



# ELLICOTT CITY RETAINING WALLS INSPECTION REPORT

## STREAM WALLS

## HISTORIC ELLICOTT CITY, MARYLAND

MAY 2016



**PREPARED BY: KCI TECHNOLOGIES, INC.**  
**PREPARED FOR: HOWARD COUNTY BUREAU OF**  
**ENVIRONMENTAL SERVICES**

HOWARD COUNTY BUREAU OF  
ENVIRONMENTAL SERVICES  
RETAINING WALLS INSPECTION REPORT

STREAM WALLS

HISTORIC ELLICOTT CITY, MARYLAND

*Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland, License No. 32608, Expiration Date: 01-15-2018.*



Robert A. Weaver, P.E.

5-16-2016

Date

This inspection report was prepared under my supervision. The condition data and recommendations contained within this report are based on a visual inspection of accessible portions of the existing structure. No responsibility is accepted for the existence of latent defects, which cannot be detected during visual inspection.



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**HOWARD COUNTY BUREAU OF  
ENVIRONMENTAL SERVICES  
RETAINING WALLS INSPECTION REPORT  
STREAM WALLS**

**HISTORIC ELLICOTT CITY, MARYLAND**

**MAY 2016**

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Appendix A:

Letter of Concern

# Ellicott City Retaining Walls Inspection Report

## *Introduction*

KCI conducted an above-water visual condition inspection of all retaining walls located along Hudson Branch and Tiber Branch in Old Ellicott City, MD. The walls are comprised of a mix of stone masonry, concrete, concrete block, and brick. The walls line either bank of the stream, and in many locations support buildings, decks, pedestrian bridges, and vehicular bridges. The walls run along a few parking lots and under roadways and buildings. Prior to performing field work, KCI identified portions of walls owned by private property owners and informed the County, who provided notification to the respective property owners. Satellite maps from Google Earth and tax maps provided by the County were used to determine property lines.

This report includes documentation of all wall types and locations, along with location maps. Condition notes, photographs, and defect sketches of each wall are included. Recommendations for maintenance, repair, rehabilitation, and/or further monitoring or investigation are provided, along with a cost estimate for each of the recommended actions.

The inspections were performed between October 22, 2015 and November 16, 2015 and between April 28, 2016 to May 03, 2016.

## *Executive Summary*

The condition of individual wall sections ranges from good to poor, however, overall, the stream retaining walls are in poor condition. The stone masonry retaining walls have collapsed into the stream channel in several locations. The mortar is typically missing from the masonry joints, with the worst conditions in the splash zone. There is a large amount of vegetation growth along all walls, including mature trees. In some locations, the root systems are impacting the retaining walls, pushing stones out and causing voids. There are random voids in the stone masonry walls, some of which exhibit loss of fill. The concrete retaining walls are fractured in a few locations.

In a few locations, the retaining wall which supports a building or deck is structurally unstable due to erosion, undermining, missing stones and/or loss of fill. This condition exists at Retaining Walls 9A, 17A, and 17B. These findings were noted in a Critical Findings Memo to Howard County on October 30, 2015. Retaining Wall 17A, behind the properties along Main Street, exhibits voids with exposed fill. The presence of erosion at the back side of the wall could not be confirmed or denied due to lack of access. Erosion should be investigated, as well as the source of active water seepage through the wall. Retaining Wall 17B, adjacent to Parking Lot D, was undermined at the time of inspection, with a large sinkhole present behind the wall. The County has since completed work on the repair of this portion of the wall. Retaining Wall 9A exhibits unstable stone masonry beneath a private deck, which is sagging.

## *Repair Recommendations*

See Page 291 of this report for a breakdown of repair recommendations.

# Ellicott City Retaining Walls Inspection Report

## *Repair Priorities*

### FIRST PRIORITY (Designated as "1")

The first priority repairs include those portions of retaining wall which are failing and pose an immediate safety threat to homeowners and pedestrians. These portions of wall should be repaired immediately. This includes portions of Retaining Walls 9A and 17A (Emergency repairs at Wall 17B have been constructed). These areas were noted in a Critical Findings Memo to Howard County on October 30, 2015. The portions of the buildings above the walls in question should be inspected for structural integrity. This includes, but is not limited to, the properties at 8249, 8247, 8239, 8231, 8227, 8081 Main Street.

### SECOND PRIORITY (Designated as "2")

The second priority items include defects which do not pose an immediate safety concern, but have the potential to advance to a safety threat if left untreated. These defects exist at portions of the retaining wall which support buildings, roadways, parking lots, or pedestrian areas. The repairs should be completed within 3 years.

### THIRD PRIORITY (Designated as "3")

The third priority items include defects which exist at portions of the retaining wall which do not support pedestrian areas (along natural slopes). Failure of the wall in these areas may redirect the stream or cause flooding; however, there is less of an immediate threat to pedestrians if left untreated.

### MAINTENANCE (Designated as "M")

This item includes preventative maintenance. These repairs will increase the life span of the retaining wall and should be completed as funds become available. Maintenance items include clearing vegetation from stone masonry joints and repointing the joints.

### VEGETATION REMOVAL (Designated as "V")

This item includes the removal of vegetation growth, including mature trees, from the vicinity of the retaining walls. These repairs should be completed as funds become available; however, vegetation will continue to impact the retaining walls until removed.

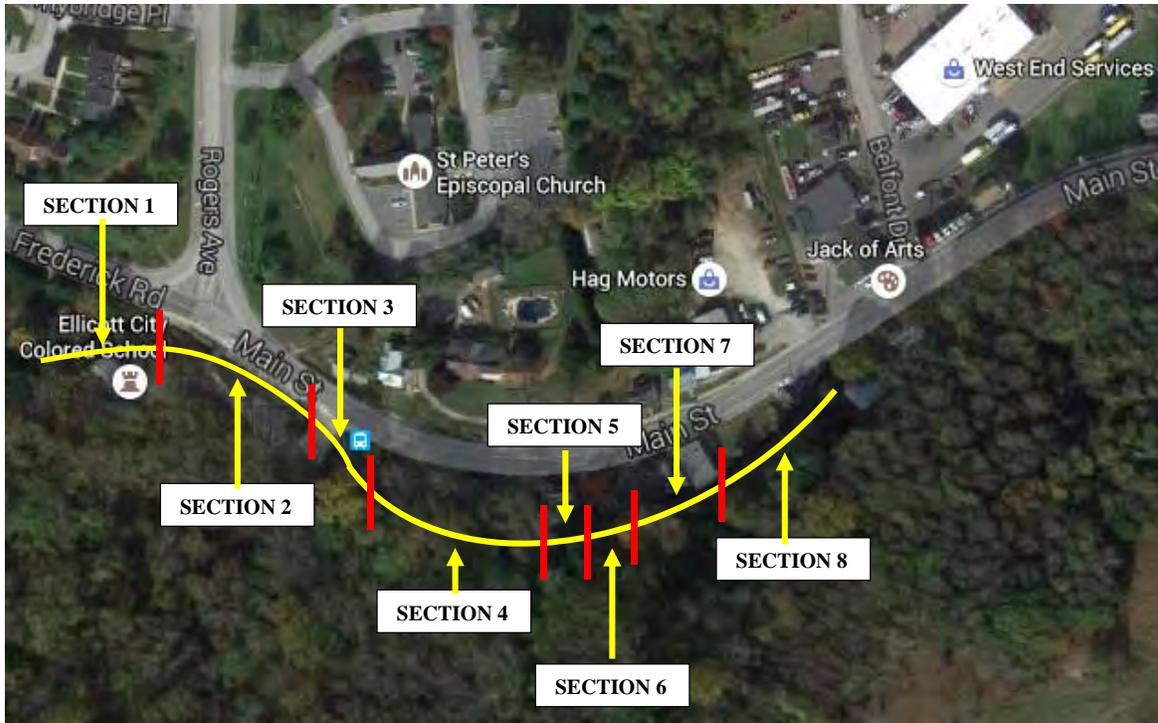
Ellicott City Retaining Walls Inspection Report



LOCATION MAP  
NOT TO SCALE

# Ellicott City Retaining Walls Inspection Report

## Retaining Walls 1A & 1B



**LOCATION MAP  
SOUTH SIDE OF MAIN STREET, NEAR ROGERS AVE.**



**PROPERTY MAP**

- = COUNTY OWNED
- = PRIVATELY OWNED

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 1A

### *Description*

Retaining Wall 1A runs along the north side of Hudson Branch, south of Main Street near Rogers Avenue in Ellicott City, MD. The wall is approximately 1,078'± long and varies between 3'-0"± and 8'-3"± high. The wall is comprised of stone masonry and concrete. The year built is unknown, and no previous inspection reports or plans were available.

The retaining wall inspection was performed on November 13 and 16, 2015 using waders. Access was obtained at the west end of the wall.

### *Inspection Findings*

Overall, the wall is in fair condition. Section 1 (western 200') is comprised of stone masonry and has random missing mortar throughout the joints. The west end of the wall is failing with a 20'-0" long x 2'-0" high area of loose and displaced stones along the base (see Photos 1 and 2). There are full-height fractures through mortar joints at 52', 60', 70', and 85' from the west end of the wall, open up to ¼" wide, with ½" horizontal offset (see Photos 3 and 4). There is a large tree at the top of the wall above one of the fractures (see Photo 4). At 65' from the west end, there is a 5'-0" wide x 2'-0" high area of loose and displaced stones (see Photo 4). Between 145' and 200' from the west end of the wall, the wall has failed and the embankment is eroded (see Photos 5 and 6).

Section 2 extends from 200' to 497' from the west end of the wall. The western 15' of Section 2 is comprised of stone masonry, which is failing at the west end and exhibits missing mortar and small voids up to 2'-0" deep along the bottom 2'-0" height (see Photos 7 and 8). There is an area of missing stones at the base of the wall at 213' from the west end, measuring 2'-6" wide x 1'-6" high. Starting at 215' from the west end, the wall is comprised of concrete. There are full-height x 1/16" wide cracks spaced at approximately 6'-0" throughout the concrete (see Photos 9 and 10). There is a pedestrian bridge over the wall located at 286' from the west end of the wall. At 306' from the west end of the wall, there is a vertical wall joint which is open up to 1" wide with missing joint material (see Photo 11). At the east end of Section 2, there are two pipe culverts through the retaining wall, and a vehicular bridge over the wall (see Photo 12). To the east of the vehicular bridge, there is erosion along the back face of the wall at the east end of Section 2 (see Photo 13).

Section 4 extends from 497' to 675' from the west end of the wall. The western 63' of Section 4 is comprised of natural stone and the foundation of a private property (see Photos 14 and 15). Starting at 560' from the west end, the wall is comprised of stone masonry. The stone masonry exhibits missing mortar throughout the joints, with large trees growing along the top of the wall (see Photos 16 and 17). At 582' from the west end, the wall has failed for a 93' length, with embankment erosion (see Photo 18). Within this area, at the eastern 32' of Section 4, the retaining wall supports a timber deck. The stones in this area are loose and displaced, with voids up to 1'-0" deep (see Photo 19).

Section 5 extends from 675' to 738' from the west end of the wall. The western 21' of Section 5 consists of a house foundation comprised of stone masonry (see Photo 20). The mortar joints are typically in good condition, except at the top east corner, where there is a 3'-6" high x 3'-0" wide area of missing mortar and loose stones above a utility pipe penetration (see Photo 21). Starting

## **Ellicott City Retaining Walls Inspection Report**

### **Retaining Wall 1A**

at 696' from the west end, the retaining wall is comprised of concrete blocks for an 11' length (see Photo 22). The concrete wall exhibits voids and undermining along the base, 5'-0" long x 1'-6" high x 8" deep (see Photo 23). The retaining wall is comprised of stone masonry from 707' to 738' from the west end, which exhibits minor random mortar loss in the joints. There is a concrete cap at the top of the wall within the eastern 12' length of Section 5, which is deteriorated within the lower 6" height (see Photo 24). There is an area of missing stones at the base at the east end of Section 5, measuring 2'-0" long x 1'-0" high x 8" deep.

Section 6 extends from 738' to 843' from the west end of the wall (see Photo 25). The stone masonry retaining wall has missing mortar, vegetation growth, and water leakage through the joints (see Photo 26). At 789' from the west end of the wall, there is a pedestrian bridge which spans the retaining wall. At 803' from the west end, there is a 4'-0" wide x 2'-0" high area of loose and displaced stones at the base of the wall, and the wall is undermined 10'-0" long x 7" high x 1'-0" deep (see Photos 27 and 28).

Section 7 extends from 843' to 956' from the west end of the wall (see Photo 29). The stone masonry retaining wall has random missing mortar and small voids, typically worst within the lower 1'-6" height of the wall. At 850' from the west end, the wall is undermined 10'-0" long x 1'-0" high x 9" deep (see Photo 29). At 869' from the west end, beneath a house, the wall is undermined 15'-0" long x 1'-6" high x 1'-6" deep (see Photos 30 and 31). Above the undermined area, the stones appear to be bulging, specifically at mid-height, up to 6" (see Photo 32). Starting at 908' from the west end, the wall is comprised of concrete. At the interface with this concrete portion, the stone masonry portion is offset horizontally to the south up to 3½" at the lower 5'-0" of the wall (see Photo 33). The concrete portion of the wall has minor scaling on the lower 1'-0".

Section 8 extends from 956' to 1,078' from the west end of the wall (see Photos 34-37). The stone masonry retaining wall typically has random areas of missing mortar and small voids, random areas of pneumatically applied mortar (PAM), and joints that can be probed to 8" deep (see Photo 38). Starting 1,032' from the west end, at the location of a pedestrian bridge, the wall is undermined for a 30'-0" length x 1'-0" high x 1'-0" deep (see Photo 39). Between 1,054' and 1,134' from the west end of the wall, the stone masonry joints exhibit missing mortar, exposed fill and vegetation growth, and can be probed to 1'-0" deep (see Photo 40). Between 1,079' and 1,099' from the west end, the wall is leaning toward the stream channel up to 9" (see Photo 41). At 1,110' from the west end, there is a 3'-0" long x 8" wide vertical fracture with active water leakage near the base of the wall (see Photo 42). At the east end of Section 8, there is a missing stone at the base, 1'-6" high x 3'-0" wide x 2'-0" deep (see Photo 43).

At the east end of Retaining Wall 1A, there is a private driveway behind the wall. The asphalt pavement exhibits cracking and settlement in a 33'-0" long x 13'-0" wide area (see Photos 44 and 45). At 1,090' from the west end, there is a sinkhole behind the wall, measuring 3'-2" long x 3'-2" wide x 9" deep (see Photo 46). Between 1,079' and 1,099' from the west end of the wall (bulging portion), there is a gap between the pavement and the wall, between 5" and 9" wide, which can be probed to 1'-8" deep (see Photo 47). There are also several 1'-0" diameter x up to 2'-0" deep sinkholes along the backside of the wall (see Photo 48).

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 1A

### *Recommendations*

The vegetation growth including mature trees within the vicinity of the wall should be removed immediately. The collapsed portions of the wall should be rebuilt. The bulging areas of the wall should be repaired. The undermined areas of the wall should be underpinned. The random voids throughout the wall and along the base of the wall should be filled with stone. The masonry joints should be re-pointed with mortar throughout the wall. At the east end of the wall, the sinkholes behind the wall should be filled.

Retaining Wall	Repair Recommendation	Priority	Wall Section	Station	Photos	Unit	Qty.	Unit Cost	Total Est. Cost
1A	Replace missing stones.	2	1	0'	1, 2	CY	1	\$1,000	\$1,000
			1	65'	4	CY	0.5	\$1,000	\$500
			2	213'	8	CY	0.5	\$1,000	\$500
			5	696'	23	CY	0.5	\$1,000	\$500
			5	736'	-	CY	0.5	\$1,000	\$500
			6	803'	27, 28	CY	0.5	\$1,000	\$500
			8	1,131'	43	CY	0.5	\$1,000	\$500
1A	Underpin undermined portions of wall.	2	6	803'	27, 28	CY	0.5	\$1,000	\$500
			7	850'	29	CY	0.5	\$1,000	\$500
			7	869'	30, 31	CY	1	\$1,000	\$1,000
			8	1,032'	39	CY	1	\$1,000	\$1,000
1A	Repoint the masonry joints.	2	1	0'	3, 4	SF	90	\$35	\$3,150
			2	200'	7, 8	SF	30	\$35	\$1,050
			4	560'	16, 17	SF	75	\$35	\$2,625
			5	693'	21	SF	10	\$35	\$350
			6	742'	26	SF	300	\$35	\$10,500
			7	843'	31	SF	50	\$35	\$1,750
			8	956'	40	SF	700	\$35	\$24,500
			1A	Fill sinkholes behind east end of wall.	2	8	1,090'	46-48	CY
1A	Tie-back leaning/bulging portions of wall.	2	7	869'	32	LS	-	\$500	\$500
			7	908'	33	LS	-	\$500	\$500
			8	1,079'	41	LS	-	\$500	\$500
1A	Replace vertical joint seal in concrete wall.	2	2	306'	11	LF	8	\$100	\$800
1A	Seal vertical cracks in concrete wall.	2	2	215'	9, 10	LF	100	\$35	\$3,500
1A	Rebuild collapsed portions of stone masonry wall.	3	1	145'	5, 6	CY	45	\$1,000	\$45,000
			4	582'	18, 19	CY	10	\$1,000	\$10,000
1A	Remove trees / vegetation growth in the vicinity of the wall.	V	-	-	-	LS	1	\$20,000	\$20,000
<b>Total Repair Costs</b>									<b>\$134,725</b>

Note: These estimated costs are approximate and should only be used as a reference and for project planning purposes. Although they represent the costs for individual repair activities, they may not represent the total cost of a complete repair/rehabilitation project. Costs for items such as Design, Permitting, Mobilization/Demobilization, Maintenance of Traffic, Stream Diversion, Submittal Reviews, etc. would have to be added to the costs provided to develop a comprehensive project cost.

**SECOND PRIORITY (Designated as "2")** - The second priority items include defects which do not pose an immediate safety concern, but have the potential to advance to a safety threat if left untreated. These defects exist at portions of the retaining wall which support buildings, roadways, parking lots, or pedestrian areas. The repairs should be completed within 3 years.

**THIRD PRIORITY (Designated as "3")** - The third priority items include defects which exist at portions of the retaining wall which do not support pedestrian areas (along natural slopes). Failure of the wall in these areas may redirect the stream or cause flooding; however, there is less of an immediate threat to pedestrians if left untreated.

**VEGETATION REMOVAL (Designated as "V")**

This item includes the removal of vegetation growth, including mature trees, from the vicinity of the retaining walls. These repairs should be completed as funds become available; however, vegetation will continue to impact the retaining walls until removed.

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 1A



*Photo 1 – Section 1, West End, Looking Northeast.  
Note Failing Wall at West End.*



*Photo 2 – Loose and Displaced Stones along Base near West End of Section 1.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1A



*Photo 3 – Typical Full-Height Fracture at Masonry Joint in Section 1.*



*Photo 4 – Full-Height Fracture with Tree at Top of Wall, and Loose Stones at Base in Section 1, Looking Northeast.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1A



*Photo 5 – Failed Portion of Wall at East End of Section 1.*



*Photo 6 – Failed Portion of Wall at East End of Section 1, Looking Northeast.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1A



*Photo 7 – Section 2, Looking Northeast.  
Note Failing Stone Masonry at West End.*

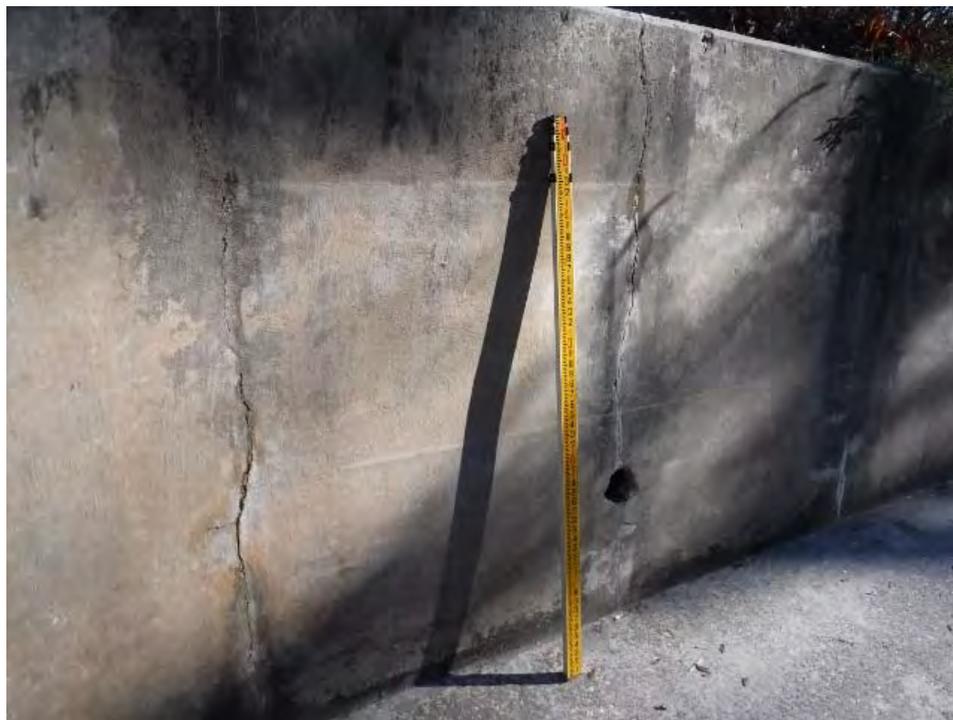


*Photo 8 – Voids along Base of Section 2 Stone Masonry, Looking West.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1A



*Photo 9 – Section 2, Looking Northeast.*



*Photo 10 – Typical Full-Height Cracks in Section 2 Concrete.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1A

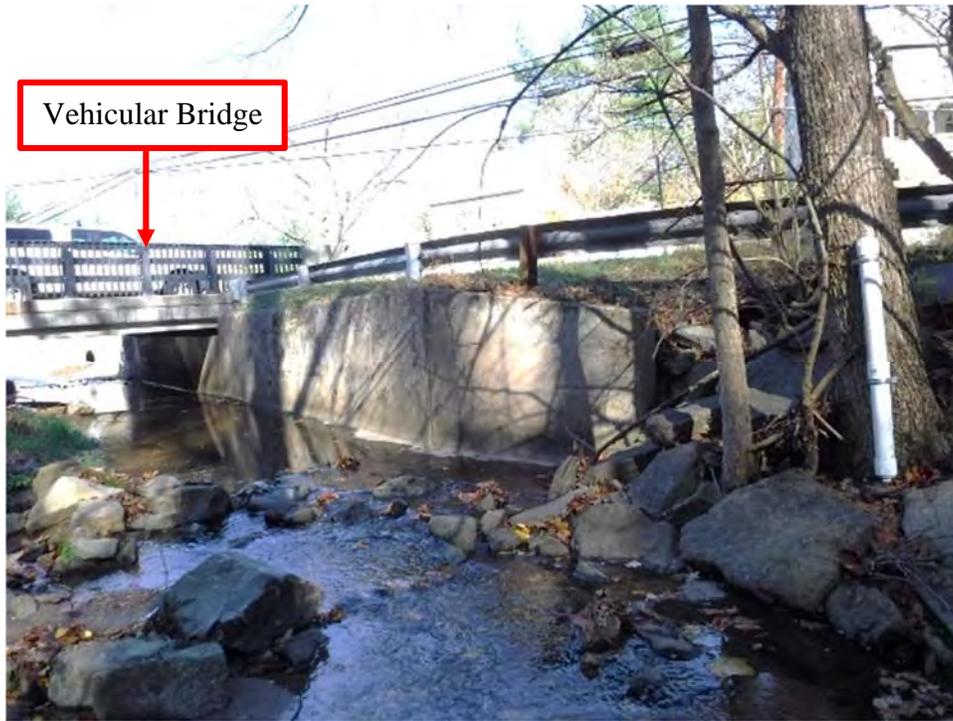


*Photo 11 – Section 2, Looking Northeast.  
Note Wall Joint with Missing Material.*



*Photo 12 – Culverts and Vehicular Bridge at East End of Section 2,  
Looking Northeast.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1A



*Photo 13 – East End of Section 2, Looking Northwest.  
Note Erosion Behind East End of Wall.*

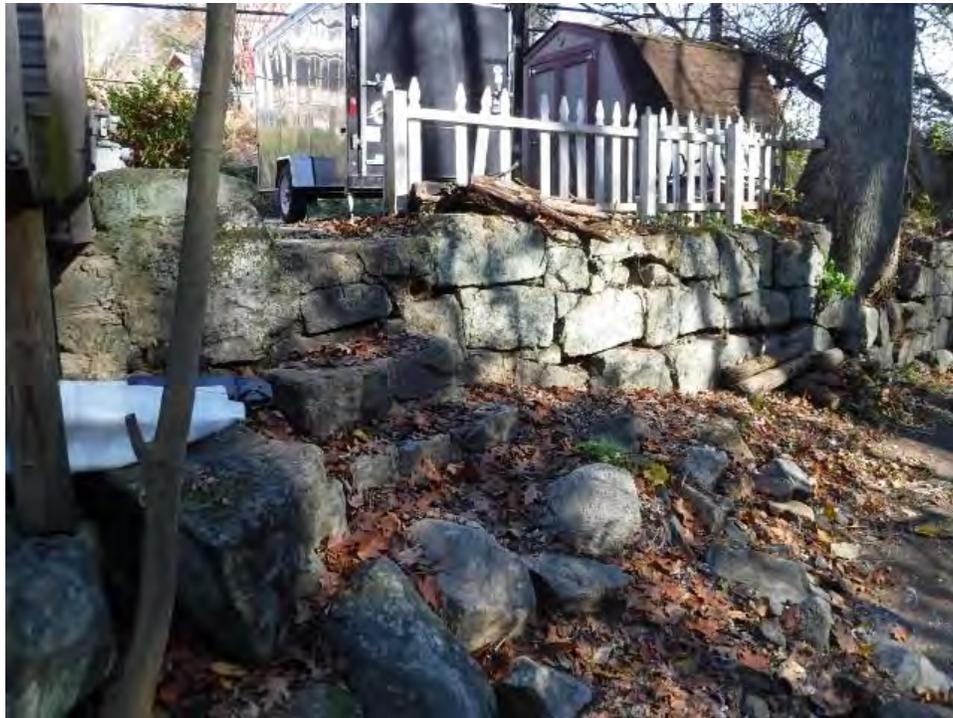


*Photo 14 – Start of Section 4 (Natural Stone), Looking East.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1A



*Photo 15 – Section 4, Looking East.  
Note Start of Stone Masonry Wall, East of House.*

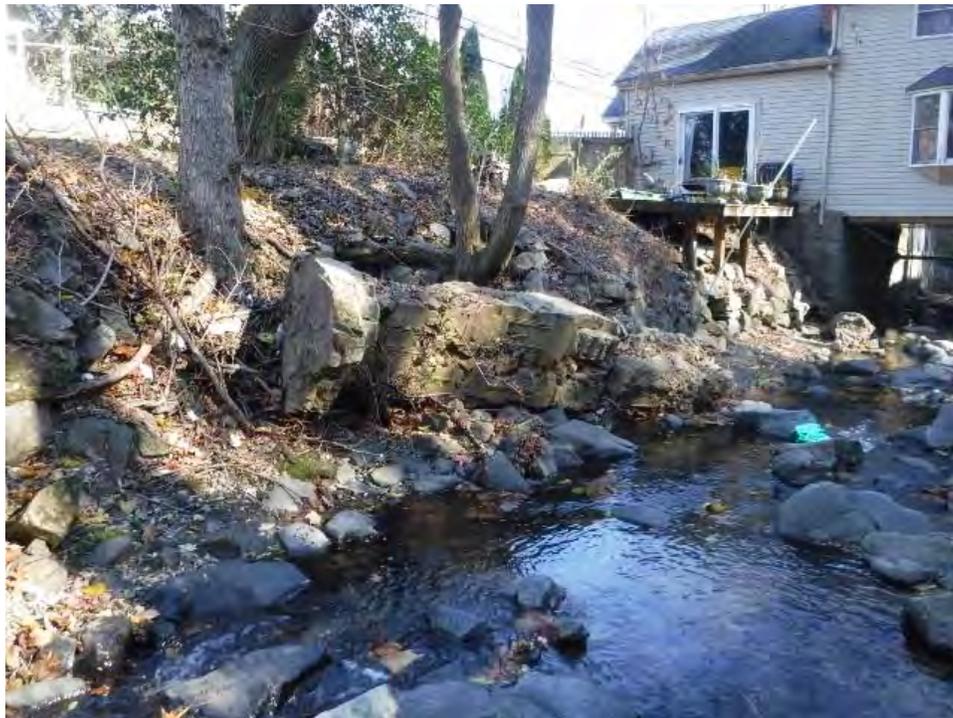


*Photo 16 – Section 4 with Missing Mortar, Looking Northeast.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1A



*Photo 17 – Section 4 with Mature Tree Growth, Looking Northeast.*



*Photo 18 – Failed Portion at East End of Section 4, Looking Northeast.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1A



*Photo 19 – Displaced Stones and Voids beneath Timber Deck at East End of Section 4, Looking East.*



*Photo 20 – Section 5 House Foundation, Looking North.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1A



*Photo 21 – Section 5 with Missing Mortar and Loose Stones at Top East Corner of Wall beneath House.*



*Photo 22 – Section 5, Looking Northeast.  
Note Concrete Block Portion.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1A



*Photo 23 – Undermining along Concrete Block Portion of Section 5.*



*Photo 24 – Stone Masonry Portion of Section 5 with Missing Mortar and Deteriorated Concrete Cap, Looking Northeast.*

**Ellicott City Retaining Walls Inspection Report**  
**Retaining Wall 1A**



*Photo 25 – Section 6, Looking Northeast.*

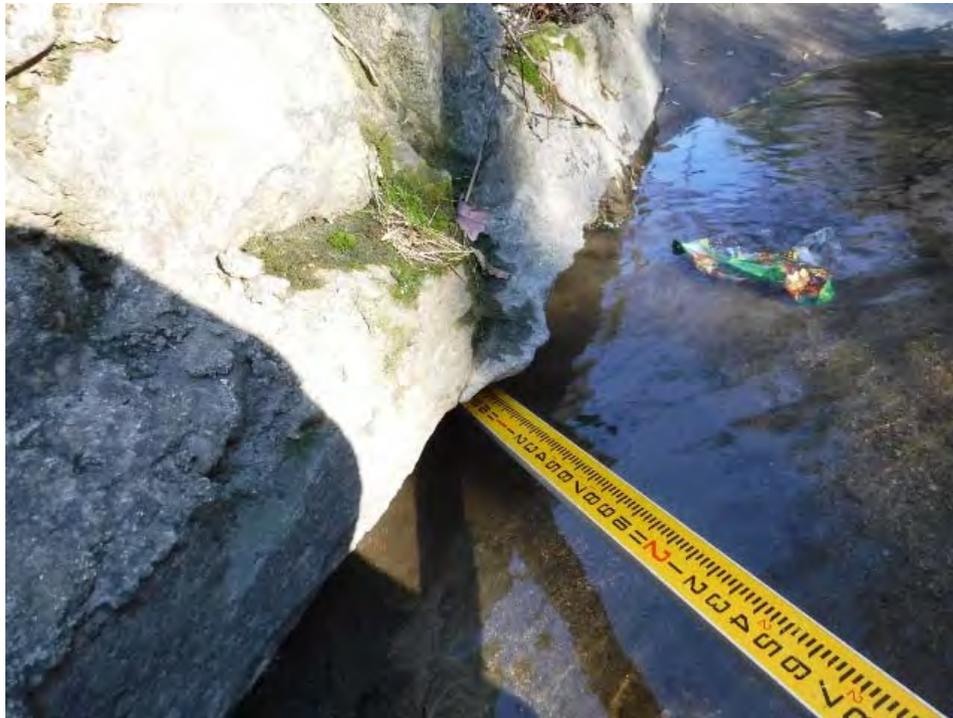


*Photo 26 – Section 6, Looking Northeast.*  
*Note Vegetation Growth.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1A



*Photo 27 – Section 6, East of Pedestrian Bridge, Looking Northeast.  
Note Area of Undermining.*



*Photo 28 – Undermined Area in Section 6, 14' East of Pedestrian Bridge.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1A



*Photo 29 – Section 7, Looking North.  
Note Undermining.*



*Photo 30 – Section 7, Looking Northeast.  
Note Undermining.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1A



*Photo 31 – Undermining Beneath House in Section 7, Looking Northeast.  
Note Missing Mortar.*



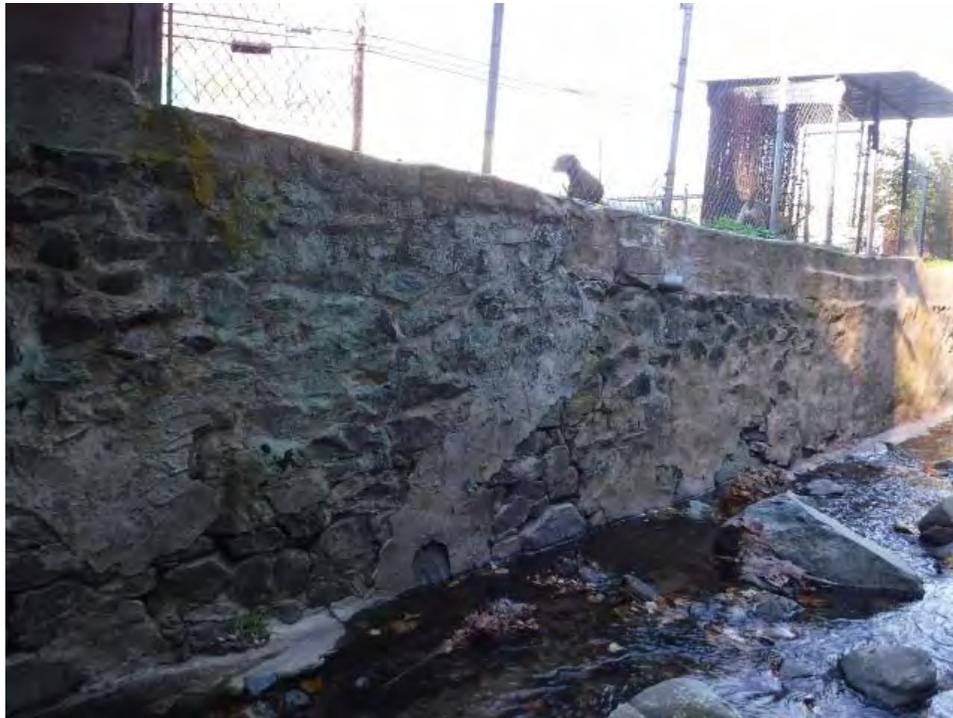
*Photo 32 – Bulging Beneath House in Section 7, Looking Northeast.*

## Ellicott City Retaining Walls Inspection Report

### Retaining Wall 1A



*Photo 33 – Horizontal Offset Between Stone Masonry and Concrete Portions, at East End of Section 7, Looking Northwest.*



*Photo 34 – Section 8, Looking Northeast.*

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 1A



*Photo 35 – Section 8, Looking Northeast.*



*Photo 36 – Section 8, Looking Northeast.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1A



*Photo 37 – East End of Section 8, Looking Northeast.*

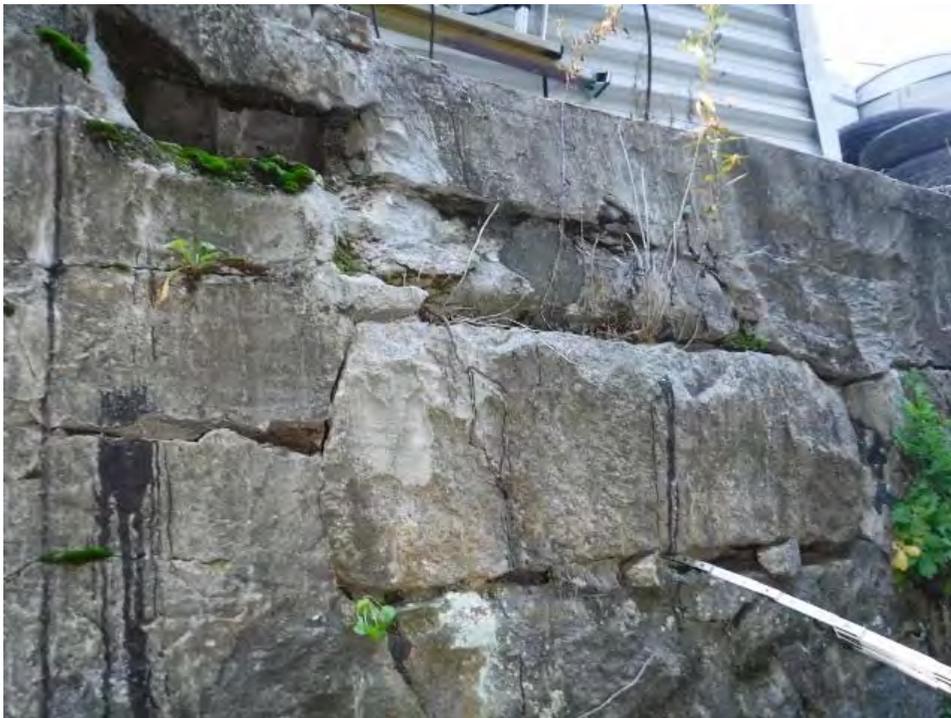


*Photo 38 – Typical Missing Mortar and Voids in Section 8, Looking Northeast.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1A



*Photo 39 – Undermining Beneath Pedestrian Bridge in Section 8.*



*Photo 40 – Typical Missing Mortar and Voids in Eastern 80' of Section 8.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1A

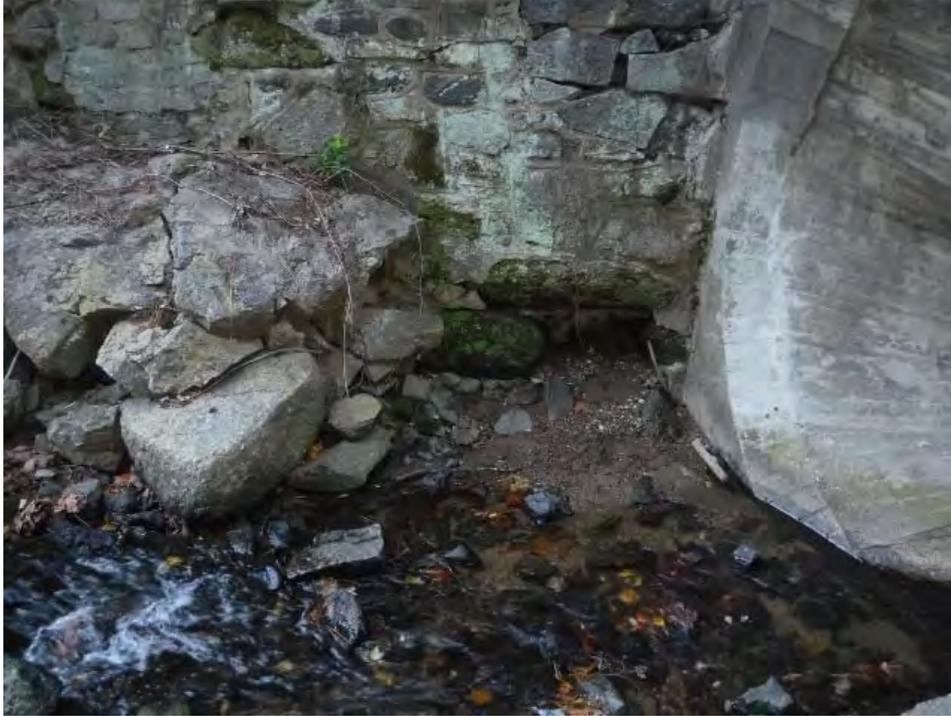


*Photo 41 – Leaning Portion of Section 8, Looking West.*

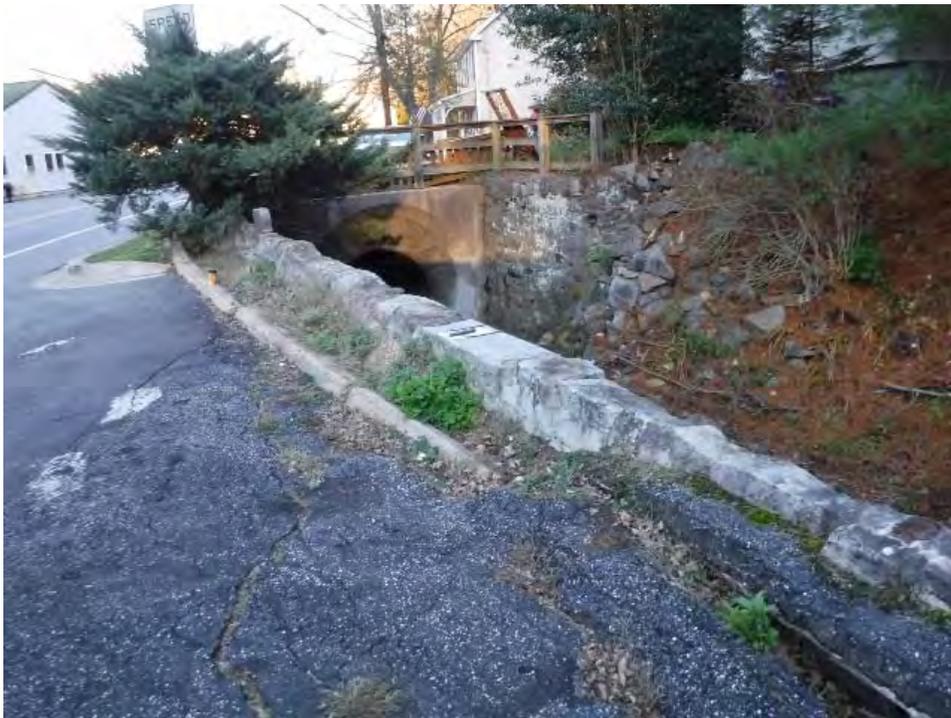


*Photo 42 – Fracture at 24' from East End of Section 8, Above Area of Water Leakage.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1A



*Photo 43 – Missing Stone at East End of Section 8, Looking North.*



*Photo 44 – Private Driveway above East End of Section 8, Looking East.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1A



*Photo 45 – Settlement in Pavement above East End of Section 8, Looking West.*



*Photo 46 – Sinkhole at 44' from the East End of Section 8, Looking South.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1A



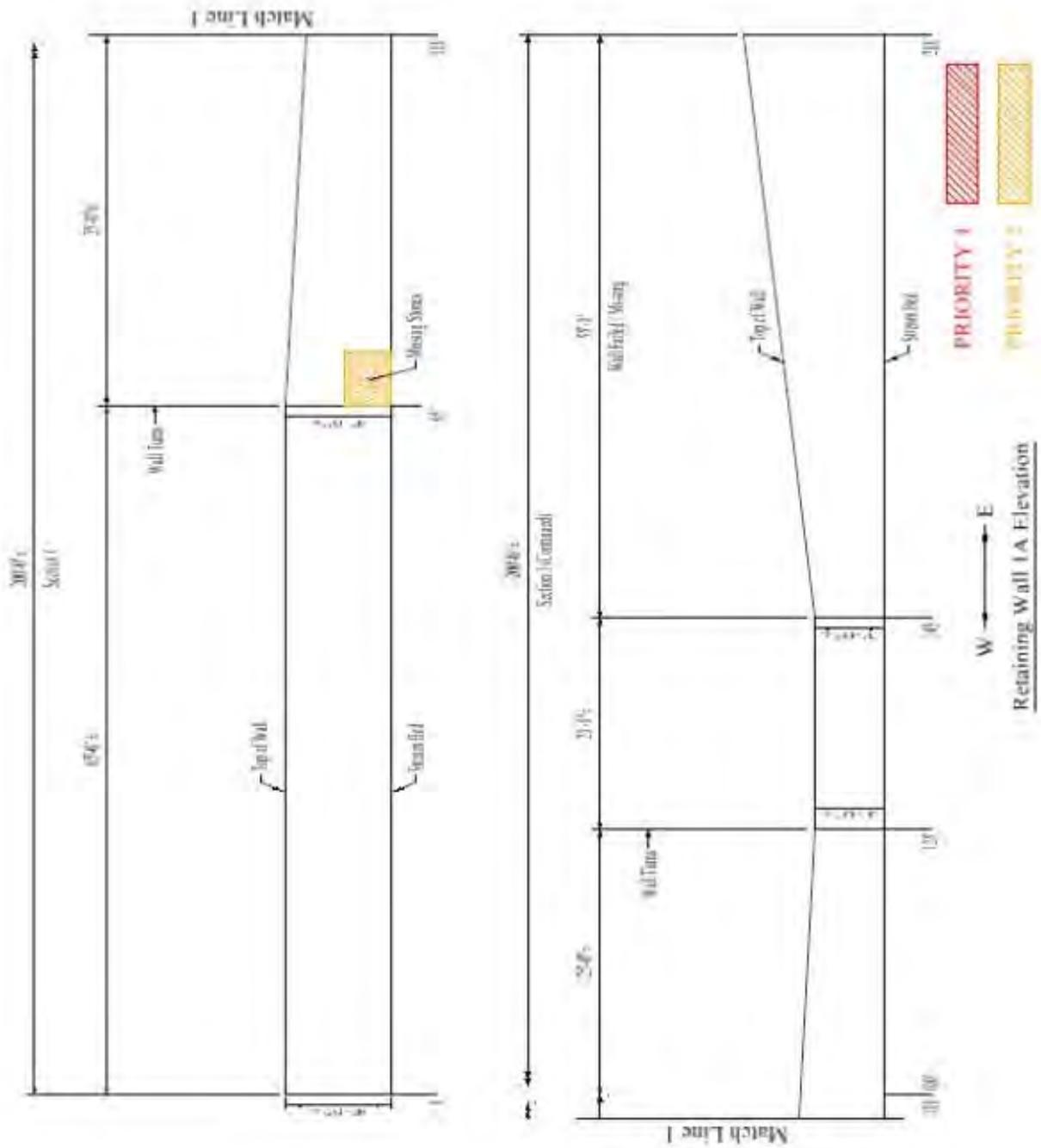
*Photo 47 – Gap between Pavement and Section 8, Looking West.*



*Photo 48 – Sinkholes along Backside of Section 8, Looking West.*

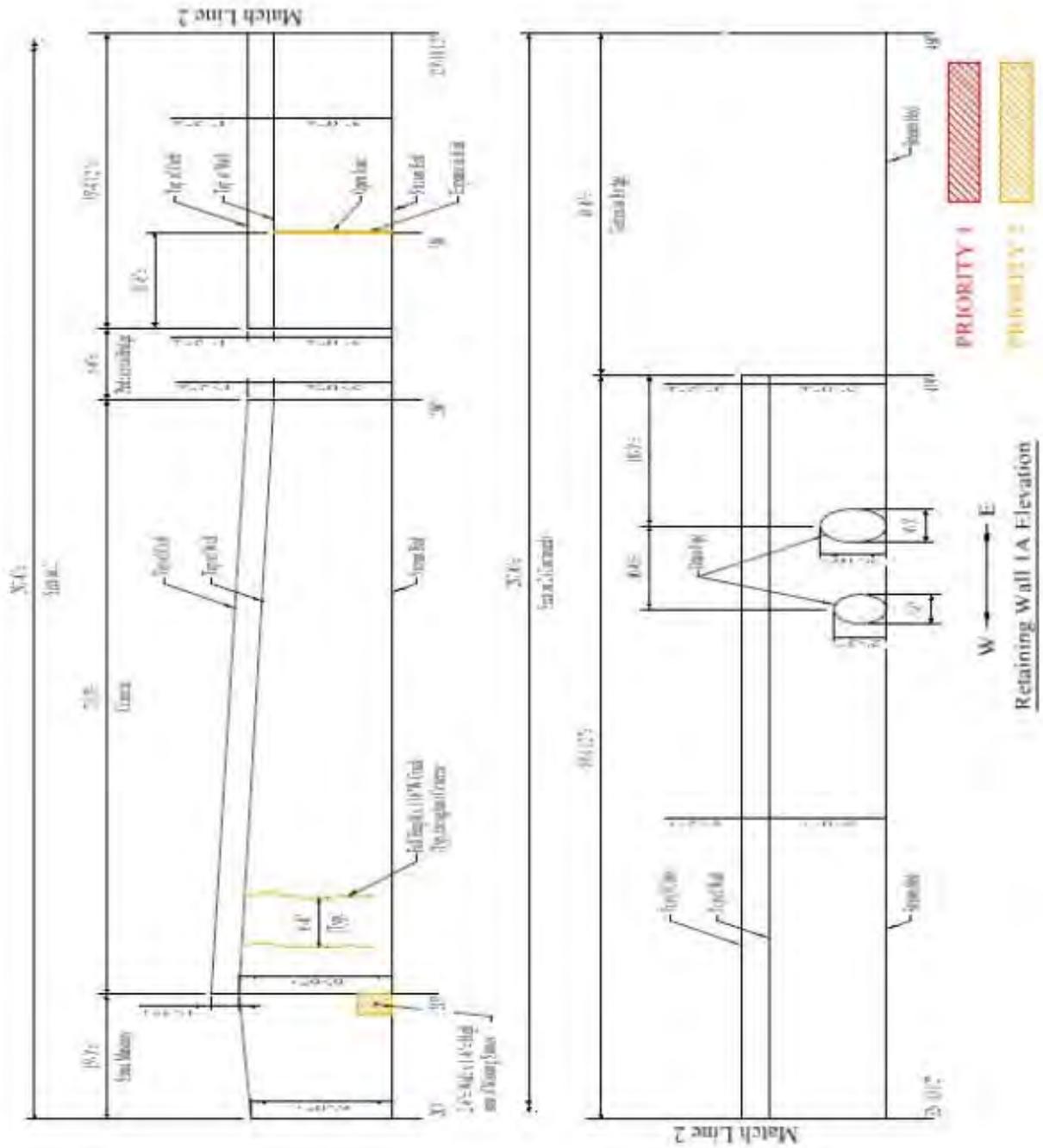
# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 1A



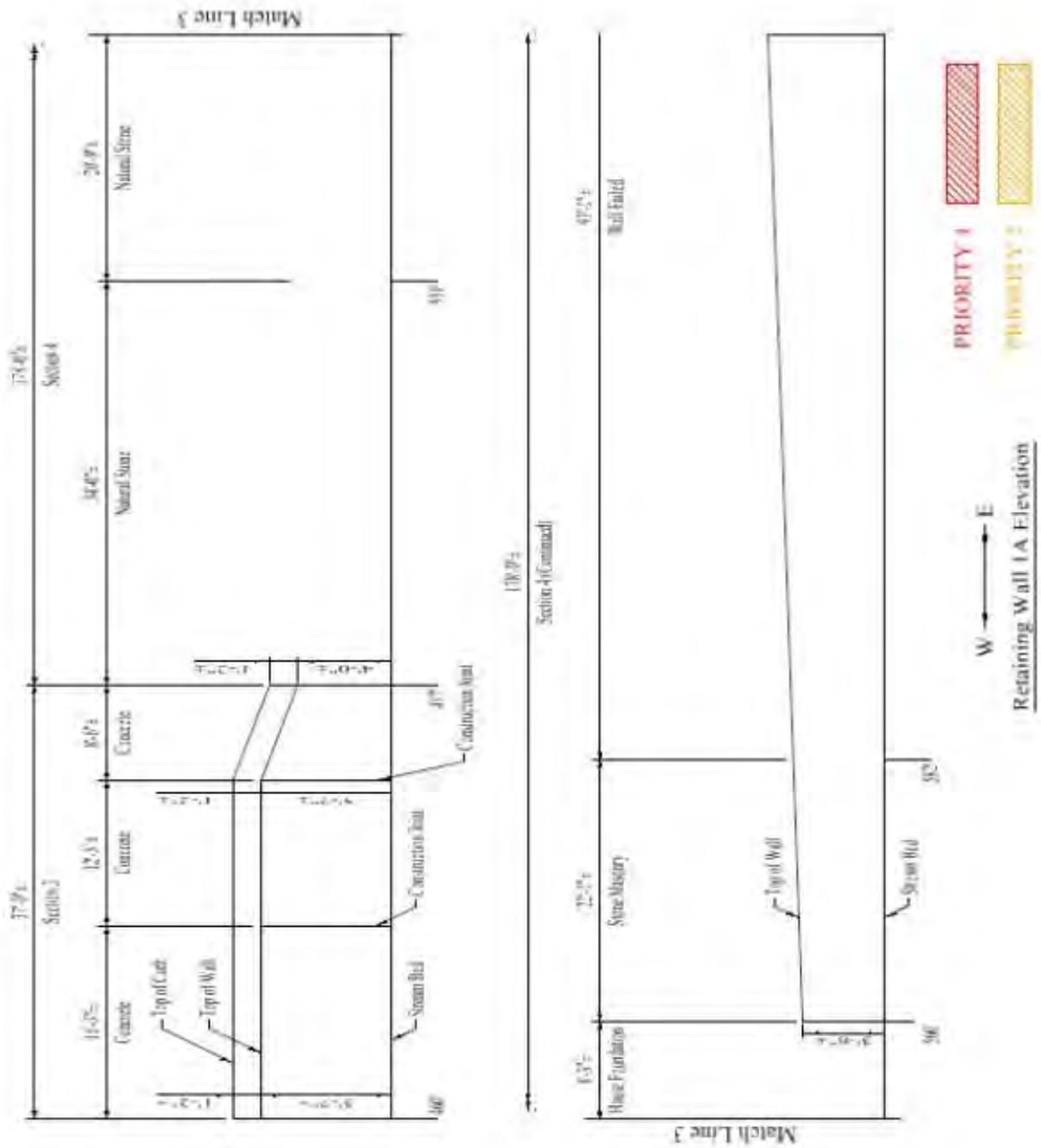
# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 1A



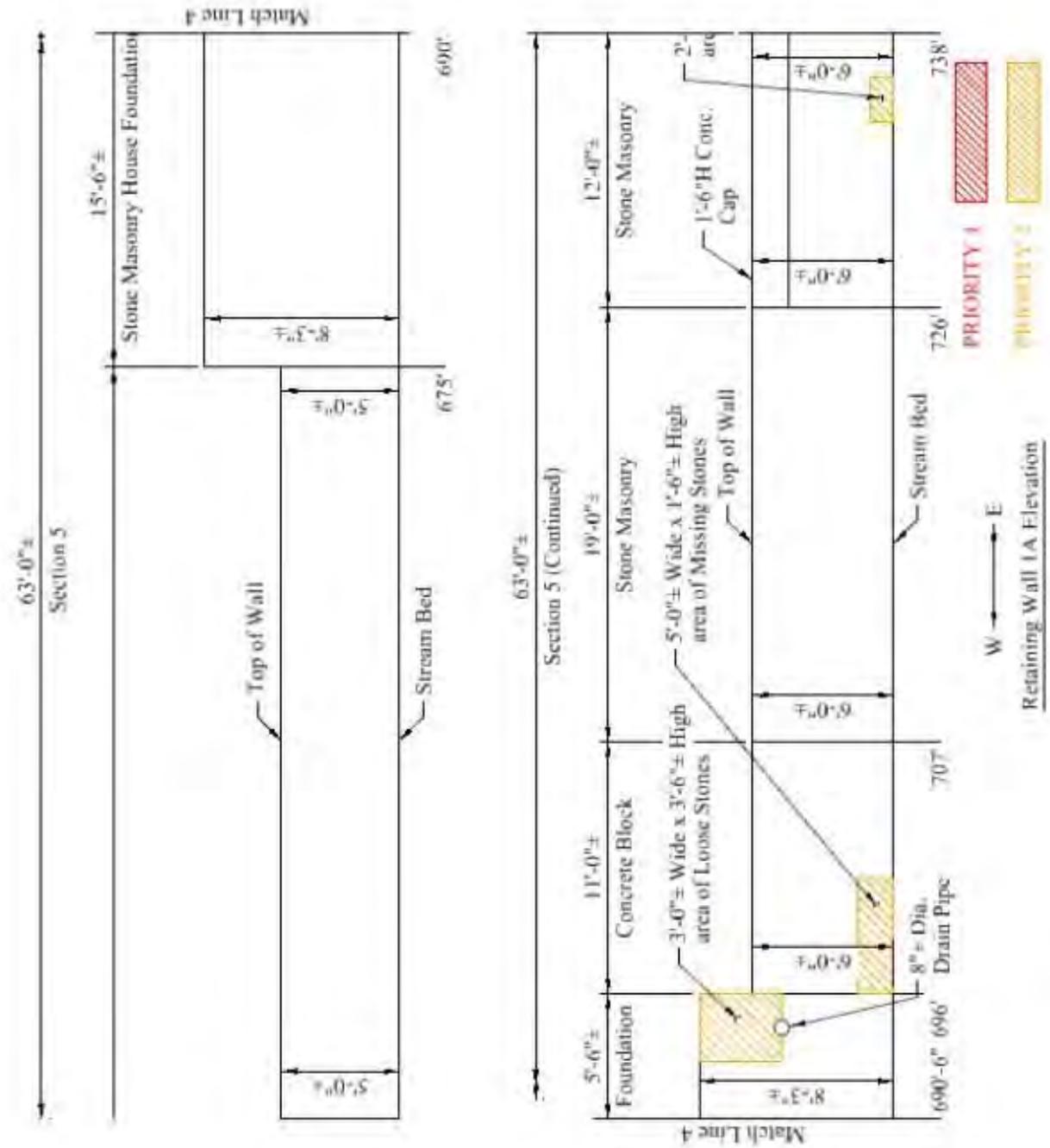
# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 1A



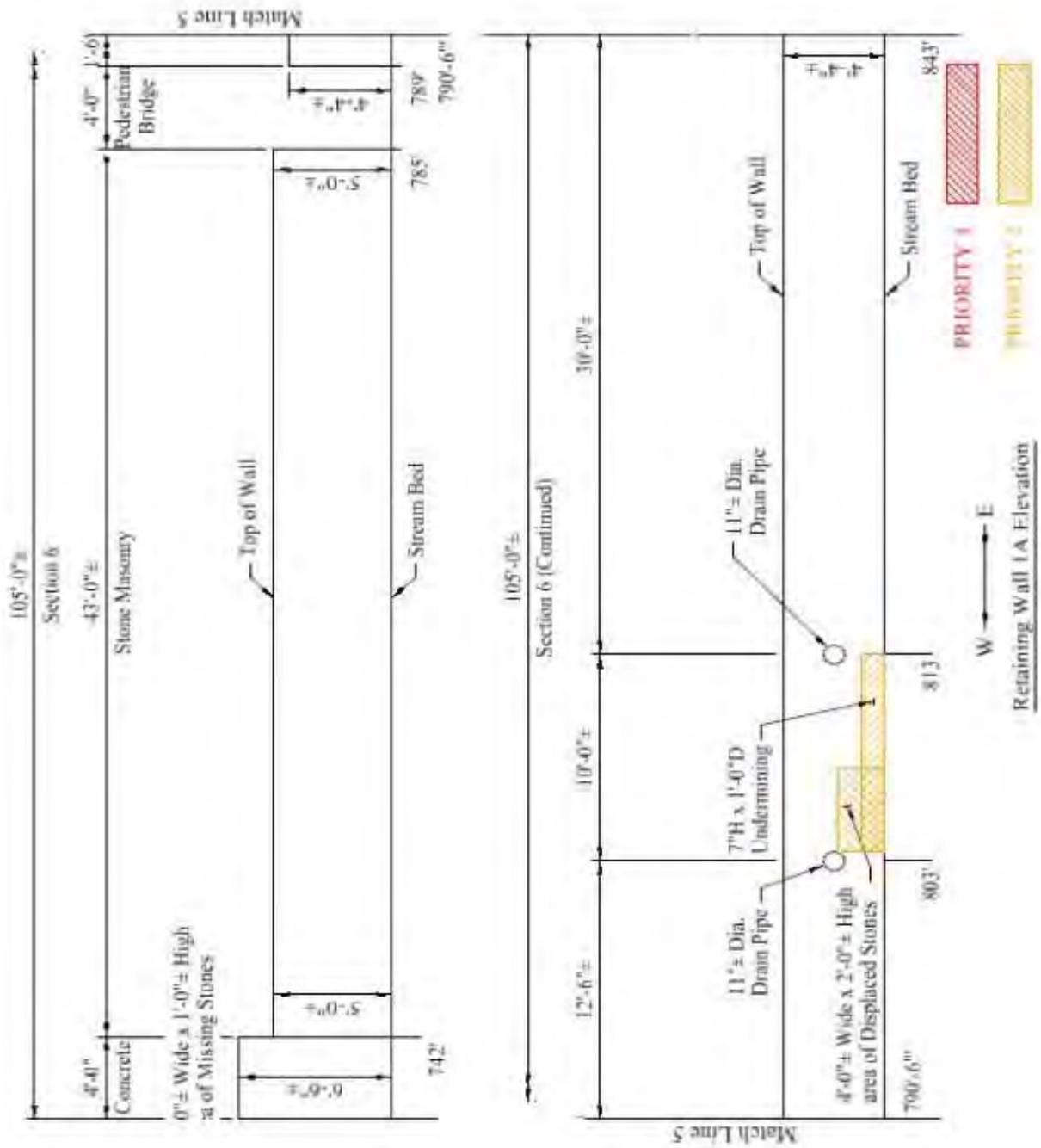
# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 1A



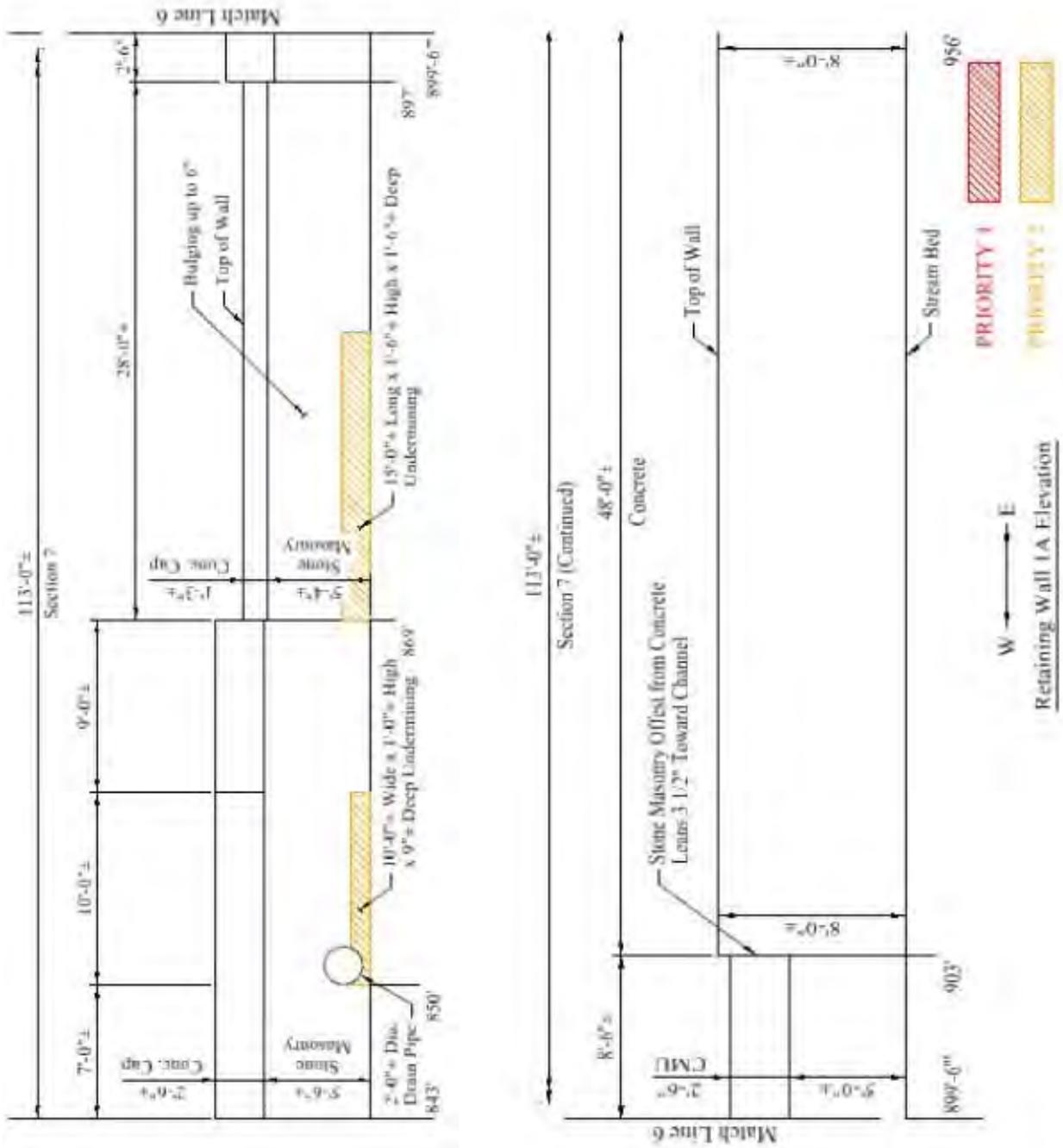
# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 1A



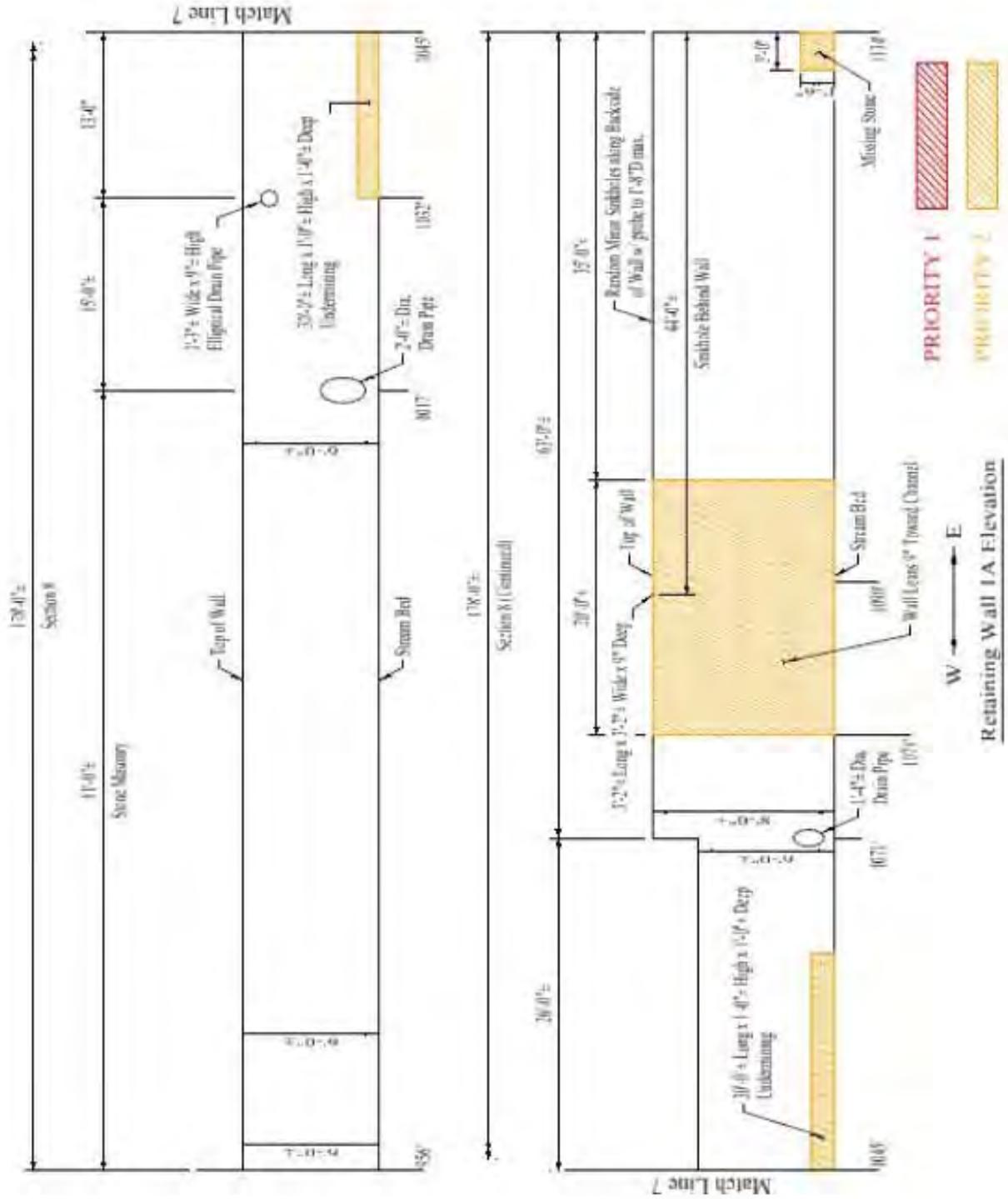
# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 1A



# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 1A



# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 1B

### *Description*

Retaining Wall 1B runs along the south side of Hudson Branch, south of Main Street near Rogers Avenue in Ellicott City, MD. The wall is approximately 1,078'± long and varies between 3'-0" and 11'-0"± high. The wall is comprised of stone masonry and concrete. The year built is unknown, and no previous inspection reports or plans were available.

The retaining wall inspection was performed on November 16, 2015 using waders. Access was obtained at the west end of the wall.

### *Inspection Findings*

Overall, the wall is in fair condition. Section 1 (western 163') is comprised of brick. The brick wall has vegetation growth throughout and large riprap along the wall (see Photos 1 and 2).

Section 2 extends from 163' to 400' from the west end of the wall. This portion of the wall is comprised of concrete. There are typically hairline vertical cracks extending from the drain pipes. There is a pedestrian bridge over the wall at 183' from the west end. Adjacent to west side of the pedestrian bridge, there is vegetation growth and riprap in front of the concrete retaining wall (see Photo 3). There is a vehicular bridge over the wall at 322' from the west end (see Photo 6). At the first wall joint west of the vehicular bridge, the top of the wall has a 1'-7" wide x 6" high area of delamination (see Photo 7).

Section 3 extends from 400' to 578' from the west end of the wall. The retaining wall is missing in this portion (see Photo 6).

Section 4 extends from 578' to 603' from the west end of the wall. This section consists of a 20' wide concrete abutment for a house which spans the stream channel (see Photo 8). There is undermining at the west end of the abutment, 1'-4" long x 3" high x 5" deep (see Photo 9). Behind the west end, there is an erosion hole 3'-0" long x 1'-4" high x 2'-0" deep, causing undermining of the abutment wingwall (see Photo 10). There is a fracture and undermining at the east end of the abutment, 1'-0" wide x 9" high x 8" deep (see Photo 11).

Section 5 extends from 603' to 630' from the west end of the wall and runs behind several private properties. The wall is comprised of concrete blocks from 603' to 609' from the west end. There is a broken block at the top of the wall with a void 3'-0" long x 10" high (see Photo 12). To the east of the concrete block, the wall is comprised of stone masonry which is covered with vegetation growth (see Photo 13). The joints have missing mortar and the wall leans slightly toward the stream channel. Along the bottom of the wall, there is a 21'-0" long x 1'-2" high gap due to missing stones which exhibits undermining up to 1'-0" deep. The soil behind the top of the wall is soft in this area.

Section 6 extends from 630' to 702' from the west end of the wall. The retaining wall is mostly missing in this portion. There is an old spring house remaining (see Photo 14), and a collapsed portion of wall adjacent to a pedestrian bridge (see Photo 15).

## Ellicott City Retaining Walls Inspection Report

### Retaining Wall 1B

Section 7 extends from 702' to 1,034' from the west end of the wall. The retaining wall is missing in this portion (see Photo 15).

Section 8 extends from 1,034' to 1,047' from the west end of the wall. The wall is comprised of stone masonry and ends at a pipe culvert. This portion of wall exhibits random missing mortar and vegetation growth. There is an area of missing stones at the top of the wall at the west end of Section 8 (see Photo 16).

### ***Recommendations***

The vegetation growth including mature trees within the vicinity of the wall should be removed immediately. The failed portions of wall should be rebuilt. The undermined portions of the wall should be underpinned. The masonry joints should be re-pointed with mortar throughout the wall.

Retaining Wall	Repair Recommendation	Priority	Wall Section	Station	Photos	Unit	Qty.	Unit Cost	Total Est. Cost
1B	Underpin undermined portions of wall.	2	4	578'	8-10	CY	0.5	\$1,000	\$500
			4	602'	11	CY	0.5	\$1,000	\$500
			5	609'	-	CY	0.5	\$1,000	\$500
1B	Fill void in concrete with grout.	2	5	606'	13	CY	0.5	\$400	\$200
1B	Rebuild collapsed portions of stone masonry wall.	3	3	400'	6	CY	18	\$1,000	\$18,000
			6	630'	14, 15	CY	5	\$1,000	\$5,000
			7	702'	15	CY	35	\$1,000	\$35,000
1B	Repoint the masonry joints.	M	5	603'	-	SF	30	\$35	\$1,050
			8	1,034'	-	SF	20	\$35	\$700
1B	Remove trees / vegetation growth in the vicinity of the wall.	V	-	-	-	LS	1	\$20,000	\$20,000
<b>Total Repair Costs</b>									<b>\$81,450</b>

Note: These estimated costs are approximate and should only be used as a reference and for project planning purposes. Although they represent the costs for individual repair activities, they may not represent the total cost of a complete repair/rehabilitation project. Costs for items such as Design, Permitting, Mobilization/Demobilization, Maintenance of Traffic, Stream Diversion, Submittal Reviews, etc. would have to be added to the costs provided to develop a comprehensive project cost.

**SECOND PRIORITY** (Designated as "2") - The second priority items include defects which do not pose an immediate safety concern, but have the potential to advance to a safety threat if left untreated. These defects exist at portions of the retaining wall which support buildings, roadways, parking lots, or pedestrian areas. The repairs should be completed within 3 years.

**THIRD PRIORITY** (Designated as "3") - The third priority items include defects which exist at portions of the retaining wall which do not support pedestrian areas (along natural slopes). Failure of the wall in these areas may redirect the stream or cause flooding; however, there is less of an immediate threat to pedestrians if left untreated.

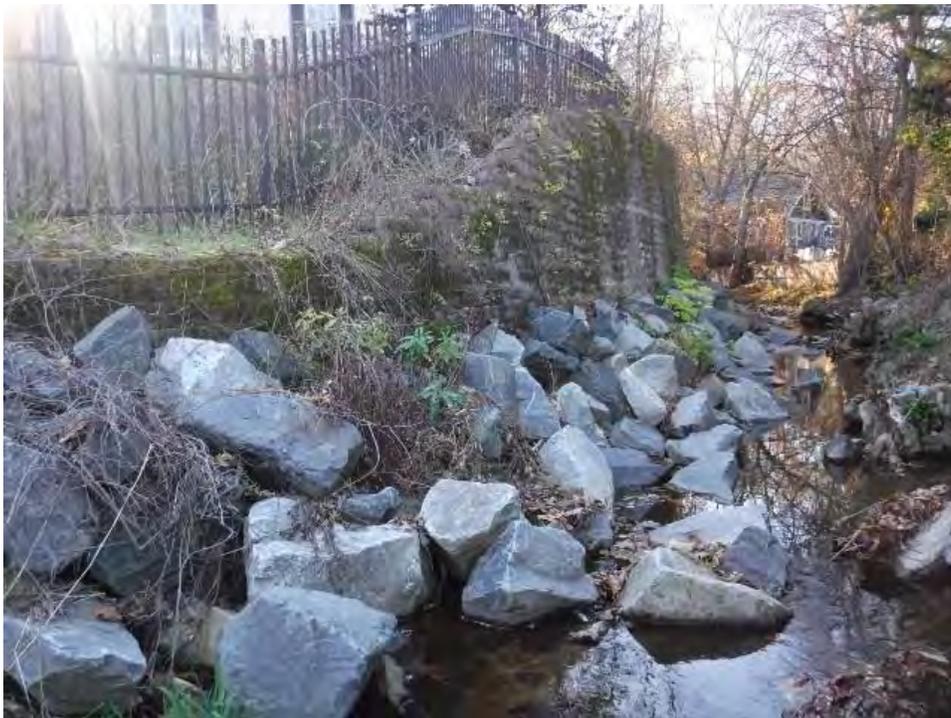
**MAINTENANCE** (Designated as "M") - This item includes preventative maintenance. These repairs will increase the life span of the retaining wall and should be completed as funds become available. Maintenance items include clearing vegetation from stone masonry joints and repointing the joints.

**VEGETATION REMOVAL** (Designated as "V") - This item includes the removal of vegetation growth, including mature trees, from the vicinity of the retaining walls. These repairs should be completed as funds become available; however, vegetation will continue to impact the retaining walls until removed.

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1B



*Photo 1 – Section 1 at West End, Looking Southeast.*



*Photo 2 – Section 1, Looking Southwest*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1B



*Photo 3 – West End of Section 2, Looking Southwest.  
Note Vegetation Growth and Natural Stone.*



*Photo 4 – Section 2, Looking Southwest towards Pedestrian Bridge.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1B



*Photo 5 – Section 2, Looking Southwest*



*Photo 6 – East End of Section 2, Looking Southwest.  
Note Missing Retaining Wall in Section 3 to East.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1B



*Photo 7 – Section 2, Cracking and Delamination at Top of Wall at 1<sup>st</sup> Joint West of Vehicular Bridge.*



*Photo 8 – Section 4, House Abutment, Looking South.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1B



*Photo 9 – Undermining at West End of Section 4 House Abutment.*



*Photo 10 – Undermining at Southwest Wingwall of House Abutment in Section 4, Looking Southeast.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1B



*Photo 11 – Fracture and Undermining at Lower East Corner of Section 4 House Abutment.*



*Photo 12 – Broken Concrete Block at Top of Wall in Section 5.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1B



*Photo 13 – Section 5, Looking Southwest.  
Note Vegetation Growth.*



*Photo 14 – Abandoned Spring House in Section 6,  
52' West of the Pedestrian Bridge.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1B



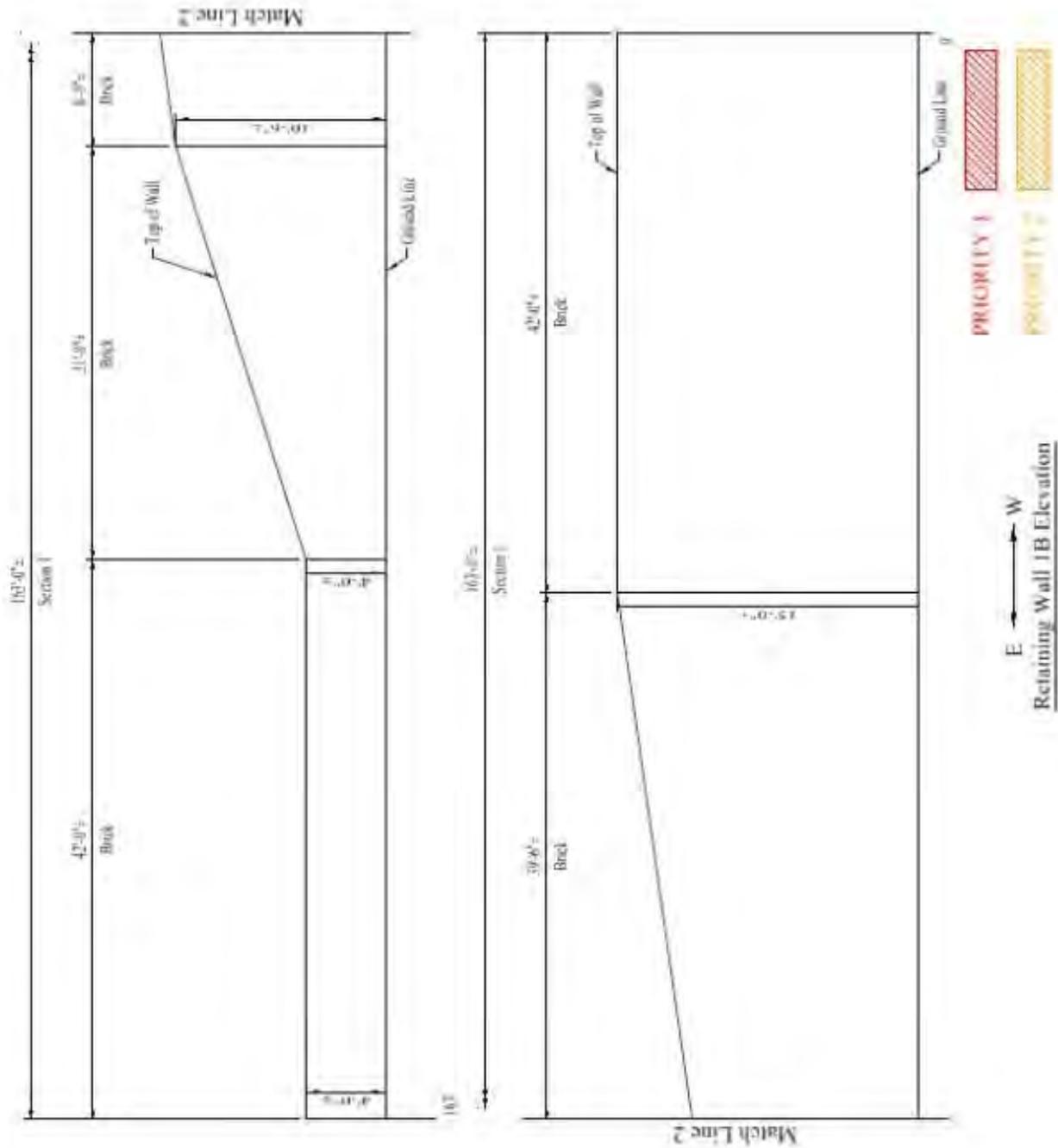
*Photo 15 – Failed Portion of Wall around Pedestrian Bridge at East End of Section 6, Looking Southeast. Section 7 Shown in Background.*



*Photo 16 – Elevation of Section 8, Looking Southeast.  
Note Failed Portion at East End.*

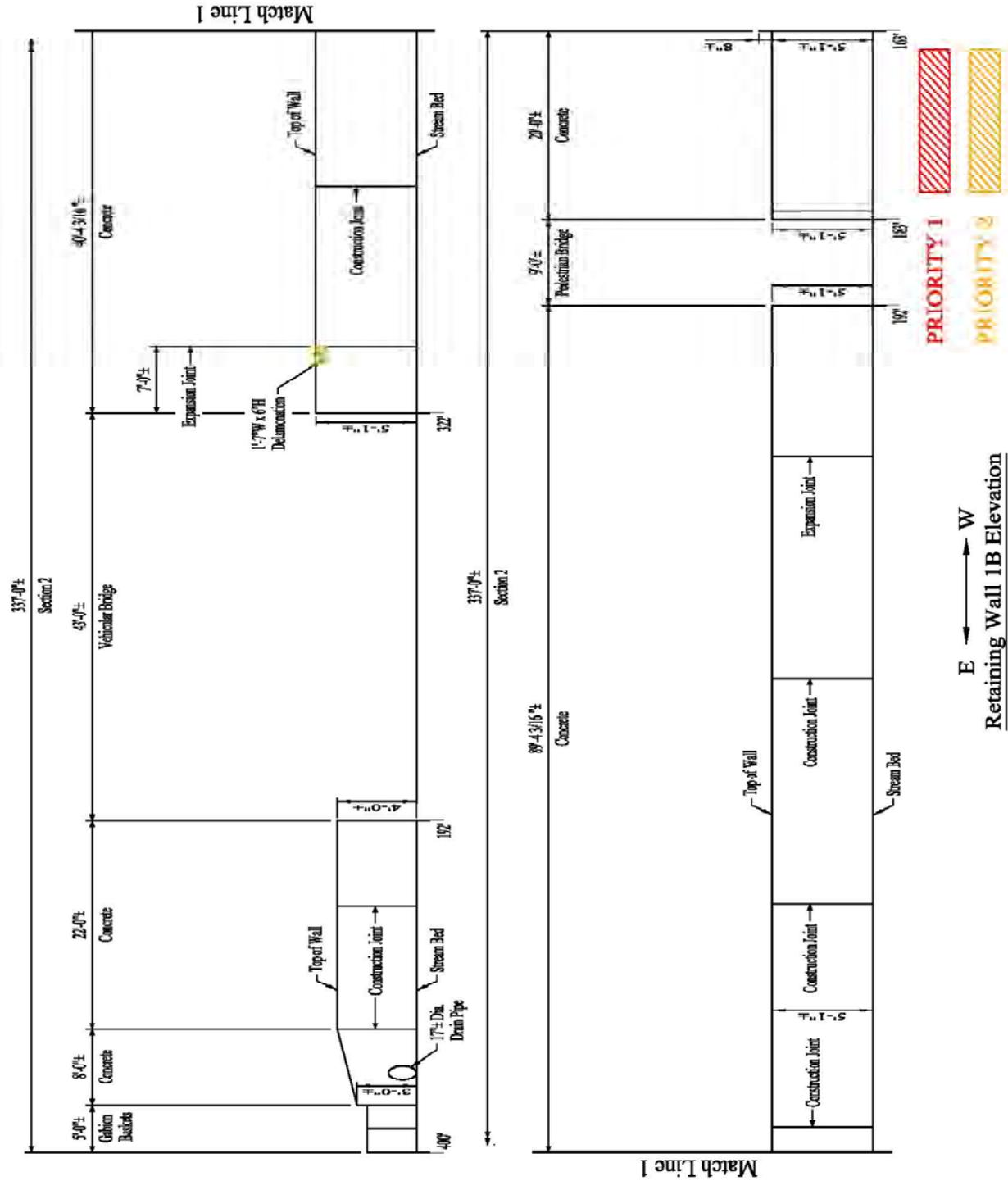
# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 1B



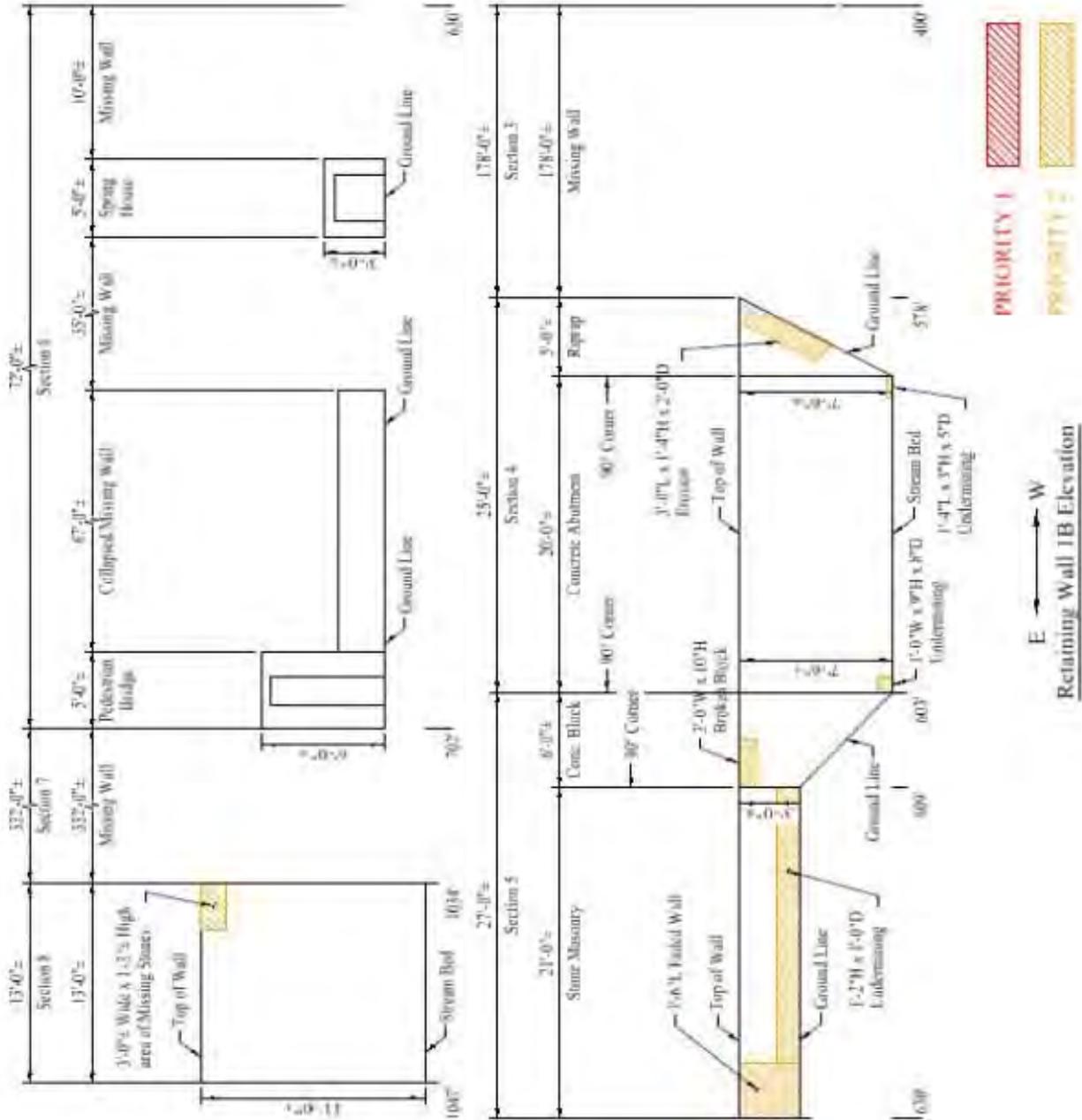
# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 1B



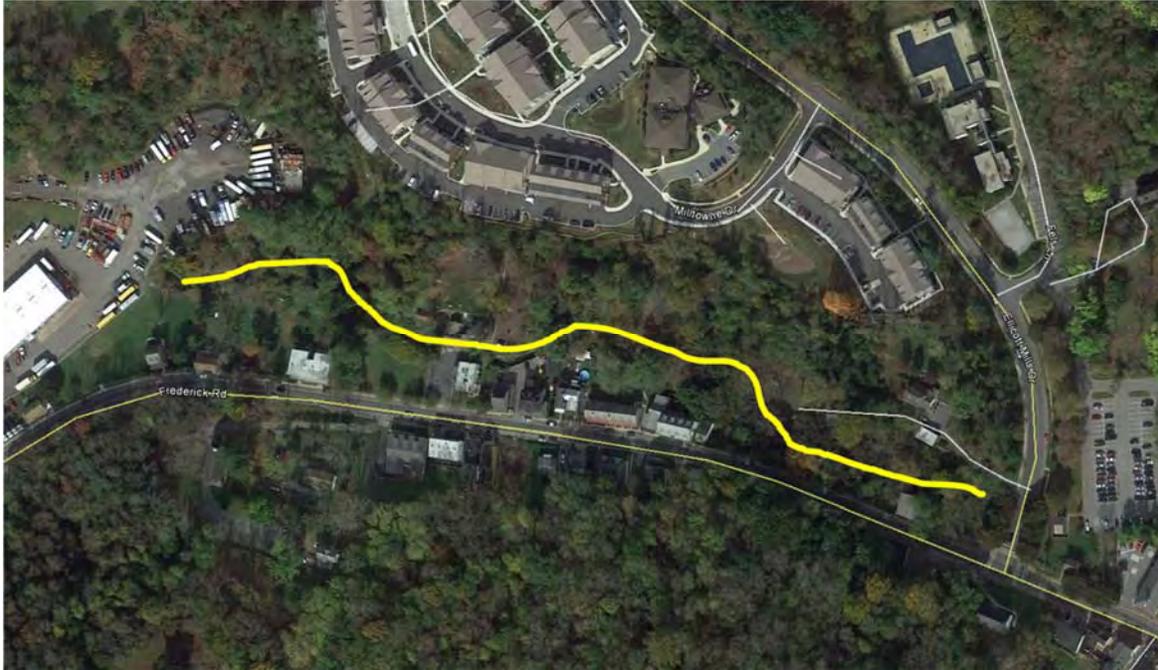
# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 1B



# Ellicott City Retaining Walls Inspection Report

## Retaining Walls 1C & 1D



### LOCATION MAP

**NORTH SIDE OF MAIN STREET, WEST OF ELLICOTT MILLS DR.**



### PROPERTY MAP

- █ = COUNTY OWNED
- █ = PRIVATELY OWNED

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 1C

### *Description*

Retaining Wall 1C is positioned along the north bank of Hudson Branch, north of Main Street, between Belfont Drive and Ellicott Mills Drive in Ellicott City, MD. The wall is approximately 1,145'-0"± long and varies between 2'-0"± and 12'-0"± high. The wall is comprised of stone masonry and concrete. The year built is unknown, and no previous inspection reports or plans were available. For inspection purposes, the wall has been designated in five sections, starting at the east end, at a reinforced concrete headwall for an 8'-0" high x 14'-0" wide corrugated metal pipe culvert.

The retaining wall inspection was performed on May 3, 2016 using waders. Access was obtained at the east end of the wall.

### *Inspection Findings*

Section 1 extends 134' from the east end. The stone masonry retaining wall does not begin until 60' from the east end in Section 1. Overall, the wall is in poor condition. There are three reinforced concrete erosion control barriers positioned on the embankment below the stone masonry wall in Section 1 (see Photos 1 and 3). The concrete barriers typically have minor moss growth throughout. There is a 1'-0" diameter tree growing on top of the concrete barrier closest to the stream bed, causing vertical fractures in the barrier (see Photo 2). The second concrete barrier from the stream bed has a 4'-6" long x 6" high x 3" deep spall in the south face at the east end. The stone masonry wall in Section 1 has no mortar remaining and random missing stones throughout, with joints that can be probed up to 1'-0" deep at the east and west ends (see Photo 4).

Section 2 extends from 134' to 273' from the east end and is comprised of stone masonry and concrete. There is heavy vegetation growth throughout and a 1'-0" diameter tree growing through the wall, located 25'-0" from the east end of the section (see Photos 5 and 6). There are several areas of missing mortar and random small missing stones throughout with joints that can be probed up to 2'-0" deep (see Photo 7). There is a 3'-0" wide x 5'-0" high channel/cut-out for drainage in the top of the wall, located 15' from the east end of the section. The west wall of this channel/cut-out is leaning to the east by up to 1'-2" at the top of the wall (see Photo 8). The bottom of the channel has loose/displaced stones with up to 1'-0" build-up of debris (see Photo 8).

A 15'-0" length of the wall in Section 2 has failed, located 36'-0" from the east end (see Photo 9). This area can be probed up to 2'-0" deep and a fence post is exposed. In the remaining intact portions of the wall, there is typically hairline map cracking with minor efflorescence and shallow spalls throughout the concrete portions (see Photos 10 and 11). Under a pedestrian bridge, the wall has a 9'-0" long x 6" high x 1'-0" deep area of undermining (see Photos 12 and 13). There is 12'-0" long x 12'-0" high x 5'-0" deep failed area starting 7'-0" from the west end (see Photo 14). In the western 7' of Section 2, there is a full height x 7'-0" wide area with no mortar remaining, random missing/displaced stones, and joints that can be probed up to 1'-6" deep (see Photo 14).

Section 3 extends from 273' to 795' from the east end. There is a 6'-0" long x 6'-0" high area of erosion at the east end, adjacent to Section 2. There is 16'-0" long x 2'-0" high area of a failed and mostly buried stone masonry wall starting 20'-0" from the east end (see Photo 15). There is a 26'-

## **Ellicott City Retaining Walls Inspection Report**

### **Retaining Wall 1C**

0" long stone masonry wall with a concrete cap starting 36' from the east end of the section, with approximately 30% of the mortar missing, mostly along the bottom 1'-0" (see Photo 16). At the east end of the wall, there is a 2'-6" diameter tree, a full height x 4'-0" wide area with no mortar remaining, and small voids, displaced stones, and open joints that can be probed up to 1'-6" deep (see Photo 17).

Section 4 extends from 795' to 902' from the east end and is comprised of mostly stone masonry (see Photos 18 through 22). There is typically missing mortar, random loose/displaced stones, and joints that can be probed up to 2'-0" deep along the top and bottom 2'-0". There is heavy vegetation growth along the top of the wall. At the east end of the section, there is a 4'-0" long x 1'-0" high x 1'-0" deep area of undermining (see Photo 18). Starting 31'-0" from the east end of the section, there is a full height x 10'-0" wide area of displaced stones (see Photo 23). There is a 8'-0" long x 3'-0" high area of stones along the bottom of the wall that are displaced up to 6" to the south, in the center of Section 4 (see Photo 24). Starting 35'-0" from the west end of the section, there is a full height x 18'-0" wide area with 90% of the mortar missing, small voids, and joints that can be probed up to 1'-6" deep (see Photo 21). Near the west end of the section, there is a 4'-0" long x 1'-0" high x 1'-0" deep area of undermining (see Photo 25).

Section 5 extends from 902' to 1,145' from the east end. There is a 78' long stone masonry wall at the west end, with vegetation/bamboo growing along the top (see Photos 26 through 28). In the east half of the wall, there is hairline map cracking throughout the mortar with random areas of moderate efflorescence. There is a vertical full height x ¼" wide crack near the center of the stone masonry wall (see Photo 29). In the west half of the wall, there is minor to moderate scaling, up to 2" deep, along the concrete footing. Starting 27'-0" from the west end, there is an 11'-0" long x 1'-0" high area of loose stones along the top of the wall. There is a 10" long x 6" high x up to 1'-6" deep void in the top west end of the stone masonry wall (see Photo 30).

### ***Recommendations***

The vegetation growth including mature trees within the vicinity of the wall should be removed immediately. The failed portions of the wall and areas with displaced stones should be rebuilt. The undermined areas of the wall should be underpinned. The random voids throughout the wall and along the base of the wall should be filled with stone. The masonry joints should be re-pointed with mortar throughout the wall.

## Ellicott City Retaining Walls Inspection Report

### Retaining Wall 1C

Retaining Wall	Repair Recommendation	Priority	Wall Section	Station	Photos	Unit	Qty.	Unit Cost	Total Est. Cost	
1C	Replace missing stones.	3	5	1,107'	-	CY	1	\$1,000	\$1,000	
			5	1,143'	30	CY	0.5	\$1,000	\$500	
1C	Underpin undermined portions of wall.	2	2	245'	13	CY	0.5	\$1,000	\$500	
			4	795'	18	CY	0.5	\$1,000	\$500	
			4	879'	25	CY	0.5	\$1,000	\$500	
1C	Repoint the masonry joints.	3	1	60'	4	SF	85	\$35	\$2,975	
			2	144'	5-7	SF	200	\$35	\$7,000	
			2	273'	11-14	SF	150	\$35	\$5,250	
			3	309'	17	SF	20	\$35	\$700	
			3	314'	16	SF	35	\$35	\$1,225	
			4	815'	21	SF	350	\$35	\$12,250	
1C	Rebuild collapsed portions of stone masonry wall.	2	2	162'	8	CY	4	\$1,000	\$4,000	
			2	170'	9	CY	10	\$1,000	\$10,000	
			2	254'	14	CY	11	\$1,000	\$11,000	
			3	293'	15	CY	2.5	\$1,000	\$2,500	
			2	4	826'	20,23	CY	5	\$1,000	\$5,000
			2	4	845'	20,24	CY	2	\$1,000	\$2,000
1C	Remove trees / vegetation growth in the vicinity of the wall.	V	-	-	-	LS	1	\$20,000	\$20,000	
<b>Total Repair Costs</b>								<b>\$86,900</b>		

Note: These estimated costs are approximate and should only be used as a reference and for project planning purposes. Although they represent the costs for individual repair activities, they may not represent the total cost of a complete repair/rehabilitation project. Costs for items such as Design, Permitting, Mobilization/Demobilization, Maintenance of Traffic, Stream Diversion, Submittal Reviews, etc. would have to be added to the costs provided to develop a comprehensive project cost.

**SECOND PRIORITY** (Designated as "2") - The second priority items include defects which do not pose an immediate safety concern, but have the potential to advance to a safety threat if left untreated. These defects exist at portions of the retaining wall which support buildings, roadways, parking lots, or pedestrian areas. The repairs should be completed within 3 years.

**THIRD PRIORITY** (Designated as "3") - The third priority items include defects which exist at portions of the retaining wall which do not support pedestrian areas (along natural slopes). Failure of the wall in these areas may redirect the stream or cause flooding; however, there is less of an immediate threat to pedestrians if left untreated.

**MAINTENANCE** (Designated as "M") - This item includes preventative maintenance. These repairs will increase the life span of the retaining wall and should be completed as funds become available. Maintenance items include clearing vegetation from stone masonry joints and repointing the joints.

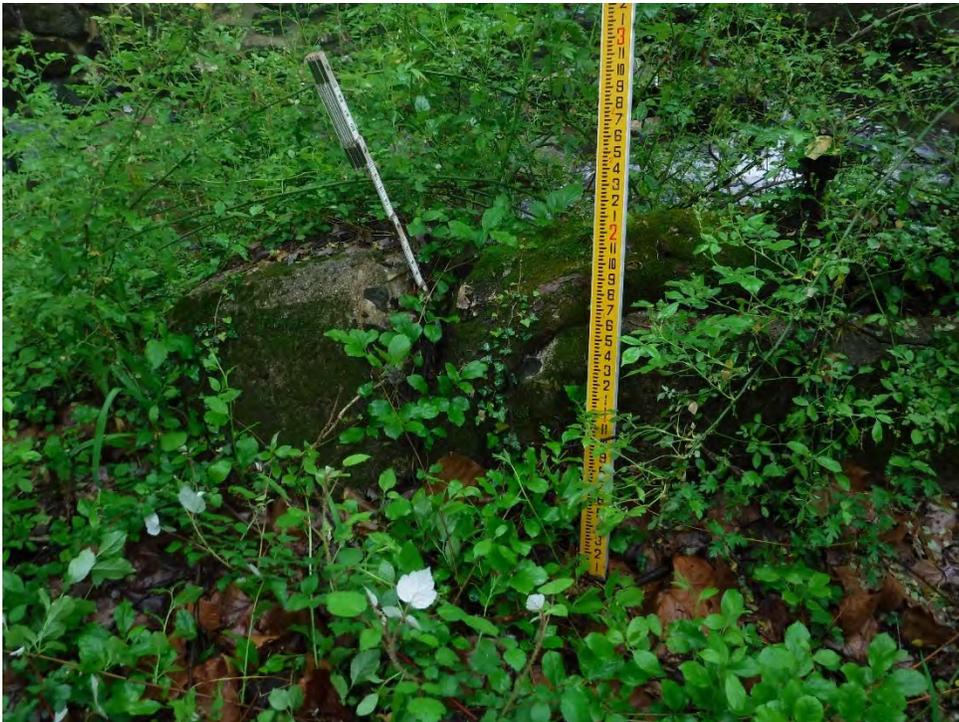
**VEGETATION REMOVAL** (Designated as "V") - This item includes the removal of vegetation growth, including mature trees, from the vicinity of the retaining walls. These repairs should be completed as funds become available; however, vegetation will continue to impact the retaining walls until removed.

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 1C



*Photo 1 – Concrete Walls in Section 1, Looking North.*



*Photo 2 – Fracture in Concrete Barrier in Section 1, Looking South.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1C



*Photo 3 – Stone Masonry Wall in Section 1, Looking North.*



*Photo 4 – Missing mortar and Small Voids at the East End of the Stone Masonry Wall in Section 1.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1C



*Photo 5 – East End of Section 2, Looking Northeast.  
Note Heavy Vegetation Growth*



*Photo 6 – Heavy Vegetation and Tree Growth in Section 2, Looking North.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1C



*Photo 7 – Typical Missing Mortar and Small Voids in Section 2.*



*Photo 8 – West Wall of Drainage Channel Leaning to the East and Loose/Displaced Stones at East End of Section 2, Looking North.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1C



*Photo 9 – Failed Portion of Wall in East Half of Section 2.*



*Photo 10 – Section 2, Looking Northeast. Note Shallow Spalls in Concrete.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1C



*Photo 11 – Section 2, Looking Northeast. Note Shallow Spalls in Concrete.*



*Photo 12 – Undermining of Wall under Pedestrian Bridge and Typical Missing Mortar and Small Voids in Section 2, Looking Northwest.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1C



*Photo 13 – Undermining of Wall under Pedestrian Bridge in Section 2, Looking North.*



*Photo 14 – Failed Wall and Missing Mortar at West End of Section 2.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1C



*Photo 15 – Buried/Failed Wall and Large Tree in Section 3, Looking Northwest.*



*Photo 16 – Missing Mortar and Small Voids in Section 3.*

**Ellicott City Retaining Walls Inspection Report**  
**Retaining Wall 1C**



*Photo 17 – Missing Mortar, Small Voids, and Displaced Stones at East End of Wall in Section 3.*



*Photo 18 – East End of Section 4, Looking West. Note Undermining.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1C



*Photo 19 – Vegetation Growth along Top of Section 4, Looking Northeast.*



*Photo 20 – Areas of Bulging and Displaced Stones in Section 4, Looking Northeast.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1C



*Photo 21 – Missing Mortar and Vegetation Growth in Section 4,  
Looking Northeast.*



*Photo 22 – Missing Mortar along the Bottom of Section 4, Looking Northeast.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1C



*Photo 23 –Displaced Stones in Section 4, Looking Northeast.*



*Photo 24 –Displaced Stones at Base of Wall near Center of Section 4, Looking Northeast.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1C



*Photo 25 – Undermining near West End of Section 4, Looking North.*



*Photo 26 – East End of Stone Masonry Wall in Section 5, Looking Northwest.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1C



*Photo 27 – Center of Stone Masonry Wall in Section 5, Looking North.*



*Photo 28 – West End of Stone Masonry Wall in Section 5, Looking Southeast.*

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 1C



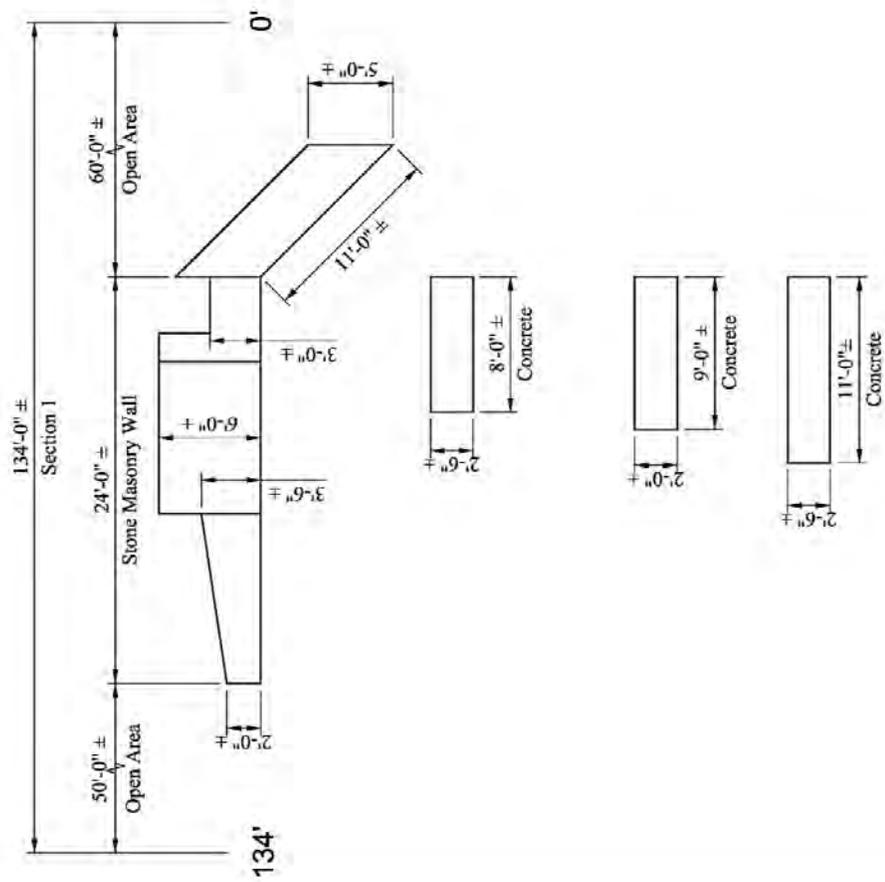
*Photo 29 – Crack in Stone Masonry Wall in Section 5, Looking North.*



*Photo 30 – Void at West End of the Stone Masonry Wall in Section 5, Looking East.*

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 1C



W ← → E

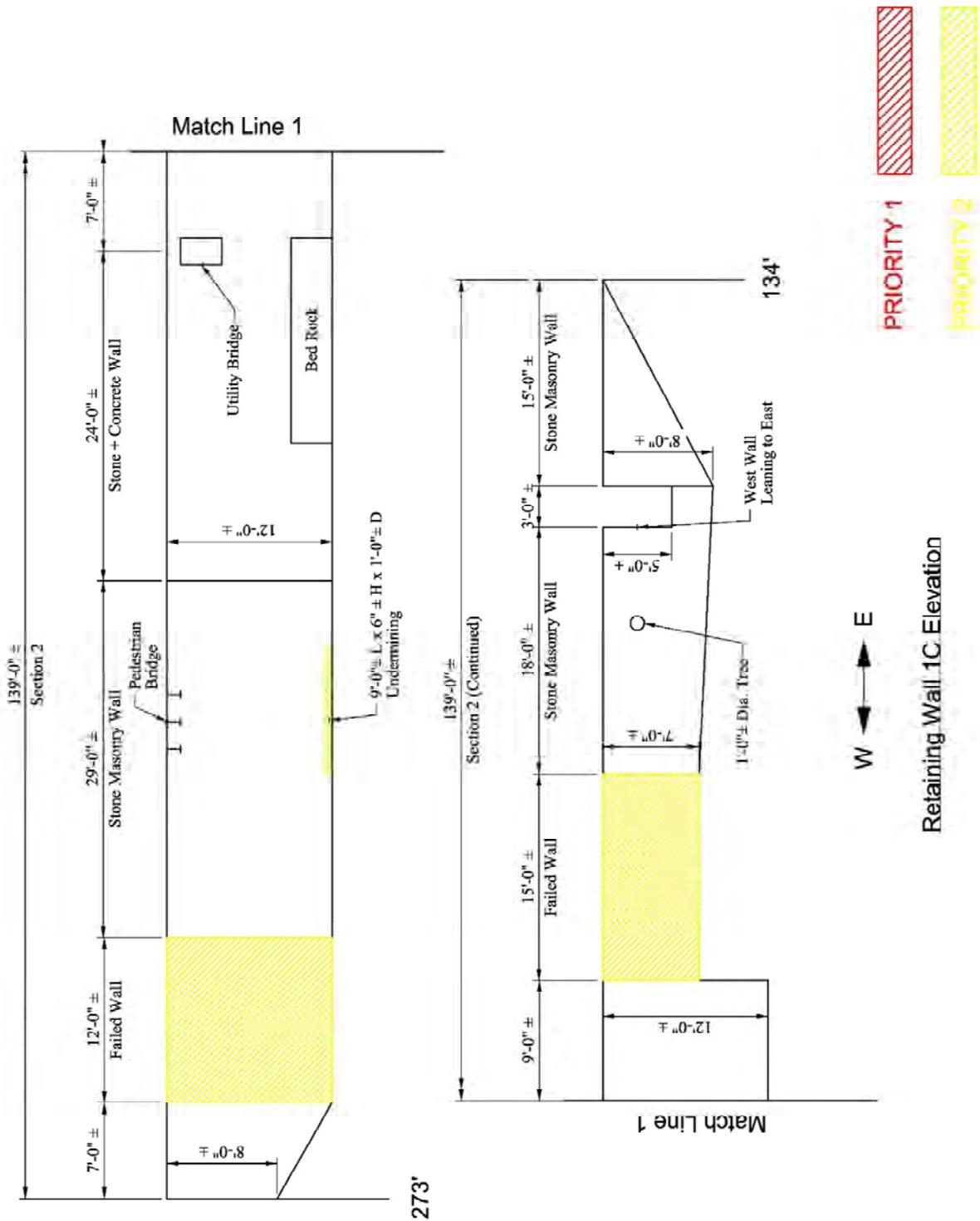
Retaining Wall 1C Elevation

**PRIORITY 1**

**PRIORITY 2**

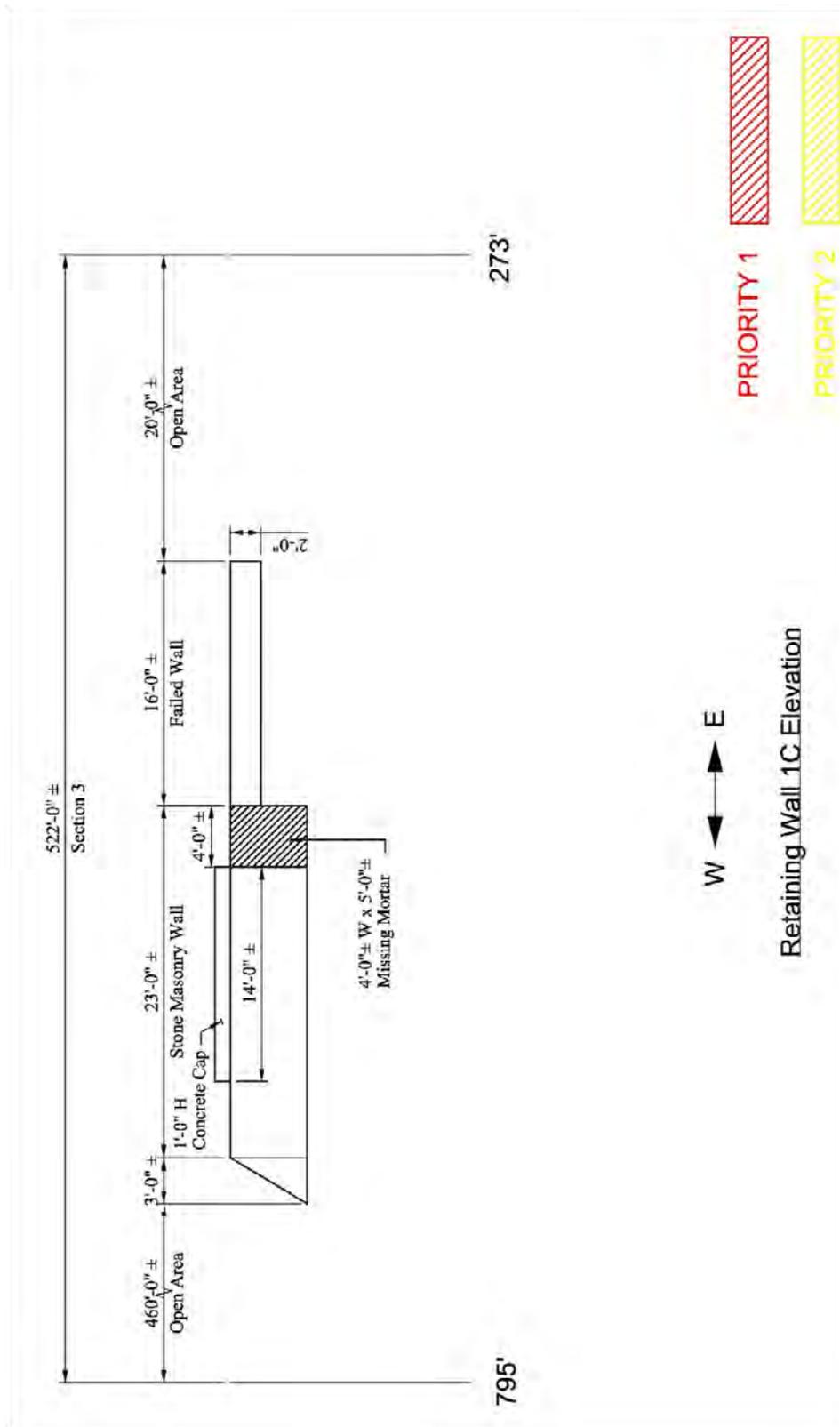
# Ellicott City Retaining Walls Inspection Report

## Retaining Walls 1C



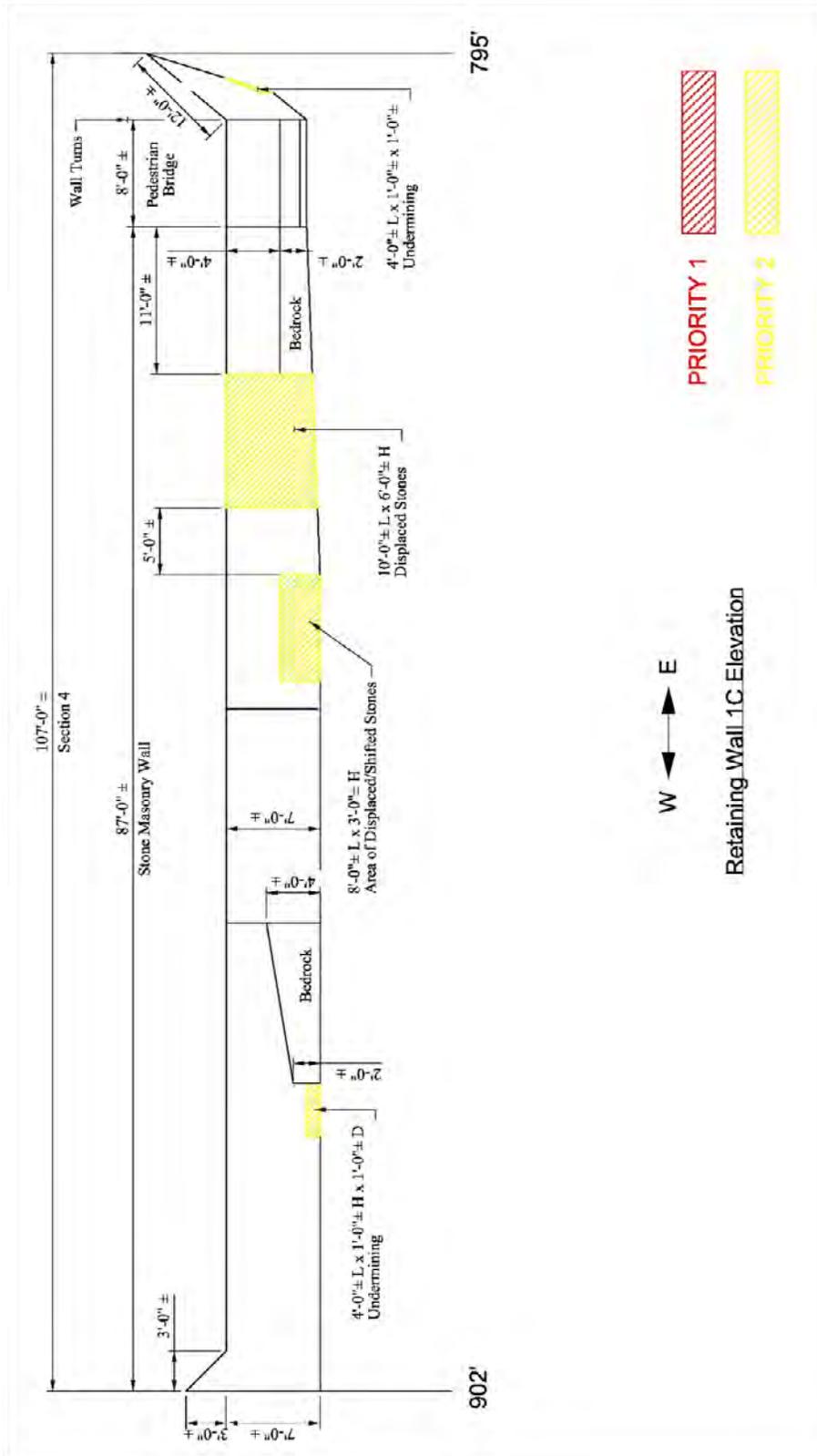
# Ellicott City Retaining Walls Inspection Report

## Retaining Walls 1C



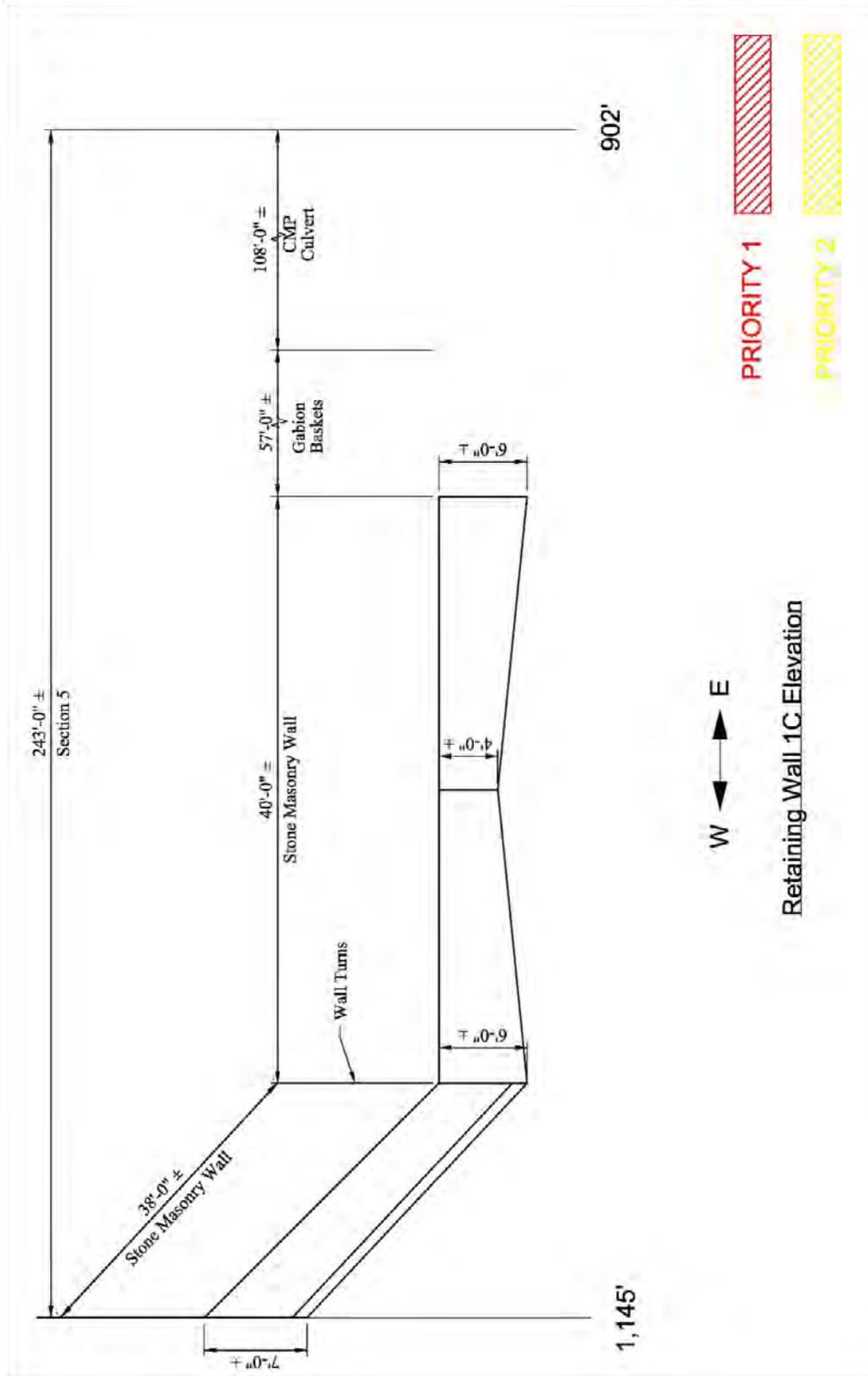
# Ellicott City Retaining Walls Inspection Report

## Retaining Walls 1C



# Ellicott City Retaining Walls Inspection Report

## Retaining Walls 1C



# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 1D

### *Description*

Retaining Wall 1D is positioned along the south bank of Hudson Branch, north of Main Street, between Belfont Drive and Ellicott Mills Drive in Ellicott City, MD. The wall is approximately 1,152'-0"± long and varies between 4'-0"± and 20'-0"± high. The wall is comprised of stone masonry, concrete, and timber. The year built is unknown, and no previous inspection reports or plans were available. For inspection purposes, the wall has been designated in 10 sections, starting at the east end, at a reinforced concrete headwall for an 8'-0" high x 14'-0" wide corrugated metal pipe culvert.

The retaining wall inspection was performed on April 28 and 29, 2016 using waders. Access was obtained at the east end of the wall.

### *Inspection Findings*

Overall, the wall is in fair condition. Section 1 (eastern 35') is comprised of reinforced concrete and has hairline map cracking with minor efflorescence in random areas and along the top 1'-0" (see Photo 1).

Section 2 extends from 35' to 75' from the east end and is comprised of stone masonry (see Photo 2). The top half of the eastern 18' of Section 2 has up to 15% of the mortar missing, random small missing stones, and joints that can be probed up to 1'-0" deep. There is an 8'-0" long x 1'-0" high area of loose stones with missing mortar along the bottom of the wall, with joints that can be probed up to 6" deep, starting 10'-0" from the east end. At 18' from the east end of Section 2, there is a vertical joint between the existing wall and the 2'-0" wide addition, which is open up to 5" wide at the bottom (see Photo 3). The western 22' of Section 2 has missing mortar and random small missing stones along the bottom 1'-0", with joints that can be probed up to 1'-0" deep (see Photo 4).

Section 3 extends from 75' to 107' from the east end of the wall and is mostly comprised of concrete covered stone masonry (see Photo 5). The east 10'-0" of Section 3 is comprised of timber in the top half and concrete covered stone masonry in the bottom half. The concrete is typically spalled up to 4" deep throughout 70% of the area. This section is undermined 10'-0" long x 2'-0" high x up to 1'-0" deep with several large stones missing (see Photo 6). There is a 9'-0" long x 2'-0" high area of failed timber wall starting 1'-0" from the east end (see Photo 7).

In the center third of Section 3, there are diagonal and horizontal fractures, up to 2" wide, with small spalls. In the west 22'-0", there are small trees and vegetation growth along the top, a 6'-0" long x 6" high x 6" deep spall at mid-height and a 5'-6" long x 5" high x 4" deep spall near the top west end (see Photo 5). Along the bottom, there is a 2'-6" long x 2'-0" high x up to 10" deep void at the west end, a 6'-6" long x 1'-6" high x up to 1'-6" deep void located 3'-6" from the west end, and an 8'-0" long x 1'-6" high x up to 2'-8" deep void located 14'-0" from the west end (see Photo 8). Behind the west end of the wall, there is a full height x 1'-6" wide area of missing and loose stones with voids that can be probed up to 2'-6" deep.

## **Ellicott City Retaining Walls Inspection Report**

### **Retaining Wall 1D**

Section 4 extends from 107' to 241' from the east end of the wall. The eastern 128' of Section 4 is comprised of natural stone, the foundation of a private property, and two small concrete abutments; one abandoned, and the other supporting a utility pipe (see Photos 9 through 12). The 10'-0" long timber wall to the west of the private property, located approximately 40' from the streambed, has failed (see Photo 10). The west 6'-0" of Section 4 is comprised of stone masonry, with up to 50% of the mortar missing and random small missing stones, with joints that can be probed up to 10" deep (see Photo 13). The top 2'-6" is failing with minor tree and vegetation growth.

Section 5 extends from 241' to 353' from the east end. The eastern 8' of Section 5 is a concrete abutment for a pedestrian bridge (see Photo 14). There is minor scaling throughout, full length x 4" high x up to 7" deep undermining (see Photo 15), and a 10'-0" diameter x 4'-0" deep scour hole in front of the bridge abutment. Just west of the abutment is a 60' long section of natural stone/boulders along the bank (see Photo 16). The western 44' of Section 5 is comprised of stone masonry with approximately 25% of the mortar missing, moss and vegetation growth throughout, and a few random shifted stones near the top (see Photos 17 through 19). The bottom 5'-0" consists of a 2'-0" wide concrete bump-out with undermining along the full length x 1'-0" high x up to 1'-2" deep. There is a 5'-6" long x 2'-3" high x up to 1'-5" deep spall with exposed corroded reinforcement located 8'-0" from the east end and a 5'-0" long x 1'-2" high x up to 1'-2" deep spall located 12'-0" from the west end (see Photo 20).

Section 6 extends from 353' to 532' from the east end of the wall. The eastern 9' of Section 6 is comprised of a stone masonry retaining wall near the top of the bank (see Photo 21). Just below the stone wall, there are two deteriorated and abandoned concrete structures (see Photo 22). The remaining 170' of Section 6 is comprised of a natural stream bank.

Section 7 extends from 532' to 801' from the east end of the wall (see Photos 23 through 25). The eastern 84' of Section 7 is comprised of concrete and typically has random areas of minor scaling with vegetation growth throughout the top of the wall. There is a 32'-0" long x 2'-3" high x up to 1'-10" deep undermined area starting from the east end (see Photo 26). Just west of the concrete wall, there is a 15' long concrete block wall with a 3" wide x full height vertical fracture (see Photo 27).

Section 8 extends from 801' to 900' from the east end and is comprised of a mixture of stone masonry and concrete blocks (see Photos 28 through 31). The eastern 26' of Section 8 is stone masonry with approximately 10% of the mortar missing, mostly along the bottom 2'-0" (see Photo 28). Beneath the pedestrian bridge, starting 26' from the east end, there is an 8'-0" long x 2'-0" high area of missing mortar and random small missing stones at the bottom (see Photo 29). Also, located 26' through 61' from the east end of the section, there are several open joints between the concrete blocks, up to ¼" wide x up to 7" deep with up to ¾" horizontal offset (see Photo 29). Located 61' from the east end of the section, there is a full height x 5'-0" wide area with no mortar remaining and random small missing stones (see Photo 31). The western 38' of Section 8 typically has missing mortar and stones along the bottom 1'-0", which can be probed up to 2'-2" deep (see Photos 31 and 32) with approximately 10% of the mortar missing, random small missing stones, and minor moss growth.

## Ellicott City Retaining Walls Inspection Report

### Retaining Wall 1D

Section 9 extends from 900' to 930' from the east end and is comprised of a mixture of stone masonry and concrete blocks (see Photo 33). There is approximately 10% of the mortar missing, random small missing stones, and minor vegetation growth along the horizontal joint at the top of the wall. There is a 3'-6" long x 1'-0" high x up to 3'-10" deep void area under the 3'-0" diameter concrete pipe outfall (see Photo 34). At the west end, there is a 6'-0" high x up to 5'-0" wide area with no mortar remaining and random small missing stones below a small drain pipe.

Section 10 extends from 930' to 1,152' from the east end (see Photo 35). There is a 45' long stone masonry wall starting 162' from the east end of Section 10, with missing mortar along the bottom 1'-0". There is a 4'-0" long x 1'-0" high area of missing stones at the top east end of the wall. At the west end of the wall, there is 3'-0" diameter tree growing on top of the wall causing a full height x 3'-0" wide area of failure with a 1" wide vertical fracture that can be probed up to 1'-0" deep and a 4'-0" long x 2'-0" high x 1'-7" deep void area at the bottom (see Photo 36). The western 15' of Section 10 consists of stacked stone and concrete debris with no mortar (see Photo 36).

### ***Recommendations***

The vegetation growth including mature trees within the vicinity of the wall should be removed immediately. The failed portions of the wall should be rebuilt. The undermined areas of the wall should be underpinned. The random voids throughout the wall and along the base of the wall should be filled with stone. The masonry joints should be re-pointed with mortar throughout the wall.

Retaining Wall	Repair Recommendation	Priority	Wall Section	Station	Photos	Unit	Qty.	Unit Cost	Total Est. Cost
1D	Replace missing stones.	2	4	235'	13	CY	1.5	\$1,000	\$1,500
		2	5	309'	20	CY	2	\$1,000	\$2,000
		2	8	827'	29	CY	0.5	\$1,000	\$500
		3	10	1,092'	35	CY	0.5	\$1,000	\$500
1D	Repair spalls.	2	3	85'	5	CY	0.5	\$1,000	\$500
			5	317'	20	CY	1	\$1,000	\$1,000
			5	341'	-	CY	0.5	\$1,000	\$500
1D	Underpin undermined portions of wall.	2	3	75'	6,8	CY	7	\$1,000	\$7,000
			5	241'	15	CY	0.5	\$1,000	\$500
			7	532'	26	CY	5	\$1,000	\$5,000
			9	912'	34	CY	0.5	\$1,000	\$500
1D	Repoint the masonry joints.	2	2	53'	3, 4	SF	68	\$35	\$2,380
			4	235'	13	SF	18	\$35	\$630
			5	309'	17,18	SF	143	\$35	\$5,005
			8	801'	28	SF	52	\$35	\$1,820
			8	827'	29	SF	16	\$35	\$560
			8	862'	32	SF	60	\$35	\$2,100
			9	930'	33	SF	21	\$35	\$735
		3	10	1,092'	35	SF	45	\$35	\$1,575
1D	Seal cracks in concrete wall.	2	3	85'	5	LF	25	\$35	\$875
			7	620'	27	LF	3	\$35	\$105
1D	Rebuild collapsed portions of stone masonry wall.	3	10	1,135'	36	CY	3	\$1,000	\$3,000
1D	Rebuild collapsed portions of timber wall.	2	3	75'	7	LS	1	\$1,000	\$1,000
		3	4	157'	10	LS	1	\$1,000	\$1,000
1D	Remove trees / vegetation growth in the vicinity of the wall.	V	-	-	-	LS	1	\$20,000	\$20,000
<b>Total Repair Costs</b>									<b>\$60,285</b>

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 1D

Note: These estimated costs are approximate and should only be used as a reference and for project planning purposes. Although they represent the costs for individual repair activities, they may not represent the total cost of a complete repair/rehabilitation project. Costs for items such as Design, Permitting, Mobilization/Demobilization, Maintenance of Traffic, Stream Diversion, Submittal Reviews, etc. would have to be added to the costs provided to develop a comprehensive project cost.

**SECOND PRIORITY** (Designated as "2") - The second priority items include defects which do not pose an immediate safety concern, but have the potential to advance to a safety threat if left untreated. These defects exist at portions of the retaining wall which support buildings, roadways, parking lots, or pedestrian areas. The repairs should be completed within 3 years.

**THIRD PRIORITY** (Designated as "3") - The third priority items include defects which exist at portions of the retaining wall which do not support pedestrian areas (along natural slopes). Failure of the wall in these areas may redirect the stream or cause flooding; however, there is less of an immediate threat to pedestrians if left untreated.

**MAINTENANCE** (Designated as "M") - This item includes preventative maintenance. These repairs will increase the life span of the retaining wall and should be completed as funds become available. Maintenance items include clearing vegetation from stone masonry joints and repointing the joints.

**VEGETATION REMOVAL** (Designated as "V") - This item includes the removal of vegetation growth, including mature trees, from the vicinity of the retaining walls. These repairs should be completed as funds become available; however, vegetation will continue to impact the retaining walls until removed.

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 1D



*Photo 1 – Section 1, Looking Southwest.*



*Photo 2 – Section 2, Looking Southwest.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1D



*Photo 3 – Vertical Joint at 18' from East End with Missing Mortar in Section 2.*



*Photo 4 – Section 2 with Missing Mortar and Random Small Missing Stones.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1D



*Photo 5 – Section 3, Looking South.  
Note Fractures at Center of Wall and Random Spalls.*



*Photo 6 – Undermining at East End of Section 3, Looking Southeast.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1D



*Photo 7 – Failed Portion of Timber Wall at East End of Section 3,  
Looking South.*



*Photo 8 – Typical Voids along Base of Section 3 Stone Masonry,  
Looking Southeast.*

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 1D



*Photo 9 – Section 4, Looking Southwest.*



*Photo 10 – Section 4, Looking Southwest.  
Note Failed Timber Wall*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1D



*Photo 11 – Concrete Abutments in Section 4, Looking South.*



*Photo 12 – Section 4, Looking Southwest.*

## Ellicott City Retaining Walls Inspection Report

### Retaining Wall 1D



*Photo 13 – West End of Section 4 with Missing Mortar and Random Small Missing Stones, Looking South.*



*Photo 14 – Section 5, East End, Looking South.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1D



*Photo 15 – Undermining along Concrete Portion of Section 5, Looking West.*



*Photo 16 – Section 5, Looking Southwest.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1D



*Photo 17 – Section 5 with Vegetation Growth, Looking South.*



*Photo 18 – Section 5 with Vegetation Growth, Looking South.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1D



*Photo 19 – Shifted Stones near Top West End of Section 5, Looking South.*



*Photo 20 – Spall in Section 5, 8' from the East End, Looking Southwest.*

**Ellicott City Retaining Walls Inspection Report**  
**Retaining Wall 1D**



*Photo 21 – Stone Masonry Wall at Top East Corner of Section 6*



*Photo 22 – Abandoned Abutment at East End of Section 6, Looking West.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1D



*Photo 23 – Section 7, Looking Southwest.*



*Photo 24 – Section 7, Looking Southwest.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1D



*Photo 25 – Section 7, Looking South.*



*Photo 26 – Undermining at East End of Section 7, Looking Southwest.*

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 1D



*Photo 27 – Vertical Fracture near West End of Section 7.*



*Photo 28 – Section 8, Looking Southwest.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1D



*Photo 29 – Section 8, Looking Southwest. Note Open and Offset Joint at Top of Wall and Missing Stones and Mortar at Bottom of Wall.*



*Photo 30 – Section 8, Looking Southwest.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1D



*Photo 31 – Section 8, Looking Southwest.  
Note Missing Mortar/Stones along the Base.*



*Photo 32 – Missing Stones/Mortar along the Base of Section 8.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1D



*Photo 33 – Section 9, Looking Southwest.*



*Photo 34 – Section 9, Void Under Pipe Outfall, Looking Southwest.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 1D



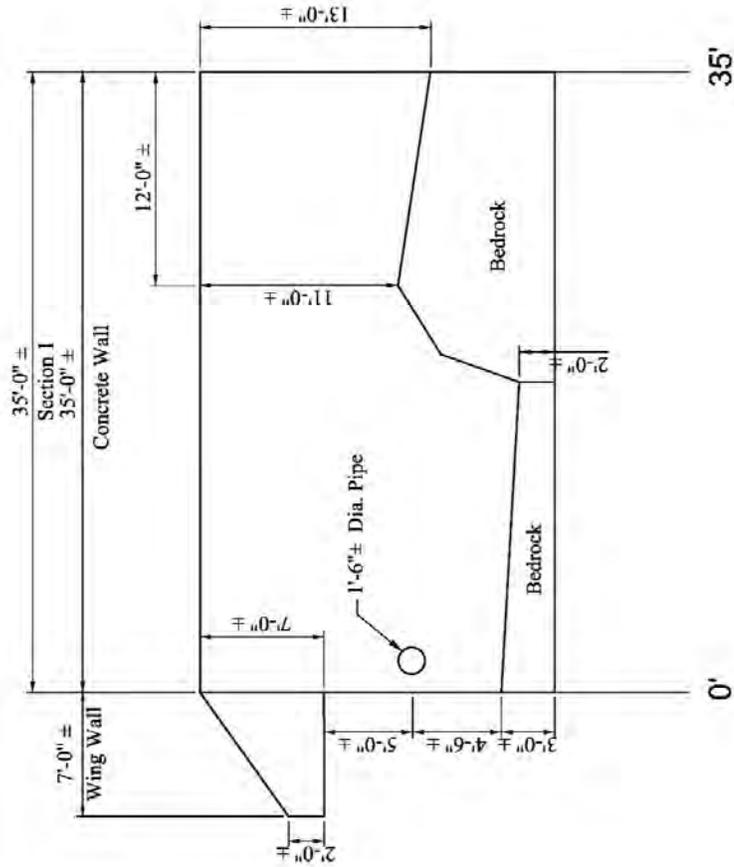
*Photo 35 – Section 10, Looking Southwest.*



*Photo 36 – Undermining, Fracture, Large Tree Growth and Loose Stacked Stones at West End of Section 10, Looking South.*

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 1D

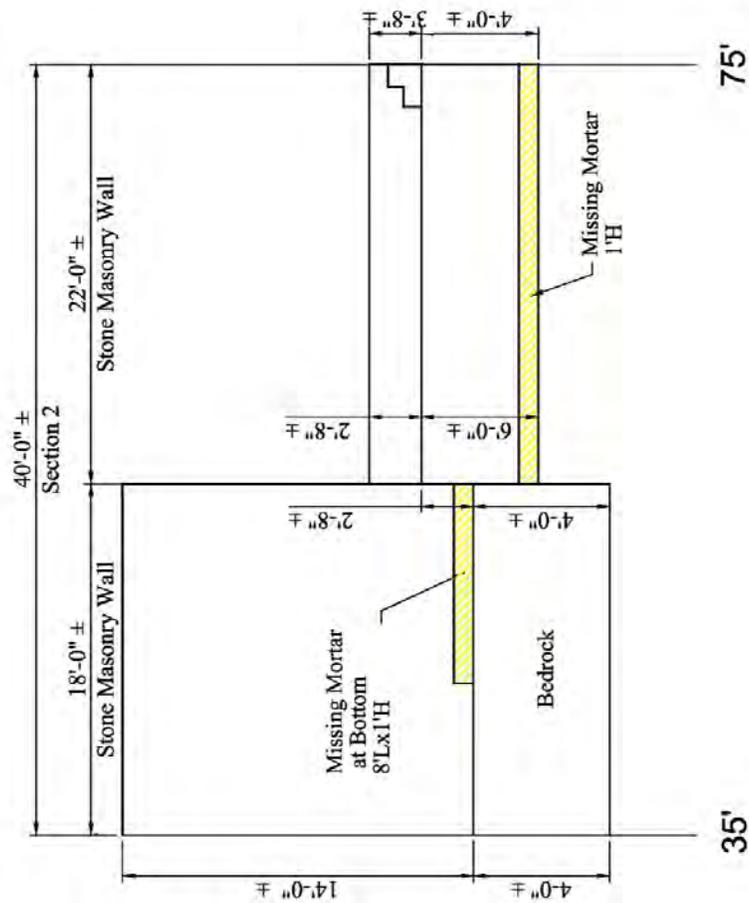


E ← → W

Retaining Wall 1D Elevation

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 1D



**PRIORITY 1**

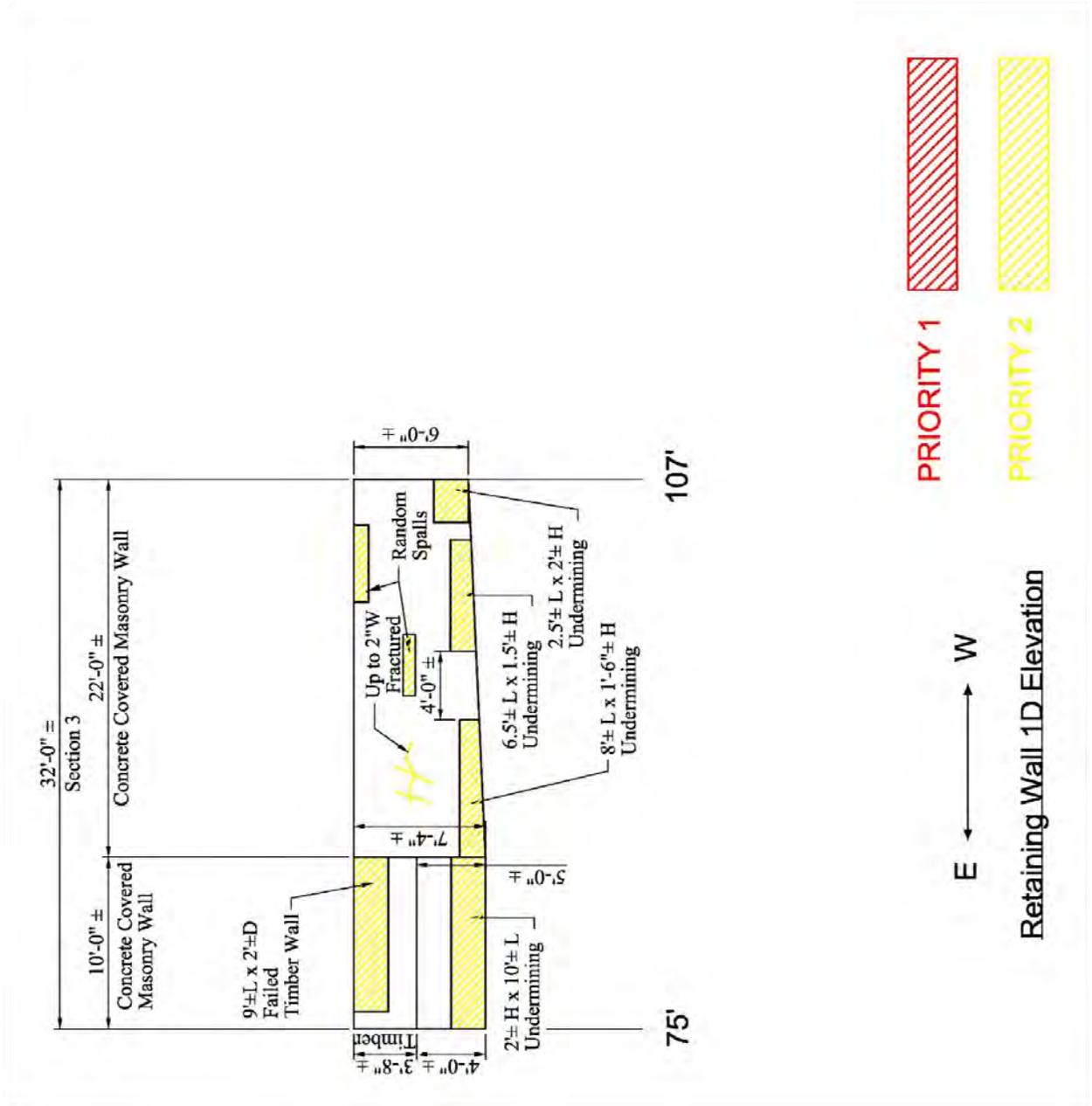
**PRIORITY 2**



Retaining Wall 1D Elevation

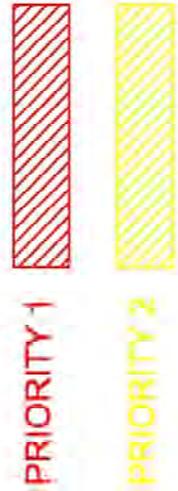
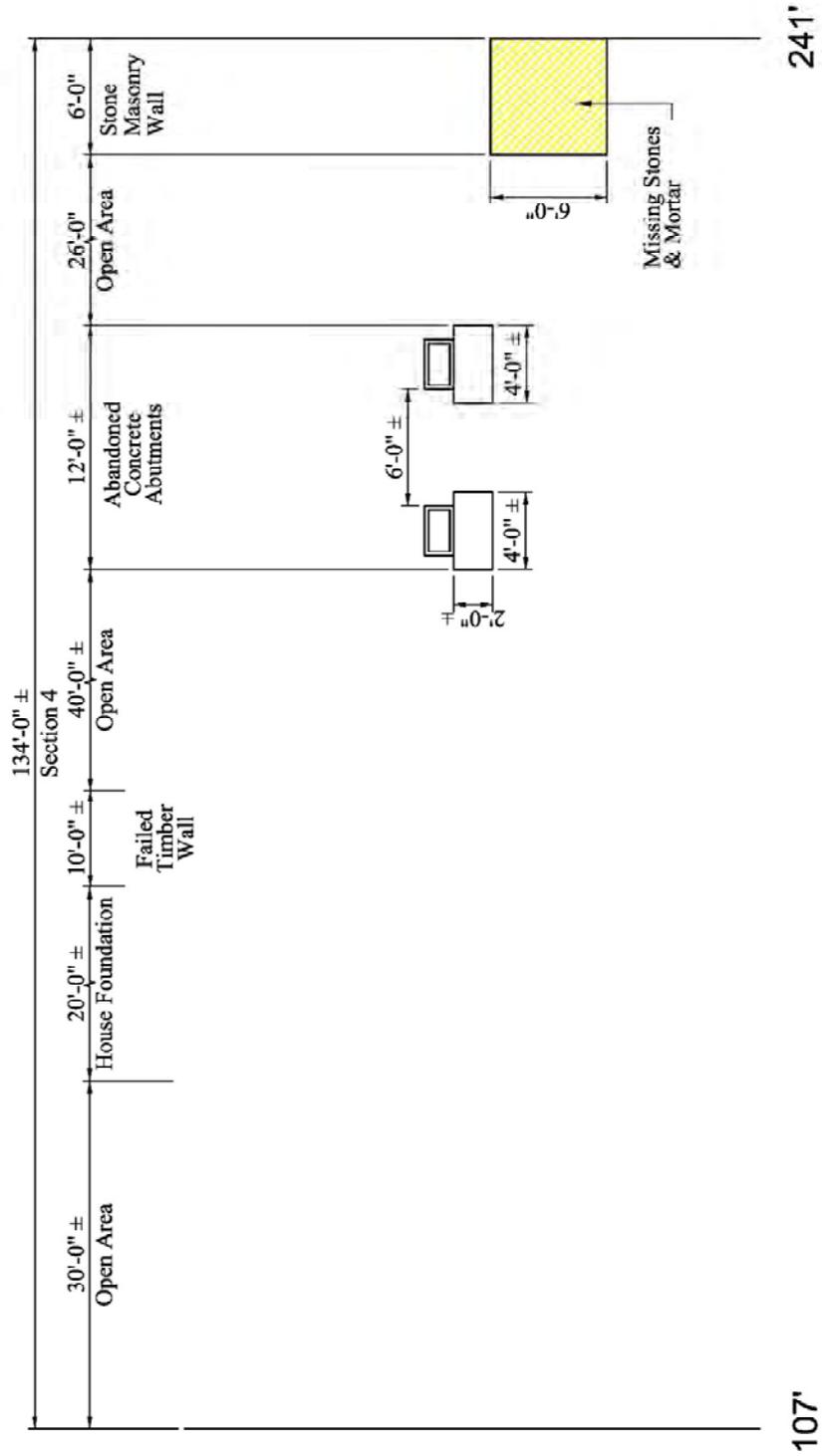
# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 1D



# Ellicott City Retaining Walls Inspection Report

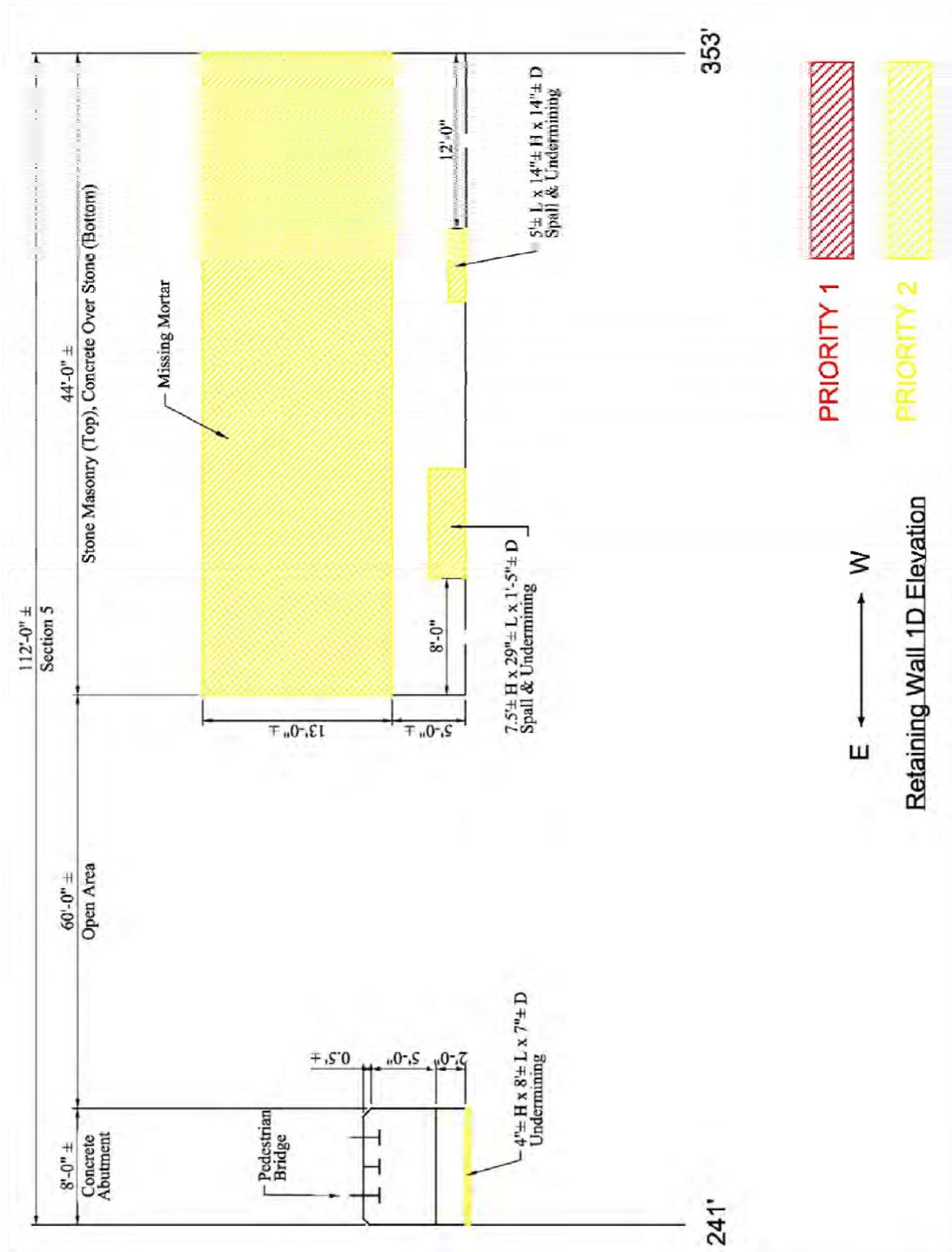
## Retaining Wall 1D



Retaining Wall 1D Elevation

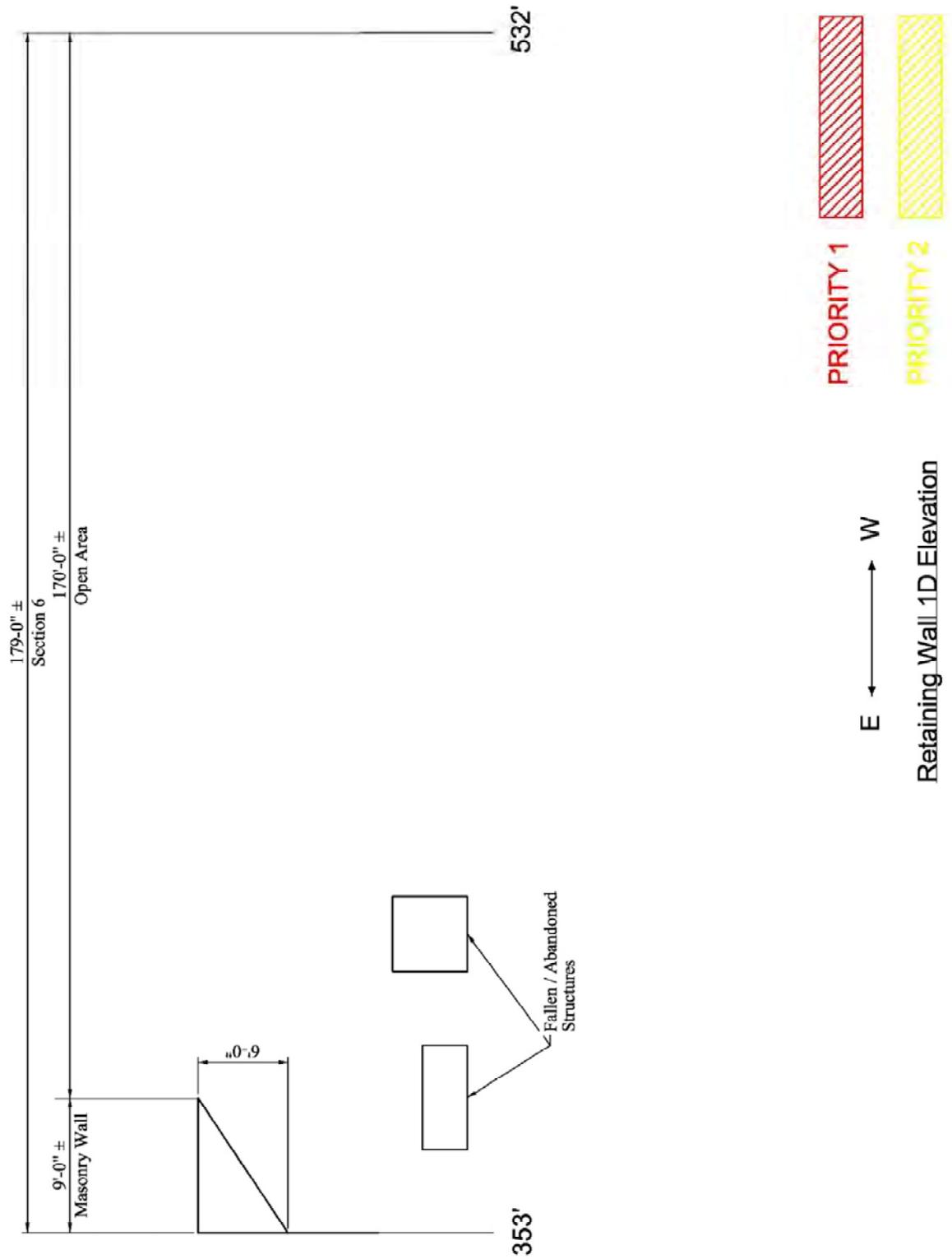
# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 1D



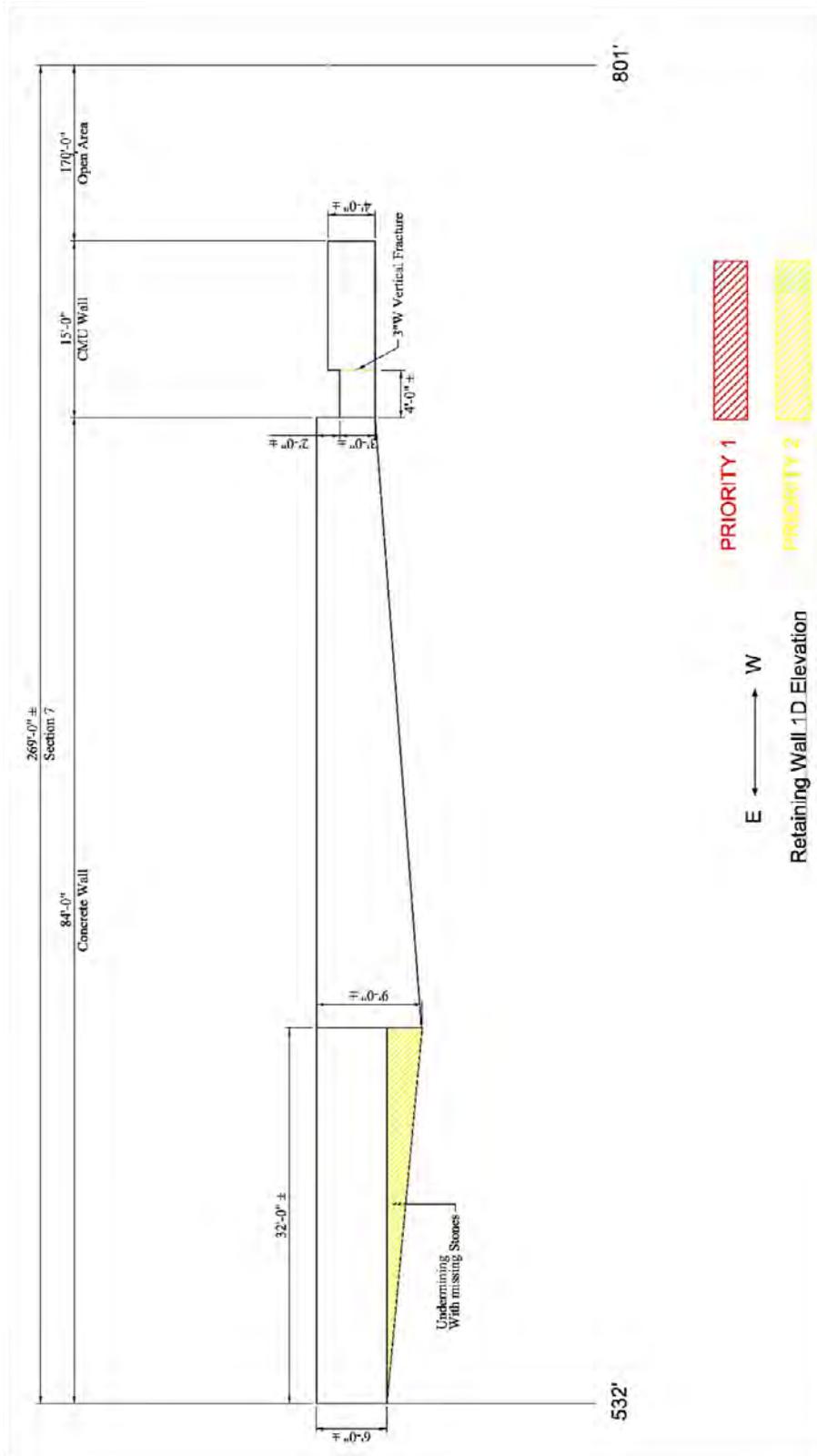
# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 1D



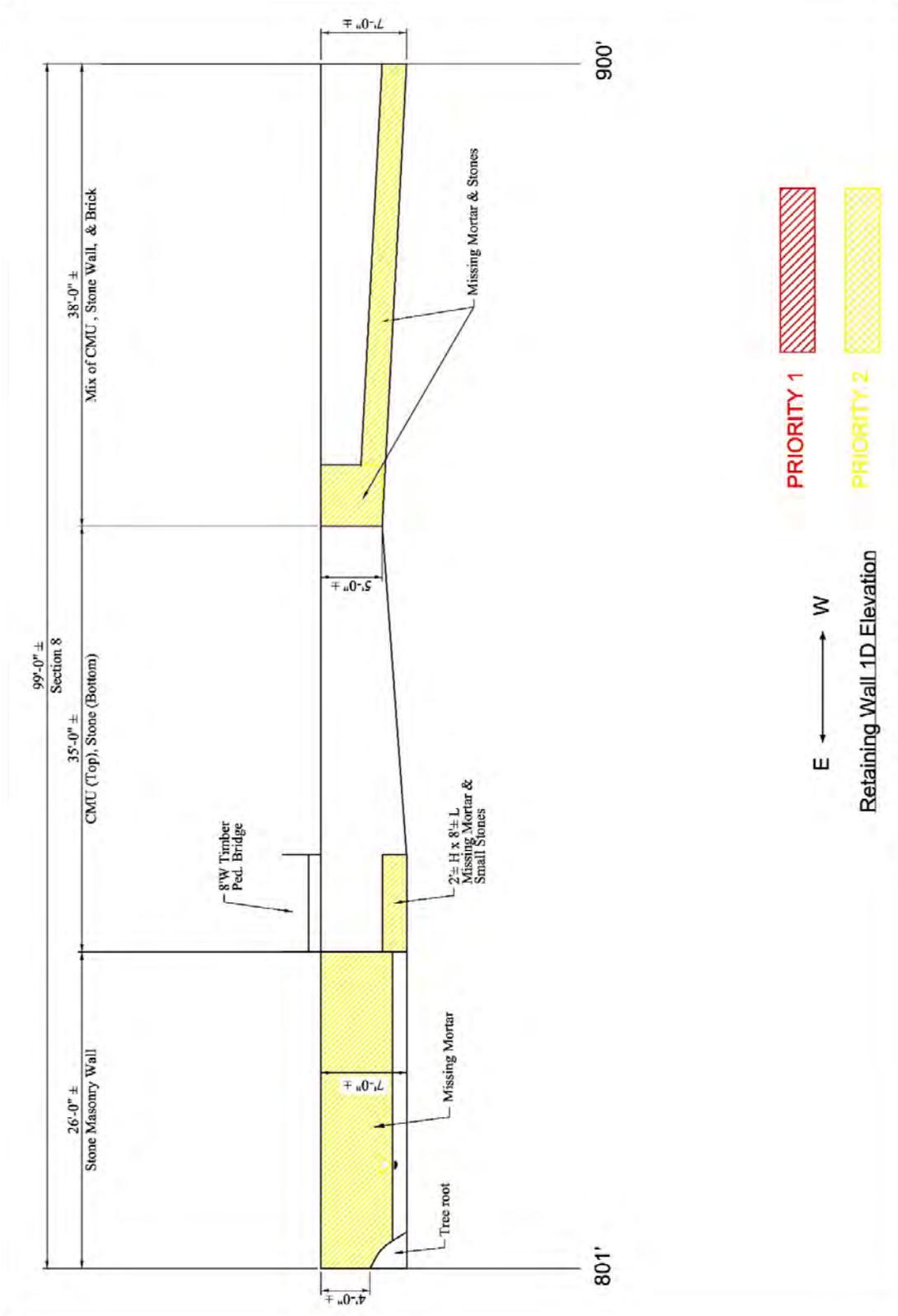
# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 1D



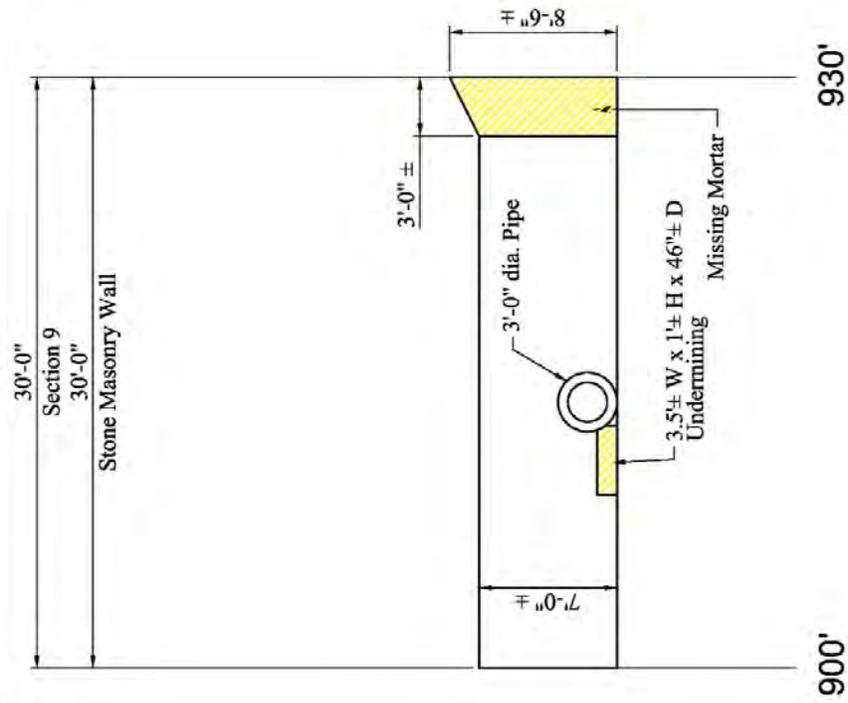
# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 1D



# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 1D



**PRIORITY 1**

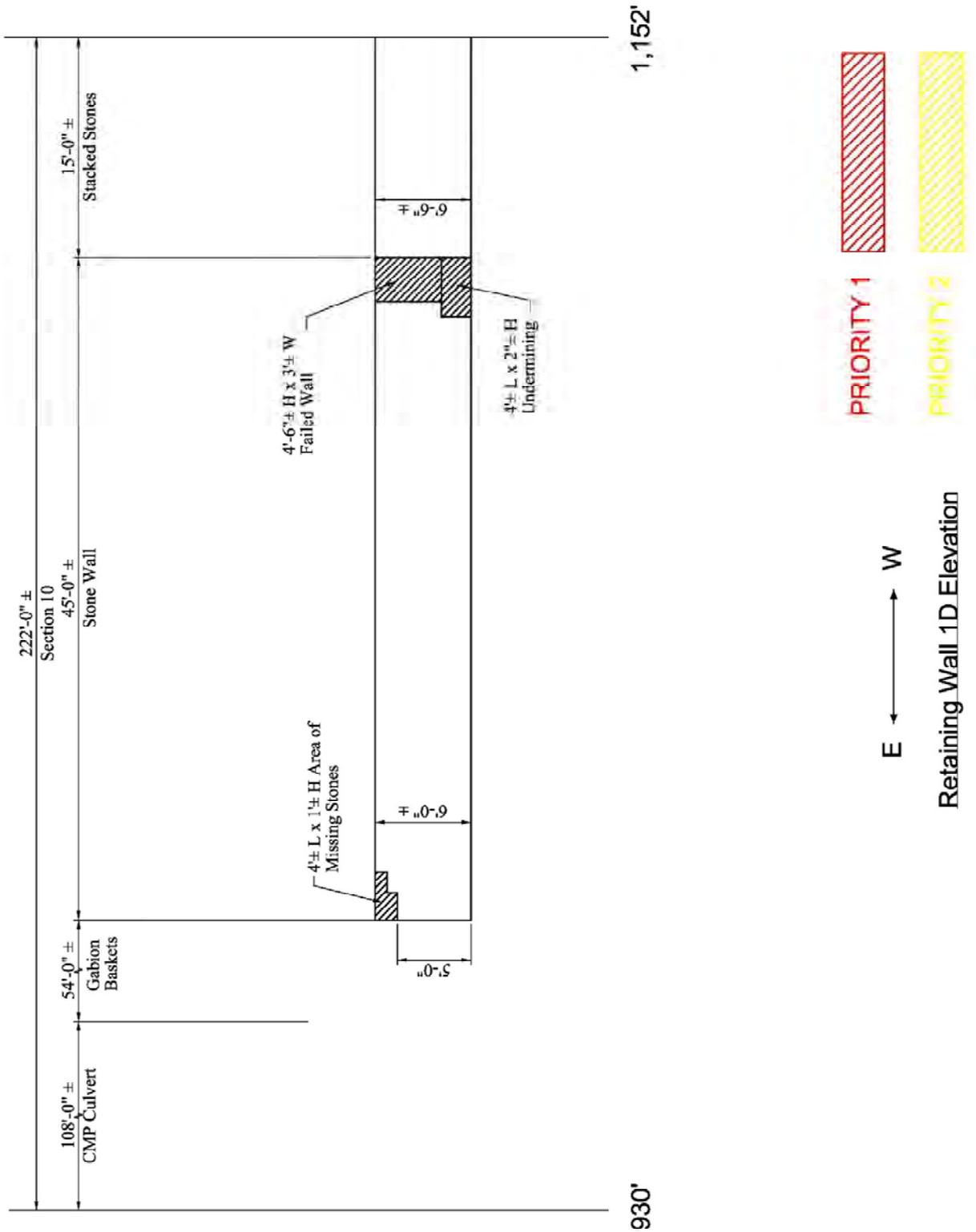
**PRIORITY 2**



Retaining Wall 1D Elevation

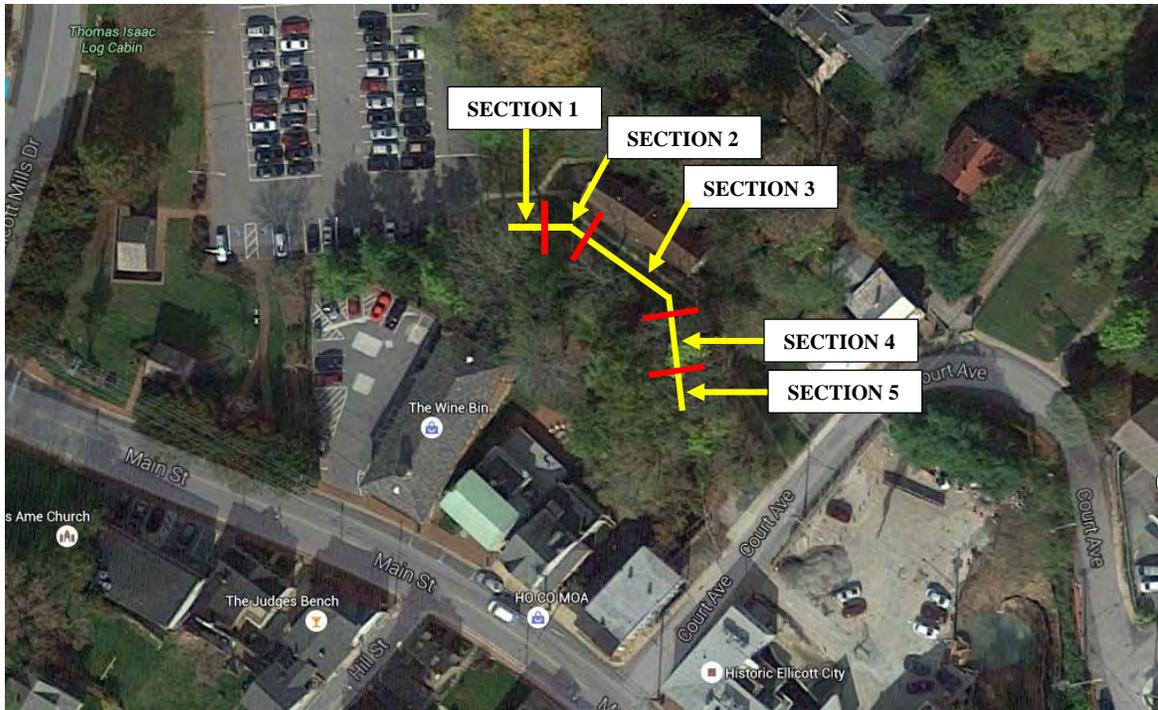
# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 1D



# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 8A



**LOCATION MAP  
EAST OF PARKING LOT F**



**PROPERTY MAP**

	= COUNTY OWNED
	= PRIVATELY OWNED

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 8A

### *Description*

Retaining Wall 8A runs along the north side of Hudson Branch, east of Parking Lot F, in Ellicott City, MD, and ends (at the east end) at Retaining Wall 9A. The wall is approximately 189'± long and varies between 4'-0"± and 12'-0"± high. The wall is comprised of stone masonry and concrete. The year built is unknown, and no previous inspection reports or plans were available.

This retaining wall inspection was performed on November 11, 2015 using waders. Access was obtained at the west end of the wall.

### *Inspection Findings*

Overall, the retaining wall is in fair condition. There are several large trees growing along the top of the wall and through the wall.

Section 1 (western 22') stone masonry exhibits missing mortar throughout the joints, with penetration into fill up to 2'-0" deep. The soil along the top backside of the wall is soft with minor depressions, which may be evidence of sinkholes. At the west end of the wall, there is a 15'-0" long area of embankment erosion up to 5'-0" high, with exposed tree root systems and evidence of wall failure (see Photo 5). Starting 4' from the west end of the wall, there is a 1'-6" high x 13'-0" long section at the top of the wall which is leaning south, toward the stream channel, up to 5" (see Photo 6). There is a void measuring 1'-4" high x 2'-6" wide in this area, with penetration up to 2'-0" deep (see Photo 6). At the east end of Section 1, there is a concrete culvert at the base of the retaining wall (see Photo 7). There is a void at the top west corner of the culvert, measuring 1'-0" high x 5" wide x 9" deep (see Photo 8).

Section 2 extends from 22' to 52' from the west end. There are random missing small stones throughout, as well as missing medium sized stones along the base of the wall, with voids up to 2'-0" deep. There is vegetation growth in the voids (see Photo 9). The concrete portion of the wall (top 4') is leaning to the north, away from the stream channel, up to 2.5" at the west end and 6" at the east end. The concrete is fractured full-height x 2" wide at 39' from the west end of the wall (see Photo 9). Starting 38' from the west end of the wall, there is a void between the concrete portion and stone masonry portion of the wall, measuring 2'-4" high x 12'-0" long x 1'-5" deep with exposed root systems (see Photo 10).

Section 3 extends from 52' to 112' from the west end of the wall. There are three voids in the wall within the western 6' length of Section 3, measuring up to 1'-5" high x 2'-6" wide x 2'-0" deep with exposed fill (see Photo 11). The top of the wall (concrete portion) is leaning up to 1'-0" towards the north within the western 20' length of Section 3 (see Photo 12). There are random small voids along the base of the wall throughout Section 3, with penetration up to 1'-8" deep (see Photo 13).

Section 4 extends from 112' to 121' from the west end of the wall. There is minor cracking in the concrete portion of the wall. There is a void located 117' from the west end of the wall, at mid-height of the wall, measuring 10" high x 1'-8" wide x 1'-9" deep (see Photo 14). Within the eastern 4' length of Section 4, the top stones of the masonry portion are pushed out 4" toward the stream channel (see Photo 15).

## Ellicott City Retaining Walls Inspection Report Retaining Wall 8A

Section 5 extends from 121' to 179' from the west end of the wall. The retaining wall has collapsed into the stream for a 58' length leading up to Retaining Wall 9A (see Photo 16).

The stream channel bottom is comprised of rocks. There was no evidence of scour or undermining along the base of the wall.

### **Recommendations**

The failed portions of wall at the east and west ends should be rebuilt. The trees growing within the vicinity of the wall are impacting the wall and should be removed immediately. The random voids throughout the wall and along the base of the wall should be filled with stone. The masonry joints should be re-pointed with mortar throughout the wall.

Retaining Wall	Repair Recommendation	Priority	Wall Section	Station	Photos	Unit	Qty.	Unit Cost	Total Est. Cost
8A	Rebuild collapsed portions of stone masonry wall.	3	1	0'	5	CY	5	\$1,000	\$5,000
			5	121'	16	CY	20	\$1,000	\$20,000
8A	Replace missing stones.	3	1	4'	6	CY	0.5	\$1,000	\$500
			2	38'	10	CY	2	\$1,000	\$2,000
			2	52'	11, 13	CY	3	\$1,000	\$3,000
			2	117'	14	CY	0.5	\$1,000	\$500
8A	Repoint the masonry joints.	M	1	0'	-	SF	110	\$35	\$3,850
			2	22'	9	SF	180	\$35	\$6,300
			3	52'	11	SF	540	\$35	\$18,900
			4	112'	14	SF	152	\$35	\$5,320
8A	Remove trees / vegetation growth in the vicinity of the wall.	V	-	-	-	LS	1	\$10,000	\$10,000
<b>Total Repair Costs</b>								<b>\$75,370</b>	

Note: These estimated costs are approximate and should only be used as a reference and for project planning purposes. Although they represent the costs for individual repair activities, they may not represent the total cost of a complete repair/rehabilitation project. Costs for items such as Design, Permitting, Mobilization/Demobilization, Maintenance of Traffic, Stream Diversion, Submittal Reviews, etc. would have to be added to the costs provided to develop a comprehensive project cost.

**THIRD PRIORITY** (Designated as "3") - The third priority items include defects which exist at portions of the retaining wall which do not support pedestrian areas (along natural slopes). Failure of the wall in these areas may redirect the stream or cause flooding; however, there is less of an immediate threat to pedestrians if left untreated.

**MAINTENANCE** (Designated as "M") - This item includes preventative maintenance. These repairs will increase the life span of the retaining wall and should be completed as funds become available. Maintenance items include clearing vegetation from stone masonry joints and repointing the joints.

**VEGETATION REMOVAL** (Designated as "V") - This item includes the removal of vegetation growth, including mature trees, from the vicinity of the retaining walls. These repairs should be completed as funds become available; however, vegetation will continue to impact the retaining walls until removed.

## Ellicott City Retaining Walls Inspection Report Retaining Wall 8A



*Photo 1 – Backside from West End, Looking East.*



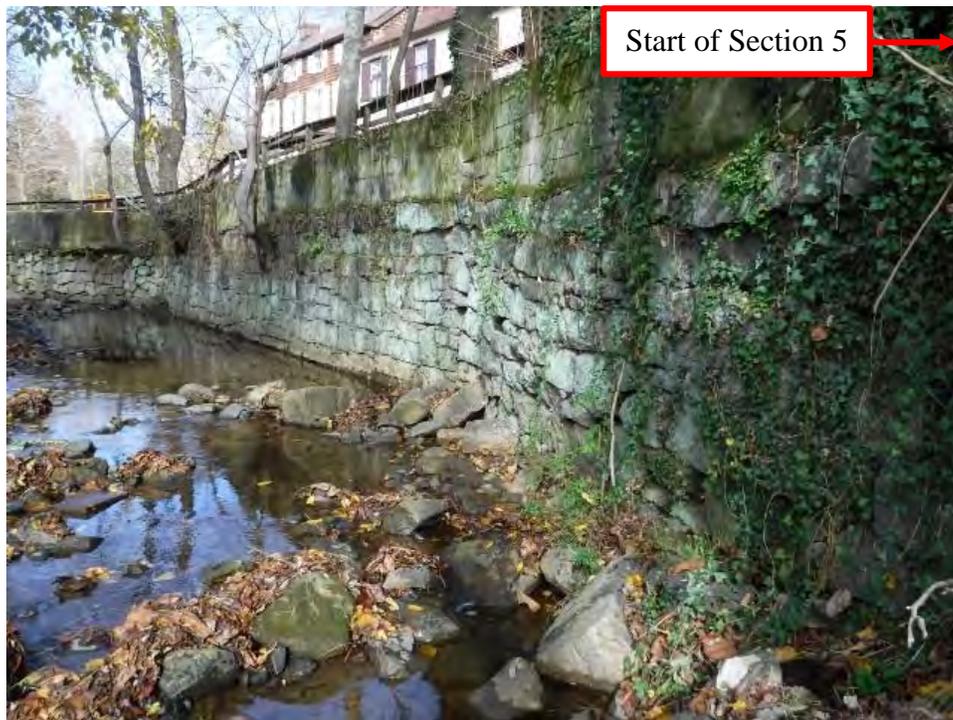
*Photo 2 – Backside from East End, Looking West.*

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 8A



*Photo 3 – Elevation of Wall, Looking East from West End.*



*Photo 4 – Elevation of Wall, Looking West From East End.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 8A



*Photo 5 – Wall Failure and Embankment Erosion at West End of Section 1.*



*Photo 6 – Stone Movement and Void at Top of Wall, 4' from West End of Wall.*

**Ellicott City Retaining Walls Inspection Report**  
**Retaining Wall 8A**



*Photo 7 – Elevation of Section 1, Looking Northwest.*



*Photo 8 – Void at Top West Corner of Concrete Culvert in Section 1.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 8A



*Photo 9 – Elevation of Section 2, Looking North.  
Note Missing Mortar, Voids, and Fractured Concrete.*



*Photo 10 – Void beneath Concrete Portion in Section 2, Looking Northeast.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 8A



*Photo 11 – Elevation of Section 3, Looking East.  
Note Missing Mortar, Voids, and Vegetation Growth.*



*Photo 12 – Top of Wall Leaning to North in Section 3, Looking East.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 8A



*Photo 13 – Typical Voids along Base of Section 3.*



*Photo 14 – Elevation of Section 4, Looking East.  
Note Missing Mortar and Void.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 8A



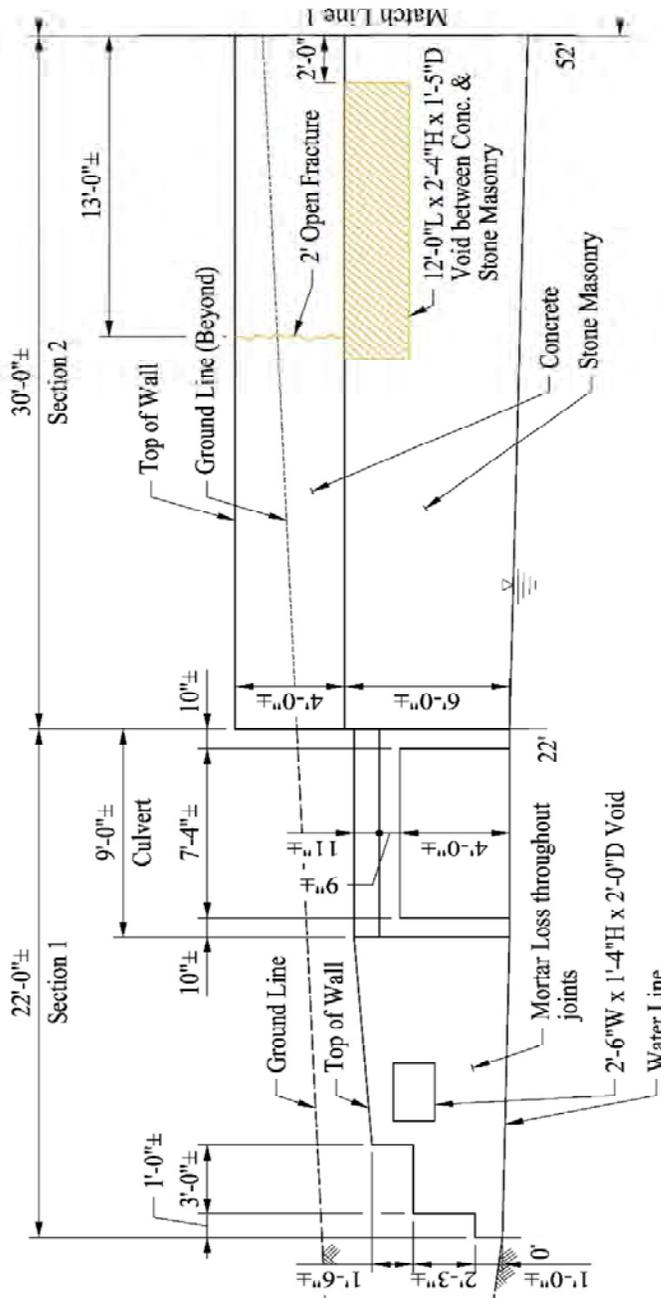
*Photo 15 – Misaligned Stones at West End of Section 4, Looking North.*



*Photo 16 – Failed Portion of Wall in Section 5, Looking East.*

# Ellicott City Retaining Walls Inspection Report

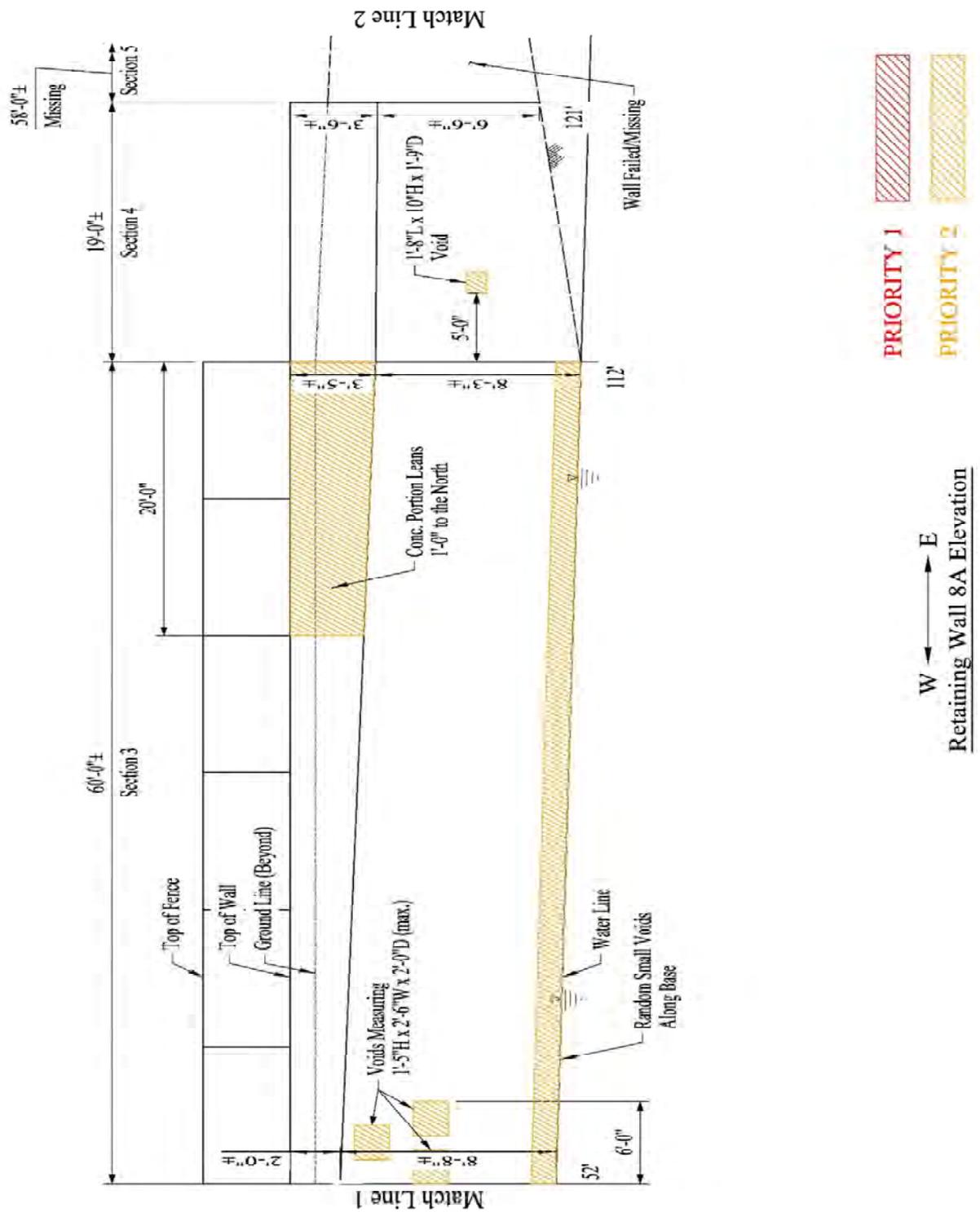
## Retaining Wall 8A



W ← → E  
Retaining Wall 8A Elevation

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 8A



# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 8B

### *Description*

Retaining Wall 8B runs along the south side of Hudson Branch, east of Parking Lot F, in Ellicott City, MD (See Photos 1-4). Retaining Wall 8B ends (at the east end) at Retaining Wall 9B. The wall is approximately 147'± long and 5'-0"± high. The wall is comprised of stone masonry. The year built is unknown, and no previous inspection reports or plans were available.

The retaining wall inspection was performed on November 11, 2015 using waders. Access was obtained at the west end of the wall.

### *Inspection Findings*

Overall, the retaining wall is in fair condition. Section 1 (western 23') is comprised of stone masonry. At the west end, there is a large corrugated metal pipe culvert which sits in front of the retaining wall (see Photo 1). There is missing mortar throughout the masonry joints and vegetation growth along the top of the wall (see Photo 2).

Section 2 extends from 23' to 53' from the west end of the wall. The wall has failed and the bank is eroded from 23' to 40' from the west end of the wall (see Photo 3). The stone masonry wall in Section 2 is covered by vegetation growth. The masonry joints exhibit missing mortar. At the east end of Section 2, there is a 4'-0" wide area with loose and bulging stones with penetration up to 3'-4" deep, due to a large tree growing at the top of the wall (see Photo 4).

Section 3 extends from 53' to 103' from the west end of the wall. There is missing mortar in the joints and vegetation growth along the top of the wall (see Photo 5). A 17'-0" length of the wall near the east end is buried under soil and vegetation (see Photo 6).

Section 4 extends from 103' to 135' from the west end of the wall. There is a large tree growing at the top of the wall at the west end of Section 4, and the wall exhibits missing stones within a 3'-0" wide area below the tree (see Photo 7). At 3' from the east end of Section 4, the wall is fractured full height x 10" wide with exposed fill (see Photo 8).

Section 5 (eastern 18') exhibits loose and bulging stones. At the east end, portions of the wall have collapsed and the banks are eroded leading up to Retaining Wall 9B (see Photo 10).

The stream channel bottom is comprised of rocks. There was no evidence of scour or undermining along the base of the wall.

## Ellicott City Retaining Walls Inspection Report

### Retaining Wall 8B

#### *Recommendations*

Vegetation growth including mature trees is impacting the wall. The trees and vegetation should be removed immediately. The failed portions of wall should be rebuilt, providing proper drainage. The masonry joints should be re-pointed with mortar throughout the wall.

Retaining Wall	Repair Recommendation	Priority	Wall Section	Station	Photos	Unit	Qty.	Unit Cost	Total Est. Cost
8B	Rebuild collapsed and failing portions of stone masonry wall.	2	2	23'	3	CY	3	\$1,000	\$3,000
		3	5	135'	10	CY	2	\$1,000	\$2,000
8B	Replace missing stones.	2	4	103'	7	CY	1	\$1,000	\$1,000
8B	Repoint the masonry joints.	M	1	0'	2	SF	115	\$35	\$4,025
			2	40'	-	SF	65	\$35	\$2,275
			3	53'	5	SF	250	\$35	\$8,750
8B	Remove trees / vegetation growth in the vicinity of the wall.	V	-	-	-	LS	1	\$10,000	\$10,000
<b>Total Repair Costs</b>									<b>\$31,050</b>

Note: These estimated costs are approximate and should only be used as a reference and for project planning purposes. Although they represent the costs for individual repair activities, they may not represent the total cost of a complete repair/rehabilitation project. Costs for items such as Design, Permitting, Mobilization/Demobilization, Maintenance of Traffic, Stream Diversion, Submittal Reviews, etc. would have to be added to the costs provided to develop a comprehensive project cost.

**THIRD PRIORITY** (Designated as "3") - The third priority items include defects which exist at portions of the retaining wall which do not support pedestrian areas (along natural slopes). Failure of the wall in these areas may redirect the stream or cause flooding; however, there is less of an immediate threat to pedestrians if left untreated.

**MAINTENANCE** (Designated as "M") - This item includes preventative maintenance. These repairs will increase the life span of the retaining wall and should be completed as funds become available. Maintenance items include clearing vegetation from stone masonry joints and repointing the joints.

**VEGETATION REMOVAL** (Designated as "V") - This item includes the removal of vegetation growth, including mature trees, from the vicinity of the retaining walls. These repairs should be completed as funds become available; however, vegetation will continue to impact the retaining walls until removed.

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 8B



*Photo 1 – West End of Section 1, Looking South.*



*Photo 2 – Section 1, Looking East  
Note Missing Mortar and Vegetation Growth.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 8B



*Photo 3 – Failed Portion of Section 2, Looking Southwest.*



*Photo 4 – Section 2, Loose Stones at Large Tree.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 8B



*Photo 5 – Section 2, Looking East.  
Note Vegetation Growth.*



*Photo 6 – Section 3, Looking West.  
Note Buried Portion of Wall.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 8B



*Photo 7 – Section 4, Large Tree and Missing Stones at Top of Wall.*



*Photo 8 – Fracture at East End of Section 4, Looking Southwest.*

**Ellicott City Retaining Walls Inspection Report**  
**Retaining Wall 8B**



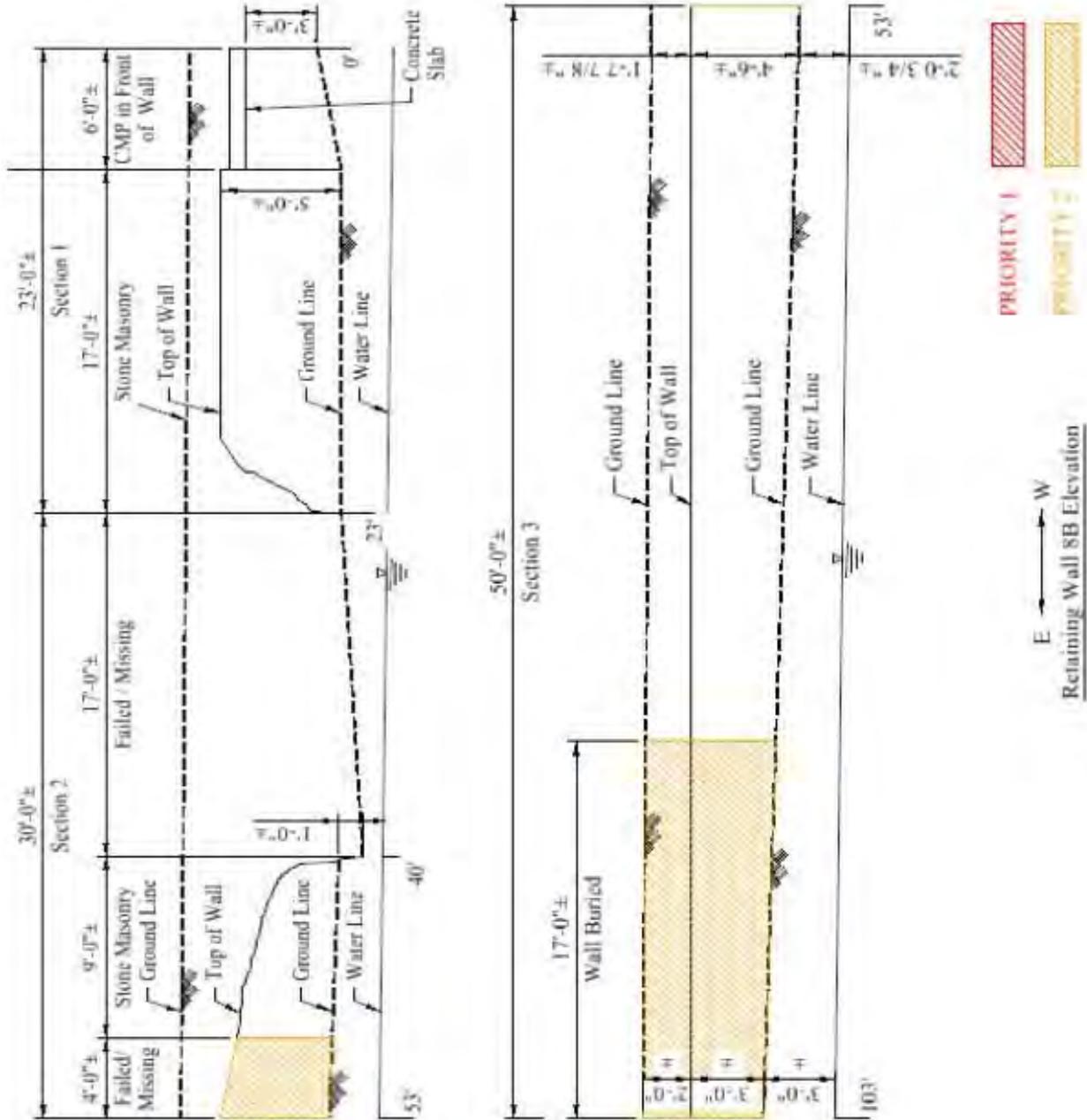
*Photo 9 – Sections 4 and 5, Looking East.*



*Photo 10 – Section 5 Remnants of Wall with Surrounding Erosion at East End, Looking Southwest.*

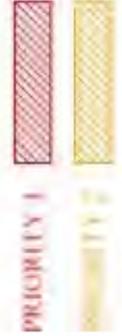
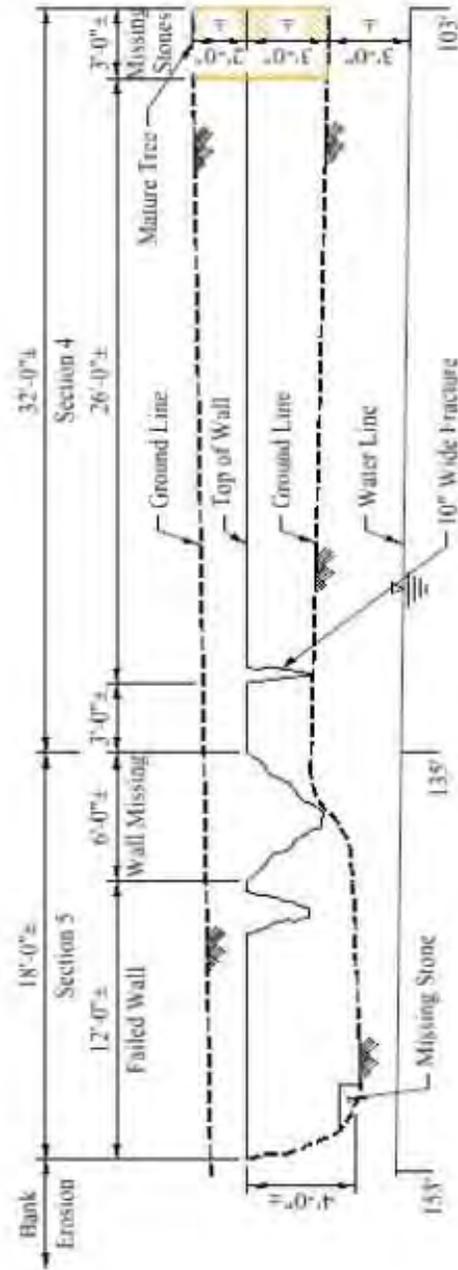
# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 8B



# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 8B



E ← → W  
 Retaining Wall 8B Elevation

# Ellicott City Retaining Walls Inspection Report

## Retaining Walls 9A & 9B



**LOCATION MAP  
WEST OF COURT AVENUE**



**PROPERTY MAP**

- = COUNTY OWNED
- = PRIVATELY OWNED

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 9A

### *Description*

Retaining Wall 9A runs along the north side of Hudson Branch, west of Court Avenue, in Ellicott City, MD (See Photo 1). The wall is approximately 42'± long and 10'-0"± high. The lower portion of the wall (4'-4" H) is comprised of stone masonry, while the upper portion (5'-8" H) is comprised stone and brick columns. The year built is unknown, and no previous inspection reports or plans were available.

The retaining wall inspection was performed on October 21, 2015 using waders. Access was obtained via a stairwell at the west end of the wall.

### *Inspection Findings*

Overall, the retaining wall is in serious condition. There are random failed mortar joints within the lower stone masonry portion (see Photo 2). At the west end of the wall, the upper portion is leaning toward the stream channel, with a gap up to 1" wide at the bottom of the back face of the wall (see Photo 3). This area was noted in a Critical Findings Memo to Howard County on October 30, 2015. There are steel I-beams which span the stream channel and penetrate into the stone at the upper portion of the retaining wall. These I-beams support a timber deck over the stream, which is private property (see Photo 4). The retaining wall is loose and bulging with missing stones in the vicinity of the I-beams (see Photo 5). The timber deck above the retaining wall is sagging at its northeast corner (see Photo 6). The area was roped off at the time of inspection.

The stream channel bottom is comprised of rocks. There is a mature tree growing in front of the wall, located at approximately 5'-0" from the west end of the wall (see Photo 2). There was no evidence of scour or undermining along the base of the wall.

### *Recommendations*

The mature tree growing in front of the wall should be removed. Due to the bulging, loose, and leaning portions of the wall, the upper portion of the retaining wall (5'-8" H) should be removed and replaced. The lower stone masonry portion (4'-4" H) of the wall can remain in place; however, the mortar joints should be re-pointed.

Retaining Wall	Repair Recommendation	Priority	Wall Section	Station	Photos	Unit	Qty.	Unit Cost	Total Est. Cost
9A	Remove the timber deck and rebuild the upper portion of the retaining wall, addressing settlement and providing proper drainage.	1	1	-	3-6	CY	13	\$1,000	\$13,000
9A	Repoint the masonry joints.	1	1	-	2	SF	182	\$35	\$6,370
9A	Remove the mature tree growing in front of the wall.	V	1	5'	2	LS	1	\$2,000	\$2,000
<b>Total Repair Costs</b>									<b>\$21,370</b>

Note: These estimated costs are approximate and should only be used as a reference and for project planning purposes. Although they represent the costs for individual repair activities, they may not represent the total cost of a complete repair/rehabilitation project. Costs for items such as Design, Permitting, Mobilization/Demobilization, Maintenance

## **Ellicott City Retaining Walls Inspection Report**

### **Retaining Wall 9A**

of Traffic, Stream Diversion, Submittal Reviews, etc. would have to be added to the costs provided to develop a comprehensive project cost.

**FIRST PRIORITY** (Designated as "1") - The first priority repairs include those portions of retaining wall which are failing and pose an immediate safety threat to homeowners and pedestrians. These portions of wall should be repaired immediately. This includes portions of Retaining Walls 9A and 17A (Emergency repairs at Wall 17B have been constructed). These areas were noted in a Critical Findings Memo to Howard County on October 30, 2015. The portions of the buildings above the walls in question should be inspected for structural integrity. This includes, but is not limited to, the properties at 8249, 8247, 8239, 8231, 8227, 8081 Main Street.

**VEGETATION REMOVAL** (Designated as "V") - This item includes the removal of vegetation growth, including mature trees, from the vicinity of the retaining walls. These repairs should be completed as funds become available; however, vegetation will continue to impact the retaining walls until removed.

## Ellicott City Retaining Walls Inspection Report Retaining Wall 9A



*Photo 1 – Elevation from West End, Looking Northeast.  
Note Mature Tree Growing in Front of Wall.*



*Photo 2 – Typical Failed Mortar Joint, Portion below Deck Shown.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 9A



*Photo 3 – West End Leaning Toward Channel,  
Looking East.*

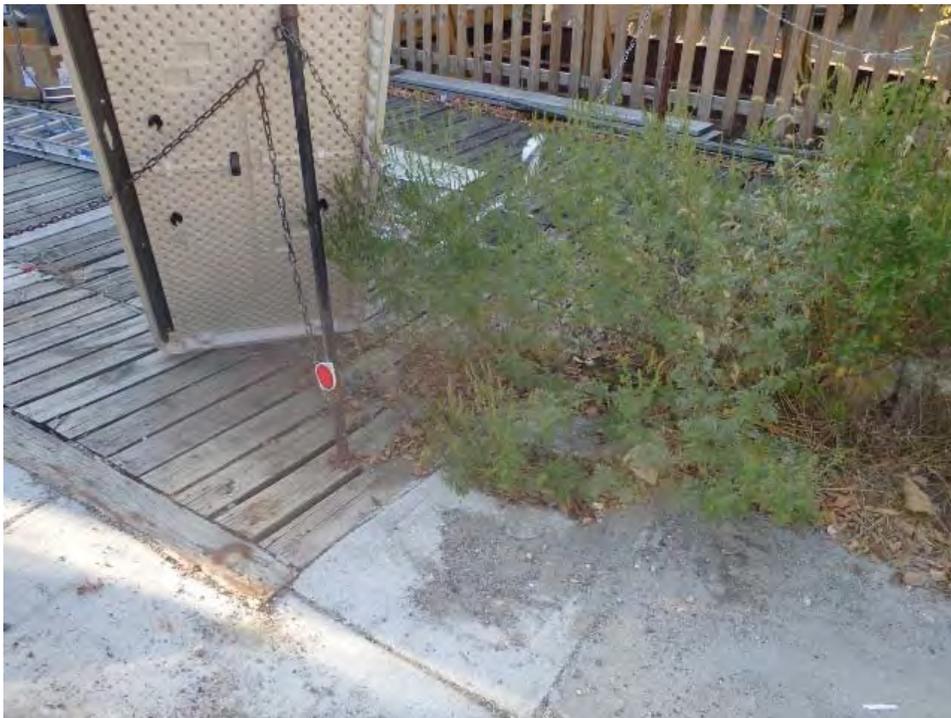


*Photo 4 – Portion below Timber Deck, Looking Northeast.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 9A



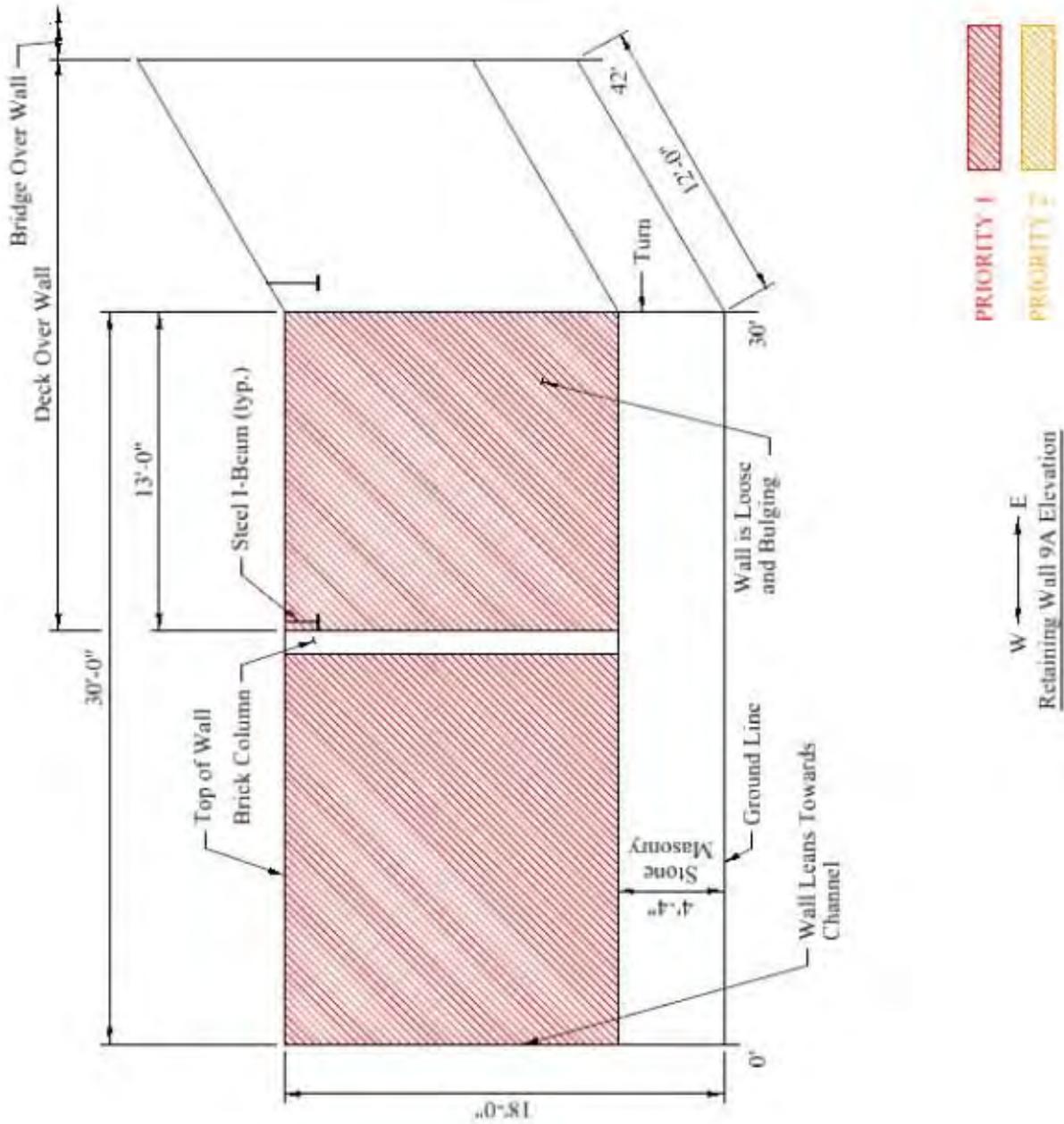
*Photo 5 – Bulged Area below Timber Deck, Looking Northeast.*



*Photo 6 – Sagging at Northeast Corner of Timber Deck, Looking Southwest.*

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 9A



# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 9B

### *Description*

Retaining Wall 9B runs along the south side of Hudson Branch, west of Court Avenue, in Ellicott City, MD. The wall is approximately 77'± long and varies between 6'-0"± high and 12'-0"± high. The wall is comprised of stone masonry. The east half of the wall is beneath a timber deck, which is private property. The year built is unknown, and no previous inspection reports or plans were available.

The retaining wall inspection was performed on October 21, 2015 using waders. Access was obtained via a stairwell at the west end of Retaining Wall 9A.

### *Inspection Findings*

Overall, the retaining wall is in poor condition. At the east end of the wall, adjacent to the Court Avenue Bridge (HO-129X), there is an 8'-0" wide repaired area at the base of the wall, consisting of a grout-covered stone pile (see Photo 1). There is typically missing mortar throughout the joints within the east half of the wall (see Photo 3). The joints could be probed to 10" deep. The west half of the retaining wall exhibited missing mortar throughout, and loose stones throughout the lower half of the wall (see Photo 4). There is a 2'-0" long fracture at the top of the wall, 12' from the west end. The west side of the fracture is leaning outward 2¼" past the east side (see Photo 5). At the west end of the wall, there is a fractured joint at mid-height which extends the full depth of the wall (see Photo 6). The bank is eroded behind the end of the wall and the wall leans toward the stream channel. The wall has failed for a 30' length between Retaining Wall 9B and Retaining Wall 8B.

The stream channel bottom is comprised of rocks. There was no evidence of scour or undermining along the base of the wall.

### *Recommendations*

Due to the large failed portion of the wall, and the fractured and offset west portion of the wall, the western 16' length of the retaining wall should be rebuilt, as well as the portion of wall between Retaining Walls 8B and 9B.

Retaining Wall	Repair Recommendation	Priority	Wall Section	Station	Photos	Unit	Qty.	Unit Cost	Total Est. Cost
9B	Repoint the masonry joints.	2	1	-	3, 4	SF	300	\$35	\$10,500
9B	Rebuild the western 16' length of the stone masonry retaining wall, as well as the wall between Retaining Walls 8B and 9B.	3	1	0'	2	CY	10.0	\$1,000	\$10,000
<b>Total Repair Costs</b>									<b>\$20,500</b>

Note: These estimated costs are approximate and should only be used as a reference and for project planning purposes. Although they represent the costs for individual repair activities, they may not represent the total cost of a complete repair/rehabilitation project. Costs for items such as Design, Permitting, Mobilization/Demobilization, Maintenance of Traffic, Stream Diversion, Submittal Reviews, etc. would have to be added to the costs provided to develop a comprehensive project cost.

## **Ellicott City Retaining Walls Inspection Report**

### **Retaining Wall 9B**

#### SECOND PRIORITY (Designated as "2")

The second priority items include defects which do not pose an immediate safety concern, but have the potential to advance to a safety threat if left untreated. These defects exist at portions of the retaining wall which support buildings, roadways, parking lots, or pedestrian areas. The repairs should be completed within 3 years.

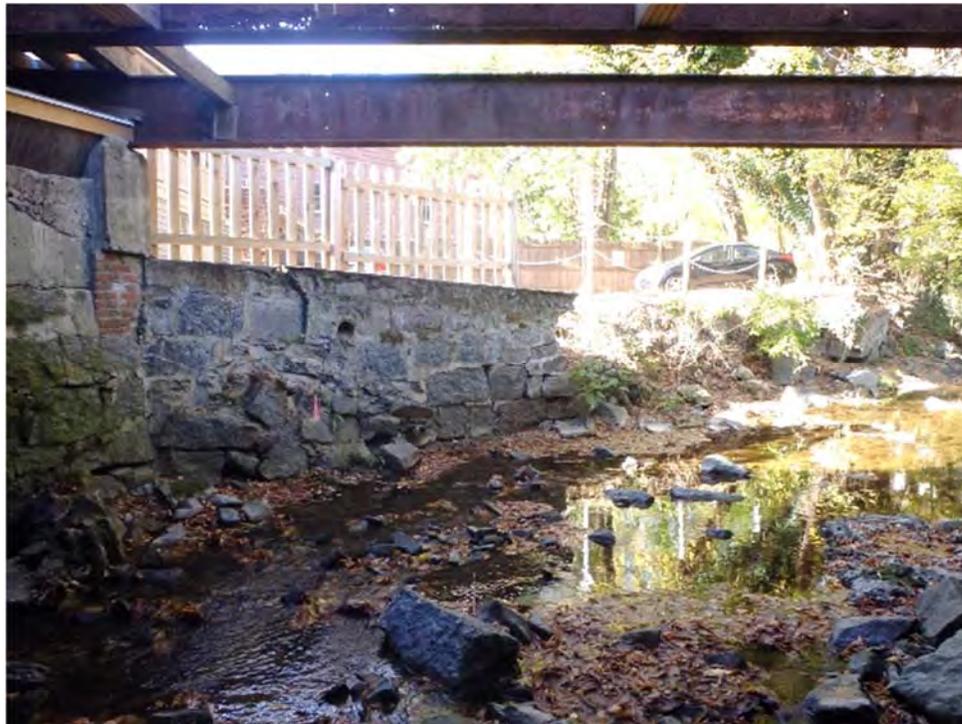
#### THIRD PRIORITY (Designated as "3")

The third priority items include defects which exist at portions of the retaining wall which do not support pedestrian areas (along natural slopes). Failure of the wall in these areas may redirect the stream or cause flooding; however, there is less of an immediate threat to pedestrians if left untreated.

## Ellicott City Retaining Walls Inspection Report Retaining Wall 9B



*Photo 1 – Elevation (East Half), Looking Southwest.  
Note Repaired Area at East End.*

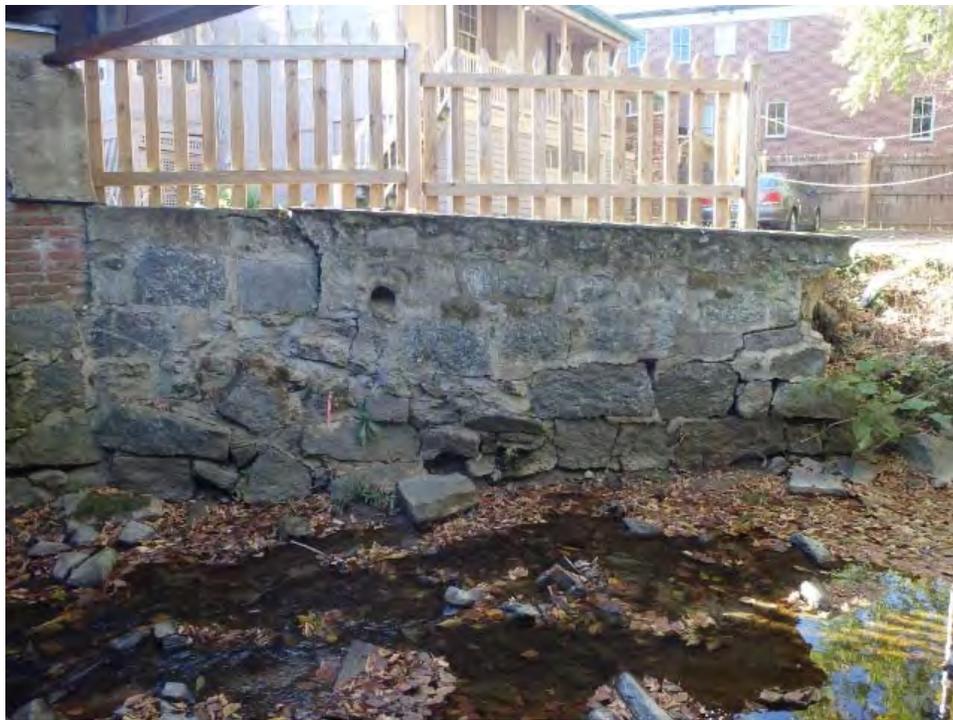


*Photo 2 – Elevation (West Half), Looking Southwest.  
Note Collapsed Wall and Bank Erosion Beyond West End.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 9B



*Photo 3 – Typical Missing Mortar in Joints Throughout East Half of Wall, Portion beneath Timber Deck Shown.*



*Photo 4 – Missing Mortar and Loose Stones along Base (West Half), Looking South.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 9B



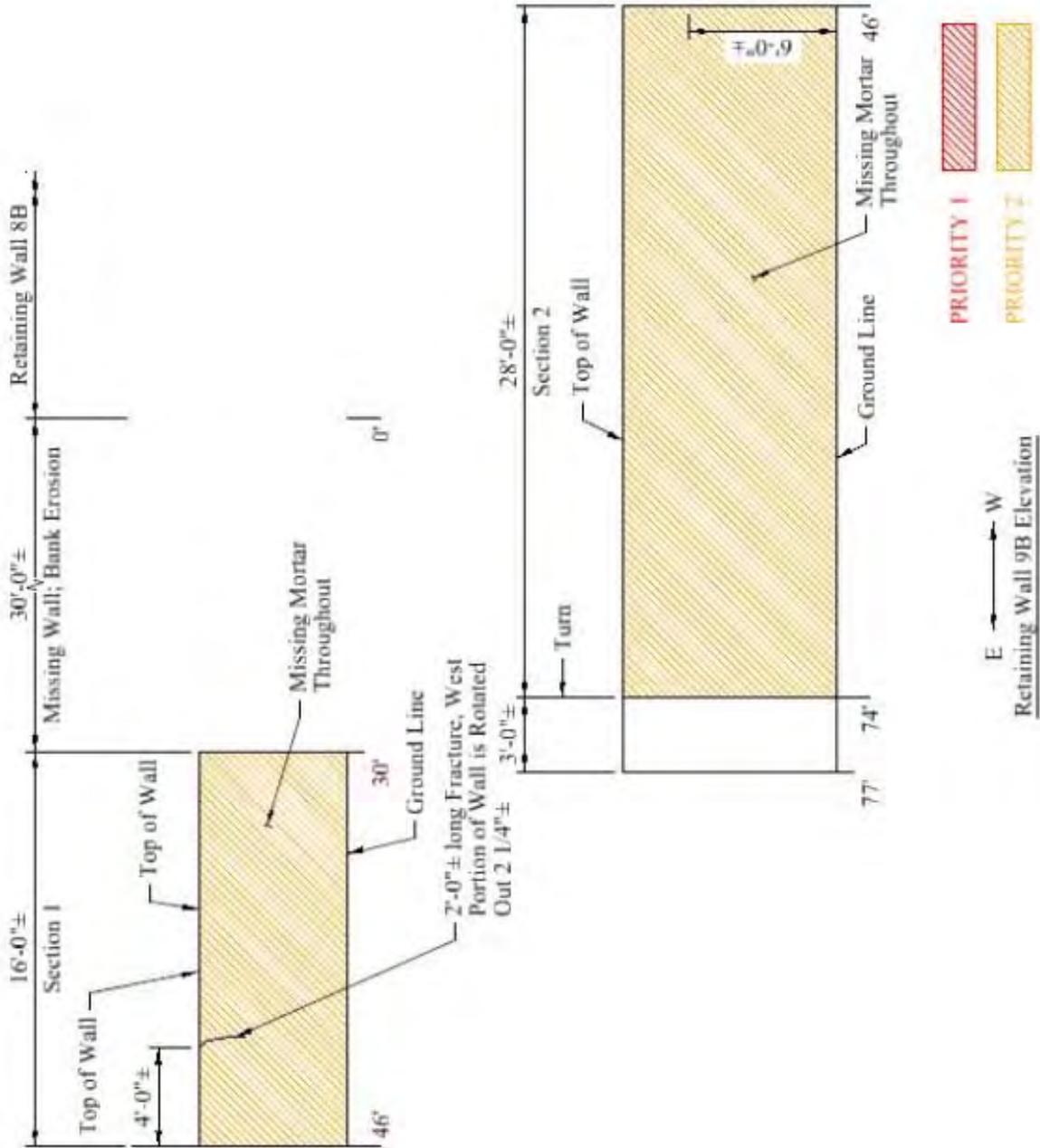
*Photo 5 – Fracture at 12' from West End, Looking West.*



*Photo 6 – Full-Depth Fracture at West End, Looking East.  
Note Erosion at End of Wall.*

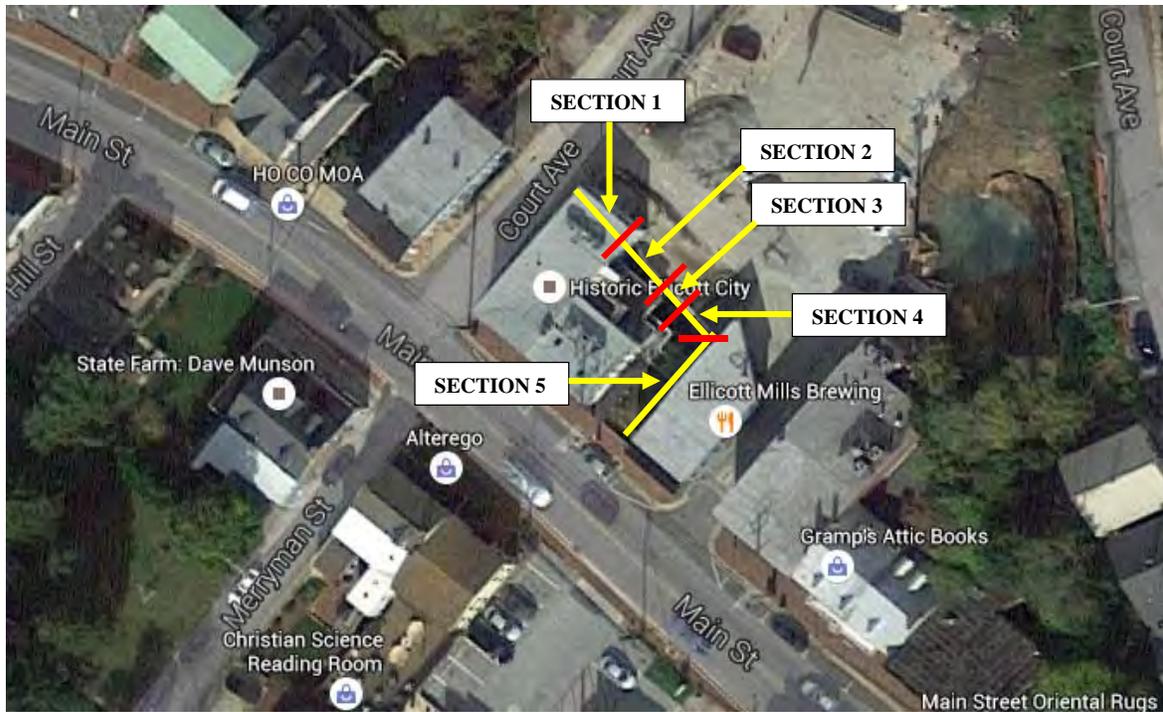
# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 9B



# Ellicott City Retaining Walls Inspection Report

## Retaining Walls 10A & 10B



**LOCATION MAP**  
**EAST OF COURT AVENUE, SOUTH OF PARKING LOT E**



**PROPERTY MAP**

- ▬ = COUNTY OWNED
- ▬ = PRIVATELY OWNED

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 10A

### *Description*

Retaining Wall 10A runs along the north side of Hudson Branch between Court Avenue and Main Street, south of Parking Lot E, in Ellicott City, MD. The wall is approximately 104'± long and 11'-0"± high. The wall is comprised of stone masonry. The east end of the wall terminates at the brick arch structure underneath Main Street. The year built is unknown, and no previous inspection reports or plans were available.

The retaining wall inspection was performed on October 21 and November 10, 2015 using waders. Access was obtained via a stairwell at the west end of Retaining Wall 9A.

### *Inspection Findings*

Overall, the retaining wall is in fair condition. Section 1 (western 10' beneath 8334 Main Street) exhibits an area of missing mortar at the base measuring 3'-0" high x 4'-0" wide, located 3' from the west end (see Photo 1). The joints could be probed up to 1'-3" deep in this area.

Section 2 extends from 10' to 28' from the west end of the wall (beneath 8320 Main Street). The stone masonry wall is in very good condition with sound mortar joints. There are steel I-beams which span the stream channel and penetrate into the stone at the top of the retaining wall, supporting a deck (see Photo 2).

Section 3 extends from 28' to 49' from the west end of the wall. The stone masonry wall is typically in very good condition with sound mortar joints. At 44' from the west end of the wall, there is a 9'-0" high x 5'-0" wide area of missing mortar at the base of the wall, with vegetation growth and penetration into the joints up to 1'-4" deep (see Photo 3).

Section 4 extends from 49' to 104' from the west end of the wall (beneath 8308 Main Street - the Ellicott Mills Brewing Company building on the west side of the alley – continuing to Main Street). At the west end of Section 4, there is a 7'-0" high x 5'-0" wide area of missing mortar with penetration into the joints up to 1'-10" deep (see Photos 4 and 5). At 55' from the west end of the wall, there is a 2'-0" high x 8'-0" wide x 6'-0" deep area of missing stones and loss of fill at the top of the wall (see Photos 4 and 6). The concrete footing is undermined starting at 58' from the west end of the wall and continuing to the east end of the wall, up to 1'-0" high x full depth (2'-6" deep) of the footing (see Photo 8). At 63' from the west end of the wall, the wall turns to the south and there is a 7'-0" high x 4'-0" wide area of missing mortar with penetration into the joints up to 1'-10" deep. There is scour up to 2'-0" deep along the concrete footing below this area (see Photo 7). At 94' from the west end of the wall, adjacent to the Main Street Arch Bridge, there is an area of missing mortar measuring 6'-0" high x 10'-0" wide, with penetration into the joints up to 2'-0" deep. There are missing stones and loss of fill beneath the drain pipe within this area (see Photo 9).

## Ellicott City Retaining Walls Inspection Report Retaining Wall 10A

### *Recommendations*

The lost fill behind the wall should be replaced, and any missing stones should be replaced. The stone masonry joints should be re-pointed in the areas of missing mortar. The undermining along the footing should be monitored for penetration past the face of the wall.

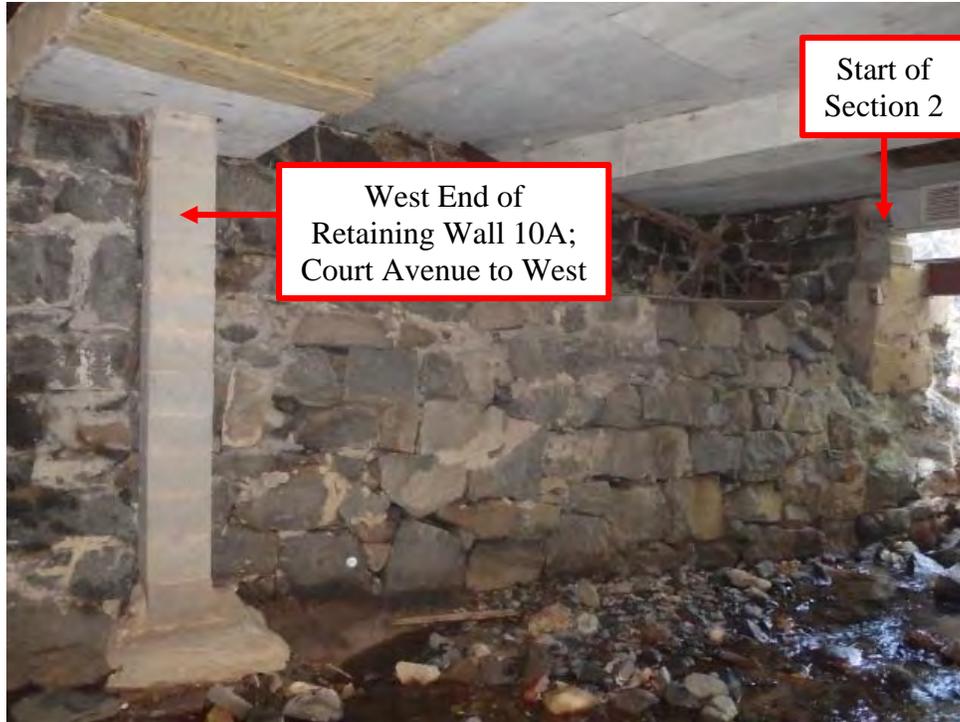
Retaining Wall	Repair Recommendation	Priority	Wall Section	Station	Photos	Unit	Qty.	Unit Cost	Total Est. Cost
10A	Backfill the areas of fill loss.	2	4	55'	4, 6	CY	4	\$50	\$200
			4	94'	9	CY	1	\$50	\$50
10A	Replace missing stones.	2	4	55'	4, 6	CY	2	\$1,000	\$2,000
			4	94'	9	CY	1	\$1,000	\$1,000
10A	Repoint the masonry joints.	2	1	3'	1	SF	12	\$35	\$420
			3	44'	3	SF	45	\$35	\$1,575
			4	49'	4, 5	SF	35	\$35	\$1,225
			4	63'	7	SF	28	\$35	\$980
			4	94'	9	SF	60	\$35	\$2,100
10A	Repair undermining with grout bags.	2	4	58'	8	CY	5	\$500	\$2,500
<b>Total Repair Costs</b>								<b>\$12,050</b>	

Note: These estimated costs are approximate and should only be used as a reference and for project planning purposes. Although they represent the costs for individual repair activities, they may not represent the total cost of a complete repair/rehabilitation project. Costs for items such as Design, Permitting, Mobilization/Demobilization, Maintenance of Traffic, Stream Diversion, Submittal Reviews, etc. would have to be added to the costs provided to develop a comprehensive project cost.

SECOND PRIORITY (Designated as "2") - The second priority items include defects which do not pose an immediate safety concern, but have the potential to advance to a safety threat if left untreated. These defects exist at portions of the retaining wall which support buildings, roadways, parking lots, or pedestrian areas. The repairs should be completed within 3 years.

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 10A



*Photo 1 – Elevation of Section 1 (beneath 8334 Main Street), Looking Northeast. Note Missing Mortar along Base of Wall.*



*Photo 2 – Elevation of Sections 2 and 3, Looking Northeast. Note Steel I-Beams Supporting Deck in Section 2 (beneath 8320 Main Street).*

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 10A



*Photo 3 – Elevation of Sections 2 and 3, Looking Northwest.  
Note Vegetation Growth at East End.*



*Photo 4 – Elevation of Section 4 (beneath 8308 Main Street),  
Looking Northeast.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 10A



*Photo 5 – Missing Mortar at West End of Section 4.*



*Photo 6 – Missing Stones and Loss of Fill at Top of Wall, 6'-0" from West End of Section 4.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 10A



*Photo 7 – Missing Mortar and Scour in Section 4, Looking East.*



*Photo 8 – Undermined Concrete Footing in Section 4, Looking Northeast.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 10A



*Photo 9 – Missing Mortar at East End of Wall (Section 4), with Missing Stones and Loss of Fill Beneath Drain, Looking Northeast.*





# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 10B

### *Description*

Retaining Wall 10B runs along the south side of Hudson Branch, between Court Avenue and Main Street, south of Parking Lot E, in Ellicott City, MD. The wall is approximately 100'± long and varies between 12'-0" ± high and 10'-0"± high. The wall is comprised of stone masonry. The year built is unknown, and no previous inspection reports or plans were available.

The retaining wall inspection was performed on November 10, 2015 using waders. Access was obtained via a stairwell at the west end of Retaining Wall 9A.

### *Inspection Findings*

Overall, the retaining wall is in fair condition. Section 1 (western 25' beneath 8334 Main Street) exhibits isolated areas of deteriorated mortar in the joints, with the majority missing along the bottom 1'-0" height of the wall (see Photo 2).

Section 2 extends from 25' to 52' from the west end of the wall (beneath 8320 Main Street). The stone masonry exhibits isolated areas of deteriorated mortar in the joints, and the joints could be probed up to 1'-4" deep within the lower 2'-0" of the wall (see Photo 4). There are two missing stones along the base of the wall: 1'-6" high x 8" wide x 1'-8" deep located 46' from the west end of the wall, and 10" high x 1'-4" wide x 1'-4" deep located 50' from the west end (see Photo 5).

Section 3 extends from 52' to 70' from the west end of the wall (beneath 8320 Main Street). There is missing mortar throughout the joints with penetration up to 1'-4" deep, and heavy vegetation growth (see Photo 6). There are two masonry joints open up to 4" wide x 6'-0" long, located on either side of the drain pipe near Match Line 3 (see Photos 6 and 7).

Section 4 extends from 70' to 100' from the west end of the wall (beneath 8320 Main Street). There is random missing mortar, with penetration up to 1'-0" deep into the joints (see Photo 9). At 74' from the west end of the wall, there is an area of missing stones at the top of the wall, measuring 1'-4" high x 2'-6" wide x 1'-8" deep (see Photo 10). Along the base of the wall within Section 4, there are random areas of missing stones, with the largest measuring 2'-2" high x 7'-0" wide x 2'-6" deep, located at 88' from the west end of the wall (see Photo 11). At the east end of the wall, there is a missing stone at the top, measuring 10" high x 1'-8" wide x 1'-0" deep (see Photo 12).

## Ellicott City Retaining Walls Inspection Report Retaining Wall 10B

### *Recommendations*

The missing stones should be replaced. The mortar joints should be repointed throughout the wall. Vegetation should be cleared from the wall.

Retaining Wall	Repair Recommendation	Priority	Wall Section	Station	Photos	Unit	Qty.	Unit Cost	Total Est. Cost
10B	Replace missing stones.	2	2	46'	5	CY	1	\$1,000	\$1,000
			2	50'	5	CY	1	\$1,000	\$1,000
			4	74'	10	CY	1	\$1,000	\$1,000
			4	88'	11	CY	5	\$1,000	\$5,000
			4	100'	12	CY	1	\$1,000	\$1,000
10B	Repoint the masonry joints.	2	1	0'	2	SF	50	\$35	\$1,750
			2	25'	4	SF	50	\$35	\$1,750
			3	52'	6, 7	SF	180	\$35	\$6,300
			4	70'	9	SF	50	\$35	\$1,750
10B	Remove trees / vegetation growth in the vicinity of the wall.	V	3	52'	6	LS	1	\$1,000	\$1,000
<b>Total Repair Costs</b>									<b>\$21,550</b>

Note: These estimated costs are approximate and should only be used as a reference and for project planning purposes. Although they represent the costs for individual repair activities, they may not represent the total cost of a complete repair/rehabilitation project. Costs for items such as Design, Permitting, Mobilization/Demobilization, Maintenance of Traffic, Stream Diversion, Submittal Reviews, etc. would have to be added to the costs provided to develop a comprehensive project cost.

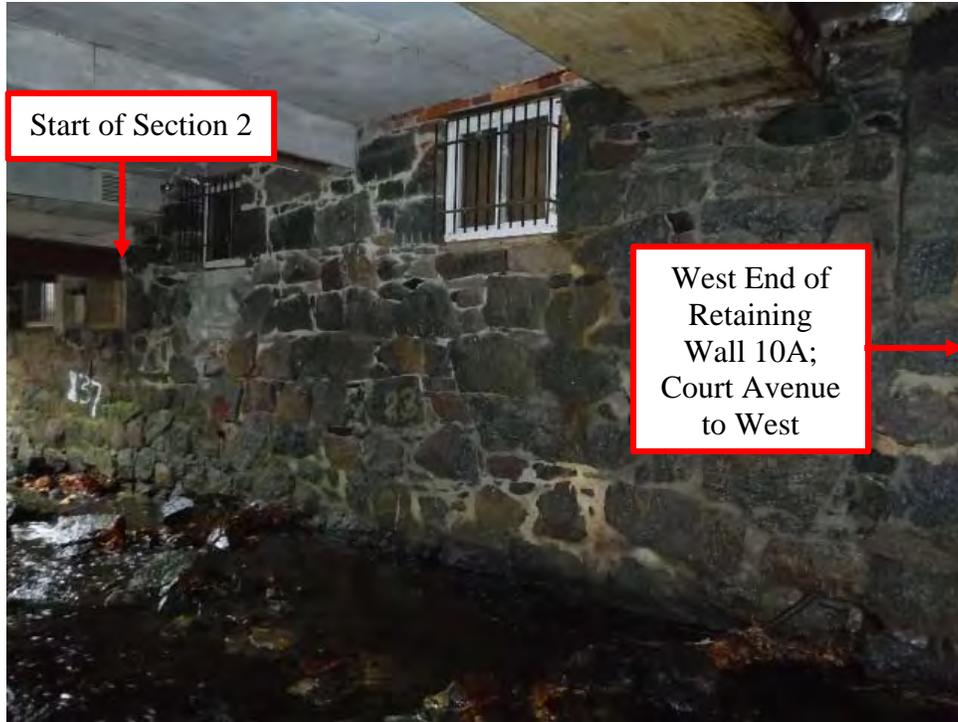
**SECOND PRIORITY** (Designated as "2") - The second priority items include defects which do not pose an immediate safety concern, but have the potential to advance to a safety threat if left untreated. These defects exist at portions of the retaining wall which support buildings, roadways, parking lots, or pedestrian areas. The repairs should be completed within 3 years.

**THIRD PRIORITY** (Designated as "3") - The third priority items include defects which exist at portions of the retaining wall which do not support pedestrian areas (along natural slopes). Failure of the wall in these areas may redirect the stream or cause flooding; however, there is less of an immediate threat to pedestrians if left untreated.

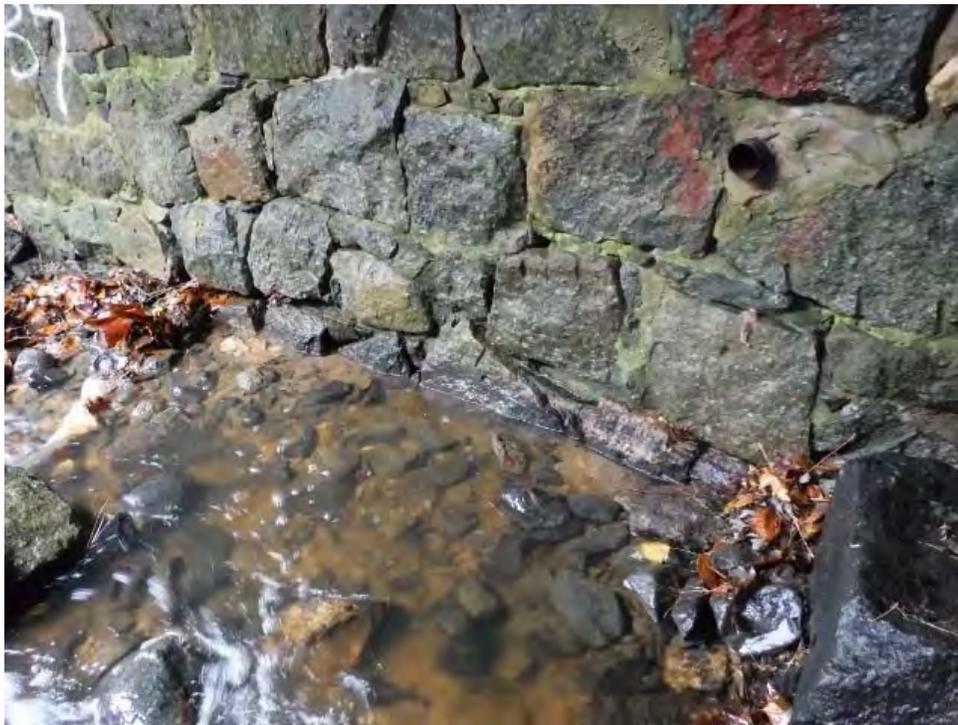
**VEGETATION REMOVAL** (Designated as "V")

This item includes the removal of vegetation growth, including mature trees, from the vicinity of the retaining walls. These repairs should be completed as funds become available; however, vegetation will continue to impact the retaining walls until removed.

## Ellicott City Retaining Walls Inspection Report Retaining Wall 10B



*Photo 1 – Elevation of Section 1 (beneath 8334 Main Street), Looking Southeast.*



*Photo 2 – Typical Missing Mortar in Joints within Section 1.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 10B



*Photo 3 – Elevation of Section 2 (beneath 8320 Main Street), Looking East.*



*Photo 4 – Typical Missing Mortar and Penetration into Joints in Section 2.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 10B



*Photo 5 – Missing Stones at Base of Wall in Section 2.*



*Photo 6 – Elevation of Section 3 (beneath 8320 Main Street), with Missing Mortar and Vegetation Growth, Looking Southwest.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 10B



*Photo 7 – Masonry Joint Open to 4" Wide in Section 3, Looking Southeast.*



*Photo 8 – Elevation of Section 4 (beneath 8320 Main Street), Looking South.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 10B



*Photo 9 – Typical Missing Mortar within Section 4.*



*Photo 10 – Missing Stone at Top of Wall in Section 4, 74' from West End of Wall.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 10B



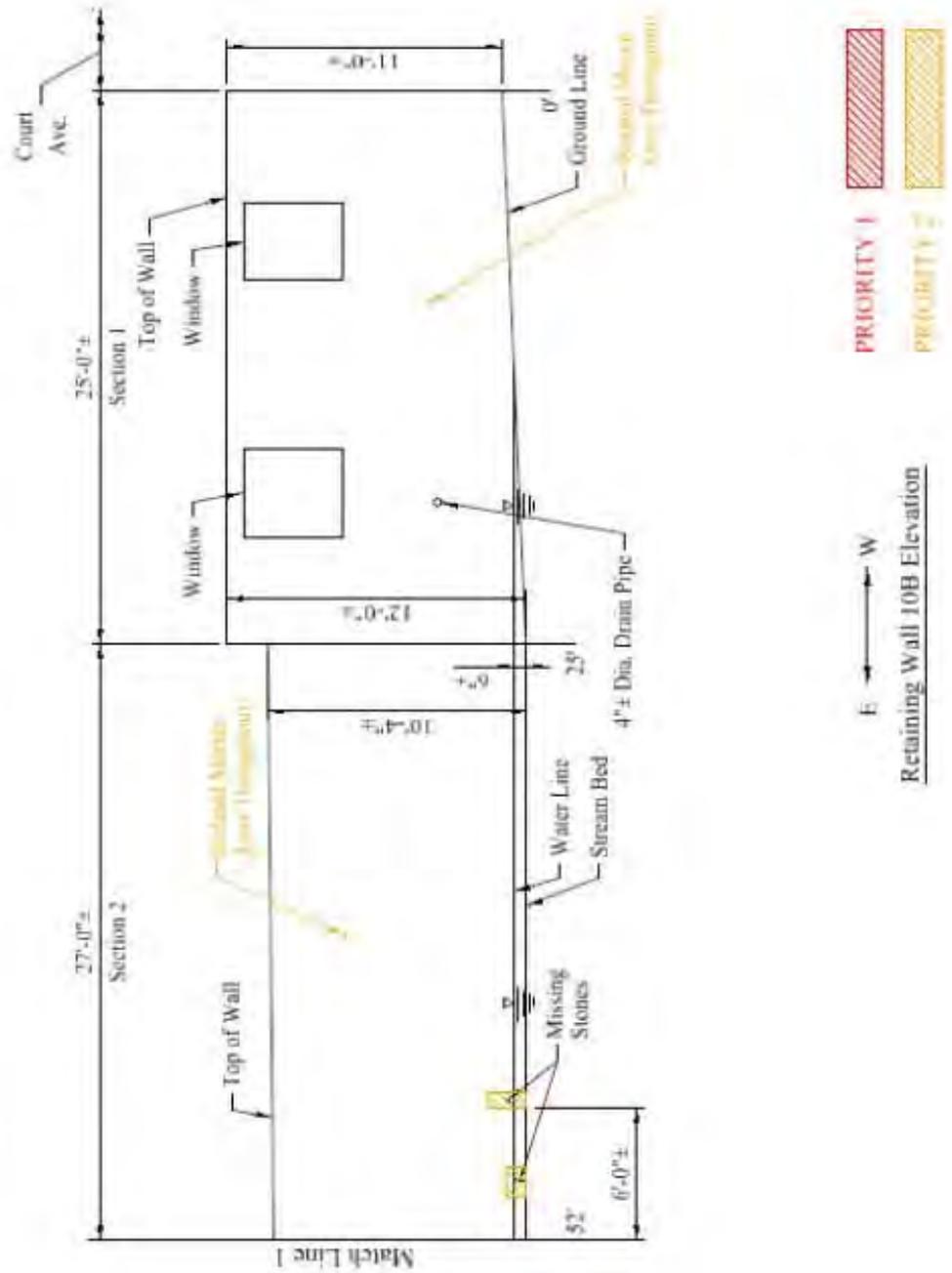
*Photo 11 – Typical Missing Stones along Base of Section 4, 5'-0" from the East End.*



*Photo 12 – Missing Stone at Top of Wall at East End of Section 4.*

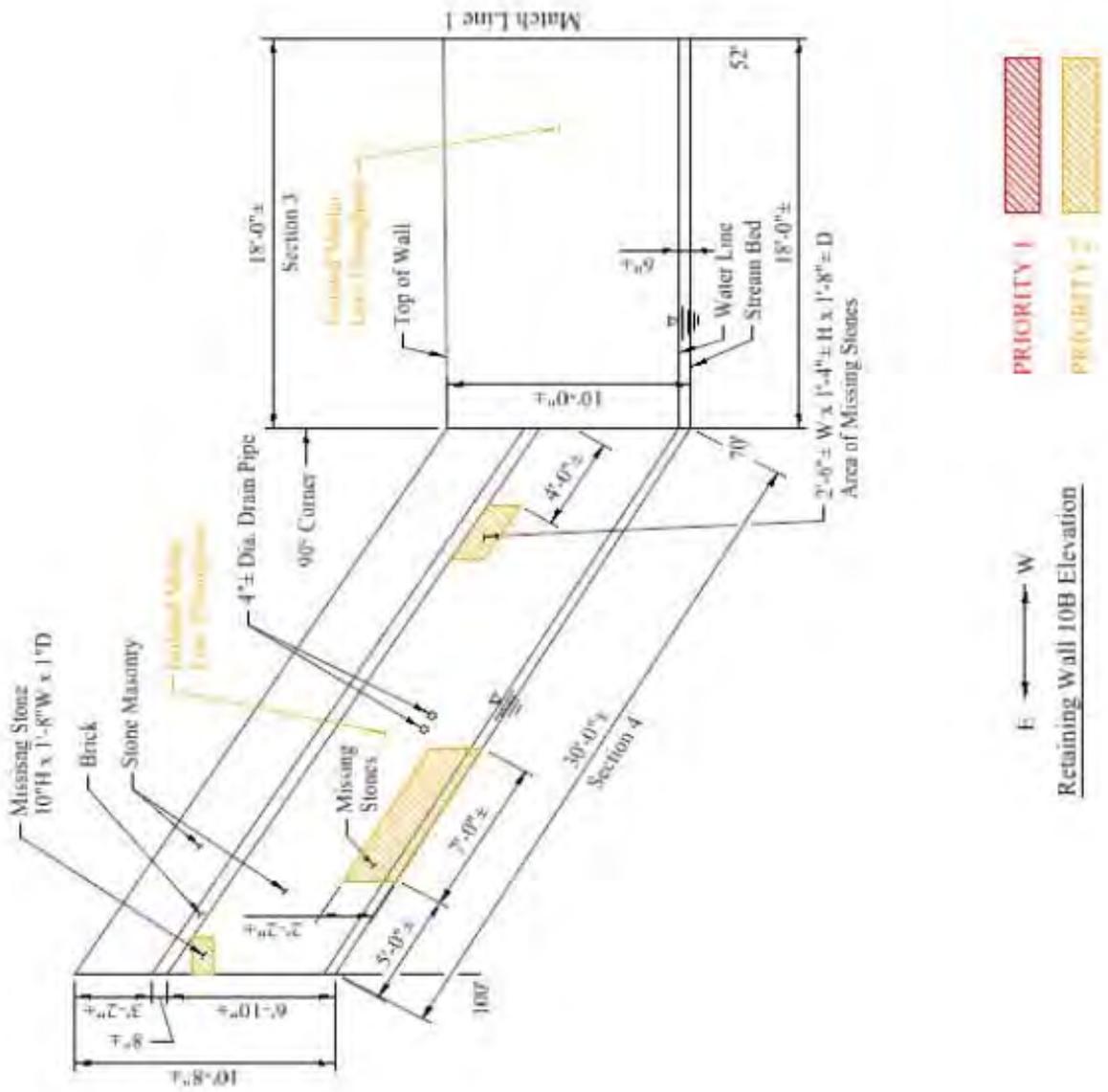
# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 10B



# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 10B



# Ellicott City Retaining Walls Inspection Report

## Retaining Walls 12A & 12B



**LOCATION MAP**  
**SOUTH OF MAIN STREET, BENEATH BUILDINGS**



**PROPERTY MAP**

- = COUNTY OWNED
- = PRIVATELY OWNED

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 12A

### *Description*

Retaining Wall 12A runs along the east side of Hudson Branch, beneath the buildings at 8307 Main Street, in Ellicott City, MD. The wall begins (at the north end) at the brick arch bridge beneath Main Street, and ends (at the south end) at Retaining Wall 13A. The wall is approximately 189'± long and varies between 10'-4"± and 15'-6"± high. The wall is comprised of concrete. The year built is unknown, and no previous inspection reports or plans were available.

The retaining wall inspection was performed on November 16, 2015 using waders. Access was obtained at the south end of the wall.

### *Inspection Findings*

Overall, the retaining wall is in good condition. There are several full height vertical hairline cracks with minor efflorescence, typically located at the drains (see Photo 1). At the north end of the wall, there is a concrete bump-out located 1'-6" above the ground line, measuring 3'-6" high x 3'-0" wide x 4'-6" long (see Photo 2). At 68' from the north end of the wall, there is moderate efflorescence extending 5'-0" wide x full-height of the wall, below a drain pipe (see Photo 4). At 131' from the north end of the wall, there is a 58'-0" long x 3'-0" wide concrete overpour along the ground line. The overpour is undermined 20'-0" long x 1'-9" high x 3'-0" deep at the south end (see Photo 5). The undermining does not extend below the front face of the retaining wall. At the south end of the wall, on the south face, there is a small void at the back corner measuring 3" high x 5" wide x 6" deep (see Photo 6).

The stream channel bottom is comprised of rocks. There was no evidence of scour or undermining along the base of the wall.

### *Recommendations*

The undermining of the concrete overpour at the south end of the wall should be monitored for encroachment on the concrete retaining wall. No repairs are recommended at this time.

Retaining Wall	Repair Recommendation	Priority	Wall Section	Station	Photos	Unit	Qty.	Unit Cost	Total Est. Cost
12A	None	-	-	-	-	0	0	\$0	\$0
<b>Total Repair Costs</b>									<b>\$0</b>

Note: These estimated costs are approximate and should only be used as a reference and for project planning purposes. Although they represent the costs for individual repair activities, they may not represent the total cost of a complete repair/rehabilitation project. Costs for items such as Design, Permitting, Mobilization/Demobilization, Maintenance of Traffic, Stream Diversion, Submittal Reviews, etc. would have to be added to the costs provided to develop a comprehensive project cost.

## Ellicott City Retaining Walls Inspection Report Retaining Wall 12A



*Photo 1 – Elevation at North End, Looking Northeast.  
Note Vertical Hairline Crack with Efflorescence.*



*Photo 2 – Concrete Bump-Out at North End of Wall, Looking Northeast.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 12A



*Photo 3 – Wall Elevation, Looking Southeast.*



*Photo 4 – Moderate Efflorescence below Drain Pipe, 68' from North End of Wall.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 12A



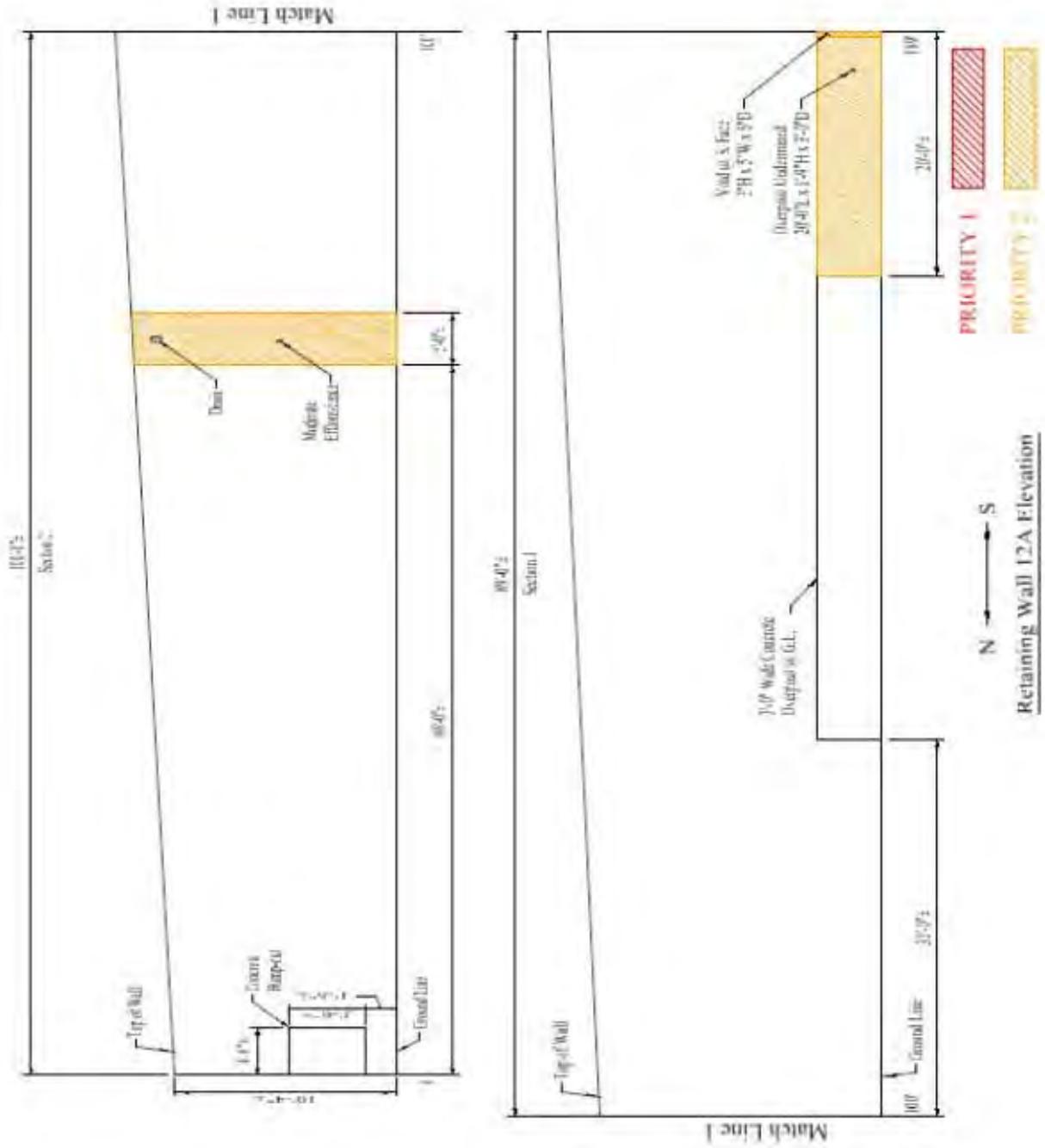
*Photo 5 – Undermined Concrete Overpour Starting 169' from West End of Wall, Looking Northeast.*



*Photo 6 – Void at South End of Wall, Looking North.*

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 12A



# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 12B

### *Description*

Retaining Wall 12B runs along the west side of Hudson Branch, beneath the buildings at 8307 Main Street, in Ellicott City, MD. The wall begins (at the north end) at the brick arch bridge beneath Main Street, and ends (at the south end) at Retaining Wall 13B. The wall is approximately 189'± long and 15'-0"± high. The wall is comprised of stone masonry and concrete. The year built is unknown, and no previous inspection reports or plans were available.

The retaining wall inspection was performed on November 16, 2015 using waders. Access was obtained at the south end of the wall.

### *Inspection Findings*

Overall, the retaining wall is in good condition. The mortar joints throughout the stone masonry portion have minor isolated locations of deterioration, mostly within the lower 1'-0" of the wall. Mortar loss is more extensive in the northernmost 50' of the wall, where joints can be probed up to 6" deep (see Photo 3). The top portion of the wall is comprised of concrete block and varies from 2'-8" high (north end) to 7'-6" high (south end). At the top north corner of the concrete portion, 17' from the north end there is a 1'-6" high x 1'-0" wide void for utility pipe access (see Photo 4). Approximately 46' from the north end, there is a full height x 10'-0" wide area of heavy efflorescence (see Photo 5). At the south end of the wall, there is a 30'-0" long x 2'-5" high x 1'-0" wide concrete overpour along the ground line, which is slightly undermined with edge spalling up to 6" deep (see Photo 6). The undermining does not extend under the front face of the retaining wall.

The stream channel bottom is comprised of rocks. There was no evidence of scour or undermining along the base of the wall.

### *Recommendations*

The mortar joints should be repointed throughout the wall where deteriorated. The undermining of the concrete overpour at the south end of the wall should be monitored for encroachment on the concrete retaining wall.

Retaining Wall	Repair Recommendation	Priority	Wall Section	Station	Photos	Unit	Qty.	Unit Cost	Total Est. Cost
12B	Repoint the masonry joints.	M	1	0'	3	SF	300	\$35	\$10,500
<b>Total Repair Costs</b>									<b>\$10,500</b>

Note: These estimated costs are approximate and should only be used as a reference and for project planning purposes. Although they represent the costs for individual repair activities, they may not represent the total cost of a complete repair/rehabilitation project. Costs for items such as Design, Permitting, Mobilization/Demobilization, Maintenance of Traffic, Stream Diversion, Submittal Reviews, etc. would have to be added to the costs provided to develop a comprehensive project cost.

MAINTENANCE (Designated as "M") - This item includes preventative maintenance. These repairs will increase the life span of the retaining wall and should be completed as funds become available. Maintenance items include clearing vegetation from stone masonry joints and repointing the joints.

## Ellicott City Retaining Walls Inspection Report Retaining Wall 12B



*Photo 1 – Elevation at North End, Looking Northwest.*



*Photo 2 – Wall Elevation, Looking Southwest.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 12B



*Photo 3 – Typical Missing Mortar within Northern 50' Length of Wall.*



*Photo 4 – Pipe Access at Top of Wall, 17' from North End.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 12B



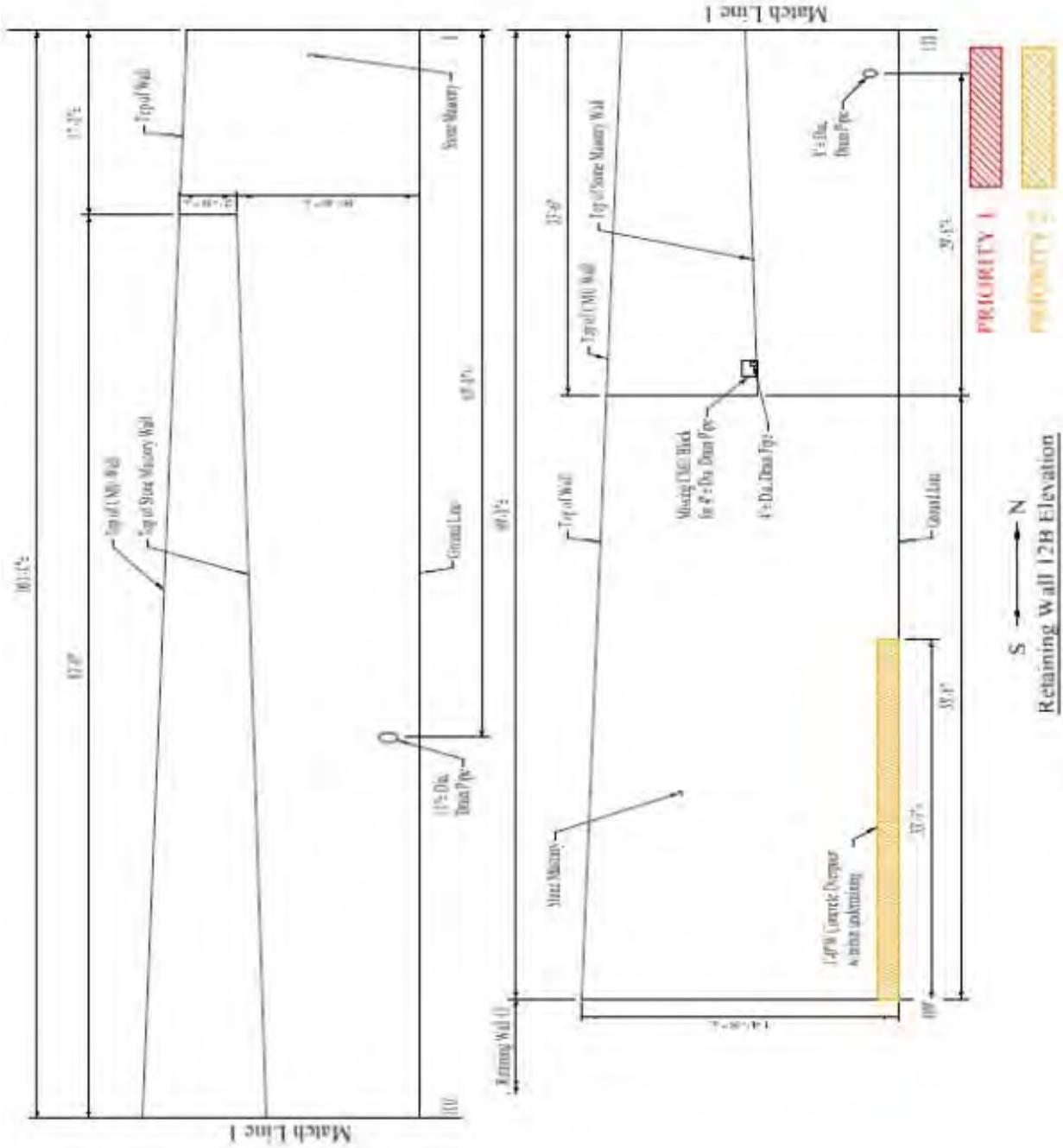
*Photo 5 – Heavy Efflorescence Located 46' from North End, Looking Southwest.*



*Photo 6 – Undermined Concrete Overpour at South End, Looking Northwest.*

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 12B



# Ellicott City Retaining Walls Inspection Report

## Retaining Walls 13A & 13B



**LOCATION MAP  
IN PARKING LOT D**



**PROPERTY MAP**

- = COUNTY OWNED
- = PRIVATELY OWNED

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 13A

### *Description*

Retaining Wall 13A runs along the north side of Tiber Branch, in Parking Lot D, in Ellicott City, MD. The wall begins (at the west end) at Retaining Wall 12A, and ends (at the east end) at Structure HO-181X under Parking Lot D. The portion of the wall beneath Pedestrian Bridge No. HO-182X (96'-109' from the west end of the wall) was not inspected, as it is considered part of the bridge. The wall is approximately 204'± long and varies between 5'-4"± and 6'-6"± high. The wall is comprised of stone masonry. The year built is unknown, and no previous inspection reports or plans were available.

The retaining wall inspection was performed on October 23, 2015 using waders. Access was obtained at the west end of the wall.

### *Inspection Findings*

Overall, the retaining wall is in fair condition. There is vegetation growth in front of the wall throughout the length. Within Section 1 (western 96'), the stone masonry exhibits missing mortar in the joints, with missing small stones within the lower 2'-0" height of the wall with penetration up to 1'-0" deep (see Photo 2). At the west end, the wall is undermined 1'-0" long x 6" high x 2'-0" deep (see Photos 3 and 4). At 26' from the west end, there is a 1'-0" high x 1'-0" wide void at mid-height, which could be probed 2'-0" deep to fill (see Photo 5). At 30' from the west end of the wall, there is a full-height x 8'-0" wide area of missing mortar which could be probed to 1'-0" deep.

Pedestrian Bridge No. HO-182X extends from 96' to 109' from the west end of the wall and was not included in this inspection.

Section 2 extends from 109' to 204' from the west end of the wall. The stone masonry exhibits light efflorescence at the mortar joints within the western 25' length of Section 2. The remainder of Section 2 exhibits isolated loss of mortar in the joints (see Photo 7). Approximately 146' from the west end of the wall, there is moderate efflorescence in the joints around a drain pipe (see Photo 7). The top face of the concrete overpour footing is exposed along the full length of Section 2. At 168' from the west end of the wall, the footing is undermined beneath a drain pipe, measuring 2'-0" long x 1'-6" high x 6" deep (see Photo 8). The undermining does not extend under the front face of the retaining wall.

The stream channel bottom is comprised of rocks.

## Ellicott City Retaining Walls Inspection Report Retaining Wall 13A

### *Recommendations*

The vegetation growth should be removed from the vicinity of the retaining wall. The masonry joints should be repointed throughout the wall where the mortar has deteriorated. Stones should be placed at the locations of voids with exposed fill. The west end of the retaining wall at the location of undermining (Section 1) and the undermining of the concrete overpour footing in Section 2 should be filled with grout.

Retaining Wall	Repair Recommendation	Priority	Wall Section	Station	Photos	Unit	Qty.	Unit Cost	Total Est. Cost
13A	Repair undermining with grout bags.	3	1	0'	3, 4	CY	0.5	\$500	\$250
			2	168'	8	CY	0.5	\$500	\$250
13A	Replace missing stones.	3	1	8'	2	CY	1	\$1,000	\$1,000
			1	26'	5	CY	0.5	\$1,000	\$500
13A	Repoint the masonry joints.	M	1	8'	2	SF	176	\$35	\$6,160
			1	30'	-	SF	24	\$35	\$840
			2	134'	7	SF	80	\$35	\$2,800
13A	Remove trees / vegetation growth in the vicinity of the wall.	V	1, 2	-	1, 6	LS	1	\$500	\$500
<b>Total Repair Costs</b>									<b>\$12,300</b>

Note: These estimated costs are approximate and should only be used as a reference and for project planning purposes. Although they represent the costs for individual repair activities, they may not represent the total cost of a complete repair/rehabilitation project. Costs for items such as Design, Permitting, Mobilization/Demobilization, Maintenance of Traffic, Stream Diversion, Submittal Reviews, etc. would have to be added to the costs provided to develop a comprehensive project cost.

**THIRD PRIORITY** (Designated as "3") - The third priority items include defects which exist at portions of the retaining wall which do not support pedestrian areas (along natural slopes). Failure of the wall in these areas may redirect the stream or cause flooding; however, there is less of an immediate threat to pedestrians if left untreated.

**MAINTENANCE** (Designated as "M") - This item includes preventative maintenance. These repairs will increase the life span of the retaining wall and should be completed as funds become available. Maintenance items include clearing vegetation from stone masonry joints and repointing the joints.

**VEGETATION REMOVAL** (Designated as "V") - This item includes the removal of vegetation growth, including mature trees, from the vicinity of the retaining walls. These repairs should be completed as funds become available; however, vegetation will continue to impact the retaining walls until removed.

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 13A



*Photo 1 – Elevation of Section 1, Looking Northwest.  
Note Vegetation Growth.*



*Photo 2 – Typical Loss of Mortar and Small Stones within Section 1.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 13A



*Photo 3 – Undermining at West End of Wall, Looking East.*

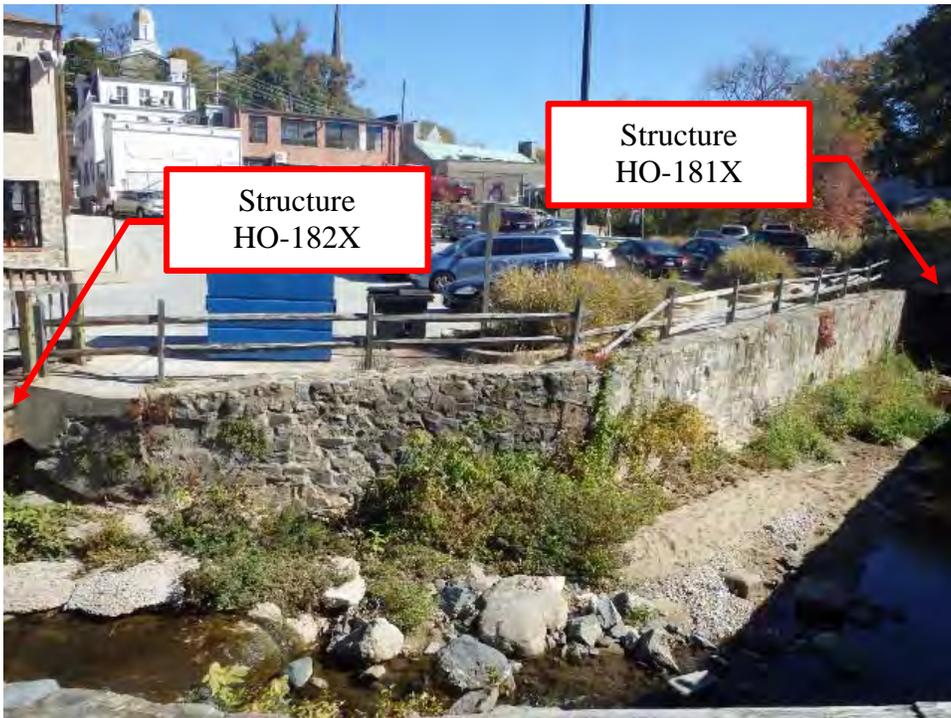


*Photo 4 – Undermining at West End of Wall, Looking North.*

**Ellicott City Retaining Walls Inspection Report**  
**Retaining Wall 13A**



*Photo 5 – Void Located 26' from West End of Wall.*



*Photo 6 – Elevation of Section 2, Looking Northeast.  
Note Vegetation Growth.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 13A



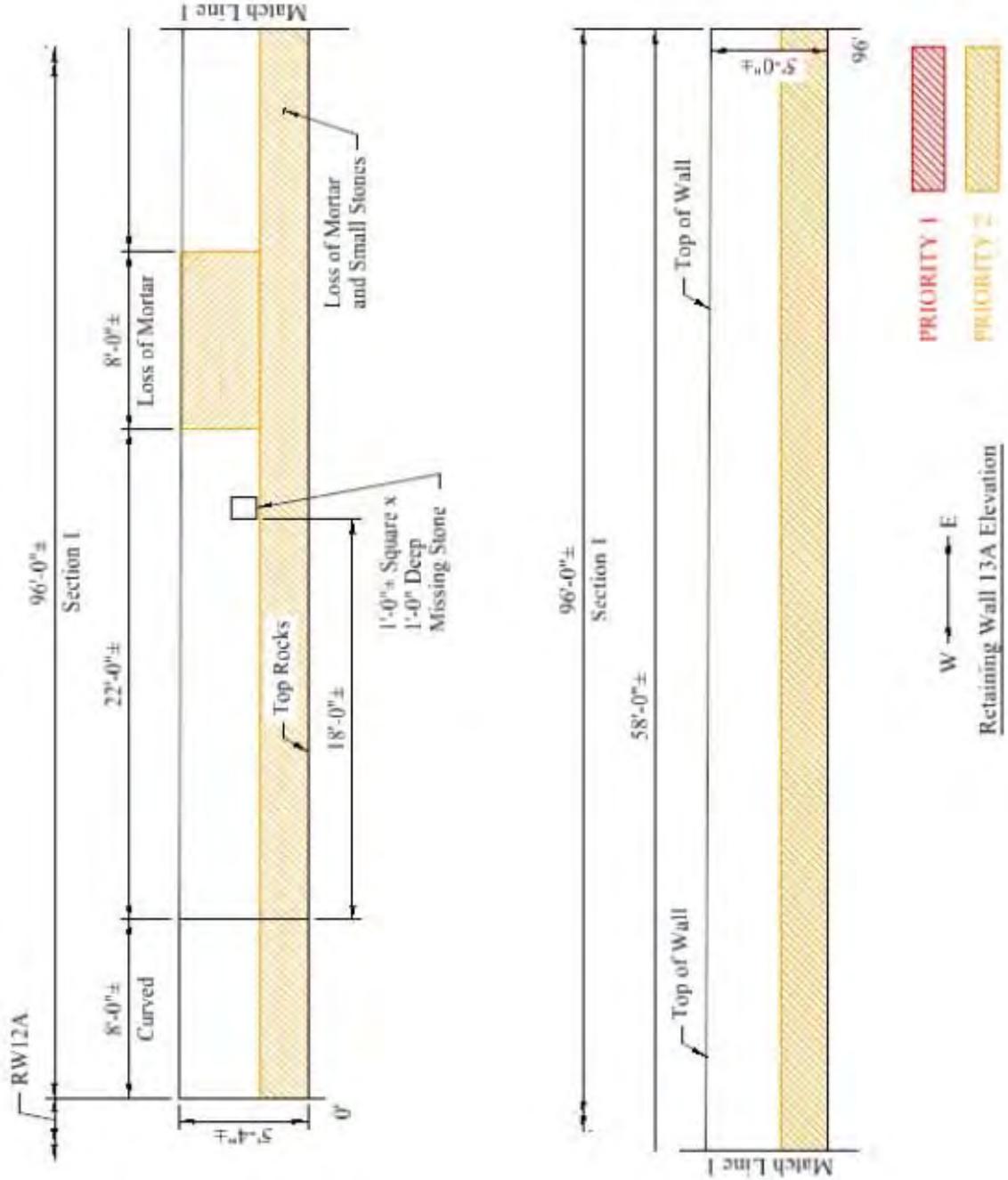
*Photo 7 – Moderate Efflorescence Surrounding Drain in Section 2.  
Note Minor Random Missing Mortar in Joints.*



*Photo 8 – Exposed and Undermined Footing below Drain Pipe in Section 2.*

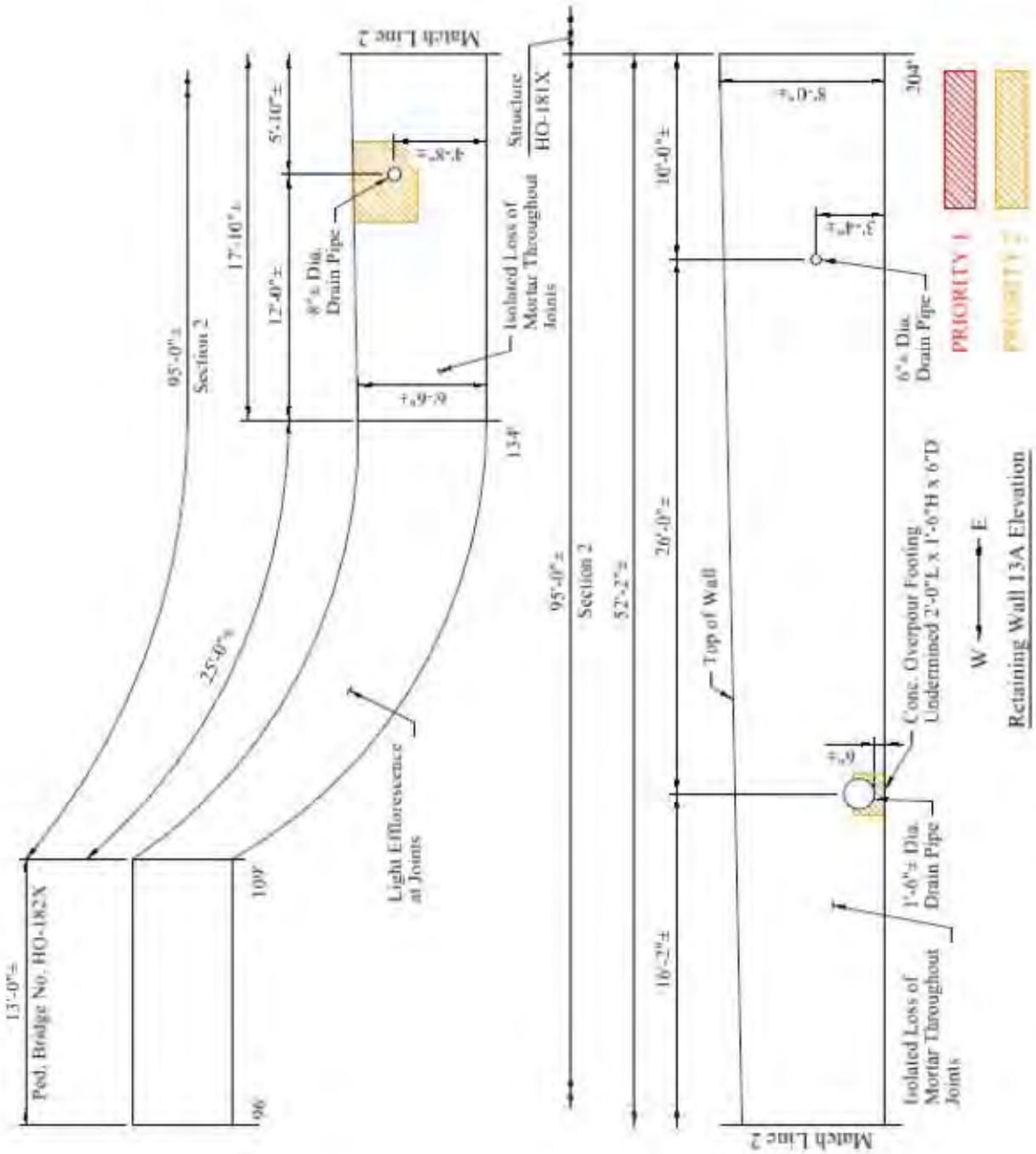
# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 13A



# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 13A



# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 13B

### *Description*

Retaining Wall 13B runs along the south side of Tiber Branch, in Parking Lot D, in Ellicott City, MD. The wall starts (at the west end) at Retaining Wall 12B, and ends (at the east end) at Structure HO-181X under Parking Lot D. The portion of the wall beneath Pedestrian Bridge No. HO-182X (107'-120' from west end) was not inspected, as it is considered part of the bridge. The wall is approximately 226'± long and varies between 3'-0"± and 8'-3"± high. The wall is comprised of stone masonry. The year built is unknown, and no previous inspection reports or plans were available.

The retaining wall inspection was performed on October 23, 2015 using waders. Access was obtained at the west end of the wall.

### *Inspection Findings*

Overall, the retaining wall is in fair condition. There is vegetation growth in front of the wall throughout the length. Within Section 1 (western 107'), the stone masonry wall has been covered by a pneumatically-applied mortar (P.A.M.) coating, which typically ends 1'-0" above the ground line (see Photos 1 and 3). Starting 9' from the west end of the wall, there is missing mortar, random missing small stones, and vegetation growth throughout the top 9'-0" height of the wall (see Photo 1). At 5' from the west end of the wall, there is a void at the base of the wall measuring 2'-6" high x 2'-0" wide x 2'-4" deep (see Photo 2). Starting 9' from the west end of the wall, there are voids beneath the P.A.M. coating for a 5'-0" length, which could be probed 2'-0" deep to fill (see Photos 3 and 4). Starting 26' from the west end of the wall, there are voids beneath the P.A.M. coating for a 30'-0" length, which could be probed up to 3'-0" deep to fill (see Photo 5). The east end of Section 1 (adjacent to Structure HO-182X) is comprised of natural stone (see Photo 6).

Pedestrian Bridge No. HO-182X extends from 107' to 120' from the west end of the wall and was not included in this inspection.

Section 2 extends from 120' to 226' from the west end of the wall. The stone masonry exhibits light efflorescence in the mortar joints (see Photo 8). At the east end of Section 2, there is a full-height x 7'-0" wide area of missing mortar, missing small stones, and vegetation growth. There is minor bulge in this area. Pneumatically-applied mortar has been placed over the stone masonry in this area; however, it is failing (see Photo 9).

The stream channel bottom is comprised of rocks.

## Ellicott City Retaining Walls Inspection Report Retaining Wall 13B

### *Recommendations*

The vegetation growth in the vicinity of the wall should be removed immediately. The voids along the base of the wall in Section 1 should be filled. The area of bulging stones and failed coating at the east end of Section 2 should be repaired.

Retaining Wall	Repair Recommendation	Priority	Wall Section	Station	Photos	Unit	Qty.	Unit Cost	Total Est. Cost
13B	Replace missing stones.	3	1	5'	2	CY	1	\$1,000	\$1,000
			1	9'	4	CY	1	\$1,000	\$1,000
			1	26'	5	CY	4	\$1,000	\$4,000
13B	Fill voids with grout below P.A.M coating.	3	1	5'	4	CY	1	\$500	\$500
			1	9'	4	CY	1	\$500	\$500
			1	26'	5	CY	4	\$500	\$2,000
13B	Remove P.A.M. coating and repoint the masonry joints.	3	2	219'	9	SF	58	\$50	\$2,900
13B	Repoint the masonry joints.	M	1	9'	1	SF	20	\$35	\$700
13B	Remove trees / vegetation growth in the vicinity of the wall.	V	1, 2	-	1, 3, 6, 9	LS	1	\$5,000	\$5,000
<b>Total Repair Costs</b>									<b>\$17,600</b>

Note: These estimated costs are approximate and should only be used as a reference and for project planning purposes. Although they represent the costs for individual repair activities, they may not represent the total cost of a complete repair/rehabilitation project. Costs for items such as Design, Permitting, Mobilization/Demobilization, Maintenance of Traffic, Stream Diversion, Submittal Reviews, etc. would have to be added to the costs provided to develop a comprehensive project cost.

**THIRD PRIORITY** (Designated as "3") - The third priority items include defects which exist at portions of the retaining wall which do not support pedestrian areas (along natural slopes). Failure of the wall in these areas may redirect the stream or cause flooding; however, there is less of an immediate threat to pedestrians if left untreated.

**MAINTENANCE** (Designated as "M") - This item includes preventative maintenance. These repairs will increase the life span of the retaining wall and should be completed as funds become available. Maintenance items include clearing vegetation from stone masonry joints and repointing the joints.

**VEGETATION REMOVAL** (Designated as "V") - This item includes the removal of vegetation growth, including mature trees, from the vicinity of the retaining walls. These repairs should be completed as funds become available; however, vegetation will continue to impact the retaining walls until removed.

## Ellicott City Retaining Walls Inspection Report Retaining Wall 13B



*Photo 1 – Elevation at West End of Section 1, Looking West.  
Note Vegetation Growth and P.A.M. Coating.*



*Photo 2 – Void below P.A.M. Coating at 5' from West End of Wall.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 13B



*Photo 3 – Typical P.A.M. Coating throughout Section 1 and Vegetation Growth along Top of Wall.*



*Photo 4 – Void below P.A.M. Coating Probed to 2'-0" Deep, 9' from West End of Wall.*

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 13B



*Photo 5 – Void below P.A.M. Coating Probed to 3'-0" Deep, 26' from West End of Wall.*



*Photo 6 – Natural Stone at East End of Section 1, Looking Southeast.*

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 13B



*Photo 7 – Elevation of Section 2, Looking East.*



*Photo 8 – Typical Light Efflorescence in Mortar Joints in Section 2.*

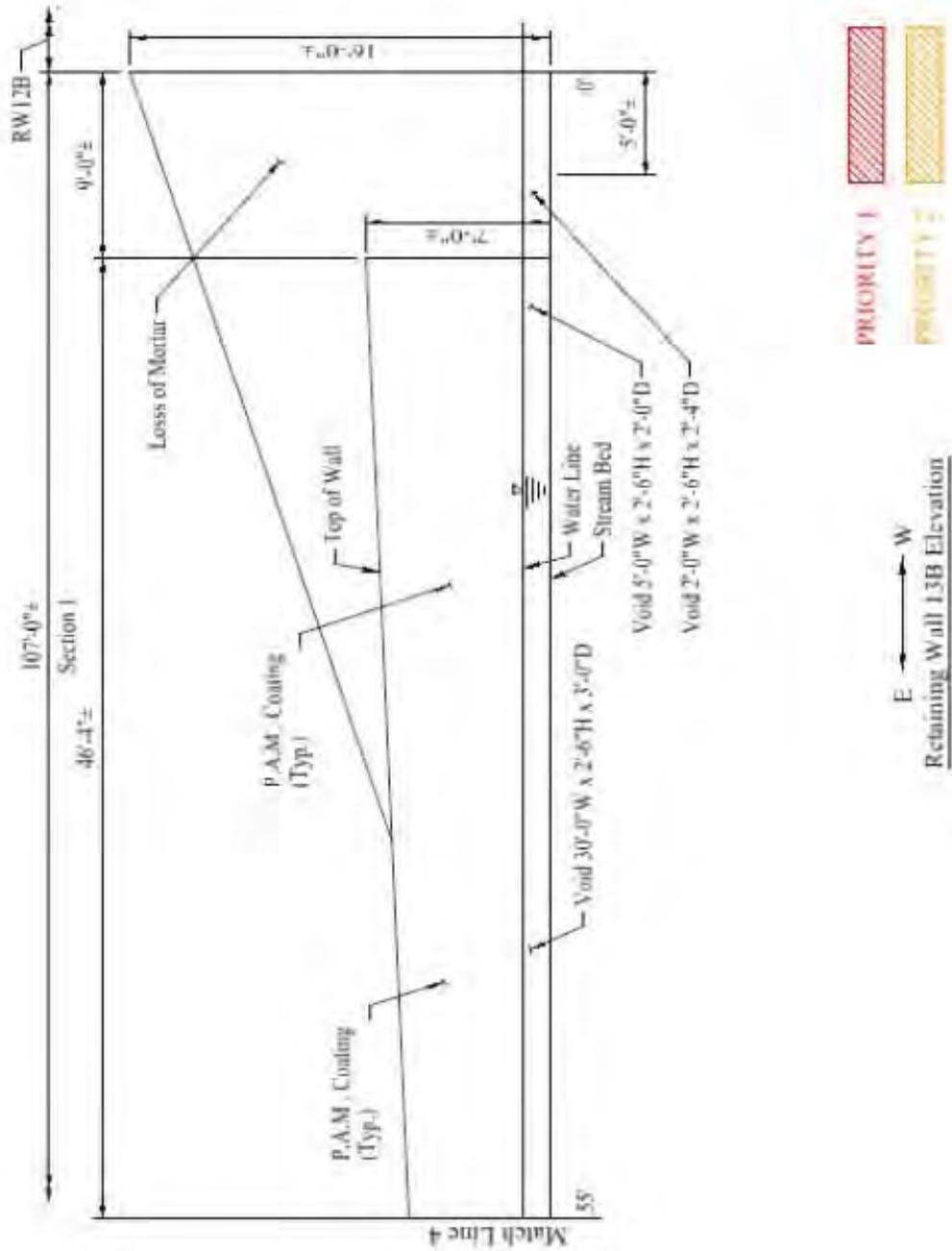
**Ellicott City Retaining Walls Inspection Report**  
**Retaining Wall 13B**



*Photo 9 – Failing P.A.M. Coating at East End of Section 2, With Bulging and Vegetation Growth.*

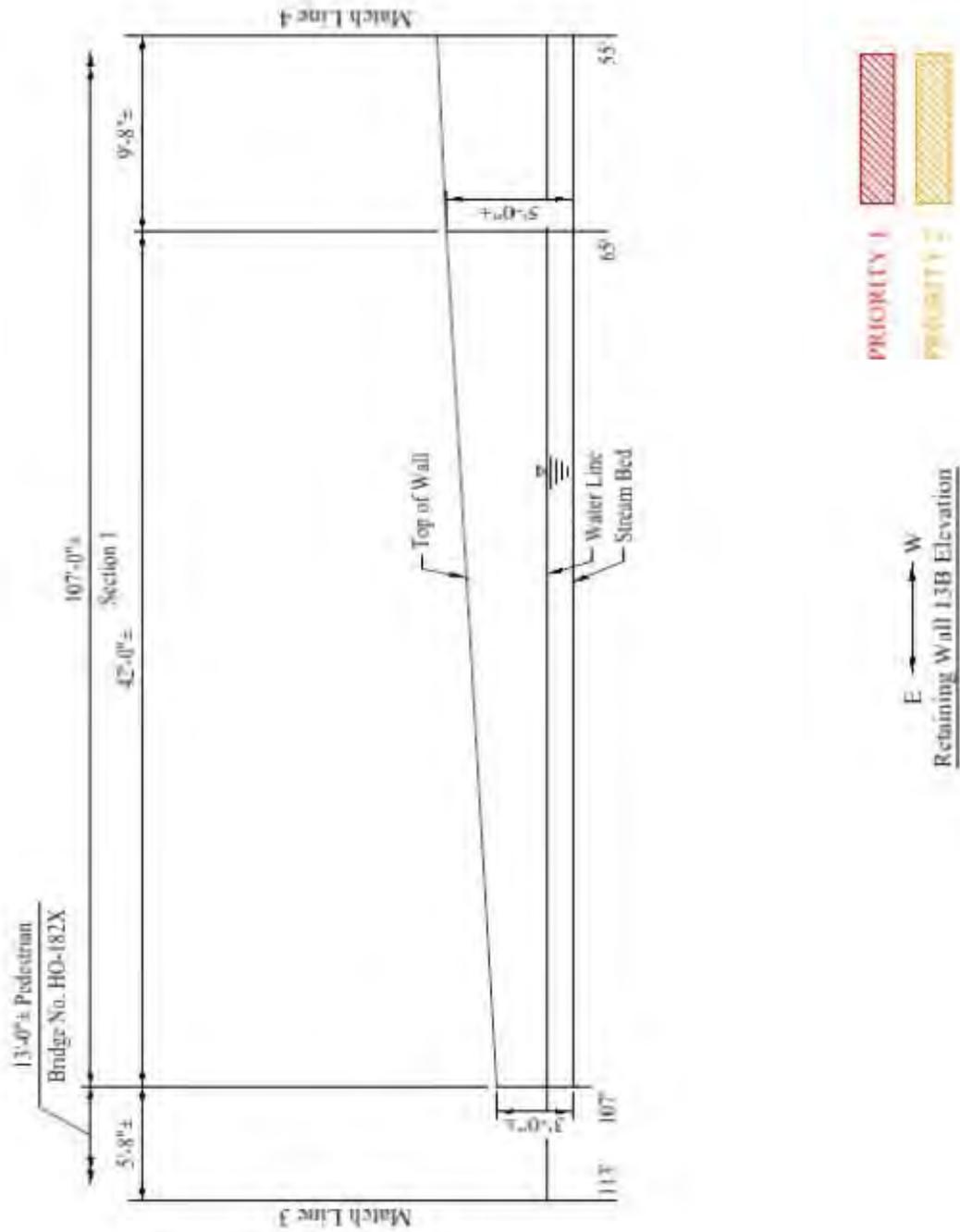
# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 13B



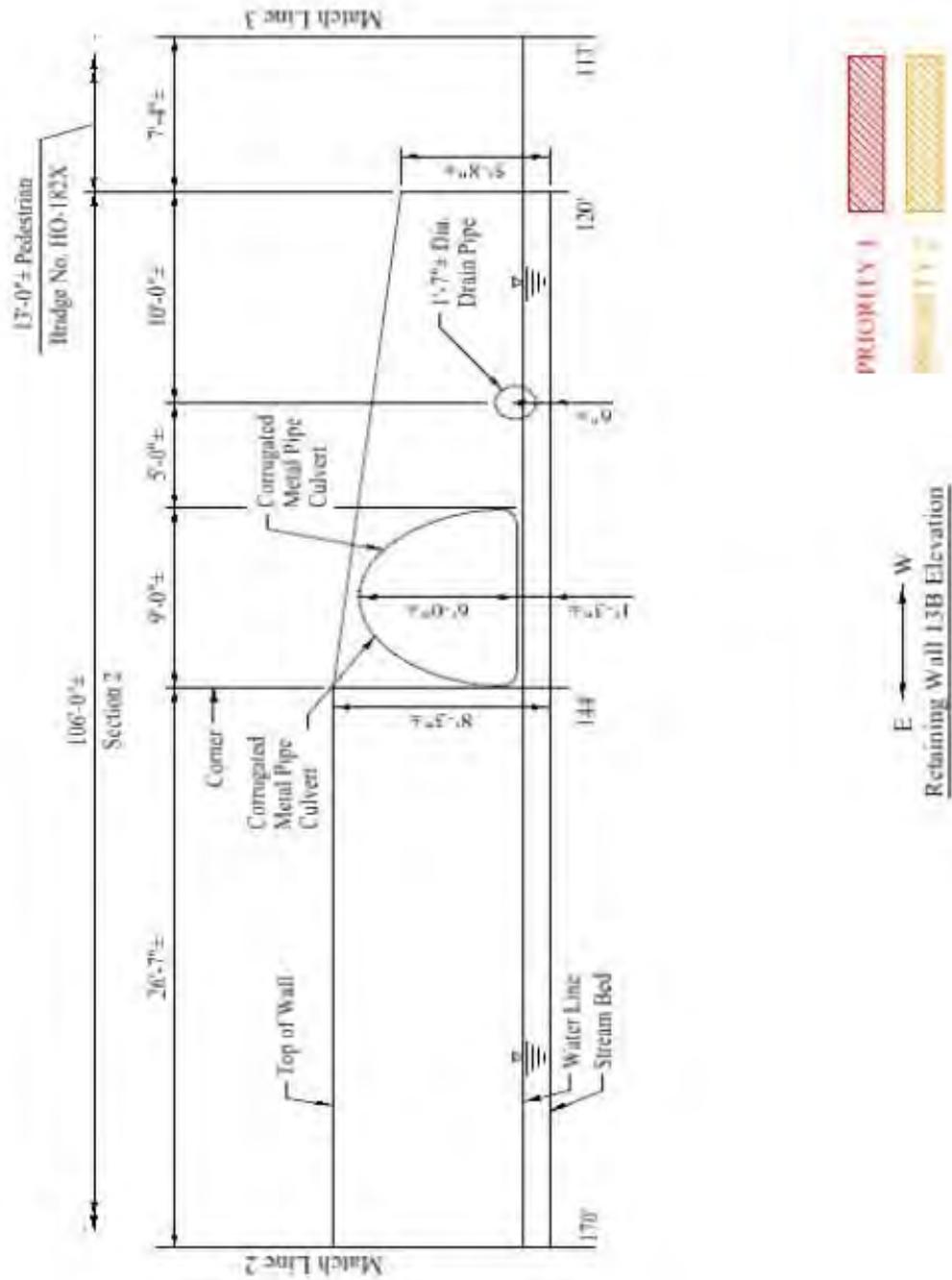
# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 13B



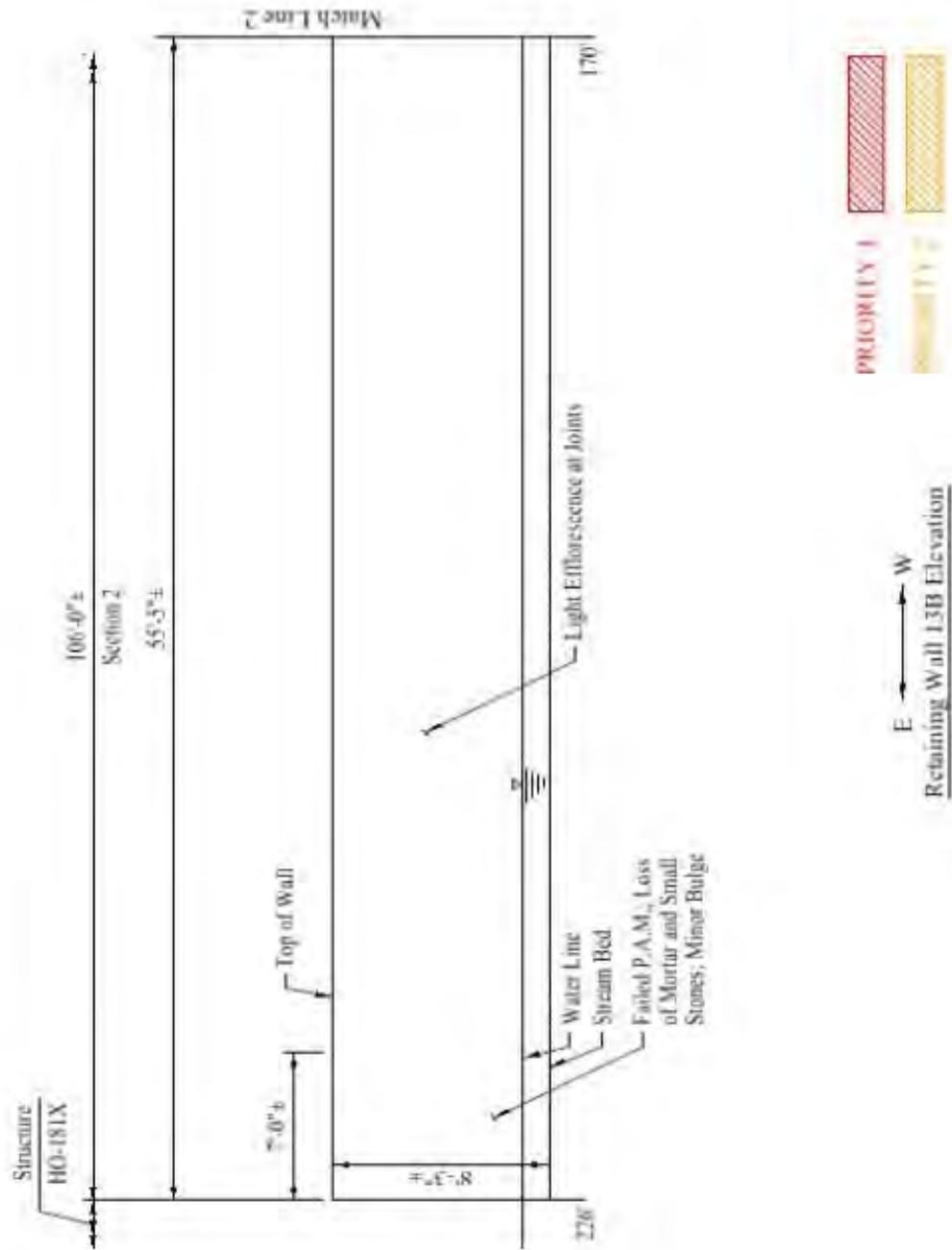
# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 13B



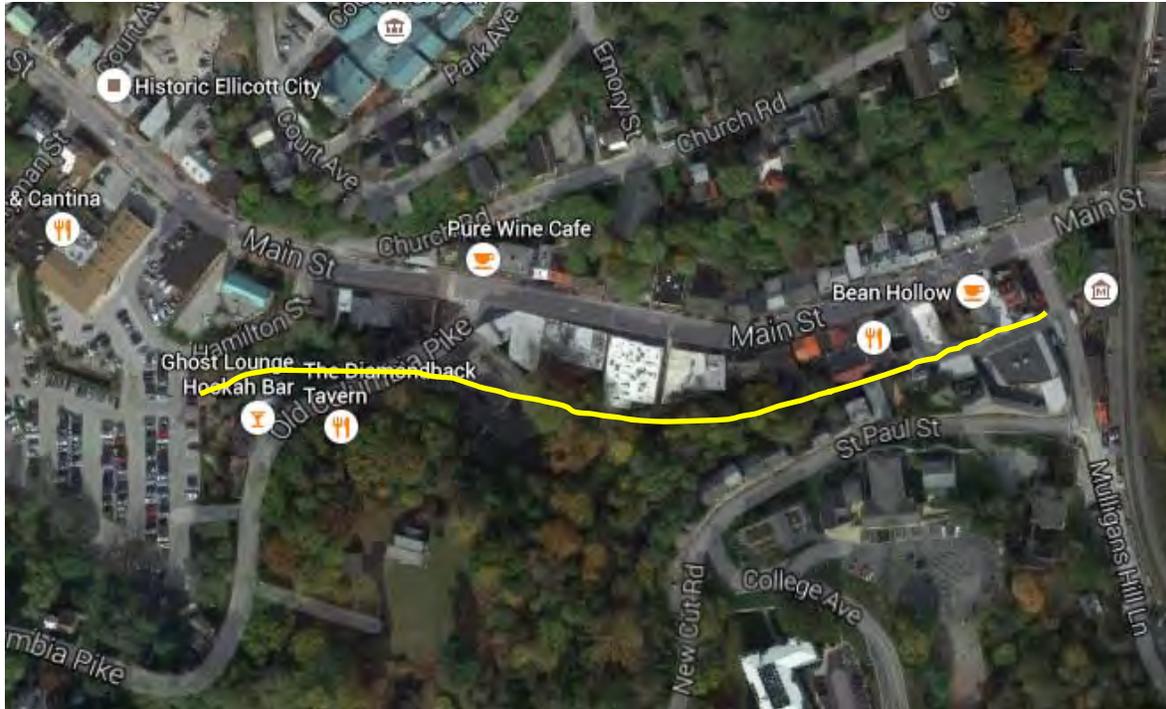
# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 13B

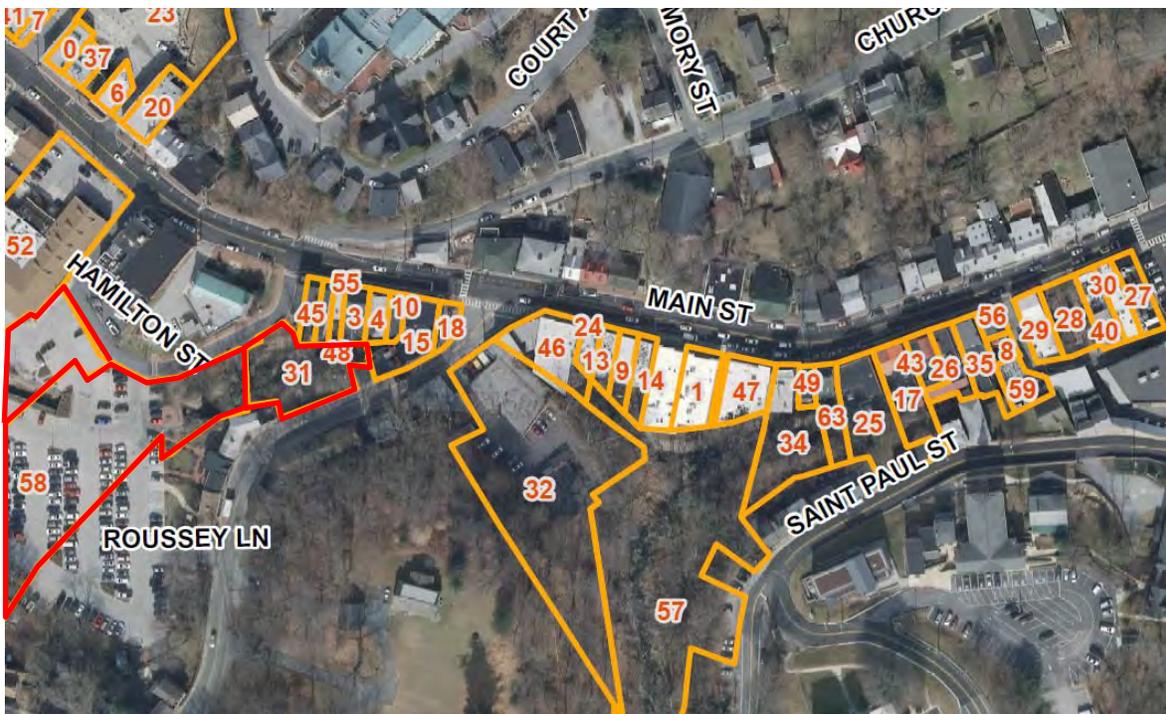


# Ellicott City Retaining Walls Inspection Report

## Retaining Walls 17A & 17B



**LOCATION MAP**  
**EAST OF PARKING LOT D TO MARYLAND AVENUE**



**PROPERTY MAP**

	= COUNTY OWNED
	= PRIVATELY OWNED

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 17A

### *Description*

Retaining Wall 17A runs along the north side of Tiber Branch, between Parking Lot D and Maryland Avenue in Ellicott City, MD. The wall starts (at the west end) at Structure No. HO-181X, continues beneath Old Columbia Pike and beneath/behind several private properties along Main Street, and ends (at the east end) at the Maryland Avenue vehicular bridge. The wall is approximately 1,233'± long and varies between 5'-0"± and 15'-0"± high. The wall is comprised of stone masonry and concrete. The year built is unknown, and no previous inspection reports or plans were available.

The retaining wall inspection was performed between October 27 and November 5, 2015 using waders. Access was obtained via Parking Lot D.

### *Inspection Findings*

Overall, the retaining wall is in poor condition. Section 1 extends from the west end to 88' from the west end of the wall. The western 28'-0" length of the wall is comprised of stone masonry and has random missing mortar and vegetation growth throughout the joints (see Photo 1). The worst area is at the bottom west corner, where the joints could be probed to 7" deep. There is moderate efflorescence around a drain at the top west end of the wall. The retaining wall is missing between 28' and 88' from the west end.

Section 2 extends from 88' to 145' from the west end of the wall and is comprised of large stones with missing mortar and voids which could be probed to 3'-0" deep (see Photos 2 and 3). There are several large trees growing along the top of the wall, which are impacting the wall (see Photo 4). There is vegetation growth through the open joints throughout Section 2.

Section 3 extends from 145' to 185' from the west end of the wall and is comprised of concrete (see Photo 5). The wall has a full-height fracture at 157' from the west end, which was open to ¼" wide (see Photo 5). There is a large tree (~2'-0" diameter trunk) located behind the wall, in line with this fracture, that could be impacting the wall. The bottom of the wall was undermined for a 10'-0" length x 6" high and could be probed up to 1 foot deep (see Photo 5). The top right corner of the wall (5'-0" high x 4'-0" wide) has fractured and is leaning up to 4 inches towards the channel (see Photos 5 and 6). The portion of the wall perpendicular to this corner (running north-south towards house) was leaning to the east. This portion of the wall supports a timber house column at the corner of the house. The column was out of plumb, although measurements were not taken due to lack of access (see Photos 7 and 8). The presence of erosion behind the wall was not investigated. This area was noted in a Critical Findings Memo to Howard County on October 30, 2015.

Section 4 extends from 185' to 281' from the west end of the wall and is comprised of stone masonry which has missing mortar and voids which could be probed to 2'-0" deep, and vegetation growth (see Photo 9). There is a 1'-0" high x 1'-0" wide void above a drain pipe near the top of the wall at the west end (see Photo 10). There is a 10'-0" wide stone masonry wall which has been constructed on top of the original wall, under a cantilevered portion of a house (see Photo 11). The base of the original retaining wall exhibited a 10'-0" long x 2'-0" high void with undermining that could be probed 2'-0" deep to fill (see Photo 11). Starting at 223' from the west end of the wall,

## **Ellicott City Retaining Walls Inspection Report**

### **Retaining Wall 17A**

there is a 10'-0" wide area of bulging with up to 4" of horizontal displacement (see Photo 12). The bulging was worse at the top of the wall. The presence of sink holes or erosion behind the retaining wall was not investigated due to lack of access. There was vegetation growth with root systems at the top of the wall and randomly throughout the mortar joints. This area was noted in a Critical Findings Memo to Howard County on October 30, 2015. At 233' from the west end, there is a 10'-0" wide portion of the wall which exhibited active water leakage through the open joints (see Photo 13). The voids at the joints could be probed up to 5'-0" deep to fill. There is a brick wall bearing on top of the stone masonry wall, and a building column which bears on this brick wall at the west corner of the building (see Photo 13). The back face of the building bears on the stone masonry wall in the eastern half of the property (see Photo 13). At the east end of Section 4, the back face of a building bears on the stone masonry wall (see Photo 14). There were typically voids probed 2'-6" deep to fill with vegetation growth. There is a large void (missing stones) at the base of the wall at 263' from the west end, measuring 2'-0" high x 3'-0" wide x 2'-6" deep (see Photo 14).

Section 5 extends from 281' to 342' from the west end of the wall and is comprised of stone masonry (see Photos 15-18). There is missing mortar throughout 50% of the joints, which could be probed to 1'-6" deep (see Photo 16). The bottom of the wall at the west end has a 7'-0" long x 5" high x 1'-0" deep area of undermining (see Photo 19).

Section 6 extends from 342' to 461' from the west end of the wall and is comprised of stone masonry, concrete cap, and concrete block (see Photos 20-23). There are small voids and missing mortar throughout 5% of the joints. At 381' from the west end, the wall is undermined 2'-0" long x 1'-0" high x 2'-0" deep.

Section 7 extends from 461' to 567' from the west end of the wall and is comprised of stone masonry and concrete block (see Photos 24-26). There is missing mortar and small voids up to 1'-0' x 1'-0" which can be probed to 2'-0" deep throughout the east half of Section 7 (see Photo 27). Approximately 30' from the east end, there is a large 2'-0" diameter tree growing at the top of the wall causing the lower stone wall to bulge and the top concrete wall to fail (see Photo 27). There is a 3'-0" wide x 1'-6" high x 2'-6" deep void and a 5'-0" wide x 3'-0" high x 4'-0" deep void along the bottom of the wall near the east end (see Photo 28). At the east end of the retaining wall, the stones are loose and shifted (see Photo 26).

Section 8 extends from 567' to 607' from the west end of the wall. There is no wall in this section. The natural slope is stable.

Section 9 extends from 607' to 795' from the west end of the wall and is comprised mostly of stone masonry with a concrete wall (building foundation) at the eastern 35' (see Photos 29-32). There is a mature tree with exposed roots growing at the base of the wall where stone masonry meets concrete. There is loose and missing mortar throughout 50% of the joints and a few small trees, up to 3" diameter, growing along the top of the wall. There are also several trees growing along the base of the wall. The western 5'-0" length of the wall has collapsed with loose stones (see Photos 29 & 33). There is a 3'-0" wide x 6" high x 6" deep void along the bottom of the wall near the west end, a 2'-0" wide x 3'-0" high x 1'-6" deep void around a drain pipe at mid height at mid length, and just to the east, an adjacent void surrounding a drain pipe which can be probed to 3'-

## **Ellicott City Retaining Walls Inspection Report**

### **Retaining Wall 17A**

6" deep (see Photo 34). At the east end of the stone wall, 35' from the east end of Section 8, there is an area of loose stones and loss of mortar which can be probed to 2'-0" deep (see Photo 35).

Section 10 extends from 795' to 993' from the west end of the wall and is comprised mostly of stone masonry and concrete blocks (see Photos 36-39). There is typically mortar loss along the bottom of the wall in the splash zone. At 805' from the west end of the wall, there is a 2'-0" wide x 2'-0" high x 6" deep void at the base, below a timber deck post which bears on the wall (see Photo 36). At 815' from the west end of the wall, there is a full-height x 2'-0" wide area of loose stones and loss of mortar with voids that can be probed to 2'-0" deep, under a timber deck post (see Photo 40).

Section 11 extends from 993' to 1,157' from the west end of the wall and is comprised mostly of stone masonry (see Photos 41-44). The joints along the bottom of the wall can be probed to 1'-6" deep within the western 100' of the section. Under the deck at 8081 Main Street (30'-0" wide) there is loose and missing mortar throughout 50% of the joints. Just to the east of 8081 Main Street, there is a full height x 2'-0" wide area of missing mortar with voids that can be probed to 2'-0" deep (see Photo 45). There is a 3'-0" wide x 3'-0" high square opening in the wall under 8069 Main Street (see Photo 46). The east end of Section 11, surrounding the pedestrian bridge, is in very good condition with sound mortar.

Section 12 extends from 1,157' to 1,233' from the west end and is comprised mostly of stone masonry (see Photos 47-49). There is missing mortar and small voids throughout 60% of the joints, which can be probed up to 2'-0" deep, in the west 52'-0" (see Photo 50). The remaining mortar is loose and deteriorated. There is a 14'-0" wide x 8'-0" high area of stones that are bulging outward to the south up to 6" at the base of the wall, starting 10'-0" from the west end of the section. The bottom of the wall at the east end has a 4'-0" long x 2" high x 6" deep area of undermining in the southeast corner (see Photo 51).

### ***Recommendations***

The portions of the buildings above the retaining wall in Sections 3-4 should be inspected for structural integrity. These buildings may require temporary support during work on the wall. Remove and rebuild the bulging portions of the stone masonry wall. Remove and replace the leaning/failed portions of the concrete wall. Remove all trees and vegetation from the top, front, and back of the wall. Fill all undermined areas and voids with grout. Replace all missing stones. The stone masonry joints should be re-pointed in the areas of missing mortar. The area of active water leakage in Section 4 should be investigated and repaired as necessary.

## Ellicott City Retaining Walls Inspection Report

### Retaining Wall 17A

Retaining Wall	Repair Recommendation	Priority	Wall Section	Station	Photos	Unit	Qty.	Unit Cost	Total Est. Cost
17A	Rebuild collapsed portions of stone masonry wall.	1	9	607'	29	CY	1	\$1,000	\$1,000
17A	Rebuild failing portions of concrete wall.	1	3	157'	5-8	CY	4	\$1,000	\$4,000
17A	Tie-back leaning/bulging portions of wall.	1	4	223'	12	CY	1	\$1,000	\$1,000
			7	537'	27	CY	0.5	\$1,000	\$500
			10	815'	40	CY	1	\$1,000	\$1,000
			12	1,167'	-	CY	1	\$1,000	\$1,000
17A	Replace missing stones.	1	4	185'	10	CY	0.5	\$1,000	\$500
			4	263'	14	CY	0.5	\$1,000	\$500
			7	557'	28	CY	2	\$1,000	\$2,000
			9	607'	34	CY	1	\$1,000	\$1,000
			10	805'	36	CY	0.5	\$1,000	\$500
17A	Underpin undermined portions of wall.	1	3	145'	5	CY	0.5	\$1,000	\$500
			4	205'	11	CY	1	\$1,000	\$1,000
			5	281'	19	CY	0.5	\$1,000	\$500
			6	381'	-	CY	0.5	\$1,000	\$500
			12	1,229'	51	CY	0.5	\$1,000	\$500
17A	Repoint the masonry joints.	M	1	0'	1	SF	50	\$35	\$1,750
			2	88'	2, 3	SF	300	\$35	\$10,500
			4	185'	9	SF	500	\$35	\$17,500
			5	281'	16	SF	100	\$35	\$3,500
			6	342'	-	SF	10	\$35	\$350
			7	461'	27	SF	40	\$35	\$1,400
			9	607'	35	SF	50	\$35	\$1,750
			10	795'	40	SF	75	\$35	\$2,625
			11	993'	45	SF	100	\$35	\$3,500
			12	1,157'	50	SF	200	\$35	\$7,000
17A	Remove trees / vegetation growth in the vicinity of the wall.	V	-	-	-	LS	1	\$40,000	\$40,000
<b>Total Repair Costs</b>									<b>\$105,875</b>

Note: These estimated costs are approximate and should only be used as a reference and for project planning purposes. Although they represent the costs for individual repair activities, they may not represent the total cost of a complete repair/rehabilitation project. Costs for items such as Design, Permitting, Mobilization/Demobilization, Maintenance of Traffic, Stream Diversion, Submittal Reviews, etc. would have to be added to the costs provided to develop a comprehensive project cost.

**FIRST PRIORITY** (Designated as "1") - The first priority repairs include those portions of retaining wall which are failing and pose an immediate safety threat to homeowners and pedestrians. These portions of wall should be repaired immediately.

**MAINTENANCE** (Designated as "M") - This item includes preventative maintenance. These repairs will increase the life span of the retaining wall and should be completed as funds become available. Maintenance items include clearing vegetation from stone masonry joints and repointing the joints.

**VEGETATION REMOVAL** (Designated as "V") - This item includes the removal of vegetation growth, including mature trees, from the vicinity of the retaining walls. These repairs should be completed as funds become available; however, vegetation will continue to impact the retaining walls until removed.

## Ellicott City Retaining Walls Inspection Report Retaining Wall 17A



*Photo 1 – Elevation of Section 1, Looking Northwest.  
Note Vegetation Growth and Efflorescence.*



*Photo 2 – Elevation of Section 2, Looking Northeast.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 17A



*Photo 3 – Elevation of Section 2, Looking North.  
Note Missing Mortar.*



*Photo 4 – Elevation of Section 2, Looking North.  
Note Tree Growth.*

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 17A



*Photo 5 – Elevation of Section 3, Looking North.  
Note Full-Height Fracture, Undermining, and Leaning Top Corner.*



*Photo 6 – Top Corner Fractured and Leaning in Section 3, Looking North.*

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 17A



*Photo 7 – Building Column Bearing on Retaining Wall; Out of Plumb, Looking Northwest.*



*Photo 8 – View of Cantilevered Portion of Building over Section 3, Looking West.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 17A



*Photo 9 – Section 4 West Half Elevation, Looking North.  
Note Missing Mortar, Voids, and Vegetation Growth.*



*Photo 10 – Void above Drain Pipe in Section 4, Looking Northeast.*

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 17A



*Photo 11 – Section 4 Elevation, Looking North.  
Note Voids and Undermining along Base.*



*Photo 12 – View of Cantilevered Portion of Building over Section 4,  
Looking West. Note Bulging Wall.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 17A



*Photo 13 – Section 4 East Half Elevation, Looking Northeast.  
Note Active Water Leakage and Vegetation Growth.*



*Photo 14 – Section 4 Elevation at East End, Looking Northeast.  
Note Missing Mortar, Voids, and Vegetation Growth.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 17A



*Photo 15 – Elevation at West End of Section 5, Looking Northeast.*



*Photo 16 – Elevation of West Half of Section 5, Looking Northeast.  
Note Missing Mortar.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 17A



*Photo 17 – Elevation of East Half of Section 5, Looking Northwest.*



*Photo 18 – Elevation at East End of Section 5, Looking West.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 17A



*Photo 19 – Undermining at West End of Section 5.*

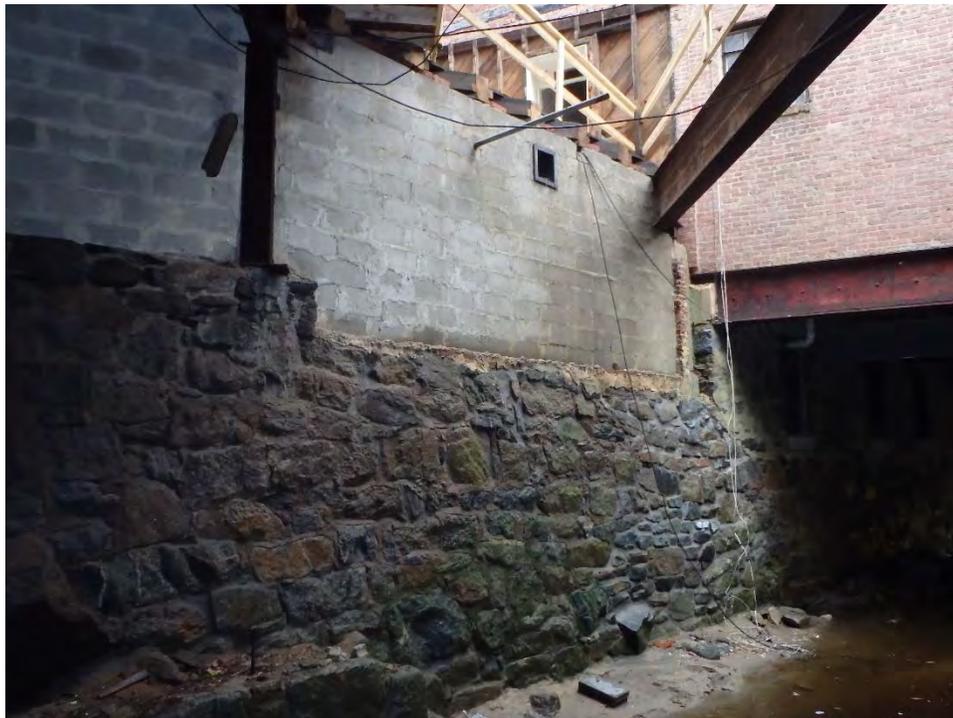


*Photo 20 – Elevation at West End of Section 6, Looking Northeast.*

**Ellicott City Retaining Walls Inspection Report**  
**Retaining Wall 17A**



*Photo 21 – Elevation of West Half of Section 6, Looking Northeast.*



*Photo 22 – Elevation of East Half of Section 6, Looking Northeast.*

**Ellicott City Retaining Walls Inspection Report**  
**Retaining Wall 17A**



*Photo 23 – Elevation at East End of Section 6, Looking Northwest.*

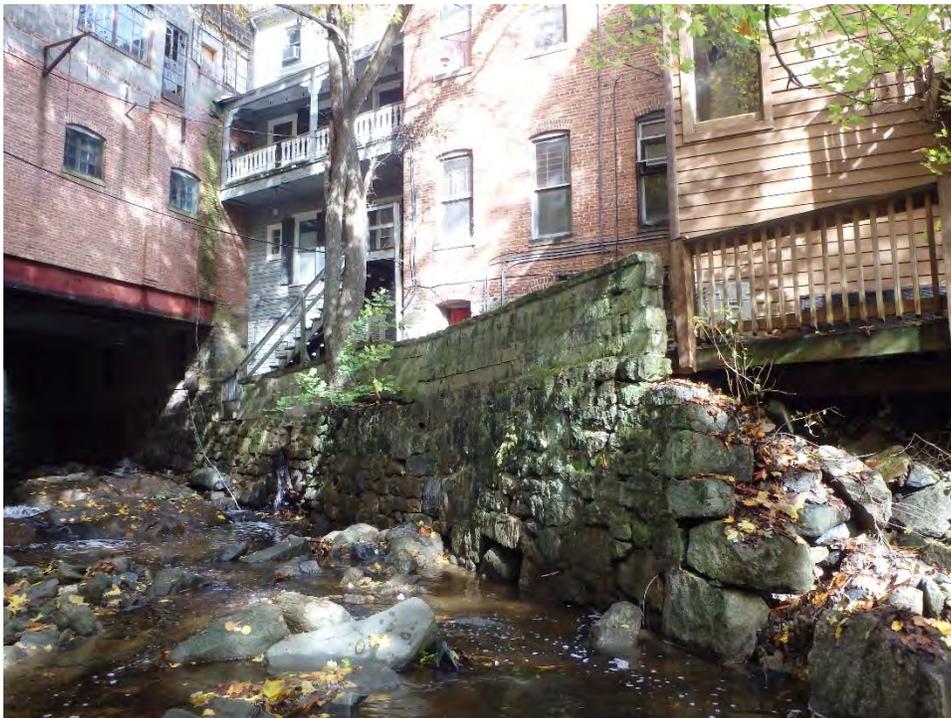


*Photo 24 – Elevation of West Half of Section 7, Looking Northeast.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 17A



*Photo 25 – Elevation of East Half of Section 7, Looking Northeast.*



*Photo 26 – Elevation of East Half of Section 7, Looking Northwest.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 17A



*Photo 27 – Large Tree Growth, Failing Concrete Wall, Voids and Missing Mortar in the East Half of Section 7, Looking Northeast.*



*Photo 28 – 5'-0" Long x 3'-0" High Void at Base of Wall Near East End of Section 7.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 17A



*Photo 29 – Elevation at West End of Section 8, Looking Northeast.*



*Photo 30 – Elevation of West Half of Section 8, Looking Northeast.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 17A



*Photo 31 – Elevation of East Half of Section 8, Looking Northwest.*



*Photo 32 – Elevation at East End of Section 8, Looking Northwest.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 17A

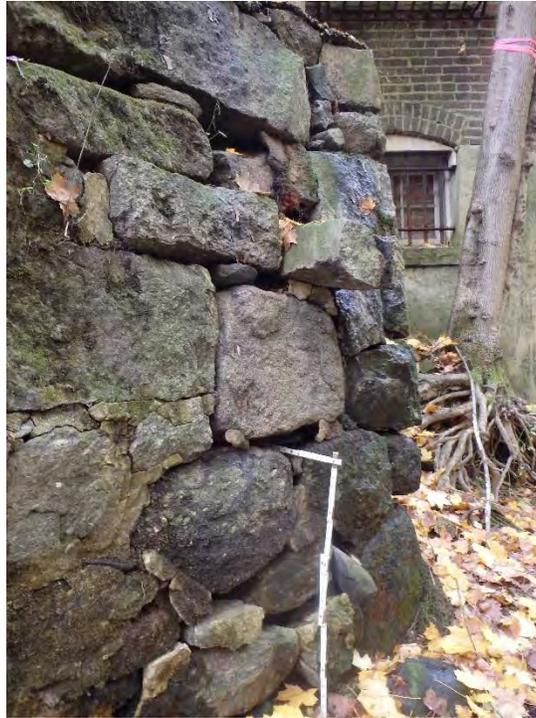


*Photo 33 – Collapsed West End of Section 8, Looking Northwest.*



*Photo 34 – Void and Missing Joint Material at Mid-length in Section 8.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 17A



*Photo 35 – Void and Missing Joint Material, 35' From East End in Section 8.*



*Photo 36 – Elevation at West End of Section 9, Looking North.  
Note Void under the First Deck Post from the West*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 17A



*Photo 37 – Elevation of West Half of Section 9, Looking Northwest.  
Note Missing Mortar along Base of Wall.*



*Photo 38 – Elevation of East Half of Section 9, Looking Northeast.  
Note Missing Mortar along Base of Wall.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 17A



*Photo 39 – Elevation at East End of Section 9, Looking Northwest.  
Note Voids along Base of Wall.*



*Photo 40 – Voids and Loose Stones in Section 9, 20' From West End.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 17A



*Photo 41 – Elevation at West End of Section 10, Looking Northwest.*



*Photo 42 – Elevation of West Half of Section 10, Looking Northwest.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 17A

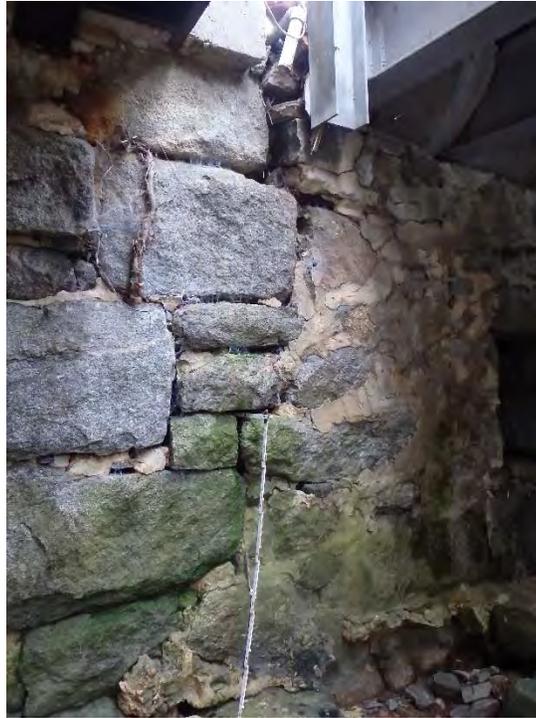


*Photo 43 – Elevation of East Half of Section 10, Looking Northwest.*



*Photo 44 – Elevation of East End of Section 10, Looking Northwest.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 17A



*Photo 45 – Missing Mortar in Section 10, Just East of 8081 Main Street.*



*Photo 46 – Opening in Wall in Section 10, Just East of 8081 Main Street.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 17A



*Photo 47 – Elevation at West End of Section 11, Looking Northwest.  
Note Bulging and Missing Mortar Throughout*



*Photo 48 – Elevation of Middle of Section 11, Looking Northwest.  
Note Missing Mortar Throughout*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 17A



*Photo 49 – Elevation at East End of Section 11, Looking Northwest.*



*Photo 50 – Typical Missing Mortar and Small Voids in Section 11.*

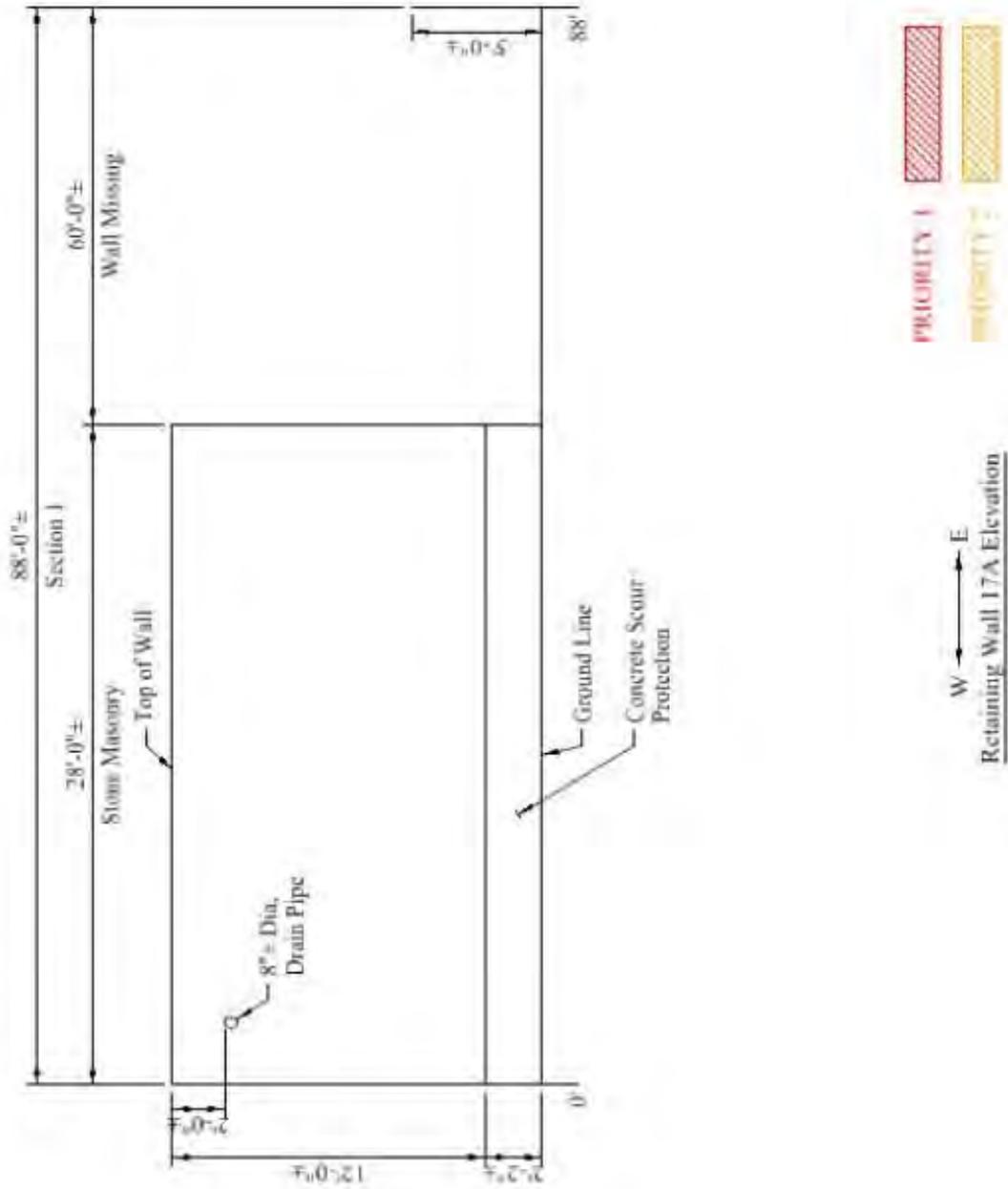
## Ellicott City Retaining Walls Inspection Report Retaining Wall 17A



*Photo 51 – Undermining at East End of Section 11.*

# Ellicott City Retaining Walls Inspection Report

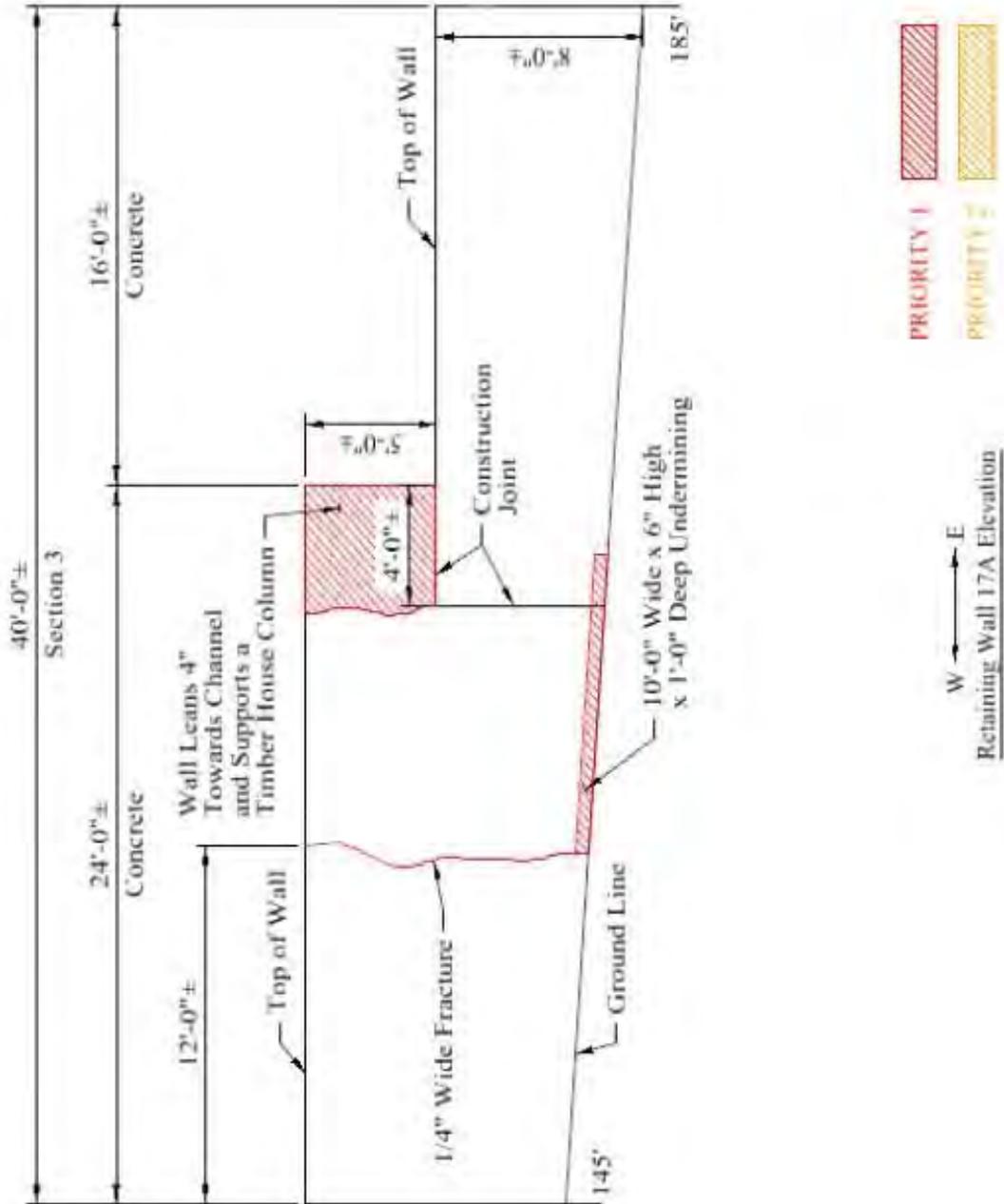
## Retaining Wall 17A





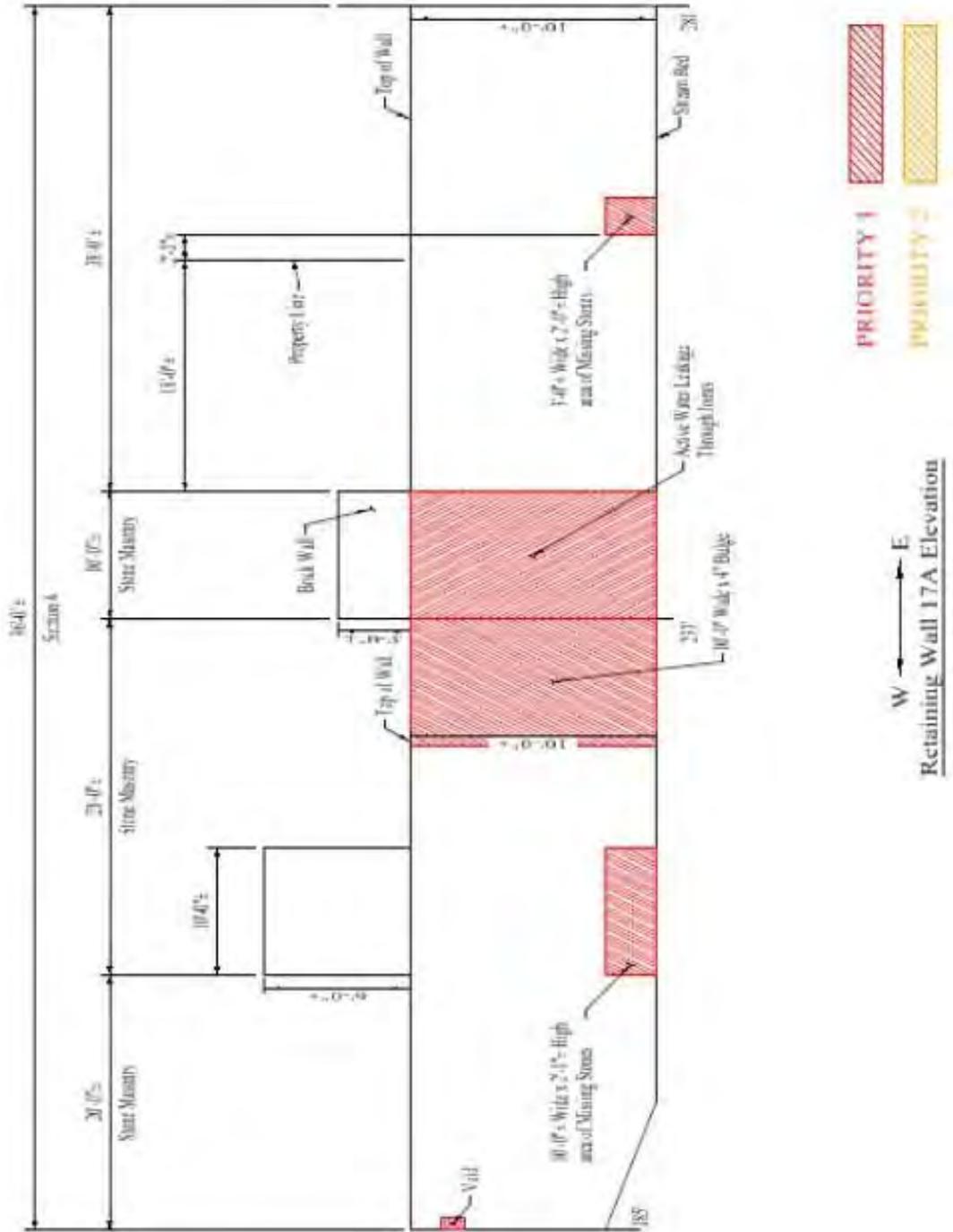
# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 17A



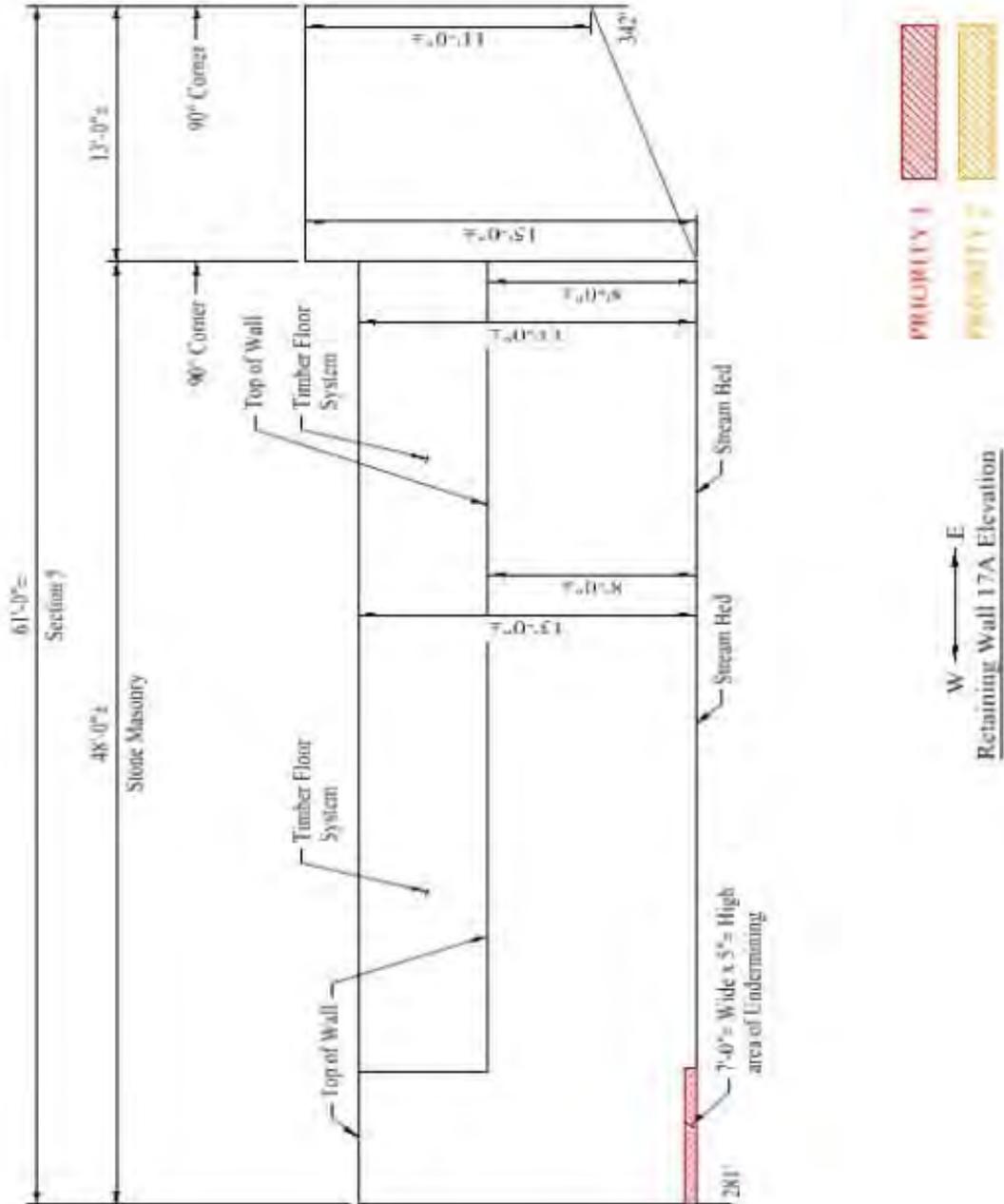
# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 17A



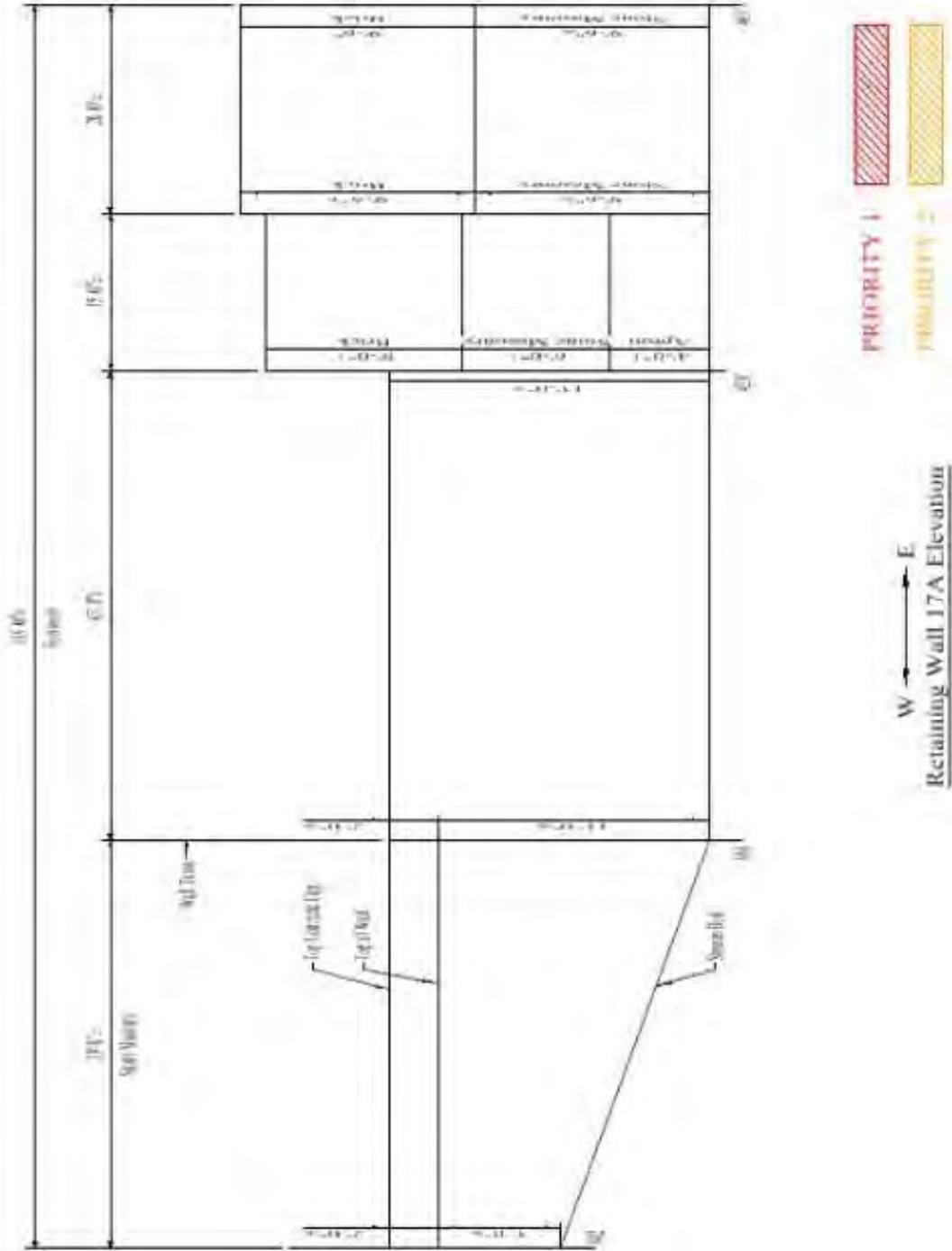
# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 17A



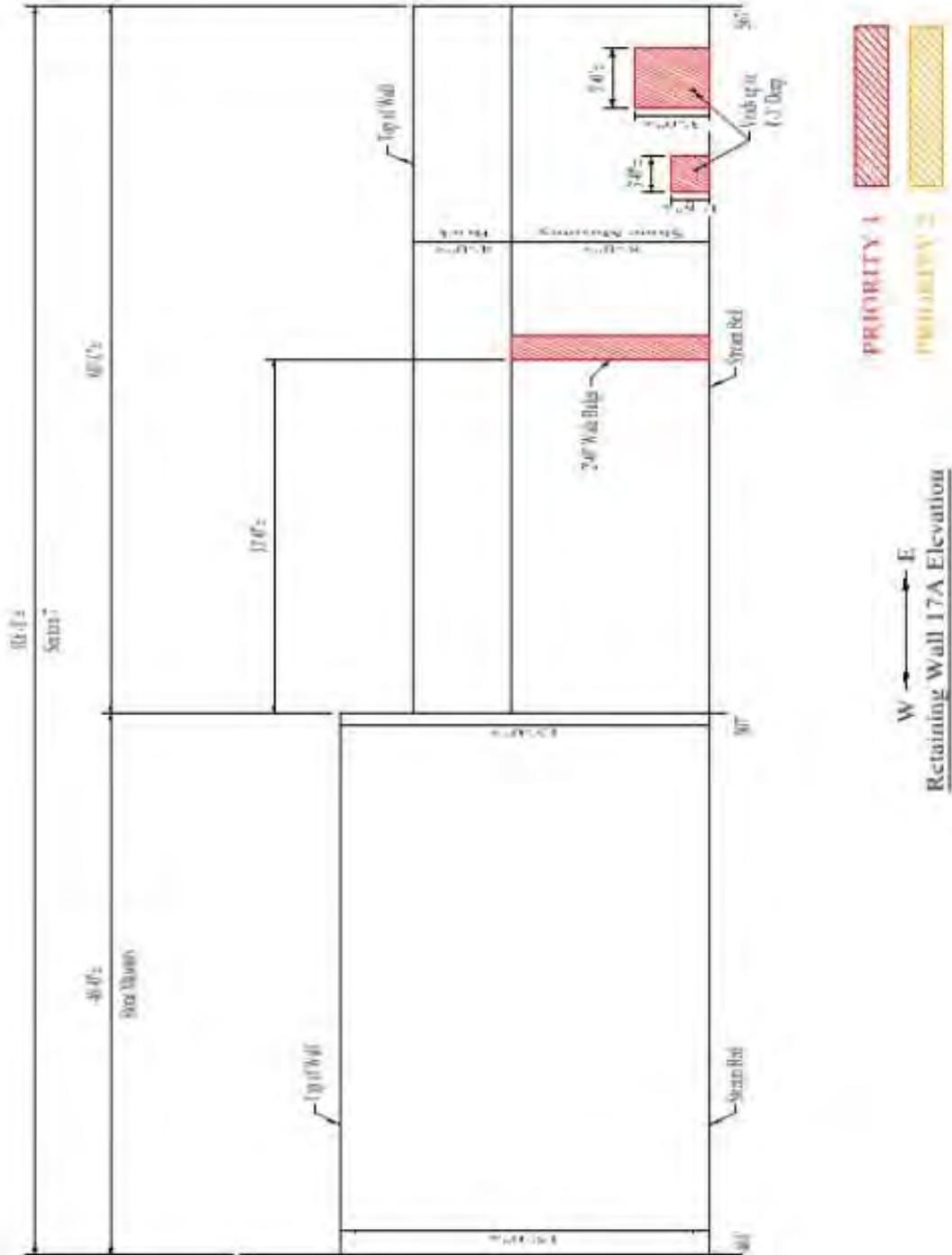
# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 17A



# Ellicott City Retaining Walls Inspection Report

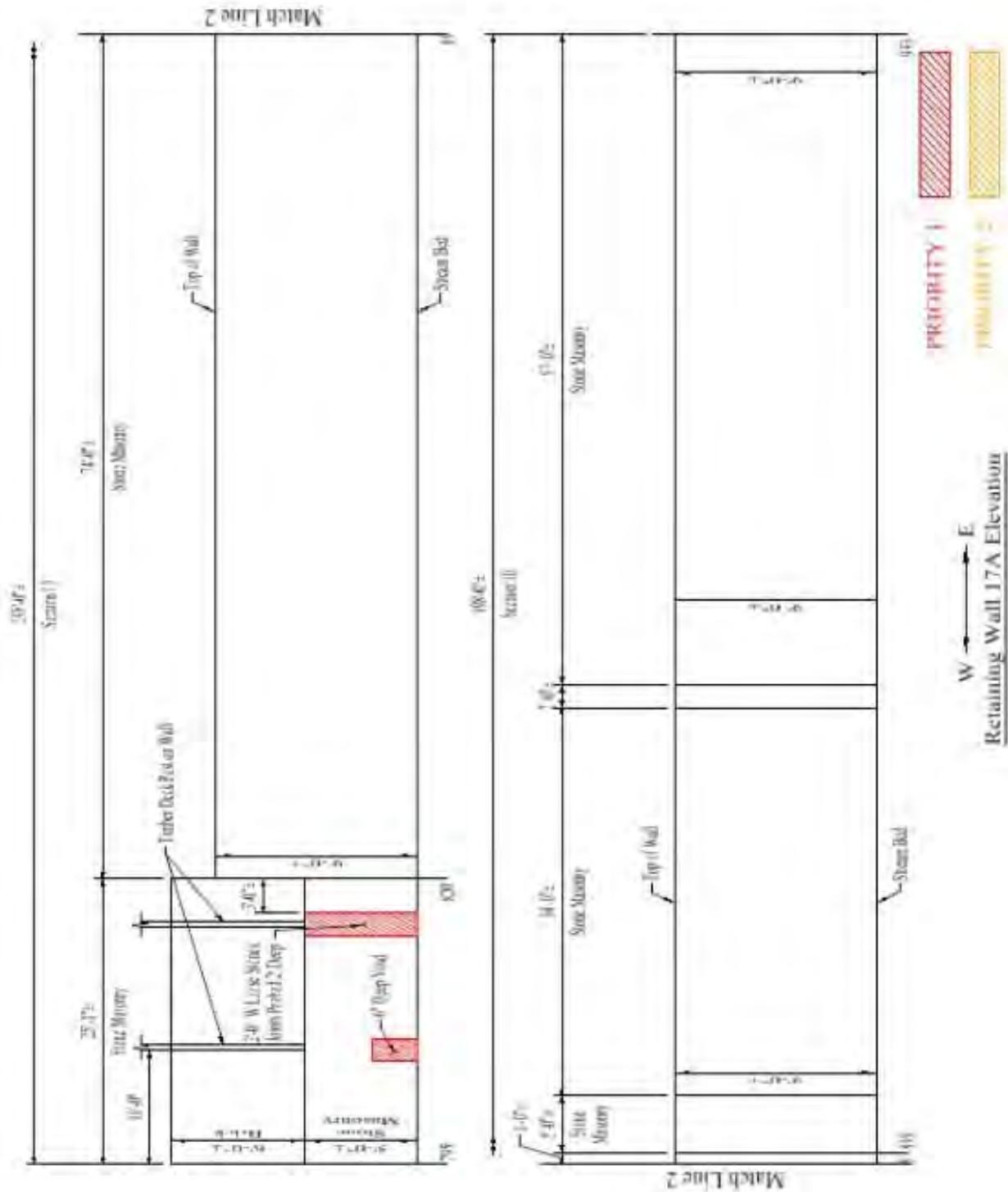
## Retaining Wall 17A





# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 17A







# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 17B

### *Description*

Retaining wall 17B runs along the south side of Tiber Branch, between Parking Lot D and Maryland Avenue in Ellicott City, MD. The wall starts (at the west end) at Structure No. HO-181X, continues beneath Old Columbia Pike and beneath/behind several private properties along Main Street, and ends (at the east end) at the Maryland Avenue vehicular bridge. The wall is approximately 1,239'± long and varies between 5'-0"± and 20'-0"± high. The wall is comprised of stone masonry and concrete. The year built is unknown, and no previous inspection reports or plans were available.

This retaining wall inspection was performed between October 27, 2015 and November 5, 2015 using waders. Access was obtained via Parking Lot D.

### *Inspection Findings*

Overall, the wall is in fair condition. The western 53' length (Section 1) is comprised of stone masonry and the top 2'-0" has missing mortar, tree roots, and moss growth throughout the joints (see Photos 1-2). There is a 2'-6" high x 4'-0" wide area of loose stones around a drain pipe at the top west corner of the wall (see Photo 3). Approximately 20' from the west end, there is a 3'-0" wide x 4'-0" high area of missing mortar which could be probed to 10" deep. The bottom of the wall, starting 19' from the west end, has a 34' long x up to 2'-0" high area of undermining up to 4'-0" deep (see Photo 4). This area was noted in a Critical Findings Memo to Howard County on October 30, 2015. Grout bags have been installed and the undermined area has been filled with grout since this inspection based off of the Critical Findings Memo (see Photo 5).

In Section 1, behind the wall, there is a grass area that serves as a courtyard for several businesses. A patio has been constructed, positioned so that the north edge of the patio is 3'-0" from the front face of the retaining wall. The north edge of the patio (1'-0" wide) shows signs of settlement towards the channel (see Photo 6). There is a sinkhole behind the retaining wall located 32'-0" from the west end of the wall. The hole is 3'-0" in diameter on the surface, but extends at least 10'-0" in either direction underground (see Photo 7). There was evidence of a broken drain pipe in the hole. This area was noted in a Critical Findings Memo to Howard County on October 30, 2015. The sinkhole has been filled with flowable fill since this inspection based off of the Critical Findings Memo (see Photo 8).

Section 2 extends from 53' to 152' from the west end of the wall and is comprised of stone masonry. There is heavy vegetation/vine growth throughout (see Photos 9 and 10). Located 10' from the west end, there is a full-height fracture open up to 1" wide and 1'-0" diameter tree at the top of the wall (see Photo 11). There is a large area of missing mortar with vine and root growth in the joints, in the top half of the wall at the east end.

Section 3 extends from 152' to 252' from the west end of the wall. The retaining wall is missing in this area. The natural slope is stable.

Section 4 extends from 252' to 340' from the west end of the wall and is comprised of stone masonry and concrete (see Photos 12-14). Approximately 10' from the west end, there is a 5'-0"

## **Ellicott City Retaining Walls Inspection Report**

### **Retaining Wall 17B**

wide x 2'-0" high x 2'-0" deep drainage opening at the top of the wall. There are random isolated areas of loose/missing mortar throughout which can be probed up to 2'-0" deep to the fill. The worst area is within the west 20', where the stones are misaligned horizontally up to 4" (see Photo 14).

Section 5 extends from 340' to 435' from the west end of the wall and is comprised of stone masonry with a concrete cap at the west 31', concrete wall in the middle 39', and stone masonry at the east 25' (see Photos 15-18). There is up to 6" deep scaling throughout the 39' long concrete wall (see Photo 16). There is missing mortar with small voids that can be probed to 3'-0" deep and minor vegetation growth throughout between 410' and 435' from the west end of the wall (see Photo 17). Approximately 15' from the east end, there is a 2'-0" diameter tree growing out of the top of the wall (see Photo 17). The east end of the stone masonry wall extends behind the Section 6 concrete wall (see Photo 18).

Section 6 extends from 435' to 485' from the west end and is comprised of concrete with typical minor scaling along the bottom 1'-0" (see Photo 19). The bottom of the wall at the west end has a 6'-0" long x 9" high x 9" deep area of undermining (see Photo 20). Starting 15' behind the east end of the wall, there is 35' long x 15' high x 15' wide area of erosion (see Photo 21).

Section 7 extends from 485' to 685' from the west end of the wall. The retaining wall is missing in this area (see Photo 21). The natural slope is stable.

Section 8 extends from 685' to 722' from the west end, located approximately 15' above the stream bed, and is comprised of stone masonry (see Photo 22). There is missing mortar and small stones throughout, vine growth, and a few random small trees growing along the top of the wall (see Photo 23). There are random large missing stones throughout the western 20' length of Section 8. There is a 2'-0" diameter tree growing at the west end and a 1'-0" diameter tree growing through the wall near the east end (see Photo 23).

Section 9 extends from 722' to 837' from the west end of the wall. The retaining wall is missing in this area (see Photo 23). The natural slope is stable.

Section 10 extends from 837' to 932' from the west end of the wall. The portion between 837' and 894' from the west end (beneath 8125 Main Street) is comprised of stone masonry with a concrete cap (see Photos 24-27). There are random areas of missing and/or deteriorated mortar throughout the joints, mostly along the bottom 1'-0" height. There is a 2'-1" wide x 1'-2" high x 1'-3" deep square drainage opening along the bottom of the wall, located at 874' from the west end. Just below the drainage opening, there is a 2'-10" wide x 9" high area of missing mortar and small stones with minor loss of fill, which could be probed to 1'-0" deep (see Photo 26). There is a 1'-6" wide x 1'-6" high x 3'-9" deep square drainage opening along the bottom of the wall, located 10' from the east end, with visible water leaking just below the drainage opening. The portion of wall between 894' and 932' from the west end (beneath 8109/8111/8113 Main Street) is comprised of bedrock, stone masonry, brick, and concrete. There are random areas of missing and/or deteriorated mortar throughout the joints. Within the open area at 894' from the west end, there is a large tree growing out of the top of the wall and active water leaking from an above gutter. There

## **Ellicott City Retaining Walls Inspection Report**

### **Retaining Wall 17B**

is a 5'-0" wide x 3'-0" high void, which could be probed to 2'-6" deep, 2'-0" from the bottom, located at 927' from the west end of the wall (see Photo 27).

Section 11 extends from 932' to 1,148' from the west end of the wall. The portion between 932' and 995' from the west end (beneath 8095/8101 Main Street) is comprised of bedrock, concrete, and stone masonry (see Photo 28). There is a 2'-0" wide x 2'-0" high area of loose stones with missing mortar, which could be probed to 9" deep, at the top west end (see Photo 29) and a 2'-0" wide x 1'-0" high area of loose stones with missing mortar, which could be probed to 9" deep, approximately 7'-0" from the west end at mid-height. The bottom of the wall is undermined at the west end of Section 11, 30' long x 1'-0" high x up to 1'-5" deep (see Photo 30). The portion of wall between 995' and 1,024' from the west end (beneath 8085 Main Street) is comprised of stone masonry and concrete. There is a 3'-0" wide x 5'-0" high failed wall with missing stones and loss of fill, which could be probed up to 7'-0" deep, at the bottom west end (see Photo 31). There is a broken drainage pipe and a 1'-10" wide x 1'-2" high area of loose stones, which could be probed to 1'-6" deep, approximately 13'-0" from the west end at the top. The retaining wall is missing between 1,024' and 1,032' from the west end of the wall. Riprap has been placed in this area (see Photo 32). The portion of wall between 1,032' and 1,072' from the west end (beneath 8081 Main Street) is comprised of stone masonry. There are random small areas of missing and/or deteriorated mortar throughout the joints, which could be probed up to 1'-0" deep, mostly along the bottom 1'-0". There is a 1'-8" wide x 2'-0" high x 2'-0" deep square opening in the top of the wall for a drain pipe at 1,065' from the west end. The portion of wall between 1,072' and 1,148' from the west end (beneath 8069 Main Street) is comprised of stone masonry. There is a pedestrian bridge at the east end of Section 11 (see Photo 33).

Section 12 extends from 1,148' to 1,239' from the west end of the wall. The portion between 1,148' and 1,171' from the west end (beneath 8059 Main Street) is comprised of stone masonry (see Photo 34). There is an 8" wide x 1'-0" high square opening in the top of the wall for a drain pipe, at mid-length. The bottom of the wall at the east end has a 5'-0" long x 1'-0" high area of missing mortar, which could be probed up to 1'-0" deep. The portion between 1,171' and 1,239' from the west end (beneath 8055/8049 Main Street) is comprised of stone masonry. There are random areas of missing mortar and small stones throughout 40% of the joints, which can be probed up to 2'-0" deep (see Photo 35). The remaining mortar is in good condition. Typically, there is missing mortar along the bottom 1'-0" height and undermining up to 5" high x 10" deep along the full length. There is a displaced stone at the bottom of the wall, protruding 1'-0" outward, 1,187' from the west end (see Photo 36). Above the displaced stone, there are gaps up to 3'-0" wide x 6" high x 1'-0" deep. There is up to 3'-0" deep scour adjacent to the wall at this location. The bottom of the wall, starting at 1,197' from the west end, has a 3'-0" long x 1'-6" high x 1'-0" deep area of undermining/missing stone (see Photo 37). There is a 1'-4" wide x 1'-0" high x 2'-0" deep void/missing stone, 3'-0" from the base of the wall, at 1,203' from the west end (see Photo 38).

## Ellicott City Retaining Walls Inspection Report

### Retaining Wall 17B

#### *Recommendations*

Based off of the Critical Findings Memo which was submitted to Howard County on October 30, 2015, the undermined area and the sinkhole in Section 1 have been repaired since this inspection.

Remove all trees and vegetation from the top and back of the wall. Fill all undermined areas and voids with grout. Replace all missing stones. The stone masonry joints should be re-pointed in the areas of missing mortar.

Retaining Wall	Repair Recommendation	Priority	Wall Section	Station	Photos	Unit	Qty.	Unit Cost	Total Est. Cost
17B	Replace missing stones.	2	1	0'	3	CY	0.5	\$1,000	\$500
			8	685'	23	CY	0.5	\$1,000	\$500
			10	874'	26	CY	0.5	\$1,000	\$500
			10	927'	27	CY	0.5	\$1,000	\$500
			11	995'	31	CY	0.5	\$1,000	\$500
			12	1,187'	36	CY	0.5	\$1,000	\$500
			12	1,203'	38	CY	0.5	\$1,000	\$500
17B	Underpin undermined portions of wall.	2	6	435'	20	CY	1	\$1,000	\$1,000
			11	932'	30	CY	2	\$1,000	\$2,000
			12	1,197'	37	CY	1	\$1,000	\$1,000
17B	Repoint the masonry joints.	M	1	0'	1, 2	SF	50	\$35	\$1,750
			2	53'	11	SF	10	\$35	\$350
			4	252'	14	SF	100	\$35	\$3,500
			5	410'	17	SF	200	\$35	\$7,000
			8	685'	23	SF	100	\$35	\$3,500
			10	837'	26	SF	50	\$35	\$1,750
			11	932'	29	SF	200	\$35	\$7,000
			12	1,148'	35	SF	100	\$35	\$3,500
17B	Remove trees / vegetation growth in the vicinity of the wall.	V	-	-	-	LS	1	\$10,000	\$10,000
<b>Total Repair Costs</b>								<b>\$45,850</b>	

Note: These estimated costs are approximate and should only be used as a reference and for project planning purposes. Although they represent the costs for individual repair activities, they may not represent the total cost of a complete repair/rehabilitation project. Costs for items such as Design, Permitting, Mobilization/Demobilization, Maintenance of Traffic, Stream Diversion, Submittal Reviews, etc. would have to be added to the costs provided to develop a comprehensive project cost.

**SECOND PRIORITY** (Designated as "2") - The second priority items include defects which do not pose an immediate safety concern, but have the potential to advance to a safety threat if left untreated. These defects exist at portions of the retaining wall which support buildings, roadways, parking lots, or pedestrian areas. The repairs should be completed within 3 years.

**MAINTENANCE** (Designated as "M") - This item includes preventative maintenance. These repairs will increase the life span of the retaining wall and should be completed as funds become available. Maintenance items include clearing vegetation from stone masonry joints and repointing the joints.

**VEGETATION REMOVAL** (Designated as "V") - This item includes the removal of vegetation growth, including mature trees, from the vicinity of the retaining walls. These repairs should be completed as funds become available; however, vegetation will continue to impact the retaining walls until removed.

## Ellicott City Retaining Walls Inspection Report Retaining Wall 17B



*Photo 1 – Elevation of Section 1, Looking Southwest.*



*Photo 2 – Elevation of Section 1, Looking Southeast.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 17B



*Photo 3 – Loose Stones at Top West Corner of Section 1, Looking South.*



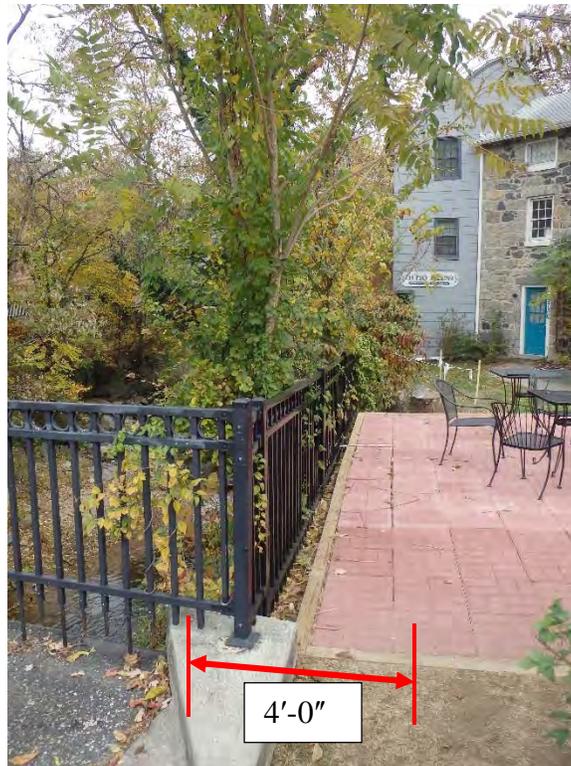
*Photo 4 – Undermining Along East Half of Section 1, Looking Southwest.*

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 17B



*Photo 5 – EMERGENCY REPAIR - Grout Bags Installed at Area of Undermining Along Section 1, Looking East.*



*Photo 6 – View of Patio Above Wall with Settled Edge at Section 1, Looking East.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 17B



*Photo 7 – View of Erosion Hole behind Section 1, Looking North.*



*Photo 8 – EMERGENCY REPAIR – Sinkhole has been filled  
Along Section 1, Looking Northeast.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 17B



*Photo 9 – Elevation at West End of Section 2, Looking Southeast.*



*Photo 10 – Elevation at East End of Section 2, Looking Southwest.  
Note Vegetation Growth.*

**Ellicott City Retaining Walls Inspection Report**  
**Retaining Wall 17B**



*Photo 11 – Fracture in Section 2 below Tree.*



*Photo 12 – Elevation at West End of Section 4, Looking Southeast.*

**Ellicott City Retaining Walls Inspection Report**  
**Retaining Wall 17B**



*Photo 13 – Elevation at East End of Section 4, Looking Southwest.*



*Photo 14 – Mortar Loss in Section 4.*

**Ellicott City Retaining Walls Inspection Report**  
**Retaining Wall 17B**



*Photo 15 – Elevation at West End of Section 5, Looking Southeast.*



*Photo 16 – Elevation of Middle Portion of Section 5, Looking Southeast.  
Note Scaling Near Base.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 17B



*Photo 17 – Elevation at East End of Section 5, Looking Southeast.  
Note Missing Mortar, Voids, and Large Tree Growth*



*Photo 18 – Elevation at East End of Section 5, Behind Section 6, Looking Southeast.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 17B



*Photo 19 – Elevation of Section 6, Looking Southeast.*



*Photo 20 – Undermining at West End of Section 6, Looking Southeast.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 17B



*Photo 21 – Erosion at East End of Section 6, Looking Southwest.  
Note Missing Wall to East of Section 6 (Section 7).*



*Photo 22 – Elevation of Section 8, Looking South.*

**Ellicott City Retaining Walls Inspection Report**  
**Retaining Wall 17B**



*Photo 23 – Missing Stones/Mortar and Tree Growth at East End of Section 8.  
Note Missing Wall to East of Section 8 (Section 9).*



*Photo 24 – Elevation at West End of Section 10, Looking Southeast.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 17B



*Photo 25 – Elevation from Middle of Section 10, Looking Southwest.*



*Photo 26 – Missing Mortar and Stones at Bottom of Wall in Section 10 (at 874').*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 17B



*Photo 27 – Elevation at East End of Section 10, Looking Southwest.  
Note Void at East End (at 827’).*



*Photo 28 – Elevation at West End of Section 11, Looking Southeast.*

**Ellicott City Retaining Walls Inspection Report**  
**Retaining Wall 17B**



*Photo 29 – Loose Stones and Missing Mortar at Top at West End of Section 11.*



*Photo 30 – Undermining at the West End of Section 11.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 17B



*Photo 31 – Failed Wall with Loose Stones and Loss of Fill in Section 11.*



*Photo 32 – Rip-Rap between 1,024' and 1,032' from the west end of the wall (Section 11).*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 17B



*Photo 33 – Elevation at East End of Section 11, Looking Southwest.*



*Photo 34 – Elevation at West End of Section 12, Looking Southeast.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 17B



*Photo 35 – Missing Mortar in Section 12, Looking Southwest.*



*Photo 36 – Displaced Stone and Scour in Section 12*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 17B



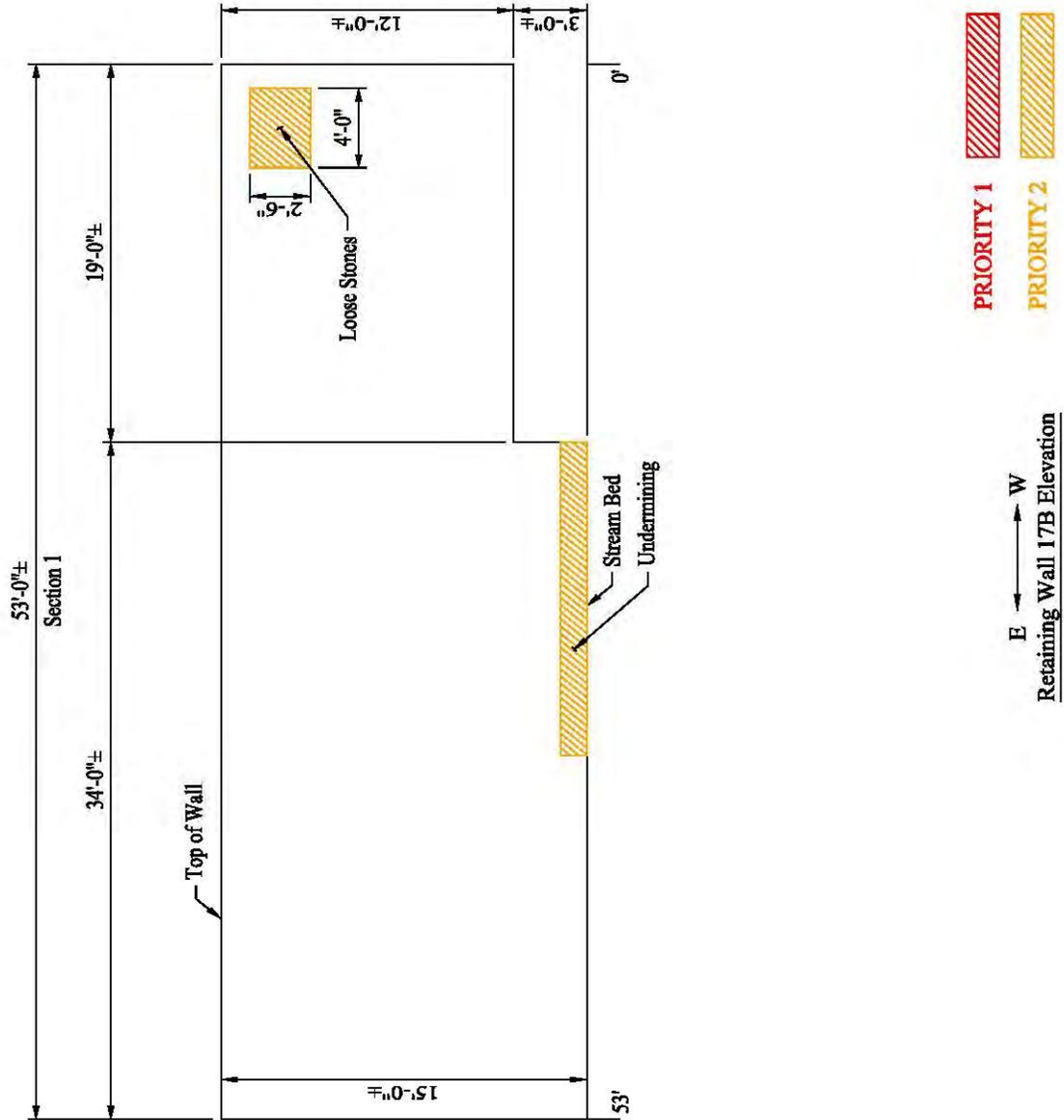
*Photo 37 – Undermining in Section 12.*



*Photo 38 – Void/Missing Stone in Section 12, 36' from East End.*

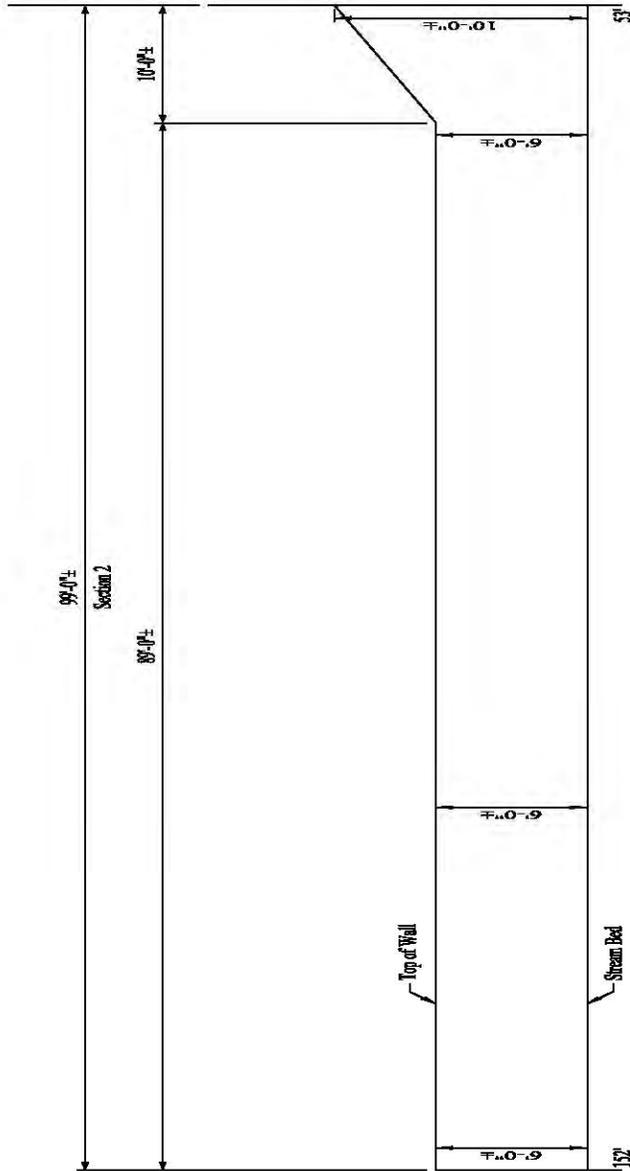
# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 17B



# Ellicott City Retaining Walls Inspection Report

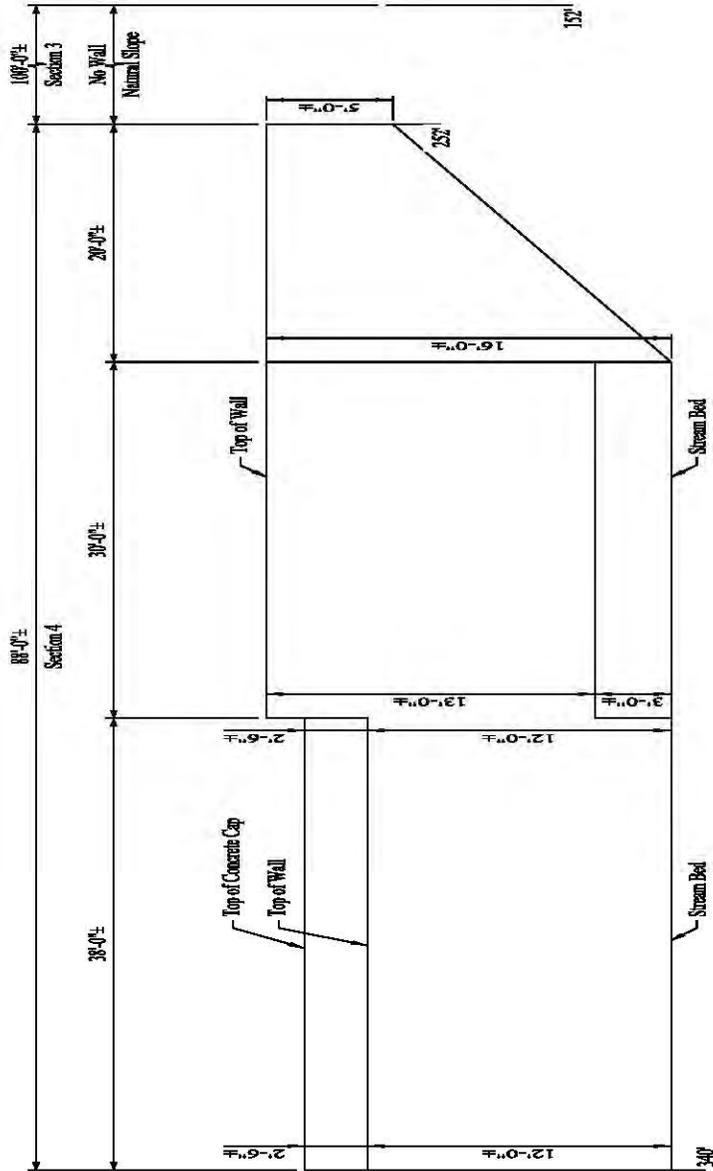
## Retaining Wall 17B



E ← → W  
Retaining Wall 17B Elevation

# Ellicott City Retaining Walls Inspection Report

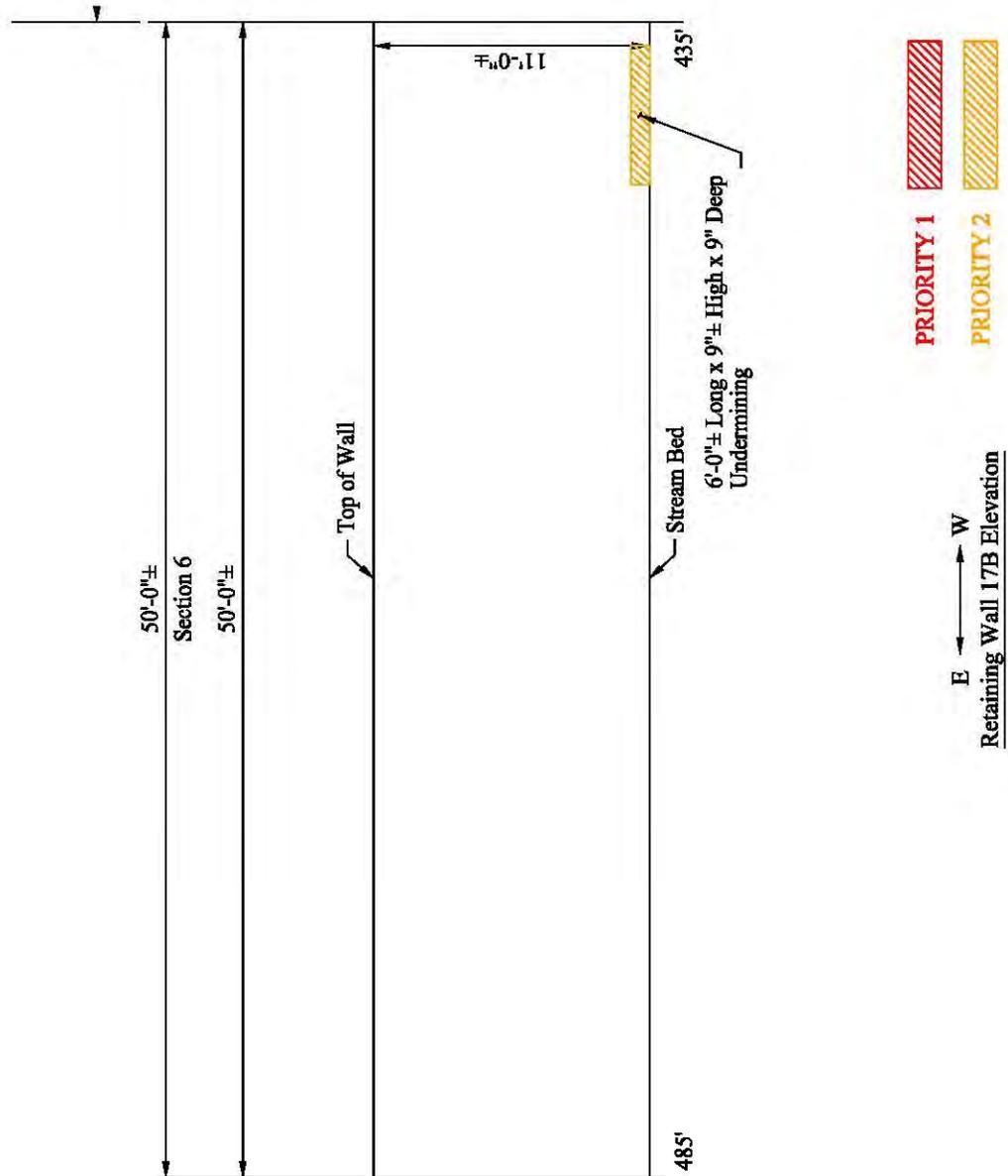
## Retaining Wall 17B





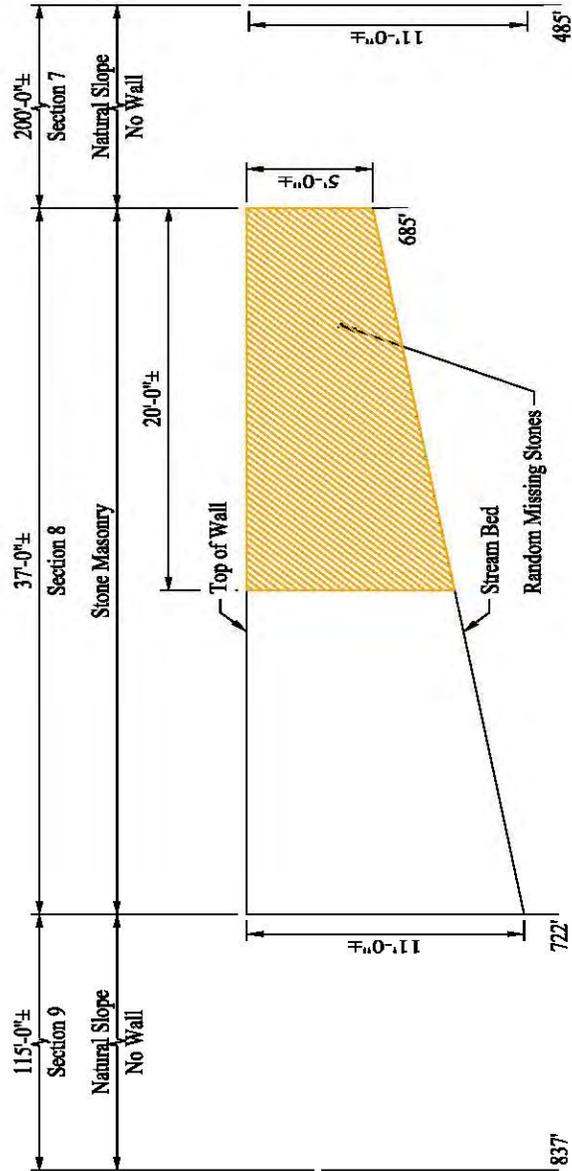
# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 17B



# Ellicott City Retaining Walls Inspection Report

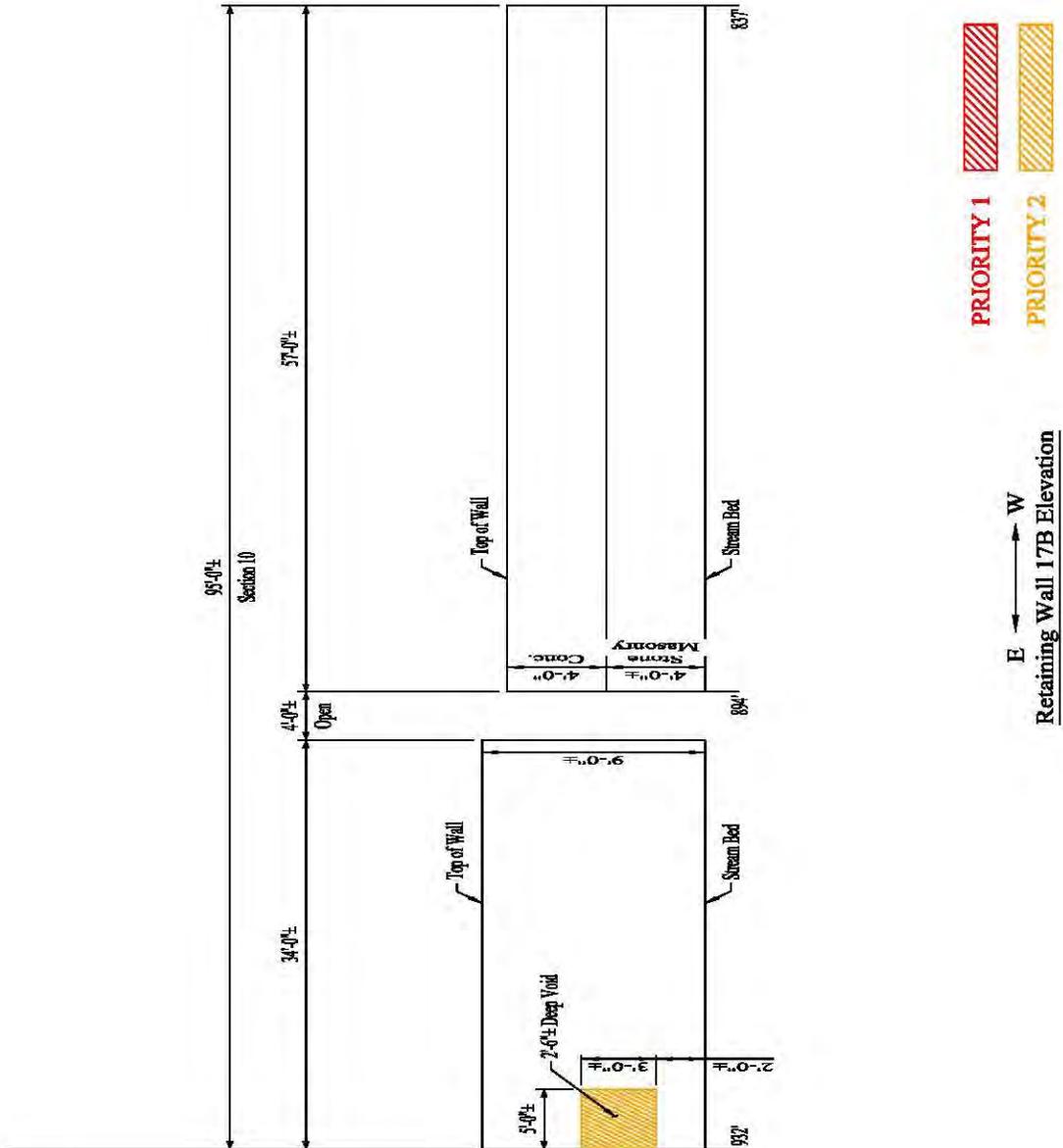
## Retaining Wall 17B



E ← → W  
Retaining Wall 17B Elevation

# Ellicott City Retaining Walls Inspection Report

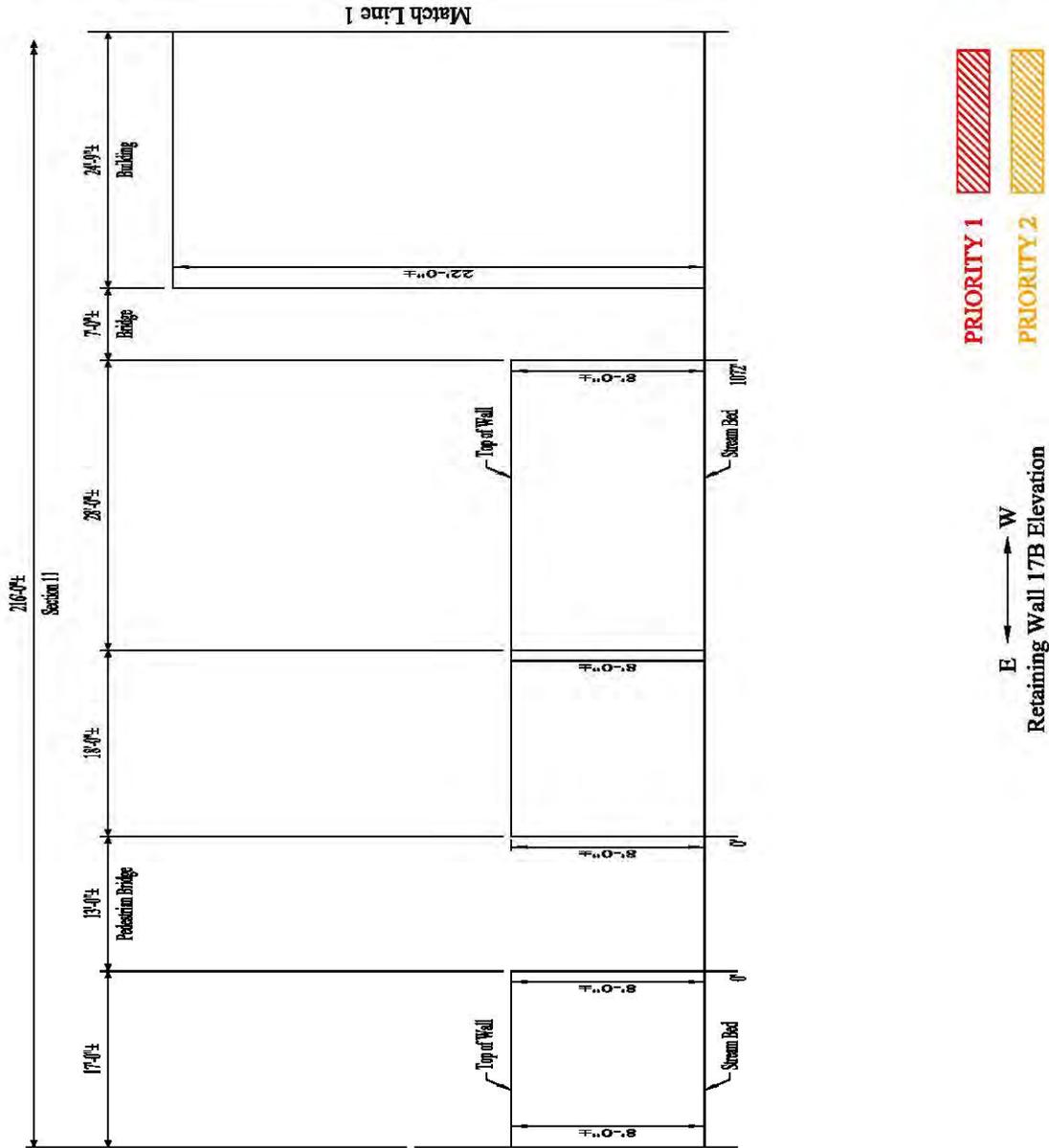
## Retaining Wall 17B





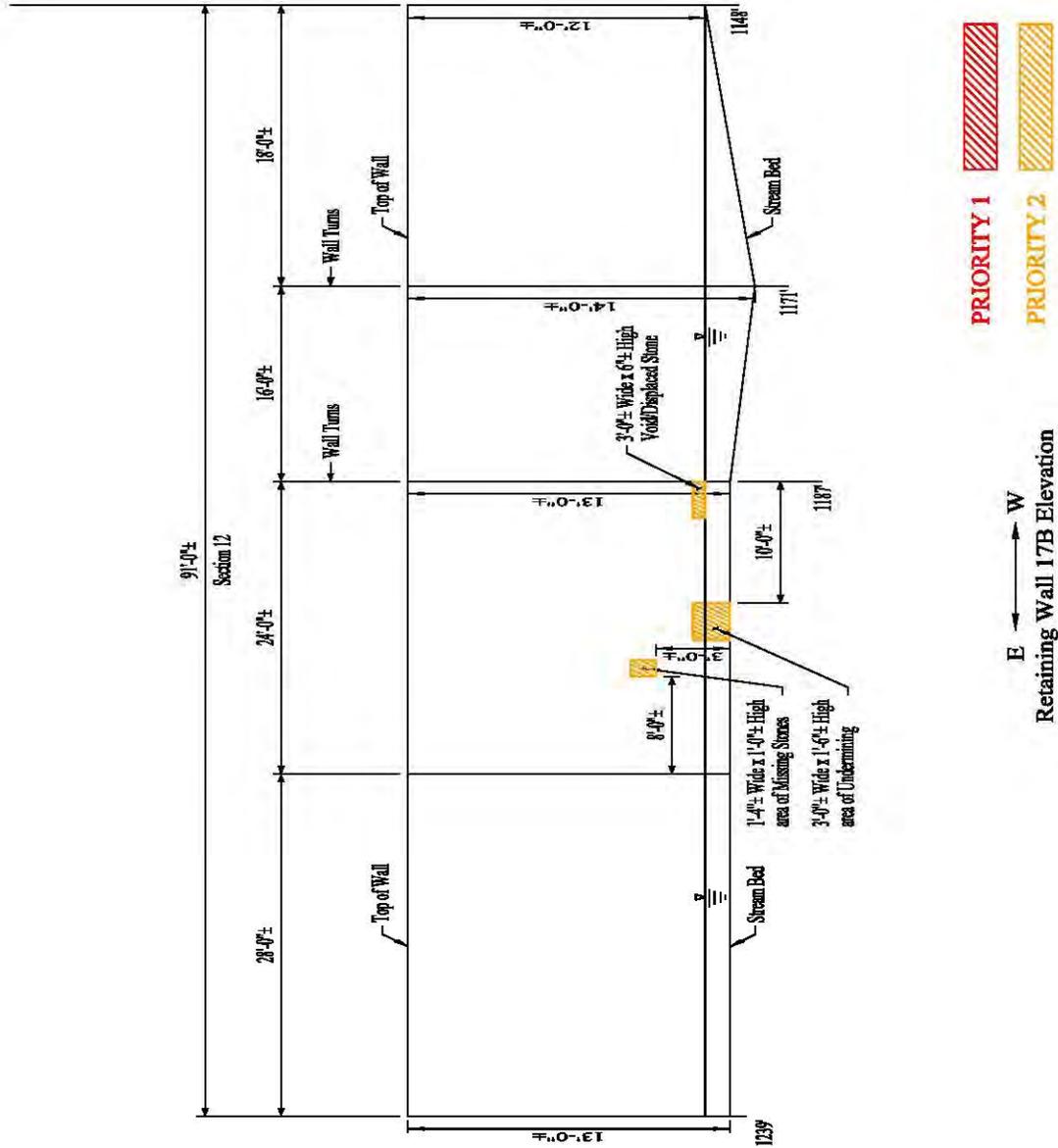
# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 17B



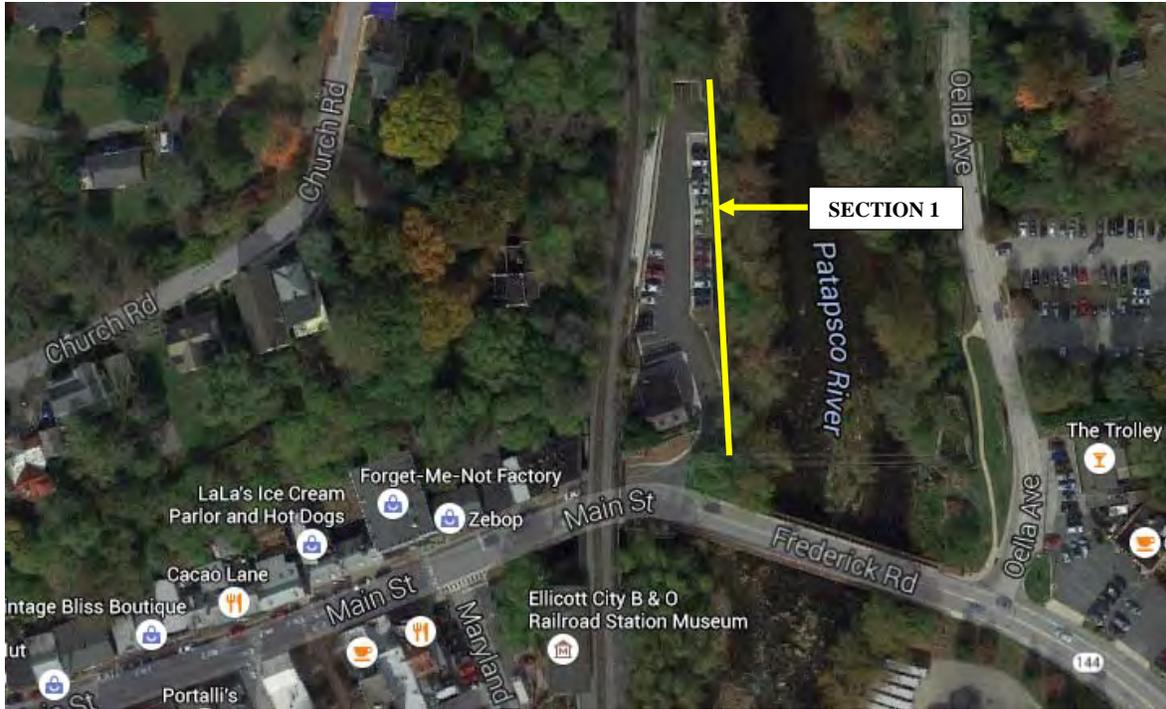
# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 17B



# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 28



### LOCATION MAP

### EAST OF PARKING LOT B

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 28

### *Description*

Retaining Wall 28 runs along the east side of Parking Lot B, along the Patapsco River, in Ellicott City, MD. The wall is approximately 380'± long and 6'-0"± high. The wall is comprised of stone masonry. The year built is unknown, and no previous inspection reports or plans were available.

The retaining wall inspection was performed on October 21, 2015. Access was obtained via the gate at the south end of Parking Lot B.

### *Inspection Findings*

Overall, the retaining wall is in good condition. There is typically light efflorescence throughout the wall (see Photo 3). There were small isolated areas of mortar loss in the joints throughout the wall (see Photo 4). Approximately 30' from the north end of the wall, there is a 6'-0" long cracked mortar joint, open up to ½" wide (see Photo 5). The northernmost 20' length of the wall has mortar loss throughout the joints. There are two large areas of loose and missing stones within the northern 10' length of the wall (see Photo 6). Fill was visible in the voids. There are a few mature trees growing along the top of the wall; however, they are not visibly affecting the wall.

The wall is positioned approximately 20' from the edge of the stream channel. There was no evidence of scour or undermining.

### *Recommendations*

The missing stones should be replaced. The mortar joints should be repointed throughout the wall. The mature trees growing along the top of the wall should be monitored for encroachment / effect on the wall.

Retaining Wall	Repair Recommendation	Priority	Wall Section	Station	Photos	Unit	Qty.	Unit Cost	Total Est. Cost
28	Replace missing stones.	3	1	370'	6	CY	2	\$1,000	\$2,000
28	Repoint the masonry joints.	M	1	-	3-5	SF	100	\$35	\$3,500
<b>Total Repair Costs</b>									<b>\$5,500</b>

Note: These estimated costs are approximate and should only be used as a reference and for project planning purposes. Although they represent the costs for individual repair activities, they may not represent the total cost of a complete repair/rehabilitation project. Costs for items such as Design, Permitting, Mobilization/Demobilization, Maintenance of Traffic, Stream Diversion, Submittal Reviews, etc. would have to be added to the costs provided to develop a comprehensive project cost.

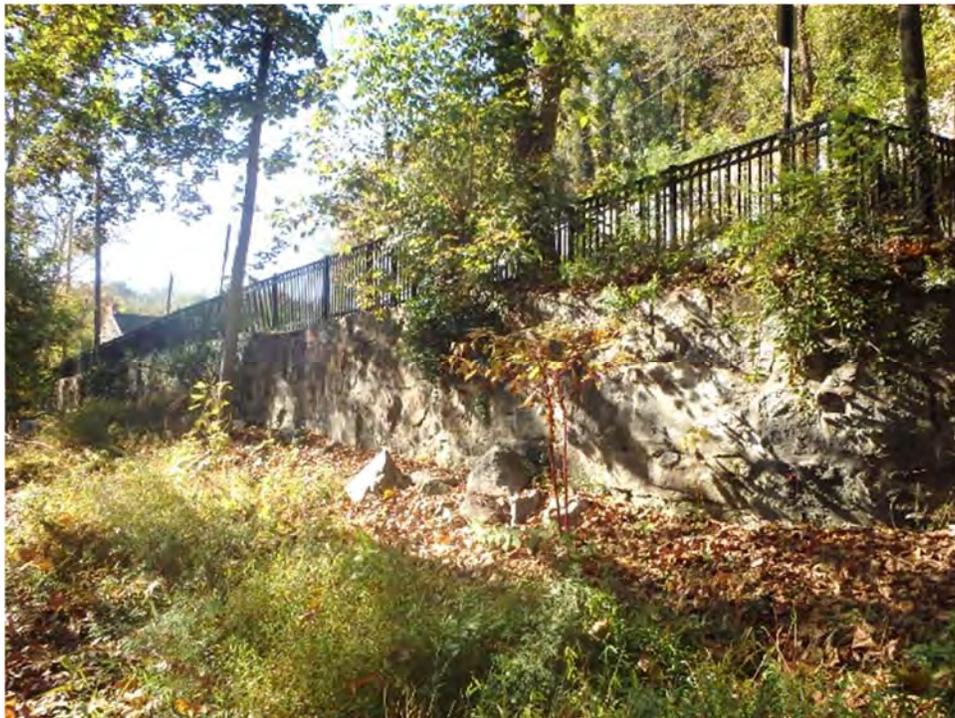
**THIRD PRIORITY** (Designated as "3") - The third priority items include defects which exist at portions of the retaining wall which do not support pedestrian areas (along natural slopes). Failure of the wall in these areas may redirect the stream or cause flooding; however, there is less of an immediate threat to pedestrians if left untreated.

**MAINTENANCE** (Designated as "M") - This item includes preventative maintenance. These repairs will increase the life span of the retaining wall and should be completed as funds become available. Maintenance items include clearing vegetation from stone masonry joints and repointing the joints.

## Ellicott City Retaining Walls Inspection Report Retaining Wall 28



*Photo 1 – Elevation from South End, Looking Northwest.*



*Photo 2 – Elevation from North End, Looking Southwest.  
Note Mature Tree Growth along Top of Wall.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 28



*Photo 3 – Typical Light Efflorescence throughout Wall.*



*Photo 4 – Typical Isolated Mortar Loss throughout Wall.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 28



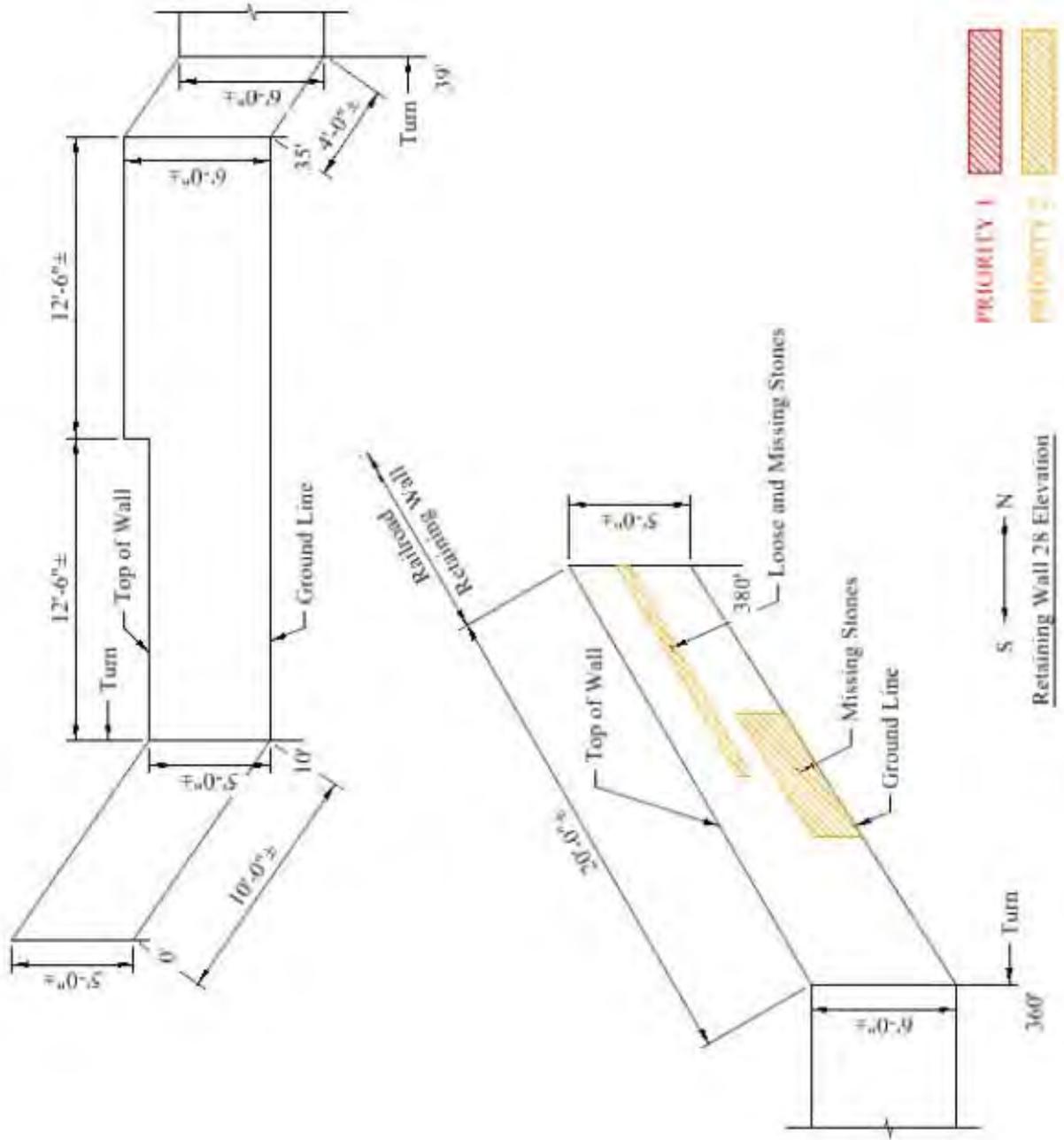
*Photo 5 – Cracked Mortar Joint at 350' from South End of Wall.*



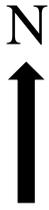
*Photo 6 – Loose and Missing Stones at North End of Wall.*

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 28



**Ellicott City Retaining Walls Inspection Report**  
**Retaining Wall 29**



**LOCATION MAP**

**MAIN STREET, EAST OF MARYLAND AVENUE**

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 29

### *Description*

Retaining Wall 29 runs along the south edge of Main Street, east of Maryland Avenue, along the north edge of Tiber Run in Ellicott City, MD. The wall is approximately 52'± long and 16'-0"± high. The wall is comprised of stone masonry. The upper 3'-6" height of the wall serves as a pedestrian barrier along Main Street. The year built is unknown, and no previous inspection reports or plans were available.

The retaining wall inspection was performed on October 21, 2015 using waders. Access was obtained via the ladder approximately 30' to the east of the retaining wall.

### *Inspection Findings*

Overall, the retaining wall is in fair condition. There is mortar loss throughout the joints, with vegetation growth present (see Photo 2). There are typically loose small stones adjacent to the failed joints. There is an area of missing stones at the top of the south face of the wall, 7' from the west end, measuring 4'-6" long x 1'-6" high (see Photo 2).

On the north face of the wall (pedestrian side), there are loose stones within the bottom 1'-0" height, throughout the length of the wall. Some stones are missing, with fill visible and penetration up to 1'-0" deep (see Photos 3-6).

The stream channel bottom is comprised of small rocks, gravel and sand. There was no evidence of scour or undermining.

### *Recommendations*

The upper 3'-6" of the retaining wall (pedestrian barrier) should be repaired, due to loose and missing stones. The remaining height of the wall (south face) should be repointed at the masonry joints.

Retaining Wall	Repair Recommendation	Priority	Wall Section	Station	Photos	Unit	Qty.	Unit Cost	Total Est. Cost
29	Replace missing stones.	2	1	7'	2	CY	1	\$1,000	\$1,000
			1	NF	3-6	CY	4	\$1,000	\$4,000
29	Repoint the masonry joints.	M	1	-	2	SF	858	\$35	\$30,030
29	Remove vegetation from the wall.	V	1	-	2	LS	1	\$500	\$500
NF = North Face								<b>Total Repair Costs</b>	<b>\$35,530</b>

Note: These estimated costs are approximate and should only be used as a reference and for project planning purposes. Although they represent the costs for individual repair activities, they may not represent the total cost of a complete repair/rehabilitation project. Costs for items such as Design, Permitting, Mobilization/Demobilization, Maintenance of Traffic, Stream Diversion, Submittal Reviews, etc. would have to be added to the costs provided to develop a comprehensive project cost.

SECOND PRIORITY (Designated as "2") - The second priority items include defects which do not pose an immediate safety concern, but have the potential to advance to a safety threat if left untreated. These defects exist at portions of the retaining wall which support buildings, roadways, parking lots, or pedestrian areas. The repairs should be completed within 3 years.

## **Ellicott City Retaining Walls Inspection Report**

### **Retaining Wall 29**

MAINTENANCE (Designated as "M") - This item includes preventative maintenance. These repairs will increase the life span of the retaining wall and should be completed as funds become available. Maintenance items include clearing vegetation from stone masonry joints and repointing the joints.

VEGETATION REMOVAL (Designated as "V") - This item includes the removal of vegetation growth, including mature trees, from the vicinity of the retaining walls. These repairs should be completed as funds become available; however, vegetation will continue to impact the retaining walls until removed.

**Ellicott City Retaining Walls Inspection Report**  
**Retaining Wall 29**



*Photo 1 – Elevation, Looking Northwest.*



*Photo 2 – Area of Missing Stones at Top of South Face.  
Note Missing Mortar throughout Joints*

**Ellicott City Retaining Walls Inspection Report**  
**Retaining Wall 29**



*Photo 3 – Failed Mortar Joints and Missing Stones in North Face.*



*Photo 4 – Loose and Missing Stones at Base of North Face at Mid-Length, Looking South.*

**Ellicott City Retaining Walls Inspection Report**  
**Retaining Wall 29**



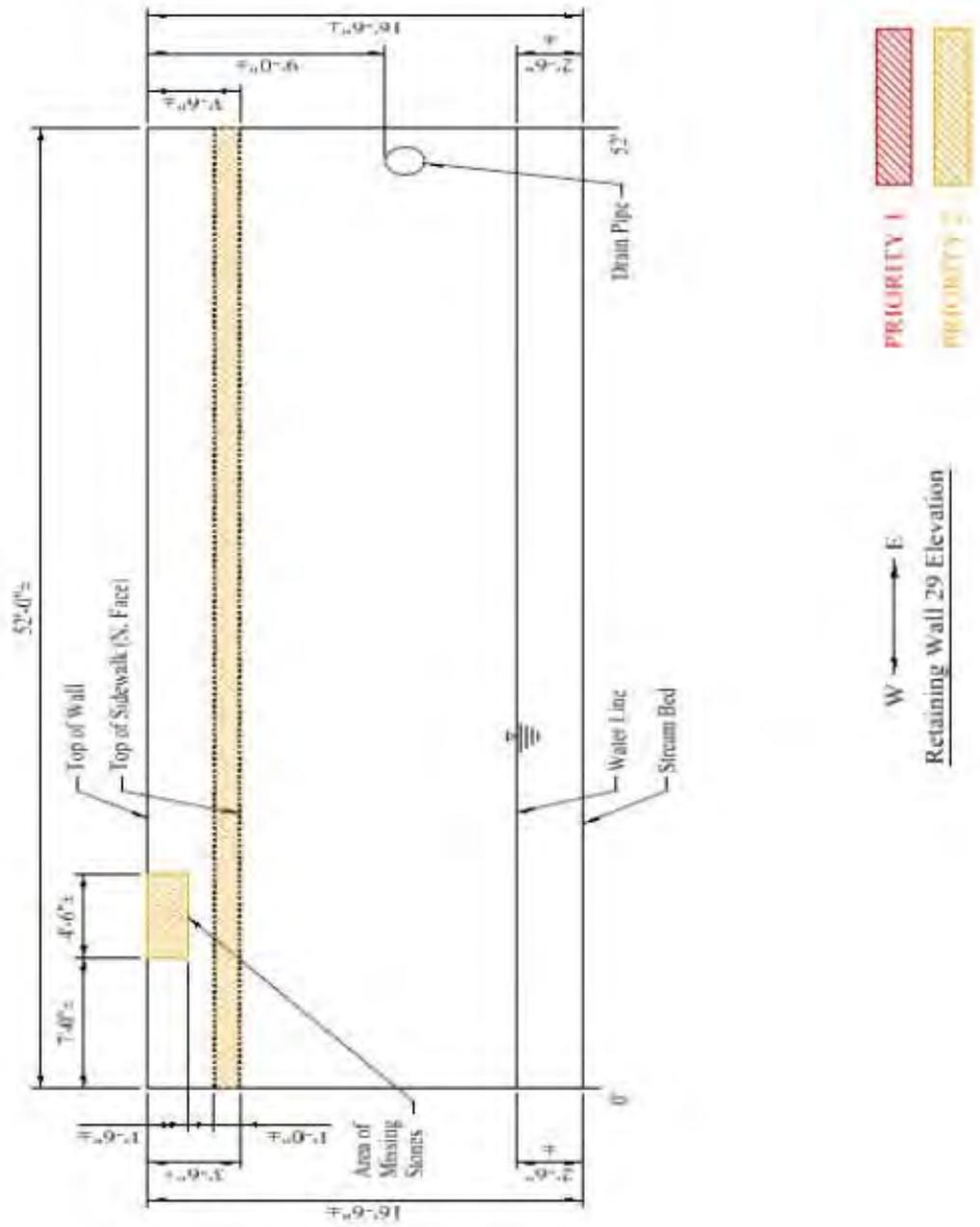
*Photo 5 – Loose and Missing Stones at Base of North Face at 15' from East End, Looking South.*



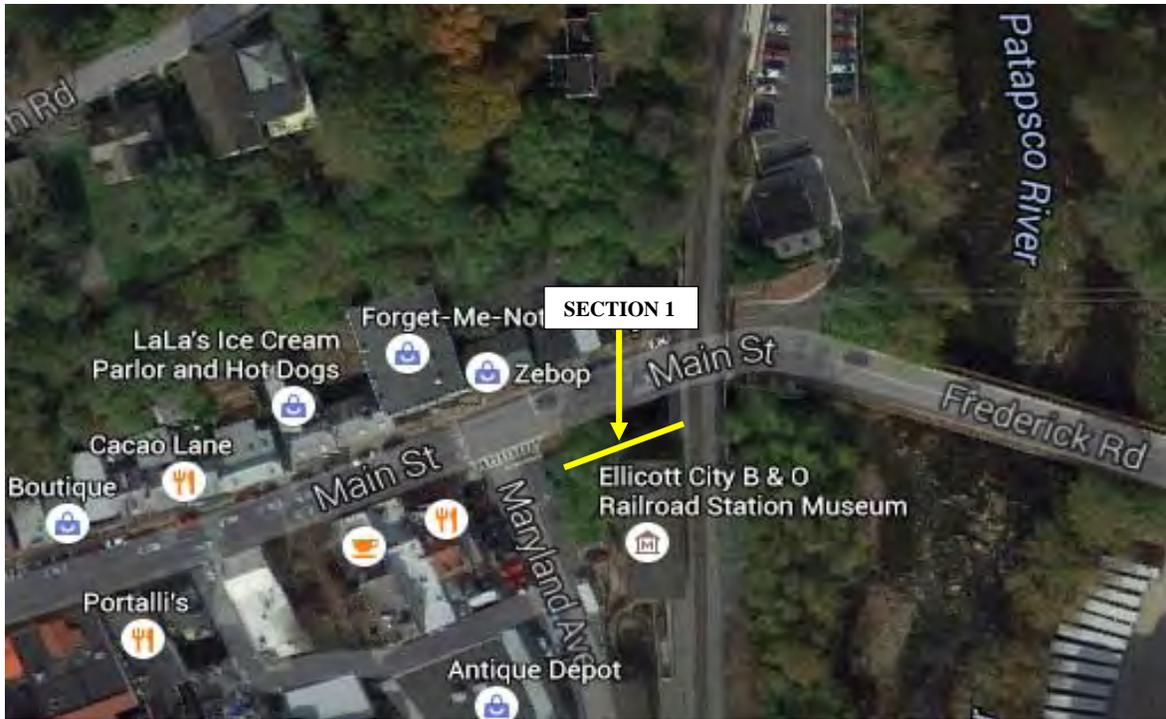
*Photo 6 – Large Loose Stone at Base of North Face near West End, Looking South.*

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 29



**Ellicott City Retaining Walls Inspection Report  
Retaining Wall 30**



**LOCATION MAP**

**AT ELLICOTT CITY B&O RAILROAD STATION MUSEUM  
ALONG TIBER RUN**

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 30

### *Description*

Retaining Wall 30 runs along the south side of Tiber Run adjacent to the Ellicott City B&O Railroad Station Museum, in Ellicott City, MD. The wall is approximately 42'± long between the CSX Railroad Bridge (east limit) and Maryland Avenue Bridge (west limit). The wall varies between 12'-0"± and 15'-0"± high. The wall is comprised of stone masonry. The year built is unknown. The previous inspection report from February 2015 was available for review, but no plans were available. The railroad bridge has a catwalk which is supported by timber posts, one of which bears directly on top of the retaining wall, approximately 8'-0" from the east end of the wall.

The retaining wall inspection was performed on October 21, 2015 using waders. Access was obtained via the ladder attached to the opposite retaining wall, approximately 30' to the east.

### *Inspection Findings*

Overall, the retaining wall is in poor condition. The east end of the wall is bulging outward for a 10'-0" length, with a large area of missing stones and settled soil above the wall.

The stone masonry retaining wall has random areas of mortar loss throughout the joints (see Photo 3). There is light to moderate vegetation growth on the wall. A small area of stones at the top of the wall have shifted, located approximately 5'-0" from the west end (see Photo 4). There is a 4" diameter drain pipe located 1'-0" below the area of shifted stones. The east end of the retaining wall is bulging outward for a 10'-0" length (see Photo 5). The front face of the wall is bulging outward up to 1'-10" at the base of the wall (see Photos 5 and 6). There is a large void behind the bulge at the east end, extending full height at the interface between the wall and the railroad bridge abutment, and can be probed to approximately 2'-0" deep horizontally (southward).

Above the east end of the wall, there is an area of soil settlement extending 5'-0" to the south from the front face of the wall (see Photo 7). The settlement extends to the catwalk support post (to the west), which bears directly on top of the wall in the vicinity of the bulging portion (see Photo 8). There is up to 2" vertical misalignment between the stones on the top of the wall, directly under the support post, and the adjacent stone to the west. This is most evident at the southwest corner of the base of the catwalk support post (see Photo 9).

The stream channel bottom is comprised of small rocks, gravel and sand. There are several small missing stones along the base of the wall; however, there is no evidence of scour or undermining (see Photo 10).

## Ellicott City Retaining Walls Inspection Report

### Retaining Wall 30

#### *Recommendations*

Because the east end of the retaining wall is bulging with a large void behind it, this area should be repaired immediately. Based on the condition of the catwalk support structure and the condition of the retaining wall supporting it, access to the catwalk should be prohibited, allowing no pedestrians or other loads on the catwalk structure. The missing stones along the base of the wall should be replaced.

Retaining Wall	Repair Recommendation	Priority	Wall Section	Station	Photos	Unit	Qty.	Unit Cost	Total Est. Cost
30	Rebuild the bulging eastern portion of the retaining wall, addressing settlement and providing proper drainage. In order to do so, the catwalk support structure must first be removed.	2	1	32'	5-9	CY	22	\$1,000	\$22,000
30	Reset the shifted stones at the top west end of the wall.	3	1	5'	4	EA	4	\$100	\$400
30	Replace missing stones along the base of the wall.	3	1	-	10	CY	1	\$1,000	\$1,000
30	Repoint the masonry joints.	M	1	-	3	SF	444	\$35	\$15,540
30	Remove trees / vegetation growth in the vicinity of the wall.	V	1	-	2	LS	1	\$500	\$500
<b>Total Repair Costs</b>									<b>\$39,440</b>

Note: These estimated costs are approximate and should only be used as a reference and for project planning purposes. Although they represent the costs for individual repair activities, they may not represent the total cost of a complete repair/rehabilitation project. Costs for items such as Design, Permitting, Mobilization/Demobilization, Maintenance of Traffic, Stream Diversion, Submittal Reviews, etc. would have to be added to the costs provided to develop a comprehensive project cost.

**SECOND PRIORITY** (Designated as "2") - The second priority items include defects which do not pose an immediate safety concern, but have the potential to advance to a safety threat if left untreated. These defects exist at portions of the retaining wall which support buildings, roadways, parking lots, or pedestrian areas. The repairs should be completed within 3 years.

**THIRD PRIORITY** (Designated as "3") - The third priority items include defects which exist at portions of the retaining wall which do not support pedestrian areas (along natural slopes). Failure of the wall in these areas may redirect the stream or cause flooding; however, there is less of an immediate threat to pedestrians if left untreated.

**MAINTENANCE** (Designated as "M") - This item includes preventative maintenance. These repairs will increase the life span of the retaining wall and should be completed as funds become available. Maintenance items include clearing vegetation from stone masonry joints and repointing the joints.

**VEGETATION REMOVAL** (Designated as "V") - This item includes the removal of vegetation growth, including mature trees, from the vicinity of the retaining walls. These repairs should be completed as funds become available; however, vegetation will continue to impact the retaining walls until removed.

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 30



*Photo 1 – Retaining Wall and CSX Railroad Bridge, Looking East.*



*Photo 2 – Elevation, Looking South.*

## Ellicott City Retaining Walls Inspection Report Retaining Wall 30



*Photo 3 – Typical Loose and Missing Mortar in Joints between Stones.*



*Photo 4 – Area of Shifted Stones at Top of Wall, 5' From West End.*

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 30



*Photo 5 – Bulge at East End of Wall, Looking East.*

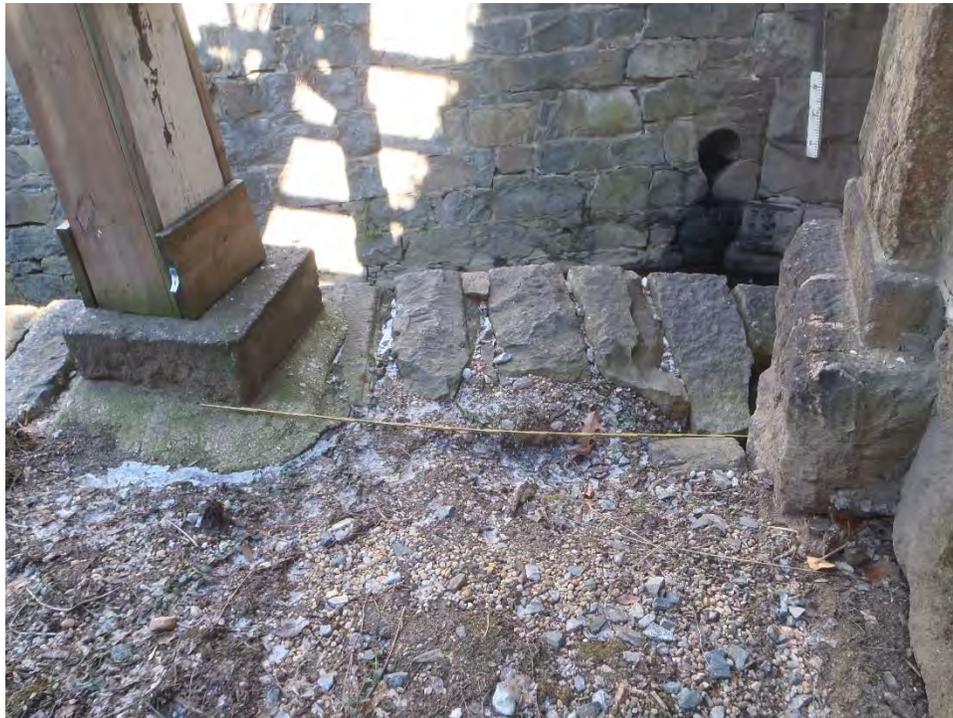


*Photo 6 – Bulge and Void at East End of Wall, Looking West.*

**Ellicott City Retaining Walls Inspection Report**  
**Retaining Wall 30**



*Photo 7 – Settlement at Top East End behind Wall, Looking Northeast.*



*Photo 8 – Settlement at Top East End with Catwalk Support Post Within Limits of Bulge.*

**Ellicott City Retaining Walls Inspection Report**  
**Retaining Wall 30**



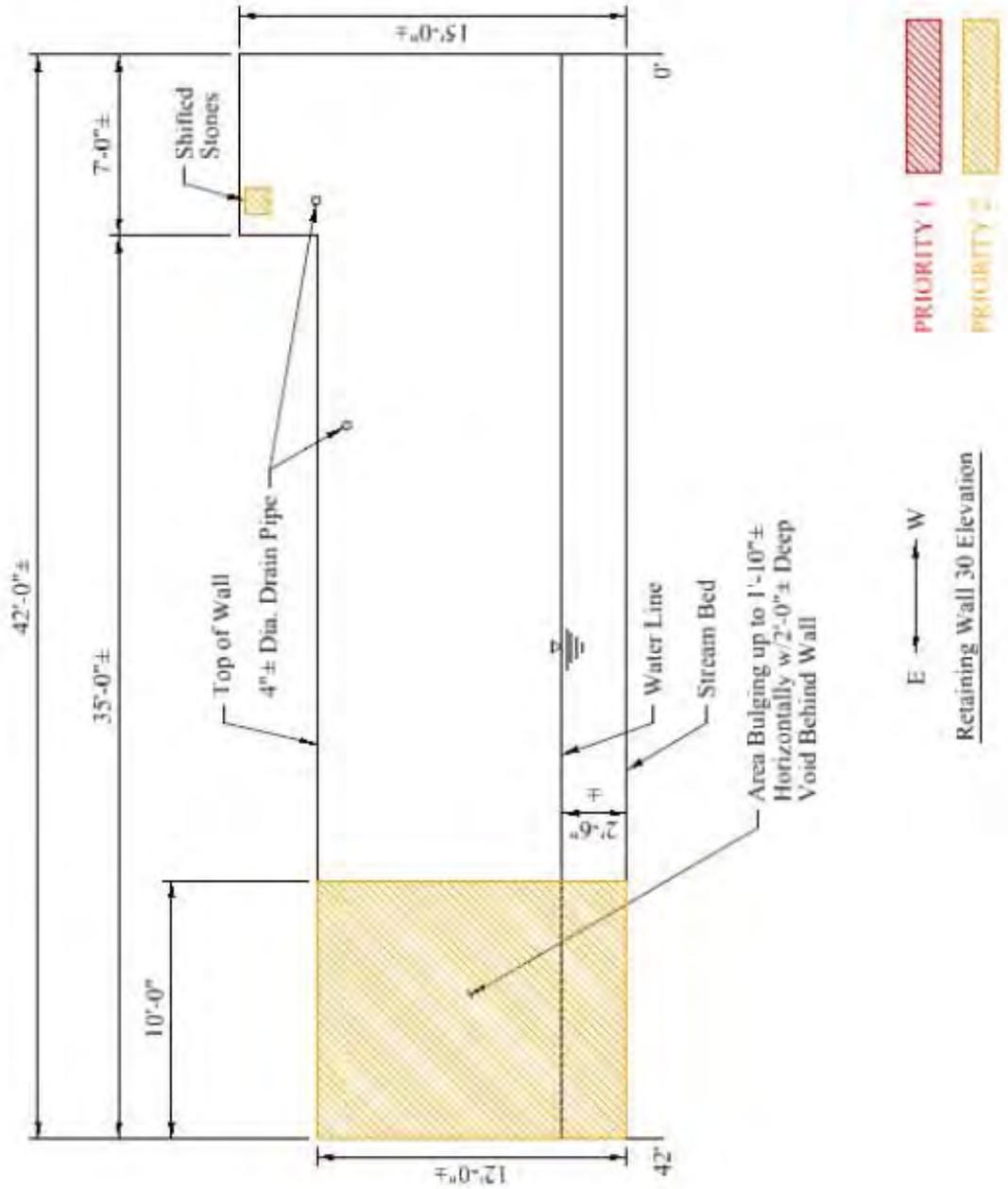
*Photo 9 – 2" Vertical Misalignment between Stones at Southwest Corner of Catwalk Support Post.*



*Photo 10 – Typical Missing Stones along Base of Wall.*

# Ellicott City Retaining Walls Inspection Report

## Retaining Wall 30



# Ellicott City Retaining Walls Inspection Report

## Conclusions

### *Repair Recommendations by Priority*

#### FIRST PRIORITY

The first priority repairs include those portions of retaining wall which are failing and pose an immediate safety threat to homeowners and pedestrians. These portions of wall should be repaired immediately. This includes portions of Retaining Walls 9A and 17A (Emergency repairs at Wall 17B are currently under construction). These areas were noted in a Critical Findings Memo to Howard County on October 30, 2015. The portions of the buildings above the walls in question should be inspected for structural integrity. This includes, but is not limited to, the properties at 8249, 8247, 8239, 8231, 8227, 8081 Main Street.

Retaining Wall	Repair Recommendation	Priority	Wall Section	Station	Photos	Unit	Qty.	Unit Cost	Total Est. Cost
9A	Remove the timber deck and rebuild the upper portion of the retaining wall, addressing settlement and providing proper drainage.	1	1	-	3-6	CY	13	\$1,000	\$13,000
9A	Repoint the masonry joints.	1	1	-	2	SF	182	\$35	\$6,370
17A	Rebuild collapsed portions of stone masonry wall.	1	9	607'	29	CY	1	\$1,000	\$1,000
17A	Rebuild failing portions of concrete wall.	1	3	157'	5-8	CY	4	\$1,000	\$4,000
17A	Tie-back leaning/bulging portions of wall.	1	4	223'	12	CY	1	\$1,000	\$1,000
			7	537'	27	CY	0.5	\$1,000	\$500
			10	815'	40	CY	1	\$1,000	\$1,000
			12	1,167'	-	CY	1	\$1,000	\$1,000
17A	Replace missing stones.	1	4	185'	10	CY	0.5	\$1,000	\$500
			4	263'	14	CY	0.5	\$1,000	\$500
			7	557'	28	CY	2	\$1,000	\$2,000
			9	607'	34	CY	1	\$1,000	\$1,000
			10	805'	36	CY	0.5	\$1,000	\$500
17A	Underpin undermined portions of wall.	1	3	145'	5	CY	0.5	\$1,000	\$500
			4	205'	11	CY	1	\$1,000	\$1,000
			5	281'	19	CY	0.5	\$1,000	\$500
			6	381'	-	CY	0.5	\$1,000	\$500
			12	1,229'	51	CY	0.5	\$1,000	\$500
<b>Total Repair Costs</b>									<b>\$35,370</b>

# Ellicott City Retaining Walls Inspection Report

## Conclusions

### SECOND PRIORITY

The second priority items include defects which do not pose an immediate safety concern, but have the potential to advance to a safety threat if left untreated. These defects exist at portions of the retaining wall which support buildings, roadways, parking lots, or pedestrian areas. The repairs should be completed within 3 years.

Retaining Wall	Repair Recommendation	Priority	Wall Section	Station	Photos	Unit	Qty.	Unit Cost	Total Est. Cost	
1A	Replace missing stones.	2	1	0'	1, 2	CY	1	\$1,000	\$1,000	
			1	65'	4	CY	0.5	\$1,000	\$500	
			2	213'	8	CY	0.5	\$1,000	\$500	
			5	696'	23	CY	0.5	\$1,000	\$500	
			5	736'	-	CY	0.5	\$1,000	\$500	
			6	803'	27, 28	CY	0.5	\$1,000	\$500	
			8	1,131'	43	CY	0.5	\$1,000	\$500	
1A	Underpin undermined portions of wall.	2	6	803'	27, 28	CY	0.5	\$1,000	\$500	
			7	850'	29	CY	0.5	\$1,000	\$500	
			7	869'	30, 31	CY	1	\$1,000	\$1,000	
			8	1,032'	39	CY	1	\$1,000	\$1,000	
1A	Repoint the masonry joints.	2	1	0'	3, 4	SF	90	\$35	\$3,150	
			2	200'	7, 8	SF	30	\$35	\$1,050	
			4	560'	16, 17	SF	75	\$35	\$2,625	
			5	693'	21	SF	10	\$35	\$350	
			6	742'	26	SF	300	\$35	\$10,500	
			7	843'	31	SF	50	\$35	\$1,750	
			8	956'	40	SF	700	\$35	\$24,500	
1A	Fill sinkholes behind east end of wall.	2	8	1,090'	46-48	CY	3	\$1,000	\$3,000	
1A	Tie-back leaning/bulging portions of wall.	2	7	869'	32	LS	-	\$500	\$500	
			7	908'	33	LS	-	\$500	\$500	
			8	1,079'	41	LS	-	\$500	\$500	
1A	Replace vertical joint seal in concrete wall.	2	2	306'	11	LF	8	\$100	\$800	
1A	Seal vertical cracks in concrete wall.	2	2	215'	9, 10	LF	100	\$35	\$3,500	
1B	Underpin undermined portions of wall.	2	4	578'	8-10	CY	0.5	\$1,000	\$500	
			4	602'	11	CY	0.5	\$1,000	\$500	
			5	609'	-	CY	0.5	\$1,000	\$500	
1B	Fill void in concrete with grout.	2	5	606'	13	CY	0.5	\$400	\$200	
1C	Underpin undermined portions of wall.	2	2	245'	13	CY	0.5	\$1,000	\$500	
			4	795'	18	CY	0.5	\$1,000	\$500	
			4	879'	25	CY	0.5	\$1,000	\$500	
1C	Rebuild collapsed portions of stone masonry wall.	2	2	162'	8	CY	4	\$1,000	\$4,000	
			2	170'	9	CY	10	\$1,000	\$10,000	
			2	254'	14	CY	11	\$1,000	\$11,000	
			2	4	826'	20,23	CY	5	\$1,000	\$5,000
			2	4	845'	20,24	CY	2	\$1,000	\$2,000
1D	Replace missing stones.	2	4	235'	13	CY	1.5	\$1,000	\$1,500	
			5	309'	20	CY	2	\$1,000	\$2,000	
			8	827'	29	CY	0.5	\$1,000	\$500	
1D	Repair spalls.	2	3	85'	5	CY	0.5	\$1,000	\$500	
			5	317'	20	CY	1	\$1,000	\$1,000	
			5	341'	-	CY	0.5	\$1,000	\$500	
1D	Underpin undermined portions of wall.	2	3	75'	6,8	CY	7	\$1,000	\$7,000	
			5	241'	15	CY	0.5	\$1,000	\$500	
			7	532'	26	CY	5	\$1,000	\$5,000	
			9	912'	34	CY	0.5	\$1,000	\$500	

## Ellicott City Retaining Walls Inspection Report Conclusions

Retaining Wall	Repair Recommendation	Priority	Wall Section	Station	Photos	Unit	Qty.	Unit Cost	Total Est. Cost
1D	Repoint the masonry joints.	2	2	53'	3, 4	SF	68	\$35	\$2,380
			4	235'	13	SF	18	\$35	\$630
			5	309'	17,18	SF	143	\$35	\$5,005
			8	801'	28	SF	52	\$35	\$1,820
			8	827'	29	SF	16	\$35	\$560
			8	862'	32	SF	60	\$35	\$2,100
			9	930'	33	SF	21	\$35	\$735
1D	Seal cracks in concrete wall.	2	3	85'	5	LF	25	\$35	\$875
			7	620'	27	LF	3	\$35	\$105
1D	Rebuild collapsed portions of timber wall.	2	3	75'	7	LS	1	\$1,000	\$1,000
9B	Repoint the masonry joints.	2	1	-	3, 4	SF	300	\$35	\$10,500
10A	Backfill the areas of fill loss.	2	4	55'	4, 6	CY	4	\$50	\$200
			4	94'	9	CY	1	\$50	\$50
10A	Replace missing stones.	2	4	55'	4, 6	CY	2	\$1,000	\$2,000
			4	94'	9	CY	1	\$1,000	\$1,000
10A	Repoint the masonry joints.	2	1	3'	1	SF	12	\$35	\$420
			3	44'	3	SF	45	\$35	\$1,575
			4	49'	4, 5	SF	35	\$35	\$1,225
			4	63'	7	SF	28	\$35	\$980
			4	94'	9	SF	60	\$35	\$2,100
10A	Repair undermining with grout bags.	2	4	58'	8	CY	5	\$500	\$2,500
10B	Replace missing stones.	2	2	46'	5	CY	1	\$1,000	\$1,000
			2	50'	5	CY	1	\$1,000	\$1,000
			4	74'	10	CY	1	\$1,000	\$1,000
			4	88'	11	CY	5	\$1,000	\$5,000
			4	100'	12	CY	1	\$1,000	\$1,000
10B	Repoint the masonry joints.	2	1	0'	2	SF	50	\$35	\$1,750
			2	25'	4	SF	50	\$35	\$1,750
			3	52'	6, 7	SF	180	\$35	\$6,300
			4	70'	9	SF	50	\$35	\$1,750
17B	Replace missing stones.	2	1	0'	3	CY	0.5	\$1,000	\$500
			8	685'	23	CY	0.5	\$1,000	\$500
			10	874'	26	CY	0.5	\$1,000	\$500
			10	927'	27	CY	0.5	\$1,000	\$500
			11	995'	31	CY	0.5	\$1,000	\$500
			12	1,187'	36	CY	0.5	\$1,000	\$500
			12	1,203'	38	CY	0.5	\$1,000	\$500
17B	Underpin undermined portions of wall.	2	6	435'	20	CY	1	\$1,000	\$1,000
			11	932'	30	CY	2	\$1,000	\$2,000
			12	1,197'	37	CY	1	\$1,000	\$1,000
29	Replace missing stones.	2	1	7'	2	CY	1	\$1,000	\$1,000
			1	NF	3-6	CY	4	\$1,000	\$4,000
30	Rebuild the bulging eastern portion of the retaining wall, addressing settlement and providing proper drainage. In order to do so, the catwalk support structure must first be removed.	2	1	32'	5-9	CY	22	\$1,000	\$22,000
<b>Total Repair Costs</b>									<b>\$206,735</b>

## Ellicott City Retaining Walls Inspection Report Conclusions

### THIRD PRIORITY

The third priority items include defects which exist at portions of the retaining wall which do not support pedestrian areas (along natural slopes). Failure of the wall in these areas may redirect the stream or cause flooding; however, there is less of an immediate threat to pedestrians if left untreated.

Retaining Wall	Repair Recommendation	Priority	Wall Section	Station	Photos	Unit	Qty.	Unit Cost	Total Est. Cost
1A	Rebuild collapsed portions of stone masonry wall.	3	1	145'	5, 6	CY	45	\$1,000	\$45,000
			4	582'	18, 19	CY	10	\$1,000	\$10,000
1B	Rebuild collapsed portions of stone masonry wall.	3	3	400'	6	CY	18	\$1,000	\$18,000
			6	630'	14, 15	CY	5	\$1,000	\$5,000
			7	702'	15	CY	35	\$1,000	\$35,000
1C	Replace missing stones.	3	5	1,107'	-	CY	1	\$1,000	\$1,000
			5	1,143'	30	CY	0.5	\$1,000	\$500
1C	Repoint the masonry joints.	3	1	60'	4	SF	85	\$35	\$2,975
			2	144'	5-7	SF	200	\$35	\$7,000
			2	273'	11-14	SF	150	\$35	\$5,250
			3	309'	17	SF	20	\$35	\$700
			3	314'	16	SF	35	\$35	\$1,225
1C	Rebuild collapsed portions of stone masonry wall.	3	3	293'	15	CY	2.5	\$1,000	\$2,500
			10	1,092'	35	CY	0.5	\$1,000	\$500
1D	Repoint the masonry joints.	3	10	1,092'	35	SF	45	\$35	\$1,575
1D	Rebuild collapsed portions of stone masonry wall.	3	10	1,135'	36	CY	3	\$1,000	\$3,000
1D	Rebuild collapsed portions of timber wall.	3	4	157'	10	LS	1	\$1,000	\$1,000
8A	Rebuild collapsed portions of stone masonry wall.	3	1	0'	5	CY	5	\$1,000	\$5,000
			5	121'	16	CY	20	\$1,000	\$20,000
8A	Replace missing stones.	3	1	4'	6	CY	0.5	\$1,000	\$500
			2	38'	10	CY	2	\$1,000	\$2,000
			3	52'	11, 13	CY	3	\$1,000	\$3,000
			4	117'	14	CY	0.5	\$1,000	\$500
8B	Rebuild collapsed and failing portions of stone masonry wall.	3	2	23'	3	CY	3	\$1,000	\$3,000
			5	135'	10	CY	2	\$1,000	\$2,000
8B	Replace missing stones.	3	4	103'	7	CY	1	\$1,000	\$1,000
9B	Rebuild the western 16' length of the stone masonry retaining wall, as well as the wall between Retaining Walls 8B and 9B.	3	1	0'	2	CY	10.0	\$1,000	\$10,000

## Ellicott City Retaining Walls Inspection Report Conclusions

Retaining Wall	Repair Recommendation	Priority	Wall Section	Station	Photos	Unit	Qty.	Unit Cost	Total Est. Cost
13A	Repair undermining with grout bags.	3	1	0'	3, 4	CY	0.5	\$500	\$250
			2	168'	8	CY	0.5	\$500	\$250
13A	Replace missing stones.	3	1	8'	2	CY	1	\$1,000	\$1,000
			1	26'	5	CY	0.5	\$1,000	\$500
13B	Replace missing stones.	3	1	5'	2	CY	1	\$1,000	\$1,000
			1	9'	4	CY	1	\$1,000	\$1,000
			1	26'	5	CY	4	\$1,000	\$4,000
13B	Fill voids with grout below P.A.M coating.	3	1	5'	4	CY	1	\$500	\$500
			1	9'	4	CY	1	\$500	\$500
			1	26'	5	CY	4	\$500	\$2,000
13B	Remove P.A.M. coating and repoint the masonry joints.	3	2	219'	9	SF	58	\$50	\$2,900
28	Replace missing stones.	3	1	370'	6	CY	2	\$1,000	\$2,000
30	Reset the shifted stones at the top west end of the wall.	3	1	5'	4	EA	4	\$100	\$400
30	Replace missing stones along the base of the wall.	3	1	-	10	CY	1	\$1,000	\$1,000
<b>Total Repair Costs</b>									<b>\$216,775</b>

## Ellicott City Retaining Walls Inspection Report Conclusions

### MAINTENANCE

The fourth priority items include preventative maintenance. These repairs will increase the life span of the retaining wall and should be completed as funds become available. Maintenance items include clearing vegetation from stone masonry joints and repointing the joints.

Retaining Wall	Repair Recommendation	Priority	Wall Section	Station	Photos	Unit	Qty.	Unit Cost	Total Est. Cost
1B	Repoint the masonry joints.	M	5	603'	-	SF	30	\$35	\$1,050
			8	1,034'	-	SF	20	\$35	\$700
8A	Repoint the masonry joints.	M	1	0'	-	SF	110	\$35	\$3,850
			2	22'	9	SF	180	\$35	\$6,300
			3	52'	11	SF	540	\$35	\$18,900
			4	112'	14	SF	152	\$35	\$5,320
8B	Repoint the masonry joints.	M	1	0'	2	SF	115	\$35	\$4,025
			2	40'	-	SF	65	\$35	\$2,275
			3	53'	5	SF	250	\$35	\$8,750
12B	Repoint the masonry joints.	M	1	0'	3	SF	300	\$35	\$10,500
13A	Repoint the masonry joints.	M	1	8'	2	SF	176	\$35	\$6,160
			1	30'	-	SF	24	\$35	\$840
			2	134'	7	SF	80	\$35	\$2,800
13B	Repoint the masonry joints.	M	1	9'	1	SF	20	\$35	\$700
17A	Repoint the masonry joints.	M	1	0'	1	SF	50	\$35	\$1,750
			2	88'	2, 3	SF	300	\$35	\$10,500
			4	185'	9	SF	500	\$35	\$17,500
			5	281'	16	SF	100	\$35	\$3,500
			6	342'	-	SF	10	\$35	\$350
			7	461'	27	SF	40	\$35	\$1,400
			9	607'	35	SF	50	\$35	\$1,750
			10	795'	40	SF	75	\$35	\$2,625
			11	993'	45	SF	100	\$35	\$3,500
			12	1,157'	50	SF	200	\$35	\$7,000
17B	Repoint the masonry joints.	M	1	0'	1, 2	SF	50	\$35	\$1,750
			2	53'	11	SF	10	\$35	\$350
			4	252'	14	SF	100	\$35	\$3,500
			5	410'	17	SF	200	\$35	\$7,000
			8	685'	23	SF	100	\$35	\$3,500
			10	837'	26	SF	50	\$35	\$1,750
			11	932'	29	SF	200	\$35	\$7,000
			12	1,148'	35	SF	100	\$35	\$3,500
28	Repoint the masonry joints.	M	1	-	3-5	SF	100	\$35	\$3,500
29	Repoint the masonry joints.	M	1	-	2	SF	858	\$35	\$30,030
30	Repoint the masonry joints.	M	1	-	3	SF	444	\$35	\$15,540
<b>Total Repair Costs</b>								<b>\$199,465</b>	

## Ellicott City Retaining Walls Inspection Report Conclusions

### VEGETATION REMOVAL

This item includes the removal of vegetation growth, including mature trees, from the vicinity of the retaining walls. These repairs should be completed as funds become available; however, vegetation will continue to impact the retaining walls until removed.

Retaining Wall	Repair Recommendation	Priority	Wall Section	Station	Photos	Unit	Qty.	Unit Cost	Total Est. Cost
1A	Remove trees / vegetation growth in the vicinity of the wall.	V	-	-	-	LS	1	\$20,000	\$20,000
1B	Remove trees / vegetation growth in the vicinity of the wall.	V	-	-	-	LS	1	\$20,000	\$20,000
1C	Remove trees / vegetation growth in the vicinity of the wall.	V	-	-	-	LS	1	\$20,000	\$20,000
1D	Remove trees / vegetation growth in the vicinity of the wall.	V	-	-	-	LS	1	\$20,000	\$20,000
8A	Remove trees / vegetation growth in the vicinity of the wall.	V	-	-	-	LS	1	\$10,000	\$10,000
8B	Remove trees / vegetation growth in the vicinity of the wall.	V	-	-	-	LS	1	\$10,000	\$10,000
9A	Remove the mature tree growing in front of the wall.	V	1	5'	2	LS	1	\$2,000	\$2,000
10B	Remove trees / vegetation growth in the vicinity of the wall.	V	3	52'	6	LS	1	\$1,000	\$1,000
13A	Remove trees / vegetation growth in the vicinity of the wall.	V	1, 2	-	1, 6	LS	1	\$500	\$500
13B	Remove trees / vegetation growth in the vicinity of the wall.	V	1, 2	-	1, 3, 6, 9	LS	1	\$5,000	\$5,000
17A	Remove trees / vegetation growth in the vicinity of the wall.	V	-	-	-	LS	1	\$40,000	\$40,000
17B	Remove trees / vegetation growth in the vicinity of the wall.	V	-	-	-	LS	1	\$10,000	\$10,000
29	Remove vegetation from the wall.	V	1	-	2	LS	1	\$500	\$500
30	Remove trees / vegetation growth in the vicinity of the wall.	V	1	-	2	LS	1	\$500	\$500
<b>Total Repair Costs</b>								<b>\$159,500</b>	

# Ellicott City Retaining Walls Inspection Report

## Conclusions

### *Conclusions – Cost Breakdown by Retaining Wall*

<b>Retaining Wall</b>	<b>Est. Cost</b>
1A	\$134,725
1B	\$81,450
1C	\$86,900
1D	\$60,285
8A	\$75,370
8B	\$31,050
9A	\$21,370
9B	\$20,500
10A	\$12,050
10B	\$21,550
12A	\$0
12B	\$10,500
13A	\$12,300
13B	\$17,600
17A	\$105,875
17B	\$45,850
28	\$5,500
29	\$35,530
30	\$39,440
<b>TOTAL</b>	<b>\$817,845</b>

APPENDIX A – LETTER OF CONCERN



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936 Ridgebrook Road • Sparks, MD 21152 • Phone 410-316-7800 • Fax 410-316-7885

## MEMORANDUM

**TO:** Mark S. Richmond, P.E.

**FROM:** Robert A. Weaver, P.E.

**DATE:** October 30, 2015

**SUBJECT:** Consulting Services Agreement CA 23-2013  
Task 73: Ellicott City Retaining Wall Inspections  
Critical Findings at Wall #9 and Wall #17  
KCI Job No. 17-133314.73

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As discussed at our site meeting on October 29, 2015, several critical findings were discovered during the recent inspections of Retaining Wall Nos. 9 and 17. Our inspection on October 21, 2015 revealed a section of wall which is leaning and may result in failure for support of a private residence deck at Wall 9. Our October 27, 2015 inspection at Wall 17 revealed severe undermining at the base of the wall and a 3' diameter sinkhole behind the wall on the south side of Tiber Run near Parking Lot D, as well as several unstable portions of the wall on the north side of the stream, where private buildings bear on the wall.

Detailed descriptions and photographs are included with this correspondence for your reference.

Should you require additional information, please do not hesitate to call me at 410-316-7800 x1543.

**CC:** James Witmer, P.E.  
John Hudacek, P.E.  
Kerry Rexroad, P.E.  
File

*Employee-Owned Since 1988*

## **RETAINING WALL #9**

### **8398 Court Ave**

#### **Inspection Findings**

Retaining Wall 9 is just west of Court Ave, west of Parking Lot E. The wall is behind the property located at 8398 Court Ave and is along the north side of the stream.

The wall is out of plumb, leaning towards the channel. Stone masonry portions of the wall have loose and missing stones. There are steel I-beams cantilevered into the retaining wall which support a timber deck on the property. The stones around these beams are unstable. The northeast corner of the deck has sunken in and is currently roped off.

#### **Assessment and Recommendations**

The wall should be removed and rebuilt. The steel I-beams and timber deck may need to be temporarily supported during this work.



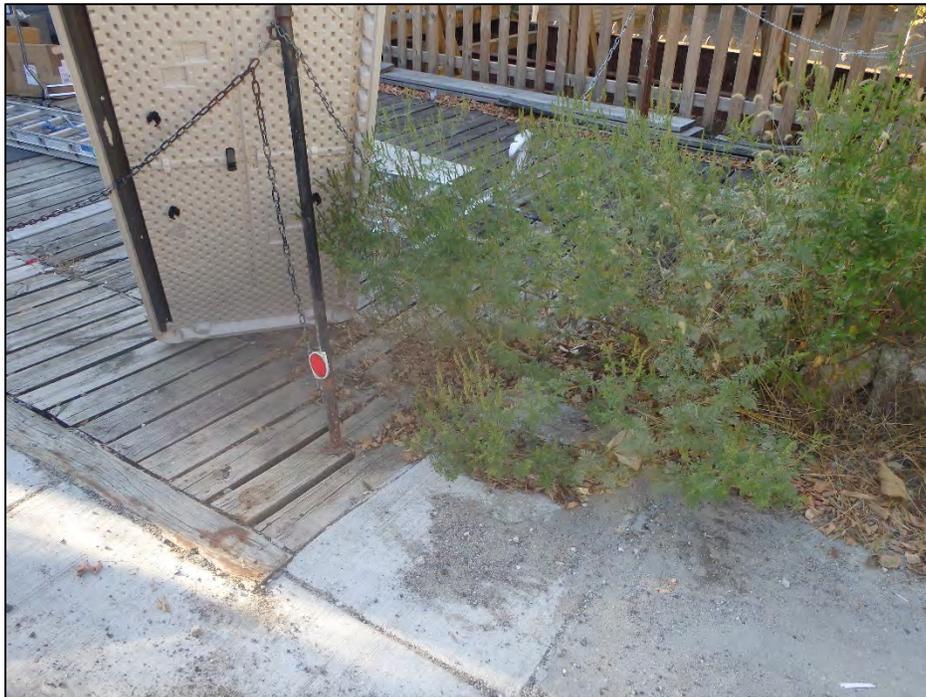
Photograph 1. Overall View of RW9, Looking Northeast.



Photograph 2. RW9 Leaning Toward Channel, Looking East.



Photograph 3. Loose Stones in RW9, Looking Northeast.



Photograph 4. Northeast Corner of Deck Closed off at Top of RW9, Looking Southwest.

## **RETAINING WALL #17B (South Wall)**

### **Inspection Findings**

Retaining Wall 17B is positioned along the south bank of Tiber Creek, just east of Parking Lot D (between parking lot and Old Columbia Pike). The wall is undermined along its length along the channel, up to 2 feet high, and could be probed up to 4 feet deep. There was an area of loose stones measuring 2 feet high x 4 feet wide around a drain pipe at the top right corner of the wall.

Behind the wall, there is a grass area that serves as a courtyard for several businesses. A patio has been constructed, positioned so that the north edge of the patio is 3 feet from the front face of the retaining wall. There is an erosion hole behind the retaining wall located 32 feet from the west end of the wall. The erosion hole is 3 feet in diameter on the surface, but extends at least 10 feet in either direction underground. There was evidence of a broken drain pipe in the erosion hole. The extent of the erosion could not be determined; however, it can be assumed that the erosion is encroaching upon the patio at the west end of the wall. The north edge of the patio (1 foot wide) shows signs of settlement towards the channel.

### **Assessment and Recommendations**

While the ends of the wall are supported and connected to adjacent walls, erosion behind the wall may continue without affecting the wall itself. The erosion hole behind the wall is a safety hazard to pedestrians and has been marked off with rope by the local business owner. The patio poses a safety hazard to pedestrians and could continue to settle as erosion continues.

As an immediate measure, the patio and area behind the wall should be roped off or fenced in to prevent public access. The eroded area behind the wall should be backfilled, possibly with flowable fill. The drain pipes should be repaired or replaced to allow for proper drainage. The undermined area below the wall should be backfilled with grout or grout bags and scour countermeasures, such as a concrete apron, should be installed. To dissipate the flow energy that has undermined the wall, a plunge pool should be constructed with large boulders at the downstream end of the adjacent bridge apron.



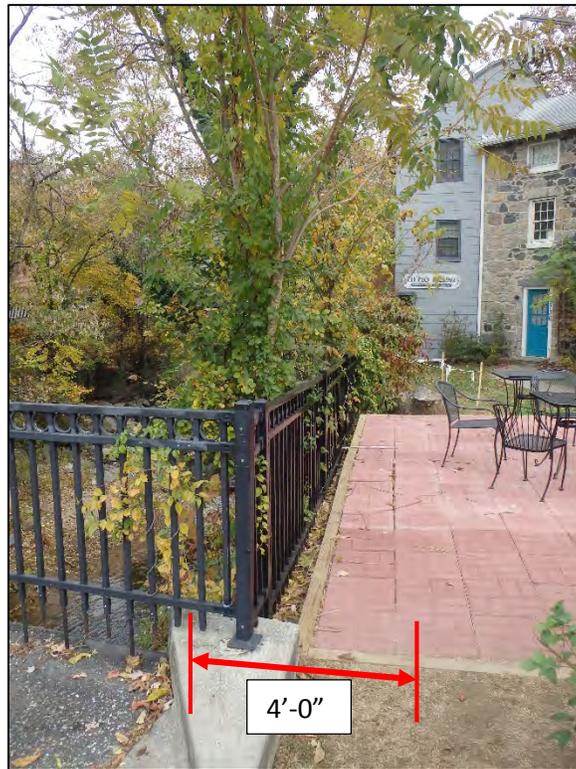
Photograph 1. Overall View of RW17B (S.Wall), Looking Southeast.  
Wall is Undermined, Up to 4'-0" Back



Photograph 2. View of Undermining Along Wall, Looking Southwest.



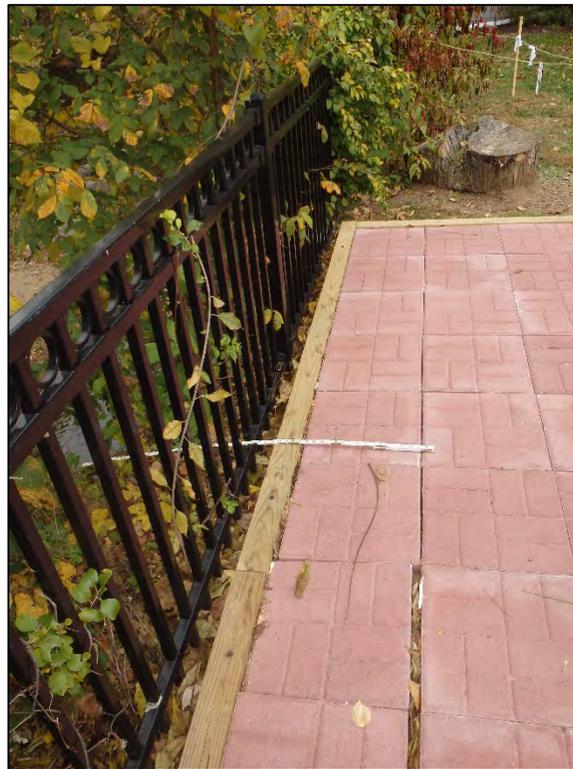
Photograph 3. View of Patio above Wall, Looking South.



Photograph 4. View of Patio with Settled Edge, Looking East.



Photograph 5. Top Right Corner of Wall - Drain Below Patio with Loose Stones, Looking South.



Photograph 6. View of Settled Patio, Looking East.



Photograph 7. View of Erosion Hole behind Wall, Looking North.



Photograph 8. View of Erosion Hole behind Wall, at Location of Broken Drain Pipe

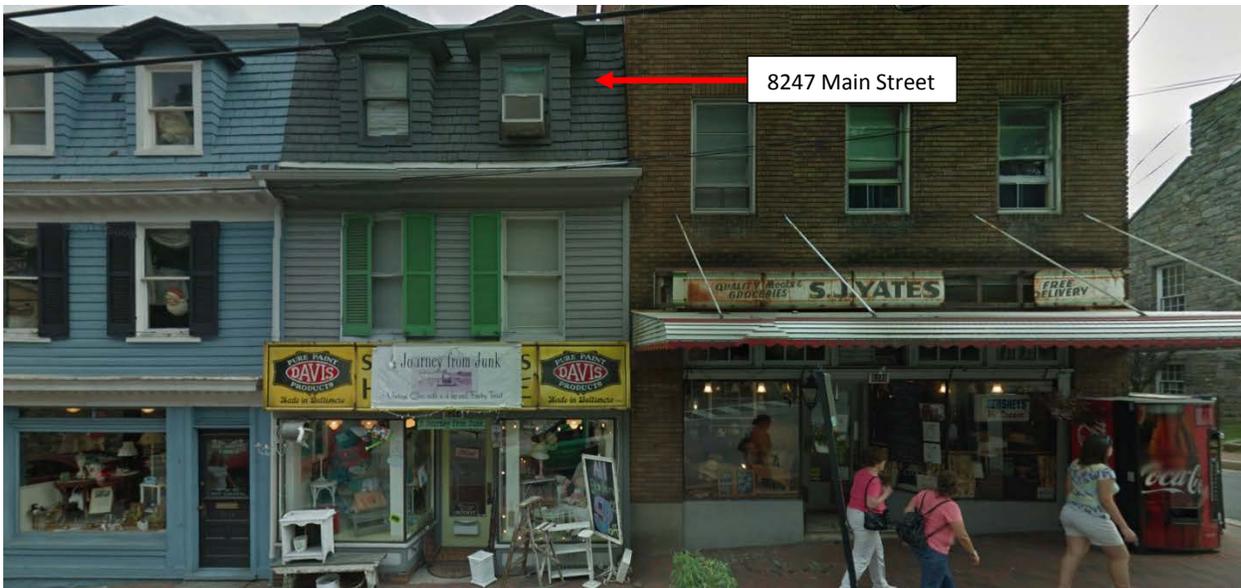
## RETAINING WALL #17A (North Wall)

### Inspection Findings

Retaining Wall 17A is positioned along the north bank of Tiber Creek, east of Parking Lot D (between parking lot and Old Columbia Pike), along the back side of several private properties. The wall acts as part of the structural support system for several houses and businesses along Main Street. The stone masonry portions of the wall typically have missing mortar at the joints, with voids that could be probed 2 feet deep to fill. The wall voids could be probed deeper than 2 feet in some locations, with the condition generally worse along the base of the wall.

### Journey From Junk 8247 Main Street

The retaining wall along the back of this property is constructed of concrete. The wall exhibits a full-height fracture at mid-length, open up to ¼ inch wide. There is a large tree (~2 foot diameter trunk) located behind the wall, in line with this fracture, that could be impacting the wall. The bottom of the wall was undermined 10 feet long x 6 inches high and could be probed up to 1 foot deep. The top right corner of the wall (5 feet high x 4 feet wide) has fractured and is leaning up to 4 inches towards the channel. The portion of the wall perpendicular to this corner (running north-south towards house) was leaning to the east. This portion of the wall supports a timber column at the corner of the house. The column is out of plumb, although measurements were not taken due to lack of access. The presence of erosion behind the wall was not investigated.





Photograph 1. View of RW17A (N.Wall), Looking Northeast.  
Note Tree Behind Wall.



Photograph 2. Full-Height Fracture and Undermining, Looking North.



Photograph 3. View of Portion of Wall Supporting the Building Column, Looking Northwest.



Photograph 4. View of Cantilevered Portion of Building over Wall, Looking West.

**Salon Marielle**  
**8239 Main Street**

The retaining wall along the back of this property is constructed of stone masonry. There is a 10 foot long stone masonry wall which has been constructed on top of the original wall, under the back portion of the house. The base of the original retaining wall exhibits loss of mortar at the joints, with a 9 foot long x 2 foot high area with voids that could be probed 2 feet deep to fill. A 5 foot wide portion of the wall at the east edge of the property is bulging with up to 4 inches of horizontal displacement. The bulging is worse at the top of the wall. The presence of sink holes or erosion behind the retaining wall was not investigated due to lack of access. There is vegetation growth with root systems at the top of the wall and randomly throughout the mortar joints.





Photograph 1. View of RW17A (N.Wall), Looking North.



Photograph 2. View of Cantilevered Portion of Building over Wall, Looking West. Note Bulging Wall.

## Residence

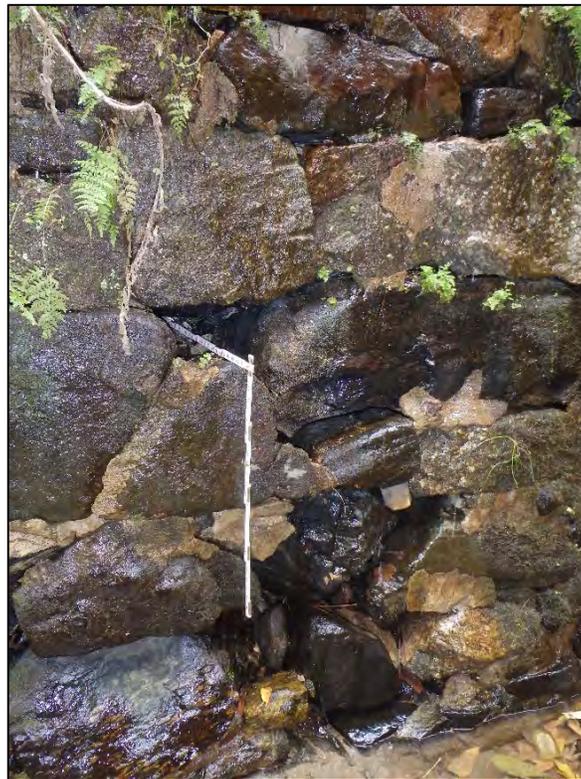
### 8231 Main Street

The retaining wall along the back of this property is constructed of stone masonry. There is a 10 foot long portion of the wall along the west half of the property with active water leakage through the open joints (weather was clear at time of inspection). The voids at the joints could be probed up to 5 feet deep to fill. There is a brick wall bearing on top of the stone masonry wall, and a building column which bears on this brick wall at the west corner of the building. The back face of the building bears on the stone masonry wall in the eastern half of the property.





Photograph 1. View of RW17A (N.Wall), Looking Northeast.



Photograph 2. View of Voids and Water Leakage Through Wall, Looking North.

## Retropolitan

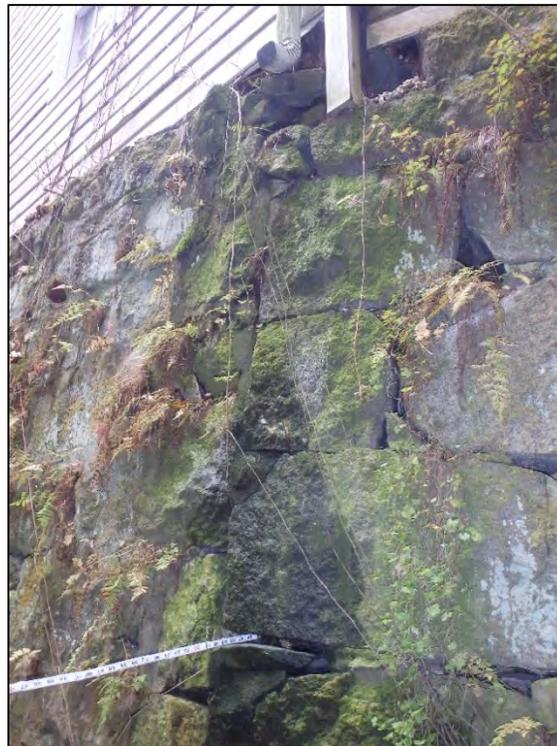
### 8227 Main Street

The retaining wall along the back of this property is constructed of stone masonry. There are typically voids probed 2.5 feet deep to fill with vegetation growth. There is a large void at the base of the wall, measuring 2 feet high x 3 feet wide x 2.5 feet deep (missing stone). The back face of the building bears on the stone masonry wall.





Photograph 1. View of RW17A (N.Wall), Looking Northeast.



Photograph 2. View of Typical Voids and Vegetation Growth Throughout Wall, Looking Northwest.

## **Assessment and Recommendations**

The length of the wall supports several buildings along Main Street. There is erosion behind the wall as evidenced by probing; however, the extent of erosion is unknown. The wall is unstable in locations which support building structures. If these portions of wall were to fail, the building columns which bear on the wall will fail.

The source of the water leakage should be investigated prior to performing any wall repairs. The recommendations for the wall in this area are as follows:

- The portions of the buildings above the retaining wall should be inspected for structural integrity. These buildings may require temporary support during this work.
- Remove and rebuild the bulging portions of the stone masonry wall.
- Remove and replace the leaning portions of the concrete wall.
- Remove all trees and vegetation from the top and back of the wall.
- Fill all undermined areas and voids with grout.
- Replace all missing stones.
- Repoint all areas of missing mortar.