIA DISTRICT
1650 ARCH STREET
PHILADELPHIA PA 19103-2004

August 31, 2023

Environmental Resources Branch

Ms. Ranjana Sharp
Waterways and Wetlands Program, Southeast Regional Office
Pennsylvania Department of Environmental Protection
2 East Main Street
Norristown, PA 19401
rsharp@pa.gov

Dear Ms. Sharp:

This letter is to notify you that the U.S. Army Corps of Engineers (USACE), Philadelphia District has prepared a draft integrated feasibility report and environmental assessment (IFR/EA) titled "Eastwick, Philadelphia County, Pennsylvania, Flood Risk Management, Continuing Authorities Program, Section 205 of the Flood Control Act of 1948, as amended". We are requesting your review of this document in accordance with Section 102 of the National Environmental Policy Act (NEPA).

The USACE, in partnership with the Philadelphia Water Department, proposes to construct a levee to manage flooding from Cobbs Creek during high streamflow events in the Eastwick neighborhood of Philadelphia (i.e., the tentatively selected plan). The 1300-foot long levee would be located along the left bank of Cobbs Creek within the city-owned Eastwick Regional Park and Clearview Landfill. The levee design was modeled to be effective to reduce flooding up to and including the 1% AEP (Annual Exceedance Probability) (100-year floodplain). A variety of alternatives were considered during the formulation of a tentatively selected plan, which are described in the IFR/EA.

The draft IFR/EA was prepared in accordance with NEPA regulations, the Council on Environmental Quality's regulations for implementing NEPA and *U.S. Army Corps of Engineers Procedures for Implementing NEPA, Engineering Regulation (ER) 200-2-2.* The EA evaluates existing environmental, cultural, and socio-economic conditions in the study area, and the effects of the project on existing resources in the immediate and surrounding areas.

The IFR/EA can be downloaded from our District website: http://www.nap.usace.army.mil/Missions/CivilWorks/PublicNoticesReports.aspx

Pursuant to NEPA, the USACE requests your review and comment on the draft IFR/EA within 30 days of the date of this letter. Steps proposed to be taken in order to reduce potential adverse impacts to natural resources are presented in the report. All necessary permits and approvals will be obtained prior to construction. Concurrence with the USACE's Coastal Zone Management Act consistency determination is being requested from the Pennsylvania Department of Environmental Protection.

If you have any questions please contact Ms. Valerie Whalon, Biologist, Environmental Resources Branch at (215-656-0620) valerie.m.whalon@usace.army.mil. Thank you for your attention to this matter.

Sincerely,

LEARY.ADRIAN.1384973384

Digitally signed by LEARY.ADRIAN.1384973384
Date: 2023.08.25 09:29:48 -04'00'

FOR Peter R. Blum, P.E.
Chief, Planning Division

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, PHILADELPHIA DISTRICT
1650 ARCH STREET
PHILADELPHIA PA 19103-2004

August 31, 2023

Environmental Resources Branch

Mr. Tyler Neimond
Stream Habitat Section Chief
PA Fish & Boat Commission
450 Robinson Lane
Bellefonte PA, 16823
tneimond@pa.gov

Dear Mr. Neimond:

This letter is to notify you that the U.S. Army Corps of Engineers (USACE), Philadelphia District has prepared a draft integrated feasibility report and environmental assessment (IFR/EA) titled "Eastwick, Philadelphia County, Pennsylvania, Flood Risk Management, Continuing Authorities Program, Section 205 of the Flood Control Act of 1948, as amended". We are requesting your review of this document in accordance with Section 102 of the National Environmental Policy Act (NEPA).

The USACE, in partnership with the Philadelphia Water Department, proposes to construct a levee to manage flooding from Cobbs Creek during high streamflow events in the Eastwick neighborhood of Philadelphia (i.e., the tentatively selected plan). The 1300-foot long levee would be located along the left bank of Cobbs Creek within the city-owned Eastwick Regional Park and Clearview Landfill. The levee design was modeled to be effective to reduce flooding up to and including the 1% AEP (Annual Exceedance Probability) (100-year floodplain). A variety of alternatives were considered during the formulation of a tentatively selected plan, which are described in the IFR/EA.

The draft IFR/EA was prepared in accordance with NEPA regulations, the Council on Environmental Quality's regulations for implementing NEPA and *U.S. Army Corps of Engineers Procedures for Implementing NEPA, Engineering Regulation (ER) 200-2-2.* The EA evaluates existing environmental, cultural, and socio-economic conditions in the study area, and the effects of the project on existing resources in the immediate and surrounding areas.

The IFR/EA can be downloaded from our District website: http://www.nap.usace.army.mil/Missions/CivilWorks/PublicNoticesReports.aspx

Pursuant to NEPA, the USACE requests your review and comment on the draft IFR/EA within 30 days of the date of this letter. Steps proposed to be taken in order to reduce potential adverse impacts to natural resources are presented in the report. All necessary permits and approvals will be obtained prior to construction.

If you have any questions please contact Ms. Valerie Whalon, Biologist, Environmental Resources Branch at (215-656-0620) valerie.m.whalon@usace.army.mil. Thank you for your attention to this matter.

Sincerely,

LEARY.ADRIAN.1384973384 Digitally signed by LEARY.ADRIAN.1384973384 Date: 2023.08.25 09:30:19 -04'00'

FOR Peter R. Blum, P.E.
Chief, Planning Division

Enclosures

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, PHILADELPHIA DISTRICT
1650 ARCH STREET
PHILADELPHIA PA 19103-2004

August 31, 2023

Environmental Resources Branch

Delaware Riverkeeper Network
925 Canal Street
7th Floor, Suite 3701
Bristol, PA 19007
drn@delawareriverkeeper.org

To Whom it May Concern:

This letter is to notify you that the U.S. Army Corps of Engineers (USACE), Philadelphia District has prepared a draft integrated feasibility report and environmental assessment (IFR/EA) titled "Eastwick, Philadelphia County, Pennsylvania, Flood Risk Management, Continuing Authorities Program, Section 205 of the Flood Control Act of 1948, as amended". We are requesting your review of this document in accordance with Section 102 of the National Environmental Policy Act (NEPA).

The USACE, in partnership with the Philadelphia Water Department, proposes to construct a levee to manage flooding from Cobbs Creek during high streamflow events in the Eastwick neighborhood of Philadelphia (i.e., the tentatively selected plan). The 1300-foot long levee would be located along the left bank of Cobbs Creek within the city-owned Eastwick Regional Park and Clearview Landfill. The levee design was modeled to be effective to reduce flooding up to and including the 1% AEP (Annual Exceedance Probability) (100-year floodplain). A variety of alternatives were considered during the formulation of a tentatively selected plan, which are described in the IFR/EA.

The draft IFR/EA was prepared in accordance with NEPA regulations, the Council on Environmental Quality's regulations for implementing NEPA and *U.S. Army Corps of Engineers Procedures for Implementing NEPA, Engineering Regulation (ER) 200-2-2.* The EA evaluates existing environmental, cultural, and socio-economic conditions in the study area, and the effects of the project on existing resources in the immediate and surrounding areas.

The IFR/EA can be downloaded from our District website: http://www.nap.usace.army.mil/Missions/CivilWorks/PublicNoticesReports.aspx

Pursuant to NEPA, the USACE requests your review and comment on the draft IFR/EA within 30 days of the date of this letter. Steps proposed to be taken in order to reduce potential adverse impacts to natural resources are presented in the report. All necessary permits and approvals will be obtained prior to construction.

If you have any questions please contact Ms. Valerie Whalon, Biologist, Environmental Resources Branch at (215-656-0620) valerie.m.whalon@usace.army.mil. Thank you for your attention to this matter.

Sincerely,

LEARY.ADRIAN.1384973384

Digitally signed by LEARY.ADRIAN.1384973384
Date: 2023.08.25 09:30:42 -04'00'

FOR Peter R. Blum, P.E.
Chief, Planning Division

Enclosures

PUBLIC NOTICE (Enclosure 1)

THIS IS NOT A PAID ADVERTISEMENT

US Army Corps of Engineers
Philadelphia District

Public Notice

Public Notice No. CENAP-PL-E-23-XX

Date July XX, 2023

In Reply Refer to:
Environmental Resources Branch

Draft
INTEGRATED FEASIBILITY REPORT/ENVIRONMENTAL ASSESSMENT
FLOOD RISK MANAGEMENT STUDY
CONTINUING AUTHORITIES PROGRAM
SECTION 205 OF THE WATER RESOURCES DEVELOPMENT ACT
EASTWICK, PHILADELPHIA COUNTY, PENNSYLVANIA

In accordance with Section 102 of the National Environmental Policy Act, as amended, Section 404 of the Clean Water Act, and Section 10 of the Rivers and Harbors Act, notice is hereby given that the U.S. Army Corps of Engineers, Philadelphia District, is issuing a draft a integrated feasibility report and environmental assessment (IFR/EA) titled *Eastwick, Philadelphia County, Pennsylvania, Flood Risk Management, Continuing Authorities Program, Section 205 of the Water Resources Development Act*. The EA evaluates several alternative flood risk management solutions, and identified a preferred alternative/tentatively selected plan (TSP).

For the preferred alternative/TSP, the USACE, in partnership with the Philadelphia Water Department, proposes to construct a levee to manage flooding from Cobbs Creek during high streamflow events in the Eastwick neighborhood of Philadelphia (i.e., the tentatively selected plan). The 1300-foot levee would be located along the left bank of Cobbs Creek within the city-owned Eastwick Regional Park and Clearview Landfill. The levee design was modeled to be effective to reduce flooding up to and including the 0.2% AEP (Annual Exceedance Probability) (500-year floodplain).

In accordance with the National Environmental Policy Act of 1969, a draft IFR/EA and Finding of No Significant Impact (FONSI) statement has been prepared for this project, and is being circulated to the appropriate Federal, State, and local agencies, and the interested public. This document can be obtained from: http://www.nap.usace.army.mil/Missions/CivilWorks/PublicNoticesReports.aspx.

In accordance with Section 404 of the Clean Water Act would be avoided or minimized, if possible. If it is not possible, wetland impacts would be mitigated.

In accordance with Section 401 of the Clean Water Act, Water Quality Certification is being requested from the Pennsylvania Department of Environmental Protection.

In accordance with Section 307 (c) of the Coastal Zone Management Act of 1972, an activity affecting land or water uses in a State's coastal zone must be consistent with the enforceable policies of a State's Coastal Zone Management Program. Concurrence with CZM consistency determination is being requested from the Pennsylvania Department of Environmental Protection.

It has been determined that the proposed work is not likely to adversely affect listed species or their critical habitat pursuant to Section 7 of the Endangered Species Act as amended.

Review of the National Register of Historic Places indicates that no registered properties, or properties listed as eligible for inclusion, would be impacted.

The Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires all Federal agencies to consult with the National Marine Fisheries Service on all actions, or proposed actions, permitted, funded, or undertaken by the agency, that may adversely affect Essential Fish Habitat (EFH). No effects on EFH are expected.

All practicable means to avoid or minimize adverse environmental effects have been incorporated into the TSP. The public and all agencies are invited to comment on this proposal. More detailed information on this work is available for public review at the Philadelphia District Office.

Any person may request, in writing, to the District Engineer, within the comment period specified in this notice, that a public hearing be held to consider this proposal. Requests for a public hearing shall state, in detail, the reasons for holding a public hearing.

All comments on the work described in this public notice should be directed to Mr. Peter R. Blum, P.E. ATTN: Environmental Resources Branch, at PDPA-NAP@usace.army.mil no later than 30 days from the date of this notice.

FOR THE DISTRICT ENGINEER:

Peter R. Blum, P.E.
Chief, Planning Division
Philadelphia District
U.S. Army Corps of Engineers

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, PHILADELPHIA DISTRICT
1650 ARCH STREET
PHILADELPHIA PA 19103-2004

COORDINATION LIST (Enclosure 2)

Ms. Barbara Rudnick, NEPA Team Leader

U.S. Environmental Protection Agency
US EPA Region 3
Four Penn Center
1600 John F. Kennedy Blvd. Philadelphia,
PA 19103-2029
rudnick.barbara@epa.gov

Mr. Gregory Becoat
U.S. Environmental Protection Agency
Region 3, Air Emissions
US EPA Region 3
Four Penn Center
1600 John F. Kennedy Blvd. Philadelphia,
PA 19103-2029
becoat.gregory@epa.gov

Mr. Rick McCorkle
U.S. Fish and Wildlife Service
Pennsylvania Field Office
110 Radnor Rd; Suite 101
State College, PA 16801
richard_mccorkle@fws.gov
IR1_ESPenn@fws.gov

Ms. Jennifer Anderson
Assistant Regional Administrator Greater
Atlantic Region Fisheries Office National
Marine Fisheries Service
55 Great Republic Drive
Gloucester, MA 01930
jennifer.anderson@noaa.gov

Ms. Karen Greene, Fishery Biologist
Habitat Conservation Division
National Marine Fisheries Service Sandy
Hook Laboratory
74 Magruder Road
Highlands, NJ 07732
karen.greene@noaa.gov

Mr. John Hohenstein, Environmental Program Manager
Waterways and Wetlands Program, Southeast Regional Office
Pennsylvania Department of Environmental Protection
2 East Main Street
Norristown, PA 19401
johohenste@pa.gov
cc: rsharp@pa.gov

Tyler Neimond
Stream Habitat Section Chief
PA Fish & Boat Commission
450 Robinson Lane
Bellefonte PA, 16823
tneimond@pa.gov

Federal Consistency Coordinator
Compacts and Commissions Office
P.O. Box 8465
400 Market Street, 10th Floor
Harrisburg, PA 17105-8465
RA-Fed_Consistency@pa.gov

Ms. Robin Dushane
Cultural Preservation Director
Eastern Shawnee Tribe of Oklahoma
12705 S. 705 Road
Wyandotte, OK 74370

Mr. Jesse Bergevin
Tribal Historic Preservation Officer
Oneida Indian Nation
2037 Dream Catcher Plaza
Oneida, NY 13421

Ms. Bonney Hartley
Tribal Historic Preservation Officer
Stockbridge-Munsee Community of Mohican Indians
New York Office
65 1st Street
Troy, NY 12180

Mr. Arnold Printup
Tribal Historic Preservation Officer
St. Regis Mohawk Tribe
412 State Route 37
Hogansburg, NY 13655

Mr. Paul Racette
Watershed Programs Manager
Pennsylvania Environmental Council
1315 Walnut Street, Suite 532
Philadelphia, PA 19107

Eastwick
Continuing Authorities Program Section 205
Flood Risk Management Feasibility Study

Philadelphia, Pennsylvania

Appendix C

Economics

August 2023

U.S. ARMY CORPS OF
ENGINEERS
PHILADELPHIA DISTRICT

ECONOMICS
TECHNICAL APPENDIX

EASTWICK, PHILADELPHIA, PA

CAP 205

FEASIBILITY STUDY

AUGUST 2023

U.S. Army Corps of Engineers
Philadelphia District

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1. EXECUTIVE SUMMARY

Located at the southwest corner of Philadelphia County, the community of Eastwick is a primarily residential neighborhood with a highly diverse population demographic home to more than 15,000 permanent residents. As indicated by both the Climate and Economic Justice Screening Tool (CEJST) and the Environmental Justice Screening and Mapping Tool (EJScreen), Eastwick is an economically disadvantaged and environmental justice community.

Eastwick has a long history of impacts from storm events, most recently from Hurricane Isaias and Hurricane Ida, including damaged homes, unnavigable roads, disrupted utilities, and negative impacts to health and safety. These events result in serious impacts to economic opportunities, social resiliency, and life safety.

Modeling the community of Eastwick in HEC-FDA version 1.4.3 provides a projection of flood risk over the 50-year period of analysis starting in Base Year 2030. Incorporating both structure value and content value, the Eastwick inventory has over 2,400 structures with a total Depreciated Replacement Value (DRV) of $1.16 billion. In FY2023 Price Level and using the FY2023 Federal Discount Rate of 2.5%, the modeled area representing Eastwick is projected to experience $6.6 million in Average Annual Damages ($187 million Present Value over the 50-year period of analysis).

As any structural or floodplain measures may impact hydraulics upstream and downstream of the measure, the inventory and modeling area is correspondingly extended upstream and downstream of the Eastwick model reaches. This includes modeling 300+ more structures, primarily non-residential, and increases the total inventory to $1.41 billion with $15.4 million in Average Annual Damages ($438 million Present Value).

The table below provides an overview of the future-without project condition and National Economic Development (NED) comparison between the levee alternative, identified as the Tentatively Selected Plan, and the leading nonstructural-only alternative. The nonstructural-only alternative would be primarily acquisition, rather than elevations, due to the characteristics of the housing units (e.g., connected townhouses).

National Economic Development

	Decision Metric	FWOP	Levee Alternative (TSP)	Nonstructural (10% AEP)
NED	FWOP AAD	$15,432,000	$15,432,000	$15,432,000
	FWP AAD	$15,432,000	$10,906,000	$13,257,000
	Reduced AAD (AAB)	**$0**	**$4,526,000**	**$2,176,000**
	Initial Construction	$0	$13,332,000	$8,417,000
	AA OMRR&R	$0	$67,000	$0
	AAC	**$0**	**$539,000**	**$297,000**
	AANB	**$0**	**$3,986,000**	**$1,879,000**
	BCR	**1.0**	**8.4**	**7.3**
	Residual Risk*	100%	27.0%	67.0%

*Residual Risk accounts for residual damages within the community of Eastwick

The levee alternative reasonably maximizes net NED benefits for the study area with $3,986,000 million in AANB and a BCR of 8.4. Residual risk within the community of Eastwick is also improved with the levee alternative with only 27% residual damages compared to 67% with the leading nonstructural-only alternative.

The following tables expand upon the NED comparison to include RED, OSE, and EQ planning accounts.

Regional Economic Development

	Decision Metric	FWOP	Levee Alternative (TSP)	Nonstructural (10% AEP)
Regional Economic Development (RED)	Impact on Regional Business Output	Business output will decline due to displacement of facilities from repetitive and persistent inundation	Very positive impact on reducing impacts to business output. Successfully diverting flood water will allow businesses to avoid downtimes, avoid clean-up costs, and explore new opportunities	No positive impact on regional business output
	Impact on Income	Business closures within the study area will stunt the local economy. Impassable roadways from repetitive inundation will reduce total working days for population	Very positive impact. Avoided damaging flood events will reduce missed workdays and remove cleanup and repair costs from burdening the local community	Minimally improved. Persistent impact to majority of residents and businesses. Population relocated as part of acquisition will not experience lost workdays from flood delays
	Impact on Employment	Business closures within the study area will stunt the local economy. Local and regional employment threatened by closed businesses	Very positive impact. Avoiding damaging flood events will keep businesses open, roads passable, and strengthen regional and local employment opportunities and economic growth	Minimally improved. Persistent impact to majority of residents and businesses. Population relocated as part of acquisition will not experience lost employment opportunities
	Tax Base Changes	With continued flooding, tax values on homes and collected sales tax values will remain depressed	Very positive impact. Lowering flood risk will reduce downward pressure on home values and taxable sales	No improvement. Acquisition of residential structures removes tax base

As the Tentatively Selected Plan is expected to keep floodwaters from repetitively inundating the entire community of Eastwick, downward pressure on regional output, income, employment, and real estate tax base would be alleviated in the FWP condition. This is particularly beneficial for an economically disadvantaged and underserviced community where improvements to economic growth opportunities and vitality can materialize as significant enhancements to quality of life.

The 10% AEP floodplain acquisition plan has modest positive RED impacts compared to the No-Action condition, but the vast majority of the population continues to feel negative impacts to business output, income, employment, and tax base. Persistent flooding through the town will keep homes values in the area depressed while repetitive flooding causes missed employment hours and employment opportunities.

Other Social Effects

	Decision Metric	FWOP	Levee Alternative	Nonstructural (10% AEP)
Other Social Effects (OSE)	Health and Safety	Continued risks to health and safety. Repetitive and persistent flooding	Very positive impact. Reduced flooding mitigates critical service disruptions, such as potable water, electric, natural gas, sewage treatment, access to emergency services, and availability of medical services	Minimal improvement. Majority of population subject to continued flooding
	Economic Vitality	Continued flooding depresses local economic health and opportunity	Very positive impact. Reduced flood risk allows for economic growth opportunities and higher investment in the community	Minimal improvement. Local economic opportunities continue to worsen
	Social Connectedness	Continued risk forces residents to leave area and disrupt social connectivity	Moderately positive impact. Reduced flood risk lessens pressure on residents to leave the area and disrupt social network	No improvement. Community cohesiveness continues to decline
	Identity	Continued risk forces residents to leave area and degrade community identity	Moderately positive impact. Reduced flood risk lessens pressure on residents to leave the area and abandon community identity	No improvement. Community identity continues to degrade
	Social Vulnerability and Resiliency	Continued flooding exacerbates existing social vulnerability and environmental injustice	Very positive impact. Reduced flood risk improves community value, improves resiliency, and mitigates some environmental justice issues	Minimal improvement. Majority of population receives no increased resiliency nor decrease in environmental injustice
	Participation	Continued flooding worsens community members' trust in local and regional governance	Very positive impact. Community trust in regional and local government office improves, strengthened community can participate more fully in local and regional governance	Minimal improvement. Majority of population remains underserviced
	Leisure and Recreation	Continued flooding degrades available leisure	Moderately positive impact. Leisure and	No improvement. Leisure and recreation areas

		and recreation areas such as public parks	recreation areas are flooded less frequently and available for use more often	continue to flood and degrade

For OSE benefits of the Tentatively Selected Plan, reducing flood risk to the community and decreasing the frequency of damaging flood events has significant positive impacts on community resiliency, continued access to critical services, and long-term community health and viability.

For OSE benefits of the 10% AEP nonstructural-only plan, the measures do not keep water from repetitively and persistently flooding the community of Eastwick. Even with some reduction of flood damages to residential structures through acquisition, the social community will continue to degrade and remain underserviced. The acquisition of structures may actually exacerbate issues regarding community connectiveness and community identity by actively reducing the population within the neighborhood.

Life Safety Risk Analysis

	Decision Metric	FWOP	Levee Alternative	Nonstructural (10% AEP)
Life Safety Risk	Incremental Risk	No	Yes	No
	Transformed Risk	No	Yes	No
	Transferred Risk	No	Yes, but potentially mitigated by formulating complementary features	No

Quantitative life safety risk analysis, performed using HEC-LifeSim 2.0, for the Tentatively Selected Plan is expected during the next study phase. This includes following guidelines outlined in PB 2019-04 *Incorporating Life Safety into Flood and CSRM Studies* and EP 1105-2-63 *Guide for Incorporating Life Risk in USACE Flood and CSRM Project Development*. Analysis will focus on incremental risk, transformed risk, and potential actions to reduce residual risk within Eastwick and transferred risk to areas outside of Eastwick.

Potential induced (transferred) flooding from constructed structural measures, both in terms of asset damage and life safety risk, will be further incorporated into the formulation process by investigating complementary structural and nonstructural measures upstream and downstream of the levee location. This may include targeted asset acquisition, floodplain management, berms, and other potential measures.

The EQ analysis developed for the structural alternative and nonstructural alternatives is not a comprehensive representation of the environmental constraints, impacts, or benefits associated with the plan. An in-depth assessment of the impacts of the levee alternative can be found in the Main Report and in the Environmental Appendix. Direct environmental costs are incorporated directly into the cost estimates for the levee alternative. Impacts on EQ are from both plans are negligible. There are no long-term improvements or degradations anticipated for water quality, air quality, noise pollution, endangered species, wetlands, aquatic habitats, or terrestrial habitats. Certain impacts from structure demolition, such as air quality and noise pollution, may be temporary, but would be expected to dissipate quickly after demolition and clean-up is completed. A more in-depth analysis of potential EQ opportunities is expected in the next study phase.

In summary, plan selection is in compliance with ER 1105-2-100 *Planning Guidance Notebook* and the ASA(CW) policy directive on *Comprehensive Documentation of Benefits in Decision Document* (January 5th). In review of NED, RED, OSE, and EQ planning accounts, the levee alternative is the NED Plan, Net Total Benefits Plan, and the Tentatively Selected Plan (TSP). The alternative will be optimized in the next study phase and potential complementary features investigated, but in its current alignment and scope is expected to reduce damages in the area by $128 million in Present Value terms over the 50-year period of analysis. In FY2023 Price Level and FY2023 Federal Discount Rate of 2.5%, the levee alternative has a BCR of 8.4 with $3,986,000 in Average Annual Net Benefits.

The TSP is projected to cost $13,332,000 with an Average Annual Cost of $539,000, including $67,000 in Average Annual OMRR&R, over the 50-year period of analysis.

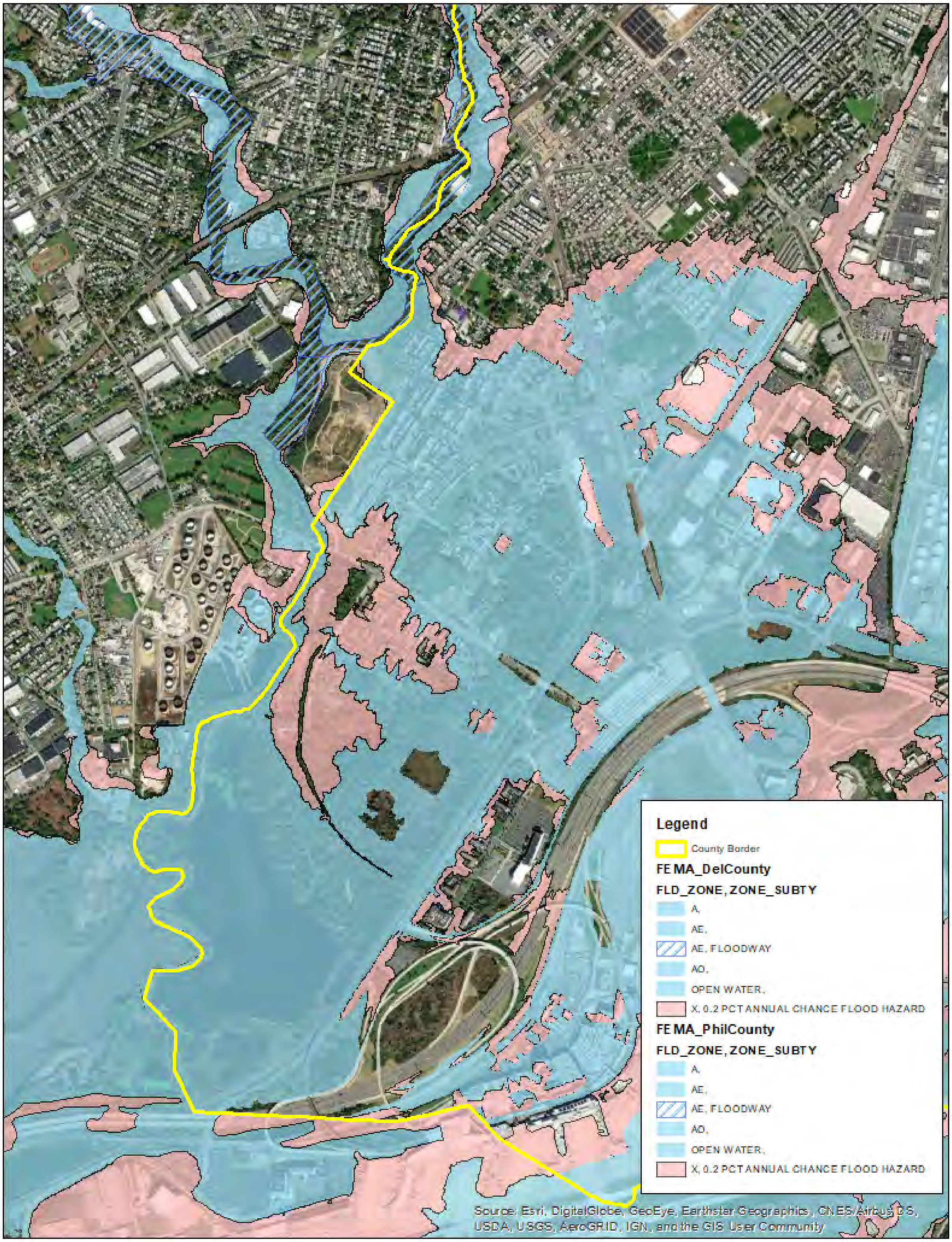
2. INTRODUCTION

This appendix presents the economics methodology, assumptions, and resulting analysis for managing flood risk within the neighborhood of Eastwick, Philadelphia, Pennsylvania. This report will detail each step of the analytical process and describe relevant inputs and results for the entirety of the model area. The assessment is conducted at a Feasibility level and provides risk-informed results on flood risk and potential flood risk management alternatives within the neighborhood of Eastwick over the full 50-year period of analysis.

Eastwick is the most southwestern neighborhood in the city of Philadelphia bordering the county line with Delaware County. Located just north of the Philadelphia International Airport, Eastwick is an economically disadvantaged, primarily residential neighborhood with a highly diverse population demographic. Eastwick is situated at the confluence of Cobbs Creek and Darby Creek with a long history of damaging flood events. The study area for this feasibility-level analysis is based on the FEMA 0.2% Annual Exceedance Probability (AEP) floodplain within the neighborhood of Eastwick though the model area extends both upstream and downstream of this boundary to capture potential incremental risk from proposed flood risk management measures.

Figure 1 on the following page provides an overview of the flood risk facing the neighborhood of Eastwick. The study area is heavily vulnerable to both the 1% AEP flood event and the 0.2% AEP flood event with numerous historic damaging events. Economic analysis will cover all four planning accounts, including National Economic Development (NED) analysis conducted using HEC-FDA 1.4.3, and qualitative assessments of Regional Economic Development (RED), Other Social Effects (OSE), and Environmental Quality (EQ).

Figure 1: Eastwick – FEMA 0.2% AEP Floodplain



3. HEC-FDA SOFTWARE DESCRIPTION

The Hydrologic Engineering Center – Flood Damage Reduction Analysis (HEC-FDA) software version 1.4.3 is used to model Future Without-Project Conditions and a variety of scenarios for Future With-Project Conditions.

HEC-FDA ver. 1.4.3 provides integrated hydrologic engineering and economic risk analysis during the formulation and evaluation of flood damage reduction plans in compliance with policy regulations ER 1105-2-100 *Planning Guidance Notebook*, ER 1105-2-101 *Risk Assessment for Flood Risk Management Studies*, and EM 1110-2-1619 *Risk-Based Analysis for Flood Damage Reduction Studies*. Uncertainty in stage-probability, depth-percent damage, and stage-damage functions are quantified and incorporated into economic and engineering performance analyses of alternatives. The process applies Monte Carlo simulation, a numerical-analysis procedure that computes the expected value of damage while explicitly accounting for uncertainty in the basic parameters used to determine flood inundation damage.

Data on historic flood events, water surface profiles, inventory characteristics, and vulnerable critical infrastructure within the study area will be used as input for the HEC-FDA software. Future Without-Project Conditions are used as the base condition over the 50-year period of analysis and are compared against potential alternatives to determine with-project National Economic Development (NED) benefits.

Due to the complex hydraulic nature of the floodplain, HEC-FDA modeling incorporated 2-D gridded input (depth grids) rather than the traditional 1-D linear hydraulic modeling. This approach allows for HEC-FDA analysis to more closely match the actual study area environment and allows for modeling the depth and inundation at each individual structure location in the floodplain. More information on the hydraulic modeling and 2-D gridded approach can be found in the Hydraulics & Hydrology (H&H) Appendix.

The model will use an FY2023 Price Level and FY2023 Project Evaluation and Formulation Rate (Discount Rate) of 2.5% as directed in EGM 23-01 *Federal Interest Rates for Corps of Engineers Projects for Fiscal Year 2023*.

4. CLIMATE AND ECONOMIC JUSTICE / ENVIRONMENTAL JUSTICE

Two screening tools were run to determine the opportunities for economic and environmental justice within the neighborhood of Eastwick. The Council on Environmental Quality (CEQ) developed the Climate and Economic Justice Screening Tool (CEJST) and the Environmental Protection Agency (EPA) developed the Environmental Justice Screening and Mapping Tool (EJScreen). Together, the tools help provide relevant socioeconomic data, identify disadvantaged communities, and indicate potential environmental issues. These factors allow for integrating economic and environmental justice criteria into the formulation and alternatives screening.

Climate and Economic Justice Screening Tool (CEJST)

The CEJST provides the following socioeconomic information for Eastwick, Philadelphia, PA based on the most recent American Community Survey data from the U.S. Census Bureau. For the purposes of this study, the neighborhood of Eastwick is captured within four Census tracts shown in Table 1. A map of the Census tracts used for the evaluation is provided on the following page (Figure 2).

Table 1: CEJST Demographics Information

	Census Tracts			
Category	**42101005400**	**42101005500**	**42101005600**	**42101006000**
Total Population	1,577	6,321	1,158	6,467
Percent Black or African American alone	70.0%	71.0%	88.0%	73.0%
Percent American Indian / Alaska Native	0.0%	0.0%	0.0%	0.0%
Percent Asian	8.0%	2.0%	0.0%	8.0%
Percent Native Hawaiian or Pacific	0.0%	0.0%	0.0%	0.0%
Percent two or more races	2.0%	7.0%	5.0%	5.0%
Percent White	11.0%	13.0%	2.0%	10.0%
Percent Hispanic or Latino	7.0%	11.0%	3.0%	1.0%
Percent other races	2.0%	2.0%	0.0%	0.0%
Percent age under 10	9.0%	7.0%	19.0%	11.0%
Percent age 10 to 64	75.0%	76.0%	72.0%	76.0%
Percent age over 64	15.0%	15.0%	7.0%	12.0%
Life expectancy (years)	78	78.59	68.7	79.09
Life expectancy (percentile)	55th	49th	98th	44th

The neighborhood of Eastwick, as defined for this study, has just over 15,000 permanent residents with a percent Black or African American population between 70% and 88% depending on the Census tract. This is well above the national average of 13.6% as stated in the 2020 Census. The remaining population is a smaller mix of Asian, White, and Hispanic populations.

In terms of population, three of the Census tracts are near the national average in terms of life expectancy and percentage of the population over the age of 64. The exception is Census tract 42101005600 where the life expectancy is 10 years lower than the national average and is in the 98th percentile for the nation.

Figure 2: CEJST – Census Tracts

Table 2 provides additional CEJST information and determinations on whether the tracts fall within a disadvantaged community. In total, the CEJST provides 130 descriptive criteria for each Census tract. The table below provides only selected criteria that summarizes and highlights important factors in the community. A full methodology on classification of disadvantaged communities can be found at the CEQ website link below:

https://screeningtool.geoplatform.gov/en/methodology

Table 2: CEJST Disadvantaged Community Criteria

	Census Tracts			
Category	**42101005400**	**42101005500**	**42101005600**	**42101006000**
Identified as disadvantaged	TRUE	TRUE	TRUE	TRUE
Adjusted percent of individuals below 200% Federal poverty line (percentile)	72nd	51st	80th	71st
Adjusted percent of individuals below 200% Federal poverty line (percent)	35%	23%	42%	35%
Tract experienced historic underinvestment	TRUE	TRUE	TRUE	TRUE
Proximity to NPL (Superfund) sites (percentile)	96th	92nd	93rd	89th
Current asthma among adults (percentile)	93rd	94th	99th	97th
Share of properties at risk of flood in 30 years (percentile)	96th	89th	97th	67th

Based on the criteria outlined in the CEJST, all four Census tracts used to represent the neighborhood of Eastwick for this study are classified as disadvantaged. This classification is based on numerous criteria, but higher than national average poverty rates, proximity to superfund sites, asthma-afflicted adults, vulnerability to flood risk, and history of underinvestment highlight some of the climate and economic factors used to make this determination.

To meet the directive of Justice40 (Executive Order 14008), a Federal goal to provide 40% of overall benefits of certain Federal investments to marginalized, underserved, and overburdened communities, Eastwick serves as a prime opportunity to manage flood risk in a vulnerable and disadvantaged area.

Environmental Justice Screening and Mapping Tool (EJScreen)

EJScreen presents three kinds of information from the online mapping tool: environmental indicators, socioeconomic indicators, and EJ/supplemental indexes. The supplemental indexes summarize how an environmental indicator and socioeconomic factors come together in the same location. EJScreen can help identify areas that may warrant additional consideration, analysis, or outreach due to potential environmental justice concerns.

For the purposes of this study, Eastwick is defined using the same four Census tracts as used for the CEJST analysis. Figure 3 on the following page shows the tract boundaries.

Using the EJScreen tool, the figures on the following pages present a selection of environmental and socioeconomic indicators for the neighborhood of Eastwick. Factors are compared against both State and National averages to gage the relative severity of potential environmental justice issues. The environmental justice indexes combine data on low income and people of color populations with a single environmental indicator.

The supplemental indexes combine data on low-income, limited English speaking, less than high school education, unemployed, and low life expectancy populations with a single environmental indicator to offer a more wholistic perspective on community-level vulnerability. The full methodology for the EJScreen Tool can be found on the EPA's website:

https://www.epa.gov/ejscreen

Figure 3: EJScreen – Census Tracts

Figure 4: EJScreen – Environmental Justice and Supplemental Indexes

Selected Variables	Percentile in State	Percentile in USA
Environmental Justice Indexes		
Particulate Matter 2.5 EJ Index	95	90
Ozone EJ Index	89	86
Diesel Particulate Matter EJ Index*	93	92
Air Toxics Cancer Risk EJ Index*	91	87
Air Toxics Respiratory HI EJ Index*	92	89
Traffic Proximity EJ Index	92	90
Lead Paint EJ Index	79	86
Superfund Proximity EJ Index	96	95
RMP Facility Proximity EJ Index	95	93
Hazardous Waste Proximity EJ Index	89	85
Underground Storage Tanks EJ Index	93	92
Wastewater Discharge EJ Index	83	76

**Environmental Justice indexes combine data on low income and people of color populations with a single environmental indicator*

Selected Variables	Percentile in State	Percentile in USA
Supplemental Indexes		
Particulate Matter 2.5 Supplemental Index	89	82
Ozone Supplemental Index	78	74
Diesel Particulate Matter Supplemental Index*	88	85
Air Toxics Cancer Risk Supplemental Index*	82	74
Air Toxics Respiratory HI Supplemental Index*	86	77
Traffic Proximity Supplemental Index	84	81
Lead Paint Supplemental Index	59	74
Superfund Proximity Supplemental Index	90	88
RMP Facility Proximity Supplemental Index	87	84
Hazardous Waste Proximity Supplemental Index	81	76
Underground Storage Tanks Supplemental Index	86	83
Wastewater Discharge Supplemental Index	61	60

**Supplemental indexes combine data on low-income, limited English speaking, less than high school education, unemployed, and low life expectancy populations with a single environmental indicator*

For both the Environmental Justice and Supplemental Indexes, the neighborhood of Eastwick rates far above both state and national averages for key environmental variables. Particularly indicative are the ratings for particulate matter, air toxics, superfund proximity, Risk Management Program (RMP) facility proximity, and underground storage tanks. All rate near or above the 80^{th}-90^{th} percentile in the nation.

Figure 5: EJScreen – Environmental and Socioeconomic Variables

Selected Variables	Value	State		USA	
		Avg.	%tile	Avg.	%tile
Pollution and Sources					
Particulate Matter 2.5 (μg/m³)	9.46	8.7	87	8.67	75
Ozone (ppb)	42.9	42.1	57	42.5	57
Diesel Particulate Matter* (μg/m³)	0.458	0.27	91	0.294	80-90th
Air Toxics Cancer Risk* (lifetime risk per million)	30	31	83	28	80-90th
Air Toxics Respiratory HI*	0.4	0.32	98	0.36	80-90th
Traffic Proximity (daily traffic count/distance to road)	800	660	78	760	77
Lead Paint (% Pre-1960 Housing)	0.38	0.47	40	0.27	65
Superfund Proximity (site count/km distance)	0.35	0.18	88	0.13	92
RMP Facility Proximity (facility count/km distance)	2	0.82	89	0.77	90
Hazardous Waste Proximity (facility count/km distance)	1.6	1.5	70	2.2	65
Underground Storage Tanks (count/km²)	11	3.6	91	3.9	90
Wastewater Discharge (toxicity-weighted concentration/m distance)	26	77	91	12	98
Socioeconomic Indicators					
Demographic Index	65%	26%	91	35%	86
Supplemental Demographic Index	17%	13%	77	15%	68
People of Color	90%	24%	93	40%	89
Low Income	41%	28%	76	30%	70
Unemployment Rate	6%	5%	68	5%	67
Limited English Speaking	3%	2%	80	5%	68
Less Than High School Education	14%	9%	80	12%	69
Under Age 5	3%	5%	31	6%	29
Over Age 64	15%	18%	37	16%	47
Low Life Expectancy	20%	20%	58	20%	57

Figure 5 provides the values used to inform the Environmental Justice indexes and Supplemental indexes provided in Figure 4. In concert with the environmental indicators, the selected socioeconomic indicators are also suggestive of disadvantaged community with Low Income, Unemployment Rate, Limited English Speaking, and Less than High School Education all above the national average.

While EJScreen is a screening-level tool and does not conclusively identify environmental justice communities, the selected indicators are strongly suggestive that Eastwick classifies as an environmental justice community and presents an opportunity to provide Federal benefits in a disadvantaged community.

5. STRUCTURE INVENTORY DEVELOPMENT

This section will cover the creation of the structure inventory and describe the use of 2-D gridded hydraulic engineering inputs for HEC-FDA version 1.4.3. More detailed information on the development of hydrologic and hydraulic inputs can be found in the H&H Appendix.

Development of the structure inventory involves surveying existing floodplain structures to collect the data necessary to determine expected flood risk damages. The purpose for collecting this information is to determine what structures are located in the floodplain, the depreciated replacement value of the structures and their associated contents, and the zero-damage elevation at which they are initially susceptible to flooding.

Structure Identification and Valuation

The structure inventory was developed using the National Structure Inventory (NSI) with additional aerial and street-level surveying. Adjustments to depreciated replacement value are based on results from RSMeans. The NSI was originally developed for the USACE Modeling, Mapping, and Consequence (MMC) center and aggregates data from a variety of sources, including the Federal Emergency Management Agency (FEMA)'s Hazus Program, Homeland Infrastructure Foundation-Level Data, Esri, Microsoft, and the U.S. Census Bureau. The NSI, paired with primary surveyed data, provides required HEC-FDA 1.4.3 inputs such as structure location (Northing & Easting coordinates), category type, occupancy types, number of floors, and construction type. A full description of the development and maintenance of the NSI can be found at the NSI website:

https://www.hec.usace.army.mil/confluence/nsi

Figure 6 shows the raw data outputs from the NSI for both Philadelphia County and Delaware County in the vicinity of Eastwick. The NSI data was eventually clipped and refined to the 0.2% AEP floodplain within Eastwick and to the floodplains upstream and downstream of potential flood risk management measures. Figure 7 shows the clipped inventory entered into HEC-FDA after additional manual adjustment to building centroid locations.

To capture square footage estimates, polygons were drawn over the building footprints of each structure in the asset inventory. Paired with the number of floor estimates from the NSI, total square footage estimates are calculated for each asset. Figure 8 shows an example square footage polygon set within Eastwick.

RSMeans Square Foot Cost Book allows for calculating the depreciated replacement value of structures based on recorded inputs such as construction type, building usage, number of floors, and square foot measurements. Structure inputs were recorded using Google Earth Pro and Esri's ArcGIS. Depreciated replacement values were originally developed using the 2021 Square Foot Cost Book and periodically updated using Engineer Manual (EM) 1110-2-1304, *Civil Works Construction Cost Index System (CWCCIS).* Current results use price levels derived from EM 1110-2-1304, dated 30 September 2022.

Foundation heights (used to calculate first floor elevations (FFE)) were also captured on a population-level basis using Google Earth Pro street view. All foundation height measurements are available for review in the supporting technical documentation or in the HEC-FDA model.

The HEC-FDA asset inventory contains twenty-seven occupancy types aggregated into six categories. These categories are Residential, Religious, Public, Commercial, Industrial, and Closed. For completeness, assets that are closed or no longer have value are included in the asset inventory ("CLOSED") to show they have not been erroneously overlooked, but have values of $0 in HEC-FDA

Table 3 provides a breakdown of the structure categories and occupancy types entered into HEC-FDA.

Figure 6: National Structure Inventory Markers

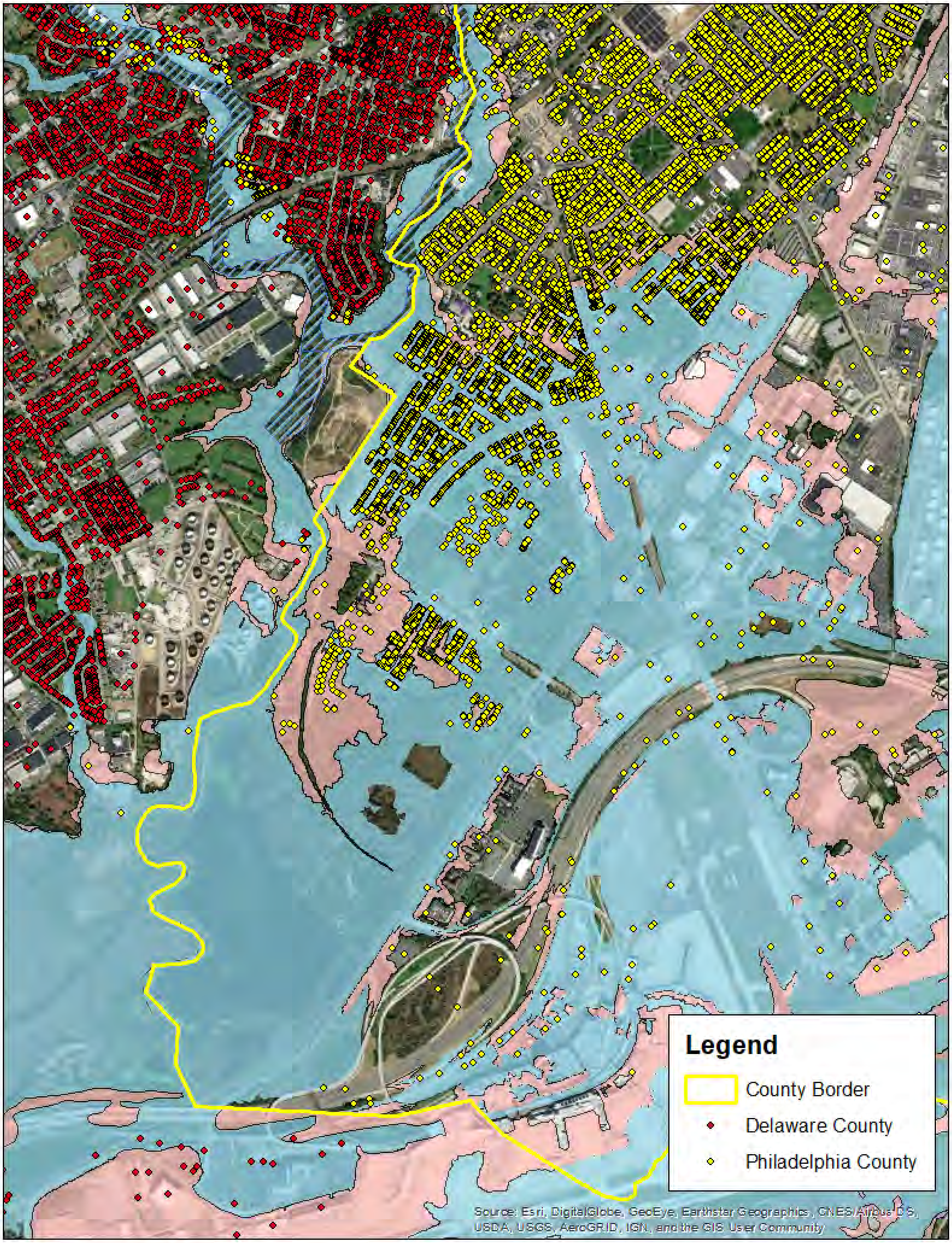


Figure 7: Eastwick Plus Upstream/Downstream Markers

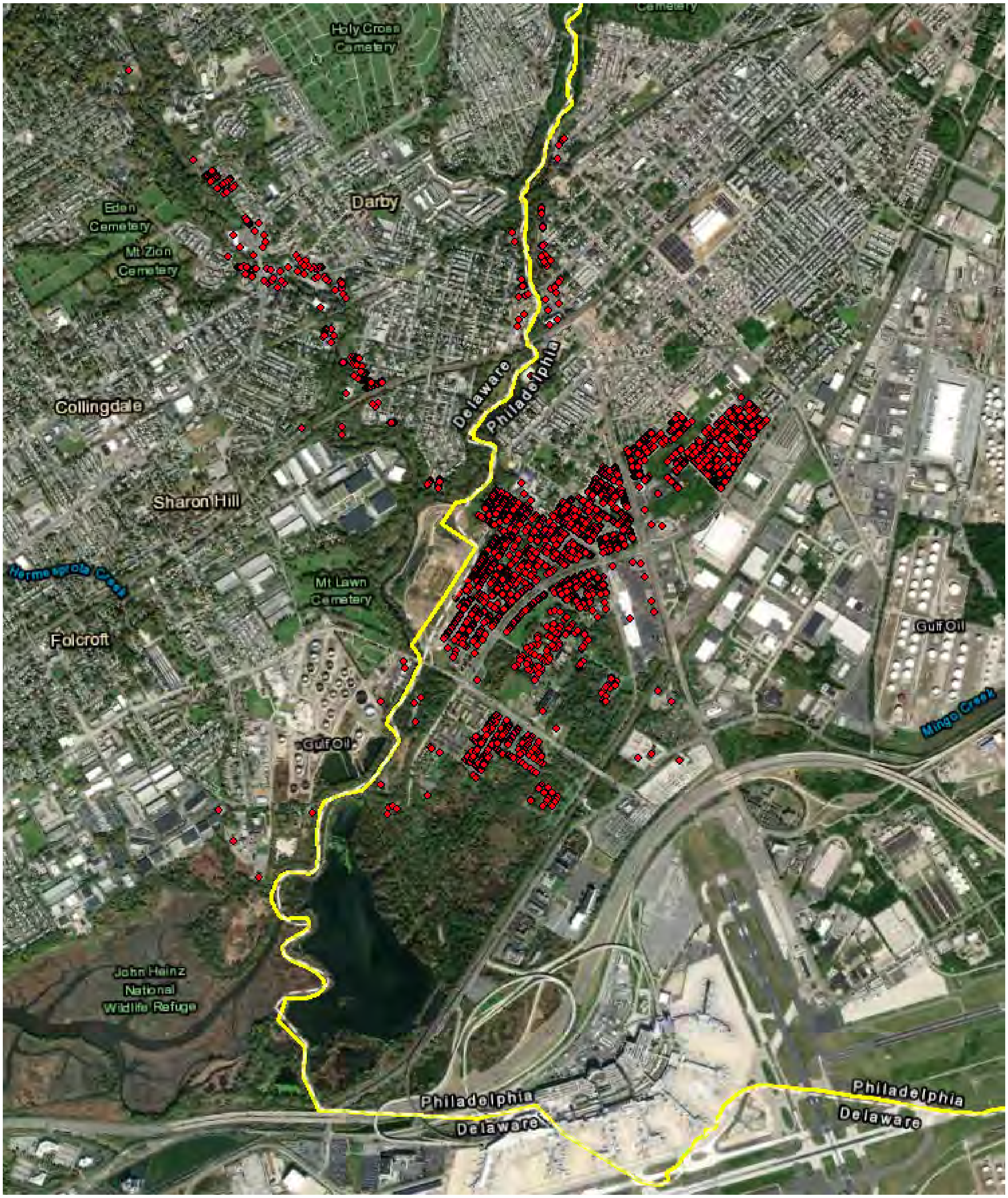


Figure 8: Eastwick Square Footage Polygons Example

All captured square footage measurements are available for review in the supporting technical documentation. Please note that square footage measurements, and associated structure value estimates, do not affect tax assessments nor flood insurance premiums for any other local, state, or Federal agency. The measurements and associated values are only used for the economic analysis of this flood risk management study.

The HEC-FDA asset inventory contains twenty-seven occupancy types aggregated into six categories. These categories are Residential, Religious, Public, Commercial, Industrial, and Closed. For completeness, assets that are closed or no longer have value are included in the asset inventory ("CLOSED") to show they have not been erroneously overlooked, but have values of $0 in HEC-FDA

Table 3: HEC-FDA Category and Occupancy Types

Category	Occupancy	Description	CSVR	Source
RES	SFR1-BV	Single-Family Residential 1 Story – Brick	0.435	EM 1110-2-1619
RES	SFR1-WV	Single-Family Residential 1 Story – Wood	0.435	EM 1110-2-1619
RES	SFR2-BV	Single-Family Residential 2 Story – Brick	0.441	EM 1110-2-1619
RES	SFR2-WV	Single-Family Residential 2 Story – Wood	0.441	EM 1110-2-1619
RES	SFR2-MS	Single-Family Residential 2 Story – Masonry	0.441	EM 1110-2-1619
RES	SFR2-BV-RB*	Single-Family Residential 2 Story – Brick – Refurbished Basement	0.441	EM 1110-2-1619
RES	MFR1-WV	Multi-Family 1 Story – Wood	0.435	EM 1110-2-1619
RES	MFR2-WV	Multi-Family 2 Story – Wood	0.441	EM 1110-2-1619
RES	MFR2-BV	Multi-Family 2 Story – Brick	0.441	EM 1110-2-1619
REL	REL	Religious Services Building	0.500	
PUB	FIRE	Fire Station	0.840	Southwest Coastal LA
COM	MEDOFFICE	Medical Office	0.760	Southwest Coastal LA
PUB	EDU-1S	Education (School) 1 Story	0.840	Southwest Coastal LA
PUB	EDU-3S	Education (School) 3 Story	0.840	Southwest Coastal LA
IND	WAREHOUSE	Warehouse	0.760	Southwest Coastal LA
COM	BANK	Bank	0.760	Southwest Coastal LA
COM	RENTAL	Rental Car Service	1.150	IWR 96-R-12
COM	EQUINE	Equestrian Services	0.500	
COM	FASTFOOD	Fast Food Service	0.490	IWR 96-R-12
COM	RETAIL	Retail Building	1.450	IWR 96-R-12
COM	OFFICE	Office Building (General)	0.760	Southwest Coastal LA
CLOSED	CLOSED	Closed or No Value	0.000	-
COM	GROCERY	Grocery Store	1.690	IWR 96-R-12
COM	SERVICE	Gas Station Service	1.150	IWR 96-R-12
COM	AUTOMOTIVE	Automotive Service	1.150	IWR 96-R-12
RES	APT	Apartment Building (4+ Story)	0.441	EM 1110-2-1619
RES	SFR3-BV	Single-Family Residential 3 Story – Brick	0.441	EM 1110-2-1619

Content values are established using Content-to-Structure Values (CSVRs) with the implicit assumption that the content values of a structure are directly related to the value of the structure itself. CSVRs are applied at the occupancy type level and are pulled from a variety of sources. The majority of occupancy types have available CSVRs in EM 1110-2-1619 *Risk-Based Analysis for Flood Damage Reduction Studies* and IWR 96-R-12 *Analysis of Nonresidential Content Value and Depth-Damage Data for Flood Damage Reduction Studies.*

The remaining CSVRs were sourced from the *Depth-Damage Relationships for Structures, Contents, and Vehicles and Content-to-Structure Value Ratios (CSVR) in Support of the Donaldsonville to the Gulf, Louisiana, Feasibility Study* (March 2006). Two occupancy types, Equestrian Services and Religious Services, did not have readily available documented CSVRs and use instead use CSVRs of 50%. While there is a risk of over- or under-counting content-related damages by using this entry, these structures account for only 5 of 2,748 assets and the overall risk to the economic analysis is low.

As shown in Table 4 below, the HEC-FDA structure inventory includes 2,748 assets valued at $939 million in structure value and $467 million in content value. This comprises the entire inventory including Eastwick and assets both upstream and downstream of the potential levee measure. The inventory is primarily residential with over 95% of assets categorized as single-family residences or apartment units. The remaining assets are categorized as commercial, public, industrial, or religious services.

Table 4: HEC-FDA Category Type Summary (in Thousands)

Category	Description	Count	Structure Value (000's)	Content Value (000's)	Total Value (000's)	Average Value (000's)
RES	Residential	2629	$825,000	$364,000	$1,189,000	$452
COM	Commercial	84	$55,000	$58,000	$113,000	$1,347
PUB	Public	6	$28,000	$23,000	$51,000	$8,564
REL	Religious	3	$6,000	$3,000	$8,000	$2,753
IND	Industrial	20	$25,000	$19,000	$44,000	$2,213
CLOSED	Closed	6	$0	$0	$0	$0
TOTAL	**-**	**2748**	**$939,000**	**$467,000**	**$1,406,000**	***$513**

*Average Value excludes CLOSED structures

Though residential structures constitute the majority of assets by count and by total value, the average value for commercial, public, religious, and industrial structures are much higher due to larger square footage footprints and more robust CSVRs.

For this study, vehicle values and potential damages were not captured. While vehicles in Eastwick are certainly at risk of damage depending on the availability of high ground and delivered warning times for flood events, the overall contribution of vehicle damages to total flood damages is expected to be low and would not be expected to alter alternative comparison or selection.

Table 5 provides inventory summary statistics broken into the 27 occupancy types.

Table 5: HEC-FDA Occupancy Type Summary

Category	Occupancy	Count	Structure Value (000's)	Content Value (000's)	Total Value (000's)	Average Value (000's)
RES	SFR1-BV	109	$17,700	$7,700	$25,400	$233
RES	SFR1-WV	5	$1,100	$500	$1,600	$320
RES	SFR2-BV	2313	$713,300	$314,500	$1,027,800	$444
RES	SFR2-WV	38	$13,800	$6,100	$19,900	$525
RES	SFR2-MS	2	$800	$400	$1,200	$595
RES	SFR2-BV-RB	146	$41,600	$18,300	$59,900	$410
RES	MFR1-WV	4	$10,500	$4,600	$15,100	$3,773
RES	MFR2-WV	1	$1,000	$400	$1,400	$1,403
RES	MFR2-BV	1	$1,000	$400	$1,400	$1,401
REL	REL	3	$5,500	$2,800	$8,300	$2,753
PUB	FIRE	2	$4,900	$4,100	$9,100	$4,526
COM	MEDOFFICE	2	$3,300	$2,500	$5,800	$2,918
PUB	EDU-1S	2	$9,600	$8,100	$17,600	$8,817
PUB	EDU-3S	2	$13,400	$11,300	$24,700	$12,350
IND	WAREHOUSE	20	$25,100	$19,100	$44,300	$2,213
COM	BANK	1	$800	$600	$1,500	$1,476
COM	RENTAL	1	$1,300	$1,500	$2,800	$2,778
COM	EQUINE	2	$200	$100	$400	$182
COM	FASTFOOD	11	$4,700	$2,300	$7,100	$643
COM	RETAIL	33	$21,700	$31,600	$53,200	$1,613
COM	OFFICE	22	$20,000	$15,200	$35,200	$1,601
CLOSED	CLOSED	6	$0	$0	$0	$0
COM	GROCERY	3	$900	$1,600	$2,500	$846
COM	SERVICE	1	$100	$100	$200	$198
COM	AUTOMOTIVE	8	$2,100	$2,400	$4,500	$559
RES	APT	3	$21,400	$9,400	$30,800	$10,273
RES	SFR3-BV	7	$3,100	$1,400	$4,500	$648
TOTAL	**-**	**2748**	**$939,100**	**$467,100**	**$1,406,200**	***$513**

*Average Value excludes CLOSED structures

= Critical Infrastructure

Of the 2,629 residential structures, 2,499 (95%) are 2-story single-family residences. The remaining residential structures are apartment buildings, 1-story residences, 3-story residences, and multi-family residences (e.g., duplex). Of the 199 non-residential structures, the majority are retail services, office space, or industrial warehouses. The most valuable assets in the inventory are education-related assets (schools) and large apartment buildings.

Occupancy types shaded in green denote critical infrastructure assets. This is not meant to capture the full range of critical infrastructure transmission services in the area, including utility lines, waste management, or water/gas pipes, but rather highlight the major infrastructure building-like assets at risk from flood events. Of the 2,748 assets, only 29 are potentially categorized as critical infrastructure.

Structure Ground Elevations

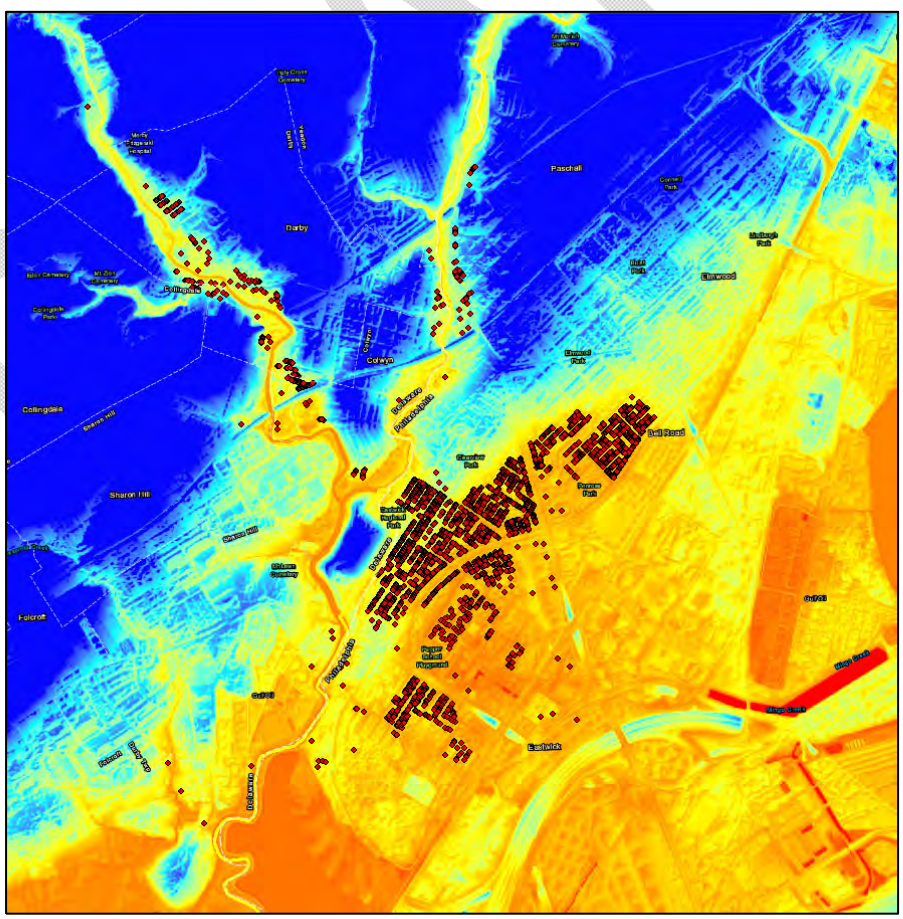
Ground elevations, added to foundation heights, are used to estimate FFEs for each asset in the inventory. Ground elevation is the height of the land at the inventory marker location, typically at the central point of the structure.

Ground elevation is calculated at a population level with the availability of a National Oceanic and Atmospheric Administration (NOAA) Digital Coast Bare Earth Light Detection and Ranging (LiDAR)-derived Digital Elevation Model (DEM). As the LiDAR-derived DEM is available for the entire study area, each individual structure is provided a unique, calculated ground elevation with a high degree of certainty.

Figure 9 shows the LiDAR-derived DEM for the entire study area. The areas shaded in red have the lowest elevation with areas shaded in green or blue having the highest. The structure inventory is overlaid as red markers. Each structure ground elevation is calculated at the intersection of their marker and the underlying Digital Elevation Model for all 2,748 assets.

Ground elevations are recorded in North American Vertical Datum 1988 (NAVD88). More detailed integration of ground elevation, floodplain characteristics, and associated flood patterns can be found in the H&H Appendix.

Figure 9: HEC-FDA Ground Elevations – LiDAR-derived DEM



Depth-Percent Damage Functions

Damage functions are user-defined curves applied within the model to determine the extent of storm-induced damages attributable to inundation. Depth-percent damage curves are created for both structures and contents and for all structure occupancy types.

Damage is determined as a percentage of overall structure or content value using a triangle distribution of values: Minimum, Most Likely (ML), and Maximum. For inundation, damage is determined by the storm-surge heights in relation to the first floor elevation or begin damage point. The begin damage point is the elevation relative to the main floor (0ft) where damage is expected to begin. For the FWOP condition, all structures in the asset inventory have a begin damage point of 0 which indicates that flood damages begin only once flood waters reach the main floor entry.

Depth-percent damage curves provide the option for quantifying damages at thresholds below the First Floor Elevation if the asset has value below the main floor of the structure. This is typically for a below-ground basement with vulnerabilities to flood water below the first floor doorframe.

It is important to note that Section 13a of the Water Resources Development Act (WRDA) 1990 stipulates the following constraints:

> SEC. 13. FLOOD PLAIN MANAGEMENT.
> (a) BENEFIT-COST ANALYSIS- The Secretary shall not include in the benefit base for justifying Federal flood damage reduction projects--
> (1) any new or substantially reconstructed structure built in the 100-year flood plain after July 1, 1991; and
> (2) any structure that becomes located in the 100-year flood plain by virtue of constrictions placed in the flood plain after July 1, 1991.
> (b) COST SHARING- Not later than January 1, 1992, the Secretary shall transmit to Congress a report on the feasibility and advisability of increasing the non-Federal share of costs for new projects in areas where new or substantially reconstructed structures and other constrictions are built or placed in the 100-year flood plain after the initial date of the affected governmental units entry into the regular program of the national flood insurance program of the National Flood Insurance Act of 1968.
> (c) REGULATIONS- The Secretary, in consultation with the Director of the Federal Emergency Management Agency, shall issue regulations to implement subsection (a). Such regulations shall define key terms, such as new or substantially reconstructed structure, constriction, and 100-year flood plain.
> (d) APPLICABILITY- The provisions of this section shall apply to any project, or separable element thereof, for which a final report of the Chief of Engineers has not been forwarded to the Secretary on or before July 1, 1995.

For structures that have been elevated or constructed above the 1% AEP floodplain before July 1, 1991, but have later refurbished their basements or installed other living space below the FFE after this date, these specific portions of the structures are not countable for the economic damages according to WRDA 1990. These structures are captured under the occupancy type SFR2-BV-RB. As the date of these refurbishments are not readily available, it is assumed all refurbishments occurred after July 1, 1991. In practice, this means that while damage to valuable living space may occur well below the FFE, damages in HEC-FDA is not counted until inundation has reached the main floor of the structure.

The depth-percent damage functions utilized in this study are developed by the North Atlantic Coast Comprehensive Study (NACCS) - *Resilient Adaptation to Increasing Risk: Physical Depth Damage Function Summary Report* and by the *Depth-Damage Relationships for Structures, Contents, and Vehicles and Content-to-Structure Value Ratios (CSVR) in Support of the Donaldsonville to the Gulf, Louisiana, Feasibility Study* (March 2006). Each applied depth-percent damage function can be found in the HEC-FDA model.

Reach Delineation

Damage reaches are specific geographical areas within a floodplain. They are used to define consistent data for plan evaluations and to aggregate structure and other potential flood inundation damage information by stage of flooding. Reaches are drawn according to hydrologic boundaries and can be aggregated as necessary to present damages by proposed alternatives.

As this economic analysis incorporated 2-D gridded hydraulic inputs, depth information is calculated at the exact location of each structure rather than based on the station location relative to the 1-D river centerline. Reaches for this study are defined to improve uncertainty application, such as exceedance probability curves, within HEC-FDA.

Table 6 briefly describes the eight HEC-FDA reaches used for the study. Figure 10 on the following page displays the geospatial location for each HEC-FDA reach.

Table 6: HEC-FDA Reach Delineations

Reach Name	Description	Number of Structures
EW1	Eastwick 1	238
EW2	Eastwick 2	311
EW3	Eastwick 3	1875
DC1	Darby Creek 1	15
DC2	Darby Creek 2	18
DC3	Darby Creek 3	206
CC1	Cobbs Creek 1	12
CC2	Cobbs Creek 2	73

The majority of structures for the study area are located within the three Eastwick reaches. It is important to note that the reaches are defined primarily for hydrologic reasons and not for municipal reasons. Therefore, structures within the neighborhood of Eastwick may be located in a reach without Eastwick in the name and vice versa though the vast majority of structures in Eastwick are in fact captured in reach EW1, EW2, or EW3. Ultimately, damages can be aggregated at an asset-by-asset by level if necessary.

Figure 10: HEC-FDA Reach Delineations

2-D Gridded Hydraulic Input

Importing 2-D hydraulic modeling allows for simulating direction during flood events and for modeling depth at each individual structure location to more accurately estimate flood damages. Depth refers to the vertical distance in feet above the ground surface elevation. This is distinct from stage which is the vertical distance in feet above or below a local or national datum (for this study, NAVD88).

2-D depth grids are associated with the structure inventory by compiling one depth grid for each modeled storm return frequency and then overlaying the inventory atop those grids in ArcGIS. The projected depth of inundation for each storm event at the exact location of each individual structure is then assigned to each individual structure. This provides the depth of inundation (if any) for all eight storm events on an asset-by-asset level.

For this study, depth grids were created for the 0.5 AEP, 0.2 AEP, 0.1 AEP, 0.04 AEP, 0.02 AEP, 0.01 AEP, 0.005 AEP, and 0.002 AEP flood events. Visually, the depth grid will look similar to the LiDAR-derived DEM shown in Figure 9, but will indicate depth rather than ground elevation. For high-frequency storm events such as the 0.5 AEP and the 0.2 AEP, the depths for most structures will be "-9999" indicating that the associated hydraulic modeling of the storm event does not project any flood waters above ground elevation at that location. It is important to note that positive depth at a structure indicates flood waters have reached ground elevation, but does not necessarily mean that the structure is vulnerable to flood damages. Most structures have some level of foundation height and therefore the begin damage point may be several feet above ground elevation. Therefore, even if a structure has positive depth (flood water above ground elevation), they may not be damaged until the depth reaches a defined threshold above ground elevation.

As HEC-FDA is originally intended to model structures and flood hazards in terms of stage, the recorded depths were transformed into stage by adding ground elevation (NAVD88) to the depths at each structure. The series of tables below show the transformation from raw depth grid intersections to projected depths to stage heights in NAVD88 for a random selection of structures in Eastwick.

Current hydraulic and hydrology inputs indicate the most recent and best available depth grids and engineering inputs available for the HEC-FDA modeling. Following release of the draft report, optimization and refinement of the technical inputs will improve input accuracy and will alter modeled results. This is an expected procedure for incremental analysis and will be documented in this Appendix prior to release of the final Feasibility Report.

Table 7 shows the raw 2-D grid output for a random sample of structures in the Eastwick area.

Table 7: HEC-FDA Raw Depth Grid Intersections Example

Structure	Cat	Occupancy	Northing	Easting	0.5	0.2	0.1	0.05	0.02	0.01	0.005	0.002
Struc_0836	RES	SFR2-BV	218416.139	2670265.213	-9999	-9999	-9999	-9999	-9999	0.029535	0.494495	0.938584
Struc_0837	RES	SFR2-BV-RB	218399.023	2670254.411	-9999	-9999	-9999	-9999	-9999	-9999	-9999	0.419538
Struc_0838	RES	SFR2-BV	218382.038	2670243.843	-9999	-9999	-9999	-9999	-9999	-9999	-9999	0.221108
Struc_0839	RES	SFR2-BV-RB	218365.707	2670233.620	-9999	-9999	-9999	-9999	-9999	-9999	-9999	0.49872
Struc_0840	RES	SFR2-BV	218348.329	2670222.757	-9999	-9999	-9999	-9999	-9999	-9999	0.167533	0.839742
Struc_0841	RES	SFR2-BV	218105.275	2669793.370	-9999	-9999	0.187349	1.60438	2.90059	3.8704	4.88029	6.22453
Struc_0842	RES	SFR2-BV	218089.884	2669783.294	-9999	-9999	0.624731	2.03199	3.3162	4.27765	5.27922	6.61249
Struc_0843	RES	SFR2-BV	218074.276	2669773.488	-9999	-9999	0.572998	1.99307	3.2952	4.26658	5.27788	6.61504
Struc_0844	RES	SFR2-BV	218058.542	2669763.337	-9999	-9999	-9999	1.29415	2.59591	3.56701	4.57855	5.9161
Struc_0845	RES	SFR2-BV	218043.647	2669754.013	-9999	-9999	0.061318	1.42292	2.63952	3.55169	4.51166	5.78889
Struc_0846	RES	SFR2-BV-RB	218029.429	2669744.083	-9999	-9999	0.467035	1.82136	3.02545	3.9298	4.88281	6.15101
Struc_0847	RES	SFR2-BV	218013.401	2669734.680	-9999	-9999	0.529164	1.86378	3.03813	3.92251	4.85758	6.10315
Struc_0848	RES	SFR2-BV	217998.329	2669724.528	-9999	-9999	0.466652	1.83494	3.05395	3.96862	4.93153	6.21487
Struc_0849	RES	SFR2-BV	217966.788	2669702.679	-9999	-9999	-9999	1.29989	2.59552	3.56288	4.5732	5.91093
Struc_0850	RES	SFR2-BV-RB	217950.286	2669691.704	-9999	-9999	-9999	1.15029	2.37271	3.28859	4.25074	5.53058
Struc_0851	RES	SFR2-BV-RB	217934.926	2669681.769	-9999	-9999	-9999	1.2976	2.50622	3.41163	4.36188	5.62623
Struc_0852	RES	SFR2-BV	217919.741	2669671.375	-9999	-9999	-9999	1.46175	2.76292	3.73239	4.74207	6.07687
Struc_0853	RES	SFR2-BV	217905.121	2669661.982	-9999	-9999	-9999	1.32006	2.6006	3.55589	4.55199	5.87049
Struc_0854	RES	SFR2-BV	217890.599	2669652.062	-9999	-9999	-9999	1.0514	2.24137	3.13384	4.07009	5.31697

For these example structures, no asset has flood waters above ground elevation (i.e., flood waters do not reach the structure) until the 10% AEP event. Eventually, all twenty assets experience flooding at ground level by the 0.2% AEP event. It is important to reiterate that flood depth refers to flooding relative to ground elevation. If these assets have foundation heights above ground elevation, as most structures in the study area do, then they won’t experience flood damages until the flood water reach the FFE. This mathematical intersection of water stage, FFE, and begin damage point occurs within HEC-FDA for every asset individually.

Table 8 shows the transformation from raw depths to NAVD88 stages.

Table 8: HEC-FDA Depth Grid Adjustments Example

Structure	Cat	Occupancy	Northing	Easting	0.5	0.2	0.1	0.05	0.02	0.01	0.005	0.002
Struc_0836	RES	SFR2-BV	218416.139	2670265.213	-2.00	-1.999	-1.998	-1.997	-1.996	0.030	0.494	0.939
Struc_0837	RES	SFR2-BV-RB	218399.023	2670254.411	-2.00	-1.999	-1.998	-1.997	-1.996	-1.995	-1.994	0.420
Struc_0838	RES	SFR2-BV	218382.038	2670243.843	-2.00	-1.999	-1.998	-1.997	-1.996	-1.995	-1.994	0.221
Struc_0839	RES	SFR2-BV-RB	218365.707	2670233.620	-2.00	-1.999	-1.998	-1.997	-1.996	-1.995	-1.994	0.499
Struc_0840	RES	SFR2-BV	218348.329	2670222.757	-2.00	-1.999	-1.998	-1.997	-1.996	-1.995	0.168	0.840
Struc_0841	RES	SFR2-BV	218105.275	2669793.370	-2.00	-1.999	0.187	1.604	2.901	3.870	4.880	6.225
Struc_0842	RES	SFR2-BV	218089.884	2669783.294	-2.00	-1.999	0.625	2.032	3.316	4.278	5.279	6.612
Struc_0843	RES	SFR2-BV	218074.276	2669773.488	-2.00	-1.999	0.573	1.993	3.295	4.267	5.278	6.615
Struc_0844	RES	SFR2-BV	218058.542	2669763.337	-2.00	-1.999	-1.998	1.294	2.596	3.567	4.579	5.916
Struc_0845	RES	SFR2-BV	218043.647	2669754.013	-2.00	-1.999	0.061	1.423	2.640	3.552	4.512	5.789
Struc_0846	RES	SFR2-BV-RB	218029.429	2669744.083	-2.00	-1.999	0.467	1.821	3.025	3.930	4.883	6.151
Struc_0847	RES	SFR2-BV	218013.401	2669734.680	-2.00	-1.999	0.529	1.864	3.038	3.923	4.858	6.103
Struc_0848	RES	SFR2-BV	217998.329	2669724.528	-2.00	-1.999	0.467	1.835	3.054	3.969	4.932	6.215
Struc_0849	RES	SFR2-BV	217966.788	2669702.679	-2.00	-1.999	-1.998	1.300	2.596	3.563	4.573	5.911
Struc_0850	RES	SFR2-BV-RB	217950.286	2669691.704	-2.00	-1.999	-1.998	1.150	2.373	3.289	4.251	5.531
Struc_0851	RES	SFR2-BV-RB	217934.926	2669681.769	-2.00	-1.999	-1.998	1.298	2.506	3.412	4.362	5.626
Struc_0852	RES	SFR2-BV	217919.741	2669671.375	-2.00	-1.999	-1.998	1.462	2.763	3.732	4.742	6.077
Struc_0853	RES	SFR2-BV	217905.121	2669661.982	-2.00	-1.999	-1.998	1.320	2.601	3.556	4.552	5.870
Struc_0854	RES	SFR2-BV	217890.599	2669652.062	-2.00	-1.999	-1.998	1.051	2.241	3.134	4.070	5.317

As Table 8 shows, positive depths (flood water above ground elevation) were unchanged from the raw depth grid intersection. For "-9999" results, depths were adjusted to -2ft and then monotonically increase by 0.001ft. All structures in the asset inventory have a begin damage point of 0 and foundation heights above 1ft which means that any amount of depth below 0 results in $0 damages. Thus, in terms of HEC-FDA computation, a depth of -9 and -2 both result in the same $0 calculation.

Table 9: HEC-FDA Depth Grid to Stage (NAVD88)

Structure	Cat	Occupancy	Northing	Easting	0.5	0.2	0.1	0.05	0.02	0.01	0.005	0.002
Struc_0836	RES	SFR2-BV	218416.139	2670265.213	17.600	17.601	17.602	17.603	17.604	19.630	20.094	20.539
Struc_0837	RES	SFR2-BV-RB	218399.023	2670254.411	17.900	17.901	17.902	17.903	17.904	17.905	17.906	20.320
Struc_0838	RES	SFR2-BV	218382.038	2670243.843	18.100	18.101	18.102	18.103	18.104	18.105	18.106	20.321
Struc_0839	RES	SFR2-BV-RB	218365.707	2670233.620	17.700	17.701	17.702	17.703	17.704	17.705	17.706	20.199
Struc_0840	RES	SFR2-BV	218348.329	2670222.757	17.400	17.401	17.402	17.403	17.404	17.405	19.568	20.240
Struc_0841	RES	SFR2-BV	218105.275	2669793.370	14.300	14.301	16.487	17.904	19.201	20.170	21.180	22.525
Struc_0842	RES	SFR2-BV	218089.884	2669783.294	14.100	14.101	16.725	18.132	19.416	20.378	21.379	22.712
Struc_0843	RES	SFR2-BV	218074.276	2669773.488	13.500	13.501	16.073	17.493	18.795	19.767	20.778	22.115
Struc_0844	RES	SFR2-BV	218058.542	2669763.337	14.500	14.501	14.502	17.794	19.096	20.067	21.079	22.416
Struc_0845	RES	SFR2-BV	218043.647	2669754.013	14.600	14.601	16.661	18.023	19.240	20.152	21.112	22.389
Struc_0846	RES	SFR2-BV-RB	218029.429	2669744.083	14.000	14.001	16.467	17.821	19.025	19.930	20.883	22.151
Struc_0847	RES	SFR2-BV	218013.401	2669734.680	13.800	13.801	16.329	17.664	18.838	19.723	20.658	21.903
Struc_0848	RES	SFR2-BV	217998.329	2669724.528	14.000	14.001	16.467	17.835	19.054	19.969	20.932	22.215
Struc_0849	RES	SFR2-BV	217966.788	2669702.679	14.600	14.601	14.602	17.900	19.196	20.163	21.173	22.511
Struc_0850	RES	SFR2-BV-RB	217950.286	2669691.704	14.700	14.701	14.702	17.850	19.073	19.989	20.951	22.231
Struc_0851	RES	SFR2-BV-RB	217934.926	2669681.769	14.500	14.501	14.502	17.798	19.006	19.912	20.862	22.126
Struc_0852	RES	SFR2-BV	217919.741	2669671.375	14.300	14.301	14.302	17.762	19.063	20.032	21.042	22.377
Struc_0853	RES	SFR2-BV	217905.121	2669661.982	14.400	14.401	14.402	17.720	19.001	19.956	20.952	22.270
Struc_0854	RES	SFR2-BV	217890.599	2669652.062	14.600	14.601	14.602	17.651	18.841	19.734	20.670	21.917

Table 9 shows the final stage entries (NAVD88) for HEC-FDA. For example, Struc_0837, a brick two story single-family residence with a refurbished basement, has a ground elevation of 19.9ft NAVD88. For this particular structure, flood water does not reach the residence until the 0.2% AEP. But as this asset has a foundation height of 8ft (not shown in the table but searchable in the HEC-FDA model and supplemental technical documents), the structure does not actually experience damage in the modeling.

The full list of structure ground elevations, stage transformations, ground elevations, and recorded foundation heights are available for review in the supplemental technical documentation and HEC-FDA model.

6. FUTURE WITHOUT-PROJECT CONDITION

As mentioned above, HEC-FDA links the predictive capability of hydraulic and hydrologic modeling with project area infrastructure information, structure and content damage functions, and economic valuations to estimate the total damages under various proposed alternatives while accounting for risk and uncertainty. The model output is then used to determine the net National Economic Development (NED) benefits of each project alternative in comparison with the No-Action Plan, or Future Without-Project Condition (FWOP).

Future Without-Project Condition damages are used as the base condition and potential project alternatives are measured against this base to evaluate the project effectiveness and cost efficiency. Future Without-Project Condition damages in this section are presented as Average Annual Damages (AAD) over a 50-year period of analysis with the FY2023 Project Evaluation and Formulation Rate (Discount Rate) of 2.5% and the FY2023 Price Level.

Sea Level Change Considerations

Sea Level Change (SLC) is not expected to have a strong influence on Water Surface Profiles (WSP) in the study area over the 50-year period of analysis. Storm surge can flow up the Delaware River and enter Darby Creek though the cumulative effect of this surge is expected to be minimal. Following release of the draft report, the WSPs will be revised to include storm surge and model the Intermediate SLC scenario over the period of analysis. Sensitivity testing will be conducted for the Low and High SLC scenarios. It is not expected that the inclusion of SLC impacts will greatly affect FWOP results nor plan evaluation/comparison/selection, but may affect the optimized height of a structural alternative if identified as the Tentatively Selected Plan.

More information on SLC considerations at this stage of the analysis can be found in the Climate Change section of the H&H Appendix.

HEC-FDA Results

Within the reaches denoting the neighborhood of Eastwick (i.e., EW1, EW2, EW3), the area is projected to experience $6.6 million in Average Annual Damages (AAD) over the period of analysis. This is equivalent to $187 million in Present Value damages over the 50-year period of analysis. It is important to note that this does not project Eastwick will experience exactly $6.6 million in damages every year, but rather is projected to experience an average of $6.6 million damages per year with most years having low or no flood damages and a small number of years having major flood events with damages well in excess of $6.6 million. Table 10 shows the results for the community of Eastwick.

Table 10: HEC-FDA Eastwick FWOP Results

	CLOSED	**COM**	**IND**	**PUB**	**REL**	**RES**	**TOTAL**
EW1	$0	$0	$0	$0	$0	$1,992,000	$1,992,000
EW2	$0	$91,000	$2,000	$6,000	$5,000	$428,000	$532,000
EW3	$0	$52,000	$1,000	$18,000	$0	$4,005,000	$4,076,000
TOTAL	**$0**	**$143,000**	**$3,000**	**$24,000**	**$5,000**	**$6,425,000**	**$6,600,000**

The HEC-FDA reaches upstream and downstream of the neighborhood of Eastwick experience an additional $8.8 million in Average Annual Damages (AAD) over the 50-year period of analysis. The modeled AAD in these areas is driven primarily by commercial and residential structures in reaches CC2 and DC3. These areas will be further investigated in the next study phase to determine what factors are driving consequences in the 2D HEC-FDA modeling.

Table 11 provides an overview of HEC-FDA results by reach and by category type.

Table 11: HEC-FDA Upstream/Downstream FWOP Results

	CLOSED	COM	IND	PUB	REL	RES	TOTAL
CC1	$0	$11,000	$0	$0	$0	$12,000	$23,000
CC2	$0	$1,689,000	$567,000	$582,000	$221,000	$1,917,000	$4,976,000
DC1	$0	$194,000	$175,000	$0	$0	$0	$369,000
DC2	$0	$27,000	$170,000	$0	$0	$63,000	$260,000
DC3	$0	$1,010,000	$544,000	$23,000	$0	$1,626,000	$3,203,000
TOTAL	**$0**	**$2,931,000**	**$1,456,000**	**$605,000**	**$221,000**	**$3,618,000**	**$8,831,000**

HEC-FDA results indicate that residential and commercial assets contribute the majority of expected average annual damages. This result is unsurprising as residential and commercial properties account for over 98% of total assets in the inventory. For commercial, the structures are typically much larger than other occupancy types, and thus more valuable, with higher anticipated content values and lower foundation heights. This increases the projected consequence value and increases the probability of damage over the 50-year period of analysis. Both factors contribute to elevated expected annual damages.

In terms of reaches, Eastwick experiences the majority of damage to residential assets with 64% of residential structure damage occurring in EW1, EW2, and EW2. As indicated earlier in the Appendix, Eastwick is an environmental justice and economically disadvantaged community which can exacerbate vulnerability of the population and lengthen post-storm recovery times.

7. FUTURE WITH-PROJECT DAMAGES

Performing economic analysis on proposed alternatives within the study area was an iterative process with complex interdependence between study reaches and between certain measure combinations. Economic analysis centered on structural measures (levees and floodwalls) and nonstructural measures (elevations and floodproofing).

This section will detail the methodology and results of evaluating proposed flood risk management measures including expected flood damages reduced and potential induced flooding from structural measures upstream and downstream of the neighborhood of Eastwick.

Nonstructural Evaluation

Nonstructural measures fall into four broad groups resulting from the inventory and screening process (as discussed in the Nonstructural Appendix) including Acquisition / Relocation, Building Retrofit (floodproofing, elevations), Land Use Management (zoning changes, undeveloped land preservation), and Early Flood Warnings (evacuation planning, emergency response systems). Refinements to the National Flood Insurance Program (including increasing homeowner participation and increasing municipal protection in the Community Rating System) also represent a nonstructural opportunity, though they are outside the scope and authority of this assessment. Each measure type has a varying level of flood damage reduction function and/or adaptive capacity and a comprehensive nonstructural alternative would include each of the four measures as necessary to optimize FRM benefits.

At this stage of the analysis, nonstructural economic assessment incorporates only building retrofits (elevations and floodproofing) and potential acquisitions in HEC-FDA modeling. More expansive nonstructural measures, such as land use management and early flood warning programs, require additional coordination with local, state, and Federal agencies to gage what is currently in place and what measures may be realistic. That coordination will continue after release of the draft report.

Building elevation is the process of vertically lifting the asset out of the floodplain. The structure remains in the same location, but with a considerably higher foundation height and first floor elevation. Certain household systems, such as HVAC units, are also elevated while other features such as vehicle parking and sheds are not elevated. Foundation types are typically transformed from basement construction, crawlspaces, or slab-on-grade to an elevated foundation such as piers or enclosed piles.

As certain residential structures are not easily elevated, such as attached rowhouses, acquisition of assets becomes a potential alternative. Rowhouses are single-family homes built side-by-side and share a common wall. Some rowhouses may also share common utility and mechanical infrastructure though this varies by construction design. Rowhouses, like single-family detached housing, may be initially constructed near ground elevation or constructed above the 1% AEP floodplain depending on zoning and insurance requirements at the time of building. Due to the difficulty, risk, and high cost in elevating a vulnerable single rowhouse structure, or elevating all attached rowhouse structures at the same time, building elevation measure are reserved for detached residential properties. Attached rowhouses may be eligible for acquisition as part of the nonstructural alternative.

Floodproofing retrofits includes both wet- and dry-floodproofing. For this study, floodproofing measures are only recommended for non-residential assets including commercial, industrial, religious, and public occupancy types. Wet-floodproofing includes permanent or contingent measures applied to a structure or its contents to provide flood damage resistance while allowing floodwaters to enter the structure or area. Generally, this includes properly anchoring the structure, maintaining water passthroughs, using flood resistance materials, elevating electric outlets, and moving mechanical and utility equipment to a higher floor. Based on the construction design or usage of the structure, wet-floodproofing may not be a viable measure for all assets and would require an asset-by-asset evaluation if implemented.

Dry-floodproofing is a combination of measures intended to create a watertight seal around the structure, including all attendant utilities and equipment, to maintain an impermeable barrier during a flood event. Structural components must be able to handle a higher hydrostatic pressure during flood events as flood water cannot pass through the structure, but will instead load up against walls and entryways. Dry-floodproofing may involve permanent passive measures, such impervious construction materials and reinforced doors, or temporary active measures such as stoplogs. While dry-floodproofing substantially mitigates post-storm recovery compared to wet-floodproofing, as flood waters do not breach the structure perimeter, the risk is also much higher due to numerous potential failure points. Any failure of construction materials, or installed impermeable systems, or delayed active barriers may result in total inundation of the structure. Similar to wet-floodproofing, construction design or usage of the structure may limit the effectiveness of dry-floodproofing for certain assets and would require an asset-by-asset evaluation if implemented.

Though this section evaluates nonstructural as stand-alone measures and a nonstructural-only plan is included in the final array of alternatives, nonstructural measures may also be implemented as complementary residual risk reduction features for other perimeter plans.

Parametric Cost Estimates

Elevation costs are adapted from the North Atlantic Coast Comprehensive Study (NACCS) and are generalized for raising residential structures of varying sizes, designs, and construction materials. Certain residential structures, such as rowhouses, are not eligible for elevation based on impractical implementation. For these assets, acquisition costs are identified based on the NACCS and from recent home sales in the area (to derive fair market value). Within Eastwick, particularly the areas most vulnerable to flooding, the overwhelming majority of structures are rowhouse construction. As such, parametric elevation costs were considered, but ultimately not used in nonstructural elevation at this phase of the study as few structures were eligible for elevation.

As defined in ER 1110-2-1302 *Civil Works Cost Engineering* (dated 30 June 2016), the costs used for nonstructural evaluation are Class 5 estimates. These estimates are also referred to as "Rough Order of Magnitude" (ROM) costs and are based on preliminary technical information (0%-5% level of design). These costs are appropriate for screening-level analysis and to distinguish between alternatives if economic comparisons are very disparate. If competing alternatives are similar in terms of economic results, or if nonstructural measures are included in the TSP, nonstructural cost estimates will be improved in the next study phase.

For acquisition estimates, the fair market value for the property (including land value) is added to additional costs for relocation of residents, demolition of the structure, removal of debris, excavation of underground utilities, and restoration of the site to natural conditions. Acquired properties are usually deed restricted from further development. In the NACCS, these additional costs are stated at $70,000 in 2015 Price Level. In 2023 Price Level, using EM 1110-2-1304 *CWCCIS*, additional costs are approximately $105,000. Fair market value for the properties ranges greatly by structure and varies, in part, by the structure in relation to the floodplain. Structure spatially located in high flood risk areas have typically lower market value compared to comparable structure in low flood risk areas. For the purposes of this Class 5 estimate, the total average acquisition cost for a rowhouse structure was estimated at $400,000 per asset. When considering potential additional contingencies, engineering and design (E&D) requirements, and supervisory and administration (S&A) costs, the Class 5 estimate may be low, but this was intentionally chosen to avoid erroneously screening-out nonstructural measures by utilizing a conservatively high acquisition cost estimate.

Nonstructural Aggregation

Nonstructural measures focused on assets directly adjacent the primary source of flooding, the confluence of Darby Creek and Cobbs Creek, as well as evaluating nonstructural all assets within the 10% AEP, 5% AEP, and 2% AEP floodplains. Assets are considered eligible based on the FFE in comparison to estimates flood stages at those storm frequencies. Structures may be spatially located in a floodplain, but with foundation heights that bring them vertically out of the projected stage for that storm event. Those structures would not be considered eligible as they do not experience flood damages for those storms.

Nonstructural analysis aggregation is based on Planning Bulletin (PB) 2019-03: *Further Clarification of Existing Policy for USACE Participation in Nonstructural FRM and CSRM Measures* and the National Nonstructural Committee's Best Practices Guide (BPG) 2020-06 *Structure Aggregation Methods Used in the Formulation and Evaluation of Nonstructural Alternatives*. As stated in PB 2019-03, nonstructural analysis is not conducted on an asset-by-asset basis, but rather formulated and evaluated using a logical aggregation method that may involve, but is not limited to, groupings of structures by flood risk, first floor elevation, neighborhood, or a shared characteristic.

The following figures show the spatial location of structures eligible for acquisition for each of the modeled nonstructural alternatives.

Figure 11: Nonstructural Alternative – 10% AEP Floodplain Threshold

Figure 12: Nonstructural Alternative – 5% AEP Floodplain Threshold

Figure 13: Nonstructural Alternative – 2% AEP Floodplain Threshold

Figure 14: Nonstructural Alternative – Near Confluence of Darby and Cobbs

Nonstructural Model Results

Table 12 shows the number of structures eligible for acquisition under each nonstructural alternative, the total projected cost (Class 5 estimate), and the associated Average Annual Cost (AAC). Costs and benefits are presented in FY2023 Price Level using the FY2023 Federal Discount Rate of 2.5%.

Interest During Construction was computed using the process outlined in IWR Report 88-R-2 *National Economic Development Procedures Manual – Urban Flood Damages* (March 1988) and the National Nonstructural Committee (NNC) Best Practices Guide 2020-01: *Calculating Interest During Construction for Nonstructural Alternatives* at the FY2023 Federal Discount Rate of 2.5%.

Average Annual Operation, Maintenance, Repair, Replacement, and Rehabilitation (OMRR&R) is assumed to be $0 for nonstructural measures.

Table 12: Nonstructural Alternatives Cost Summary

Alternative	Number of Acquisitions	Total Estimated Construction Cost	Interest During Construction	Average Annual Cost (AAC)
10% AEP	21	$8,400,000	$17,000	$297,000
5% AEP	77	$30,800,000	$63,000	$1,088,000
2% AEP	212	$84,800,000	$175,000	$2,996,000
Confluence	21	$8,400,000	$17,000	$297,000

Table 13 shows the Average Annual Damage (AAD) reduction, also referred to as Average Annual Benefits (AAB), the Benefit-to-Cost Ratio (BCR), Average Annual Net Benefits (ANNB), and the residual risk for each nonstructural alternative. The residual risk is the percentage of damage across Eastwick (reaches EW1, EW2, EW3) expected to occur even after plan implementation.

It is important to note that the residual damage to acquired structures is always $0 (as the structure is evacuated and demolished). Residual risk comes from structures not eligible for acquisition that continue to experience flood damages in the FWP condition.

Table 13: Nonstructural Alternatives Results Summary

Alternative	FWOP AAD*	FWP AAD	Reduced AAD	BCR	AANB	Residual %
10% AEP	$6,601,000	$4,425,000	$2,176,000	7.3	$1,879,000	67.0%
5% AEP	$6,601,000	$3,847,000	$2,754,000	2.5	$1,666,000	58.3%
2% AEP	$6,601,000	$1,534,000	$5,067,000	1.7	$2,071,000	23.2%
Confluence	$6,601,000	$6,582,000	$19,000	0.1	($278,000)	99.7%

*FWOP AAD and FWP AAD are only for reaches EW1, EW2, and EW3

For the modeled nonstructural alternatives, the NED maximizing alternative involves acquiring the 21 structures vulnerable to the 10% AEP flood event. However, this measure only removes 33% of modeled damages within the community. Even after these structures are acquired, the remaining structures would remain at risk and health issues related to repetitive flooding would persist.

Acquiring only the structures near the confluence of Cobbs Creek and Darby Creek (Figure 14) is not economically justified due to existing elevated foundation heights. While flood waters regularly reach the ground elevation for these structures, potentially impeding access, foundation heights in excess of

8ft off the ground prevent measurable damage to the structure itself. Not captured in the modeling would be damages to vehicles or hazards associated with limited ingress and egress to the structures.

RED/OSE/EQ Evaluation

Regional Economic Development (RED), Other Social Effects (OSE), and Environmental Quality (EQ) evaluation of the nonstructural alternatives is handled qualitatively. Certain metrics, such as life safety risk, may be developed quantitatively if necessary for comparison and selection of the TSP.

As defined in IWR 2011-RPT-01 *Regional Economic Development (RED) Procedures Handbook* (March 2011), RED impacts are defined as the transfers of economic activity within a region or between regions in the FWOP condition and for each alternative plan. Spending in an area can spur economic activity, leading to increases in employment, income, and output of the regional economy, while chronic or catastrophic flooding can lead to regional losses in those same categories. As distinct from NED analysis, RED impacts and benefits are local and do not affect the net value of national output of goods and services.

RED impacts, and potential benefits, are unique to each study area based on population employment, labor income, tax base, and local business output. Table 14 provides a qualitative analysis for primary RED metrics across the four modeled nonstructural alternatives.

Table 14: Nonstructural Alternatives – RED Impacts

Metric	No-Action	10% AEP	5% AEP	2% AEP	Confluence
Impact on Regional Business Output	Business output will be lower due to displacement of facilities from repetitive inundation	No positive impact on regional business output	No positive impact on regional business output	No positive impact on regional business output. Some businesses acquired and relocated as part of alternative	No positive impact on regional business output
Impact on Income	Business closures within the study area will stunt the local economy. Impassable roadways from repetitive inundation will reduce total working days for population	Minimally improved. Persistent impact to majority of residents and businesses. Population relocated as part of acquisition will not experience lost workdays from flood delays	Minimally improved. Persistent impact to majority of residents and businesses. Population relocated as part of acquisition will not experience lost workdays from flood delays	Marginally improved. Persistent impact to majority of residents and businesses. Population and businesses relocated as part of acquisition will not experience lost workdays or business hours from flood delays	Minimally improved. Persistent impact to majority of residents and businesses. Population relocated as part of acquisition will not experience lost workdays from flood delays

Impact on Employment	Business closures within the study area will stunt the local economy. Local and regional employment threatened by closed businesses	Minimally improved. Persistent impact to majority of residents and businesses. Population relocated as part of acquisition will not experience lost employment opportunities	Minimally improved. Persistent impact to majority of residents and businesses. Population relocated as part of acquisition will not experience lost employment opportunities	Marginally improved. Persistent impact to majority of residents and businesses. Population and businesses relocated as part of acquisition will not experience lost employment or hiring opportunities	Minimally improved. Persistent impact to majority of residents and businesses. Population relocated as part of acquisition will not experience lost employment opportunities
Tax Base Changes	With continued flooding, tax values on homes and collected sales tax values will remain depressed	No improvement. Acquisition of residential structures removes tax base	No improvement. Acquisition of residential structures removes tax base	No improvement. Acquisition of residential and non-residential structures removes tax base	No improvement. Acquisition of residential structures removes tax base

Among the four qualitatively assessed nonstructural alternatives, the 2% AEP floodplain acquisition plan has the most positive RED impact compared to the No-Action condition, but the benefits are still modest and the majority of the population continue to feel negative impacts to business output, income, employment, and tax base. Persistent flooding will keep homes values in the area depressed while repetitive flooding causes missed employment hours and employment opportunities.

As defined in IWR 09-R-4 *Handbook on Applying "Other Social Effects" Factors in Corps of Engineers Water Resources Planning"* (December 2009), and expanded in IWR 2013-R-03 *Applying Other Social Effects in Alternatives Analysis* (April 2013), other social effects refers to how the constituents of life that influence personal and group definitions of satisfaction, well-being, and happiness are affected by some condition or proposed intervention. Social effects is a broad term, but is generally narrowed to factors on Health and Safety, Economic Vitality, Social Connectedness, Identity, Social Vulnerability and Resiliency, Participation, and Leisure and Recreation.

Table 15 provides an overview of each social effect as defined in IWR 09-R-4.

Table 15: Other Social Effects (OSE) Description

Social Factor	**Description**
Health and Safety	Perceptions of personal and group safety and freedom from risks
Economic Vitality	Personal and group definitions of quality of life, which is influenced by the local economy's ability to provide a good standard of living
Social Connectedness	Community's social networks within which individuals interact; these networks provide significant meaning and structure to life

Identity	Community members' sense of self as a member of a group, in that they have a sense of definition and grounding
Social Vulnerability and Resiliency	Probability of a community being damaged or negatively affected by hazards and its ability to recover from a traumatic event
Participation	Ability of community members to interact with others to influence social outcomes
Leisure and Recreation	Amount of personal leisure time available and whether community members are able to spend it in preferred recreational pursuits

Table 16 qualitatively assesses how each nonstructural alternative may positively or negatively impact the defined social factors compared to the No-Action Plan.

Table 16: Nonstructural Alternatives – OSE Impacts

Social Factor	No-Action	10% AEP	5% AEP	2% AEP	Confluence
Health and Safety	Continued risks to health and safety. Repetitive and persistent flooding	Minimal improvement. Majority of population subject to continued flooding	Minimal improvement. Majority of population subject to continued flooding	Marginal improvement. Majority of population subject to continued flooding. Critical services continued to be disrupted.	Minimal improvement. Majority of population subject to continued flooding
Economic Vitality	Continued flooding depresses local economic health and opportunity	Minimal improvement. Local economic opportunities continue to worsen	Minimal improvement. Local economic opportunities continue to worsen	Marginal improvement. Local economic opportunities continue to worsen	Minimal improvement. Local economic opportunities continue to worsen
Social Connectedness	Continued risk forces residents to leave area and disrupt social connectivity	No improvement. Community cohesiveness continues to decline	No improvement. Community cohesiveness continues to decline	No improvement. Community cohesiveness continues to decline	No improvement. Community cohesiveness continues to decline
Identity	Continued risk forces residents to leave area and degrade community identity	No improvement. Community identity continues to degrade	No improvement. Community identity continues to degrade	No improvement. Community identity continues to degrade	No improvement. Community identity continues to degrade
Social Vulnerability and Resiliency	Continued flooding exacerbates existing social vulnerability and environmental injustice	Minimal improvement. Majority of population receives no increased resiliency nor decrease in	Minimal improvement. Majority of population receives no increased resiliency nor decrease in	Marginal improvement. Majority of population receives no increased resiliency nor decrease in	Minimal improvement. Majority of population receives no increased resiliency nor decrease in

		environmental injustice	environmental injustice	environmental injustice	environmental injustice
Participation	Continued flooding worsens community members' trust in local and regional governance	Minimal improvement. Majority of population remains underserviced	Minimal improvement. Majority of population remains underserviced	Marginal improvement. Majority of population remains underserviced	Minimal improvement. Majority of population remains underserviced
Leisure and Recreation	Continued flooding degrades available leisure and recreation areas such as public parks	No improvement. Leisure and recreation areas continue to flood and degrade	No improvement. Leisure and recreation areas continue to flood and degrade	No improvement. Leisure and recreation areas continue to flood and degrade	No improvement. Leisure and recreation areas continue to flood and degrade

Among the qualitatively assessed OSE contributors, few are improved by the potential nonstructural alternatives. The nonstructural measures do not keep water from repetitively and persistently flooding the community of Eastwick. Even with some reduction of flood damages to residential and non-residential structures through acquisition, the social community will continue to degrade and remain disadvantaged and underserviced. The acquisition of structures may actually exacerbate community connectiveness and community identity issues by actively reducing the population within the neighborhood.

The Environmental Quality (EQ) analysis provided here is not a comprehensive representation of the environmental constraints, impacts, or benefits associated with potential nonstructural plans. An in-depth assessment of the impacts of various plans can be found in the Main Report and in the Environmental Appendix. Direct environmental costs, if any, are incorporated directly into the cost estimates for the various plans. This EQ section is meant to convey the ongoing investigation of the environmental quality account as it relates to plan formulation and plan selection. As EQ is one of the four planning accounts, it must be presented equally with NED, RED, and OSE impacts to provide a complete description of the FWOP and FWP conditions. Potential EQ benefits are presented qualitatively.

The EQ account is defined in ER 1105-2-100 *Planning Guidance Notebook* as the displaying the non-monetary effects on ecological, cultural, and aesthetic resources including the positive and adverse effects of ecosystem. For the proposed nonstructural measure, impacts on EQ are negligible. There are no long-term improvements or degradations anticipated from these potential alternatives for water quality, air quality, noise pollution, endangered species, wetlands, aquatic habitats, or terrestrial habitats. Certain impacts from structure demolition, such as air quality and noise pollution, may be temporary, but would be expected to dissipate quickly after demolition and clean-up is completed. As the vacated lands are intended to be reverted to their natural condition, some marginal EQ benefits are possible.

Structural Evaluation

Structural measures in the economic analysis for this study fall into two main categories: levees and floodwalls. Levees are an earthen embankment, typically with an impermeable clay core, designed to contain, control, or divert the flow of water to reduce risk of flooding for vulnerable structures. Floodwalls are similar flood risk management structures, but constructed of masonry or concrete. Floodwalls typically have a narrower footprint, but a deeper base and are usually more expensive than levee options depending on available real estate. Within HEC-FDA, levees and floodwalls have equal effectiveness as flood risk management measures. More information on structural measures can be found in the Civil Engineering Appendix.

For this study, available real estate at the most likely location for a structural measure is wide enough to allows for construction of a levee system (rather than a floodwall system). As such, cost estimates were only developed for a levee alternative given the cheaper cost estimate and equal effectiveness.

Cost Estimates

Levee alternative cost estimates are presented as a Total Project Cost Summary (TPCS) at a Class 4 level (5%-10% level of design) developed at an October 2022 (FY2023) Price Level. The cost estimate incorporates contingency, adaptive management, environmental monitoring, E&D, and S&A.

Levee alignment, design, and estimated costs will continue to change during refinement and optimization. Those adjustments will be applied to the economic evaluation as necessary. Current preliminary cost estimates indicate the levee alternative estimates a total cost of $13.3 million with a Subtotal Average Annual Cost of $472,000 using an FY2023 Federal Discount rate of 2.5%.

Interest During Construction (IDC) was computed using the process outlined in IWR Report 88-R-2 *National Economic Development Procedures Manual – Urban Flood Damages* (March 1988) at the FY2023 Federal Discount Rate of 2.5%. IDC is estimated to be $69,000 over the period of construction.

Average Annual Operation, Maintenance, Repair, Replacement, and Rehabilitation (OMRR&R) is estimated to be 0.5% of the initial construction cost over the 50-year period of analysis.

Total Estimated AAC, including both IDC and OMRR&R, is $539,000.

The preliminary levee alignment is shown in Figure 15 and the TPCS provided in Table 17. More information on the TPCS can be found in the Main Report and Engineering Appendices.

Figure 15: Levee Alternative Preliminary Alignment

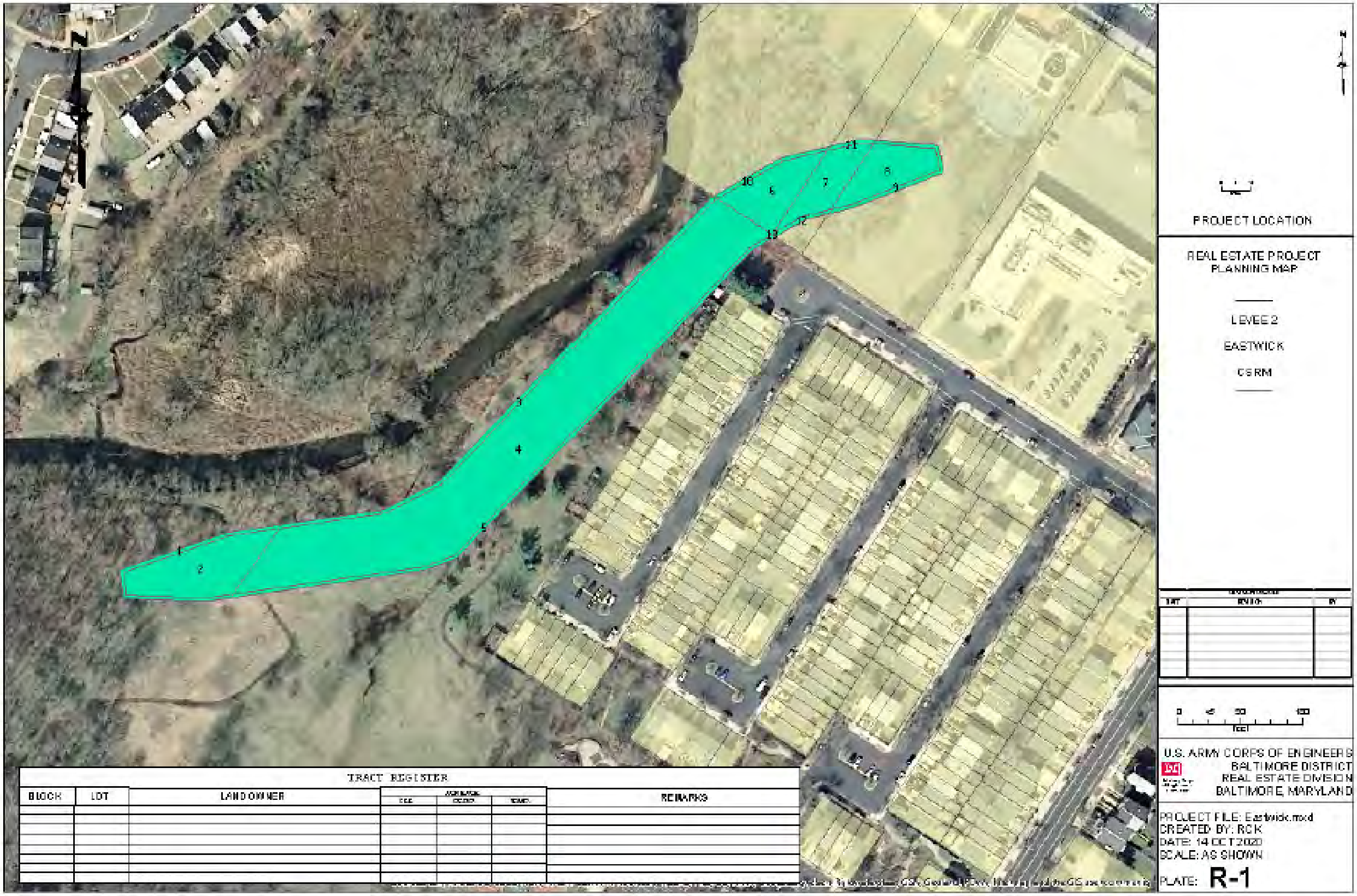


Table 17: Levee Alternative Preliminary CWBS

ACCOUNT NUMBER	DESCRIPTION OF ITEM	QTY	UOM	UNIT PRICE	ESTIMATED AMOUNT	CONTINGENCY	TOTAL ESTIMATED AMOUNT
1	LANDS AND DAMAGES				$129,000	$32,000	$161,000
2	RELOCATIONS				$0	$0	$0
6	FISH AND WILDLIFE FACILITIES				$183,000	$79,000	$262,000
11	LEVEES AND FLOODWALLS	1	Job	LS	$6,055,000	$2,616,000	$8,671,000
ALL	COMPOSITE INDEX				$330,000	$143,000	$473,000
30	PLANNING, ENGINEERING, & DESIGN @ 12%	1	Job	LS	$1,644,000	$710,000	$2,354,000
31	CONSTRUCTION MANAGEMENT (S&A) @ 8.6%	1	Job	LS	$985,000	$426,000	$1,411,000
		TOTAL PROJECT AMOUNT			$9,326,000	$4,006,000	$13,332,000
		ROUNDED			**$9,326,000**	**$4,006,000**	**$13,332,000**
		Interest During Construction					$68,843
		Total Construction Cost					**$13,400,843**
		Federal Discount Rate					2.500%
		Period of Analysis					50
		Capital Recovery Factor					0.03526
		Subtotal AAC					**$472,488**
		Average Annual OMRR&R					$67,004
		Total Estimated AAC					$539,492
		ROUNDED					**$539,000**

Levee Model Results

Table 18 shows the HEC-FDA model results for each reach in the study area. While damage reduction is located solely in reaches EW1, EW2, and EW3, results from all reaches are presented to acknowledge potential incremental, or induced, flood risk upstream or downstream of the proposed levee location. For the purposes of identifying the Tentatively Selected Plan, only the net benefits of the current levee alignment is evaluated and compared against the nonstructural alternatives. In calculating the net NED benefits, any modeled induced damage values are removed from the damage reduction benefits total.

Table 18: Levee Alternative Results Summary

Reach	FWOP AAD	FWP AAD	Reduced AAD
CC1	$23,000	$40,000	-$17,000
CC2	$4,976,000	$5,008,000	-$32,000
DC1	$369,000	$636,000	-$267,000
DC2	$260,000	$292,000	-$32,000
DC3	$3,203,000	$3,150,000	$53,000
EW1	$1,992,000	$584,000	$1,408,000
EW2	$532,000	$451,000	$81,000
EW3	$4,076,000	$745,000	$3,331,000
TOTAL	**$15,432,000**	**$10,906,000**	**$4,526,000**

Rounded AAB	**$4,526,000**
AAC	**$539,000**
BCR	**8.4**
AANB	**$3,986,000**

The levee alternative, without potential additional complementary features, has a BCR of 8.4 and AANB of $3,986,000. The benefits are driven by the significant reduction of flood damages in reaches EW1 and EW3. Residual risk, capturing only the structures in the Eastwick reaches of EW1, EW2, and EW3, is 27.0%. This is the percentage of damages expected to occur even after the project is implemented. Residual risk does not capture potential damages from a failure event, but only damages from projected flood events that exceed the performance level of the feature. In this case, the 1% AEP event. Future optimization will investigate the optimized levee height.

Additional formulation will investigate whether alternative levee alignments or complementary features, either structural or nonstructural, can reduce incremental flood risk in the FWP condition. Complementary features may be upstream or downstream of the levee location and may include floodplain management, structural measures (berms, levees), and/or nonstructural measures (elevation, floodproofing, acquisition). More information on the hydraulic performance of potential complementary features can be found in the H&H Appendix.

Following optimization of the levee height and potential complementary features, performance metrics as defined by ER 1105-2-101 (e.g., Annual Exceedance Probability (AEP), Long-Term Exceedance Probability (LTEP), Assurance by Event) will be calculated for the selected plan.

RED/OSE/EQ Evaluation

Regional Economic Development (RED), Other Social Effects (OSE), and Environmental Quality (EQ) evaluation of the levee alternative is handled qualitatively. Certain metrics, such as life safety risk, may be developed quantitatively if necessary for comparison and selection of the TSP.

As with the nonstructural alternatives, RED impacts and potential benefits for the structural alternatives are unique to each study area based on population employment, labor income, tax base, and local business output. Table 19 provides a qualitative analysis for primary RED metrics across the four modeled nonstructural alternatives.

Table 19: Levee Alternative – RED Impacts

Metric	No-Action	Levee Alternative
Impact on Regional Business Output	Business output will decline due to displacement of facilities from repetitive and persistent inundation	Very positive impact on reducing impacts to business output. Successfully diverting flood water will allow businesses to avoid downtimes, avoid clean-up costs, and explore new opportunities
Impact on Income	Business closures within the study area will stunt the local economy. Impassable roadways from repetitive inundation will reduce total working days for population	Very positive impact. Avoided damaging flood events will reduce missed workdays and remove cleanup and repair costs from burdening the local community
Impact on Employment	Business closures within the study area will stunt the local economy. Local and regional employment threatened by closed businesses	Very positive impact. Avoiding damaging flood events will keep businesses open, roads passable, and strengthen regional and local employment opportunities and economic growth
Tax Base Changes	With continued flooding, tax values on homes and collected sales tax values will remain depressed	Very positive impact. Lowering flood risk will reduce downward pressure on home values and taxable sales

As the levee alternative will keep floodwaters from repetitively inundating the entire community of Eastwick, downward pressure on regional output, income, employment, and real estate tax base would be alleviated in the FWP condition. This is particularly beneficial for an economically disadvantaged and underserviced community where improvements to economic growth opportunities and vitality can materialize as significant enhancements to quality of life.

For the OSE account, as with the modeled nonstructural alternatives, social effects of a structural alternative factors on Health and Safety, Economic Vitality, Social Connectedness, Identity, Social Vulnerability and Resiliency, Participation, and Leisure and Recreation. Table 20 qualitatively assesses how the levee alternative may positively or negatively impact social factors compared to the No-Action Plan.

Table 20: Levee Alternative – OSE Impacts

Social Factor	No-Action	Levee Alternative
Health and Safety	Continued risks to health and safety. Repetitive and persistent flooding	Very positive impact. Reduced flooding mitigates critical service disruptions, such as potable water, electric, natural gas, sewage

		treatment, access to emergency services, and availability of medical services
Economic Vitality	Continued flooding depresses local economic health and opportunity	Very positive impact. Reduced flood risk allows for economic growth opportunities and higher investment in the community
Social Connectedness	Continued risk forces residents to leave area and disrupt social connectivity	Moderately positive impact. Reduced flood risk lessens pressure on residents to leave the area and disrupt social network
Identity	Continued risk forces residents to leave area and degrade community identity	Moderately positive impact. Reduced flood risk lessens pressure on residents to leave the area and abandon community identity
Social Vulnerability and Resiliency	Continued flooding exacerbates existing social vulnerability and environmental injustice	Very positive impact. Reduced flood risk improves community value, improves resiliency, and mitigates some environmental justice issues
Participation	Continued flooding worsens community members' trust in local and regional governance	Very positive impact. Community trust in regional and local government office improves, strengthened community can participate more fully in local and regional governance
Leisure and Recreation	Continued flooding degrades available leisure and recreation areas such as public parks	Moderately positive impact. Leisure and recreation areas are flooded less frequently and available for use more often

Reducing flood risk to the community and decreasing the frequency of damaging flood events has significant positive impacts on community resiliency, continued access to critical services, and long-term community health and viability.

As with the Environmental Quality (EQ) analysis provided for nonstructural, the EQ analysis developed for the structural alternative is not a comprehensive representation of the environmental constraints, impacts, or benefits associated with the plan. An in-depth assessment of the impacts of the levee alternative can be found in the Main Report and in the Environmental Appendix. Direct environmental costs are incorporated directly into the cost estimates for the levee alternative.

For the proposed levee alternative, impacts on EQ are negligible. There are no long-term improvements or degradations anticipated for water quality, air quality, noise pollution, endangered species, wetlands, aquatic habitats, or terrestrial habitats. Certain impacts from structure demolition, such as air quality and noise pollution, may be temporary, but would be expected to dissipate quickly after demolition and clean-up is completed. The levee is constructed near Cobbs Creek, but construction would follow all guidelines to limit impacts to riparian habitats. EQ benefit prospects are limited given the relatively short footprint of the levee. Habitat creation on the levee is possible, but the steepness of the slope may constrain opportunities and would not be expected to positively or negatively impact habitat for endangered species.

8. LIFE SAFETY RISK ANALYSIS

This section is intended to qualitatively assess life safety risk and apply the guidelines outlined in PB 2019-04 *Incorporating Life Safety into Flood and CSRM Studies* and EP 1105-2-63 *Guide for Incorporating Life Risk in USACE Flood and CSRM Project Development*. Quantitatively assessing life safety risk will be accomplished in the next study phase by applying HEC-LifeSim 2.0 for the Tentatively Selected Plan.

The abbreviated qualitative life safety risk analysis in this section will cover the four Tolerable Risk Guidelines (TRGs) outlined in PB 2019-04, a qualitative description of residual risks, including transferred or transformed risks, and an explanation of the key variables that will inform the quantitative life loss analysis.

Life safety risk analysis is a systematic approach for describing the nature of flood risk including the likelihood and severity of occurrence while explicitly acknowledging the uncertainty in the analysis. Life loss consequences are the determination of the population at risk and the estimated statistical life loss in a given area. An assessment of the various types of risk, including residual risk, transferred risk, transformed risk, and incremental risk, can help inform whether the Tentatively Selected Plan and other alternatives provide a tolerable level of safety for the study area in the future with-project condition.

Tolerable Risk Guidelines

An outline and qualitative assessment of the TRGs is completed below. Like all planning objectives, the extent to which the TRGs objectives can be met will vary based on the conditions in the study area and the efficiency and effectiveness of measures that contribute towards meeting the objectives.

TRG 1 – Understanding the Risk. The first tolerable risk guideline involves considering whether society is willing to live with the risk associated with the flood risk management system to secure the benefits of living and working in that area. To properly understand the risk, an assessment of life safety risk will cover both societal and individual life risks. Societal risk is the risk of widespread or large-scale catastrophes from the inundation of a vulnerable area that would result in a negative societal response. Conversely, individual risk the risk represented by the probability of life loss for the identifiable person or group by location that is most at risk of loss of life due to a structural failure. Individual life risk is influenced by location, exposure, and vulnerability within an area. Life safety risk encompasses understanding the societal, individual, economic, and environmental risks associated with the construction of a project in the study area.

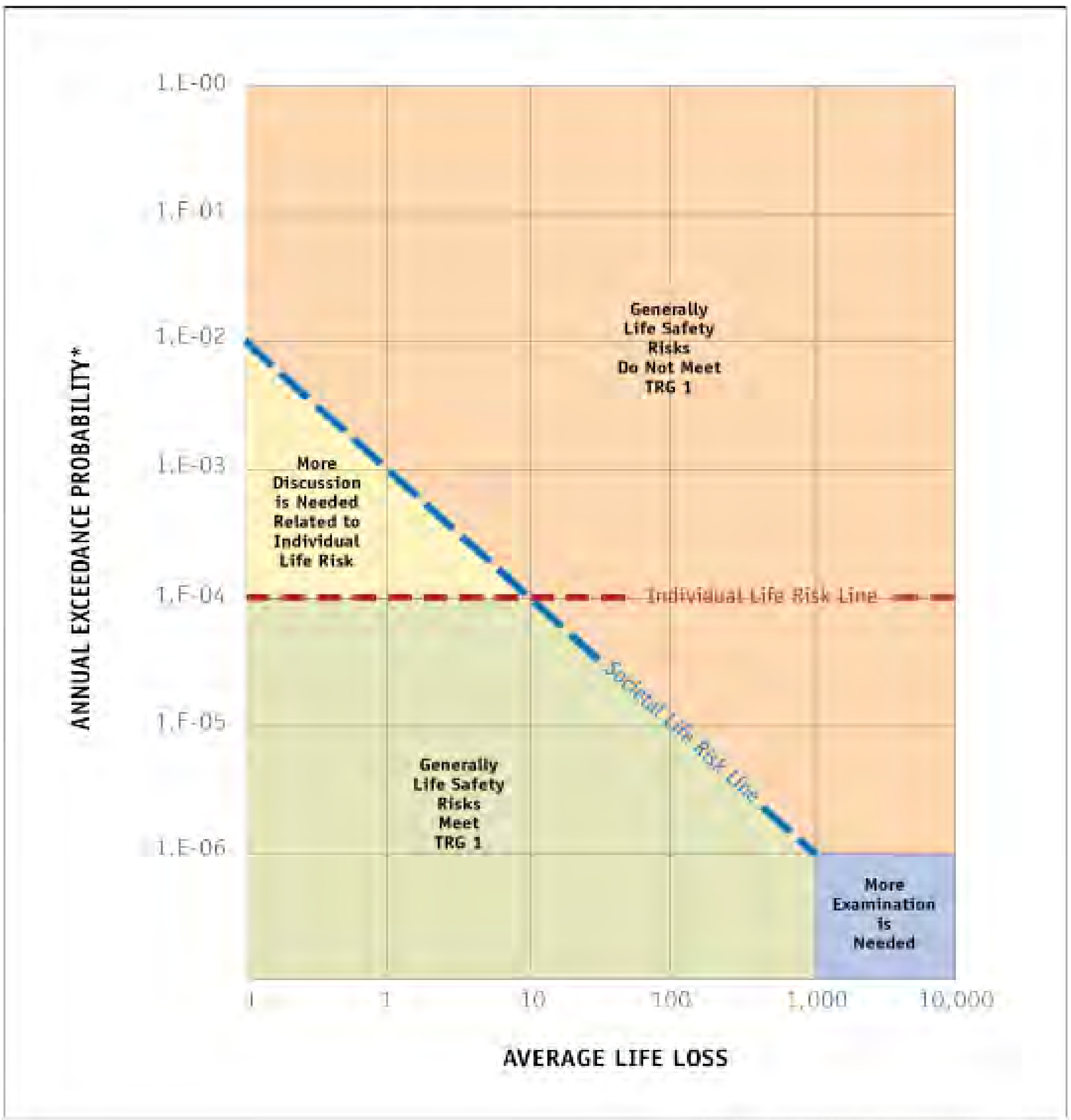
The Life Safety Risk Matrix in Figure 16 below shows the framework for quantitatively determining whether the life safety risk is tolerable for the study area. The full quantitative effort will be completed during the quantitative life safety risk assessment in the next study phase.

TRG 2 – Building Risk Awareness. The second tolerable risk guideline involves determining that there is a continuation of recognition and communication of the floodwall risk. A proper emergency action plan (EAP) is required to ensure risk awareness within the vulnerable population as well as to maintain risk communication such as public engagement activities, media stories, and a current community website. The comprehensive life safety risk assessment will include recommendations for the EAP and floodplain management plan.

TRG 3 – Fulfilling Daily Responsibilities. The third tolerable risk guideline involves determining that the risks associated with the floodwall system are being properly monitored and managed by those responsible for managing the risk. This responsibility is met by demonstrating monitoring and risk management activities such as documented regular inspections, updated and tested emergency plans, instrumentation programs, and interim risk reduction measures plans. Proper Operations, Maintenance, Repair, Rehabilitation, and Replacement (OMRR&R) mitigates the risk of failure and corresponding life safety consequences.

TRG 4 – Actions to Reduce Risk. The fourth guideline is determining if there are cost effective, socially acceptable, or environmentally acceptable ways to reduce risks from an individual or societal risk perspective. The comprehensive life safety risk assessment will investigate whether complementary risk reduction measures are feasible or appropriate for the study area.

Figure 16: Life Safety Risk Matrix



Residual and Incremental Risk

Residual risk, as defined in ER 1105-2-101 *Risk Assessment for Flood Risk Management Studies* (2019), is the flood risk that remains after a proposed flood risk management project is implemented. Residual risk includes the consequence of capacity exceedance as well as consideration of project performance, robustness, and resiliency. The quantitative residual risk percentages presented in this study, such as the figures shown in Table 21, are derived from HEC-FDA and only consider capacity exceedance. Residual risk due to potential project failure, also referred to as incremental risk, is not captured within the economic modeling.

Transformed risk is a risk that emerges or increases as a result of mitigating another risk. A levee may transform the flood risk from gradual and observable long before action is necessary to sudden and catastrophic if a breach occurs. Transferred risk is when a risk is relocated to another location or when risk is increased in another area due to actions taken in a separate area. A levee may transfer risk upstream or downstream of the levee location depending on the change in hydraulics imposed on the flood source. Transferred risk is captured within HEC-FDA by expanding the inventory and model area beyond the neighborhood of Eastwick and capturing the full net change in flood damages, both reduced and induced, in the model results. Reaches CC1, CC2, DC1, DC2, and DC3 extend beyond Eastwick to capture potential transferred risk.

Quantitatively modeling incremental risk and transformed risk is accomplished using HEC-LifeSim 2.0 and incorporates variables such as population at risk (PAR) age demographics, warning times, warning effectiveness, PAR response, flood arrival time, and fatality rate thresholds.

Table 21 qualitatively assesses life safety risk for the two types of measures proposed: levees and acquisition.

Table 21: Qualitative Life Safety Risk Analysis

Risk	**Description**	**Levee (Structural)**	**Acquisition (Nonstructural)**
Residual flood damages within neighborhood of Eastwick	Future with-project damages expected due to capacity exceedance or unacquired structures	27.0%	10% AEP: 67.0% 5% AEP: 58.3% 2% AEP: 23.2% Confluence: 99.7%
Incremental Risk	Risk due to failed performance of measure (e.g., breach)	Yes, potential for incremental risk due to impounded water behind levee during flood events	No, acquisition of structures removes population from the floodplain without changing dynamics of flooding
Transformed Risk	Changing nature of flood risk (e.g., gradual to sudden)	Yes, levee would transform risk from observable and gradual to sudden in the scenario of a levee breach. Probability of risk would be expected to be low	No, acquisition of structures removes population from the floodplain without changing dynamics of flooding

		based on proper design and implementation of measure	
Transferred Risk	Changing location of risk upstream or downstream	Yes, levee may induce flooding upstream or downstream of levee location by preventing Eastwick as a channel “overflow” point.	No, acquisition of structures removes population from the floodplain without changing dynamics of flooding

The levee alternative would transform risk for the neighborhood of Eastwick, by lowering the risk repetitive flooding, but increases the risk of catastrophic events by impounding water behind the structural measure. The quantitative measurement of the transformed risk will depend on the probability of failure and the consequences of failure.

The levee alternative may also transfer risk upstream and downstream of the proposed levee location. As shown previously in Table 18, the levee alternative may transfer $348,000 AAD to neighboring reaches in the study area. While relatively minor compared to the total $15.4 million in total AAD, it is important to hydraulically track the change in flood characteristics in the entire area as well as investigate potential optimizations and complementary features that may reduce induced structure damage or life safety risk. Further analysis to reduce residual risk and transferred risk is expected in the next study phase.

9. FOCUSED ARRAY OF ALTERNATIVES

As potential complementary features are formulated, evaluated, and compared, the focused array of alternatives will expand to include alternatives with cooperative components. These complementary features will be intended to reduce residual risk, reduce induced flooding, and realize additional study opportunities.

For this stage of the analysis, the focused array compares the most economically viable nonstructural alternative (i.e., 10% AEP) alongside the proposed structural (levee) alternative. Table 22 provides the comparison across all four planning accounts.

Table 22: Focused Array of Alternatives

	Decision Metric	FWOP	Levee Alternative	Nonstructural (10% AEP)
NED	FWOP AAD	$15,432,000	$15,432,000	$15,432,000
	FWP AAD	$15,432,000	$10,906,000	$13,257,000
	Reduced AAD (AAB)	**$0**	**$4,526,000**	**$2,176,000**
	Initial Construction	$0	$13,332,000	$8,417,000
	AA OMRR&R	$0	$67,000	$0
	AAC	**$0**	**$539,000**	**$297,000**
	AANB	**$0**	**$3,986,000**	**$1,879,000**
	BCR	**1.0**	**8.4**	**7.3**
	Residual Risk*	100%	27.0%	67.0%

*Residual Risk accounts for residual damages within the community of Eastwick

	Decision Metric	FWOP	Levee Alternative	Nonstructural (10% AEP)
Regional Economic Development (RED)	Impact on Regional Business Output	Business output will decline due to displacement of facilities from repetitive and persistent inundation	Very positive impact on reducing impacts to business output. Successfully diverting flood water will allow businesses to avoid downtimes, avoid clean-up costs, and explore new opportunities	No positive impact on regional business output
	Impact on Income	Business closures within the study area will stunt the local economy. Impassable roadways from repetitive inundation will reduce total working days for population	Very positive impact. Avoided damaging flood events will reduce missed workdays and remove cleanup and repair costs from burdening the local community	Minimally improved. Persistent impact to majority of residents and businesses. Population relocated as part of acquisition will not experience lost workdays from flood delays
	Impact on Employment	Business closures within the study area will stunt the local economy. Local and regional employment threatened by closed businesses	Very positive impact. Avoiding damaging flood events will keep businesses open, roads passable, and strengthen regional and local employment	Minimally improved. Persistent impact to majority of residents and businesses. Population relocated as part of acquisition will not experience lost

			opportunities and economic growth	employment opportunities
	Tax Base Changes	With continued flooding, tax values on homes and collected sales tax values will remain depressed	Very positive impact. Lowering flood risk will reduce downward pressure on home values and taxable sales	No improvement. Acquisition of residential structures removes tax base

	Decision Metric	FWOP	Levee Alternative	Nonstructural (10% AEP)
Other Social Effects (OSE)	Health and Safety	Continued risks to health and safety. Repetitive and persistent flooding	Very positive impact. Reduced flooding mitigates critical service disruptions, such as potable water, electric, natural gas, sewage treatment, access to emergency services, and availability of medical services	Minimal improvement. Majority of population subject to continued flooding
	Economic Vitality	Continued flooding depresses local economic health and opportunity	Very positive impact. Reduced flood risk allows for economic growth opportunities and higher investment in the community	Minimal improvement. Local economic opportunities continue to worsen
	Social Connectedness	Continued risk forces residents to leave area and disrupt social connectivity	Moderately positive impact. Reduced flood risk lessens pressure on residents to leave the area and disrupt social network	No improvement. Community cohesiveness continues to decline
	Identity	Continued risk forces residents to leave area and degrade community identity	Moderately positive impact. Reduced flood risk lessens pressure on residents to leave the area and abandon community identity	No improvement. Community identity continues to degrade
	Social Vulnerability and Resiliency	Continued flooding exacerbates existing social vulnerability and environmental injustice	Very positive impact. Reduced flood risk improves community value, improves resiliency, and mitigates some environmental justice issues	Minimal improvement. Majority of population receives no increased resiliency nor decrease in environmental injustice
	Participation	Continued flooding worsens community members' trust in local and regional governance	Very positive impact. Community trust in regional and local government office improves, strengthened community can participate more fully in	Minimal improvement. Majority of population remains underserviced

			local and regional governance	
	Leisure and Recreation	Continued flooding degrades available leisure and recreation areas such as public parks	Moderately positive impact. Leisure and recreation areas are flooded less frequently and available for use more often	No improvement. Leisure and recreation areas continue to flood and degrade

	Decision Metric	**FWOP**	**Levee Alternative**	**Nonstructural (10% AEP)**
Life Safety Risk	Incremental Risk	No	Yes	No
	Transformed Risk	No	Yes	No
	Transferred Risk	No	Yes, but potentially mitigated by formulating complementary features	No

In terms of Environmental Quality, the nonstructural alternative is neutral, while the levee alternative may generate short-term impacts to noise pollution, air quality, and water quality. These impacts would be mitigated as possible during construction and would be expected to be negligible post construction.

While both the structural (levee) and nonstructural alternatives are economically viable in terms of NED benefits, the structural alternative has higher AANB, provides more positive RED impacts, and improves the environmental justice and social advantages of the community of Eastwick. In compliance with ER 1105-2-100 *Planning Guidance Notebook* and the ASA(CW) policy directive on *Comprehensive Documentation of Benefits in Decision Document* (January 5th), the levee alternative is the NED Plan, Net Total Benefits Plan, and the Tentatively Selected Plan (TSP).

10. CONCLUSION

In summary, the community of Eastwick, as indicated by both the Climate and Economic Justice Screening Tool (CEJST) and the Environmental Justice Screening and Mapping Tool (EJScreen), is an economically disadvantaged and environmental justice community home to more than 15,000 permanent residents. Compounding the economic and social vulnerability of the area is the considerable risk from flood events with a projected $6.6 million in Average Annual Damages in the future-without project condition.

In compliance with ER 1105-2-100 *Planning Guidance Notebook* and the ASA(CW) policy directive on *Comprehensive Documentation of Benefits in Decision Document* (January 5th), the levee alternative is the NED Plan, Net Total Benefits Plan, and the Tentatively Selected Plan (TSP). While the proposed levee will be optimized in the next study phase, and potential complementary features formulated and evaluated, the measure is projected to reduce damages in the area by $128 million in Present Value terms over the 50-year period of analysis. In FY2023 Price Level and FY2023 Federal Discount Rate of 2.5%, the levee alternative has a BCR of 8.4 with $3,986,000 in Average Annual Net Benefits.

The TSP is projected to cost $13,332,000 with an Average Annual Cost of $539,000, including $67,000 in Average Annual OMRR&R, over the 50-year period of analysis.

Eastwick
Continuing Authorities Program Section 205
Flood Risk Management Feasibility Study

Philadelphia, Pennsylvania

Appendix D

Real Estate

August 2023

U.S. ARMY CORPS OF
ENGINEERS
PHILADELPHIA DISTRICT

REAL ESTATE
TECHNICAL APPENDIX

EASTWICK, PHILADELPHIA, PA

CAP 205

FEASIBILITY STUDY

JULY 2023

US Army Corps
of Engineers®

BALTIMORE DISTRICT

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EASTWICK 205 CAP FEASIBLITY STUDY

JULY 2023 REAL ESTATE PLAN

Contents

Exhibits

1. **Statement of Purpose**

a. Purpose – The purpose of this Real Estate Plan (REP) is to describe the minimum Lands, Easements, Right-of-Way, Relocations, and Disposal Areas (LERRD) requirements for the construction, operation, and maintenance of the Eastwick, Philadelphia County, Pennsylvania Continuing Authorities Program (Section 205) Flood Risk Management Project. The Non-Federal Sponsor requested the U.S. Army Corps of Engineers (Corps) provide technical assistance concerning a potential levee project in the Eastwick Neighborhood portion of the City.

b. Study Authorization – Section 205 of the 1948 Flood Control Act authorizes the U.S. Army Corps of Engineers (USACE) to plan, design, and construct structural and non-structural flood control projects in partnership with non-Federal government agencies. Authority to design and implement this project is provided under Section 205 of the Flood Control Act of 1948 (PL 80-858), as amended, provides a continuing authority for the Corps of Engineers to develop and construct small flood control projects without the need of specific congressional authorization.

c. Non-Federal Sponsor – The Philadelphia Water Department (PWD), on behalf of the City of Philadelphia, will act as the Non-Federal Sponsor (NFS) and executed a Section 205 Continuing Authorities Program (CAP) with USACE in August 2017.

2. **Real Estate Requirements**

a. Tentatively Selected Plan – The purpose of this project is to support the Feasibility Report for the Eastwick, Philadelphia County, Pennsylvania Continuing Authorities Program (Section 205) Flood Risk Management (P#2 451948) Project. The project is in preparation for a tentatively selected plan meeting in which one of the two remaining alternatives will be decided upon. The two Tentatively Selected Plan (TSP) alternatives chosen are Levee alignments 2 and 3. The project information provided in this report is currently in-progress and including updates to the project total construction costs.
   1. Structural Plan – The USACE, in partnership with the Philadelphia Water Department, proposes to construct a levee along the left bank of Cobbs Creek within the city-owned Eastwick Regional Park and Clearview Landfill.
   2. Nonstructural Plan – The TSP includes no nonstructural measures

b. Required Lands, Easements, and Rights-of-Way – Both current TSP alternatives being considered are Levee 2 and Levee 3 requiring two parcels in total. One privately owned parcel and One parcel owned by the NFS, as described and shown below. The minimum estates required for this project is a Temporary Work Area Easement and Perpetual Flood Protection Levee/Floodwall Easement on lands as follows:

Levee 2

Estate Type	Acres
Fee	2.576
FPLE[1]	
NSME[2]	
TWAE[3]	0.330
FNS[4]	
Total Acres	

Ownership Type	No. of Parcels
Private	1
Public	
Sponsor	1
Total Parcels	

Levee 3

Estate Type	Acres
Fee	2.804
FPLE	
NSME	
TWAE	0.361
FNS	
Total Acres	

Ownership Type	No. of Parcels
Private	1
Public	
Sponsor	1
Total Parcels	

c. <u>Land Value Estimate</u>

Levee 2

Estate Type	Estimated Land Value
Fee	$80,241
FPLE	
NSME	
TWAE	$2,544
Total LER Value	

Levee 3

Estate Type	Estimated Land Value
Fee	$87,341
FPLE	
NSME	
TWAE	$2,783
Total LER Value	

[1] FPLE – Flood Protection Levee Easement
[2] NSCE – Non-standard Mitigation Easement
[3] TWAE – Temporary Work Area Easement
[4] FNS – Federal Navigation Servitude

Standard Estates

FLOOD PROTECTION LEVEE/FLOODWALL EASEMENT (Estate No. 9)

A perpetual and assignable right and easement in (the land described in Schedule A) (Tract Nos. ____) to construct, maintain, repair, operate, patrol and replace a flood protection levee/floodwall, including all appurtenances thereto; reserving, however, to the owners, their heirs and assigns, all such rights and privileges in the land as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however to existing easements for public roads and highways, public utilities, railroads and pipelines.

TEMPORARY WORK AREA EASEMENT (Estate No.15)

A temporary easement and right-of-way in, on, over and across (the land described in Schedule A) (Tract Nos. ____), for a period not to exceed one (1) year, beginning with date possession of the land is granted to the United States, for use by the United States, its representatives, agents, and contractors as a work area, including the right to move, store and remove equipment and supplies, and erect and remove temporary structures on the land and to perform any other work necessary and incident to the construction of the Upper Delaware River Watershed Flood Risk Reduction Project, together with the right to trim, cut, fell and remove there from all trees, underbrush, obstructions, and any other vegetation, structures, or obstacles within the limits of the right-of-way; reserving, however, to the landowners, their heirs and assigns, all such rights and privileges as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however to existing easements for public roads and highways, public utilities, railroads and pipelines.

3. Real Estate Owned by the Non-Federal Sponsor

The Philadelphia Water Department (PWD), on behalf of the City of Philadelphia owns all real estate identified as Parcel ID 539257 within this report.

4. Nonstandard Estates

There are no proposed non-standard estates for the current recommended plan.

5. Existing Federal Projects

The Eastwick Neighborhood is east of the confluence of the Darby and Cobbs Creek and subject to frequent and severe flooding; in 2001, the Environmental Protection Agency (EPA) added the Clearview Landfill Site (Lower Darby Creek Area Superfund Site) to the list of Superfund Sites to include the landfill. Cleanup work at the Clearview Landfill began in 2017. Currently EPA is leading the permanent relocation of businesses on the landfill, removal of contaminated soil from the City Park, construction of a new forested cover over the landfill waste and stabilizing the streambanks. This work began in early 2019. Construction activity for the cleanup of the landfill is ongoing.

6. **Federally Owned Land**

The Government currently owns no lands in the project area.

7. **Federal Navigation Servitude**

Navigational Servitude does not apply as this project is not located on a designated navigable stream nor does the project aid commerce or navigation.

8. **Real Estate Mapping**

Maps displaying the proposed project placement area and surrounding Federal Projects are shown in Exhibit “A”.

9. **Induced Flooding**

No induced flooding is anticipated at this time within the project study area.

10. **Baseline Cost Estimate for Real Estate**

Levee 2 BCERE costs:

Project Cost Category	Federal	Non-Federal	Contg	Total
Total 01-Lands and Damages		$129,385	$116,447	$245,832
Total 02-Relocations (Utility/Facility)				
Total Project BCERE		$129,385	$116,447	$245,832

Levee 3 BCERE costs:

Project Cost Category	Federal	Non-Federal	Contg	Total
Total 01-Lands and Damages		$136,724	$123,052	$259,776
Total 02-Relocations (Utility/Facility)				
Total Project BCERE		$136,724	$123,052	$259,776

11. **Uniform Relocation Assistance (Public Law 91-646)**

It is anticipated that there will be no project features that will require relocations of any persons, farms or businesses in the subject area as would be required under Public Law 91-646, as amended.

12. Minerals and Timber Activity

There is no present or anticipated mining and drilling activity in the vicinity of the project that may affect the operation thereof. There is no present or anticipated timber harvesting activity in the vicinity of the project that may affect the operation thereof.

13. Non-Federal Sponsor Capability Assessment

The Philadelphia Water Department (PWD) is the Non-Federal Sponsor (NFS). The NFS is fully capable of acquiring property. The assessment of the NFS's Real Estate Acquisition Capability is included as Exhibit "C" to this plan.

14. Land Use Zoning

The enactment of zoning ordinances is not proposed to facilitate acquisition.

15. Real Estate Acquisition Schedule

All permits and easements will be acquired prior to advertisement for construction bids.

Milestone	Forecasted Dates
PPA Execution	August 2024
Notice to Proceed with Acquisition to Sponsor	January 2025
Sponsor's Authorization for Entry for Construction	June 2025
USACE's Certification of Real Estate	July 2025
USACE's Solicitation for Construction Contracts	September 2025
USACE's Award of Construction Contracts	February 2026

16. Facility and Utility Relocations

The proposed plan does not yet identify any utilities and/or facilities that will require relocation.

17. Environmental Contamination

The Eastwick Neighborhood is east of the confluence of the Darby and Cobbs Creek and subject to frequent and severe flooding; in 2001, the Environmental Protection Agency (EPA) added the Clearview Landfill Site (Lower Darby Creek Area Superfund Site) to the list of Superfund Sites to include the landfill, Eastwick Recreation Park and a portion of the Eastwick neighborhood. The EPA is currently the lead agency conducting a Remedial Action.

In early 2019, Remedial Action activities were initiated at the Clearview Landfill site. These activities include: the permanent relocation of businesses on the landfill, removal of contaminated soil from the City Park, construction of a new forested cover over the landfill waste, and stabilization of the streambanks.

Following the relocation of the businesses, the buildings and above ground structures were demolished and removed from the site. Some concrete pads that were once associated with the buildings have been designated to remain to serve as staging areas for future operation and maintenance (O&M) purposes.

18. Project Public Support

Public meetings have been conducted. At this time the content of the information presented to the public has been conceptual and general in nature. It is reasonable to suggest that the general public is in favor of flood risk reduction and environmental restoration projects; however, until more detailed alignments are available, which will more definitively determine which landowners are impacted; attempting to realize actual landowner attitudes at this time is premature.

19. Non-Federal Sponsor Risk Notification

The NFS has been given notice of their responsibility for cost sharing, real estate acquisition, and operations and maintenance for the Project. The NFS has also been notified of the risks of performing real estate acquisition activities.

20. Risk Analysis

There appears to be low real estate risks associated with this project. for those alternatives that are being recommended for further study, a risk analysis will be performed during the feasibility study. Possible risks associated with all alternatives are:

- Availability of funding for construction of levee
- Relocations- Availability of replacement housing for displaced persons
- Contamination within the project site
- Induced flooding

PLAN CERTIFICATION

This Real Estate Plan has been prepared in accordance with Corps of Engineers Regulation 405-1-12, Chapter 12. It is recommended that this REP be accepted for the purposes stated herein.

Prepared by:

____

JANAY DIXON
Realty Specialist
Civil Projects Support Branch
Janay.C.Dixon@usace.army.mil

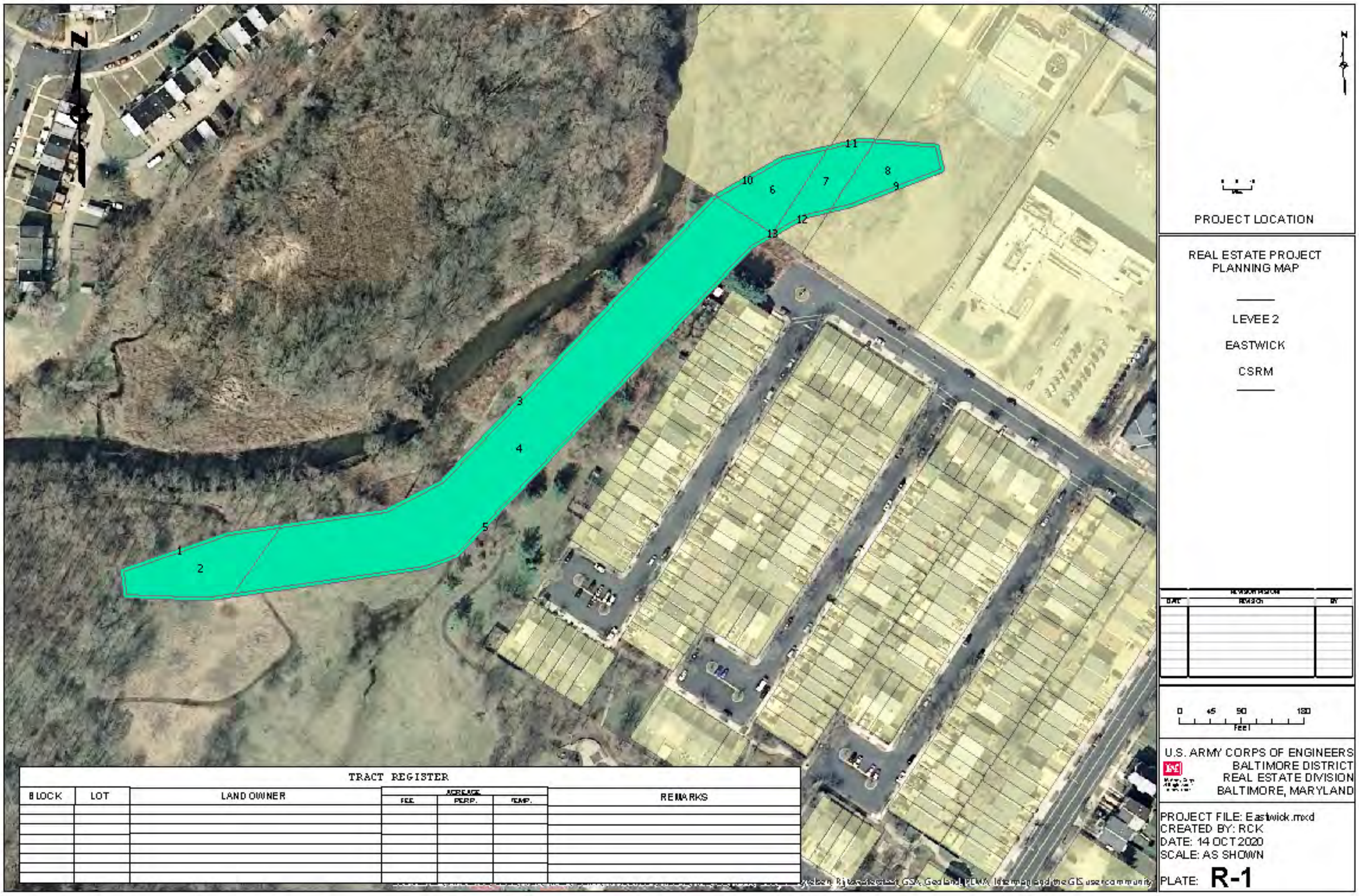
Reviewed and approved by:

____

STANLEY H. GRAHAM
Chief, Real Estate Division
Baltimore District
Stanley.H.Graham@usace.army.mil

EXHIBIT “A”

PROJECT MAPS




10
11
8
6
7
9
13
12
3
4
5
1
2
PROJECT LOCATION
REAL ESTATE PROJECT PLANNING MAP
LEVEE 3
EASTWICK
CSRM
0 75 150 300
Feet
U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT
REAL ESTATE DIVISION
BALTIMORE, MARYLAND
PROJECT FILE: EASTWICK.mxd
CREATED BY: RCK
DATE: 19 OCT 2020
SCALE: AS SHOWN
PLATE: R-1
TRACT REGISTER
BLOCK
LOT
LAND OWNER
ACREAGE
FEE
PERP.
TEMP.
REMARKS

Exhibit B

Non-Federal Sponsor Real Estate Acquisition Capability Assessment Form

Project: Eastwick, Philadelphia, PA CAP 205 Feasibility Study

Non-Federal Sponsor: Philadelphia Water Department (PWD)

I. Legal Authority:

a. Does the sponsor have legal authority to acquire and hold title to real property for project purposes?

No. The City of Philadelphia has the ability to acquire land and easements for property located in Philadelphia County. The Philadelphia Water Department (Current NFS) does not have this authority.

b. Does the sponsor have the power of eminent domain for this project?

No, the Philadelphia Water Department does not have the power of eminent domain. The City of Philadelphia has the power of condemnation.

c. Does the sponsor have "quick-take" authority for this project?

The Philadelphia Water Department is not familiar with “quick-take” authority so most likely does not have the authority.

d. Are any of the lands/interests in land required for the project located outside the sponsor's political boundary?

Yes, the land that’s required for the tie in elevation for the levee alternative is located in Darby Township, Delaware County.

e. Are any of the lands/interests in land required for the project owned by an entity whose property the sponsor cannot condemn?

Yes, Darby Township is the owner of the land required for the levee alternative. A resolution will be required from Darby Township supporting the project. The levee alternative will raise the water surface elevation during the 100-year event on the Darby Township side of Darby-Cobbs Creek so the township may not be inclined to support the project.

II. Human Resource Requirements:

a. Will the sponsor's in-house staff require training to become familiar with the real estate requirements of Federal projects including P.L. 91-646, as amended?

Yes

b. If the answer to II.a. is "yes", has a reasonable plan been developed to provide such training?

No

c. Does the sponsor's in-house staff have sufficient real estate acquisition experience to meet its responsibilities for the project?

No

d. Is the sponsor's projected in-house staffing level sufficient considering its other work load, if any, and the project schedule?

No

e. Can the sponsor obtain contractor support, if required, in a timely fashion?

No

f. Will the sponsor likely request USACE assistance in acquiring real estate?

Yes. The PWD and City of Philadelphia lack the legal authority to guarantee all easements required for implementation.

III. Other Project Variables:

a. Will the sponsor's staff be located within reasonable proximity to the project site?

Yes

b. Has the sponsor approved the project/real estate schedule/milestones?

No. PWD hasn’t been provided a real estate schedule or milestones.

Prepared by:

JANAY DIXON
Realty Specialist

Reviewed and approved by:

CRAIG R. HOMESLEY
Chief, Civil Projects Support Branch
Real Estate Division

Eastwick
Continuing Authorities Program Section 205
Flood Risk Management Feasibility Study

Philadelphia, Pennsylvania

Appendix E

Natural and Nature-Based Features
Complementary Measures

August 2023

U.S. ARMY CORPS OF
ENGINEERS
PHILADELPHIA DISTRICT

DRAFT

July 2023

Engineering with Nature: Natural and Nature-Based Features Support

Eastwick Flood Risk Management Study: Natural and Nature-Based Features Complementary Measures to the Structural Levee in the Tentatively Selected Plan

Prepared for

US Army Corps of Engineers®

Prepared by

ANCHOR QEA

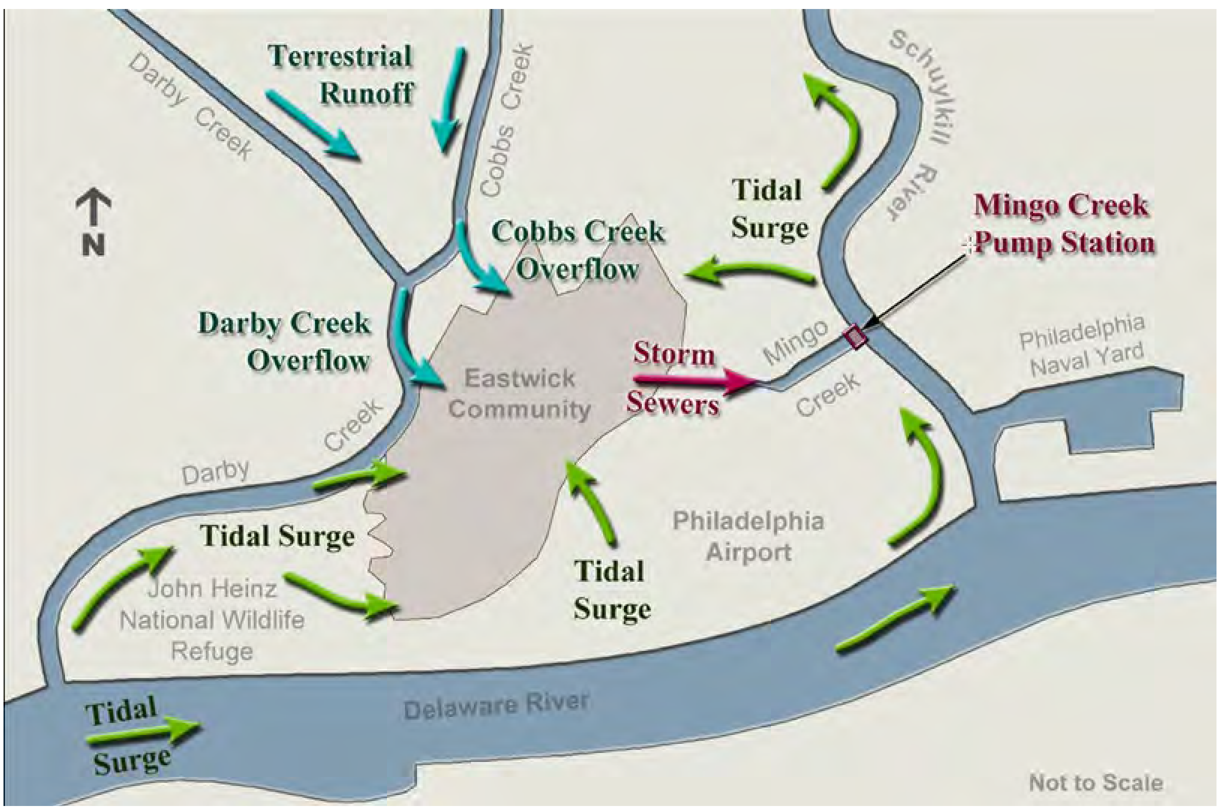
Dredge Research Collaborative

1 Introduction

As one of the lowest-lying communities in Philadelphia, Eastwick, Pennsylvania, sits atop 6,000 acres of historical wetlands and adjacent to the Clearview Landfill (a federally designated Superfund site). This area is prone to flooding events due to its low elevation and proximity to Darby and Cobbs creeks and the Delaware River (Arcadis 2022 and USACE 2023). The neighborhood is densely developed with residential homes and commercial establishments and has been experiencing increased frequency, duration, and intensity of riverine and marsh flooding during storm events.

There are four major sources of flooding in the Eastwick neighborhood: riverine flooding, coastal flooding, tidal flooding, and stormwater flooding (Arcadis 2022). Figure 1 details water movement within the region as presented by U.S. Army Corps of Engineers (USACE) during the Tentatively Selected Plan (TSP) Milestone meeting held January 31, 2023. Combined flooding from any or all of these sources threatens residents and infrastructure in the area. Riverine flooding is the most acute form of flood risk threatening the Eastwick community, prompting federal involvement to evaluate a solution to flood risk associated with historical overflow, specifically due to Cobbs and Darby creeks.

Figure 1
Flooding Sources in Eastwick



After evaluating multiple flood risk mitigation (FRM) measures, USACE is proposing levee construction in the TSP along the riverbank to reduce flooding due to its cost effectiveness, reduced risk to homes, and minimal impact on community cohesion. USACE presented two potential alignments shown in Figure 2 during the TSP Milestone meeting held January 31, 2023.

Figure 2
Potential Levee Alignments

Levees are earthen embankments used to protect land that is normally dry but may be flooded when rainfall or storm surge raises water levels in a nearby body of water. While levees do not eliminate flooding potential entirely, they provide a physical barrier between rising water levels and threatened property, wildlife, and people. Levees constructed in urban environments pose unique challenges integrating into the existing ecosystems, urban uses, and viewsheds.

Whereas USACE proposed levee addresses flooding within the Eastwick community, the FRM strategy could use natural and nature-based features as complementary measures to USACE's structural levee to increase the ecological, social, and aesthetic value of the system. As part of the USACE Engineering Research and Development Center Engineering With Nature Proving Ground initiative, Anchor QEA, and the Dredge Research Collaborative were tasked to work with USACE Philadelphia District to review the proposed FRM measures and develop natural and nature-based features to incorporate as part of the selected plan.

2 Background

Eastwick residents also have a complicated history of environmental injustices, in addition to the current environmental threats, having been disenfranchised and excluded in decisions surrounding land and community domain (EFNC 2012). As part of the Philadelphia City Planning Commission urban renewal project in the 1950s, nearly half of Eastwick residents were displaced, and a radical reduction of the natural flood-mitigating tidal marshland was recorded. Eastwick residents continued to be excluded from project developments, and it wasn't until 2015 when residents won a pledge from the city to be included in future planning efforts. Coalition groups, like the Eastwick Friends and Neighbors Coalition, Inc., were formed to advocate and address environmental concerns for Eastwick's sustainable future. To further address these environmental injustices, the City of Philadelphia Office of Sustainability is spearheading coordination among community organizations and local, state, and federal agency partners (such as USACE and the U.S. Environmental Protection Agency [EPA])to "[…] strengthen partnership and collaboration, create a shared understanding of the issues, and co-develop actions that build a resilient future" (McGraw et al. 2022).

The proximity of Eastwick properties vulnerable to intense flooding events near the Clearview Landfill has triggered landfill capping and restoration efforts by EPA. This includes "[…] permanent relocation of business on the landfill, removal of contaminated soil from the City Park, construction of new forested cover over landfill waste, and stabilizing the streambanks" (EPA 2023). Existing projects include EPA remedial action to clean up waste and restore residential areas that have contaminated soil resulting from the Clearview Landfill. EPA-led landfill cleanup work has constructed approximately 15 acres of evapotranspiration cover since its beginning in August 2019, with approximately 29 additional acres remaining to be capped as of June 2022 (EPA 2022). New vegetation includes more than 1,000 trees and shrubs that function not only to minimize the generation of leachate and groundwater contamination, but also helps manage stormwater during heavy precipitation events and stabilize the shoreline.

The City of Philadelphia is also exploring installation of an intermediate FRM system containing temporary cellular structures filled with soils that will be planted with native vegetation to provide an increased level of FRM protection before the more robust levee is installed. The City of Philadelphia Office of Sustainability and Office of Transportation, Infrastructure, and Sustainability actively coordinates these various efforts of the city, state, and federal entities with the goal to improve the community well-being of Eastwick.

Connecting completed, ongoing, and future projects into an integrated system with natural and nature-based features and strategies will provide the community a diverse protection system against future flooding events.

3 Approach

FRM projects that implement nature-based components could experience higher levels of preparedness, greater resistance, quicker recovery, and ability to adapt to flooding events. A holistic approach to traditional levee design can be invaluable to a community experiencing recurring and intensifying flooding events such as Eastwick, while increasing the ecological and social value of the project. The combination of a comprehensive FRM strategy with natural and nature-based features in addition to USACE's structural levee can increase the ecological, social, and aesthetic benefits of the protection system. *S*ome of these features include trails with seating, levee ramps and stairs, outdoor classrooms/amphitheater, bioswales, managed riparian habitat, tree screens, and levee overlooks. These complementary approaches to the standard levee design are presented, each focused on increasing one of these primary benefits to encourage and prioritize different values in the decision-making process. These plans are not designed to be comprehensive or independent but, rather, components to be considered and implemented where feasible in the final design. Figures 3 and 4 detail the suite of potential complementary measures locational to the proposed levee outlined in the TSP that may be considered in part or in whole to improve the base levee design.

3.1 Ecological Benefits

The proximity of the levee to the shoreline presents an opportunity to increase the ecological value of the levee project by maximizing creek-adjacent wetlands and riparian buffers to improve overall river connectivity and provide increased flood protection. Complementary measures with the levee would preserve as much as feasible of the upland wetlands previously constructed during the EPA restoration efforts, minimize impacts to the existing riparian forest habitat to the north, and encourage minimization of the overall levee footprint.

Preservation of existing habitats, planting of varying species of vegetation to support intended habitat development, and introduction of strategic features to the levee offer a focused and intentional diversification of habitats, while improving public accessibility. The existing creekbank would be preserved and enhanced with additional vegetation to support wetland habitat and riparian buffer development. Minimal grading for bioswales along the toe of the proposed levee would improve drainage and direct water to the constructed and existing wetland systems. The creekbank up to the levee and levee itself would be planted with vegetation strategically selected to minimize structural risk to the levee, while providing diversity of both riparian and nonriparian habitats, such as riparian forest, riparian grasslands, wetlands, and meadows. Select portions of the levee section would be widened and graded to improve public accessibility along and across the levee. This approach would minimize the overall footprint of the levee by using the steepest slopes structurally feasible except where necessary to accommodate public access over and across the levee, while preserving and enhancing the existing valuable habitat. Increasing the ecological value of the levee system adds an additional layer of defense against flood risk, improves resilience for the community prone to flooding, and enhances the sustainability of a natural system in an urban environment.

3.2 Social Connectivity

The Eastwick community has historically used the area along the creeks recreationally and socially through a series of open spaces and trail systems. Complementary measures to the proposed levee system could focus on maintaining this social connectivity, while providing FRM. Accessibility through measures including Americans with Disabilities Act-compliant ramps, bicycle paths, and pedestrian trails, as well as diversification of spaces for public use (e.g., amphitheater, lawn, or living classrooms) could be integrated and built around the levee system to encourage public access and use to support overall social connectivity, accessibility, and integration to existing trail networks. This design concept is intended to incorporate and extend the use of the current site through trails and open space. The trail network would connect to current and proposed trails, including the new trail constructed along the EPA landfill restoration from 80th to 84th streets and the Cobbs Creek Trail. This system could be expanded to connect to existing points of interest, including the John Heinz Wildlife Management Refuge, Eastwick Park and Playground, Cibotti Recreation Center and Ballfields, and Penrose Elementary School Connection to these points of interest will also provide extension to existing social spaces. For example, on the southern side, the lawn space and modified grassy slope could extend the current Eastwick Park and Playground space, whereas a living classroom on the northern side would provide an extension to the nearby Penrose Elementary School.

Installation of the levee to protect the community from floods during storm events should minimize impacts to the current community and could, instead, be an asset to the region with incorporation of complementary social connectivity measures.

3.3 Viewshed and Aesthetics

Levees, by function, involve an increase in elevation to protect the land behind from rising water during storm events. Levees are also traditionally uniform and monolithic in shape and form. This increase in height and uniformity in structure consequently impacts the viewshed and isolates the community from the aesthetic value of the creeks and surrounding habitat. Complementary measures to the proposed levee could blend the levee into the surrounding landscape, while improving the visual interest of the system.

Grading the levee gradually into the surrounding landscape is proposed, providing a more natural aesthetic, and allowing easier public access. This intentional grading of the levee into land will connect open space along the existing trail network, while accommodating different forms of accessibility (e.g., ramps or stairs). Creation of specific moments of visual interest from the levee could be designed to provide views of the surrounding area, including floodplain bench views, creek views, and city skyline views that take advantage of the increased elevation. Visual interest would be directed by both vegetation and levee bump outs to direct the viewer orientation and enhance active and passive pause points of interest.

The levee alignment abuts to private spaces residents use in the community. Planting trees between the levee and adjacent properties will provide a tree screen for increased privacy between public trails and private spaces, while still providing visibility to public spaces for security. Incorporating visual and aesthetic components to a built structure in an urban environment can broaden the benefits of the installation beyond its original intention. Such components can encourage public engagement and strengthen community cohesion.

3.4 Recommendations

Proposed strategies can be integrated in part or in whole with various combinations to both the proposed (Figures 5-8) and alternate levee design (Figures 9-11). Collaboration with concurrent initiatives, like those spearheaded by the City of Philadelphia Office of Sustainability, can provide an integrated and comprehensive flood resilience strategy. A developed plan that fully takes into consideration the proposed solution to address flooding, improves the ecologic and social features of the system to meet the needs of the Eastwick community, and balances cost versus benefit of the project, which should ultimately drive decision-making regarding the implementation of complementary natural and nature-based features into the final levee design phases.

Proposed complementary measures as presented herein for the TSP should be incorporated into a system-wide approach to FRM for the Eastwick community, including upstream and downstream impacts of the projects. Numerical modeling should be updated to fully understand the effects of the natural and nature-based features on the individual projects and the system, while assessing the performance of the system over time.

4 Next Steps

Integration of a levee into an urban system requires consideration of the impacts the system has to the surrounding community, including the ecological, social, and aesthetic impacts. A robust levee directly impacts local communities in a more direct and blatant way than levees installed in suburban and rural areas. Complementary measures, particularly those using natural and nature-based features, should be strongly considered to offset the impact to the community, while continuing to provide the required FRM. The means and methods to quantify, document, and enhance the less-tangible ecological, social, and aesthetic benefits of a project need to be further assessed to ensure these components are properly addressed for urban projects where these aspects are a high priority for local stakeholders.

5 References

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Figures

FIGURE 3 | EASTWICK LEVEE ZONES

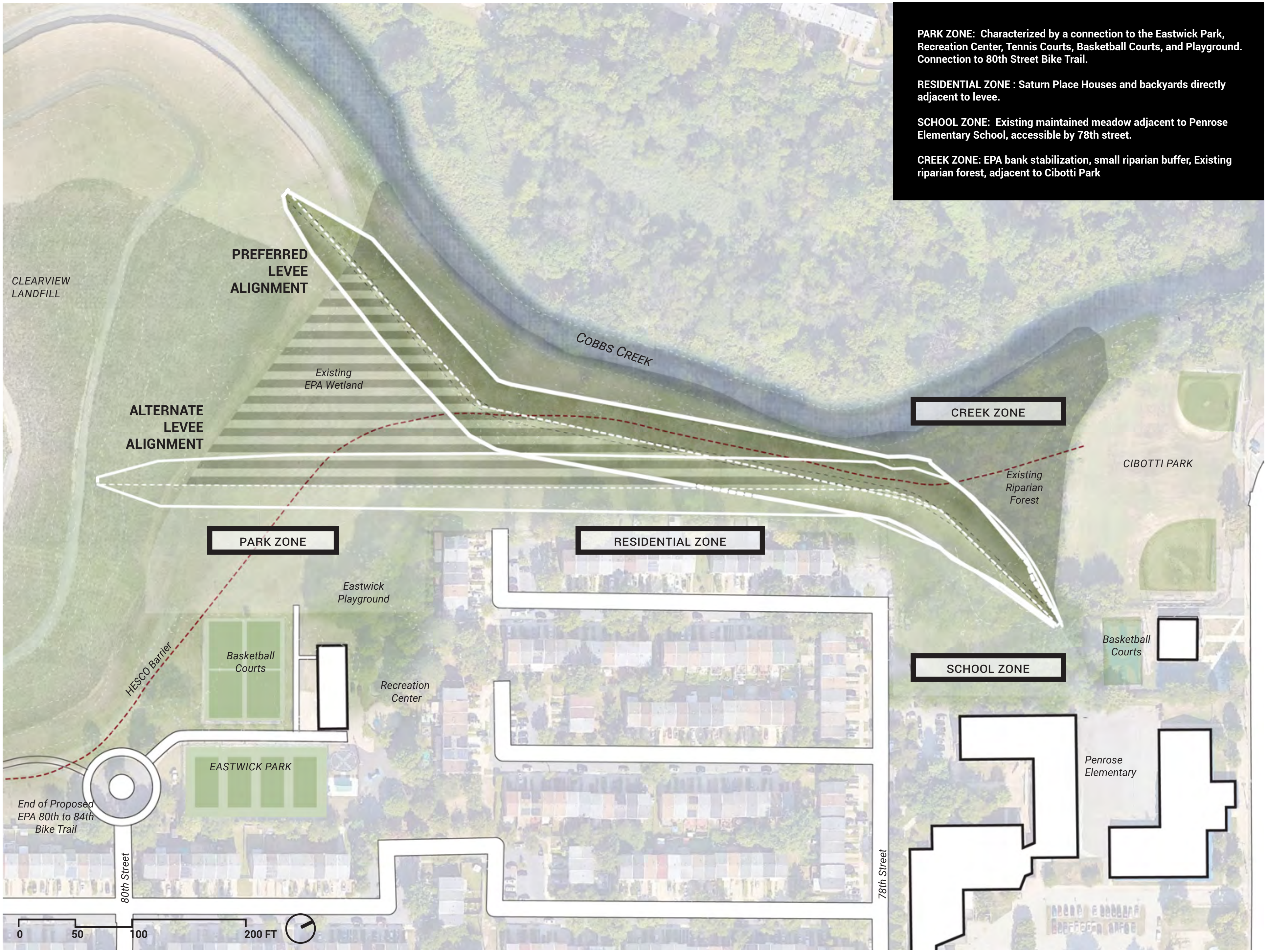

FIGURE 4 | EASTWICK LEVEE MODIFICATION OPTIONS

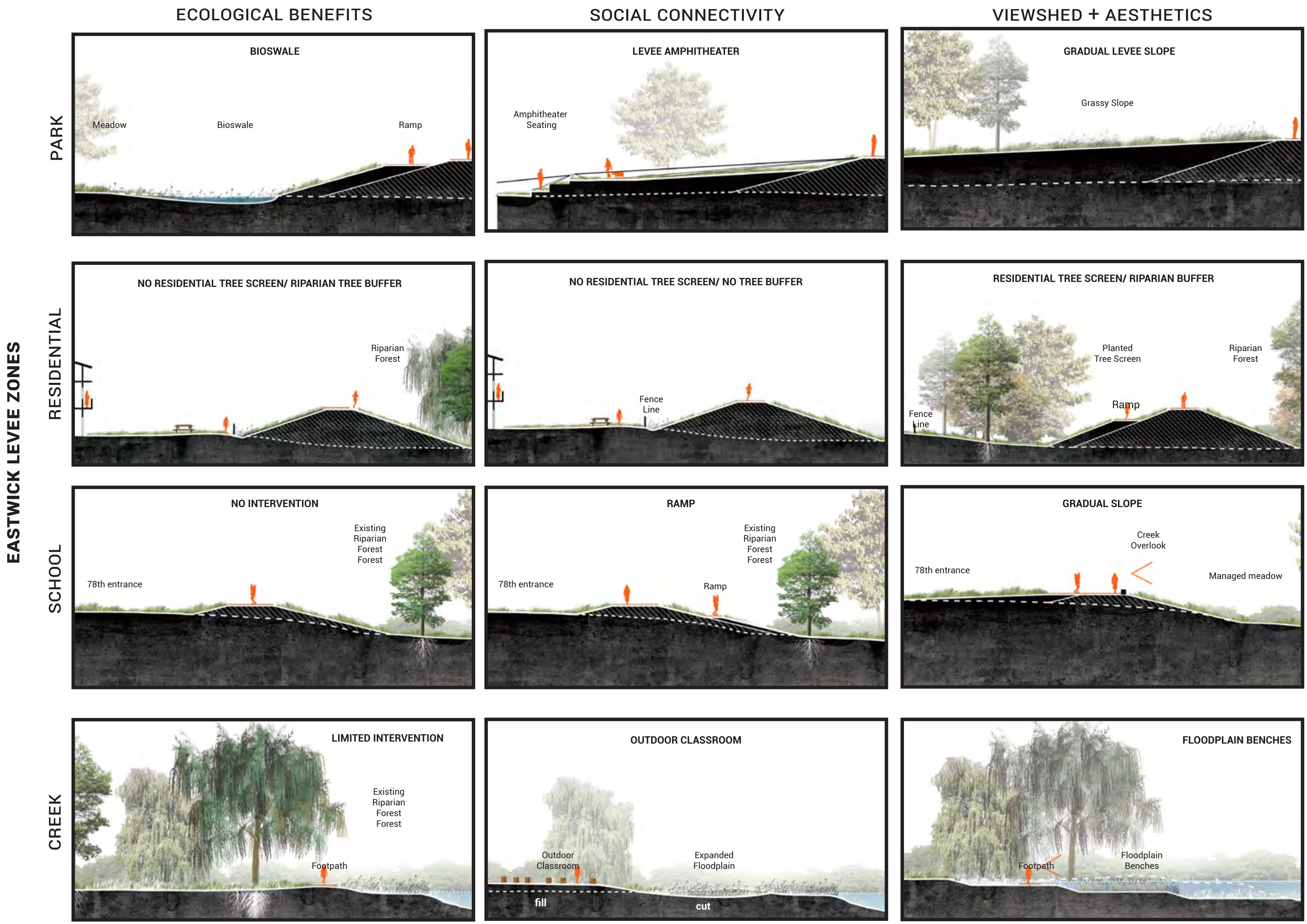

FIGURE 5 | **PREFERRED EASTWICK ALIGNMENT** LEVEE PLAN

1. **GRADED LEVEE SLOPE** Levee graded into the landscape to allow for easier access and to blend the levee form into the surrounding landscape
2. **LEVEE OVERLOOK:** Area for visual overlook out over the creek
3. **LEVEE RAMPS AND STAIRS** Provide accessibility while minimizing levee footprint
4. **TREE SCREENS** Plant trees between the levee and the adjacent houses in order to provide privacy.
5. **OUTDOOR CLASSROOM:** Connect Penrose School to the creek with the addition of an outdoor classroom. Built up on higher ground with fill from adjacent wetland excavation.
6. **CIRCUIT TRAIL:** Creation of a Creek Bike Trail with the ability to connect to a future Cobbs Creek Circuit Trail.

FIGURE 6 | **PREFERRED EASTWICK ALIGNMENT** LEVEE PLAN DETAIL

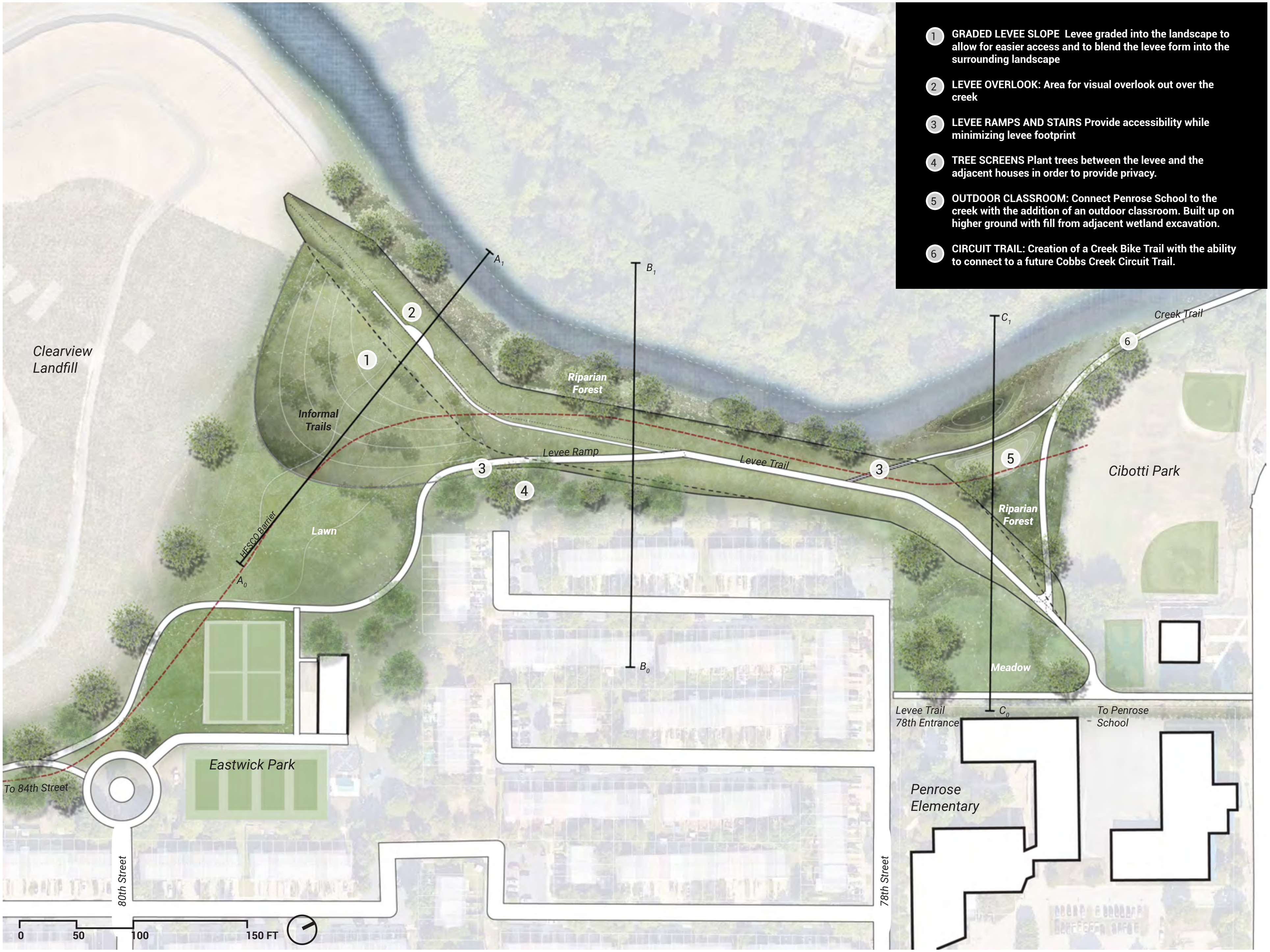

FIGURE 7 | PREFERRED EASTWICK ALIGNMENT SECTIONS

FIGURE 8 | **PREFERRED EASTWICK ALIGNMENT** RENDERING

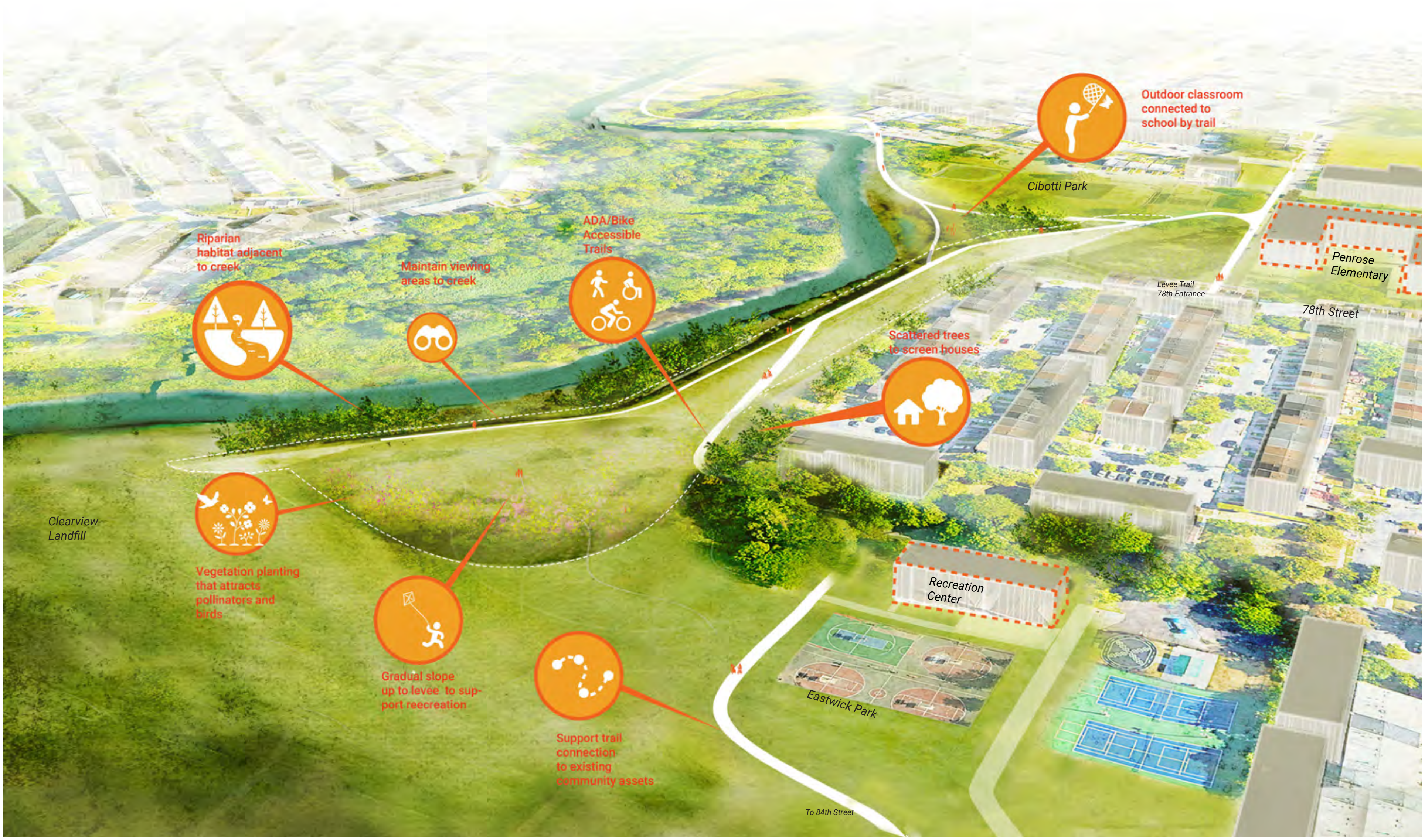

FIGURE 9 | **ALTERNATE EASTWICK ALIGNMENT** LEVEE PLAN

FIGURE 10 | **ALTERNATE EASTWICK ALIGNMENT** PLAN DETAIL

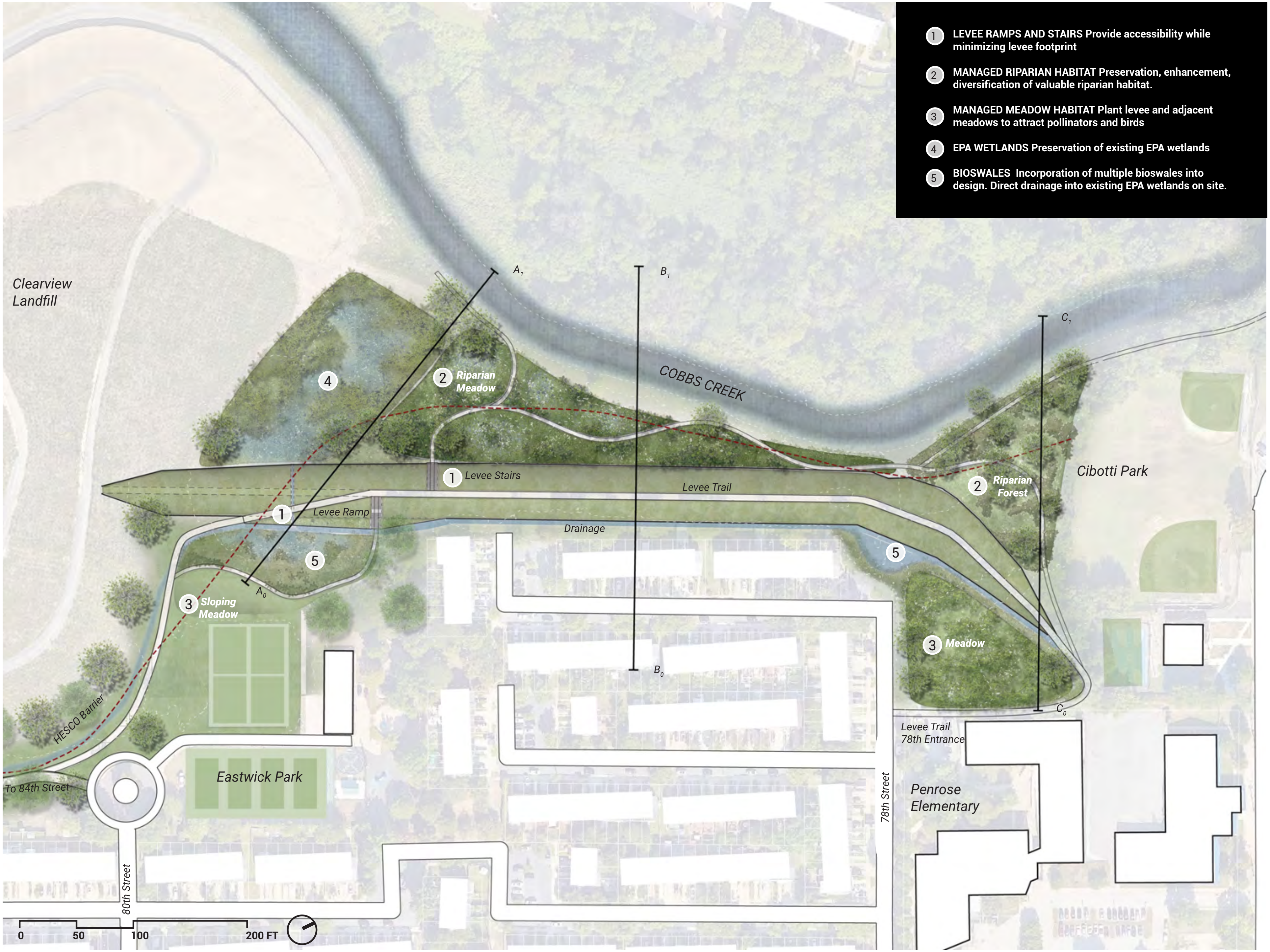

FIGURE 11 | **ALTERNATE EASTWICK ALIGNMENT** SECTIONS

Eastwick
Continuing Authorities Program Section 205
Flood Risk Management Feasibility Study

Philadelphia, Pennsylvania

Appendix F

Miscellaneous Documentation

August 2023

U.S. ARMY CORPS OF
ENGINEERS
PHILADELPHIA DISTRICT

CERTIFICATE OF LEGAL REVIEW

The Philadelphia District, Office of Counsel has reviewed the

DRAFT FEASIBILITY STUDY AND ENVIRONMENTAL ASSESSMENT DECISION DOCUMENT, CONTINUING AUTHORITIES PROGRAM SECTION 205, FLOOD RISK MANAGEMENT, EASTWICK, PHILADELPHIA COUNTY, PENNSYLVANIA, AUGUSY 2023.

A policy and legal compliance review for the subject document has been completed and all comments have been resolved in the enclosed report. The subject report was prepared in accordance with the requirements of ER 1105-2-100 and meets all applicable requirements subject to the following reservations:

1. If recreation is included, the final feasibility report must include a discussion of Corps policy regarding adding recreation features as described in Appendix E of the ER 1105-2-10, the Planning Guidance Notebook.

2. If the Non-Federal Sponsor cannot acquire the necessary real estate located in Delaware County required for the project, the final report cannot be signed. Acceptable alternatives include revising the design so that the real estate in Delaware County is not needed or obtaining the commitment in writing (i.e., Letter of Intent) of the governmental entity owning the real estate to become a non-Federal sponsor of the project during the D&I phase.

Date: August 29, 2023

Amanda Phily

Amanda G. Phily
Office of Counsel