US Army Corps of Engineers®
New York District

Passaic River, New Jersey

Passaic River Tidal General Reevaluation Report

Lower Passaic River, New Jersey

Appendix H
Cost Engineering

DRAFT

September 2017

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1 INTRODUCTION

The Cost Engineering appendix presents the supporting cost information used in updating the authorized design of features of the Passaic River, New Jersey, Tidal Flood Risk Management Project presented in the General Reevaluation Report (GRR) as well as the Tentatively Selected Plan (TSP), the Locally Preferred Plan (LPP). The New York District Corps of Engineers (NYD) produced a Draft General Design Memorandum (GDM) in 1995 and the first phase of a GRR for the entire Passaic River Watershed in 2013, both of which identified hurricane/storm surge/tidal protection to help manage flood risks in portions of Harrison, Kearny and Newark, New Jersey. The three "tidal" levees and floodwalls have since been separated out from the Main Passaic Watershed GRR and have been identified for separate funding and analysis as part of a series of Authorized But Unconstructed (ABU) Hurricane Sandy-related projects. The Harrison, Kearny and Newark tidal levees were analyzed at a GRR level of study making full use of the data acquired in 1995 and 2013, as well as the latest hydrologic, hydraulic, topographic and structural information.

The ABU Hurricane Sandy-related project was evaluated by comparing design heights to each other at a preliminary level of detail to compare costs and benefits to determine the optimum design height. The alternatives analyzed included the 1995 draft GDM elevation and line of protection (LOP) with crest elevations 2 and 4 feet above the GDM elevation, as well as a smaller plan set back from the shoreline that provided flood risk management for the interior of the City of Newark. Preliminary typical levee and floodwall cross-sections were developed to estimate comparative quantities and costs.

After consideration of the potential Hazardous, Toxic, and Radioactive Waste (HTRW) impacts, potential environmental impacts, and the challenges associated with floodwall construction adjacent to several Superfund sites, the New Jersey Department of Environmental Protection (NJDEP), the non-Federal partner, selected a smaller alternative, known as the "Flanking Plan", as the LPP, which includes floodwall segments set back from the coastline.

This appendix provides the detailed cost estimate for the TSP, the LPP. The plan will provide flood risk management along portions of the Passaic River, and includes parts of Newark Bay in New Jersey.

A general project location map of the Passaic River Tidal Project Area (the ABU Project) is provided in Figure 1, which shows the 1995 line of protection alignment. The LPP is shown in Figure 2.

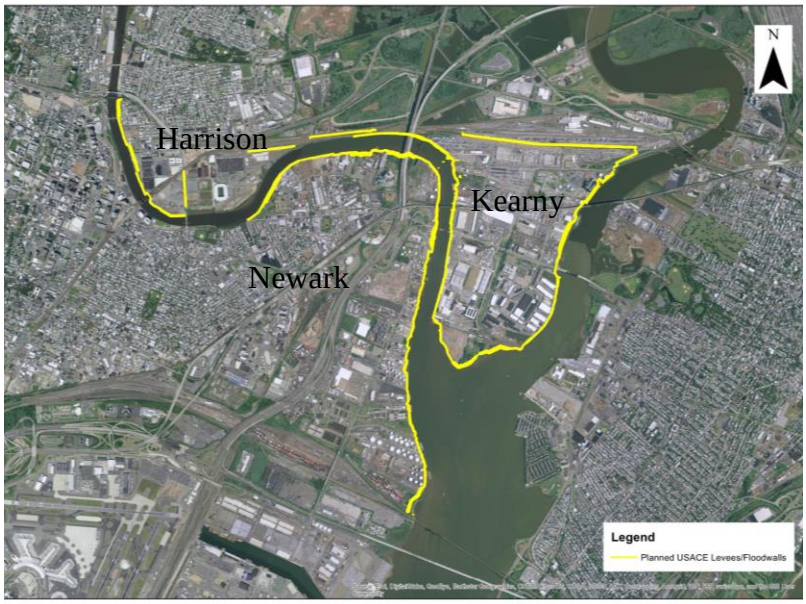


Figure 1: Passaic River Tidal Project Area – 1995 GDM Alignment

Figure 2: Passaic River Tidal Project, Locally Preferred Plan

2 PROJECT PURPOSE

The purpose of the Passaic River, New Jersey, Tidal GRR is to document the development of the updated cost estimates, plan formulation and environmental impacts of the tidal portion for the Passaic River Flood Risk Management Project, determine if storm risk management in the study area is still in the federal interest, and present the Selected Plan for construction.

3 PROJECT HISTORY

Flooding in the Passaic River Basin has been studied extensively over the past century at both the state and federal level. The State of New Jersey has produced numerous documents containing multiple recommendations advancing flood storage as key to solving the problem in the Passaic River Basin; however, none of the proposed upstream local solutions would reduce storm surge flooding in the tidal portion of the basin.

In 1936, the U.S. Army Corps of Engineers (USACE) first became involved in the basin flood control planning effort as a direct result of the passage of the Flood Control Acts. Since then, the USACE has issued reports containing recommendations eight times since 1939, the latest being in 1995. Due to the lack of widespread public support, none of the basin-wide plans were implemented. Opposition was based on concerns of municipalities and various other interests throughout the basin.

The latest Feasibility Report was NYD's 'General Design Memorandum, Flood Protection Feasibility Main Stem Passaic River, December 1987," which was the basis for project authorization. The project at the time included a system of levees and floodwalls with associated closure structures, interior drainage and pump stations within the tidal portion of the Passaic River Basin.

Since authorization, planning and design efforts were conducted and presented in NYD's "Draft General Design Memorandum (GDM), Passaic River Flood Damage Reduction Project, Main Report and Supplement 1 to the Environmental Impact Statement, September 1995, and associated appendices." These efforts affirmed that the authorized project remained appropriate for the Passaic River Basin based on the problems, needs, and planning and design criteria at the time.

Since 1996, the State has requested that USACE proceed with three elements of the Passaic River Basin project: the preservation of natural storage, the Joseph G. Minish Waterfront Park, and the Harrison portion of the tidal project area. In 2007, the NYD prepared a draft Limited Reevaluation Report to reaffirm federal interest in construction of the tidal portion in Harrison.

Following the impact of Hurricane Sandy on the region in 2012, the NYD initiated a general reevaluation of the entire Passaic River Basin project to reaffirm project viability and move to construction. Due to the lapse of time since the last study and the current emphasis on design

resiliency when considering sea level change, the project was evaluated at the design height and two additional design heights of +2 feet and +4 feet. Due to potential challenges presented by HTRW and Superfund site proximity to the authorized alignment, an additional alternative, the smaller Flanking Plan, was also considered.

4 TENTATIVELY SELECTED PLAN

The Passaic Tidal Tentatively Selected Plan is the LPP and consists of concrete floodwalls and gates along three reaches as described below. The design elevation is 14 feet NAVD. The typical ground elevation is 6 to 10 feet NAVD. For areas with a wall height of four feet or less, the wall is a concrete I-wall; for areas where the wall is greater than four feet, the wall is a pile-supported, concrete T-wall. The project reaches are shown in Figure 3.

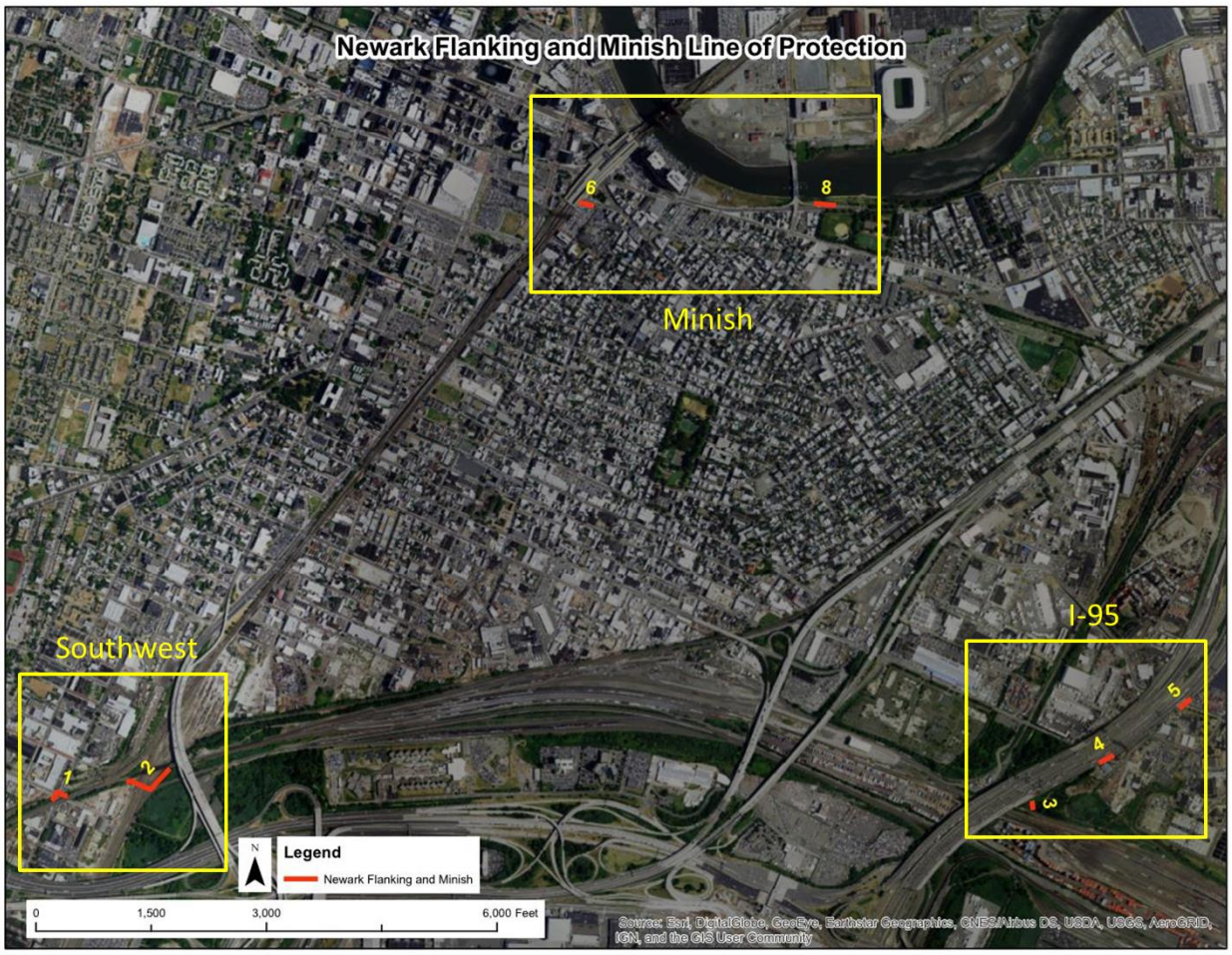


Figure 3: Passaic Tidal Project Reaches

4.1 Southwest Reach

The Southwest Reach alignment consists of two wall and gate segments that cut off flanking of the South Ironbound area of Newark by flood surge entering the Perimeter Ditch around Newark Liberty International Airport.

Segment 1: 290 linear feet (LF) of floodwall with two closure gates: a 65 LF gate across Frelinghuysen Avenue and a 45 LF gate across East Peddie Street. Both gates would be approximately 4.0 feet high. The floodwall height would range from approximately 2.6 to 4.0 feet.

Segment 2: 705 LF of floodwall located between McCarter Highway and Frelinghuysen Avenue, north of East Peddie Street. This segment includes five closure gates, totaling 190 LF to allow passage along the numerous railroad tracks at this location. Floodwall and gate height along this segment would vary from 4.8 to 8.2 feet.

4.2 I-95 Reach

The I-95 Reach includes three wall segments:

Segment 3: 139 LF of floodwall with a tide gate across an unnamed tidal creek just east of the New Jersey Turnpike. The floodwall height of this segment will be a maximum of 9.4 feet. The wall includes an outfall with a backflow prevention device.

Segment 4: 180 LF of floodwall across Delancy Street just east of the New Jersey Turnpike. The closure gate across Delancy Street would be approximately 60 LF and the floodwall height would range from approximately 4.1 to 4.8 feet.

Segment 5: 226 LF of floodwall across Wilson Avenue just east of the New Jersey Turnpike. The closure gate across Wilson Ave would be approximately 60 LF and the floodwall height would range from approximately 3.1 to 3.2 feet.

4.3 Minish Park Reach

The Minish Park Reach alignment includes one segment at Minish Park and one at Newark Penn Station:

Segment 6: 204 LF of floodwall along Edison Place and across New Jersey Railroad Avenue at Edison Place. The closure gate across NJRR Avenue would be approximately 24 LF and the height of the floodwall would range from approximately 0.9 to 3.1 feet.

Segment 8: 297 LF of floodwall along the side of the off ramp from Raymond Blvd to Jackson Street. This segment boarders the sidewalk adjacent to Riverfront Park and would have a height ranging from approximately 1.3 to 3.4 feet.

The total LPP alignment length is approximately 2,040 LF feet and includes 8 closure gates and a tidal culvert. Interior drainage features have not yet been identified.

5 DETAILED COST ESTIMATE

5.1 Methods

For the detailed cost estimate, project quantities were developed using Microsoft Excel and manual calculations, where applicable. The cost estimate was compiled using the Micro-Computer Aided Cost Estimating System, Second Generation (MCACES, 2nd Generation or MII).

5.2 Cost Basis

The cost basis for the detailed cost estimate is a combination of MII's 2012 English Cost Book, 2014 Region 1 equipment book, estimator-created site specific cost items, local historic quotations, and quotations from local material suppliers. For the purposes of updating the cost book to present day pricing, a current, area-specific labor library was used to reflect market labor conditions. Major material costs were verified. For cost book material items that did not reflect current commodities pricing, vendor quotes were obtained and estimator judgment applied where warranted. Different aspects of the cost basis are outlined below.

5.2.1 Design Criteria / Quantity Development:

- Quantity take-offs were performed for the floodwall using end area methods. Wall heights of 4 feet or less are concrete I-walls; wall heights greater than 4 feet are pile supported, concrete T-walls.
- Pile quantities were calculated based on monolith height and depth to bedrock. H-piles were used for all conditions.
- Epoxy-coated sheet pile, two times the wall height below grade, was used along the entire line of protection to prevent seepage.
- In constricted areas, a vertical pile design is assumed; however, the computations were not changed from battered to vertical as this change is expected to have only minimal effect on the pile cost.
- Permanent and temporary easements were set at 15 feet each, for each side of the wall.
- Gravity outlets consist of 24-inch in diameter pipes. The cost for the outlets was developed using cost templates developed for other projects. The cost templates include pipe length, concrete housing, riprap, sluice gates and outflow prevention. No new outlets were added.
- Closure gate costs were calculated separately and included in their respective project components as a lump sum.
- Relocation costs were estimated as an allotment for each reach.
- Mobilization and demobilization costs were estimated at 3 percent of the construction cost.

- Traffic maintenance costs were generally assumed to be 2 percent of the construction cost.
- Common fill is assumed to be reused material from the floodwall excavation. Hauling and disposal costs are included for the balance of the material.
- Due to the length of the project, permanent electrical power along the project alignment is not feasible. Instead, the sluice gates' motors will be powered by a portable, truck mounted generator.

5.2.2 Lands and Damages

Two types of easements are required for the coastal risk management project: Permanent Floodwall Easements, in locations where the construction, operation, maintenance, patrol, and repair and replacement of the LOP are required; and Temporary Easements, to allow right-of-way in, over and across the land for the planned construction schedule.

5.2.3 Pre-construction, Engineering, and Design/Supervision and Administration

Pre-construction, Engineering, and Design (PED), and Supervision and Administration were calculated as 20 percent and 8 percent, respectively, of project construction costs.

5.2.4 Escalation

Escalation in the Total Project Cost Summary was based on Civil Works Construction Cost Index System tables as revised on March 31, 2017.

5.2.5 Contingencies

Cost contingencies for the Selected Plan were developed through an Abbreviated Risk Analysis (ARA), shown in Attachment 1. The overall cost contingency was 48.5 percent.

5.3 First Costs

Detailed project first costs for the Recommended Plan are presented in Table 1 and are shown in the MII in Attachment 2.

Table 1: Project First Costs

Description	Amount	Cont.%	Cont. $	Total
01 – Lands and Damages	$484,000	19.5%	$94,000	$578,000
02 – Relocations	$350,000	73.9%	$259,000	$609,000
06 – Fish and Wildlife	$500,000	20.6%	$103,000	$603,000
11 – Levees and Floodwalls	$8,390,000	36.9%	$3,093,000	$11,483,000
13 – Pumping Plant	$3,816,000	49.7%	$1,897,000	$5,713,000
15 – Floodway Control & Diversion	$9,957,000	73.4%	$7,304,000	$17,261,000
18 – Cultural Resources	$1,600,000	14.1%	$226,000	$1,826,000
30 – Engineering & Design	$3,691,000	43.0%	$1,588,000	$5,279,000
31 – Construction Management	$1,969,000	17.5%	$345,000	$2,314,000
TOTAL	**$30,757,000**	**48.5%**	**$14,909,000**	**$45,666,000**

6 OPERATION AND MAINTENANCE

The performance of the Selected Plan will continue to meet its design intent if it is properly maintained during normal (non-storm conditions) and properly operated during times of nor'easters and hurricane flooding events. The need for proper maintenance of the plan is critical given the potential damages to infrastructure in this urban area if deterioration or damage to structures occurs due to lack of maintenance. The operation and maintenance (O&M) regiment will be developed in detail during construction; however, a general outline is summarized below.

6.1 Emergency Operations

Emergency surveillance, communication and chain of responsibility for the project's structures and associated infrastructure will fall under existing protocols agreed upon by the New Jersey Department of Environmental Protection (NJDEP), property owners, and NYD. Particular attention should be given to monitoring the performance of the project structures during storms in the first few years of operation, to ensure that they function as designed. Coordination and communication with NYD, the National Weather Service and National Hurricane Center, and the State of New Jersey will be required during storms to initiate standard flood-fighting techniques. Typical flood-fighting methods will include the following:

- Storm patrolling and reporting of trouble spots, ensuring gates are closed and sandbagged as needed
- Scour hole repair
- Unclogging of drainage outlets; and
- Ensuring the proper operation of pump stations (if included).

6.2 Maintenance

Maintenance is defined as the upkeep and repair of structures to maintain the function of the structure after construction is complete.

6.2.1 Floodwall

Maintenance of the concrete I- and T-walls is based on maintaining the integrity of the structure, which may be reduced due to loss of material at the toe of the structure and/or liquefaction of soil due to poor drainage. In addition, repair of the concrete will be performed to minimize corrosion of the reinforcing steel within the concrete.

6.2.2 Closure Gates

Maintenance of moveable structures, elimination of rust, and removal of debris will be required regularly to ensure proper operation. Periodic deployment should occur to ensure proper operation, traffic maintenance, and other logistics.

6.2.3 Pump Stations

Maintenance of pumps, moveable structures, elimination of rust, removal of debris, and servicing of auxiliary power will be required regularly to ensure proper operation.

6.2.4 Outfalls

Drainage outfalls must be maintained clear of debris which could restrict drainage, jam backflow prevention devices, and prevent closure of associated sluice gates. Sluice gate motors and tracks will be maintained. Portable power sources should be periodically tested.

6.3 Rehabilitation

Due to the steel construction of many of the outfall and gate features, and synthetic material in the backflow prevention devices, replacement or rehabilitation of these items is assumed to be required every 25 years. The cost to replace the aforementioned items has been estimated using present worth calculations and included in the O&M costs outlined below.

6.4 O&M Costs

To address the items above, the annual O&M cost includes annual inspections and maintenance of the project including pumps, gate chambers, closure gates, sluice gates and backflow prevention. Annual O&M costs are shown in Table 2.

Table 2: Annual O&M Costs

Item	First Cost	Present Worth	Capital Recovery	O&M
Southwest Reach				
FLOODWALL				$4,000
CLOSURE GATES				$6,500
Gate Replacement	$1,462,177	$314,368	$12,512	
Total O&M - Southwest			**$12,512**	**$10,500**
I-95 Reach				
FLOODWALL				$2,200
CLOSURE GATES				$9,750
Gate Replacement	$923,852	$198,628	$7,905	
Total O&M – I-95			**$7,905**	**$11,950**
Minish				
FLOODWALL				$1,960
CLOSURE GATES				$6,500
Gate Replacement	$427,265	$91,862	$3,656	
Total O&M - Minish			**$3,656**	**$8,460**
Interior Drainage				
SLUICE GATES				$203,500
Gate Replacement	$6,266,798	$2,901,528	$168,869	
PUMP STATION				$100,000
Gate Replacement	$1,000,000	$463,000	$26,947	
Total O&M – Interior Drainage			**$195,816**	**$303,500**
Total Annual O&M				**$554,000**

7 ANNUALIZED COSTS

7.1 Project Life

The project life is 50 years.

7.2 Interest and Amortization

The interest rate used in converting investment costs to equivalent annual costs is the rate set by the Water Resources Council for the evaluation of federal government water resources projects. This rate has been set at 2.875 percent for Fiscal Year 2017.

Amortization is the financial or economic process of recovering an investment in a project over a given period. The amortization period is the period of time assumed or selected for economic recovery of the net investment in a project (50-years). When combined, interest and amortization become the capital recovery factor which, when applied to project costs, will result in the annual cost of the project investment.

7.3 Monitoring Costs

The non-federal partner or its designee will be responsible for conducting the post-construction monitoring of the project mitigation site and any other environmental areas associated with the line of protection. Three consecutive years of post-construction monitoring are planned at $50,000 per year. However, the plan should be adaptive and allow for a longer or shorter monitoring period depending on the annual results. The annual monitoring costs will be considered as part of the non-federal partners cost share; however, they are not included in the annual cost summary.

7.4 Interest During Construction

Interest during construction (IDC) was calculated to account for the cost of capital during the construction periods prior to the realization of project benefits. IDC was calculated for each project reach based on the following construction durations:

- Southwest: 12 months
- I-95: 12 months
- Minish: 12 months

The construction costs were assumed to be distributed evenly across the construction period. Project costs were amortized over the expected period of project construction at an interest rate of 2.875 percent.

7.5 Annual Costs

The Recommended Plan's annualized costs are shown in Table 3.

Table 3: Project Annual Costs

Total Project Costs*	$ 45,666,000
Interest During Construction	$ 599,000
Total Investment Costs	**$ 46,265,000**
Annualized Investment Costs	$ 1,707,000
Annual Operations and Maintenance Costs	$ 554,000
Total Average Annual Costs	**$ 2,261,000**
*2016 Price level	

8 TOTAL PROJECT COSTS

The Total Project Cost Summary (TPCS) is shown in Table 4. The costs for each contract are escalated to the midpoint of construction.

Table 4: Total Project Cost Summary

PROJECT: **Passaic River Tidal GRR**
PROJECT NO: TBD
LOCATION: Newark, New Jersey

DISTRICT: **New York District**
POC: **CHIEF, COST ENGINEERING, xxx**

PREPARED: **9/18/2017**

This Estimate reflects the scope and schedule in report; This Estimate reflects the latest plans, the Flanking Plan for the Passaic River Tidal GRR

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): 2018									
						Effective Price Level Date: 1 OCT 17									
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	**TOTAL ($K)**	Spent Thru: **1-Oct-15** ($K)	**TOTAL FIRST COST** ($K)	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*		*K*	*L*	*M*	*N*	*O*
02	RELOCATIONS	$350	$259	73.9%	$609	4.7%	$366	$271	$637	$0	$637	8.3%	$397	$293	$690
06	FISH & WILDLIFE FACILITIES	$500	$103	20.6%	$603	4.6%	$523	$108	$631	$0	$631	8.3%	$567	$117	$683
11	LEVEES & FLOODWALLS	$8,390	$3,093	36.9%	$11,483	4.2%	$8,744	$3,223	$11,967	$0	$11,967	8.3%	$9,469	$3,490	$12,959
13	PUMPING PLANT	$3,816	$1,897	49.7%	$5,713	5.0%	$4,008	$1,993	$6,001	$0	$6,001	8.3%	$4,341	$2,158	$6,499
15	FLOODWAY CONTROL & DIVERSION STRU	$9,957	$7,304	73.4%	$17,261	4.6%	$10,418	$7,643	$18,061	$0	$18,061	8.3%	$11,282	$8,277	$19,559
18	CULTURAL RESOURCE PRESERVATION	$1,600	$226	14.1%	$1,826	5.0%	$1,681	$237	$1,918	$0	$1,918	8.3%	$1,820	$257	$2,077
	CONSTRUCTION ESTIMATE TOTALS:	$24,613	$12,882		$37,495	4.6%	$25,741	$13,474	$39,215	$0	$39,215	8.3%	$27,875	$14,592	$42,467
01	LANDS AND DAMAGES	$484	$94	19.5%	$578	4.7%	$507	$99	$606	$0	$606	8.3%	$549	$107	$656
30	PLANNING, ENGINEERING & DESIGN	$3,691	$1,588	43.0%	$5,279	5.5%	$3,894	$1,676	$5,569	$0	$5,569	16.1%	$4,522	$1,946	$6,468
31	CONSTRUCTION MANAGEMENT	$1,969	$345	17.5%	$2,314	5.5%	$2,077	$364	$2,441	$0	$2,441	22.1%	$2,536	$445	$2,980
	PROJECT COST TOTALS:	$30,757	$14,909	48.5%	$45,666		$32,219	$15,613	**$47,831**	$0	**$47,831**	9.9%	$35,482	$17,089	$52,571

ESTIMATED TOTAL PROJECT COST: **$52,571**

9 COST APPORTIONMENT

The estimated Total Project Cost is $52,571,000. The expected cost share for the Passaic River Tidal Coastal Storm Risk Management project is $34,269,000 federal (65 percent) and $18,452,000 non-federal (35 percent), as shown in Table 5.

Table 5: Cost Apportionment

Federal Project Cost (65%)	**$34,269,000**
Non-Federal Project Cost (35%)	**$18,452,000**
LERR	
LER	$606,000
Relocations	$637,000
Cash Balance	$17,059,000
Monitoring	$150,000
Total Project Cost (100%)	**$52,721,000**

As the non-federal partner, NJDEP must comply with all applicable federal laws, policies and other requirements, including but not limited to:

a) Provide all lands, easements, rights-of-way, and relocations (LERR).

b) If the value of the partner's LERR contributions, plus the 5 percent minimum cash contribution, do not equal at least 35 percent of the total project cost, then the partner is required to provide an additional cash contribution necessary to equal a total of 35 percent. The partner is required to pay the additional cash contributions during construction at a rate proportional to federal expenditures. If the value of the partner's LERR contributions, plus the 5 percent minimum cash contribution, exceeds 35 percent of the total project cost, then the federal contribution is reduced accordingly. If the value of the partner's LERR contributions, plus the 5 percent minimum cash contribution, exceeds 50 percent of the total project cost, the project is cost shared at 50 percent federal, 50 percent non-federal cost.

c) For so long as the project remains authorized, operate, maintain, repair, replace, and rehabilitate the completed project, or functional portion of the project, including mitigation features, at no cost to the government, in a manner compatible with the project's authorized purposes and in accordance with applicable federal and State laws and any specific directions prescribed by the government in the Operations, Maintenance, Replacement, Repair and Rehabilitation (OMRR&R) manual and any subsequent amendments thereto.

d) Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Public Law 100-17), and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way, required for the construction, operation, and maintenance of the project, including those necessary for relocations, borrow materials, or excavated material disposal, and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act.

e) Provide the non-federal share of that portion of the costs of mitigation and data recovery activities associated with historic preservation, that are in excess of 1 percent of the total amount authorized to be appropriated for the project, in accordance with the cost sharing provisions of the agreement.

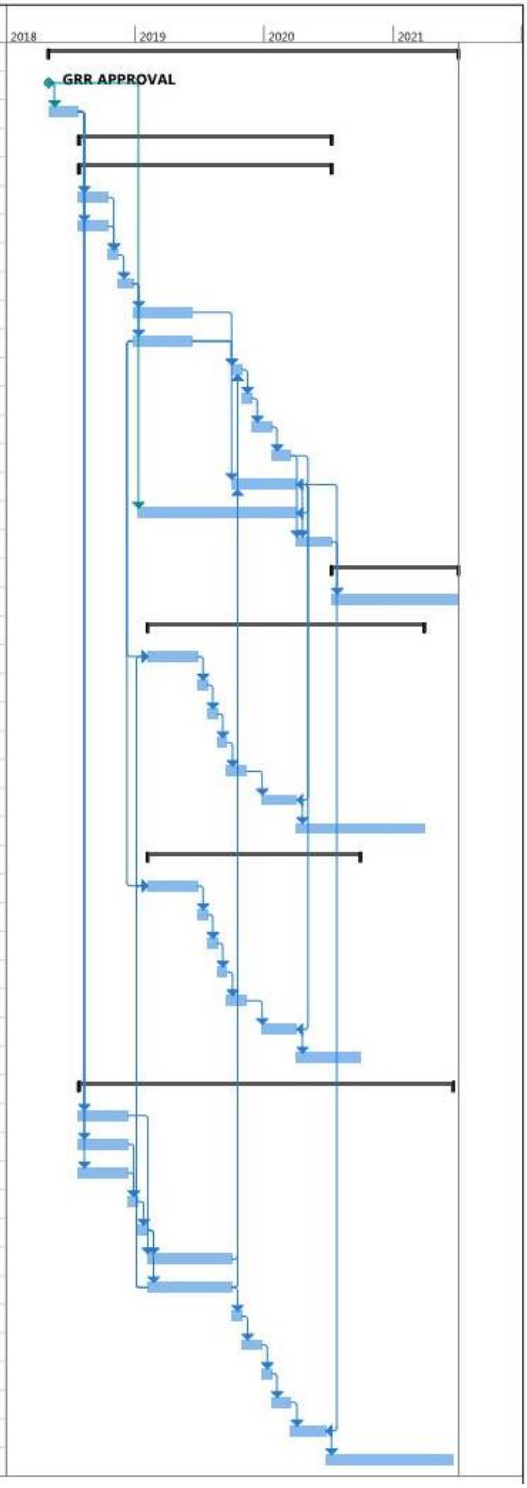
f) Do not use federal funds to meet the non-federal partner's share of total project costs unless the federal granting agency verifies in writing that the expenditure of such funds is authorized.

10 CONSTRUCTION SCHEDULE

The proposed construction schedule is shown in Figure 4.

Figure 4: Construction Schedule

ID	Task Name	Duration	Start	Finish
1	**Passaic River Tidal GRR (LPP)**	**829 days**	**Tue 5/1/18**	**Sun 7/4/21**
2	**GRR APPROVAL**	**1 day**	**Tue 5/1/18**	**Tue 5/1/18**
3	Field Survey	60 days	Wed 5/2/18	Tue 7/24/18
4	**CONTRACT 1 - SOUTHWEST Plans & Specs**	**512 days**	**Wed 7/25/18**	**Thu 7/9/20**
5	**Design Activities**	**512 days**	**Wed 7/25/18**	**Thu 7/9/20**
6	DDR - 30%	60 days	Wed 7/25/18	Tue 10/16/18
7	P&S - 30%	60 days	Wed 7/25/18	Tue 10/16/18
8	30% DQC review	20 days	Wed 10/17/18	Tue 11/13/18
9	VE Study	30 days	Wed 11/14/18	Tue 12/25/18
10	DDR - 90%	120 days	Wed 12/26/18	Tue 6/11/19
11	P&S - 90%	120 days	Wed 12/26/18	Tue 6/11/19
12	90% DQC, BCOES Reviews	20 days	Wed 10/2/19	Tue 10/29/19
13	Contract 1 - Revised 90% for review	20 days	Wed 10/30/19	Tue 11/26/19
14	90% ATR & IEPR Reviews	40 days	Wed 11/27/19	Tue 1/21/20
15	Contract 1 - 100% DDR and P&S	40 days	Wed 1/22/20	Tue 3/17/20
16	Real Estate Acquisition	132 days	Wed 10/2/19	Thu 4/2/20
17	Railroad Coordination	320 days	Fri 1/11/19	Thu 4/2/20
18	Contract 1 Advertise and Award	70 days	Fri 4/3/20	Thu 7/9/20
19	**CONTRACT 1 - SOUTHWEST Construction Activities**	**256 days**	**Thu 7/9/20**	**Sun 7/4/21**
20	Southwest Construction	12 emons	Thu 7/9/20	Sun 7/4/21
21	**CONTRACT 2 - I-95 Construction Activities**	**558 days**	**Wed 2/6/19**	**Sun 3/28/21**
22	2 - P&S - 90%	100 days	Wed 2/6/19	Tue 6/25/19
23	90% DQC, BCOES Reviews	20 days	Wed 6/26/19	Tue 7/23/19
24	Contract 2 - Revised 90% for review	20 days	Wed 7/24/19	Tue 8/20/19
25	90% ATR & IEPR Reviews	20 days	Wed 8/21/19	Tue 9/17/19
26	2 - 100% DDR and P&S	40 days	Wed 9/18/19	Tue 11/12/19
27	Contract 3 Advertise & Award	70 days	Fri 12/27/19	Thu 4/2/20
28	I-95 Construction	12 emons	Thu 4/2/20	Sun 3/28/21
29	**CONTRACT 3 - MINISH Construction Activities**	**430 days**	**Wed 2/6/19**	**Tue 9/29/20**
30	3 - P&S - 90%	100 days	Wed 2/6/19	Tue 6/25/19
31	90% DQC, BCOES Reviews	20 days	Wed 6/26/19	Tue 7/23/19
32	Contract 3 - Revised 90% for review	20 days	Wed 7/24/19	Tue 8/20/19
33	90% ATR & IEPR Reviews	20 days	Wed 8/21/19	Tue 9/17/19
34	3 - 100% DDR and P&S	40 days	Wed 9/18/19	Tue 11/12/19
35	Contract 3 Advertise & Award	70 days	Fri 12/27/19	Thu 4/2/20
36	Minish Construction	6 emons	Thu 4/2/20	Tue 9/29/20
37	**CONTRACT 4 - INTERIOR DRAINAGE P&S**	**758 days**	**Wed 7/25/18**	**Fri 6/18/21**
38	Interior Drainage Final Analyses	100 days	Wed 7/25/18	Tue 12/11/18
39	DDR - 30%	100 days	Wed 7/25/18	Tue 12/11/18
40	P&S - 30%	100 days	Wed 7/25/18	Tue 12/11/18
41	30% DQC review	20 days	Wed 12/12/18	Tue 1/8/19
42	VE Study	20 days	Wed 1/9/19	Tue 2/5/19
43	DDR - 90%	170 days	Wed 2/6/19	Tue 10/1/19
44	P&S - 90%	170 days	Wed 2/6/19	Tue 10/1/19
45	90% DQC, BCOES Reviews	20 days	Wed 10/2/19	Tue 10/29/19
46	Contract 4 - Revised 90% for review	40 days	Wed 10/30/19	Tue 12/24/19
47	90% ATR & IEPR Reviews	20 days	Wed 12/25/19	Tue 1/21/20
48	4 - 100% DDR and P&S	40 days	Wed 1/22/20	Tue 3/17/20
49	Contract 4 Advertise & Award	70 days	Wed 3/18/20	Tue 6/23/20
50	Interior Drainage Construction	12 emons	Tue 6/23/20	Fri 6/18/21



ATTACHMENT 1
Abbreviated Risk Analysis (ARA) Report

ATTACHMENT 2
MII Summary