Fairfax County Flood Risk Management Study

Description and Comparison of Flood Risk Management Plans along and adjacent to the George Washington Memorial Parkway

Prepared by USACE, Baltimore District for Fairfax County

4 April 2014

Revised 11 September 2014

Table of Contents

Revisions Note: Minor revisions were made to this document related to the locations of closure structures on page 1 and the *Potential Plans Comparison Matrix* on page 6 on 5 June 2014. Additional minor revisions were made on 11 September 2014 to the graphic photograph pages to better describe and depict the heights of the levees/flood walls.

Description of Plans

The purpose of this document is to briefly describe and compare the potential floodwall and levee sections along or adjacent to the George Washington Memorial Parkway (GWMP) that Fairfax County is evaluating and coordinating with National Park Service. The purpose of the project is to reduce the flood risk to various communities (Belle View, New Alexandria, Riverview, and River Towers). All of the plans will require the levee tie-out on the north side along Belle Haven Road and a floodwall/levee along the south side of the project that ties into high ground. Although the alignment for the south side of the project has not been finalized, for this document it was assumed that the floodwall/levee would run south of the River Towers (See Figure 1).

The top of protection of these plans has not been determined. For visual impact purposes, graphics were developed to depict walls/levees with a top elevation of 12 feet and 14.5 feet NGVD29. FEMA's 1% annual chance base flood (100 year-flood) elevation is 11.2 feet NGVD29. However, additional heights of structures could be considered.

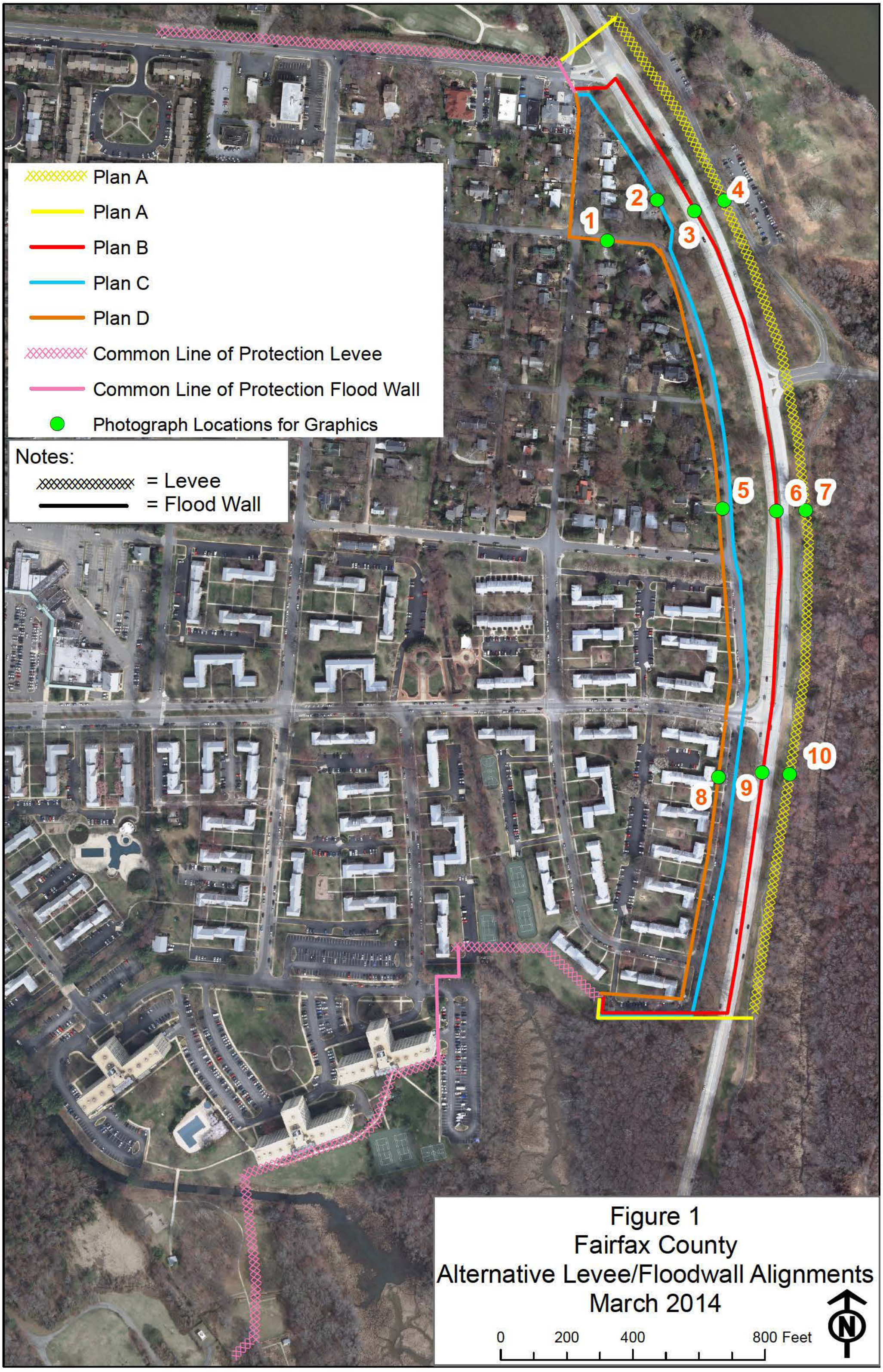
Plan A – Grassed levee along the east side of the GWMP. This plan would include two closure structures across the entire GWMP; one at the northern end near Belle Haven Road and one at the southern end (at the south end of the Belle View condos). The plan would also include a closure structure across the entrance to the marina. A 15-foot easement would be required on both sides of the levee, which would need to be clear of trees. The levee footprint width would vary with the height of the levee. The levee would likely be 10 feet wide at the top with 2.5:1 side slopes. This plan would also involve rerouting the walking path and reconfiguring the parking areas.

Plan B – Floodwall along the GWMP median. The floodwall would likely have a stone face (if required by NPS). This plan would include two closure structures across the southbound lanes of the GWMP; one at the northern end near Belle Haven Road and one at the southern end (at the south end of the Belle View condos). A third closure would be required at the median opening at Belle View Boulevard. A fourth closure would be required at the median opening to the marina entrance. A fifth closure would likely be required in the median at the Belle Haven Road intersection for sight distance reasons. These median closures would be lengthy because of sight distance reasons and lack of traffic lights. Removing the left turn lanes at Belle View Boulevard and the marina entrance could be considered. All trees in this section of the median would have to be removed.

Plan C – Floodwall along the west side of the GWMP, just east of Boulevard View. This **f**loodwall would likely have a stone façade. Most of the floodwall would not be on NPS property, however, it would be near it and construction easements would be required. NPS trees

would need to be removed (assumption at this point is that all trees within 40 feet of both sides of the floodwall would need to be removed). Two closure structures would be required; one across Belle View Boulevard and one across Belle Haven Road.

Plan D – Floodwall along front of houses/condos on Boulevard View and along Old Towne Road and 10th Street. This project alignment would be completely off of NPS land and would likely have no impacts to NPS trees. The plan would include numerous road, driveway and sidewalk closures, as well as significant utility modifications Seven houses at the northern end of the project area would be outside the line of protection.


Plan A
Plan A
Plan B
Plan C
Plan D
Common Line of Protection Levee
Common Line of Protection Flood Wall
Photograph Locations for Graphics
Notes:
= Levee
= Flood Wall
1
2
3
4
5
6
7
8
9
10
Figure 1
Fairfax County
Alternative Levee/Floodwall Alignments
March 2014
0
200
400
800 Feet
N

US Army Corps of Engineers
Baltimore District

SYMBOL	REV.	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DISTRICT, BALTIMORE
CORPS OF ENGINEERS
BALTIMORE, MARYLAND

PLATE	DRAWING NUMBER	FILE NAME
	XXXXX	457W101-100yr_plan1
SCALE: AS SHOWN	DATE: APR 2013	PLT SCALE: XXX

BELLE VIEW/NEW ALEXANDRIA
FAIRFAX COUNTY, VIRGINIA
LOCAL FLOOD DAMAGE REDUCTION STUDY

PLAN A, LEVEE EAST OF GW PKWY

Sheet Number:
W101

Updated: 11/8/07 ID = e1enxmmx Plot: 12/03/07

BLVD.
36"x58" S.D.
12" SAN.
12"W
BOX CULV.
24" SAN.
24" SAN F.M.
POTOMAC AVE.
EAST WAKEFIELD DR.
TENTH ST.
LEVEE
GEORGE WASHINGTON PKWY.
REMOVE ALL TREES WITHIN 15' OF LEVEE
RECONSTRUCT PORTION OF BIKE TRAIL
TIES INTO WALL/LEVEE ALONG SOUTH SECTION OF PROJECT
18" S.D.
24" S.D.
S.D.
FLOODWALL
CLOSURE STRUCTURE
SCALE IN FEET
100 0 100 200
10" SAN
10" SAN F.M.
21" S.D.

SYMBOL	REV.	DATE	DESCRIPTION	BY

US Army Corps of Engineers
Baltimore District

U.S. ARMY ENGINEER DISTRICT, BALTIMORE
CORPS OF ENGINEERS
BALTIMORE, MARYLAND

PLATE	DRAWING NUMBER	FILE NAME
	XXXXX	457W102-100yr_plan1
SCALE: AS SHOWN	DATE: MAR 2014	PLT SCALE: XXX

BELLE VIEW/NEW ALEXANDRIA
FAIRFAX COUNTY, VIRGINIA
LOCAL FLOOD DAMAGE REDUCTION STUDY

PLAN A, LEVEE EAST OF GW PKWY

Sheet Number:
W102

Updated: 11/8/07
Plot: 12/03/07
ID = e1enxmmx

Fairfax County
Flood Risk Management Study
Potential Plans Comparison Matrix
11 Sep 2014

Plan Name	Previous Alignment Name	Description	Impact to Properties	Impact to Trees	Impact to Utilities	Impact to Roads/Access	Impact to View	Areas Protected	Pre-Flood Actions	Estimated Construction Cost (for top of protection at elev. 12 feet)*	Advantages	Disadvantages
A	N/A	Grassed levee along east side of GWMP; two closures across entire GWMP; closure at access road to marina	Levee on NPS property	Major impact to NPS trees on east side of GWMP (rough estimation is 125-350 trees)**(see notes below)	Minimal	Major impact to roads/access; 2 closures across entire GWMP; one closure across marina access road; GWMP will be impacted/partially closed during construction and during predicted floods; portions of parking lot, driveway and bike trail will likely need to be reconfigured	Moderate to Major; see graphic photos of levee (depending on height); visual impact of closure structures	All structures protected	Major - closure structures (including 2 across GWMP) must be installed; significant manpower and resources may be needed to install closures	$21M	All structures protected; Minimal impact to utilities; Grassed levee blends with landscape; Less impact to GWMP/traffic during construction than Plan B	Depending on height of levee, could have significant visual impacts from GWMP; Significant manpower and resources needed to install closure structures; Significant impact to trees, but could be mitigated; Visual impact of closure structures
B	GWMP1	Floodwall along GWMP median; two closures across southbound GWMP lane; three long closures in the median (for sight distance) at Belle Haven Road, Marina entrance, and at Belle View Boulevard (eliminating left turn lanes at marina and Belle View Blvd could be considered as part of this plan).	Floodwall on NPS property	Minimal impact - few trees impacted at northern end of GWMP median	Minimal	Major impact to roads/access; 2 closures across southbound lane of GWMP; one median closure at Belle View Boulevard; one median closure at marina entrance; one median closure at Belle Haven Road for sight distance. May consider eliminating left turn lanes at marina and Belle View Blvd. GWMP will be impacted/partially closed during construction and during predicted floods	Moderate to Major; see graphic photos of floodwall (depending on height); visual impact of closure structures	All structures protected	Major - closure structures (including 2 across GWMP and lengthy median closures) must be installed; significant manpower and resources may be needed to install closures	$34M	All structures protected; Minimal impact to trees; minimal impact to utilities; If left turn lanes eliminated, may improve safety at intersections	Depending on height of floodwall, could have significant visual impacts along GWMP; Significant manpower and resources needed to install closure structures; Significant impact to GWMP/traffic during construction; If left turn lanes eliminated, may have significant impact to traffic routes
C	BVN1 BVC1 BVS1	Floodwall along eastern edge of Boulevard View, just outside NPS property and behind houses on 10th Street	Floodwall adjacent to NPS property line (just outside line) in most areas; will need easements	Major impact to trees on west side of GWMP (estimation is 250 trees)	Minimal	Minimal impact; two road closures - one across Belle View Blvd and one across Belle Haven Road	Moderate to Major impact to view (depending on height); see graphic photos	All structures protected	Minimal - only two closure structures - across Belle View Boulevard and Belle Haven Road	$13M	Only need two closure structures (average length); Minimal utility impacts; All houses protected; Least risk due to least number of closure structures and utility crossings; No (or minor) impact to GWMP during construction	Will require easements on private properties and NPS properties; Significant tree loss on NPS and private property, but could be mitigated
D	BVN3 BVC3 BVS3	Floodwall along Old Towne Road and 10th St. and along west side of Boulevard View in front of houses and BV condos; some houses are outside line of protection	Completely off of and likely no impacts to NPS property; on BV and R/W lands	Moderate/Major impact to trees along west side of Boulevard View (estimation is 130 trees); no impact to NPS trees	Major - wall would cross all utilities along Boulevard View, requiring relocations and/or modifications	Major impact; 11 road closures; 12 driveway closures; 20 sidewalk closures	Moderate to Major impact to view (depending on height); see graphic photos; wall is close to BV condos and houses	7 houses not protected	Major - many closure structures must be installed	$27M	Wall will be outside of NPS property; Likely no NPS tree loss; No impact to GWMP during construction	Some properties unprotected; Will require multiple driveway, roadway and sidewalk closure gates; Major utility relocation along BV View; Significant tree loss on properties west of road, but could be mitigated

Notes:

These descriptions/impacts are only for the plan section along/adjacent to the GWMP; they do not include the levee tie-out along Belle Haven Road to the north, or the floodwall/levee portion of the project to the south since these impacts will be the same for each plan (except for the cost)

* Estimated construction cost does include the northern tie-out and southern section of levee/floodwall; in 2013 dollars - no escalation applied

**Rough estimate of tree loss for Plan A is 125-350. Range is broad due to the fact that no tree survey has been completed in this area. Low estimate is based on counting stems from leaf-off imagery; high estimate is based on limited site survey for 100 foot section and extrapolating. Precise impact to trees will not be known until a detailed tree survey is completed and the levee alignment, road/parking lot realignment, and stockpile areas are determined.

BV = Belle View Condominiums

RT = River Towers

NPS = National Park Service

R/W = Right of Way

Floodwall and Levee Graphics for Plans A, B, C and D

Note: The following section includes graphical depictions of a potential floodwall and levee for the various plans. The intent of the modified photographs is to provide an idea of what the levee or floodwall heights might look like and what the visual impact might be. The façade has not been determined; many of the floodwalls are shown with a stone façade, others that were previously created show a brick façade. Various facades would be evaluated in the future before any final decision would be made. The location where the floodwall/levee is depicted is shown on Figure 1. The location points are numbered on the map and on the photograph/graphic pages. No top of elevation has been determined, so photographs were modified to depict floodwalls/levees with a top elevation of 12 feet NGVD and 14.5 feet NGVD. (FEMA's current 1% annual chance (100 year) flood elevation is 11.2 feet NGVD). A floodwall or levee of another height could be considered. The photos for most of the plans were recently developed. A few of the photos developed for Plan C were created previously and displayed during the October 2012 public meeting.

Plan A – Grassed Levee along East Side of GWMP

Grassed Levee Graphics for Plan A at Point #4
Looking East along GWMP

Existing Conditions

Top of levee elevation = 12 feet (NGVD29)
Adjacent ground elevation = 7.5 feet
Height of levee above adjacent ground = 4.5 feet
Height of levee above GWMP Median (elevation 9.7 feet) = 3.3 feet

Grassed Levee Graphics for Plan A at Point #4
Looking East along GWMP

Existing Conditions

Top of levee elevation = 14.5 feet (NGVD29)
Adjacent ground elevation = 7.5 feet
Height of levee above adjacent ground = 7 feet
Height of levee above GWMP Median (elevation 9.7 feet) = 5.8 feet

Grassed Levee Graphics for Plan A at Point #7
Looking East along GWMP

Existing Conditions

Top of levee elevation = 12 feet (NGVD29)
Adjacent ground elevation = 4.6 feet
Height of levee above adjacent ground = 7.4 feet
Height of levee above GWMP Median (elevation 6.6 feet) = 5.4 feet

Grassed Levee Graphics for Plan A at Point #7
Looking East along GWMP

Existing Conditions

Top of levee elevation = 14.5 feet (NGVD29)
Adjacent ground elevation = 4.6 feet
Height of levee above adjacent ground = 9.9 feet
Height of levee above GWMP Median (elevation 6.6 feet) = 7.9 feet

Grassed Levee Graphics for Plan A at Point #10
Looking East along GWMP

Existing Conditions

Top of levee elevation = 12 feet (NGVD29)
Adjacent ground elevation = 4.5 feet
Height of levee above adjacent ground = 7.5 feet
Height of levee above GWMP Median (elevation 7 feet) = 5 feet

Grassed Levee Graphics for Plan A at Point #10
Looking East along GWMP

Existing Conditions

Top of levee elevation= 14.5 feet (NGVD29)
Adjacent ground elevation = 4.5 feet
Height of levee above adjacent ground = 10.0 feet
Height of levee above GWMP Median (elevation 7 feet) = 7.5 feet

Plan B – Floodwall along the Median of the GWMP

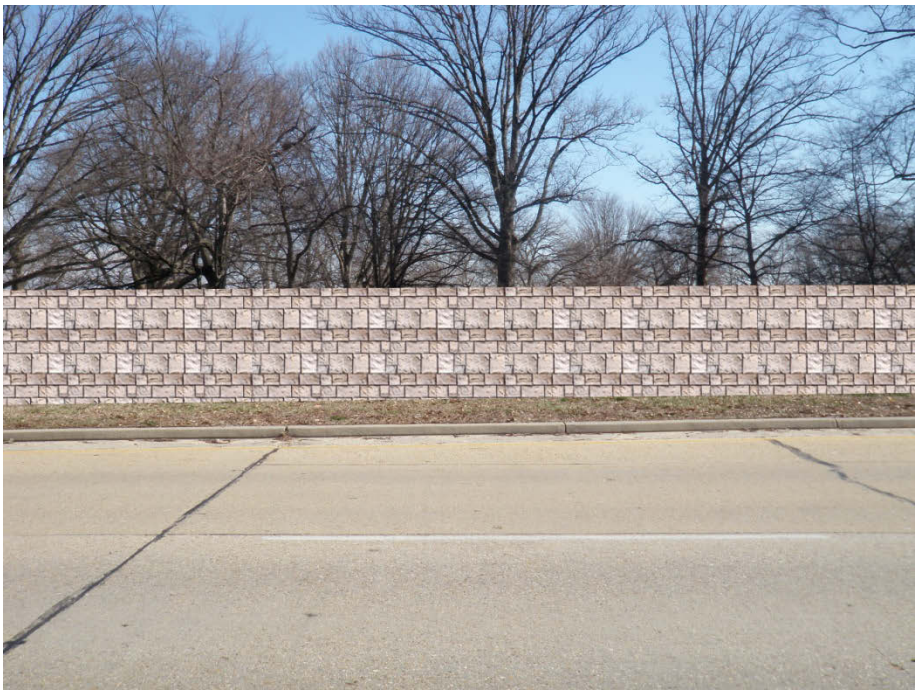
Floodwall Graphics for Plan B at Point #3
Looking East along GWMP Median

Existing Conditions

Top of floodwall elevation = 12 feet (NGVD29)
Adjacent ground elevation = 9.7 feet
Height of wall above adjacent ground = 2.3 feet

Floodwall Graphics for Plan B at Point #3
Looking East along GWMP Median

Existing Conditions



Top of floodwall elevation = 14.5 feet (NGVD29)
Adjacent ground elevation = 9.7 feet
Height of wall above adjacent ground = 4.8 feet

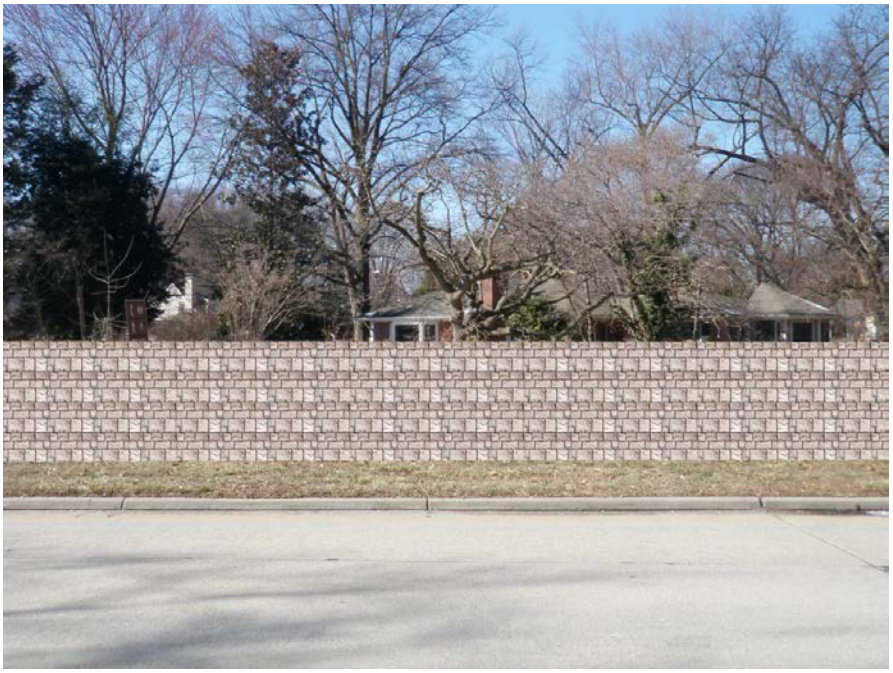
Floodwall Graphics for Plan B at Point #3
Looking West along GWMP Median

Existing Conditions

Top of floodwall elevation = 12 feet (NGVD29)
Adjacent ground elevation = 9.7 feet
Height of wall above adjacent ground = 2.3 feet

Floodwall Graphics for Plan B at Point #3
Looking West along GWMP Median

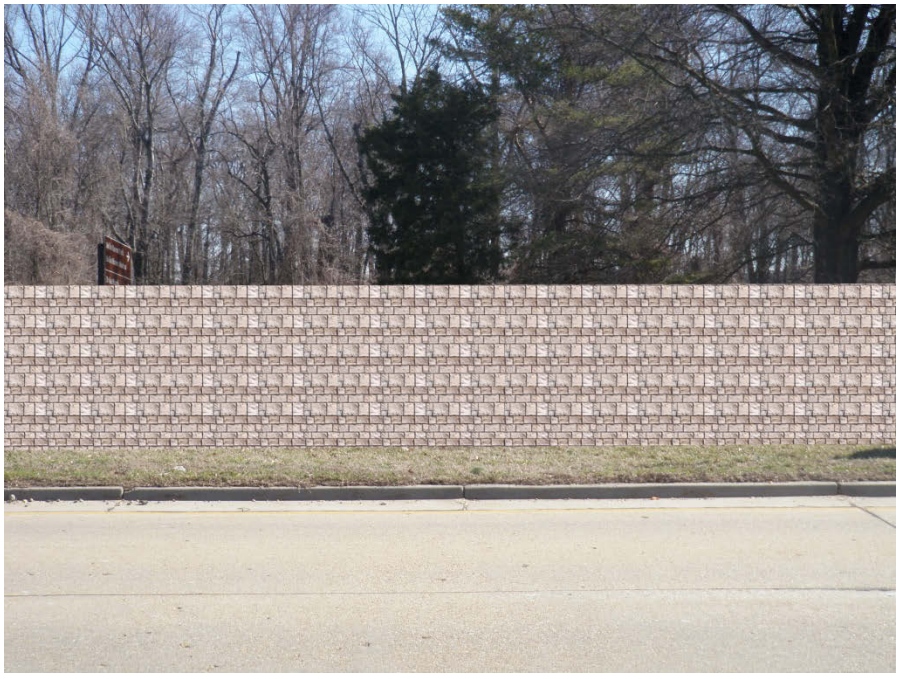
Existing Conditions



Top of floodwall elevation = 14.5 feet (NGVD29)
Adjacent ground elevation = 9.7 feet
Height of wall above adjacent ground = 4.8 feet

Floodwall Graphics for Plan B at Point #6
Looking East along GWMP

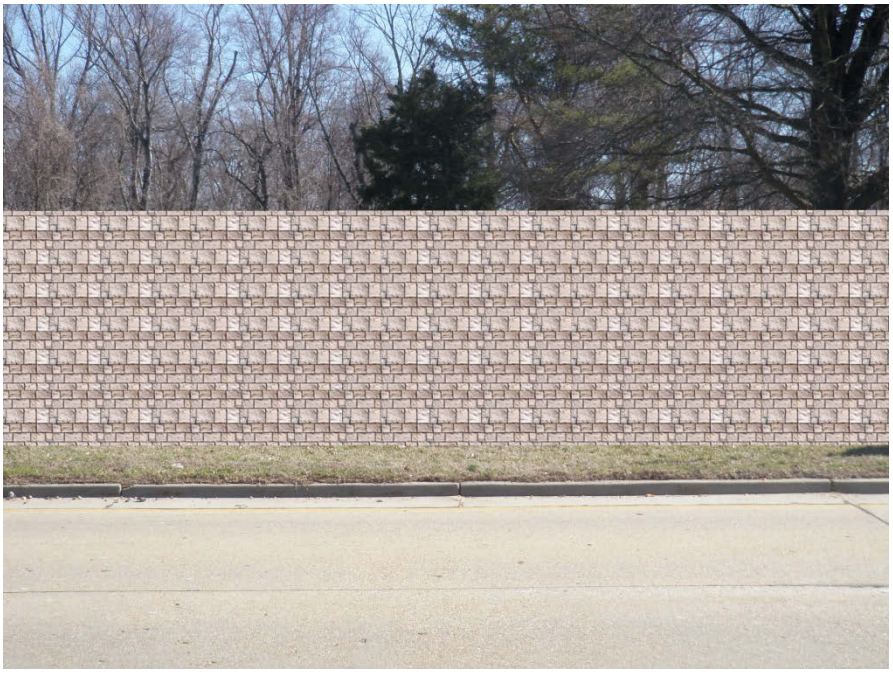
Existing Conditions



Top of floodwall elevation = 12 feet (NGVD29)
Adjacent ground elevation = 6.6 feet
Height of wall above adjacent ground = 5.4 feet

Floodwall Graphics for Plan B at Point #6
Looking East along GWMP

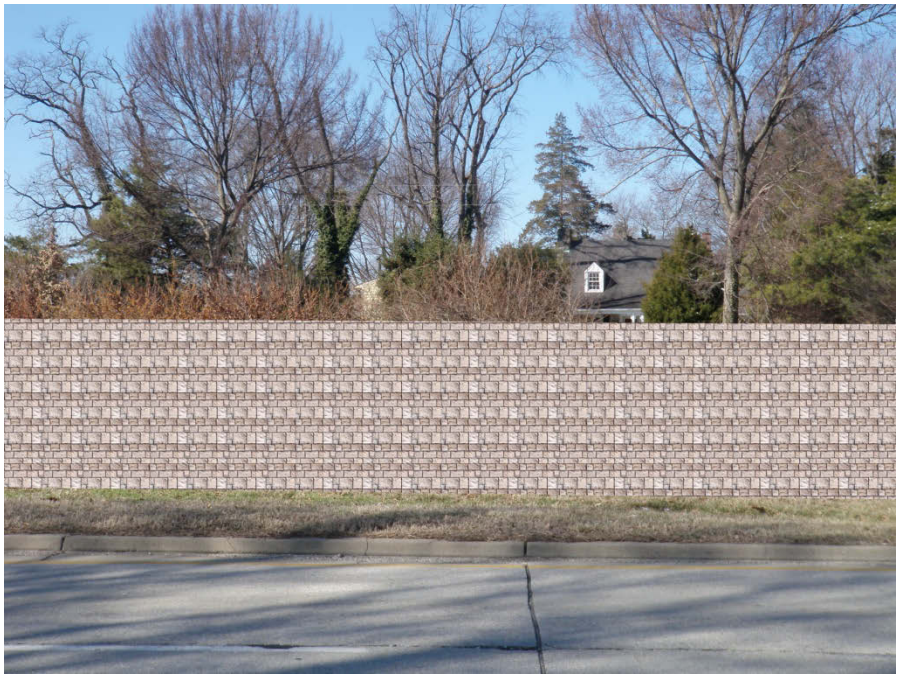
Existing Conditions



Top of floodwall elevation = 14.5 feet (NGVD29)
Adjacent ground elevation = 6.6 feet
Height of wall above adjacent ground = 7.9 feet

Floodwall Graphics for Plan B at Point #6
Looking West along GWMP

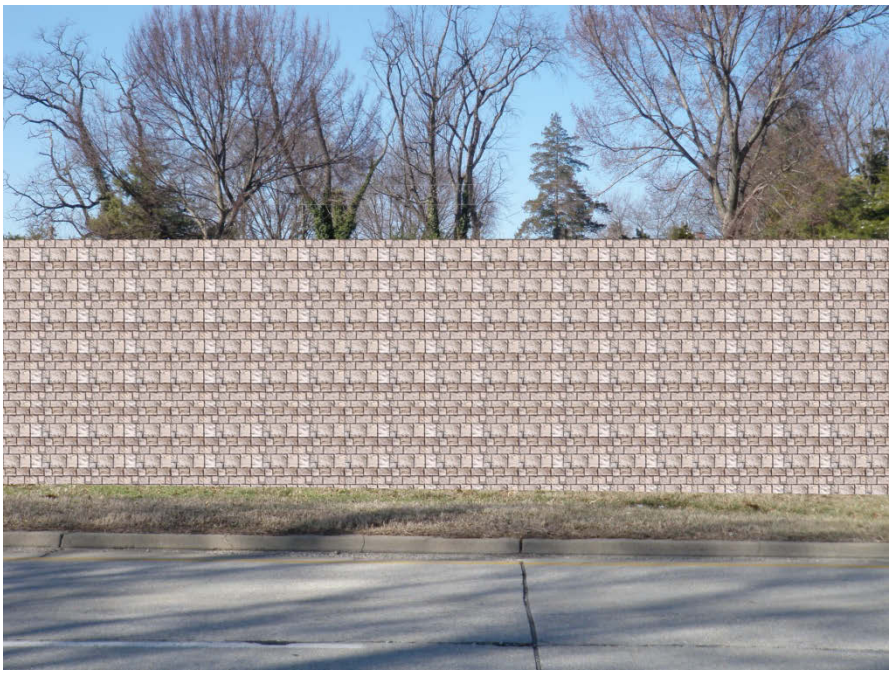
Existing Conditions



Top of floodwall elevation = 12 feet (NGVD29)
Adjacent ground elevation = 6.6 feet
Height of wall above adjacent ground = 5.4 feet

Floodwall Graphics for Plan B at Point #6
Looking West along GWMP

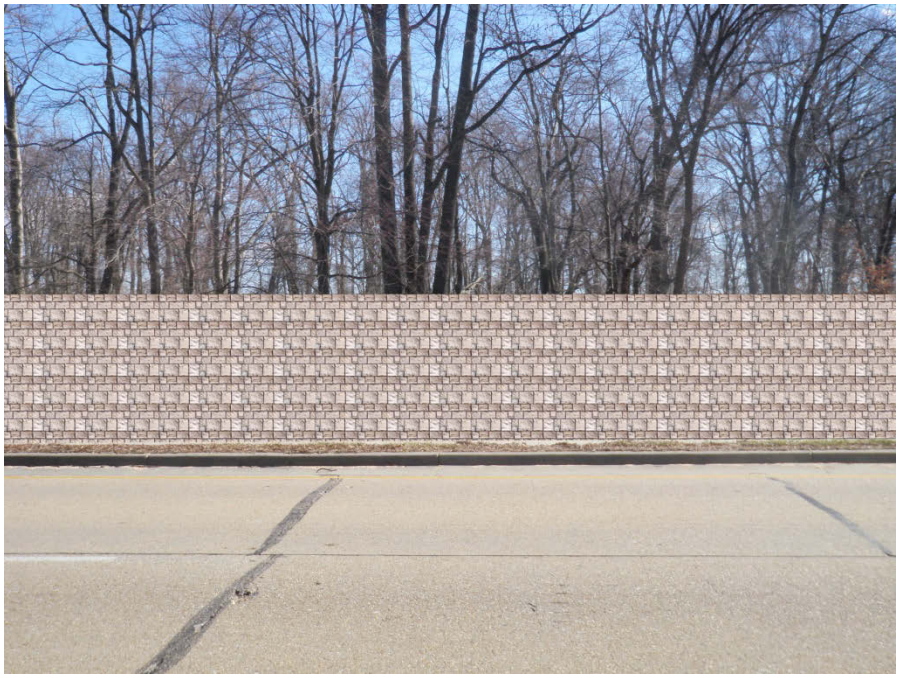
Existing Conditions



Top of floodwall elevation = 14.5 feet (NGVD29)
Adjacent ground elevation = 6.6 feet
Height of wall above adjacent ground = 7.9 feet

Floodwall Graphics for Plan B at Point #9
Looking East along GWMP

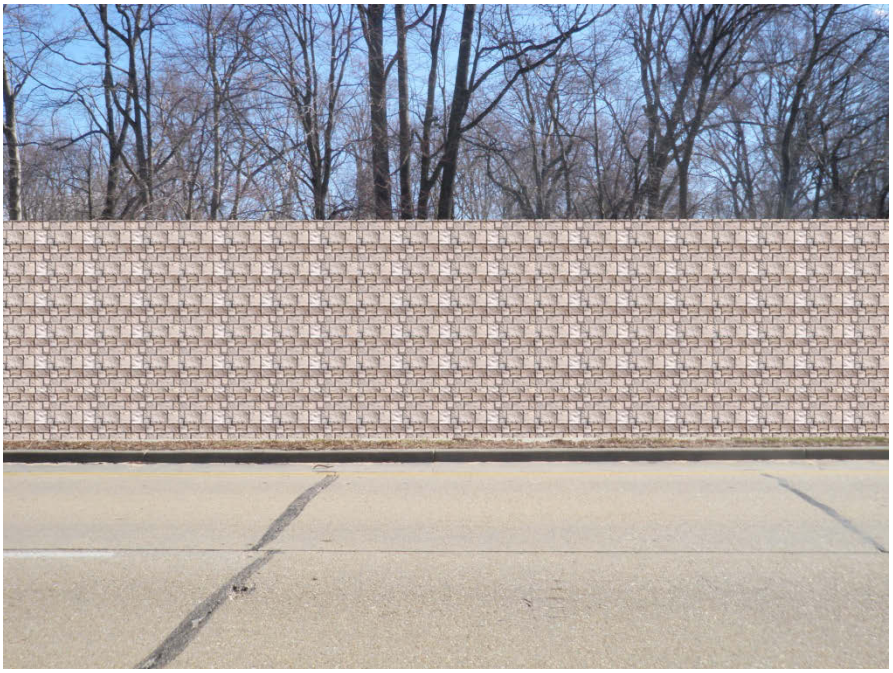
Existing Conditions



Top of floodwall elevation = 12 feet (NGVD29)
Adjacent ground elevation = 7.0 feet
Height of wall above adjacent grade = 5.0 feet

Floodwall Graphics for Plan B at Point #9
Looking East along GWMP

Existing Conditions



Top of floodwall elevation = 14.5 feet (NGVD29)
Adjacent ground elevation = 7.0 feet
Height of wall above adjacent ground = 7.5 feet

Plan C – Floodwall along the Eastern Edge of Boulevard View and Behind Houses on 10th Street (West side of GWMP)

Floodwall Graphics for Plan C at Point #2
Looking West from GWMP

Existing Conditions

Top of floodwall elevation = 12 feet (NGVD29)
Adjacent ground elevation = 9.7 feet
Height of wall above adjacent ground = 2.3 feet

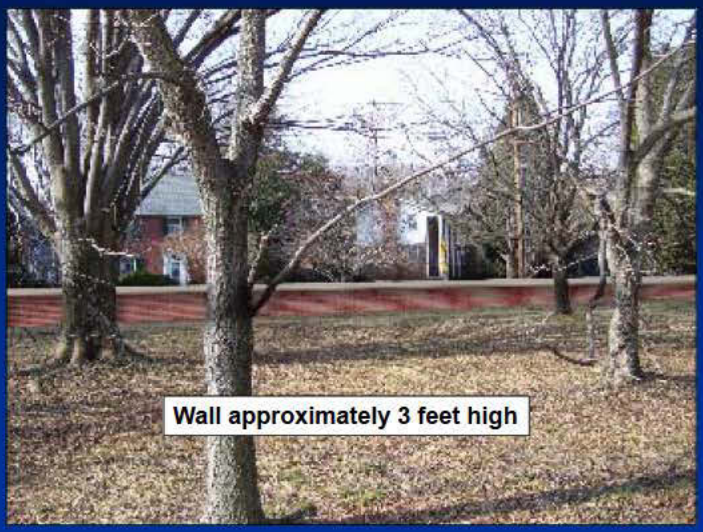
Floodwall Graphics for Plan C at Point #2
Looking West from GWMP

Existing Conditions

Top of floodwall elevation = 14.5 feet (NGVD29)
Adjacent ground elevation = 9.7 feet
Height of wall above adjacent ground = 4.8 feet

Boulevard View Central Looking West

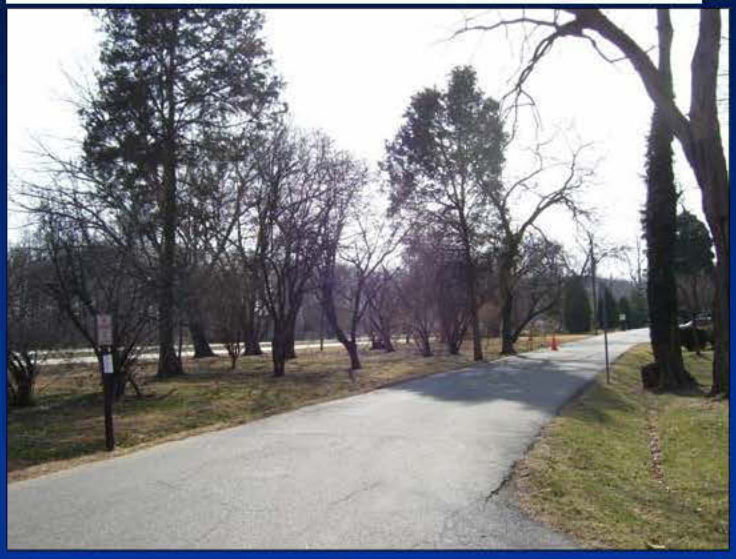
Plan C Looking West
Floodwall Elevation 12 Feet



Boulevard View Central Looking West

Plan C Looking West
Floodwall Elevation 14.5 Feet

Boulevard View Central Looking Southeast Along Road Near H Street



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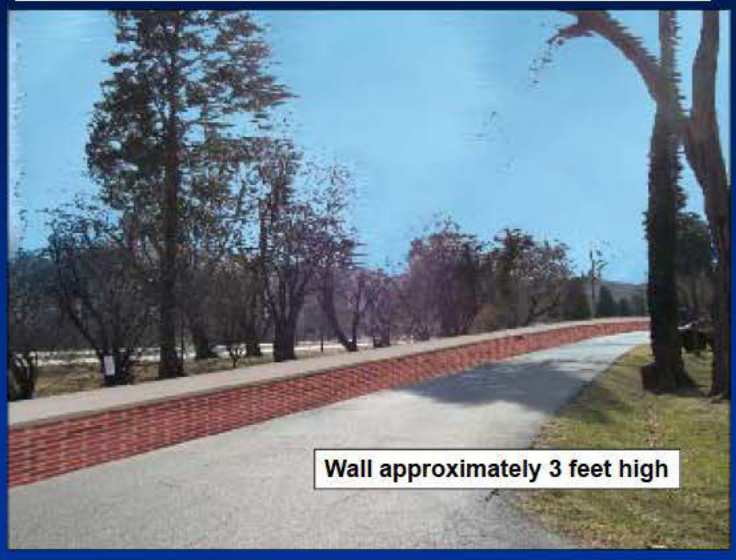
Plan C Looking Southeast Floodwall Elevation 12 Feet



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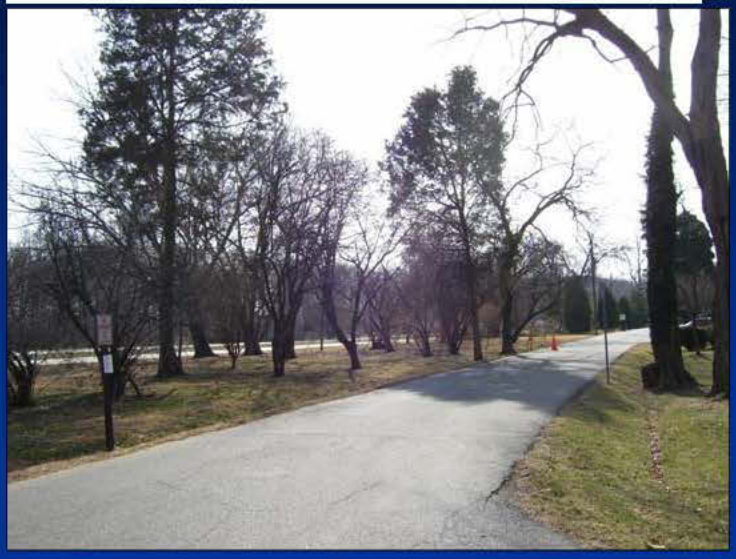
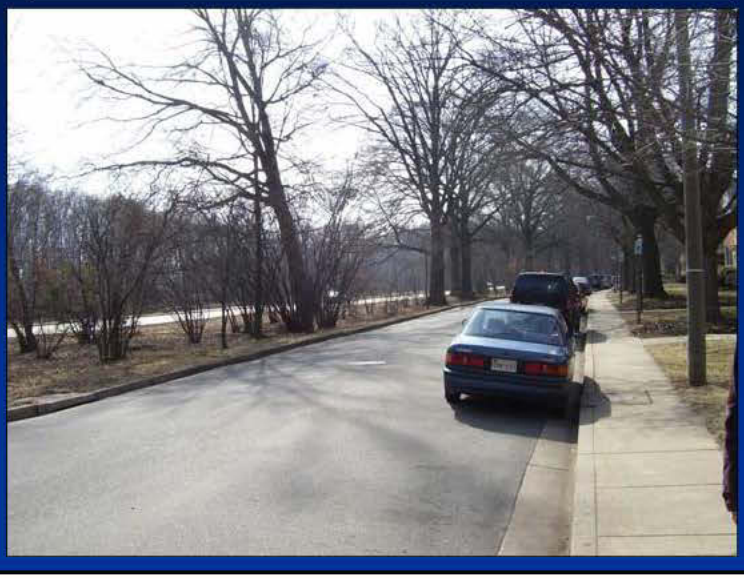
Boulevard View Central Looking Southeast Along Road Near H Street



Plan C Looking East Floodwall Elevation 14.5 Feet

Boulevard View South
Looking South

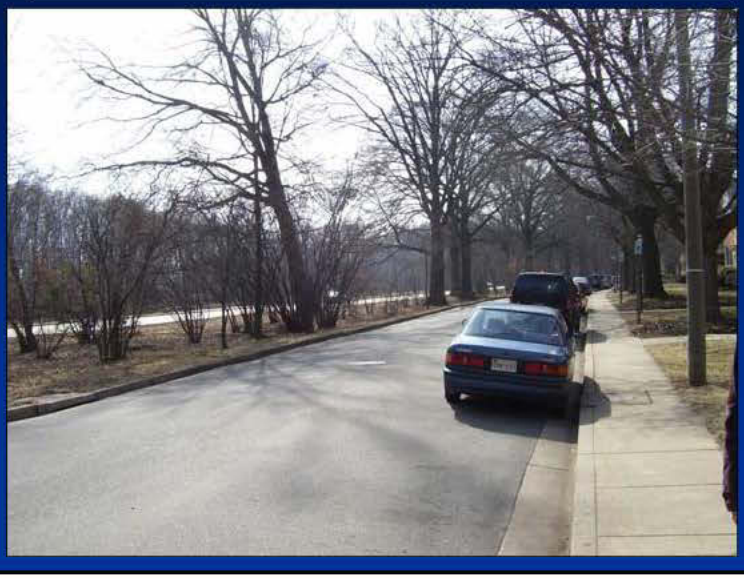


1

Plan C Looking South
Floodwall Elevation 12 Feet

2

Boulevard View South
Looking South



Plan C Looking South
Floodwall Elevation 14.5 Feet

Plan D – Floodwall along the Western Side of Boulevard View

(West side of GWMP)

Floodwall Graphics for Plan D at Point #1
Looking South at house on Old Towne Road

Existing Conditions

Note: Opening in the floodwall is for a closure structure at the walkway

Top of floodwall elevation = 12 feet (NGVD29)
Adjacent ground elevation = 8.6 feet
Height of wall above adjacent ground = 3.4 feet

Floodwall Graphics for Plan D at Point #1
Looking South at house on Old Towne Road

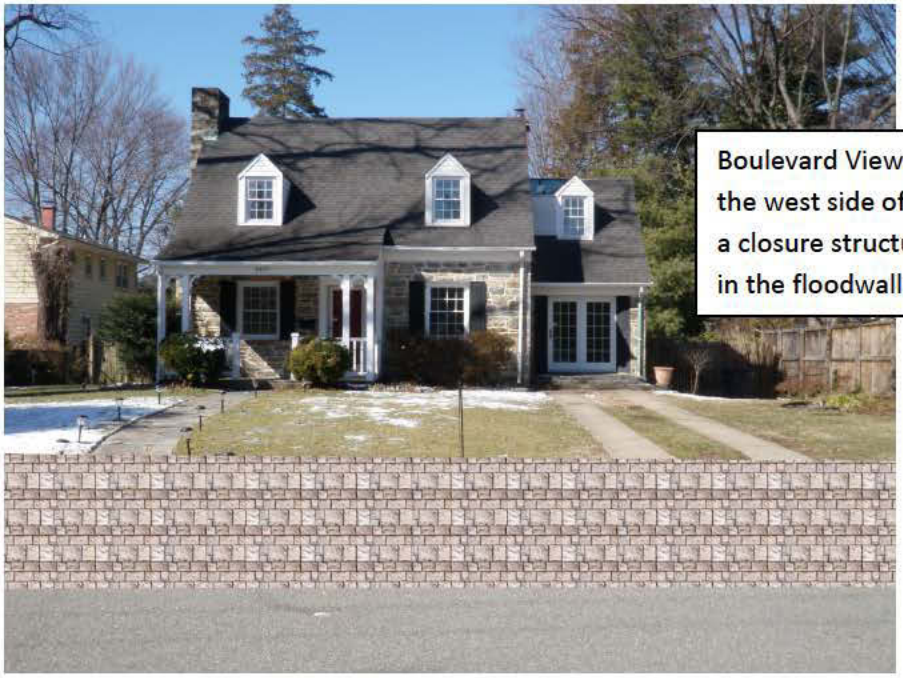
Existing Conditions

Note: Opening in the floodwall is for a closure structure at the walkway

Top of floodwall elevation = 14.5 feet (NGVD29)
Adjacent ground elevation = 8.6 feet
Height of wall above adjacent ground = 5.9 feet

Floodwall Graphics for Plan D at Point #5
Looking West along Boulevard View

Existing Conditions

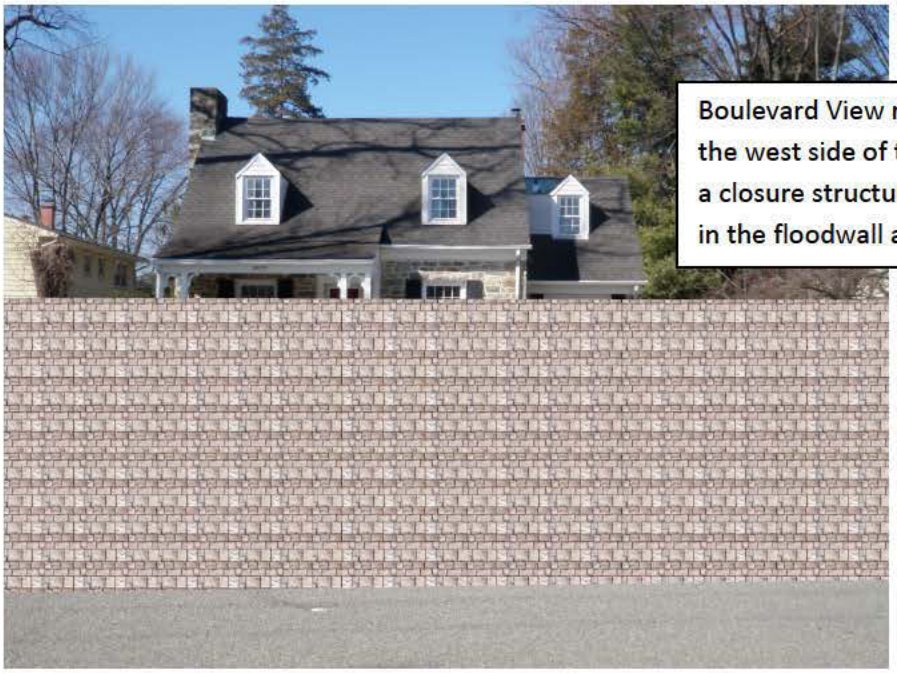


Boulevard View may be relocated to the west side of the floodwall; if not, a closure structure would be needed in the floodwall across the driveway

Top of floodwall elevation = 12 feet (NGVD29)
Adjacent ground elevation = 9.9 feet
Height of wall above adjacent ground = 2.1 feet

Floodwall Graphics for Plan D at Point #5
Looking West along Boulevard View

Existing Conditions



Top of floodwall elevation = 14.5 feet (NGVD29)
Adjacent ground elevation = 9.9 feet
Height of wall above adjacent ground = 4.6 feet

Floodwall Graphics for Plan D at Point #8
Looking West from Boulevard View

Existing Conditions

Note: Opening in the floodwall is for a closure structure at the walkway

Top of floodwall elevation = 12 feet (NGVD29)
Adjacent ground elevation = 8.2 feet
Height of wall above adjacent ground = 3.8 feet

Floodwall Graphics for Plan D at Point #8
Looking West from Boulevard View

Existing Conditions

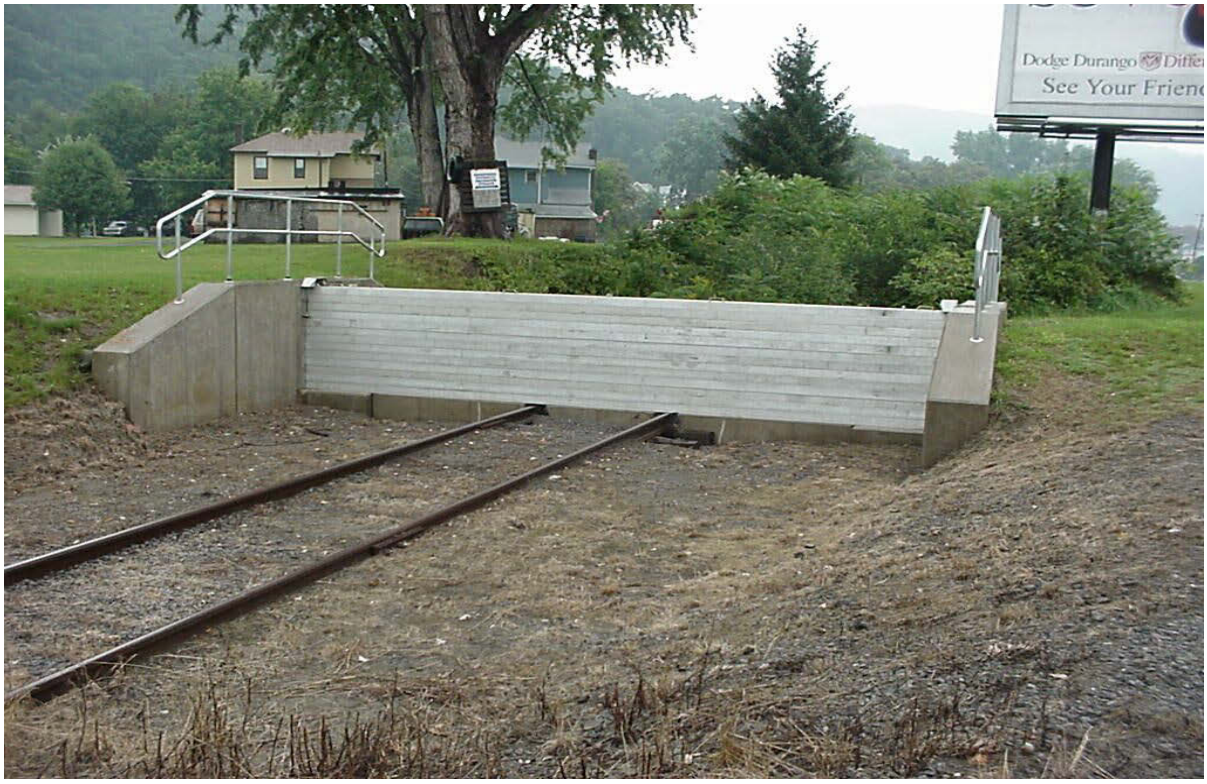
Note: Opening in the floodwall is for a closure structure at the walkway

Top of floodwall elevation = 14.5 feet (NGVD29)
Adjacent ground elevation = 8.2 feet
Height of wall above adjacent ground = 6.3 feet

Examples of Closure Structures

All of the plans will require closure structures. Here are descriptions and photographs/graphics of the various types of structures typically used in flood risk management projects.

Stop Log Closure Structures – Aluminum "logs" are placed individually, stacking on top of each other. When the structure is open, all that is seen are the abutments. This is the most visually appealing closure structure, but takes longer to construct. It also requires that the "logs" be stored nearby and are readily accessible.



The U.S. Army Corps of Engineers' Washington, D.C. and Vicinity Flood Risk Management Project, which is located on National Park Service property, includes a stop log structure that is currently under construction. Below are architectural graphics showing the stop log structure along 17th Street:

Swing/Hinge Closure Structures – For swing/hinge closure structures, large permanent gates are hinged to abutments. Prior to flood event, the gates are swung closed. These structures can be closed fairly quickly, but are less visually appealing than the stop log structure.

Slider Gate Closure Structures – For slider gate closure structures, a large permanent gate is located behind/adjacent to floodwall and "slides" into place to close the opening. These structures can be closed fairly quickly, but are less visually appealing than the stop log structure. This type of structure only works in particular floodwall configurations.